Summit on Color in Medical Imaging 2013

Standards and Recommendations for Color Medical Displays

A Review of Current Activities at AAPM and IEC

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DISCLOSURES

- Equipment loans: RMD, EIZO/NANAO, PLANAR, CHIMEI-O.
- Collaborative R&D agreements (CRADAs) with FIMI/BARCO and VARIAN.
- Mention of commercial products herein is not to be construed as either an actual or implied endorsement of such products by DHHS.

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Outline



- 2 The AAPM WGMD and TG196
- 3 The IEC 62B/MT51
- Intercomparison overview





- CDRH is invested in the development of medical device standards and participates significantly in the development process.
- Consensus and recognized standards facilitate regulatory review.
 - CDRH participates in 550 national and international standard committees
 - 250 staff experts
 - 1061 recognized standards.
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Why standardize image display?

The diagnostic imaging chain is as effective as its weakest component!

Poor display quality can:

- Reduce effectiveness of diagnostic or screening test
- Cause inconsistent clinical decisions

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- Mission: To advance the science, education and professional practice of medical physics.
- Goals: ... To disseminate scientific and technical information in the discipline, and to promote standards for the practice of medical physics.
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- Purpose: The Working Group on Medical Displays provides guidelines to clinicians, medical physicists, developers, and engineers as to the use of display devices for image viewing across a variety of disciplines and specialties.
- WGMD identifies display use and performance testing methodologies that would benefit from increase communication between industry and medical professionals, and from tutorial and guideline documents.
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- Provide guidelines to clinicians, medical physicists, developers, and engineers for proper implementation, utilization, and performance testing of color displays for medical use.
- The specialties of interest include radiology, cardiology, pathology, dermatology, and other medical disciplines that use color images.
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Previous and current work at AAPM - I

• TG18: Assessment of display performance for medical imaging systems. Guidelines and acceptance criteria for acceptance testing and quality control of medical display devices.



deckard.mc.duke.edu/~samei/tg18¹

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Previous and current work at AAPM - II

- Limitations of TG18
 - Widely used in radiology.
 - Grayscale-centered. Only "color" aspect: multi-head consistency.
 - Already somewhat obsolete in terms of display technology needs revising.
- TG196: Color displays
 - First task- gray tracking
 - Intercomparison of color meters
 - Report out by end of 2013
- Other areas might include handhelds and 3D.

Previous and current work at AAPM - III

gray tracking color coordinates, expressed in CIE chromaticity (u', v') pairs, of a set of display pixel values corresponding to equal driving levels for all subpixel elements, spanning the entire range of luminance of a calibrated display device. This is also referred to as "white point" or "grayscale" tracking performance.



Distance plot for gray, red, green, and blue color patterns with respect to a common reference standard ("truth").

¹E. Samei et al., Med Phys 32, 1205-1225 (2005).

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 - First-amendment: gray tracking: following the work of TG196 (2013)
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- Gather performance data for reference and non-reference sensors used in labs and field
- One display sent to all participants
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Summary

Participating Labs

Laboratories JP1, JP2, JP3, BE, US1, US2, BR.

Instruments

i1, Spec, CAS140, CS100A, CS1000, CA310, CS2000, PR730, Topcon SR3 ...

Data showed per lab/meter combination.

Sample results I



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Sample results II



Distance plot for gray, red, green, and blue color patterns with respect to a common reference standard ("truth").

Other efforts in standards and guidelines



Display Metrology Committee of Video Electronics Standards Association (VESA) for third version of "Flat Panel Display Measurements Standard"².

ICDM

ICDM (International Committee for Display Metrology) is charged with setting standards for display metrology. Publishes the Information Display Measurements Standard, with 140 display measurements (http://icdm-sid.org/).



Professional guidelines with general recommendations/requirements for the practice.

²VESA, "Flat Panel Display Measurements Standard, Version 2.0", technical report (VESA, 2003). Badano – Summit on Color in Medical Imaging, 4/2013 Imaging Physics Laboratory, DIAM/OSEL/CDRH/FDA 19/22 What one step, if any, would you suggest we take in order to improve the handling of color in medical imaging systems within your area of expertise?

- Coordination of efforts and recommendation/guidelines across disciplines with more involvement from vendors.
- Consistent approaches for multi-component analyses.

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Final remarks

- More work is needed but requires more resources and increased participation of stakeholders (homework assignment).
- Not to hinder innovation in devices, it's the standard approach/methodology that allows for different and novel implementations.

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