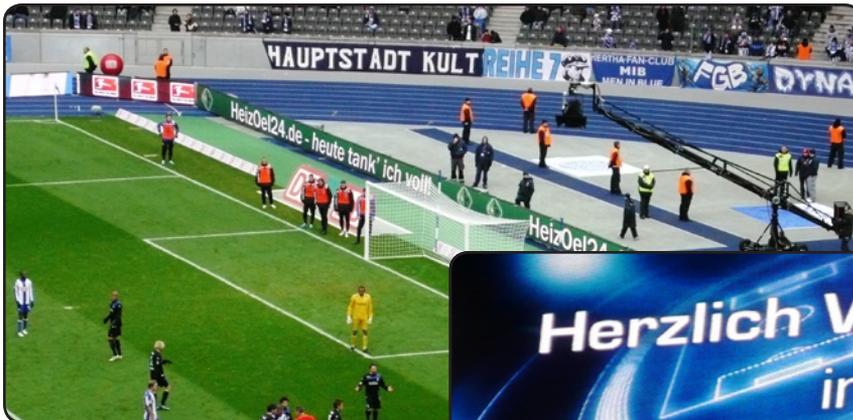


# APPLICATION NOTE

## The 3D Live Test of Sportcast in Berlin with LDK 8000 and LDK 8300 Super SloMo Cameras

*Courtesy of [www.live-production.tv](http://www.live-production.tv)*

December 2010



*Together with its partners WIGE Media AG,  
Studio Berlin Adlershof and 3ALITY,  
Sportcast carried out another 3D test.*



# Introduction

Sportcast is one of the largest producers of live sports in HD worldwide, and as a subsidiary of DFL Deutsche Fußball Liga GmbH, it is the host broadcaster of the Bundesliga and 2nd Bundesliga in Germany. In addition, Sportcast produces all DFB cup matches and provides consulting on productions in various media formats to further associations and leagues as a competent contact partner. After the two DFB cup matches on October 26 and 27, 2010 Sportcast produced

another 3D Bundesliga match on November 27, 2010 in Berlin.

With the start of the second half of the 2010/11 Bundesliga season, Sky and Telekom will show one match per match day in 3D. In an interview with *Werben & Verkaufen* magazine, DFL managing director Tom Bender stated: "We see the 3D production of the Bundesliga first as a test and try to cover the costs. To generate additional money with the match coverage in 3D the

market has to grow. But even if the TV manufactures would only sell 3D devices from now on, it would take some time to become a viable business. Nevertheless for the product and the brand, Bundesliga 3D plays an important role," and he continued, "the quality of our product is not only decisive for the German market, but also abroad. We deliver technically the best quality currently available. This includes the production in HD and also selected matches in 3D."



*The Olympiastadion in Berlin and the Broadcast Compound.*

# Introduction (cont.)

Following these guidelines, Sportcast has carried out another 3D test production: The 2nd Bundesliga match: Hertha BSC Berlin vs. MSV Duisburg on November 27, 2010, which was produced with WIGE Media AG. Together with its US partner 3ALITY Digital and its German partner Studio Berlin Adlershof (SBA), the 3D setup and the production at the Olympia Stadium in Berlin was produced with eight stereo camera pairs at temperatures around the freezing point. Camera pairs #1 and #2 were Grass Valley™ LDK 8000s mounted on 3ALITY TS-4 side-by-side rigs positioned on lower main camera shooting platforms (similar to 2D

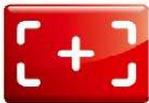
productions). All other camera platforms (except the beauty shot) were positioned at ground level.

Camera pair #3 was a premiere in Germany: Two Grass Valley LDK 8300 Super SloMo cameras were mounted on a 3ALITY TS-2 mirror rig and the 3D signals were recorded on EVS XT2+ servers for smooth replays of highlights in 3D super-slow motion.

Another premiere was camera pair #4: Two Sony HDC-P1 cameras were mounted on a 3ALITY wireless controlled TS-5 mirror rig, with the video signals transmitted wirelessly via two Link L1500 transmitters (MPEG-2 at 19 Mb/s per channel).

In addition, the camera shading and matching in the OB truck (via the Sony RCP-1500—X/Y and rotation, intraocular, and conversion) was carried out with a proprietary wireless link. The entire system was mounted on a Sachtler Artemis EFP/SE via a GPI-Pro spring arm.

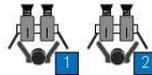
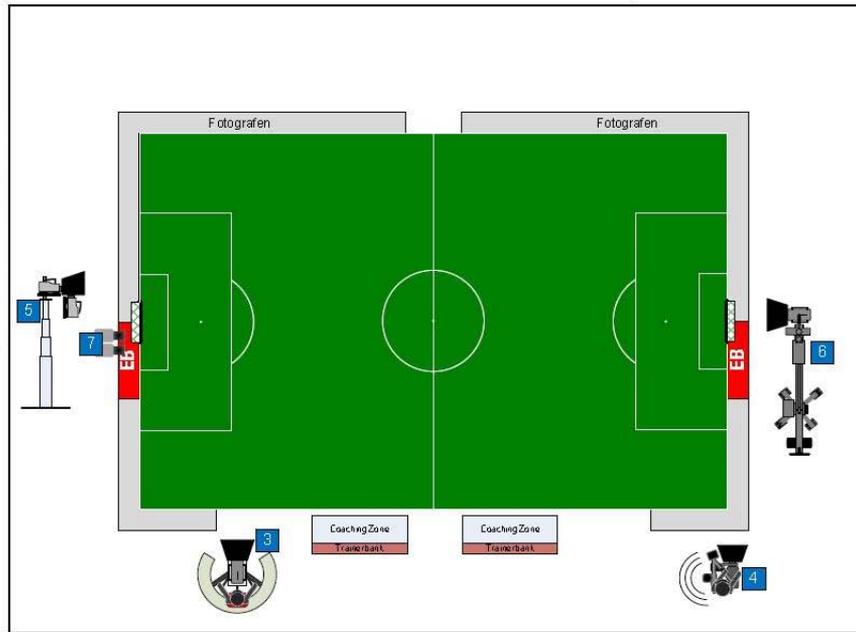
Camera pair #5 (two LDK 8000s on TS-2 mirror rig) was mounted on a MAT Tower, while camera pair #6 (two LDK 8000s on TS-2 mirror rig) was fixed on a MAT Crane. Camera pairs #7 (in goal) and #8 (beauty) were Cunima MCU mounted on Stereotec rigs.



**SPORT  
CAST**

## Kamera-Konzepte s3D 2. Bundesliga Hertha BSC – MSV Duisburg

	Standort
KA1	Führung, Mitte hoch
KA2	Führung nah, Mitte hoch
KA3	Flach links, Höhe 16m-Linie, SSL
KA4	Flach rechts, SteadyCam drahtlos
KA5	Flach links, Hintertor Höhe 5m-Linie, Towercam
KA6	Flach rechts, Hintertor Höhe 5m-Linie, 6m-Kran
KA7	Flach links, Hintertor Höhe, Chips
KA8	Beauty Shot



The 3D Camera plan.

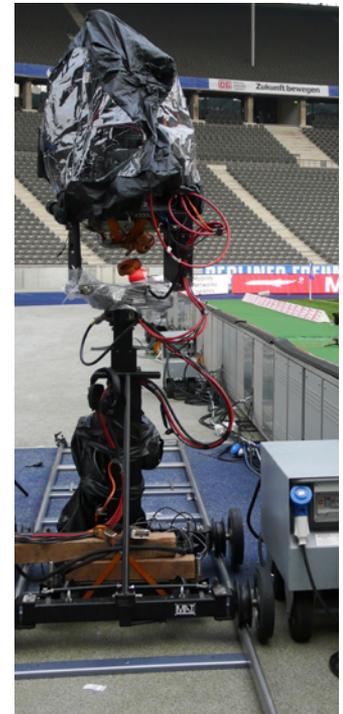
## The 3D Camera Pairs

All LDK 8000/LDK 8300 cameras were equipped with 22X Fujinon zoom lenses and could be used across the entire zoom range without any limitations. Camera #2 operated with a 2X zoom extender delivering a zoom range of ~340 mm. All the cameramen appreciated the unrestrained zoom range not limiting their creative image capturing.

At the broadcast compound in front of the stadium, the SBA HD1 truck with 3D layer was parked next to the WIGE 3D production unit (which is a new member of the WIGE OB fleet). The WIGE 3D production unit houses the convergence area with six workspaces for convergence operators, one desk for the stereographer, and the workspace for the 3D technicians to control the 3D rigs. The work of the convergence operators was supported by 3ALITY's SIP 2900 stereoscopic image processor. The SIP 2900 can control up to eight cameras simultaneously. Using integrated Web-based software,

engineers can monitor, assess, adjust, and control the cameras from one powerful, rack mounted control center. During the preparations prior to the match, the convergence operators used the SIP 2900 to align the lenses ensuring near pixel-perfect tracking even during the most complex zooms.

During the match the stereographer referred to the SIP 2900's multitude of viewing modes and analysis tools to monitor, assess, and optimize 3D on the fly. In the graphics area, WIGE was using a Brainstorm system for the production in Berlin. Brainstorm enables the creation, preview, and playout of real-time graphics and statistics during live 3D sports events. A single operator can control the system which offers refraction and distortion effects which are shown in real time. Calibration of the 3D graphics is done by viewing a straight line in the set and adjusting the distortion to match a similar line in the scene.



## The WIGE 3D Production Unit

As usual, the camera shading was done in the vision control area in the SBA HD1 truck. The Grass Valley OCPs were software updated to enable the control of one camera pair with one OCP. All the 3D camera signals were visible on the monitor wall in the production area.

The live switching of the 3D program was carried out on a Grass Valley Kayenne™ Video Production Center switcher including the replay of the super slo-mo signals from the EVS XT2+.

The 5.1 surround sound was mixed on a Lawo MC66 console. In total, 21 staff including the director and the 3D producer were working in the two trucks delivering an excellent 3D signal of the match.

To train the 3D skills of more than one director, the first half of the game was directed by Knut Fleischmann while the second half was directed by Jürgen Schmitz. The technical leadership for the 3D production was by Tobias Vees (WIGE), the 3D producer was Jens Wolf (WIGE) and the 3D stereographer was Nicholas Brown (3ALITY).



3D Infrastructure in the SBA HD1.



# The 3D Distribution Test

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To test out various 3D distribution formats, Sportcast has asked their subsidiary HD Sat Communication to set up a test bed in partnership with the EBU.

The uncompressed 3D signal was sent via a Net Insight Nimbra fiber link as five signal types to five displays: a dual stream uncompressed signal, a dual stream JPEG 2000 signal, a dual stream MPEG-4 signal, a dual stream MPEG 2 signal, and a side-by-side MPEG-4 and MPEG-2 signal. Ericsson provided the encoders and multiplexers and used various data rates to be shown on the displays.

In parallel, the uncompressed 3D signal was recorded on a DVS server for further evaluations by the EBU. Attached to the DVS server was a STAN stereoscopic analyzer, developed by Fraunhofer

HHI in partnership with KUK Filmproduction. STAN combines real-time image analysis with intelligent visualization tools and intuitive graphical user interfaces to assist cameramen and production staff in shooting the right stereo content for 3D post-production and 3D live events. Corresponding feature points in the scene are matched automatically to determine the given disparity range, and to compute stereo calibration data. Using actuators, the stereo baseline and other mechanical parameters of the stereo rig can be adjusted automatically so that the specified disparity range is not exceeded and the stereo images are almost rectified.

Furthermore, residual distortions in color and stereo geometry can be corrected using real-time color matching and rectification. STAN

uses a touchscreen for intuitive user interaction and control. Various viewing tools such as crop/opacity overlay, side-by-side, checkerboard, or anaglyphic stereo can be selected to analyze the 3D quality while other tools such as RGB parade, signal waveforms, or color histograms assist control of color quality.

Real-time estimation of dense pixel-by-pixel disparity maps can be used to visualize the depth structure of the scene. Basic stereo parameters such as convergence planes can be adjusted manually and the results viewed in real-time on the screen. Related shift-cropscale processing is done on-the-fly.

In addition, STAN can generate and store metadata for post-production processes.

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