XII. MICROWAVE AND MILLIMETER WAVE TECHNIQUES

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1. RESEARCH OBJECTIVES

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The principal emphasis is twofold: first, we are developing reliable, low-noise, wide-band receiver technology, and second, the Very-Long Baseline Interferometry technique (VLBI) is being extended to the use of orbiting antennas (OVLBI). An additional requirement in receiver work that has been more frequently needed than in the past is greater freedom from adjacent-band interference, and protection against burnout from high-power rf sources. At wavelengths longer than 1 cm, we are emphasizing the development of cooled transistor receivers, using GaAs-FET transistors, while at millimeter wavelengths we are placing the strongest effort into cooled mixer devices. The principal projects are the following.

1. A cooled 7-mm mixer is nearing completion, aimed at operation with a 5-GHz bandwidth centered at 43 GHz. The first model was tested last year, and the present version represents the next generation of development. The device will be cooled to 20°K, using a closed-cycle helium refrigerator.

2. Work is continuing on the development of a 15-GHz cooled GaAs-FET amplifier, having an instantaneous bandwidth of 1 GHz and excess noise lower than 100 K. The first developmental models have been built, and an operational version will be tested in early 1981. The high-frequency limits of GaAs-FET technology will also be investigated.

3. Development studies of an orbiting VLBI station (OVLBI) are under way, in cooperation with the Marshall Space Flight Center at Huntsville, and with Cal Tech's Jet Propulsion Laboratory. The prototype antenna, a paraboloid of 50-cm diameter, is being developed by MSFC, while the VLBI-specific aspects of the mission are being worked on by MIT and JPL.