



2013 ICC Meeting
Medical Imaging Working Group
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mRGB

AAPM TG196 Progress

Michael Flynn
Radiology Research
Henry Ford Health System
Detroit, MI





sRGB: IEC 61966-2-1

- sRGB is a standard RGB color space created cooperatively by HP and Microsoft in 1996 for use on monitors, printers and the Internet.
- the sRGB gamma cannot be expressed as a single numerical value. The overall gamma is approximately 2.2, consisting of a linear (gamma 1.0) section near black, and a non-linear section elsewhere
- IEC 61966-2-1:1999 is the official specification of sRGB. It provides viewing environment, encoding, and colorimetric details.

IEC 61966-2-1

Colour Measurement and Management in Multimedia Systems and Equipment

Part 2-1: Default RGB Colour Space – sRGB

1. GENERAL
 1. Introduction
 2. Scope
 3. Normative References
 4. Definitions
2. REFERENCE CONDITIONS
 1. Reference Display Conditions
 2. Reference Viewing Conditions
 3. Reference Observer Conditions
3. ENCODING CHARACTERISTICS
 1. Introduction
 2. Transformation from RGB values to 1931 CIE XYZ values
 3. Transformation from 1931 CIE XYZ values to RGB values

ANNEX A: Ambiguity in the Definition of the Term "Gamma"

ANNEX B: sRGB and ITU-R BT.709-2 Compatibility

ANNEX C: Usage Guidelines

ANNEX D: Typical Viewing Conditions

ANNEX E: Recommended Treatment for Viewing Conditions

ANNEX F: Bibliography



aRGB: Adobe RGB (1998)

- The Adobe RGB color space is an RGB color space developed by Adobe Systems in 1998.
- It was designed to encompass most of the colors achievable on CMYK color printers, but by using RGB primary colors on a computer display.
- A gamma of 2.2 is assumed.
- The color space encompasses roughly 50% of the visible colors specified by the Lab color space, improving upon the gamut of the sRGB color space primarily in cyan-greens.

Adobe RGB (1998)

Color Image Encoding

Version 2005-05, May 2005

Introduction

1. Scope
2. References
3. Terms
4. Requirements
 1. General
 2. Reference Viewing Environment
 3. Adobe RGB (1998) Color Image Encoding
5. Indicating the use of Adobe RGB (1998) ..

Annex A: The Adobe RGB (1998) ICC profile

Annex B: Practical tolerances for display devices

Annex C: Implementation notes

http://http://en.wikipedia.org/wiki/Adobe_RGB_color_space
<http://www.adobe.com/digitalimag/pdfs/AdobeRGB1998.pdf>



ACR-AAPM-SIIM standard

- The ACR-AAPM-SIIM technical guideline for electronic imaging was recently revised with participation by three professional Radiology organizations:
 - The American College of Radiology (ACR),
 - The American Association of Physicists in Medicine (AAPM),
 - The Society for Imaging Informatics in Medicine (SIIM).
- The recently published guidelines contain specific recommendations for viewing conditions and display characteristics.
 - DICOM Grayscale with defined L_{\max} and L_{\min} .
 - D65 white point.
 - Undefined color gamut.

ACR–AAPM–SIIM Technical Standard for Electronic Practice of Medical Imaging

JT Norweck, JA Seibert, KP Andriole,
DA Clunie, BH Curran, MJ Flynn,
E Krupinski, RP Lieto, DJ Peck, TAMian

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Display

1. Workstation Characteristics
 - f. Ergonomic factors
 2. Viewing Conditions
2. Display characteristics
 - a. Luminance response
 1. Ambient Luminance, L_{amb}
 2. Minimum Luminance, L_{min}
 3. Maximum Luminance, L_{max}
 4. Luminance Ratio, LR
 5. L_{max} for Diagnostic & other
 6. Luminance vs Gray Level
 7. Calibration
 8. Quality Control
 9. White Point.
 - b. Pixel Pitch and Display Size

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AAPM TG196: mRGB

AAPM Task Group No. 196
Requirements and methods for
color displays in medicine.

Aldo Badano, PhD
Paul Boynton
Wei-Chung Cheng
Danny Deroo
Michael Flynn
Patrick Le Callet
Takashi Matsui
John Penczek
Craig Revie
Hans Roehrig
Ehsan Samei
Peter Steven
Stan Swiderski
Gert Van Hoey
Masahiro Yamaguchi



Medical RGB Color space (mRGB)

Report of AAPM Task Group 196

Expected in 2014

<http://www.aapm.org/pubs/reports/>

http://www.aapm.org/org/structure/default.asp?committee_code=TG196



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/m ²	80	160 (125-200)	350/420/250	350/420/250
L_{min} , cd/m ²	-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/m ²	-nd-	-nd-	$L_{amb} < L_{min}/4$	$L_{amb} < L_{min}/4$