



3D HDTV Under Consideration by Broadcasters Worldwide

Broadcasters all over the world are excited about the prospects of 3D HDTV for home viewing. While consumers are now able to purchase 3D-capable HDTV sets and can view a limited amount of 3D content from Blu-ray discs and multichannel video programming distributors (MVPDs, i.e., DBS satellite and cable systems), prospects for delivery via free over-the-air terrestrial services appear to be farther off.

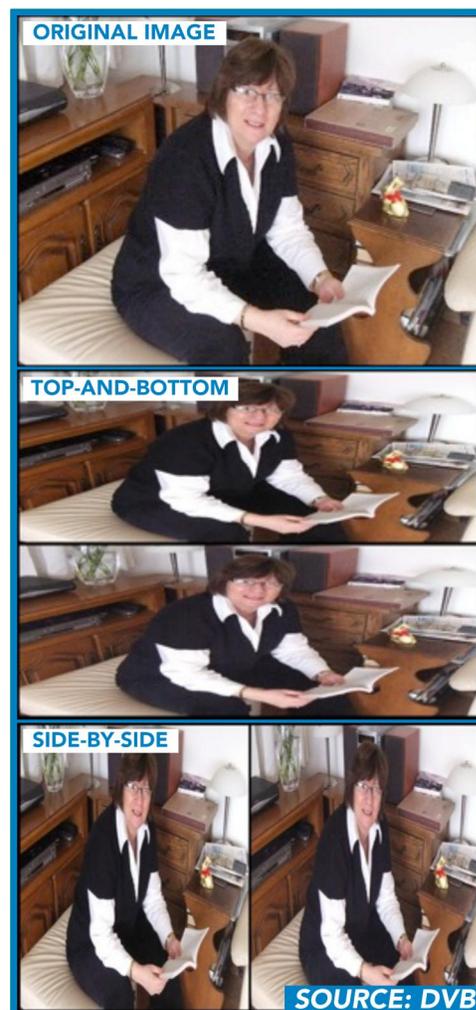
There have been a number of recent developments pertaining to 3D over broadcast, some of which are discussed below. A number of basic concepts and definitions are relevant to all of these:

- *Frame-compatible formats* — a frame-compatible 3D format is one that carries separate left and right video signals within the video frame used to convey a conventional (2D) high definition signal by squeezing them to fit within the space of one picture. The advantage of such a format is that it can be delivered through existing broadcast plants and equipment as if it were a 2D HDTV signal. Examples of side-by-side and top-and-bottom frame compatible signals are shown in the figure at the right. One disadvantage of this method is that the resolution of each image is reduced by approximately 1/2 compared to the original image (necessary so as to be able to “fit” the two images in the space of one).

The recent 3D coverage of the World Cup soccer tournament was done using the side-by-side frame compatible format (additional information on the World Cup 3D coverage is available at <http://v-net.tv/NewsDisplay.aspx?id=452>).

- *Color anaglyph format* — this is the familiar “red-blue” technique for creating a 3D image. More generally, two chromatically opposite colors are used to carry the left and right images simultaneously in each image. One advantage of the anaglyph format is that it is compatible with existing 2D HDTV displays. While broadcasters have occasionally aired 3D anaglyph commercials during special events (like the Super Bowl), anaglyph technology is not a contender for 3D services generally.

- *Active-shutter glasses* — most of the in-home 3D technologies currently being deployed rely on the use of active-shutter glasses as opposed to the passive, polarized 3D glasses typically used in movie theaters or the older-style red-blue anaglyph glasses. Active-shutter glasses utilize liquid crystal display (LCD) “shutters” which are under the control of the 3D source via a wireless link, either RF or infrared. One of the current issues regarding home 3D systems is the fact that each system uses a different and incompatible, active-shutter glasses technology.



ATSC activities – at the most recent meeting of the ATSC Board of Directors this past May, the ATSC Board formed “Planning Teams” to consider technical feasibility and market requirements in three key future technology areas, one of which is delivery of 3D content. The 3D TV Team (PT-1) will analyze and report on the likely benefits and limitations of a standard for terrestrial broadcast delivery of 3D TV. The team will be chaired by Craig Todd, Chief Technology Officer of Dolby Laboratories. Additional information on ATSC activities may be found on their Web site at www.atsc.org/.

Also, earlier this year at the 2010 NAB Show, there was a demonstration in the ATSC TechZone of 3D-TV using non real-time (NRT) services. This demonstration was conducted by a consortium of Korean Broadcasters, LG Electronics and Kyung Hee University, and included an end-to-end implementation of the NRT technology which is one of the core elements of ATSC 2.0 (see the [April 19, 2010 issue](#) of *TV TechCheck* for additional information).

DVB activities – another DTV standards development organization, the DVB project, is also undertaking a program of work expected to lead to standards for 3D-TV. Two groups of specialists have been established by DVB, the first to explore the commercial requirements for 3D-TV, and the second to respond with a technology that will meet the requirements. DVB indicates that the technical system, once agreed by all concerned, will be submitted for consideration to the ETSI and ITU.

David Wood from the EBU is chair of the commercial requirements group, which, in mid-July, released a commercial requirements document. Identified in this document (and given in the table below) are 20 specific commercial requirements (CRs) covering the areas for digital TV reception that they believe are needed to provide a user friendly, HDTV Frame Compatible service. A copy of the commercial requirements document is available for download on the Internet at www.dvb.org/technology/standards/a151_CR_for_DVB-3DTV.pdf.

A DVB webinar was given recently by David Wood in which he explains the various 3D-TV solutions and the next steps within the DVB Project. The webinar presentation as well as a video file archive of the webinar itself are available for download at www.dvb.org/news_events/news/3d-tv-webinar-now-availab/.

CR1	<i>3D-TV specifications shall provide “Frame Compatible” 3DTV Services over existing HDTV broadcast infrastructures.</i>	CR11	<i>The 3D-TV Specification should provide a mechanism to guide a receiver to optimally position on screen graphics within a stereoscopic view.</i>
CR2	<i>The 3D-TV specifications shall support various Frame Compatible 3D formats / structures as specified in the HDMI Specification.</i>	CR12	<i>The 3D-TV Specification shall support signaling of all the formats specified by CR 2.</i>
CR3	<i>The 3D-TV Specification should be extendible to support future frame compatible formats and phases of work to support “service compatible formats” and evolutions of 3D-TV technologies.</i>	CR13	<i>The 3D-TV specification signaling shall make provision for expansion to support the signaling of additional 3D encoding formats in the future</i>
CR4	<i>The 3D-TV Specification shall allow services which exclusively contain 3D-TV events / programs and those that are a mix of 3D-TV and 2D events / programs.</i>	CR14	<i>The 3D-TV Specification shall not prohibit future deployment of 3D enabled Integrated DTV sets that will decode and display 3D transmissions directly “off air”.</i>
CR5	<i>Provision should be made for a 3D receiver to identify 3D events that are available, for which EPG listings of 3D-TV content can be included.</i>	CR15	<i>While it is not expected that legacy receivers can sensibly render 3DTV Specification transmissions, the 3DTV Specification shall not have an adverse effect on such legacy receivers.</i>
CR6	<i>The 3D-TV Specification shall address frame compatible 3D-TV Services over HD broadcast infrastructures up to the point of reception by the digital receiver, but shall not address how the 3D transmission is displayed nor any technologies used to achieve 3D viewing effect.</i>	CR16	<i>It should be possible to signal that a 3D version of a 2D service or event is being simulcast, and vice-versa, together with information on where the simulcast can be found.</i>
CR7	<i>The 3DTV specification shall provide a mechanism for broadcasters to signal a position for DVB subtitles within a stereoscopic view.</i>	CR17	<i>It should be possible to include in the broadcast signal information about the pixel arrangement used to decimate the master HDTV full samples/line pictures to create the anamorphic version, if available.</i>
CR8	<i>The 3D-TV Specification shall use where possible, existing DVB subtitling specifications.</i>	CR18	<i>Signaling should be capable of being inserted at the point of transmission and the point of packaging.</i>
CR9	<i>Extensions to existing DVB Subtitling for 3D-TV shall be selected on the basis of simplicity. The DVB 3D subtitling solution shall introduce minimum additional complexity to existing DVB subtitling implementations and shall be backward compatible.</i>	CR19	<i>3DTV Specification systems shall support the signaling of all existing DVB audio types and codecs specified for TV services.</i>
CR10	<i>The 3D-TV specification shall allow 3D subtitles to the equivalent quality level as that of 2D subtitles.</i>	CR20	<i>Nothing proposed in the signaling or distribution video formats for the 3D-TV Specification should prevent future expansion to support new 3D encoding technologies.</i>

Australian White Paper on 3D — Australian company Broadcast Australia released in July a white paper which explores the challenge of establishing a 3D-TV environment for Australia, and highlighting the importance of laying the foundations to ensure the country’s free-to-air broadcasting infrastructure is ready to deliver new and unique digital content. Broadcast Australia (www.broadcastaustralia.com.au) provides fully managed transmission services for both analog and digital television and analog radio (including AM, FM and HF radio services) to its major customers: the Australian Broadcasting Corporation (ABC) and Special Broadcasting Service (SBS).

This white paper, entitled “3D or Not 3D: The Road Ahead for TV”, provides insight into the current 3D-TV environment, exploring the consumer proposition and drivers for deployment, as well as considering the various technology options, how they work, and what issues need to be addressed in order to make 3D-TV successful. A copy of this white paper is available for download at

www.broadcastaustralia.com.au/assets/files/White%20Papers/BA_3D_TV_WhitePaper.pdf.

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Papers accepted for presentation at the 2011 NAB Broadcast Engineering Conference will be eligible for the [NAB Best Paper Award](#). Established in 2010, the Best Paper Award honors the author(s) of a paper of exceptional merit published in the *NAB Broadcast Engineering Conference Proceedings*. The yearly proceedings, published as both a book and a CD-ROM is a compendium of these technical papers, and an important archive of the leading edge of broadcast engineering issues.

Proposals for technical papers submitted for the 65th annual [Broadcast Engineering Conference](#) will be accepted until the October 22 deadline. If you have any questions, contact John Marino, VP NAB Science and Technology at (202) 429-5346.