

# Ittiam HEAAC v2 Multichannel Decoder

## HE-AAC v2 (Enhanced aacPlus) Multichannel Decoder

AAC is a popular audio coding technique recommended by MPEG committee. SBR and PS are the tools used in combination with the AAC general audio codec resulting in Enhanced aacPlus (also known as HEAAC v2). 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

- MPEG2 and MPEG4 AAC LC (Low complexity), SBR, PS (Parametric Stereo)
- 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.
- Supports decoding the following optional Tools: TNS (Temporal Noise Shaping), PNS (Perceptual Noise Shaping), Intensity Stereo & Mid/Side Stereo
- File formats supported: ADIF, ADTS, GA Header
- Compliance:
  - ISO/IEC 13818 - 4, 14496 – 4 (MPEG AAC and PNS Conformance)
  - ISO/IEC 14496 - 4:AMD8 (MPEG SBR Conformance)
  - ISO/IEC 14496 – 4:AMD11 (MPEG PS Conformance)

- ETSI TS 126 406 V6.3.0 (3GPP PS Conformance)
- Performs Low Power SBR Decoding for stereo bit-stream and performs High Quality SBR Decoding for mono or PS bit-stream
- 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.
- Multichannel streams with PS
- Dependently switched CCE
- DRC

### Decoder Validation

The MPEG-4 HEAAC v2 Multichannel decoder implementation has been validated using the latest conformance tool given by MPEG-4.

### Resource requirements on C64x Processor

Decode Level	MCPS	Pgm	Tables	Scratch	Static
	Peak	ROM (kB)		RAM (kB)	
3GP-PS	10.7	176.9	29.8	16.0	23.2
SBR 5.1	26.7				57.1

**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	MCPS	MCPS	MCPS
	Ave	Peak	Ave	Peak
AAC 2.0	4.6	5.9	11.0	13.0
AAC 5.1.0.1	14.6	16.0	31.9	34.8
SBR Level 2	7.1	10.6	16.1	22.5
SBR Level 3	12.4	17.6	27.7	37.4
SBR 5.1	19.6	26.7	54.4	71.1
PS	6.5	9.1	19.8	30.8
3GP-PS	9.5	10.7	29.5	32.4

### Memory Usage (kB)

Description	Program	Tables	Stack	Scratch	Static	Input	Output
Upto 2 ch. decode	176.9	29.8	2.7	16.0	23.2	1.5	8.0
Upto 6 ch. decode					57.1	6.0	24.0

#### Note:

- Performance generated on *CCS 2.20.18 with C64xx Cycle Accurate Simulator with 0 wait state memory access*
- Hardware Configuration performance generated on a DM642 processor with all data and program memory sections placed in the external memory, with cache configuration of 16 kB L1 P Cache, 16 kB 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 the 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), (SBR 5.1, al\_sbr\_cm\_48\_5.1.adts, 5.1 channels, 48 kHz, 128 kbps), (PS al\_sbr\_ps\_iid\_34\_4.adts, 48 kHz, 32 kbps) and (3GP-PS s\_cl\_2t\_1\_28s.adts, 48 kHz, 28 kbps).
- Program memory doesn't include the code size of the test bench and standard library functions
- Codec memory usage (Static, 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

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