Requirements of LCD-monitor for Proofing

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WG3 ISO/TC130 Japan National Committee
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- Japanese domestic discussion body for ISO/TC130
- Developed series of Japan Color with supports form related industry organizations and companies
  - 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
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 ≥ 125lx between monitor and observer
    - Attach hood to the monitor
    - JSPST’s study shows similar conditions
  - White point
    - Chromaticity: adjustable 4500 - 7000K and chroma ΔC_{ab} * < 3
    - Luminance level: 80-160cd/m2
    - Chromaticity and Luminance level should be visually match an unprinted sheet of paper in ambient illumination conditions
  - Opto-electronic transfer function
    - β = 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