

RECOMMENDATION ITU-R BT.812*

Subjective assessment of the quality of alphanumeric and graphic pictures in Teletext and similar services

(Question 119/11)

(1992)

The ITU Radiocommunication Assembly,

considering

- a) that there are systems which handle graphic and alphanumeric pictures and transmit them by means of appropriate digital codes;
- b) that subjective tests often have to be used to assess the relative quality of the pictures and the effects produced on them by transmission errors;
- c) that methods for the subjective assessment of the quality of television pictures have been agreed (see Recommendation ITU-R BT.500);
- d) that alphanumeric and graphic pictures have a specific character distinct from that of conventional television pictures, and the mental process involved in their subjective assessment may differ;
- e) that the results of subjective tests can be analysed and presented in many ways;
- f) that the results of subjective tests can be interpreted in many ways,

recommends

- 1 that the general methods of test used for laboratory experiments and, whenever possible, for operational assessments be as given in Recommendation ITU-R BT.500, excepting, as appropriate, the viewing conditions and specific procedures described in Annex 1;
- 2 that, in view of the importance of establishing the basis of subjective assessments of the quality of alphanumeric and graphic pictures, the most complete descriptions possible of test configurations, test materials, observers, and methods should be provided in all test reports;
- 3 that, in view of the importance of ensuring that test outcomes relate well to the use of systems in practice, due note should be taken of assessment context, as described in § 3 of Annex 1.

* Radiocommunication Study Group 6 made editorial amendments to this Recommendation in 2002 in accordance with Resolution ITU-R 44.

ANNEX 1

The subjective quality of alphanumeric and graphic pictures in Teletext and similar services

Recommendation ITU-R BT.500 proposes methods to evaluate the subjective quality of pictures as contained in current television programmes. Studies are needed on the quality of alphanumeric and graphic pictures which are used for several new services transmitted via television channels and which use digital codes to describe alphanumeric and graphic pictures. Some transmission parameters have an effect on the quality of displayed pictures: page resolution (number of rows per page and number of characters per row) in the case of alphamosaic coding of Teletext, character cell resolution (number of pixels and lines per cell) in the case of DRCS (dynamically re-definable character set (see Recommendation ITU-R BT.653)) coding and picture resolution in the case of broadcast audiography, facsimile or Teletext. Further, the effects of transmission errors which may affect the codes should also be considered. Thus, measurements of quality and determinations of objective-to-subjective relationships for these parameters are necessary.

Studies have shown that there are different aspects required for the quality assessment of these pictures which may have characteristics different from those of conventional television pictures. Parameters such as pixel format, character cell resolution, spacings, colours and layout have effects on various quality attributes: legibility, quality, comfort, annoyance, effort of reading, fatigue and aesthetic considerations. Three main aspects are considered here: the viewing conditions, the assessment methods and the assessment context.

1 Viewing conditions

Recommendation ITU-R BT.500 defines viewing conditions for television pictures corresponding to low illumination levels in the room. It is likely that alphanumeric and graphic pictures would be viewed also in normal lighting conditions. Thus, a complementary set of viewing conditions is suggested for study: illumination of 500 lux, screen maximum luminance from 70 to 200 cd/m², screen contrast ratio from 30 to 50 and a value of 1/4 for the ratio of background luminance (from the walls of the room) to maximum screen luminance. Viewing distances from four to eight times picture height should also be considered.

2 Assessment methods

A considerable number of studies have been made on typographical aspects. Most of them have used "performance measures" such as detection or recognition thresholds, recognition ratio, speed of reading, etc. Very few have used "subjective measures" which are conventionally used in assessing the quality of television pictures. It is considered that new systems transmitted via television channels should have good performance (for example, percentage of good recognition of letters higher than 95%). The quality and impairment scales given in Recommendation ITU-R BT.500

could thus be used efficiently although studies are needed to establish the way in which these scales can be related to legibility. A comparison with speech quality assessment methods (ITU-T) has been tried and a 5-grade scale of “effort of reading” is suggested for further study.

Another method compares results of subjective assessments made using two different 5-grade scales given in Table 1.

TABLE 1

Legibility and reading effort scales

Quality of legibility scale	Reading effort scale
Excellent legibility	No reading effort
Good legibility	Attention necessary, but no appreciable reading effort
Fair legibility	Moderate reading effort
Poor legibility	Substantial reading effort
Bad legibility	Very substantial reading effort

It was found important to make the wording of each grade scale very explicit. The mean values of the scores obtained with the reading effort scale are generally higher than those obtained with the legibility scale and the range of the scores given by the observers is higher in the case of the reading effort scale.

Another experiment used the quality scale described in § 4.1.5.1 of Recommendation ITU-R BT.500 to assess opinions of both overall quality and overall legibility of typescript transmitted by a television system of variable line standard and bandwidth. For each opinion, two models, one of greater complexity and accuracy, but both invoking the concept of “impairment-scale” addition were found that described the combined effects of limited horizontal and vertical definition. Legibility was also measured in terms of the proportion of characters correctly identified. However, legibility in such terms remained high when quality was low, and it is evident that, usually, the former criterion is less useful.

Another study carried out comparisons of performance and subjective methods on printed text material using fixed-width and variable-width characters. Subjective methods were shown to be the more sensitive. The same type of study was repeated using a cathode-ray tube display, applying this time only subjective methods. The use of these subjective methods produced results dealing with the visually optimum sizes of fixed and variable matrices.

At the moment, few experiments have been made on the subjective quality of alphanumeric and graphic pictures in the television field and further studies are required.

3 Assessment context

A new approach to service assessment considers the case where user activities in the service under study can be defined accurately. Assessments are not made according to the conventional method of presenting images and simply asking viewers for standard subjective assessments (e.g. Recommendation ITU-R BT.500). Instead, viewers use the images presented as if they were using the service under study and all evaluations are performed in this context.

Service-use emulation does not preclude the use of conventional subjective measures. However, it establishes a context for subjective evaluations that is more appropriate to the service under study. It also may permit the use of objective measures of viewer performance and the development of new subjective measures that are particularly appropriate to the service and parameters under study. Finally, it establishes a more secure basis for generalizing assessments made in the laboratory to those made under service conditions.
