PANEL: STABILIZATION OF FUNDAMENTAL-FREQUENCY MICROWAVE OSCILLATORS FOR RADIO-RELAY SYSTEMS

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Session Framework

Frequency tolerances for microwave communications are presently under study within the International Telecommunications Union (ITU). This is being carried out in preparation for the World Administrative Radio Conference, 1979 (WARC-79), which will revise the existing Radio Regulations. The International Radio Consultative Committee (CCIR) will hold in the Autumn of 1978, its Special Preparatory Meeting (SPM) for the WARC-79. So far, the CCIR has prepared a report entitled "Frequency Tolerances for Radio-Relay Systems", which is to be submitted to the SPM.

This matter has far-reaching implications because the revised frequency tolerances will be in effect for the next 20 years, or so. It is therefore opportune at this time to bring into focus the available and emerging technologies and techniques for practical implementation of the new frequency tolerances. For this Symposium it appears to be most appropriate to concentrate on fundamental-frequency microwave oscillators which are attractive for their inherent simplicity but require special attention to frequency stabilization.

Several options are available for preventing excessive frequency variations due to variations of the ambient temperature, which is indispensable in communications applications. The most straightforward solutions are those using a fundamental-frequency control device tuned to the output frequency. A temperature-compensated high-Q cavity is the only frequency controlling device presently used for this purpose. Applications are limited, however, to frequencies above 4 GHz in order to avoid excessive cavity size that would be incompatible with compact equipment design.

The dielectric resonator, exploiting recent ceramic material improvements, promises an attractive, small size alternative. It can be readily incorporated into MIC oscillator designs. The practical lower frequency limit of this approach is at least below 2 GHz and possibly below 1 GHz. The surface-acoustic-wave (SAW) delay line and resonator promise, in turn, to close the remaining frequency gap down to the quartz crystal applicability range.

The panel is composed of two specialists in each of the three areas of frequency control under consideration. The objectives of the session are:

- Present the main features of the established microwave generation techniques using cavity-stabilized, fundamental-frequency oscillators.
- Examine the frequency control potential of dielectric resonators and SAW devices for microwave radio-relay applications.
- Compare the alternatives in the light of the new frequency tolerances proposed by the CCIR Study Group 9 (Doc. 9/371, 11 October 1977): 20 ppm (100-470 MHz), 100 ppm (470-2450 MHz), 200 ppm (2450-10500 MHz), and 300 ppm (10500-40000 MHz).

Each panel member is allocated five minutes for his/her opening statement in order to assure time for a productive discussion. Vugraph and 24 mm slide projectors will be available also to participants from the floor. Their presentations will be limited to three minutes. Picture taking of projections and recording of verbal presentations and discussion are not permitted in the interest of a mutually profitable exchange of views.