

Physical Sciences Notes

NUCLEAR PHYSICS

Light Velocity Within Nucleus

The principle of microscopic causality assumes that signals do not travel faster than the velocity of light, even in the subnuclear distances inside a proton. This had previously been experimentally verified down to distances somewhat less than a proton radius, which is 10 to the minus 13 centimeters, by observing strong pion-nucleon interactions.

Now scientists using the Alternate Gradient Synchrotron at Brookhaven National Laboratory have verified the principle by direct pion-nucleon experiments down to distances considerably less than 10 to the minus 15 centimeters, and indirectly to distances less than 10 to the minus 16 cm.

Causality, a cornerstone of relativity theory, is thus verified down to distances between one-hundredth and one-thousandth the size of a proton radius.

The Brookhaven scientists used the highest energy pi meson beams available in the world, 29 billion electron volts, to check on the principle. The whole experiment was done with a "picket fence" slab of scintillators, recording reactions in a liquid hydrogen target, the events being automatically registered and analyzed by an on-line computer. Several million events were recorded each hour, Dr. S. J. Lindenbaum, the Brookhaven's group leader, reported to the American Physical Society meeting in New York.

The results are expected to hold up at much higher energies, Dr. Lindenbaum says.

COMETARY ASTRONOMY

Old Comet 'Hand' Discovers New One

The first new comet of 1967 has been discovered by the Japanese astronomer, Tsutomu Seki, who has previously been the first to spot several other comets.

Discovery of the faint object was confirmed by Dr. Y. Kozai of Tokyo Astronomical Observatory.

The fast-moving comet was detected on Feb. 4 in the constellation of Hercules, which rises in the eastern sky after midnight. It was then tenth magnitude and located at right ascension 18 hours, 13 minutes and declination 22 degrees, 21 minutes. Unless it brightens considerably, it will not be visible to the naked eye.

News of the discovery was telegraphed to observatories around the world by the Smithsonian Astrophysical Observatory, Cambridge, Mass.

NUCLEAR FUSION

New Fusion Instrument Proposed

A new research instrument, a superconducting Scyllac, a junior version of which is now in use in experiments basic to finding a way to control nuclear fusion, is included in the contingency budget for fiscal year 1968. The proposed instrument would be on the same principle but would be ten times as large as the one operating at the Atomic Energy Commission's Los Alamos Scientific Laboratory.

The method involves using "floating rings" to obtain

the complicated magnetic field required to contain the reacting plasma sufficiently long to permit accurate analysis of how thermonuclear energy could be tapped. Inclusion in the contingency budget means that construction of the instrument has been approved but the decision to proceed is deferred.

The apparatus is the "one major instrument on which all internal studies have been completed," a requisite to building a larger instrument, Dr. Fred L. Ribex said at the American Physical Society meeting in New York. Building the instrument and its associated electrical equipment will cost some \$8 million during the next five years, according to budget estimates.

The superconducting Scyllac involves suspending copper rings inside a doughnut-shaped vessel containing the gaseous plasma long enough for their magnetic field to give the required twist to the magnetic lines of force within which the plasma is contained. This produces "high beta plasmas in theta pinches."

SOLAR SYSTEM ASTRONOMY

Russian Almanac of Lunar Sky

Soviet astronomers have produced a lunar astronomical almanac containing data on the locations of stars as seen from the moon.

Star charts of the sky from earth become outdated after several years, but a star chart for the lunar sky must be revised after only several days. A group of astronomers at the Ukrainian SSR Academy of Sciences undertook the task of developing the principles necessary to compile a lunar astronomical almanac, under the direction of Avenir Yakovkin.

The precession of the earth's axis causes each pole to complete a cone on the celestial sphere every 26,000 years. The moon's axis has a precessional period of only 18.6 years, a situation that makes it extremely difficult to construct a star chart of the lunar sky.

HIGH ENERGY ACCELERATORS

Weston vs. Brookhaven Discussed

The Atomic Energy Commission's decision to build the world's largest atom smasher at Weston, Ill., instead of building onto the present facility at Brookhaven, N.Y., was defended by Commission spokesmen last week at hearings of the Joint Committee on Atomic Energy. Supporters of the Brookhaven site had claimed it would save money to locate the new 200-Bev accelerator there, where the 33-Bev accelerator is located.

Commissioner Gerald F. Tape admitted to the committee the accelerator at Brookhaven, presently the largest in the world, could be used as a first stage, or injector, for the planned 200-Bev machine, and that this might save about \$37 million of the estimated \$375 million cost. But he said that it would restrict the amount of research that could be done at the facility, and make it more difficult to keep at least one of the units operating.

He said that building a separate 200-Bev machine would not mean that the Brookhaven accelerator would languish, since research must be carried out at various levels of energy.