



UHD TV ECOSYSTEM REFERENCE DIAGRAM

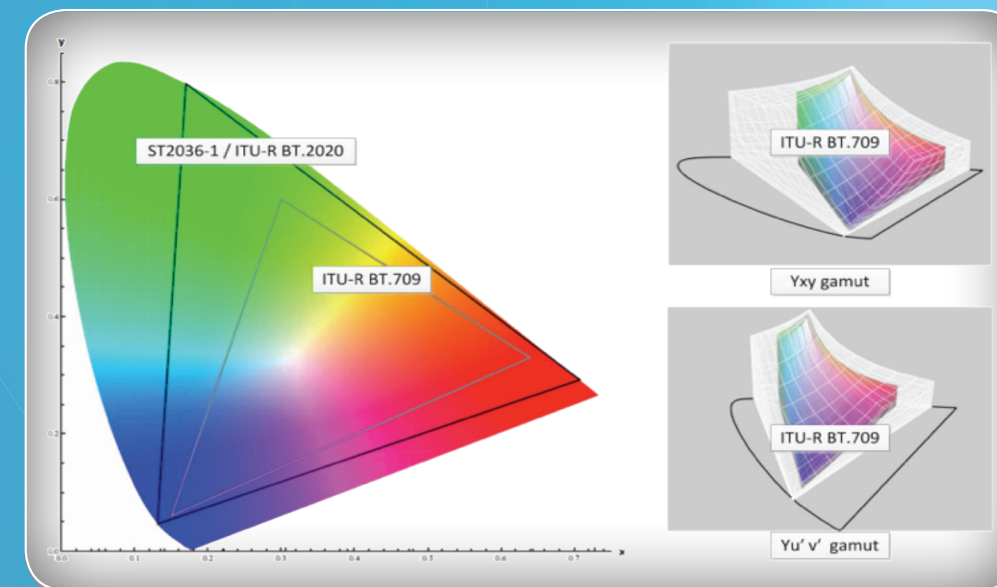
Based on the Final Report of the UHD TV Ecosystem SMPTE Study Group

System Category	System Nomenclature	Luma or RGB samples per line	Lines per frame	Frame rate (Hz)
UHD TV 1	3840 x 2160/23.98/p	3840	2160	24/1.001
	3840 x 2160/24/p	3840	2160	24
	3840 x 2160/25/p	3840	2160	25
	3840 x 2160/29.97/p	3840	2160	30/1.001
	3840 x 2160/30/p	3840	2160	30
	3840 x 2160/50/p	3840	2160	50
	3840 x 2160/59.94/p	3840	2160	60/1.001
	3840 x 2160/60/p	3840	2160	60
	3840x2160/100/p	3840	2160	100
	3840x2160/119.88/p	3840	2160	120/1.001
UHD TV 2	3840 x 2160/120/p	3840	2160	120
	7680 x 4320/23.98/p	7680	4320	24/1.001
	7680 x 4320/24/p	7680	4320	24
	7680 x 4320/25/p	7680	4320	25
	7680 x 4320/29.97/p	7680	4320	30/1.001
	7680 x 4320/30/p	7680	4320	30
	7680 x 4320/50/p	7680	4320	50
	7680 x 4320/59.94/p	7680	4320	60/1.001
	7680 x 4320/60/p	7680	4320	60
	7680x4320/100/p	7680	4320	100

Image sample structures and frame rates of UHD TV systems

Dimensions in meters unless otherwise specified						
Screen Diagonal	Screen Width	Screen Height	Distance to Center Viewer	Width of Viewer	Side Viewer Normal to Far Edge of Screen	Worst-Case Viewing Angle (degrees)
120"	2.66	1.50	2.25	0.67	2.00	41.63
90"	2.00	1.13	1.69	0.67	1.67	44.70
60"	1.33	0.75	1.13	0.67	1.34	49.88

Critical Viewing Distances



UHD TV Supported Color Gamut in both x,y and u,v

	CIE x	CIE y
Red Primary	0.708	0.292
Green Primary	0.170	0.797
Blue Primary	0.131	0.046
Reference White	0.3127	0.3290

UHD TV reference primaries and reference white

Note: These values are consistent with Rec. ITU-R BT.2020. Conventional reference primaries consistent with Recommendation ITU-R BT.709 may be optionally used by UHD TV1 up to a frame rate of 60Hz.

Television Resolutions Relative to UHD TV

Standard-definition television (SDTV)

480p (720x480)

576p (720x576)

High-definition television (HDTV)

720p (1280x720)

1080i (1920x1080)

1080p (1920x1080)

Ultra-high-definition television (UHD TV)

2160p (3840x2160) (UHD TV1)

4320p (7680x4320) (UHD TV2)

SMPTE UHD TV Standards

SMPTE ST 425-3:2014

Image Format and Ancillary Data Mapping for the Dual Link 3 Gb/s Serial Interface

SMPTE ST 425-4:2012

Dual 3 Gb/s Serial Digital Interface for Stereoscopic Image Transport

SMPTE ST 425-5:2014

Image Format and Ancillary Data Mapping for the Quad Link 3 Gb/s Serial Interface

SMPTE ST 425-6:2014

Quad 3 Gb/s Serial Digital Interface for Stereoscopic Image Transport

SMPTE ST 435:2012 (3 Parts)

10.6921 Gb/s Serial Signal/Data Optical Interface

SMPTE ST 2036-1:2013

Ultra High Definition Television — Image Parameter Values for Program Production

SMPTE ST 2036-2:2012

Ultra High Definition Television — Audio Characteristics and Audio Channel Mapping for Program Production

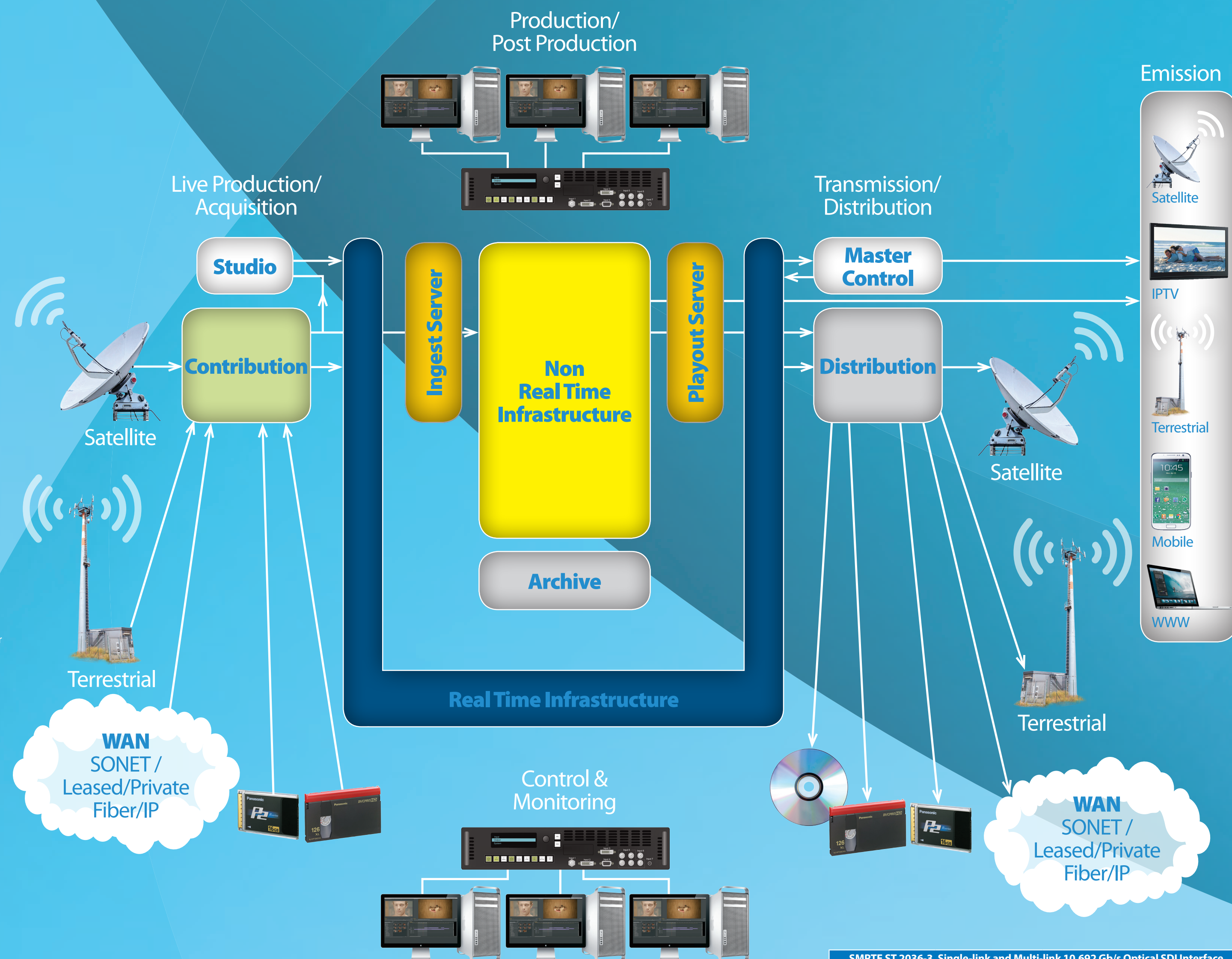
SMPTE ST 2036-3:2012

Ultra High Definition Television — Mapping into Single-link or Multi-link 10 Gb/s Serial Signal/Data Interface

Other UHD TV Standards

Recommendation ITU-R BT.2020 (2012)

Parameter values for ultra-high-definition television systems for production and international programme exchange



Interfaces

Multi-link 3G SDI			
For 2D image formats with nominal payloads of up to 10Gb/s			
Image Format	Frames per Second (nominal)	SDI Standard	
		10-bit 4:2:0 10-bit 4:2:2	12-bit 4:2:0 12-bit 4:2:2 12-bit 4:4:4 10-bit 4:4:4(4)
UHD TV1	50, 60	ST 425-5 Quad Link 3G	
	24, 25, 30	ST 425-3 Dual-link 3G	ST 425-5 Quad-link 3G

Note: Both optical fiber and coaxial cable based interfaces are defined.

Proposed Single-link and Multi-link 6G SDI			
Proposed single-link, dual-link and quad-link 6G SDI standards for 2D image formats with nominal payloads of up to 20 Gb/s			
Image Format	Frames per Second (nominal)	Proposed SDI Standard	
		10-bit 4:2:0 10-bit 4:2:2	12-bit 4:2:0 12-bit 4:2:2 12-bit 4:4:4 10-bit 4:4:4(4)
UHD TV2	24, 25, 30	ST 2081-12 Quad-link 6G SDI	
UHD TV1	100, 120		
UHD TV1	50, 60	ST 2081-11 Dual-link 6G SDI	ST 2081-12 Quad-link 6G SDI
	24, 25, 30	ST 2081-10 Single-link 6G SDI	ST 2081-11 Dual-link 6G SDI

Note: Both optical fiber and coaxial cable based interfaces are defined.

Proposed Single-link and Multi-link 12G SDI			
Proposed single-link, dual-link and quad-link 12G SDI standards for 2D image formats with nominal payloads of up to 40 Gb/s			
Image Format	Frames per Second (nominal)	Proposed SDI Standard	
		10-bit 4:2:0 10-bit 4:2:2	12-bit 4:2:0 12-bit 4:2:2 12-bit 4:4:4 10-bit 4:4:4(4)
UHD TV2	50, 60	ST 2082-12 Quad-link 12G SDI	
UHD TV2	24, 25, 30	ST 2082-11 Dual-link 12G SDI	ST 2082-12 Quad-link 12G SDI
UHD TV1	100, 120		
UHD TV1	50, 60	ST 2082-10 Single-link 12G SDI	ST 2082-11 Dual-link 12G SDI
	24, 25, 30	ST 2082-10 Single-link 12G SDI	ST 2082-10 Dual-link 12G SDI

Note: Both optical fiber and coaxial cable based interfaces are defined.

Proposed Single-link and Multi-link 24G SDI			
TC-32NF is tasked with developing standards for 2D image formats with nominal payloads up to 144 Gb/s			
Image Format	Frames per Second (nominal)	Proposed SDI Standard	
		10-bit 4:2:0 10-bit 4:2:2 10-bit 4:4:4	12-bit 4:2:0 12-bit 4:2:2 12-bit 4:4:4 10-bit 4:4:4(4)
UHD TV2	100, 120	ST 2083-12 Quad-link 24G SDI	ST 2083-13 Octa-link 24G SDI
UHD TV2	50, 60	ST 2083-11 Dual-link 24G SDI	ST 2083-12 Quad-link 24G SDI
UHD TV2	24, 25, 30	ST 2083-10 Single-link 24G SDI	ST 2083-11 Dual-link 24G SDI
UHD TV1	100, 120		
UHD TV1	24, 25, 30, 50, 60		ST 2083-10 Single-link 24G SDI

Note: Both optical fiber and coaxial cable based interfaces are defined.

SMPTE ST 435 Single-link 10.692 Gb/s Optical SDI Interface			
The single 10.692Gb/s optical SDI interface supports 2D image formats with nominal payloads of up to 9 Gb/s			
Image Format	Frames per Second (nominal)	Proposed SDI Standard	
		10-bit 4:2:0 10-bit 4:2:2 10-bit 4:4:4	12-bit 4:2:0 12-bit 4:2:2 12-bit 4:4:4 10-bit 4:4:4(4)
UHD TV1	24, 25, 30		ST 435-1 Single-link 10G

Proposed 25 Gb/s Optical SDI Interface			
Proposed SMPTE ST 2062 supports 2D image formats with nominal payloads of up to 18 Gb/s			
Image Format	Frames per Second (nominal)	Proposed SDI Standard	
		10-bit 4:2:0 10-bit 4:2:2 10-bit 4:4:4	12-bit 4:2:0 12-bit 4:2:2 12-bit 4:4:4
UHD TV2	24, 25, 30		ST 2062-1 Single-link 25G

SMPTE is the preeminent standards development body in the motion imaging and media industry. SMPTE Standards help the industry make the connection between the development of key media technologies and the business drivers that facilitate interoperability and industry growth. Join the SMPTE standards process and participate in the development of future standards. To learn more about SMPTE Standards Committees go to <https://www.smpte.org/standards/engineering-committees>. The UHD TV ecosystem study group report is available on the smpte website at <https://www.smpte.org/standards/reports>. Information provided in this wall chart is subject to change. Published July 2014.



Adobe

