another, as do electrons within an atom.

By taking advantage of this characteristic, a superconducing detector capable of operating in the range of frequency from audio—about 10,000 cycles per second—through the radio and microwave bands to the far infrared—about 10 million cycles per second—has been developed and successfully operated in laboratory tests. This covers a range far broader than previously available with any other single detector known.

The device, now still in the stage of laboratory development, is likely to find its first use with radio telescopes, in the opinion of its discoverers, Drs. Arnold H. Silver and James E. Zimmerman of Ford Motor Company's Scientific Laboratory in Dearborn, Mich.

In addition to the radio astronomers' need for its great sensitivity, one reason they are apt to be the first to test the device under actual operating conditions is that they are accustomed to working with detectors that have to be cooled to very low temperatures, as are masers.

The detector is made by connecting two separate pieces of a superconductor with a very narrow—about one-millionth of an inch—superconducting link. The structure then becomes the equivalent of a giant, diatomic molecule.

When a direct current voltage is applied across two such weakly connected superconductors, the electrical current that flows through the diatomic connection is not constant; it oscillates at a frequency directly proportional to the applied voltage.

Because the electrons in the superconductors all move together in a precisely related way, the oscillating current is largely and easily measured. The relationship between voltage and frequency is such that for one-millionth of a volt, the frequency of the oscillation is approximately 500 megacycles per second, which is in the ultra high region.

When connected to an appropriate antenna, this oscillation becomes a transmitter of electromagnetic radiation at very small but yet detectable power levels.

As a detector, the weakly connected superconducting oscillator is used to pick up the incoming wave and convert it to some convenient frequency where it can be amplified by conventional electronics.

A related application of the oscillator-detector is as a wide-range spectrometer for measurements on the absorption or emission of electromagnetic radiation by various materials. In this manner, the device can very sensitively detect the characteristic resonances of many substances in the frequency range below the infrared.

Drs. Silver and Zimmerman reported details on the superconducting point contact oscillating detector they developed to the American Physical Society meeting in Chicago last week.

Hormone Insecticide

Sex lures, overcrowding, starvation and sterilization by high-intensity light have all been named as biological weapons in man's fight against insects. Toxic chemicals as insecticides are out of fashion because of their harmful side effects on man.

Biological pest killers are ascendant. And the next addition to the biological arsenal, possibly the most near-perfect yet, may be an insecticide that keeps insects from growing up and procreating. Scientists have isolated and structurally identified a juvenile insect hormone, one of two hormones that regulate the growth and development of all insects.

Normally, juvenile hormone is secreted from a tiny gland at the base of the brain in insect larvae and its production stops when adulthood is reached. If this hormone could be incorporated into an insecticide and kept continually present in the insect's blood stream, it would prevent sexual development. Juvenile hormone can penetrate the unbroken skin of larvae or can be taken in with the food. It is possible, therefore, for an insecticide compound to be sprayed on plants.

However, no immediate plans for pursuing the hormone's possible applications as an insecticide have been made because it has not been synthesized successfully. Studies of juvenile hormone were begun by Dr. Herbert A. Roller and colleagues in 1962. In four years they were able to extract only ten-millionths of an ounce of the hormone from giant silk worm moths. "We are now in the process of synthesizing this hormone," Dr. Roller says. "No insecticide studies are possible until synthesis is complete."

Dr. Roller coundueted his research with two colleagues at the University of Wisconsin, Drs. Karl H. Dahm and Barry M. Trost, and with Dr. Charles C. Sweeley of the University of Pittsburgh.

In addition to its potential applications in controlling insect pests, identification of the hormone could bring new insight into the workings of all hormones, Dr. Roller believes. Knowledge gained from studies of hormone structure "may be generally applicable to questions of hormonal mechanisms in other animals, including man," he said.