U.S. Food and Drug Administration
Protecting and Promoting *Your* Health

Medical Imaging Working Group meeting
FDA interactive session

Medical RGB color space - mRGB (Michael Flynn / Albert Xthona)

June 20th 2014

US FDA - White Oak Conference Center

Goal of mRGB group

- Problem to be solved: “There is no suitable colour space and display calibration objective for medical imaging displays designed to display colour medical images”

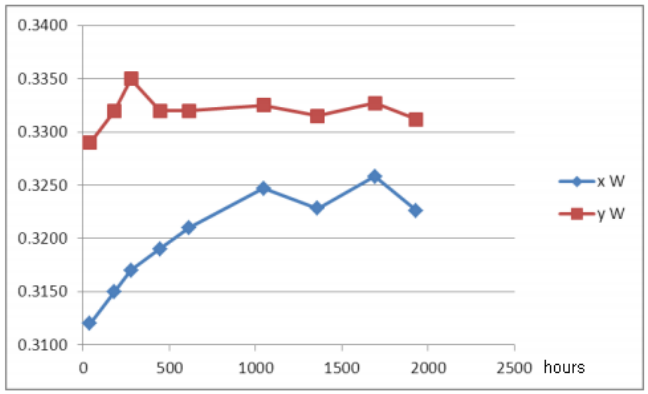
- Group activities
  - Educate
  - Standardize
  - Expose
  - Promote metrics

Educate

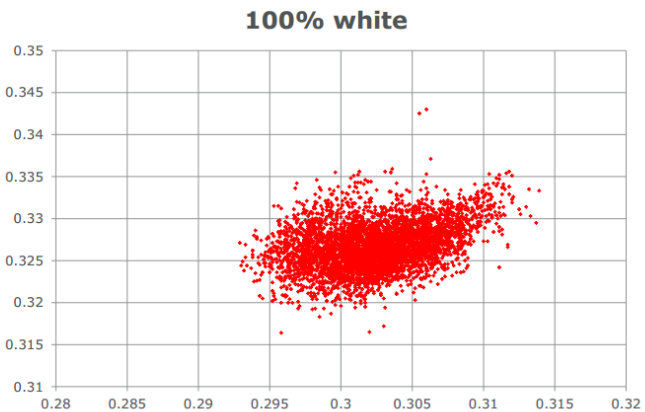
- Educate the community about inherent instability of color medical displays
  - Drift over time of displays (also colour behaviour)
  - Variability between types/brands and individual display units
  - Potential impact of variability/instabilities on clinical practice

- Eg. Results presented eg. at ICC/FDA summit on color in medical imaging and at other group meetings/conference calls

Color point stability of displays over time

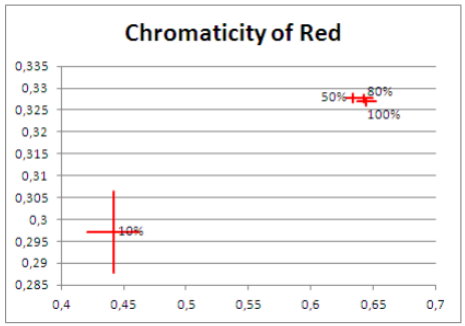


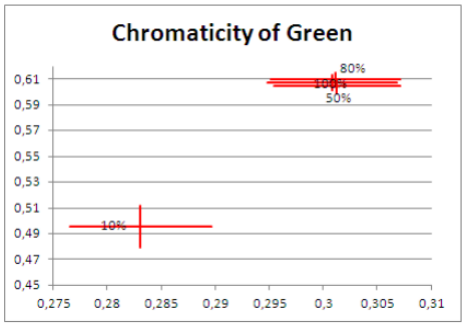
White point variation of color displays (1)

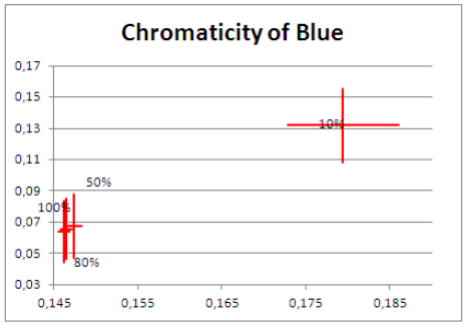


- (x,y)-coordinates of 4355 color displays during manufacturing measured with Minolta CA-210

Primary variation of color displays (1)







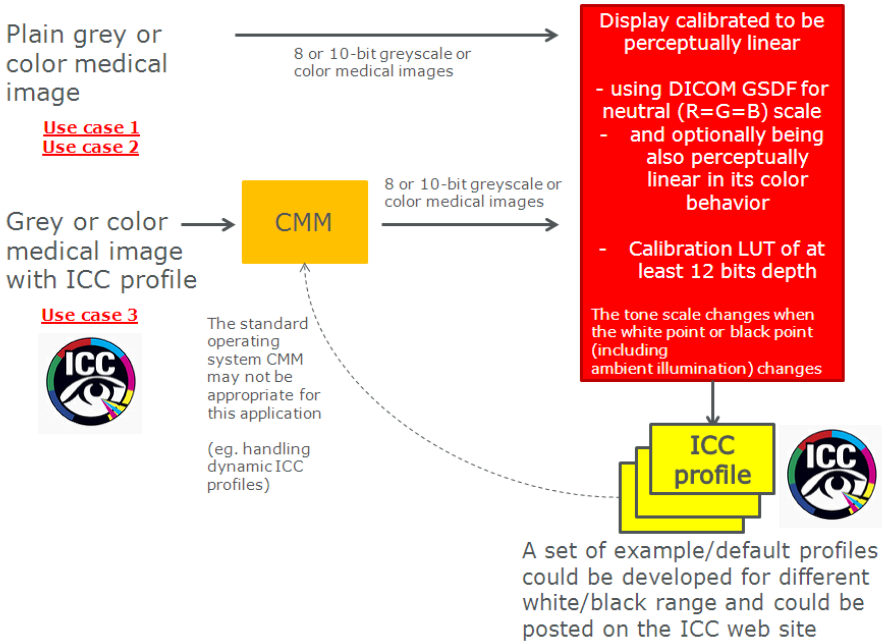
Standardize

- Standardize the visualization architecture and specifications for color medical visualization solutions

Color spaces compared — * IEC 62563 terminology

Specification*	sRGB	aRGB	ACR	mRGB
Luminance Response	~2.2 power function	2.199 power function	DICOM GSDF	DICOM GSDF
Color Gamut	HDTV based ITU-R BT.709-5	'Wide' (extended G)	-nd-	sRGB (aRGB option ?)
L_{max} , cd/m²	80	160 (125-200)	350/420/250	350/420/250
L_{min} , cd/m²	-nd-	0.56	L_{max} / LR	L_{max} / LR
Luminance Ratio (LR)	-nd-	287.9 (230-400)	350 (> 250)	350
White Point	D65	D65	D65	D65
Gray tracking	-nd-	-nd-	-nd-	IEC MT51
Surround	20% refl. lx	Gray < 20% L_{max}	-nd-	20% L_{max}
Ambient Illumination, lx	64 (D50)	32	20-40	-nd-
Veiling Glare	1.0%	accounted	-nd-	-nd-
L_{amb} , cd/m²	-nd-	-nd-	$L_{amb} < L_{min}/4$	$L_{amb} < L_{min}/4$

AAPM TG196 http://www.color.org/groups/medical/Flynn.pdf



Expose

- Expose details of a suitable visualization architecture and corresponding specifications

- Provide a public reference implementation
  - Example ICC profiles
  - Sample application of how colour can be appropriately handled in medical imaging

Promote

- Measurement methodologies & metrics
  - Primary stability
  - Perceptually Linear Color Behavior
  - Metrics for colour calibration accuracy
  - …

- Collaboration with other groups
  - AAPM TG 196
  - IEC MT51

International Electrotechnical Commission