



Fermilab

\bar{p} Note #283

PERFORMANCE OF A 1-2 GHz PREAMPLIFIER
FOR STOCHASTIC BEAM COOLING SYSTEM

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The characteristics of the LBL continuous - wave wide-band low-noise preamplifier, version B, have been presented over a frequency range of approximately 1-2GHz.

In this preamplifier the source leads of the transistors in the first two stages are soldered directly to copper studs which are attached to the copper enclosure box to get better thermoconductivity.

Two sets of noise figures were presented with one set optimized at 300⁰K and the other at 18⁰K. When the N.F. was optimized at 80⁰K the result was very much the same as the one optimized at 18⁰K. It was found that different transistors behaved differently hence individual amplifier must be optimized at the intended operating temperature.

The VSWR data presented are those of the room temperature. The change in VSWR at low temperatures are not significantly different from those at room temperature.

The output power as a function of input power at various frequencies and their intermodulation products are very much the same at all temperatures.

The preamplifier is unconditionally stable with an open or shorted sliding line at the input port.

Figure Captions

- Fig. 1 Preamplifier gain, phase-shift and noise figure as a function of frequency measured at ambient temperature of 293°K without cryostat input and output cables.
- Fig. 2 Preamplifier noise figure as a function of frequency measured at ambient temperature of 293°K without cryostat input and output cables.
- Fig. 3 Gain as a function of frequency with the ambient temperature as parameter.
- Fig. 4 Phase-shift as a function of frequency with the ambient temperature as parameter.
- Fig. 5 Noise figure as a function of frequency with the ambient temperature as parameter. Noise figure optimized at 293°K .
- Fig. 6 Noise figure as a function of frequency with the ambient temperature as parameter. Noise figure optimized at 18°K .
- Fig. 7 Preamplified input and output voltage standing - wave ratio as a function of frequency.
- Fig. 8 Real part of the input impedance as a function of frequency with the ambient temperature as parameter.
- Fig. 9 Imaginary part of the input impedance as a function of frequency with the ambient temperature as parameter.
- Fig. 10 Typical performance characteristics of the 1-2 GHz preamplifier.
- Fig. 11 Typical performance characteristics of the 1-2 GHz preamplifier.

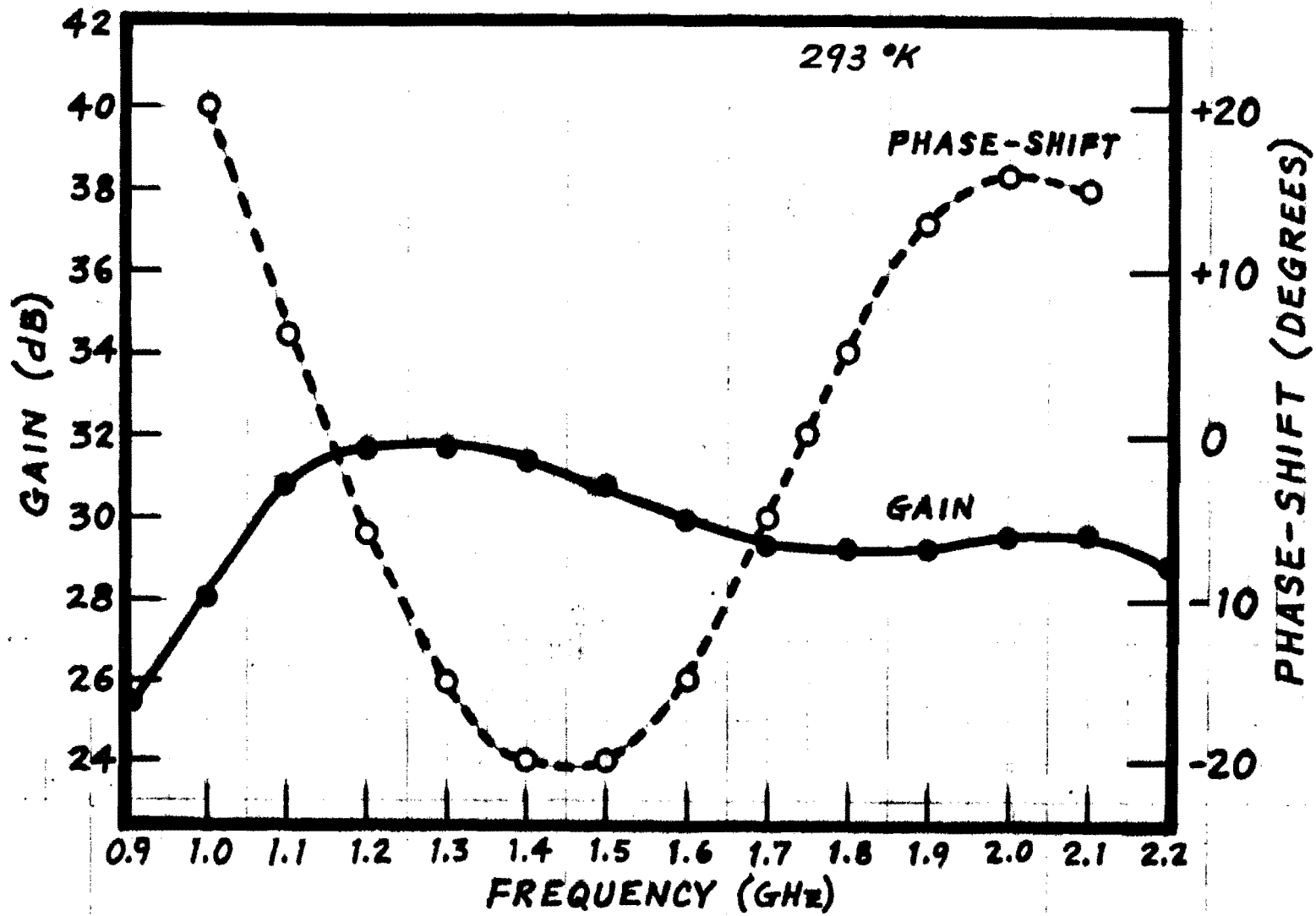


FIG. 1

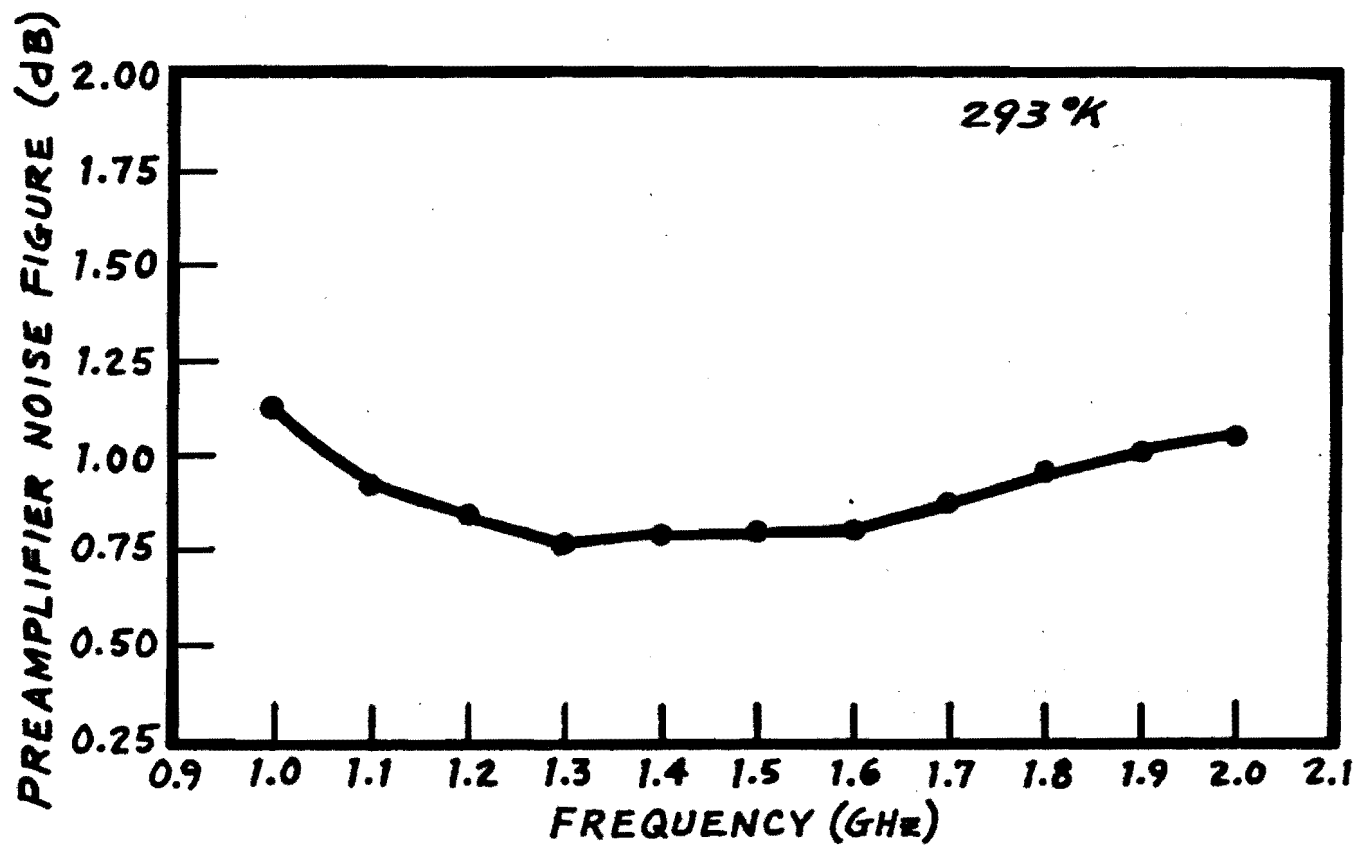


FIG. 2

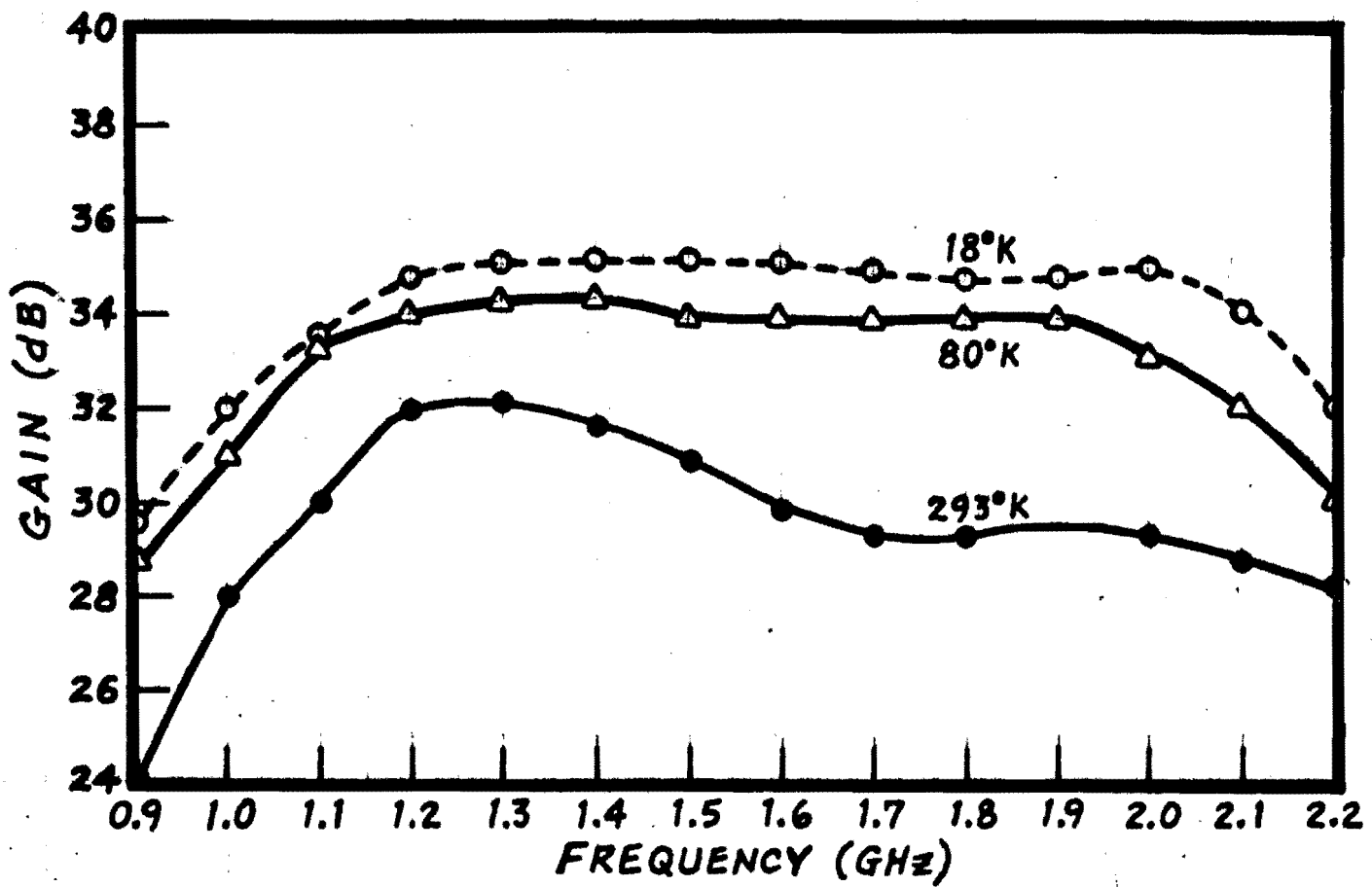


FIG. 3

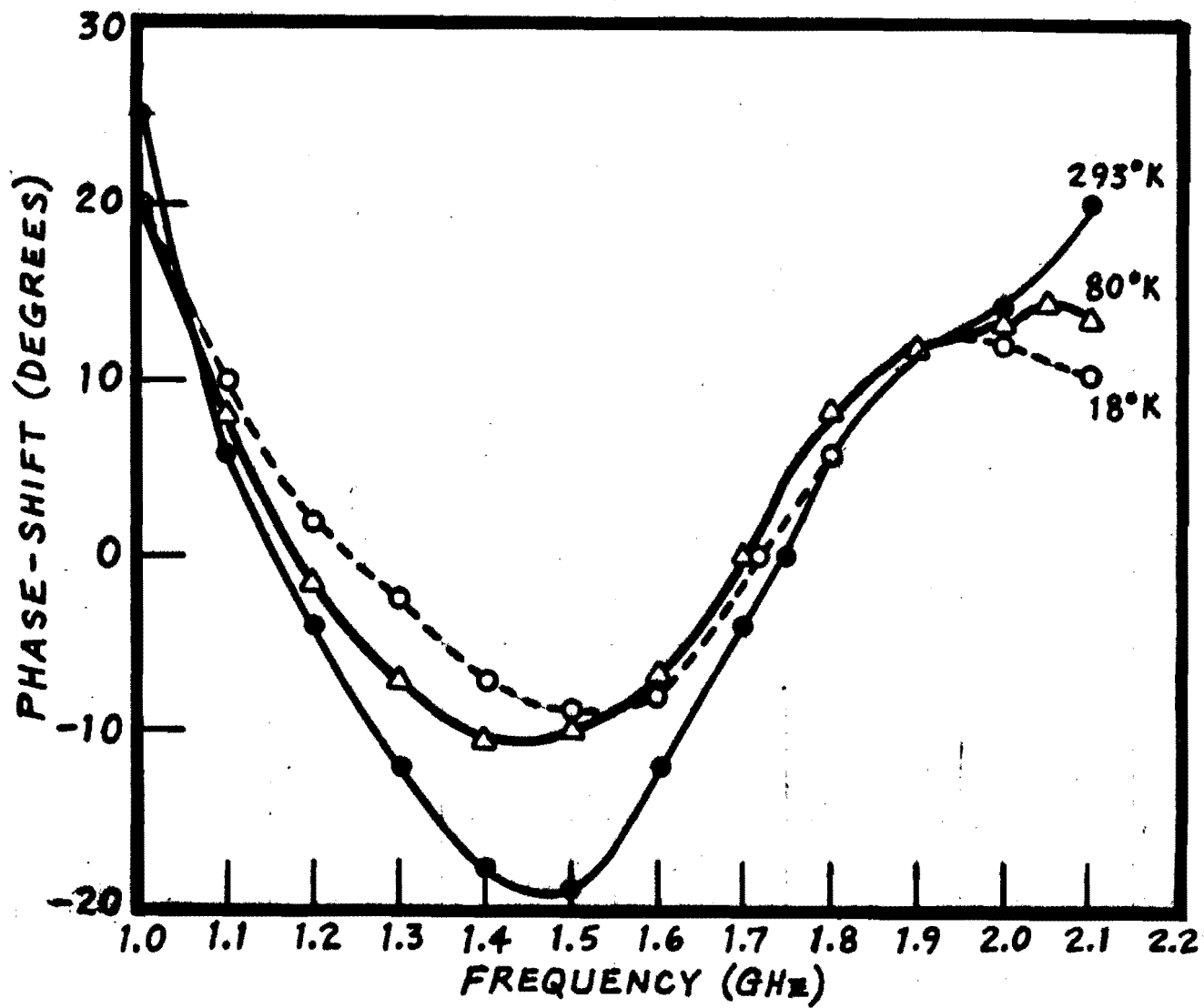


FIG. 4

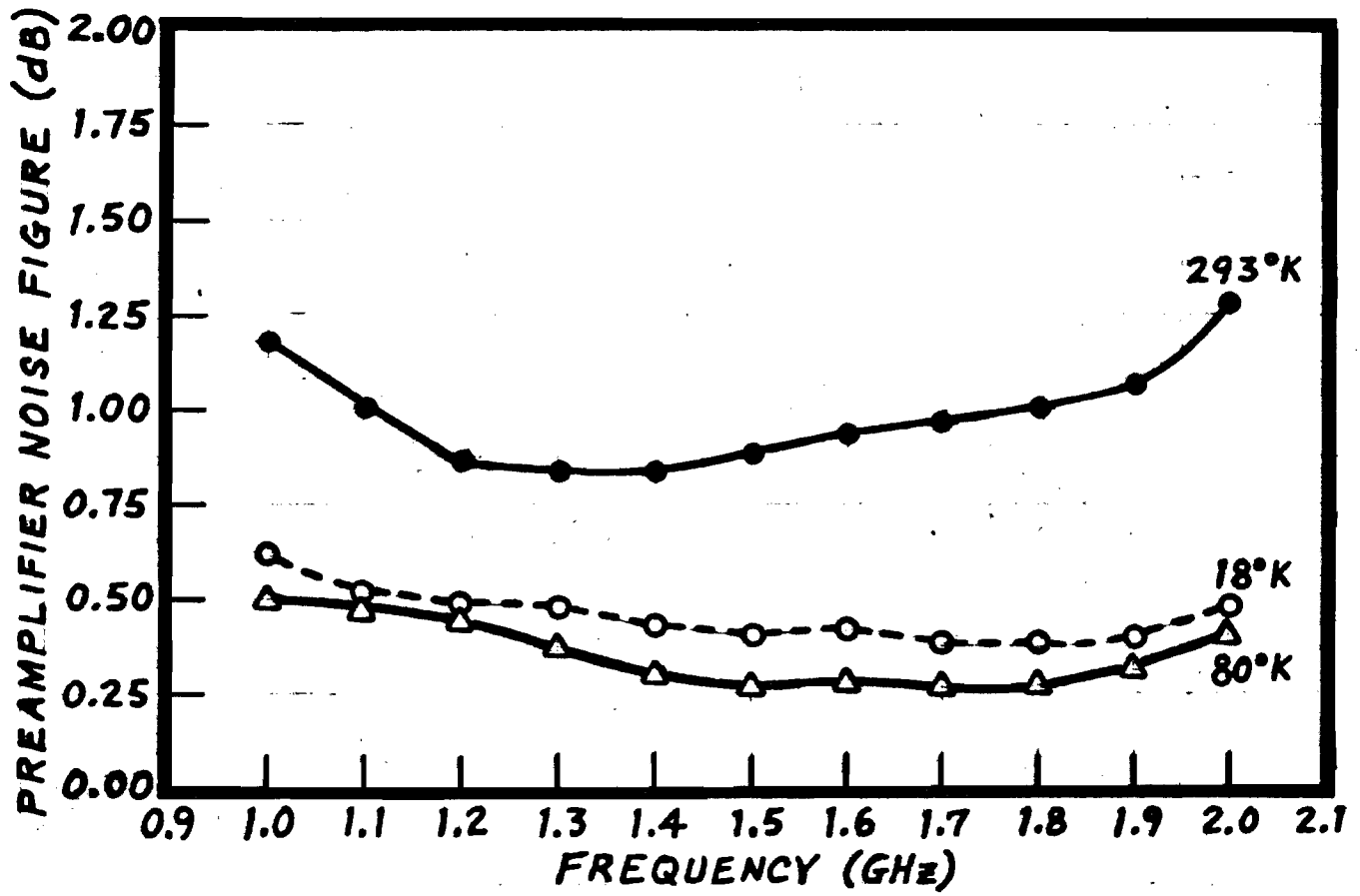


FIG. 5

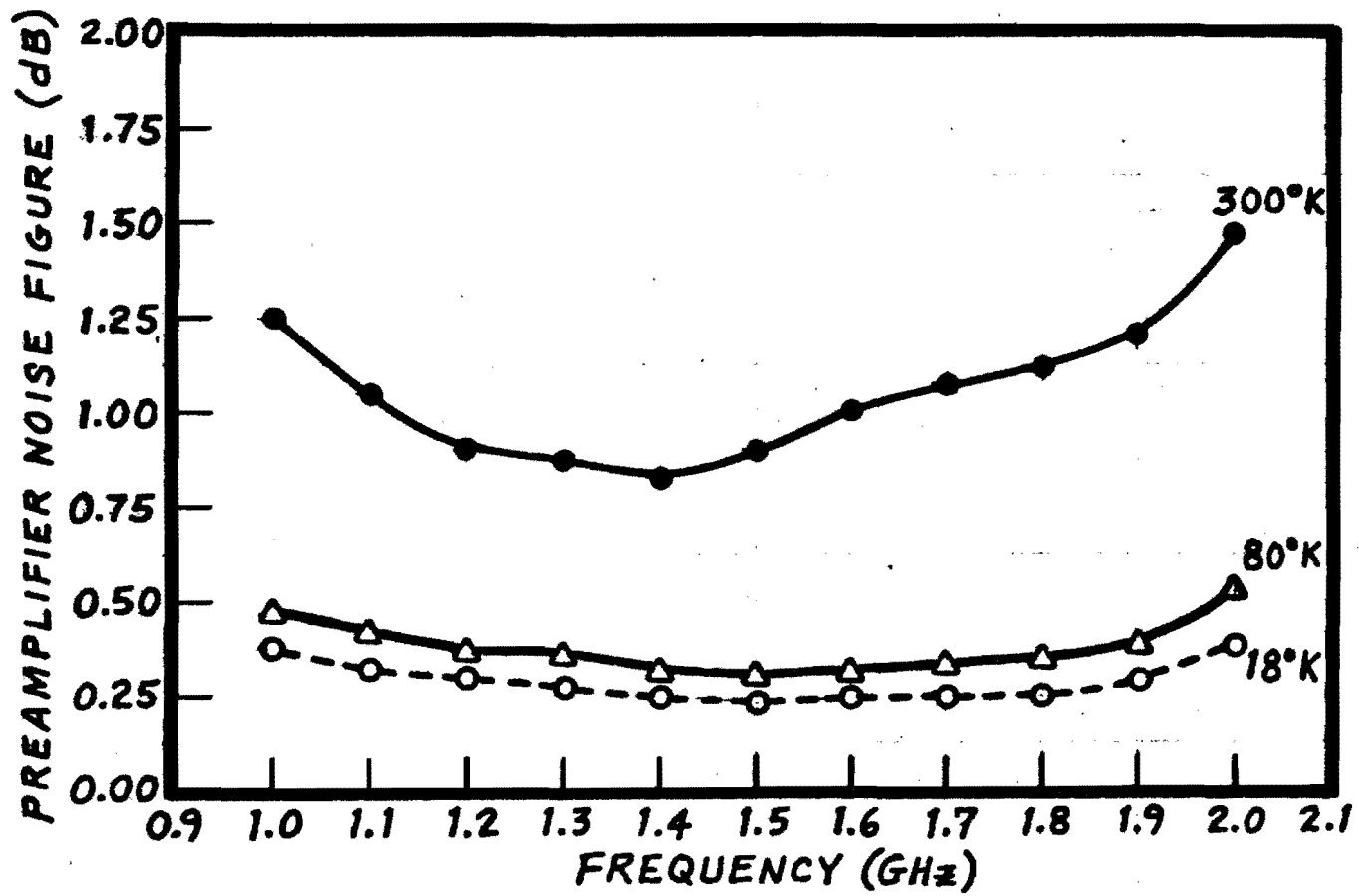


FIG. 6

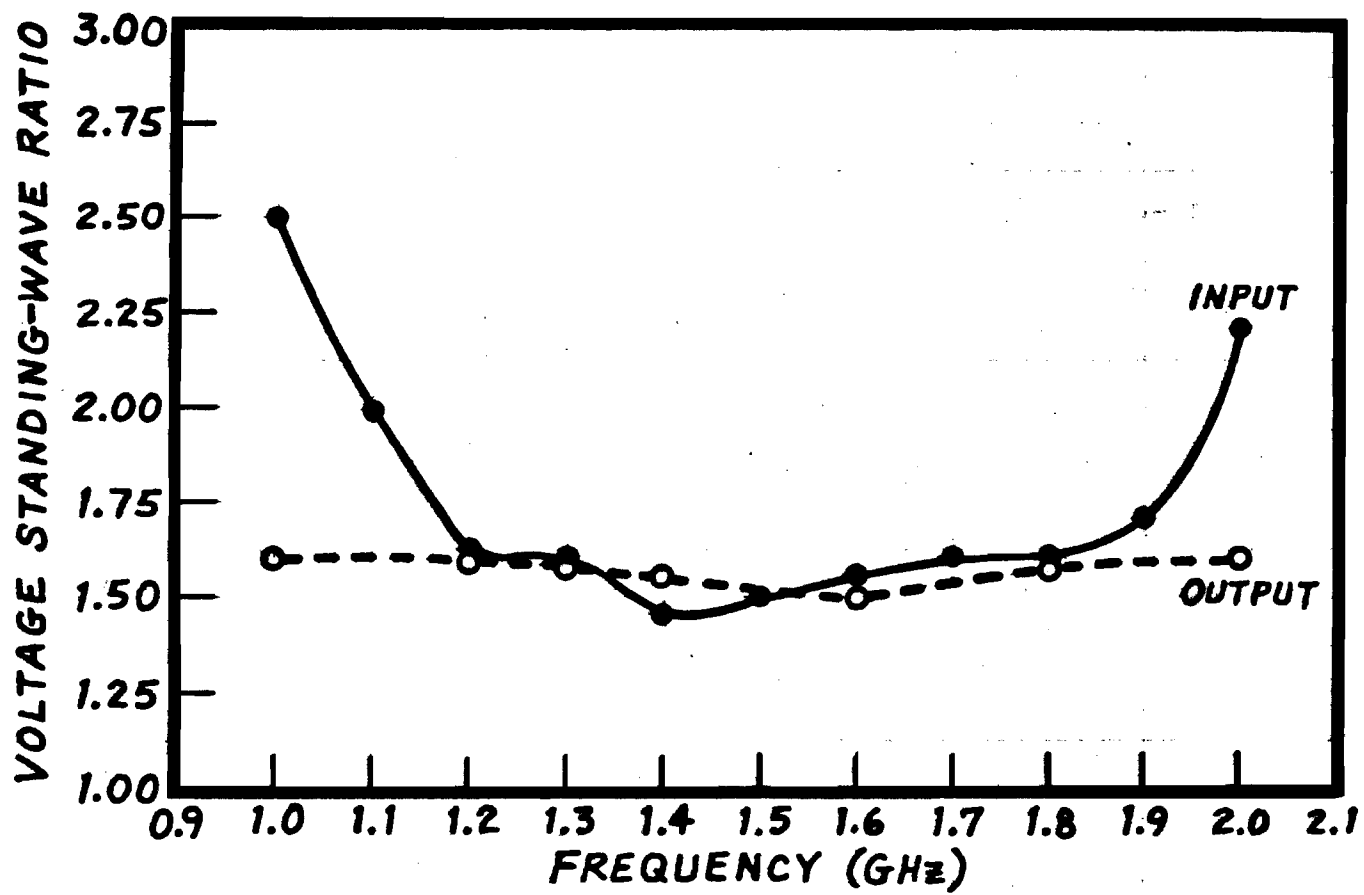


FIG. 7

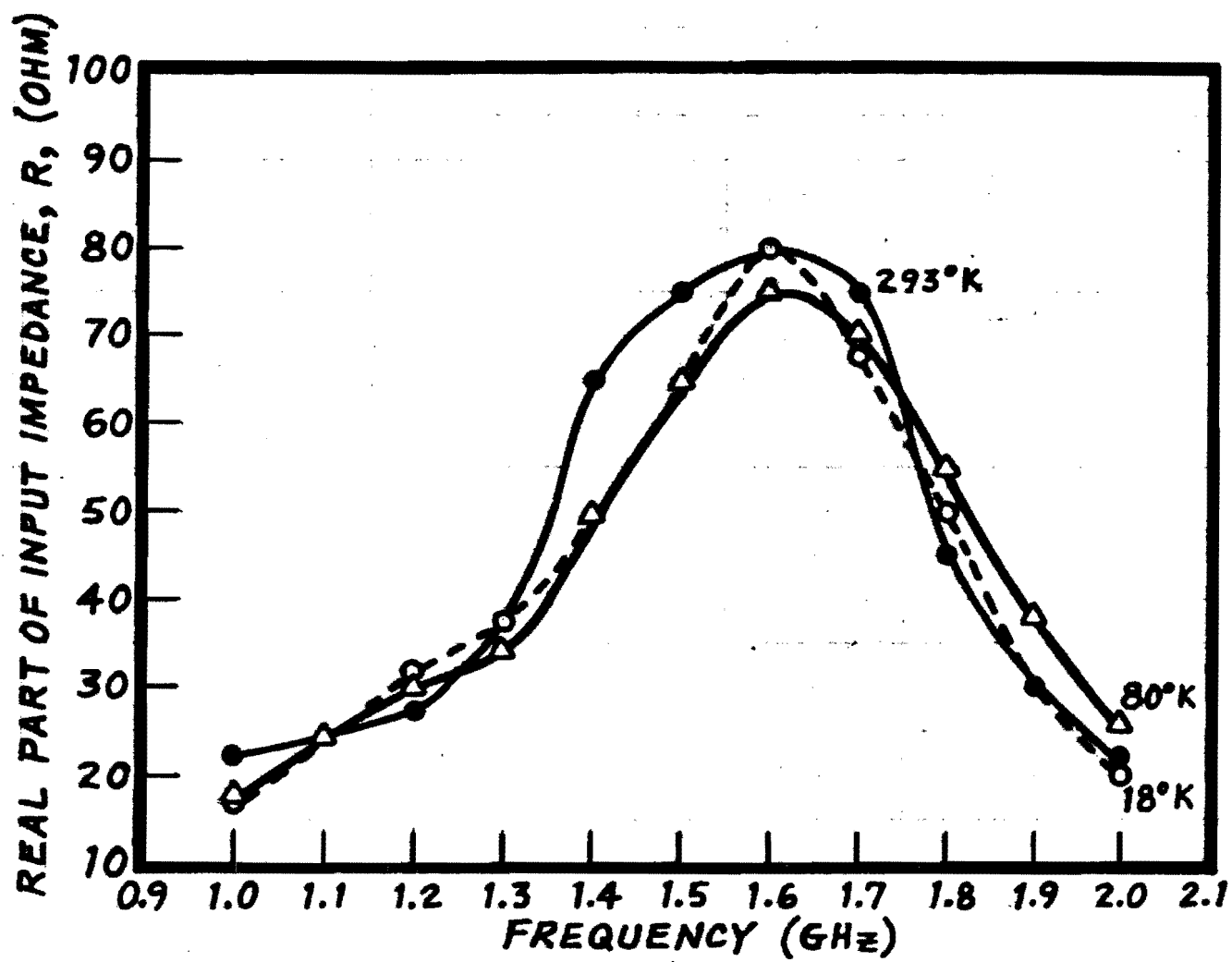


FIG. 8

IMAGINARY PART OF INPUT IMPEDANCE, jX , (OHM)

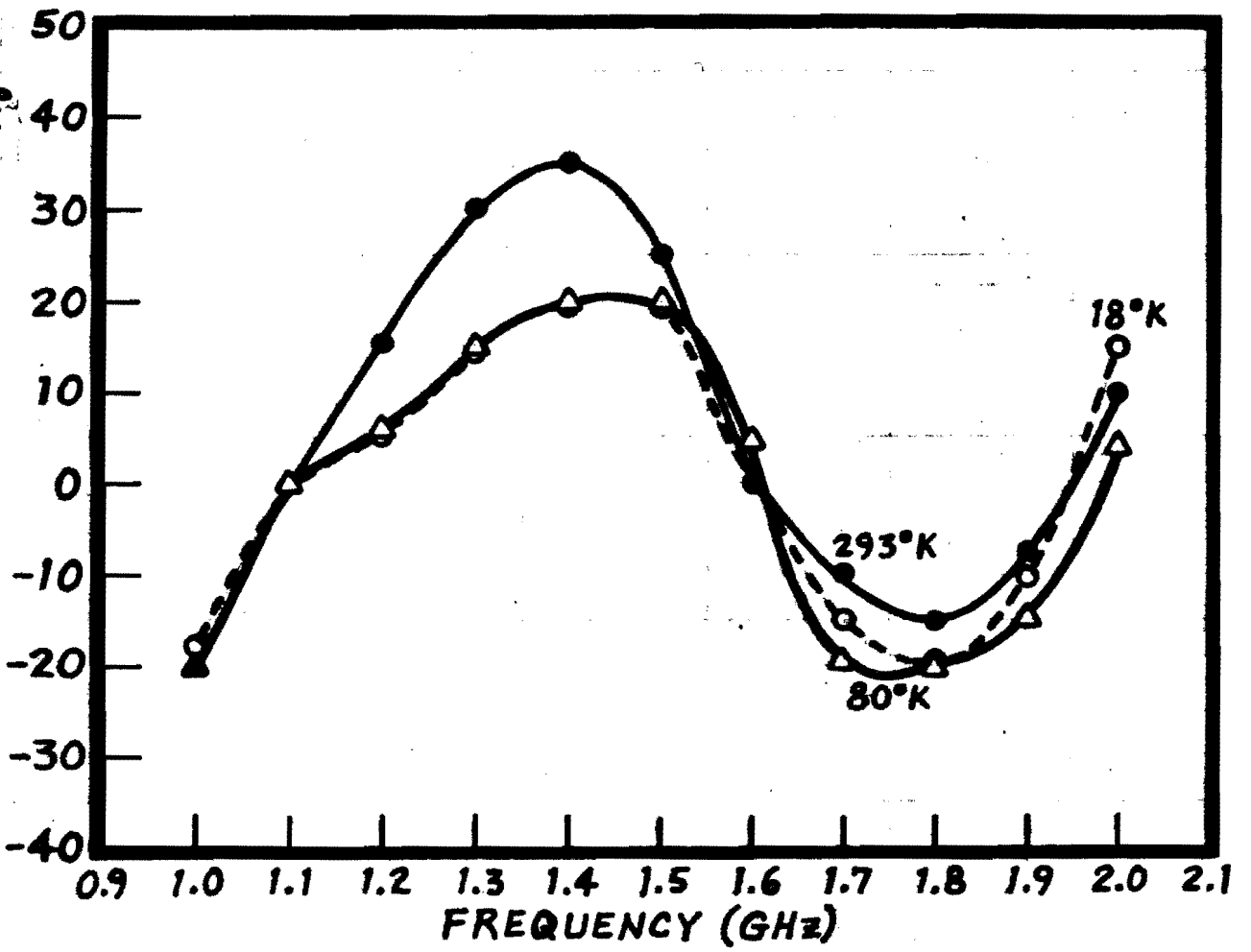


FIG. 9

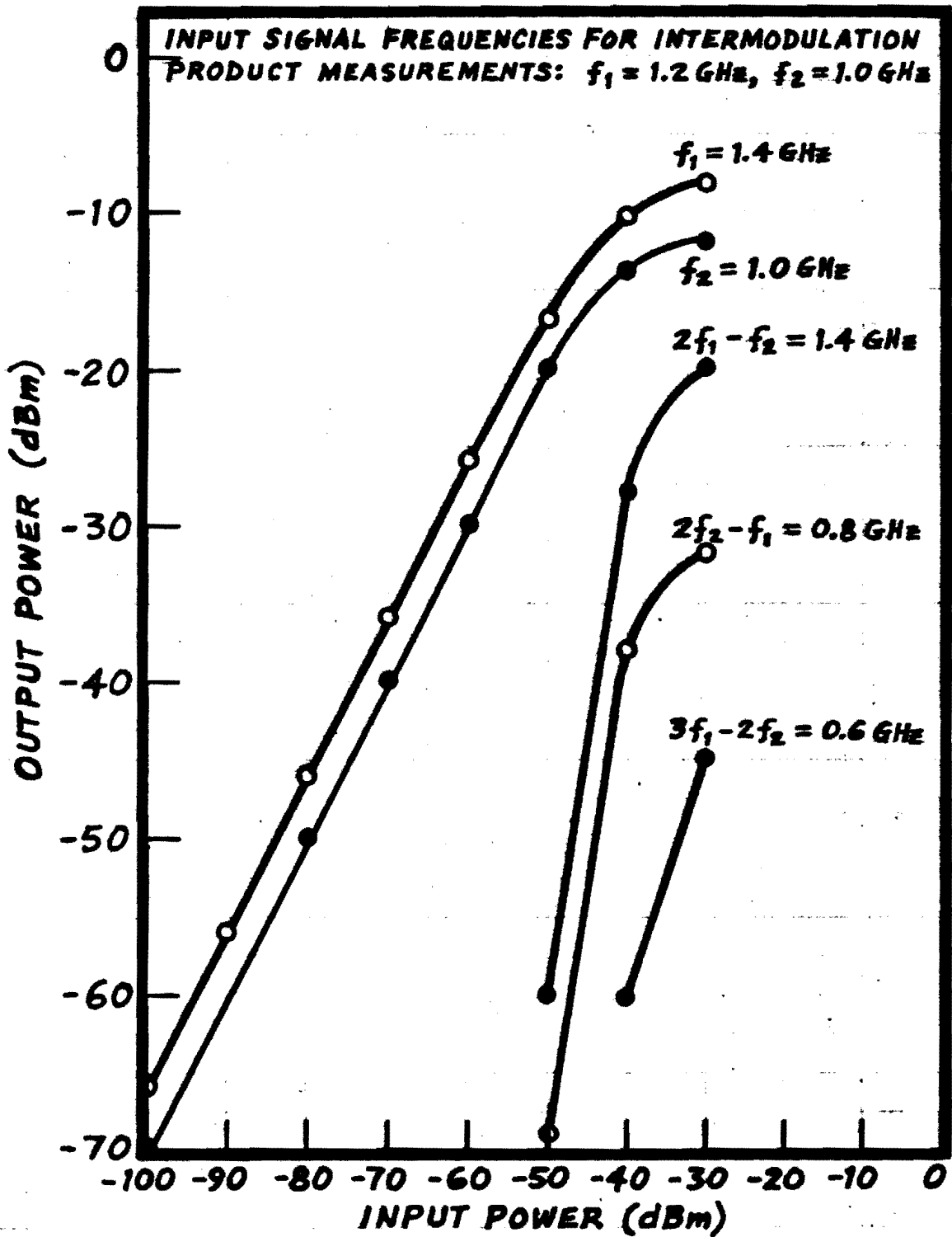


FIG. 10

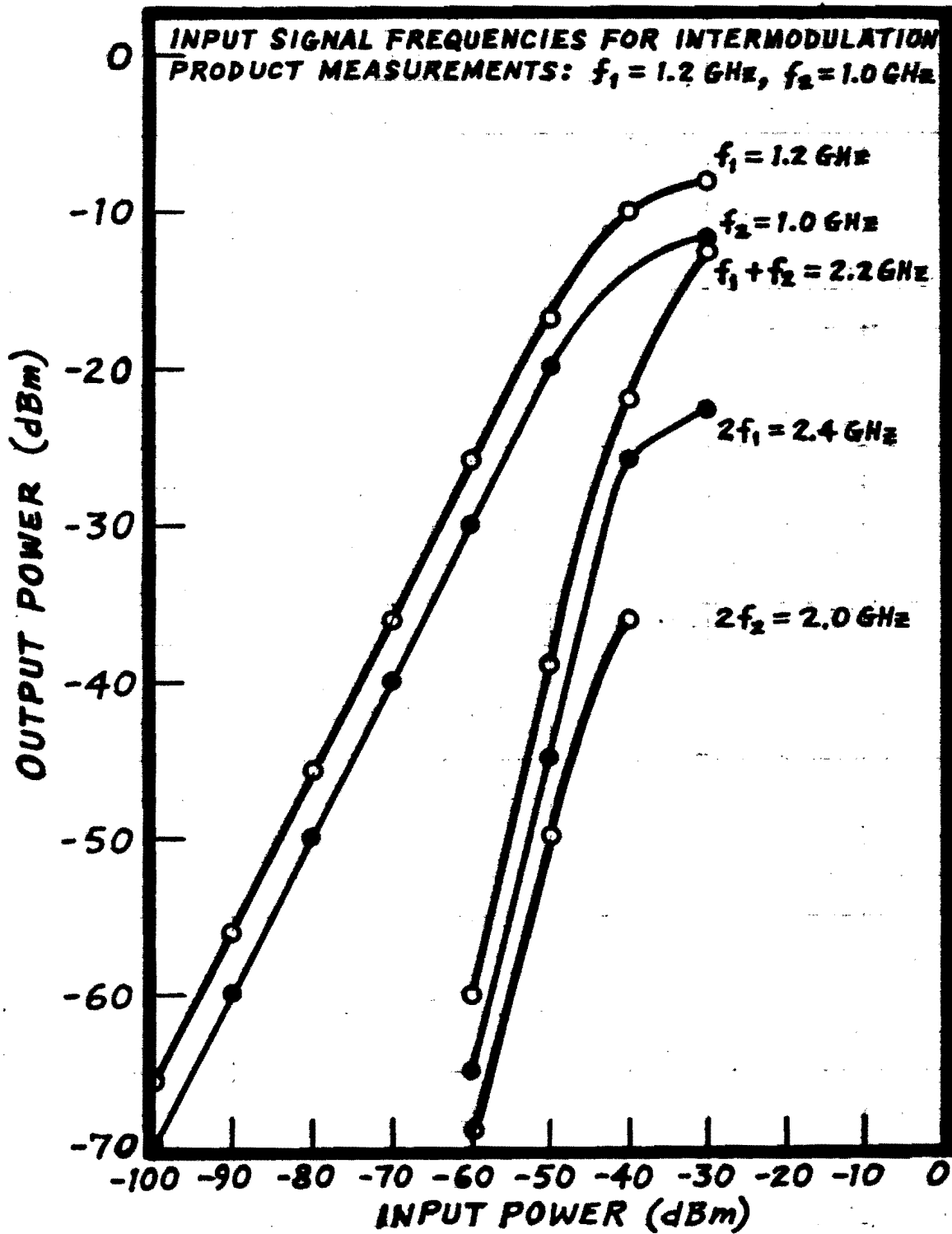


FIG. 11