
MPEG-H TV AUDIO SYSTEM

The new TV system for Personalized and Immersive Audio



NorDig Technical Committee, September 20, 2017

MPEG-H Audio Standardization



MPEG-H Audio LC Profile



SCTE^{*)}



MPEG-H is an open standard

Comparison of the MPEG and ETSI process

- **MPEG:** Competitive and collaborative process for technology selection
 - Call for Proposals -> proposal selection -> collaborative phase
 - Several companies contributed to the MPEG-H 3D Audio standard
 - Fraunhofer, Qualcomm, Technicolor, Sony, Samsung, Orange, Apple, ETRI, Dolby
 - Ballot phase: Review of draft specifications according to ISO rules
 - Several stages from working draft to final specification

- **ETSI:**
 - Technology developed outside of ETSI
 - New work item can be started with support from four ETSI members
 - Final draft available to ETSI members for review

MPEG's IPR Policy

- The MPEG standards are developed under the umbrella of ISO/IEC.
- As a consequence the IPR policy of ISO/IEC applies, which can be found here:
<http://isotc.iso.org/livelink/livelink/Open/6344764>
- In summary ISO/IEC asks for:
 - “...any party participating in the work of ITU, ISO or IEC should, **from the outset**, draw the attention of the Director of ITU-TSB, the Director of ITU-BR, or the offices of the CEOs of ISO or IEC, respectively, to any known patent or to any known pending patent application, **either their own or of other organizations**, ...”

MPEG's IPR Policy

- The ISO/IEC policy offers the IP holders three options:
 - a) To provide the IP free of charge on RAND conditions
 - b) To provide the IP against a license fee covered by RAND conditions
 - c) The IP holder is not willing to provide its IP under the conditions described in a) or b). In this case the IP from this IP holder shall be removed from any standard or specification.

- In any case the IP holder shall provide ISO/IEC with a written patent statement.

Received IPR Statements for MPEG-H 3D Audio

- The IPR statements received by ISO/IEC are published and can be found at the ISO/IEC web page
- Here are a few samples:
 - Fraunhofer, against license fee under FRAND conditions, submitted: Nov. 30, 2015
 - Dolby, against license fee under FRAND conditions, submitted: Feb. 26, 2015
 - Technicolor, against license fee under FRAND conditions, submitted: May 26, 2016
 - Qualcomm, against license fee under FRAND conditions, submitted: July 07, 2016

MPEG-H Audio

Decoder implementation and integration

➤ MPEG

➤ Conformance:

- MPEG has defined app. 200 test streams
- Conformance criteria for both bitstreams and decoders
- Assist implementers and to ensure interoperability

➤ Reference Software:

- Reference code available since June 2016

➤ Fraunhofer Decoder Test Suite - support for implementation



➤ Trademark Program for Receivers

➤ Enable Independent implementations

MPEG-H Audio

Coding Efficiency

■ MPEG Verification Test - MPEG-H 3D Audio LC Profile

| | Use Case | Bit Rates |
|---------------|---------------------------|----------------|
| Test 1 | Ultra-HD Broadcast | 768 kb/s |
| Test 2 | HD Broadcast | 512 - 256 kb/s |
| Test 3 | High Efficiency Broadcast | 256 - 48 kb/s |
| Test 4 | Mobile | 384 kb/s |

- Seven test labs
- 288 listeners
- 15576 subjective ratings

<http://mpeg.chiariglione.org/standards/mpeg-h/3d-audio/mpeg-h-3d-audio-verification-test-report>

MPEG-H Audio – Verification Test

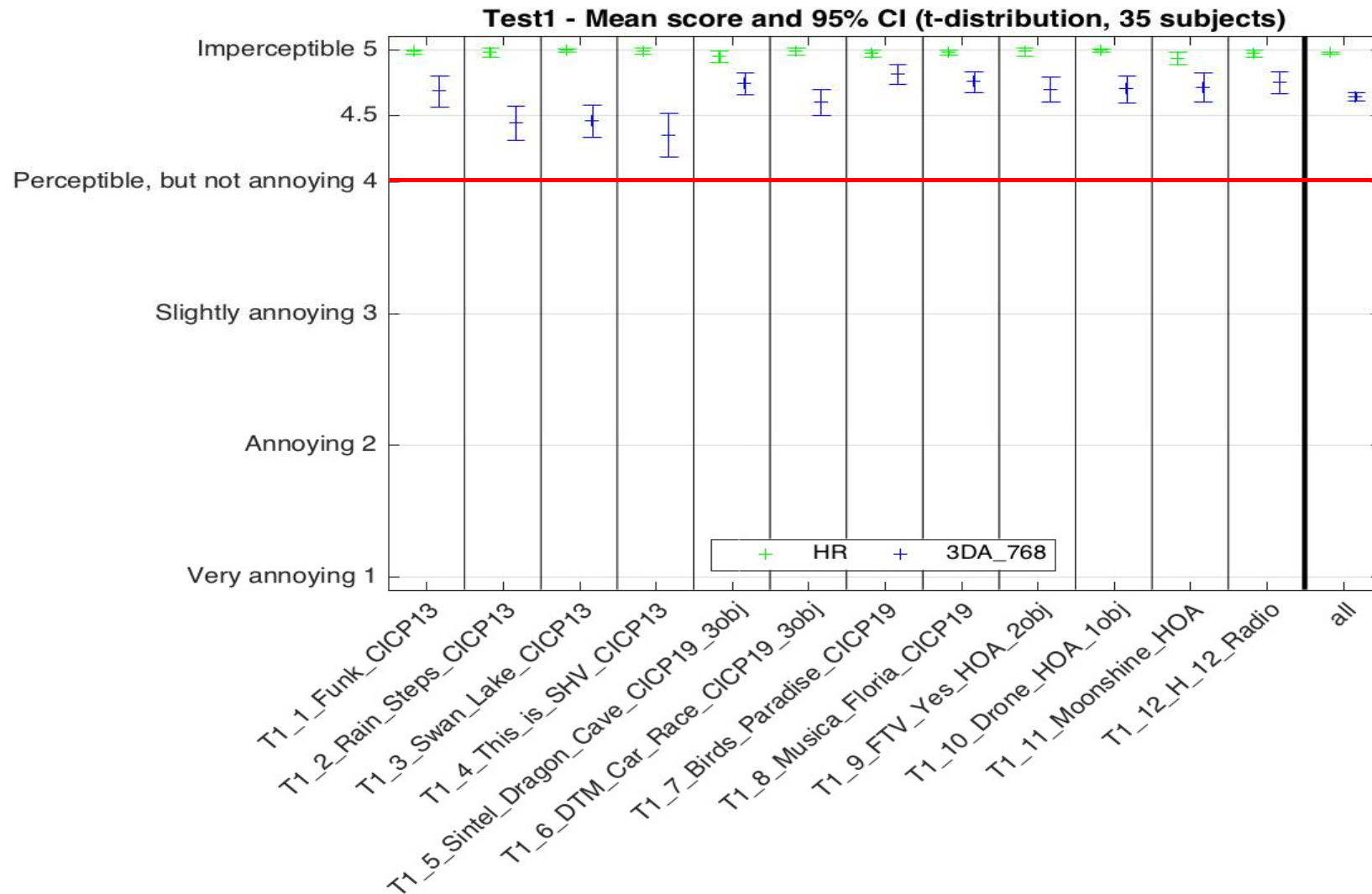
Test cases

- Ultra HD Broadcast (Test method: BS.1116)
 - 22.2, 7.1+4H Channel and HOA content
 - Channels, channels & objects, HOA & objects
 - 768 kbit/s

- HD Broadcast or A/V Streaming (Test method: MUSHRA)
 - 11.1 (7.1 + 4H), 7.1 (5.1+2H) channel and HOA content
 - 512 to 256 kbit/s

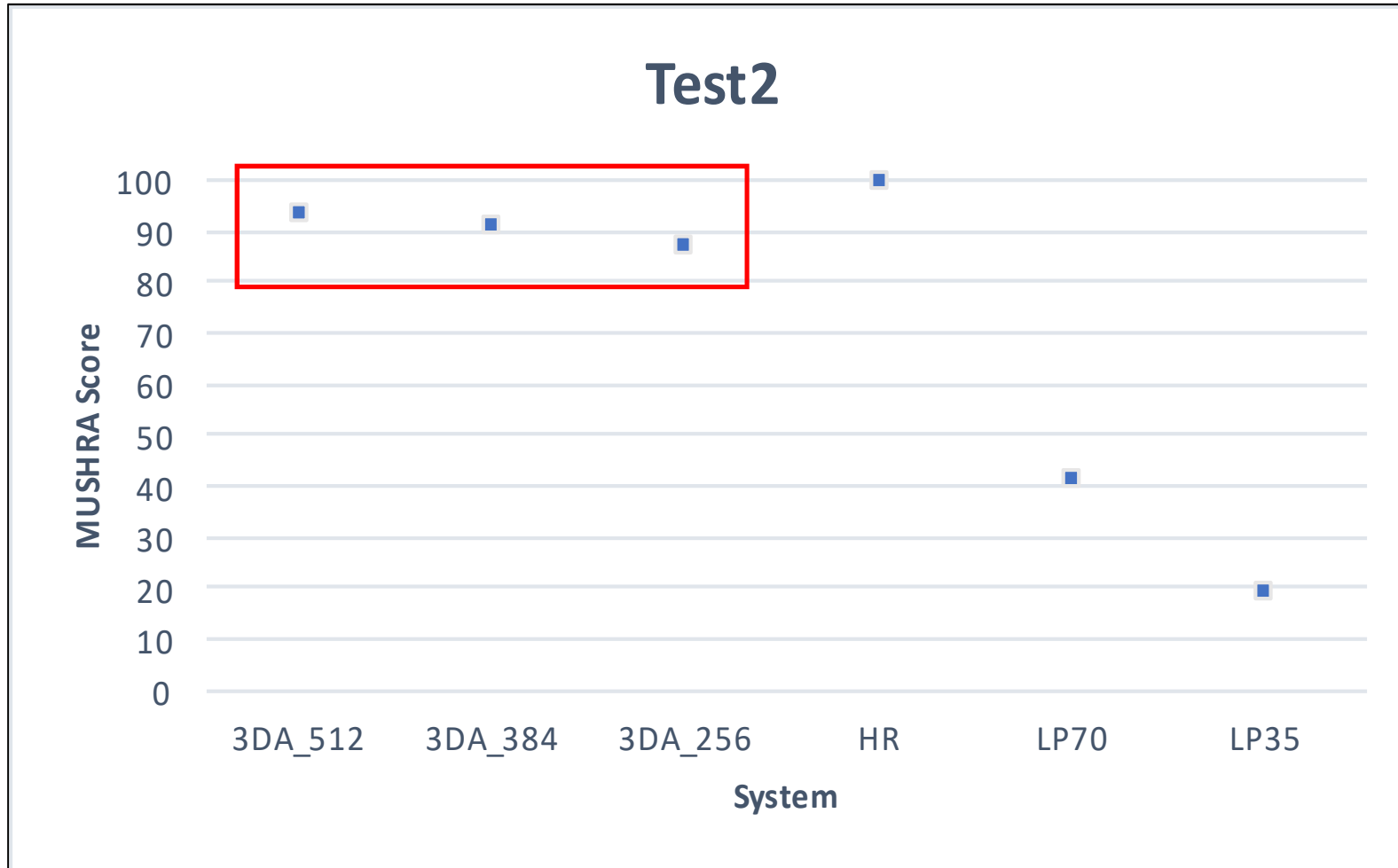
MPEG-H Audio – Verification Test

Ultra HD Broadcast (BS.1116)



MPEG-H Audio – Verification Test

HD Broadcast or A/V Streaming



MPEG-H Audio LC Profile

Features

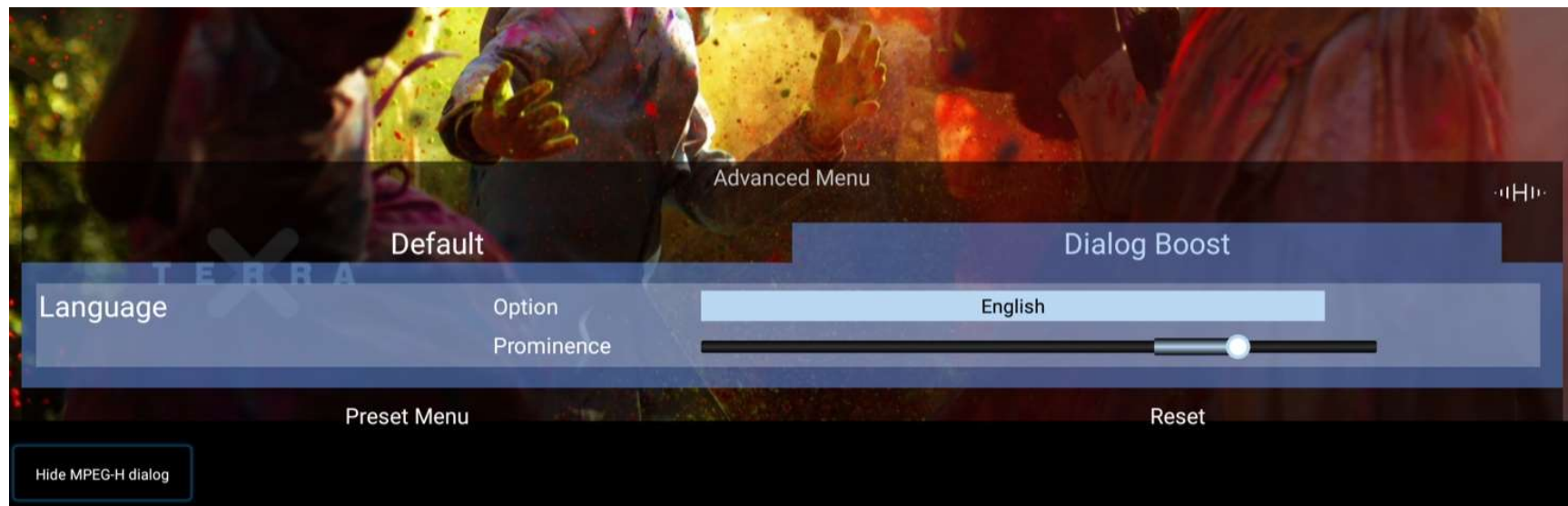
- Flexible content format
 - All types supported: Channel signals, Objects, Scene-based (HOA)
 - Flexibility: any combination, including complete mixes
 - Up to 16 audio elements (signals) to be decoded simultaneously

- One stream for all target devices
 - Enhanced Loudness and DRC enables
 - adaptation to playback environment
 - home vs. mobile playback, quiet vs. noisy environment
 - Built-in Renderer enables
 - Adaptation to the playback system (loudspeaker setup)
 - Adjustment of the audio mix based on user interactivity

MPEG-H Audio LC Profile

Metadata for Personalization

- Enables automatic device selection based on user preferences
 - Language, audio description, dialogue enhancement
- Enables manual user selection while program is running
 - Two steps: Preset menu, Advanced menu



MPEG-H Audio

Unique Feature – Immediate Playout Frames

- Enable true Random Access Points in the audio bitstream
 - Seamless switching (e.g., for bit rate adaptation in adaptive streaming scenarios)
 - Sample accurate configuration change

- Random Access Points of audio and video can be aligned
 - Allows seamless cutting audio and video streams in the coded domain (e.g., local program insertion, Ad-insertion)

MPEG-H Audio

Unique Feature - Detached User Interface



- User Interface on TV (User Interactivity with TV remote control)
 - User Interaction in TV, TV embeds the User Interaction information into audio stream
 - TV passes the audio stream to the Soundbar/AVR over HDMI
 - MPEG-H Audio decoding in the Soundbar/AVR

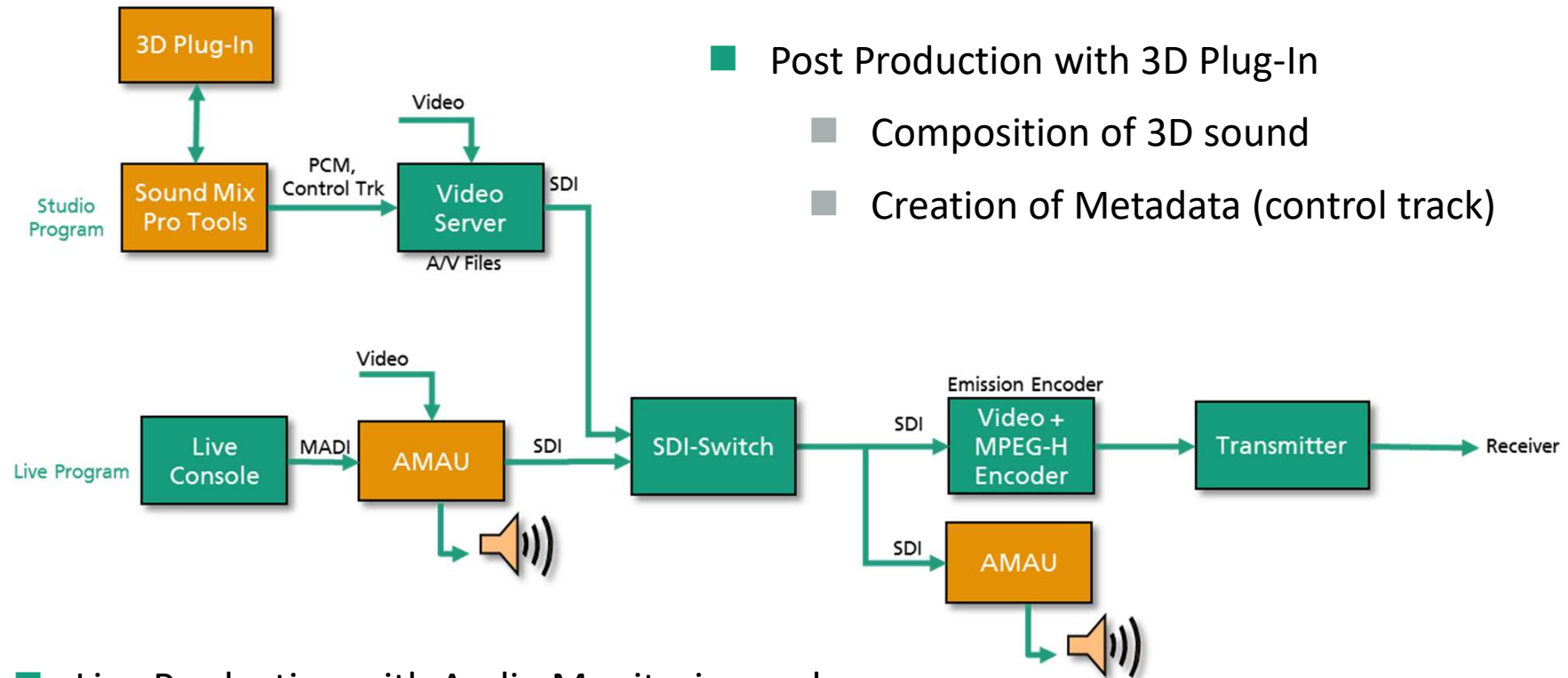
MPEG-H Audio Production

Unique Feature – Robust Audio Metadata over SDI

- Control Track: Metadata in Production workflow
 - Contains all control parameters for MPEG-H production
 - Synchronized with video frame rate
 - Robust against level changes (up to -30dB) and resampling
 - Can be used in existing broadcast facilities (SDI based)
 - One SDI track

MPEG-H Production Workflow

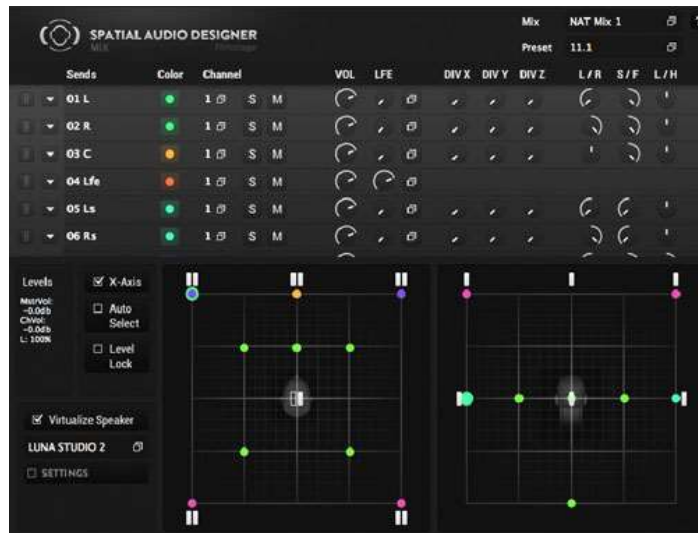
Production Scenario



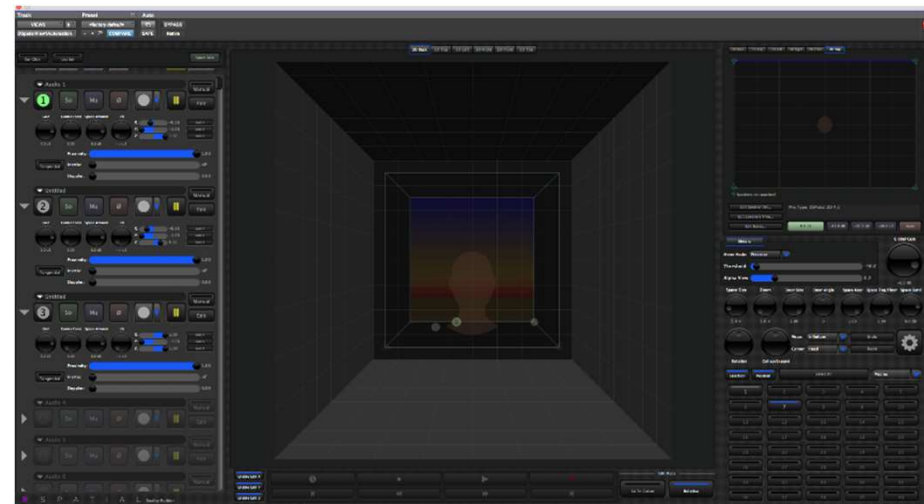
- Post Production with 3D Plug-In
 - Composition of 3D sound
 - Creation of Metadata (control track)

- Live Production with Audio Monitoring and Authoring Unit (AMAU)
 - Creation of Metadata (control track)

MPEG-H Production Tools



NAT Spatial
Audio Designer
Plugin



DSpatial Plugin



Pyramix first DAW with native MPEG-H export

Audio Monitoring and Authoring Units (AMAU)



Jünger Multichannel
Monitoring & Authoring Unit



Linear Acoustic Authoring and
Monitoring System

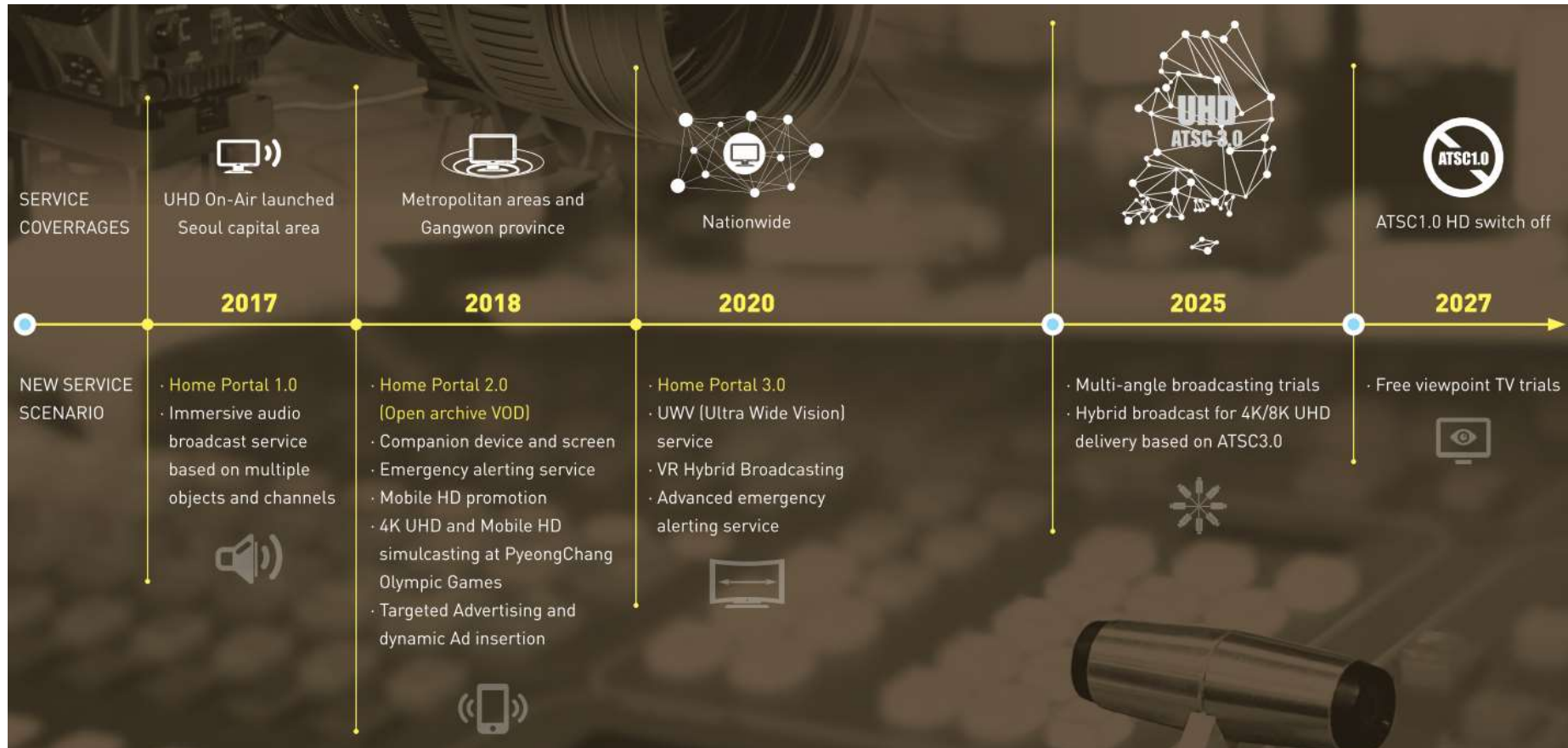
MPEG-H Audio in South Korea

Terrestrial UHDTV Service in South Korea

- **First and currently only regular** UHDTV service worldwide using a Next Generation Audio Codec
 - Regular service started end of May 2017
 - Currently available in the Seoul area
 - TVs and STBs are available from LG and Samsung

- **MPEG-H 3D Audio is the only audio codec** specified for this service
 - Encoders are available from DS Broadcast, KaiMedia and PixTree
 - TV sets and STBs as well as encoders support the full feature set of the MPEG-H 3D Audio LC-Profile Level 3 (12 channels, up to 16 elements can be decoded simultaneously, 32 elements can be transmitted)

Korean UHDTV Timeline



Korean UHDTV The Next Steps



Planned Streaming Service for
Winter Olympics 2018

Planned Mobile TV Service to Replace the Existing T-DMB Service



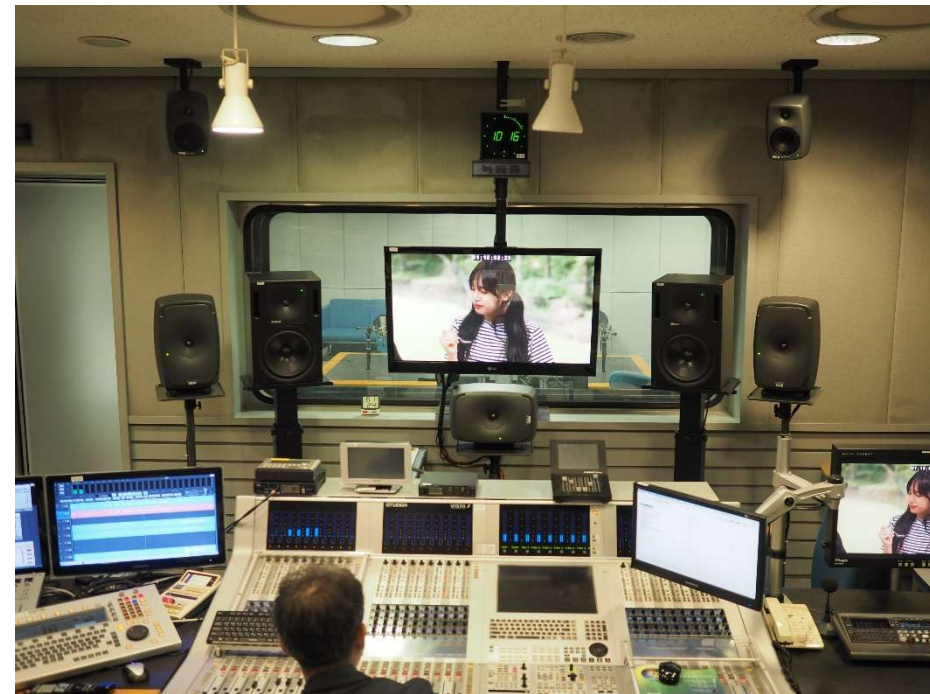
Korean UHDTV

Preparation for the Next Step in Audio



Training at Fraunhofer Demo Room

Immersive Audio Studio with 7.1 +4 H setup at SBS, Seoul



MPEG-H Audio Device Support

jünger

 LINEAR ACOUSTIC®


NEW AUDIO TECHNOLOGY


Pyramix

 S P A T I A L
THE IMMERSIVE COMPANY

KaiMedia


DS BROADCAST

PIXTREE

 LG

 SAMSUNG

cādence®


MStar
semiconductor

 ANALOG
DEVICES

 REALTEK

MPEG-H TV Audio System

MPEG-H Audio TVs in Europe

Example: Elkjop Megastore, Oslo



MPEG-H Audio

Content Production from “Stereo” to “Immersive”

- **Stage 1:** Stereo and 5.1 with pre-defined and static setups
 - No metadata in the workflow (pre-defined in the encoder)
 - No need for metadata in the workflow

- **Stage 2:** Stereo and 5.1 with flexible setups and dynamic updates
 - Setups selected and defined through authoring
 - Dynamic metadata delivered with PCM (on SDI or file-based)

- **Stage 3:** Immersive, Object Based Audio (OBA) production
 - Authoring and Monitoring tools for 3D audio and OBA
 - Dynamic metadata delivered with PCM audio

MPEG-H Audio

Summary

- Open Standard
- Unique Features
 - Detached UI Manager
 - Immediate Playout Frames
 - Robust Metadata Transport using the Control Track
- Implementations are on the market
- The only Next Generation Audio system which is used in a regular 24/7 service worldwide

⇒ **It is time to take the next step for audio in broadcast!**
The MPEG-H TV Audio System is ready.