

ITU-T and Related U.S. Standards Development

Outputs

- Leadership of ITU-T and related U.S. telecommunications standards committees.
- Technical contributions presenting U.S. standards proposals and ITS research results.
- Proposed ITU Recommendations and associated U.S. industry standards.

The Institute has a long and distinguished history of leadership, technical contributions, and advocacy of U.S. Government and industry proposals in international and related national telecommunication standards committees. These activities are focused in the International Telecommunication Union (ITU) — the United Nations-affiliated standards organization responsible for the cooperative planning and interoperation of public telecommunication systems and services worldwide. The ITU's Telecommunication Standardization Sector (ITU-T) develops international standards (Recommendations) addressing technical, operating, and tariff questions relating to all aspects of wireline telecommunications. ITU-T Recommendations have a strong impact on both the evolution of U.S. telecommunications infrastructures and the competitiveness of U.S. telecommunications products in international trade.

ITS has played a strong role in ITU-T standardization work for many years. The Institute's goal there — and in related national standards work — has been to motivate the development and standardization of user-oriented, technology-independent measures of telecommunication service quality. Such measures promote competition and technology innovation among equipment and service providers, facilitate interworking among independently operated networks and dissimilar technologies in the provision of end-to-end services, and give users a quantitative, practical means of defining their telecommunication requirements and selecting products that effectively meet them.

In FY 2003, the Institute provided leadership in two key ITU-T groups: Study Group 13 Working Party 4

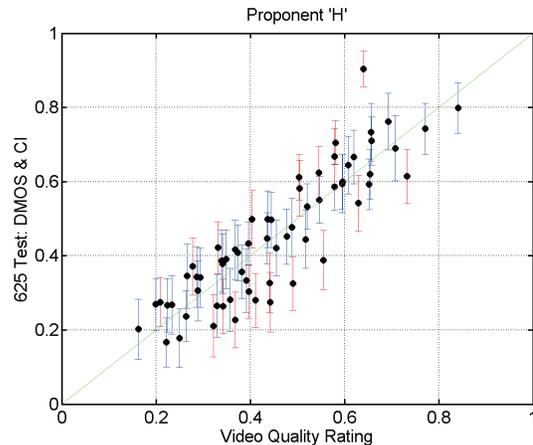
(Network Performance and Resource Management) and Study Group 9's Working Group on Quality Assessment. SG 13/WP 4 develops performance Recommendations for high-speed synchronous digital hierarchy (SDH), asynchronous transfer mode (ATM), dense wave division multiplexing (DWDM), and Internet Protocol (IP) based network technologies. SG 9's Working Group on Quality Assessment defines quality objectives for integrated broadband cable networks and television and sound transmission. ITS also provided leadership and technical contributions to the ITU affiliated Video Quality Experts Group (VQEG) and the American National Standards Institute (ANSI) accredited T1 (Telecommunications) Committee's Technical Subcommittee T1A1 (Performance, Reliability, and Signal Processing). VQEG works in conjunction with ITU-T SG 9 and ITU-R WP6Q (Broadcasting Services — Performance Assessment and Quality Control) to develop objective, computer implementable, perception-based video quality metrics (VQMs) that emulate the human visual system. T1A1 contributes strongly to ITU-T in all of these technology areas.

During FY 2003, the Institute's SG 13 leadership participated in managing over a dozen standards development projects, contributing to new or revised draft Recommendations in technology areas including IP network Quality of Service (QoS), optical network performance, multi-protocol label switching (MPLS) performance, and IP and ATM network resource management. ITS led SG 13/WP 4 participation in special activities including the conduct of a SG 13 "Futures Session" to plan advanced network standardization, formation of an ITU-T Joint Rapporteur Group on Next Generation Networks (JRG-NGN), and publication of an *IEEE Communications Magazine* Feature Topic on IP Network QoS. The lead article in this issue is referenced below. ITS spearheaded industry standards planning on several issues of interest to U.S. industry and government, e.g., QoS signaling for IP-based networks. The ability to control QoS in multi-service, multi-provider IP networks is expected to be important to user acceptance of voice over IP (VoIP) — and to IP-based telephony deployment, service innovation, and revenue growth.

ITS has co-chaired the ITU Video Quality Experts Group since its formation in 1997. VQEG enables video experts from many countries to collaborate in developing and evaluating video quality metrics, and its results strongly impact the standardization of VQMs in both ITU-T and ITU-R. The group works primarily via an e-mail reflector, publicly accessible at <http://www.VQEG.org>. Over 300 participants are currently subscribed to this reflector.

During FY 2003, VQEG completed a 3-year evaluation of proposed “full reference” VQMs for assessing the video quality of standard definition television. Eight proponent laboratories from six countries submitted candidate VQMs for evaluation. Seven research organizations from three countries formed an independent laboratory group that conducted the evaluation. The laboratory group developed a comprehensive test plan, coordinated it among the participants (and interested standards bodies), selected test material (unknown to the proponents) comprising a representative sample of distribution quality television content, processed the selected video “clips” through widely used video compression systems, and obtained subjective ratings of the source and degraded video quality using human viewer panels. The proponents independently evaluated the same source and degraded video clips using their candidate objective VQMs. The laboratory group performed a comprehensive analysis of the resulting data to confirm the validity of the subjective test results and to compare the subjective and objective ratings. VQEG presented the results in a final report to ITU-T SG 9 (see below).

The figure (above right) illustrates the correlation between subjective and objective ratings for the proponent VQM that provided the best overall correlation with the subjective results (VQM “H” in the referenced report). The y-axis represents the subjective video quality rating produced by the human viewer panels — specifically, the normalized difference between the mean opinion score (MOS) of the unimpaired source video and that of the degraded output video. The x-axis represents the corresponding normalized video quality rating predicted by the candidate objective VQM. An “ideal” objective VQM would produce exactly the same rating as the subjective viewer panels for each source and degraded video clip, and all of the plotted points would lie exactly on the diagonal. The correlation illustrated is for the 625-line television system used in much of Europe; it is numerically 0.89. For the 525-line television system used in North America, the same VQM produced an even better overall correlation (about 0.94). VQM H was the only VQM rated in the top-performing group for both the 525- and 625-line systems.



Difference mean opinion score (DMOS) and confidence interval (CI) versus video quality rating for proponent ‘H.’

On the strength of these results, several cooperating standards organizations took action to standardize the VQM H objective video quality assessment algorithm during FY 2003. Committee T1 standardized the new algorithm in American National Standard T1.801.03-2003. ITU-R SG 6 submitted a new Recommendation documenting the new algorithm for ITU-R approval, and ITU-T SG 9 plans to submit a compatible Recommendation for ITU-T approval early in 2004. Details regarding the Institute’s video quality contributions to ITU-R are provided in the ITU-R Standards Activities section of this report (pp. 66-67). Details regarding VQM H (which was developed at ITS) are provided in the Video Quality Research section of this report (pp. 60-61).

Recent Publications

N. Seitz, “ITU-T QoS standards for IP-based networks,” *IEEE Communications Magazine*, Vol. 41, No. 6, pp. 82-89, Jun. 2003.

A. Webster, “Final Report from the Video Quality Experts Group on the Validation of Objective Models of Video Quality Assessment, Phase II (FR-TV2),” ITU-T Study Group 9 Contribution 60, Sep. 2003.

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