

The Distribution of Average Picture Levels in Television Programs — A Technical Note

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An analysis of measurements made over 14½ hours of television programs is presented to show the distribution of average picture levels as a percentage of total time. It has been found that for 90% of the time the average picture level is between 20 and 70% and that the mean value of the distribution is close to 40%.

AVERAGE PICTURE LEVEL (APL) is defined as: the average level of the picture signal during active scanning time integrated over a frame period; and expressed as a percentage of blanking to reference white range.* APL is sometimes called duty cycle or scene key. A low-keyed scene is described subjectively as having a dark background or low general illumination. Knowledge of average picture level is important because it affects the differential gain, differential phase, and gain of a video system. The change in gain with APL is called dynamic gain. [Differential gain and differential phase vary with instantaneous picture level as well as with average picture level.]

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* CBC Engineering Standards & Practices Vol. 1, Section 4.2.1.-2.

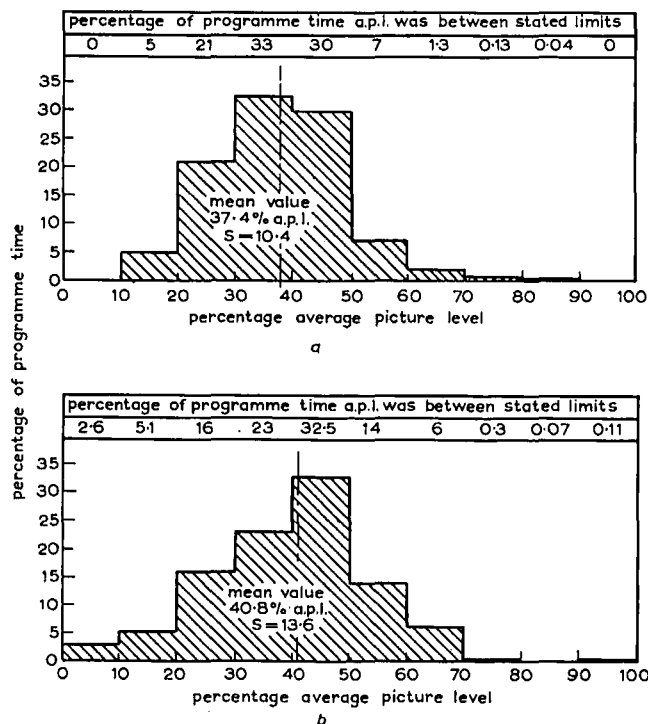


Fig. 1. Distribution of average picture level: (a) program media—film, 25.5%; live, 43%; video tape, 25%; slides, 3.5%. (b) program media—film, 59%; live, 28%; video tape, 11%; slides, 2%. (S indicates standard deviation.)

The results presented here are derived from recordings of the average picture levels of two Montreal television stations, CBMT, CBFT.

Continuous recordings were made between 4:00 and 11:30 P.M. on weekday evenings. The evening period was chosen because it contains the peak viewing hours; also it contains a wide range of programme material and media, and it contains programmes both local and network sources. Average picture levels observed during this peak period are probably typical of television programmes.

The results of the investigation are presented in the histograms of Fig. 1.

The average picture level distributions of the two channels monitored showed a marked similarity. The difference between mean values was 3.4%. 60% of the time the average picture level was between 30 and 60% and for 90% of the time APL was between 20 and 70%.

While they did not occupy a large percentage of total programme time, extreme values of APL did occur and must be taken into account therefore in specifying the performance of video systems. Samples of APL records are shown here to illustrate some of the extremes that occurred in programme material. Figure 2 (a) is a morning physical exercise with fixed staging. The very fine variations in APL are due to the movement of part of the body during exercise. The commercial in the middle of this scene has the characteristic frequent large changes in scene key designed to attract the eye of the viewer. Figure 2 (b) is a typical newscast with "on the spot" film inserts.

Extreme values of APL were of short duration, typically of 1 to 1½ seconds and they occurred most frequently during programme breaks, newscast, commercials and slide changes. Excursions of APL toward blanking level were more frequent and of longer duration than excursions toward high average picture levels.

Video signals from live studio and VTR generally had a more constant average picture level than motion-picture film. Apart from this there was little correlation between the average picture level and the medium of the material. Programmes from the network had average picture levels similar to programmes produced locally. A breakdown of the total time according to the programme media is given beside each histogram.

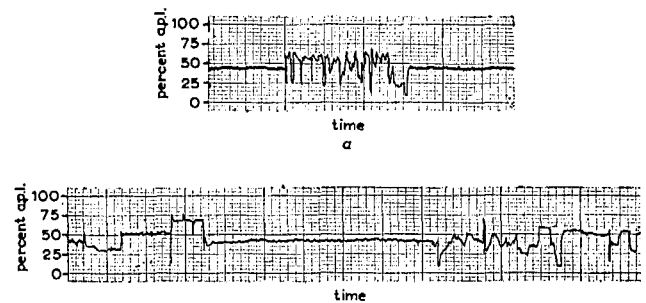


Fig. 2. Average picture level: (a) commercial in studio program; (b) news studio and film clips.