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"Maser" Aids Astronomers

A ten-carat synthetic ruby made to oscillate at microwave frequencies may be able to increase the sensitivity of radio telescopes one hundred-fold.

A DEVICE that will increase by 100 times the listening sensitivity of radio telescopes is now being installed on the Naval Research Laboratory's 50-foot antenna located in Washington, D.C.

Radio telescopes provide a means of studying the sun, planets and far-away galaxies by tuning in on the radio waves broadcast by these heavenly objects.

The device, known as a "maser," is a ten-carat synthetic ruby that is made to oscillate at microwave frequencies. If the instrument works successfully, it will be the first known time a maser has been used on a radio telescope.

Maser devices developed so far operate only at very low temperatures, about 455 degrees below zero Fahrenheit. The principle on which they work was first demonstrated for beams of molecules in gases in 1954 by Dr. C. H. Townes and his co-workers at Columbia University.

They coined the word "maser," which stands for "microwave amplification by stimulated emission of radiation." Dr. Townes is working with Naval Research Laboratory scientists on applying the maser to a radio telescope.

One of the first objects the NRL's radio telescope will be trained on is Saturn. As yet, no radio waves have been detected from this ringed planet. But C. H. Mayer told Science Service that NRL scientists expected "no difficulty" in picking up Saturn's radio broadcasts at a wavelength of three centimeters, or slightly more than one inch.

Radio waves have previously been detected from Mars, Venus and Jupiter at this same wavelength by the NRL team, which includes Mr. Mayer, T. P. McClough and R. M. Sloanaker.

The NRL scientists will also try to record the radio waves from Mercury, but believe they have less chance of hearing that planet's broadcasts.

One outstanding characteristic of masers is their very low "noise" level compared to conventional microwave equipment. Because the radio waves broadcast by most heavenly objects are so very weak, the noise level of the equipment severely limits the radio sources that can be detected. By reducing this noise level by a factor of ten, maser-equipped radio telescopes can scan a volume of space 30 times larger than possible with conventionally equipped antennas.

Scientists at Harvard College Observatory are also working on a maser device to attach to their radio telescope, and have operated it successfully in the laboratory at a wavelength of 21 centimeters.