

AbstractID: 5977 Title: Characteristics and Performance Evaluation of Digital Image Displays

As departments make the transition from screen/film imaging to soft-copy interpretation, the emphasis of the quality control program must shift from controlling the quality and consistency of the images on film to controlling the quality and consistency of the image on the display device. A fundamental feature of this new QC process is the assessment of the performance of the display device itself. This presentation will cover the performance characteristics of CRT and LCD displays and quality assurance and assessment techniques for primary display systems. The information given reflects the recommendations of the American College of Radiology (ACR) as outlined in their Technical Standard for Teleradiology (Rev. 2002) and the American Association of Physicists in Medicine (AAPM) in On-line Report #3 (OR-3), the report of Task Group 18 (TG18), entitled Assessment of Display Performance for Medical Imaging Systems. The presentation will introduce the performance requirements of the ACR and AAPM for primary displays and will provide instructions for performing display assessment based on TG18 methodology. Recommendations for the instrumentation necessary to perform these tasks will also be made. As a summary, important characteristics of a display QC program will be outlined.

Learning objectives

1. Understand the technology behind CRT and LCD display devices and how they affect display performance.
2. Gain familiarity with the information contained in OR-3 and the standards for display performance and QC in the ACR standard for teleradiology.
3. Gain familiarity with the procedural details involved with evaluation of primary diagnostic display devices according to the methods outlined in the pending TG18 task group report.
4. Be able to establish and support an on-going primary display QC program in a PACS-based clinical environment.

AbstractID: 5977 Title: Characteristics and Performance Evaluation of Digital Image Displays

Outline

Display Performance Requirements

ACR

AAPM

Instrumentation

Luminance Meter

Light baffle

Illuminance Meter

Diffusion Box

Pocket Telescope (30x – 50x)

Magnifying Glass (2x)

Plastic ruler

Masks

Test patterns

TG18 QC (General Purpose QC and Geometric distortion)

TG18 LN (Luminance response)

TG18 UNL-10 and –80 (Luminance uniformity, Chromaticity, Dead pixel evaluation)

TG18 AFC (Noise assessment)

TG18 CX (Resolution)

TG18 VG (Veiling glare)

TG18 LPH and LPV (Dead pixel evaluation)

Procedures

Luminance Response

Max Brightness & Contrast

Luminance Uniformity

Reflection

Specular Reflectance

Diffuse Reflectance

Luminance of the Reflected Illuminance

Reflection & Ambient Lighting

Specular reflection of illuminated background objects

Diffuse reflection effect on Lmin and contrast

Resolution (CRT only)

Noise

Geometric Distortion (CRT only)

Veiling Glare (CRT only)

Pixel Defects (LCD only)

Acceptance Tests

Luminance Response

Luminance Uniformity

Reflection

Noise

Resolution (CRT)

Geometric Distortion (CRT)

Veiling Glare (CRT)

Pixel Defects (LCD only)

Monthly (CRT) / Quarterly (LCD) Tests

Luminance response

Evaluation of the TG18-QC test pattern

Experience

Self-calibrating displays

Test frequency

References

1. Thronworth, WT, et al, Standards and Accreditation Committee, ACR, 2003,

http://www.acr.org/departments/stand_accred/standards/pdf/teleradiology.pdf

2. Samei, E, et al, Acceptance Testing & Quality Control of Electronic Devices for Soft-copy Display, AAPM (Draft document),

<http://deckard.mc.duke.edu/~samei/tg18>

Objectives :

Participants will be familiar with primary display performance requirements published by the ACR and the AAPM.

Participants will be able to perform primary display assessment according to procedures outlined in AAPM TG18 (draft).

Participants will be able to design and implement a robust quality control program for primary displays in a PACS environment.

Participants will be able to identify specific performance tests for CRT displays and for LCD displays.