**INTERNATIONAL ORGANIZATION FOR STANDARDIZATION**

**ORGANISATION INTERNATIONALE NORMALISATION**

**ISO/IEC JTC 1/SC 29/WG 11**

**CODING OF MOVING PICTURES AND AUDIO**

**WG 11 N13858**

**July 2013, Vienna, AT**

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| **Source** | **Audio Subgroup** |
| **Status** | **Approved** |
| **Title** | **Call for Proposals on Dynamic Range Control Technology** |

# Introduction

WG11 has an interest in new tools for dynamic range control (DRC) and Program Level Control (PLC). While WG11 has DRC capability integrated with the MPEG-4 Advanced Audio Coding profile coders [1], as in the AAC IMDCT-based multi-band DRC, it is interested in pursuing technology that could be more broadly applicable, be an advance on the AAC technology, and take into account recent developments in the field, including regulatory developments.

# Requirements

Requirements for new DRC technology are:

* Supports DRC configurations (as defined in Coding Independent Code Points 23001-8 AMD1 and MPEG-4 File Format 14496-12 PDAM3), e.g.
	+ multiple DRC sets
	+ different DRC for channel groups (e.g. put center in a separate group in a 5.0 channel presentation). Output loudspeaker configurations and loudspeaker index are defined in [2].
	+ index of encoder DRC characteristics
* Support DRC configuration for a downmix, to be applied to the signal after downmix
* Is universally applicable (codec agnostic, codec can be a PCM format)
* Can apply DRC gain to the time domain audio signal after audio decoding is complete
* DRC processing in decoder imposed negligible additional algorithmic audio delay for single band compression
* Supports time resolution of 1ms or better for fast gain changes to meet professional requirements
* Supports gain resolution of 0.25dB or better
* Efficient gain encoding for minimizing overall bit rate increase
* If payload is embedded in a host codec's bitstream, it should maintain backwards compatibility
* Supports gain modifications, imposed by additional meta-data in bitstream: at a minimum changes in the compress and boost factors.
* Provides a loudness normalization option using loudness metadata defined in [2]
* Takes advantage of peak level signaling so as to prevent clipping
* Has low complexity at decoder side

Optional additional system functionality

* + Supports extension to multi-band with flexible number of bands and band crossover frequencies

# Procedure

## Framework for Testing

Reference System

Coder: MPEG-4 Advanced Audio Coding Profile bitstream and decoder

DRC: MPEG-4 Advanced Audio Coding Profile IMDCT-based DRC

System under Test:

Coder: MPEG-4 Advanced Audio Coding Profile bitstream and decoder

DRC: Proponent DRC

## Constraints

All test items shall be coded using MPEG-4 AAC as follows:

* Stereo (2-channel) test material sampled at 48 kHz with a total bitrate of 256 kb/s
* Stereo (2-channel) test material sampled at 24 kHz with a total bitrate of 160 kb/s

The total bitrate shall include the data rate for the native AAC DRC metadata or the proponent metadata. For proponent submission, metadata does not need to be integrated into the AAC bitstream.

## Signal Set

Test items shall be stereo (2-channel) signals. Proponent is free to submit any test set that has reasonably representative music signals (i.e. not hypothetical synthetic signals). It is recommended to use at least 6 test items.

## Submission package

A complete submission package to the Call for Proposals on DRC shall be:

* A technical description of the proposal
* Listening test results based on the Framework for Testing.
* Original test material
* Bitstreams and decoded waveforms associated with the listening test.
* Ability to process a test item at the MPEG meeting (e.g. executables)
* A complexity estimate of the proposal, expressed as multiply-adds per output sample of only the DRC functionality.
* DRC meta-data bitrate
* If MPEG undertakes to standardize DRC technology and if the proponent submission is selected as a basis for standardization development, the proponent will
	+ Make the technology available to MPEG as a DRC encoder and decoder in full C/C++ source code (not AAC base coder, just metadata encoder and decoder)
	+ Make the technology available to potential users of the standard under the ISO IPR policy.

# Evaluation

The submissions will be evaluated with the goal of identifying a path towards enabling state-of-the-art dynamic range control of audio. MPEG will consider all submitted material when evaluating a submission. If needed, MPEG may conduct additional listening tests as part of the evaluation. That evaluation is expected to result in the selection of candidate(s) as the basis for further work. If there are multiple candidate submissions that meet the needs and MPEG feels are of interest (e.g. they have different characteristics or applicability), MPEG may choose to select more than one, or synthesize one or more DRCs from the candidates. In all cases, MPEG will expect to refine the proposals and develop a harmonious approach and architecture.

# Timeline for Submission

Submission package shall be made available as a contribution to the 106th MPEG meeting. If proponent is not an MPEG delegate, please email submission package prior to October 18,, 2013 to:

Schuyler Quackenbush, MPEG Audio Chair

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Candidates should expect to attend the 106th meeting and be prepared to discuss details of their proposal, and if their technology is selected for contributing towards the anticipated solution, participate in the standardization process in the following meetings.

# References

1. 14496-3 MPEG-4 Audio
2. ISO/IEC 23001-8 (MPEG-B: Coding independent media description code points)