100/178/NP

NEW WORK ITEM PROPOSAL

Proposer	Date of proposal
Japan	August 2000
TC/SC	Secretariat
TC 100	Netherlands
Date of circulation	Closing date for voting
2000-09-01	2000-11-30

A proposal for a new work item within the scope of an existing technical committee or subcommittee shall be submitted to the Central Office. The proposal will be circulated to the P-members of the technical committee or subcommittee for voting, and to the O-members for information. The proposer may be a National Committee of the IEC, the secretariat itself, another technical committee or subcommittee, an organization in liaison, the Committee of Action or one of the advisory committees, or the General Secretary. Guidelines for proposing and justifying a new work item are given in ISO/IEC Directives, Part 1, Annex C (see extract overleaf). **This form is not to be used for amendments or revisions to existing publications.**

The proposal (to be completed by the proposer)

Title of proposal

Multimedia systems and equipment – Quality assessment – Audio-video conferencing systems

☐ Standard	☒ Technical Report

Scope (as defined in ISO/IEC Directives, Part 3, 6.2.1)

This standard defines objective methods of measurement and reporting forms of end-to-end quality for network-based audio-video conferencing systems.

Purpose and justification, including the market relevance and relationship to Safety (Guide 104), EMC (Guide 107), Environmental aspects (Guide 109) and Quality assurance (Guide 102) . (attach a separate page as annex, if necessary)

Evolution of Information Technologies together with global computer communication network, varieties of implementation of technologies on encoding, decoding and scalability for network-based audio-video conferencing systems are in the market. In order to compare quality of such system at the global market places, an International Standard should be established as early as possible.

Target date	for first CD 2001-10	for IS 2002-12
Estimated number of meetings 4	Frequency of meetings 2 per year	Date and place of first meeting: virtual a.s.a.p
Proposed working methods	☒ E-mail	☒ ftp

Relevant documents to be considered

100/AGM(PT 61966)67

Relationship of project to activities of other international bodies

Liaison organizations	**Need for coordination within ISO or IEC**
ITU-T/SG 12, ITU-R/JWP 10-11Q	

Preparatory work

Check one of the two following boxes

☒ A draft is attached for vote and comment ☐ An outline is attached

We nominate a project leader as follows in accordance with ISO/IEC Directives, Part 1, 2.3.4 (name, address, fax and e-mail):

Dr. Hiroaki Ikeda, Chiba University, +81-43-290-3352, ikeda@tu.chiba-u.ac.jp;
Dr. Yushi Komachi, Panasonic/MGCS, +81-3-5445-3663, komachi@y-adagio.com

Concerns known patented items (see ISO/IEC Directives, Part 2)	**Name and/or signature of the proposer**
☐ yes ☒ no	Mikio Takagi
If yes, provide full information as an annex	

Comments and recommendations from the TC/SC officers

Comments with respect to the proposal in general, and recommendations thereon
1) Work allocation ☒ Project team ☐ New working group ☐ Existing working group no:
2) Draft suitable for direct submission as ☐ CD ☐ CDV
3) General quality of the draft (conformance with ISO/IEC Directives, Part 3) ☐ Little redrafting needed ☒ Substantial redrafting needed ☐ no draft (outline only)
4) Relationship with other activities In IEC IEC 61966 - "Multimedia systems and equipment - Colour measurement and managment In other organizations
Other remarks
Remarks from the TC/SC officers The TC 100 secretariat proposes to allocate this important work to a new project team, for the time being, directly under TC 100. In due time the TC 100 secretariat expects additional potential items for standardization in this technical area ("Multimedia systems and equipment - End-to-End characteristics of audio and video"), which could justify the establishment of a new TA within TC 100. The allocation of this project and future projects in the same area will be discussed during the next TC 100/AGM meeting in Athens (19 October 2000).
Remarks from the Sector Board

Elements to be clarified when proposing a new work item

Title

Indicate the subject matter of the proposed new standard.

Indicate whether it is intended to prepare a standard, a technical report or an amendment to an existing standard.

Scope

Give a clear indication of the coverage of the proposed new work item and, if necessary for clarity, exclusions.

Indicate whether the subject proposed relates to one or more of the fields of safety, EMC, the environment or quality assurance.

Purpose and justification

Give details based on a critical study of the following elements wherever practicable.

a) The specific aims and reason for the standardization activity, with particular emphasis on the aspects of standardization to be covered, the problems it is expected to solve or the difficulties it is intended to overcome.

b) The main interests that might benefit from or be affected by the activity, such as industry, consumers, trade, governments, distributors.

c) Feasibility of the activity: Are there factors that could hinder the successful establishment or general application of the standard?

d) Timeliness of the standard to be produced: Is the technology reasonably stabilized? If not, how much time is likely to be available before advances in technology may render the proposed standard outdated? Is the proposed standard required as a basis for the future development of the technology in question?

e) Urgency of the activity, considering the needs of the market (industry, consumers, trade, governments etc.) as well as other fields or organizations. Indicate target date and, when a series of standards is proposed, suggest priorities.

f) The benefits to be gained by the implementation of the proposed standard; alternatively, the loss or disadvantage(s) if no standard is established within a reasonable time. Data such as product volume of value of trade should be included and quantified.

g) If the standardization activity is, or is likely to be, the subject of regulations or to require the harmonization of existing regulations, this should be indicated.

If a series of new work items is proposed, the purpose and justification of which is common, a common proposal may be drafted including all elements to be clarified and enumerating the titles and scopes of each individual item.

Relevant documents

List any known relevant documents (such as standards and regulations), regardless of their source. When the proposer considers that an existing well-established document may be acceptable as a standard (with or without amendments), indicate this with appropriate justification and attach a copy to the proposal.

Cooperation and liaison

List relevant organizations or bodies with which cooperation and liaison should exist.

Preparatory work

Indicate the name of the project leader nominated by the proposer.

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

MULTIMEDIA SYSTEMS AND EQUIPMENT – QUALITY ASSESSMENT –

AUDIO-VIDEO CONFERENCING SYSTEMS

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
6) Attention is drawn to the possibility that some of the elements of this international standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 6XXX has been prepared by IEC technical committee 100: Audio, Video and Multimedia Systems and Equipment.

The text of this standard is based on the following documents:

FDIS	Report on voting
100/XX/FDIS	100/XX/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

Introduction

This proposal was performed as a stage 0 by a small group of experts from the former project team 61966 on colour measurement and management in multimedia systems and equipment as an expansion of the scope for PWI 61966-11: Quality assessment – Impaired video in network systems. The reasons of this expansion has been briefly described in 100/AGM(London/PT 61966)13 of 24 March 1998. It was further worked and presented as 100/AGM(PT 61966)67.

A study group on audio-video quality has been installed in the Institute of Image Electronics Engineers of Japan. The study group recognized market needs to work and to standardize “IEC 6xxxx: Multimedia systems and equipment – Quality Assessment – Audio-Video Teleconferencing Systems” as part of quality aspects of multimedia systems and equipment.

MULTIMEDIA SYSTEMS AND EQUIPMENT – QUALITY ASSESSMENT –

AUDIO-VIDEO CONFERENCING SYSTEMS

1 Scope

This International Standard specifies items to be measured by objective methods, methods of measurement together with measuring conditions, processing of the measured data and forms to report acquired information for assessment of end-to-end quality of audio-video tele-conferencing systems over worldwide digital networks, where pear-to-pear bandwidth is time variant and is not garranteed when it established.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

3 Terms and definitions

3.1
teleconferencing system
network based digital system in which multiple media are in use for information exchange among participants in a virtual conference

3.2
vertual conference
meeting of a group of people who do not assemble to the same geographical place, but they exchange their views and opinions in use of multimedia logically connected each other.

3.3
latency
time required to send and receive a signal.

3.4
lineality
the number of video frames skipped at receiving end

3.5
PSNR
peak signal to noise ratio

4 Items to be measured

4.1 Video quality

4.1.1 Frame rate and linearity

The original analogue video is encoded at 30 frame/s and transmitted to a client by either live or on-demand over the local area network. The frame rate of received digital videos are measured.

Table – Streamed and received frame rates

Product	Small size (160×120)	Large size (320×240)
N	4,95 fps	4,97 fps
R	14,71 fps	12,51 fps
V	28,01 fps	28,55 fps

NOTE – The product N performed in real time encoding and streaming, the other products steamed encoded and archived digital videos.

The linearity is also measured. For all products, fairly good linearity are noted.

4.1.2 Latency

The delay time in second from analogue video input to encoder and received digital video.

4.1.3 PSNR

4.1.3.1 Method of measurement

The peak signal-to-noise ratio between a full reference image and a reproduced image define by the following equation shall be calculated.

$$PSNR = 10 \log_{10}\left(\frac{255^2}{MSE}\right)$$

$$MSE = \frac{1}{(P2-P1+1)(M2-M1+1)(N2-N1+1)} \sum_{p=P1}^{P2} \sum_{m=M1}^{M2} \sum_{n=N1}^{N2} (d(p,m,n) - o(p,m,n))^2$$

where *d(p,m,n)* and *o(p,m,n)* represent respectively degraded and original pixel value at frame p, row m and column n.

NOTE PSNR requires a very high degree of normalisation to be used with confidence. The normalisation requires both spatial and temporal alignment as well as corrections for gain and offset. The normalisation method is described in annex B.

4.1.3.2 Report of the measured result

4.1.4 Colour reproduction

4.1.4.1 Method of measurement

Under consideration. See also worked example in annex A.

4.1.4.2 Report of the measured results

The measured results shall be reported together with the conditions use in the measurements.

NOTE Table shows examples of colour shift in $\Delta u'v$ from the original NTSC colour bars directly displayed on the same equipment using cathode ray tubes.

Table – Average colour shifts of saturated colours

Condition	Small size (160×120)	Large size (320×240)
N	0,025	0,012
R	0,042	0,015
V	0,029	0,009

4.1.5 Impairment/Blockiness

4.2 Audio quality

4.2.1 Echo cancellation

4.2.2 Distortion

4.2.3 Background noise

4.2.4 Frequency response

4.2.5 Dynamic range

4.3 Overall quality

4.3.1 Synchronisation of audio and video (lip sync)

Received and recorded videos are analized to acquire delay between synchronised audio and video.

Table – Synchronisation

Product	Small size (160×120)	Large size (320×240)
N	0,699 (s)	0,818 (s)
R	0,494 (s)	0,469 (s)
V	0,448 (s)	0,446 (s)

4.3.2 Scalability

Autonomous function to tune frame rate dynamically depending on time variant available bandwidth between the server and the client logical link.

Annex A
(Informative)

Video quality assessment (trial)

A.1 Introduction

This annex is prepared just for information to report some of the preliminary results of measurement made in The Laboratory of Multimedia Systems, Faculty of Engineering, Chiba University, Japan. Three different target products for application to desk-top personal computers are tested. They are getting popular and are publicly available for evaluation.

A.2 Configuration for measurement

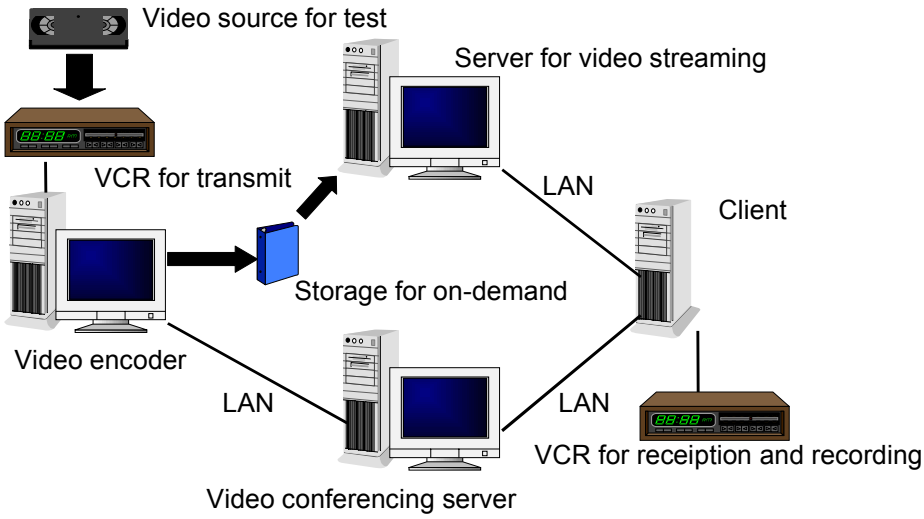

Figure A.1 – General configuration for measuement

Annex B
(normative)

Normalization for calculation of PSNR

B.1

B.2

Bibliography

ITU-T/SG 9: Temporary document 50Rev 1, “PROPOSED DRAFT NEW RECOMMENDATION J.FULLREF” on Question 22/9, Geneva, 15 – 19 May 2000

Measuring quality in videoconferencing systems, Part number PC316, Intel Corporation (November 1997)

Criteria for product evaluation, NASA Desktop video expert center, National Aeronautics and Space Administration, Ames Research Center, Moffett Field, California (August 1997)

Quality aspects of computer-based video services, Norbert Gerfelder (Fraunhofer Institute for Computer Graphics, Darmstadt, Germany and Wolfgang Muller (Darmstadt Technical University), (Oct. 1995)