



**Technology Committee  
3D White Paper**



## Technology Committee 3D White Paper

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### Introduction

Nearly 50 years after the concept was first introduced, leading creatives and engineers are determined to elevate 3D – alongside color and sound – as an essential part of the motion picture process. The latest digital production and projection technologies are being utilized to make 3D the foundation for a number of new business opportunities – not just in animation and feature films – but in sports, concerts, video games and other popular media.

However, to create a truly seamless entertainment experience, 3D must be deployed “from the lens...to the living room.” To make this a reality, a number of systems are being developed, over a variety of platforms. While these various encoding and viewing techniques differ somewhat, their proponents agree that the quality and consistency of 3D motion pictures today differ greatly from the past. In fact, when properly implemented, the 3D experience can be a powerful one.

According to a recent survey conducted by USC’s Entertainment Technology Center in cooperation with the Consumer Electronics Association, more than 60 percent of consumers surveyed have already enjoyed a satisfying 3D experience in theaters. Equally important, many of these respondents look forward to having a similar type of experience at home.

All of this underscores the important role that standardization plays in the 3D marketing process and why the industry should set the right expectations when promoting 3D. In this regard, DEG: The Digital Entertainment Group has undertaken this white paper which briefly examines the numerous types of 3D delivery and display options available.

Following are proposals from some technology providers in the space, including: DDD, Dolby, Panasonic, Real D, Sensio and TDVision.

### **Description/Overview:**

DDD is a supplier of software and hardware content solutions for 3D consumer devices and has licensed its 3D technology to Sharp, Hyundai IT, Samsung, and Wistron (original design manufacturer for Dell, Acer, HP, and Sony.)

DDD endorses using the most appropriate 3D encoding solution for each distribution channel, similar to how 2D video for broadcast, mobile, and optical media are each currently packaged and delivered differently. DDD's currently deployed solutions support popular 3D encoding formats and are designed to accept new profiles to support future 3D encoding methods. DDD's technology supports open 3D formats, such as over/under, proprietary 3D formats, such as checkerboard, and works with glasses-based technologies.

DDD does not have a proprietary 3D encoding format, but instead works with CE manufacturers to build 3D decoding and real-time 2D to 3D conversion capabilities into consumer devices to support various 3D distribution formats.

# DEG CONSUMER 3D TEMPLATE - TriDef Digital 3D: DDD

**Characteristics:** (check all that apply to your format)

Image: Source		Stereo Pair	Image + Data			
		X				
Image: Format		Split Frame Side-by-side	Split Frame Checkerboard	Split Frame Over/under	Image + Data	Full Frame L/R Eyes
		X	X	X		
Image: Compression		MPEG-2	H.264	MVC	Proprietary	
		X	X			
Compatibility: 2D						
Compatibility: DVD (video/audio)		Existing players	Modified players			
		X				
Compatibility: DVD (menus/subtitles)		Existing players	Modified players			
Compatibility: Blu-ray (video/audio)		Existing players	Modified players			
		X				
Compatibility: Blu-ray (menus/subtitles)		Existing players	Modified players			
Compatibility: Broadcast (video/subtitles)		Existing receivers	Modified receivers			
		X				
Compatibility: Broadcast (menus/subtitles)		Existing receivers	Modified receivers			
Compatibility: Interconnect (Supports transport of signal)		Existing HDMI	Modified HDMI			
		X				
Compatibility: Interconnect (Supports automatic display configuration)		Existing HDMI	Modified HDMI		Other***	
Compatibility: Display Type (how data is rendered)		Existing Stereoscopic * (with glasses)	New Stereoscopic** (with glasses)	Autostereoscopic (without glasses)		
		X				

(\*) NOTE: 3D format is not compatible with 2D presentation (to provide 2D, separate graphics/subtitles/video/audio need to be provided)

(\*\*) NOTE: supports video/audio only and does not support menu/subtitles in their existing format

## Footnotes & Additional Questions:

\* Existing stereoscopic displays would include '3D Ready' 120Hz plasma or DLP, and polarized LCD displays. Appropriate active or passive glasses are required.

\*\* New stereoscopic would include as-yet unavailable commercially displays. Appropriate active or passive glasses would be required.

\*\*\* Other might include head-mounted displays.

## **DEG CONSUMER 3D TEMPLATE - TriDef Digital 3D: DDD**

**How do you see your system being deployed (currently and in within XX months) given compatibility issues,(e.g. decoder requirements, location of decoder (TV, Player, other), transcoding)?**

DDD doesn't rely on a proprietary format, so there are very few compatibility issues. DDD's technology is currently implemented in software for PC and mobile handset use, in FPGA form for TV integration, and in chip form for TV and set top box integration.

Here are DDD's 3D consumer device deployments within the past 15 months:

**April 2008** – Hyundai IT began selling 46" 3D LCD HDTVs throughout Japan. DDD implemented TriDef Digital 3D in an FPGA circuit board that was built into every TV. Japanese consumers can use these TVs to decode 3D content which is being broadcast in side-by-side format by Nippon BS Broadcasting on the BS11 channel. Current broadcast equipment is capable of transcoding stereo content into a side-by-side single HD frame for broadcast over a satellite network. The 3D decoder is built into the TV, so the consumer simply presses the 3D button on the TV's remote control and puts on the polarized glasses, and they're able to watch broadcast content in full color 3D.

**December 2008** – Hyundai IT began selling 32" 3D LCD HDTVs throughout Japan that use the same DDD technology as described above.

**January 2009** – Samsung exhibited the next generation "3D-Friendly" Plasma HDTVs at CES. DDD's 3D technology was licensed to Samsung in February 2008, the technology was implemented as an ASIC, and chip manufacturing began in July 2008. At CES, Samsung displayed the DDD chip's 2D to 3D conversion capability by plugging an Xbox into the TV and letting the DDD chip automatically convert Xbox games into 3D in real-time. The DDD chip handles 3D decoding of common formats such as side-by-side, above-below, horizontally interlaced, vertically interlaced, and checkerboard. 3D decoding and processing is built into the TV and 3D commands can be controlled by the TV's remote. Samsung has publicly stated that they plan on launching this product worldwide as early as August 2009.

**June 2009** – Acer premiered their new Aspire 3D laptop during Computex and indicated a launch date of October 2009. DDD technology is used on these laptops to play DRM-free 3D HD home video content encoded with industry standard tools and secured in a DDD file container.

**How does your system handle subtitles, closed captioning (for SD) and graphics given compatibility and/or potential dynamic 3D presentation issues?**

DDD's technology automatically detects subtitles and closed captioning and places them at the plane of the screen (i.e. zero depth.)

Currently, DDD's technology treats onscreen graphics the same as objects in the scene. Future implementations will be able to use metadata to appropriately handle onscreen graphics.

### **Description/Overview:**

Dolby Laboratories is a provider of a high resolution 3D solution that includes delivery and tool sets for the cinema. The Dolby 3D approach in the home is based on the following:

1. A logical tiered path from an infrastructure-friendly methodology to full resolution 3D
2. High resolution 3D that has compatibility with existing product base of players and displays
3. Forward looking interoperability with LCD, PDP and DLP displays, BD, set-top boxes and media players
4. Support for multiple distribution methods that include Blu-ray, Broadcast, Internet downloads, VOD and streaming
5. Use of advanced video codecs (H.264) to minimize bitrates

Dolby claims its 3D approach is flexible and does not require the introduction of new consumer electronics equipment, workflows or distribution channels for the initial deployment while offering improved performance for next generation devices.

# DEG CONSUMER 3D TEMPLATE - Dolby 3D: Dolby Laboratories

**Characteristics:** (check all that apply to your format)

<b>Image: Source</b>		<b>Stereo Pair</b>	<b>Image + Data</b>			
		X	X			
<b>Image: Format</b>		<b>Split Frame Side-by-side</b>	<b>Split Frame Checkerboard</b>	<b>Split Frame Over/under</b>	<b>Image + Data</b>	<b>Full Frame L/R Eyes</b>
		X <sup>1</sup>	X <sup>1</sup>	X <sup>1</sup>		X
<b>Image: Compression</b>		<b>MPEG-2</b>	<b>H.264</b>	<b>MVC</b>	<b>Proprietary</b>	
			X			
<b>Compatibility: 2D</b>						
<b>Compatibility: DVD (video/audio)</b>		<b>Existing players</b>	<b>Modified players</b>			
<b>Compatibility: Blu-ray (video/audio)</b>		<b>Existing players</b>	<b>Modified players</b>			
		X	X			
<b>Compatibility: Broadcast (video/audio)</b>		<b>Existing receivers</b>	<b>Modified receivers</b>			
		X <sup>2</sup>	X			
<b>Compatibility: Interconnect (Supports transport of signal)</b>		<b>Existing HDMI</b>	<b>Modified HDMI</b>			
		X	X			
<b>Compatibility: Interconnect (Supports automatic display configuration)</b>		<b>Existing HDMI</b>	<b>Modified HDMI</b>			
<b>Compatibility: Display Type (how data is rendered)</b>		<b>Existing Stereoscopic (with glasses)</b>	<b>New Stereoscopic (with glasses)</b>	<b>Autostereoscopic (without glasses)</b>		
		X	X			

## **Footnotes & Additional Questions:**

<sup>1</sup> Dolby's approach can use any one of the frame compatible systems

<sup>2</sup> Broadcast excluded, others may require updated firmware.

## **Considerations/Comments:**

The Dolby approach is not stereo display dependent and is compatible to existing 3D display formats.

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<sup>1</sup> Dolby's approach can use any one of the frame compatible systems

<sup>2</sup> Broadcast excluded, others may require updated firmware.

## **DEG CONSUMER 3D TEMPLATE – Panasonic**

### **Description/Overview:**

Panasonic is developing a full-HD(High Definition: 1920x1080) per eye solution for BD (Blu-ray Disc) based on MPEG-4 AVC MVC (Multi View Coding). Panasonic claims that this solution provides the best possible quality for home Stereoscopic viewing

This quality is achieved without requiring a 100 percent increase of bit-rate for 3D video compared to 2D video. Due to the utilization of the MVC video codec, the increase would be roughly 50 percent and is varied depending on the 3D content, therefore this allows that more than 2hrs of 3D movies can be recorded onto one 50GB disc.

This solution is fully backwards compatible and conventional 2D Blu-ray players will be able to play content and provide a full-HD 2D image.

# DEG CONSUMER 3D TEMPLATE – Panasonic

**Characteristics:** (check all that apply to your format)

Image: Source		Stereo Pair	Image + Data			
		X				
Image: Format		Split Frame Side-by-side	Split Frame Checkerboard	Split Frame Over/under	Image + Data	Full Frame L/R Eyes
						X
Image: Compression		MPEG-2	H.264	MVC	Proprietary	
				X		
Compatibility: 2D		Existing players				
		X				
Compatibility: DVD (video/audio)		Existing players	Modified players			
Compatibility: DVD (menus/subtitles)		Existing players	Modified players			
Compatibility: Blu-ray (video/audio)		Existing players	Modified players	Existing players (2D playback)		
			X	X		
Compatibility: Blu-ray (menus/subtitles)		Existing players	Modified players	Existing players (2D playback)		
			X	X		
Compatibility: Broadcast (video/subtitles)		Existing receivers	Modified receivers			
Compatibility: Broadcast (menus/subtitles)		Existing receivers	Modified receivers			
Compatibility: Interconnect (Supports transport of signal)		Existing HDMI	Modified HDMI			
			X			
Compatibility: Interconnect (Supports automatic display configuration)		Existing HDMI	Modified HDMI		Other***	
Compatibility: Display Type (how data is rendered)		Existing Stereoscopic * (with glasses)	New Stereoscopic** (with glasses)	Autostereoscopic (without glasses)		
		X <sup>1</sup>	X			

(1) Output video format from player is not in the scope of the format, assuming BD. Output video format conversion to accommodate interface to existing stereoscopic display may be varied depends on player implementation.

## Footnotes & Additional Questions:

\* Existing stereoscopic displays would include '3D Ready' 120Hz plasma or DLP, and polarized LCD displays. Appropriate active or passive glasses are required. It depends on capability of output video format conversion functionality on the 3D-BD player.

\*\* New stereoscopic would include as-yet unavailable commercially displays. Appropriate active or passive glasses would be required.

\*\*\* Other might include head-mounted displays.

## **DEG CONSUMER 3D TEMPLATE – Panasonic**

### **How do you see your system being deployed (currently and in within XX months) given compatibility issues, e.g. Decoder requirements, location of decoder (TV, Player, other) transcoding?**

Panasonic believes that this technology will be deployed with BD by 2010 and that the MVC decoder will be integrated within the BD Player. HDMI can be used to transport the baseband signal to the display. The bandwidth required for transport over HDMI is covered by the current HDMI spec and Panasonic anticipates that the modification for signaling a 3D signal can be done by a software update without requiring a hardware update.

### **How does your system handle subtitles, closed captioning (for SD) and graphics given compatibility and/or potential dynamic 3D presentation issues?**

Panasonic believes that: 1) subtitles and graphics will be rendered by the player and composited over video and 2) realtime (metadata) control will be given to the content author to help avoid 3D presentation issues.

#### **Instructions:**

- Complete table for current solution; optional table for future solution (within XX months)
- All information provided must be publicly available.

### **Considerations/Comments:**

Panasonic's proposed format realizes full HD(1920 x 1080 pixels) images to left eye and right eye from the source through display without degrading original 3D image quality. Panasonic is working hard to launch both 3D capable BD players and plasma displays in 2010. Panasonic believes that full-HD 3D solution will bring the ever best 3D experience to the home.

## **DEG CONSUMER 3D TEMPLATE - REAL D Multiplexed 3D Format**

### **Description/Overview:**

The REAL D Multiplexed 3D Format is designed to provide visually lossless transport of high resolution stereoscopic images through the current infrastructure of delivery for home entertainment. The format supports packaged media, broadcast, cable, and satellite delivery schemes to the home.

The Format is derived by multiplexing two full resolution images into a single image that has the attributes of a normal image. This allows the multiplexed frame to be handled by the existing cable, broadcast, disk I/P and satellite infrastructure. The format is created by using quincunx sampling to remove diagonal information from the image while maintaining horizontal and vertical information. (This sampling scheme preserves quality because the eye has lower visual acuity in diagonal direction than horizontally and vertically.) The format also includes a robust tag embedded in the last two lines of the image that uniquely identifies the frame as containing 3D content. Because this is embedded in the image it requires no special handling or metadata by the distribution system.

The REAL D Multiplexed 3D Format is compatible with existing distribution systems, disk players and set top boxes. It can be implemented today by inserting a demultiplexer device between the source (STB, player) and the television. The format is supported by several 3D televisions available today (including Hyundai, JVC, Samsung) and in the near future, it will be supported natively by a broader range of televisions, removing the requirement for the separate demultiplexing device. It is currently deployed in more than 50 locations for commercial and professional use in scientific and post production applications using an external demultiplexing device.

# DEG CONSUMER 3D TEMPLATE - REAL D Multiplexed 3D Format

**Characteristics:** (check all that apply to your format)

Image: Source		Stereo Pair	Image + Data			
		X				
Image: Format		Split Frame Side-by-side	Split Frame Checkerboard	Split Frame Over/under	Image + Data	Full Frame L/R Eyes
		X			X <sup>1</sup>	X <sup>1</sup>
Image: Compression		MPEG-2	H.264	MVC	Proprietary	
		X	X			
Compatibility: 2D						
Compatibility: DVD (video/audio)		Existing players	Modified players			
		X	X			
Compatibility: DVD (menus/subtitles)		Existing players	Modified players			
		X	X			
Compatibility: Blu-ray (video/audio)		Existing players	Modified players			
		X	X			
Compatibility: Blu-ray (menus/subtitles)		Existing players	Modified players			
		X	X			
Compatibility: Broadcast (video/subtitles)		Existing receivers	Modified receivers			
		X	X			
Compatibility: Broadcast (menus/subtitles)		Existing receivers	Modified receivers			
		X	X			
Compatibility: Interconnect (Supports transport of signal)		Existing HDMI	Modified HDMI			
		X	X			
Compatibility: Interconnect (Supports automatic display configuration)		Existing HDMI	Modified HDMI		Other***	
Compatibility: Display Type (how data is rendered)		Existing Stereoscopic * (with glasses)	New Stereoscopic** (with glasses)	Autostereoscopic (without glasses)		
		X	X			

(\*) NOTE: 3D format is not compatible with 2D presentation (to provide 2D, separate graphics/subtitles/video/audio need to be provided)

(\*\*) NOTE: supports video/audio only and does not support menu/subtitles in their existing format

## Footnotes & Additional Questions:

How do you see your system being deployed (currently and in within XX months) given compatibility issues, e.g.

- Decoder requirements
- Location of decoder (TV, Player, other)
- Transcoding

## **DEG CONSUMER 3D TEMPLATE - REAL D Multiplexed 3D Format**

It is important to note that this system does not require any changes or updates to the existing distribution infrastructure for the purposes of transport.

The system will be deployed in two halves. The multiplexing end will be a mastering process that occurs to multiplex the left and right stereoscopic frame pair to the single frame. The multiplexed frames are then mastered for distribution through the same process as 2D content. Beta level mastering software is available today, and will be fully developed for deployment within 6 months.

The demultiplexing process most logically occurs in the television, but could also be done in a set top box a disk player or in a stand alone demultiplexing box. The demultiplexing process will logically provide specific characteristics, depending on the specific display technology being addressed. Standalone demultiplexing devices are available today. It is expected that demultiplexing functionality will be embedded in televisions within 12 months.

The format is tolerant to transcoding and transrating in the distribution infrastructure.

### **How does your system handle subtitles, closed captioning (for SD) and graphics given compatibility and/or potential dynamic 3D presentation issues?**

If 3D subtitles are superimposed in the original images, they will be passed transparently through the system. Locally generated subtitles and graphics map easily into the distribution or the demultiplexed format. Specific generation of subtitles is not within the scope of the format. Java programming structures inherent in the disk and STB environments are capable of producing graphics and data overlays compatible with the format, for demultiplexing in the display.

### **Considerations/Comments**

REAL D claims that its format is available to deploy today through existing transport mechanisms for home entertainment. Multiplexing is easily supported in mastering, and demultiplexing requires simple processing at the television.

### **Additional Questions**

**“Explain compatibility with existing HDMI”** RealD 3D multiplexed format puts the two images into a 2D image representation, with a 3D identifier tag embedded in the image. As such, it is fully compatible with existing HDMI transport protocols, and does not require additional bandwidth or metadata.

**“Can you explain how MVC works with RealD Technology?”** RealD 3D multiplexed format is compatible with conventional 2D representation of images, and as such will fit into the primary image stream of SVC (MVC), looking like a 2D image.

**“How do we know this technology is compatible with an undefined autostereoscopic display format?”** Clearly if the format is undefined, we can't know that any format is compatible. On the other hand, we know that autostereoscopic displays will display a number of views, and that given 2 views (as is delivered in the RealD 3D multiplexed format), it is possible to create the necessary additional views through computation.

**Description/Overview:**

SENSIO3D is a member of the spatial compression family of stereoscopic codecs. It is based on frames pre-processing (encoding) and a split-screen checkerboard spatial layout coupled with advanced interpolation algorithms at the decoding stage. Encapsulated inside the main video stream already handled by video equipments, a SENSIO3D stream can be distributed, for 3D playback, using the currently deployed 2D infrastructure. Using a scheme similar in concept to DTS-HD Master Audio, SENSIO3D can be extended to support Full Frame L/R eyes data. The main video stream contains a spatially compressed SENSIO3D stream (Core) and a second synchronized stream contains additional information that provides configurable quality increments. At full capacity, the actual complete data for both eyes is available. On systems which do not provide decoding for this additional data, a SENSIO3D frame is available and can be decoded using current algorithms and distributed using the current infrastructure. Full backwards compatibility is therefore provided.

# DEG CONSUMER 3D TEMPLATE - SENSIO3D: SENSIO Technologies Inc.

**Characteristics:** (check all that apply to your format)

Image: Source	Stereo Pair	Image + Data			
	X				
Image: Format	Split Frame Side-by-side	Split Frame Checkerboard	Split Frame Over/under	Image + Data	Full Frame L/R Eyes
		X			X <sup>1</sup>
Image: Compression	MPEG-2	H.264	MVC	Proprietary	
	X	X			
Compatibility: 2D					
Compatibility: DVD (video/audio)	Existing players	Modified players			
	X	X			
Compatibility: DVD (menus/subtitles)	Existing players	Modified players			
Compatibility: Blu-ray (video/audio)	Existing players	Modified players			
	X	X			
Compatibility: Blu-ray (menus/subtitles)	Existing players	Modified players			
Compatibility: Broadcast (video/subtitles)	Existing receivers	Modified receivers			
	X	X			
Compatibility: Broadcast (menus/subtitles)	Existing receivers	Modified receivers			
Compatibility: Interconnect (Supports transport of signal)	Existing HDMI	Modified HDMI			
	X	X			
Compatibility: Interconnect (Supports automatic display configuration)	Existing HDMI	Modified HDMI		Other***	
Compatibility: Display Type (how data is rendered)	Existing Stereoscopic * (with glasses)	New Stereoscopic** (with glasses)	Autostereoscopic (without glasses)		
	X	X			

(\*) NOTE: 3D format is not compatible with 2D presentation (to provide 2D, separate graphics/subtitles/video/audio need to be provided)

(\*\*) NOTE: supports video/audio only and does not support menu/subtitles in their existing format

## **Additional Questions:**

***How do you see your system being deployed (currently and in within XX months) given compatibility issues, e.g.***

The technology has been on the market since 2003 (S3D-100 processor). Sensio claims that in 2009, for the consumer market, deployments will occur in media centers and multimedia PCs.

## **DEG CONSUMER 3D TEMPLATE - SENSIO3D: SENSIO Technologies Inc.**

Concurrently, new 3D content coming from various sources (VOD, PPV, DVD or BD) will be released to support these (titles to be announced) and 3DTV integration using SENSIO 3D technology will be launched by January 2010 (expected number of units over 1.5M in the US market only).

Over the past months, Sensio has reached major commercial milestones supporting this claim. These can be found in the details in the "Considerations/Comments" section.

The technical basis we believe our claim is founded is:

### **Decoder requirements**

SENSIO3D is a spatial compression technique which doesn't require any modification or special handling by the installed infrastructure for 3D playback. Resources wise, its implementation has low requirements with a maximum of 180K gates and 415 kbits of dual port memory for 1080p 12-bits 4:4:4 processing. Existing memory present inside video ICs or FPGA can be multiplexed to be used by the decoder, lowering the requirements some more.

For a software implementation, a CPU as low-end as an Intel Atom can be used for lower resolution content (SD). For 1080p decoding, a mid range Core 2 Duo based computer is required.

### **Location of decoder (TV, Player, other)**

Decoder can be placed inside the source (receiver, disk player), in a box sitting somewhere in the video path (scalers, STB) or in the display (3DTV, Monitors). Decoder has also been successfully integrated inside a Media Center PC using CPU resources only. Ideal hardware location of the decoder is inside video SoC (first integration in progress) and 3DTVs are a first implementation target.

### **Transcoding**

SENSIO3D is a pre-compression done just before actual video compression like MPEG2 or H.264. It doesn't require any transcoding.

### ***How does your system handle subtitles, closed captioning (for SD) and graphics given compatibility and/or potential dynamic 3D presentation issues?***

Closed captions are handled in bitmaps encoded in SENSIO3D, making it compatible with current DVDs and legacy players. This same approach is used for menus in DVD titles. This has already been done for SENSIO3D DVDs on the market right now. SENSIO3D also has provision for an optional data stream that contains depth information for each frame. This data can be an overall maximum parallax distance for the whole frame, or for customizable regions of a given frame. Interactive graphics can then be rendered at the right depth using this information if the playback device supports it. The way to encode and interpret this additional data is dependent on the medium used. For example, having data synchronized to the video stream is not possible on a DVD, but Blu-ray Disk has provision for frame synchronized custom user data.

### **Considerations/Comments:**

Since 2003, SENSIO 3D is the sole format currently used to distribute Hollywood 3D movies to the consumer market (namely Spy Kids 3D, The Adventures of Shark Boy and Lava Girl, Jaws 3D, etc). Over the past year, major commercial milestones have been attained by Sensio and have thus been adopted by the industry, such as;

#### **1. Broadcast TV in Sensio 3D:**

a. Cinema: Sensio is being adopted for 3D Live broadcast.

i. USA: Cinedigm has 85 3D Live theaters with a target of 200 by the end of 2009. They have presented the BCS Bowl (Jan 2009) and the NBA Skills Competition (Feb. 2009).

ii. Europe:

- OpenSky (Italy) is deploying 3D Live to several 3D Cinemas (number to be confirmed in Q3)
- France Telecom: has broadcasted in Live 3D the Don Giovanni opera in 4 Theaters in May 2009 and has deployed 3D live into 20 theaters for the Tennis French Open Finals in France and Spain in June 2009. They plan more 3D Live theaters for the next Live events.

iii. Rest of the World: more announcements will be made in the Q3-Q4 timeframe)

## **DEG CONSUMER 3D TEMPLATE - SENSIO3D: SENSIO Technologies Inc.**

All of this content is planned to become available on PPV or VOD for the consumer market

- b. Home : Beta testing: getting ready Q4 2009 - 2010
  - i. Eutelsat (Europe) is presently broadcasting in Sensio 3D, 24/7.
  - ii. France Telecom has broadcasted to 3DTVs in Sensio 3D into specific locations.
- 2. Home Video:
  - a. Sensio has already released 16 3D titles on DVD: Large format and Hollywood 3D titles
  - b. Sensio is the only 3D format adopted by the DVD forum
  - c. Sensio is a contributing member of the BDA and has the intention to participate in the discussion and work on 3D
  - d. The first Media player with Sensio software decoding with ArcSoft will be shipping to store in June 2009
- 3. Gaming:
  - a. Ubisoft stereoscopic games for consoles such as PS3 and Xbox 360 will output in Sensio 3D, starting with the Avatar 3D game from James Cameron which was presented at E3 on June 2<sup>nd</sup> in Los Angeles.

In conclusion, this 3D multi-platform distribution technology is being adopted for broadcast, gaming and is the first 3D consumer distribution format that was specified within the DVD forum. By providing the highest quality spatial compression technology, content availability, IP protection and scalability to meet original resolution via full left and right eyes, SENSIO believes that its technology is the best option to address short and long term 3D distribution requirements for all platforms targeted to the consumer market.

# DEG CONSUMER 3D TEMPLATE - TDV CODE/2D+ Delta: TDVision Systems

**Characteristics:** (check all that apply to your format)

<b>Image: Source</b>	<b>Stereo Pair</b>	<b>Image + Data</b>			
	X	X			
<b>Image: Format</b>	<b>Split Frame Side-by-side</b>	<b>Split Frame Checkerboard</b>	<b>Split Frame Over/under</b>	<b>Image + Data</b>	<b>Full Frame L/R Eyes</b>
				X	X
<b>Image: Compression</b>	<b>MPEG-2</b>	<b>H.264</b>	<b>MVC</b>	<b>Proprietary</b>	
	X	X	X	X	
<b>Compatibility: 2D</b>					
<b>Compatibility: DVD (video/audio)</b>	<b>Existing players</b>	<b>Modified players</b>			
		X			
<b>Compatibility: DVD (menus/subtitles)</b>	<b>Existing players</b>	<b>Modified players</b>			
<b>Compatibility: Blu-ray (video/audio)</b>	<b>Existing players</b>	<b>Modified players</b>			
	X	X			
<b>Compatibility: Blu-ray (menus/subtitles)</b>	<b>Existing players</b>	<b>Modified players</b>			
<b>Compatibility: Broadcast (video/subtitles)</b>	<b>Existing receivers</b>	<b>Modified receivers</b>			
	X	X			
<b>Compatibility: Broadcast (menus/subtitles)</b>	<b>Existing receivers</b>	<b>Modified receivers</b>			
<b>Compatibility: Interconnect (Supports transport of signal)</b>	<b>Existing HDMI</b>	<b>Modified HDMI</b>			
	X				
<b>Compatibility: Interconnect (Supports automatic display configuration)</b>	<b>Existing HDMI</b>	<b>Modified HDMI</b>		<b>Other***</b>	
				X	
<b>Compatibility: Display Type</b> (how data is rendered)	<b>Existing Stereoscopic *</b> (with glasses)	<b>New Stereoscopic**</b> (with glasses)	<b>Autostereoscopic</b> (without glasses)		
	X	X			

(\*) NOTE: 3D format is not compatible with 2D presentation (to provide 2D, separate graphics/subtitles/video/audio need to be provided)

(\*\*) NOTE: supports video/audio only and does not support menu/subtitles in their existing format

## **Footnotes & Additional Questions:**

\* Existing stereoscopic displays would include '3D Ready' 120Hz plasma or DLP, and polarized LCD displays. Appropriate active or passive glasses are required.

\*\* New stereoscopic would include as-yet unavailable commercially displays. Appropriate active or passive glasses would be required.

\*\*\* Other might include head-mounted displays.

## **How do you see your system being deployed (currently and in within XX months) given compatibility issues, e.g. decoder requirements, location of decoder (TV, Player, other), transcoding?**

How does your system handle subtitles, closed captioning (for SD) and graphics given compatibility and/or potential dynamic 3D presentation issues?

Instructions:

- Complete table for current solution; optional table for future solution (within XX months)
- All information provided must be publicly available.

## **Considerations/Comments:**

### **TDVision's TDVCodec Characteristics**

#### **Input Sources:**

Stereo Pair (Tiff Sequence, DPX, TGA, JPG, PNG, Uncompressed AVI)

Image + Data (IOD, Toe-In, Floating Window, SMPTE TF3D Pre-Spec)

#### **Image Format:**

2D + Delta + Data (2D = Left View / Right View / Third View, Delta = Differential Stereoscopic Complimentary compressed information, Data = Acquisition meta-data, Autostereo DOT information, Floating Window directives)

#### **Image Compression:**

MPEG-2, MPEG-4, H.264/AVC, VC1, MVC, Proprietary

#### **Compatibility\* DVD**

Modified Players

#### **Compatibility\* Blu-ray**

Existing Players

#### **Compatibility\* Broadcast**

Existing Receivers

#### **Compatibility Interconnect**

Existing Interconnect (HDMI, DisplayPort, DVI, Fiber, Ethernet)

#### **Automatic Display Configuration**

Supported through EDID/DDC Autoconfiguration

#### **Compatibility\* Display Type**

All Current and Future 3D Ready Displays

(Legacy 2D at full resolution, DLP Checkerboard, LCD Xpol / Row Interleave, Dual 1080p output, Dual projectors, Anaglyph, Autostereoscopic, Planar, HMD, TDVisor)

#### **\*Compatibility**

**TDVision defines true compatibility as the ability of EXISTING 2D MPEG decoders and Displays to be able to play the content in full resolution 2D WITHOUT the use of external interpolation chips, boxes or other hardware.**