ing collisions of the exotic atom with ordinary neighbouring helium atoms and it was just these collisions which were supposed to short-circuit the slow route of the 'intruder' into the nucleus via successive electromagnetic transitions.

The stable antiproton is evidently a much better tool for studying this phenomenon than the unstable negative kaon. It was also clear to the Tokyo group that the properties of the antiproton beam required for a thorough investigation of the effect make CERN's LEAR low energy antiproton ring the world's only conceivable machine for the job.

No time was lost in moving the experiment to CERN, now as a Tokyo/Munich/CERN collaboration (Experiment PS205). Only eight months after the KEK result, a short test run produced similar effects at LEAR, this time in the gaseous phase and in helium-3 as well as helium-4.

Many questions remain to be answered. Is the Condo trapping mechanism the correct one? Is the effect unique to helium? Does the lifetime depend on the physical/chemical state of the stopping substance, and are there potential applications in exotic atom chemistry?

Four further weeks of running are scheduled this year during which the collaboration plans to answer some of these questions by looking at these trapped antiproton states in solid, liquid and gaseous helium-3 and helium-4. Further projects are underway to detect visible light produced in the deexcitation process and to pump the metastable atoms with lasers, perhaps prolonging their lifetime even further and permitting high precision spectroscopy. It may even prove possible to catalyse antihydrogen production via chemical reactions of the metastable atoms with positrons or positronium.

Schooling

An important CERN contribution to education is its regular Physics Schools in Member States and further afield. These bring together postgraduate students and young research workers, creating valuable additional opportunities for young scientists.

The two-week School of Physics, established in 1962, is held in a different country each year. Since 1970 it has been organized in alternate years with the Joint Institute for Nuclear Research (JINR), Dubna, near Moscow, and located alternately in Eastern and Western Europe. The twelfth joint CERN-JINR School, held in Alushta in the Crimea last May, attracted about 100 students from 18 countries.

The organization of the School now has been modified following recent political evolution. From next year there will be an annual CERN European School of High Energy Physics. JINR will be represented on the Organizing Committee and the location will rotate among all European countries, including the Commonwealth of Independent States. In 1993, Poland will host the first such School.

This year's School takes place from 13-26 September in Monschau, near Aachen, Germany.

Also this year is the 4th Hellenic School of Elementary Particle Physics, to be held in Corfu from 2-20 September. It will be a basic course on the Standard Electroweak Model and Quantum Chromodynamics. The School Secretary is Ms. V. Veziri, Physics Department, National Technical University, 157 73 Zografou, tel/fax (+30 1) 778 4541, telex 221682 NTUA GR.

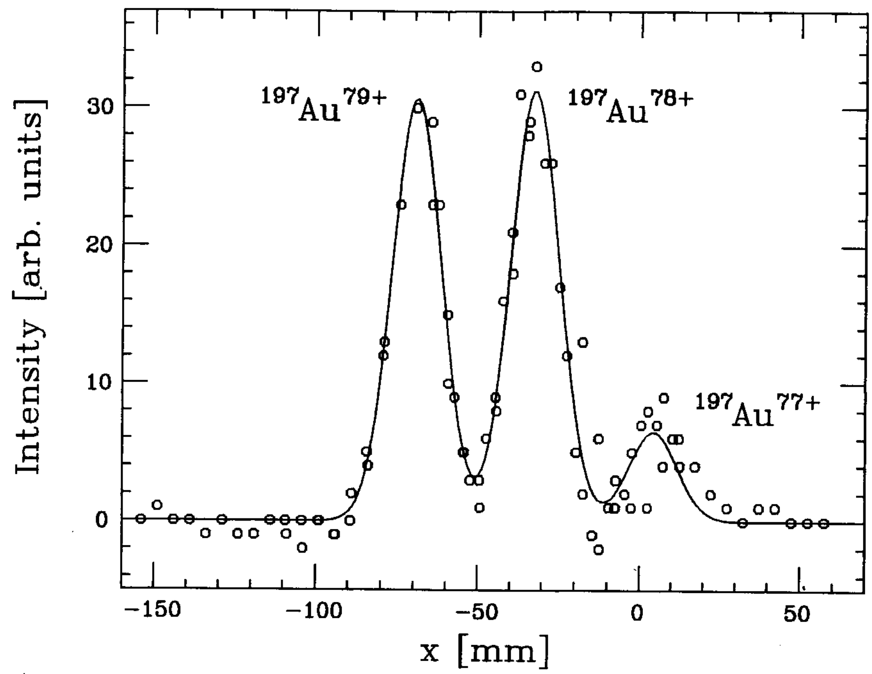
BROOKHAVEN
High energy gold

On April 24, Brookhaven's Alternating Gradient Synchrotron (AGS) started to deliver gold ions at 11.4 GeV per nucleon (2,000 GeV per ion) to experimenters who were delighted not only to receive the world's highest energy gold beam but also to receive it on schedule.

High energy gold beams mark the culmination of the development of the AGS into a fully functioning complex capable of delivering high energy heavy ions of almost any sort. It also promises well for the experimental programme at the RHIC high energy ion collider now under construction at Brookhaven, which will use the AGS as injector.

The beam starts in the Tandem Van de Graaff which every three seconds produces a pulse of 10^9 gold ions of charge +33 and kinetic energy 1 MeV per nucleon. They are transported through a 550 metre transfer line to the new AGS Booster, which accelerates the ions to 0.75 GeV per nucleon by r.f. bunch coalescing. Initially, the very slow heavy ions are collected in the Booster ring in 48 r.f. bunches. During acceleration, as the ions approach a respectable speed, the 48 bunches go through four steps of coalescing two bunches into one (48, 24, 12, 6, 3), reducing the required swing in the r.f. frequency by a factor of 16.

1.5×10^8 ions of gold 33+ are extracted from the Booster and stripped in a 0.05 mm copper foil to yield beams of highly stripped gold ions. Not everything ran smoothly. The AGS injection was initially set up on the fully stripped gold 79+ beam, but it was promptly shut down by a very rare April thunderstorm. In



Brookhaven gold. After acceleration in the Alternating Gradient Synchrotron (AGS) Booster to 0.75 GeV/c per nucleon, the gold 33+ beam passes through a 50 micron thick copper stripping foil in the transfer line to the AGS. This shows the charge distribution of the gold beam after the stripping foil measured with a multiwire profile monitor downstream of two analyzing bending magnets.

the recovery process, the injection was inadvertently set up for gold 78+. This beam was subsequently accelerated in the AGS and extracted to the experiments. When the error was discovered, it seemed best to leave well enough alone; so the program is operating, rather mysteriously to many, with gold 78+!

The AGS accelerates the nearly fully stripped gold from 0.75 GeV per nucleon to 11.4 GeV per nucleon and then delivers the beam of 10^7 ions per pulse to a total of 11 experiments on four different beamlines. The experiments include four searches for quark gluon plasma or exotic matter using counter techniques and seven small experiments that use either emulsion or track detector stacks.

The gold beam presently being extracted from the AGS is essentially the one which will be used in experiments for the next several years and which eventually will be injected into the Relativistic Heavy Ion Collider (RHIC), presently under construction. RHIC will accelerate the ions to 20 TeV per ion (100 GeV/nucleon) giving an ion collision energy of 40 TeV.

From Ed Bleser

FERMILAB
Preparing to collide

Against the background of stringent Environment, Safety and Health (ES&H) regulations mandated by the US Department of Energy for all national Labs, Fermilab prepared to mount the next major Tevatron proton-antiproton collider run.

The Tevatron Collider was last in action in 1989, when a very successful one-year run exceeded all expectations for the number of proton-antiproton collisions recorded. This time the big CDF detector is joined by D0 (March 1990, page 6), one-third the way round the four-mile Tevatron ring. For the first time, two major detectors will operate at the Collider.

The stakes are high as the big prize is the sixth ('top') quark, where data collected across the board suggest that the long-awaited final constituent of hadronic matter should finally be within reach. These indications – consistency arguments from Z decays at CERN's LEP electron-positron collider, supplemented by other data, notably neutrino experiments – are substantially reinforced by results from CDF, which have established that the top quark has to be heavier than 89 GeV.

The upgraded CDF detector employs improved triggering to exploit higher proton-antiproton collision rates, together with a silicon microvertex detector to pick up transient particles decaying near the collision point, improved central tracking and increased muon detection.

With a major physics discovery on the cards and with two detectors at work, each inverse nanobarn of Fermilab's integrated luminosity will be eagerly scanned.