

Continuous Maser Ray Is Forecast

2 New Crystals Used By I. B. M. Scientists

By Earl Ubell
Science Editor

Imagine a beam of light so sharply focused that you could direct it at a spot six inches wide at a distance of ten miles.

Imagine, too, that this same beam of light had all the properties of radio waves—that you could send voice, television and other signals over it.

Such a light ray could revolutionize the communications industry, because it would enable engineers to pack dozens of radio, telephone and television broadcasts into the same frequency channels. And they could point their messages anywhere in space.

Yesterday, two scientists—one twenty-nine years old, the other thirty — brought that beam closer to engineering reality by making it possible to generate such rays on a continuous basis.

The Maser

With this announcement, the International Business Machines Corp. got in on a scientific act now being exploited by half a dozen electronics firms and universities. The act goes by the name of "maser," which is really the name given to the device that produces the beam of light.

Up to now, scientists could make masers that threw out the special light in short pulses of 1/1000th of a second at half-minute intervals. Scientists at Hughes Aircraft Co. and Bell Telephone Laboratories achieved that result by using ruby crystals. But it was hardly practical for communication purposes.

Now the two young I. B. M. scientists, Dr. Peter P. Sorokin and Dr. Mirek J. Stevenson, have used two new crystals—one containing uranium and the other a rare earth, samarium—to demonstrate the possibility of continuous maser light.

"We haven't made our maser work continuously," said Dr. Sorokin, who is one of two scientist sons of Dr. Pitirim A. Sorokin, professor of sociology at Harvard. "We have shown it is possible to do so with a few technical adjustments. With the ruby, it was impossible."

Light Ray, Radio Wave

To understand what this maser crystal does, remember that a light ray is in every physical respect exactly like a radio wave except in frequency. Both are composed of alternating electric and magnetic pulses. But a light ray has a frequency 10,000,000 times that of an FM radio beam.

Man-made radio waves have an important characteristic that permits the radio engineer to manipulate them to send signals. They are said to be "coherent." Such waves "march in step" through space.

As it comes from any source except a maser, light is incoherent. Its waves rumble helter-skelter through space, and you can't tell when one wave train begins and the last one ends.

A maser (some prefer to call laser when it produces light) generates coherent light by releasing pent up energy of atoms in a crystal. But the energy—light energy—is released in step.

In the ruby laser, chromium atoms release the energy when stimulated by an oncoming light. That's where laser gets its name—Light Amplification by Stimulated Emission of Radiation.

In the I. B. M. crystals, uranium and samarium play the same role. However, the light from the uranium is infra-red; the samarium light is visible red. Continuous operation can be obtained because neither of these two elements requires as much energy storage to make it behave as a maser as does chromium.

With coherent light waves, engineers can send signals, and since their frequency is so much higher than that of even radar waves, it will be possible to pack more information in one frequency channel. This could create an optical channel in the ether to join the AM, FM, TV and radar broadcasting hands.