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# AMERICAN NATIONAL STANDARD

# ANSI/SCTE 24-21 2022 (R2022)

**BV16 Speech Codec Specification for Voice over IP Applications in Cable Telephony** 

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#### 1 **DOCUMENT TYPES AND TAGS**

Document Type: Specification Document Tags:

□ Test or Measurement

 $\Box$  Checklist

 $\boxtimes$  Architecture or Framework

□ Metric  $\Box$  Cloud

 $\Box$  Procedure, Process or Method

□ Facility

⊠ Access Network

Customer Premises

# 2 DOCUMENT RELEASE HISTORY

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Note: This document is a reaffirmation of SCTE 24-21 2017. No substantive changes have been made to this document. Information components may have been updated such as the title page, NOTICE text, headers, and footers.

# Contents

1	DOCUMENT TYPES AND TAGS	3
2	DOCUMENT RELEASE HISTORY	4
3	INTRODUCTION	7
4	OVERVIEW OF THE BV16 SPEECH CODEC	7
	4.1 Brief Introduction of Two-Stage Noise Feedback Coding (TSNFC)	7
	4.2 Overview of the BV16 Codec	9
5	DETAILED DESCRIPTION OF THE BV16 ENCODER	.13
	5.1 High-Pass Pre-Filtering	13
	5.2 Short-Term Linear Predictive Analysis	13
	5.3 Conversion to LSP	16
	5.4 LSP Quantization	18
	5.5 Conversion to Short-Term Predictor Coefficients	23
	5.6 Long-Term Linear Predictive Analysis (Pitch Extraction)	24
	5.7 Long-Term Predictor Parameter Quantization	32
	5.8 Excitation Gain Quantization	33
	5.9 Excitation Vector Quantization	37
	5.10Bit Multiplexing	40
6	DETAILED DESCRIPTION OF THE BV16 DECODER	42
	6.1 Bit De-multiplexing	42
	6.2 Long-Term Predictor Parameter Decoding	42
	6.3 Short-Term Predictor Parameter Decoding	42
	6.4 Excitation Gain Decoding	45
	6.5 Excitation VQ Decoding and Scaling	48
	6.6 Long-Term Synthesis Filtering	48
	6.7 Short-Term Synthesis Filtering	48
	6.8 Example Postfilter	48
	6.9 Example Packet Loss Concealment	50
AP	PENDIX 1: GRID FOR LPC TO LSP CONVERSION	.54
AP	PENDIX 2: FIRST-STAGE LSP CODEBOOK	. 55
AP	PENDIX 3: SECOND-STAGE LSP SHAPE CODEBOOK	. 57
	PENDIX 4: PITCH PREDICTOR TAB CODEBOOK	
	PENDIX 5: GAIN CODEBOOK	. 59
AР	PENDIX 5: GAIN CODEBOOK PENDIX 6: GAIN CHANGE THRESHOLD MATRIX	
	PENDIX 5: GAIN CODEBOOK PENDIX 6: GAIN CHANGE THRESHOLD MATRIX PENDIX 7: EXCITATION VQ SHAPE CODEBOOK	.60

# Figures

Figure 1	Basic codec structure of Two-Stage Noise Feedback Coding (TSNFC)	8
Figure 2	An alternative codec structure of Two-Stage Noise Feedback Coding (TSNFC)	9
Figure 3	Block diagram of the BV16 encoder	10
Figure 4	Block diagram of the BV16 decoder	.12
Figure 5	Short-term linear predictive analysis and quantization (block 210)	14
Figure 6	LSP quantizer (block 216)	.19
Figure 7	Long-term predictive analysis and quantization (block 220)	25
Figure 8	Prediction residual quantizer (block 230)	34
Figure 9	Filter structure used in excitation VQ codebook search	38
Figure 10	) Bit stream format	41
Figure 11	Short-term predictor parameter decoder (block 420)	43
Figure 12	2 Excitation gain decoder	46

# Tables

Table 1 Bit allocation of the BV16 codec	12	2
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## **3** INTRODUCTION

This document is identical to SCTE 24-21 2012 except for informative components which may have been updated such as the title page, NOTICE text, headers and footers. No normative changes have been made to this document.

This document contains the description of the BV16 speech codec<sup>1</sup>. BV16 compresses 8 kHz sampled narrowband speech to a bit rate of 16 kb/s by employing a speech coding algorithm called Two-Stage Noise Feedback Coding (TSNFC), developed by Broadcom.

The rest of this document is organized as follows. Section 4 gives a high-level overview of the TSNFC algorithm. Sections 5 and 6 give detailed description of the BV16 encoder and decoder, respectively. The BV16 codec specification given in Sections 5 and 6 contain sufficient details to allow those skilled in the art to implement bit-stream compatible and functionally equivalent BV16 encoders and decoders.

## 4 OVERVIEW OF THE BV16 SPEECH CODEC

In this section, the general principles of Two-Stage Noise Feedback Coding (TSNFC) are first introduced. Next, an overview of the BV16 algorithm is given.

### 4.1 Brief Introduction of Two-Stage Noise Feedback Coding (TSNFC)

In conventional Noise Feedback Coding (NFC), the encoder modifies a prediction residual signal by adding a noise feedback signal to it. A scalar quantizer quantizes this modified prediction residual signal. The difference between the quantizer input and output, or the quantization error signal, is passed through a noise feedback filter. The output signal of this filter is the noise feedback signal added to the prediction residual. The noise feedback filter is used to control the spectrum of the coding noise in order to minimize the perceived coding noise. This is achieved by exploiting the masking properties of the human auditory system.

Conventional NFC codecs typically use only a short-term noise feedback filter to shape the spectral envelope of the coding noise, and a scalar quantizer is used universally. In contrast, Broadcom's Two-Stage Noise Feedback Coding (TSNFC) system uses a codec structure employing two stages of noise feedback coding in a nested loop: the first NFC stage performs short-term prediction and short-term noise spectral shaping (spectral envelope shaping), and the second nested NFC stage performs long-term prediction and long-term noise spectral shaping (harmonic shaping). Such a nested two-stage NFC structure is shown in Figure 1 below.

<sup>&</sup>lt;sup>1</sup> The "BV16 speech codec" specification is based on Broadcom Corporation's BroadVoice<sup>®</sup>16 speech codec. The BroadVoice<sup>®</sup> open source software is provided under the GNU Lesser General Public License ("LGPL"), version 2.1, as published by the Free Software Foundation.

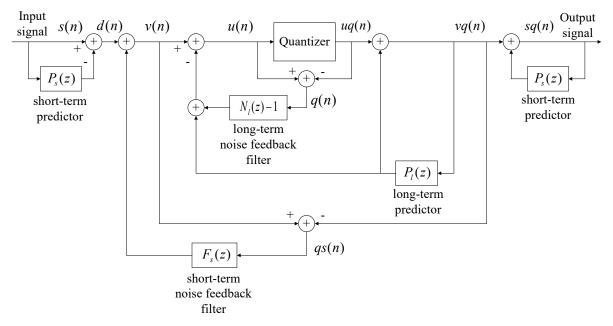


Figure 1 Basic codec structure of Two-Stage Noise Feedback Coding (TSNFC)

In Figure 1 above, the outer layer (including the two short-term predictors and the short-term noise feedback filter) follows the structure of the conventional NFC codec. The TSNFC structure in Figure 1 is obtained by replacing the simple scalar quantizer in the conventional (single-stage) NFC structure by a "predictive quantizer" that employs long-term prediction and long-term noise spectral shaping. This "predictive quantizer" is represented by the inner feedback loop in Figure 1, including the long-term predictor and long-term noise feedback filter. This inner feedback loop uses an alternative but equivalent conventional NFC structure, where  $N_l(z)$  represents the filter whose frequency response is the desired noise shape for long-term noise spectral shaping. In the outer layer, the short-term noise feedback filter  $F_s(z)$  is usually chosen as a bandwidth-expanded version of the short-term predictor  $P_s(z)$ . The choice of different NFC structures in the outer and inner layers is based on complexity consideration. By combining two stages of NFC in a nested loop, the TSNFC in Figure 1 can reap the benefits of both short-term and long-term prediction and also achieve short-term noise spectral shaping at the same time.

It is natural and straightforward to use a scalar quantizer in Figure 1. However, to achieve better coding efficiency, a vector quantizer is used in BV16. In the Vector Quantization (VQ) codebook search, the u(n) vector cannot be generated before the VQ codebook search starts. Due to the feedback structure in Figure 1, the elements of u(n) from the second element on will depend on the vector-quantized version of earlier elements. Therefore, the VQ codebook search is performed by trying out each of the candidate codevectors in the VQ codebook (i.e. fixing a candidate uq(n) vector first), calculating the corresponding u(n) vector and the corresponding VQ error q(n) = u(n) - uq(n). The VQ codevector that minimizes the energy of q(n) within the current vector time span is chosen as the winning codevector, and the corresponding codebook index becomes part of the encoder output bit stream for the current speech frame.

The TSNFC decoder structure is simply a quantizer decoder followed by the two feedback filter structures involving the long-term predictor and the short-term predictor, respectively, shown on the right half of Figure 1. Thus, the TSNFC decoder is similar to the decoders of other predictive coding techniques such as Adaptive Predictive Coding (APC), Multi-Pulse Linear Predictive Coding (MPLPC), and Code-Excited Linear Prediction (CELP).

If the alternative NFC structure in the inner feedback loop of Figure 1 is also used in the outer feedback loop, an alternative TSNFC codec structure is obtained, as shown in Figure 2 below. Here  $N_s(z)$  represents a short-term filter whose frequency response is the desired noise shape for short-term noise spectral shaping. The codec structure in Figure 2 is mathematically equivalent to the structure in Figure 1, but it allows direct specification of the short-term noise spectral shape as defined by  $N_s(z)$ . This can be an advantage in some applications.

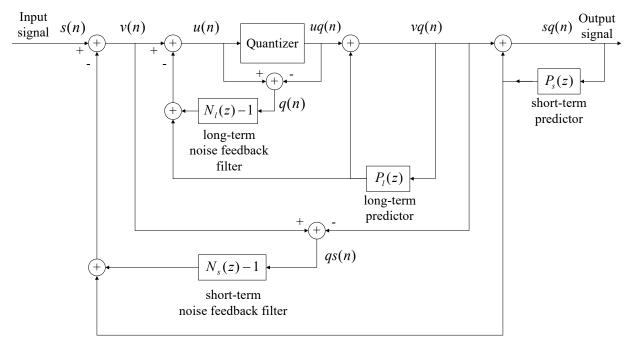


Figure 2 An alternative codec structure of Two-Stage Noise Feedback Coding (TSNFC)

## 4.2 Overview of the BV16 Codec

The BV16 codec is a purely forward-adaptive TSNFC codec. It operates at an input sampling rate of 8 kHz and an encoding bit rate of 16 kb/s, or 2 bits per sample. BV16 uses a frame size of 5 ms, or 40 samples. There is no look ahead. Therefore, the total algorithmic buffering delay is just the frame size itself, or 5 ms. The main design goal of BV16 is to make the coding delay and the codec complexity as low as possible, while providing toll speech quality exceeding or equivalent to that of G.728 and G.729E.

The block diagram of the BV16 encoder is shown in Figure 3. It is based on the alternative TSNFC codec structure shown in Figure 2. The BV16 decoder block diagram is shown in Figure 4.

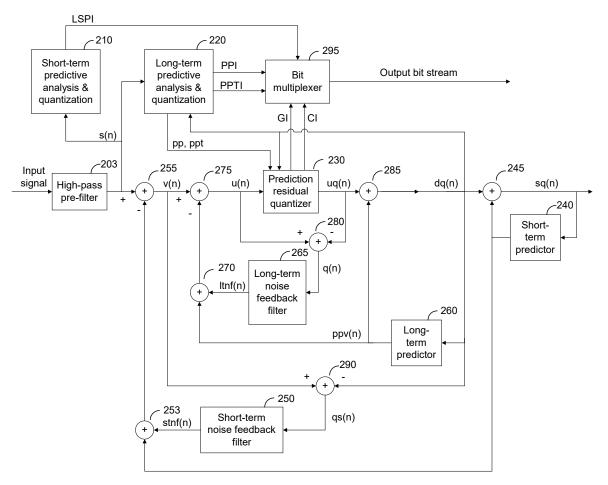


Figure 3 Block diagram of the BV16 encoder

Due to the small frame size, the parameters of the short-term predictor (also called the "LPC predictor") and the long-term predictor (also called the "pitch predictor") are both transmitted and updated once a frame. The gain of the excitation signal is transmitted once every frame. The excitation VQ uses a vector dimension of 4 samples. Hence, there are 10 excitation vectors in a frame.

The BV16 encoder first passes the input signal through a fixed pole-zero high-pass pre-filter to remove possible DC bias or low frequency rumble. The resulting signal is then used to derive the LPC predictor coefficients.

To keep the complexity low, BV16 uses a relatively low LPC predictor order of 8, and the LPC analysis window is 20 ms (160 samples) long. The LPC analysis window is asymmetric, with the peak of the window located at the center of the current frame, and the end of the window coinciding with the last sample of the current frame. Autocorrelation LPC analysis based on Levinson-Durbin recursion is used to derive the coefficients of the 8<sup>th</sup>-order LPC predictor. The

derived LPC predictor coefficients are converted to Line-Spectrum Pair (LSP) parameters, which are then quantized by an inter-frame predictive coding scheme.

The inter-frame prediction of LSP parameters uses an  $8^{\text{th}}$ -order moving-average (MA) predictor. The MA predictor coefficients are fixed. The time span that this MA predictor covers is  $8 \times 5$  ms = 40 ms. The inter-frame LSP prediction residual is quantized by a two-stage vector quantizer. The first stage employs an 8-dimensional vector quantizer with a 7-bit codebook. The second stage uses an 8-dimensional sign-shape VQ with 1 bit for sign and 6 bits for shape.

For long-term prediction, a three-tap pitch predictor with an integer pitch period is used. To keep the complexity low, the pitch period and the pitch taps are both determined in an open-loop fashion.

The three pitch predictor taps are jointly quantized using a 5-bit vector quantizer. The distortion measure used in the codebook search is the energy of the open-loop pitch prediction residual. The 32 codevectors in the pitch tap codebook have been "stabilized" to make sure that they will not give rise to an unstable pitch synthesis filter.

The excitation gain is also determined in an open-loop fashion to keep the complexity low. The average power of the open-loop pitch prediction residual within the current frame is calculated and converted to the logarithmic domain. The resulting log-gain is then quantized using intersubframe MA predictive coding. The MA predictor order for the log-gain is 8, corresponding to a time span of  $8 \times 5 = 40$  ms. Again, the log-gain MA predictor coefficients are fixed. The log-gain prediction residual is quantized by a 4-bit scalar quantizer.

The 4-dimensional excitation VQ codebook has a simple sign-shape structure, with 1 bit for sign, and 4 bits for shape. In other words, only 16 four-dimensional codevectors are stored, but the mirror image of each codevector with respect to the origin is also a codevector.

In the BV16 decoder, the decoded excitation vectors are scaled by the excitation gain. The scaled excitation signal passes through a long-term synthesis filter and a short-term synthesis filter. Figure 4 shows the block diagram of the BV16 decoder.

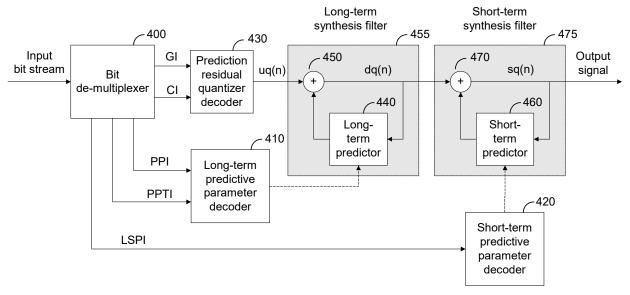


Figure 4 Block diagram of the BV16 decoder

Table 1 shows the bit allocation of BV16 in each 5 ms frame. The LSP parameters are encoded into 14 bits per frame, including 7 bits for the first-stage VQ, and 1 + 6 = 7 bits for the second-stage sign-shape VQ. The pitch period and pitch predictor taps are encoded into 7 and 5 bits, respectively. The excitation gain in each frame is encoded into 4 bits. The 10 excitation vectors are each encoded with 1 bit for sign and 4 bits for shape, resulting in 50 bits per frame for excitation VQ. Including the other 30 bits of side information, the grand total is 80 bits per 40-sample frame, which is 2 bits/sample, or 16 kb/s.

Parameter	Bits per frame (40 samples)
LSP	7 + 7 = 14
Pitch Period	7
3 Pitch Predictor Taps	5
Excitation Gain	4
10 Excitation Vectors	$(1+4) \times 10 = 50$
Total	80

 Table 1 Bit allocation of the BV16 codec

## **5 DETAILED DESCRIPTION OF THE BV16 ENCODER**

In this section, detailed description of each functional block of the BV16 encoder in Figure 3 is given. When necessary, certain functional blocks will be expanded into more detailed block diagrams. The description given in this section will be in sufficient detail to allow those skilled in the art to implement a mathematically equivalent BV16 encoder.

### 5.1 High-Pass Pre-Filtering

Refer to Figure 3. The input signal is assumed to be represented by 16-bit linear PCM. Block 203 is a high-pass pre-filter with fixed coefficients. It is a second-order pole-zero filter with the following transfer function.

$$H_{hpf}(z) = \frac{0.924133 - 1.848267 z^{-1} + 0.924133 z^{-2}}{1 - 1.899109 z^{-1} + 0.905396 z^{-2}}$$

This high-pass pre-filter removes undesirable low-frequency components from the input signal.

### 5.2 Short-Term Linear Predictive Analysis

The high-pass filtered signal s(n) is buffered at block 210, which performs short-term linear predictive analysis and quantization to obtain the coefficients for the short-term predictor 240 and the short-term noise feedback filter 250. This block 210 is further expanded in Figure 5.

Refer to Figure 5. The input signal s(n) is buffered in block 211, where a 20 ms asymmetric analysis window is applied to the buffered s(n) signal array. The "left window" is 17.5 ms long, and the "right window" is 2.5 ms long. Let *LWINSZ* be the number of samples in the left window (*LWINSZ* = 140 for 8 kHz sampling), then the left window is given by

$$wl(n) = \frac{1}{2} \left[ 1 - \cos\left(\frac{n\pi}{LWINSZ + 1}\right) \right], n = 1, 2, \dots, LWINSZ.$$

Let *RWINSZ* be the number of samples in the right window. Then, RWINSZ = 20 for 8 kHz sampling. The right window is given by

$$wr(n) = \cos\left(\frac{(n-1)\pi}{2RWINSZ}\right), n = 1, 2, \dots, RWINSZ$$

The concatenation of wl(n) and wr(n) gives the 20 ms asymmetrical analysis window, with the peak of the window located at the center of the current frame. When applying this analysis window, the last sample of the window is lined up with the last sample of the current frame. Therefore, the codec does not use any look ahead.

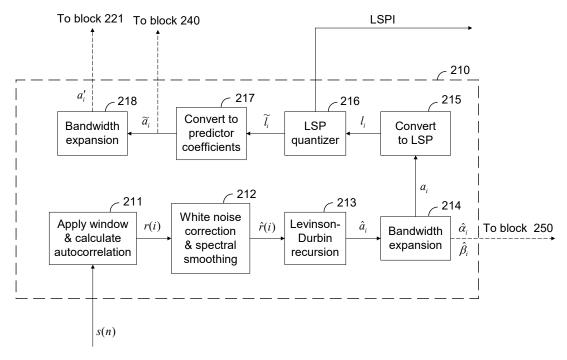


Figure 5 Short-term linear predictive analysis and quantization (block 210)

More specifically, without loss of generality, let the sampling time index range of n = 1, 2, ..., FRSZ corresponds to the current frame, where the frame size FRSZ = 40. Then, the s(n) signal buffer stored in block 211 is for n = -119, -118, ..., -1, 0, 1, 2, ..., 40. The asymmetrical LPC analysis window function can be expressed as

$$w(n) = \begin{cases} wl(n+120), & n = -119, -118, ..., 20\\ wr(n-20), & n = 21, 22, ..., 40 \end{cases}$$

The windowing operation is performed as follows.

$$s_w(n) = s(n)w(n), \quad n = -119, -118, ..., -1, 0, 1, 2, ..., 40.$$

Next, block 211 calculates the autocorrelation coefficients as follows.

$$r(i) = \sum_{n=-119+i}^{40} s_w(n) s_w(n-i), \quad i = 0, 1, 2, ..., 8.$$

The calculated autocorrelation coefficients are passed to block 212, which applies a Gaussian window to the autocorrelation coefficients to perform spectral smoothing. The Gaussian window function is given by

$$gw(i) = e^{\frac{-(2\pi i\sigma/f_s)^2}{2}}, i = 1, 2, ..., 8,$$

where  $f_s$  is the sampling rate of the input signal, expressed in Hz, and  $\sigma$  is 40 Hz.

After multiplying the r(i) array by such a Gaussian window, block 212 then multiplies r(0) by a white noise correction factor of  $WNCF = 1 + \varepsilon$ , where  $\varepsilon = 0.0001$ . In summary, the output of block 212 is given by

$$\hat{r}(i) = \begin{cases} 1.0001 \times r(0), & i = 0\\ gw(i)r(i), & i = 1, 2, \dots, 8 \end{cases}$$

Block 213 performs the Levinson-Durbin recursion to convert the autocorrelation coefficients  $\hat{r}(i)$  to the short-term predictor coefficients  $\hat{a}_i$ , i = 0, 1, ..., 8. If the Levinson-Durbin recursion exits pre-maturely before the recursion is completed (for example, because the prediction residual energy E(i) is less than zero), then the short-term predictor coefficients of the last frame is also used in the current frame. To do the exception handling this way, there needs to be an initial value of the  $\hat{a}_i$  array is set to  $\hat{a}_0 = 1$  and  $\hat{a}_i = 0$  for i = 1, 2, ..., 8. The Levinson-Durbin recursion is performed in the following algorithm.

1. If  $\hat{r}(0) \le 0$ , use the  $\hat{a}_i$  array of the last frame, and exit the Levinson-Durbin recursion.

2. 
$$E(0) = \hat{r}(0)$$

- 3.  $k_1 = -\hat{r}(1)/\hat{r}(0)$
- 4.  $\hat{a}_1^{(1)} = k_1$

5. 
$$E(1) = (1 - k_1^2)E(0)$$

- 6. If  $E(1) \le 0$ , use the  $\hat{a}_i$  array of the last frame, and exit the Levinson-Durbin recursion.
- 7. For i = 2, 3, 4, ..., 8, do the following

$$k_{i} = \frac{-\hat{r}(i) - \sum_{j=1}^{i-1} \hat{a}_{j}^{(i-1)} \hat{r}(i-j)}{E(i-1)}$$

$$\hat{a}_{i}^{(i)} = k_{i}$$

$$\hat{a}_{j}^{(i)} = \hat{a}_{j}^{(i-1)} + k_{i} \hat{a}_{i-j}^{(i-1)}, \text{ for } j = 1, 2, ..., i-1$$

$$E(i) = (1 - k_{i}^{2})E(i-1)$$
If  $E(i) \le 0$ , use the  $\hat{a}_{i}$  array of the last frame, and exit the Levinson - Durbin recursion.

If the recursion is exited pre-maturely, the  $\hat{a}_i$  array of the last frame is used as the output of block 213. If the recursion is completed successfully (which is normally the case), then the final output of block 213 is taken as

$$\hat{a}_0 = 1$$
  
 $\hat{a}_i = \hat{a}_i^{(8)}$ , for  $i = 1, 2, ..., 8$ 

Block 214 performs bandwidth expansion as follows

$$a_i = (0.96852)^i \hat{a}_i$$
, for  $i = 0, 1, ..., 8$ .

In addition, it also performs bandwidth expansion operations to derive the coefficients of the short-term noise feedback filter (block 250). Block 250 in Figure 3 has a transfer function of

$$F_{s}(z) = N_{s}(z) - 1 = \frac{\sum_{i=1}^{8} \hat{\beta}_{i} z^{-i}}{\sum_{i=0}^{8} \hat{\alpha}_{i} z^{-i}} .$$

Block 214 calculates the coefficients of  $F_s(z)$  as

$$\hat{\alpha}_i = (0.85)^i \hat{a}_i$$
, for  $i = 0, 1, ..., 8$ ,  
 $\hat{\beta}_i = \left[ (0.5)^i - (0.85)^i \right] \hat{a}_i$ , for  $i = 1, 2, ..., 8$ 

#### 5.3 Conversion to LSP

In Figure 5, block 215 converts the LPC coefficients  $a_i$ , i = 1, 2, ..., 8 of the prediction error filter given by

$$A(z) = 1 + \sum_{i=1}^{8} a_i \ z^{-i}$$

to a set of 8 Line-Spectrum Pair (LSP) coefficients  $l_i$ , i = 1, 2, ..., 8. The LSP coefficients, also known as the Line Spectrum Frequencies (LSF), are the angular positions normalized to 1, i.e. 1.0 corresponds to the Nyquist frequency, of the roots of

$$A_{n}(z) = A(z) + z^{-9}A(z^{-1})$$

and

$$A_m(z) = A(z) - z^{-9}A(z^{-1})$$

on the upper half of the unit circle,  $z = e^{j\omega}$ ,  $0 \le \omega \le \pi$ , less the trivial roots in z = -1 and z = 1 of  $A_p(z)$  and  $A_m(z)$ , respectively. Due to the symmetry and anti-symmetric of  $A_p(z)$  and  $A_m(z)$ , respectively, the roots of interest can be determined as the roots of

$$G_p(\omega) = \sum_{i=0}^{4} g_{p,i} \cos(i\omega)$$

and

$$G_m(\omega) = \sum_{i=0}^4 g_{m,i} \cos(i\omega)$$

where

$$g_{p|m,i} = \begin{cases} f_{p|m,4} & i = 0\\ 2f_{p|m,4-i} & i = 1,\dots,4 \end{cases}$$

in which

$$f_{p,i} = \begin{cases} 1.0 & i = 0\\ a_i + a_{9-i} - f_{p,i-1} & i = 1,...,4 \end{cases}$$

and

$$f_{m,i} = \begin{cases} 1.0 & i = 0\\ a_i - a_{9-i} + f_{p,i-1} & i = 1,\dots,4 \end{cases}$$

The subscript "p|m" means dual versions of the equation exist, with either subscript "p" or subscript "m". The roots of  $A_p(z)$  and  $A_m(z)$ , and therefore the roots of  $G_p(\omega)$  and  $G_m(\omega)$ , are interlaced, with the first root belonging to  $G_p(\omega)$ . The evaluation of the functions  $G_p(\omega)$  and  $G_m(\omega)$  are carried out efficiently using Chebyshev polynomial series. With the mapping  $x = \cos(\omega)$ ,

$$\cos(m\omega) = T_m(x)$$

where  $T_m(x)$  is the *m<sup>th</sup>*-order Chebyshev polynomial, the two functions  $G_p(\omega)$  and  $G_m(\omega)$  can be expressed as

$$G_{p|m}(x) = \sum_{i=0}^{4} g_{p|m,i} T_i(x).$$

Due to the recursive nature of Chebyshev polynomials the functions can be evaluated as

$$G_{p|m}(x) = \frac{b_{p|m,0}(x) - b_{p|m,2}(x) + g_{p|m,0}}{2}$$

where  $b_{p|m,0}(x)$  and  $b_{p|m,2}(x)$  are calculated using the following recurrence

$$b_{p|m,i}(x) = 2x b_{p|m,i+1}(x) - b_{p|m,i+2}(x) + g_{p|m,i}$$

with initial conditions  $b_{p|m,5}(x) = b_{p|m,6}(x) = 0$ .

The roots of  $G_p(x)$  and  $G_m(x)$  are determined in an alternating fashion starting with a root in  $G_p(x)$ . Each root of  $G_p(x)$  and  $G_m(x)$  is located by identifying a sign change of the relevant function along a grid of 60 points, given in Appendix 1. The estimation of the root is then refined using 4 bisections followed by a final linear interpolation between the two points surrounding the root. It should be noted that the roots and grid points are in the cosine domain. Once the 8 roots

$$x_i = \cos(\omega_i), \quad i = 1, 2, \dots, 8$$

are determined in the cosine domain, they are converted to the normalized frequency domain according to

$$l_i = \cos^{-1}(x_i)/\pi$$
,  $i = 1, 2, ..., 8$ 

in order to obtain the LSP coefficients. In the rare event that less than 8 roots are found, block 215 returns the LSP coefficients of the previous frame,  $l_i(k-1), i = 1, 2, ..., 8$ , where the additional parameter k represents the frame index of the current frame. The LSP coefficients of the previous frame at the very first frame are initialized to

$$l_i(0) = i/9, \quad i = 1, 2, \dots, 8.$$

#### 5.4 LSP Quantization

Block 216 of Figure 5 vector-quantizes and encodes the LSP coefficient vector,  $\mathbf{l} = [l_1 \ l_2 \ \dots \ l_8]^T$ , to a total of 14 bits. The output LSP quantizer index array,  $LSPI = \{LSPI_1, LSPI_2\}$ , is passed to the bit multiplexer (block 295), while the quantized LSP coefficient vector,  $\widetilde{\mathbf{l}} = [\widetilde{l_1} \ \widetilde{l_2} \ \dots \ \widetilde{l_8}]^T$ , is passed to block 217.

The LSP quantizer is based on mean-removed inter-frame moving-average (MA) prediction with two-stage vector quantization (VQ) of the prediction error. The quantizer enables bit-error detection at the decoder by constraining the codevector selection at the encoder. It should be noted that the encoder must perform the specified constrained VQ in order to maintain interoperability properly. The first-stage VQ is searched using the simple mean-squared error (MSE) distortion criterion, while the second-stage sign-shape VQ is searched using the weighted mean-square error (WMSE) distortion criterion.

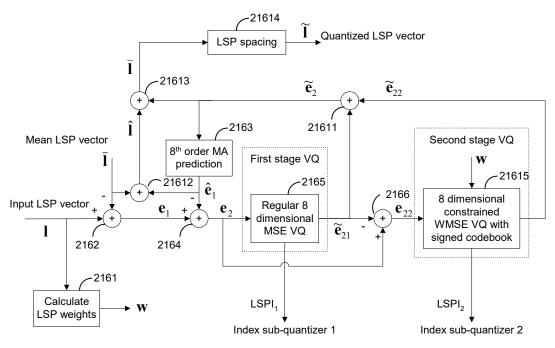


Figure 6 LSP quantizer (block 216)

Block 216 is further expanded in Figure 6. The first-stage VQ takes place in block 2165, and the second-stage constrained sign-shape VQ takes place in block 21615. Except for the LSP quantizer indices  $LSPI_1, LSPI_2$  all signal paths in Figure 6 are for vectors of dimension 8. Block 2161 uses the unquantized LSP coefficient vector to calculate the weights to be used later in the second-stage WMSE VQ. The weights are determined as

$$w_i = \begin{cases} 1/(l_2 - l_1), & i = 1\\ 1/\min(l_i - l_{i-1}, l_{i+1} - l_i), & 1 < i < 8\\ 1/(l_M - l_{M-1}), & i = 8 \end{cases}$$

Basically, the *i*-th weight is the inverse of the distance between the *i*-th LSP coefficient and its nearest neighbor LSP coefficient.

Adder 2162 subtracts the constant LSP mean vector,

 $\bar{\mathbf{I}} = \begin{bmatrix} 0.0950317 & 0.1489563 & 0.2513123 & 0.3629456 & 0.4780884 & 0.5877075 & 0.7058105 & 0.8007202 \end{bmatrix}^T$ 

from the unquantized LSP coefficient vector to get the mean-removed LSP vector,

$$\mathbf{e}_1 = \mathbf{l} - \overline{\mathbf{l}}$$
.

In Figure 6, block 2163 performs 8<sup>th</sup> order inter-frame MA prediction of the mean-removed LSP vector  $\mathbf{e}_1$  based on the  $\mathbf{\tilde{e}}_2$  vectors in the previous 8 frames, where  $\mathbf{\tilde{e}}_2$  is the quantized version of the inter-frame LSP prediction error vector<sup>2</sup>. Let  $\tilde{e}_{2,i}(k)$  denote the *i*-th element of the vector  $\mathbf{\tilde{e}}_2$  in the frame that is *k* frames before the current frame. Let  $\hat{e}_{1,i}$  be the *i*-th element of the inter-frame-predicted mean-removed LSP vector  $\mathbf{\hat{e}}_1$ . Then, block 2163 calculates the predicted mean-removed LSP vector according to

$$\hat{e}_{1,i} = \mathbf{p}_{LSP,i}^{T} \cdot \begin{bmatrix} \widetilde{e}_{2,i}(1) & \widetilde{e}_{2,i}(2) & \widetilde{e}_{2,i}(3) & \widetilde{e}_{2,i}(4) & \widetilde{e}_{2,i}(5) & \widetilde{e}_{2,i}(6) & \widetilde{e}_{2,i}(7) & \widetilde{e}_{2,i}(8) \end{bmatrix}^{T}, \quad i = 1, 2, \dots, 8,$$

where  $\mathbf{p}_{LSP,i}$  holds the 8 prediction coefficients for the *i*-th LSP coefficient and is given by

Adder 2164 calculates the prediction error vector

$$\mathbf{e}_2 = \mathbf{e}_1 - \hat{\mathbf{e}}_1,$$

which is the input to the first-stage VQ. In block 2165 the 8-dimensional prediction error vector,  $\mathbf{e}_2$ , is vector quantized with the 128-entry, 8-dimensional codebook,  $\mathbf{CB}_1 = \{\mathbf{cb}_1^{(0)}, \mathbf{cb}_1^{(1)}, \dots, \mathbf{cb}_1^{(127)}\}$ , listed in Appendix 2. The codevector minimizing the MSE is denoted  $\tilde{\mathbf{e}}_{21}$  and the corresponding index is denoted  $LSPI_1$ :

$$LSPI_{1} = \underset{k \in \{0,1,\dots,127\}}{\operatorname{arg\,min}} \left\{ \left( \mathbf{e}_{2} - \mathbf{c} \mathbf{b}_{1}^{(k)} \right)^{\mathrm{T}} \left( \mathbf{e}_{2} - \mathbf{c} \mathbf{b}_{1}^{(k)} \right) \right\},$$
$$\widetilde{\mathbf{e}}_{21} = \mathbf{c} \mathbf{b}_{1}^{(LSPI_{1})},$$

<sup>&</sup>lt;sup>2</sup> At the first frame, the previous, non-existing, quantized interframe LSP prediction error vectors are set to zero-vectors.

where the notation  $I = \underset{i}{\operatorname{argmin}} \{D(i)\}$  means that I is the argument that minimizes the entity D(i), i.e.

$$D(I) \le D(i)$$
 for all  $i$ .

Adder 2166 subtracts the first-stage codevector from the prediction error vector to form the quantization error vector of the first stage,

 $\mathbf{e}_{22} = \mathbf{e}_2 - \widetilde{\mathbf{e}}_{21} \,.$ 

This is the input to the second-stage VQ, which is a sign-shape VQ with a 2-entry, 1-dimensional sign codebook,  $\mathbf{S} = \{s_0, s_1\} = \{-1, +1\}$ , and a 64-entry, 8-dimensional shape codebook,  $\mathbf{CB}_2 = \{\mathbf{cb}_2^{(0)}, \mathbf{cb}_2^{(1)}, \dots, \mathbf{cb}_2^{(63)}\}$ , listed in Appendix 3. The product codevector that minimizes the WMSE, subject to the constraint that the 3 first elements of the intermediate quantized LSP vector,

$$\vec{\mathbf{l}} = \hat{\mathbf{l}} + \widetilde{\mathbf{e}}_2$$
$$= \bar{\mathbf{l}} + \hat{\mathbf{e}}_1 + \widetilde{\mathbf{e}}_{21} + \widetilde{\mathbf{e}}_{22},$$

preserve the ordering property

$$egin{array}{cccc} ec{l}_1 &\geq & 0 \ ec{l}_2 &\geq & ec{l}_1 \ ec{l}_3 &\geq & ec{l}_2 \end{array},$$

is selected as,

$$\widetilde{\mathbf{e}}_{22} = s_{I_{sg}} \mathbf{c} \mathbf{b}_{2}^{(I_{sh})},$$

where the indices are given by

$$\{I_{sg}, I_{sh}\} = \arg\min_{\{i,k\} \in \{(h,j) \mid h \in \{0,1\}, \bar{I}_{1}^{(h,j)} \ge 0, \bar{I}_{2}^{(h,j)} \ge \bar{I}_{1}^{(h,j)}, \bar{I}_{3}^{(h,j)} \ge \bar{I}_{2}^{(h,j)}, j \in \{0,1,\dots,63\}} \left\{ \left( \mathbf{e}_{22} - s_i \mathbf{cb}_{2}^{(k)} \right)^T \mathbf{W} \left( \mathbf{e}_{22} - s_i \mathbf{cb}_{2}^{(k)} \right) \right\},$$

and the weighting matrix is

$$\mathbf{W} = \begin{bmatrix} w_1 & & 0 \\ & w_2 & & \\ & & \ddots & \\ 0 & & & w_8 \end{bmatrix}$$

The symbol  $\tilde{I}_i^{(h,j)}$  is the *i*-th element of the reconstructed LSP vector  $\tilde{I}$  that is generated by using a sign index  $I_{sg} = h$  and the *j*-th shape codevector in **CB**<sub>2</sub>. From the sign index,  $I_{sg}$ , and the shape index,  $I_{sh}$ , the index of the second stage VQ,  $LSPI_2$ , is calculated as

$$LSPI_{2} = \begin{cases} 127 - I_{sh}, & I_{sg} = 0\\ I_{sh}, & I_{sg} = 1 \end{cases},$$

In the unlikely event that no product codevector fulfills the constraint, the product codevector  $\tilde{\mathbf{e}}_{22} = \mathbf{cb}_2^{(0)}$  is selected, and the index  $LSPI_2 = 0$  is returned.

Once the quantization is complete, the remaining operations of block 216 construct the quantized LSP vector from the codevectors, LSP mean, and MA prediction. Adder 21611 calculates the quantized prediction error vector by adding the stage 1 and stage 2 quantized vectors,

$$\widetilde{\mathbf{e}}_2 = \widetilde{\mathbf{e}}_{21} + \widetilde{\mathbf{e}}_{22}$$
.

Adder 21612 adds the mean LSP vector and the predicted mean-removed LSP vector to obtain the predicted LSP vector,

$$\hat{\mathbf{l}} = \bar{\mathbf{l}} + \hat{\mathbf{e}}_1$$
 .

Adder 21613 adds the predicted LSP vector and the quantized prediction error vector to get the intermediate reconstructed LSP vector,

$$\mathbf{\widetilde{l}} = \mathbf{\widehat{l}} + \mathbf{\widetilde{e}}_2$$
.

Block 21614 checks the elements of the reconstructed LSP vector to enforce certain minimum spacing rules. It enforces a minimum value of 6 Hz for the smallest LSP coefficient, a maximum value of 3991 Hz for the largest LSP coefficient, and a minimum distance between neighboring LSP coefficients of 50 Hz. In the normalized domain of the LSP coefficients, the spacing requirement is given by

$$\begin{array}{lll} \widetilde{l}_{1} & \geq & 0.0015 \\ \widetilde{l}_{i+1} - \widetilde{l}_{i} & \geq & 0.0125 & i = 1, 2, \dots, 7 \, . \\ \widetilde{l}_{8} & \leq & 0.99775 \end{array}$$

The spacing is carried out as follows:

(i) The elements of the intermediate reconstructed LSP vector are sorted such that

$$\breve{l}_1 \leq \breve{l}_2 \leq \ldots \leq \breve{l}_8$$
.

(ii) Set  $l_{\text{max}} = 0.91025$ .

(iii) If 
$$\overline{l_1} < 0.0015$$
, set  $\overline{l_1} = 0.0015$ .  
else if  $\overline{l_1} > l_{\max}$ , set  $\overline{l_1} = l_{\max}$ .  
else set  $\overline{l_1} = \overline{l_1}$ .  
(iv) for  $i = 2, 3, ..., 8$  do the following:  
1. Set  $l_{\min} = \overline{l_{i-1}} + 0.0125$ .  
2. Set  $l_{\max} \leftarrow l_{\max} + 0.0125$ .  
3. If  $\overline{l_i} < l_{\min}$ , set  $\overline{l_i} = l_{\min}$ .  
else if  $\overline{l_i} > l_{\max}$ , set  $\overline{l_i} = l_{\max}$ .  
else set  $\overline{l_i} = \overline{l_i}$ .

#### 5.5 Conversion to Short-Term Predictor Coefficients

Refer back to Figure 5. In block 217, the quantized set of LSP coefficients  $\{\tilde{l}_i\}$ , which is determined once a frame, is converted to the corresponding set of linear prediction coefficients  $\{\tilde{a}_i\}$ , the quantized linear prediction coefficients for the current frame.

With the notation

$$\begin{aligned} x_{p,i} &= \cos(\pi \ \widetilde{l}_{2i-1}), \quad i = 1, 2, 3, 4 \\ x_{m,i} &= \cos(\pi \ \widetilde{l}_{2i}), \quad i = 1, 2, 3, 4 \end{aligned}$$

the 4 unique coefficients of each of the two polynomials  $A_p^{\Delta}(z) = A_p(z)/(1+z^{-1})$  and  $A_m^{\Delta}(z) = A_m(z)/(1-z^{-1})$  can be determined using the following recursion:

For 
$$i = 1, 2, 3, 4$$
, do the following :  
 $a_{p|m,i}^{\Delta} = 2 \left( a_{p|m,i-2}^{\Delta} - x_{p|m,i} a_{p|m,i-1}^{\Delta} \right)$   
 $a_{p|m,j}^{\Delta} = a_{p|m,j}^{\Delta} + a_{p|m,j-2}^{\Delta} - 2 x_{p|m,i} a_{p|m,j-1}^{\Delta}, \quad j = i - 1, i - 2, ..., 1$ 

with initial conditions  $a_{p|m,0}^{\Delta} = 1$  and  $a_{p|m,-1}^{\Delta} = 0$ . In the recursion above,  $\{a_{p,i}^{\Delta}\}$  and  $\{a_{m,i}^{\Delta}\}$  are the sets of four unique coefficients of the polynomials  $A_p^{\Delta}(z)$  and  $A_m^{\Delta}(z)$ , respectively. Similarly, let the two sets of coefficients  $\{a_{p,i}\}$  and  $\{a_{m,i}\}$ , each of 4 unique coefficients except for a sign on  $\{a_{m,i}\}$ , represent the unique coefficients of the polynomials  $A_p(z)$  and  $A_m(z)$ , respectively. Then,  $\{a_{p,i}\}$  and  $\{a_{m,i}\}$  can be obtained from  $\{a_{p,i}^{\Delta}\}$  and  $\{a_{m,i}^{\Delta}\}$  as

$$\begin{aligned} a_{p,i} &= a_{p,i}^{\Delta} + a_{p,i-1}^{\Delta}, & i = 1, 2, 3, 4 \\ a_{m,i} &= a_{m,i}^{\Delta} - a_{m,i-1}^{\Delta}, & i = 1, 2, 3, 4 \end{aligned}$$

From  $A_p(z)$  and  $A_m(z)$ , the polynomial of the prediction error filter is obtained as

$$\widetilde{A}(z) = \frac{A_p(z) + A_m(z)}{2}.$$

In terms of the unique coefficients of  $A_p(z)$  and  $A_m(z)$ , the coefficients  $\{\tilde{a}_i\}$  of  $\tilde{A}(z)$  can be expressed as

$$\widetilde{a}_{i} = \begin{cases} 1.0, & i = 0\\ 0.5 (a_{p,i} + a_{m,i}), & i = 1, 2, 3, 4\\ 0.5 (a_{p,9-i} - a_{m,9-i}), & i = 5, 6, 7, 8 \end{cases}$$

where the tilde signifies that the coefficients correspond to the quantized LSP coefficients. Note that

$$\widetilde{A}(z) = 1 - P_s(z) = 1 + \sum_{i=1}^{8} \widetilde{a}_i z^{-i}$$
,

where

$$P_s(z) = -\sum_{i=1}^8 \widetilde{a}_i \ z^{-i}$$

is the transfer function of the short-term predictor block 240 in Figure 3.

Block 218 performs further bandwidth expansion on the set of predictor coefficients  $\{\tilde{a}_i\}$  using a bandwidth expansion factor of  $\gamma_1 = 0.75$ . The resulting bandwidth-expanded set of filter coefficients is given by

$$a'_i = \gamma_1^{\ i} \widetilde{a}_i$$
, for  $i = 1, 2, ..., 8$ .

This bandwidth-expanded set of filter coefficients  $\{a'_i\}$  is used to update the coefficients of the weighted short-term synthesis filter block 221 in Figure 7 (to be discussed later). This completes the description of short-term predictive analysis and quantization block 210 in Figure 3 and Figure 5.

#### 5.6 Long-Term Linear Predictive Analysis (Pitch Extraction)

In Figure 3, the long-term predictive analysis and quantization block 220 uses the short-term prediction residual signal d(n) of the current frame and its quantized version dq(n) in the previous

frames to determine the quantized values of the pitch period and the pitch predictor taps. This block 220 is further expanded in Figure 7 below.

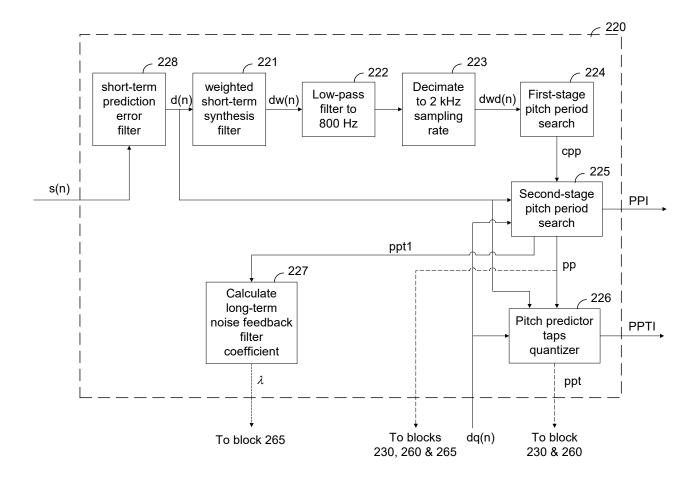


Figure 7 Long-term predictive analysis and quantization (block 220)

Now refer to Figure 7. Block 228 performs short-term prediction error filtering to get the short-term prediction residual d(n) as follows.

$$d(n) = s(n) + \sum_{i=1}^{8} \widetilde{a}_i s(n-i).$$

The short-term prediction residual signal d(n) passes through the weighted short-term synthesis filter block 221, whose output is calculated as

$$dw(n) = d(n) - \sum_{i=1}^{8} a'_{i} dw(n-i)$$

The signal dw(n) is passed through a fixed low-pass filter block 222, which has a -3 dB cut off frequency at about 800 Hz. A 4<sup>th</sup>-order elliptic filter is used for this purpose. The transfer function of this low-pass filter is

$$H_{lpf}(z) = \frac{0.0433083 - 0.0687180z^{-1} + 0.0991097z^{-2} - 0.0687180z^{-3} + 0.0433083z^{-4}}{1 - 2.9580236z^{-1} + 3.6337313z^{-2} - 2.1249529z^{-3} + 0.5003969z^{-4}}$$

Block 223 down-samples the low-pass filtered signal to a sampling rate of 2 kHz. This represents an 4:1 decimation.

The first-stage pitch search block 224 then uses the decimated 2 kHz sampled signal dwd(n) to find a "coarse pitch period", denoted as *cpp* in Figure 7. The time lag represented by *cpp* is in terms of number of samples in the 2 kHz down-sampled signal dwd(n). A pitch analysis window of 15 ms is used. The end of the pitch analysis window is aligned with the end of the current frame. At a sampling rate of 2 kHz, 15 ms correspond to 30 samples. Without loss of generality, let the index range of n = 1 to n = 30 correspond to the pitch analysis window for dwd(n). Block 224 first calculates the following values

$$c(k) = \sum_{n=1}^{30} dwd(n)dwd(n-k),$$
  

$$E(k) = \sum_{n=1}^{30} [dwd(n-k)]^{2},$$
  

$$c2(k) = \begin{cases} c^{2}(k), & \text{if } c(k) \ge 0\\ -c^{2}(k), & \text{if } c(k) < 0 \end{cases}$$

for all integers from k = MINPPD - 1 to k = MAXPPD + 1, where MINPPD and MAXPPD are the minimum and maximum pitch period in the decimated domain, respectively, MINPPD = 2 sample and MAXPPD = 34 samples. Block 224 then searches through the range of k = MINPPD, MINPPD + 1, MINPPD + 2, ..., MAXPPD to find all local peaks<sup>3</sup> of the array  $\{c2(k)/E(k)\}$  for which c(k) > 0. Let  $N_p$  denote the number of such positive local peaks. Let  $k_p(j), j = 1, 2, ..., N_p$  be the indices where  $c2(k_p(j))/E(k_p(j))$  is a local peak and  $c(k_p(j)) > 0$ , and let  $k_p(1) < k_p(2) < ... < k_p(N_p)$ . For convenience, the term c2(k)/E(k) will be referred to as the "normalized correlation square".

If  $N_p = 0$ , the output coarse pitch period is set to cpp = MINPPD, and the processing of block 224 is terminated. If  $N_p = 1$ , block 224 output is set to  $cpp = k_p(1)$ , and the processing of block 224 is terminated.

If there are two or more local peaks ( $N_p \ge 2$ ), then block 224 uses *Algorithms 3.8.1, 3.8.2, 3.8.3,* and *3.8.4* (to be described below), in that order, to determine the output coarse pitch period *cpp*. Variables calculated in the earlier algorithms will be carried over and used in the later algorithms.

<sup>&</sup>lt;sup>3</sup> A value is characterized as a local peak if both of the adjacent values are smaller.

(i) Set c2max = -1, Emax = 1, and jmax = 0.

Block 224 first uses Algorithm 3.8.1 below to identify the largest quadratically interpolated peak around local peaks of the normalized correlation square  $c2(k_p)/E(k_p)$ . Quadratic interpolation is performed for  $c(k_p)$ , while linear interpolation is performed for  $E(k_p)$ . Such interpolation is performed with the time resolution for the sampling rate of the input speech (8 kHz). In the algorithm below, D denotes the decimation factor used when decimating dw(n) to dwd(n). Thus, D = 4.

Algorithm 3.8.1 Find largest quadratically interpolated peak around  $c2(k_p)/E(k_p)$ :

(ii) For  $j = 1, 2, ..., N_n$ , do the following 12 steps: 1. Set  $a = 0.5 \left[ c(k_p(j)+1) + c(k_p(j)-1) \right] - c(k_p(j))$ 2. Set  $b = 0.5 \left[ c(k_p(j)+1) - c(k_p(j)-1) \right]$ 3. Set ji = 04. Set  $ei = E(k_p(j))$ 5. Set  $c2m = c2(k_n(j))$ 6. Set  $Em = E(k_n(j))$ 7. If  $c2(k_p(j)+1)E(k_p(j)-1) > c2(k_p(j)-1)E(k_p(j)+1)$ , do the remaining part of step 7:  $\Delta = [E(k_n(j)+1) - ei]/D$ For k = 1, 2, ..., D/2, do the following indented part of step 7:  $ci = a (k/D)^{2} + b (k/D) + c(k_{n}(j))$  $ei \leftarrow ei + \Delta$ If  $(ci)^2 Em > (c2m) ei$ , do the next three indented lines: ii = k $c2m = (ci)^2$ Em = ei8. If  $c2(k_p(j)+1)E(k_p(j)-1) \le c2(k_p(j)-1)E(k_p(j)+1)$ , do the remaining part of step 8:  $\Delta = [E(k_n(j) - 1) - ei]/D$ For k = -1, -2, ..., -D/2, do the following indented part of step 8:  $ci = a (k/D)^{2} + b (k/D) + c(k_{n}(j))$  $ei \leftarrow ei + \Delta$ If  $(ci)^2 Em > (c2m) ei$ , do the next three indented lines: ii = k $c2m = (ci)^2$ Em = ei9. Set  $lag(j) = k_{n}(j) + ji/D$ 

10. Set c2i(j) = c2m11. Set Ei(j) = Em12. If  $c2m \times Emax > c2max \times Em$ , do the following three indented lines: jmax = j c2max = c2mEmax = Em

(iii) Set the first candidate for coarse pitch period as  $cpp = k_n(jmax)$ .

The symbol  $\leftarrow$  indicates that the parameter on the left-hand side is being updated with the value on the right-hand side<sup>4</sup>.

To avoid picking a coarse pitch period that is around an integer multiple of the true coarse pitch period, a search through the time lags corresponding to the local peaks of  $c2(k_p)/E(k_p)$  is performed to see if any of such time lags is close enough to the output coarse pitch period of block 224 in the last frame, denoted as *cpplast*<sup>5</sup>. If a time lag is within 25% of *cpplast*, it is considered close enough. For all such time lags within 25% of *cpplast*, the corresponding quadratically interpolated peak values of the normalized correlation square  $c2(k_p)/E(k_p)$  are compared, and the interpolated time lag corresponding to the maximum normalized correlation square is selected for further consideration. The following algorithm performs the task described above. The interpolated arrays c2i(j) and Ei(j) calculated in *Algorithm 3.8.1* above are used in this algorithm.

Algorithm 3.8.2 Find the time lag maximizing interpolated  $c2(k_p)/E(k_p)$  among all time lags close to the output coarse pitch period of the last frame:

(i) Set index im = -1(ii) Set c2m = -1(iii) Set Em = 1(iv) For  $j = 1, 2, ..., N_p$ , do the following: If  $|k_p(j) - cpplast| \le 0.25 \times cpplast$ , do the following: If  $c2i(j) \times Em > c2m \times Ei(j)$ , do the following three lines: im = j c2m = c2i(j)Em = Ei(j)

Note that if there is no time lag  $k_p(j)$  within 25% of *cpplast*, then the value of the index *im* will remain at -1 after *Algorithm 3.8.2* is performed. If there are one or more time lags within 25% of

<sup>&</sup>lt;sup>4</sup> An equal sign is not applicable due to a potential mathematical conflict.

<sup>&</sup>lt;sup>5</sup> For the first frame *cpplast* is initialized to 12.

cpplast, the index *im* corresponds to the largest normalized correlation square among such time lags.

Next, block 224 determines whether an alternative time lag in the first half of the pitch range should be chosen as the output coarse pitch period. Basically, block 224 searches through all interpolated time lags lag(j) that are less than 16, and checks whether any of them has a large enough local peak of normalized correlation square near every integer multiple of it (including itself) up to 32. If there are one or more such time lags satisfying this condition, the smallest of such qualified time lags is chosen as the output coarse pitch period of block 224.

Again, variables calculated in *Algorithms 3.8.1* and *3.8.2* above carry their final values over to *Algorithm 3.8.3* below. In the following, the parameter *MPDTH* is 0.065, and the threshold array *MPTH*(*k*) is given as *MPTH*(2) = 0.63, *MPTH*(3) = 0.48, *MPTH*(4) = 0.42, *MPTH*(5) = 0.36, and *MPTH*(*k*) = 0.30, for k > 5.

Algorithm 3.8.3 Check whether an alternative time lag in the first half of the range of the coarse pitch period should be chosen as the output coarse pitch period:

For  $j = 1, 2, 3, ..., N_p$ , in that order, do the following while lag(j) < 16:

- (i) If  $j \neq im$ , set *threshold* = 0.73; otherwise, set *threshold* = 0.4.
- (ii) If  $c2i(j) \times Emax \leq threshold \times c2max \times Ei(j)$ , disqualify this *j*, skip step (iii) for this *j*, increment *j* by 1 and go back to step (i).
- (iii) If  $c2i(j) \times Emax > threshold \times c2max \times Ei(j)$ , do the following:

a) For k = 2, 3, 4, ..., do the following while  $k \times lag(j) < 32$ :

- 1.  $s = k \times lag(j)$
- 2. a = (1 MPDTH) s
- 3. b = (1 + MPDTH) s
- 4. Go through m = j+1, j+2, j+3, ..., N<sub>p</sub>, in that order, and see if any of the time lags lag(m) is between a and b. If none of them is between a and b, disqualify this j, stop step (iii), increment j by 1 and go back to step (i). If there is at least one such m that satisfies a < lag(m) ≤ b and c2i(m) × Emax > MPTH(k) × c2max × Ei(m), then it is considered that a large enough peak of the normalized correlation square is found in the neighborhood of the k-th integer multiple of lag(j); in this case, stop step (iii) a) 4., increment k by 1, and go back to step (iii) a) 1.
- b) If step (iii) a) is completed without stopping prematurely, that is, if there is a large enough interpolated peak of the normalized correlation square within

 $\pm 100 \times MPDTH\%$  of every integer multiple of lag(j) that is less than 32, then stop this algorithm and stop the operation of block 224, and set  $cpp = k_p(j)$  as the final output coarse pitch period of block 224.

If *Algorithm 3.8.3* above is completed without finding a qualified output coarse pitch period *cpp*, then block 224 examines the largest local peak of the normalized correlation square around the coarse pitch period of the last frame, found in *Algorithm 3.8.2* above, and makes a final decision on the output coarse pitch period *cpp* using the following algorithm. *Algorithm 3.8.4* performs this final decision. Again, variables calculated in *Algorithms 3.8.1* and *3.8.2* above carry their final values over to *Algorithm 3.8.4* below. In the following, the parameters are *SMDTH* = 0.095 and *LPTH1* = 0.79.

Algorithm 3.8.4: Final decision of the output coarse pitch period

- (i) If im = -1, that is, if there is no large enough local peak of the normalized correlation square around the coarse pitch period of the last frame, then use the *cpp* calculated at the end of *Algorithm 3.8.1* as the final output coarse pitch period of block 224, and exit this algorithm.
- (ii) If im = jmax, that is, if the largest local peak of the normalized correlation square around the coarse pitch period of the last frame is also the global maximum of all interpolated peaks of the normalized correlation square within this frame, then use the *cpp* calculated at the end of *Algorithm 3.8.1* as the final output coarse pitch period of block 224, and exit this algorithm.
- (iii) If *im* < *jmax*, do the following indented part:
  - If  $c2m \times Emax > 0.43 \times c2max \times Em$ , do the following indented part of step (iii):
    - a) If lag(im) > MAXPPD/2, set block 224 output  $cpp = k_p(im)$  and exit this algorithm.
    - b) Otherwise, for k = 2, 3, 4, 5, do the following indented part:
      - 1. s = lag(jmax) / k
      - 2. a = (1 SMDTH) s
      - 3. b = (1 + SMDTH) s
      - 4. If lag(im) > a and lag(im) < b, set block 224 output  $cpp = k_p(im)$  and exit this algorithm.

(iv) If im > jmax, do the following indented part:

If  $c2m \times Emax > LPTH1 \times c2max \times Em$ , set block 224 output  $cpp = k_p(im)$  and exit this algorithm.

(v) If algorithm execution proceeds to here, none of the steps above have selected a final output coarse pitch period. In this case, just accept the *cpp* calculated at the end of *Algorithm 3.8.1* as the final output coarse pitch period of block 224.

Block 225 takes *cpp* as its input and performs a second-stage pitch period search in the undecimated signal domain to get a refined pitch period *pp*. Block 225 first converts the coarse pitch period *cpp* to the undecimated signal domain by multiplying it by the decimation factor *D*, where D = 4. Then, it determines a search range for the refined pitch period around the value *cpp*  $\times D$ . The lower bound of the search range is  $lb = \max(MINPP, cpp \times D - D + 1)$ , where MINPP = 10 samples is the minimum pitch period. The upper bound of the search range is  $ub = \min(MAXPP, cpp \times D + D - I)$ , where MAXPP is the maximum pitch period, which is 136 samples.

Block 225 maintains a signal buffer with a total of MAXPP + 1 + FRSZ samples, where FRSZ is the frame size, which is 40 samples. The last FRSZ samples of this buffer are populated with the open-loop short-term prediction residual signal d(n) in the current frame. The first MAXPP + 1 samples are populated with the MAXPP + 1 samples of quantized version of d(n), denoted as dq(n), immediately preceding the current frame. For convenience of writing equations later, the symbol dq(n) will be used to denote the entire buffer of MAXPP + 1 + FRSZ samples, even though the last FRSZ samples are really d(n) samples. Again, let the index range from n = 1 to n = FRSZ denotes the samples in the current frame.

After the lower bound lb and upper bound ub of the pitch period search range are determined, block 225 calculates the following correlation and energy terms in the undecimated dq(n) signal domain for time lags k within the search range [lb, ub].

$$\widetilde{c}(k) = \sum_{n=1}^{FRSZ} dq(n) dq(n-k)$$
$$\widetilde{E}(k) = \sum_{n=1}^{FRSZ} dq(n-k)^2$$

The time lag  $k \in [lb, ub]$  that maximizes the ratio  $\tilde{c}^2(k)/\tilde{E}(k)$  is chosen as the final refined pitch period. That is,

$$pp = \underset{k \in [lb, ub]}{\operatorname{arg\,max}} \left[ \frac{\widetilde{c}^{2}(k)}{\widetilde{E}(k)} \right] \; .$$

Once the refined pitch period *pp* is determined, it is encoded into the corresponding output pitch period index *PPI*, calculated as

$$PPI = pp - 10$$
.

Possible values of *PPI* are all integers from 0 to 126. Therefore, the refined pitch period pp is encoded into 7 bits, without any distortion. The value of *PPI* = 127 is reserved for signaling purposes and therefore is not used by the codec.

Block 225 also calculates ppt1, the optimal tap weight for a single-tap pitch predictor, as follows

$$ppt1 = \frac{\widetilde{c}(pp)}{\widetilde{E}(pp)}$$

In the degenerate case where  $\tilde{E}(pp) = 0$ , ppt1 is set to zero. Block 227 calculates the long-term noise feedback filter coefficient  $\lambda$  as follows.

$$\lambda = \begin{cases} 0.5, & ppt \ l \ge 1 \\ 0.5 \times ppt \ l, & 0 < ppt \ l < 1 \\ 0, & ppt \ l \le 0 \end{cases}$$

#### 5.7 Long-Term Predictor Parameter Quantization

Pitch predictor taps quantizer block 226 quantizes the three pitch predictor taps to 5 bits using vector quantization. The pitch predictor has a transfer function of

$$P_l(z) = \sum_{i=1}^3 b_i \ z^{-pp+2-i}$$
,

where pp is the pitch period calculated in Section 5.6.

Rather than minimizing the mean-square error of the three taps  $b_1$ ,  $b_2$ , and  $b_3$  as in conventional VQ codebook search, block 226 finds from the VQ codebook the set of candidate pitch predictor taps that minimizes the pitch prediction residual energy in the current frame. Using the same dq(n) buffer and time index convention as in block 225, and denoting the set of three taps corresponding to the *j*-th codevector,  $\mathbf{b}_j = \begin{bmatrix} b_{j1} & b_{j2} & b_{j3} \end{bmatrix}^T$ , as  $\{b_{j1}, b_{j2}, b_{j3}\}$ , we can express such pitch prediction residual energy as

$$E_{j} = \sum_{n=1}^{FRSZ} \left[ dq(n) - \sum_{i=1}^{3} b_{ji} dq(n-pp+2-i) \right]^{2}.$$

The codevector is selected from a 3-dimensional codebook of 32 codevectors,  $\{\mathbf{b}_0, \mathbf{b}_1, \dots, \mathbf{b}_{31}\}$ , listed in Appendix 4. The codevector that minimizes the pitch prediction residual energy is selected. The index of the selected codevector is given by

$$PPTI = j^* = \arg\min_{j \in \{0, 1, \dots, 31\}} \{ E_j \}$$

and the corresponding set of three quantized pitch predictor taps, denoted as  $ppt = \{b_1, b_2, b_3\}$  in Figure 7, is given by

$$\begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix} = \mathbf{b}_{j^*}.$$

This completes the description of block 220, long-term predictive analysis and quantization.

#### 5.8 Excitation Gain Quantization

There is one residual gain for each frame. The unquantized residual gain is based on the pitch prediction residual of the frame and is quantized in an open-loop fashion in the base-2 logarithmic domain. The quantization of the residual gain is part of the prediction residual quantizer block 230 in Figure 3. Block 230 is further expanded in Figure 8. All the operations in Figure 8 are performed on a frame-by-frame basis.

Block 300 in Figure 8 calculates the pitch prediction residual signal, given by

$$e(n) = dq(n) - \sum_{i=1}^{3} b_i dq(n - pp + 2 - i), \quad n = 1, 2, ..., FRSZ$$

where the same dq(n) buffer and time index convention of block 225 is used. That is, the current frame of dq(n) for n = 1, 2, ..., FRSZ is the unquantized open-loop short-term prediction residual signal d(n).

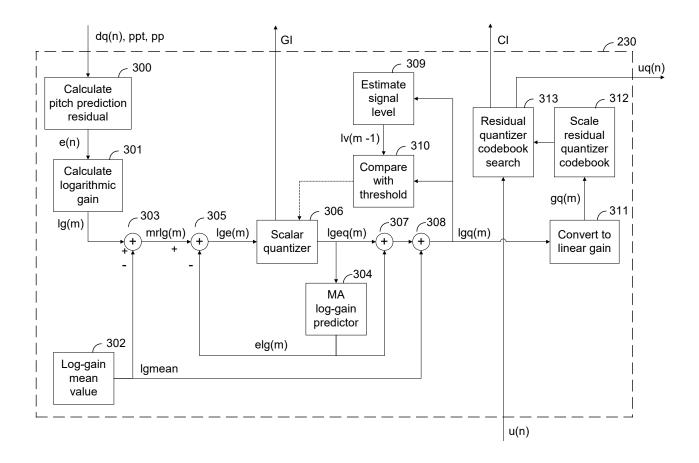


Figure 8 Prediction residual quantizer (block 230)

Block 301 calculates the residual gain in the base-2 logarithmic domain. First, the average power of the pitch prediction residual signal in the current frame, the *m*-th frame, is calculated as

$$P_e(m) = \frac{1}{FRSZ} \sum_{n=1}^{FRSZ} e^2(n)$$

The logarithmic gain (log-gain) of the current frame is calculated as

$$lg(m) = \begin{cases} \log_2 P_e(m), & \text{if } P_e(m) > 1 \\ 0, & \text{if } P_e(m) \le 1 \end{cases}$$

The long-term mean value of the log-gain is calculated off-line and stored in block 302. This loggain mean value is lgmean = 11.45752. The adder 303 calculates the mean-removed version of the log-gain as mrlg(m) = lg(m) - lgmean. The MA log-gain predictor block 304 is an 8<sup>th</sup>-order FIR filter with its memory initialized to zero at the very first frame. The coefficients of this loggain predictor lgp(k), k = 1, 2, 3, ..., 8, are fixed, as given below: lgp(1) = 0.7801514 lgp(2) = 0.7377625 lgp(3) = 0.6150818 lgp(4) = 0.5926208 lgp(5) = 0.4674072 lgp(6) = 0.3635864 lgp(7) = 0.2378540lgp(8) = 0.1286926

Block 304 calculates its output, the estimated log-gain, as

$$elg(m) = \sum_{k=1}^{GPO} lgp(k) lgeq(m-k)$$
,

where GPO = 8 is the gain predictor order, and lgeq(m - k) is the quantized version of the log-gain prediction error at frame m - k.

The adder 305 calculates the log-gain prediction error as

$$lge(m) = mrlg(m) - elg(m).$$

The scalar quantizer block 306 performs 4-bit scalar quantization of the resulting log-gain prediction error lge(m). The codebook entries of this gain quantizer, along with the corresponding codebook indices, are listed in Appendix 5. The operation of this quantizer is controlled by block 310, whose purpose is to achieve a good trade-off between clear-channel performance and noisy-channel performance of the excitation gain quantizer. The operation of block 310 will be described later.

For each temporarily quantized lgeq(m), the adders 307 and 308 together calculate the corresponding temporarily quantized log-gain as

$$lgq(m) = lgeq(m) + elg(m) + lgmean$$

Block 309 estimates the signal level based on the final quantized log-gain, to be determined later subject to the constraint imposed by block 310. Let lv(m) denote the output estimated signal level of block 309 at frame *m*. Since the final value of lgq(m) has not been determined yet at this point, block 310 can only use the estimated signal level at the last frame, namely, lv(m - 1). One way to think of this situation is that block 309 has a one-sample delay unit for its input lgq(m).

At frame *m*, block 310 controls the quantization operation of block 306 based on lv(m - 1), lgq(m - 1), and  $lgq(m - 2)^6$ . It uses an  $NG \times NGC$  gain change threshold matrix T(i, j), i = 1, 2, ..., NG, j = 1, 2, ..., NGC to limit how high lgq(m) can go. The parameter values are NG = 18 and NGC = 12. The threshold matrix T(i, j) is given in Appendix 6.

<sup>&</sup>lt;sup>6</sup> The initial values of lgq(m-1) and lgq(m-2) are 0, i.e. lgq(0)=0 and lgq(-1)=0.

Block 310 and block 306 work together to perform the quantization of lge(m) in the following way. First, the row index into the threshold matrix T(i, j) is calculated as

$$i = \left\lceil \frac{lgq(m-1) - lv(m-1) - GLB}{2} \right\rceil,$$

where GLB = -24, and the symbol  $\lceil . \rceil$  means "take the next larger integer" or "rounding to the nearest integer toward infinity". If i > NG, *i* is clipped to *NG*. If i < 1, *i* is clipped to 1.

Second, the column index into the threshold matrix T(i, j) is calculated as

$$j = \left\lceil \frac{lgq(m-1) - lgq(m-2) - GCLB}{2} \right\rceil,$$

where GCLB = -8. If j > NGC, j is clipped to NGC. If j < 1, j is clipped to 1.

Third, with the row and column indices i and j calculated above, a gain quantization limit is calculated as

$$GL = lgq(m-1) + T(i, j) - elg(m) - lgmean$$

Fourth, block 306 performs normal scalar quantization of lge(m) into its nearest neighbor in the quantizer codebook. If the resulting quantized value is not greater than GL, this quantized value is accepted as the final quantized log-gain prediction error lgeq(m), and the corresponding codebook index is the output gain index  $GI_m$ . On the other hand, if the quantized value is greater than GL, it is accepted as the final output lgeq(m) of block 306, and the corresponding codebook index is accepted as the final output lgeq(m) of block 306, and the corresponding codebook index is accepted as  $GI_m$ . However, if it is still greater the GL, then block 306 keeps looking for the next smaller quantizer codebook entry (in descending order of codebook entry value), until it finds one that is not greater than GL. In such a search, the first one (that is, the largest one) that it finds to be no greater than GL is chosen as the final output lgeq(m) of block 306, and the corresponding codebook entries are greater than GL, then the smallest gain quantizer codebook entry is chosen as the final output lgeq(m) of block 306, and the gain quantizer codebook entries are greater than GL. The final gain quantizer codebook index  $GI_m$ . The final gain quantizer codebook index  $GI_m$  is passed to the bit multiplexer block 295 of Figure 3.

Once the quantized log-gain prediction error lgeq(m) is determined in this way, adders 307 and 308 add elg(m) and lgmean to lgeq(m) to obtain the quantized log-gain lgq(m) as

$$lgq(m) = lgeq(m) + elg(m) + lgmean$$

After this final quantized log-gain lgq(m) subject to the constraint imposed by block 310 is calculated, it is used by block 309 to update the estimated signal level lv(m). This value lv(m) is used by block 310 in the next frame (the (m + 1)-th frame).

At frame *m*, after the final quantized log-gain lgq(m) is calculated, block 309 estimates the signal level using the following algorithm. The parameter values used are  $\alpha = 4095/4096$ ,  $\beta = 511/512$ , and  $\gamma = 255/256$ . At codec initialization, the related variables are initialized as: lmax(m - 1) = -100, lmin(m - 1) = 100, lmean(m - 1) = 12.5, lv(m - 1) = 17, and x(m - 1) = 17.

Algorithm for updating estimated long-term average signal level:

- (i) If lgq(m) > lmax(m 1), set lmax(m) = lgq(m); otherwise; set  $lmax(m) = lmean(m - 1) + \alpha [lmax(m - 1) - lmean(m - 1)]$ .
- (ii) If lgq(m) < lmin(m 1), set lmin(m) = lgq(m); otherwise; set  $lmin(m) = lmean(m - 1) + \alpha [lmin(m - 1) - lmean(m - 1)]$ .
- (iii) Set  $lmean(m) = \beta \times lmean(m 1) + (1 \beta) [lmax(m) + lmin(m)]/2$ .
- (iv) Set lth = lmean(m) + 0.2 [lmax(m) lmean(m)].
- (v) If lgq(m) > lth, set  $x(m) = \gamma \times x(m 1) + (1 \gamma)lgq(m)$ , and set  $lv(m) = \gamma \times lv(m 1) + (1 \gamma) x(m)$ ; Otherwise, set x(m) = x(m - 1) and lv(m) = lv(m - 1).

Block 311 converts the quantized log-gain lgq(m) to the quantized gain gq(m) in the linear domain as follows.

$$gq(m) = 2^{\frac{lgq(m)}{2}}$$

Block 312 scales the residual vector quantization (also called excitation VQ) codebook by simply multiplying every element of every codevector in the excitation VQ codebook by gq(m). The resulting scaled codebook is then used by block 313 to perform Excitation VQ codebook search, as described in the next section.

### 5.9 Excitation Vector Quantization

The excitation VQ codebook has a sign-shape structure, with 1 bit for sign and 4 bits for shape. The vector dimension is 4. Thus, there are 16 independent shape codevectors stored in the codebook, but the negated version of each shape codevector (i.e., the mirror image with respect to the origin) is also a valid codevector for excitation VQ. The 16 shape codevectors, along with the corresponding codebook indices, are listed in Appendix 7.

Block 313 in Figure 8 performs the excitation VQ codebook search using the filter structure shown in Figure 9, which is essentially a subset of the encoder shown in Figure 3. The only difference is that the prediction residual quantizer (block 230) in Figure 3 is replaced by block 248

in Figure 9, which is labeled as "scaled VQ codebook". This scaled VQ codebook is calculated in Section 5.8.

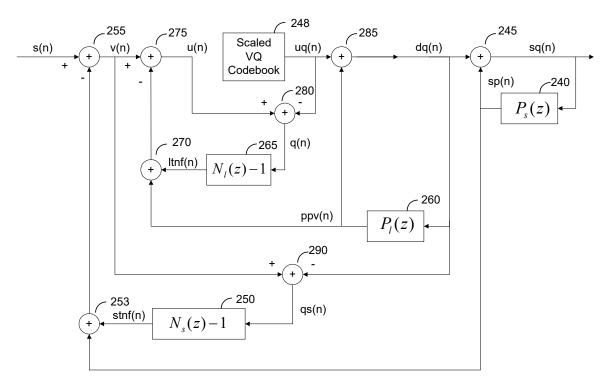


Figure 9 Filter structure used in excitation VQ codebook search

The four filters of blocks 240, 250, 260, and 265 have transfer functions given by

$$P_s(z) = -\sum_{i=1}^{8} \widetilde{a}_i \ z^{-i} \text{ (see Section 5.5)},$$

where  $\tilde{a}_i$  is the *i*-th coefficient of the quantized short-term prediction error filter;

$$N_{s}(z) - 1 = \frac{\sum_{i=1}^{8} \hat{\beta}_{i} z^{-i}}{\sum_{i=0}^{8} \hat{\alpha}_{i} z^{-i}} \text{ (see Section 5.2);}$$
$$P_{l}(z) = \sum_{i=1}^{3} b_{i} z^{-pp+2-i},$$

where pp is the pitch period, and  $b_i$  is the *i*-th long-term predictor coefficient;

$$N_l(z) - 1 = \lambda \, z^{-pp} \,,$$

where  $\lambda$  is the long-term noise feedback filter coefficient calculated in Section 5.6.

Using the filter structure in Figure 9, block 313 in Figure 8 performs excitation VQ codebook search one excitation vector at a time. Each excitation vector contains four samples. The excitation gain gq(m) is updated once a frame. Each frame contains 10 excitation vectors. Therefore, for each frame, the same scaled VQ codebook is used in 10 separate VQ codebook searches corresponding to the 10 excitation vectors in that frame.

Let n = 1, 2, 3, 4 denote the sample time indices corresponding to the current four-dimensional excitation vector. Before the excitation VQ codebook search for the current excitation vector starts, the high-pass filtered input s(n), n = 1, 2, 3, 4 has been calculated in Section 5.1. In addition, before the VQ codebook search starts, the initial filter states (also called "filter memory") of the four filters in Figure 9 (blocks 240, 250, 260, and 265) are also known. All the other signals in Figure 9 are not determined yet for n = 1, 2, 3, 4.

The basic ideas of the excitation VQ codebook search are explained below. Refer to Figure 9. Block 248 stores the N scaled shape codevectors, where N = 16. Counting also the negated version of each scaled shape codevector, it is equivalent to having 2N scaled codevectors available for excitation VQ. From these 2N scaled codevectors, block 248 puts out one scaled codevector at a time as uq(n), n = 1, 2, 3, 4. With the initial filter memories in blocks 240, 250, 260, and 265 set to what were left after vector-quantizing the last excitation vector, this uq(n) vector then "drives" the rest of the filter structure until the corresponding quantization error vector q(n), n = 1, 2, 3, 4 is obtained. The energy of this q(n) vector is calculated and stored. This process is repeated for each of the 2N scaled codevectors, with the filter memories reset to their initial values before the process is repeated each time. After all 2N codevectors have been tried, the scaled codevector that minimizes the energy of the quantization error vector q(n), n = 1, 2, 3, 4 is selected as the winning scaled codevector and is used as the VQ output vector. The corresponding output VQ codebook index is a 5-bit index consisting of a sign bit as the most significant bit (MSB), followed by 4 shape bits. If the winning scaled codevector is a negated version of a scaled shape codevector, then the sign bit is 1, otherwise, the sign bit is 0. The 4 shape bits are simply the binary representation of the codebook index of the winning shape codevector, as defined in Appendix 7. Note that there are 10 such excitation codebook indices in a frame, since each frame has 10 excitation vectors. These 10 indices are grouped in an excitation codebook index array, denoted as  $CI = \{CI(1), CI(2), ..., CI(10)\}$ , where CI(k) is the excitation codebook index for the k-th excitation vector in the current frame. This excitation codebook index array CI is passed to the bit multiplexer block 295 in Figure 3.

Given a uq(n) vector (taking the value of one of the 2N scaled codevectors), the way to derive the corresponding energy of the q(n) vector is now described in more detail below. First, block 260 performs pitch prediction to produce the pitch-predicted vector ppv(n) as

$$ppv(n) = \sum_{i=1}^{3} b_i dq(n - pp + 2 - i) , n = 1, 2, 3, 4.$$

Adder 285 then updates the dq(n) vector as

$$dq(n) = uq(n) + ppv(n), n = 1, 2, 3, 4.$$

Next, block 240 and adder 245 together calculate short-term predicted speech vector sp(n) and quantized speech vector sq(n) as follows.

For 
$$n = 1, 2, 3, 4$$
, calculate  $sp(n)$  and  $sq(n)$  as follows:  
 $sp(n) = -\sum_{i=1}^{8} \tilde{a}_i \ sq(n-i)$   
 $sq(n) = dq(n) + sp(n)$ 

Then, block 250 and adders 290, 253, and 255 work together to update the v(n) vector as follows.

For 
$$n = 1, 2, 3, 4$$
, calculate  $stnf(n)$  and  $v(n)$  as follows:  
 $stnf(n) = \sum_{i=1}^{8} \hat{\beta}_i [v(n-i) - dq(n-i)] - \sum_{i=1}^{8} \hat{\alpha}_i stnf(n-i)$   
 $v(n) = s(n) - sp(n) - stnf(n)$ 

Finally, the corresponding q(n) vector is calculated as

$$q(n) = v(n) - ppv(n) - \lambda q(n - pp) - uq(n), n = 1, 2, 3, 4.$$

The energy of the q(n) vector is calculated as

$$E_q = \sum_{n=1}^4 q^2(n) \,.$$

Such calculation from a given uq(n) vector to the corresponding energy term  $E_q$  is repeated 2N times for the 2N scaled VQ codevectors. After the winning scaled codevector that minimizes the  $E_q$  term is selected, the filter memories of blocks 240, 250, 260, and 265 are updated by using the filter memories that were left after the calculation of the  $E_q$  term for that particular winning codevector was done. Such updated filter memories become the initial filter memories used for the excitation VQ codebook search for the next excitation vector.

#### 5.10 Bit Multiplexing

The bit multiplexer block 295 in Figure 3 packs the five sets of indices *LSPI*, *PPI*, *PPTI*, *GI*, and *CI* into a single bit stream. This bit stream is the output of the BraodVoice16 encoder. It is passed to the communication channel.

Figure 10 shows the BV16 bit stream format in each frame. In Figure 10, the bit stream for the current frame is the shaded area in the middle. The bit stream for the last frame is on the left, while the bit stream for the next frame is on the right. Although the bit stream of different frames may not be sent next to each other in a packet voice system, this illustration is meant to show that time goes from left to right, and the 30 side information bits consisting of *LSPI*, *PPI*, *PPTI*, and *GI* goes before the excitation codebook indices CI(k), k = 1, 2, ..., 10 when the bit stream is transmitted in a serial manner. Note that for each index, the most significant bit (MSB) goes first (on the left), while the least significant bit (LSB) goes last.

This completes the detailed description of the BV16 encoder.

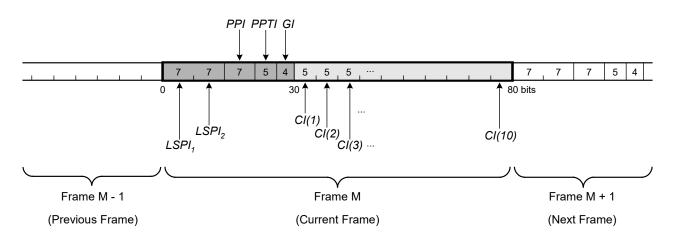


Figure 10 Bit stream format

### 6 DETAILED DESCRIPTION OF THE BV16 DECODER

This section gives a detailed description of each functional block in the BV16 decoder shown in Figure 4. Those blocks or signals that have the same labels as their counterparts in the encoder of Figure 3 have the same meaning as those counterparts.

#### 6.1 Bit De-multiplexing

The bit de-multiplexer block 400 takes one frame of input bit stream at a time, and de-multiplexes, or separates, the five sets of indices *LSPI*, *PPI*, *PPTI*, *GI*, and *CI* from the current frame of input bit stream. As described in Section 5 above, *LSPI* contains two indices: a 7-bit first-stage VQ index and a 7-bit second-stage VQ index. *PPI* is a 7-bit pitch period index. *PPTI* is a 5-bit pitch predictor tap VQ index. *GI* is a 4-bit gain index, and *CI* contains ten 5-bit excitation VQ indices, each with 1 sign bit and 4 shape bits.

#### 6.2 Long-Term Predictor Parameter Decoding

The long-term predictor parameter decoder (block 410) decodes the indices *PPI* and *PPTI*. The pitch period is decoded from *PPI* as

$$pp = PPI + 10$$

Let  $\{\mathbf{b}_0, \mathbf{b}_1, \dots, \mathbf{b}_{31}\}\$  be the 3-dimensional, 32-entry codebook used for pitch predictor tap VQ, as listed in Appendix 4. Let  $\mathbf{b}_j$  be the *j*-th codevector in this codebook, where the subscript *j* is the codebook index listed in the first column of the table in Appendix 4. The three pitch predictor taps  $b_1$ ,  $b_2$ , and  $b_3$  are decoded from *PPTI* as

$$\begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix} = \mathbf{b}_{PPTI} \ .$$

#### 6.3 Short-Term Predictor Parameter Decoding

The short-term predictor parameter decoding takes place in block 420 of Figure 4. Block 420 receives the set of decoded LSP indices,  $LSPI = \{LSPI_1, LSPI_2\}$ , from the bit de-multiplexer, block 400 in Figure 4. First, block 420 reconstructs the LSP coefficients,  $\{\tilde{l}_i\}$ , from the LSP indices, and then it produces the coefficients of the short-term prediction error filter,  $\{\tilde{a}_i\}$ , from the LSP coefficients according to the conversion procedure specified in Section 5.5.

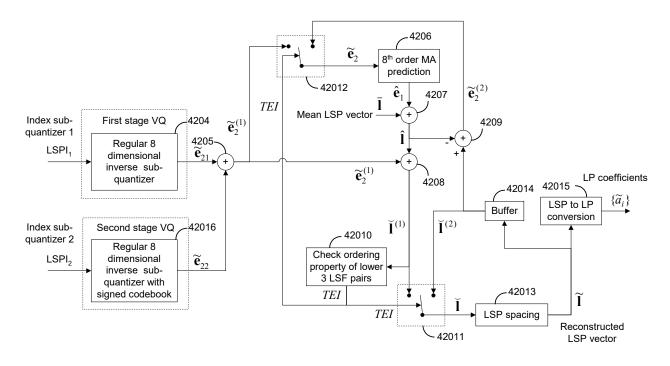


Figure 11 Short-term predictor parameter decoder (block 420)

Block 420 of Figure 4 is expanded in Figure 11. The reconstruction of the LSP coefficients from the LSP indices is the inverse of the LSP quantization, and many operations have equivalents in Section 5.4 and Figure 6. The first-stage VQ is decoded in block 4204, and the second-stage split VQ is decoded in block 42016.

In block 42016, the received index  $LSPI_2$  is decoded into the sign index,

$$I_{sg} = \begin{cases} 0, & LSPI_2 > 63\\ 1, & LSPI_2 \le 63 \end{cases},$$

and the shape vector index,

$$I_{sh} = \begin{cases} 127 - LSPI_2, & LSPI_2 > 63\\ LSPI_2, & LSPI_2 \le 63 \end{cases}.$$

From the sign and shape indices the reconstructed output of the second stage VQ is calculated as

$$\widetilde{\mathbf{e}}_{22} = s_{I_{sg}} \mathbf{c} \mathbf{b}_{2}^{(I_{sh})}.$$

From the index for the first stage VQ, block 4204 looks up the quantized first stage vector from the codebook  $\mathbf{CB}_1 = \{ \mathbf{cb}_1^{(0)}, \mathbf{cb}_1^{(1)}, \dots, \mathbf{cb}_1^{(127)} \},\$ 

$$\widetilde{\mathbf{e}}_{21} = \mathbf{c} \mathbf{b}_1^{(LSPI_1)}$$

Adder 4205 performs the equivalent operation of Adder 21611 in Figure 6. It adds the first-stage and second-stage vectors to obtain a first reconstructed prediction error vector,

$$\widetilde{\mathbf{e}}_{2}^{(1)} = \widetilde{\mathbf{e}}_{21} + \widetilde{\mathbf{e}}_{22}$$

Equivalent to block 2163 in Figure 6, block 4206 performs the 8<sup>th</sup>-order MA prediction of the mean-removed LSP vector according to

$$\hat{e}_{1,i} = \mathbf{p}_{LSP,i}^{T} \begin{bmatrix} \widetilde{e}_{2,i}(1) & \widetilde{e}_{2,i}(2) & \widetilde{e}_{2,i}(3) & \widetilde{e}_{2,i}(4) & \widetilde{e}_{2,i}(5) & \widetilde{e}_{2,i}(6) & \widetilde{e}_{2,i}(7) & \widetilde{e}_{2,i}(8) \end{bmatrix}^{T}, \quad i = 1, 2, \dots, 8,$$

where  $\tilde{e}_{2,i}(k)$  and  $\mathbf{p}_{LSP,i}$  are defined in Section 5.4. Adder 4207, equivalent to Adder 21612 in Figure 6, generates the predicted LSP vector by adding the mean LSP vector and the predicted mean-removed LSP vector,

$$\hat{\mathbf{l}} = \bar{\mathbf{l}} + \hat{\mathbf{e}}_1$$

Subsequently, adder 4208 adds the predicted LSP vector to the first reconstructed prediction error vector to obtain a first intermediate reconstructed LSP vector,

$$\widecheck{\mathbf{l}}^{(1)} = \widehat{\mathbf{l}} + \widetilde{\mathbf{e}}_2^{(1)} \,.$$

Adder 4209 subtracts the predicted LSP vector from a second intermediate reconstructed LSP  $\check{I}^{(2)}$ , to calculate a second reconstructed prediction error vector

$$\widetilde{\mathbf{e}}_2^{(2)} = \widecheck{\mathbf{l}}^{(2)} - \widehat{\mathbf{l}} \quad :$$

to be used to update the MA predictor memory in the presence of bit-errors. Block 42010 determines the ordering property of the first 3 first intermediate reconstructed LSP coefficients,

$$egin{array}{rcl} egin{array}{ccc} egin{array}{cccc} egin{array}{ccc} egin{array}{ccc} egin{arr$$

This ordering property was enforced during the encoding operation of the constrained VQ of the second stage, block 21615 of Figure 6. If the ordering is found to be preserved, the *Transmission-Error-Indicator*, *TEI*, is set to 0 to indicate that no bit-errors in the LSP bits have been detected. Otherwise, if it is not preserved, the *Transmission-Error-Indicator* is set to 1 to indicate the likely presence of bit-errors in the LSP bits.

If the *Transmission-Error-Indicator* is 0, the switches 42011 and 42012 are in the left position, and they route the first reconstructed prediction error vector  $\tilde{\mathbf{e}}_2^{(1)}$  and the first intermediate reconstructed LSP vector  $\mathbf{\tilde{I}}^{(1)}$  to the reconstructed prediction error vector  $\tilde{\mathbf{e}}_2$  and the intermediate reconstructed LSP vector  $\mathbf{\tilde{I}}$ , respectively. Otherwise, if the *Transmission-Error-Indicator* is 1, the

switches 42011 and 42012 are in the right position, and they route the second reconstructed prediction error vector  $\tilde{\mathbf{e}}_2^{(2)}$  and the second intermediate reconstructed LSP vector  $\breve{\mathbf{I}}^{(2)}$  to the reconstructed prediction error vector  $\tilde{\mathbf{e}}_2$  and the intermediate reconstructed LSP vector  $\breve{\mathbf{I}}$ , respectively. Hence, the reconstructed prediction error vector and the intermediate reconstructed LSP vector are obtained as

$$\widetilde{\mathbf{e}}_2 = \begin{cases} \widetilde{\mathbf{e}}_2^{(1)}, & \text{if } TEI = 0 \\ \widetilde{\mathbf{e}}_2^{(2)}, & \text{if } TEI = 1 \end{cases}$$

and

$$\vec{\mathbf{I}} = \begin{cases} \vec{\mathbf{I}}^{(1)}, & \text{if } TEI = 0\\ \vec{\mathbf{I}}^{(2)}, & \text{if } TEI = 1 \end{cases},$$

respectively. Block 42013 enforces LSP spacing; it is functionally identical to block 21614 in Figure 6, as specified in Section 5.4. Block 42014 buffers the reconstructed LSP vector for future use in the presence of bit-errors. The reconstructed LSP vector of the current frame becomes the second intermediate reconstructed LSP vector of the next frame,

$$\widetilde{\mathbf{I}}^{(2)}(k+1) = \widetilde{\mathbf{I}}(k) \,,$$

where the additional parameter k here represents the frame index of the current frame. For the very first frame the second intermediate reconstructed LSP vector is initialized to

$$\tilde{\mathbf{l}}^{(2)} = \begin{bmatrix} 1/9 & 2/9 & \dots & 8/9 \end{bmatrix}^T$$

The final step of the short-term predictor parameter decoding is to convert the reconstructed LSP coefficients to linear prediction coefficients. This operation takes place in block 42015, which is functionally identical to block 217 of Figure 5, described in Section 5.5.

#### 6.4 Excitation Gain Decoding

The excitation gain decoder is shown in Figure 12. It is part of block 430 in Figure 4. It decodes the gain index in GI into the corresponding decoded frame excitation gain gq(m) in the linear domain. All operations in Figure 12 are performed on a frame-by-frame basis.

Refer to Figure 12. Let *m* be the frame index of the current frame, and assume the same convention for the frame index *m* as in Section 5.8. Block 501 decodes the 4-bit gain index  $GI_m$  into the log-gain prediction error lgeq(m) using the codebook in Appendix 5. Switch 502 is normally in the upper position, connecting the output of block 501 to the input of block 503. Then, the MA log-gain predictor (block 503) calculates the estimated log-gain for the current frame as

$$elg(m) = \sum_{k=1}^{GPO} lgp(k) lgeq(m-k)$$
,

where GPO = 8, and lgp(k), k = 1, 2, ..., GPO are the MA log-gain predictor coefficients given in Section 5.8.

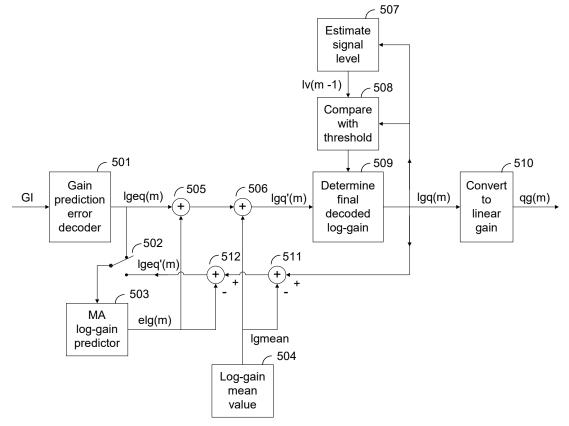


Figure 12 Excitation gain decoder

Block 504 holds the long-term average log-gain value lgmean = 11.45752. Adders 505 and 506 adds elg(m) and lgmean, respectively, to lgeq(m), resulting in the temporarily decoded log-gain of

$$lgq'(m) = lgeq(m) + elg(m) + lgmean$$
.

Block 507 is functionally identical to block 309 in Figure 8, described in Section 5.8. It is important to note that equivalently to the encoder, the log-gain value passed to block 507 for updating its estimate of the long-term average signal level is the final value of the decoded log-gain lgq(m), i.e. after the threshold check of block 508 and potential log-gain extrapolation and substitution of block 509, respectively, as described below.

Block 508 calculates the row and column indices i and j into the threshold matrix T(i, j) in the same way as block 310 in Figure 8. Namely, the row index is calculated as

$$i = \left\lceil \frac{lgq(m-1) - lv(m-1) - GLB}{2} \right\rceil,$$

where GLB = -24. If i > NG, *i* is clipped to *NG*. If i < 1, *i* is clipped to 1. The column index is calculated as

$$j = \left\lceil \frac{lgq(m-1) - lgq(m-2) - GCLB}{2} \right\rceil,$$

where GCLB = -8. If j > NGC, j is clipped to NGC. If j < 1, j is clipped to 1.

Block 508 controls the actions of block 509 and switch 502 in the following way. If  $GI_m = 0$  or  $lgq'(m) \le T(i, j) + lgq(m - 1)$ , then switch 502 is in the upper position, block 509 determines the final decoded log-gain as

$$lgq(m) = lgq'(m)$$
,

and the filter memory in the MA log-gain predictor (block 503) is updated by shifting the old memory values by one position, and then assigning lgeq(m) to the newest position of the filter memory.

If, on the other hand,  $GI_m > 0$  and lgq(m) > T(i, j) + lgq(m - 1), then the temporarily decoded loggain lgq'(m) is discarded, block 509 determines the final decoded log-gain as

$$lgq(m) = lgq(m-1)$$

(by extrapolating the decoded log-gain of the last sub-frame); furthermore, switch 502 is moved to the lower position, adders 511 and 512 subtract *lgmean* and elg(m), respectively, from lgq(m) to get

$$lgeq'(m) = lgq(m) - lgmean - elg(m),$$

and this lgeq'(m) is used to update the newest position of the filter memory of block 503, after the old memory values are shifted by one position.

Once the final decoded log-gain lgq(m) subject to the constraint imposed by block 509 is determined as described above, it is used by block 508 to update the estimated signal level lv(m). This value lv(m) is then used by block 509 in the next frame (the (m + 1)-th frame).

Block 510 converts final decoded log-gain lgq(m) to the linear domain as  $gq(m) = 2^{\frac{lgq(m)}{2}}$ .

#### 6.5 Excitation VQ Decoding and Scaling

The excitation codebook index array CI of each frame contains 10 excitation codebook indices, CI(k), k = 1, ..., 10, each containing 1 sign bit and 4 shape bits. The excitation vectors are decoded vector-by-vector.

Let gq(m) denote the decoded excitation gain in the linear domain for the current frame. In addition, let CI(k) denote the received excitation codebook index of the current excitation vector that needs to be decoded. This index assumes a value between 0 and 31. The most significant bit of this index is the sign bit. Therefore, if CI(k) < 16, the sign bit is 0; otherwise, the sign bit is 1. Let  $c_j(n)$ , n = 1, 2, 3, 4 represent the *j*-th shape codevector in Appendix 7, with a shape codebook index of *j*. Furthermore, without loss of generality, let n = 1, 2, 3, 4 correspond to the sample time indices of the current vector. Then, in Figure 4, the decoded and scaled excitation vector, or uq(n), n = 1, 2, 3, 4, is obtained as

$$uq(n) = \begin{cases} gq(m) c_{CI(k)}(n), & n = 1, 2, 3, 4, \\ -gq(m) c_{CI(k)-16}(n), & n = 1, 2, 3, 4, \\ \text{if } CI(k) \ge 16 \end{cases}$$

#### 6.6 Long-Term Synthesis Filtering

Let n = 1, 2, ..., FRSZ correspond to the sample time indices of the current frame. In Figure 4, the long-term synthesis filter (block 455, consisting of block 440 and adder 450 in a feedback loop) performs sample-by-sample long-term synthesis filtering as follows.

$$dq(n) = uq(n) + \sum_{i=1}^{3} b_i dq(n - pp + 2 - i), n = 1, 2, \dots FRSZ.$$

#### 6.7 Short-Term Synthesis Filtering

The short-term synthesis filter (block 475, consisting of block 460 and adder 470 in a feedback loop) performs sample-by-sample short-term synthesis filtering to obtain the output signal as follows.

$$sq(n) = dq(n) - \sum_{i=1}^{8} \widetilde{a}_i \ sq(n-i), n = 1, 2, \dots FRSZ.$$

#### 6.8 Example Postfilter

This document specifies codec components that need to be clearly specified in order to foster inter-operability. Decoder postfiltering is not a mandatory component of this BV16 Codec Specification, since such postfiltering does not affect bit-stream compatibility or encoder-decoder inter-operability. However, an example postfilter is described in this section for reference

purposes only. An implementer of BV16 can utilize other postfilters without affecting interoperability.

The example postfilter is an all-zero single tap pitch postfilter. The input to the pitch postfilter is the pitch period, pp, and the output signal, sq(n), from the short-term synthesis filter<sup>7</sup>. In principle, the postfiltering is given by

$$spf(n) = b_{pf}(1) sq(n) + b_{pf}(2) sq(n - pppf), n = 1, 2, ... FRSZ,$$

where spf(n) denotes the postfiltered output signal and *pppf* is the pitch period used for the pitch postfilter.

First the pitch period of the decoder is refined by selecting the lag, pppf, corresponding to the highest squared normalized pitch correlation of the output signal in a ±4 sample range of the pitch period, pp, i.e. the lag, pppf, that maximizes,

$$Csq(pppf) = \frac{\left[\sum_{n=1}^{FRSZ} sq(n) \ sq(n-pppf)\right]^2}{\left[\sum_{n=1}^{FRSZ} sq(n) \ sq(n)\right] \left[\sum_{n=1}^{FRSZ} sq(n-pppf) \ sq(n-pppf)\right]}, pppf = pp_{min}, pp_{min}+1, \dots, pp_{max},$$

where  $pp_{min} = pp-4$  and  $pp_{max} = pp+4$ , with the following constraints:

if 
$$pp_{min} < MINPP$$
:  $pp_{min} = MINPP$ ,  $pp_{max} = MINPP+8$ , and similarly  
if  $pp_{max} > MAXPP$ :  $pp_{max} = MAXPP$ ,  $pp_{min} = MAXPP-8$ .

With the refined lag the normalized pitch correlation is calculated as

$$Cpf = \frac{\left[\sum_{n=1}^{FRSZ} sq(n) sq(n-pppf)\right]}{\sqrt{\left[\sum_{n=1}^{FRSZ} sq(n) sq(n)\right]\left[\sum_{n=1}^{FRSZ} sq(n-pppf) sq(n-pppf)\right]}}$$

If the numerator is less than zero or the denominator is zero, the normalized pitch correlation is set to zero, Cpf = 0. Next, a running mean of the normalized pitch correlation is calculated as

$$Crm(m) = 0.75 Crm(m-1) + 0.25 Cpf$$
,

where Crm(m) is the running mean of the current frame, and Crm(m-1) is the running mean of the previous frame<sup>8</sup>. Based on the normalized pitch correlation and the running mean of the normalized pitch correlation, the initial pitch postfilter tap is calculated as

<sup>&</sup>lt;sup>7</sup> At the first frame, the history of sq(n) is set to zero.

$$a_{pf} = \begin{cases} 0 & Crm(m) < 0.55 \text{ and } Cpf < 0.8\\ 0.3 \ Cpf & \text{otherwise} \end{cases}.$$

Subsequently, a scaling factor is calculated as

$$g_{pf} = \sqrt{\frac{\sum_{n=1}^{FRSZ} [sq(n)]^2}{\sum_{n=1}^{FRSZ} [sq(n) + a_{pf} \ sq(n - pppf)]^2}}$$

It is set to one if either the numerator or the denominator is zero. The two pitch postfilter coefficients of the current (m-th) frame is calculated as

$$b_{pf,m}(1) = g_{pf}$$
 and  $b_{pf,m}(2) = g_{pf} a_{pf}$ .

In practice, for the first *Lint*=20 samples of each frame, the impulse responses of adjacent pitch postfilters are interpolated while the pitch postfilter of the current frame is used for the remaining samples of the frame:

$$spf(n) = b_{pf}(1,n) sq(n) + b_{pf}(2,n) sq(n - pppf_m) + b_{pf}(3,n) sq(n - pppf_{m-1}), n = 1, 2, ... FRSZ,$$

where  $pppf_m$  and  $pppf_{m-1}$  are the refined pitch period of the current and previous frames, respectively, and

A linear interpolation between adjacent pitch postfilters<sup>9</sup> is used:

$$\alpha(n) = \frac{n}{L \operatorname{int} + 1}$$

#### 6.9 Example Packet Loss Concealment

<sup>8</sup> For the first frame, running mean of the previous frame is set to zero, i.e. Crm(0)=0.

<sup>&</sup>lt;sup>9</sup> For the first frame, the parameters of the previous pitch postfilter are set to  $pppf_0=100, b_0(1)=1, b_0(2)=0.$ 

Similar to decoder postfiltering, packet loss concealment is not a mandatory component of this BV16 Codec Specification, since packet lost concealment does not affect bit-stream compatibility or encoder-decoder inter-operability. However, an example packet loss concealment technique is described in this section for reference purposes only. An implementer of BV16 can utilize other packet loss concealment techniques without affecting inter-operability.

The example packet loss concealment technique utilizes the synthesis model of the decoder. In principle, all side information of the previous frame is repeated while the excitation of the cascaded long-term and short-term synthesis filters is from a random source, scaled to a proper level. Hence, with the additional index m denoting the m-th frame, during packet-loss:

- The pitch period, pp, is set to the pitch period of the last frame<sup>10</sup>:  $pp = pp_{m-1}$ .
- The pitch taps,  $b_1 b_2$  and  $b_3$ , are set to the pitch taps of the last frame<sup>11</sup>.  $b_i = b_{m-1,i}$ , i=1,2,3.
- The short-term synthesis filter coefficients,  $\tilde{a}_i, i = 1,...,8$ , are set to those of the last frame<sup>12</sup>:
  - $\widetilde{a}_i = \widetilde{a}_{m-1,i}, i=1,\ldots,8.$
- A properly scaled random sequence is used as long-term synthesis filter excitation, uq(n), n = 1, 2, ... FRSZ.

The speech synthesis of the bad frame (part of lost packet) now takes place exactly as specified in Sections 6.6, 6.7, and 6.8 if the example postfilter is included.

The random sequence is scaled according to

$$uq(n) = g_{plc} \cdot \sqrt{\frac{E_{m-1}}{\sum_{n=1}^{FRSZ} [r(n)]^2}} \cdot r(n), n = 1, 2, \dots FRSZ,$$

where r(n), n = 1, 2, ... FRSZ, is a random sequence,  $E_{m-1}$  is in principle the energy of the long-term synthesis filter excitation of the previous frame<sup>13</sup>, and the scaling factor,  $g_{plc}$ , is calculated as detailed below.

During good frames an estimate of periodicity is updated as

$$per_m = 0.5 \ per_{m-1} + 0.5 \ bs$$
,

<sup>&</sup>lt;sup>10</sup> If the first frame is lost a value of 100 is used for the pitch period.

<sup>&</sup>lt;sup>11</sup> If the first frame is lost the pitch taps are set to zero.

<sup>&</sup>lt;sup>12</sup> If the first frame is lost the short-term filter coefficients are set to zero.

<sup>&</sup>lt;sup>13</sup> The energy is initialized to zero, i.e.  $E_0=0$ .

where *bs* is the sum of the three pitch taps clipped at a lower threshold of zero and an upper threshold of one<sup>14</sup>, while it is maintained during bad frames:  $per_m = per_{m-1}$ . Based on the periodicity the scaling factor is calculated as

$$g_{plc} = -2 \ per_{m-1} + 1.9$$

with  $g_{plc}$  clipped at a lower threshold of 0.1 and an upper threshold of 0.9.

After synthesis of the signal output of a lost frame, memories of predictive quantizers are updated.

The memory of the inverse LSP quantizer is updated with

$$\widetilde{e}_{2,i} = \widetilde{I}_{m-1,i} - \hat{e}_{1,i} - \overline{I}_i, i=1,2,...,8,$$

where  $\hat{e}_{1,i}$  is given in Section 6.3,  $\bar{I}_i$  in Section 5.4, and  $\tilde{I}_{m-1,i}$  denotes the i-th LSP coefficients of the (m-1)-th frame (as decoded according to Section 6.3 for a good frame, or repeated for a bad frame).

The memory of the inverse gain quantizer is updated with

$$lgeq(m) = lgq(m) - lgmean - elg(m),$$

where elg(m) is given in Section 6.4, *lgmean* in Section 5.8, and lgq(m) is calculated as

$$lgq(m) = \begin{cases} \log_2 \frac{E_{m-1}}{FRSZ}, & \text{if } \frac{E_{m-1}}{FRSZ} > 1\\ 0, & \text{if } \frac{E_{m-1}}{FRSZ} \le 1 \end{cases}.$$

The level estimation for a bad frame is updated exactly as for a good frame, see Section 6.4.

At the end of a good frame (after synthesis of the output) the estimate of periodicity is estimated as explained above, and the energy of the long-term synthesis filter excitation is updated as

$$E_m = \sum_{n=1}^{FRSZ} [uq(n)]^2 \; .$$

At the end of the processing of a bad frame (after synthesis of the output and update of predictive quantizers), the energy of the long-term synthesis filter excitation and the long-term synthesis filter coefficients are scaled down when 8 or more consecutive frames are lost:

<sup>&</sup>lt;sup>14</sup> The estimate of periodicity is initialized to zero, i.e. *per*<sub>0</sub>=0.

$$E_{m} = \begin{cases} E_{m-1} & Nclf < 8\\ (\beta_{Nclf})^{2} & E_{m-1} & Nclf \ge 8 \end{cases},$$
$$b_{m,i} = \begin{cases} b_{m-1,i} & Nclf < 8\\ \beta_{Nclf} & b_{m-1,i} & Nclf \ge 8 \end{cases}, \quad i=1,2,3,$$

where Nclf is the number of consecutive lost frames, and the scaling,  $\beta_{Nclf}$ , is given by

$$\beta_{\scriptscriptstyle N\!clf} = \begin{cases} 1 - 0.02 \, (Nclf - 7) & 8 \leq Nclf \leq 57 \\ 0 & Nclf > 57 \end{cases}.$$

This will gradually mute the output signal when consecutive packets are lost for an extended period of time.

# **APPENDIX 1: GRID FOR LPC TO LSP CONVERSION**

<u>a.1</u>	
Grid point	Grid value
0	0.9999390 0.9935608
1 2	0.9933608
3	0.9848033
4	0.9723342
5	0.9377942
6	0.9215393
7	0.8995972
8	0.8753662
9	0.8487854
10	0.8198242
11	0.7887573
12	0.7558899
13	0.7213440
14	0.6853943
15	0.6481323
16	0.6101379
17	0.5709839
18	0.5300903
19	0.4882507
20	0.4447632
21	0.3993530
22	0.3531189
23	0.3058167
24	0.2585754
25	0.2109680
26	0.1630859
27	0.1148682
28	0.0657349
29	0.0161438
<u>30</u> 31	-0.0335693 -0.0830994
31	-0.1319580
33	-0.1804199
34	-0.2279663
35	-0.2751465
36	-0.3224487
37	-0.3693237
38	-0.4155884
39	-0.4604187
40	-0.5034180
41	-0.5446472
42	-0.5848999
43	-0.6235962
44	-0.6612244
45	-0.6979980
46	-0.7336731
47	-0.7675781 -0.7998962
48 49	
50	-0.8302002 -0.8584290
51	-0.8842468
52	-0.9077148
53	-0.9288635
54	-0.9472046
55	-0.9635010
56	-0.9772034
57	-0.9883118
58	-0.9955139
59	-0.9999390

# **APPENDIX 2: FIRST-STAGE LSP CODEBOOK**

Data         Data <thdata< th="">         Data         Data         <thd< th=""><th>Index</th><th>Element 1</th><th>Element 2</th><th>Element 3</th><th>Element 4</th><th>Element 5</th><th>Element 6</th><th>Element 7</th><th>Element 8</th></thd<></thdata<>	Index	Element 1	Element 2	Element 3	Element 4	Element 5	Element 6	Element 7	Element 8
1         -0.0053177         -0.0013902         -0.0027079         -0.002810         -0.000281         0.0001414         -0.0003760           2         -0.000288         -0.0004141         -0.001364         -0.0076218         -0.0042191         -0.0042191         -0.0014144         -0.0013853           4         -0.002270         -0.001466         -0.0007620         -0.0012035         -0.00171219         -0.0007621         -0.0007621         -0.0007621         -0.0007621         -0.0007621         -0.0007620         -0.0021532         -0.0007629         -0.0021533         -0.0007629         -0.0021533         -0.0007761         -0.0017621         -0.0007761         -0.0017521         -0.0007761         -0.0017521         -0.0007761         -0.0017521         -0.0001751         -0.0017521         -0.0017614         -0.0017521         -0.0017514         -0									
2         -0.009108         -0.001811         -0.0014071         -0.0110474         -0.023800         -0.0042191         -0.0015151         0.015859           4         -0.0023270         -0.001496         -0.0071030         0.0022093         -0.0012119         -0.0003021         0.0001385           5         -0.006104         -0.0013807         -0.0018177         -0.0018177         -0.0018177         -0.0018177         -0.0018171         -0.0012343         -0.0021852         -0.0003185         -0.0003185         -0.003485           7         -0.000510         -0.0013201         -0.0018177         -0.0018772         -0.0018787         -0.0002551         -0.0023201         -0.0013886         -0.007782           9         -0.002114         -0.0025717         -0.001417         -0.0044976         -0.0013886         -0.001782           10         -0.0032806         -0.0012516         -0.0044976         -0.004411         -0.002364         -0.012461           11         -0.0022806         -0.00126527         -0.014266         -0.0044976         -0.0038376         -0.0116141           12         -0.0072667         -0.014266         -0.0046976         -0.0023990         -0.0126467         -0.003902         -0.0061515         -0.016240           1	1								
3         0.0011128         0.0017218         -0.0042191         -0.0073776         -0.001303         -0.0009513         0.0009562           5         -0.001129         -0.0071320         0.00048294         0.0010395         0.0007172         0.0009561         0.0009561           6         0.000140         0.00041877         0.0012345         0.0002372         0.00092163           7         0.0009561         0.0001172         0.0002381         0.0007472         0.0002383         0.00074599           8         0.00047485         -0.0007310         0.0011033         0.0002202         0.00138646         0.0002200         0.00138646           10         0.0005712         0.0105816         0.00073766         0.0012202         0.01186844           11         0.0005553         0.00023731         0.00073761         0.0012843         0.0012446         0.0012446           12         0.0035964         0.0128642         0.00018348         0.0013438         0.0012446         0.0012446           14         0.0007256         0.0012843         0.0007541         0.007547         0.0012844         0.0007541         0.0075414         0.0075414         0.0075414         0.0075414         0.0075414         0.0075414         0.0075414         0.0075	2								
4         -0.0023270         -0.001496         -0.0071030         -0.0022093         -0.0012119         -0.0003212         -0.001385           5         -0.006104         -0.001385         -0.0003121         -0.001385         -0.0003212         -0.001385           6         0.0006104         -0.0013851         -0.0018771         -0.0038910         -0.003485         -0.0003491         -0.0034910         -0.003485         -0.0013851         -0.001913         -0.0087204         -0.0025910         -0.001411         -0.0077522         -0.0014717         -0.0049967         -0.0013386         -0.007752         -0.001417         -0.0049967         -0.0014311         -0.0027752         -0.0014171         -0.0014967         -0.0014311         -0.002776         -0.0112451           10         -0.0023206         -0.0013551         -0.004571         -0.0149667         -0.0014311         -0.004276         -0.0112451           13         -0.0046234         -0.002664         -0.0012861         -0.016246         -0.0038348         -0.0142451         -0.0149764         -0.0038376         -0.0112451           14         -0.0047614         -0.007567         -0.0128021         -0.0014976         -0.0149764         -0.0049764         -0.0038476         -0.0112451         -0.0164754         -0.0099666									
5         -0.0081329         -0.007732         0.0094824         0.001335         0.000772         0.000729         0.000729           7         0.0009561         0.0081329         0.0009513         0.0011003         -00012872         0.0032533         0.0007453           8         0.0004148         -0.007512         0.0158315         0.0005708         0.0002202         0.0014253         0.0074533           9         0.002114         0.005533         0.0042877         0.0108326         -0.0049677         -0.0049677         -0.0049678         -0.0046886         -0.0018563           10         0.003553         0.0042877         0.010326         -0.0042746         -0.0018166           12         0.001900         0.0050640         0.012882         -0.0046477         -0.0									
6         0.0006104         0.0001370         -0.0001372         -0.00018727         -0.00038910         -0.0003485           8         -0.0044785         -0.007572         -0.0015815         0.001913         0.0087204         -0.0003951         -0.0013886         0.007362           9         -0.0041785         -0.00137308         -0.0118326         -0.0018717         -0.0014811         -0.002205         -0.0142746         -0.0017362           10         -0.002206         -0.0013351         -0.0019353         -0.0017812         -0.0018214         -0.0018246         -0.0014311         -0.0014375         -0.0116245           12         -0.001220         -0.0046501         -0.0128612         -0.0001535         -0.0064318         -0.0014376         -0.0116245           14         -0.0001220         -0.00460501         -0.0128612         -0.0044886         -0.0014378         -0.0007515         -0.0162440           15         -0.0000229         -0.0014675         -0.0090866         -0.007542         -0.007513         -0.016240           16         -0.0071760         -0.014475         -0.0090866         -0.0027542         -0.0027613         -0.007267           17         -0.00017760         -0.0144751         -0.0090867         -0.013711 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>									
8         -0.0044785         -0.0015721         -0.001417         -0.007320         -0.0004774         -0.000571         -0.0017332           10         -0.0033902         -0.0013708         -0.001226         -0.004567         -0.0043411         -0.003286         -0.0017362           11         -0.0032806         -0.001351         -0.0012506         -0.0012502         -0.0012502         -0.0012642         -0.0012642         -0.0012642         -0.0012642         -0.0012642         -0.0012642         -0.0012642         -0.0012642         -0.0012642         -0.0012642         -0.0012642         -0.0012642         -0.0012644         -0.0012641         -0.002286         -0.0012641         -0.0012652         -0.017467         -0.0014667         -0.0014788         -0.0002866         -0.0017614         -0.0017667         -0.017657         -0.0014615         -0.0017613         -0.0017613         -0.0017613         -0.00177362         -0.00177362         -0.00177362         -0.00177362         -0.00177362         -0.00177362         -0.00177362         -0.00177362         -0.00177362         -0.00177362         -0.00177362         -0.00173783         -0.00173783         -0.00173783         -0.00173783         -0.00173783         -0.00173783         -0.00173783         -0.00173783         -0.0017373         -0.00077372         -0.0016730 </td <td>-</td> <td>0.0006104</td> <td>0.0040817</td> <td>-0.0010300</td> <td>-0.0081787</td> <td>-0.0126343</td> <td>-0.0218582</td> <td>-0.0007629</td> <td>-0.0092163</td>	-	0.0006104	0.0040817	-0.0010300	-0.0081787	-0.0126343	-0.0218582	-0.0007629	-0.0092163
8         -0.0044785         -0.0015721         -0.001417         -0.007320         -0.0004774         -0.000571         -0.0017332           10         -0.0033902         -0.0013708         -0.001226         -0.004567         -0.0043411         -0.003286         -0.0017362           11         -0.0032806         -0.001351         -0.0012506         -0.0012502         -0.0012502         -0.0012642         -0.0012642         -0.0012642         -0.0012642         -0.0012642         -0.0012642         -0.0012642         -0.0012642         -0.0012642         -0.0012642         -0.0012642         -0.0012642         -0.0012644         -0.0012641         -0.002286         -0.0012641         -0.0012652         -0.017467         -0.0014667         -0.0014788         -0.0002866         -0.0017614         -0.0017667         -0.017657         -0.0014615         -0.0017613         -0.0017613         -0.0017613         -0.00177362         -0.00177362         -0.00177362         -0.00177362         -0.00177362         -0.00177362         -0.00177362         -0.00177362         -0.00177362         -0.00177362         -0.00177362         -0.00173783         -0.00173783         -0.00173783         -0.00173783         -0.00173783         -0.00173783         -0.00173783         -0.00173783         -0.0017373         -0.00077372         -0.0016730 </td <td>7</td> <td>0.0090561</td> <td>0.0081329</td> <td>0.0096436</td> <td>0.0009613</td> <td>0.0011063</td> <td>-0.0042572</td> <td>0.0038910</td> <td>-0.0034485</td>	7	0.0090561	0.0081329	0.0096436	0.0009613	0.0011063	-0.0042572	0.0038910	-0.0034485
10         -0.0039902         0.0013708         -0.010226         -0.004477         -0.004467         -0.004341         -0.004341         -0.0014276         -0.0014276           11         0.0032806         0.0013351         -0.004501         0.0017614         -0.0032265         -0.0114276         -0.0016476           13         0.001910         0.005964         0.0128632         0.0018533         0.0088348         0.0054915         -0.0015414         0.0005641         -0.0016431           14         -0.000222         0.0005006         0.025522         -0.0174671         -0.0009861         -0.0016497         -0.0005615         -0.0017611         0.00076141         0.00076141         0.00076141         0.00077611         -0.0017767         -0.0104755         -0.0002752         0.00077611         -0.0017752         -0.0001775         -0.0017755         -0.0009765         -0.0002755         -0.00097755         -0.00097755         -0.00097755         -0.00097755         -0.0007755         -0.0017755         -0.0017755         -0.0007775         -0.0017755         -0.0017755         -0.0017755         -0.0017755         -0.0017755         -0.0017755         -0.001775         -0.001775         -0.001775         -0.0017755         -0.001777         -0.001777         -0.001777         -0.001777         -0.00177	8	-0.0044785	-0.0070572	-0.0158615	0.0019913	0.0087204		0.0022583	-0.0074539
11         0.0035553         0.0042877         0.019286         0.007812         0.0082245         0.0018274         0.0011024           13         0.0010910         0.0059064         0.0124632         0.0015434         0.0015143         0.003902         -0.0059015         -0.0110245           14         -0.0007226         0.004000         0.0256427         0.0128021         0.0046496         -0.004902         -0.00059015         -0.014616         0.0048966         -0.014910         0.006124         0.0016032         0.000000         0.0256427         0.0128021         0.0049896         0.0048966         -0.0047150           16         -0.0074081         -0.0085509         -0.016767         -0.004675         -0.000466         -0.0027503         0.0016113         0.0016113         0.0007614         -0.007803           19         -0.0001970         0.002599         0.0160231         -0.0012752         -0.0024550         -0.0024692         -0.012711         -0.0025726         -0.0027633         -0.0012712         -0.0027532         -0.0012764         -0.0025609         -0.016133         -0.0027071         -0.0012702           10         -0.002715         -0.0027233         -0.0127844         -0.0197015         -0.0027071         -0.0168702           20	9	0.0042114	0.0052719	-0.0061417	0.0057449	0.0057068	-0.0022202	0.0133896	0.0077362
12         0.0032806         0.0013351         -0.0044501         0.00149184         0.003264         -0.0038376         -0.0038376         -0.0018376           14         -0.0047226         -0.0046234         0.0096664         0.0042486         -0.004697         -0.0039902         -0.008688         -0.0014781           15         -0.0002279         0.0008669         -0.017552         -0.017461         -0.0008666         -0.0007544         0.0008668         -0.0047150           16         -0.0019760         -0.0025950         -0.0127824         -0.0019753         -0.0014753         -0.001470         -0.0038763         -0.0146113         0.0037613         0.0046143         -0.0027524         -0.0038726         -0.0006714         -0.0028509         -0.0127121         -0.0037526         -0.0006715         -0.004550         -0.004652         -0.001977         -0.0038726         -0.000977         -0.0038726         -0.000977         -0.014618         -0.0117271         -0.0024550         -0.004682         -0.017771         -0.014826         -0.0022125         -0.014618         -0.014826         -0.0022067         -0.0138736         -0.0178767         -0.0138767         -0.0138767         -0.0138767         -0.0138767         -0.0138767         -0.0138767         -0.0017867         -0.0138767         -0.01387	10	-0.0039902				-0.0049667		-0.0066986	-0.0186844
13         0.0010910         0.009664         0.001553         0.008348         0.015143         0.009664         0.009664         0.009664         0.0096497           15         -0.0000229         0.000000         0.0265427         0.0128021         0.0049896         0.0054398         0.0006888         -0.007411         0.0075414         0.0075414         0.0076414         0.0076414         0.0076414         0.0076414         0.0076414         0.0076414         0.0076414         0.0076414         0.0007803           17         -0.0019760         -0.002599         0.0128734         -0.005867         0.00226373         0.00265373         0.00265373         0.00265373         0.00265373         0.00265373         0.00265373         0.00265373         0.00265373         0.00265373         0.00265373         0.00265373         0.00265373         0.00265373         0.00265373         0.0126343         0.0026527         0.004662         0.00265373         0.0128744         -0.0056672         0.02265473         0.0016622         0.0009772         0.0046682         0.0017727         0.0046682         0.007927         0.0046682           22         -0.0016612         0.00007614         -0.0082639         0.0112874         -0.0018635         0.007727         0.0046682         0.007727         0.0046683 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>									
14         -0.0047226         -0.0046234         0.0064697         -0.0039902         -0.0059912         -0.0059912         -0.0059912         -0.0059912         -0.0059912         -0.00152410           15         -0.00074081         -0.0089569         -0.017552         -0.0174561         -0.0074831         -0.0148010         0.0076141         0.0076141         0.0076141         0.0076141         0.0037613         0.0037613         0.0037613         0.0037614         0.0037613         0.0037613         0.0037613         0.0037613         0.0037613         0.0037613         0.0037613         0.0037613         0.0037711         0.0037526         0.0006225         0.0027752         0.0045515         -0.0046622         -0.0013711         -0.0038203         0.0117264         0.0126343         0.0037272         0.0046622         -0.0013771         -0.0045623         0.0001977         -0.0046622         -0.0017777         -0.0046622         -0.0017777         -0.0046622         -0.0017727         -0.0046622         -0.0017873         -0.0017873         -0.0017873         -0.0017873         -0.0017873         -0.0017873         -0.0017873         -0.0017873         -0.0017873         -0.0017873         -0.0017873         -0.0017873         -0.0017873         -0.0017873         -0.0017873         -0.0017873         -0.0017873         -0									
15         -0.0000229         0.00008098         -0.0047150           16         -0.007481         -0.0008509         -0.017552         -0.017450         -0.001733         -0.0161133         0.0008608         -0.007611           18         -0.0019760         -0.0027161         -0.0077667         -0.0104753         -0.00161133         0.0002761         0.0002761           19         -0.0001970         -0.002599         -0.0128784         -0.015453         -0.001476         -0.005670         -0.0223007         -0.0135471           10         -0.000716         -0.00064158         -0.00032923         -0.017264         -0.0248200         -0.016632         -0.00035477           11         -0.0006714         -0.0006714         -0.0018920         -0.018839         -0.005912         -0.007267         -0.0168076           23         -0.0046158         -0.0014920         -0.002607         -0.018899         -0.0053024         -0.007267         -0.0016022           24         -0.0006714         -0.019095         -0.018639         -0.012635         -0.002515         -0.002515         -0.002515         -0.0016022           25         -0.011475         -0.0426481         -0.002544         -0.0067144         -0.0005755         -0.0137863         -0.01472	-								
16         -0.0074081         -0.0089569         -0.017552         -0.017451         -0.0077411         0.0077411         0.0077411         0.0077411         0.0077411         0.0077411         0.0077411         0.0077411         0.0077411         0.0077411         0.0077411         0.0077411         0.0077411         0.0077411         0.0077411         0.0077411         0.0077411         0.00774011         0.00774011         0.00774011         0.00774011         0.00774011         0.00774011         0.00774011         0.00774011         0.00774011         0.00774011         0.00774011         0.0075471         0.0075471         0.0075471         0.0075471         0.0075471         0.0075471         0.0075471         0.0075471         0.0075471         0.0075471         0.0075471         0.0075471         0.0075471         0.0075471         0.0076711	-								
17         -0.0019760         -0.0027161         -0.007762         -0.0104675         -0.0009866         -0.002874         0.000751           18         -0.0044403         -0.002959         -0.0128784         -0.001975         -0.00058670         0.0226593         0.0125122           20         -0.0057526         +0.0064125         -0.0029755         -0.0028870         0.0126343         0.00088670         0.0226593         0.0125122           21         -0.002125         +0.0064158         -0.0083923         0.0117264         -0.00284260         0.00126343         -0.0036262         -0.001907           22         -0.0066158         -0.0046158         -0.0083233         -0.0112305         -0.0025121         -0.0007267         -0.0016622           24         -0.0006714         -0.019951         -0.0148613         -0.0032441         -0.0035124         -0.007267         -0.016622           25         0.0114737         -0.0246811         -0.00067444         -0.0065144         -0.0007278         -0.001622         -0.007267         -0.016622           26         0.009580         0.0107727         0.0146339         -0.0072444         -0.0007267         -0.001622         -0.0067144         -0.0007267         -0.0141525           29         0.0005	-								
18         -0.0044403         -0.0059509         -0.0128784         -0.019725         -0.0304413         -0.0016113         -0.002165         0.00058670         0.0226593         0.012512           20         -0.0057526         -0.006425         +0.0029755         -0.0046820         -0.0046692         -0.012874         -0.0046692         -0.0013711         -0.003477           21         -0.001632         0.000076         -0.0083136         -0.0128784         -0.0015915         -0.0020727         -0.0016837           22         -0.006714         -0.0006714         -0.0008136         -0.0112305         -0.0005124         -0.0006714         -0.0006714         -0.0006714         -0.000777         -0.0016323           25         0.0114136         0.0131760         0.0045929         -0.0082147         -0.0005141         -0.000777         -0.0016027           26         0.006714         -0.003574         0.0396042         0.0238495         0.0131344         -0.0005141         -0.000779           27         0.0114075         0.03574         0.0396042         0.0232349         0.0015134         -0.0017624         -0.014525           20.005680         0.007177         0.0036601         -0.0035234         -0.007589         0.015146         -0.0032534         <									
19         -0.0001907         0.0020599         0.0160294         0.004583         -0.001476         -0.0026070         0.022653         0.012512           20         -0.0057526         -0.00083923         0.001764         0.0248260         0.0126343         0.0082626         0.0001907           21         -0.0046158         -0.00483923         0.00248260         0.0126343         0.0028627         0.0128343         0.0023027         -0.0046082           23         0.0046158         -0.0148926         0.0029087         0.018899         -0.007207         0.0166027           24         -0.0066141         -0.0114905         -0.018639         -0.0112035         -0.0073024         0.007207           25         0.011475         -0.0246811         -0.002445         -0.006714         -0.007208           26         0.0089951         0.0114975         -0.0224081         -0.007344         -0.007304         -0.014152           27         0.011673         0.0330574         0.0390042         0.0238495         0.015174         -0.0087019         0.006735           28         0.006135         0.007727         0.014833         0.0214986         0.031302         0.004767         -0.024816           30         0.0065800         0.									
200         -0.0095726         -0.0006142         -0.0005747         -0.0005747           21         -0.0016632         -0.0046158         -0.0083923         0.0117264         -0.0248260         -0.0126343         0.0082626         0.0001907           22         -0.0016632         0.0000761         -0.0018714         -0.0128784         -0.0196915         -0.0223007         -0.0168026           23         0.0006714         -0.0006714         -0.0007267         -0.0016022           25         0.0114316         0.0113795         -0.0246811         -0.0023445         -0.007144         -0.0005146         -0.0007267         -0.016022           27         0.0116730         0.033574         0.0396042         -0.0328495         -0.01714         -0.0007144         -0.0007144         -0.0007144         -0.0007144         -0.0007142         -0.001727           28         0.0061035         0.007777         0.104839         0.0035621         0.0215308         0.0017674         -0.007844           30         0.006502         0.0056458         0.0067139         0.0021846         -0.014825         -0.00777         -0.014823           31         0.016724         0.015354         0.007774         -0.0013843         -0.0099030         -0.017824									
21         -0.002125         -0.0046158         -0.008323         0.0117264         0.0242800         0.0018263         0.0082667         0.0018637           22         -0.0016632         0.000076         -0.0051346         -0.0084035         -0.0188784         -0.0019015         -0.0046082           23         0.0046158         0.0114517         0.0148926         0.0082087         0.0018529         -0.0053024         0.0070267         -0.0016022           25         0.0114136         0.0104529         -0.0096278         0.0067155         -0.0075186         -0.0075185         -0.0075185         -0.0075185         -0.0075185         -0.0075186         -0.0075024         -0.0075124         -0.0075024         -0.0075024         -0.0075024         -0.0141525           29         0.0060502         0.0075458         0.0028004         -0.023394         0.021308         0.0075124         -0.0099030         -0.018724         -0.0028806           31         0.0147324         0.0162458         0.0276260         0.0238480         0.0214386         0.0131302         0.0047677         -0.009803         -0.0187244         -0.0028806           32         -0.0081662         -0.0075448         0.0027350         0.0018040         -0.0018753         -0.0098040         -0.0018254 <td>-</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	-								
22         -0.0016632         0.000076         -0.0051346         -0.0084035         -0.0128784         -0.019615         -0.0223007         -0.0168076           23         0.0006714         -0.0006714         -0.0006714         -0.0006714         -0.0006714         -0.0006714         -0.0006715         -0.017863         0.0112305         -0.007575         -0.017863         0.0114441           26         0.006135         0.033574         0.0336042         0.0238495         0.0116144         -0.0086714         -0.007208           27         0.0116730         0.0336042         0.0238495         0.0115174         -0.008716         -0.007208           28         0.006135         0.007174         0.0048095         0.0156174         -0.008716         -0.007208           29         0.006580         0.017727         0.014839         0.0216880         0.0018122         -0.007444           30         0.006580         0.0167139         0.000735         0.009808         -0.0018724         -0.0288086           31         0.0147324         0.0161285         0.027620         0.0214386         0.0018469         -0.0018464           32         -0.008308         -0.016731         -0.0003334         -0.0098469         -0.0118724         -0.008469<									
23         0.0046158         0.0114517         0.0148926         0.0092087         0.0188599         0.0058212         0.007027         0.0040082           24         -0.0006714         -0.010714         -0.01995         -0.0186339         0.0112305         -0.007027         -0.0016022           25         0.0114136         0.0113760         0.0045929         -0.0092345         -0.0067444         -0.008515         -0.008719         -0.0072098           27         0.0116730         0.033574         0.0396042         -0.0238495         0.011514         -0.008714         -0.008719         -0.0067192           28         0.0061035         0.007177         0.012800         -0.0075989         0.015174         -0.008708         0.0056455         -0.0087183           30         0.0065002         0.005692         0.0015625         0.001433         -0.009408         -0.0017624         -0.016434         -0.0075484         -0.0047836           31         0.0147324         0.0161285         0.0276260         0.0238400         -0.0017744         -0.0015434         -0.0017744         -0.0014444         -0.0023544         -0.001744         -0.0023544         -0.0047833           34         -0.007544         -0.0015444         0.0023541         -0.0015444									
24         -0.0006714         -0.010925         -0.0186339         0.0112305         -0.007627         0.0016022           25         0.0114136         0.0131760         0.0045929         -0.009207         0.013892         0.0076675         0.0137863         0.014241           26         0.008951         0.0114975         0.0246811         -0.0092545         -0.0067144         -0.0005115         -0.0075789           27         0.016035         0.0072174         0.002800         -0.0151374         0.002800         -0.0151374         0.0004716         -0.0073624         -0.0014371         -0.0073624         -0.0141525         0.006135         -0.001727         0.0108087         -0.0073634         -0.0014371         -0.0028800         0.0151302         -0.00141125         -0.0014313         -0.0028800         0.0131302         0.0047671         -0.008808           31         0.0147324         0.0167331         -0.0003433         -0.009408         -0.0017624         0.016687           33         -0.0031662         -0.007744         -0.006324         -0.009790         -0.017624         0.016881           34         -0.003162         -0.0017741         -0.0103531         -0.016324         -0.009790         -0.017944         -0.0028444         -0.001977 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>									
26         0.0089951         0.011473         -0.0246811         -0.0092545         -0.0067144         -0.0080719         -0.0080719         0.0007088           27         0.0116730         0.033574         0.0396042         0.0238495         0.0113144         -0.0080714         -0.0080719         -0.0070784           28         0.0061035         0.007177         0.0140839         0.0032621         0.0325394         0.0216980         0.0056152         -0.00181224         -0.028886           30         0.0066300         0.0013354         -0.0167313         -0.0090408         -0.0099030         -0.0017624         0.0161657           31         -0.0050354         -0.007744         -0.0063324         -0.0090790         0.0121918         0.0022354         0.0048523           34         -0.0050354         -0.007744         -0.0033223         -0.016632         -0.019177         -0.0039524         -0.017824         0.0042343           35         0.007888         0.0054169         -0.0033223         -0.016632         -0.019177         -0.0039524         -0.017844         0.0042343           36         -0.0073910         -0.011412         0.011662         -0.001738         -0.0049820         -0.015102         -0.0018616           37         <									
27         0.0116730         0.0393574         0.0396042         0.0238495         0.0113144         0.0006714         -0.0000719         0.0067749           28         0.0061055         0.007127         0.01208000         -0.0156174         0.0043716         -0.0073624         -0.0141525           29         0.0065800         0.00055458         0.0007139         0.00067139         0.0008087         -0.0099030         -0.0182724         -0.0288086           31         0.0147324         0.0115345         0.002756260         0.0238800         0.0214386         0.0004707         -0.0047836           32         -0.0031662         -0.0056992         -0.011444         0.0063324         -0.009790         0.0121918         0.0022354         0.0048523           34         -0.003534         -0.007744         -0.0113053         -0.01191193         -0.0039520         -0.0159454         0.0048523           35         0.0077888         0.0054169         0.0038223         -0.0101661         -0.0043945         -0.0043950         -0.0112062         0.0018161           36         -0.003060         -0.00112646         0.0100616         -0.0043945         -0.0043950         0.012067         0.007141           38         -0.0017171         -0.0031599									
28         0.0061035         0.0072174         0.0028000         -0.0075989         0.0156174         0.0043716         -0.0073624         -0.00141525           29         0.0065002         0.007727         0.0140839         0.0036621         0.0325394         0.0021632         0.0006132         0.00073624         0.00288086           31         0.0147324         0.0161285         0.0276260         0.0238800         0.0214386         0.0131302         0.0047607         -0.0048363           32         -0.0031662         -0.005992         -0.0114444         0.0063324         -0.0009790         0.0121918         0.0022354         0.0048523           34         -0.005354         -0.0077744         -0.013531         -0.0145052         -0.019177         -0.0038920         -0.0118616           35         0.0078888         0.0054169         0.0038223         -0.001977         -0.003920         -0.0118616           36         -0.0038910         -0.0043845         -0.0018452         -0.0018616         -0.0043845         -0.0018616           37         -0.0030060         -0.0051117         0.0013962         -0.0184953         -0.0264816         -0.012627         0.007134           38         -0.0071710         0.0113644         -0.0025084	26	0.0089951	0.0114975	-0.0246811	-0.0092545	-0.0067444	-0.0065155	-0.0055161	-0.0072098
29         0.0069580         0.0107727         0.0140839         0.0036621         0.0325394         0.0216980         0.0056152         0.0061188           30         0.0065002         0.0056458         0.000733         0.0008087         -0.0099030         -0.0182724         -0.0288086           31         0.0147324         0.0161285         0.016260         0.023800         0.0214386         0.0017607         -0.0047837           32         -0.0083008         -0.0135345         -0.016311         -0.0003433         -0.0090790         0.0119118         0.0022354         0.0048233           34         -0.005354         -0.007744         -0.0103531         -0.016632         -0.0191177         -0.003920         -0.0170212         -0.0018616           35         0.0078888         0.0054169         0.0032223         -0.016632         -0.019177         -0.003920         -0.017012         -0.0018616           36         -0.0035910         -0.0023575         0.010861         -0.0043945         -0.014384         0.007130           39         0.0071490         0.0111084         0.01277         -0.023575         0.0041809         0.0051651         -0.0048302         -0.014384         0.0071303           41         -0.0023757         0.0418	27	0.0116730	0.0303574	0.0396042	0.0238495	0.0113144	0.0006714	-0.0080719	0.0067749
30         0.0065002         0.0056458         0.0067139         0.0007935         0.0008087         -0.0099030         -0.018724         -0.028806           31         0.0147324         0.0161285         0.0276260         0.0238800         0.0214386         0.01031302         0.0047607         -0.0047836           32         -0.0031662         -0.0056992         -0.0011444         0.006324         -0.0090790         0.0121918         0.0022354         0.0048533           34         -0.005354         -0.0077744         -0.010331         -0.0169177         -0.0039520         -0.0170212         -0.0018616           36         -0.0038810         -0.007321         -0.012686         0.0100861         -0.0043945         -0.0049820         -0.0151062         0.0018161           37         -0.003060         -0.0051117         0.0013962         0.0250015         -0.0003738         -0.0043935         0.0120697         0.0071030           39         0.007190         -0.011031509         -0.0094299         -0.0188920         -0.024816         -0.0149384         0.0002277           41         -0.008100         -0.0123575         0.0041809         0.0050584         0.0026299         0.0041122         0.0141622         0.0130822           42	28	0.0061035	0.0072174	0.0028000	-0.0075989	0.0156174	0.0043716	-0.0073624	-0.0141525
31         0.0147324         0.0161285         0.0276260         0.0238800         0.0214386         0.0131302         0.0047607         -0.0047836           32         -0.0083008         -0.015345         -0.0167313         -0.0090408         -0.0008469         -0.001724         0.0161667           33         -0.0050354         -0.0077744         -0.010531         -0.0145035         -0.0191193         -0.0039924         -0.0179454         0.0042343           35         0.0078888         0.0054169         0.003823         -0.010632         -0.0109177         -0.0039520         -0.0170212         -0.0018616           36         -0.003910         -0.002314         0.0016632         -0.0109177         -0.0039520         -0.012067         0.0018616           37         -0.003060         -0.0051117         0.0013962         0.025015         -0.0043395         -0.012067         0.0012067           38         -0.0017411         -0.0013509         -0.0094299         -0.018495         -0.0024836         0.00264816         -0.0149384         0.0071030           39         0.0071990         0.0112641         -0.014364         -0.0085379         -0.0129345         0.0042267         0.022921           40         -0.0084001         0.0027397		0.0069580	0.0107727	0.0140839	0.0036621	0.0325394	0.0216980	0.0056152	0.0061188
32         -0.0083008         -0.0135345         -0.0167313         -0.0003433         -0.0090408         -0.0008469         -0.0017624         0.0161667           33         -0.0031662         -0.0056992         -0.0011444         0.0063324         -0.0090700         0.0121918         0.0022354         0.0048233           34         -0.0050354         -0.007744         -0.01038223         -0.011632         -0.019179         -0.0039920         -0.017021         -0.0018616           35         0.0078888         0.0052117         -0.0013821         -0.0112686         0.0003915         -0.004995         -0.012697         0.0014516           37         -0.0017471         -0.0013741         -0.00174299         -0.0154495         -0.004595         0.012667         0.002921           40         -0.0070190         0.0111084         0.0142746         0.007648         -0.0085373         -0.024816         -0.019384         0.0071030           39         0.0070190         0.0111084         0.012747         -0.0278168         -0.0061511         -0.00282169         0.01122         0.0141602         0.0310822           41         -0.0027390         -0.0027847         -0.0278168         -0.005151         -0.0028433         -0.007974           42									
33         -0.0031662         -0.0056992         -0.0011444         0.0063324         -0.0090790         0.0121918         0.0022354         0.0048523           34         -0.0050354         -0.0077744         -0.013531         -0.0145035         -0.019177         -0.0039520         -0.017944         0.0042343           35         0.0078888         0.0054169         0.0038221         -0.0116632         -0.0109177         -0.0039520         -0.0151062         0.0018616           36         -0.0038910         -0.0082321         -0.0112686         0.010861         -0.0043945         -0.0045935         0.0120677         0.007111           38         -0.0017471         -0.0031509         -0.0094299         -0.0154495         -0.0083738         -0.0045395         0.012267         0.0072921           40         -0.0084000         -0.0120621         -0.0198364         -0.006529         0.0041102         0.011660         0.0082169         0.0122467         0.0029221           41         -0.002375         0.0041809         0.0055084         0.0065561         -0.0085163         -0.002836         -0.009724           42         -0.008400         -0.022375         0.0041809         0.012551         -0.0018622         -0.0124512         -0.0261376         -0.0									
34         -0.0050354         -0.007744         -0.013531         -0.0145035         -0.0191193         -0.0035934         -0.0159454         0.0042343           35         0.0078888         0.0054169         0.0038223         -0.0016632         -0.010777         -0.0039520         -0.0170212         -0.018616           36         -0.0030060         -0.0082321         -0.012686         0.0100861         -0.0043955         -0.012067         0.0071411           38         -0.0017471         -0.0031509         -0.0094299         -0.0154495         -0.0083373         -0.0219345         -0.0042267         0.0022217           40         -0.0084000         -0.0120621         -0.019864         -0.0065299         0.0011122         0.0114162         0.015264           41         -0.0012970         -0.0023575         0.0041809         0.0055084         -0.0051651         -0.006536         -0.0094333         -0.007074           43         0.0224075         0.0190277         0.0123291         0.0016629         -0.0124512         -0.0261765         -0.009394           44         0.002414         0.001520         -0.002218         0.0160808         -0.0124512         -0.0261375         -0.0026137         0.0190277           45         0.0045136									
35         0.0078888         0.0054169         0.0038223         -0.0016632         -0.019177         -0.0039520         -0.0170212         -0.0018616           36         -0.0038910         -0.0082321         -0.0112686         0.0100861         -0.0043945         -0.0049820         -0.011062         0.0018616           37         -0.003060         -0.0051117         0.0013962         0.0250015         -0.003388         -0.0026395         0.0120697         0.0071411           38         -0.0017471         -0.0013909         -0.004299         -0.015495         -0.0126816         -0.0123451         -0.0126816         -0.019344         0.0071030           39         0.007190         0.0111084         0.0142746         0.007648         -0.0025930         -0.0042169         0.001267         0.002221           40         -0.0084000         -0.0120621         -0.018364         -0.005508         0.0045700         0.0082169         0.011602         0.0131682           41         -0.0023575         0.019277         -0.012321         0.005151         -0.0041122         -0.0146102         0.007924           43         0.0224075         0.019277         -0.012321         0.0018629         -0.0124512         -0.0021755         -0.0003484         0.012297 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>									
36         -0.0038910         -0.0082321         -0.0112686         0.0100861         -0.0043945         -0.0049820         -0.0151062         0.0018616           37         -0.0030060         -0.0051117         0.0013962         0.0250015         -0.00045395         0.0120697         0.0071411           38         -0.0017471         -0.0031509         -0.0094299         -0.0154495         -0.0083738         -0.0024816         -0.0142984         0.0070190           39         0.0070190         0.0111084         0.0142746         0.0070584         -0.0045700         0.0042267         0.002221           40         -0.0084000         -0.0120621         -0.019364         -0.0055084         0.0066299         0.0041122         0.0141602         0.031822           41         -0.0012970         -0.002787         0.012291         0.0018616         -0.0045151         -0.006536         -0.009394           42         -0.0008011         0.002730         -0.002787         0.012291         0.0018616         0.014912         -0.0141602         0.0310822           43         0.0224075         0.0190277         0.1123291         0.0018616         0.014918         0.0025735         -0.1013073         0.0105972           45         0.0045166 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>									
37-0.0030060-0.00511170.00139620.0250015-0.0003738-0.00453950.01206970.007141138-0.0017471-0.0031509-0.0094299-0.0154495-0.0188980-0.0264816-0.0143840.007130390.00701900.01110840.01427460.0070648-0.0085373-0.02193450.00422670.00292140-0.0012970-0.0235750.00418090.00550840.00662990.00411220.01816020.031082242-0.00080110.0027390-0.0027847-0.0278168-0.0018692-0.0124512-0.021765-0.0093994430.02579500.02240750.01902770.01232910.0018692-0.0124512-0.0261765-0.0093994440.00241140.0011520-0.0022180.00186160.01499180.005735-0.01030730.0105972450.00451660.00861360.02843480.01609800.01275630.01240540.02613070.01927746-0.00633160.0018450.04234310.02175140.0008698-0.00411990.00856020.010215848-0.0227127-0.0309753-0.002831-0.0045471-0.004708-0.0036620.00064090.0024567490.0002204-0.0077820.007533-0.0061646-0.00997920.0275980.0179730.012502510.00222020.00451310.02246070.0024567-0.0183847-0.0183847-0.0183846-0.011929510.0022678-0.002538									
38         -0.0017471         -0.0031509         -0.0094299         -0.0154495         -0.0188980         -0.0264816         -0.0149384         0.0071030           39         0.0070190         0.0111084         0.0142746         0.0070648         -0.0085373         -0.0219345         0.0042267         0.0029221           40         -0.0084000         -0.0120621         -0.0198364         -0.0063629         0.0110550         0.0042570         0.002169         0.0152664           41         -0.002375         0.0041809         0.0055084         0.0066299         0.0041122         0.0141602         0.030822           42         -0.008011         0.0027390         -0.0278168         -0.0051651         -0.005536         -0.0094833         -0.0070724           43         0.0257950         0.0224075         0.0190277         0.0123291         0.0018692         -0.0124512         -0.0261765         -0.009394           44         0.0045166         0.0086136         0.0284348         0.0160980         0.0127563         0.0124054         0.0261307         0.0190277           45         0.00045166         0.0081845         0.042341         0.0217514         0.0008698         -0.0014199         0.0085602         0.0012188           48 <td< td=""><td>-</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>	-								
39         0.0070190         0.0111084         0.0142746         0.0070648         -0.0085373         -0.0219345         0.0042267         0.0029221           40         -0.0084000         -0.0120621         -0.0198364         -0.0063629         0.0110550         0.0045700         0.0082169         0.0152664           41         -0.0012970         -0.0023575         0.0041809         0.0055084         0.0066299         0.0041122         0.0141602         0.0310822           42         -0.0008011         0.0027390         -0.027847         -0.0278168         -0.0051651         -0.0065536         -0.0094833         -0.0070724           43         0.0257950         0.0224075         0.0190277         0.0123291         0.0018622         -0.0124512         -0.0261765         -0.009394           44         0.0045166         0.0086136         0.0284348         0.016980         0.0127563         0.0124054         0.0261307         0.0190277           45         0.0045166         0.0081845         0.0423431         0.0217514         0.008698         -0.0041199         0.0085602         0.0112184           47         -0.008316         -0.00782         -0.0029831         -0.0041708         -0.0041199         0.0085602         0.0112158									
40-0.0084000-0.0120621-0.0198364-0.00636290.01105500.00457000.00821690.015266441-0.0012970-0.00235750.00418090.00550840.00662990.00411220.01416020.031082242-0.0080110.0027390-0.0027847-0.0278168-0.0051651-0.0065536-0.0094833-0.0070724430.02579500.02240750.01902770.01232910.0018692-0.0124512-0.0261765-0.009994440.00244140.0011520-0.0020180.00186160.01499180.005035-0.01030730.0105972450.00451660.00861360.02843480.01609800.01275630.01240540.02613070.01297746-0.0064392-0.00725560.00814060.0079956-0.002372-0.0159760-0.0059891-0.001274147-0.0083160.00188450.04234310.02175140.0008698-0.00411990.00856020.010215848-0.0227127-0.0309753-0.0029831-0.0045471-0.0044708-0.0036620.00064090.0024567490.0003204-0.0077820.0007553-0.0061646-0.00997920.02725980.01799770.015502950-0.0022678-0.00523380.002240670.0083466-0.0264080.0046997-0.00214390.002304152-0.0029678-0.00523380.00224060.0103210.00222550.0150700.00697330.0021973540.0022410.00									
41-0.0012970-0.00235750.00418090.00550840.00662990.00411220.01416020.031082242-0.00080110.0027390-0.0027847-0.0278168-0.0051651-0.0065536-0.0094833-0.0070724430.02579500.02240750.01902770.01232910.0018692-0.0124512-0.0261765-0.0093994440.00241410.0011520-0.0020180.00186160.01499180.0050735-0.01030730.0105972450.00451660.00861360.02843480.01609800.01275330.01240540.02613070.019027746-0.0064392-0.00725560.00814060.0079956-0.0225372-0.0159760-0.0059891-0.001274147-0.0083160.00188450.04234310.02175140.0008698-0.00411990.00856020.010215848-0.0227127-0.0309753-0.0029831-0.0045471-0.0044708-0.0036620.00064090.0024567490.0003204-0.0077820.0007553-0.0061646-0.00997920.02725980.01799770.015502950-0.0022583-0.00341800.02436070.0083466-0.02460480.004697-0.00214390.002304152-0.0029678-0.0052380.002436070.0083466-0.02460480.0046973-0.0188966-0.008104530.002240410.00299840.00212860.0054932-0.0150223-0.0383453-0.0137787-0.0153046540.002441 <td></td> <td></td> <td></td> <td></td> <td></td> <td>0.0110550</td> <td></td> <td></td> <td></td>						0.0110550			
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450.00451660.00861360.02843480.01609800.01275630.01240540.02613070.019027746-0.0064392-0.00725560.00814060.0079956-0.0225372-0.0159760-0.0059891-0.001274147-0.0083160.00188450.04234310.02175140.0008698-0.00411990.00856020.010215848-0.0227127-0.0309753-0.0029831-0.0045471-0.0044708-0.0036620.00064090.0024567490.0003204-0.00077820.0007553-0.0061646-0.00997920.02725980.01799770.015502950-0.0022583-0.0034180-0.0074692-0.0160370-0.0401917-0.0083847-0.0189896-0.0101929510.0022020.00450130.02436070.0083466-0.02460480.0046997-0.00214390.002304152-0.0029678-0.0052380.00254060.01103210.0029221-0.0056763-0.0311356-0.0081024530.00192260.00105290.00468440.03221130.0202550.0150700.00697330.0021973540.00241410.00299840.00212860.01412960.0075910.01544950.00109556-0.0076904-0.0126266-0.0251846-0.02613070.04045880.01326750.01966090.0226059570.00669100.00887300.01576230.018266-0.0260468-0.0259018-0.029122-0.0175323590.00576020.01398470.0									0.00/0//
46-0.0064392-0.00725560.00814060.0079956-0.0225372-0.0159760-0.0059891-0.001274147-0.00083160.00188450.04234310.02175140.0008698-0.00411990.00856020.010215848-0.0227127-0.0309753-0.0029831-0.0045471-0.0044708-0.00036620.00064090.0024567490.0003204-0.00077820.0007553-0.0061646-0.00997920.02725980.01799770.015502950-0.0022583-0.0034180-0.0074692-0.0160370-0.0401917-0.0083847-0.0189896-0.0101929510.0022020.00450130.02436070.0083466-0.02460480.0046997-0.00214390.002304152-0.0029678-0.0052380.00254060.01103210.0029221-0.0056763-0.0311356-0.0081024530.00192260.00105290.00468440.03221130.02022550.01500700.00697330.0021973540.00024410.00299840.00212860.0142960.00175910.01544950.009109556-0.0076904-0.0126266-0.0251846-0.02613070.00405880.01326750.01966990.0226059570.00669100.00887300.01576230.0182266-0.0250468-0.025018740.044693058-0.0050049-0.0121231-0.0460205-0.0182266-0.0250468-0.0259186-0.0284729-0.0171322590.00576020.01398470.05791							0.0050735		
47-0.00083160.00188450.04234310.02175140.0008698-0.00411990.00856020.010215848-0.0227127-0.0309753-0.0029831-0.0045471-0.0044708-0.00036620.00064090.0024567490.0003204-0.00077820.0007553-0.0061646-0.00997920.02725980.01799770.015502950-0.0022583-0.0034180-0.0074692-0.0160370-0.0401917-0.0083847-0.0189896-0.0101929510.00220020.00450130.02436070.0083466-0.02460480.0046997-0.00214390.002304152-0.0029678-0.00523380.00254060.01103210.0029221-0.0056763-0.0311356-0.0081024530.00192260.00105290.00468440.03221130.02022550.01500700.00697330.0021973540.00024410.00299840.00212860.0054932-0.0150223-0.0383453-0.0137787-0.0153046550.00241850.04186250.03169250.02568050.01412960.00775910.01544950.009109556-0.0076904-0.0126266-0.0251846-0.02613070.00405880.01326750.01966090.0226059570.00669100.00887300.01576230.0129970.01935580.02302550.02018740.044693058-0.005049-0.0121231-0.0460205-0.0182266-0.0260468-0.0259018-0.0284729-0.0171322590.0057602 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>									
48-0.0227127-0.0309753-0.0029831-0.0045471-0.0044708-0.00036620.00064090.0024567490.0003204-0.00077820.0007553-0.0061646-0.00997920.02725980.01799770.015502950-0.0022583-0.0034180-0.0074692-0.0160370-0.0401917-0.0083847-0.0189896-0.0101929510.00220020.00450130.02436070.0083466-0.02460480.0046997-0.00214390.002304152-0.0029678-0.00523380.00254060.01103210.0029221-0.0056763-0.0311356-0.0081024530.00192260.00105290.00468440.03221130.02022550.01500700.00697330.0021973540.00024410.00299840.00212860.0054932-0.0150223-0.0383453-0.0137787-0.0153046550.00241850.04186250.03169250.02568050.01412960.00775910.01544950.009109556-0.0076904-0.0126266-0.0251846-0.02613070.00405880.01326750.01966090.0226059570.00669100.00887300.01576230.01029970.01935580.02302550.02018740.044693058-0.005049-0.0121231-0.0460205-0.0182266-0.0260468-0.0259018-0.0284729-0.0171322590.00576020.01398470.05791470.0351944-0.0040665-0.0186386-0.0284729-0.0171432600.002571									
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550.00241850.04186250.03169250.02568050.01412960.00775910.01544950.009109556-0.0076904-0.0126266-0.0251846-0.02613070.00405880.01326750.01966090.0226059570.00669100.00887300.01576230.01029970.01935580.02302550.02018740.044693058-0.0050049-0.0121231-0.0460205-0.0182266-0.0260468-0.0259018-0.0209122-0.0175323590.00576020.01398470.05791470.0351944-0.0040665-0.0186386-0.0284729-0.0171432600.00257110.00531010.01195530.00704190.01701350.0213165-0.0242462-0.0078735610.01768490.03411100.03609470.03253940.03621670.03176120.02337650.0178757									
56-0.0076904-0.0126266-0.0251846-0.02613070.00405880.01326750.01966090.0226059570.00669100.00887300.01576230.01029970.01935580.02302550.02018740.044693058-0.0050049-0.0121231-0.0460205-0.0182266-0.0260468-0.0259018-0.029122-0.0175323590.00576020.01398470.05791470.0351944-0.0040665-0.0186386-0.0284729-0.0171432600.00257110.00531010.01195530.00704190.01701350.0213165-0.0242462-0.0078735610.01768490.03411100.03609470.03253940.03621670.03176120.02337650.0178757									
57         0.0066910         0.0088730         0.0157623         0.012997         0.0193558         0.0230255         0.0201874         0.0446930           58         -0.0050049         -0.0121231         -0.0460205         -0.0182266         -0.0260468         -0.0259018         -0.0209122         -0.0175323           59         0.0057602         0.0139847         0.0579147         0.0351944         -0.0040665         -0.0186386         -0.0284729         -0.0171432           60         0.0025711         0.0053101         0.0119553         0.0070419         0.0170135         0.0213165         -0.0242462         -0.0078735           61         0.0176849         0.0341110         0.0360947         0.0325394         0.0362167         0.0317612         0.0233765         0.0178757									
58         -0.0050049         -0.0121231         -0.0460205         -0.0182266         -0.0260468         -0.0259018         -0.0209122         -0.0175323           59         0.0057602         0.0139847         0.0579147         0.0351944         -0.0040665         -0.0186386         -0.0284729         -0.0171432           60         0.0025711         0.0053101         0.0119553         0.0070419         0.0170135         0.0213165         -0.0242462         -0.0078735           61         0.0176849         0.0341110         0.0360947         0.0325394         0.0362167         0.0317612         0.0233765         0.0178757									
59         0.0057602         0.0139847         0.0579147         0.0351944         -0.0040665         -0.0186386         -0.0284729         -0.0171432           60         0.0025711         0.0053101         0.0119553         0.0070419         0.0170135         0.0213165         -0.0242462         -0.0078735           61         0.0176849         0.0341110         0.0360947         0.0325394         0.0362167         0.0317612         0.0233765         0.0178757									
61         0.0176849         0.0341110         0.0360947         0.0325394         0.0362167         0.0317612         0.0233765         0.0178757									
			0.0053101						
62         0.0018082         0.0054245         0.0223770         0.0096283         -0.0214233         -0.0161209         -0.0263824         -0.0237961	-								
	62	0.0018082	0.0054245	0.0223770	0.0096283	-0.0214233	-0.0161209	-0.0263824	-0.0237961

00.000716         00.000325         00.000210         00.000325         00.0001167           64         00.001162         00.001452         00.001241         00.000325         00.000325         00.000325           65         00.001241         00.001452         00.001241         00.001241         00.0012405         00.0012455         00.0012455         00.0012455         00.0012455         00.0012455         00.0012455         00.0012455         00.0012455         00.0012455         00.0012455         00.0012455         00.0012455         00.0012455         00.00124555         00.0012455 <t< th=""><th>62</th><th>0.0040426</th><th>0.0196520</th><th>0.0692679</th><th>0.0602520</th><th>0.0200146</th><th>0.0145402</th><th>0.0096075</th><th>0.0001144</th></t<>	62	0.0040426	0.0196520	0.0692679	0.0602520	0.0200146	0.0145402	0.0096075	0.0001144
65         0.0012283         0.001242         -0.0012741         0.0043182         0.007583         0.005583           66         0.002511         -0.0054202         0.0017327         0.0032272         -0.0048129         -0.0112797         0.0075846         0.0007585           67         0.0005124         -0.0014927         -0.0044575         -0.0012707         0.0007581         0.0012256           68         0.000514         -0.0012891         -0.0017667         -0.0047677         0.0014912         -0.0017661         -0.0017661         -0.0017661         -0.00178225         -0.0117821         -	63	0.0040436	0.0186539	0.0682678	0.0692520	0.0290146	0.0145493	0.0086975	0.0001144
66         -0.0025101         -0.0025177         -0.0025177         0.0025177           7         -0.002512         -0.007310         -0.0025177         -0.0012475         -0.0005341         -0.0012455           68         -0.0060541         -0.0012405         -0.0066054         -0.007310         -0.0124057           7         -0.0060541         -0.0012403         -0.0002081         -0.0012707         -0.012507           7         -0.006677         -0.012823         -0.0020881         -0.0012701         -0.012502         -0.0012802           7         -0.006677         -0.0128018         -0.0160282         -0.0012801         -0.0012802         -0.0012802         -0.0012802           7         -0.0064200         -0.0003828         -0.012820         -0.012812         -0.0128146         -0.0004812           7         -0.0064201         -0.0003872         -0.012801         -0.0014812         -0.0228220           7         -0.006670         -0.013738         -0.015818         -0.021801         -0.014812         -0.022820           7         -0.0067141         -0.014784         -0.015818         -0.015818         -0.017815         -0.0149714         -0.017815         -0.014781         -0.0178111         -0.015811         -0.01	-								
67         0.0082922         0.00114975         0.00114975         0.0001495           68         0.000752         -0.000410         -0.0012490         -0.0017495         0.0006405         -0.0002449         -0.0019455           69         -0.000614         -0.0012381         -0.0002491         -0.0017697         -0.0008100         -0.0115167         -0.00081100           71         0.0176697         -0.00181301         -0.0015299         -0.00151297         -0.00181391           72         -0.0003406         -0.0042791         -0.0015301         -0.00181391         -0.00181391           73         -0.0033406         -0.0042531         -0.0017471         -0.0017410         -0.00174131         -0.0025272           74         -0.0036670         -0.017346         -0.017345         -0.0127471         -0.0027251         -0.00174131         -0.0174314         -0.0174									
68         -0.0067825         -0.0084545         -0.0217209         -0.002480         -0.0014930           00         -0.000534         -0.0012383         -0.00023981         -0.0062180         -0.00171661         -0.0249707         -0.0115727         -0.0027390           10         -0.07697         -0.0149918         -0.0105200         -0.0115210         -0.0133877         -0.0014572         -0.0027390           73         -0.003440         -0.0014521         -0.0027390         -0.0014572         -0.0021387         -0.00231846         -0.0064545           74         -0.0037766         -0.003522         -0.014171         -0.016381         -0.0224871         -0.00097119         -0.00251846         -0.006142         -0.0229015           75         -0.0014191         -0.006371         -0.0124925         -0.0141781         -0.0120239           76         -0.0067124         -0.0147861         -0.0214902         -0.0117975         -0.0013975         -0.0112023         -0.0117975         -0.0019978         -0.0019975         -0.0112097         -0.0112098         -0.0019978         -0.0119912         -0.0116928         -0.0019912         -0.0116928         -0.0019912         -0.0116928         -0.0019912         -0.0116928         -0.0019912         -0.01169212         -0.011750									
69         0.0006104         0.00121994         0.017692         0.0009962         0.0008005         0.0008110         0.01015167         0.0081100           71         0.000534         0.0012381         0.0007809         0.0013700         0.0105309         0.00151367         0.0081100           72         0.0005440         -0.0018181         0.0106867         0.0013807         0.0013810         -0.0018321         -0.00181291           73         -0.0033406         -0.0014918         0.0012087         0.0012417         0.0001718         -0.0017412         0.0025121           74         -0.003766         -0.0045281         0.0123241         -0.0012417         0.00017412         -0.002471         0.00017412         0.0021421         0.0017301           75         -0.002447         0.0006714         0.0115681         0.0110202         0.0117022         0.0117022         0.011702         0.011702         0.011702         0.011702         0.0116981         0.010708           70         -0.002447         0.0006714         0.0114658         0.0218326         0.0001708         0.0016981         0.0117082         0.0116991         0.016827           80         -0.0118351         0.01056763         -0.0128866         0.0010798         0.0017866									
70         -0.0000534         0.001283         -0.0002180         -0.0171661         -0.024707         0.015127         0.00027300           71         0.017667         0.0149918         0.0146820         0.001520         0.0123367         -0.0003472         0.0023307           73         -0.003406         -0.004420         0.000070         0.0014871         0.0021981         0.0021984           74         -0.0037766         -0.0035281         0.0124717         0.0100811         0.0021184         -0.012681         0.0228015           75         -0.0014264         -0.011348         0.013681         0.0248032         0.0144561         0.0017705         -0.0147718         0.0120239           76         -0.0034256         -0.0035858         -0.0018669         -0.019726         -0.0117206         -0.0117705         -0.01102039           78         -0.003447         -0.001973         -0.011824         -0.0112039         -0.01120239         -0.01120230         -0.0119706         -0.0112039           79         -0.002447         -0.0007414         -0.0149814         -0.0012333         -0.0112330         -0.0112039         -0.0112039         -0.0112039         -0.0112039         -0.00112033         -0.0012724         -0.0156937           80									
71         0.0176697         0.014908         0.014068         0.009789         0.0013470         0.0015329         0.00018321         0.00081329           73         -0.0033406         -0.0014230         0.000076         0.0004807         0.0153310         0.0027188         0.0025214         -0.0018321         -0.0018321         -0.0018321         -0.0018321         -0.0018325           75         -0.0014191         0.00262637         0.0223225         0.0124812         0.0117035         0.0016481         -0.016812         -0.026714         -0.0141941         0.0126264         0.0248022         0.0117035         0.0116712         -0.0117181         -0.01120229           78         -0.004256         -0.0019746         0.0193644         0.0216483         0.0117305         -0.01147181         -0.0112023           79         -0.002447         -0.004747         0.0014685         -0.0021937         -0.0114995         -0.0119075         -0.0114995         -0.0112089         -0.0019769         -0.0016980         -0.0001976         -0.0019776         -0.0019776         -0.0019776         -0.0019776         -0.0019776         -0.0019776         -0.0019776         -0.0019776         -0.0019776         -0.0019776         -0.0019776         -0.0019776         -0.00114917         -0.0149829									
72         -0.0064240         -0.0068328         -0.0105820         -0.0212367         -0.0021346         -0.0064545           74         -0.037766         -0.0083528         -0.0154724         -0.0229741         0.0008111         -0.001414         -0.01251846         -0.0229015           75         -0.0011244         -0.0125472         -0.0229015         -0.014648         -0.0166812         -0.0229015           76         -0.0061264         -0.0126430         -0.014648         -0.0166812         -0.001738         -0.001738         -0.001738         -0.001738         -0.001738         -0.017278         -0.017786         -0.017278         -0.017786         -0.017786         -0.017978         -0.017786         -0.017978         -0.017786         -0.017978         -0.017978         -0.017978         -0.017978         -0.017978         -0.017978         -0.017978         -0.017978         -0.017974         -0.									
73         -0.003406         0.000420         0.0015310         0.009718         0.002352           74         -0.0037766         0.002352         0.0124174         -0.0229720         0.001441         -0.0171432         -0.002352           75         0.001491         0.0002637         0.0032302         0.014618         -0.016081         0.023802         0.014618         0.017013         0.0014648         0.017013           76         -0.0066124         0.011644         -0.016081         0.023802         0.014618         0.012070         -0.007313         0.0117020         0.011702         0.0012036         0.00102057         0.0012036         0.0012036         0.0012036         0.0012036         0.0012036         0.0012036         0.0012036         0.0012036         0.0016098         0.016479         0.0114708         0.0114708         0.0114708         0.0114708         0.0148258           81         0.0006714         0.0141455         0.021458         0.0121528         0.0102236         0.0010237         0.0016238         0.0106238         0.0010237         0.0016238           82         0.0015180         0.0117345         0.0012345         0.0011223         0.001724         0.0168278           83         0.0001735         0.0002367         0									
74         -0.0037766         -0.003828         -0.0154724         -0.022873         0.00042114         -0.016812         -0.0228015           75         -0.0061264         -0.015681         -0.0051270         -0.0073015         -0.016812         -0.0075815           76         -0.0061264         -0.015681         -0.0014850         -0.0012720         -0.0014781         -0.0120239           78         -0.0034256         -0.0013858         -0.0013860         -0.0019726         -0.0117506         -0.0117506         -0.0116986         -0.0012033           79         -0.0020471         -0.00146580         -0.022333         -0.0016860         -0.0001586         -0.0019796         -0.0116980         -0.002333         -0.0016886         -0.0011706         -0.0016987         -0.011905         -0.0211518         -0.0128326         -0.0001068         -0.00116987           82         -0.0021724         -0.007345         -0.0211258         -0.0128326         -0.0014997         -0.0128335           84         -0.0017246         -0.0223071         -0.0123368         -0.007424         -0.0273912         -0.016828           84         -0.0017246         -0.0023071         -0.013386         -0.0017484         -0.0017484         -0.0017484         -0.00724721         -0.0									
75         0.001491         0.002567         0.001703         0.001464         0.0117035         0.001464         0.0107313           77         -0.0086670         -0.017346         0.019364         0.0210648         0.0226528         0.0131302         -0.0147781         0.012299           78         -0.0024256         -0.0015985         -0.001971         -0.0112975         -0.0012302         -0.011302         -0.011138         -0.0197067           79         -0.002477         -0.0016714         -0.0144658         -0.0219710         -0.0197266         -0.0015087         -0.0016088         -0.0016988         -0.000977         -0.0114658         -0.0123326         -0.0000736         -0.0014988         -0.0114983         -0.0114983         -0.0114983         -0.0114983         -0.0114983         -0.0114983         -0.0116822         -0.001523         -0.0016223         -0.001724         -0.0168228           84         -0.0061722         -0.0073073         -0.001498         -0.016328         0.011598         -0.0116823         -0.0016226         -0.014942         -0.027144         -0.016328           85         -0.001723         -0.001757         -0.0006256         -0.0082747         -0.0014988         -0.0173748         -0.0115433         0.019714         -0.0173747 <t< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></t<>									
76         -0.0061264         -0.017346         0.0196541         0.0210048         0.005282         0.0179822         0.0147816         0.0017811           78         -0.0034256         -0.0037803         -0.013588         -0.0115809         -0.01151138         -0.0197057           79         -0.0020447         0.0006714         0.014658         -0.0127956         -0.01151138         -0.0119095         -0.0216980         -0.0228353         -0.01018256         -0.00002365         -0.000079         0.0161667           81         -0.0122301         0.0005725         -0.0111351         -0.0211285         -0.012230         0.000797         0.01668228           82         -0.002373         -0.0007466         -0.025037         -0.0132860         0.0023857         0.0159912         0.0168228           84         -0.001772         -0.0002567         -0.0137880         0.01037880         0.0103780         0.0137840         0.014827           85         -0.0017871         -0.0006256         -0.00224042         -0.017880         0.0103786         0.003702         -0.00178474         0.0147874         0.0147874         0.0147874         0.0147874         0.0147874         0.0147874         0.014784         0.0023706         -0.00023747         0.0035804         0.0099640 <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>									
77         -0.0086670         -0.0147781         0.0120239           78         -0.0034256         -0.004771         0.0147781         0.0120239           79         -0.0020447         0.0006714         0.0414658         0.022971         0.0115705         -0.0116988         0.0003967           80         -0.0020472         0.0006714         0.0414658         0.022971         0.015896         -0.001688         0.0003967           80         -0.0020472         0.0006714         0.0414658         0.022971         0.015896         -0.0017570         -0.0016880         0.001682         0.0006712         0.016997           81         0.012321         0.0008756         -0.0175315         0.005763         -0.0044998         -0.016729         0.0058512         -0.0028195         0.0013335           85         -0.001757         -0.006256         -0.00231318         0.0167070         0.016370         0.017880         0.016370         0.017874         0.018341         -0.0023146         0.018341         -0.002787         0.001774         0.006256         -0.0027747         -0.007724         0.007724         0.007724         0.007724         0.007724         0.007724         0.007724         0.007724         0.007724         0.007724         0.007724 <t< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></t<>									
78         -0.0034256         -0.0019780         -0.012976         -0.0151138         -0.00151138         -0.00151139         -0.0016447         -0.001668         -0.0001741         -0.01144583         -0.0016171         -0.002313         -0.002313         -0.002313         -0.002313         -0.0016370         -0.0131433         -0.002313         -0.016330         -0.0131433         -0.001632         -0.011444         -0.002313         -0.016330         -0.0131433         -0.001632         -0.0131433         -0.001632         -0.0131433         -0.016330         -0.0131433         -0.016330         -0.0131433         -0.016330         -0.0131433         -0.016330         -0.0131433         -0.0163143         -0.0163143         -0.01631433         -0.01631433         -0.01631433         -0.01631433         -0.01631433         -0.01631433         -0.01631433         -0.01631433         -0.01631433         -0.01631433         -0.01631433         -0.01131433         -0.01131433									
79         -0.0020447         0.0016705         -0.016098         0.0003967           80         -0.0080755         -0.019905         -0.016980         -0.002833         -0.0102325         -0.0090795         -0.016087           81         0.0123291         0.005629         -0.0057455         -0.0211258         -0.0128326         0.0001068         0.0061417         -0.0149689           82         -0.0029373         -0.0080795         -0.0181351         -0.0306763         -0.0044979         -0.008578         -0.0159243           84         -0.0061722         -0.0097046         -0.0025577         -0.0135218         -0.0065180         -0.0117840         -0.0159434           85         -0.0051880         -0.0117860         -0.00251318         -0.01297144         -0.0123430         -0.0097427           7         -0.0238661         -0.0446222         -0.0124681         -0.002314         -0.002747         -0.0007747           89         -0.0065528         -0.0038924         -0.0128026         -0.0023231         -0.0084381         -0.0002747         -0.0007747           90         -0.0135227         -0.034042         -0.0894012         -0.0187950         -0.0092321         -0.0084381         -0.0000774         -0.007759           91									
80         -0.0080795         -0.0119095         -0.0216980         -0.0218336         -0.0001668         -0.0001068         0.0001107           81         -0.012331         -0.008725         -0.0073455         -0.0118336         -0.0008512         -0.0018316           82         -0.001721         -0.008704         -0.022507         -0.0118326         -0.0068512         -0.0228195         -0.0018312           84         -0.006172         -0.0097146         -0.022507         -0.0113286         -0.0068512         -0.0228195         -0.001531           85         -0.001751         -0.0006256         -0.00164922         -0.0227509         -0.0364304         -0.007427           87         -0.0066528         -0.0088272         -0.0133145         -0.0143738         -0.007502         -0.0007629           89         -0.0135727         -0.0006322         -0.0143738         -0.0087402         -0.007629           90         -0.0135727         -0.0246811         -0.0134738         -0.0087402         -0.007629           91         -0.0095404         -0.0426446         -0.0143738         -0.007247         -0.007629           92         -0.011572         -0.0008232         -0.012746         -0.0037314         -0.00733145         -0.016370									
81         0.0123291         0.0065229         -0.0075455         -0.0211258         -0.0128326         0.00010223         0.007724         0.0156937           82         -0.0061722         -0.008705         -0.013328         -0.0016233         0.0017631         0.0056763         -0.0146955         0.0015861         -0.0115808         -0.0017724         -0.0156937           84         -0.0061722         -0.0097046         -0.02253138         0.0018808         -0.0178800         -0.0178800         -0.0178800         -0.0178800         -0.0178800         -0.0178800         -0.0178404         -0.017874         -0.0145874           7         -0.0235661         -0.0346222         -0.017976         -0.0174866         -0.007744         -0.017874         -0.0145874           80         -0.0066528         -0.0083272         -0.0246811         -0.0185901         -0.0073218         -0.0007321         -0.0007479         -0.007329           90         -0.0135727         -0.034042         -0.0185901         -0.0024381         -0.0090322         -0.0014781         -0.007443         -0.017830         -0.0024545         -0.0117850         -0.007444         -0.0025450         -0.017716         -0.0267639           91         -0.0011978         0.0003244         -0.014839									
82         -0.0029373         -0.0080795         -0.0181351         -0.0304497         -0.0047219         0.0010223         0.0016322           84         -0.0061722         -0.0097046         -0.025307         -0.0133286         0.0058678         0.015370         -0.0018208           85         -0.0051880         -0.0111084         -0.0178680         0.012510         -0.00227509         -0.0363404         0.0079427           86         -0.001751         -0.0006256         -0.0146942         -0.0227509         -0.0363404         0.0097427           87         -0.006528         -0.0006252         -0.0146942         -0.0007747         -0.000769           90         -0.0135727         -0.0040632         -0.0144738         0.00376102         -0.0007747         -0.000769           91         0.0099640         -0.0462646         0.0453796         -0.003231         -0.0008310         -0.002747         -0.0007832           92         -0.0034714         -0.0042645         -0.014441         -0.003314         -0.007231         -0.0008321         -0.002747         -0.0007231           93         -0.001177         -0.003204         -0.001276480         -0.012314         -0.0017810         -0.0027830         -0.0027830         -0.0027830         -0.00									
83         0.0141983         0.017611         0.0065763         0.004098         -0.0164795         0.0085812         0.015912         0.0163335           84         -0.00611880         -0.0111084         -0.0178600         0.025133         0.0195914         0.012810         0.011731           85         -0.0051880         -0.011084         -0.0178600         0.0251338         0.019714         0.017874         0.0145874           86         -0.006528         -0.0088272         -0.0044811         -0.001174660         -0.0017414         -0.007747         -0.0007874           87         -0.008539         -0.0084272         -0.0144933         0.0327225         0.01776163         0.0233940         0.0019771           90         -0.0135727         -0.034042         -0.089443         0.0160370         0.0025405         -0.0107101         -0.0267639           91         -0.037414         -0.0084245         -0.0141837         0.0035450         -0.0177101         -0.0267639           93         -0.011978         0.0003244         0.0014727         0.0045435         -0.017716         -0.0027852         -0.0487366           94         -0.002346         0.0014572         -0.0014333         -0.0027916         -0.0027852         -0.048736									
84         -0.0061722         -0.009704         -0.028307         -0.0133286         0.0019581         -0.0028195         0.001931         -0.001786         0.0119588         0.0019581         0.0010757         -0.006256         -0.0082626         -0.0146942         -0.0227599         -0.0344364         0.0007427           87         0.0283661         0.0346222         0.0130768         0.0110700         0.0147946         0.0127374         0.014587           88         -0.006528         -0.0088272         -0.034145         0.0007722         -0.000729           90         -0.0135727         -0.03404042         -0.0894012         -0.018950         -0.0093231         -0.0008357           91         0.0099640         0.0462646         0.04277480         0.016370         0.00225406         -0.0160649         -0.0127181           92         -0.001178         -0.0032444         0.0029274         -0.0017800         0.0022850         -0.0171801         0.022756         0.0092850         -0.017800         0.0022850         -0.017810         0.022756         0.0092850         -0.017800         0.0022850         -0.017800         0.022756         0.0092850         -0.017810         0.022756         0.0092720         -0.0027576         -0.0027576         -0.0027924         -0.002792									
85         -0.0051880         -0.0111054         -0.017680         0.0225138         0.019541         -0.0164304         0.0007427           87         0.0283661         0.0346222         0.0130768         0.011746         0.017146         0.0197147         0.00077427           88         -0.006528         -0.0085391         -0.0005391         -0.0005391         -0.0005391         -0.0005392         -0.0005392         -0.0114843         0.0017700         -0.0023747         -0.0002747         -0.00085391         -0.0005391         -0.0018390         0.00035914         -0.0005391         -0.0084381         -0.009322         -0.0088577         -0.0018714         -0.0054245         -0.0117461         -0.005450         -0.0117615         -0.02267639         -0.0012718         -0.0005424         -0.014427         -0.0014373         -0.0027264         -0.028750         -0.0117051         -0.0226759         -0.011826         -0.029744         -0.0289464         -0.027854         -0.0128730         -0.0028852         -0.0018188         -0.018265         -0.00181858         -0.0188539         -0.0217615         -0.0287852         -0.00181858         -0.0182656         -0.01217616         -0.0287852         -0.0018730         -0.027853         -0.00181858         -0.0128783         -0.00187747         -0.0212778         -0.0018774									
86         0.0019531         -0.0010757         -0.006256         -0.002262         -0.017486         -0.017486         -0.0177144         0.0174874         0.00174874           87         0.0283661         0.0346222         0.013706         0.011700         0.0174866         0.0197144         0.0137874         0.0007629           88         -0.006528         -0.0334042         -0.0284012         -0.009332         -0.009332         -0.009332         -0.009332         -0.0009332         -0.0009332         -0.0008517           90         -0.015727         -0.034042         -0.018950         -0.003731         -0.0084371         -0.0028571           91         -0.003714         -0.0054245         -0.011441         0.0039444         0.0178375         0.0054560         -0.017061         -0.0227639         -0.018184         -0.00182801         0.00227850         -0.0018188         -0.011818         -0.011818         -0.0118188         -0.0011818         -0.0118188         -0.00118188         -0.00118188         -0.00118188         -0.0011818         -0.00118188         -0.00118188         -0.00118188         -0.00118188         -0.00118188         -0.00118188         -0.00118188         -0.00118188         -0.00118188         -0.00118188         -0.00118188         -0.00118188         -0.00118184	-								
87         0.0283661         0.0346222         0.013768         0.011700         0.0174866         0.017144         0.017144         0.017774         0.0007629           89         0.0018539         0.0035934         -0.0066328         -0.0124893         0.0327225         0.0176163         0.0233944         0.0193710           90         -0.0135727         -0.0340042         -0.089590         -0.093231         -0.0084381         -0.0002346         -0.0186494           91         0.0099640         0.0462646         0.0453766         0.00269274         0.0534699         0.0328463         -0.0197830         -0.02267639           93         -0.0013346         0.0034943         -0.0014572         0.0013346         0.00328463         -0.0127161         -0.0226756           94         0.0023346         0.0034943         -0.0019302         -0.016785         -0.0001818         -0.0138168           96         -0.0091782         -0.011826         -0.0068283         0.0034714         -0.0229766         -0.0413076         -0.0166931         -0.0166321         -0.011826         -0.001783           97         -0.0042267         -0.0017824         -0.0017655         -0.0031763         -0.0017630         -0.0017631         -0.0167701         -0.0065321         -									
88         -0.0066528         -0.0088272         -0.0246811         -0.0331345         0.0147338         0.0057602         -0.0007247         -0.0007629           89         0.0018539         0.0035934         -0.0089401         -0.0189401         -0.009331         -0.009331         -0.009331         -0.009331         -0.009331         -0.009331         -0.009331         -0.009332         -0.001971         -0.0093414         -0.009324         -0.003414         -0.009324         -0.0034414         -0.00267639         -0.0011978         0.003204         0.002247         0.054999         -0.012716         -0.028522         -0.047330         -0.0028522         -0.0119783         0.0028521         -0.0127716         -0.028522         -0.047336         -0.0018185         -0.001782         -0.001782         -0.001782         -0.001785         -0.0017651         -0.0206451         -0.0166531         -0.0166321         -0.0016185         -0.0001785         -0.0017651         -0.007744         -0.021667         -0.004122         -0.017761         -0.226671         -0.021667         -0.0016183         -0.001655         -0.0001782         -0.0017651         -0.017641         -0.021667         -0.00161351         -0.0176151         -0.0226611         -0.0116163         -0.2016770         -0.0164303         -0.0017649         -0.0126231									
89         0.0018539         0.003334         0.0008332         -0.0124893         0.0027225         0.0176163         0.0233994         0.0193710           90         -0.0135727         -0.0340042         -0.0894012         -0.008321         -0.0090331         -0.0090332         -0.008577           91         0.009940         0.0445246         -0.014849         0.016370         0.0025406         -0.010649         -0.012184           92         -0.003174         -0.003204         0.0020274         0.0358963         0.0117051         -0.02267639           93         -0.0011782         -0.0014572         0.0014343         -0.0054932         -0.012716         -0.0328522         -0.048786           95         0.0008100         0.0262756         0.0493164         0.037755         0.049496         0.0279365         0.0011818         -0.0181818         -0.0181818         -0.0181818         -0.0181818         -0.0118188         -0.010714         -0.0217667         -0.0166931         -0.0017124         -0.017144         -0.0217667         -0.0166931         -0.0161221         -0.01111160         -0.017144         -0.0217305         -0.0013231         -0.0011112         -0.0111160         -0.016785         -0.0021439         -0.01143135         -0.0122491         -0.0021439         <									
90         -0.0135727         -0.034042         -0.0894012         -0.0193590         -0.0093231         -0.0084381         -0.0090322         -0.0016049         -0.0102184           91         0.00934714         -0.0054245         -0.01124141         0.00337164         -0.0122184         -0.010535965         -0.0117830         -0.00227639           93         -0.001178         0.0003204         0.0082169         0.0209274         0.0535492         -0.012716         -0.028522         -0.0487365           94         0.0023346         0.00349143         -0.0014343         -0.0054932         -0.012784         -0.012852         -0.0487365           95         0.0088501         0.0262756         0.0493164         0.037755         0.04939496         0.0279236         -0.0018785         -0.0016785         -0.0016785         -0.0016785         -0.0016785         -0.0016785         -0.0016785         -0.0016785         -0.0016785         -0.0016785         -0.0016785         -0.0017940         -0.016783         -0.0017940         -0.016785         -0.0001794         -0.016785         -0.0001723         -0.0035172         -0.016771           98         -0.0082703         -0.0082703         -0.0082703         -0.0018785         -0.0016235         -0.00116806         -0.010234         -0.00									
91         0.0099400         0.0462646         0.0453796         0.0276489         0.0160370         0.0025406         -0.0106049         -0.0192184           92         -0.0034714         -0.0054245         -0.0114441         0.0039444         0.0178375         0.0054550         -0.0171051         -0.0267639           93         -0.0011978         0.0032440         0.0082169         0.0328923         -0.012716         -0.0328522         -0.0487366           94         0.0091782         -0.0118226         -0.049302         -0.012716         -0.0328522         -0.0483766           96         -0.0091782         -0.0182266         -0.0430679         0.0019302         -0.016555         0.0016785         -0.000188         -0.001605           97         -0.0042267         -0.0043437         -0.0011826         -0.0021767         -0.0166321         -0.0016321         -0.001772         -0.017774           99         -0.013851         -0.0027034         -0.0199659         -0.013758         -0.0016301         -0.016031         -0.00160321         -0.001772           100         -0.0047898         -0.001986         -0.013758         -0.0016301         -0.0016321         -0.001778           101         -0.0027390         -0.0113758         -0.005305<									
92         -0.0034714         -0.0054245         -0.0114441         0.0039444         0.0178375         0.0054550         -0.0171051         -0.0267639           93         -0.0011978         0.0032446         0.00282169         0.023646         0.0032846         0.004932         -0.0127716         -0.0328222         -0.0487366           95         0.0088501         0.0262756         0.0493164         0.0377655         0.0499496         0.0279236         -0.0018158         -0.018158         -0.018158         -0.018158         -0.018158         -0.010655           96         -0.0091782         -0.0143226         -0.0018265         0.0004214         0.0279456         0.000704         -0.016556         0.0001655         0.00016531         -0.001651           98         -0.0084577         -0.007744         -0.0206451         -0.017667         -0.0166321         -0.001792         -0.0122801         -0.001023         -0.007370           100         -0.0013351         -0.0021439         0.0114136         0.0434952         0.0037308         -0.0016321         -0.0016737           102         -0.0027390         -0.0128491         -0.013503         -0.0289612         -0.044826         0.0028915         0.0007378           103         0.0343170         0.0									
93         -0.0011978         0.0003204         0.0082169         0.020274         0.0536499         0.0358963         0.0197830         0.0092850           94         0.0023346         0.0034943         -0.0014572         0.0014372         -0.0014373         -0.0127716         -0.0328522         -0.0487366           95         0.0088501         0.0262756         0.0499464         0.0377555         0.0499466         0.027236         -0.0018158         -0.0108158           96         -0.0042267         -0.0048327         -0.0018264         -0.027674         -0.066931         -0.016321         -0.0011122         -0.011770           98         -0.0088577         -0.0017744         -0.021659         -0.0137518         -0.0016321         -0.001122         -0.0167770           100         -0.004789         -0.002139         -0.013515         -0.001351         -0.0014792         -0.013751         -0.0163402         -0.0076370           102         -0.0023790         -0.010986         -0.0138452         -0.0037038         -0.004496         -0.0063400         -0.0076370           103         0.033170         0.0328259         0.0218492         -0.003708         -0.0128496         -0.0063400         -0.0076370           104         -0.0025763									
94         0.0023346         0.0014572         0.0014543         -0.0054932         -0.0127716         -0.0328522         -0.0487366           95         0.0088501         0.0262756         0.0493164         0.037755         0.0499496         0.0279236         -0.0018158         -0.0010605           97         -0.0042267         -0.004327         -0.0011826         0.006556         0.0016555         0.0016555         -0.0016631         -0.0107714         -0.0206451         -0.0217667         -0.0166321         -0.0041122         -0.0117651           98         -0.00482877         -0.00137863         0.0051422         0.0017090         -0.0126801         -0.00135172         -0.016770           100         -0.0047389         -0.001986         -0.0137853         -0.0056305         -0.0164806         -0.0150452         -0.0211258           101         -0.001351         -0.0014399         -0.013803         -0.028612         -0.0042496         -0.003400         -0.0076370           102         -0.0027390         -0.001986         -0.013803         -0.028703         -0.0042496         -0.006237         0.006507           103         0.0334170         0.0352859         0.021494         -0.0054703         -0.0044066         0.0020523         -0.002741									
95         0.0088501         0.0262756         0.0493164         0.0377655         0.0499496         0.0279236         -0.0018158         -0.0118168           96         -0.0042267         -0.0043271         -0.0014327         0.001182         -0.0003714         -0.002370         -0.0011783           97         -0.0042267         -0.0004781         -0.0017744         -0.0206451         -0.0166931         -0.0166321         -0.0041122         -0.0111160           99         0.0114822         0.0137863         -0.0055100         -0.0065305         -0.017558         -0.0056305         -0.0116806         -0.0164321         -0.0016430         -0.0017770           100         -0.004789         -0.0014351         -0.0021439         0.0114136         0.0434952         0.0037308         -0.0042496         -0.0063400         -0.0075370           102         -0.0027390         -0.0010986         -0.013880         -0.0128801         -0.0044926         0.0062637         0.00050571           103         0.0352859         0.021824         -0.0023744         -0.0054778         0.012389         0.015029         0.0067179           104         -0.002627         0.0002543         -0.0017864         0.0360778         0.00218459         0.0027148         0.002723									
96         -0.0091782         -0.0182266         -0.0430679         0.0019302         0.0016556         0.0016785         -0.0005188         -0.00110605           97         -0.0042267         -0.0044327         -0.0011826         0.0068283         0.0033714         0.02079465         0.0002370         -0.0017051           98         -0.0088577         -0.0077444         -0.0206451         -0.0217667         -0.0166931         -0.0016321         -0.001770           100         -0.0047989         -0.0082703         -0.0190659         0.0137558         -0.0023306         -0.0028016         -0.001233         -0.0016321         -0.0016370           102         -0.0027390         -0.001986         -0.013803         -0.0289612         -0.0440826         0.002815         0.0004730           103         0.0343170         0.0352859         0.0218124         0.0093842         -0.0054703         -0.0048260         0.002815         0.0017085           104         -0.0022545         -0.0224901         -0.0150681         0.0316778         0.021848         0.015263         0.0084390         0.021988           106         -0.0022627         0.002253         -0.0224944         -0.0537415         -0.011806         0.0026237         -0.0027394         0.0227394	-								
97         -0.0042267         -0.004327         -0.0011826         0.0068283         0.0034714         0.0279465         0.0020370         -0.0107651           98         -0.0088577         -0.0077744         -0.0206451         -0.0166931         -0.0166321         -0.0041122         -0.0111160           99         0.0114822         0.0137863         0.0051422         0.0017090         -0.0166305         -0.0116806         -0.0150452         -0.0217570           100         -0.004798         -0.0021439         0.0114136         0.0434952         0.0037308         -0.0042496         -0.0063400         -0.007370           102         -0.0027390         -0.010986         -0.0135803         -0.0284212         -0.044826         0.0028915         0.0004730           103         0.0343170         0.0352859         0.0218124         -0.0054703         -0.0086594         0.0022537         0.0006515           105         -0.0029221         -0.0022583         0.0017624         0.0089951         0.0164185         0.0172653         0.0484390         0.0271988           106         -0.002627         0.002532         -0.0027847         -0.0027847         -0.0027847         -0.0027847         -0.0027847           107         0.0006087         0.00242572									
98         -0.0088577         -0.0077744         -0.0206451         -0.0217667         -0.0166931         -0.016321         -0.0041122         -0.0111160           99         0.0114822         0.0137863         0.0051422         0.0017090         -0.0126801         -0.001223         -0.0035172         -0.0167770           100         -0.00213351         -0.0021439         0.0114136         0.0434952         0.0037308         -0.0042496         -0.0063400         -0.0076370           102         -0.0027390         -0.0010986         -0.0103989         -0.0135803         -0.029612         -0.0440826         0.0028915         0.0004730           103         0.0343170         0.0352859         -0.021491         -0.0150681         0.01306778         -0.022694         0.0056155           105         -0.0025678         -0.0022545         -0.0224091         -0.0150681         0.0172653         0.0484390         0.0271988           106         -0.0026627         0.0002594         -0.0224014         -0.002823         0.0060196         0.002253         -0.0027847         -0.0067490           107         0.0066886         0.0035782         0.0127869         0.031345         -0.0178479         -0.0026468         -0.0027241         -0.0117798         -0.0027141									
99         0.0114822         0.0137863         0.0051422         0.0017090         -0.0126801         -0.0010223         -0.0035172         -0.0167770           100         -0.0047989         -0.0082703         -0.0190659         0.0137558         -0.005305         -0.0116806         -0.015452         -0.0211258           101         -0.0027390         -0.0010986         -0.013580         -0.0135803         -0.0289612         -0.0440826         0.0028915         0.0004730           103         0.0343170         0.0352859         0.0218124         0.0093842         -0.0054703         -0.0066594         0.0026237         0.0005057           104         -0.00275678         -0.0022545         -0.0224991         -0.0150681         0.0306778         0.0213089         0.0150299         0.0065155           105         -0.0026627         0.002254         -0.0224304         -0.0337415         -0.0128479         -0.0069809         -0.0067749           107         0.0036087         -0.0030670         0.0042572         0.01278470         -0.0027542         -0.017798         -0.0027847         -0.0027211           108         -0.0036886         -0.0030670         0.0042572         0.01278490         0.028754         -0.0117788         -0.0027144									
100         -0.0047989         -0.0082703         -0.0190659         0.0137558         -0.0056305         -0.0116806         -0.0150452         -0.0211258           101         -0.0013351         -0.0021439         0.0114136         0.0434952         0.0037308         -0.0042496         -0.0063400         -0.0076370           102         -0.0027390         -0.010986         -0.013989         -0.0135803         -0.028612         -0.0440826         0.002840         0.00063507           103         0.0343170         0.0352859         0.0218124         0.0093842         -0.0021308         0.015029         0.0065155           105         -0.0029221         -0.0022543         -0.0224304         -0.037415         -0.0128479         -0.0069809         -0.0067749           107         0.0076294         0.042272         0.0127869         0.0384750         0.0027542         -0.01778         -0.0075261           108         -0.0038986         -0.0030670         0.0042572         0.0127869         0.0384750         0.027542         -0.01778         -0.0054169           109         -0.0036087         0.0035782         0.0424576         0.0331345         0.0332794         0.0281830         0.0280609         0.0207291           110         0.0046082 <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>									
101         -0.0013351         -0.0021439         0.0114136         0.0434952         0.0037308         -0.0042496         -0.0063400         -0.0076370           102         -0.0027390         -0.0010986         -0.0138803         -0.0289612         -0.0440826         0.0028915         0.0004730           103         0.0343170         0.0352859         0.0218124         0.0093842         -0.0254703         -0.0086594         0.0028617         0.0002891         0.0065155           104         -0.0057678         0.0022545         -0.0224991         -0.0150681         0.0306778         0.0213089         0.0150299         0.0065155           105         -0.0026627         0.0002594         -0.0224304         -0.037415         -0.0119095         -0.0128479         -0.0069809         -0.0067749           106         -0.0026627         0.0002594         -0.0224304         -0.037415         -0.0119095         -0.0128479         -0.0027847         -0.0075226           108         -0.0038986         -0.0030670         0.0042572         0.0127869         0.0327542         -0.0117788         -0.021791           110         0.0046082         0.0080490         0.0111084         -0.0059188         -0.0157547         -0.0019455         -0.0029141									
102         -0.0027390         -0.0010986         -0.013989         -0.0135803         -0.0289612         -0.0440826         0.0028915         0.0004730           103         0.0343170         0.0352859         0.0218124         0.0093842         -0.0054703         -0.0086594         0.0062637         0.0050507           104         -0.0027678         -0.0022545         -0.0224991         -0.0150681         0.0306778         0.0213089         0.016299         0.0065155           105         -0.0026627         0.0002594         -0.0224304         -0.0537415         -0.0119095         -0.0128479         -0.0069809         -0.0075226           107         0.0076294         0.0422287         0.0109787         0.0002823         0.00027542         -0.0117798         -0.007526           108         -0.0036687         0.0035782         0.0424576         0.0331345         0.032794         0.0281830         0.0280699         0.2027291           110         0.0046082         0.0080490         0.011084         -0.005918         -0.0157547         -0.0019455         -0.0029144           111         0.0034485         0.017858         0.0821762         0.027291         -0.00314102         -0.0573120         -0.0361557         -0.0185471         -0.0157477									
103         0.0343170         0.0352859         0.0218124         0.0093842         -0.0054703         -0.0086594         0.0062637         0.005057           104         -0.0057678         -0.0022545         -0.0224991         -0.0150681         0.0306778         0.0213089         0.0150299         0.0065155           105         -0.0022211         -0.002594         -0.0224304         -0.0537415         -0.0119095         -0.0128479         -0.0069809         -0.007749           107         0.0076294         0.0422287         0.0109787         0.0002823         -0.00021542         -0.0117798         -0.0075266           108         -0.0036087         0.0035782         0.0424576         0.0331345         0.0332794         0.0281830         0.0280609         0.0207291           110         0.0046082         0.0080490         0.0111084         -0.0065918         -0.0157547         -0.0019455         -0.0029144           111         0.0034485         0.0175858         0.082172         -0.0185471         -0.0157547         -0.0019455         -0.0029144           111         0.0046082         -0.0080490         0.0111084         -0.0051912         -0.0093765         -0.009765         -0.009765         -0.0019455         -0.0017193           1									
104         -0.0057678         -0.0092545         -0.0224991         -0.0150681         0.0306778         0.0213089         0.0150299         0.0065155           105         -0.0022627         -0.0022583         0.0017624         0.0089951         0.0164185         0.0172653         0.0484390         0.0271988           106         -0.0026627         0.0002594         -0.0224304         -0.0537415         -0.0119095         -0.0128479         -0.0069809         -0.0067749           107         0.0076294         0.0422287         0.0109787         0.002823         0.0060196         0.0020523         -0.0027847         -0.0075226           108         -0.003686         -0.0030670         0.0042572         0.0127869         0.0332794         0.0281830         0.0280609         0.0207291           110         0.0046082         0.0080490         0.0111084         -0.005718         -0.0157547         -0.019455         -0.0029144           111         0.003485         0.0175858         0.0821762         0.0272980         0.0156860         0.0159531         0.0184174         0.0143356           112         -0.0314102         -0.0573120         -0.0361857         -0.0184171         -0.0215912         -0.0097656         -0.0018997           113 <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>									
105         -0.0029221         -0.0022583         0.0017624         0.0089951         0.0164185         0.0172653         0.0484390         0.0271988           106         -0.0026627         0.0002594         -0.0224304         -0.0537415         -0.0119095         -0.0128479         -0.0069809         -0.0067749           107         0.0076294         0.0422287         0.0109787         0.0002823         0.0060196         0.0020523         -0.0027847         -0.0075226           108         -0.0038986         -0.0030670         0.0424576         0.0331345         0.0327542         -0.0117798         -0.0054169           109         -0.0036087         0.0035782         0.0424576         0.0331345         0.032794         0.0281830         0.0280609         0.0207291           110         0.0046082         0.008490         0.0111084         -0.0065918         -0.0157547         -0.019455         -0.029144           111         0.0034485         0.0178588         0.0821762         0.0272980         0.0156860         0.0159511         0.0184174         0.014333           112         -0.0314102         -0.0573120         -0.0361557         -0.0185471         -0.0215912         -0.0093765         -0.0017921         -0.0060349           113 <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>									
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$									
107         0.0076294         0.0422287         0.0109787         0.0002823         0.0060196         0.0020523         -0.0027847         -0.0075226           108         -0.0038986         -0.0030670         0.0042572         0.0127869         0.0384750         0.0027542         -0.0117798         -0.0054169           109         -0.0036087         0.0035782         0.0424576         0.0331345         0.0332794         0.0281830         0.0280609         0.0207291           110         0.0046082         0.0080490         0.0111084         -0.0055918         -0.0157547         -0.0019455         -0.0029144           111         0.0034485         0.0175858         0.0821762         0.0272980         0.0156860         0.0159531         0.0184174         0.0143356           112         -0.0314102         -0.0573120         -0.0361557         -0.0185471         -0.0215912         -0.0093765         -0.00178299         0.0107193           114         -0.001106         -0.0014343         0.0100021         0.0084229         0.0087585         0.0477676         0.0178299         0.0107193           114         -0.0015106         -0.0081024         -0.0302200         -0.0461807         -0.0130497         -0.0201721         -0.0060349           11									
109-0.00360870.00357820.04245760.03313450.03327940.02818300.02806090.02072911100.00460820.00804900.0111084-0.0065918-0.0519485-0.0157547-0.0019455-0.00291441110.00344850.01758580.08217620.02729800.01568600.01595310.01841740.0143356112-0.0314102-0.0573120-0.0361557-0.0185471-0.0215912-0.0093765-0.0097656-0.00189971130.00074010.00143430.0100210.00842290.00875850.04776760.01782990.0107193114-0.0015106-0.0081024-0.0302200-0.0461807-0.0730972-0.0303497-0.0201721-0.00603491150.00994110.02597810.0389252-0.0061798-0.01116180.00612640.0084991-0.016098116-0.0020447-0.0056534-0.0065460-0.004425-0.0104218-0.0178070-0.058556-0.0127106117-0.0028152-0.00292210.01083370.06164550.02922820.02188270.01126860.00427251180.01021580.0152206-0.001757-0.0186920-0.0433731-0.058403-0.030887-0.0182495120-0.0082016-0.057471-0.0547714-0.05756380.00628660.00292970.00977330.00609591210.00226590.00802610.0223210.02297970.04172520.04569240.06497960.0428009122-0	107	0.0076294	0.0422287	0.0109787		0.0060196	0.0020523	-0.0027847	-0.0075226
109-0.00360870.00357820.04245760.03313450.03327940.02818300.02806090.02072911100.00460820.00804900.0111084-0.0065918-0.0519485-0.0157547-0.0019455-0.00291441110.00344850.01758580.08217620.02729800.01568600.01595310.01841740.0143356112-0.0314102-0.0573120-0.0361557-0.0185471-0.0215912-0.0093765-0.0097656-0.00189971130.00074010.00143430.0100210.00842290.00875850.04776760.01782990.0107193114-0.0015106-0.0081024-0.0302200-0.0461807-0.0730972-0.0303497-0.0201721-0.00603491150.00994110.02597810.0389252-0.0061798-0.01116180.00612640.0084991-0.016098116-0.0020447-0.0056534-0.0065460-0.004425-0.0104218-0.0178070-0.058556-0.0127106117-0.0028152-0.00292210.01083370.06164550.02922820.02188270.01126860.00427251180.01021580.0152206-0.001757-0.0186920-0.0433731-0.058403-0.030887-0.0182495120-0.0082016-0.057471-0.0547714-0.05756380.00628660.00292970.00977330.00609591210.00226590.00802610.0223210.02297970.04172520.04569240.06497960.0428009122-0	108	-0.0038986	-0.0030670	0.0042572	0.0127869	0.0384750	0.0027542	-0.0117798	-0.0054169
1110.00344850.01758580.08217620.02729800.01568600.01595310.01841740.0143356112-0.0314102-0.0573120-0.0361557-0.0185471-0.0215912-0.0093765-0.0097656-0.00189971130.00074010.00143430.01000210.00842290.00875850.04776760.01782990.0107193114-0.0015106-0.0081024-0.0302200-0.0461807-0.0730972-0.0303497-0.0201721-0.00603491150.00994110.02597810.0389252-0.0061798-0.01116180.00612640.0084991-0.0016098116-0.0020447-0.0056534-0.0065460-0.0004425-0.0104218-0.0178070-0.0585556-0.0127106117-0.0028152-0.00292210.01083370.06164550.02922820.02168270.01126860.00427251180.01021580.01594300.04640960.03309630.02616120.02090450.01589200.0118602120-0.0082016-0.0157471-0.05756380.00628660.00292970.00977330.00609591210.00226590.00802610.0223210.02297970.0417252-0.0384445-0.0217361-0.0125041230.02845000.08267210.11262510.05327610.0114975-0.038445-0.0217361-0.012504124-0.009766-0.00135040.00823210.04110720.02230830.0020828-0.0291138-0.0363312124-0.009766-		-0.0036087							0.0207291
1110.00344850.01758580.08217620.02729800.01568600.01595310.01841740.0143356112-0.0314102-0.0573120-0.0361557-0.0185471-0.0215912-0.0093765-0.0097656-0.00189971130.00074010.00143430.01000210.00842290.00875850.04776760.01782990.0107193114-0.0015106-0.0081024-0.0302200-0.0461807-0.0730972-0.0303497-0.0201721-0.00603491150.00994110.02597810.0389252-0.0061798-0.01116180.00612640.0084991-0.0016098116-0.0020447-0.0056534-0.0065400-0.0004425-0.0104218-0.0178070-0.0585556-0.0127106117-0.0028152-0.00292210.01083370.06164550.02922820.02168270.01126860.00427251180.01021580.015206-0.0010757-0.018920-0.0433731-0.0584030-0.0330887-0.01824951190.03412630.07594300.04640960.03309630.02616120.02090450.01589200.0113602120-0.0082016-0.0157471-0.05756380.00626660.00292970.00977330.00609591210.00226590.00826610.02223210.02297970.0417252-0.038445-0.0217361-0.01255041230.02845000.08267210.11262510.05327610.0114975-0.0184174-0.0278168-0.0363122124-0.009766<	110	0.0046082	0.0080490	0.0111084	-0.0065918	-0.0519485	-0.0157547	-0.0019455	-0.0029144
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	111	0.0034485	0.0175858	0.0821762	0.0272980			0.0184174	0.0143356
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	112	-0.0314102	-0.0573120	-0.0361557	-0.0185471	-0.0215912	-0.0093765	-0.0097656	-0.0018997
1150.00994110.02597810.0389252-0.0061798-0.01116180.00612640.0084991-0.0016098116-0.0020447-0.0056534-0.0065460-0.0004425-0.0104218-0.0178070-0.0585556-0.0127106117-0.0028152-0.00292210.01083370.06164550.02922820.02168270.01126860.00427251180.01021580.0152206-0.0010757-0.0186920-0.0433731-0.0584030-0.0330887-0.01824951190.03412630.07594300.04640960.03309630.02616120.02090450.01589200.0113602120-0.0082016-0.0157471-0.0547714-0.05756380.00628660.00292970.00977330.00609591210.00226590.00802610.02223210.02297970.04172520.04569240.06497960.0428009122-0.0109406-0.0265427-0.0845337-0.0739746-0.0471725-0.0384445-0.0217361-0.01255041230.02845000.08267210.11262510.05327610.0114975-0.0184174-0.0278168-0.0385132124-0.0009766-0.00135040.00823210.04110720.02230830.0020828-0.0291138-0.03633121250.00682070.02429200.05808260.06839750.07894900.06214140.04457860.01908871260.02931980.06307220.0497131-0.0120468-0.0440521-0.0440979-0.0299225-0.0291214 <th>113</th> <th>0.0007401</th> <th>0.0014343</th> <th>0.0100021</th> <th>0.0084229</th> <th>0.0087585</th> <th>0.0477676</th> <th>0.0178299</th> <th>0.0107193</th>	113	0.0007401	0.0014343	0.0100021	0.0084229	0.0087585	0.0477676	0.0178299	0.0107193
116-0.0020447-0.0056534-0.0065460-0.0004425-0.0104218-0.0178070-0.0585556-0.0127106117-0.0028152-0.00292210.01083370.06164550.02922820.02168270.01126860.00427251180.01021580.0152206-0.0010757-0.0186920-0.0433731-0.0584030-0.0330887-0.01824951190.03412630.07594300.04640960.03309630.02616120.02090450.01589200.0113602120-0.0082016-0.0157471-0.0547714-0.05756380.00628660.00292970.00977330.00609591210.00226590.00802610.02223210.02297970.04172520.04569240.06497960.0428009122-0.0109406-0.0265427-0.0845337-0.0739746-0.0471725-0.0384445-0.0217361-0.01255041230.02845000.08267210.11262510.05327610.0114975-0.0184174-0.0278168-0.0385132124-0.0009766-0.00135040.00823210.04110720.02230830.0020828-0.0291138-0.03633121250.00682070.02429200.05808260.06839750.07894900.06214140.04457860.01908871260.02931980.06307220.0497131-0.0120468-0.0440521-0.0440979-0.0299225-0.0291214	114	-0.0015106	-0.0081024		-0.0461807	-0.0730972			-0.0060349
117-0.0028152-0.00292210.01083370.06164550.02922820.02168270.01126860.00427251180.01021580.015206-0.0010757-0.0186920-0.0433731-0.0584030-0.0330887-0.01824951190.03412630.07594300.04640960.03309630.02616120.02090450.01589200.0113602120-0.0082016-0.0157471-0.0547714-0.05756380.00628660.00292970.00977330.00609591210.00226590.00802610.02223210.02297970.04172520.04569240.06497960.0428009122-0.0109406-0.0265427-0.0845337-0.0739746-0.0471725-0.0384445-0.0217361-0.01255041230.02845000.08267210.11262510.05327610.0114975-0.0184174-0.0278168-0.0385132124-0.0009766-0.00135040.00823210.04110720.02230830.0020828-0.0291138-0.03633121250.00682070.02429200.05808260.06839750.07894900.06214140.04457860.01908871260.02931980.06307220.0497131-0.0120468-0.0440521-0.0440979-0.0299225-0.0291214	115	0.0099411	0.0259781	0.0389252	-0.0061798	-0.0111618		0.0084991	-0.0016098
117-0.0028152-0.00292210.01083370.06164550.02922820.02168270.01126860.00427251180.01021580.015206-0.0010757-0.0186920-0.0433731-0.0584030-0.0330887-0.01824951190.03412630.07594300.04640960.03309630.02616120.02090450.01589200.0113602120-0.0082016-0.0157471-0.0547714-0.05756380.00628660.00292970.00977330.00609591210.00226590.00802610.02223210.02297970.04172520.04569240.06497960.0428009122-0.0109406-0.0265427-0.0845337-0.0739746-0.0471725-0.0384445-0.0217361-0.01255041230.02845000.08267210.11262510.05327610.0114975-0.0184174-0.0278168-0.0385132124-0.0009766-0.00135040.00823210.04110720.02230830.0020828-0.0291138-0.03633121250.00682070.02429200.05808260.06839750.07894900.06214140.04457860.01908871260.02931980.06307220.0497131-0.0120468-0.0440521-0.0440979-0.0299225-0.0291214	116	-0.0020447	-0.0056534	-0.0065460	-0.0004425	-0.0104218	-0.0178070	-0.0585556	-0.0127106
1190.03412630.07594300.04640960.03309630.02616120.02090450.01589200.0113602120-0.0082016-0.0157471-0.0547714-0.05756380.00628660.00292970.00977330.00609591210.00226590.00802610.02223210.02297970.04172520.04569240.06497960.0428009122-0.0109406-0.0265427-0.0845337-0.0739746-0.0471725-0.0384445-0.0217361-0.01255041230.02845000.08267210.11262510.05327610.0114975-0.0184174-0.0278168-0.0385132124-0.0009766-0.00135040.00823210.04110720.02230830.0020828-0.0291138-0.03633121250.00682070.02429200.05808260.06839750.07894900.06214140.04457860.01908871260.02931980.06307220.0497131-0.0120468-0.0440521-0.0440979-0.0299225-0.0291214	117	-0.0028152	-0.0029221		0.0616455	0.0292282	0.0216827	0.0112686	0.0042725
120-0.0082016-0.0157471-0.0547714-0.05756380.00628660.00292970.00977330.00609591210.00226590.00802610.02223210.02297970.04172520.04569240.06497960.0428009122-0.0109406-0.0265427-0.0845337-0.0739746-0.0471725-0.0384445-0.0217361-0.01255041230.02845000.08267210.11262510.05327610.0114975-0.0184174-0.0278168-0.0385132124-0.0009766-0.00135040.00823210.04110720.02230830.0020828-0.0291138-0.03633121250.00682070.02429200.05808260.06839750.07894900.06214140.04457860.01908871260.02931980.06307220.0497131-0.0120468-0.0440521-0.0440979-0.0299225-0.0291214	118	0.0102158	0.0152206	-0.0010757	-0.0186920	-0.0433731		-0.0330887	-0.0182495
1210.00226590.00802610.02223210.02297970.04172520.04569240.06497960.0428009122-0.0109406-0.0265427-0.0845337-0.0739746-0.0471725-0.0384445-0.0217361-0.01255041230.02845000.08267210.11262510.05327610.0114975-0.0184174-0.0278168-0.0385132124-0.0009766-0.00135040.00823210.04110720.02230830.0020828-0.0291138-0.03633121250.00682070.02429200.05808260.06839750.07894900.06214140.04457860.01908871260.02931980.06307220.0497131-0.0120468-0.0440521-0.0440979-0.0299225-0.0291214	119	0.0341263	0.0759430	0.0464096	0.0330963		0.0209045	0.0158920	
1210.00226590.00802610.02223210.02297970.04172520.04569240.06497960.0428009122-0.0109406-0.0265427-0.0845337-0.0739746-0.0471725-0.0384445-0.0217361-0.01255041230.02845000.08267210.11262510.05327610.0114975-0.0184174-0.0278168-0.0385132124-0.0009766-0.00135040.00823210.04110720.02230830.0020828-0.0291138-0.03633121250.00682070.02429200.05808260.06839750.07894900.06214140.04457860.01908871260.02931980.06307220.0497131-0.0120468-0.0440521-0.0440979-0.0299225-0.0291214	120	-0.0082016	-0.0157471	-0.0547714	-0.0575638	0.0062866	0.0029297	0.0097733	0.0060959
1230.02845000.08267210.11262510.05327610.0114975-0.0184174-0.0278168-0.0385132124-0.0009766-0.00135040.00823210.04110720.02230830.0020828-0.0291138-0.03633121250.00682070.02429200.05808260.06839750.07894900.06214140.04457860.01908871260.02931980.06307220.0497131-0.0120468-0.0440521-0.0440979-0.0299225-0.0291214		0.0022659				0.0417252			0.0428009
124         -0.0009766         -0.0013504         0.0082321         0.0411072         0.0223083         0.0020828         -0.0291138         -0.0363312           125         0.0068207         0.0242920         0.0580826         0.0683975         0.0789490         0.0621414         0.0445786         0.0190887           126         0.0293198         0.0630722         0.0497131         -0.0120468         -0.0440521         -0.0440979         -0.0299225         -0.0291214			-0.0265427	-0.0845337	-0.0739746			-0.0217361	-0.0125504
125         0.0068207         0.0242920         0.0580826         0.0683975         0.0789490         0.0621414         0.0445786         0.0190887           126         0.0293198         0.0630722         0.0497131         -0.0120468         -0.0440521         -0.0440979         -0.0299225         -0.0291214									
126 0.0293198 0.0630722 0.0497131 -0.0120468 -0.0440521 -0.0440979 -0.0299225 -0.0291214				0.0082321	0.0411072		0.0020828	-0.0291138	-0.0363312
127         0.0271988         0.0838776         0.1353760         0.1022873         0.0741501         0.0458984         0.0275192         -0.0002823									
	127	0.0271988	0.0838776	0.1353760	0.1022873	0.0741501	0.0458984	0.0275192	-0.0002823

# **APPENDIX 3: SECOND-STAGE LSP SHAPE CODEBOOK**

Index         Element 1         Element 3         Element 4         Element 4         Element 5         Element 6           0         -0.0012776         -0.001228         0.0007718         -0.00124105         0.00027465         -0.0017458         0.00027465           1         -0.0012710         -0.0012710         -0.0012710         -0.00174125         0.0017458         0.00027165           2         -0.00127210         -0.001284         -0.00174125         0.0017458         0.00127454         0.00027163           3         -0.00127210         -0.0012840         -0.0017188         -0.0017488         0.00017468           3         -0.001481         -0.00127421         -0.0017188							-		
1         -0.00027755         -0.0011471         -0.00036712         -0.00037161         -0.00027166           2         -0.00127261         -0.00187219         -0.00187219         -0.00037181         -0.00047548         0.00027161           4         -0.00217209         -0.00271085         -0.00174291         0.00027101         -0.00174291         0.00027105           5         -0.00189721         -0.00271462         -0.00023171         -0.00171717         -0.00171717         -0.00171717         -0.00171717         -0.00171717         -0.00171717         -0.00171717         -0.00171717         -0.00171717         -0.00171717         -0.00171717         -0.00171717         -0.00171717         -0.00171717         -0.00171717         -0.00171717         -0.00171717         -0.0017171         -0.00171717         -0.00171717         -0.00171717         -0.0017171         -0.001	Index	Element 1	Element 2	Element 3	Element 4	Element 5	Element 6	Element 7	Element 8
2         -0.00118256         -0.0019617         -0.00403597         -0.0003518         0.0007239         -0.00072319           4         0.00012162         0.00082397         -0.0027109         -0.0023813         -0.00013185         -0.00033185         -0.000133187         -0.00023805           5         -0.00256148         -0.00236172         -0.00238037         -0.00238037         -0.00226171           7         -0.00256148         -0.00131187         -0.00238037         -0.00226171         -0.00226171           8         -0.001681         -0.0017272         0.00138146         -0.00113116         -0.001097847         -0.000263771           9         -0.0048807         -0.0014851         -0.00176120         -0.00138116         -0.00113116         -0.00167847         -0.00063818         0.000716184           9         -0.0044897         -0.00387071         -0.00187281         -0.00176141	0								
3         -0.0037219         -0.0018446         0.00494385         -0.002566         0.00161731         -0.0018972         0.00033405           5         -0.0018972         -0.0021443         -0.0037944         -0.00136405         -0.001713187         -0.00033405           6         -0.0025544         -0.00021241         -0.00229297         -0.00184466         -0.001713187         -0.00026318         -0.00024318           8         -0.000161         -0.00147211         -0.00174670         -0.00314105         -0.00174917         -0.0026318         0.00054855           9         -0.00064850         -0.00174571         -0.00174572         -0.00174571         -0.00174571         -0.00174571         -0.00174571         -0.0017572         -0.0017572         -0.0017572         -0.0017572         -0.0017572         -0.0017572         -0.0017572         -0.0017572         -0.0017572<	1								
4         0.00021362         0.00032397         -0.00271606         -0.0073185         0.00132315         -0.00033305         -0.00628642           6         -0.00236485         -0.0012134         -0.0023927         -0.0022421         0.0073187         -0.00226451         -0.00026757         -0.00262451           7         -0.004850         -0.0014721         -0.0047674         -0.0033116         -0.0015986         -0.0016818         -0.00658883         0.00054883           9         -0.0048505         -0.0016818         -0.00765228         -0.00187244         -0.0026331         -0.00688838         0.00054883           10         -0.0048507         -0.00187291         -0.00176129         -0.0031171         -0.00161743         -0.0017161           12         -0.0045867         -0.00175771         -0.0017161         -0.0001751         -0.0017161         -0.0017161         -0.0017161         -0.0017161         -0.0017171         -0.0017170         -0.00185161         -0.0017170         -0.00185161         -0.0017170         -0.00181517         -0.00181517         -0.00181517         -0.00181517         -0.00181517         -0.00181517         -0.00181517         -0.00181517         -0.00181517         -0.00181517         -0.00181517         -0.00181517         -0.00181517         -0.00181517									
5         -0.00199972         -0.00291443         -0.00139440         -0.0043401         -0.00117187         -0.00031470         -0.00191498           7         -0.00487518         -0.00372125         -0.00032397         -0.0018446         -0.00171411         -0.0048944         -0.00029318         -0.00264853           8         -0.0010881         -0.001451271         -0.00374074         -0.0037401         -0.0025318         -0.00264853           9         -0.00064850         -0.00137617         -0.00137407         -0.00037491         -0.00059855         -0.0007767           11         -0.00464507         -0.00457711         -0.00137617         -0.00177571         -0.00177571         -0.00177571         -0.00177571         -0.00177571         -0.00177571         -0.00177571         -0.00177571         -0.00177571         -0.00177571         -0.00177571         -0.0017571         -0.0017571         -0.0017571         -0.0017571         -0.0017571         -0.0017571         -0.0017571         -0.0017571         -0.0017571         -0.0017571         -0.0017572         -0.00175721         -0.00175721         -0.00175721         -0.00175721         -0.00175721         -0.00175721         -0.00175721         -0.00175721         -0.00175721         -0.00175721         -0.00175721         -0.00175721         -0.00175721<									
6         -0.00256348         -0.0031214         -0.0023037         -0.0023422         0.00234037         -0.0026751         -0.0026751           8         -0.0010681         -0.0014571         -0.0047674         -0.00331116         -0.0139886         -0.00167847         -0.00085383         0.0068583           9         -0.0046850         -0.0013618         +0.0075228         -0.00287244         -0.0025311         -0.00085383         -0.0016731         -0.0016731         -0.0016773         -0.0016773         -0.0016773         -0.0017774         -0.0049027           13         -0.00445867         -0.0038709         -0.0017629         -0.00047740         -0.0005774         -0.0094027           14         -0.00245160         -0.0037202         -0.0093416         -0.0058706         -0.001772         -0.0094313           15         -0.00451661         -0.0152627         -0.0093416         -0.0058706         -0.0017329         -0.0045701           16         -0.000753         -0.0058707         -0.0017400         -0.001753         -0.0017329         -0.0045701           17         -0.00245160         -0.0123702         -0.0045701         -0.0017248         -0.0017318         -0.0017312         -0.0045701           16         -0.00075340         -0.001									
7         -0.00487518         -0.00072205         0.00084297         0.00188446         -0.00174011         -0.000269318         -0.000269318         0.00054855           9         -0.0010681         -0.00171251         -0.0077407         0.00371401         -0.00054855         -0.00054855           10         -0.0013287         -0.00152291         -0.0017252         0.00352328         -0.0017657         -0.00176574         -0.00054856         -0.000176574         -0.0019324           11         -0.00424957         -0.00547791         -0.00152574         -0.0019324         -0.0017574         -0.0019324           12         -0.00424957         -0.0055702         -0.00152267         -0.00015269         -0.00018516         -0.0012730         -0.0009342           13         -0.0020752         -0.0045267         -0.0015267         -0.0015267         -0.0019730         -0.0019734         -0.0027458         -0.00215149           14         -0.0027520         -0.0041113         0.0055170         -0.00181571         -0.00181547         -0.0019734         -0.0017331         -0.0009342           15         -0.0027520         -0.00414131         -0.0050770         -0.00181577         -0.00181577         -0.00181577         -0.00181578         -0.00175720         -0.001449741									
8         -0.00010681         -0.0014721         -0.0047074         -0.00167847         -0.0063885           9         -0.0064850         -0.0015781         -0.0075228         -0.0074623         -0.00053287         -0.00053287           10         -0.00432587         -0.0053701         -0.00151731         -0.00053121         -0.00055183         -0.00055183         -0.00055197         -0.00161731         -0.0017741         -0.000193024           11         -0.00132567         -0.0055070         -0.00118380         -0.0075781         -0.000193024           14         -0.0023214         -0.00356701         -0.00113380         -0.00357831         -0.0013720         -0.000193024           15         -0.00451660         -0.0132572         -0.0016720         -0.00025730         -0.0015730         -0.0019733         -0.0001973         -0.00118732         -0.000118732         -0.000118732         -0.000118732         -0.00011873         -0.000118732         -0.000118732         -0.000118732         -0.000118732         -0.000118732         -0.000118732         -0.000118732         -0.000118732         -0.000118732         -0.000118732         -0.000118732         -0.000118732         -0.000118732         -0.000118732         -0.000118732         -0.000118732         -0.000118732         -0.000118732         -0.000	-								
9         -0.0064850         -0.00137401         -0.00737401         -0.00037201         -0.0073757           11         -0.0111658         0.00389090         -0.007223         0.00331116         0.00032177         -0.001767         -0.001767           12         -0.0042957         -0.0058670         -0.0011380         0.00331116         0.00052149         -0.00642757         -0.0016455         -0.0019324           14         -0.00242957         -0.00386700         -0.0011380         0.00334003         0.00058746         -0.0018457         -0.0019324           15         0.0042957         -0.00386710         -0.0018457         -0.0018437         -0.0019324           16         0.00007520         0.0039771         0.0007907         -0.007390         -0.0017373         -0.0019342           17         -0.0007380         0.00411250         0.0114940         -0.0021770         -0.007373         -0.0017373         -0.0017373           18         -0.0007380         -0.0029808         -0.0007180         -0.00215149         -0.0007363         -0.0017373         -0.001737373         -0.001737373         -0.001737373737373         -0.001737373737373737373         -0.00184575         -0.00184575         -0.00184575         -0.00184575         -0.00184575         -0.00184574									
10         -0.00432587         -0.0075228         0.0035234         0.00276144         -0.00205231         0.003757           11         -0.0161658         0.00547791         -0.00512695         -0.00231171         0.00565049         -0.0011734         -0.00049027           13         -0.00424957         -0.0056779         -0.00512695         -0.00055538         -0.0056575         -0.00616455         -0.00193244           14         -0.0025214         -0.00273267         -0.0005761         -0.0005770         -0.0015777         -0.0015734         -0.0015734           15         -0.00451660         -0.0132572         -0.0016760         -0.002770         -0.0015734         -0.0015734         -0.0015734         -0.0015734         -0.0017534									
11         -0.01011658         0.0035727         -0.0017431         -0.00090027           12         -0.0045867         -0.005720         -0.001595         -0.0001751         -0.00056457         -0.0064537           14         -0.0025214         -0.0017374         -0.0015373         -0.0015373         -0.0015394           15         0.0045160         -0.0123757         -0.00153267         -0.0035813         -0.0045394           16         0.0000763         -0.0015201         -0.0015172         -0.0018477         -0.0018477         -0.0018477         -0.0018477         -0.0018477         -0.0018477         -0.0018477         -0.0018477         -0.0018477         -0.0018477         -0.00215149           16         0.00007520         -0.00424113         0.00380770         -0.007079         -0.00027814         -0.00215149           17         -0.0025309         -0.0017484         0.0021797         -0.0012797         -0.0012798         -0.00224658         -0.0024768         0.00118081           17         -0.00253830         -0.0012452         -0.00124857         -0.0025478         -0.00124688         0.0007914         -0.00224688         0.00129088           12         -0.0025381         -0.00026347         -0.00126487         -0.00264414         0.0	-								
12         -0.00463867         -0.0058700         -0.0011399         -0.0027249         -0.00645175         -0.00107574         -0.00900027           14         -0.00245214         -0.00283013         -0.0038610         -0.00185161         -0.00283113         -0.00453449           15         -0.00451660         -0.0123267         -0.0038610         -0.0038510         -0.0018517         -0.0038471         -0.0059342           16         -0.0000763         -0.0039673         -0.0050760         -0.00217500         -0.0018517         -0.00185174         -0.00151747         -0.0015748         0.0025752         -0.000274658         -0.0005726         -0.00135174         -0.00152718         -0.0005720         -0.0005973         -0.01251715         -0.0015260         -0.0039753         -0.00254059         -0.00152717         -0.015206         -0.0039753	-								
13         -0.00424957         -0.0051455         -0.0051455         -0.00164555         -0.00193024           15         0.00451660         -0.01326752         -0.00163269         -0.00040436         0.00058746         -0.00235530         -0.0013729         -0.00017329         -0.000457001           17         -0.00207520         -0.00244081         0.0058706         -0.0021750         -0.00151729         -0.00151729         -0.00151729         -0.0017329         -0.0017329         -0.0017329         -0.0017329         -0.0017329         -0.0017329         -0.0011739         -0.0011739         -0.0011739         -0.0011739         -0.001178         -0.00178         -0									
14         -0.00243214         -0.0038416         -0.00183461         -0.0023813         0.00453949           15         0.00451660         -0.0123722         0.00560763         0.00039673         0.00560760         -0.00251770         0.00186157         0.01089478         -0.00115732         0.00457001           17         -0.00207520         -0.0039861         0.0060119         -0.00214658         0.00114740         -0.00215747         -0.00215747         -0.00215747         -0.00215747         -0.00274658         0.000274658         0.0006763         0.0103745         0.000274658         0.000274658         0.000274658         0.000274658         0.000274658         0.000274658         0.000274658         0.00057453         0.000274658         0.00057453         0.00274658         0.00057453         0.00274658         0.00057455         0.00257674         0.00135094         0.00135094         0.000763         0.0105753         0.0025965         0.00059153         0.0025965         0.00059153         0.0025965         0.00059153         0.0025965         0.00059153         0.0025915         0.0025915         0.0025915         0.0025915         0.0025915         0.0025915         0.0025915         0.0025915         0.0025915         0.0025915         0.0025915         0.0025915         0.0025915         0.0025915         <	13								
16         0.0000763         0.00037673         0.00037720         0.0018157         0.00180175         0.0018175         0.00181732         0.00051747         0.00215149           18         -0.0007346         -0.0029808         0.0061196         -0.00274658         0.00017053         -0.00257858         0.0017520         -0.00274658         0.000162506         -0.00274658         0.0000763         -0.00017205         -0.00174575         0.00017205         -0.0017205         -0.00174575         -0.0017205         -0.0017205         -0.001745720         -0.001748592         -0.00178013         -0.0088824         -0.000464630         -0.000544739           20         -0.00274520         -0.0017444         -0.002778213         -0.00288824         -0.002464630         -0.0039733         -0.0024412         -0.00174144         -0.00244114         -0.002464630         -0.00056592         -0.0066766         -0.01129163           25         -0.00224794         -0.00461435         0.00084702         -0.00274631         -0.00265692         -0.0066766         -0.01129150           26         -0.00217475         -0.00161455         -0.00074631         -0.0067430         -0.00056592         -0.0066766         -0.01129150           27         -0.01251747         -0.00126648         0.000745051         -0.00062									
17         -0.00217520         -0.00434113         0.000218147         -0.0001785828         0.00017053         -0.001184082           19         -0.0023809         -0.00412750         0.00414490         -0.000318147         -0.00017058         -0.00137842         0.00047682         0.00047682         0.00027658           10         -0.00035806         -0.00138147         -0.000315941         -0.00135141         0.00027070         -0.0102968           21         -0.0005340         -0.00462341         0.00443875         -0.00235101         -0.00467682         -0.00037070         -0.0102968           23         -0.00719452         -0.013144         0.00247192         -0.00236111         -0.00257531         -0.00254059           24         -0.00224364         -0.0042772         -0.0061706         -0.00025612         -0.000256522         -0.00625621         -0.000256522         -0.00635169         -0.00236117         -0.00656592         -0.00605052         -0.00035018         -0.00256522         -0.00605052         -0.00025652         -0.00605052         -0.00650521         -0.00650592         -0.00650592         -0.00650592         -0.00650592         -0.00650592         -0.00650592         -0.00650592         -0.00650592         -0.00650592         -0.00650592         -0.00650593         -0.00650593	15	0.00451660	-0.01326752	-0.00163269	-0.00040436	0.00058746	-0.00355530	-0.00116730	-0.00093842
18         -0.00079346         -0.0029888         0.001184082           19         -0.00298309         -0.0012750         0.001184082         -0.00001703         -0.00021658         0.00006513           20         -0.0053540         -0.00462341         0.00235399         -0.0169802         -0.0000763         -0.00046301         -0.00129584           21         -0.0057220         -0.0021232         -0.00458592         -0.00782013         -0.0088824         -0.0029660         -0.00029731         -0.00236511         -0.00056592         -0.00248717         -0.0026660         -0.000248717         -0.0026552         -0.00066706         -0.0115013           25         -0.00173765         -0.00151879         -0.00443104         -0.0027801         -0.000256592         -0.00660706         -0.0115013           26         -0.0024374         -0.00151879         -0.00443104         -0.00074400         -0.00505592         -0.00660706         -0.0115013           27         -0.001518790         -0.00431443         -0.0024985         -0.00074051         -0.00052611         -0.00053261         -0.0001318         -0.002151912           28         -0.0017765         -0.0019313         -0.00074331         -0.00074305         -0.00062564         -0.00712585         -0.00051870         -0.00065	16	0.00000763	0.00039673	0.00560760	-0.00251770	0.00186157	0.01089478	-0.00137329	0.00457001
19         -0.00298309         -0.00412750         0.01414490         0.0021097         -0.00090763         0.0006753         0.000738         0.00013546         -0.00013546         0.00013546         0.00013546         0.00042341         0.0044592         -0.00257874         0.00315094         0.00467682         0.00099709         -0.0102968           21         -0.0053240         -0.00422142         -0.00078213         -0.00236511         0.00467682         0.00099709         -0.0102968           23         -0.00719452         -0.0101494         0.00247192         -0.006071218         -0.00236511         0.0066592         -0.0066676         0.00115013           25         -0.00224304         -0.00616455         0.00030871         0.0051717         0.00066592         0.000609320         0.00224552           27         -0.01228931         -0.00179531         -0.00070953         0.00191003         0.01485443         0.000244114         0.00030577         0.00024119           28         -0.00177765         -0.00151747         -0.00124985         0.0075991         -0.00141199         0.00244141         0.00305073         0.00025150           29         -0.00414127         -0.0126448         0.00075911         -0.00124534         0.001945504         -0.00356293         -0.000244141 </td <td>17</td> <td>-0.00207520</td> <td>-0.00434113</td> <td></td> <td>0.00775909</td> <td>-0.00274658</td> <td>0.00917053</td> <td>-0.00515747</td> <td>-0.00215149</td>	17	-0.00207520	-0.00434113		0.00775909	-0.00274658	0.00917053	-0.00515747	-0.00215149
10         0.0003588         0.0017089         0.0025939         -0.0169902         0.0001703         0.0016768         -0.0013314         0.0010790           21         -0.00057220         -0.00221252         -0.00457892         -0.00467682         0.00046763         -0.00598145         0.00254739           23         -0.00719452         -0.00153184         0.00253181         -0.000598145         0.0065981         -0.000598145         0.00254057           24         -0.00224304         -0.00453184         0.000531769         -0.00612871         0.00666981         -0.0026706         0.01116901           25         -0.00224304         -0.00418792         -0.00461140         -0.0056522         -0.0066706         0.0115912           26         -0.00157871         -0.0015883         -0.00157871         -0.00215912         -0.00215912         -0.00017765         -0.0012648         0.0061959         -0.0026561         -0.0023697         -0.0021285           27         -0.0157871         -0.0012648         -0.00234985         -0.0024981         -0.0023697         -0.0003518         -0.00253176           28         -0.0067490         -0.0174219         -0.012648         -0.0075591         -0.0038677         -0.00036629         -0.0002532376           31	18	-0.00079346	-0.00209808	0.00601196	-0.00038147	-0.00785828	0.00248718	-0.00209808	0.01184082
1         -0.00503540         0.0044321         0.0043592         -0.0027821         0.0046762         0.00090790         0.01029968           22         -0.00057220         -0.0038592         -0.00323651         0.00193024         0.0039735         0.00254059           24         -0.00220680         -0.00582886         0.0051169         0.00539978         0.00623413         0.00669861         0.0039215           25         -0.00220680         -0.00450134         0.00026703         0.00539977         0.00528717         0.00506706         0.01150113           26         -0.00428772         -0.0061455         0.0007953         0.00531769         -0.0044710         -0.00506592         -0.006080597         -0.00015031           28         -0.0177765         -0.001774219         -0.01019013         -0.00471285         -0.00023498         -0.0075351         -0.00380377         -0.00023498         -0.0075351         -0.00380377         -0.00023493         -0.00128453         -0.00023493         -0.00128453         -0.000234937         -0.00128453         -0.000234937         -0.00128453         -0.000234937         -0.00128453         -0.000234937         -0.00128453         -0.000284937         -0.00128453         -0.000284937         -0.00128433         -0.001284337         -0.000284937         -0.001	19	-0.00298309	-0.00412750	0.01414490	0.00212097	-0.00019073	-0.00061798	-0.00274658	0.00065613
12         -0.00057220         0.0021252         -0.00782013         -0.0028601         -0.00598145         0.0054739           23         -0.00719452         -0.00582886         0.00253081         0.00602480         -0.00253081         0.0066248         0.00329151           25         -0.00224304         -0.00458286         0.000582856         0.000582856         0.000282552         -0.000660760         0.01150513           26         -0.00428772         -0.0016455         0.00080872         0.00007100         0.00182552         -0.00093320         0.00828552           27         -0.01528931         -0.00153747         0.00061553         -0.000215347         0.000601559         0.00090524         -0.000712858         -0.00253376           29         -0.00414276         -0.00153474         -0.00126488         0.0075991         -0.00386237         -0.00385233           30         -0.00671400         -0.01766968         0.00551523         -0.00739500         -0.0049570         -0.00385623         -0.00382377           32         -0.00067130         -0.003578308         0.00490570         -0.00385623         -0.00022334           33         -0.00326538         -0.00357613         -0.00922394         0.00149550         -0.00026523           34	20	0.00035858		0.00259399	-0.01609802			-0.00133514	0.00100708
23         -0.00719452         -0.01031494         0.00231192         -0.00236511         0.00193024         -0.0039753         0.00234059           24         -0.00224304         0.00450134         0.0026703         0.0056592         -0.0066976         0.01150513           25         -0.00224304         0.0045134         0.00026703         0.00028713         0.00026703         0.0005828         0.00030518         0.0017755         -0.0013518         0.00443171         0.00463144         0.00070552         0.00030518         0.0002531         0.00030518         0.00023320         0.00238253           28         -0.0017765         -0.00177165         -0.00177477         -0.00177477         -0.00177477         -0.00177477         -0.00177477         -0.00177477         -0.00177477         -0.00177477         -0.00174219         -0.00234987         -0.0085573         -0.00038073         -0.00038073         -0.00038073         -0.00038073         -0.00038073         -0.00038073         -0.00038073         -0.00038073         -0.00038073         -0.00038073         -0.00038073         -0.00038073         -0.00038073         -0.00038073         -0.00038073         -0.00038333         -0.00234984         -0.00173531         -0.00234984         -0.00173531         -0.002234983         -0.000183564         -0.00123543			-0.00462341		-0.00257874		0.00467682	0.00090790	-0.01029968
24         -0.0029680         -0.00582886         0.0011169         0.0053938         0.00604248         0.00421143         0.00669861         0.00392151           25         -0.00243772         -0.00616455         0.00080872         0.0062502         0.0060706         0.01151513           26         -0.00428772         -0.00616455         0.0007933         -0.00074005         0.000802561         0.00082552           27         -0.01528931         -0.000195313         -0.0007953         -0.01091003         0.01485443         0.0026564         -0.00171258         -0.00253673           29         -0.00414276         -0.00515747         -0.0126648         0.001935028         -0.00038673         -0.00023653         -0.00033673         -0.000235633         -0.00033673         -0.000235633         -0.000356373         -0.000236533         -0.00326538         -0.0003450497         -0.01124359           33         -0.003260538         -0.00336070         -0.00453049         -0.0087462         -0.00395615         -0.00124143           34         -0.0038070         -0.00453049         -0.00549615         -0.00128144         -0.004694971         -0.01124359           34         -0.0038070         -0.00453049         -0.00553645         -0.001545743         -0.00128145         -0.001									
15         -0.00224304         -0.00450134         0.00026703         0.00528717         0.00506592         0.0060706         0.01150513           26         -0.00428772         -0.00616455         0.00080872         0.00531769         -0.004710         -0.00903320         0.00828512           27         -0.01528931         -0.0019933         -0.0043014         0.00074005         0.00093261         0.00030518         0.00019103         0.01485443         0.00241411         0.0038057         -0.00023176           28         -0.0017756         -0.00174219         -0.01129150         -0.00234985         -0.0076591         -0.00885773         0.00038673         0.00651553           30         -0.0069110         -0.00174219         -0.00124351         -0.00124351         -0.00234937         -0.00885773         0.00038673         -0.0028137           31         -0.00380707         -0.00124313         -0.00124353         -0.00124353         -0.00124359         -0.00124359           34         -0.00380707         -0.00452944         -0.00895061         -0.00895061         -0.00895061         -0.001825743         -0.001243174           35         -0.0075228         -0.00459244         -0.00354040         -0.01325743         -0.00143566         -0.001242174           <	23			0.00247192			0.00193024		0.00254059
26         -0.00428772         -0.0051879         0.00407310         -0.00506592         0.00903320         0.00828552           27         -0.01528931         -0.00518799         0.00449371         0.0043104         0.00074005         0.000062561         0.00030518         0.00215912           28         -0.0017765         -0.0015313         -0.0007053         -0.01933289         0.0026564         -0.00712585         -0.00253376           30         -0.00871490         -0.011746968         0.00254148         0.0049570         0.0194550         -0.0025337         0.00028573         0.000845337         -0.00028337           31         -0.00326538         -0.0033405         0.00357056         -0.00495711         0.01183319         0.00845337         -0.0012833           33         -0.00325638         -0.00455949         -0.00859566         -0.00354066         -0.0012837           34         -0.00380707         -0.00453949         -0.0055665         -0.00635946         -0.00128450         -0.00128451         -0.00128565         -0.00128373           37         -0.0063051         -0.00655365         -0.00659943         0.00173950         -0.00459442         -0.00058224         0.00138743         -0.00128452         -0.00752746         -0.00604033         -0.01154513									
27         -0.0152831         -0.0019313         -0.0007953         -0.00070953         -0.0001003         0.01485443         0.0002561         0.00030518         -0.00011212           28         -0.00141276         -0.0015747         -0.0015744         0.000512376         -0.000253376           30         -0.0077490         -0.0112618         0.00234985         -0.00765991         -0.00885773         0.00033623         -0.00025337           31         -0.009613         -0.00098419         -0.00126484         -0.00194550         -0.00335730         0.0004537         -0.00023633         -0.000234985         -0.00194550         -0.00335730         -0.00122833           32         -0.0009610         -0.00095419         -0.00157506         -0.00922394         0.00468445         -0.00069017         -0.01151166         -0.00128379           34         -0.00380707         -0.0045208         -0.00854026         -0.00056041         -0.00065613         -0.00135156         -0.00128174           35         -0.00752528         -0.0045208         -0.00563049         -0.0135064         -0.00131566         -0.00138566         -0.00138566         -0.00138566         -0.00138566         -0.00138568         -0.00113620         -0.00113620         -0.00113621         -0.00138564         -0.00113621				0.000=0.00					
28         -0.0017775         -0.0015313         -0.0070953         -0.01091003         0.01485443         0.00244141         0.00580597         -0.00041192           29         -0.00414276         -0.00515747         -0.00102648         0.00601599         0.00085773         0.00039673         -0.00253376           30         -0.0087101         -0.01074219         -0.0112533         -0.00254985         -0.0015991         -0.00185773         0.00035203         -0.00085233         -0.00085233         -0.00025533         -0.00128334           31         -0.00236538         -0.00333405         -0.00357056         -0.00222394         -0.004648445         -0.00469971         -0.0128174           35         -0.00752258         -0.00459208         -0.0075321         -0.00959619         -0.00874626         -0.00056134         -0.00136566         -0.0128174           36         -0.00075258         -0.00659345         -0.00452425         -0.0054265         -0.00563049         -0.0135743         0.00136566         -0.0128174           37         -0.0063951         -0.00659943         -0.00173950         -0.00452423         -0.00386564         -0.0133783           37         -0.00630951         -0.00659943         -0.00173057         -0.001320564         -0.01136382         -0.0019236									
29         -0.00414276         -0.00126648         0.00601959         0.01933289         0.0068564         -0.0071288         -0.0083773         0.00032673         0.00632376           30         -0.00891113         -0.0176904         0.001712915         -0.00085773         0.00081573         0.00082397           32         -0.00096130         -0.00039419         -0.00128133         0.00173950         0.0049571         0.01183319         0.00845337         -0.00128133           33         -0.00380707         -0.00387056         -0.00922944         0.00468445         0.00046971         -0.0131166         -0.00128174           35         -0.00752258         -0.00469208         0.00773621         -0.00899566         -0.0005213         0.000299516         -0.00128174           36         -0.00063051         -0.006958252         -0.00542243         0.00132590         -0.00885564         -0.01313568           37         -0.0063051         -0.00697531         -0.0057201         0.003247222         0.00129250         -0.00885366         -0.01154327           38         -0.00091562         -0.0012845         -0.00520516         -0.00653051         -0.0069053163         -0.0069053163         -0.006905323         -0.0053051         -0.000520516         -0.001154327									
30         -0.00677490         -0.0174219         -0.01129150         -0.00234985         -0.00765991         -0.00885773         0.00039673         0.00081351           31         -0.000861103         -0.00086123         0.00578308         0.00490570         0.00194550         -0.00356293         -0.00082397           32         -0.00326538         -0.00333405         0.0037056         -0.00922394         0.00468445         0.00469971         -0.01351166         -0.00128133           33         -0.00326538         -0.00339409         -0.00596619         -0.00867462         -0.003059561         -0.00499516         -0.00128174           35         -0.00752258         -0.000459208         -0.0075321         -0.0095961         -0.0085045         -0.0035743         0.00136566         -0.0128174           36         -0.0005767         -0.00659943         0.00173950         -0.00329500         -0.0088658         -0.01154327           38         -0.00095167         -0.0128184         0.00354767         -0.0128174         -0.0052962         -0.00529628         0.0075725         -0.0053649         -0.00529628         0.0075725         -0.0063033           39         -0.00719452         -0.0129084         -0.0025424         -0.00329664         -0.00229628         -0.0052628									
31         -0.00891113         -0.01766968         0.00561523         0.0078308         0.00490570         0.00194550         -0.00356293         -0.00082397           32         -0.000326538         -0.00335058         -0.00124539         0.00124539         0.00124539           34         -0.00326538         -0.00345539         -0.001243594         -0.00468445         0.00468445         0.00468445         0.00065613         -0.001243597           34         -0.00326538         -0.00453949         -0.00596619         -0.00354064         -0.01000214         0.00416565         -0.00124397           35         -0.00752258         -0.004653051         -0.00958252         -0.0054625         -0.00354044         -0.010325743         0.00135564         -0.01033783           37         -0.00630517         -0.0026356         -0.00857544         0.00329504         -0.00886538         -0.01057268           40         -0.0081086         -0.00263266         -0.01320847         -0.01230842         -0.00554183         -0.00572988           41         -0.00186920         -0.00344086         -0.0026266         -0.01030731         0.0017901         -0.00887544         -0.01120484         -0.00152084         -0.00152084         -0.00152084         -0.0012648         0.00104523									
32         -0.00096130         -0.00098419         -0.00413513         0.00173950         0.00495911         0.01183319         0.00845337         -0.00122833           33         -0.003360707         -0.00435344         -0.00357056         -0.0022394         0.00468445         0.00069615         -0.00699615         -0.001281744           35         -0.00752258         -0.00469208         0.00773621         -0.0087462         -0.0035504         -0.0100214         0.00146565         -0.00489044           36         0.00000763         -0.00055365         -0.0055365         -0.00542423         0.00328790         -0.00886536         -0.0113783           37         -0.00630951         -0.0065365         -0.0085744         -0.003413656         -0.0013745744         -0.00347677         -0.01430511         0.0028828         0.00795746         -0.0060433           38         -0.00719452         -0.01290894         0.00675201         0.003874767         -0.01235962         -0.00534088         -0.01232868           41         -0.00186920         -0.00845172         -0.00340731         0.0017701         -0.00557544         -0.01191711         -0.01658220           42         -0.00836945         -0.00851729         -0.00642073         0.00197611         -0.0057983         0.01557922 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>									
33         -0.00326538         -0.00333405         0.00357056         -0.00922394         0.00468445         0.00469971         -0.01351166         -0.00124359           34         -0.00380707         -0.00453949         -0.0056619         -0.00359066         -0.0006513         0.000499615         -0.00128174           35         -0.00752258         -0.00452049         0.0015521         -0.00563049         -0.0155743         0.00135566         -0.00133783           37         -0.00630951         -0.0065365         -0.00659943         0.00173950         -0.00452423         0.00329590         -0.00886536         -0.01133783           38         -0.00095367         -0.0013564         -0.00257248         0.003286047         -0.01235961         -0.00259235         0.00559235         -0.00559235         -0.00526428         0.0072968           40         -0.0081086         -0.00284086         -0.00266266         -0.01030731         0.01197601         -0.0085744         -0.011505782         -0.0064258           41         -0.00836945         -0.0054380         -0.00128054         -0.0015156         -0.00855936         -0.00164578         -0.00143574         -0.011430572         -0.0064272         -0.00646210         0.01339722         -0.0067722         -0.00646210         0.01339722	-								
34         -0.00380707         -0.00453949         -0.00596619         -0.0087462         -0.00395966         -0.00065613         0.00699615         -0.00128174           35         -0.00752258         -0.00469208         0.00773621         -0.00899506         -0.00354004         -0.01000214         0.00415655         -0.00439044           36         -0.00630951         -0.00655365         -0.0065943         -0.00173950         -0.004522423         0.00329590         -0.00886536         -0.01134327           38         -0.00093567         -0.00133568         -0.00657201         0.00386047         -0.0123962         -0.00559235         0.00559235         0.00556183         -0.00572968           40         -0.0081086         -0.00985322         -0.00192261         0.01290894         -0.00526428         0.00534058         0.0123865           41         -0.00186920         -0.00533729         -0.0054266         -0.01030731         0.01290894         -0.0057922         -0.0057206         0.00128174           43         -0.01739502         -0.0054216         -0.00865036         -0.00049783         0.01192174         -0.0128085           44         -0.00631714         -0.0134588         -0.01500702         -0.00642722         -0.0064210         0.01339722         -0.0067232									
35         -0.00752258         -0.00469208         0.00773621         -0.00899506         0.00354004         -0.0100214         0.00416565         -0.00489044           36         0.00000763         -0.00075531         -0.0054252         -0.0054265         -0.00355743         0.001355743         0.001355743         -0.00133783           37         -0.00095367         -0.00055365         -0.00557241         -0.00354767         -0.01235962         -0.0059235         0.00055183         -0.00572968           40         -0.00836045         -0.00289522         -0.00412241         -0.00192261         0.0129894         -0.00556183         -0.00572968           41         -0.00186920         -0.00344086         -0.00266266         -0.01030731         0.00197601         -0.00857544         -0.001572261           42         -0.00836945         -0.00834976         -0.00074005         0.00202942         -0.00057988         0.01557222         -0.00852203           43         -0.01739502         0.00542450         -0.00310516         -0.00865936         -0.000647736         -0.00047524         0.00133722         -0.0064735         -0.00047352           44         -0.0072015         -0.0125454         -0.0133129         0.017765         -0.01364182         -0.000545242         0.00020294									
36         0.0000763         -0.0075531         -0.00958252         -0.00546265         -0.0055049         0.01355743         0.00136566         -0.01133783           37         -0.00630951         -0.006559365         -0.00659943         0.00173950         -0.00452423         0.00329590         -0.00886536         -0.01154327           38         -0.000719452         -0.01984         0.00675201         0.00386047         -0.01235962         -0.00559235         0.00556183         -0.00719264           39         -0.0081086         -0.00989532         -0.00411224         -0.0019261         0.01290894         -0.00559235         0.00556183         -0.00729268           40         -0.0081086         -0.0083729         -0.00411224         -0.00120261         -0.00857544         -0.01191711         0.01605988           42         -0.00836945         -0.0083729         -0.00865936         -0.00067983         0.00126648         0.00104523           43         -0.01739502         0.00642395         -0.00860592         0.00646589         -0.0134136         -0.0057226         0.000217736           44         -0.0052368         -0.01621246         -0.01331329         0.017765         -0.001364136         -0.01339722         -0.0067222           45         -0.0072015									
37         -0.00630951         -0.00655365         -0.00659943         0.00173950         -0.00452423         0.00329590         -0.00886536         -0.01154327           38         -0.0009367         -0.00313568         -0.00857544         0.00354767         -0.01230511         0.00208282         0.00795746         -0.0060433           39         -0.00719452         -0.01209894         0.00675201         0.00386047         -0.0123962         -0.00559235         0.0055183         -0.00572968           40         -0.0081086         -0.0098552         -0.00411224         -0.00192261         0.01290894         -0.00557248         0.00157858         0.01023865           41         -0.00836945         -0.00853729         -0.00543976         0.00074005         0.00202942         -0.000579283         0.0156648         0.0104523           43         -0.01739502         0.00542450         -0.006310516         -0.00865936         -0.0066665         0.00004578         0.00126648         0.00104523           44         -0.00631714         -0.0134588         -0.0150722         0.00646610         0.01339722         -0.00752258           46         -0.0025126         -0.01271123         0.00642305         -0.00173525         0.00836182         0.00255420         0.00226724 <td>36</td> <td>0.00000763</td> <td></td> <td>-0.00958252</td> <td>-0.00546265</td> <td>-0.00563049</td> <td>0.01355743</td> <td>0.00136566</td> <td>-0.01033783</td>	36	0.00000763		-0.00958252	-0.00546265	-0.00563049	0.01355743	0.00136566	-0.01033783
39         -0.00719452         -0.01290894         0.00675201         0.00386047         -0.01235962         -0.00559235         0.00556183         -0.00572968           40         -0.00801086         -0.00989532         -0.00411224         -0.00192261         0.01290894         -0.00554248         0.00534058         0.0123865           41         -0.00186920         -0.00344086         -0.0026266         -0.01030731         0.00197601         -0.00857544         -0.01191711         0.0165988           42         -0.00836945         -0.008542450         -0.00310516         -0.00865936         -0.0000202942         -0.0004057883         0.01126648         0.00104523           44         -0.00631714         -0.01295471         -0.00642395         -0.00480652         0.01066589         -0.0134136         -0.0072221         -0.00647736         -0.00049591           45         -0.0075216         -0.01295471         -0.00643395         -0.0048052         -0.01065898         -0.01331329         0.0173552         -0.00836182         0.0055420         0.00227942           47         0.0071904         -0.02751923         0.0068664         -0.00057220         0.00139618         0.00026703           48         0.0012885         0.000276184         0.01119232         0.00526428	37	-0.00630951		-0.00659943	0.00173950	-0.00452423	0.00329590	-0.00886536	-0.01154327
40         -0.00801086         -0.00989532         -0.00411224         -0.0019261         0.01290894         -0.00526428         0.00534058         0.01023865           41         -0.00186920         -0.00344086         -0.00262666         -0.0130731         0.00197601         -0.00857544         -0.01191711         0.0165988           42         -0.00836945         -0.00853729         -0.00543976         0.00074005         0.00202942         -0.0005788         0.00126648         0.0014523           43         -0.01739502         0.00542450         -0.00802722         0.00646210         0.01339722         -0.00647736         -0.00049591           45         -0.00720215         -0.01295471         -0.00642395         -0.0048052         0.0106589         -0.01364136         -0.01752258           46         -0.00552368         -0.01271923         0.00681305         0.0017765         -0.00057220         0.00139618         0.00226703           48         0.00125885         -0.0027184         0.0017765         -0.002712         0.00831815         -0.0017765         0.00128937           49         -0.00518036         -0.0027184         0.0017765         0.0022125         0.0283813         0.0026424         -0.0036737         0.0128937         0.0017765         0.0012893	38	-0.00095367	-0.00313568	-0.00857544	0.00354767	-0.01430511	0.00208282	0.00795746	-0.00600433
41         -0.00186920         -0.00344086         -0.00266266         -0.01030731         0.00197601         -0.00857544         -0.01191711         0.0165988           42         -0.00836945         -0.00853729         -0.00543976         0.00074005         0.0022942         -0.00057983         0.01557922         -0.00852203           43         -0.01739502         0.00542450         -0.00310516         -0.00865936         -0.00068665         0.00014578         0.00126648         0.00104523           44         -0.00631714         -0.01346588         -0.0150702         -0.00602722         0.00646210         0.01339722         -0.00672258           46         -0.0072015         -0.01295471         -0.00642395         -0.00078525         0.00836182         0.0055420         0.00020942           47         0.0071904         -0.02751923         0.0063105         0.0017765         -0.00151062         -0.00057220         0.00139618         0.00026703           48         0.00125885         0.00029945         0.00302887         -0.0056684         -0.00057177         0.01557159         -0.01921844         -0.00604033           50         -0.00518036         -0.00276184         0.0119232         0.0026703         0.00898743         0.00974274         0.00371552	39	-0.00719452	-0.01290894	0.00675201	0.00386047	-0.01235962	-0.00559235	0.00556183	-0.00572968
42         -0.00836945         -0.00853729         -0.00543976         0.00074005         0.00202942         -0.00057983         0.01557922         -0.00852203           43         -0.01739502         0.00542450         -0.00310516         -0.00865936         -0.00068665         0.00004578         0.00126648         0.00104523           44         -0.00631714         -0.01346588         -0.01500702         -0.00602722         0.00646210         0.01339722         -0.00647736         -0.00049591           45         -0.00720215         -0.01295471         -0.00642395         -0.00480652         0.01066589         -0.01364136         -0.01339722         -0.00752258           46         -0.00552368         -0.01621246         -0.01331329         0.017765         -0.00151062         -0.0005720         0.00139618         0.00026703           47         0.0071904         -0.02751923         0.00861305         0.0017765         -0.00151062         -0.0005720         0.00139618         0.00026703           48         0.00125885         0.000276184         0.01119232         0.00526428         -0.0026737         0.01557159         -0.01921844         -0.00600433           50         -0.00518036         -0.00482351         -0.00762939         0.0088973         0.0087204	40	-0.00801086	-0.00989532		-0.00192261	0.01290894	-0.00526428	0.00534058	0.01023865
43         -0.01739502         0.00542450         -0.00310516         -0.00865936         -0.00068665         0.00004578         0.00126648         0.00104523           44         -0.00631714         -0.01346588         -0.0150702         -0.00602722         0.00646210         0.01339722         -0.00647736         -0.00049591           45         -0.00720215         -0.01295471         -0.00642395         -0.00480652         0.01066589         -0.01364136         -0.01339722         -0.00752258           46         -0.00552368         -0.01621246         -0.01331329         0.01739502         -0.00738525         0.00836182         0.00139618         0.000202942           47         0.0071904         -0.02751923         0.00681305         0.0017765         -0.00151062         -0.00057220         0.00139618         0.00026703           48         0.00125885         0.000276184         0.0119232         0.00526428         -0.00367737         0.01557159         -0.01921844         -0.00600433           50         -0.00518036         -0.0048221         0.00267291         -0.01044644         -0.00055095         -0.00311879         -0.00172242           51         -0.00656891         -0.00149535         -0.03454590         0.00086975         0.01454163         0.00080190									
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$									
45-0.00720215-0.01295471-0.00642395-0.004806520.01066589-0.01364136-0.01339722-0.0075225846-0.00552368-0.01621246-0.013313290.01739502-0.007385250.008361820.005554200.00202942470.00701904-0.027519230.006813050.00177765-0.00151062-0.000572200.001396180.00026703480.001258850.000999450.00302887-0.00566864-0.000221250.02838135-0.001777650.0012893749-0.00152588-0.002761840.011192320.00526428-0.003677370.01557159-0.01921844-0.0060043350-0.00518036-0.004882810.00891876-0.00863647-0.007629390.008987430.009742740.0037155251-0.00656891-0.01495360.02567291-0.01044464-0.00462341-0.00055695-0.00331879-0.00172424520.002647400.00337219-0.00964355-0.034545900.00869750.014541630.000801090.0002746653-0.0017601-0.0100214-0.00423431-0.00650787-0.026832580.01259613-0.003593440.0035247855-0.01738739-0.021804810.00868988-0.01496887-0.000308147-0.00358580.0002059956-0.00734711-0.00787354-0.001289370.008720400.003051760.034950260.0182293757-0.00354767-0.00787354-0.001289370.008720400.003051760.034950260.0	43	-0.01739502	0.00542450					0.00126648	0.00104523
46-0.00552368-0.01621246-0.013313290.01739502-0.007385250.008361820.005554200.00202942470.00701904-0.027519230.006813050.00177765-0.00151062-0.000572200.001396180.00026703480.001258850.000999450.00302887-0.00566864-0.000221250.02838135-0.001777650.0012893749-0.00152588-0.002761840.011192320.00526428-0.003677370.01557159-0.01921844-0.0060043350-0.00518036-0.004882810.00891876-0.00863647-0.007629390.008987430.009742740.0037155251-0.00656891-0.001495360.02567291-0.01044464-0.00462341-0.00055695-0.00331879-0.00172424520.002647400.00337219-0.00964355-0.034545900.000869750.014541630.000801090.0002746653-0.0017601-0.01000214-0.00423431-0.00650787-0.026832580.01259613-0.003593440.0035247855-0.01738739-0.021804810.00868988-0.0149687-0.00506592-0.00038147-0.003593440.0032293757-0.00734711-0.00787354-0.001289370.00877380-0.001726190.013679500.0132293758-0.00668335-0.009529110.00129970.001464840.00110626-0.00101708-0.024467470.0146408158-0.00668351-0.00535400.006317140.0018720400.00351760.034									
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54-0.00197601-0.01000214-0.00423431-0.00650787-0.026832580.01259613-0.003593440.0035247855-0.01738739-0.021804810.00868988-0.01496887-0.00506592-0.00038147-0.000358580.0002059956-0.00734711-0.007484440.016105650.009429930.017906190.017761230.013679500.0132293757-0.00354767-0.00787354-0.001289370.00877380-0.001327510.00061798-0.024467470.0146408158-0.00668335-0.009529110.001029970.00148010-0.008720400.003051760.034950260.0187225359-0.034599300.005035400.006317140.001464840.00110626-0.00109100-0.006648500.0002059960-0.00075531-0.00411224-0.02098846-0.011451720.037940980.028778080.011611940.0005493261-0.00887299-0.02392578-0.011497500.035171510.029663090.00566864-0.02129364-0.0205993762-0.01180267-0.03713226-0.03850555-0.00773621-0.01717377-0.01065826-0.00489044-0.00129700									
55-0.01738739-0.021804810.00868988-0.01496887-0.00506592-0.00038147-0.000358580.0002059956-0.00734711-0.007484440.016105650.009429930.017906190.017761230.013679500.0132293757-0.00354767-0.00787354-0.001289370.00877380-0.001327510.00061798-0.024467470.0146408158-0.00668335-0.009529110.001029970.00148010-0.008720400.003051760.034950260.0187225359-0.034599300.005035400.006317140.001464840.00110626-0.00109100-0.00648500.0002059960-0.00075531-0.00411224-0.02098846-0.011451720.037940980.028778080.011611940.0005493261-0.00887299-0.02392578-0.011497500.035171510.029663090.00566864-0.02129364-0.0205993762-0.01180267-0.03713226-0.03850555-0.00773621-0.01717377-0.01065826-0.00489044-0.00129700									
56-0.00734711-0.007484440.016105650.009429930.017906190.017761230.013679500.0132293757-0.00354767-0.00787354-0.001289370.00877380-0.001327510.00061798-0.024467470.0146408158-0.00668335-0.009529110.001029970.00148010-0.008720400.003051760.034950260.0187225359-0.034599300.005035400.006317140.001464840.00110626-0.00109100-0.00648500.0002059960-0.00075531-0.00411224-0.02098846-0.011451720.037940980.028778080.011611940.0005493261-0.00887299-0.02392578-0.011497500.035171510.02963090.00566864-0.02129364-0.0205993762-0.01180267-0.03713226-0.03850555-0.00773621-0.01717377-0.01065826-0.00489044-0.00129700	-								
57-0.00354767-0.00787354-0.001289370.00877380-0.001327510.00061798-0.024467470.0146408158-0.00668335-0.009529110.001029970.00148010-0.008720400.003051760.034950260.0187225359-0.034599300.005035400.006317140.001464840.00110626-0.00109100-0.000648500.0002059960-0.00075531-0.00411224-0.02098846-0.011451720.037940980.028778080.011611940.0005493261-0.00887299-0.02392578-0.011497500.035171510.02963090.00566864-0.02129364-0.0205993762-0.01180267-0.03713226-0.03850555-0.00773621-0.01717377-0.01065826-0.00489044-0.00129700	-								
58         -0.00668335         -0.00952911         0.00102997         0.00148010         -0.00872040         0.00305176         0.03495026         0.01872253           59         -0.03459930         0.00503540         0.00631714         0.00146484         0.00110626         -0.00109100         -0.00064850         0.00020599           60         -0.00075531         -0.00411224         -0.02098846         -0.01145172         0.03794098         0.02877808         0.01161194         0.00054932           61         -0.00887299         -0.02392578         -0.01149750         0.03517151         0.02966309         0.00566864         -0.02129364         -0.02059937           62         -0.01180267         -0.03713226         -0.03850555         -0.00773621         -0.01717377         -0.01065826         -0.00489044         -0.00129700	-								
59         -0.03459930         0.00503540         0.00631714         0.00146484         0.00110626         -0.00109100         -0.00064850         0.00020599           60         -0.00075531         -0.00411224         -0.02098846         -0.01145172         0.03794098         0.02877808         0.01161194         0.00054932           61         -0.00887299         -0.02392578         -0.01149750         0.03517151         0.02966309         0.00566864         -0.02129364         -0.02059937           62         -0.01180267         -0.03713226         -0.03850555         -0.00773621         -0.01717377         -0.01065826         -0.00489044         -0.00129700									
61         -0.00887299         -0.02392578         -0.01149750         0.03517151         0.02966309         0.00566864         -0.02129364         -0.02059937           62         -0.01180267         -0.03713226         -0.03850555         -0.00773621         -0.01717377         -0.01065826         -0.00489044         -0.00129700	59	-0.03459930	0.00503540	0.00631714	0.00146484	0.00110626	-0.00109100	-0.00064850	0.00020599
62 -0.01180267 -0.03713226 -0.03850555 -0.00773621 -0.01717377 -0.01065826 -0.00489044 -0.00129700	60								
	61	-0.00887299					0.00566864		-0.02059937
63         -0.02636719         -0.04943848         0.01272583         0.01393127         0.00457001         0.00045776         0.00072479         0.00040436	-								
	63	-0.02636719	-0.04943848	0.01272583	0.01393127	0.00457001	0.00045776	0.00072479	0.00040436

# **APPENDIX 4: PITCH PREDICTOR TAB CODEBOOK**

Index	Element 1	Element 2	Element 3
0	-0.0112610	-0.1767275	0.0010985
1	-0.2130735	0.4948120	0.0315245
2	0.1685180	-0.5930480	0.2047120
3	0.1311035	0.2366640	0.1258850
4	0.2671205	0.3766175	0.0750425
5	0.2727660	0.8498230	-0.1647035
6	0.1418760	0.2827150	-0.0781860
7	0.4192810	0.5174865	0.0445555
8	-0.0790405	0.2878420	-0.0986025
9	0.0102235	0.5396730	-0.2112120
10	0.1182555	-0.3234560	-0.1257935
11	0.0584410	0.4372560	0.0544435
12	0.2677000	0.6710510	-0.0020140
13	0.0510560	0.9555970	-0.0752870
14	0.2883300	0.4584655	-0.1362610
15	0.4607545	0.6708375	-0.1777040
16	0.0267945	0.1656190	0.0300600
17	-0.1670530	0.6494750	0.4698790
18	0.0991210	-0.2931520	0.1622010
19	0.0505675	0.3623655	0.2523805
20	0.0785520	0.4996340	0.4010620
21	-0.0176085	0.7084045	0.2586975
22	0.2232055	0.3234255	0.2569580
23	0.2735290	0.4712525	0.2355345
24	-0.0867615	0.2794190	0.1318055
25	-0.2120360	0.8054810	0.3201295
26	-0.1777955	-0.3514100	0.0110170
27	-0.1222230	0.4702455	0.2991335
28	0.1735230	0.5760195	0.1928100
29	-0.0948180	0.9347840	0.1232910
30	0.3175050	0.4074400	0.2554320
31	0.0957640	0.7896425	0.0609740

# **APPENDIX 5: GAIN CODEBOOK**

Index	Element
0	-5.38477
1	-3.68066
2	-2.76855
3	-2.09717
4	-1.47217
5	-0.33984
6	0.67285
7	1.82031
8	-0.88525
9	0.16748
10	1.20313
11	2.62549
12	3.80518
13	5.64551
14	8.70605
15	11.85156

			Log-gain change of previous frame, [dB <sub>2</sub> ]											
			-8 to -6	-6 to -4	-4 to -2	-2 to 0	0 to 2	2 to 4	4 to 6	6 to 8	8 to 10	10 to 12	12 to 14	14 to 16
			j=1	j=2	j=3	j=4	j=5	j=6	j=7	j=8	j=9	j=10	j=11	j=12
	-24 to -22	i=1	0.00000	0.79102	0.55664	14.26563	14.08398	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	-22 to -20	i=2	0.00000	13.85156	1.73047	13.76758	13.92773	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
$[dB_2]$	-20 to -18	i=3	-1.96094	8.91211	7.83594	14.09961	13.77930	0.91016	-2.41406	0.00000	0.00000	0.00000	0.00000	0.00000
[q	-18 to -16	i=4	-1.96094	8.66992	13.53125	14.09570	13.95117	12.97461	2.14648	0.00000	0.00000	0.00000	0.00000	0.00000
ne,	-16 to -14	i=5	-1.47266	9.29297	13.92578	13.89063	13.87891	13.93750	12.20703	-4.99023	0.00000	0.00000	0.00000	0.00000
frame,	-14 to -12	i=6	4.60547	12.33398	14.09180	14.14258	14.16016	13.48633	12.39063	2.01172	0.00000	0.00000	0.00000	0.00000
sn	-12 to -10	i=7	10.66016	10.72656	13.83203	13.68359	13.93945	13.77930	13.09570	10.17578	-0.15430	-2.92578	0.00000	0.00000
vio	-10 to -8	i=8	6.59375	10.19531	13.34375	12.87305	13.36719	13.36328	13.12891	12.66797	0.72852	0.30078	4.87109	7.85742
pre	-8 to -6	i=9	2.64063	9.52539	9.85547	10.35938	10.63086	12.92383	12.70508	12.65234	8.96680	1.32422	4.86719	7.81445
ofţ	-6 to -4	i=10	6.24805	8.26758	8.78125	9.08594	9.03125	10.34180	11.21875	11.07227	8.32617	8.41992	7.70313	7.86133
gain	-4 to -2	i=11	6.18945	6.71875	7.98438	7.37109	7.50391	7.69922	9.09180	8.73633	6.91211	7.68750	7.22266	3.50977
	-2 to 0	i=12	4.40430	5.46484	6.17773	6.04492	6.14063	6.84766	5.89063	5.43750	4.67188	5.58008	7.70898	7.46094
log.	0 to 2	i=13	3.39648	5.41602	5.40039	4.77734	4.59375	4.63477	6.43359	3.54102	4.37891	3.70117	6.64844	4.74414
	2 to 4	i=14	0.00000	3.50000	4.60352	3.92188	3.68164	4.21680	4.18750	3.32617	3.38867	2.32813	5.15039	1.76563
Relative	4 to 6	i=15	0.00000	1.10156	3.04492	3.18945	2.60156	2.43164	2.91016	1.48438	0.43555	0.44336	1.50391	1.75391
Re	6 to 8	i=16	0.00000	-0.11914	-1.13672	1.41602	1.49609	0.72852	0.60352	-0.35352	-0.98242	-1.15039	-1.99414	0.00000
	8 to 10	i=17	0.00000	0.00000	0.00000	1.36861	1.18557	-0.36990	-4.01682	-2.21214	0.00000	-1.33077	-3.04360	0.00000
	10 to 12	i=18	0.00000	0.00000	0.00000	0.52843	0.43190	0.00000	0.00000	-2.86324	0.00000	0.00000	0.00000	0.00000

## **APPENDIX 6: GAIN CHANGE THRESHOLD MATRIX**

# **APPENDIX 7: EXCITATION VQ SHAPE CODEBOOK**

Index	Element 1	Element 2	Element 3	Element 4
0	-0.514526	0.847412	0.166748	0.120605
1	0.389648	1.125000	-1.070557	0.048584
2	-0.263916	-0.053101	0.189209	0.177734
3	2.927368	-0.262695	-0.092896	0.274292
4	-0.348755	-0.356812	-0.765747	-0.639038
5	1.912231	0.890869	-2.045654	-0.802124
6	-0.180298	-1.221802	-1.728760	-0.965210
7	1.743286	-1.338379	0.184204	-0.281128
8	-1.407593	1.109497	1.724487	-0.347900
9	2.324219	1.637939	0.742188	0.526001
10	-0.330933	-0.405396	0.890747	1.477661
11	1.545532	-0.195068	0.148560	0.073486
12	-0.583740	0.456055	0.253296	-1.269043
13	0.587769	-0.129028	0.616699	-0.256714
14	-1.211426	-0.743896	-0.608887	-0.219360
15	0.196289	-1.870728	-0.309326	1.111694