

# Requirements of LCD-monitor for Proofing

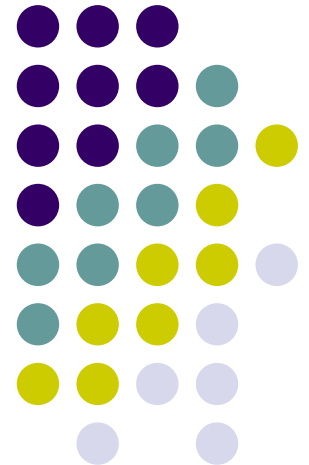
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**February 14, 2006**

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**WG3 ISO/TC130 Japan National Committee**



# ISO/TC130 Japan National Committee



- **Japanese domestic discussion body for ISO/TC130**
- **Developed series of Japan Color with supports from related industry organizations and companies**
  - **Solid color patch 1993, 1996, 2000**
  - **Sheet-fed offset lithograph characterization 1997, 2001**
  - **Newsprint characterization 2002**
  - **Web offset lithograph characterization 2003**
- **Endeavor to establish seamless color communication through print production workflow**
- **Realize needs for specifying requirements of LCD soft proofing**



# Task Force

- **Consider requirements of LCD color monitors for soft proofing in graphic arts industry**
- **Started May 2004**
- **Chair Dr. Takahashi, Tokai Univ.**
- **20 experts from the following organizations:**
  - **ISO/TC130 Japan National Committee**
  - **The Japanese Society of Printing Science and Technology(JSPST)**
  - **Japan Printing Machinery Association**
  - **Japan Federation of Printing Industries**
  - **Ad Agencies**
  - **Japan Printing Ink Makers Association**
  - **LCD Color monitor manufacturer, etc.**



# Requirements

- **Based on ISO12646:2004 Graphic technology - Displays for colour proofing -Characteristics and viewing conditions**
  - **Current ISO12646 for CRT**
    - Resolution, Uniformity, Geometric accuracy, Convergence, Ambient illumination conditions, Chromaticity and luminance of the white and black point, etc.
  - **Requirements for LCD to be added**
    - Luminance and colorimetric variations in different viewing angles
  - **Consider related standards:**
    - IEC61966-4:2000 Multimedia systems and equipment – Colour measurement and management – Part4: Equipment using liquid crystal display panels
    - Adobe RGB(1998) Color Image Encoding



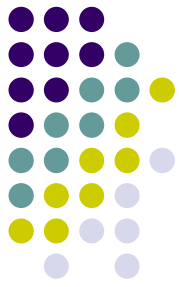
# Requirements

- **Most of the requirements are closed to the revision of ISO12646 proposed by German national body May 2005**
- **Requirements different from revising ISO12646**
  - **Ambient illumination conditions**
    - Single conditions for both monitor and hardcopy
    - D50, 500lx  $\pm$  125lx between monitor and observer
    - Attach hood to the monitor
    - JSPST's study shows similar conditions
  - **White point**
    - Chromaticity: adjustable 4500 - 7000K and chroma  $\Delta C_{ab}^* < 3$
    - Luminance level: 80-160cd/m<sup>2</sup>
    - Chromaticity and Luminance level should be visually match an unprinted sheet of paper in ambient illumination conditions
  - **Opto-electronic transfer function**
    - =1.8-2.4
    - 10 bit display driver look-up tables recommended



# Guidelines on soft proofing

- **CMS setup and profiling procedures**
  - Setup ambient illumination conditions
  - Adjust monitor white point visually matched to an unprinted sheet of paper in ambient illumination conditions
  - Create monitor profile
  - Set the monitor profile and source device profile such as Japan Color profile for CMM
  - Select media-relative colorimetric intent for rendering



# Experiment & Results

- **Experiment**
  - **Create Japan Color Type 3 Generic Profile**
  - **Produce samples (SCID/CMYK N1-N4) with 2 kinds of DDCP**
    - Deviation from Japan Color reference(ISO12642-1) Av.  $\Delta E_{ab}^*$  2.3-2.4
  - **Adjust monitor white point and create profile**
    - EIZO CG210, CG220, NEC LCD2180WGLED
  - **TF experts evaluate displayed images on monitors with comparing DDCP samples**
- **Results**
  - **Positive impressions for white on monitors**
  - **Acceptable ambient illumination conditions, but questions for detail evaluation**
  - **No significant negative comments for shadow reproduction and contrast**
  - **Differences of near neutral colors between monitors still observed**
  - **Insufficient detail expression due to resolution**