

# ETSI TS 126 304 V6.5.0 (2006-03)

*Technical Specification*

**Digital cellular telecommunications system (Phase 2+);  
Universal Mobile Telecommunications System (UMTS);  
Extended Adaptive Multi-Rate - Wideband (AMR-WB+) codec;  
Floating-point ANSI-C code  
(3GPP TS 26.304 version 6.5.0 Release 6)**



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Reference

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Keywords

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# 1 Scope

The present document contains an electronic copy of the ANSI-C code for the Floating-point Extended Adaptive Multi-Rate Wideband codec. Alternatively, fixed-point ANSI-C code is specified in 3GPP TS 26.273 [1]. The floating-point codec/encoder/decoder specified in this document or the fixed-point codec/encoder/decoder specified in [1] may be used depending on if the implementation platform is better suited for a floating-point or a fixed-point implementation. It has been verified that the fixed-point and floating-point codecs interoperate with each other without any artifacts.

The floating-point ANSI-C code in the present document defines, besides the fixed-point c-code specified in [1], one valid reference implementation of the Extended Adaptive Multi-Rate Wideband transcoder (3GPP TS 26.290 [2]). Standard conformance is enforced by meeting the conformance criteria defined in [3].

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# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
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- [1] 3GPP TS 26.273: "ANSI-C code for the Fixed-point Extended AMR Wideband codec".
- [2] 3GPP TS 26.290: " Audio codec processing functions; Extended AMR Wideband codec; Transcoding functions ".
- [3] 3GPP TS 26.274: " Audio codec processing functions; Extended Adaptive Multi-Rate - Wideband (AMR-WB+) codec; Conformance testing ".
- [4] 3GPP TS 26.244: "Transparent end-to-end packet switched streaming service (PSS); 3GPP file format (3GP)"

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# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions are given in TS 26.290 [2].

## 3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

|         |   |
|---------|---|
| AMR-WB+ | Extended Adaptive Multi-Rate WideBand   |
| ANSI    | American National Standards Institute   |
| GSM     | Global System for Mobile communications |
| I/O     | Input/Output                            |
| RAM     | Random Access Memory                    |
| ROM     | Read Only Memory                        |

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## 4 C code structure

This clause gives an overview of the structure of the C code and provides an overview of the contents and organization of the C code attached to the present document.

The C code has been verified on the following systems:

- IBM PC/AT compatible computers with Windows 2000 SP4 and Microsoft Visual C++ v.6.0 compiler.

ANSI-C was selected as the programming language because portability was desirable.

### 4.1 Contents of the C source code

The C code distribution has the files divided in five different directories, all present in the directory *c-code*. The directories are: *common*, *decoder*, *encoder*, *lib\_amr* and *include*. The distributed files with suffix "c" contain the source code and the files with suffix "h" are the header files.

Project and workspace files are provided in the directory *MSVC*.

### 4.2 Program execution

The Extended Adaptive Multi-Rate Wideband codec is implemented in two programs:

- (*encoder*) audio encoder;
- (*decoder*) audio decoder.

The programs should be called like:

- encoder [encoder options] -if <audio input file> -of <parameter file>;
- decoder [decoder options] -if <parameter file> -of <audio output file>.

The input files contain one or two channels of 16-bit linear encoded PCM audio samples stored in the *wav* file format and the parameter files contain encoded audio data and some additional flags.

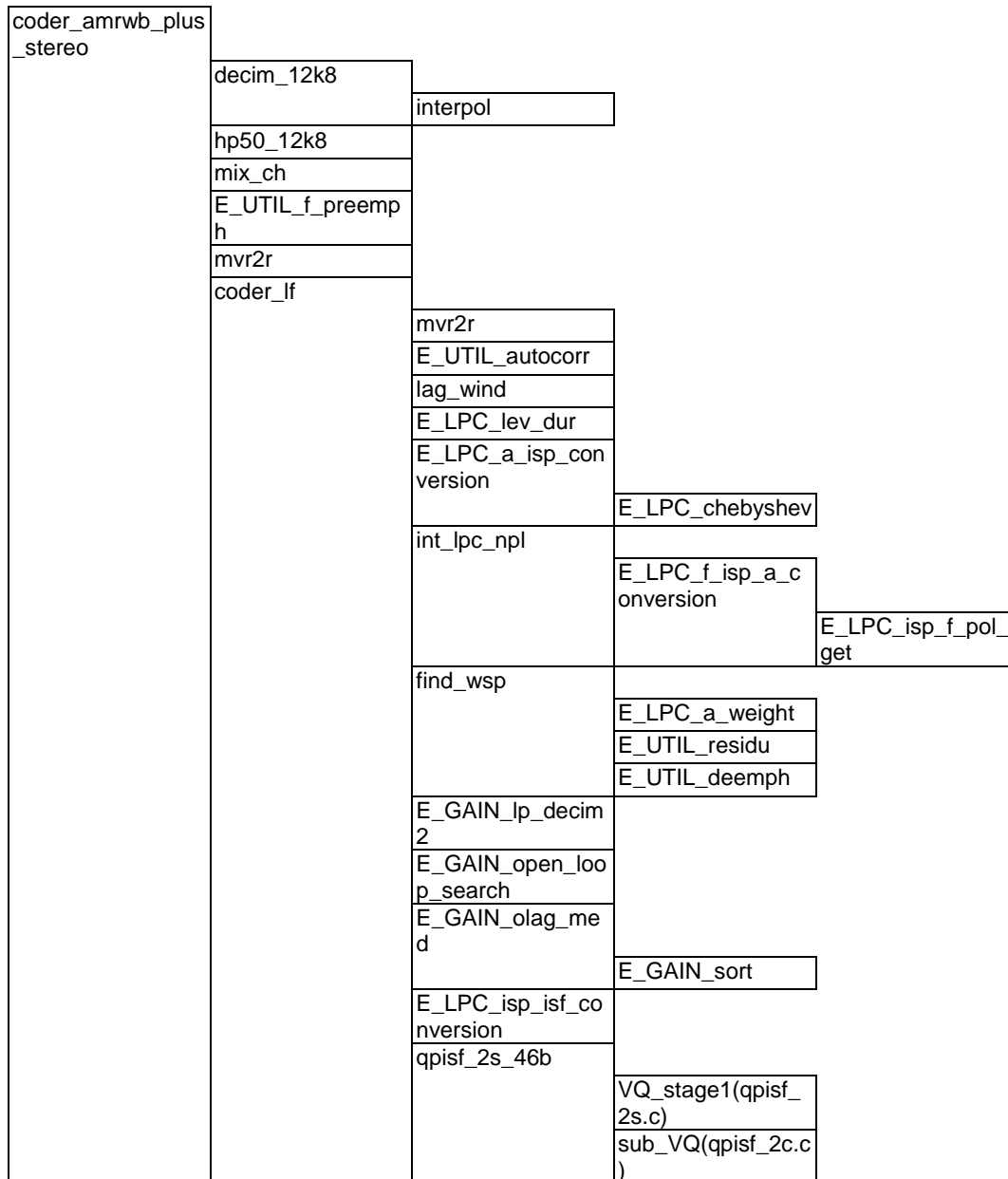
The encoder and decoder options will be explained by running the applications without input arguments. See the file *readme.txt* for more information on how to run the *encoder* and *decoder* programs.

### 4.3 Code hierarchy

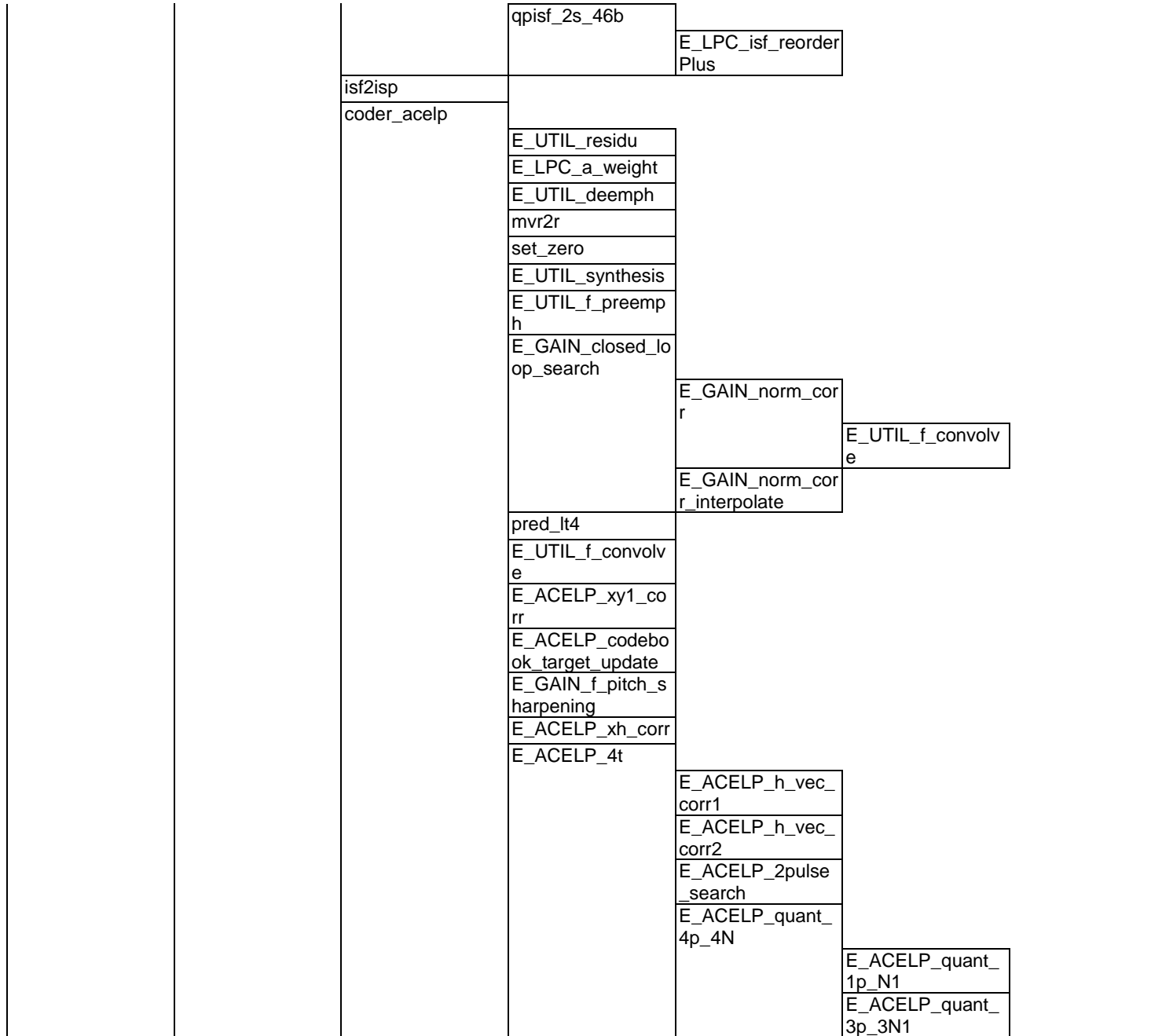
Tables 1 and 2 are call graphs that show the functions used in the audio codec.

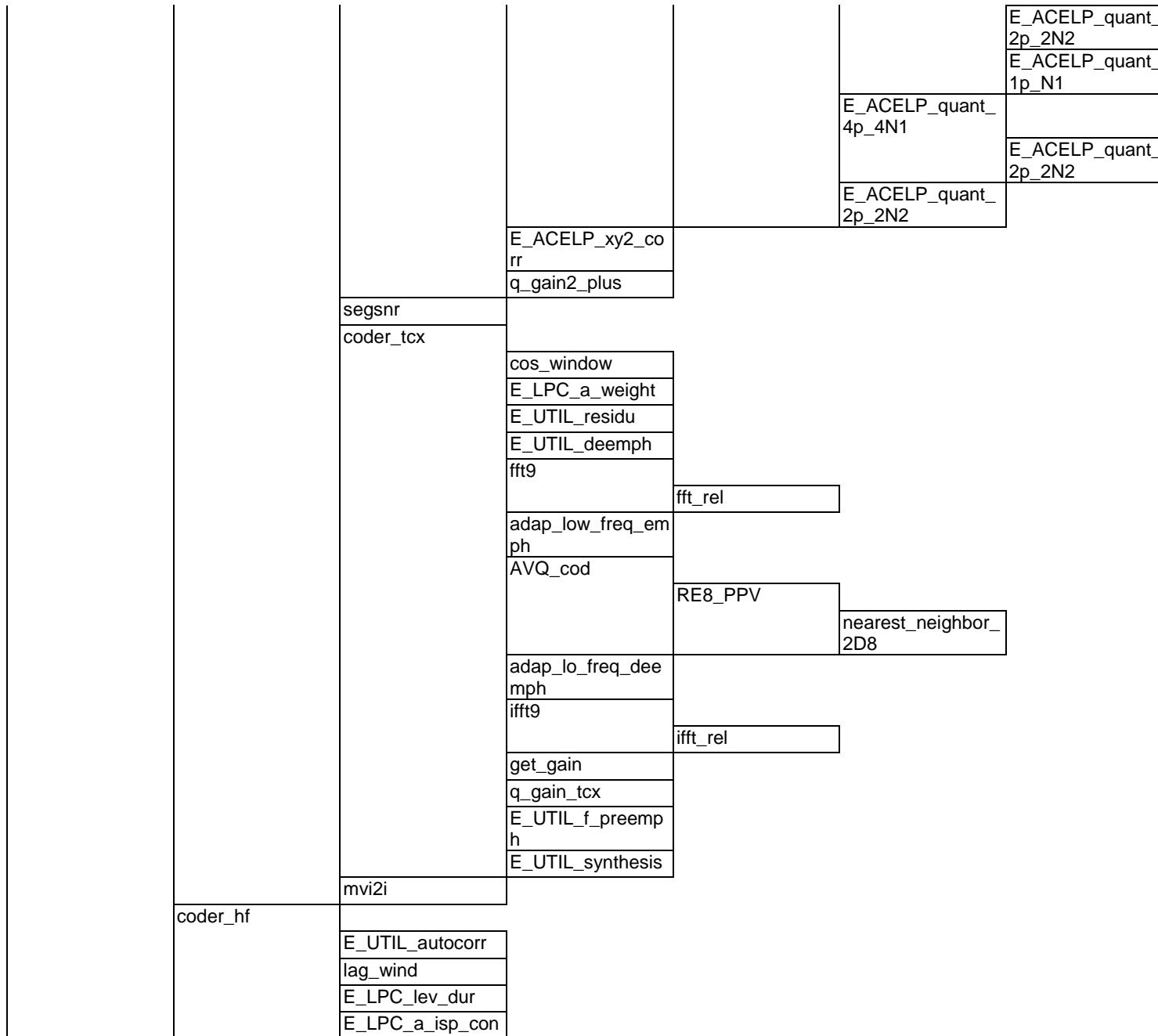
Each column represents a call level and each cell a function. The functions contain calls to the functions in rightwards neighbouring cells. The time order in the call graphs is from the top downwards as the processing of a frame advances. All standard C functions: *memcpy()*, *fwrite()*, etc. have been omitted. The initialization of the static RAM (i.e. calling the *\_init* functions) is also omitted.

Table 1: Encoder call structure

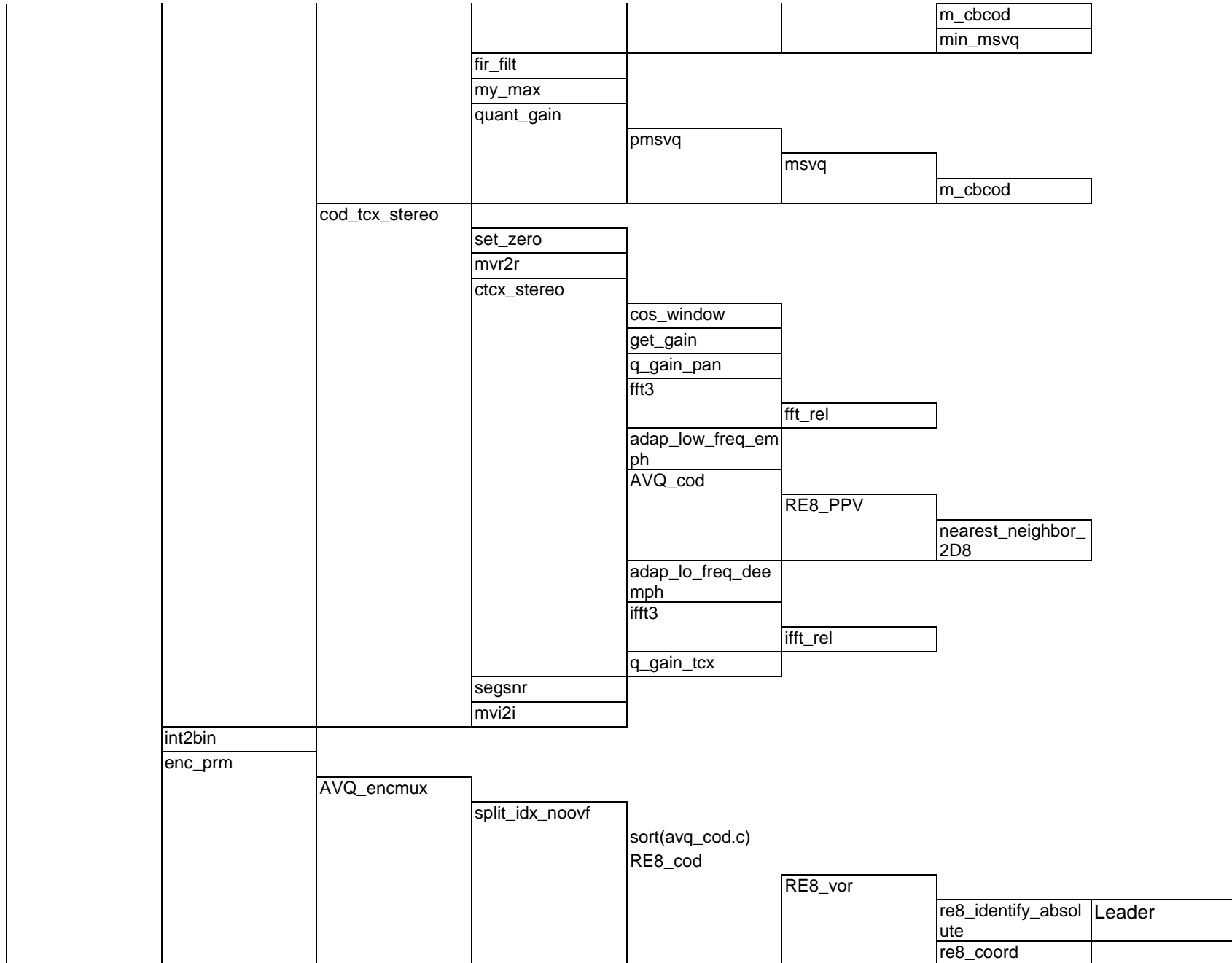


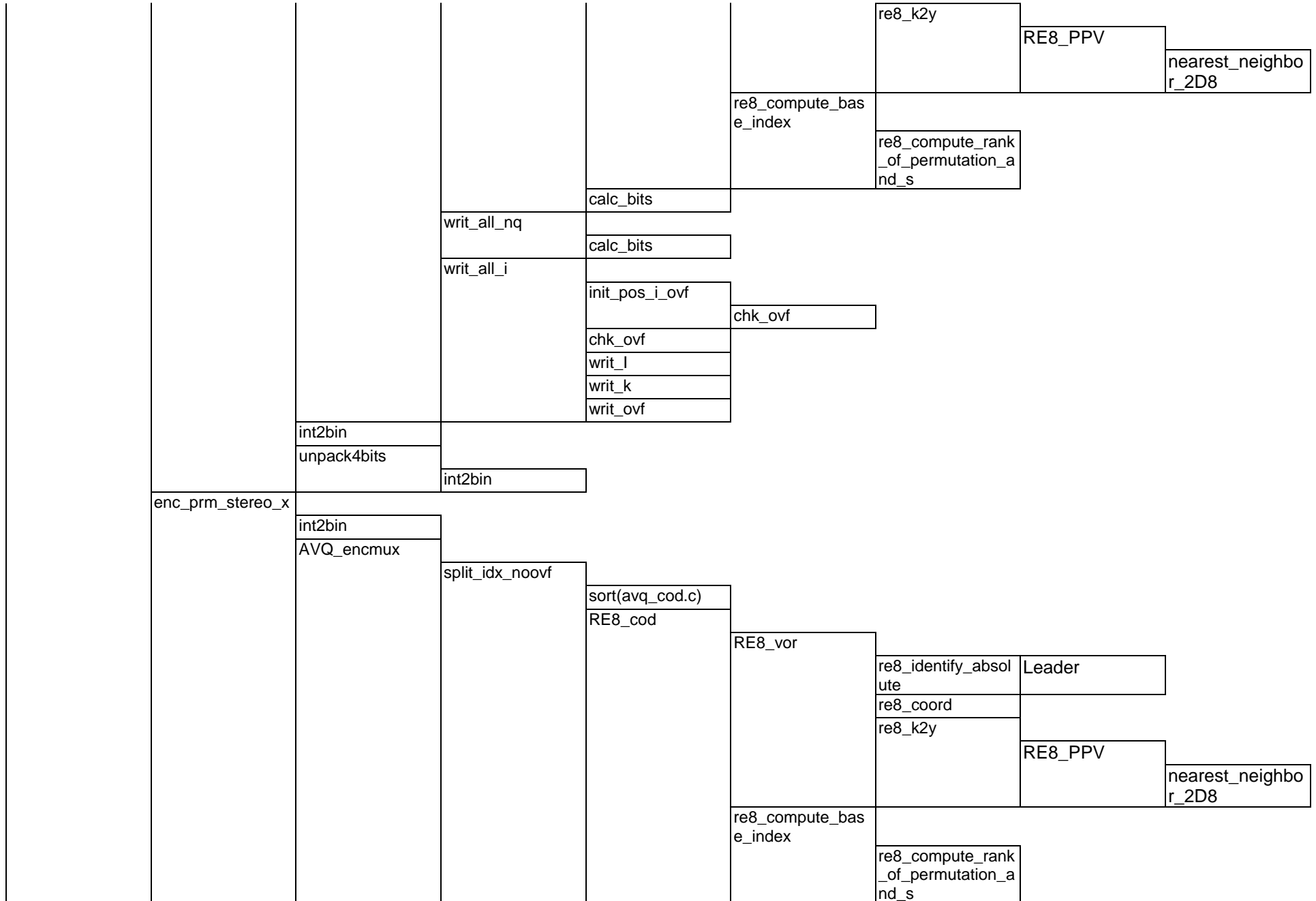




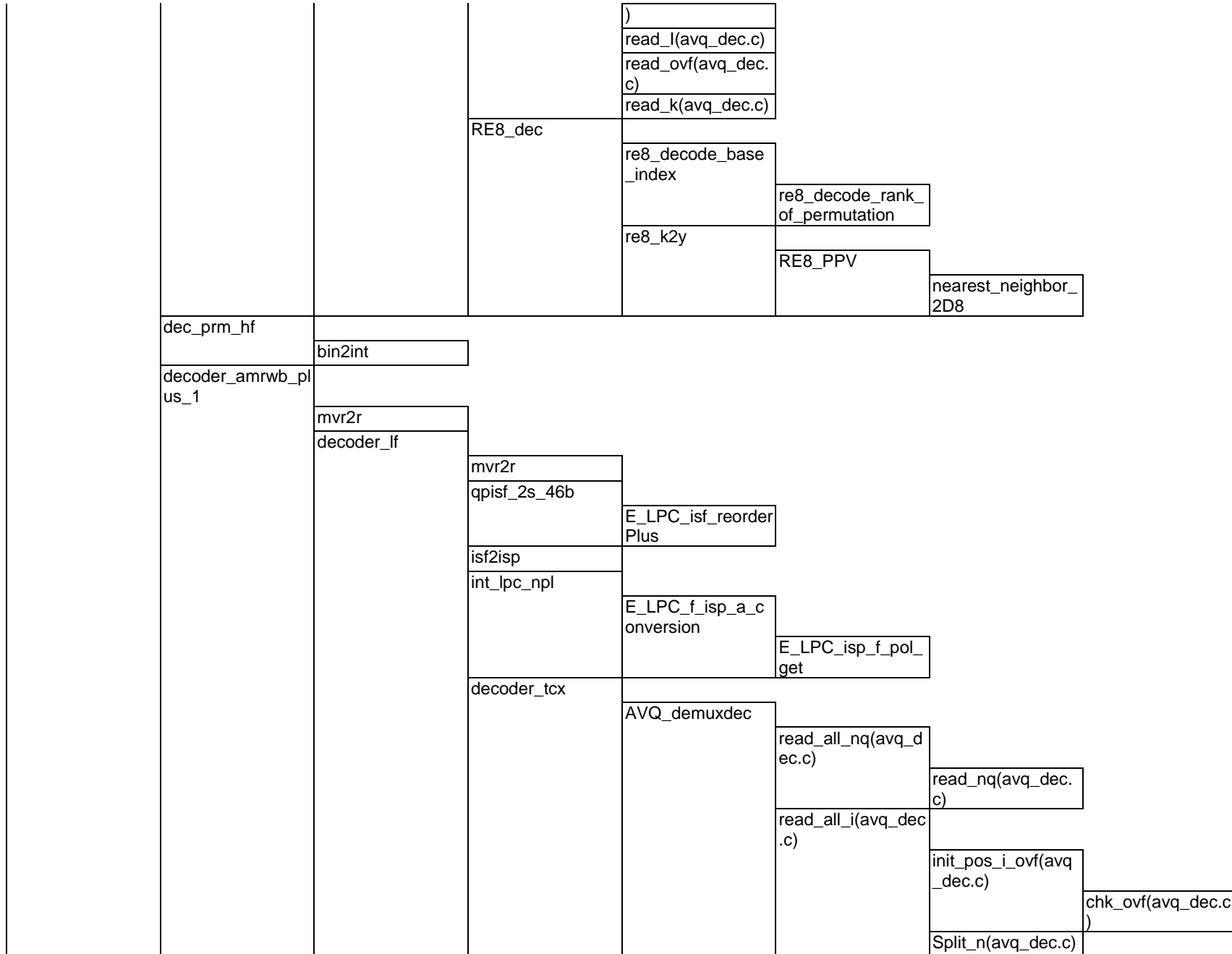


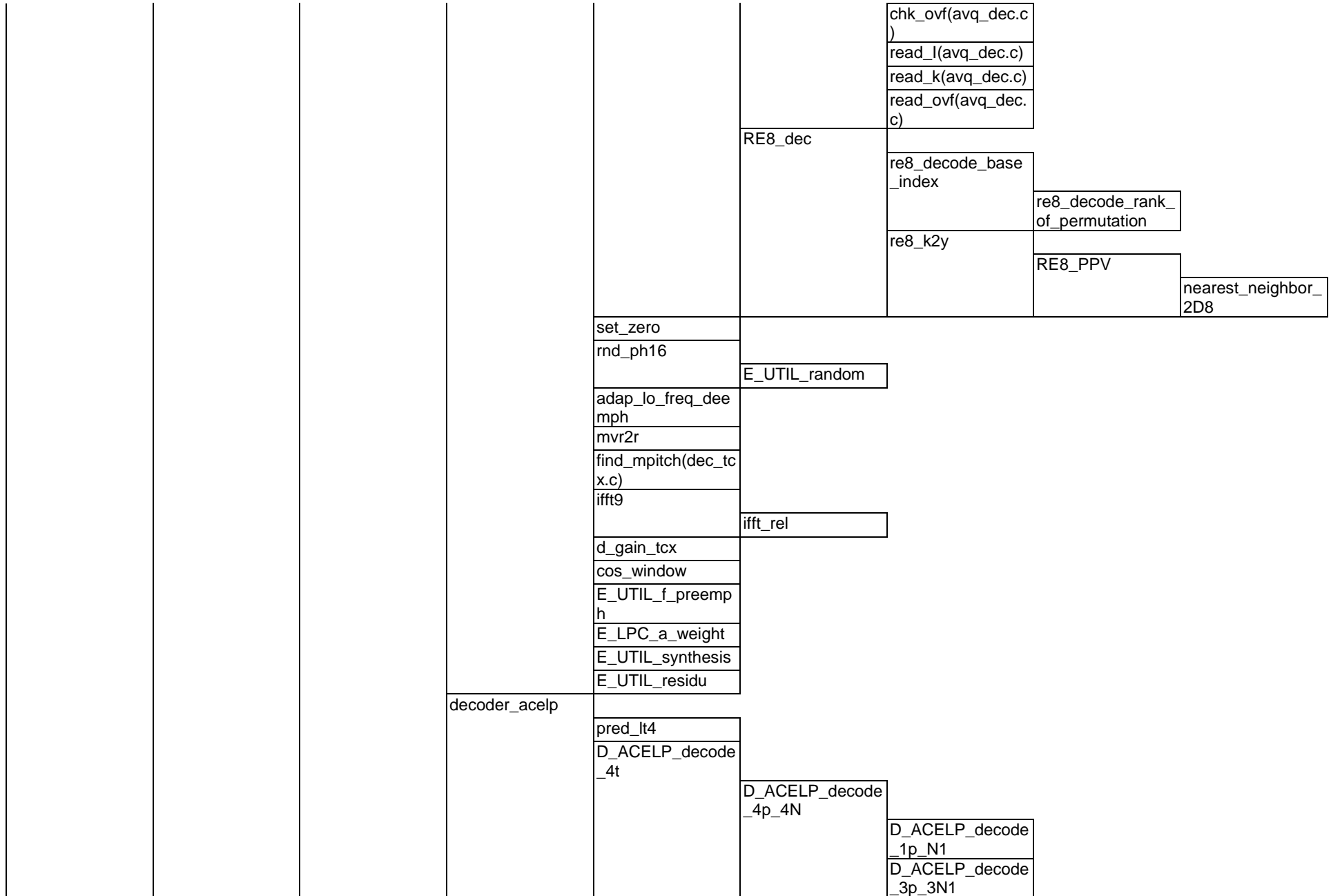






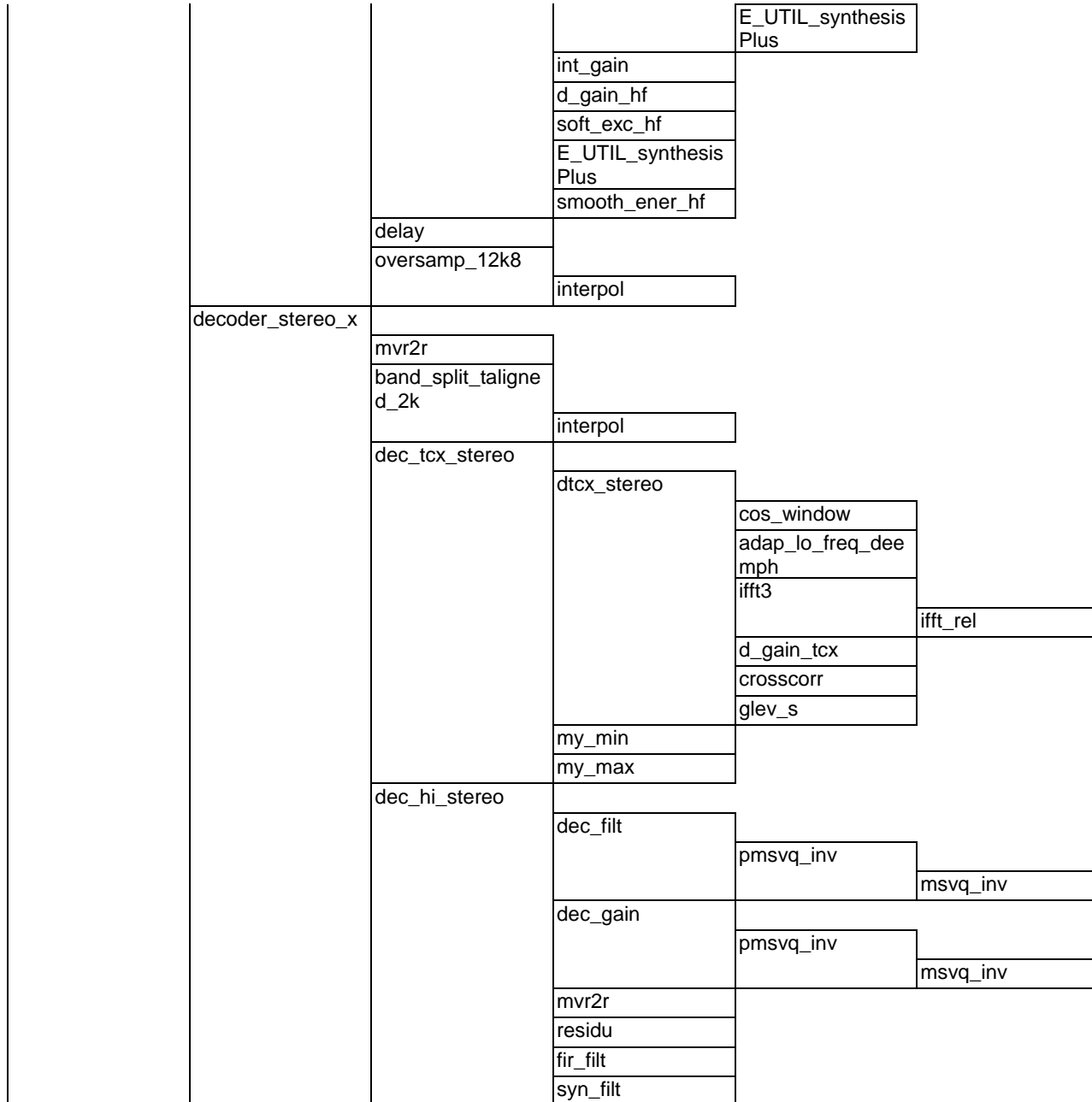












|  |               |              |          |
|--|---------------|--------------|----------|
|  |               | delay        |          |
|  |               | band_join_2k |          |
|  |               |              | interpol |
|  | hp50_12k8     |              |          |
|  | oversamp_12k8 |              |          |
|  |               | interpol     |          |

## 4.4 Variables, constants and tables

### 4.4.1 Description of fixed tables used in the C-code

This clause contains a listing of all fixed tables declared in tables\_plus.c and tables\_stereo.c files.

**Table 3: Encoder fixed tables**

| Format  | Table name            | Size | Description                              |
|---------|-----------------------|------|--|
| Float32 | NBITS_CORE            | 8    | Core bit-rates                           |
| Float32 | T_sin                 | 1152 | FFT Sine table                           |
| Float32 | T_cos                 | 1152 | FFT Cosine table                         |
| Float32 | filter_32k            | 61   | FIR table for decimation/oversampling    |
| Float32 | filter_32k_hf         | 61   | FIR table for decimation/oversampling    |
| Float32 | filter_32k_7k         | 61   | FIR table for decimation/oversampling    |
| Float32 | filter_48k            | 185  | FIR table for decimation/oversampling    |
| Float32 | Filter_48k_hf         | 185  | FIR table for decimation/oversampling    |
| Float32 | filter_8k             | 61   | FIR table for decimation/oversampling    |
| Float32 | isf_init              | 16   | Initial ISF memory                       |
| Float32 | Mean_isf              | 16   | Means of ISFs                            |
| Float32 | Dico1_isf             | 2304 | 1st stage codebook, isf0 to isf8         |
| Float32 | Dico2_isf             | 1792 | 1st stage codebook, isf9 to isf15        |
| Float32 | Dico21_isf            | 192  | 2nd stage codebook, isf2_0 to isf 2_2    |
| Float32 | Dico22_isf            | 384  | 2nd stage codebook, isf2_3 to isf 2_5    |
| Float32 | Dico23_isf            | 384  | 2nd stage codebook, isf2_6 to isf 2_8    |
| Float32 | Dico24_isf            | 96   | 2nd stage codebook, isf2_9 to isf 2_11   |
| Float32 | Dico25_isf            | 128  | 2nd stage codebook, isf2_12 to isf 2_15  |
| Float32 | Dico21_isf_36b        | 640  | 1st stage codebook, (36b) split 1        |
| Float32 | Dico22_isf_36b        | 512  | 1st stage codebook, (36b) split 2        |
| Float32 | Dico23_isf_36b        | 448  | 1st stage codebook, (36b) split 3        |
| Float32 | Dico_gain_hf          | 512  | Quantization table for one-stage HF gain |
| Float32 | Mean_isf_hf_12k8      | 8    | Means of ISFs (full band)                |
| Float32 | dico1_isf_hf_12k8     | 32   | 1nd stage isf codebook (full band)       |
| Float32 | mean_isf_hf_low_rate  | 8    | Means of isfs                            |
| Float32 | Dico1_isf_hf_low_rate | 32   | 1st stage isf codebook                   |
| Float32 | dico2_isf_hf          | 1024 | 2nd stage isf codebook                   |
| Float32 | Lag_window            | 17   | Lag window                               |
| Float32 | Filt_lp               | 13   | Low-pass fir filter for bass post filter |
| Float32 | Sin20                 | 20   | Random phase                             |
| Float32 | Inter4_2              | 65   | ¼ resolution interpolation filter        |
| Float32 | VadFiltBandFreqs      | 12   | Open-loop classifier                     |
| Float32 | Bw                    | 12   | Open-loop classifier                     |
| Float32 | Lwg                   | 8    | Open-loop claissifier                    |
| Float32 | Gain_hf_ramp          | 64   | HF gain ramp for wb->wb+ switching       |
| Float32 | Inter2_coef           | 12   | Filter coefficients for band join/split  |
| Float32 | Filter_LP180          | 2341 | Filter for 48 kHz interpolation          |
| Float32 | StereoNbits           | 18   | Stereo bit-rates                         |
| Float32 | Filter_2k             | 321  | 2k decimation filter                     |
| Float32 | Cb_filt_hi_mean       | 9    | Average filter                           |
| Float32 | Filt_hi_mscb4a        | 16*9 |  |
| Float32 | Filt_hi_mscb_7a       | 16*9 |  |
| Float32 | Filt_hi_mscb_7b       | 8*9  |  |
| Float32 | Cb_gain_hi_mean       | 2    | Average gain vector                      |
| Float32 | Gain_hi_mscb_2a       | 4*2  |  |
| Float32 | Gain_hi_mscb_5a       | 32*2 |  |
|         | TBC                   |      |  |

Table 4: Decoder fixed tables

| Format          | Table name | Size | Description |
|-----------------|------------|------|-------------|
| Same as encoder |            |      |             |

#### 4.4.2 Static variables used in the C-code

In this clause two tables that specify the static variables for the encoder and decoder respectively are shown. All static variables are declared within a C **struct**.

Table 5: Encoder static variables

| struct name      | type          | variable              | size | description                      |
|------------------|---------------|-----------------------|------|----------------------------------|
| Coder_StState    |               |                       |      |                                  |
|                  | float         | mem_decim             | 1608 | speech decimated filter memory   |
|                  | int           | decim_frac            | 1    | Fractional decimation factor     |
|                  | float         | mem_sig_in            | 4    | hp filter memory                 |
|                  | float         | mem_preemph           | 1    | speech preemphasis filter mem    |
|                  | float         | mem_decim_hf          | 46   | HF filter memory                 |
|                  | float         | old_speech_hf         | 528  | HF old speech vector             |
|                  | float         | past_q_isf_hf         | 8    | HF past quantized isf            |
|                  | float         | ispold_hf             | 8    | HF old isp                       |
|                  | float         | ispold_q_hf           | 8    | HF quantized old isp             |
|                  | float         | old_gain;             | 1    | HF old gain match                |
|                  | float         | mem_hf1               | 8    | HF memory for gain 1             |
|                  | float         | mem_hf2               | 8    | HF memory for gain 2             |
|                  | float         | mem_hf3               | 8    | HF memory for gain 3             |
|                  | float         | old_exc               | 375  | old excitation                   |
|                  | float*        | mean_isf_hf           | 1    | isf codebook mean                |
|                  | float*        | dico1_isf_hf          | 1    | isf codebook first stage         |
| Coder_State_Plus |               |                       |      |                                  |
|                  | Coder_StState | left                  | 2614 | state for left channel           |
|                  | Coder_StState | right                 | 2614 | state for right channel          |
|                  | float         | old_chan              | 528  | old left signal                  |
|                  | float         | old_chan_2k           | 140  | old left signal 2kHz sampl. rate |
|                  | float         | old_chan_hi           | 448  | old left signal HB               |
|                  | float         | old_speech_2k         | 140  | old mono signal 2kHz sampl. rate |
|                  | float         | old_speech_hi         | 448  | old mono signal HB               |
|                  | float         | old_speech_pe         | 528  | past pre-emphasised mono         |
|                  | float         | old_wh                | 9    | past weighted filter             |
|                  | float         | old_wh_q              | 9    | past quantized weighted filter   |
|                  | float         | old_gm_gain           | 2    | past gain matching               |
|                  | float         | old_exc_mono          | 9    | past mono excitation             |
|                  | float         | filt_energy_threshold | 1    | filter energy thershold          |
|                  | float         | w_window              | 64   | weighting window                 |
|                  | PMSVQ*        | *filt_hi_pmsvq        | 1    | MSVQ quantizer                   |
|                  | PMSVQ*        | *gain_hi_pmsvq        | 1    | MSVQ quantizer                   |
|                  | int           | mem_stereo_ovlp_size  | 1    | past stereo overlap size         |
|                  | float         | mem_stereo_ovlp       | 32   | past stereo overlap              |
|                  | NCLASSDATA    | *stClass              | 1    | use case B classifier            |
|                  | VadVars       | *vadSt                | 1    | VAD state                        |
|                  | short         | vad_hist              | 1    | VAD history                      |
|                  | float         | old_speech            | 528  | old speech                       |
|                  | float         | old_synth             | 16   | synthesis memory                 |
|                  | float         | past_isfq             | 16   | past isf quantizer               |
|                  | float         | old_wovlp             | 128  | last tcx overlap                 |
|                  | float         | old_d_wsp             | 187  | Weighted speech vector           |
|                  | float         | old_exc               | 392  | old excitation vector            |
|                  | float         | old_mem_wsyn          | 1    | weighted synthesis memory        |
|                  | float         | old_mem_w0            | 1    | weighted speech memory           |
|                  | float         | old_mem_xnq           | 1    | quantized target memory          |

|  |          |                    |     |                                       |
|--|----------|--------------------|-----|---------------------------------------|
|  | int      | old_ovlp_size      | 1   | last tcx overlap size                 |
|  | float    | isfold             | 16  | old isf frequency domain              |
|  | float    | ispold             | 16  | old isp                               |
|  | float    | ispold_q           | 16  | quantized old isp                     |
|  | float    | mem_wsp            | 1   | wsp vector mem                        |
|  | float    | mem_lp_decim2      | 3   | wsp decimator filter mem              |
|  | float    | ada_w              | 1   | open loop LTP                         |
|  | float    | ol_gain            | 1   | open loop LTP                         |
|  | short    | ol_wght_flg        | 1   | open loop LTP                         |
|  | long int | old_ol_lag         | 5   | past openloop lag                     |
|  | int      | old_T0_med         | 1   | past pitch                            |
|  | float    | hp_old_wsp         | 699 | past HP weighted speech               |
|  | float    | hp_ol_ltp_mem      | 7   | past HP openloop long term prediction |
|  | float    | window             | 512 | LP analysis window                    |
|  | short    | SwitchFlagPlusToWB | 1   | flag for switching to AMR-WB          |
|  | float    | mem_gain_code      | 4   | past code gain                        |
|  | short    | prev_mod           | 1   | past frame type                       |

Table 6: Decoder static variables

| struct name        | type            | variable             | size | description  |
|--------------------|-----------------|----------------------|------|--|
| Decoder_StState    |                 |                      |      |  |
|                    | float           | mem_oversamp         | 72   | Memory oversampling  |
|                    | int             | over_frac            | 1    | Fractional overclocking factor   |
|                    | float           | mem_oversamp_hf      | 24   | memory   |
|                    | float           | past_q_isf_hf        | 8    | HF past quantized isf  |
|                    | float           | past_q_isf_hf_other  | 8    | HF past quantized isf for the other channel when mono decoding stereo  |
|                    | float           | past_q_gain_hf       | 1    | HF past quantized gain   |
|                    | float           | past_q_gain_hf_other | 1    | HF past quantized gain for the other channel when mono decoding stereo |
|                    | float           | old_gain             | 1    | HF old gain match  |
|                    | float           | ispold_hf            | 8    | HF old isp   |
|                    | float           | threshold;           | 1    | HF memory for smooth ener  |
|                    | float           | mem_syn_hf           | 8    | HF synthesis memory  |
|                    | float           | mem_d_tcx            | 96   | delay compensation memory  |
|                    | float           | mem_d_nonc           | 64   | Non causality delay  |
|                    | float           | mem_synth_hi         | 16   | High band sunthesis memory   |
|                    | float           | mem_sig_out          | 4    | hp filter memory   |
|                    | float           | old_synth_hf         | 512  | synch delay memory   |
|                    | float           | lp_amp               | 1    | memory for soft exc  |
|                    | float*          | mean_isf_hf          | 1    | isf codebook mean  |
|                    | float*          | dico1_isf_hf         | 1    | isf codebook first stage   |
| Decoder_State_Plus |                 |                      |      |  |
|                    | Decoder_StState | left                 | 828  | State for left channel   |
|                    | Decoder_StState | right                | 828  | State for right channel  |
|                    | float           | mem_left_2k          | 20   | 2kHz memory on left chan   |
|                    | float           | mem_right_2k         | 20   | 2kHz memory on right chan  |
|                    | float           | mem_left_hi          | 64   | HB memory left channel   |
|                    | float           | mem_right_hi         | 64   | HB memory right channel  |
|                    | float           | my_old_synth_2k      | 35   | old 2kHz synthesis   |
|                    | float           | my_old_synth_hi      | 128  | old HB synthesis   |
|                    | float           | my_old_synth         | 148  | old stereo synth   |
|                    | float           | old_AqLF             | 85   | old quantized LPC  |
|                    | float           | old_wh               | 9    | old decoded filter   |
|                    | float           | old_wh2              | 9    | old decoded filter 2   |
|                    | float           | old_exc_mono         | 9    | old mono excitation  |
|                    | float           | old_gain_left        | 4    | old gain on left chan  |
|                    | float           | old_gain_right       | 4    | old gain on right chan   |
|                    | float           | old_wh_q             | 9    | past quantized filter  |
|                    | float           | old_gm_gain          | 2    | past gain matching   |
|                    | float           | w_window             | 64   | weighted synthesis window  |
|                    | PMSVQ           | *filt_hi_pmsvq       | 1    | past MSVQ filter   |
|                    | PMSVQ           | *gain_hi_pmsvq       | 1    | past MSVQ gain   |
|                    | int             | mem_stereo_ovlp_size | 1    | past stereo overlap size   |
|                    | float           | mem_stereo_ovlp      | 32   | past stereo overlap  |
|                    | int             | last_stereo_mode     | 1    | past stereo mode   |
|                    | float           | side_rms             | 1    | side signal RMS  |
|                    | float           | h                    | 9    | current filter   |
|                    | float           | mem_balance          | 1    | past balance factor  |



|  |       |               |      |   |
|--|-------|---------------|------|---|
|  | int   | fer_hist      | 500  | frame erasure history                   |
|  | int   | fer_hist_ptr  | 1    | frame erasure pointer                   |
|  | float | fer_mean      | 1    | frame erasure mean                      |
|  | float | old_xri       | 1148 | old spectral coefficients               |
|  | int   | last_mode     | 1    | last mode in previous 80ms frame        |
|  | float | mem_sig_out   | 4    | hp50 filter memory for synthesis        |
|  | float | mem_deemph    | 1    | speech deemph filter memory             |
|  | int   | prev_lpc_lost | 1    | previous lpc is lost when = 1           |
|  | float | old_synth     | 16   | synthesis memory                        |
|  | float | old_exc       | 392  | old excitation vector                   |
|  | float | isfold        | 16   | old isf (frequency domain)              |
|  | float | ispold        | 16   | old isp (immittance spectral pairs)     |
|  | float | past_isfq     | 16   | past isf quantizer                      |
|  | float | wovlp         | 128  | last weighted synthesis for overlap     |
|  | int   | ovlp_size     | 1    | overlap size                            |
|  | float | isf_buf       | 51   | old isf (for frame recovery)            |
|  | int   | old_T0        | 1    | old pitch value (for frame recovery)    |
|  | int   | old_T0_frac   | 1    | old pitch value (for frame recovery)    |
|  | short | seed_ace      | 1    | seed memory (for random function)       |
|  | float | mem_wsyn      | 1    | TCX synthesis memory                    |
|  | short | seed_tcx      | 1    | seed memory (for random function)       |
|  | float | wsyn_rms      | 1    | rms value of weighted synthesis         |
|  | float | past_gpitt    | 1    | past gain of pitch (for frame recovery) |
|  | float | past_gcode    | 1    | past gain of code (for frame recovery)  |
|  | int   | pitch_tcx     | 1    | for bfi                                 |
|  | float | gc_threshold  | 1    | GC threshold                            |
|  | float | old_synth_pf  | 503  | Bass post-filter: old synthesis         |
|  | float | old_noise_pf  | 24   | bass post-filter: noise memory          |
|  | int   | old_T_pf      | 2    | bass post-filter: old pitch             |
|  | float | old_gain_pf   | 2    | Bass post-filter: old pitch gain        |
|  | float | *mean_isf_hf  | 1    | HF isf codebook in-use                  |
|  | float | *dico1_isf_hf | 1    | HF isf codebook in-use                  |
|  | float | mem_gain_code | 4    | past code gain                          |
|  | float | mem_lpc_hf    | 9    | past HF lpc filter                      |
|  | float | mem_gain_hf   | 1    | past HF gain                            |
|  | short | ramp_state    | 1    | ramp state                              |

## 5 File formats

This clause describes the file formats used by the encoder and decoder programs.

### 5.1 Audio file (encoder input/decoder output)

Audio files read by the encoder must be formatted as 16 bits PCM wave (\*.wav) files. The decoder output is written as a 16 bit PCM wave file (\*.wav).

Note that the decoder, with proper command line switch, can produce a mono file from a stereo bit-stream.

## 5.2 Parameter bitstream file (encoder output/decoder input)

For AMR-WB+ operation, the files produced by the audio encoder/expected by the audio decoder are either according to the raw format defined in Reference [2] Section 8.2, or according to the 3GP file format [4], whereby the storage sample definition is found in Reference [2] Section 8.3.

## Annex A (informative): Change history

| Change history |         |           |      |     |   |       |       |
|----------------|---------|-----------|------|-----|---|-------|-------|
| Date           | TSG SA# | TSG Doc.  | CR   | Rev | Subject/Comment   | Old   | New   |
| 2004-09        | 25      | SP-040640 | -    | -   | Approved at TSG SA#25   | 2.0.0 | 6.0.0 |
| 2004-12        | 26      | SP-040841 | 001  |     | Incorrect definition of mode index for SID frames   | 6.0.0 | 6.1.0 |
| 2004-12        | 26      | SP-040841 | 002  |     | Correction of TCX coding selection for MMS encoder  | 6.0.0 | 6.1.0 |
| 2004-12        | 26      | SP-040841 | 003  |     | Misread of energy buffer in coding mode selection in MMS encoder. Correction of energy buffer initialisation  | 6.0.0 | 6.1.0 |
| 2004-12        | 26      | SP-040841 | 004  |     | Correction of stereo bit allocation tables  | 6.0.0 | 6.1.0 |
| 2004-12        | 26      | SP-040841 | 005  | 1   | Optimization of error concealment operation   | 6.0.0 | 6.1.0 |
| 2004-12        | 26      | SP-040841 | 006  | 1   | Stereo operation of pre-echo mode, saturation of gain_shape   | 6.0.0 | 6.1.0 |
| 2004-12        | 26      | SP-040841 | 007  |     | Stereo operation of pre-echo mode, alignment of encoder and decoder   | 6.0.0 | 6.1.0 |
| 2004-12        | 26      | SP-040841 | 008  | 1   | Addition of support for file formats and improved command line  | 6.0.0 | 6.1.0 |
| 2004-12        | 26      | SP-040841 | 009  | 1   | Source code editorial changes   | 6.0.0 | 6.1.0 |
| 2004-12        | 26      | SP-040841 | 010  |     | Removal of complexity counters  | 6.0.0 | 6.1.0 |
| 2004-12        | 26      | SP-040841 | 011  | 1   | Editorial changes   | 6.0.0 | 6.1.0 |
| 2004-12        | 26      | SP-040841 | 012  |     | Void. This CR in S4-040722 (Title: Editorial changes) was meant to TS 26.290 (as CR 004) and not to TS 26.304 ! The CR was implemented instead in TS 26.290 v. 6.1.0 and a remark was put in the CR database. | 6.0.0 | 6.1.0 |
| 2004-12        | 26      | SP-040841 | 013  |     | Removal of the eid tool   | 6.0.0 | 6.1.0 |
| 2004-12        | 26      | SP-040841 | 014  | 1   | Addition of frame erasure simulation at the decoder   | 6.0.0 | 6.1.0 |
| 2004-12        | 26      | SP-040841 | 015  |     | Removal of two unused stereo rates  | 6.0.0 | 6.1.0 |
| 2004-12        | 26      | SP-040841 | 016  |     | Removal of extStMode  | 6.0.0 | 6.1.0 |
| 2005-03        | 27      | SP-050096 | 019  | 1   | AMR-WB/AMR-WB+ switching  | 6.1.0 | 6.2.0 |
| 2005-03        | 27      | SP-050096 | 020  | 2   | Clean-up of unused C-code functions   | 6.1.0 | 6.2.0 |
| 2005-03        | 27      | SP-050096 | 021  | 1   | Correction of misbehaviour of constrained cholesky  | 6.1.0 | 6.2.0 |
| 2005-03        | 27      | SP-050096 | 022  | 1   | Source code bit exact editorial changes   | 6.1.0 | 6.2.0 |
| 2005-03        | 27      | SP-050096 | 023  | 2   | Correction of last frame processing   | 6.1.0 | 6.2.0 |
| 2005-03        | 27      | SP-050096 | 024  | 1   | Correction of frame erasure concealment   | 6.1.0 | 6.2.0 |
| 2005-03        | 27      | SP-050096 | 025  | 1   | Correction of references and terminology  | 6.1.0 | 6.2.0 |
| 2005-06        | 28      | SP-050252 | 026  |     | Correction of DTX handling in AMR-WB modes  | 6.2.0 | 6.3.0 |
| 2005-06        | 28      | SP-050252 | 027  |     | Remove IF2 header in AMR-WB bitstream   | 6.2.0 | 6.3.0 |
| 2005-06        | 28      | SP-050252 | 028  |     | Decoder synchronization after frame erasures  | 6.2.0 | 6.3.0 |
| 2005-06        | 28      | SP-050252 | 029  |     | Correction for buffer reading in low complexity encoder   | 6.2.0 | 6.3.0 |
| 2005-06        | 28      | SP-050252 | 030  |     | Correction to a wrong function call   | 6.2.0 | 6.3.0 |
| 2005-06        | 28      | SP-050252 | 031  |     | Correction of mode switching using configuration file   | 6.2.0 | 6.3.0 |
| 2005-06        | 28      | SP-050252 | 032  |     | Correction of information printed by decoder in DTX frames  | 6.2.0 | 6.3.0 |
| 2005-06        | 28      | SP-050252 | 033  |     | Correction of library function for 3GP file format  | 6.2.0 | 6.3.0 |
| 2005-06        | 28      | SP-050252 | 034  |     | Support for input files with sampling frequency other than 48 kHz   | 6.2.0 | 6.3.0 |
| 2005-09        | 29      | SP-050425 | 0035 |     | Correction to frame erasure concealment   | 6.3.0 | 6.4.0 |
| 2006-03        | 31      | SP-060012 | 0036 |     | Correction to end-of-file logic and initialisation in AMR-WB modes  | 6.4.0 | 6.5.0 |
| 2006-03        | 31      | SP-060012 | 0037 |     | Correction to unnecessary look ahead in encoder   | 6.4.0 | 6.5.0 |
| 2006-03        | 31      | SP-060012 | 0038 |     | Correction to memory initialization and memory overwrite when switching between AMR-WB and AMR-WB+ modes  | 6.4.0 | 6.5.0 |
| 2006-03        | 31      | SP-060012 | 0039 |     | Correction to VC 6.0 compilation warnings   | 6.4.0 | 6.5.0 |

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## History

| <b>Document history</b> |                |             |
|-------------------------|----------------|-------------|
| V6.1.0                  | December 2004  | Publication |
| V6.2.0                  | March 2005     | Publication |
| V6.3.0                  | June 2005      | Publication |
| V6.4.0                  | September 2005 | Publication |
| V6.5.0                  | March 2006     | Publication |