

# Monitor to Print Agreement

## Myth or Reality

Presenter: **Dan B. Reid**



# The last frontier in color management

- Lots of variables involved
- Not all can be controlled
- Requires a lot of interpretation



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# The obvious or not so obvious:

- CRT and LCD displays do not use CMY primaries
- Prints are subtractive printing process while computer displays are additive color process
- Color Matching for print output assumes a reference illuminant



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# The problem

- Output profiles are created using a reference white point of  $D^{50}$
- “D” indicates a particular spectral response. Not to be confused with 5000K which does not indicate spectral response
- Color matching transform from source to destination normally use a  $D^{50}$   $L^*a^*b^*$  2° observer
- Your viewing conditions rarely, if ever, resemble  $D^{50}$
- Your computer display can not be calibrated to  $D^{50}$  0 only a Kelvin temperature
- Dimming down a light booth’s intensity typically causes a shift in color temperature.



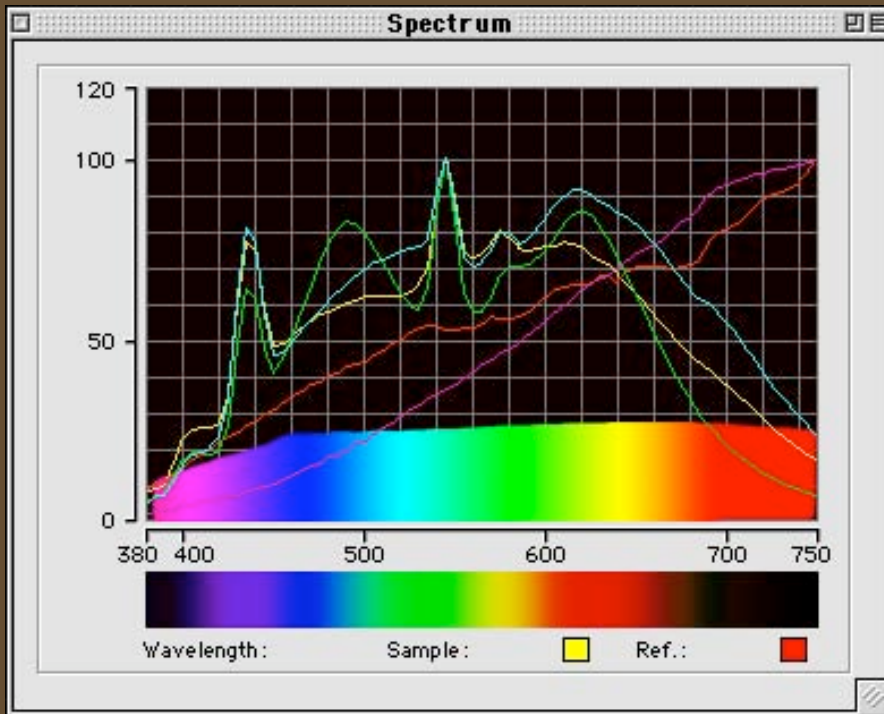
# Your computer display can't be calibrated to D<sup>50</sup>

- Even with calibration your display can never respond spectral similar to D<sup>50</sup>
- You can calibrate to a reference white in Kelvin degrees but not alter spectral response of the display
- Visual tune or select white point closest to the perceived white of a substrate under the viewing light



# Graphic Arts professional viewing booths aren't D<sup>50</sup>

- Most, if not all, of the time you are not under D<sup>50</sup> lighting conditions!



- ◆ GTI SoftView
- ◆ Just Normlicht
- ◆ Solux Task Lamp
- ◆ Office Depot Lamp
- ◆ Home Depot bulb

# Are there any standards we can adopt ?

- ISO 3664:2001 for critical comparison of reference print to digital output
- ISO 12646 for monitor to print comparison



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# ISO 12646: Display color proofing – characteristics and viewing conditions

- Currently in draft stage
- Proposes requirements for measurable tolerancing of viewing and display devices
- Describes monitor calibration techniques
- Viewing booth calibration



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# ISO 12646 (Draft 4)

## Viewing area recommendations

- Ambient illumination shall have a color temperature equal to, or less than, that of the display white point
- Illumination when measured at the face of the monitor, or in any plane between the monitor and the observer, shall be less than 64 lux and, preferably, less than 32 lux
- surround shall be 10% of the maximum luminance of the screen
- Recommends lower illumination level for light booth of as listed P2 in ISO 3664, 500 lux



# ISO 12646 (Draft 4)

## - Monitor calibration

- Bias calibration should be done at 10% of the maximum luminance level
- A white border, at least 1" in width, with the chromaticity similar to the substrate should surround image on computer display



# Keys to getting a good Monitor to Print Agreement

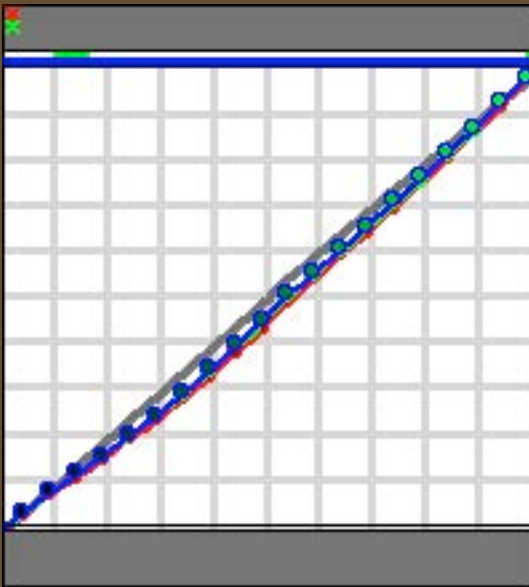
- High brightness level
- Monitor's white point is visually close to perceived white of paper stock under light source
- Calibrate to device's native gamma and not force device to respond in a different gamma
- Use a device's gain and bias controls (if available) to calibrate to reference white point and neutralize shadow bias. Less compensation will be required in VCLUTs to meet target values
- Monitor Profiling software that uses 3D LUTs to minimize color casts in neutrals is ideal



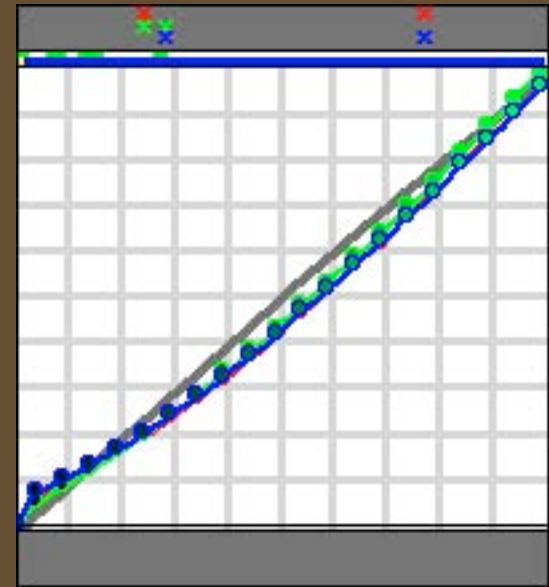
# Gray balance

- Gray balance is key
- ACD is more neutral unlike CRT technology

Apple Cinema Display



Typical CRT display

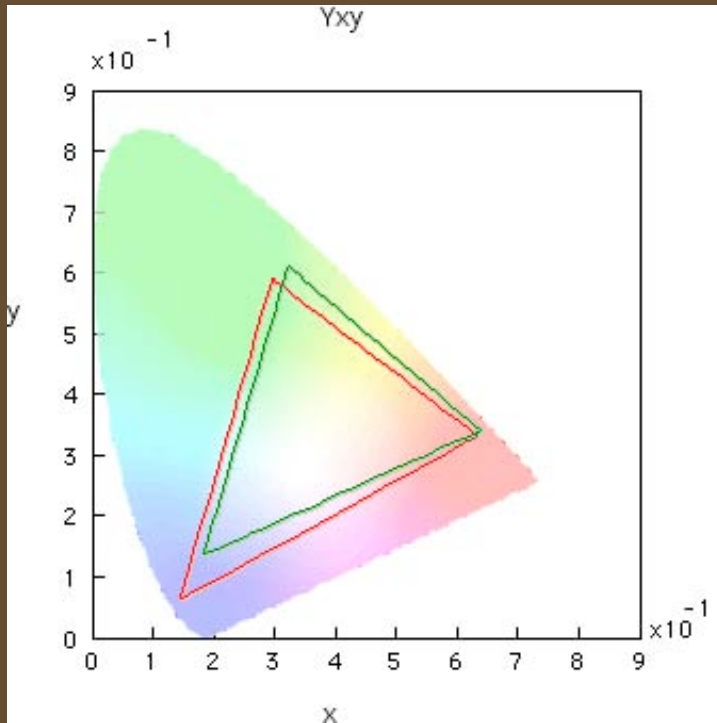


# Higher luminance levels of the computer display are key

- ACD are ideal because of their higher brightness level
- Less compensation needed at light booth to balance illumination from booth to display
- Calibrate to at least 100 cd/m<sup>2</sup> and ideally to 120 cd/m<sup>2</sup>
- Dingy yellow monitor a result of too low brightness



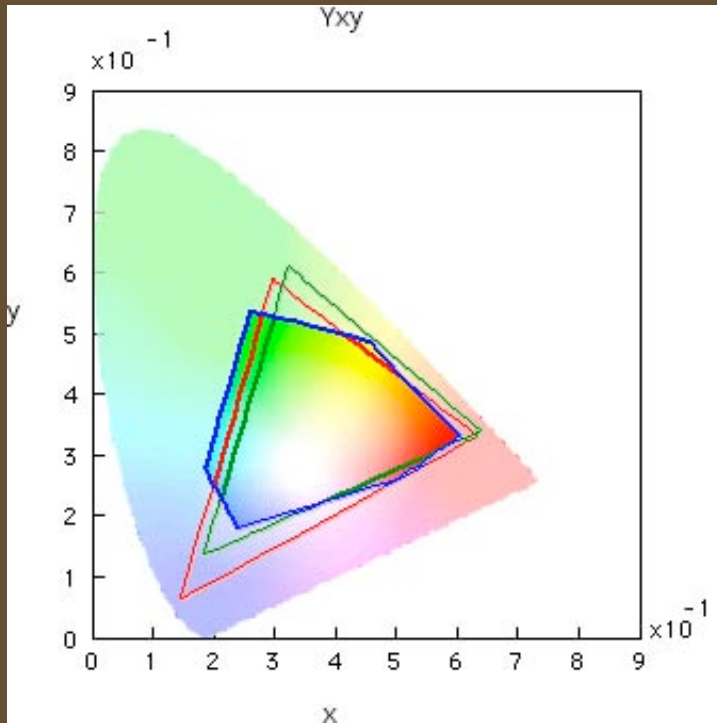
# Which Display technology is best?



◆ Apple Cinema Display

◆ CRT

# Which Display technology is best?



- ◆ Apple Cinema Display
- ◆ CRT
- ◆ US Web Coated v2

# Photoshop v6.x does an amazingly good job

- Photoshop can compensate pretty well when you have a
  - Good white point in the printer ICC profile and decent BtoA for previewing
  - Monitor white point in Monitor profile is reasonably close to Printer ICC profile
- Majority of Monitor soft-proofing fails because of poor profile white point specification (I.e. papers w/ fluorescent brighteners measured without a UV filter)



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