

# HE-AAC v2 Encoder

## HE-AAC v2 Encoder

HE-AAC v2 (High Efficiency Advanced Audio Coding Version 2) also known as aacPlus is a popular audio coding technique recommended by MPEG (Moving Picture Experts Group) committee. SBR (Spectral Bandwidth Replication) and PS (Parametric Stereo) are the tools used in combination with the AAC general audio codec resulting in Enhanced aacPlus. 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 far below the bit-rate required when using conventional AAC coding. This translates into better quality at lower bit-rates.

### Features Supported

- MPEG2 and MPEG4 AAC LC
- Spectral Band Replication
- Sampling rates
  - aacPlus Encoding
    - 32kHz,44.1kHz,48kHz
  - Plain AAC Encoding
    - 8,11.025,12,16,22.05,24,32,44.1, 48, 88.2 and 96kHz
- Supports both Mono & stereo data
- Mid Side Stereo
- Parametric Stereo
- Bit Rates
  - aacPlus Encoding
    - 16 kbps to 3\*sampling frequency per channel
  - Plain AAC Encoding
    - 8 kbps to 6\*sampling frequency per channel
- Bit Stream Formats: ADIF (Audio Data Interchange Format) and ADTS (Audio Data Transport System)
- Average Bit-rate.
- TNS (Temporal Noise Shaping)
- C Callable interface for encoder

- Efficient scratch memory with reduced stack requirements.
- Table relocatability
- XDMI API

### Not Supported

- More than two channels of audio
- IS (Intensity Stereo) Coding
- PNS (Perceptual Noise Substitution)
- MP4 packetization

### Encoder Validation

Enhanced aacPlus Encoder is an Informative standard. There is no standard measure or tool for evaluating the quality/fidelity of the encoder. The encoders produce complex artifacts, which is dependent on the source material. Taking these into consideration, the test bench for the audio coders includes the following types of test.

- Bit Stream Compliance: Tests to ensure that the generated bit-stream is in conformance with the specification.
- Objective Quality Evaluation: Audio Quality test based on the ITU BS.1387 standard for objective audio quality evaluation.
- Subjective Quality Evaluation: Listening tests to evaluate the quality.
- Artifact Listening Tests: Listening tests to ensure that the encoder does not produce the artifacts.

### Resource requirements on C64x

CPU Load (MCPS)		Program Memory (kBytes)	Data Memory (kBytes)			
Mode	Peak		Table	Scratch	Stack	Persistent
PS	27.88	237.2	40.8	38.2	2.9	75.2
SBR	37.47					
AAC	32.97					

**Note:** Input/Output memory sizes on next page

MCPS measured for 44.1kHz stereo file, 27.wav at 48kbps(PS), 64kbps(SBR) & 128kbps(AAC) at the QL2 profile with TNS enabled.

MCPS measurement on 0 wait-state memory access

## Details of C64x Resources required

### CPU Loading

Description	Simulator MCPS		Hardware MCPS	
	Ave	Peak	Ave	Peak
SBR + PS at 48 kbps, 44.1kHz	24.87	27.88	62.20	74.03
SBR at 64 kbps, 44.1 kHz	30.58	37.47	65.53	81.48
AAC only at 128 kbps, 44.1kHz	21.76	32.97	46.00	65.97

### Memory Usage (kB)

Program	Tables	Static	Scratch	Stack	Input	Output
237.2	40.8	75.2	38.2	2.9	8	1.6

**Note:**

- Performance generated on CCS 2.20.18 with C64x 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 L1 D Cache & 64 KB L2 Cache, and cache thrashed after encoding each frame.
- MCPS numbers on the hardware will vary with the I-Cache and D-Cache size and with the memory configuration/placement.
- Program memory doesn't include the code size of the test bench and standard library functions
- Data memory should be aligned to desired byte-boundary to meet the performance/functionality requirement
- MCPS/MIPS indicate the CPU usage for processing AAC only for 44.1 kHz at 128 kbps, AAC with SBR at 64kbps and AAC with SBR and PS at 48 kbps for the QL2 profile with TNS enabled. The SQAM file '27.wav' (two-channel) was used for encoding.
- Max Bit-rate =  $6 * (\text{sampling frequency}^1) * (\text{number of channels})$ .

**Note<sup>1</sup>:** AAC sampling frequency is half of input sampling frequency in SBR mode.

#### Notice

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**Kane Computing Ltd**  
 7 Theatre Court, London Road,  
 Northwich, Cheshire, CW9 5HB, UK.  
 Tel: +44(0)1606 351006  
 Fax: +44(0)1606 351007/8  
 Email: sales@kanecomputing.com  
 Web: www.kanecomputing.co.uk