

## Second DFZ-BAM-Workshop: Digital and analog ISO/IEC-test charts for multimedia devices in offices

Definition, production, application and colour management of ISO/IEC-test charts for image reproduction on copiers, printers, scanners, photo-CD-systems, monitors and displays in offices

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#### Development of analog and digital test charts for ISO/IEC- and DIN-standards for specifying image reproduction and for colour management

The four analog ISO/IEC-test charts in reflectance mode according to ISO/IEC 15775 are designed for the test of colour copiers. The test charts include many image elements. e. g. Siemens-stars, Landolt-rings and 16step equally spaced colour scales according to CIELAB. Most important for image technology is the ISO/IEC pictorial image B1 which includes a 16step grey scale and 16 CIE-test colours. This image comes in 5 resolutions between 128 x 192, 256 x 384, and 2048 x 3096 pixels. For analog production the digital ISO/IEC-test chart are described in ISO/IEC 15775.

Some applications of the digital and analog ISO/IEC-Test charts for printers, monitors and scanners will be discussed. Recently at least three methods to optimize the ISO/IEC-test chart output have been developed. Between the digital input values and the CIELAB colour difference of the 16step colour series a linear relationship is produced. This linear property allows new and very simple colour management methods. The application of these methods for the production of the reference ISO/IEC-test charts and for output colour management of slide and negative film images as function of exposure is shown. For recent technical papers see

[www.ps.bam.de/INFX91.HTM](http://www.ps.bam.de/INFX91.HTM)

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#### Colour security from input to output

Colour copiers, printers and scanners are already part of the office equipment. The same equipment is also used in print and advertising. General aids to characterize the colour properties of the office equipment were not available for a long time. In ISO/IEC 15775, DIS ISO/IEC 19839-X and DIN 33866-X the offset colour space is recommended as reference colour space for the office equipment. This bridges the gap in the use of colour between office equipment and professional users in the printing industry.

This paper gives examples and reports about the steps of the industry to use the ISO/IEC- and DIN-standards for the colour office equipment. DIS ISO/IEC 19839-X and DIN 33866-X (X=1 to 5) may be used to optimize to output and to test the optimization method.

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#### Psychophysical determination of the amount of grey samples which can be distinguished on a visual scale

New print media are able to print highly resolved images. It is now possible to generate grey scales equidistant on a visual scale. Sets of grey scales which consist of 16, 32, and up to 512 grey steps and which are approximately equidistant on the CIELAB scale have been produced by a 3600 dpi image setter. Each scale has adjacent as well as separate samples. In psychophysical experiments test persons were asked if they could see a difference in the presented pairs of grey scales. An intelligent algorithm interprets the results on the fly so that only a minimum amount of grey samples are presented to the observer. For the case of separate samples about 64 grey steps (6bit) can be distinguished by humans. For adjacent samples the number increases by a factor two to about 128 grey samples (7bit). This result is important for both grey and colour coding in image technology.

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#### The problem of fluorescence in colorimetric measurements of photographic prints

Colorimetric measures of photographic outputs are done for series of Yellow, Magentared and Cyanblue colours printed on photographic paper. These papers throughout contain optical brighteners that serve for fluorescent emission of light superimposed on the regular reflected light dependent on the thickness of the dye layer and its absorptive qualities. Accurate colorimetric measures have to consider this effect. As standard illuminant D65 is rarely realised in commercial instruments, systematic errors occur. These errors are demonstrated for a spectrophotometer equipped with a tungsten halogen lamp and a Xenon lamp in relation with an accurate D65 illumination. For a photographic paper accurate measurements could be done using two-monochromator spectrophotometers. Furthermore, the effect of an adjustable UV-filter in the beam of a Xenon lamp colour be studied. Recommendation are given, how to perform colorimetric measurements within an accuracy of < 3 CIELAB units. The mean of two measurement results one with a tungsten halogen lamp and one with a xenon arc lamp reaches in most cases the recommended accuracy < 3 CIELAB units

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#### Mercury Free Flat Panel Light Source with High Homogeneity and in the Application as Reference Monitor

The OSRAM PLANON is a mercury free flat panel light source based on a Xenon-excimer barrier discharge working principle. Due to the nature of the discharge this light source has unique features such as life-time of up to 100.000 h (MTTH), nearly temperature independent luminance and a minimum start-up time of a few ms.

These features clearly distinguish the PLANON from other light sources which utilize mercury. Accordingly there is a huge variety of applications, ranging from backlights for large size LCD displays, specialized industrial applications to projects in general lighting and reference applications, such as backlights for ISO- and DIN reference monitors. The mass production of the light source has been started successfully with diagonal sizes between 10.4" and 21.3".