θ_{max} steradians, which corresponds to a reception of isotropic light equal to the amount received by a flat absorbing surface, reduced by the concentration factor of the collector.

The collector can assume at least two configurations—that of a single trough or alternately of a series of troughs overlapping a large heat-transfer device. This latter, "concentrated flat-plate configuration" could be made from very small troughs where the problems of excessive collector depth would be avoided. An infrared reflecting sheet of glass could cover the whole system to keep in energy reradiated from the troughs.

The Winston collector has many challenges ahead before its practicality is established. Many engineering considerations, especially with the "concentrating flat-plate configuration" must be tackled. The real-life efficiency of the collector has not been fully assessed and the economic feasibility of collecting energy with this type of device remains a question.

—RAS

Proposals for PEP and ISABELLE submitted

Two proposals for major high-energy physics research installations were received by the Atomic Energy Commission this Spring. A 30-GeV center-of-mass energy electron–positron colliding-beam facility is the subject of a joint Stanford University and University of California proposal submitted in April. The other proposal, submitted in May, comes from Brookhaven National Laboratory and spells out the particulars of ISABELLE, a proton–proton intersecting storage accelerator where center-of-mass energies of up to 400 GeV would be available.

The California facility, a collaboration of the Stanford Linear Accelerator Center and the Lawrence Berkeley Laboratory, is dubbed "PEP" (high-energy positron–electron colliding-beam project). It is planned for construction at SLAC. It is a follow-on to SPEAR, the existing electron–positron storage ring that has been in operation since 1972 and is now expected to reach a total center-of-mass energy of 9 GeV early in 1975. PEP's preliminary cost estimate is $50–60 million, and if construction approval comes for FY 1976, beam operation could commence during 1979.

High-energy electron–positron colliding-beam storage rings have opened up a new physical region for the study of elementary particles and their interactions. When the colliding electron and positron annihilate, the energy produced can rematerialize into combinations of all of the presently known elementary particles. Thus, data can be obtained about the structure and interactions of these particles in a new experimental regime. Recently, experiments at the Cambridge Electron Accelerator and SPEAR at Stanford have called into question many popular theoretical ideas—ideas involving substructure within the nucleon that have been so successful in explaining a host of experiments (PHYSICS TODAY, March, page 17). PEP would extend the center-of-mass energy available for such experiments from 9 to 30 GeV, where new information is expected.

PEP has been designed as a six-sided structure with a perimeter of 2170 meters. The laboratory energy of each counter-rotating beam would range to 15 GeV. This would provide up to 30 GeV for collisions in the electron–positron center-of-mass system. The circulating current would be 100 mA with a peak luminosity at 30 GeV of 10^{32} cm^{-2} sec^{-1}. The peak luminosity requires the delivery of 5 MW of rf power to the beam to make up for energy loss by synchrotron radiation.

The design calls for six interaction regions for experimental apparatus; 20 meters of free space is centered on each region. Considerably larger distances would be available at angles greater than about 3 deg. to the beam line. The system had originally been planned to have two rings, one for electrons and positrons, the other for protons. It had the same acronym (PEP) although it stood for "proton–electron–positron" (PHYSICS TODAY, September 1972, page 18). The system would now be set up initially with only the electron–positron ring. Construction would be carried out to maintain compatibility with the possible later addition of a superconducting proton ring (with energies up to about 200 GeV) and/or a second electron ring, for electron–electron or positron–positron studies.

During 5–30 August potential users are to convene for summer study sessions at LBL to work out specific recommendations for a first complement of experimental and support facilities. Chairman of the study's steering committee is Karl Strauch (Harvard).

The proposed Brookhaven accelerator would be used together with the existing 33-GeV Alternating Gradient Synchrotron, which would serve to stack currents of protons as high as 10 A. The 400-GeV ISABELLE would provide center-of-mass energies nearly seven times that available at CERN (the 60-GeV Intersecting Storage Rings). It also far exceeds the useful energy available from the 400-GeV proton beam at the Fermi National Accelerator Laboratory, where the beam strikes a stationary target. The estimated cost for ISABELLE is $125 million. If funding for the proposal comes soon, completion of installation and the start of system testing is scheduled for 1980.

It is expected that the high energies of ISABELLE will help to provide a theoretical framework to unify weak and electromagnetic interactions. Theories to unify these forces postulate the existence of intermediate vector bosons with rest masses above 37 GeV. Storage rings with protons of 100 GeV each should produce these particles—a failure to do so would create problems for these theories. Although the unitarity limits of other interactions are higher (for lepton–lepton interactions it is 300 GeV, for hadron interactions it may be near 600 GeV), the effective strengths of weak, electromagnetic and strong interactions become sufficiently close at ISABELLE energies to allow new observations to be carried out. The accelerator's higher energies will also allow further investigation into the possible internal structure of protons and neutrons.

ISABELLE is a "square" circle with a 2690-meter circumference. It is in the nearly straight 250-meter long insertions in each of the four quadrants that the beams are brought into the horizontal plane and made to collide. The vacuum to be maintained in these experimental sections is expected to be 10^{-11} torr or better, the energy gain per turn is 12.5 kV and the expected luminosity is 10^{33} cm^{-2} sec^{-1} (PHYSICS TODAY, February 1972, page 20).

Of key importance to the proposed accelerator is the superconducting magnet system. It is designed to produce fields of 40 kG with possible upgrading to 60 kG (and hence, the possibility of 600-GeV center-of-mass energies). Despite the high magnetic field and a 10% higher capital cost over a conventional magnetic system, lower electric-power consumption favors the superconducting system—35 GWh/year compared to 90 GWh/year for the conventional system.

Both rings in ISABELLE would be electrically and magnetically independent to permit experiments of unequal energies and to allow antiproton–proton collision experiments. Other experimental projects are possible involving electron–proton interactions by adding an electron ring. Work is also underway to accelerate deuterons in the Alternating Gradient Synchrotron for possible introduction into ISABELLE for deuteron–deuteron or deuteron–proton experiments.

A special subpanel of the High-Energy Physics Advisory Panel was recently formed by the Atomic Energy Commission to advise the AEC on high-energy facility construction program proposals. The panel, headed by MIT's Victor Weisskopf, had been asked for at least a preliminary report by the end of July.

—RAS □