Ittiam HEAAC Multichannel Decoder

HE-AAC (aacPlus) Multichannel Decoder

AAC is a popular audio coding technique recommended by MPEG committee. SBR is a tool used in combination with the AAC general audio codec resulting in aacPlus (also known as HEAAC). It provides significant increase in coding gain. In SBR, the high-band, i.e. the high frequency part of the spectrum is replicated using the low-band. The bit-rate is by far below the bit-rate required when using conventional AAC coding. This translates into better quality at lower bit-rates. It can be used in consumer applications like mobile streaming and download, digital terrestrial, cable & satellite television broadcasting and Internet Video on demand service.

Features

Features supported:

- MPEG2 and MPEG4 AAC LC (Low complexity), SBR.
- Supports all sampling frequencies & bit rates for AAC only bit-streams.
- Multi-channel Decoder Features
- Channels: Upto 8 channels.
- LFE (Low Frequency Element) Decoding
- Decoding of Independent switched CCE (Channel Coupling Element)
- Supports down-mix of multi-channel stream to stereo.
- Tools: TNS (Temporal Noise Shaping), PNS (Perceptual Noise Shaping), Intensity Stereo & Mid/Side Stereo
- Bit-streams: ADIF, ADTS, GA Header
- Compliance:
  - ISO/IEC 13818 - 4, 14496 – 4 (MPEG AAC and PNS Conformance)
  - ISO/IEC 14496 - 4:AMD8 (MPEG SBR Conformance)
- Performs Low Power SBR Decoding
- SBR Level 5
- For SBR bit-streams supports AAC sampling frequency up to 48 kHz & SBR sampling frequency up to 96 kHz.
- SBR Signaling: Implicit, hierarchical explicit and backward compatible explicit.
- Supports TI XDMI API
- Robust against erroneous bit-streams
- Optimized for low footprint & processing power
- 16 bit WAV Output format support
- Supports memory allocation based on max number of channels to be decoded
- Skips the unused Independent CCE & DRC elements.

Features not supported:

- More than 8 channels of audio.
- Parametric Stereo Decoding
- Dependently switched CCE
- DRC

Decoder Validation

The MPEG-4 HEAAC Multichannel decoder implementation has been validated using the latest conformance tool given by MPEG-4.

Resource requirements on C64x+ Processor

Decode mode	MCPS	Pgm	Tables	Static	Scratch
	Peak	ROM (kB)		RAM (kB)	
SBR 5.1	23.3	96.9	25.5	56.7	16.0

Note: Input/ Output buffers details are given in the next page.

MCPS measurement done on 0 wait-state memory access

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Details of C64x+ Resources required

CPU Loading

Description	Simulator		Hardware Configuration	
	MCPS Ave	MCPS Peak	MCPS Ave	MCPS Peak
AAC 2.0	4.3	5.2	8.2	8.7
AAC 5.1.0.1	13.0	14.3	22.9	24.5
SBR Level 2	6.2	9.1	11.3	15.3
SBR Level 3	10.6	14.8	20.3	26.3
SBR 5.1	17.4	23.3	36.9	46.9

Memory Usage (kB)

Description	Program	Tables	Stack	Scratch	Static	Input	Output
Upto 2 ch. decode	96.9	25.5	2.2	9.0	16.7	1.5	8.0
Upto 6 ch. decode				16.0	56.7	6.0	24.0

Note:

- Simulator performance generated on *CCS 3.2.39.5 with C64x+ Cycle Accurate Simulator with 0 wait state memory access*
- Hardware Configuration performance generated on a DM6446 processor with all data and program memory sections placed in the external memory, with cache configuration of 32 kB L1 P Cache, 16 kB L1 D Cache & 64 kB L2 Cache, and cache thrashed after decoding each frame.
- MCPS numbers on the hardware will vary with the I-Cache and D-Cache size and with the memory configuration/placement
- MCPS/MIPS indicate the CPU usage for processing following music streams ((AAC 2.0, al05_48.adts, stereo, 48 kHz, 128 kbps, without TNS), (AAC 5.1.0.1, al15_48.adts, 5.1 + 1 Independent CCE, 48 kHz, 384 kbps, with TNS, without applying DRC), (SBR Level 2, al_sbr_sr_48_2_fsaac24.adts 48 kHz, 48 kbps), (SBR Level 3 al_sbr_sr_48_2_fsaac48.adts, 48 kHz, 48 kbps) and (SBR 5.1, al_sbr_cm_48_5.1.adts, 5.1 channels, 48 kHz, 128 kbps)
- Program memory doesn't include the code size of the test bench and standard library functions
- Codec memory usage (Static, Scratch, Input, Output) is based on the max channels init time input parameter.
- Data memory should be aligned to desired byte-boundary to meet the performance/functionality requirement