DISCUSSION ON

"The Impact of Information Theory on Television" *

Read before the Institution in London on September 30th, 1953.
Chairman: Mr. L. H. Bedford, O.B.E., M.A.(Cantab.) (Past President)

G. G. Gouriet: Concerning Dr. Bell's suggestion that the signal/noise ratio of a television system might be improved by pre-emphasizing the television signal, this would be true were it not for the fact that in television the signal/noise ratio is mainly determined at the signal source. Thus, it is not practicable at the present time to pre-emphasize the television picture signal without also pre-emphasizing the noise, so that no advantage is to be gained. If a pick-up device were to be produced giving an output signal substantially free from noise and large compared with the noise introduced by the first amplifying stage, then an improvement could be obtained by signal pre-emphasis in so far as the noise added during transmission is concerned.

The second point which I should like to raise concerns Dr. Bell's suggestion that, because of the low energy contained in the upper regions of the television sidebands, a degree of overlapping of adjacent channel sidebands might be permissible. I think it is dangerous to discuss this matter in terms of sideband energy. A pattern due to unwanted interfering sidebands can be easily discerned against a white background in spite of the fact that on each television frame it may persist for only a small fraction of the frame period. This is particularly true if the wanted and unwanted signals have the same nominal line and frame frequencies, in which case the interfering pattern will be substantially coherent.

J. A. Sargrove (Member): Arising directly out of the Author's demonstration that it would be desirable to utilize more fully the television system for conveying a greater quantity of information and not waste transmission time by continuously sending the same uninformative synchronizing pulses, may I put forward the following suggestion. (Believed to have been first made before 1939 by Dr. F. Okolicsanyi, late of Scophony, Ltd.)

This is to convey all the synchronization pulses, both frame, line and interlace on a separate carrier transmitted perhaps on a long or medium wave for the whole country. It could be received with very simple means and would not necessarily have to contain a broad band receiver.

This is even more topical now when in this country we are on the threshold of alternative TV programmes being transmitted, perhaps on six separate carriers. If in the U.S.A., before they embarked on 12-carrier TV system, they had decided to have only one "synch." station for the whole country, would not the additional information that could be transmitted on each of the twelve "picture" transmitters have been worth while? (The colour changing synch.-pulses could also be sent on this special "synch." transmitter.) The 50 (or 60) cycle mains has been discarded as a synchronizing means a long time ago due to the phase shifting that occurs locally whenever large inductive industrial loads are switched on and off. Obviously the special "synch." station would be free from this objection.

Dr. W. Saraga: Dr. Bell has pointed out that the overlapping *tête-bèche* system is based on the fact that the average power of a television sideband, as a function of frequency, decreases with increasing modulation frequency. Now the pre-emphasis system advocated by Dr. Bell is intended to make the average power of a sideband constant over the whole frequency band transmitted. I presume therefore that overlapping systems, like the *tête-bèche* system, and pre-emphasis systems, are mutually exclusive. I should be grateful for Dr. Bell's confirmation or comments.

Dr. D. A. Bell (*in reply*): While it may be true that noise in the camera and in the first stage of the camera amplifier limits the picture quality on the B.B.C.'s monitor tubes and on the receivers of viewers near the transmitting station, I doubt whether viewers living outside the 1 mV/m. contours would accept Mr. Gouriet's view. Moreover, if it were true that receiver noise and external interference is negligible up to the range at which fading makes the signal unsatisfactory, it would be possible to reduce transmitted power as a result of any device which made the signal/receiver-noise ratio even better.

Both Mr. Gouriet and Dr. Saraga question the

*See "Economy of bandwidth in television," by D. A. Bell. *J.Brit.I.R.E.*, 13, September 1953, pp. 447-470.

possibilities of the *tête-bèche* system, but I think they are overlooking the importance of *the exclusion of the unwanted carrier.* A diode detector working on a large signal is a close approximation to a synchronous detector, i.e. it discriminates in favour of modulation attached to the stronger carrier which is not synchronous with this one. Provided there is strong discrimination between the carriers, the unwanted signal using the same standards as the wanted signal will not produce a ghost image but a pattern the nature of which varies with the precise separation of the two signal frequencies. Pre-emphasis would greatly reduce the attractiveness of *tête-bèche*, but this might still be useful to reduce residual interference from a comparatively distant transmitter, relying on the effect of coherent detection.

A possible objection to the suggestion reported by Mr. Sargrove is that the path difference between the synchronizing signal from a central station and the picture signal from a local station would in fact destroy synchronization. A scanning line at present occupies approximately 100 μsec, so that to be comparable with the line resolution the synchronizing accuracy must be two or three tenths of a microsecond; and even if one put a phase adjustment in the receiver to allow for the mean path difference, the constancy of relative path lengths on different frequencies is unlikely to be good enough.

INTERNATIONAL ELECTROTECHNICAL COMMISSION

The 1953 series of meetings of the International Electrotechnical Commission, was held in Opatija, Yugoslavia, from June 22nd to July 1st. Seventeen countries were represented, and about 300 delegates attended the meetings of the various committees. The largest delegation was that from the United Kingdom, comprising 43 members appointed by the British National Committee (under the ægis of the British Standards Institution).

The following is a brief summary of the results achieved at meetings of the Technical Committees:

Graphical symbols.—A list of symbols of general application (e.g., variability) and symbols relating specifically to terminals and brushes of rotating machines and to transformers was discussed. Revised lists are to be prepared for consideration at the next meeting. A Sub-Committee was also set up to prepare a scheme of classification for diagrams of connections. This is part of the work relating to the revision of the I.E.C. publications on graphical symbols.

Radio communication.—Methods of measurement of the characteristics of broadcast television receivers were discussed, and agreement was reached on many of the proposals put forward.

A document on the procedure for applying basic climatic and mechanical robustness tests to radio components was approved for publication. A colour code for ceramic capacitors and a specification for fixed paper capacitors were passed for circulation to the National Committees for approval. Agreement was also reached regarding a group specification for ceramic capacitors and for carbon resistors, but these documents are only for internal use by the I.E.C. Committee in the drafting of detailed specifications and will not be printed in their present form.

A Sub-Committee on high-frequency cables and connectors was set up, and it was decided to undertake the study of piezo-electric crystals, with a view to the preparation of a specification.

The question of the standardization of radio transmitters was briefly discussed, and it was decided to ask the Secretariat to formulate proposals.

Electronic valves.—A specification for electronic valve bases had already been circulated to the National Committees for approval. As the result of comments received, however, a number of additions and modifications to the text were made at the meeting in Opatija, and a revised draft will now be circulated. The dimensions of sub-miniature valves were also discussed and a draft specification will be prepared by the Secretariat for circulation to the National Committees.

Electric and magnetic magnitudes and units.—A draft resolution on the rationalization of the M.K.S. system of units was discussed and adopted for circulation. It was also agreed to invite the International Union of Pure and Applied Physics to hold a joint meeting with the I.E.C. Committee on Magnitudes and Units to discuss how the decision regarding rationalization can best be implemented.