Abstracts

Superheterodyne Radiometers for Use at 70 Gc and 140 Gc

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In this paper four different millimeter wave equipments, which have been made for plasma diagnostic work, are described. They are: 1) A straightforward 70-Gc superheterodyne radiometer with an over-all noise factor of 13 db; 2) An early 140-Gc radiometer, with second harmonic mixing, which has an over-all noise factor of about 25 db; 3) A later and more sensitive 140-Gc radiometer which contains a fundamental local oscillator, VX 3352 mixer crystals and a 408-Mc IF amplifier commencing with an Adler tube; 4) A very simple 140-Gc transmission measuring equipment containing a 1-watt source and a crystal video receiver which has a tangential sensitivity of ---42 dbm. The last part of this paper discusses the minimum temperature changes which can be detected, at short millimeter wavelengths, with various types of superheterodyne radiometers, the Golay cell, the barretter, the crystal video radiometer, the 1.5°K carbon bolometer and the 1.5°K InSb photoconductive detector. The performances expected from straight traveling-wave tube radiometers and traveling-wave masers at short millimeter wavelengths are also considered. The Appendices are devoted to mixer crystal performance in the millimeter and submillimeter regions, a theory of second harmonic mixing and the voltage sensitivity of a forward biased detector crystal.

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