A Color Gamut Assessment Standard: An Inter-Laboratory Measurement Comparison

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Display Measurement Assessment Transfer Standard
— DMATS (dee’-mats)

WHAT IT IS: A uniformly backlit target assembly that exploits the capability of the measuring instrumentation in participating laboratories.

HOW IT WORKS: NIST measures, participating lab measures what it wants to, NIST re-measures, results shared with lab (NOT a calibration!).

RESULTS: Anonymous comparison shows what industry can expect in making straightforward measurements of displays.
DMATS, Cont.

White Point Calibration (e.g., CIE Illuminant A)

What about the rest of the color space?

CIE A
Tungsten Halogen 2856 K

DMATS, Cont.

Spectral Content Changes

LCD
Tungsten
CRT
Having a well-calibrated instrument and getting good results is not automatic.

DMATS, Cont.

- Narrow-band interference filter’s (x,y) are on or close to spectrum locus.
- If white point is correct and (x,y) of NBIFs measure correctly, then reasonably sure instrument is OK through entire color gamut.
DMATS, Cont.

If not using frustum, can have veiling-glare corruption from other filters.

DMATS, Cont.

Internal Testing (With Frustum)
Gamut Assessment Standard

- Integrating Sphere Source
- Stray Light Elimination Tube
- Filter Wheel
- RGB Gamut
- NDFs
- CMY Gamut, Flesh, Sky
- Polarization

From open to mirror, change in source luminance < 1/8000.

NMI INTERCOMPARISONS

- NPL Intercomparision August-September 2002
- NRC Intercomparision March 2003
- Final NIST measurement April 2005

Conclusions:
- GAS a good indicator of performance capability
- Robust source necessary for light source stability
- Filters need to be checked frequently; the interference filters should be replaced approximately every six months, other filters less often
Robust Light Source for GAS

- **WALLS MADE OF STANDARD PTFE**
  - Easy to clean — assumed, we’ll see.
  - Rugged for being shipped around world.
  - Photodiodes and filters in region of room temperatures. (?)  
  - Interchangeable lamps.

- **PROTOTYPE TESTED WITH LAMP AT TOP**
  - 250° C interior of lamp chamber (within PTFE limits).
  - No yellowing of lamp chamber observed for several days of operation. Can it be cleaned if there eventually is yellowing? We’ll see.
  - Need to rebuild back disk and retest for uniformity.

- **ASSEMBLY TO BE COMPLETED THIS SUMMER**

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Robust Light Source, Cont.
THE NEXT STEP FOR THE GAS/DMATS PROGRAM

- Begin beta testing of GAS with industry
- Build robust light source
- Build additional GAS units
- Possibly build DMATS unit for beta testing
- LED source developed by Optical Technology Division
- Goal is to offer a regular GAS program as a NIST service by the end of the year

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