International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

T.24
(11/2015)

SERIES T: TERMINALS FOR TELEMATIC SERVICES

Still-image compression – Test charts

Standardized digitized image set

Recommendation ITU-T T.24

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Recommendation ITU-T T.24

Standardized digitized image set

Summary

The images in Recommendation ITU-T T.24 include the original eight "ITU-T reference images" (the ITU-T was formerly known as the CCITT and so these images were referred to for years as the "CCITT images"), two bi-level test charts, a grayscale test chart, various screened half-tone images, electronically dithered images, computer-generated images, grayscale images and colour images. The purpose of this image set is to provide a consistent baseline for future work; for example, results of compression algorithm experiments and image quality tests can be compared by a broad range of users, knowing that the input image data is identical.

The specimens reproduced inside the Recommendation in the figures are given for illustration purposes and are not suitable for measurements.

The 3rd edition to Recommendation ITU-T T.24 is the consolidated version of Recommendation ITU-T T.24 (1998) and Corrigendum 1 (that clarifies text in Table 1 with respect to the file sizes of reference test images on a companion CD-ROM). Amendment 1 (2000) was withdrawn in 2016/02 due to the unavailability of the 1200 dpi version of the ITU-T reference images there prescribed.

This Recommendation includes an electronic attachment available from https://www.itu.int/net/itu-t/sigdb/genimage/test24.htm.

History

Edition	Recommendation	Approval	Study Group	Unique ID[*]
1.0	ITU-T T.24	1994-11-11	8	11.1002/1000/2510
2.0	ITU-T T.24	1998-06-18	8	11.1002/1000/4390
2.1	ITU-T T.24 (1998) Amd. 1	2000-02-10	8	11.1002/1000/4838
2.2	ITU-T T.24 (1998) Cor. 1	2015-11-29	16	11.1002/1000/12680
3.0	ITU-T T.24	2015-11-29	16	11.1002/1000/12981

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[*] To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11 830-en.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

Table of Contents

Included electronic files

Available from https://www.itu.int/net/itu-t/sigdb/genimage/test24.htm:

CD-ROM 1:

    Eight ITU-T reference images, ITU-T T.22 test chart No. 4, Legibility test chart, Bi-level half tones, ITU-T T.22 test chart No. 5, Houses, T.23 test chart No. 6.

CD-ROM 2:

    CCIR images, CMYK colour images, RGB colour images, Fingerprint and medical grayscale images, Line drawing images, Fine arts images, Low-contrast grayscale images.

Introduction

Test images have played an important role throughout the development of Group 3 and Group 4 facsimile. This Recommendation has been prepared with the goal of providing a standard set of images[1] to facsimile experimenters. The set includes images that have been used over the years plus new images that are applicable for grayscale and colour. The standard set of images will provide a consistent baseline for further work; for example, results of compression algorithm experiments and image quality tests can be compared by a broad range of users, knowing that the input image data is identical. The set of images, stored on a compact disk read only memory (CD-ROM), is available from the ITU.

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[1] The test images reproduced in this Recommendation are not suitable for the tests.

Recommendation ITU-T T.24

Standardized digitized image set

1 Scope

The development of image compression algorithms can be facilitated by performance comparisons to reference images and algorithms.

This Recommendation provides a reference image set that is to be used as a consistent baseline for future image compression work. For example, results of compression algorithm experiments and image quality tests can be compared by a broad range of users, knowing that the input image data is identical.

The images in this Recommendation include the original eight "ITU-T reference images" (also known as the "CCITT images"), two bi-level test charts, a grayscale test chart, various screened half-tone images, electronically dithered images, computer-generated images, grayscale images and colour images.

The specimens reproduced in the figures inside this Recommendation are given for illustration purposes and are not suitable for measurements.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T T.22]   Recommendation ITU-T T.22 (1993), *Standardized test charts for document facsimile transmissions*.

3 Definitions

3.1 Terms defined elsewhere

None.

3.2 Terms defined in this Recommendation

This Recommendation defines the following term:

3.2.1 YUV: YUV (also known as YCbCr) colour model represents the human perception of colour more closely than the red, green and blue (RGB) colour component model by emphasizing the higher sensitivity of human vision to luminance (Y) than to colour information (U or Cb and Y or Cr). This is done by representing the luminance with a higher bit resolution than Cb and Cr. The relationship between YUV and RGB is defined in clause 2.5 of [b-ITU-R BT.601].

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

CCIR   International Radio Consultative Committee (now ITU-R)

CCITT	International Telegraph and Telephone Consultative Committee (now ITU-T)
CMYK	Cyan, Magenta, Yellow and Key (black)
JPEG	Joint Photographic Experts Group
RGB	Red Green Blue
SCID	Standard Colour Image Data

5 Conventions

None.

6 Description of the standardized digitized image set

The following sub-clauses describe the various images of the ITU-T T.24 standardized digitized image set[2] that are found in the electronic attachment to this Recommendation, as well as on the ITU-T Test Signal Database at https://www.itu.int/net/itu-t/sigdb/genimage/test24.htm.

NOTE – The test images reproduced in the main body of this Recommendation are not suitable for tests.

6.1 Eight ITU-T reference images

This image set is derived from the eight ITU-T reference images (formerly known as the "CCITT images"). The eight pages were originally digitized by the French Administration as 200 pels per 25.4 mm and were used in the Group 3 facsimile algorithm selection process, completed in 1980. The digitized images herein were produced from original-quality copies of the eight ITU-T reference images, made at the time that the Group 3 compression algorithm studies were being conducted. All of the pages are A4 size, which is 210 mm wide by 297 mm long. The resolutions selected for the scanning process (200, 300, 400 and 600 pels per 25.4 mm) were based on those specified in the Group 3 and Group 4 Recommendations (200, 300 and 400 pels per 25.4 mm) plus 600 pels per 25.4 mm.

The number of pels per line is determined from the resolution and the width of the page. For the A4 page width of 210 mm, a 200 pels per 25.4 mm scan gives 1654 pels per line. The 1654 pel width is not a convenient number for computer-based processing (not divisible by 8). To correct this condition, the charts were scanned to produce the nominal pels per line and lines per image shown in the Group 3 and Group 4 Recommendations. This means that the pages were centred and overscanned. (The chart itself is 210 mm wide, but the scan line is 219.46 mm wide.) The total number of bytes required to store each of the images, as a function of resolution (or sampling density), is shown in Table 1. The eight ITU reference documents are illustrated in Figures 1 through 8.

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[2] The specimens reproduced in the figures of this Recommendation are given for illustration purposes and are not suitable for measurements

Table 1 – ITU reference documents

| Figure number | Image | Description | Dimensions | | | | Resolution (pixels/inch) (1 bit/pixel) | Size (MBytes) |
| | | | Pixels | | Inches | | | |
			Width	Height	Width	Height		
Figure 1	Document No. 1	English letter	1728	2339	8.64	11.70	200	0.48
			2592	3508	8.64	11.69	300	1.08
			3456	4677	8.64	11.69	400	1.93
			5184	7016	8.64	11.69	600	4.34
Figure 2	Document No. 2	Circuit drawing	1728	2339	8.64	11.70	200	0.48
			2592	3508	8.64	11.69	300	1.08
			3456	4677	8.64	11.69	400	1.93
			5184	7016	8.64	11.69	600	4.34
Figure 3	Document No. 3	French invoice	1728	2339	8.64	11.70	200	0.48
			2592	3508	8.64	11.69	300	1.08
			3456	4677	8.64	11.69	400	1.93
			5184	7016	8.64	11.69	600	4.34
Figure 4	Document No. 4	French text	1728	2339	8.64	11.70	200	0.48
			2592	3508	8.64	11.69	300	1.08
			3456	4677	8.64	11.69	400	1.93
			5184	7016	8.64	11.69	600	4.34
Figure 5	Document No. 5	French text figures	1728	2339	8.64	11.70	200	0.48
			2592	3508	8.64	11.69	300	1.08
			3456	4677	8.64	11.69	400	1.93
			5184	7016	8.64	11.69	600	4.34
Figure 6	Document No. 6	French chart	1728	2339	8.64	11.70	200	0.48
			2592	3508	8.64	11.69	300	1.08
			3456	4677	8.64	11.69	400	1.93
			5184	7016	8.64	11.69	600	4.34
Figure 7	Document No. 7	Kanji	1728	2339	8.64	11.70	200	0.48
			2592	3508	8.64	11.69	300	1.08
			3456	4677	8.64	11.69	400	1.93
			5184	7016	8.64	11.69	600	4.34
Figure 8	Document No. 8	Handwritten memorandum	1728	2339	8.64	11.70	200	0.48
			2592	3508	8.64	11.69	300	1.08
			3456	4677	8.64	11.69	400	1.93
			5184	7016	8.64	11.69	600	4.34

NOTE 1 – The users of the Recommendation may freely reproduce Figures 1 to 8 to check the quality of document facsimile transmission.

NOTE 2 – The values in the Size column are the uncompressed files sizes. The corresponding files on the CD-ROM are compressed.

THE SLEREXE COMPANY LIMITED

SAPORS LANE - BOOLE - DORSET - BH 25 8 ER

TELEPHONE BOOLE (945 13) 51617 - TELEX 123456

Our Ref. 350/PJC/EAC   18th January, 1972.

Dr. P.N. Cundall,
Mining Surveys Ltd.,
Holroyd Road,
Reading,
Berks.

Dear Pete,

    Permit me to introduce you to the facility of facsimile
transmission.

    In facsimile a photocell is caused to perform a raster scan over
the subject copy. The variations of print density on the document
cause the photocell to generate an analogous electrical video signal.
This signal is used to modulate a carrier, which is transmitted to a
remote destination over a radio or cable communications link.

    At the remote terminal, demodulation reconstructs the video
signal, which is used to modulate the density of print produced by a
printing device. This device is scanning in a raster scan synchronised
with that at the transmitting terminal. As a result, a facsimile
copy of the subject document is produced.

    Probably you have uses for this facility in your organisation.

                                        Yours sincerely,

                                        Phil.

                                        P.J. CROSS
                                        Group Leader - Facsimile Research

Figure 1 – Document No. 1 – English letter

Figure 2 – Document No. 2 – Circuit drawing

ÉTABLISSEMENTS ABCDEFG
SOCIÉTÉ ANONYME AU CAPITAL DE 300 000 F
20, RUE DU XVUTRSTBSL F 00000 NTBCLAG
Tél. : (35) 24.46.32 Adr. Tg. : NRVLJRQLM
Télex : 31596 F IN : 718490070257
Transporteur (ou Transitaire)
M. M. DUPONT Frères
B quai des blcdfsh F 0000 NTBCLAG

Mot directeur

CLASSEMENT	FACTURE INVOICE	Exemplaire 15
CODE CLIENT Z 04399	DATE 7-7-74	NUMÉRO 06	FEUILLET 01

Votre commande   du 74-2-2 numéro 438

Notre offre AZ/B7   du 74-1-1 numéro 12

●   ●   ●   ●

LIVRAISON

5, rue XYZ

99000 VILLE

FACTURATION

12, rue ABCD BP 15

99000 VILLE

DOMICILIATION BANCAIRE DU VENDEUR   PAYS D'ORIGINE   PAYS DE DESTINATION

CODE BANQUE   CODE GUICHET   COMPTE CLIENT   CONDITIONS DE LIVRAISON   DATE 74-03-03

ORIGINE	TRANSPORTS DESTINATION	MODE
Pays 1	Etat 2	Air

LICENCE D'EXPORTATION   NATURE DU CONTRAT (monnaie)

FAB

CONDITIONS DE PAIEMENT (échéance, %...)

MARQUES ET NUMÉROS MARKS AND NUMBERS	NOMBRE ET NATURE DES COLIS : DÉNOMINATION DE LA MARCHANDISE NUMBER AND KING OF PACKAGES: DESCRIPTION OF GOODS	NOMEN-CLATURE STATISTICAL No.	MASSE NETTE NET WEIGHT MASSE BRUTE GROSS WEIGHT	VALEUR VALUE DIMENSIONS MEASURE-MENTS
74.21.456.44.2 A	1 Composants	U 123/4	5 kg 8 kg	1400 X 13x10x6

QUANTITÉ COMMANDÉE ET UNITÉ QUANTITY ORDERED AND UNIT	N° ET RÉF. DE L'ARTICLE	DÉSIGNATION	QUANTITÉ LIVRÉE ET UNITÉ QUANTITY DELIVERED AND UNIT	PRIX UNITAIRE UNIT PRICE	MONTANT TOTAL TOTAL AMOUNT
2	AF-809	Circuit intégré	2	104,33 F	208,66 F
10	S8-T4	Connecteur	10	83,10 F	831,00 F
25	ZI07	Composant indéterminé	20	15,00 F	300,00 F

Costs	Débours	Inclus	Non Inclus
Packing	Emballages		92,14
Freight	Transport		
Insurance	Assurances		
Total Invoice amount	Montant total de la facture		1431,80
Installment	Acomptes		
NET TO BE PAID	NET A RÉGLER		1431,80

Figure 3 – Document No. 3 – French invoice

L'ordre de lancement et de réalisation des applications fait l'objet de décisions au plus haut niveau de la Direction Générale des Télécommunications. Il n'est certes pas question de construire ce système intégré "en bloc" mais bien au contraire de procéder par étapes, par paliers successifs. Certaines applications, dont la rentabilité ne pourra être assurée, ne seront pas entreprises. Actuellement, sur trente applications qui ont pu être globalement définies, six en sont au stade de l'exploitation, six autres se sont vu donner la priorité pour leur réalisation.

Chaque application est confiée à un "chef de projet", responsable successivement de sa conception, de son analyse-programmation et de sa mise en oeuvre dans une région-pilote. La généralisation ultérieure de l'application réalisée dans cette région-pilote dépend des résultats obtenus et fait l'objet d'une décision de la Direction Générale. Néanmoins, le chef de projet doit dès le départ considérer que son activité a une vocation nationale donc refuser tout particularisme régional. Il est aidé d'une équipe d'analystes-programmeurs et entouré d'un "groupe de conception" chargé de rédiger le document de "définition des objectifs globaux" puis le "cahier des charges" de l'application, qui sont adressés pour avis à tous les services utilisateurs potentiels et aux chefs de projet des autres applications. Le groupe de conception comprend 6 à 10 personnes représentant les services les plus divers concernés par le projet, et comporte obligatoirement un bon analyste attaché à l'application.

II - L'IMPLANTATION GEOGRAPHIQUE D'UN RESEAU INFORMATIQUE PERFORMANT

L'organisation de l'entreprise française des télécommunications repose sur l'existence de 20 régions. Des calculateurs ont été implantés dans le passé au moins dans toutes les plus importantes. On trouve ainsi des machines Bull Gamma 30 à Lyon et Marseille, des GE 425 à Lille, Bordeaux, Toulouse et Montpellier, un GE 437 à Massy, enfin quelques machines Bull 300 TI à programmes câblés étaient récemment ou sont encore en service dans les régions de Nancy, Nantes, Limoges, Poitiers et Rouen ; ce parc est essentiellement utilisé pour la comptabilité téléphonique.

A l'avenir, si la plupart des fichiers nécessaires aux applications décrites plus haut peuvent être gérés en temps différé, un certain nombre d'entre eux devront nécessairement être accessibles, voire mis à jour en temps réel : parmi ces derniers le fichier commercial des abonnés, le fichier des renseignements, le fichier des circuits, le fichier technique des abonnés contiendront des quantités considérables d'informations.

Le volume total de caractères à gérer en phase finale sur un ordinateur ayant en charge quelques 500 000 abonnés a été estimé à un milliard de caractères au moins. Au moins le tiers des données seront concernées par des traitements en temps réel.

Aucun des calculateurs énumérés plus haut ne permettait d'envisager de tels traitements.

L'intégration progressive de toutes les applications suppose la création d'un support commun pour toutes les informations, une véritable "Banque de données", répartie sur des moyens de traitement nationaux et régionaux, et qui devra rester alimentée, mise à jour en permanence, à partir de la base de l'entreprise, c'est-à-dire les chantiers, les magasins, les guichets des services d'abonnement, les services de personnel etc.

L'étude des différents fichiers à constituer a donc permis de définir les principales caractéristiques du réseau d'ordinateurs nouveaux à mettre en place pour aborder la réalisation du système informatif. L'obligation de faire appel à des ordinateurs de troisième génération, très puissants et dotés de volumineuses mémoires de masse, a conduit à en réduire substantiellement le nombre.

L'implantation de sept centres de calcul interrégionaux constituera un compromis entre : d'une part le désir de réduire le coût économique de l'ensemble, de faciliter la coordination des équipes d'informaticiens; et d'autre part le refus de créer des centres trop importants difficiles à gérer et à diriger, et posant des problèmes délicats de sécurité. Le regroupement des traitements relatifs à plusieurs régions sur chacun de ces sept centres permettra de leur donner une taille relativement homogène. Chaque centre "gèrera" environ un million d'abonnés à la fin du VIème Plan.

La mise en place de ces centres a débuté au début de l'année 1971 : un ordinateur IRIS 50 de la Compagnie Internationale pour l'Informatique a été installé à Toulouse en février ; la même machine vient d'être mise en service au centre de calcul interrégional de Bordeaux.

Photo n° 1 - Document très dense lettre 1,5mm de haut -
Restitution photo n° 9

Figure 4 – Document No. 4 – French text

Cela est d'autant plus valable que $T\Delta f$ est plus grand. A cet égard la figure 2 représente la vraie courbe donnant $|\phi(f)|$ en fonction de f pour les valeurs numériques indiquées page précédente.
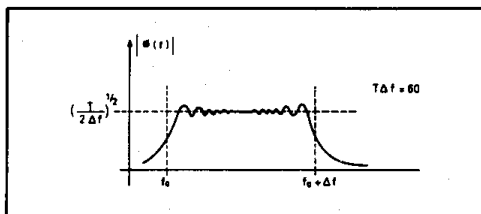

Fig. 2

Dans ce cas, le filtre adapté pourra être constitué, conformément à la figure 3, par la cascade :

— d'un filtre passe-bande de transfert unité pour $f_0 \leqslant f \leqslant f_0+\Delta f$ et de transfert quasi nul pour $f < f_0$ et $f > f_0+\Delta f$, filtre ne modifiant pas la phase des composants le traversant ;
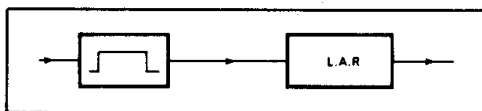

Fig. 3

— filtre suivi d'une ligne à retard (LAR) dispersive ayant un temps de propagation de groupe T_R décroissant linéairement avec la fréquence f suivant l'expression :

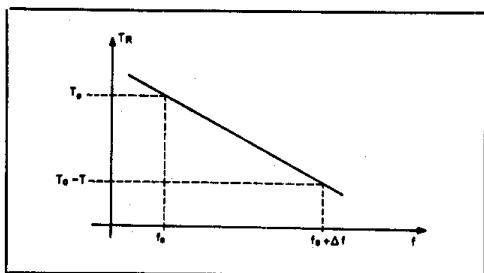$$T_R = T_0+(f_0-f)\frac{T}{\Delta f} \quad (\text{avec } T_0 > T)$$

(voir fig. 4).

Fig. 4

telle ligne à retard est donnée par :

$$\varphi = -2\pi \int_0^f T_R \, df$$

$$\varphi = -2\pi \left[T_0+\frac{f_0 T}{\Delta f}\right]f + \pi \frac{T}{\Delta f} f^2$$

Et cette phase est bien l'opposé de $/\phi(f)$,

à un déphasage constant près (sans importance) et à un retard T_0 près (inévitable).

Un signal utile $S(t)$ traversant un tel filtre adapté donne à la sortie (à un retard T_0 près et à un déphasage près de la porteuse) un signal dont la transformée de Fourier est réelle, constante entre f_0 et $f_0+\Delta f$, et nulle de part et d'autre de f_0 et de $f_0+\Delta f$, c'est-à-dire un signal de fréquence porteuse $f_0+\Delta f/2$ et dont l'enveloppe a la forme indiquée à la figure 5, où l'on a représenté simultanément le signal $S(t)$ et le signal $S_1(t)$ correspondant obtenu à la sortie du filtre adapté. On comprend le nom de récepteur à compression d'impulsion donné à ce genre de filtre adapté : la « largeur » (à 3 dB) du signal comprimé étant égale à $1/\Delta f$, le rapport de compression

est de $\dfrac{T}{1/\Delta f} = T\Delta f$
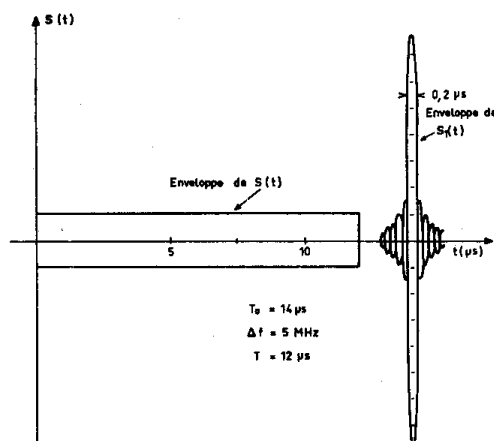
Fig. 5

On saisit physiquement le phénomène de compression en réalisant que lorsque le signal $S(t)$ entre dans la ligne à retard (LAR) la fréquence qui entre la première à l'instant 0 est la fréquence basse f_0, qui met un temps T_0 pour traverser. La fréquence f entre à l'instant $t = (f-f_0)\dfrac{T}{\Delta f}$ et elle met un temps

$T_0-(f-f_0)\dfrac{T}{\Delta f}$ pour traverser, ce qui la fait ressortir

à l'instant T_0 également. Ainsi donc, le signal $S(t)$

Figure 5 – Document No. 5 – French text figures

Limites de confiance à 95%

$G_a = \infty$

$G_a = 35$

$G_a = 25$

G_n

CC.ITT. 5337

Courbes adaptées G_n (essais subjectifs) pour
$G_a = \infty$ $G_a = 35dB$ $G_a = 25dB$

[10]   ×   □   o
[23]

Points calculés D (Q, G_a) pour
$G_a = \infty$ $G_a = 25$ $G_a = 35$ dB

●   ■   △   – dans la partie montante
×   ⊕   +   – dans la partie descendante

Courbes ━ ━ ━━━ ━ ━ ━ D (Q, G_a)

FIGURE 3

TOME V — Question 18/XII, Annexe 6

Figure 6 – Document No. 6 – French chart

CCITTの概要

沿革

CCITTは、国際電気通信連合（ITU）の四つの常設機関（事務総局、国際周波数登録委員会、CCIR、CCITT）の一つとして、ITUの中でも、世界の国際通信上の諸問題を真先に取上げ、その解決方法を見出して行く重要な機関である。日本名は、国際電信電話諮問委員会と称する。

CCITTの前身は、CCIF（国際電話諮問委員会）とCCIT（国際電信諮問委員会）である。CCIFは、1924年にヨーロッパに「国際長距離電話通信諮問委員会」が設置され、これが1925年のパリ電信電話会議のとき、正式に、「国際電話諮問委員会」として万国電信連合の公式機関となったものである。CCITは、同じく1925年の会議のとき、CCIFと併立するものとして設置された。

そして、CCIFは、1956年の12月に第18回総会が開催されたのち、CCITは、同年同月に第8回総会が開催されたのち、併合されて現在のCCITTとなった。このCCITTは、CCIFとCCITが解散した直後、第1回総会を開催し、第2回総会は、1960年にニューデリーで、第3回総会は、1964年、ジュネーブで、第4回総会は、1968年、アルゼンチンで開催された。

CCIFとCCITが合併したのは、有線電気通信の分野、とくに伝送路について電信回線と電話回線とを技術的に分ける意味がなくなってきたこと、各国とも大体において、電信部門と電話部門は同一組織内にあること、CCIFの事務局とCCITの事務局の合併による能率増進等がおもな理由であった。

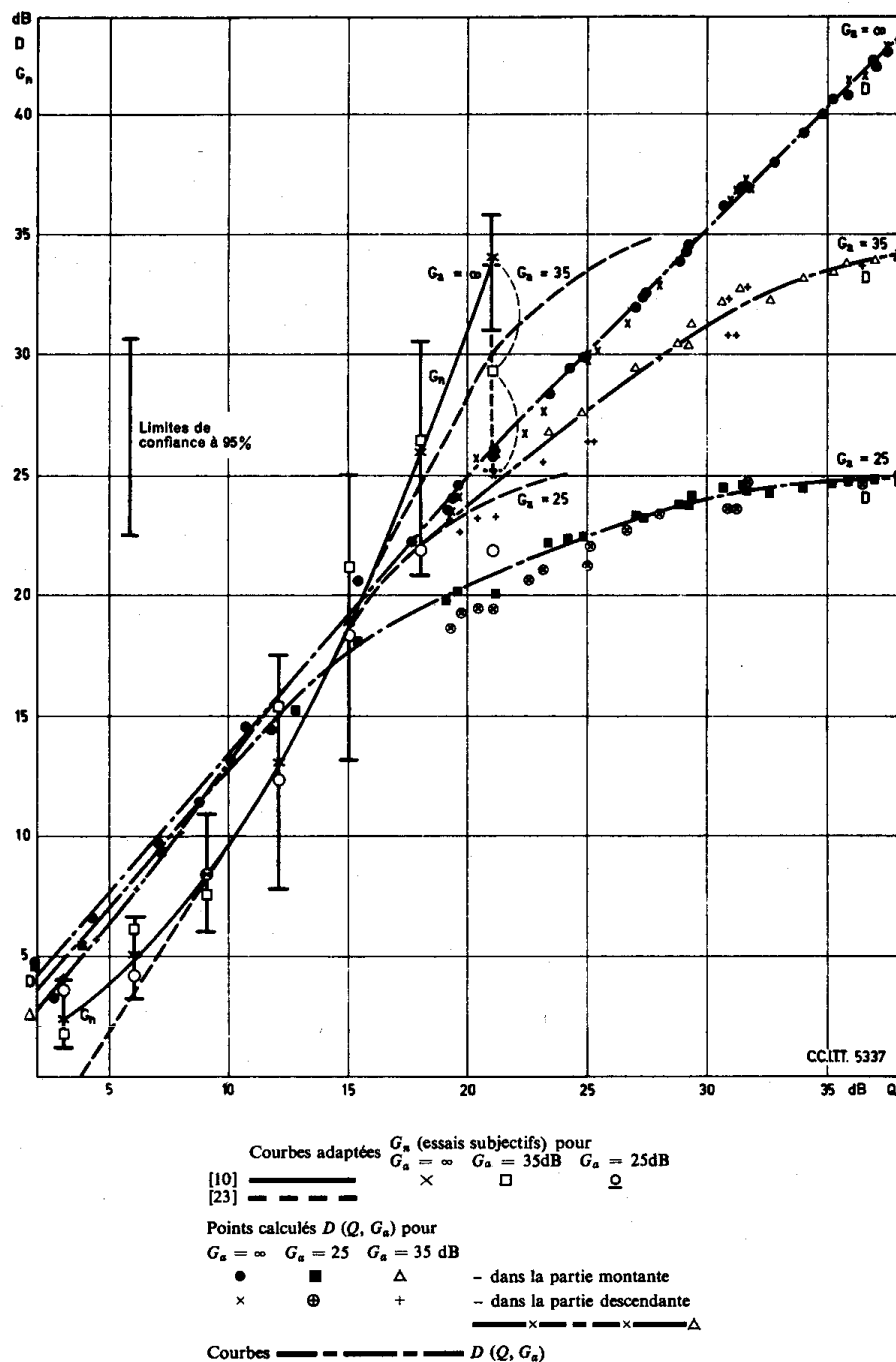CCITTは、上述のように、ヨーロッパ内の国ぐにによって、ヨーロッパ内の電信・電話の技術・運用・料金の基準を定め、あるいは統一をはかってきたので、現在でも、その影響を受け、会合参加国は、ヨーロッパの国が多く、ヨーロッパで生起する問題の研究が多い。たとえば、1960年のCCITT勧告の中で、技術上配慮する距離は約2,500kmであったが、これはヨーロッパ内領域を想定したものである。

しかしながら、1956年9月に敷設された大西洋横断電話ケーブルは、大陸間電話通信の自動化および半自動化への技術的可能性を与え、CCITTがこの問題を取り上げるに及び、CCITTの性格は漸次、汎世界的色彩を実質的に帯びるに至った。この汎世界的性格は第2次世界大戦後目ざましくなったアジア・アフリカ植民地の独立に伴ってITUの構成員の中にこれらの国が加わり、ITUの中に新しい意見が導入されたことにも起因して、技術面、政治面の双方から導入されてきたしい意見が導入されてきたことにも起因して、技術面、政治面の双方から導入されてきた。

CCITTの汎世界化は、1960年の第2回総会がニューデリーで開催されたことにもあらわれている。この総会までは、CCIT、CCIFのいずれにしろ、アメリカやアジアで総会が開催されたことがなく、CCIT・CCIF委員長も、ニューデリー総会の準備文書で、この点には注目すべきであるとのべている。

任務

ITUは、全権委員会議、主管庁会議を始めとして、七つの機関をもち、それぞれの機関の権限と任務は国際電気通信条約に明記されている。そこで条約を参照してみるならば、CCITTの任務は、つぎのとおりとなっている。

「国際電信電話諮問委員会（CCITT）は、電信および電話に関する技術、運用および料金の問題について研究し、および意見を表明することを任務とする。」（1965年モントルー条約第187号）

「各国際諮問委員会は、その任務の遂行に当たって、新しい国または発展の途上にある国における地域的および国際的分野にわたる電気通信の創設、発達および改善に直接関連のある問題について研究し、および意見を作成するように妥当な注意を払わなければならない。」（同第188号）

「各国際諮問委員会は、また、関係国の要請に基づき、その国内電気通信の問題について研究し、かつ、勧告を行なうことができる。」（同第189号）

上記第187号と第188号にいわれる「意見」とは、フランス語の Avis から訳したもので、英語では、「勧告（Recommendation）」となっている。CCITTの表明する意見は、国際法的には強制力をもたないものであって、この点が、条約、電信規則、電話規則等各国を拘束する力をもっているものと異なる。もっとも意見とは称しても、技術的分野では、電信規則のごとき、各国政府が承認してその内容を実施する強制規則をもたないので、実際にある機器の仕様を定める場合には、多くの国の意見が統一された、この「意見」に従わなければ、円滑な国際通信を行なうことができない場合が多い。この意見（または勧告）は、国際通信を行なう場合各国が直面する問題について、具体的意見を表明するもので、たとえば、大陸間ケーブルで大陸間通話を半自動化しようとする場合、その信号方式や取り扱う通話の種類および料金は、どのようにするかを研究して意見を表明する。したがって、CCITTの活動は、つねに時代の最先端を行くもので、CCITTの活動方向は、そのまま世界の国際通信の活動方向であるともいえる。

この意見は、また、電信規則以下のその他の規則のごとく、数年以上の間隔をもって開催される主管庁会議というような大会議の決定をまたなくても表明することができ、また、その改正も容易であるので、現在のように進歩の早い国際通信界では、関係国の意見を統一した国際的見解としては非常に便利である。

Figure 7 – Document No. 7 – Kanji

memorandum

FROM: A.P. Spraggs Research	TO: G.V. Smith Project Planning
EXTN: 2041	DATE: 1-9-71
TEL:	

We know that, where possible, data is reduced to alphanumeric form for transmission by communication systems. However, this can be expensive, and also some data must remain in graphic form. For example, we cannot key-punch an engineering drawing or weather map.

I think we should realise that high speed facsimile transmissions are needed to overcome our problems in efficient graphic data communication. We need research into graphics data compression.

Any comments?

Albert.

WELL, WE ASKED FOR IT !

Figure 8 – Document No. 8 – Handwritten memorandum

6.2   ITU-T T.22 test chart No. 4 – Black-white facsimile test chart BW01

This bi-level image is the digitization (at 400 pels per inch) of the high-contrast black/white chart that is one of two charts that make up [ITU-T T.22] (see Figure 9 and Table 2). Figure 9 contains text in a variety of languages, fonts and pitches and various test patterns.

Table 2 – High-contrast test chart image

Figure number	Image	Description	Dimensions				Resolution (pixels/inch) (1 bit/pixel)	Size (MBytes)
			Pixels		Inches			
			Width	Height	Width	Height		
Figure 9	ITU-T T.22 test chart No. 4	Facsimile test chart	3504	4750	8.76	11.88	400	2.09
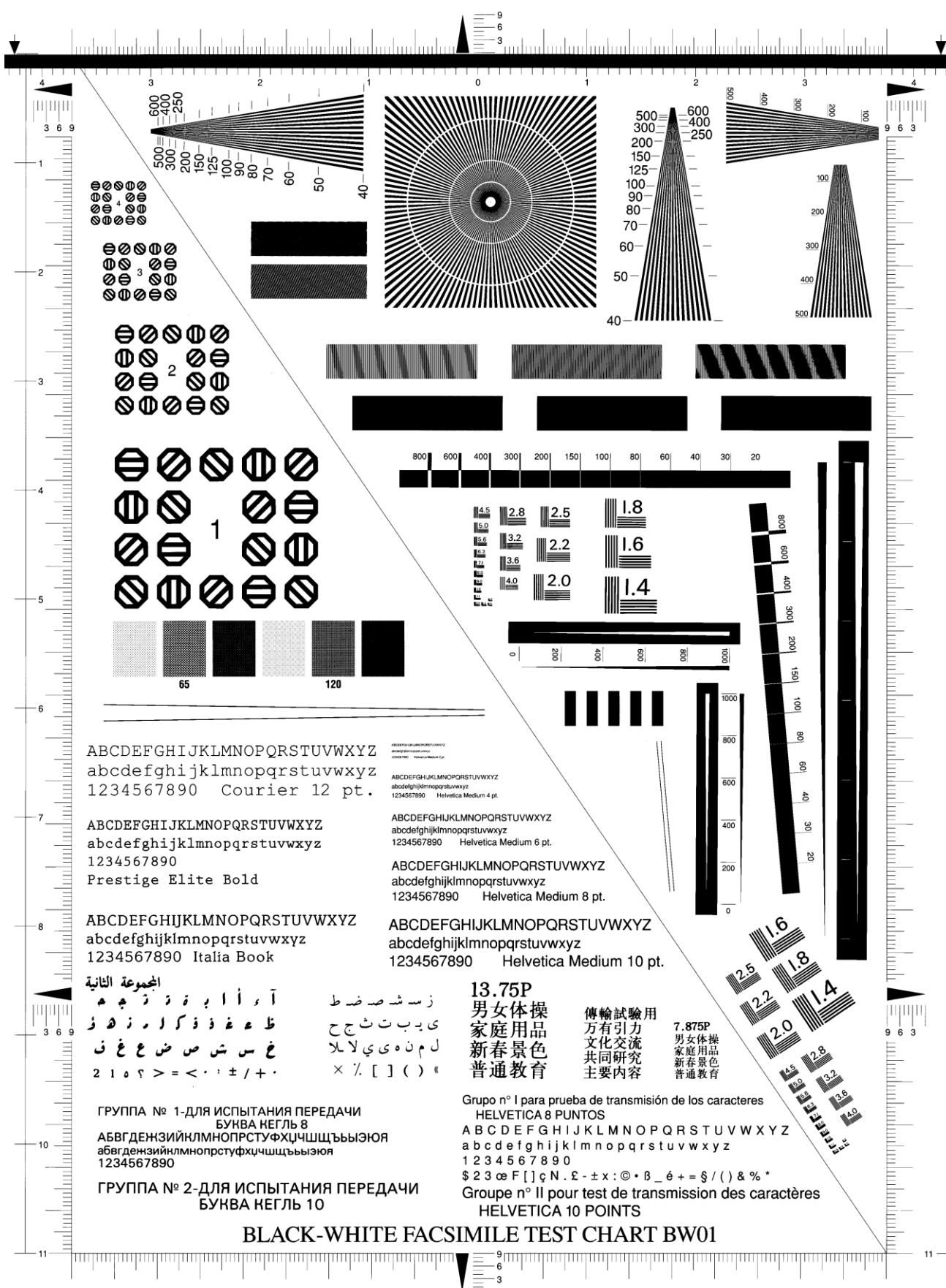
Figure 9 – Test pattern facsimile test chart BW01

6.3 Legibility test chart

This digitized image (see Figure 10 and Table 3) contains random text in four different fonts with six different point sizes. Plus, its lower half includes half-tone imagery that uses five different screen densities (65, 85, 120, 133 and 150 lines/inch).

Table 3 – Legibility test chart image

Figure number	Image	Description	Dimensions				Resolution (pixels/inch) (1 bit/pixel)	Size (MBytes)
			Pixels		Inches			
			Width	Height	Width	Height		
Figure 10	Half-tone chart	Text for legibility testing, half-tones	1728	2336	8.64	11.68	200	0.51
			2048	2800	8.53	11.67	240	0.72
			2560	3500	8.53	11.68	300	1.13
			3456	4672	8.64	11.67	400	2.02
			4096	5600	8.53	11.67	480	2.87

10 Point

dKfje giewo s1weo xcaqp cNvbm xiuyt rEdv2 dkfJe giewo slW3o xcaQp c9vbm xiuy dKfje giewo s1weo xcaqp cNvbm xiuyt rEdv2 dkfJe rEdvj dkfj5 giewo sLweo xca4G cnvbm x8uyt redVJ dkfje Gie6o slwXo xcaqp dKfje giewo s1weo xcaqp cNvbm xiuyt rEdv2 dkfJe Cnvbm xiuyt redvJ d45je giewo slBUo xc2Fp cnvbm xiWyt redOj dkfje giEwo slweo xCa7p cnvbm xi26t redvj KJfje giewo Slweo xc5Tp cnvbm xiuyt Redvj dkfje gVew dKfje giewo s1weo xcaqp

8 Point

dKfje giewo s1weo xcaqp cNvbm xiuyt rEdv2 dkfJe giewo slW3o xcaQp c9vbm xiuy eikjf kjK56 defge 83fdKfje giewo s1weo xcaqp cNvbm xiuyt rEdv2 dkfJe rEdvj dkfj5 giewo sLweo xca4G cnvbm x8uyt redVJ dkfje Gie6o slwXo xcaqp KL3er keich 3ks0d dKfje giewo s1weo xcaqp Cnvbm xiuyt redvJ d45je giewo slBUo xc2Fp cnvbm xiWyt redOj dkfje glEwo 3kdoc kdKod 34Ker cNvbm xiuyt rEdv2 dkfJe cNvbm xiuyt slweo xCa7p cnvbm xi26t redvj KJfje giewo Slweo xc5Tp cnvbm xiuyt Redvj dkfje gVew 3pajc kwmcJ el eNvbm xiuyt rEdv2 dkfJe cNvbm xiuyt

6 Point

dKfje giewo s1weo xcaqp cNvbm xiuyt rEdv2 dkfJe giewo slW3o xcaQp c9vbm xiuy eikjk kjK56 defge 83fek pwkch Kwlci hev03 dKfje giewo s1weo xcaqp cNvbm xiuyt rE dKfje giewo rEdvj dkfj5 giewo sLweo xca4G cnvbm x8uyt redVJ dkfje Gie6o slwXo xcaqp KL3er keich 3ks0d hckGH 2301s 3kchL Paroh alihc dKfje giewo s1weo xcaqp cNvbm xiuyt rE keich Cnvbm xiuyt redvJ d45je giewo slBUo xc2Fp cnvbm xiWyt redOj dkfje glEwo 3kdoc kdKod 34Ker opucu 36ogZ qtxvp du0oh lzobn dKfje giewo s1weo xcaqp cNvbm xiuyt rE kdKod slweo xCa7p cnvbm xi26t redvj KJfje giewo Slweo xc5Tp cnvbm xiuyt Redvj dkfje gVew 3pajc kwmcJ elqmn ba-1u 3hkej ahn3o ioch2 plnsk dKfje giewo s1weo xcaqp cNvbm xiuyt rE kwmcJ ba-1

4 Point

dKfje giewo s1weo xcaqp cNvbm xiuyt rEdv2 dkfJe giewo slW3o xcaQp c9vbm xiuy eikjk kjK56 defge 83fek pwkch Kwlci hev03 rEdvj dk fj5 giewo sL weo xca4G cnvbm x8uyt redVJ dkfje Gie6o dKfje giewo s1weo xcaqp cNvbm xiuyt rE dKfje giewo s1weo xcaqp cNvbm xiuyt

dKfje giewo s1weo xcaqp cNvbm xiuyt rEdv2 dkfJe giewo slW3o xcaQp c9vbm xiuy eikjk kjK56 defge 83fek pwkch Kwlci hev03 rEdvj dkfj5 giewo sL weo xca4G cnvbm x8uyt redVJ dkfje Gie6o dKfje giewo s1weo xcaqp cNvbm xiuyt rE sLweo xca4G cnvbm x8uyt redVJ

dKfje giewo s1weo xcaqp cNvbm xiuyt rEdv2 dkfJe giewo slW3o xcaQp c9vbm xiuy eikjk kjK56 defge 83fek pwkch Kwlci hev03 rEdvj dkfj5 giewo sLweo xca4G cnvbm x8uyt redVJ dkfje Gie6o dKfje giewo s1weo xcaqp cNvbm xiuyt rE slweo xca4G cnvbm x8uyt redVJ

dKfje giewo s1weo xcaqp cNvbm xiuyt rEdv2 dkfJe giewo slW3o xcaQp c9vbm xiuy eikjk kjK56 defge 83fek pwkch Kwlci hev03 rEdvj dkfj5 giewo sLweo xca4G cnvbm x8uyt redVJ dkfje Gie6o dKfje giewo s1weo xcaqp cNvbm xiuyt rE dKfje giewo s1weo xcaqp cNvbm xiuyt rE dkfje meie82 bd1

3 Point

dKfje giewo s1weo xcaqp cNvbm xiuyt rEdv2 dkfJe giewo slW3o xcaQp c9vbm xiuy eikjk kjK56 defge 83fek pwkch hev03 rEdvj dkfj5 giewo sLweo xca4G cnvbm x8uyt redVJ dkfje Gie6o dKfje giewo s1weo xcaqp cNvbm xiuyt rE dKfje giewo s1weo xcaqp cNvbm xiuyt rEdv2 dkfje giewo slW3o xcaQp

[3 point text continues — illegible]

2 Point

[2 point text — illegible]

65 Line Screen

85 Line Screen

120 Line Screen

133 Line Screen

150 Line Screen

Facsimile
Test Chart

Figure 10 – Half-tone facsimile test chart

6.4 Bi-level half-tones

Figure 11 through Figure 17 display bi-level half-tone images (see Table 4). Figures 11, 12, 13 and 14 show dithered sailboat images. The four sailboat images were made by processing a grayscale sailboat image with four different algorithms: The processing included 8×8 dithering for Figure 11, error diffusion for Figure 12, 4×4 dithering for Figure 13 and 3×3 dithering for Figure 14.

Figure 15 is a composite of the house with sky image. Starting in clockwise order from the upper left, the dither patterns are ordered 4×4, random dithering, ordered 8×8 and clump dithering.

Figure 16 combines a screened half-tone image and an electronically scanned text that has been inverted. Both the text and the image portion of the document were extracted from a magazine. Figure 17 is a composite of electronically scanned segments of magazine pages. It includes a half-tone, text and inverted text.

Table 4 – Half-tone images

| Figure number | Image | Description | Dimensions | | | | Resolution (pixels/inch) (1 bit/pixel) | Size (MBytes) |
			Pixels		Inches			
			Width	Height	Width	Height		
Figure 11	Sailboat No. 1	8×8 dithering	3072	2048	7.68	5.12	400	0.79
Figure 12	Sailboat No. 2	Error diffusion	3072	2048	7.68	5.12	400	0.79
Figure 13	Sailboat No. 3	4×4 dithering	3072	2048	7.68	5.12	400	0.79
Figure 14	Sailboat No. 4	3×3 dithering	3072	2048	7.68	5.12	400	0.79
Figure 15	House with Trees	Dithered composite	1904	1488	9.52	7.44	200	0.36
Figure 16	Magazine Text, Half-tone	Screened half-tone and inverted text	3456	4416	4.32	5.52	800	1.91
Figure 17	Magazine Page, Composite	Contains half-tone, text and inverted text	3072	4352	7.68	10.88	400	1.68
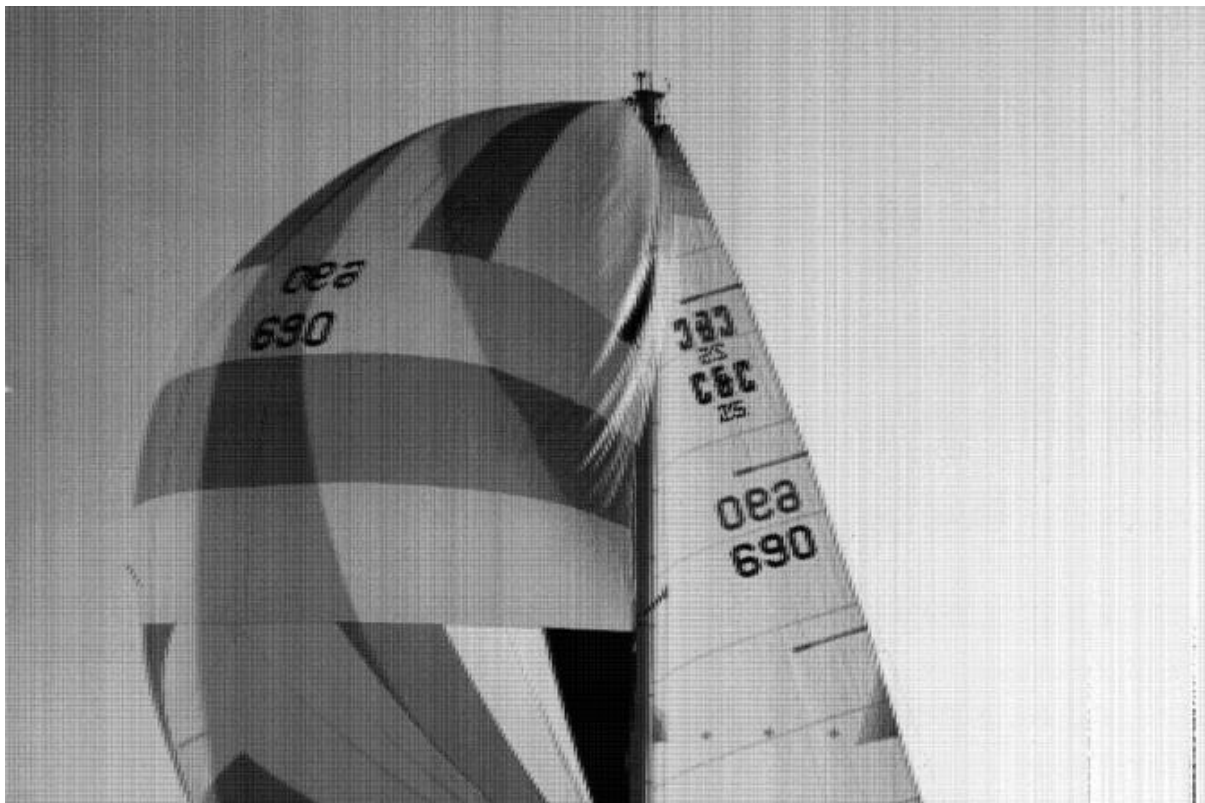
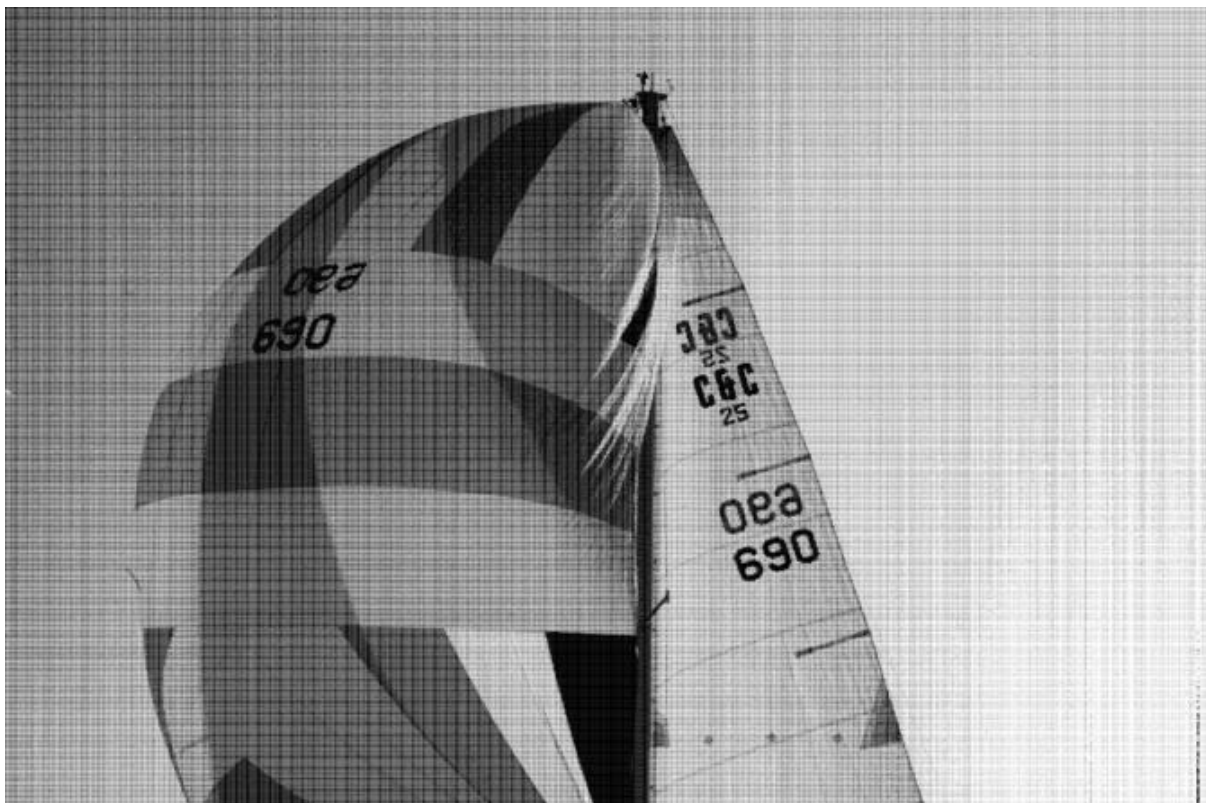**Figure 11 – Sailboat No. 1 (8 × 8 Dither)**

Figure 12 – Sailboat No. 2 (Error diffusion)

Figure 13 – Sailboat No. 3 (4 × 4 Dither)
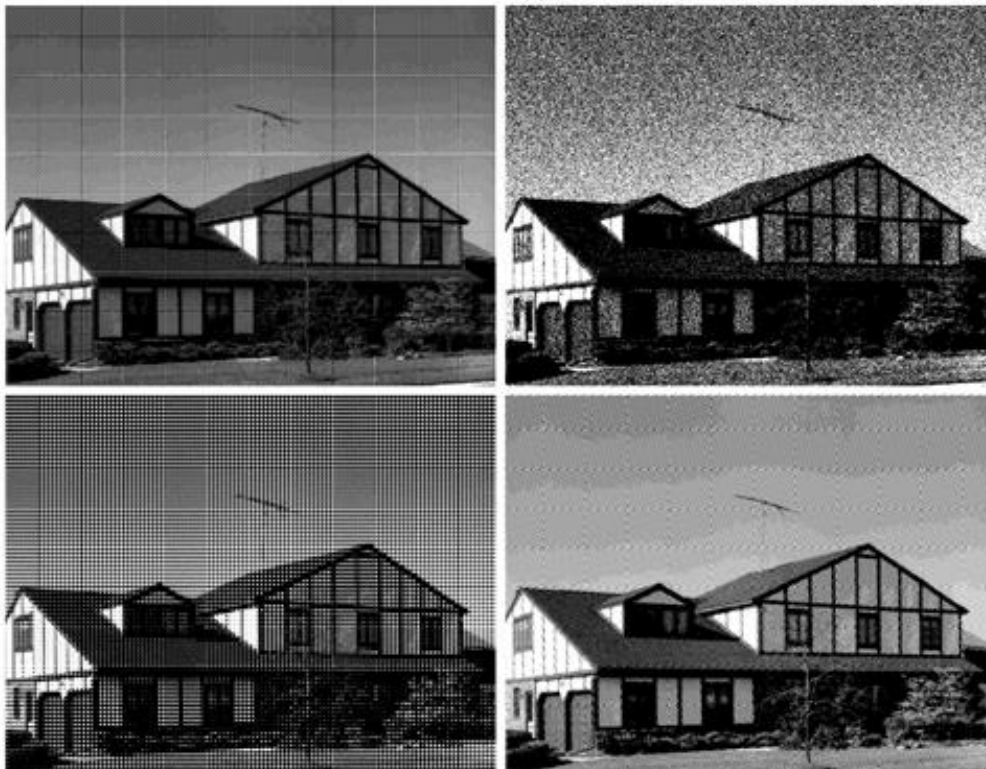

Figure 14 – Sailboat No. 4 (3 × 3 Dither)

Figure 15 – House with trees (Dithered composite)
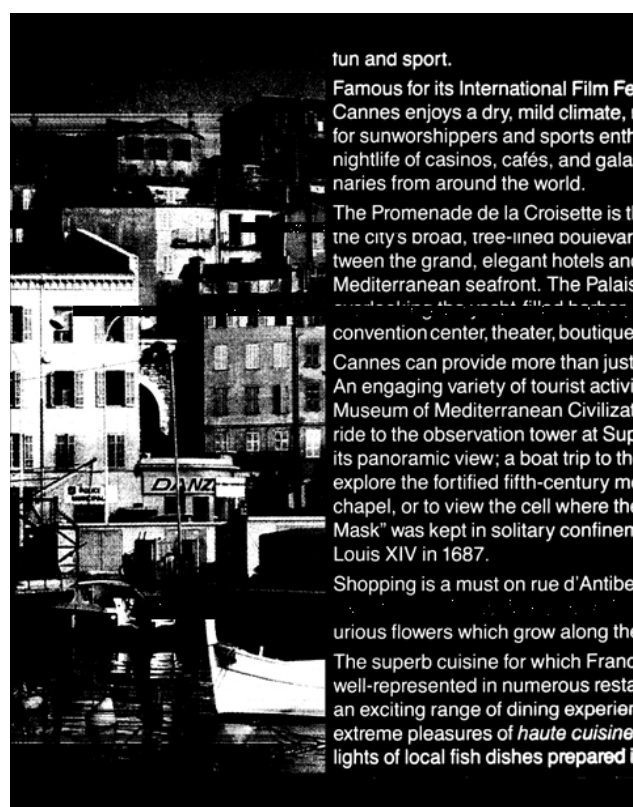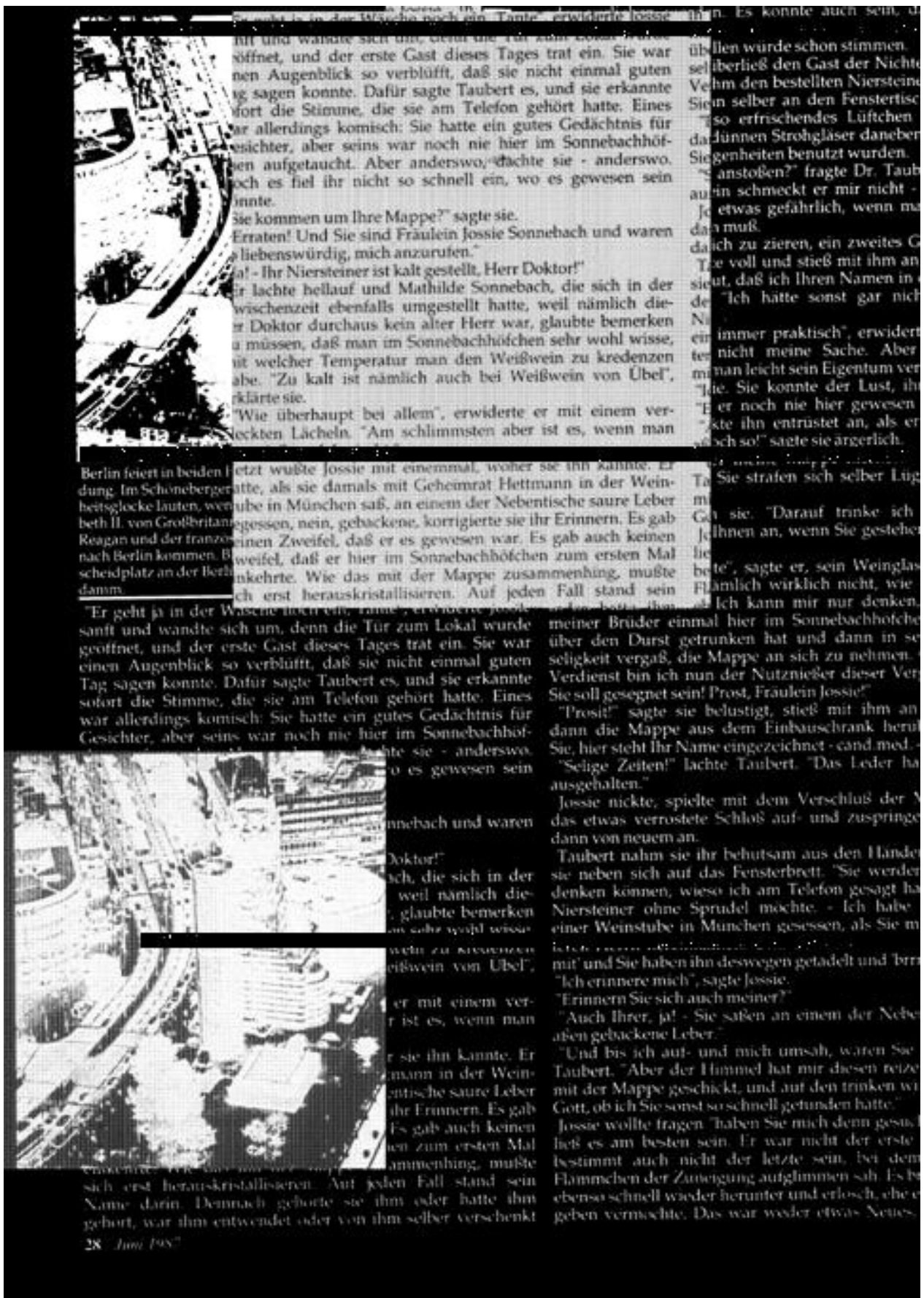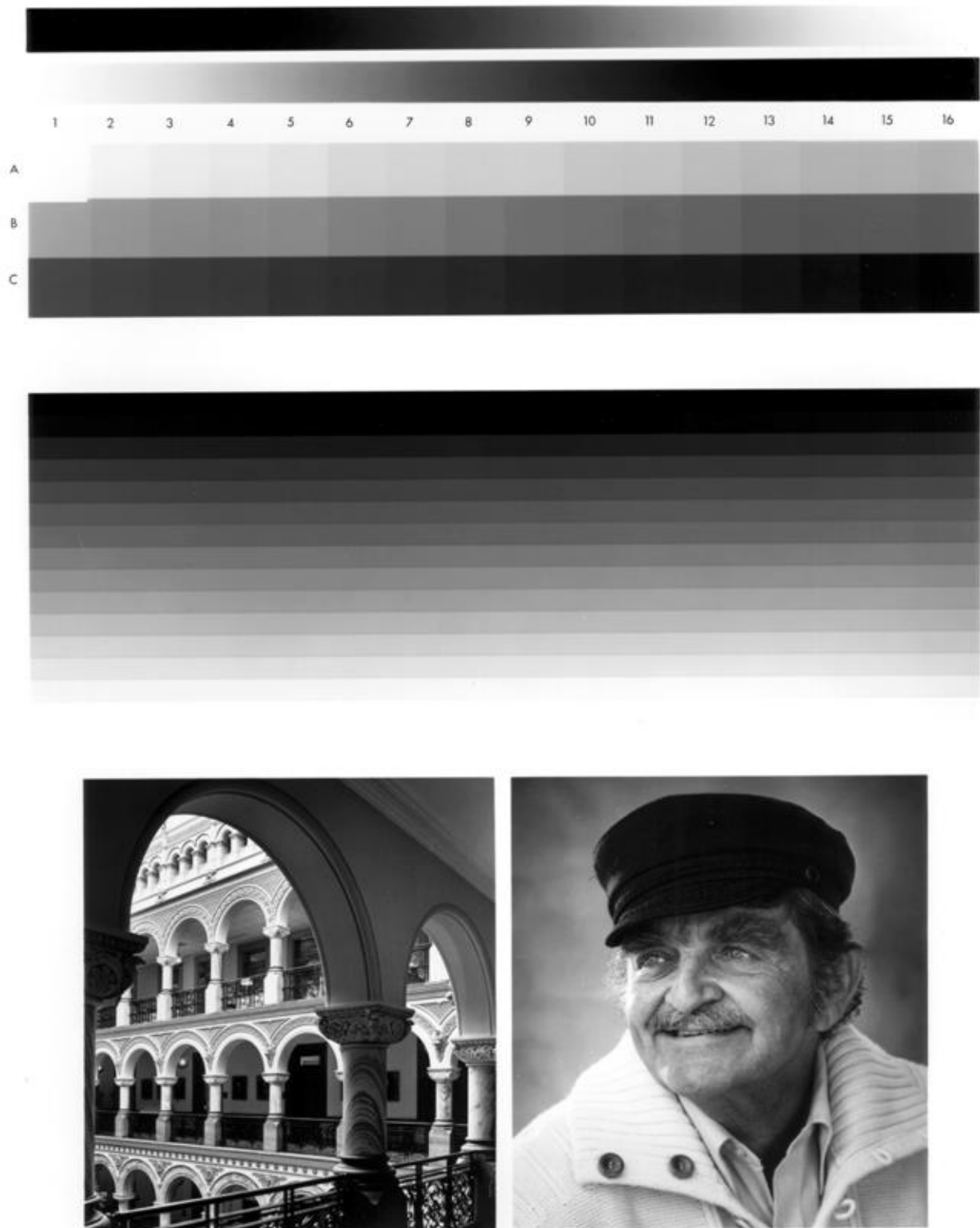

Figure 16 – Magazine text (Half-tone)

Figure 17 – Magazine composite page

6.5   ITU-T T.22 test chart No. 5 – Continuous tone test chart CT01

Figure 18 is a test chart designed specifically for facsimile. It consists of several strips and patches of various grayscale levels and two photographs, an architectural photograph and a portrait. This test chart is part of [ITU-T T.22].

CONTINUOUS TONE FACSIMILE TEST CHART CT01

Figure 18 – Continuous tone test chart CT01

6.6 House with trees and house with sky

This set of grayscale images includes a house with sky photograph and a house with trees photograph (see Figures 19 and 20). The images have been digitized as shown in Table 5.

Table 5 – Grayscale images

Figure number	Image	Description	Dimensions				Resolution (pixels/inch) (8 bit/pixel)	Size (MBytes)
			Pixels		Inches			
			Width	Height	Width	Height		
Figure 19	House with trees	Photo of a house surrounded by trees	940	820	4.70	4.10	200	0.78
			1128	984	4.70	4.10	240	1.12
			1410	1230	4.70	4.10	300	1.74
			1880	1640	4.70	4.10	400	3.09
Figure 20	House with Sky	Photo of a house; decorative plantings only	940	830	4.70	4.15	200	0.79
			1128	996	4.70	4.15	240	1.13
			1410	1245	4.70	4.15	300	1.76
			1880	1660	4.70	4.15	400	3.13

Figure 19 – House with trees

Figure 20 – House with sky

6.7   ITU-T T.23 test chart No. 6 – 4-Colour printing facsimile test chart 4CP01

This set of images comes from the facsimile colour test chart (see Figure 21 and Table 6).

The toys photo shows higher sharpness for fine detail in the stuffed animals and the faces, and provides a range of textures and patterns. The presence of both bright and pastel colours provides widespread variations in luminance, hue and saturation. In addition, the image is rich in slowly varying colour textures mixed with sharp colour boundaries.

The computer-generated simulation of spheres image exhibits shadings for a 3-dimensional effect. It shows various-sized differently-coloured spheres on a black background. It provides a wide range of colour shadings with distinct edges. In general, each sphere is one colour, shaded to give a 3-dimensional appearance. The gradual transition in colour of each sphere's shading provides an excellent medium for discerning possible contouring effects. If contouring is present, it will usually manifest itself as a series of concentric circles with slightly different colours. The spheres' edges also provide sharp boundaries against both the background and other spheres.

The graphics image is from a magazine cover and exhibits a 3-dimensional effect. It uses pastel colours to denote surfaces and fine black lines to enhance details. It contains a number of repetitive patterns coupled with sharp boundaries between various colours.

Table 6 – Colour images

| Figure number	Image	Colour space (8 bits/comp.)	Dimensions				Resolution (pixels/inch) (24 bits/pixel)	Size (MBytes)
			Pixels		Inches			
			Width	Height	Width	Height		
Figure 21	Scanned colour chart	CIELAB	1688	2347	8.44	11.74	200	11.89
Figure 21	Scanned colour chart	CIELAB	3399	4752	8.50	11.88	400	48.46
Figure 21	Computer-generated colour chart	CIELAB	1752	2375	8.76	11.88	200	12.49
Figure 21	Computer-generated colour chart	CIELAB	3504	4750	8.76	11.88	400	49.94
Figure 21	Kids with toys	CIELAB	3242	3656	8.11	9.14	400	35.56
Figure 21	Computer-generated spheres	CIELAB	1024	512	2.56	1.28	400	1.58
Figure 21	Graphics art	CIELAB	2644	3046	6.61	7.62	400	24.17
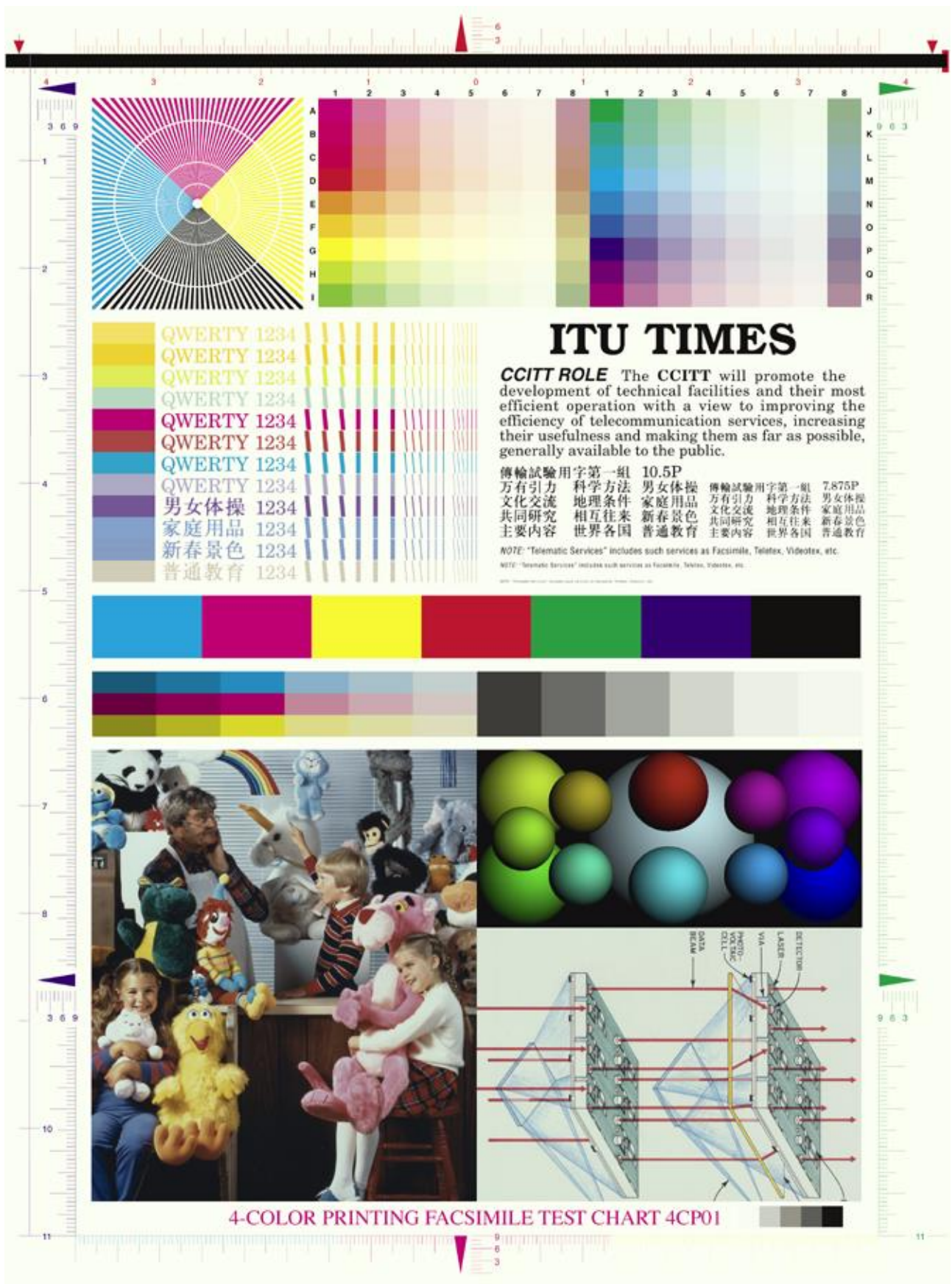
Figure 21 – Colour test chart 4CP01

6.8 CCIR images

This set includes two images that were used in the original JPEG experiments prior to its adoption as an international standard (see Figures 22 and 23 and Table 7). They are in the YUV colour space.

Table 7 – CCIR Images

Filename	Source	Image description	Colour space	Bits per component	Image dimensions Pixels (W × H)	File size (Bytes)
HOTEL	CCIR 601	Hotel	YUV	8	720 × 576	830 932
GOLD	CCIR 601	Gold	YUV	8	720 × 576	830 932

Figure 22 – CCIR 601 YUV colour image: Hotel[*]

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[*] Due to technical reasons, Figures 22 and 23 could not be reproduced with their exact colours.

Figure 23 – CCIR 601 YUV colour image: Gold*

6.9 Colour images (CMYK colour space)

This set is made up of four colour images in the CMYK colour space, adapted from [b-ISO 12640-1] (see Figures 24, 25, 26 and 27 and Table 8).

Table 8 – CMYK images

Filename	Source	Image description	Colour space	Bits per component	Image dimensions Pixels (W × H)	File size (Bytes)
BIKE	[b-ISO 12640-1]	N5 "Bike"	CMYK	8	2048 × 2560	20 972 544
WOMAN	[b-ISO 12640-1]	N1 "Portrait"	CMYK	8	2048 × 2560	20 972 544
CAFE	[b-ISO 12640-1]	N2 "Cafe"	CMYK	8	2048 × 2560	20 972 544
TOOLS	Crossfield drum scan	Tools	CMYK	8	1524 × 1200	7 315 854

Figure 24 – CMYK image: Bike

Figure 25 – CMYK image: Portrait

Figure 26 – CMYK image: Café

Figure 27 – CMYK image: Tools

6.10 Colour images (RGB colour space)

This set includes three images created with a digital camera and two compound images, all in the RGB colour space (see Figures 28, 29, 30, 31 and 32 and Table 9). The compound images consist of text with an embedded photograph.

Table 9 – RGB images

Filename	Source	Image description	Colour space	Bits per component	Image dimensions pixels (W × H)	File size (Bytes)
BIKE3	Crossfield digital camera	Motorcycle	RGB	8	781 × 919	2 153 821
WATER	PhotoCD	Water	RGB	8	2048 × 3072	18 899 574
CATS	PhotoCD	Cats	RGB	8	2048 × 3072	18 899 568
CMPND1	Computer generated	Text on photo	RGB	8	512 × 768	1 179 892
CMPND2	Computer generated	Text and photo	RGB	8	1024 × 1400	4 301 404

Figure 28 – RGB image: Motorcycle

Figure 29 – RGB image: Water

Figure 30 – RGB image: Cats

Figure 31 – RGB image: Text on photo

Figure 32 – RGB image: Text and photo

6.11 Fingerprint and medical images (Grayscale)

This set includes a scanned fingerprint at eight bits per component and five medical images at various pixel depths from eight to twelve bits per components (see Figures 33, 34, 35, 36, 37 and 38 and Table 10).

Table 10 – Grayscale medical images

Filename	Source	Image description	Colour space	Bits per component	Image dimensions pixels (W × H)	File size (Bytes)
FINGER	Fingerprint	11010092	mono	8	512 × 512	262 482
X-Ray	Medical X-ray	X-ray – "XR1.1"	mono	12	2048 × 1680	6 881 312
CR	Computer radiology	CR "CR-ABDM"	mono	10	1744 × 2048	4 465 286
CT	Computer tomography	CT "CT.1"	mono	12	512 × 512	524 320
US	Ultrasound	Ultrasound "US1.DCM"	mono	8	512 × 488	229 808
MRI	Magnetic resonance	MRI "MRI.1"	mono	11	256 × 256	92 160

Figure 33 – Fingerprint

Figure 34 – Medical X-ray

[The printed representation of this image is not available.]
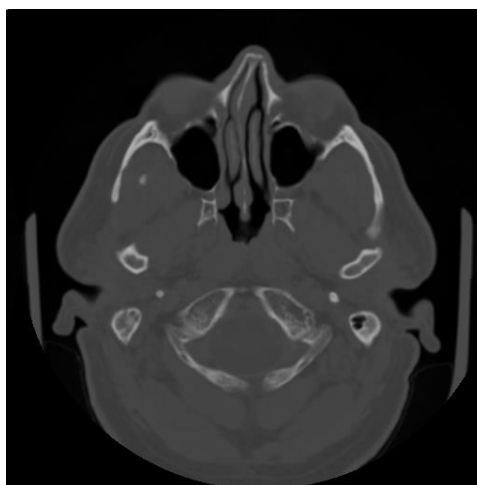
Figure 35 – Computer radiology

Figure 36 – Computer tomography

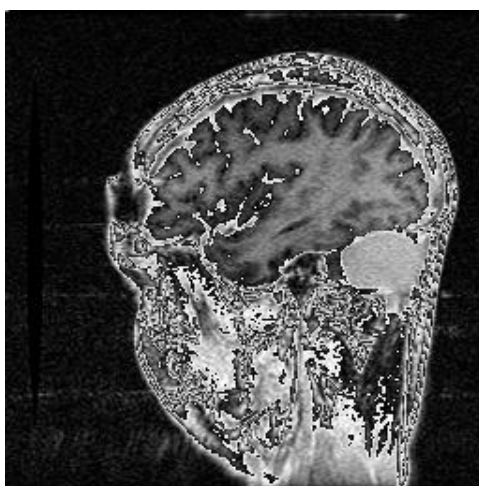**Figure 37 – Ultrasound**

Figure 38 – Magnetic resonance

6.12 Line drawing images

This set includes a computer generated line drawing in colour (CIELAB colour space) and a scan of a fine arts engraving (grayscale). See Figures 39 and 40 and Table 11.

Table 11 – Line drawing images

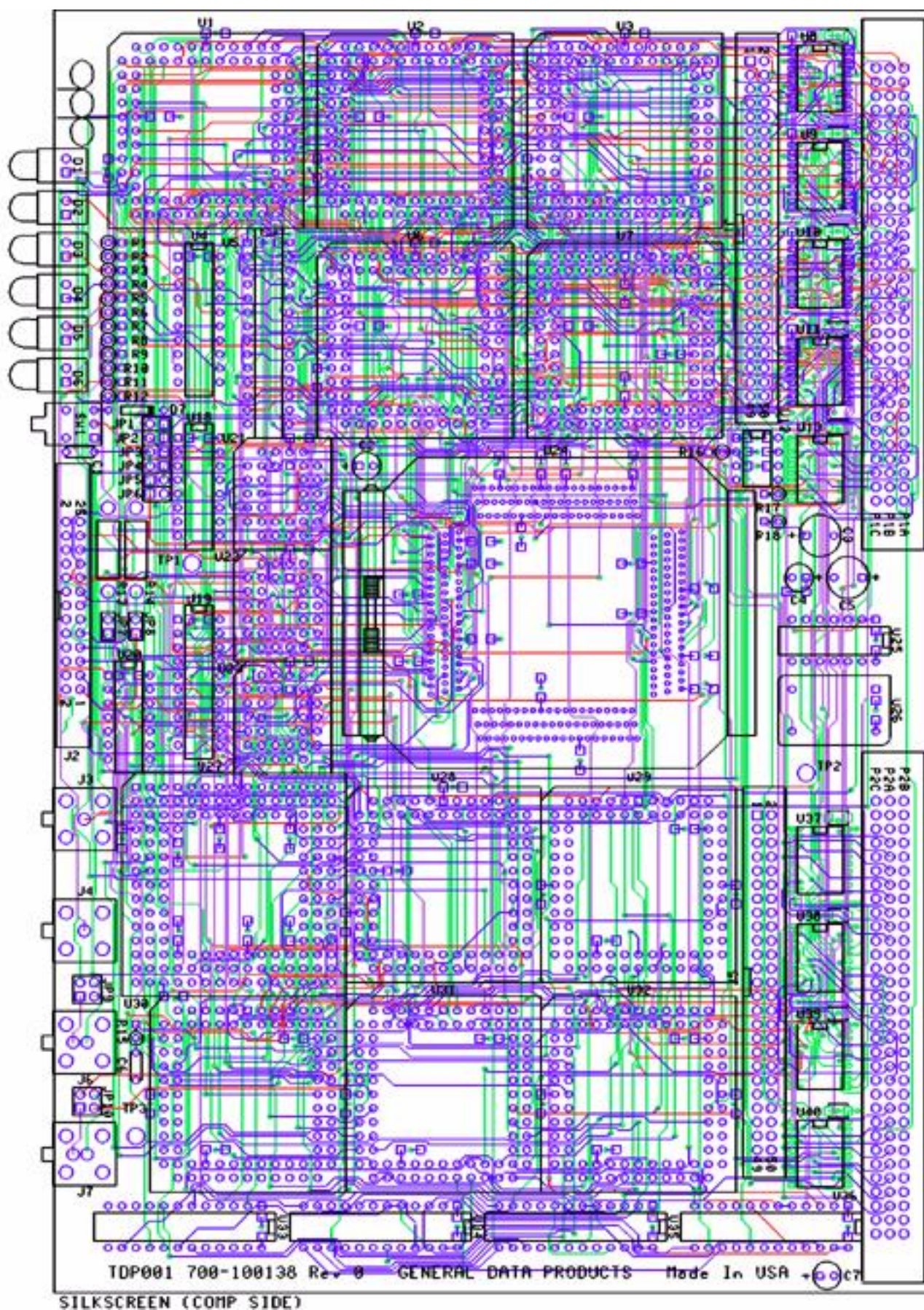| Filename	Source	Image description	Colour space	Bits per component	Image dimensions pixels (W × H)	File size (Bytes)
PC	Computer generated	Printed circuit board layout	CIELAB	8	1575 × 2185	10 324 620
EDUC	Scan	Fine arts 1, engraving	mono	8	2850 × 4096	11 676 100

Figure 39 – Printed circuit board layout

Figure 40 – Engraving

6.13   Fine arts images

These images are two scans of the same fine arts painting at eight bits per component and twelve bits per component (see Figure 41 and Table 12).

Table 12 – Scanned fine arts images

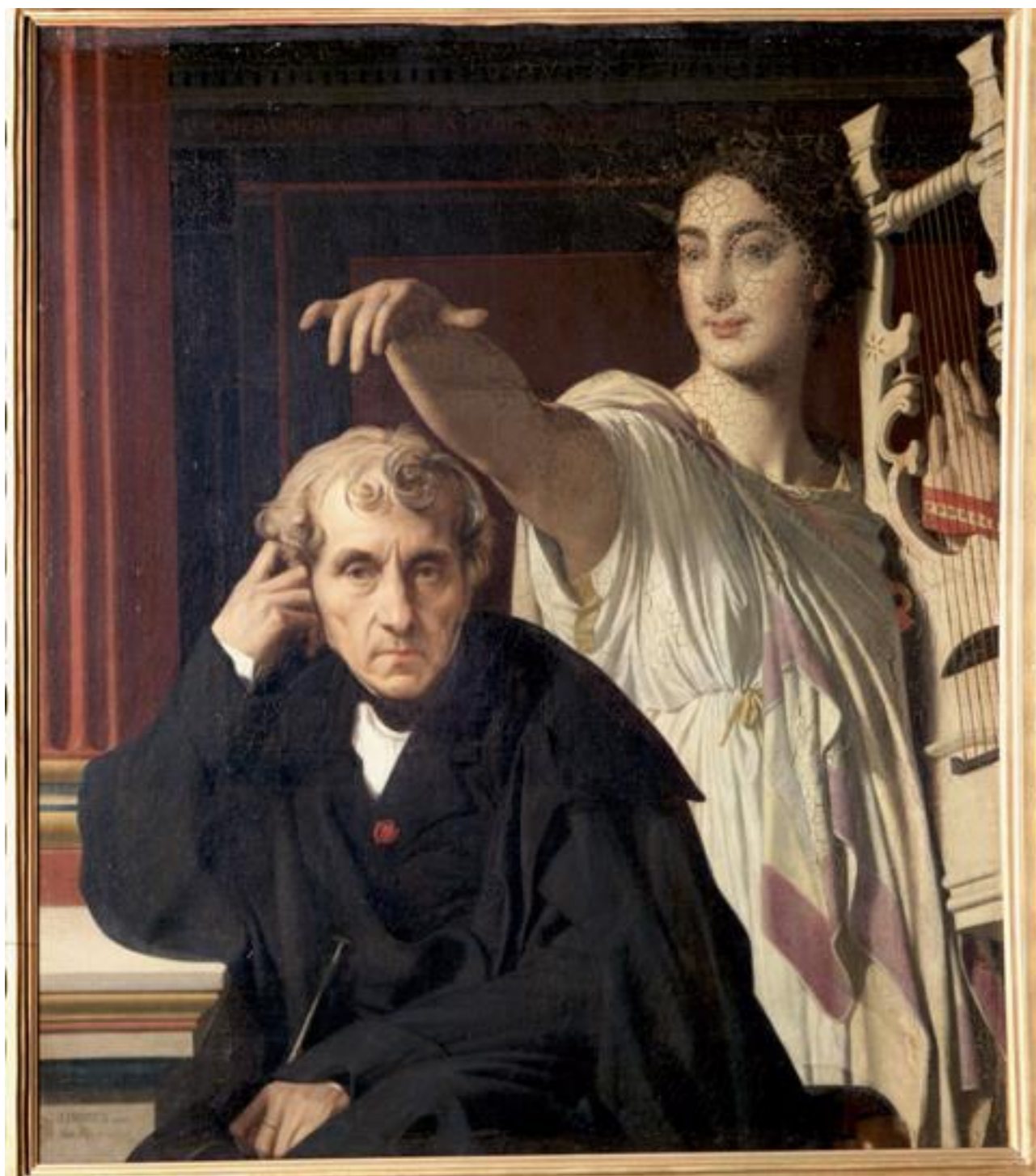| Filename	Source	Image description	Colour space	Bits per component	Image dimensions pixels (W × H)	File size (Bytes)
INGRES8	Scan	Fine arts 2, painting	RGB	8	4088 × 4608	56 512 700
INGRES16	Scan	Fine arts 3, painting	RGB	12	4088 × 4608	113 025 212

Figure 41 – Painting (Ingres 8 and Ingres 16)

6.14 Low-contrast grayscale images

This set consists of generally low-contrast, eight bits per component grayscale images (see Figures 42, 43, 44, 45, 46, 47, 48 and 49 and Table 13). Included are four aerial photographs, a scenic view, and two low-contrast charts.

Table 13 – Low-contrast grayscale images

Filename	Source	Image description	Colour space	Bits per component	Image dimensions pixels (W × H)	File size (Bytes)
AERIAL1	Remote sensing	Aerial view 1	Luminance	8	14 565 × 14 680	213 843 694
AERIAL2	Remote sensing	Aerial view 2	Luminance	8	2 048 × 2 048	4 194 774
CMPND3	Compound	Graphics	Luminance	8	5 120 × 6 624	33 915 328
MAT	Digital camera	Mountains	Luminance	8	1 528 × 1 146	175 153
SEISMIC	Remote sensing	Texture	Luminance	8	512 × 512	262 592
TARGET	Graphics	Patterns	Luminance	8	512 × 512	262 592
TXTUR1	MPEG-4 test image 1	Aerial view	Luminance	8	1 024 × 1 024	1 048 854
TXTUR2	MPEG-4 test image 2	Aerial view	Luminance	8	1 024 × 1 024	1 055 036

Figure 42 – Aerial view 1 Remote sensing

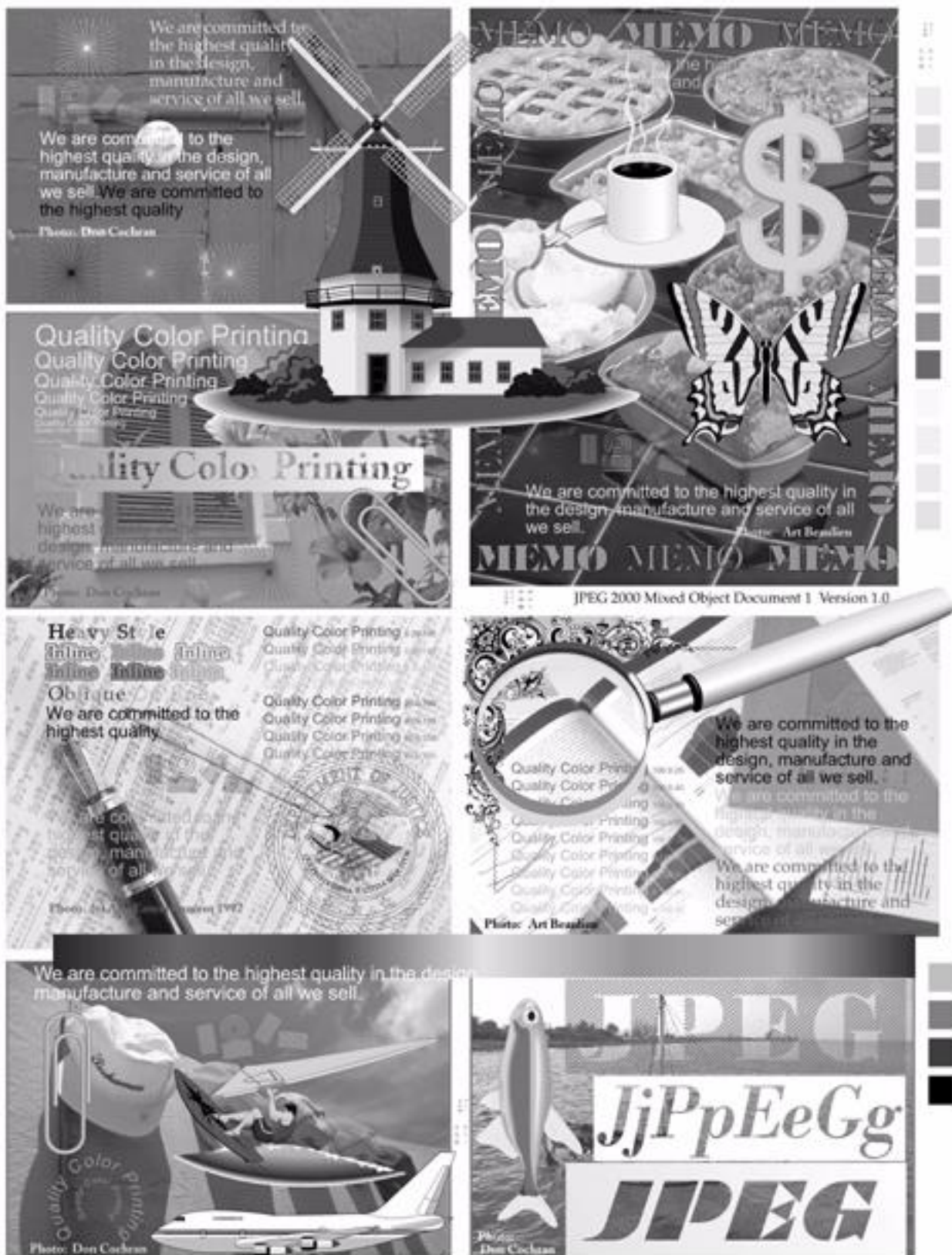**Figure 43 – Aerial view 2 Remote sensing**

Figure 44 – Compound graphics
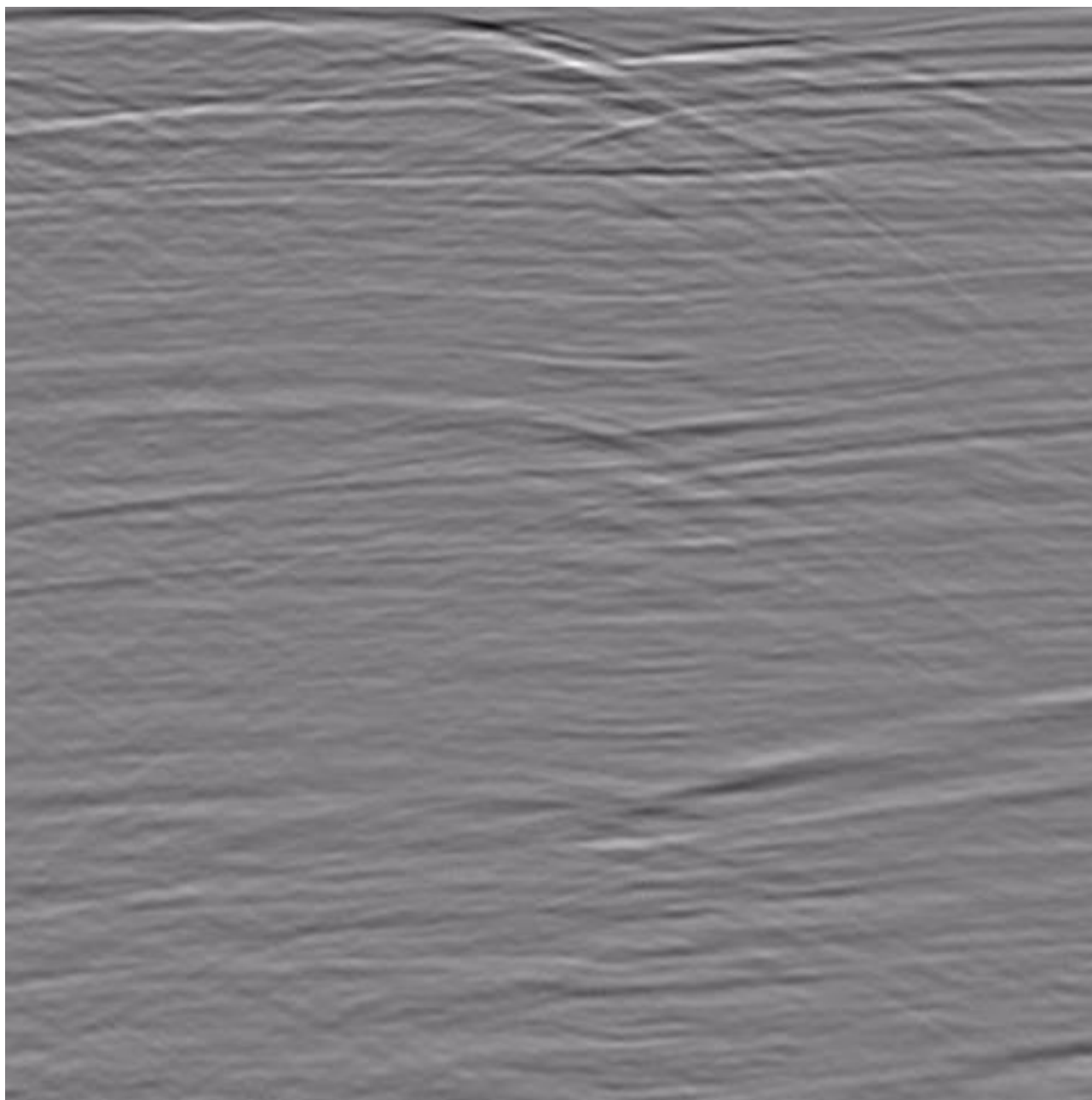
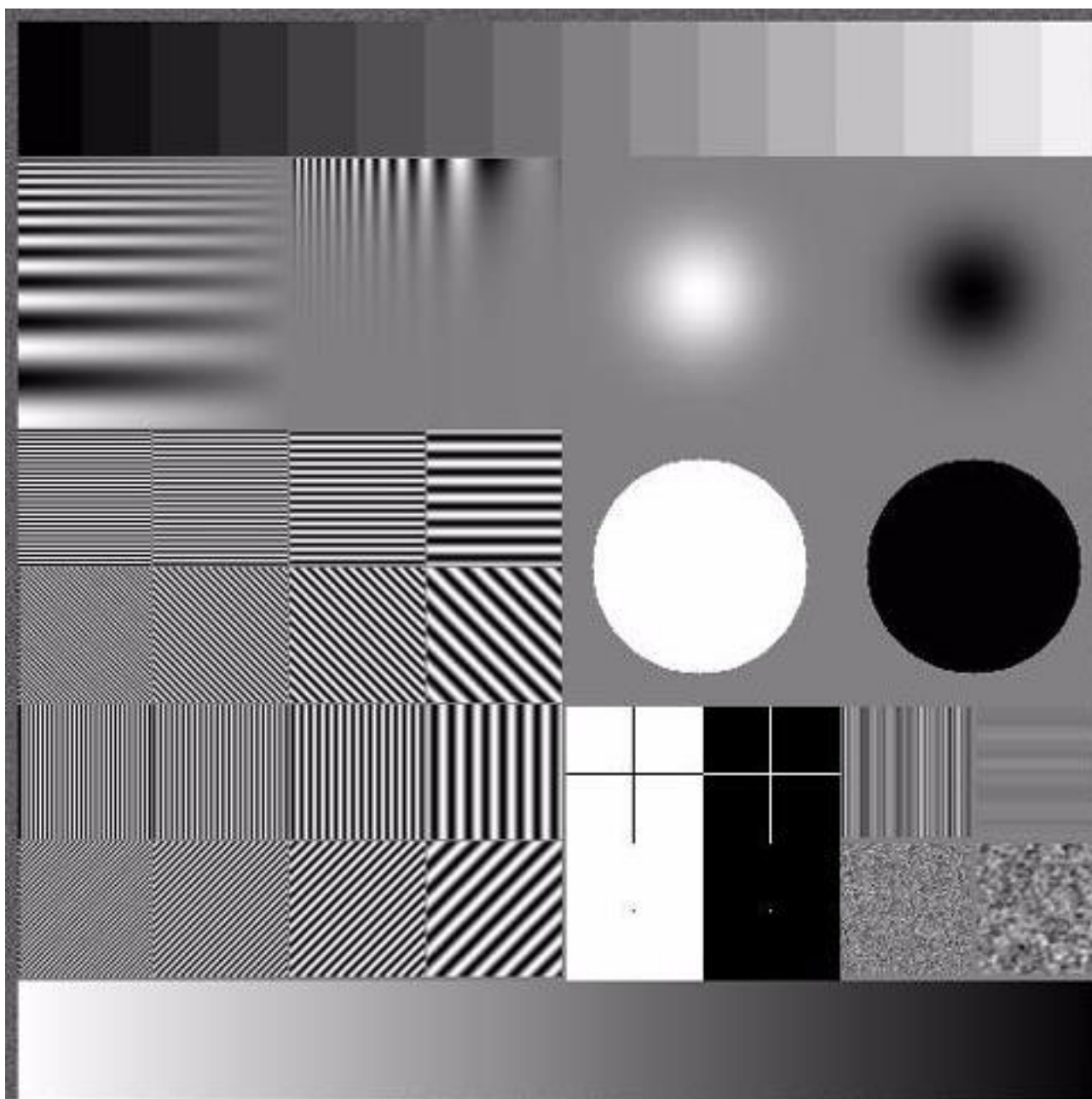**Figure 45 – Digital camera**

Figure 46 – Texture remote sensing

Figure 47 – Pattern graphics

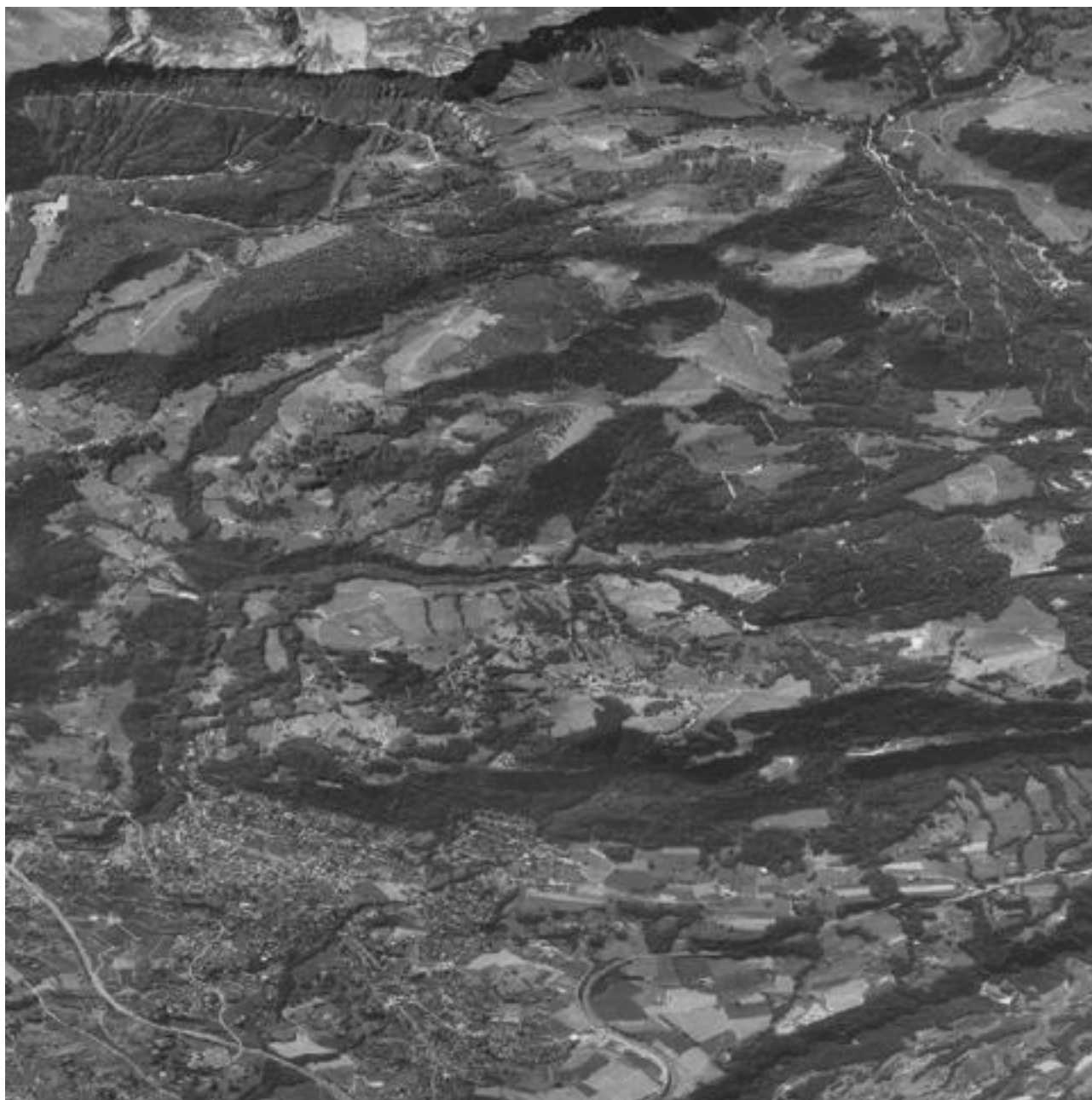**Figure 48 – MPEG-4 test image 1**

Figure 49 – MPEG-4 test image 2

Appendix I

Black/white pixel counts

(This appendix does not form an integral part of this Recommendation.)

The black/white pixel counts for all of the bi-level images in this Recommendation are summarized in Table I.1. For each bi-level image and its corresponding resolution(s), information is included on the image dimensions (in pixel units), the size of the raw image data (in bytes), the black and white pixel counts and the percentage of the image which is coloured black and white

Table I.1 – Black/white pixel counts

File name	Image name	Res. (pix./in)	Size Width	Size Height	Size (bytes)	Pixel counts Black	Pixel counts White	Percent Black	Percent White
F01_200	Document No. 1	200	1728	2339	505224	104990	3936802	2.60%	97.40%
F01_300	(English letter)	300	2592	3508	1136592	236943	8855793	2.61%	97.39%
F01_400		400	3456	4677	2020464	426637	15737075	2.64%	97.36%
F01_600		600	5184	7016	4546368	980552	35390392	2.70%	97.30%
F02_200	Document No. 2	200	1728	2339	505224	158713	3883079	3.93%	96.07%
F02_300	(Circuit drawing)	300	2592	3508	1136592	350335	8742401	3.85%	96.15%
F02_400		400	3456	4677	2020464	643328	15520384	3.98%	96.02%
F02_600		600	5184	7016	4546368	1446165	34924779	3.98%	96.02%
F03_200	Document No. 3	200	1728	2339	505224	222697	3819095	5.51%	94.49%
F03_300	(French invoice)	300	2592	3508	1136592	498319	8594417	5.48%	94.52%
F03_400		400	3456	4677	2020464	905106	15258606	5.60%	94.40%
F03_600		600	5184	7016	4546368	2004822	34366122	5.51%	94.49%
F04_200	Document No. 4	200	1728	2339	505224	371671	3670121	9.20%	90.80%
F04_300	(French text)	300	2592	3508	1136592	837842	8254894	9.21%	90.79%
F04_400		400	3456	4677	2020464	1539573	14624139	9.52%	90.48%
F04_600		600	5184	7016	4546368	3587602	32783342	9.86%	90.14%
F05_200	Document No. 5	200	1728	2339	505224	222306	3819486	5.50%	94.50%
F05_300	(French text figures)	300	2592	3508	1136592	490419	8602317	5.39%	94.61%
F05_400		400	3456	4677	2020464	892675	15271037	5.52%	94.48%
F05_600		600	5184	7016	4546368	1987057	34383887	5.46%	94.54%
F06_200	Document No. 6	200	1728	2339	505224	154711	3887081	3.83%	96.17%
F06_300	(French chart)	300	2592	3508	1136592	341837	8750899	3.76%	96.24%
F06_400		400	3456	4677	2020464	622225	15541487	3.85%	96.15%
F06_600		600	5184	7016	4546368	1387214	34983730	3.81%	96.19%
F07_200	Document No. 7	200	1728	2339	505224	310743	3731049	7.69%	92.31%
F07_300	(Kanji)	300	2592	3508	1136592	690828	8401908	7.60%	92.40%
F07_400		400	3456	4677	2020464	1239891	14923821	7.67%	92.33%
F07_600		600	5184	3035	1966680	1184951	14548489	7.53%	92.47%
F08_200	Document No. 8	200	1728	2339	505224	1603283	2438509	39.67%	60.33%

Table I.1 – Black/white pixel counts

File name	Image name	Res. (pix./in)	Size			Pixel counts		Percent	
			Width	Height	(bytes)	Black	White	Black	White
F08_300	(Memorandum)	300	2592	3508	1136592	3613143	5479593	39.74%	60.26%
F08_400		400	3456	4677	2020464	6337111	9826601	39.21%	60.79%
F08_600		600	5184	7016	4546368	14259312	22111632	39.21%	60.79%
F09_400	T.22 test chart 4	400	3504	4750	2080500	2852132	13791868	17.14%	82.86%
F10_200	Half-tone chart	200	1728	2336	504576	997022	3039586	24.70%	75.30%
F10_240		240	2048	2800	716800	1292813	4441587	22.54%	77.46%
F10_300		300	2560	3500	1120000	2052939	6907061	22.91%	77.09%
F11_400	Sailboat No. 1	400	3072	2048	786432	2500099	3791357	39.74%	60.26%
F12_400	Sailboat No. 2	400	3072	2048	786432	2551623	3739833	40.56%	59.44%
F13_400	Sailboat No. 3	400	3072	2048	786432	2558326	3733130	40.66%	59.34%
F14_400	Sailboat No. 4	400	3072	2048	786432	2515962	3775494	39.99%	60.01%
F15_200	House with trees	200	1904	1488	354144	1672859	1160293	59.05%	40.95%
F16_800	Magazine text	800	3456	4416	1907712	12337334	2924362	80.84%	19.16%
F17_400	Magazine page	400	3072	4352	1671168	8617274	4752070	64.46%	35.54%

Appendix II

Sun Raster image format

(This appendix does not form an integral part of this Recommendation.)

The Sun Raster image file format is the native bitmap format of the Sun Microsystems UNIX platforms that use the SunOs operation system. This format can store black/white, grayscale and colour bitmapped images of any pixel depth. Optionally the use of colour maps and simple run-length compression are also supported. Most UNIX imaging applications support this format.

The Sun Raster file is organized as a header, followed by an optional colour map and then by the bitmapped image data. The header is 32 bytes long and has the following format:

```
typedef struct SunRaster
{
    DWORD MagicNumber           /*Magic number */
    DWORD Width;                /*Width of the image in pixels*/
        DWORD Height;               /*Height of the image in pixels*/
        DWORD Depth;                /*Number of bits per pixel*/
        DWORD Length;               /* Size of image in bytes */
        DWORD Type                  /* Type of raster file */
        DWORD ColorMapType;         /*Type of color map*/
        DWORD ColorMapLength     /*Size of the color map in bytes*/
};
```

Magic number identifies the file as a Sun Raster image and always contains the value 59A66A95h (hexadecimal). Besides identifying the format, the magic number provides a check that the bytes in the file are being read in the proper order.

Width and height specify the size of the image in pixels. The width of a scan line is always a multiple of 16 bits, padded when necessary.

Depth is the number of bits per pixel of the image data.

Length is the size of the bitmapped image data in the bitmap file in bytes, (not including the colour map and header).

Type is the version of the bitmapped file.

ColorMapType indicates the type of colour map included in the file if any and ColorMapLength contains the number of bytes stored in the colour map

For further information contact:

Sun Microsystems Inc.
2550 Garcia Avenue
Mountain View, CA 94043

There are also a number of publicly available UNIX-based image file viewers that support the Sun Raster format.

Bibliography

[b-ITU-R BT.601]   ITU-R BT.601 (2011), *Studio encoding parameters of digital television for standard 4:3 and wide screen 19:9 aspect ratios*.

[b-ISO 12640-1]   ISO 12640-1 (1997), *Graphic technology – Prepress digital data exchange – Part 1: CMYK standard colour image data (CMYK/SCID)*.

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