Physical Sciences Notes

CRYOGENICS

Short Laser Bursts

Extremely short bursts of laser light can pass through apparently opaque material. The effect occurs only at temperatures near absolute zero.

The light beam goes through otherwise opaque material because the laser light is in a very short burst and has sufficient intensity to overcome atomic friction. The electrons circling the atoms in the material momentarily absorb the light energy, but then immediately return it to the laser beam, pushing the beam in the same direction the light was originally traveling.

This happens because the electrons are set into cooperative motion exactly timed with the vibrations of the laser beam. The laser pulse occurs in one-millionth of a millionth of a second, Dr. E. L. Hahn of the University of California, Berkeley, reported to the American Physical Society meeting.

PLASMA PHYSICS

Progress Toward Magnetic Bottle

Experiments to date indicate that there are "neither roadblocks of instabilities nor any insurmountable physics problems" in the path of the Astron. This encouraging report was made to the American Physical Society meeting by Nicholas C. Christofilos of the University of California's Lawrence Radiation Laboratory in Livermore.

The Astron concept for controlling fusion reactions involves using a cylinder of rotating high energy electrons, which act like a current-carrying coil, to create the magnetic field that contains the fusing plasma. The stability of the electron cylinder, called the E-layer, is a key feature of the Astron concept.

The E-layer remains extremely stable at 20 amperes per centimeter, which is five percent of the value required to create a magnetic bottle, Christofilos reported.

He said the observed noise power level, a measure of plasma instability, is 12 orders of magnitude, or a million million times, below the level that would cause "catastrophic loss" of the E-layer electrons.

COSMIC RAY PHYSICS

Cosmic Rays Measured from Gemini 11

First results from a novel "camera" carried on Gemini 11 to photograph the tracks of cosmic rays from space were reported to the American Physical Society meeting.

Only a sample of the 1,000 useful tracks obtained have been analyzed so far by a team of physicists from the U. S. Naval Research Laboratory and the National Aeronautics and Space Administration's Goddard Space Flight Center.

The camera was open to cosmic rays for 22 hours in the skin of the retroadapter section of the space vehicle. During that time a photographic stack consisting of a hundred layers of emulsion moved one-thousandth of an inch every minute with respect to a shallow stack above it. The relative motion of the two stacks provided a time history of the arrival of cosmic ray particles.

The tracks were developed chemically, then examined under microscopes. The identity of the nuclei causing the tracks can be inferred from the degree of blackening.

The densest track was left by a calcium nucleus, according to the principal investigator in the experiment, Dr. Maurice M. Shapiro of the Naval Research Laboratory. When track measurements are completed, the analysis of the data is expected to yield new information about the composition of cosmic rays, and to provide clues to their origin.

RADIO ASTRONOMY

Radio Telescope Planned

The man who runs the world's largest steerable radio telescope, the 250-foot dish antenna at Jodrell Bank in England, has announced plans to build an even bigger one.

Sir Bernard Lovell, who directs the University of Manchester's radio observatory with its several antennas, says his radio astronomy group is now designing a 400-foot dish, its surface to be kept true to within a quarter of an inch. The type of mounting has yet to be decided, but the cost is estimated to be about $12 million. There will be no protective dome.

The 250-foot dish now in operation has a surface of 12-gauge steel plate, weighs 88 tons and is suspended on two 180-foot towers. The entire telescope, towers and all, rotates on a circular track and can be aimed at any point in the sky with great accuracy.

Two smaller antennas, Mark II and Mark III, operate with the 250-foot dish as an interferometer to achieve greater precision.

ASTROPHYSICS

Probable Supernova Discovered

A very blue star, probably a supernova, has been discovered in the constellation of Ursa Major, of which the Big Dipper is a part.

A supernova is a star that suddenly, for reasons unknown, blazes forth with a brilliance often rivaling that of an entire galaxy of millions of stars. The new object is considered unusual because no parent galaxy, in which supernovas usually occur, is visible on plates taken with the 48-inch Schmidt telescope atop Mt. Palomar, Calif.

The very blue star was spotted by Drs. William J. Luyten and Jean H. Anderson of the University of Minnesota, who credit Dr. Allan R. Sandage of Mt. Wilson and Palomar Observatories with an assist.

The probable supernova is too faint to be seen without a large telescope. It has brightened at least 5.6 magnitudes since 1963. Astronomers around the world are being alerted by the Smithsonian Astrophysical Observatory to search their photographic plates for the beginning of the brightening.