

3DTV and Beyond



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ENABLING 3DTV



COMPELLING 3DTV

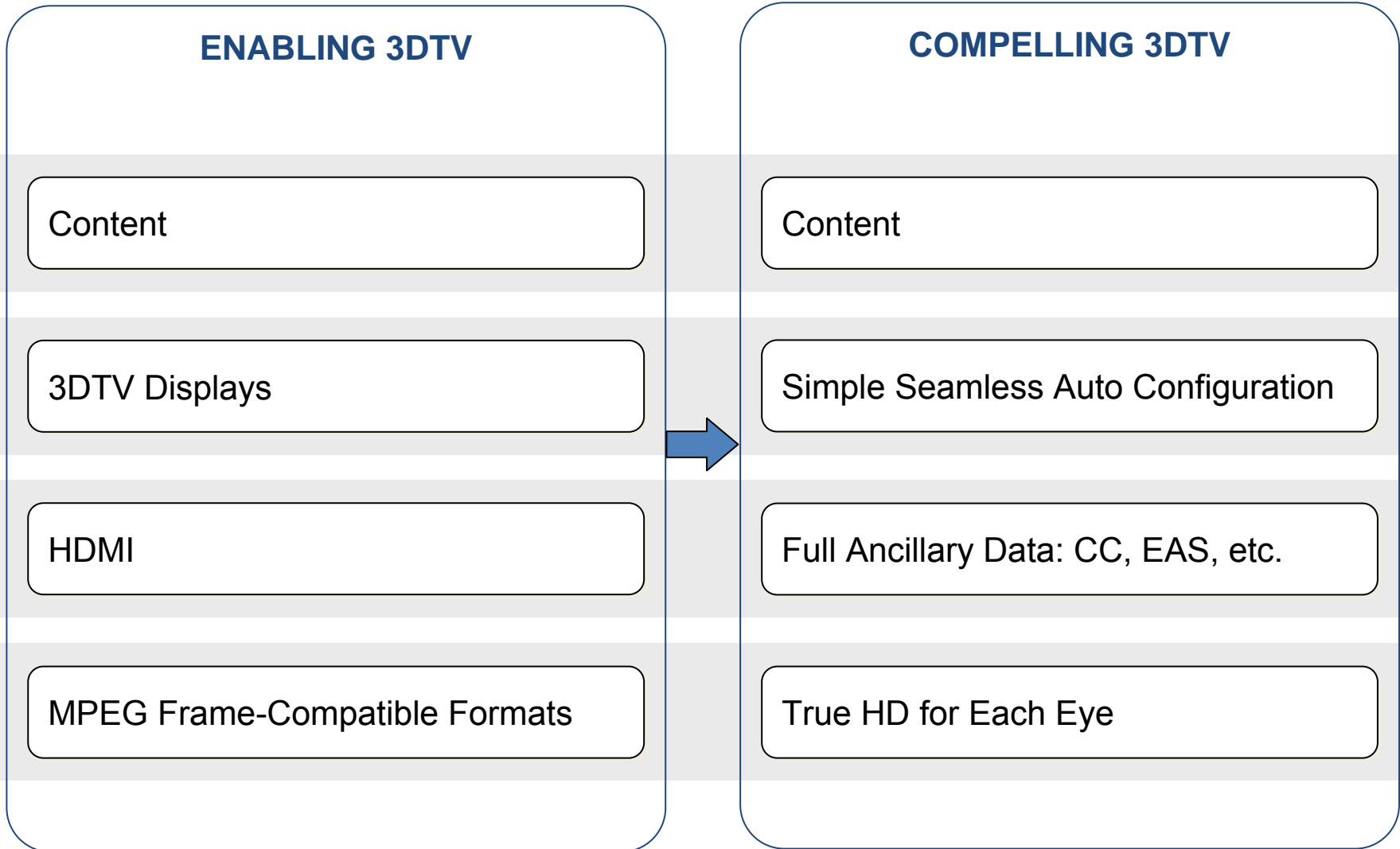
State of 3DTV Today -- Enabling

New Steps Towards Compelling 3DTV

Compelling 3DTV = Compelling Video Quality

Summary

Overview: 3DTV grows up



Enabling 3DTV – Display Technology



- Flat panel displays improve
- Support high input frame rates
- Support high output frame rates
- Incorporate eye-selective capabilities
 - active, passive and micro polarization
 - frame-sequential
 - autostereoscopic
- Enables a smooth 3D perception



The wrong physics for 3DTV



The right physics



Enabling 3DTV – Frame-Compatible Formats

MPEG4/AVC
amended to include
**Frame Packing Arrangement SEI
Message**

HDMI
versioned to support
Frame-Compatible Formats



Side-by-Side



Over-Under

“Panels”

Enables 3D to be packed into 2D frames
Enables 3D to be delivered over 2D infrastructure

Enabling 3DTV -- 3D over 2D Infrastructure

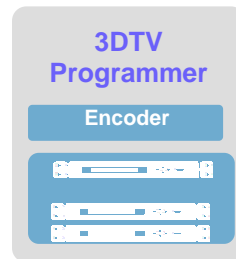
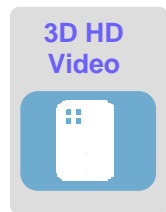


Sources

Encoders

Consumer STB

Consumer TV



Frame-compatible formats leverage existing Infrastructure

3D HD Source

Panels

Standard Encoder

MPEG-4 HD

Updated for SEI bits

Standard STB

Updated HDMI signaling

3D Enabled TV

Updated HDMI signaling

Overview: 3DTV grows up



ENABLING 3DTV

Content

3DTV Displays

HDMI

MPEG Frame-Compatible Formats

COMPELLING 3DTV

Content

Simple Seamless Auto Configuration

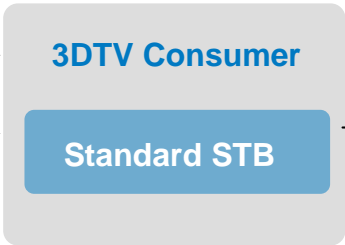
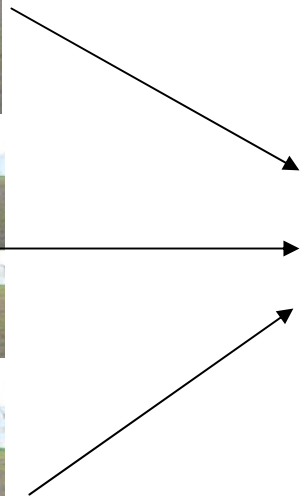
Full Ancillary Data: CC, EAS, etc.

True HD for Each Eye

3DTV set-up is complicated



Multiple Input Formats



Multiple Menu Options



Multiple Remotes



Multiple Input Formats



- 3D format auto detection
- Content reformatting
- MPEG-4 and MPEG-2



DCX Series



- seamless emergency broadcast messages
- seamless closed captioning
- seamless on-screen displays while 3D video is playing
- seamless 2D-3D channel changes

Compelling 3DTV – Full HD per Eye



Simulcast



L



R



Full HD per Eye

1080p60 Panels



L



R



Full HD per Eye



MPEG4/AVC
amended to include
Multi-View Coding (MVC)

MPEG4/AVC
amended to include
Stereo High Profile

**Provides support for
full resolution 3D**

**Provides support for
interlace & progressive 3D**

MPEG4/AVC



Base



Enhancement



Full HD per Eye

Compelling 3DTV = Compelling Video Quality!



SE6000 Encoder



Improved Distribution



Great Consumer Experience

Key Questions for Improved Video Quality

- What is the minimum operational bit rate needed to produce great quality?
- What is standing in the way of better quality?

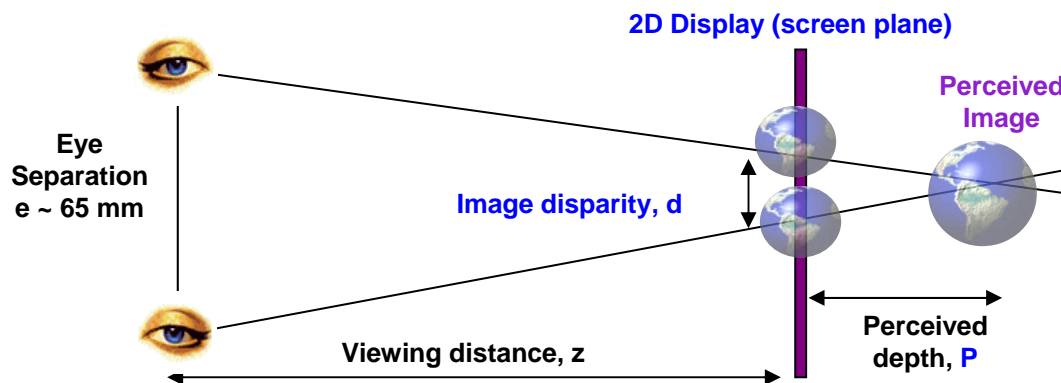


3DTV

2DTV

Sharpness
Motion Blur
Motion Stutter
Motion Stickiness
“Mosquito” Noise

Viewing-Position Distortion
Vergence-Accommodation Strain
Fatigue
Cross Talk
Vertical Alignment



Compelling 3DTV – Video Quality Standards Gap



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Rec. ITU-R BT.500-12

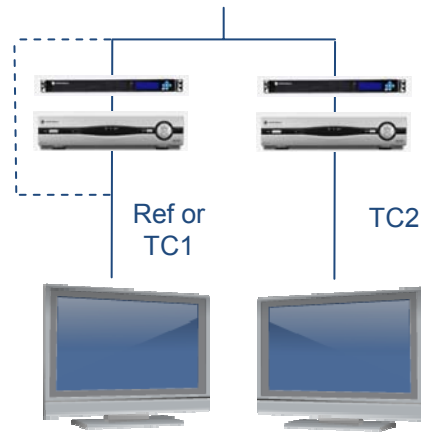
TABLE 2

Selection of test methods

Assessment problem	Method used	Description
Measure the quality of systems relative to a reference	Double-stimulus continuous quality-scale (DSCQS) method ⁽¹⁾	Rec. ITU-R BT.500, § 5
Measure the robustness of systems (i.e. failure characteristics)	Double-stimulus impairment scale (DSIS) method ⁽¹⁾	Rec. ITU-R BT.500, § 4
Quantify the quality of systems (when no reference is available)	Ratio-scaling method ⁽²⁾ or categorical scaling (under study)	Report ITU-R BT.1082
Compare the quality of alternative systems (when no reference is available)	Method of direct comparison, ratio-scaling method ⁽²⁾ or categorical scaling (under study)	Report ITU-R BT.1082
Identify factors on which systems are perceived to differ and measure their perceptual influence	Method under study	Report ITU-R BT.1082
Establish the point at which an impairment becomes visible	Threshold estimation by forced-choice method or method of adjustment (under study)	Report ITU-R BT.1082
Determine whether systems are perceived to differ	Forced-choice method (under study)	Report ITU-R BT.1082
Measure the quality of stereoscopic image coding	Double stimulus continuous quality-scale (DSCQS) method ⁽³⁾	Rec. ITU-R BT.500, § 5
Measure the fidelity between two impaired video sequences	Simultaneous double stimulus for continuous evaluation (SDSCE) method	Rec. ITU-R BT.500, § 6.4
Compare different error resilience tools	Simultaneous double stimulus for continuous evaluation (SDSCE) method	Rec. ITU-R BT.500, § 6.4



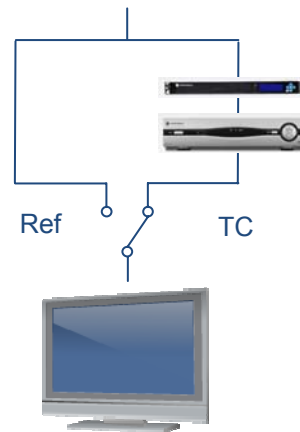
Double-stimulus tests



Simultaneous

SDSCE

Fidelity between signal and reference or other signal



Sequential

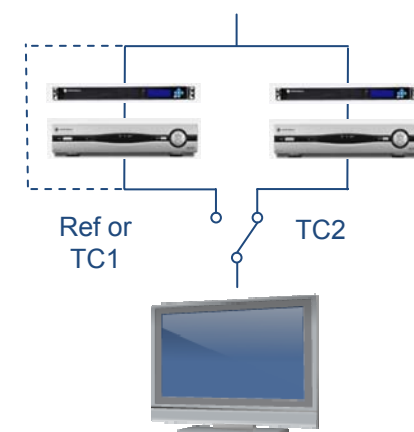
DSIS

For failure characteristics

DSCQS

For quality relative to a reference

Single-stimulus tests



Sequential

SS-ACR

For quantifying quality of various systems & test conditions

model for home viewing experience



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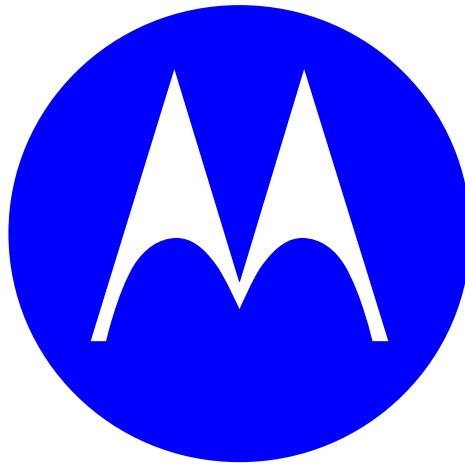
COMPELLING 3DTV

3DTV can (and is) being delivered over existing infrastructure

New consumer TV equipment creates a seamless 3DTV experience

3DTV is already moving toward higher resolution and better quality

Address the Standards Gap : Compelling 3DTV = Compelling Video Quality



Thank you