



Penning electron trap in which Hans G. Dehmelt and his colleagues can levitate single electrons in microscopic metastable orbits for periods of several days. This tube has a 4-cm diameter.

linois, and by R. Carroll of the University of Michigan), though not quite so precise, are also in agreement. In these results, analytical values for some Feynman diagrams obtained by Levine, R. Roskies (University of Pittsburgh), E. Remiddi (CERN) and others are incorporated.

Comparison between different experiments is most conveniently done by computing α , the fine-structure constant, from theory and experiment. The new measurement of α_e by Dehmelt's group, together with the QED calculation, leads to a value of α good to three parts in 10^7 .

The fine-structure constant can be obtained independently from the Josephson effect, to two parts in 10^7 . (No other method for α is currently within a factor of three of this precision.) The agreement between the two values of α is very good. The conclusion is that QED is very sound to this order, and that Bardeen-Cooper-Schrieffer theory (via the Josephson effect) is sound also—unless, of course, QED and BCS theory are both in error to the same extent, which appears unlikely.

What are the prospects for further improvement? QED calculations are expected to improve by a factor of ten or so when more of the 72 Feynman diagrams in the sixth-order calculations are solved analytically; 51 of them have been solved so far. Four years ago, when Kinoshita completed his calculation of α_e , only a few were known analytically, and he did them all numerically. Merely by pushing the numerical method further, Kinoshita thinks he can get a five-fold improvement in the calculation. Meanwhile, analytic evaluation is also being pushed vigorously.

Dehmelt's group expects further improvement in their data, too. They point out that their dimensionless ratio v_e/v_c is already the most precisely known characteristic parameter of any elementary particle, but they confidently expect even further refinement in the method to yield accuracies of a few parts in 10^8 in α_e . In the near future they hope to make the same measurements on the positron, to yield the most accurate comparison of a particle-antiparticle parameter.

"There's not much competition in that field," Dehmelt told PHYSICS TODAY, noting that the only measurement since the early work of Rich's group at Michigan is an electron-positron comparison, made in the storage rings at the Nuclear Physics Institute at Novosibirsk, yielding accuracies only around one part in 10^5 .

—JTS

References

1. R. Van Dyck Jr, P. Ekstrom, H. Dehmelt, *Nature* **262**, 776 (1976); H. G. Dehmelt, *Nature* **262**, 777 (1976).
2. R. S. Van Dyck Jr, P. B. Schwinberg, H. G. Dehmelt, *Phys. Rev. Lett.* **38**, 310 (1977).

Shuttle has space for long-term experiments

Opportunities for getting experiments aboard the Long Duration Exposure Facility (LDEF) are now being offered by the Universities Space Research Association, under the sponsorship of NASA.

In 1979 NASA will begin launches every half year of LDEF, which is a large unmanned structure capable of carrying over 70 experimental packages. This satellite will be carried aloft by the Space Shuttle, left to orbit for a period of 6–9 months and then brought back to Earth where experimental packages will be returned to the experimenters for analysis. The orbital environment provides weightlessness, high vacuum, and fluxes of solar radiation, micrometeoroids and charged particles over a large energy range.

Experiments are being sought in all fields of science and technology, but particularly from academic scientists. Physicists are encouraged to submit proposals in astrophysics, cryogenics, plasma physics and fluid dynamics. The Universities Space Research Association plans to reserve space for experiments from student groups.

Once a proposal has been approved, the Association will assist experimenters in obtaining research funding and in all other phases of experiment development and management. NASA will provide preflight acceptance testing, orbital flight

and return for experiments.

Outlines for proposals and ideas should be sent to M. H. Davis, USRA, PO Box 3006, Boulder, Colo. 80307.

NASA seeks ideas for solar-energy conversion

The National Aeronautics and Space Administration has issued a request for ideas, concepts and suggestions that would assist the agency in formulating research objectives in solar-energy conversion in space. Research at present is based on photovoltaic devices and thermal engines and, according to NASA, approaches other than these may be more effective and could make better use of the environment in space.

Ideas and concepts that are sent to NASA should center on systems that are located in space (near Earth) and, in principle, are capable of highly efficient energy conversion. Systems scalable to megawatt and gigawatt power levels are needed for potential applications in space and for transmission of energy to Earth.

NASA considers this solicitation a planning phase and, therefore, only sufficient information to permit consideration of ideas as part of an overall planning effort is required. NASA may, if further effort is justified, issue a separate announcement-of-opportunity or a request-for-proposals to pursue those objectives developed in this planning phase.

Ideas should be submitted no later than 31 March to NASA Headquarters, Code RR, Washington, D.C. 20546. Any concept description that would disclose proprietary information should not be submitted as it may serve as the basis for a further solicitation of proposals.

in brief

The CERN Super Proton Synchrotron began experiments on 7 January with nine experiments on the floor. On 13 December a 400-GeV beam had been extracted with an intensity of 4×10^{12} protons/pulse.

Among the building expenditures associated with the PEP Project (a joint effort of SLAC and Lawrence Berkeley Laboratory), ERDA has approved a \$28-million contract for the design and construction of housing for research equipment. This contract was signed by Stanford University and the joint venture of Kaiser Engineers (Oakland, Calif.) and Parsons, Brinckerhoff, Quade and Douglas Inc (San Francisco, Calif.).

The 100-inch Irénée du Pont Telescope of the Hale Observatories was recently dedicated at Las Campanas Observatory in Chile. □