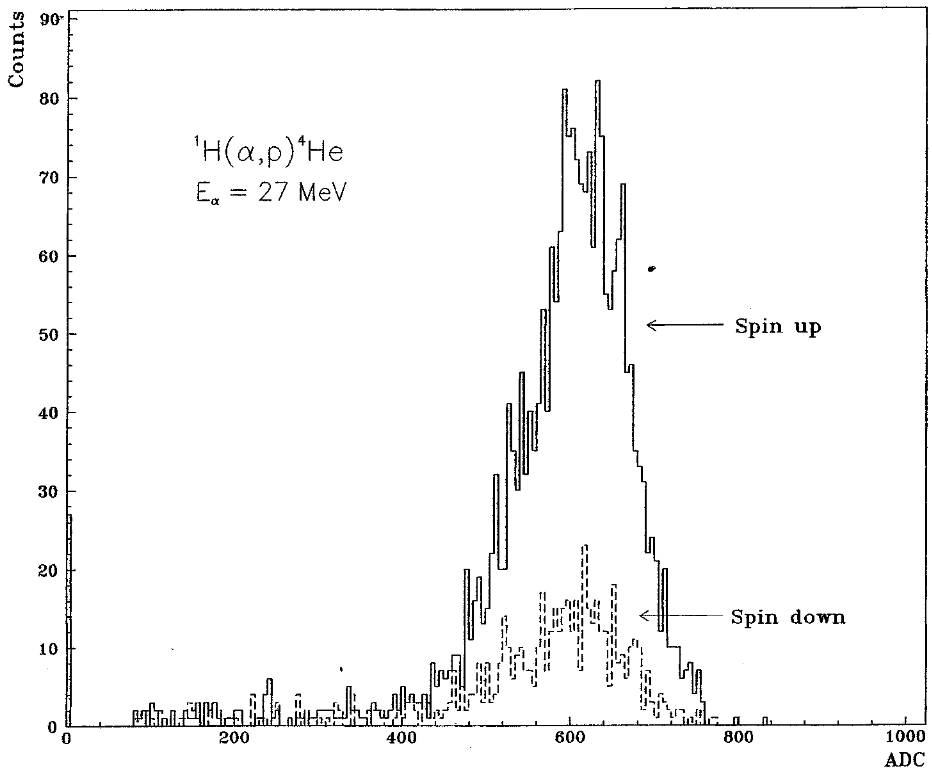
The polarized hydrogen target for storage rings developed by the FILTEX Heidelberg/Marburg/Munich/Madison collaboration has been successfully tested in Heidelberg's TSR low-energy cooler ring. Stored 27 MeV alpha beams were used to determine target density and polarization with recoil protons detected by counters either side of the beam axis. the measurement took about 10 minutes.



hydrogen polarization is conserved, although the atoms undergo about 500 wall collisions before leaving the cell. This demonstrates the high quality of the cell coating developed by the Wisconsin group. Another important result was that after several days of running with alpha beams between 50 and 300 microamps no deterioration of the target polarization was observed.

Due to the very short run time of about 10 minutes, the dependence of target parameters on cell temperature and long-term stability could be studied for the first time with high precision. The results show that a polarized storage cell in a storage ring is reliable and highly efficient. For a FILTEX-type target in a proton ring (with just one hyperfine level in a weak guide field) densities of about 5×10^{13} atoms per sq cm with polarization in excess of 80% can be produced.

For a HERMES-type target in an electron ring (two hyperfine substates in a strong guide field) densities of more than 10^{14} per sq cm with 80 or 90% polarization can be expected.

From Erhard Steffens

LOS ALAMOS Hadron future

At a Workshop on the Future of Hadron Facilities, held on 15-16 August at Los Alamos National Laboratory, several speakers pointed out that the US physics community carrying out fixed target experiments with hadron beam had not been as successful with funding as it deserved. To rectify this, they said, the community should be better organized and present a more united front.

The two-day informal workshop was organized by the Los Alamos Meson Physics Facility (LAMPF) Users Group immediately preceding its annual Users Meeting. The workshop focused on how the fixed target, hadron beam community might implement its physics goals in the context of a rapidly changing and uncertain budget situation at the US Department of Energy (July, page 18).

Speakers from Laboratories in the US, Canada, Japan and Europe described the range of activities under way and possible plans for the future. As well as examining the situation community-wide, the workshop looked specifically at the dialogue on future plans at LAMPF, to broaden the scope and perspective in which this dialogue takes place, and to begin building a broader community of researchers interested in fixed-target hadron-beam physics.

Although the hadron energy range extends from 1.5 to 150 GeV, the physics of these machines focuses on two main areas. The first is understanding quark interactions in the region where quarks are confined inside nucleons. This would range from studying subtle ('higher twist') corrections to perturbative quark field theory calculations at the upper end of the energy scale, to examining hadron spectroscopy, including the possible modifications arising when the hadrons are created in the nuclear medium.

As well as complementing what can be done at electron machines, this work also provides measurements and models that eventually will be required to understand new heavy ion collider data. Another focus is high precision tests of the Standard

Model. Studying rare decays at ultra high precision can probe an energy scale well beyond what is achievable even at the new generation of superconducting proton colliders.

The meeting showed that there is a broad based community interested in this physics which should moreover present a more coherent front to the funding agencies. For their part, LAMPF users will continue to discuss future plans for the Laboratory to provide a better focus in the broad context emphasized at the Workshop .

From David J. Ernst
Chair, LAMPF Users Group

Physics monitor

We still love SUSY

Supersymmetry, affectionately known as SUSY, is still the darling of theoretical particle physics. Invented some 20 years ago, the charismatic idea really took off at the beginning of the 1980s. At the time, a workshop at CERN reflected the youthful enthusiasm for these new ideas.

Despite experimenters hunting high and low, and with theorists never wavering in their devotion, SUSY has remained aloof. However mature SUSY suitors are reluctant to abandon their fascination. The continuing love affair was underlined in a latest CERN workshop – 'Ten years of SUSY confronting experiment' – organized by John Ellis, Dimitri Nanopoulos and Aurore Savoy-Navarro.

Opening the meeting, CERN Theory Division Leader John Ellis reminded the audience of the basic motivations behind SUSY.

The current Standard Model of physics uses the electroweak picture, unifying electromagnetism with the weak force, in tandem with the field theory of quarks and gluons (quantum chromodynamics – QCD).

The next logical step is to unify QCD and the electroweak picture, in the same way that the latter unifies electromagnetism and the weak force. On paper this can be achieved, but the typical mass scale of the resultant Grand Unified Theory (GUT, where all the forces blend into one) is of the order 10^{15} GeV, in stark contrast to the 100 GeV or so of the electroweak picture. This awesome chasm between one unification and the next – the 'Hierarchy Problem' – is difficult to swallow.

Constructing Grand Unified Theories brings other problems. The Universe is expanding only very slowly, with its initial explosive Big Bang now stretched out into a gentle heave, requiring only a small 'cosmological constant' to counter the pull of gravity. On their own, GUT field theories give an absurdly high value for this parameter. As well as making a more comfortable cosmological constant, SUSY also provides a natural scenario for particles with the relatively small masses we are used to.

What is supersymmetry? Normally, particles come in two kinds – the quarks and leptons which are the source of the basic fields; and the photons, Ws, Zs, and gluons which carry the forces between these source particles. Quarks and leptons are 'fermions', obeying the quantum restrictions of the Pauli Exclusion Principle. The field particles on the other hand are 'bosons' with no such quantum accommodation restrictions.

SUSY gives each fermion field particle a boson 'spartner', and vice versa, doubling the total number of particles on the menu. Quarks pair with 'squarks', leptons with 'sleptons', photons with 'photinos', etc.

As well as having amusing names, these additional particles provide an immediate potential source of 'dark matter' – the as yet invisible material which nevertheless has to provide the bulk of the mass of the Universe. Of all the SUSY particles, the most interesting is the lightest (probably the photino). The SUSY particles