भारतीय मानक

Indian Standard

IS/ISO 12640-4 : 2011

ग्राफिक प्रौद्योगिकी — पूर्वप्रेस डिजीटल डाटा एक्सचेंज

भाग 4 विस्तृत दायरा प्रदर्शन-संदर्भित मानक कलर इमेज डाटा

[Adobe RGB (1998)/SCID]

Graphic Technology — Prepress Digital Data Exchange

Part 4 Wide Gamut Display-Referred Standard Colour Image Data [Adobe RGB (1998)/SCID]

ICS 35.240.30; 37.100.99

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NATIONAL FOREWORD

This Indian Standard (Part 4) which is identical to ISO 12640-4 : 2011 ‘Graphic technology — Prepress digital data exchange — Part 4: Wide gamut display-referred standard colour image data [Adobe RGB (1998)/SCID]’ issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on the recommendation of the Publication and Graphic Art Technology Sectional Committee and approval of the Management and Systems Division Council.

The text of the International Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words ‘International Standard’ appear referring to this standard, they should be read as `Indian Standard’; and

b) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to an International Standard for which no Indian Standard exists. The Committee have reviewed the provisions of the following International Standard referred in this standard and has decided that they are acceptable for use in conjunction with this standard:

International Standard	*Title*
ISO 12639 : 2004	Graphic technology — Prepress digital data exchange — Tag image file format for image technology (TIFF/IT)

Annexes A and B forms integral part of this standard, Annexes C, D and E are for information only.

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Introduction

0.1 Need for standard digital test images

Standard test images provide a set of data that can be used for any of the following tasks:

— evaluating the colour reproduction of imaging systems;

— evaluating colour image output devices;

— evaluating the effect of image processing algorithms applied to the images;

— evaluating the coding technologies necessary for the storage and transmission of high-definition image data, etc.

Because they exist as standard, well-defined image data sets, typical of the high quality image content commonly encountered, standard test images enable users to be confident that the images will produce good quality reproductions, if properly rendered, and that they provide a reasonable test of the evaluation task being undertaken. No limited set of images can fully test any system but the sets provided give as reasonable a test as can be expected from a limited image set. Furthermore, the existence of a standard set enables users in different locations to produce comparisons without the need to exchange images prior to reproduction.

However, different applications require that the standard image data be provided in different image states using different image encodings (see ISO 22028-1). The user needs to select those appropriate to the evaluation task being undertaken. Whilst transformation of the image data to another image state is always possible, there is, in general, no agreement amongst experts as to how this is best done. Thus, it has been considered preferable to provide data in different image states in the various parts of ISO 12640.

ISO 12640-1 provides a set of 8-bits-per-channel data that is defined in terms of CMYK dot percentages. The colours resulting from reproduction of CMYK data are strictly defined only at the time of printing, and as such the data are only applicable to evaluation of CMYK printing applications. Transformations to other image states and colour encodings might not be well defined. In fact, the data might not even be useful for CMYK printing processes different from those typically found in traditional graphic arts applications, as the image data are defined to produce “pleasing” images when reproduced on systems using “typical” inks and producing “typical” tone value rendering. Printing systems that use inks of a distinctly different colour, or produce a very different tone value rendering, will not reproduce them as pleasing images without a well-defined colour transformation. Moreover, with a bit depth of only 8 bits per channel any colour transformation employed might well introduce artefacts.

ISO 12640-2 provides a set of test image data encoded both as XYZ values with each channel scaled to the range 0 to 65 535, and as sRGB (defined in IEC 61966-2-1), with a bit depth of 8 bits per channel. (The higher bit depth for the XYZ encoding is necessary because of the perceptual non-uniformity of the linear colour space.) Both sets of data are optimized for viewing on a reference sRGB CRT display in the reference sRGB viewing environment, and relative to CIE standard illuminant D65 for which the XYZ tristimulus values were computed prior to scaling. The images are mainly designed to be used on systems utilizing sRGB as the reference encoding, and as such are mainly applicable to the consumer market and those systems for which the colour monitor is the “hub” device. Although such systems are used for some applications in the graphic arts industry, sRGB is by no means the most common image encoding. Furthermore, a particular drawback is the fact that the sRGB colour gamut is quite different in shape to the colour gamut of typical offset printing. This difference can necessitate fairly aggressive colour re-rendering to produce optimal prints from sRGB image data.

ISO 12640-3 provides a set of test image data with a large reflection medium colour gamut, illuminated using illuminant D50. The bit depth of the natural images is 16 bits per channel, while the colour charts and vignettes are 8 bits per channel. In order to be useful for applications where large, print-referred output gamuts are encountered, common in graphic technology and photography, it was felt that it would be desirable to produce an image set in which some colours are permitted to be encoded close to the boundary

of the full colour gamut attained with surface colours. Furthermore, from the perspective of colour management, it is advantageous if the images are referenced to illuminant D50, which is the predominant reference illuminant used in graphic arts and photography, for both viewing and measurement. For this reason, it has also become the predominant reference illuminant for most colour management applications.

This part of ISO 12640 provides a set of wide gamut test image data encoded as Adobe RGB with a bit depth of 16 bits per channel. These data are optimized for viewing on a reference Adobe RGB display in the reference Adobe RGB viewing environment [defined in the *Adobe RGB (1998) Color Image Encoding specification*]. The preferred rendering of these images to any media, other than the reference Adobe RGB display in the reference Adobe RGB viewing environment, is dependent on the media and viewing environment used. Therefore, no colorimetry associated with reproduction on any other media is provided.

The images are mainly designed to be used on systems utilizing Adobe RGB as the reference encoding, and as such are mainly applicable to the professional market and those systems for which the wide gamut colour monitor is the “hub” device. Such workflows are popular among professional photographers, and are increasingly used in the graphic arts. The Adobe RGB reference display colour gamut is closer to typical offset printing gamuts than the sRGB reference display colour gamut. Adobe RGB encoded images generally require much less aggressive colour re-rendering going to print than sRGB encoded images, although this difference can necessitate colour re-rendering between Adobe RGB images and sRGB images. The purpose of this part of ISO 12640 is therefore to provide a test image data set with a larger colour gamut than sRGB, related to the Adobe RGB wide gamut display-referred colour space. The bit depth of the natural images and synthetic images is 16 bits per channel.

The possible wide gamut colour encoding choices considered were Adobe RGB, opRGB (IEC 61966-2-5) and ROMM RGB (ISO 22028-2). For this part of ISO 12640 we want the images well-colour-rendered to a well-defined large gamut reference display. For this reason, Adobe RGB was preferred over the other two choices. With opRGB the completeness of the colour rendering is left more ambiguous, i.e. it is not as clearly output-referred, and the reference medium and viewing conditions are also slightly different. ROMM RGB (ISO 22028-2) is clearly output-referred, but the reference medium is a virtual reflection print (the ICC perceptual reference medium).

0.2 Characteristics of the test images

The performance of any colour reproduction system will normally be evaluated both subjectively (by viewing the final output image) and objectively (by measurement of control elements). This requirement dictates that the test images include both natural scenes (pictures) and synthetic images (colour charts and colour vignettes). Because the results of subjective image evaluation are strongly affected by the image content, it was important to ensure that the natural images were of high quality and contained diverse subject matter. However, by requiring the images to look natural, it is difficult within a single, relatively small, sample set to produce elements in the scene that contain the subtle colour differences required in such test images, that cover the full reference colour gamut defined. Thus, while most images contain colours that extend to the gamut boundary this is often only for a limited range of hues in each image. The full reference colour gamut can only be explored by utilizing the synthetic colour chart.

A survey was conducted of all TC 130 member countries to identify desirable image content and to solicit submission of suitable images for consideration. The image set that resulted consists of 14 natural images, a colour chart and a series of colour vignettes. The natural images include flesh tones, images with detail in the extreme highlights or shadows, neutral colours, brown and wood tone colours which are often difficult to reproduce, memory colours, complicated geometric shapes, fine detail, and highlight and shadow vignettes. The colour chart and colour vignette show the colour gamut of this wide gamut display-referred colour space.

0.3 File format of the digital test images

All of the images consist of pixel interleaved data (R then G then B) with the data origin at the upper left of the image, as viewed naturally, and organized by rows. These data are included as individual files within this part of ISO 12640. The image file format is as specified in ISO 12639:2004 (TIFF/IT). The images can be imported and manipulated as necessary by a wide variety of imaging software tools and platforms in general use in the industry. See Annex C for details of the TIFF header.

Indian Standard

GRAPHIC TECHNOLOGY — PREPRESS DIGITAL DATA EXCHANGE

PART 4 WIDE GAMUT DISPLAY-REFERRED STANDARD COLOUR IMAGE DATA

[Adobe RGB (1998)/SCID]

IMPORTANT — The electronic file of this document contains colours which are considered to be useful for the correct understanding of the document. Users should therefore consider printing this document using a colour printer.

1 Scope

This part of ISO 12640 specifies a set of standard wide gamut display-referred colour images [encoded as 16-bit Adobe RGB (1998) digital data] that can be used for the evaluation of changes in image quality during coding, image processing (including colour re-rendering and colour space transformations, compression and decompression), displaying on a colour monitor and printing. These images can be used for research, testing and assessing of output systems such as printers, colour management systems and colour profiles.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 12639:2004, *Graphic technology — Prepress digital data exchange — Tag image file format for image technology (TIFF/IT)*

Adobe RGB (1998) Color Image Encoding, Version 2005-05, May 2005. Available at: <http://www.adobe.com/digitalimag/pdfs/AdobeRGB1998.pdf>

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
Adobe RGB
three-component colour image encoding defined in *Adobe RGB (1998) Color Image Encoding*

3.2
colour gamut
solid in a colour space, consisting of all those colours that are present in a specific scene, artwork, photograph, photomechanical or other reproduction; or are capable of being created using a particular output device or medium

[ISO 12231]

3.3
colour sequence
order in which the colours are stored in an image data file

3.4
orientation
origin and direction of the first line of data, with respect to the image content as viewed by the end user

NOTE The codes used to specify orientation are listed in ISO 12639:2004.

3.5
pixel
smallest discrete picture element in a digital image file

3.6
pixel interleaved
colour data organized such that the RGB colour space values for one pixel are followed by the same sequence of colour values for the next pixel

NOTE The specific order of colour components is determined by the ColourSequence tag as defined in ISO 12639:2004. Other forms of colour data interleaving are line and plane.

4 Requirements

This part of ISO 12640 provides a set of images contained in 16 image data files which form an integral part of this part of ISO 12640. Their file names are listed in Tables 1 and 2. The colour image data shall be encoded as defined in *Adobe RGB (1998) Color Image Encoding* (hereafter referred to as Adobe RGB) using 16 bits per channel and 48 bits per colour. The image characteristics of these data are described in Clause 5, and the electronic data structure is described in Clause 6.

The procedures and guidelines for use of the image data files are given in Annex A. The image data integrity, excluding any headers, shall be checked using the check-sum procedure outlined in Annex B. Typical TIFF/IT file headers used for image files are described in Annex C. Label text insertion is described in Annex D. The histogram and gamut plots for the image data files are shown in Annex E.

5 Data set characteristics

5.1 General

The orientation of the image data is defined in accordance with ISO 12639, where a value of “1” in TAG 274 indicates that the data are to be loaded from top left, horizontally; the 0th row represents the visual top of the image and 0th column represents the visual left-hand side. The image data are pixel interleaved in the colour sequence of R then G then B (16 bits per channel) for the natural images and synthetic images.

5.2 Data set definition

The set of standard colour image data consists of 14 natural (photographed) images and two synthetic images created digitally on a computer. The synthetic images consist of one colour chart with various patches, and one colour vignette. The natural images are identified as N1 to N14, respectively, and each of them also has a descriptive name derived from the picture content (e.g. Crayons). The synthetic images are identified as S1 and S2.

The label “ISO 12640-4 RGB” is inserted in each image. The co-ordinates of the text insertion are provided in Annex D.

NOTE The image set defined in this part of ISO 12640 is based on the Adobe RGB reference display gamut. Image sets contained in other parts of ISO 12640 are based on different reference media and can be more suitable for use in evaluations where the other reference media are more relevant.

5.3 Natural images

The characteristics and typical usage of the natural images are shown in Table 1. The descriptive names of these images are given following the identification code. Figure 1 shows reduced size reproductions of the natural images.

The 14 natural images have the following characteristics:

Resolution: 16 pixels/mm

Colour values: Adobe RGB data consisting of three 16-bit values

File format: ISO 12639:2004 (TIFF/IT)

Label on image: ISO 12640-4 RGB

Image data orientation: Load from top left, horizontally

Table 1 — Natural images

Name	Aspect, image size	Characteristics and typical usage
N1 Crayons	Horizontal, 4 096 × 3 072 pixels	Picture of crayons with high saturation colours; useful for checking edge-of-gamut reproduction
N2 Flowers	Vertical, 3 072 × 4 096 pixels	Useful for assessing tonal reproduction of highlight tones and saturated reds
N3 Yarn	Horizontal, 4 096 × 3 072 pixels	Image of yarn, wool and thread suitable for evaluating the colour gamut of devices, texture and fine detail reproduction
N4 Fishing	Vertical, 3 072 × 4 096 pixels	Fishing goods with fine detail, suitable for evaluating image sharpness and reproduction of detail
N5 Vases	Horizontal, 4 080 × 3 072 pixels	Picture of transparent and semi-transparent vases, suitable for evaluating the reproduction of smooth highlight tones
N6 Leaves	Horizontal, 4 096 × 3 072 pixels	Useful in evaluating the reproduction of subtle tonal variation in the leaves and of shadow detail in the dark brown of the trunks of the trees
N7 Borabora	Horizontal, 4 124 × 3 024 pixels	Landscape image; suitable for the evaluation of the reproduction of deep blue and green colours with subtle tonal variation
N8 Sunflower	Horizontal, 3 040 × 2 014 pixels	Field of sunflowers with memory colours for sky, trees and grass; suitable for evaluating the reproduction of natural scenes
N9 Bride	Vertical, 3 072 × 4 096 pixels	Close-up image to evaluate the reproduction of human skin tones
N10 Walkathon	Vertical, 2 000 × 3 008 pixels	Image of children in walking gear with bright balloons can be used to check the reproduction of images that include saturated colours and skin tones
N11 Spoon	Horizontal, 4 096 × 3 072 pixels	Image of silverware to evaluate the reproduction characteristics of highlight tones and neutral colours
N12 Violin	Vertical, 3 072 × 4 096 pixels	Low-key image of a room scene containing miscellaneous objects to evaluate dark colours, particularly browns
N13 Glass	Horizontal, 4 096 × 3 072 pixels	Image of glassware to evaluate the reproduction characteristics of highlight tones, shadow tones and neutral colours
N14 Beach	Horizontal, 3 040 × 2 014 pixels	Image of a sunny beach shot from shade of trees can be used to evaluate the reproduction of images having a high dynamic range

N1 Crayons

N2 Flowers

N3 Yarns

N4 Fishing

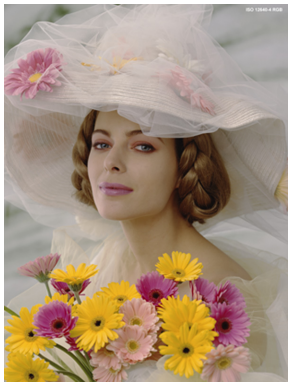
N5 Vases

N6 Leaves

N7 Borabora

N8 Sunflower

Figure 1 (*continued*)



N9 Bride

N10 Walkathon

N11 Spoon

N12 Violin

N13 Glass

N14 Beach

Figure 1 — Reduced size reproductions of the natural images

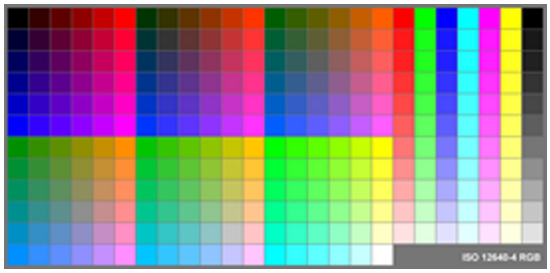
5.4 Synthetic images

5.4.1 Synthetic image content

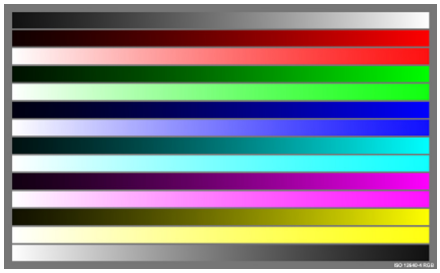
The synthetic images consist of a colour chart and a series of colour vignettes. Figure 2 shows reduced-size reproductions of the synthetic images. The interleaving, colour sequence, colour values and orientation are the same as for the natural images. The image sizes are shown in Table 2.

Table 2 — Synthetic images

Name		Aspect	Height pixels	Width pixels
S1	Colour chart	Landscape	1 332	2 736
S2	Colour vignettes	Landscape	2 608	4 256



S1 Colour chart



S2 Colour vignettes

Figure 2 — Reduced-size reproductions of the synthetic images

5.4.2 Colour chart

5.4.2.1 Design of colour chart

Image S1 (shown schematically in Figure 3) is a colour chart that consists of colour patches that are all specified to be within the Adobe RGB reference display colour gamut. By using these patches, the fidelity of colour reproduction of an image output device to the colorimetry of the original image file may be evaluated objectively by measurement. Image S1 is encoded in 16-bit Adobe RGB. Each part of the chart has two sections:

— section containing 6^3 (i.e. 216) tertiary colour patches;

— primary, secondary and tertiary grey colour section (77 patches in total).

The Adobe RGB image data encoded can be converted to viewer-observed image colorimetry using the transforms specified in *Adobe RGB*. The complete transformation, through the normalized tristimulus values to the viewer-observed tristimulus values, should be used.

NOTE When comparing the fidelity of a colour reproduction to that of an original, it is generally most appropriate to compare viewer-observed colorimetric values. However, the fidelity of measured reproduction colorimetry to original image colorimetry is not generally considered as indicative of the quality of the reproduction. To produce optimal quality, it is frequently necessary to adjust the colorimetry of a reproduction to be different from that directly associated with the image data in order to account for any differences between the Adobe RGB viewing conditions and the reproduction viewing conditions, and because of differences between the Adobe RGB and reproduction medium colour gamuts.

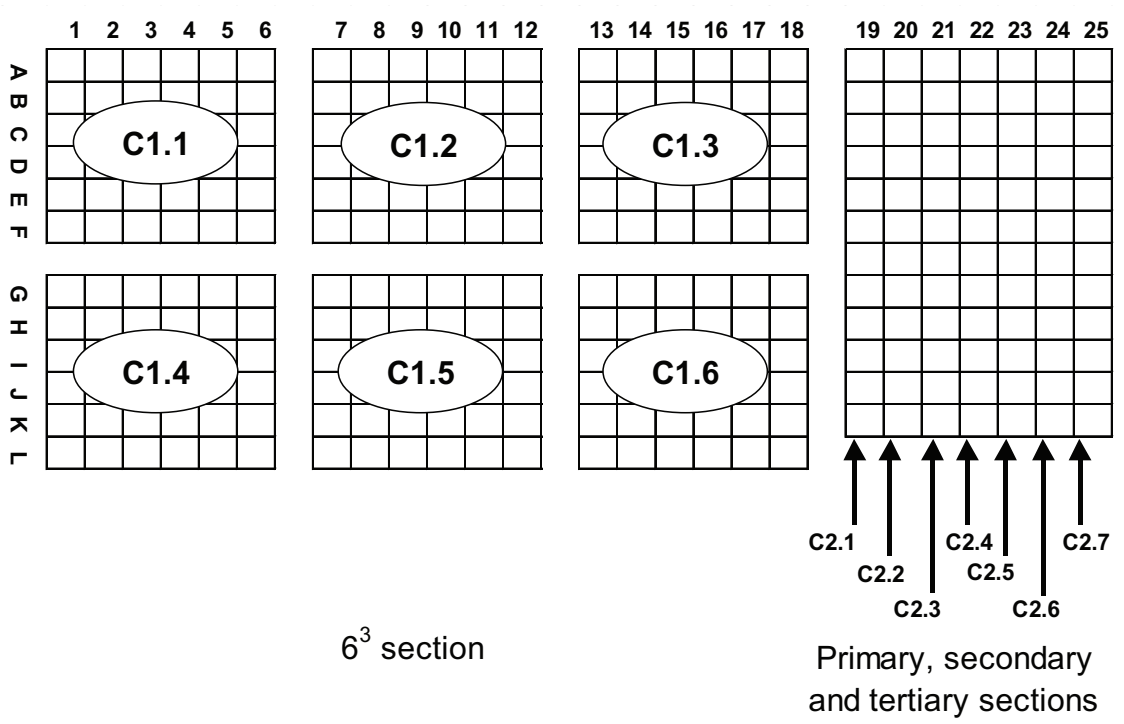


Figure 3 — Colour chart (S1)

5.4.2.2 Generation of the content of the 6^3 colour section

The Adobe RGB image data for the 6^3 section of image S1 were obtained by the following procedure:

a) Determine step differences by uniformly dividing the black and white normalized (not viewer-observed) range of L^* (0 to 100) into six steps.

b) Convert each normalized L^* value (assuming a^* and b^* values of 0) to 32-bit floating XYZ data normalized to range from 0 to 1; that is the maximum XYZ values are 0,950 5, 1,000 0 and 1,089 1, respectively.

c) Convert the resulting six normalized XYZ values to linear RGB values using Equation (1).

$$\begin{bmatrix} R \\ G \\ B \end{bmatrix} = \begin{bmatrix} 2{,}041\,59 & -0{,}56\,501 & -0{,}344\,73 \\ -0{,}969\,24 & 1{,}875\,97 & 0{,}041\,56 \\ 0{,}013\,44 & -0{,}118\,36 & 1{,}015\,17 \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix} \tag{1}$$

Obtain 216 RGB combinations by combining the 6 resultant linear RGB values in all combinations.

d) Obtain 16-bit Adobe RGB (1998) component values R', G' and B' corresponding to each of the 6^3 linear RGB values using Equation (2).

$$\left.\begin{aligned} R' &= \text{Round}\,(65\,535 \times R^{1/2{,}199\,218\,75}) \\ G' &= \text{Round}\,(65\,535 \times G^{1/2{,}199\,218\,75}) \\ B' &= \text{Round}\,(65\,535 \times B^{1/2{,}199\,218\,75}) \end{aligned}\right\} \tag{2}$$

Between the 6 blocks (C.1.1 to C.1.6) the G value is altered as the block parameter. Within each block, the R value is stepped along the horizontal direction, and the B value along the vertical direction.

NOTE This clause follows the procedure described in 4.3.4 of *Adobe RGB (1998) Color Image Encoding.*

5.4.2.3 Generation of the content of the primary, secondary and tertiary grey colour section

The Adobe RGB data for columns 19 to 25 were prepared using the following procedures:

a) Step a) of the procedure defined in 5.4.2.2 was repeated, except that the division of the range of L^* (from 0 to 90) was changed from 6 to 10 steps, and one step of L^*=5 was added to produce 11 steps altogether. Then steps b) and c) defined in 5.4.2.2 were used to obtain the linear RGB values.

b) Suitable combinations of linear RGB values were defined to provide the primary (red, green, blue), secondary (cyan, magenta, yellow) and tertiary (grey) colours.

c) By using the same procedures as those described in step d) of 5.4.2.2 the 16-bit Adobe RGB values were computed for each linear RGB combination.

It should be noted that the reason for not including a 12th level in each of these scales is that the logical choice would have been the white point (L^*=100, a^*=b^*=0). But this step is common to all the colours and is already included in the tertiary colour section.

These scales vary in the vertical direction in terms of RGB, and are arranged horizontally in the order R, G, B, C, M, Y and grey.

5.4.3 Colour vignettes

5.4.3.1 Description of the colour vignettes

Image S2 is a set of colour vignettes in which the lightness continuously changes along the horizontal direction. By using this pattern, it is possible to evaluate the tone reproduction characteristics, or the number of reproducible tonal levels, which may be obtained with any output device. It is possible visually to judge the effects of the important image processing tasks of tonal modification or data compression on tone reproduction. In particular, when discontinuities due to quantization are generated, readily recognizable vertical stripes will appear.

5.4.3.2 Generation of the content of the vignettes

Using the procedures described in 5.4.2.3 (except that the L^* range from 0 to 100 was divided into 4 096 intervals) the Adobe RGB data representing the primary, secondary and tertiary colours were obtained.

As shown in Figure 4 image S2 consists of two vignettes for each of the primary, secondary and tertiary colours. For the primary and secondary colours, the upper vignettes start with black and the lower ones with white. Both then change towards the most saturated colour of each hue from left to right. For the tertiary (grey) vignettes, the upper one starts with black changing towards white from left to right while in the lower one the order is reversed.

The frame surrounding all the vignettes, and the spaces between the individual vignettes, have a black and white normalized $L^* = 50$ and $a^* = b^* = 0$.

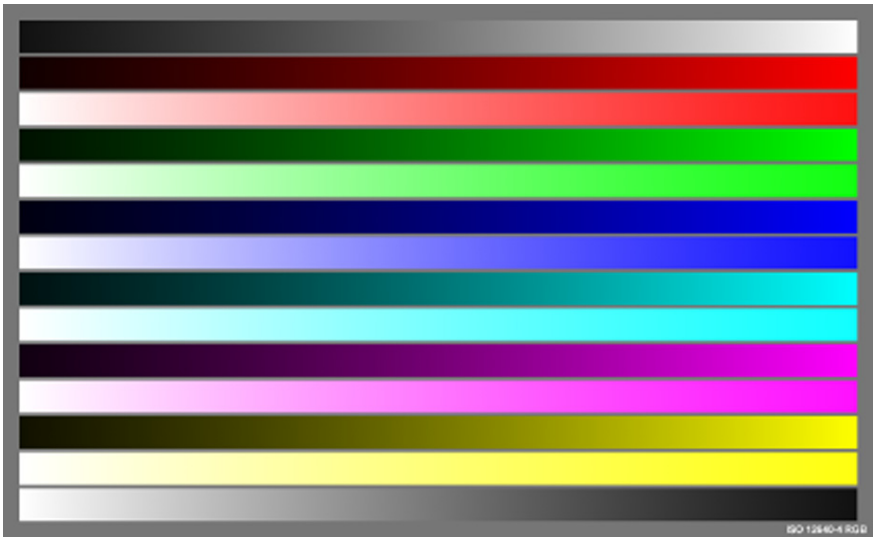


Figure 4 — Colour vignettes (S2)

6 Electronic data

Image data are contained in 16 data files that are included in this part of ISO 12640. File names correspond to the image IDs as described in 5.2 and 5.3. Table 3 shows the file name, size, colour values and descriptive name of each data file, as well as the pixel height and width of each image. The file size shown represents the file as recorded and includes headers, etc. The image data files are in accordance with ISO 12639:2004. The check-sums given in Annex B may be used to check the data integrity.

The restrictions on the use of these image data files are described in Annex A.

Table 3 — Image file characteristics

File name	File size bytes	Height pixels	Width pixels	Colour space	Colour values	Descriptive name
N01_Crayons.tif	75 499 008	3 072	4 096	RGB	Three 16-bit values	Crayons
N02_Flowers.tif	75 499 008	4 096	3 072	RGB	Three 16-bit values	Flowers
N03_Yarn.tif	75 499 008	3 072	4 096	RGB	Three 16-bit values	Yarn
N04_Fishing.tif	75 499 008	4 096	3 072	RGB	Three 16-bit values	Fishing
N05_Vases.tif	75 204 096	3 072	4 080	RGB	Three 16-bit values	Vases
N06_Leaves.tif	75 499 008	3 072	4 096	RGB	Three 16-bit values	Leaves
N07_Borabora.tif	74 827 392	3 024	4 124	RGB	Three 16-bit values	Borabora
N08_Sunflower.tif	36 736 896	2 014	3 040	RGB	Three 16-bit values	Sunflower
N09_Bride.tif	75 499 008	4 096	3 072	RGB	Three 16-bit values	Bride
N10_Walkathon.tif	36 097 536	3 008	2 000	RGB	Three 16-bit values	Walkathon
N11_Spoon.tif	75 499 008	3 072	4 096	RGB	Three 16-bit values	Spoon
N12_Violin.tif	75 499 008	4 096	3 072	RGB	Three 16-bit values	Violin
N13_Glass.tif	75 499 008	4 096	3 072	RGB	Three 16-bit values	Glass
N14_Beach.tif	36 736 896	2 014	3 040	RGB	Three 16-bit values	Beach
S01_ColourChart.tif	21 867 648	1 332	2 736	RGB	Three 16-bit values	Colour chart
S02_ColourVignettes.tif	66 599 424	2 608	4 256	RGB	Three 16-bit values	Colour vignettes

Annex A
(normative)

Guidance for use of digital data

A.1 General

To ensure that these images can be used successfully for the testing and comparisons for which they are intended, all use shall conform to the procedures and guidelines described in A.2 and A.3.

A.2 Guidelines for use

A.2.1 Reproduction

All reproductions of these images shall contain an annotation identifying this part of ISO 12640 as the data source and shall retain the label included in the image data.

A.2.2 Modification

Any images created by modification of these data (derivative images) shall also have a visible identifier added within the image. The accompanying material shall include a tabulation of the steps used to modify the image data including all editing steps used as well as any data rescaling or interpolation.

A.2.3 Colour manipulation

Any colour or tonal manipulation of these images shall be restricted to “global” changes only.

A.2.4 Cropping

Cropping of these images shall be permitted so long as the appropriate image label is included as part of, or with, the images.

A.3 Guidelines for distribution and sharing

A.3.1 General

Many of the intended uses of these images require that they be used at several locations and/or by several participants in test programmes. The following uses have been interpreted to be acceptable and allowable by ISO.

A.3.2 For-profit sale

Neither the data, nor images printed from these data, shall be sold “for-profit” except as defined in A.3.3.

A.3.3 Test and evaluation packages

It shall be permitted to include the data corresponding to these images, or derivations of these images, as part of test and evaluation packages to be sold or provided free of charge where an authentic copy of this part of ISO 12640 is included as part of the complete package.

NOTE It is recognized that certain test and evaluation packages that will make use of these images might need to embed the data to be used within other data processing procedures. The inclusion of an authentic copy of this part of ISO 12640, obtained from the appropriate standards agency, as part of the package will allow the inclusion of similar or derived data as required within the package.

A.3.4 Test and evaluation programmes

Copies of these data files, or derivative files, may be exchanged between participants in test and evaluation programmes. The sponsoring organization shall be capable of showing ownership of an authentic copy of this part of ISO 12640.

A.3.5 Reports

It shall be permitted to display these images as part of the report of test programmes, or in advertisements, as long as the organization sponsoring the display is in possession of an authentic copy of this part of ISO 12640.

Annex B
(normative)

Check-sum data

The check-sums given in Table B.1 may be used to check the data integrity. These values are calculated by summing each image plane (R, G, B) with a one-byte accumulator. The overflow bit of the accumulator is ignored. The total accumulation, T, for all three planes is also shown. These data are shown in both hex and decimal notation. These check-sums apply only to the image data and exclude any headers.

Table B.1 — Check-sum

Image	Hex				Decimal			
	R	G	B	T	R	G	B	T
N1 Crayons	EE	79	E0	47	238	121	224	71
N2 Flowers	D6	0B	FA	DB	214	11	250	219
N3 Yarn	1B	2A	96	DB	27	42	150	219
N4 Fishing	D6	F8	AA	78	214	248	170	120
N5 Vases	FA	C1	70	2B	250	193	112	43
N6 Leaves	3E	83	49	0A	62	131	73	10
N7 Borabora	86	74	29	23	134	116	41	35
N8 Sunflower	90	97	FA	21	144	151	250	33
N9 Bride	81	08	5B	E4	129	8	91	228
N10 Walkathon	8B	84	D5	E4	139	132	213	228
N11 Spoon	59	7F	A2	7A	89	127	162	122
N12 Violin	F9	9	65	67	249	9	101	103
N13 Glass	97	B3	DD	27	151	179	221	39
N14 Beach	9F	3A	27	0	159	58	39	0
S1 Colour chart	A8	A8	A8	F8	168	168	168	248
S2 Colour vignettes	CE	23	A6	97	206	351	166	151

Annex C
(informative)

Typical TIFF/IT file header used for image files

The TIFF/IT file header encoding of the colour picture file named “N01_Crayons.tif”, “Crayons”, is shown in Figure C.1. This encoding uses tags defined in ISO 12639:2004 (TIFF/IT). The PhotometricInterpretation tag is set to 2 (RGB) in this file.

The fields shown in Table C.1 are not included and take their default values.

Table C.1 — Default fields for TIFF/IT headers

Field	Value	Interpretation
NewSubfileType	0	
Orientation	1	Load from top left, horizontally
RowsPerStrip	$2^{32}-1$	Only one strip
PlanarConfiguration	1	Pixel interleaved

Offsets	Value					Description
		TIFF/IT File Header				
00000000	4D4D					Byte order "MM"(big-endian)
00000002	002A					Version number: 42
00000004	00000008					Pointer to the 1st: the 1st IFD begins in 8th byte in a file
		the 1st IFD				
00000008	0010					Number of in this IFD: 16 entries in this IFD
	Tag#	Type	Count	Value-offset		
0000000A	0100	0003	00000001	1000xxxx	256	ImageWidth: 4096 pixels/line
00000016	0101	0003	00000001	0C00xxxx	257	ImageLength: 3072 lines/image
00000022	0102	0003	00000003	00000200	258	BitsPerSample: pointer to the area of 00000200h
0000002E	0103	0003	00000001	0001xxxx	259	Compression: 1(no compression)
0000003A	0106	0003	00000001	0002xxxx	262	PhotometricInterpretation: 2 (for RGB image)
00000046	010E	0002	00000014	00000206	270	ImageDescription: pointer to the area of 00000206h
00000052	010F	0002	0000000E	00000220	271	Make(Vendor name): pointer to the area of 00000220h
0000005E	0111	0004	00000001	00000600	273	StripOffsets: 00000600h (pointer to the image data)
0000006A	0115	0003	00000001	0003xxxx	277	SamplesPerPixel: 3
00000076	0117	0004	00000001	04800000	279	StripByteCounts: 75,497,472 bytes in the strip
00000082	011A	0005	00000001	00000230	282	XResolution: pointer to the area of 00000230h
0000008E	011B	0005	00000001	00000238	283	YResolution: pointer to the area of 00000238h
0000009A	0128	0003	00000001	0003xxxx	296	ResolutionUnit: cm
000000A6	0132	0002	00000014	00000240	306	DateTime: pointer to the area of 00000240h
000000B2	8298	0002	00000029	00000258	33432	Copyright: pointer to the area of 00000298h
000000BE	8773	0007	00000230	00000282	34675	ICC profile: pointer to the area of 00000282h
000000CA	00000000					Pointer to next IFD: None
		Value area				
00000200	0010	0010	0010			BitsPerSample: 16,16,16 (16 bits/sample for each separation)
00000206	43 52 41 59 4F 4E 53 52 47 42 00 xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx					ImageDescription: "CRAYONSn"
00000220	49 53 4F 20 54 43 31 33 30 2F 57 47 32 00 xx xx					Make(Vendor name): "ISO TC130/WG2n"
00000230	00003E80	00000064				XResolution: 16000/100 (160 pixels/cm)
00000238	00003E80	00000064				YResolution: 16000/100 (160 pixels/cm)
00000240	32 30 30 38 3A 30 34 3A 30 31 20 31 30 3A 30 30 3A 30 30 00 xx xx xx xx					DateTime: "2008:04:01 10:00:00n" (April 1, 2008 at 10:00:00)
00000258	43 6F 70 79 72 69 67 68 74 20 32 30 30 38 20 49 53 4F 2C 20 41 6C 6C 20 72 69 67 68 74 73 20 72 65 73 65 72 76 65 64 2E 00 xx					Copyright: "Copyright 2008 ISO, All rights reserved.n"
00000282 – 000004B1						ICC profile data
000004B2 – 000005FF						not used
		Image data				
00000600 – 048005FF						Image data area is from 00000600h to 048005FFh

NOTE The symbol "n" represents a null byte, and "x" represents a "don't care" hexadecimal digit for padding data.

Figure C.1 — TIFF/IT file header encoding of the colour picture file named "N01_Crayons.tif"

Annex D
(informative)

Label text insertion

It should be noted that each image has a text label, ISO 12640-4 RGB, inserted in the image. Pixels representing this text have a coded value of either 0 or 65 535. This text serves to distinguish between Adobe RGB images of this part of ISO 12640 and the sRGB images of ISO 12640-2.

The position of the outer boundaries of the text is defined by a rectangle produced from the co-ordinates of two of the corners as shown in Figure D.1. The position of the text in each image (in terms of number of pixels) is given in Table D.1.

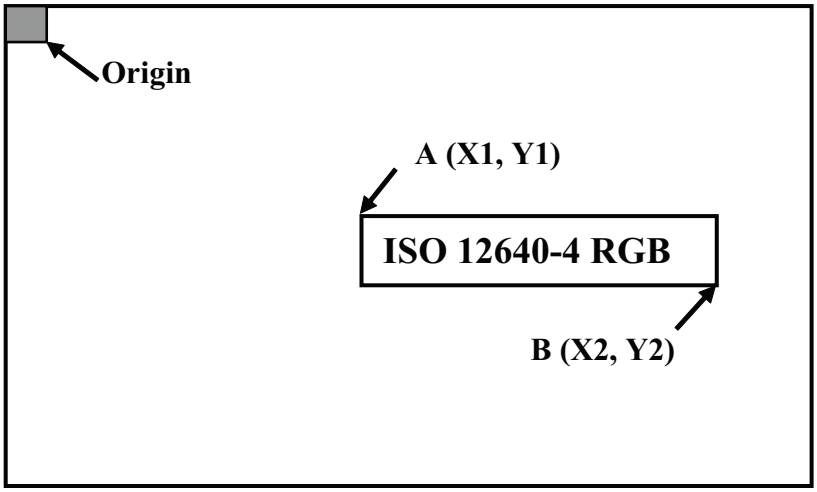


Figure D.1 — Definition of the co-ordinates of the text insertions

Table D.1 — Position of the text in each image

Image	Name	$A\ (X_1,Y_1)$	$B\ (X_2,Y_2)$
N1	Crayons	(61, 2 991)	(449, 3 028)
N2	Flowers	(61, 4 015)	(449, 4 052)
N3	Yarn	(3 645, 2 991)	(4 033, 3 028)
N4	Fishing	(2 621, 4 015)	(3 009, 4 052)
N5	Vases	(3 645, 42)	(4 033, 79)
N6	Leaves	(61, 2 991)	(449, 3 028)
N7	Borabora	(61, 2 943)	(449, 2 980)
N8	Sunflower	(2 589, 1 933)	(2976, 1 969)
N9	Bride	(2 621, 42)	(3 009, 79)
N10	Walkathon	(1 549, 42)	(1 937, 79)
N11	Spoon	(3 654, 2 991)	(4 033, 3 028)
N12	Violin	(61, 42)	(449, 79)
N13	Glass	(61, 42)	(449, 79)
N14	Beach	(61, 1 933)	(449, 1 970)
S1	Colour chart	(2 313, 1 254)	(2 701, 1 291)
S2	Colour vignettes	(3 833, 2 549)	(4 221, 2 586)

Annex E
(informative)

Histogram and gamut plots

A histogram of the L^* values, and a^* versus b^* plots of three L^* slices of each natural image are shown in Figures E.1 to E.14.

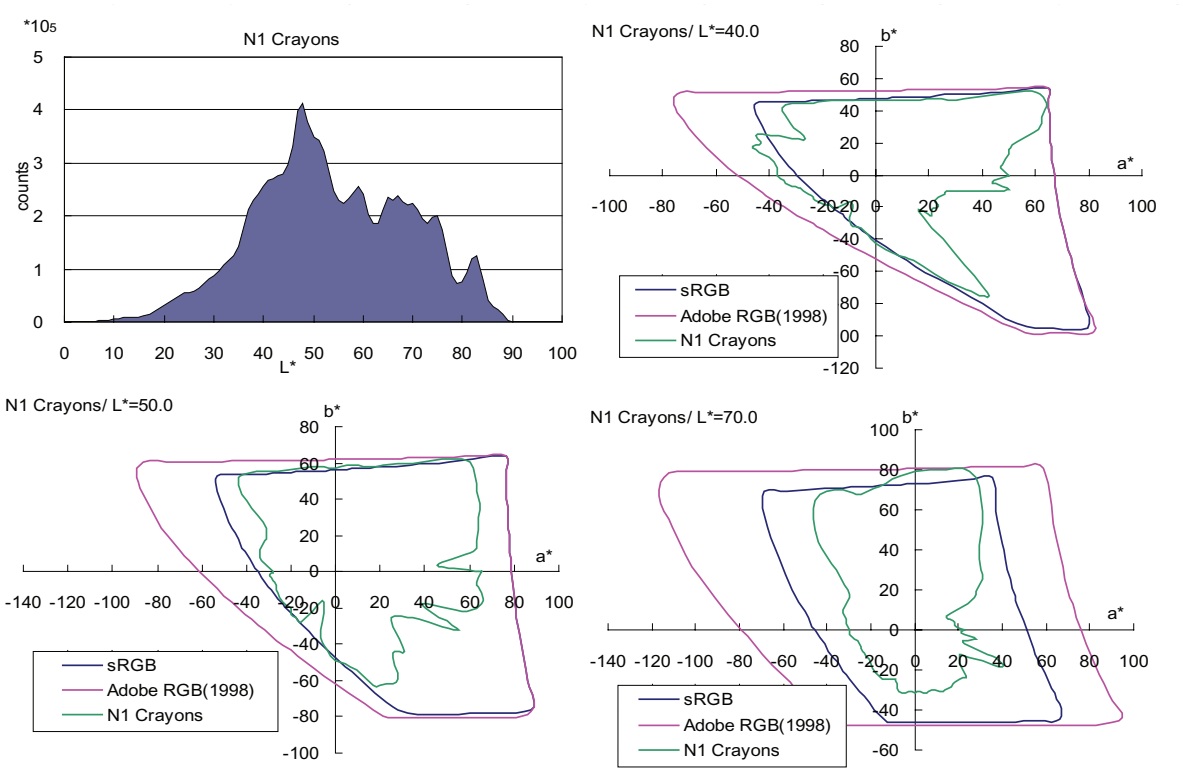


Figure E.1 — Histograms of the L^* values and a^* versus b^* plots of L^*=40, 50 and 70 for N1 Crayons

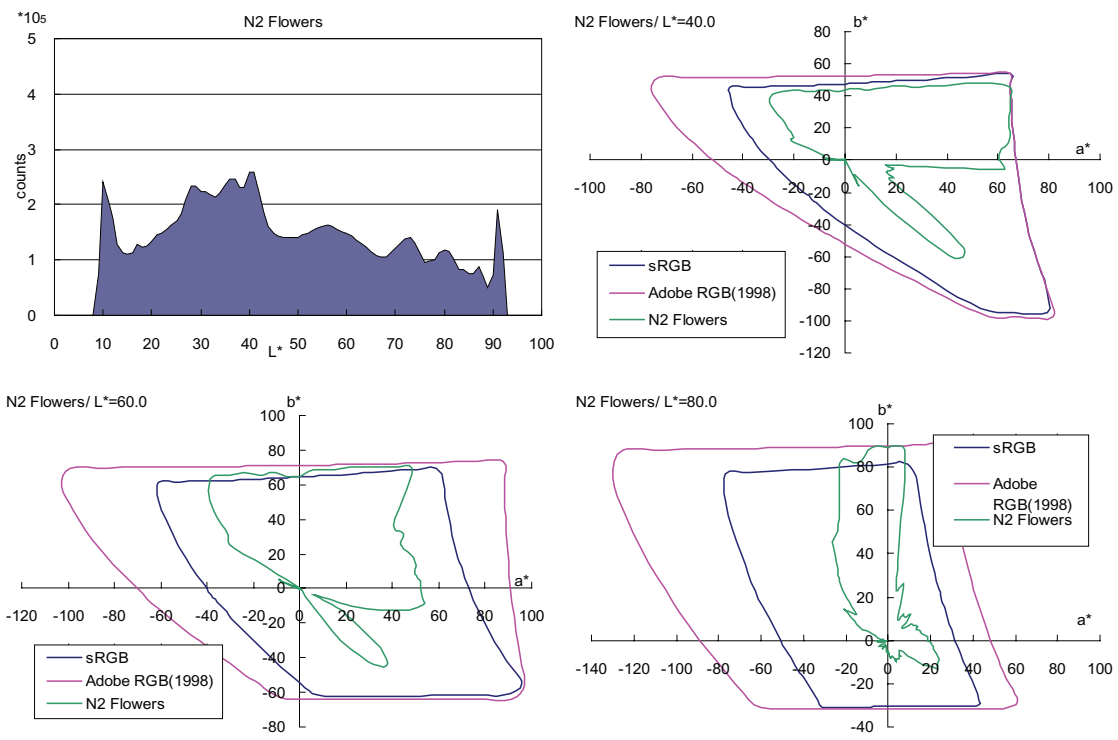


Figure E.2 — Histograms of the L^* values and a^* versus b^* plots of L^*=40, 60 and 80 for N2 Flowers

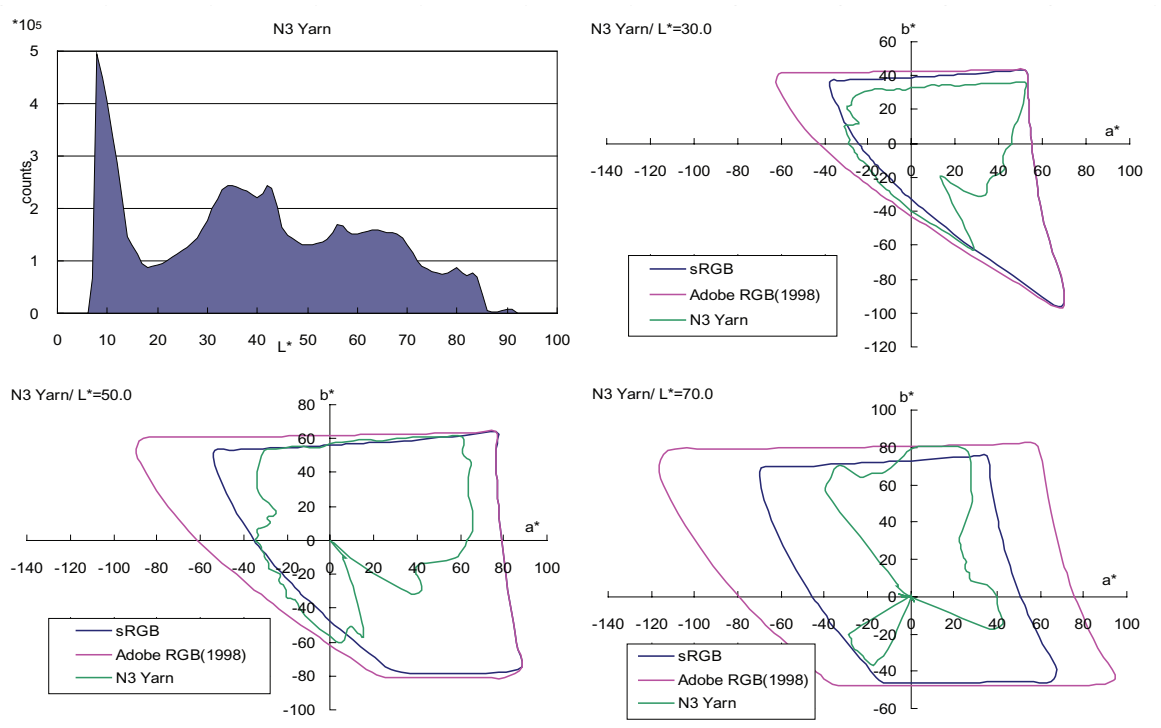


Figure E.3 — Histograms of the L^* values and a^* versus b^* plots of L^*=30, 50 and 70 for N3 Yarn

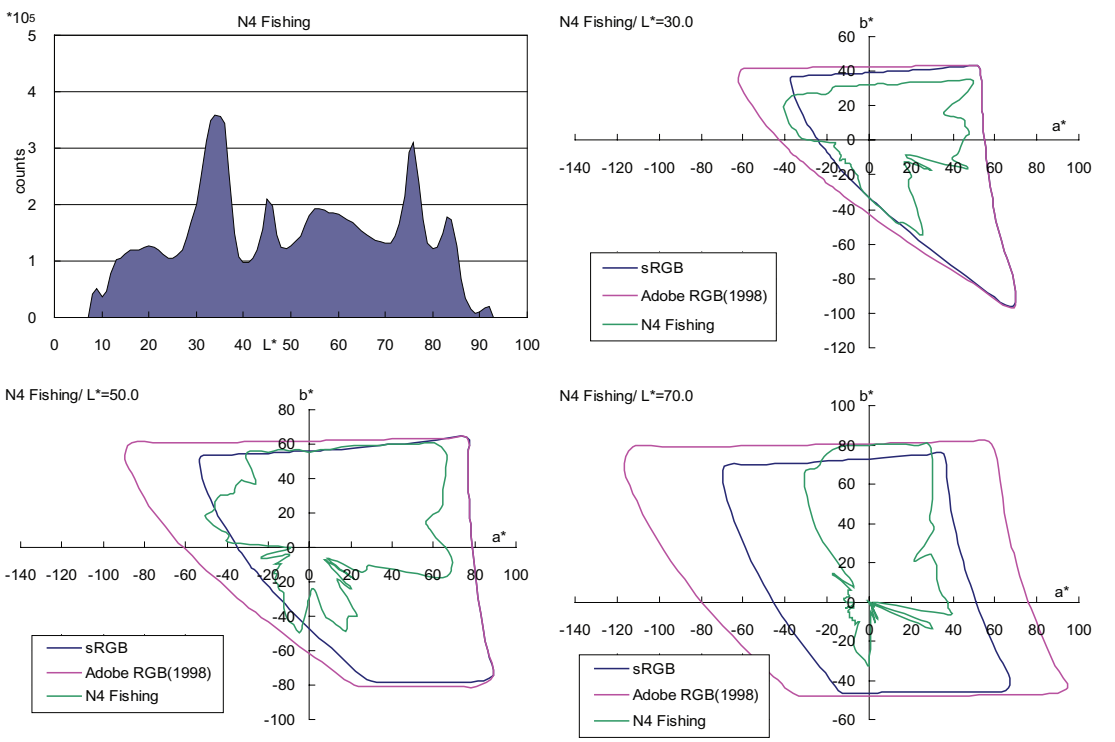


Figure E.4 — Histograms of the L^* values and a^* versus b^* plots of L^*=30, 50 and 70 for N4 Fishing

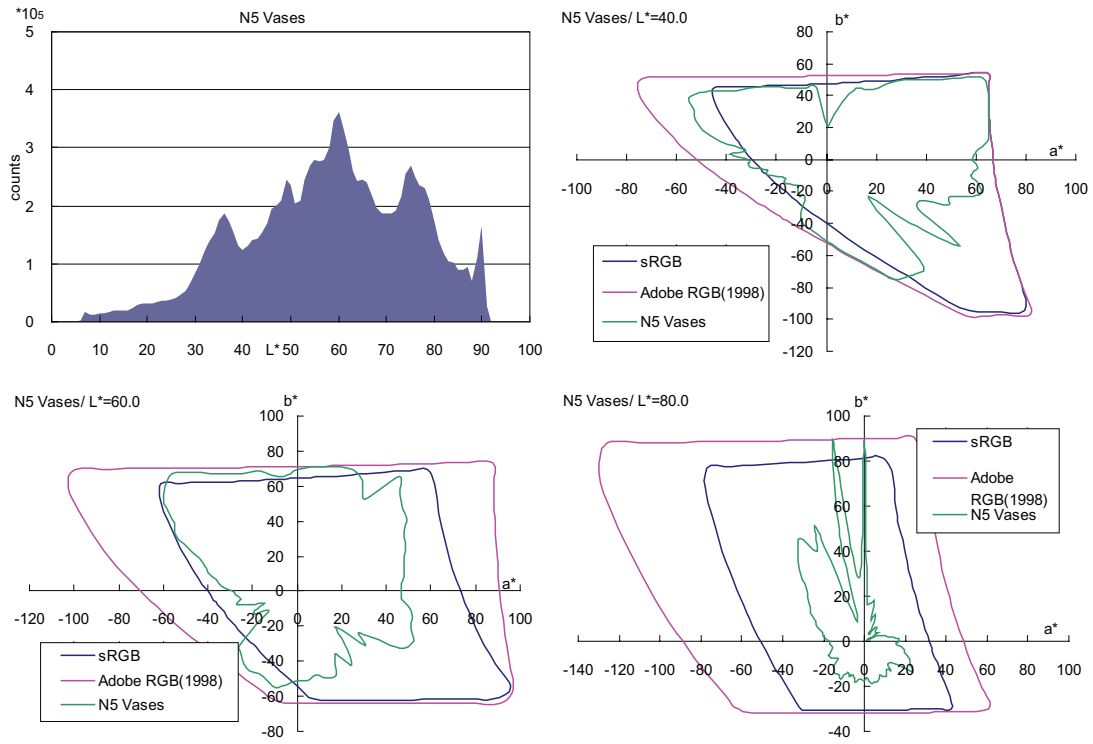


Figure E.5 — Histograms of the L^* values and a^* versus b^* plots of L^*=40, 60 and 80 for N5 Vases

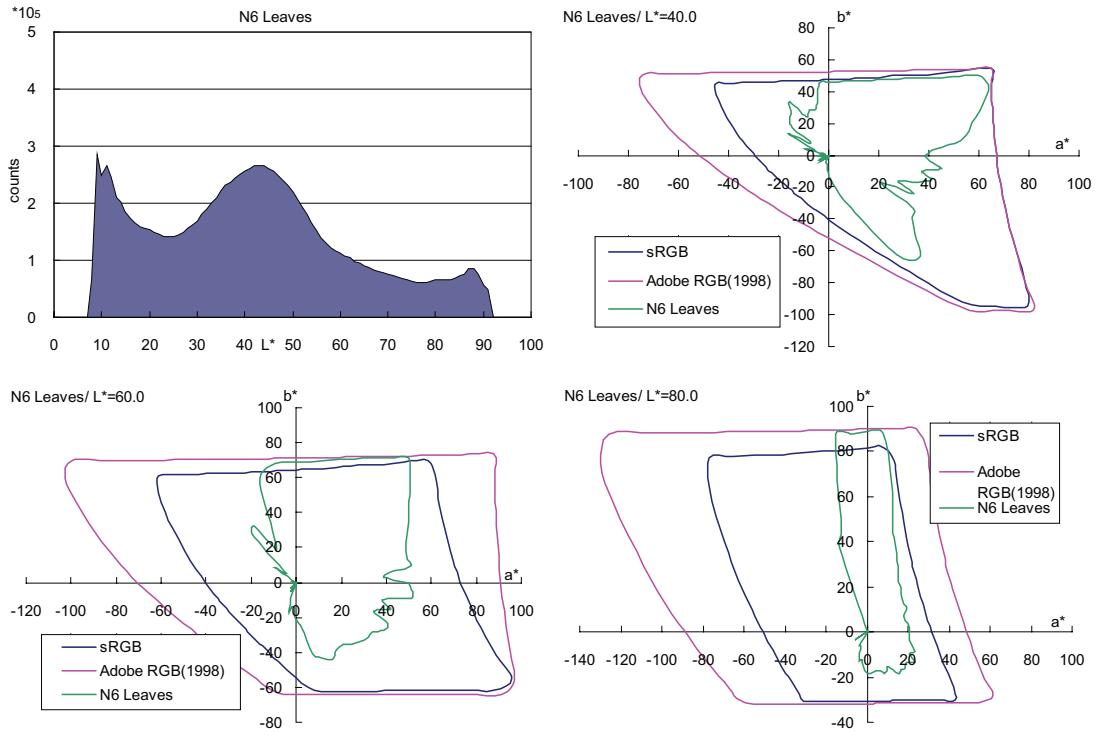


Figure E.6 — Histograms of the L^* values and a^* versus b^* plots of L^*=40, 60 and 80 for N6 Leaves

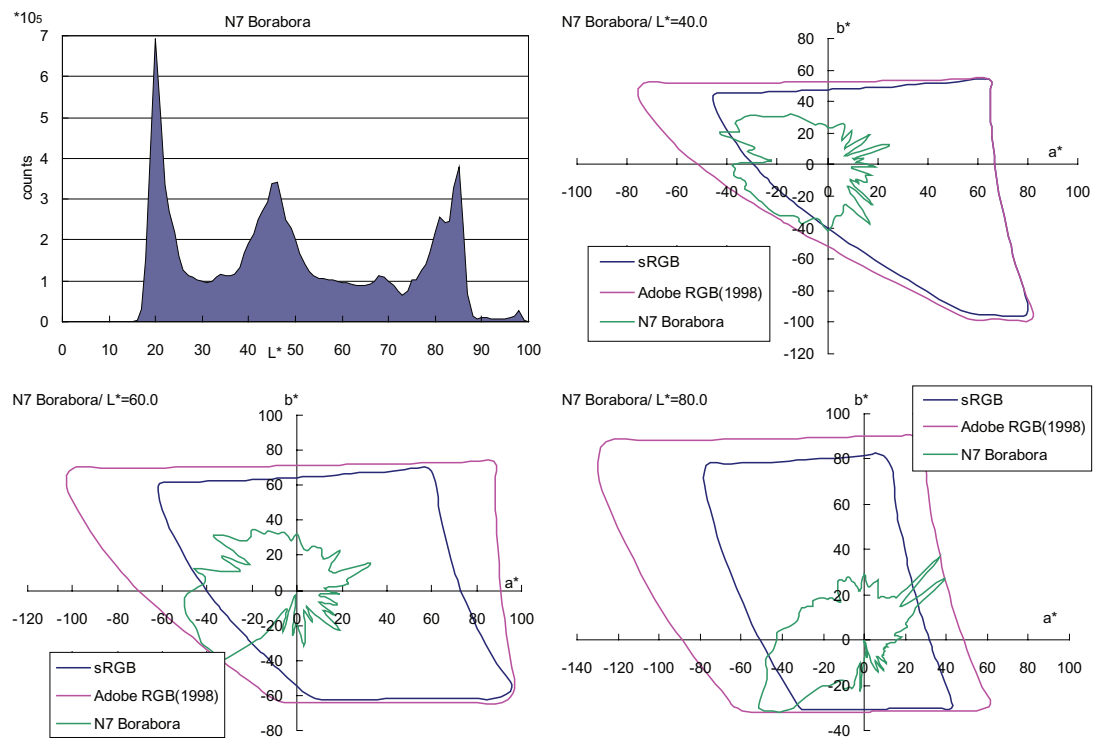


Figure E.7 — Histograms of the L^* values and a^* versus b^* plots of L^*=40, 60 and 80 for N7 Borabora

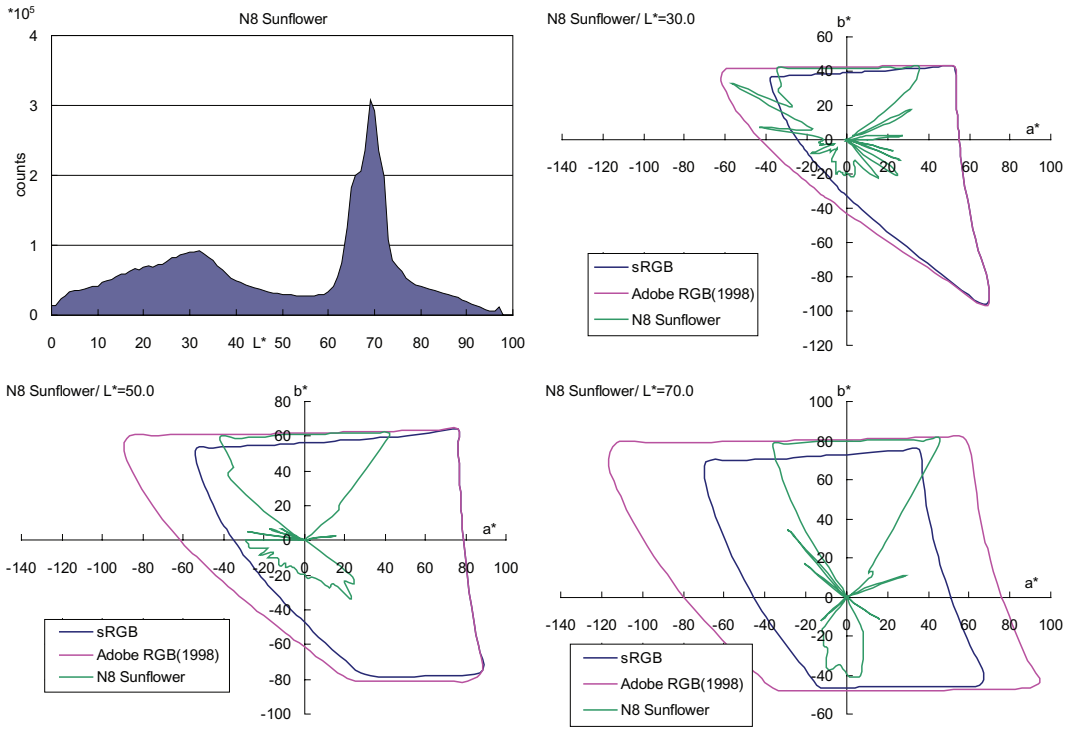


Figure E.8 — Histograms of the L^* values and a^* versus b^* plots of L^*=30, 50 and 70 for N8 Sunflower

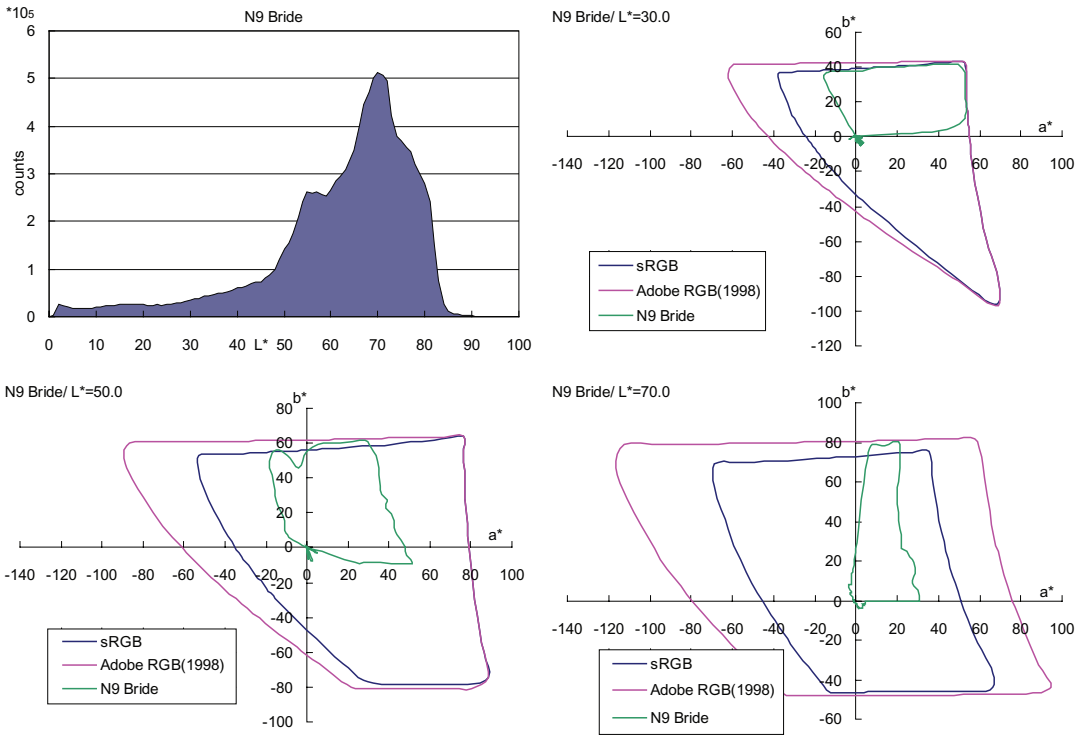


Figure E.9 — Histograms of the L^* values and a^* versus b^* plots of L^*=30, 50 and 70 for N9 Bride

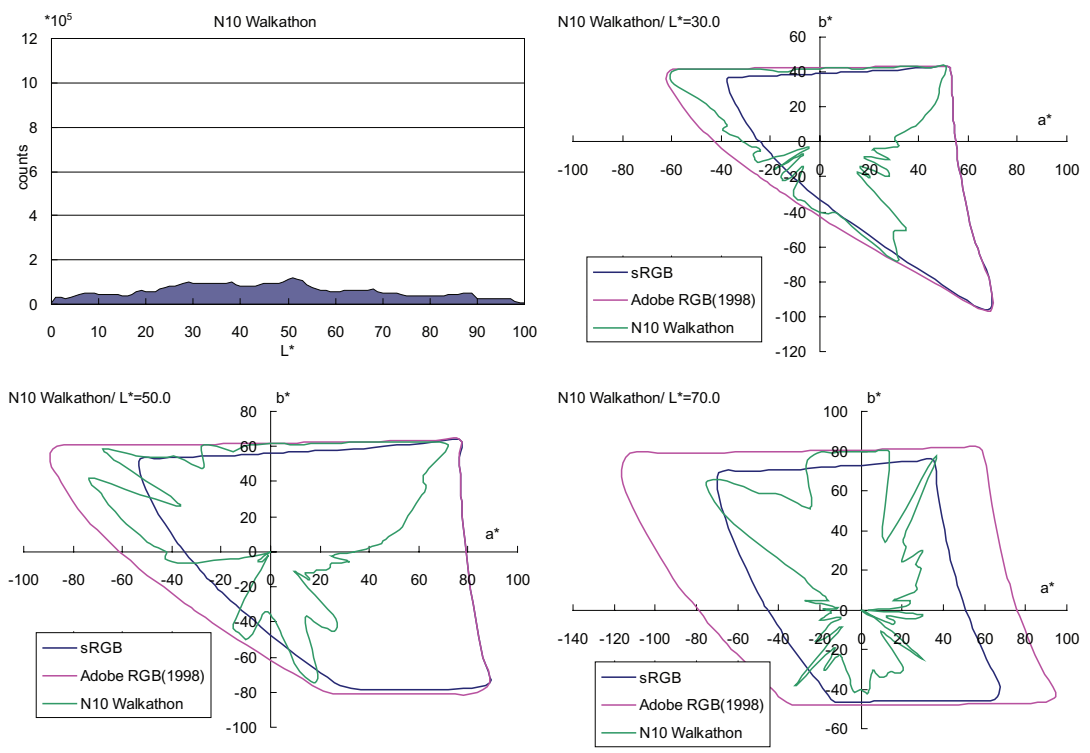


Figure E.10 — Histograms of the L^* values and a^* versus b^* plots of L^*=30, 50 and 70 for N10 Walkathon

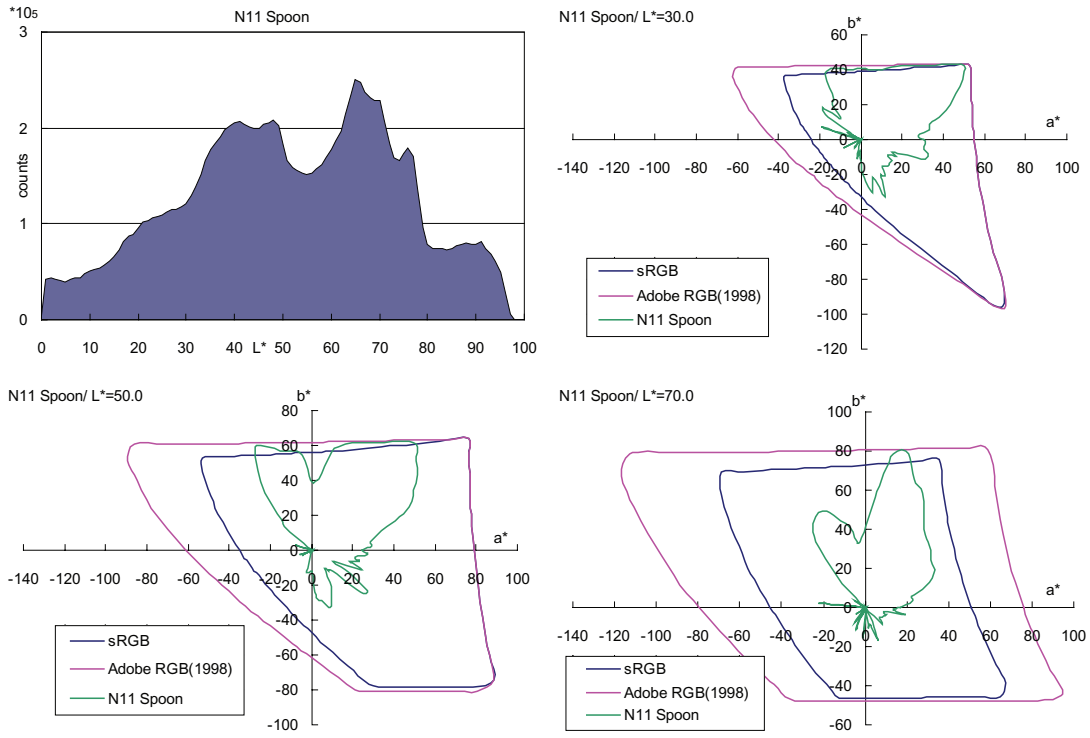


Figure E.11 — Histograms of the L^* values and a^* versus b^* plots of L^*=30, 50 and 70 for N11 Spoon

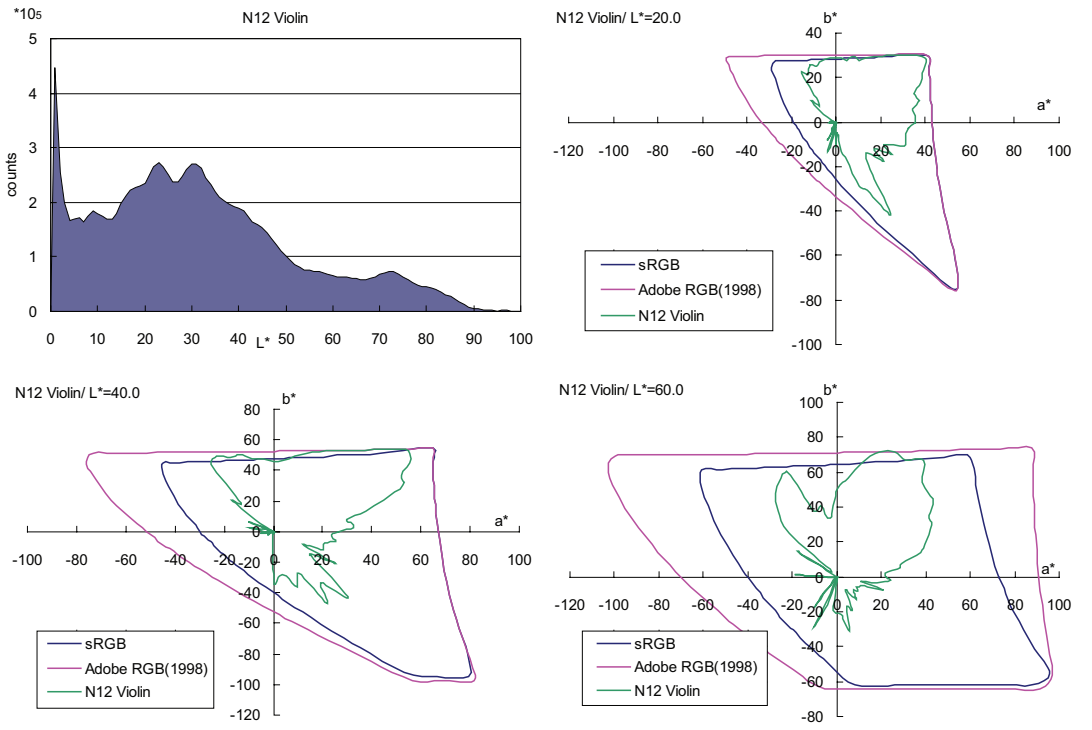


Figure E.12 — Histograms of the L^* values and a^* versus b^* plots of L^*=20, 40 and 60 for N12 Violin

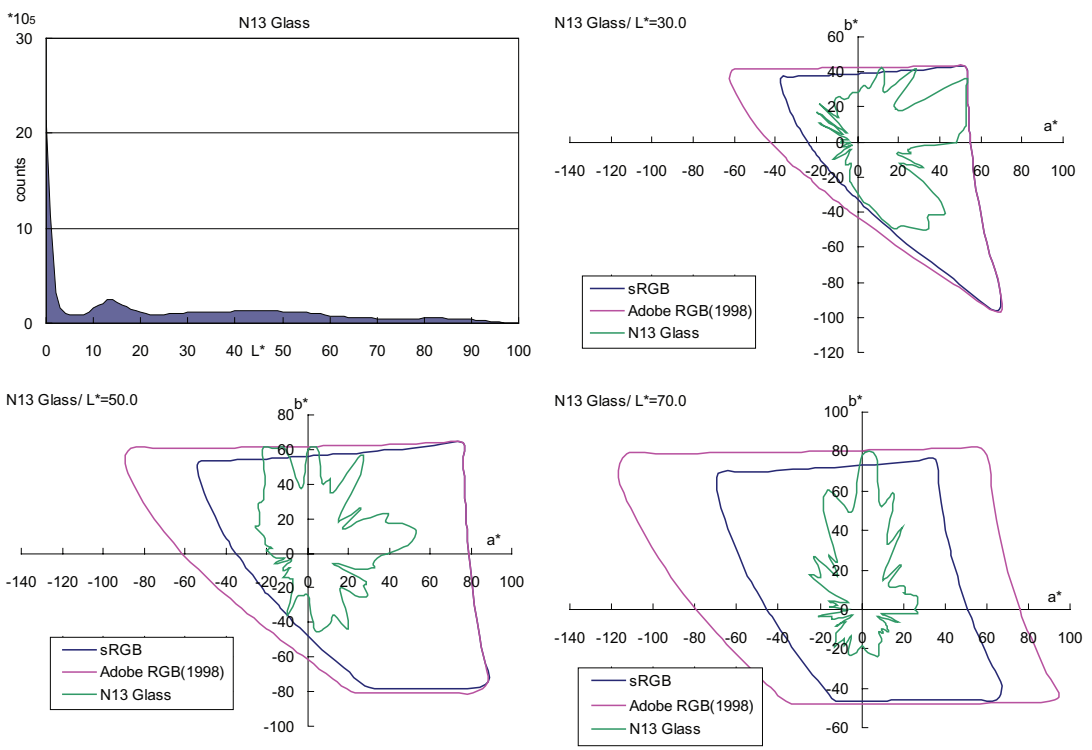


Figure E.13 — Histograms of the L^* values and a^* versus b^* plots of L^*=30, 50 and 70 for N13 Glass

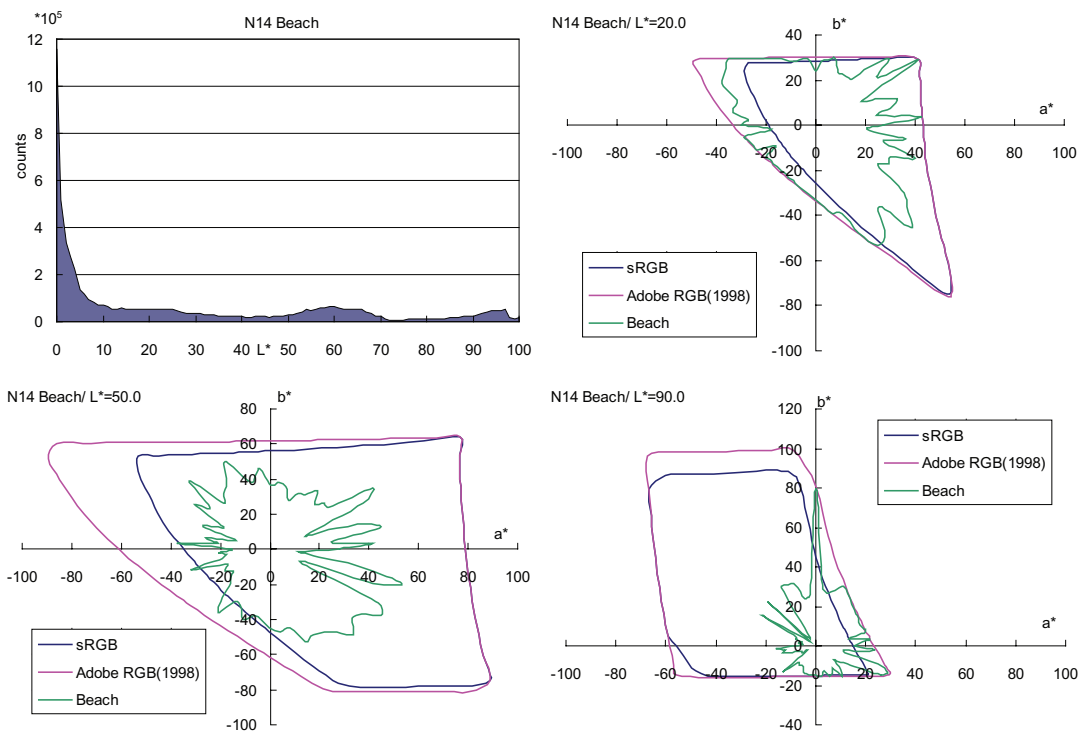


Figure E.14 — Histograms of the L^* values and a^* versus b^* plots of L^*=20, 50 and 90 for N14 Beach

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