

assembled for a test of a full cell of four magnets.

The plan for RHIC as a whole was recently reviewed by a technical committee headed by Bill Willis of CERN. The review was timed to coincide with the final preparation of an updated proposal. The report of the committee was extremely favourable, summarizing the level of preparation by stating: 'The RHIC project is now technically ready to proceed to construction.'

Hot little bangs

What might happen when two heavy nuclei, such as uranium, smash together at energies as high as those now used by particle physicists — of the order of 100 GeV per nucleon?

Nobody knows for sure what will happen, but there is no shortage of opinions on what might happen. These ideas, and the techniques for investigating them, were the subject of 'Quark Matter 86', the fifth International Conference on Ultra-Relativistic Nucleus-Nucleus Collisions, held from 13–17 April in Asilomar, California. Organized by Berkeley, the meeting brought together some 160 physicists from the nuclear physics and particle physics subcultures.

Although there is precious little data on these collisions other than a handful of cosmic ray events, this has not deterred theoretical speculation. The consensus conclusion is that if enough energy is pumped into a nucleus, normally considered as a loosely bound collection of protons and neutrons, it will eventually transform into a completely new state: the protons and neutrons will lose their separate identity and fuse together into the quark-gluon plasma or 'quag-

ma'. The whole Universe could have been in such a state a few microseconds after the initial Big Bang, and quagmas may still exist, for example in the cores of neutron stars.

Even if synthetic quagmas can be produced, it will not live long, exploding in some 10^{-23} seconds into several thousand (for uranium on uranium) particles, which will carry information to the waiting detectors about the highly transient initial state. Expected signatures include an overabundance of strange particles and flashes containing several hundred photons, as well as fluctuations in particle density ('hot spots'). Searching for these effects in the copious debris may not be easy.

Late in its career, the CERN Intersecting Storage Rings were used to study the collisions of high energy alpha particles (helium nuclei), but these are too light to provide quagmas. However Brookhaven is preparing to accelerate ions up to sulphur in the Alternating Gradient Synchrotron with energies up to about 15 GeV per nucleon, while CERN has scheduled the acceleration of oxygen ions to 225 GeV per nucleon.

Whether or not these initial studies see any signs of quagmas, there is a strong case for pushing on to the ultimate conditions provided by the Relativistic Heavy Ion Collider, RHIC, being pushed by Brookhaven for its still vacant tunnel built for the Isabelle-CBA project (see page 5).

A RHIC workshop will be held at Brookhaven in about a year, and is expected to get to grips with designing experiments for the RHIC project. (Those interested should contact T. Ludlam at Brookhaven.)

From Mike Albrow

LOS ALAMOS Proton milestone

In December, the Proton Storage Ring at the Los Alamos Meson Physics Facility (LAMPF) passed a major milestone when it operated at up to 30 microamps average beam current to service the experimental programme at the Laboratory's Neutron Scattering Center.

The Proton Storage Ring is a major addition to LAMPF's existing high current proton linear accelerator, accumulating large numbers of protons from the linac and delivering them to the neutron generating target in intense short pulses.

Operation at 30 microamps was achieved by accumulating 1.5×10^{13} protons per pulse in the storage ring at a repetition rate of 12 pulses per second. Circulating beam current losses were estimated to be less than two per cent on the basis of beam lifetime measurements at reduced repetition rate and long storage times. Losses at extraction are at a comparable level.

The present achievement demonstrates performance at 30 per cent of the design goal (at 12 Hz) and has been accomplished early in the commissioning cycle. Commissioning work at the Neutron Scattering Center will continue when beam resumes after a six-month shutdown. Major goals for the next phase are to increase current, decrease beam losses, and achieve stable use for the neutron scattering program.

Experiments in powder diffraction, chemical spectroscopy, and condensed matter physics are underway with some publishable results expected from present data-taking.