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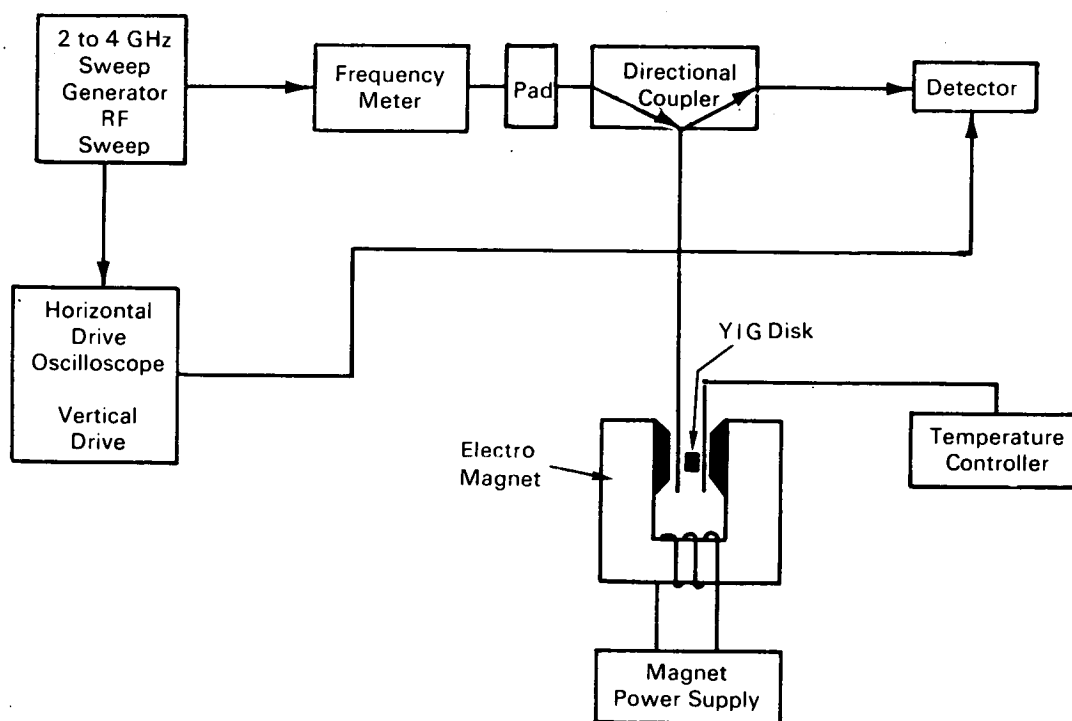
Brief 70-10033

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A Simple Tester Provides Resonant Frequency Measurements of Ferrite Devices



The problem:

The resonant frequency of a maser is determined by the shape of the isolator material, usually an yttrium iron garnet (YIG) disk, and the applied magnetic field. The thickness of the YIG disk is varied to obtain the desired resonant frequency, e.g., to shift the maser frequency 300 MHz would require a 0.001-in. thickness change for a disk that has a 0.046-in. diameter and is 0.0065-in. thick. A trial-and-error polishing operation for obtaining the final thickness is time consuming and impractical.

The solution:

A simple tester has been designed and fabricated which enables the direct measurement of the resonant frequency of a YIG disk. The YIG disk can be tested while mounted on the isolator strip with less regard for dimensional flaws. The tester includes a combination clamp, temperature-controlled electromagnet, and a coupling line element for holding and coupling the signal to the disk under test; the coupling line also receives the reflected signal.

(continued overleaf)

How it's done:

The figure shows a block diagram of the ferrite resonance tester. A microwave signal generator is swept over a particular range of frequencies, the signal being applied to a directional coupler through a frequency meter and pad. The frequency determining sweep-voltage is applied to the horizontal axis of the oscilloscope; the vertical axis of the oscilloscope receives the detector output voltage which is the rectified, reflected microwave power coupled into the directional coupler from the line. The oscilloscope presentation appears as a straight horizontal line except for a sharp dip which occurs at the resonant frequency of the ferrite; the frequency at the minimal response point is measured with the frequency meter. The directional coupler transfers the microwave signal from the generator to the line and directs the reflected signal from the line to the detector. The magnet is adjusted electrically to provide the desired field strength; this presents an environment similar to that

which the YIG ferrite element encounters in a maser. The magnet, directional coupler, strip lines, and YIG disk are maintained at a constant temperature by a thermal control unit.

Note:

Requests for further information may be directed to:
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No patent action is contemplated by NASA.

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