



3D TV and the DVB Project

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Chair CM-3DTV



Who is doing what?

- DVB developing broadcast signal formats for 3D TV
- SMPTE developing a 'file format' for 3D TV production.
- IEC/ISO developing compression systems for 3D TV delivery
- ITU-R looking for worldwide Recommendations for 3D TV
- Who is looking at production grammar?




What are Commercial Requirements?

- Factors likely to affect or determine the success of the system.
- Issues such as cost, features, complements
- Essentially answer the question ‘what does the system need to do to be successful’?
- DVB Process = CM → TM → CM

ITU-R boxes....

Matrix of signal formats for 3DTV

Compatibility level

	 Conventional HD Service Compatible (CSC) Level 4	2D HD + MVC³ (i.e. MVC) (L, R formed by matrixing)	2D HD + MVC⁴ (i.e. MVC) (Depth, occlusion, transparency data)	
	HD Frame-Compatible Compatible (FCC) Level 3	Frame compatible plus MPEG resolution extension, for example SVC ⁵		
	Conventional HD Frame Compatible (CFC) Level 2	Frame compatible (L, R in same HD frame)		
	Conventional HD Display Compatible (CDC) Level 1	Optimized colour anaglyph		
		Plano-stereoscopic profile 1st generation 3DTV	Multiview profile 2nd generation 3DTV	Object wave profile 3rd generation 3DTV
	Generation profile 			

First Gen. 3D TV = L ,R images



L ,R and Frame alternate display





Understand in depth?

- Object projected forward of the screen plane = '**negative parallax**' (right eye object on the left side of left eye object)
- In the screen plane = '**zero parallax**'
- Behind the screen plane = '**positive parallax**' (right eye object on the right side)

The fusing process is not for everyone...

- First Generation 3D TV provides no (object wave) phase information. One less depth cue than in natural vision.
- Viewers of 3DTV need to separate pointing and focusing.
- Some people do it easily, but a proportion of the public finds it difficult to do so, and to fuse the L and R images, or suffers from eye discomfort doing it after a time.

Steps to 3D TV Heaven?

- Conventional Receiver Compatible (colour anaglyph). 'ITU Level 1'

Red/Cyan anaglyph



Yellow/Dark Blue anaglyph



DVB CM-3DTV

- **No commercial demand for an ‘anaglyph’ system** identified, which in any event would not need additional standardization.
- 3D TV commercial requirements fall into two major groups.
- The first group (Phase 1) is the largely but not exclusively **Pay-TV** group. Their main need is to preserve the use of existing set to boxes in the 3D TV environment. A modest software up-grade if needed would be OK.
- The second group (Phase 2) is the largely but not exclusively **Free-to-air** group. A possible need is for existing 2D receivers to be able to watch a 2D version without needing an additional broadcast channel for a simulcast.

Where is 3D TV Heaven?

- Conventional Receiver Compatible (colour anaglyph)
- **DVB Phase 1.** Frame, or existing set top box, Compatible (SbS, TaB, ..)
- Broadcast signal needs to pass through the STB. Unraveling L and R done in the display.
- Signal from STB passes via an HDMI connector.
- Broadcast signal must be what the HDMI can handle.

SbS (suits interlace)



TaB (suits progressive)



The HDMI 1.4a mandatory options

(Hitachi, Panasonic, Philips, Silicon Image, Sony, Technicolor, Toshiba)

- Frame Compatible 3D TV : 720p/50,60 TaB, 1080p/24 TaB, and 1080i/25, 30 SbS .

The HDMI 1.4a mandatory options

(Hitachi, Panasonic, Philips, Silicon Image, Sony, Technicolor, Toshiba)

- Frame Compatible 3D TV : 720p/50,60 TaB, 1080p/24 TaB, and 1080i/25, 30 SbS.
- Non Frame Compatible 3D TV: 720p/50, 60, and 1080p/24.

Step 3 to 3D TV Heaven

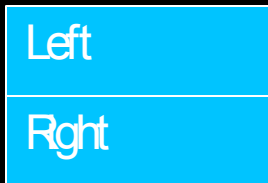
- Conventional Receiver Compatible (colour anaglyph)
- Frame, or existing set top box, Compatible (SbS, TaB). DVB Phase 1
- FC with enhancement . **DVB Phase 2**
- Service Compatible (MVC,) **DVB Phase 2.**
- DVB Phase 2 broadcasts will need to generate in the STB what HDMI can handle if first generation displays are to be used.

The Blu Ray way...

- Blue Ray uses a 'service-compatible' 3D TV format.
- The recorded signal is an AVC 2D image plus an 'MVC' extension which can be combined to create L and R images, at 1080p24.
- The L and R signals pass over the HDMI 1.4a connector to the 3D display

Frame Compatible Options ('Phase 1')

- The L and R pictures fit into an HDTV frame, and are thus receivable by standard STBs
- Three basic options: Side by Side, Top and Bottom, and Offset sub-sampled combinations.
- These all have reduced 'spectral occupancy' compared to normal HD
- The fused L and R pictures have a higher quality than the two separate pictures.



Phase 2

- The new set top box phase
- One basic concept can be **'2D plus something'**.
- The simplest type of 'something' is a complete second channel (100% overhead?)
- There are a number of other options, some proprietary and some not, for the 'something' signal (that need less overhead?).
- One option is to use the MPEG 4 AVC system, which will be used by Blu Ray. This would need about 40-80% additional bit rate for the 'something' signal.
- Another option is to provide a Frame Compatible signal plus an enhancement signal.
- What do you want to be compatible with – 2D reception or Phase 1 reception
- Can result in two 'full spectral occupancy' HD quality signals for the Stereo Pair.

Requirements for **Frame Compatible** services

- **Signaling**
 - Should provide what HDMI needs (format etc)
 - Should allow for future growth (e.g. top up signals)
 - Signaling has to 'pass through' to the display.
- **Captioning, subtitles, and multimedia**
 - DVB subtitles
 - Careful display of subtitles and multimedia

A bit of the artistic stuff now.

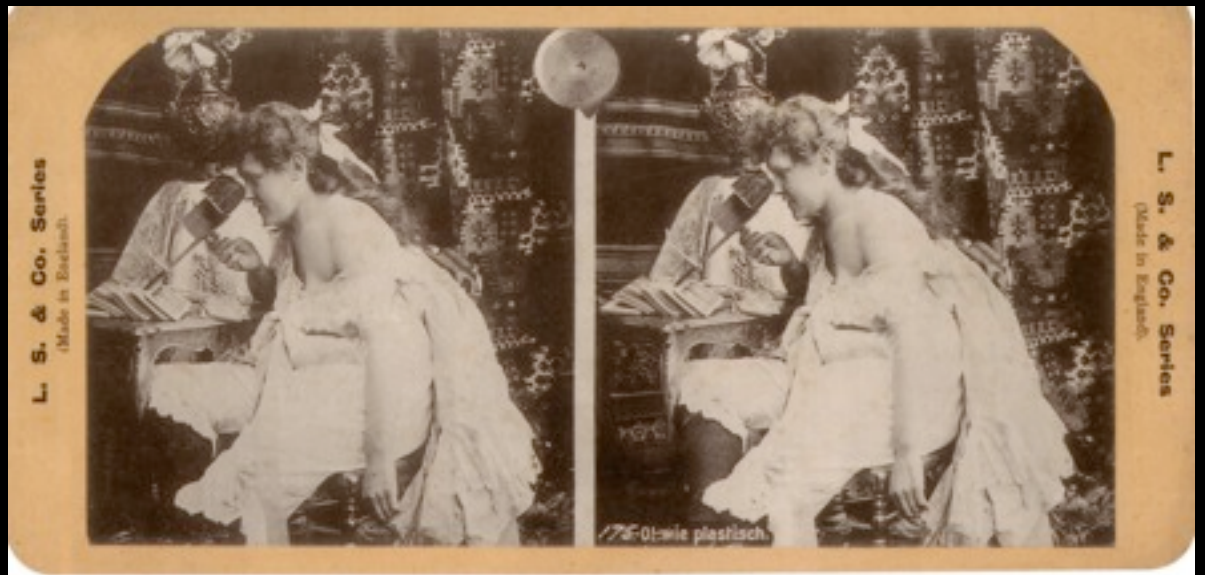
What kind of programmes are right for 3D TV?

- Particular type of shot composition and camera lens works best.
- In principle, content which the viewer wants to experience rather than observe.
- Many effects can lead to 'non real life' perception: puppet theatre effect, card-boarding, elongation, giants eye view, cyclorama background.....

Shot composition

Can we learn from the past?







64 Discussing the Strategist's Coup.



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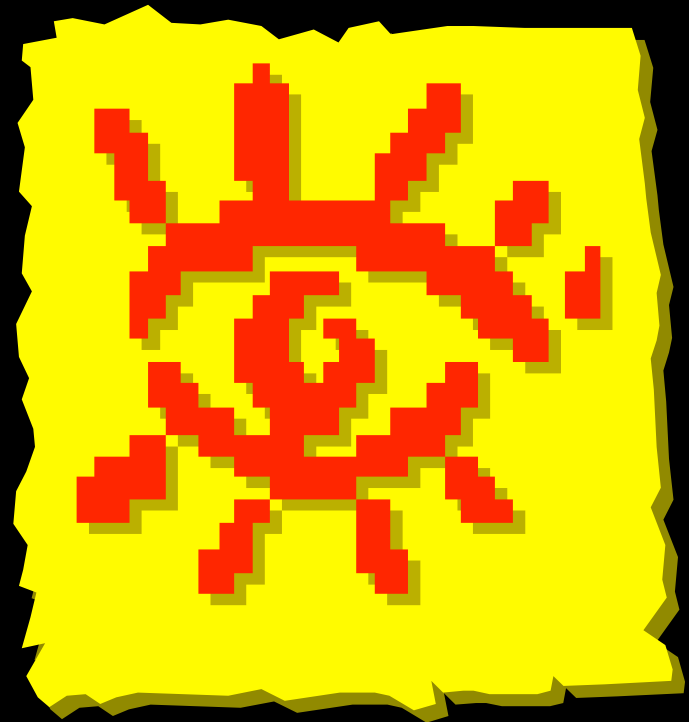
64 Ready! One, Two, —

3D suits.....

- 'POV' shots
- Medium shots with wide lenses
- constrained depth range
- key object close to screen plane.
- soap operas?
- newscasts?
- close up sports?
- small canvas events?

Is there a risk of eye-discomfort ?

- Eyestrain is caused when the eyes are asked to do things they do not normally do.
- There can be many contributory factors; vertical mis-registration, retinal rivalry, and infinity divergence. It can be minimized.
- But one of them – the need to separate focus and pointing - is fundamental to the stereoscopic process. It can be minimized by careful production grammar.



The 2010 World Cup.



Conclusions

- There is a clear commercial requirement from Pay TV broadcasters for a 'Frame Compatible' 3D-TV system.
- The major things to be done are signalling and titles.
- HDMI allows SbS and TaB for Phase 1
- The specification should be possible this year (2010)
- For Phase 2, an 'enhancement' signal later to a Phase 1 signal would be an option.
- For Phase 2 a service compatible signal would be an option. Blu Ray has adopted a 'Service Compatible' system.
- **In 2009 fragmentation looked like a heavy ball and chain around the neck of 3D TV. Today, the 'chain' is a lot less heavy than it was.**



Many thanks to all CM-3DTV participants particularly Nigel Pankard (Secretary) and Sven Reuter (Mr Timeline)
Thank you for listening in depth

