Ultra-High Definition/Wide-Color-Gamut

Standard Test Images

Reference Manual

Institute of Image Information and Television Engineers

Association of Radio Industries and Businesses

On the Release of Ultra-High Definition/Wide-Color-Gamut Standard Test Images

The Institute of Image Information and Television Engineers (ITE; formerly the Institute of Japanese Television) is dedicated to the development and progress of cutting-edge imaging technologies throughout history. Toward this end, we have released various kinds of standard test images. It cannot be overstated that the use of these test images in research and development and evaluation trials has played a major role in the practical implementation of information communication services and image information media widely used today, such as the digitization of broadcasting and communication and the development of high definition TV and 3D video systems.

In the past several years, improvements in the resolution and quality of image information media have accelerated around in the world. In Japan especially, creating the environment for 4K (3840 × 2160 pixels) and 8K (7680 × 4320 pixels) broadcasting is positioned as a part of economic growth strategy using ICT. Recently, Tokyo was also chosen as the host of the 2020 Summer Olympics. These circumstances have led to a quickening in the efforts toward the practical implementation of 4K/8K technologies, such as the development of a 4K/8K satellite broadcast system and related equipment. In addition to their high pixel counts, their bit depth and color gamut have also been expanded. As a result, it is currently not easy to set up equipment and environment to obtain test images necessary for research and development. Thus, providing ultra-high definition/wide-color-gamut standard test images that conform to new international standards, so that next-generation imaging systems such as 4K/8K can be expeditiously implemented, has become an urgent task for many institutions in academia, industry, and government involved in the R&D of imaging technologies.

Against this background, ITE and the Association of Radio Industries and Businesses (ARIB) have collaborated in producing a set of still digital images that comply with ITU-R Recommendation BT.2020, which specifies the international standards for 4K/8K images. We are releasing these images as “Ultra-High Definition/Wide-Color-Gamut Standard Test Images.” We are pleased to say that they truly meet today’s demands. I sincerely hope that with these images, R&D of next-generation image information media will be invigorated even more, and an era in which anyone can conveniently and intimately enjoy the benefits of a video experience brimming with the sensation of reality will arrive a day earlier.

May 2014

Susumu ITOH
President of the Institute of Image
Information and Television Engineers

Selection and Production of Ultra-High Definition/Wide-Color-Gamut Standard Test Images

The studio production standard for ultra-high definition television (UHDTV) was developed by International Telecommunication Union Radiocommunication Sector (ITU-R) as Recommendation ITU-R BT.2020. The ARIB standard STD-B56 was also developed by the Association of Radio Industries and Businesses (ARIB). Technical specifications toward the start of UHDTV broadcasting are also being developed. There is growing demand for standard test images appropriate for the evaluation of 8K and 4K imaging equipment and systems that are compliant to the studio standards.

The “Study Group for the Quality Evaluation Method” of the ARIB has been investigating quality evaluation methods for images and sound. As a part of these activities, we already selected and produced standard test images and sequences for the assessment of high definition systems. These test materials have been distributed by the Institute of Image Information and Television Engineers (ITE).

Recently, under the supervision of ITE, we selected and produced ultra-high definition/wide-color-gamut still images that conform to the UHDTV studio standard. These images are released as “Ultra-High Definition/Wide-Color-Gamut Standard Test Images.” We expect that these new standard test images will be widely used and lead to the rapid popularization and expansion of UHDTV.

May 2014

Yukihiro NISHIDA
Chairman
Study Group for the Quality Evaluation Method
Association of Radio Industries and Businesses

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    - “Moss”, ”Kimono”, ”Ship”

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- The use of these standard test images is limited to the following purposes:

  (1) Use for technical evaluation
    - Research and development of equipment/systems
    - Examination and testing in equipment production process
    - Evaluation of transmission paths for broadcasting/communication
    - Maintenance of equipment

  (2) Use for exhibitions
    - Exhibition in academic conferences and research meetings
    - Exhibition of equipment’s performance/functions in exhibitions[1]
      (With the exception of sales and promotional purposes)

[1] When using the standard test images for this purpose, contact ITE beforehand.

The following institutions were involved in the production of the standard test images.

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Coordinator:	Shigeyuki Sakazawa (KDDI R&D Laboratories)	
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Ultra-High Definition/Wide-Color-Gamut Standard Test Images Reference Manual

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1. Overview of Ultra-High Definition/Wide-Color-Gamut Standard Test Images

In order to offer convenient and accurate ways to assess image quality and to evaluate performance of imaging devices, systems, and methods, the Institute of Image Information and Television Engineers (ITE) has released a variety of standard test images. For example, in 1990 it published “High-Vision Standard Test Pictures” (set of nine slides) for still images. In 1992 and 1999 its digitalized versions of the images were released as “Digital HDTV Standard Pictures for Subjective Assessment” [1] and “Digital HDTV Standard Pictures for Subjective Assessment (Revised Edition)” [2], respectively. For video, ITE released “ITE/ARIB Hi-Vision Test Sequences” (60 standard test sequences, 10 reference sequences) [3] in 1993 and “ITE/ARIB Hi-Vision Test Sequences 2nd Edition” (44 general sequences, 34 specific sequences) [4] in 2009. These standard test sequences were created in collaboration with the Association of Radio Industries and Businesses (ARIB) and meet the standards of high definition images at the time. Meanwhile, the progress in technology to improve picture quality in image capture devices and display equipment has been remarkable. Research and development for commercializing next-generation imaging systems with greater sensation of reality, such as ultra-high definition TV, which features high spatial resolution of 8K and 4K as well as wide-color gamut color representation, is proceeding at an accelerated pace.

In this state of affairs, there is a growing need for standard test images compliant to new image formats. Thus, ARIB and ITE again cooperated to produce and distribute “Ultra-High Definition/Wide-Color-Gamut Standard Test Images.” These high-quality digital still images were captured using the newest photography equipment.

These standard test images are provided in three formats: 8K and 4K resolutions prescribed by the International Telecommunication Union Radiocommunication Sector (ITU-R) Recommendation BT.2020 [5] as studio production standards for ultra-high definition television (UHDTV), and 2K resolution compliant with ITU-R Recommendation BT.709 [6], which prescribes studio standards for high definition television (HDTV). Table 1-1 provides a summary of each format.

Table 1-1 Image formats of standard test images.

Resolution	8K	4K	2K
Image size (horizontal × vertical)	7680 × 4320 pixels	3840 × 2160 pixels	1920 × 1080 pixels
Aspect ratio	16: 9 (square pixels)		
Sampling ratio	RGB 4: 4: 4		
Bit depth	12 bits per color signal		10 bits per color signal
Quantization	ITU-R BT.2020 compliant		ITU-R BT.709 compliant
Color space	ITU-R BT.2020 compliant		ITU-R BT.709 compliant
File format	12-bit RAW		16-bit TIFF (Upper 10-bits are used)

For photographing the material images, the Hasselblad H4D-200MS, a digital single-lens reflex camera, was used. The primary specifications of the camera and lenses used are shown in Tables 1-2 and 1-3. The camera has two photographing modes: single-shot and multi-shot. In a single-shot mode, images are captured in a similar way to a general single-plate CCD camera. Complete color information per pixel is obtained by an interpolative process called demosaicing from pixel values each of which exclusively corresponds to one of R, G, or B color signals captured through a Bayer color filter array placed in front of the CCD sensor. In contrast, multi-shot is a photographing mode in which all color signals are directly obtained for each pixel by shifting the CCD sensor precisely one pixel in the horizontal and vertical directions while capturing the image successively four or six times. The multi-shot mode can capture faithful color information without moire or false color produced by the demosaicing process. However, because in principle it can only be applied to still objects, either single-shot or multi-shot (four times) mode was used for shooting the material images depending on the object being photographed.

Table 1-2 Camera specifications.

Camera	Hasselblad H4D-200MS
Imaging device	CCD (49.1×36.7 mm)
Effective pixels	8176×6132 pixels
Internal bit depth	16-bit
Photographing mode	Single-shot/Multi-shot (4× or 6×)
ISO sensitivity	ISO 50/100/200/400/800
Shutter speed	1/800 – 128 sec

Table 1-3 Lens specification.

Model	**HCD 4/28**	**HC 3.5/35**	**HC 3.5/50-II**	**HC 2.8/80**	**HC Macro 4/120-II**
Focal length	28.9 mm	35.8 mm	50.3 mm	82.3 mm	118.7 mm
Maximum aperture	4.0	3.5	3.5	2.8	4.0
Number of elements/ group	12/9	11/10	10/9	6/6	9/9
Focal range	0.35 m – ∞	0.5 m – ∞	0.6 m – ∞	0.7 m – ∞	0.39 m – ∞

For 8K image data, utility software provided by the camera manufacture (Phocus, ver. 8.1) was used to trim the region that fits the 8K specification and to develop it in ProPhotoRGB (ROMM RGB) color space [7]. The region was quantized/converted to a Rec. 2020-compliant color system using numerical analysis software MATLAB. For 4K and 2K resolution image data, the aforementioned region was down-sampled using the same utility software. Images conforming to Rec. 2020 or Rec. 709 were then generated using MATLAB.

Table 1-4 compares the chromaticity coordinates of the RGB primary colors and the reference white (W) specified for UHDTV (Rec. 2020) and HDTV (Rec. 709), respectively. Figure 1-1 shows the points of the primary colors on the CIE 1931 *xy* chromaticity diagram. For the UHDTV color space, the points of the three RGB primary colors lie on the horseshoe-shaped spectral locus. The color space was designed to realize a wide-color gamut compared with conventional HDTV [8, 9]. Note that when RGB values of 8K/4K image data were provided as-is to the conventional HDTV display system, correct color reproduction would not be possible.

Table 1-4 Chromaticity coordinates (CIE 1931) of UHDTV and HDTV.

	UHDTV (BT.2020)		**HDTV (BT.709)**	
	x	*Y*	*x*	*y*
R	0.708	0.292	0.640	0.330
G	0.170	0.797	0.300	0.600
B	0.131	0.046	0.150	0.060
W (D65)	0.3127	0.3290	0.3127	0.3290

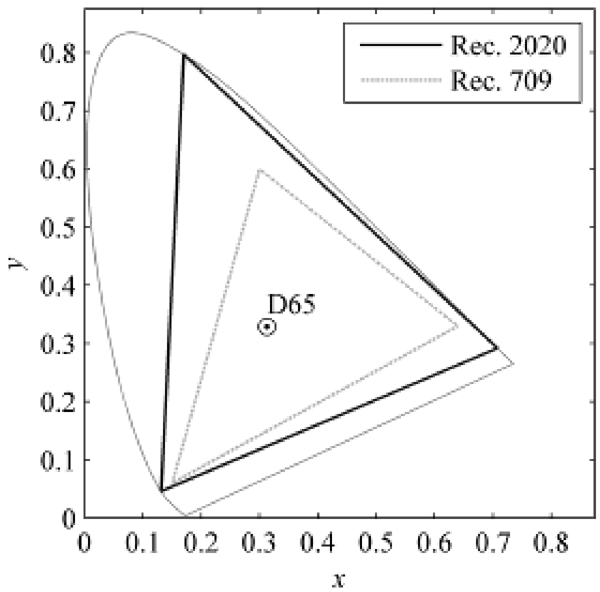


Figure 1-1 Three primary colors used in the RGB color spaces of UHDTV and HDTV.

[1] S. Yamashita, Y. Hattori, K. Masaru, and N. Narita, "Digitizing Process of HDTV Standard Pictures for Subjective Assessment" [in Japanese], The Journal of the Institute of Television Engineers of Japan, Vol. 46, No. 6, pp. 756–765, June 1992.

[2] "Digital HDTV Standard Pictures for Subjective Assessment Reference Manual (Revised Edition)" [in Japanese], ITE, April 1999.

[3] "ITE/ARIB Hi-Vision Test Sequences Reference Manual," [in Japanese], ITE, Oct. 1993.

[4] "ITE/ARIB Hi-Vision Test Sequences 2nd Edition Reference Manual," ITE, Nov. 2009.

[5] Rec. ITU-R BT.2020, "Parameter Values for Ultra-high Definition Television Systems for Production and International Programme Exchange," Aug. 2012.

[6] Rec. ITU-R BT.709, "Parameter Values for the HDTV Standards for Production and International Programme Exchange," Apr. 2002.

[7] Eastman Kodak Company, "Reference Output Medium Metric RGB Color Space (ROMM RGB) White Paper," Version 2.2, July 1999.

[8] K. Masaoka, Y. Nishida, M. Sugawara, and E. Nakasu, "Design of Primaries for a Wide-Gamut Television Colorimetry," IEEE Trans. Broadcast., Vol. 56, No. 4, Dec. 2010.

[9] K. Masaoka, Y. Nishida, and M. Sugawara, "Wide-Gamut Colorimetry for Super Hi-Vision: Advanced Television System Providing Better Visual Experience," [in Japanese], IEICE Technical Report, Vol. 111, No. 35, pp. 19–24, May 2011.

2. Recording Formats

The recording formats of the standard test images recorded on the DVD differ for 8K/4K images and 2K images.

For 8K and 4K images (12-bit), there is one file each for the R, G, and B components of an image. For each file, the data is expressed with 2 bytes per pixel. In the case of 8K, the size of one file is 66,355,200 bytes. In the case of 4K, the size is 16,588,800 bytes. Of the two bytes, a 12-bit pixel uses lower 4 bits of the first byte and all 8 bits of the second byte; the upper 4 bits of the first byte are set to “0”. Note that the 2-byte data of each pixel is recorded in high-to-low byte order (big-endian).

For 2K images (10-bit), each pixel is stored in uncompressed 16-bit TIFF format. The 10-bit value per RGB color is stored in upper 10 bits of 16-bit data for each color; the remaining lower 6 bits are set to “0”. Also, these 2-byte data are arranged in RGB order for each pixel. Each file has 12,441,600 bytes for the image data and additional data for the header information. Note that the byte order of the TIFF format is arbitrary. However, in these standard test images, the 2-byte data of each color is recorded in low-to-high byte order (little-endian).

Figure 2-1 shows the structure of the file formats. Figure 2-2 shows the directory structure within the DVD. Tables 2-1, 2-2, and 2-3 show the list of files of the standard test images.

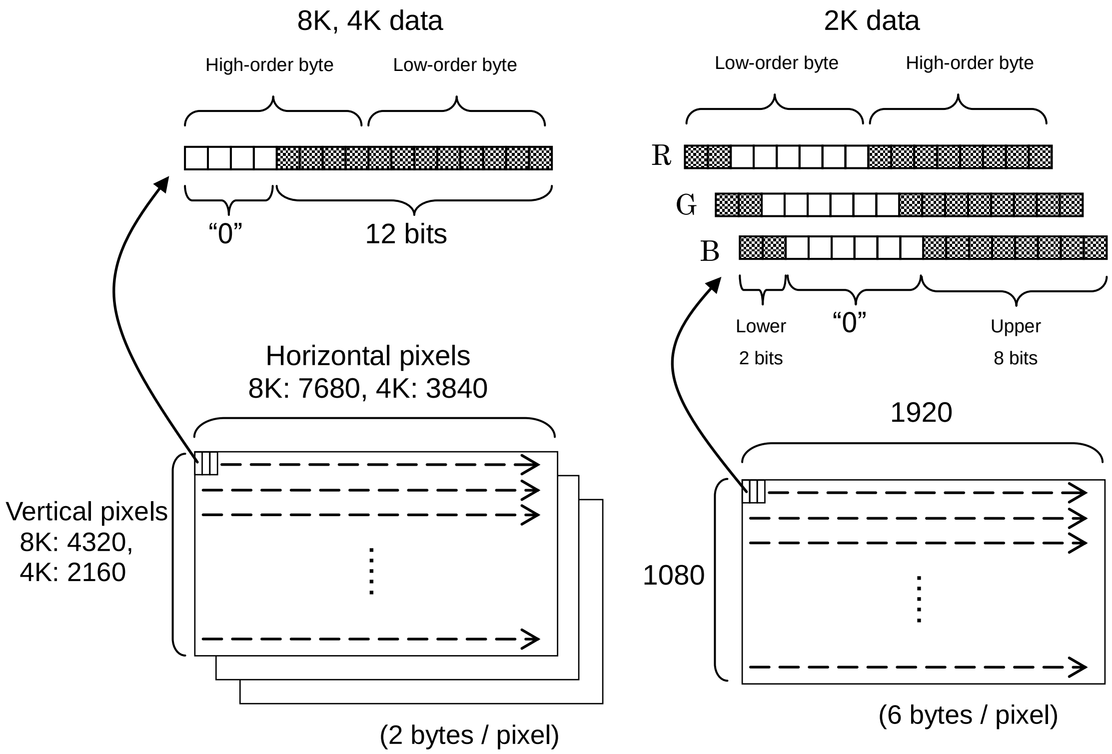


Figure 2-1 File formats

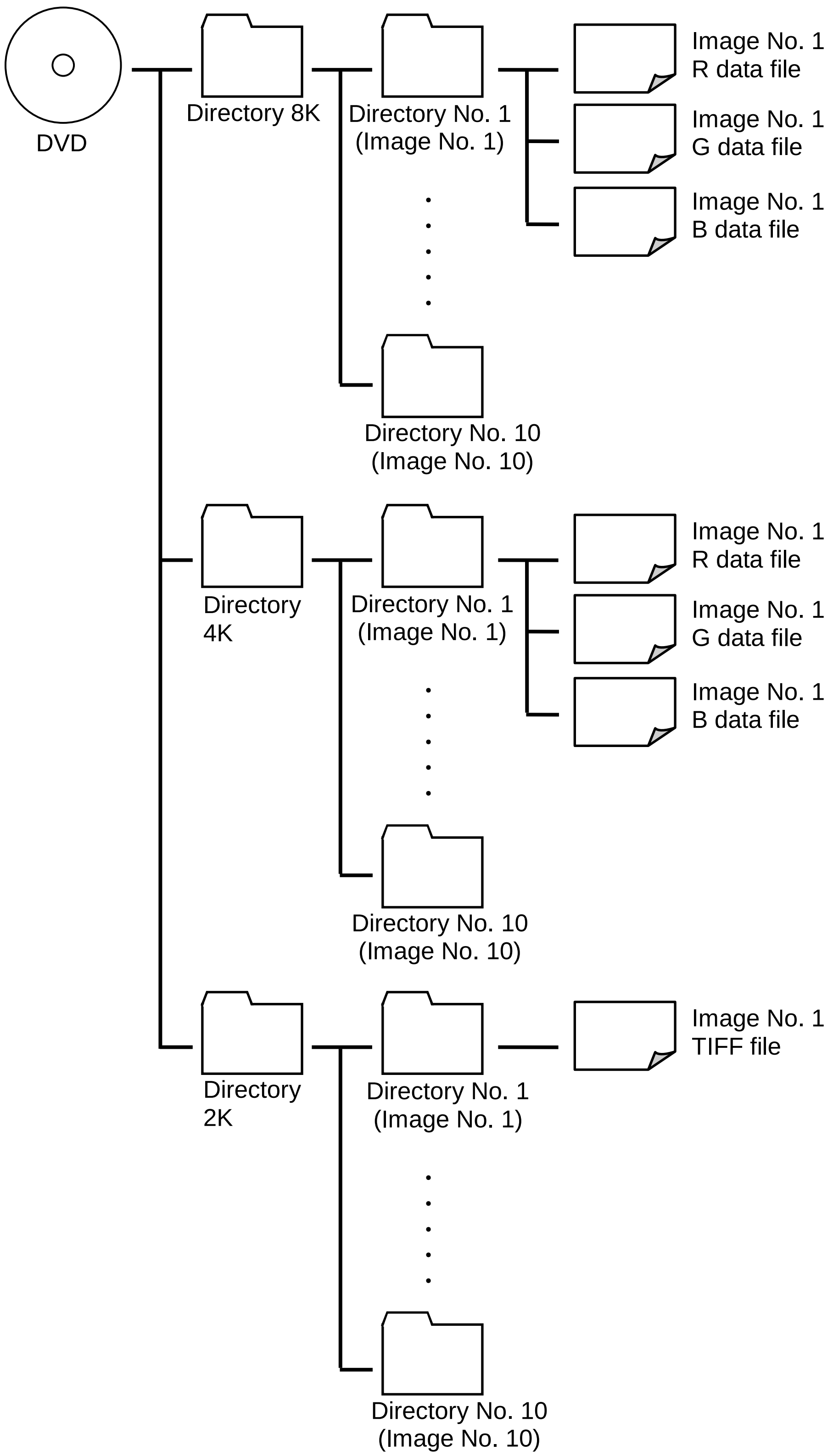


Figure 2-2 Directory structure

Table 2-1 List of file names (8K)

Directory name		File name	Content
8K	u01_Books_8K	u01_Books_8K.r	"Books" - R data
		u01_Books_8K.g	"Books" - G data
		u01_Books_8K.b	"Books" - B data
	u02_MusicBox_8K	u02_MusicBox_8K.r	"MusicBox" - R data
		u02_MusicBox_8K.g	"MusicBox" - G data
		u02_MusicBox_8K.b	"MusicBox" - B data
	u03_Moss_8K	u03_Moss_8K.r	"Moss" - R data
		u03_Moss_8K.g	"Moss" - G data
		u03_Moss_8K.b	"Moss" - B data
	u04_Kimono_8K	u04_Kimono_8K.r	"Kimono" - R data
		u04_Kimono_8K.g	"Kimono" - G data
		u04_Kimono_8K.b	"Kimono" - B data
	u05_StainedGlass_8K	u05_StainedGlass_8K.r	"StainedGlass" - R data
		u05_StainedGlass_8K.g	"StainedGlass" - G data
		u05_StainedGlass_8K.b	"StainedGlass" - B data
	u06_Butterflies_8K	u06_Butterflies_8K.r	"Butterfly" - R data
		u06_Butterflies_8K.g	"Butterfly" - G data
		u06_Butterflies_8K.b	"Butterfly" - B data
	u07_ChromaKey_8K	u07_ChromaKey_8K.r	"ChromaKey" - R data
		u07_ChromaKey_8K.g	"ChromaKey" - G data
		u07_ChromaKey_8K.b	"ChromaKey" - B data
	u08_Sea_8K	u08_Sea_8K.r	"Sea" - R data
		u08_Sea_8K.g	"Sea" - G data
		u08_Sea_8K.b	"Sea" - B data
	u09_Flowers_8K	u09_Flowers_8K.r	"Flowers" - R data
		u09_Flowers_8K.g	"Flowers" - G data
		u09_Flowers_8K.b	"Flowers" - B data
	u10_Ship_8K	u10_Ship_8K.r	"Ship" - R data
		u10_Ship_8K.g	"Ship" - G data
		u10_Ship_8K.b	"Ship" - B data

Table 2-2 List of file names (4K)

Directory name		File name	Content
4K	u01_Books_4K	u01_Books_4K.r	“Books” - R data
		u01_Books_4K.g	“Books” - G data
		u01_Books_4K.b	“Books” - B data
	u02_MusicBox_4K	u02_MusicBox_4K.r	“MusicBox” - R data
		u02_MusicBox_4K.g	“MusicBox” - G data
		u02_MusicBox_4K.b	“MusicBox” - B data
	u03_Moss_4K	u03_Moss_4K.r	“Moss” - R data
		u03_Moss_4K.g	“Moss” - G data
		u03_Moss_4K.b	“Moss” - B data
	u04_Kimono_4K	u04_Kimono_4K.r	“Kimono” - R data
		u04_Kimono_4K.g	“Kimono” - G data
		u04_Kimono_4K.b	“Kimono” - B data
	u05_StainedGlass_4K	u05_StainedGlass_4K.r	“StainedGlass” - R data
		u05_StainedGlass_4K.g	“StainedGlass” - G data
		u05_StainedGlass_4K.b	“StainedGlass” - B data
	u06_Butterflies_4K	u06_Butterflies_4K.r	“Butterfly” - R data
		u06_Butterflies_4K.g	“Butterfly” - G data
		u06_Butterflies_4K.b	“Butterfly” - B data
	u07_ChromaKey_4K	u07_ChromaKey_4K.r	“ChromaKey” - R data
		u07_ChromaKey_4K.g	“ChromaKey” - G data
		u07_ChromaKey_4K.b	“ChromaKey” - B data
	u08_Sea_4K	u08_Sea_4K.r	“Sea” - R data
		u08_Sea_4K.g	“Sea” - G data
		u08_Sea_4K.b	“Sea” - B data
	u09_Flowers_4K	u09_Flowers_4K.r	“Flowers” - R data
		u09_Flowers_4K.g	“Flowers” - G data
		u09_Flowers_4K.b	“Flowers” - B data
	u10_Ship_4K	u10_Ship_4K.r	“Ship” - R data
		u10_Ship_4K.g	“Ship” - G data
		u10_Ship_4K.b	“Ship” - B data

Table 2-3 List of file names (2K)

Directory name		File name	Content
2K	u01_Books_2K	u01_Books_2K.tif	Books
	u02_MusicBox_2K	u02_MusicBox_2K.tif	MusicBox
	u03_Moss_2K	u03_Moss_2K.tif	Moss
	u04_Kimono_2K	u04_Kimono_2K.tif	Kimono
	u05_StainedGlass_2K	u05_StaindGlass.tif	StainedGlass
	u06_Butterflies_2K	u06_Butterflies_2K.tif	Butterflies
	u07_ChromaKey_2K	u07_ChromaKey_2K.tif	ChromaKey
	u08_Sea_2K	u08_Sea_2K.tif	Sea
	u09_Flowers_2K	u09_Flowers_2K.tif	Flowers
	u10_Ship_2K	u10_Ship_2K.tif	Ship

3. Description of Standard Test Images

To evaluate image quality and performance efficiently, it is ideal that a few images can cover all the necessary evaluation items. However, if too many evaluation items are included in one image, the image becomes unnatural. Thus, taking into account the evaluation items shown in Table 3-1, the following images were selected with the goal of maintaining a good balance of evaluation items.

Table 3-1 Evaluation item and corresponding keywords

Resolution	· Luminance resolution (vertical/horizontal/diagonal) · Color resolution
Gray scale reproduction	· γ characteristic (overall tone) · Details of bright areas/dark areas · Black reproducibility (black defects, black floating) · White reproducibility (white defects, halation)
Color reproduction	· Color reproducibility · Color bleeding · Color temperature (white balance)
Degradation due to digital processing	· False contours · Quantization distortion · Blocking artifacts · Ringing · Aliasing · Chroma key processing
Readability	· Readability of lettering
Sensation of presence	· Realness of objects · Sense of immersion
Wide color gamut	· Comparison of color systems · Color reproducibility, color space conversion

The names of the standard test images are shown in Table 3-2 along with their primary evaluation items. The remaining pages provide explanation of the respective image contents as well as their shooting data.

Table 3-2 Primary evaluation items for each image

No.	Evaluation item / Image name	Resolution	Gray scale reproduction	Color reproduction	Degradation due to digital processing	Readability	Sensation of presence	Wide color gamut
1	Books	◎			◎	◎		
2	MusicBox	◎	○			○		
3	Moss			○	○		◎	
4	Kimono	◎		◎	○		◎	
5	StainedGlass	○	◎	◎		○	○	◎
6	Butterflies	◎	◎	◎				◎
7	ChromaKey	◎			◎			
8	Sea		◎	○			○	◎
9	Flowers	○		◎				◎
10 [Sample]	Ship	○	○				◎	

◎ Extremely applicable for evaluation

○ Applicable for evaluation

No. 1 Books

File name: u01_Books_8K.r/g/b, u01_Books_4K.r/g/b, u01_Books_2K.tif

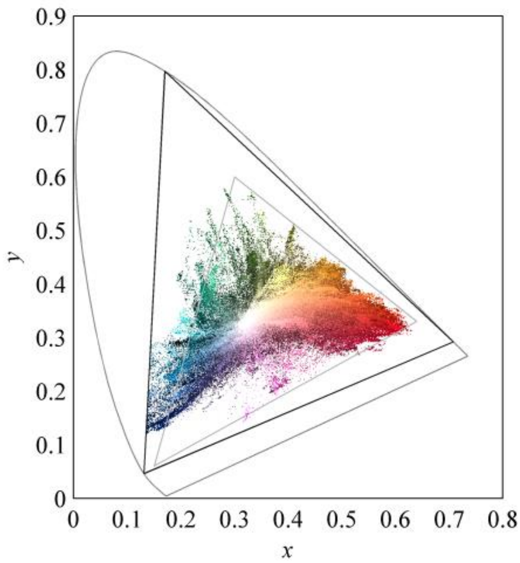
Description

A vast number of books are filled in bookshelves spanning the entire wall of a large room. The image is taken such that the books' spines can be seen. The image can be used to directly evaluate the resolution of the display equipment. Also, because there are spot illuminations in addition to general illumination, the luminosity in each region of the shelves differs. Thus, the image can be also used to evaluate the display equipment's presentation of dark areas through readability in those areas. The image is also useful for evaluating the effects of degradation such as blurriness, aliasing, ringing, and quantization distortion, which noticeably appears in the lettering areas.

Shooting data

Location	Hitoshi Suzuki Design Office (Shinjuku Ward, Tokyo)
Camera	Hasselblad H4D-200MS
Photographing mode	Multi-shot (4×)
Lens	HC 3.5/50-II
Aperture (F-number)	13
Shutter speed	2 sec
ISO sensitivity	50

Photographed in cooperation with Hitoshi Suzuki Design Office



Chromaticity distribution

No. 2 MusicBox

File name: u02_MusicBox_8K.r/g/b, u02_MusicBox_4K.r/g/b, u02_MusicBox_2K.tif

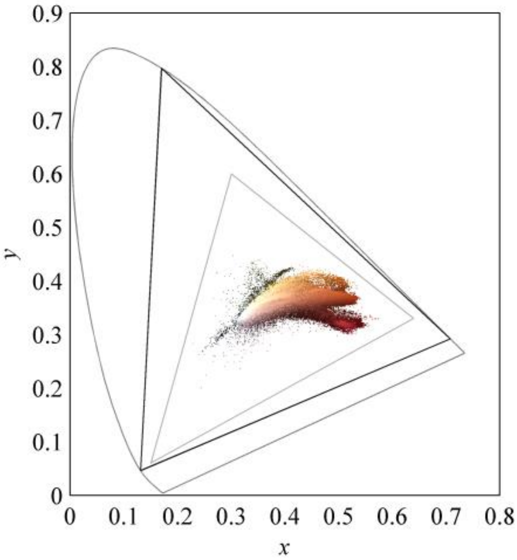
Description

Various kinds of antique music boxes are placed in a room with wooden floor. The image is taken with illumination coming from the ceiling and the rear wall. Because the image is captured in high resolution, it contains not only the texture of decorative engravings on the music boxes and that of the antique dolls, but even the instruments' wood grain and fine scratches. Thus you can use this image to test the resolution of the display equipment and compare image quality between 4K/8K and 2K formats. The image is also useful for evaluating black reproducibility using the wood grain in dark areas. Because several letters are engraved on the music boxes, the image can also be used to assess readability.

Shooting data

Location	Orugoru no Chiisana Hakubutsukan (Bunkyo Ward, Tokyo)
Camera	Hasselblad H4D-200MS
Photographing mode	Multi-shot (4×)
Lens	HC 3.5/50-II
Aperture (F-number)	16
Shutter speed	10 sec
ISO sensitivity	50

Photographed in cooperation with Orugoru no Chiisana Hakubutsukan



Chromaticity distribution

No. 3 Moss

File name: u03_Moss_8K.r/g/b, u03_Moss_4K.r/g/b, u03_Moss_2K.tif

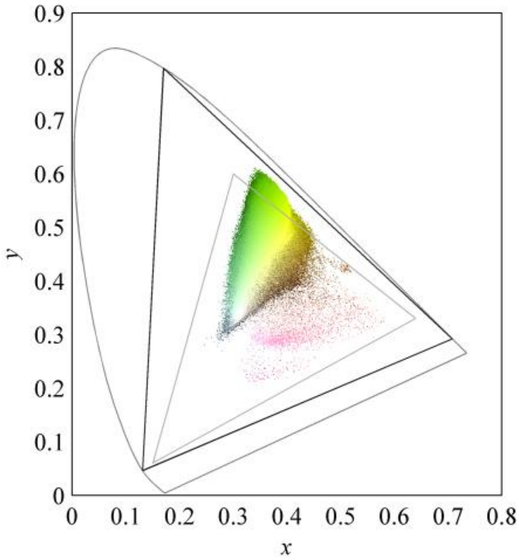
Description

This is an image of moss-covered garden. Because the entire composition, which has depth, contains detailed textures, it is well-suited for evaluating the sense of realness and immersion based on the screen size and image resolution. Elements in the image such as the moss's sharpness and tones, the textures of the rock and tree surfaces, and the edges of leaves and grass are also useful for evaluating degradation such as blurriness, aliasing, ringing, and quantization distortion due to image processing. The veins on the surface of leaves as well as moss and leaves in dark areas such as shades cast by rocks are also well-suited for assessing degradation due to image encoding and other processing.

Shooting data

Location	Hakone Museum of Art (Hakone, Ashigarashimo District, Kanagawa Pref.)
Camera	Hasselblad H4D-200MS
Photographing mode	Single Shot
Lens	HC 3.5/50-II
Aperture (F-number)	16
Shutter speed	1.6 sec
ISO sensitivity	50

Photographed in cooperation with the Hakone Museum of Art



Chromaticity distribution

No. 4 Kimono

File name: u04_Kimono_8K.r/g/b, u04_Kimono_4K.r/g/b, u04_Kimono_2K.tif

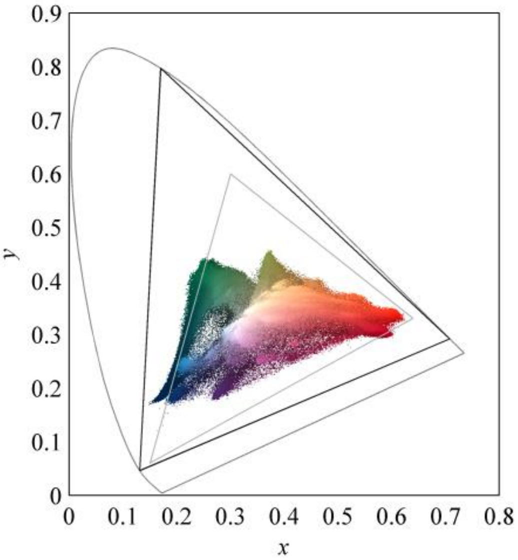
Description

This is an image of a *kara-ori* (“Chinese weave”) kimono (Noh costume) with complex patterns. The detailed texture of the fabric and the colorful design of the kimono are well-suited for assessing the display equipment’s resolution and evaluating color tones. These features are also useful for examining degradation in image encoding and other image processing. Because the image, which includes a painted pine tree and wood grains of the Noh stage in the background, is also suited for evaluating the sensation of reality, it can be used to compare image quality due to differences in image formats.

Shooting data

Location	Yarai Nohgakudo (Shinjuku Ward, Tokyo)
Camera	Hasselblad H4D-200MS
Photographing mode	Multi-shot (4×)
Lens	HC 2.8/80
Aperture (F-number)	11
Shutter speed	4 sec
ISO sensitivity	50

Photographed in cooperation with Kanzeke-Kyukoukai



Chromaticity distribution

No. 5 StainedGlass

File name: u05_StainedGlass_8K.r/g/b, u05_StaindGlass_4K.r/g/b, u05_StaindGlass.tif

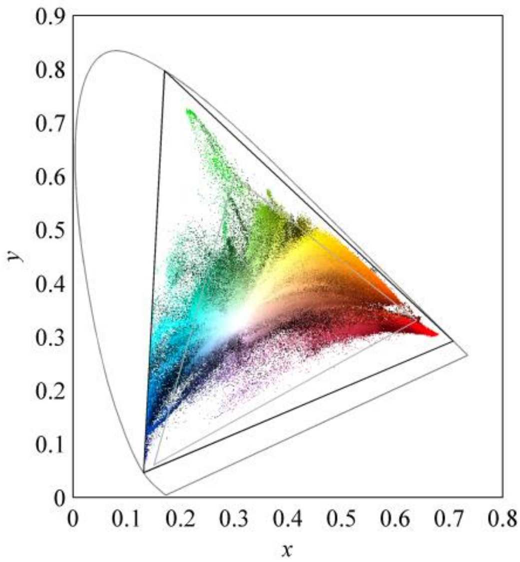
Description

This image captures stained glass that includes detailed parts. Because it also includes detailed textures along with light and dark areas, the image is well-suited for evaluating degradation of details due to image processing and image encoding and corruption of gradation and color tones. It is also useful for reproducing wide-color gamut, including the stained glass's red, yellow, green, and cyan, and for evaluating the columns' black reproducibility. Because the image also contains detailed lettering, it can be used to evaluate readability and degradation of characters due to resolution conversion and image processing.

Shooting data

Location	Nasu Stained Glass Museum (Nasu, Tochigi Pref.)
Camera	Hasselblad H4D-200MS
Photographing mode	Multi-shot (4×)
Lens	HC 3.5/50-II
Aperture (F-number)	11
Shutter speed	1 sec
ISO sensitivity	50

Photographed in cooperation with Nasu Stained Glass Museum



Chromaticity distribution

No. 6 Butterflies

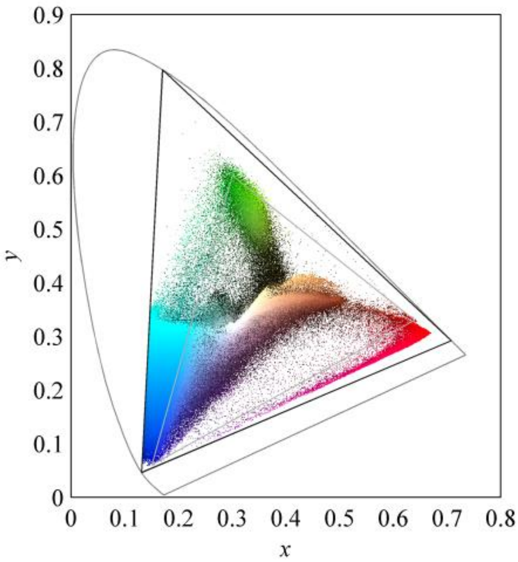
File name: u06_Butterflies_8K.r/g/b, u06_Butterflies_4K.r/g/b, u06_butterflies_2K.tif

Description

This image of butterfly specimens contains extremely fine textures. The butterflies' delicate scales are captured by the wide-color gamut, so the image is useful for confirming resolution and the color system. The texture of the scales are well-suited for evaluating viewing conditions, displays, and change in resolution due to image format conversion and other processing. In the background, the butterflies' shadows and dust are shown at extremely low signal levels. Thus differences in the reproduction conditions of black levels can be seen.

Shooting data

Location	NHK Science & Technical Research Laboratories (Setagaya Ward, Tokyo)
Camera	Hasselblad H4D-200MS
Photographing mode	Multi-shot (4×)
Lens	HC Macro 4/120-II
Aperture (F-number)	13
Shutter speed	1.3 sec
ISO sensitivity	50



Chromaticity distribution

No. 7 ChromaKey

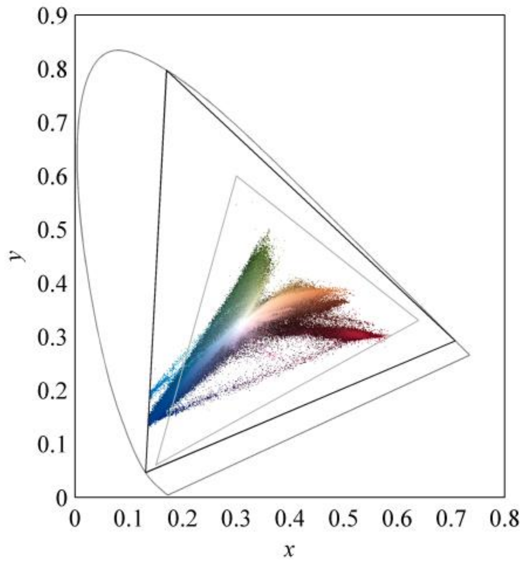
File name: u07_ChromaKey_8K.r/g/b, u07_ChromaKey_4K.r/g/b, u07_ChromaKey_2K.tif

Description

This image captures a model ship, flowers, and a doll against a blue background. It is particularly well-suited for assessing chroma key processing. Because a shallow depth of field is used in photographing the image, various blurry edges are included. The image also contains objects that make chroma key processing difficult, such as the glass filled with water and the doll's lace. The image is thus useful for evaluating the performance of chroma key processing.

Shooting data

Location	NHK Science & Technical Research Laboratories (Setagaya Ward, Tokyo)
Camera	Hasselblad H4D-200MS
Photographing mode	Multi-shot (4×)
Lens	HC 50-II
Aperture (F-number)	11
Shutter speed	0.7 sec
ISO sensitivity	50



Chromaticity distribution

No. 8 Sea

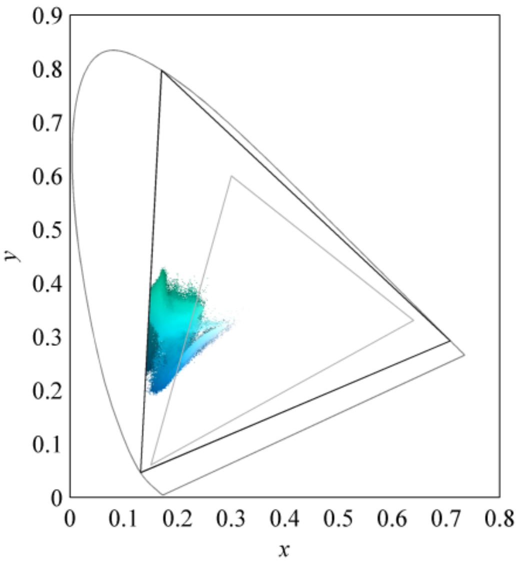
File name: u08_Sea_8K.r/g/b, u08_Sea_4K.r/g/b, u08_Sea_2K.tif

Description

This image captures the emerald green characteristic of seas with coral reefs. Because almost all colors of the sea lie outside HDTV's color gamut, the image is well-suited for evaluating wide-color gamut and tones. The portion of the sky is also useful for evaluating gradation.

Shooting data

Location	Ikema Island (Miyako-jima, Okinawa Pref.)
Camera	Hasselblad H4D-200MS
Photographing mode	Single Shot
Lens	HCD 4/28
Aperture (F-number)	11
Shutter speed	1/90
ISO sensitivity	50



Chromaticity distribution

No. 9 Flowers

File name: u09_Flowers_8K.r/g/b, u09_Flowers_4K.r/g/b, u09_Flowers_2K.tif

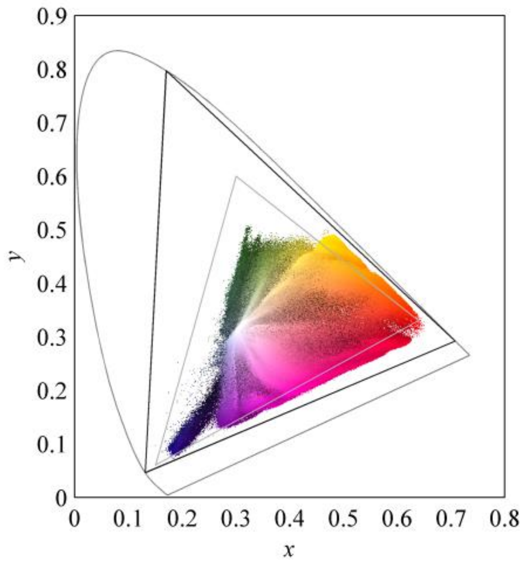
Description

This is a wide-color-gamut image in which numerous multi-colored flowers are laid out without any gaps. It contains mainly colors outside HDTV's color gamut. The image is well-suited for evaluating reproduction of wide-color gamut and assessing tones.

Shooting data

Location	NHK Science & Technical Research Laboratories (Setagaya Ward, Tokyo)
Camera	Hasselblad H4D-200MS
Photographing mode	Multi-shot (4×)
Lens	HCD 4/28
Aperture (F-number)	11
Shutter speed	2.5 sec
ISO sensitivity	50

Photographed in cooperation with dosco (flower arrangement)



Chromaticity distribution

No. 10 [Sample] Ship

File name: u10_Ship_8K.r/g/b, u10_Ship_4K.r/g/b, u10_Ship_2K.tif

Description

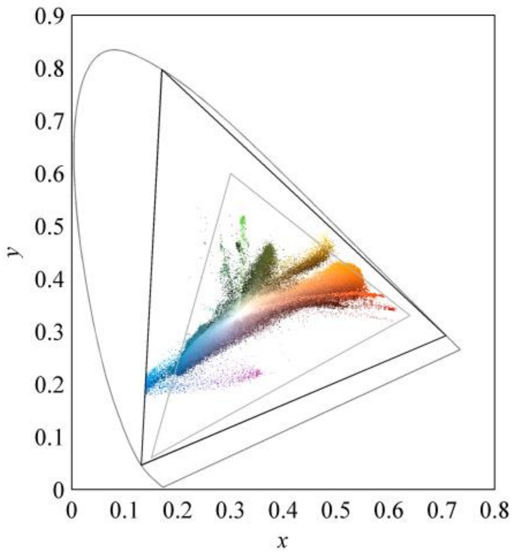
This is an image of a ship on a sunny day. It can be used to evaluate the sensation of presence based on differences in screen size and image formats between 4K/8K and 2K. The ship’s multiple masts and taut ropes are useful for assessing degradation of image quality, such as blurriness, aliasing, ringing, and quantization distortion, that occurs as a result of image encoding. The image is also well-suited for appraising gradation of the blue sky in the background.

This image is provided as a reference for purposes such as evaluation before obtaining this collection of standard test images. Because it is a single-shot image, be aware of false colors and color bleeding that occurs as a result of a noise reduction filter used to suppress false colors.

Shooting data

Location	Nippon Maru Memorial Park (Nishi Ward, Yokohama City)
Camera	Hasselblad H4D-200MS
Photographing mode	Single Shot
Lens	HC 3.5/35
Aperture (F-number)	11
Shutter speed	1/160 sec
ISO sensitivity	50

Photographed in cooperation with Nippon Maru Memorial Park



Chromaticity distribution

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