

TECHNICAL
APPLICATION NOTE

TN1000-125



SENSIO®

CONFIGURATION FOR QUINCUNX SIGNALLING
IN DVB-3DTV & HDMI 1.4a



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CONTEXT

FRAME-COMPATIBLE PLANO-STEREOSCOPIC 3DTV VIDEO FORMAT

A frame-compatible plano-stereoscopic video format means that the left-eye and right-eye images are arranged in a spatial multiplex resulting in a composite image that can be treated like a conventional HDTV image by the receiver demodulator and compression decoder.

This application note provides signalling information for quincunx pixel sampling in the side-by-side frame-compatible video format. This 3DTV signalling format is one of the possible formats that can be compressed and signalled using H.264/AVC¹ video coding and that can be carried and signalled over an HDMI V1.4² connection. This application note also supplements Annex H of the *DVB specification for the use of Video and Audio coding in Broadcasting Applications based on the MPEG-2 Transport Stream*³ and Annex A of the *DVB Frame Compatible Plano-Stereoscopic 3DTV*⁴ document.

NOTE: The diagrams contained in this document are for illustrative purposes only and are not intended to accurately depict video resolution or aspect ratio.

REFERENCES

1. ITU-T Recommendation H.264 / ISO/IEC 14496-10:201x: "Information technology - Coding of audio-visual objects- Part 10: Advanced Video Coding"
2. High-Definition Multimedia Interface Specification Version 1.4a. March 4, 2010
3. ETSI TS 101 154 V1.10.1 (2011-XX), "Digital Video Broadcasting (DVB); Specification for the use of Video and Audio Coding in Broadcasting Applications based on the MPEG-2 Transport Stream"
4. ETSI TS 1xx xxx , "Digital Video Broadcasting (DVB); Frame Compatible Stereoscopic 3DTV"



QUINCUNX SIDE-BY-SIDE COMPATIBLE VIDEO FORMAT

Quincunx side-by-side format is defined as the arrangement of the frame-compatible spatial multiplex such that the horizontally anamorphic left-eye picture is placed in a spatial multiplex to occupy the first half of each line, and the right-eye picture is placed in the spatial multiplex to occupy the second half of each line.

Figure 1 depicts how quincunx side-by-side formatted frame-compatible plano-stereoscopic video is generated.

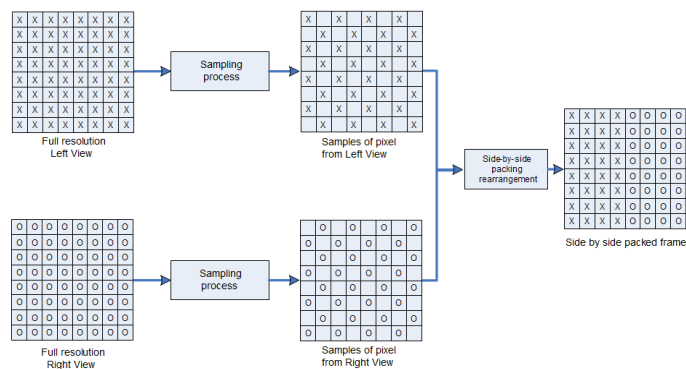


Figure 1 – Quincunx side-by-side video frame composition

As shown, the process uses simultaneous vertical and horizontal sub-sampling. With this technique, half the pixels of each source channel are retained in their original state or minimally altered if a pre-filter is applied. The first pixel of the left view is an odd sample and the first pixel of the right view is an even pixel.

The quincunx side-by-side frame-compatible 3DTV video frame has the same format as a conventional HDTV video frame.



QUINCUNX SIDE-BY-SIDE VIDEO FORMAT SIGNALLING

EBU / DVB / ETSI Standard:

Notwithstanding the following, the prescriptions of ETSI TS 101 154 (Annex H) apply. In particular, all combinations of resolution and frame rates specified in Table H.1 shall be supported.

When quincunx side-by-side video format is used, encoders shall set the following frame packing arrangement SEI parameters as follows:

frame_packing_arrangement_type shall be '3'

quincunx_sampling_flag shall be '1'

HDMI 1.4a Specifications:

In order to comply with quincunx side-by-side video format signalling, HDMI sync devices are required to specify supported sub-sampling via 3D_Detail_X in EDID according to Table H-8 of the HDMI Specification. If the HDMI sync device proposes any of the following values: '0000', '0110' and '1000' in 3D_Detail_X, decoders shall recognize and support the *frame_packing_arrangement* parameter values defined above.

When outputting a quincunx side-by-side video format over HDMI, decoders shall set the HDMI Infoframe parameters as follows:

3D_Structure shall be '1000' (Side by side half)

3D_Ext_Data shall be '0101' (Quincunx Odd-Even)

Table H-2 3D_Structure

3D_Structure	Meaning
0000	Frame packing
0001	Field alternative
0010	Line alternative
0011	Side-by-Side (Full)
0100	L + depth
0101	L + depth + graphics + graphics-depth
0110	Top-and-Bottom
0111	Reserved for future use.
1000	Side-by-Side (Half) (See Table H-3)
1001 ~ 1110	Reserved for future use.
1111	Not in use

Table H-3 3D_Ext_Data -- Additional video format information for 3D_Structure = 1000

3D_Ext_Data	Meaning	
00XX (0000, 0001, 0010, 0011)	Horizontal sub-sampling	
0100	Quincunx matrix	Odd/Left picture, Odd/Right picture
0101		Odd/Left picture, Even/Right picture
0110		Even/Left picture, Odd/Right picture
0111		Even/Left picture, Even/Right picture
1000 ~ 1111	Reserved	

If the HDMI sync device does not propose any of the following values: '0000', '0110' and '1000', the 3D_Ext_Data shall be left '0000'.