Abstracts

Guest Editor's Overview (Oct. 1993 [T-MTT])

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Microwave and millimeter wave systems are in common use today and their range of applications is expanding. It is safe to predict that these systems will be utilized in the future across the spectrum of endeavors from communications, radar, to transportation, industrial and scientific applications. Satisfying this expanding demand mandates the utilization of previously unused, or little used, mm-wave and sub-mm-wave bands. i.e. the use of the frequency band from 30 GHz to 3000 GHz, in accordance with a long term trend toward systems operating at higher and higher frequencies. The necessary technology, however, is not very well developed at the present time, which holds in particular for the sub-mm-wave band above 300 GHz. In addition, this technology (as far as it is available) suffers from high fabrication cost and lack of convenient power sources. Component costs have been driven by the small size and tight tolerances associated with the 100–3000 GHz band and in the case of conventional waveguide components, by the need for hand assembly. Power sources were largely limited in the past to vacuum tubes requiring high primary power, and, again, restrictive tolerances. Moreover, these sources are liable to catastrophic failure. Solid state sources are more reliable but their output power tends to be very low at frequencies above 100 GHz due to the small physical size of the active region, resulting in the well-known $1/f^2$ fall-off of available power. Hence a need exists to combine the outputs of many individual elements to satisfy the system power requirements.

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