

Unexplained — five examples of an isolated muon with a broad production of hadrons as seen by the JADE detector in high energy electron-positron annihilations in the PETRA ring at DESY, Hamburg. At the International Lepton-Photon Symposium at Hamburg at the end of July, the VENUS detector at TRISTAN reported preliminary evidence for these events. A report of the meeting will appear in our October issue.

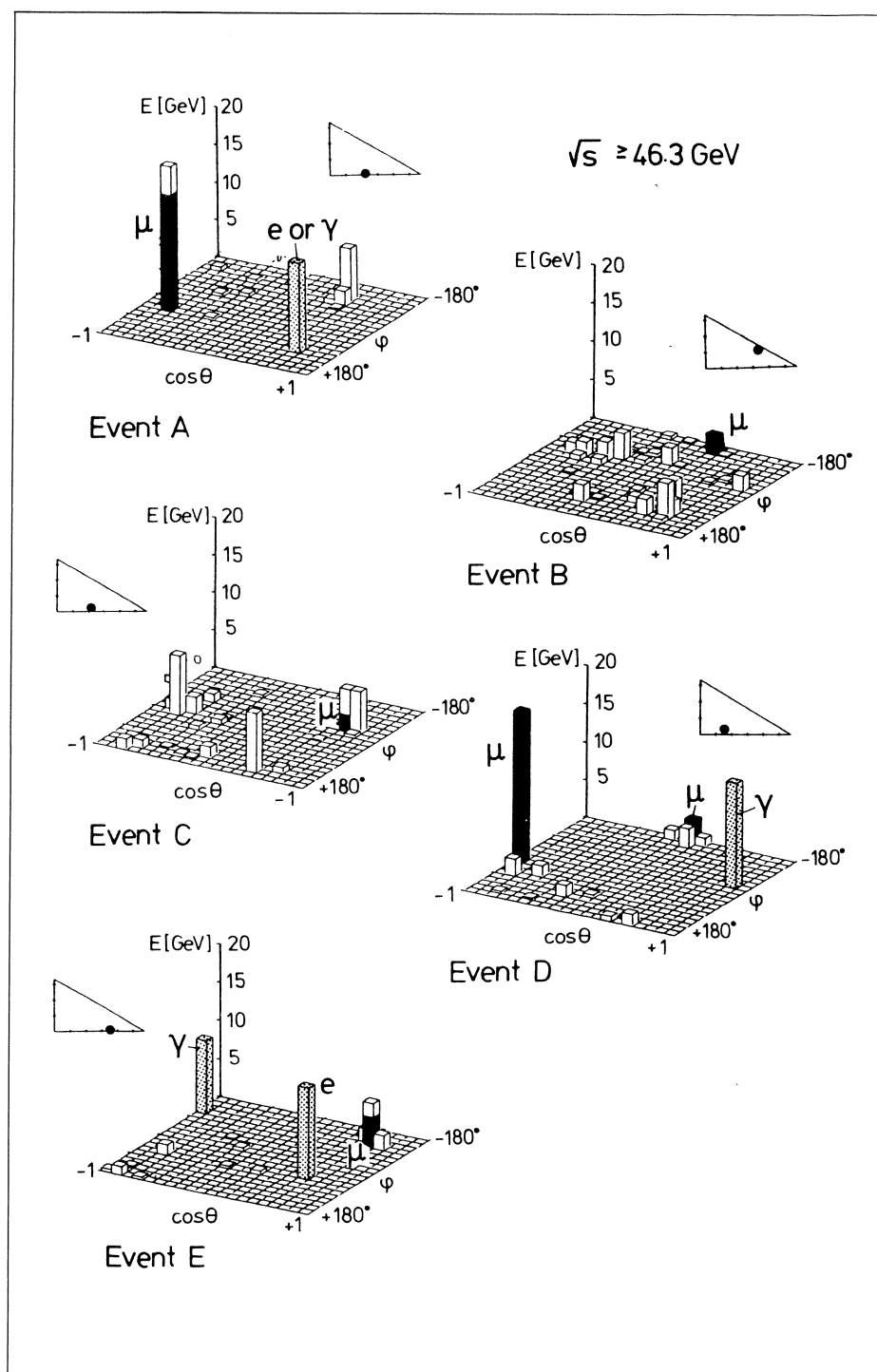
and a 100 cm 20-cell cavity) in a phase-locked mode. This success was reached after simultaneous electronic tuning of the high-Q accelerating cavities, very sensitive to mechanical vibrations.

The 130 MeV accelerator, designed mainly for nuclear physics research, has been planned and installed by a Wuppertal/Technische Hochschule Darmstadt collaboration after a successful test of a homemade superconducting linear accelerator with a five cell prototype cavity (see October 1982 issue, page 326). It consists of a 10 MeV injector (housing a five-cell capture section and two 20-cell niobium metal accelerating structures) and the 40 MeV main linear accelerator (with 8 more 20-cell structures). The electron beam is then recirculated twice isochronously back into the main linac yielding electron energies of 90 MeV and 130 MeV, respectively. The anticipated cw current of the beam is more than 20 microamps.

The accelerating cavities developed at Wuppertal and manufactured at Interatom, Bensberg, W. Germany, are of the now standard spherical design. They are operated at a frequency of 2997 MHz and a temperature of 2 K. Quality (Q) factors and accelerating fields are around some 10^9 and 5 MV/m respectively.

So far the electron gun, the 250 keV preaccelerator, chopper and prebuncher and the superconducting injector linac have been in operation, although much more equipment has been installed.

After the successful first acceleration tests more tests are scheduled in which the second 20-cell structure in the injector and two more 20-cell structures of the main linac will be added and operated in a phase-locked mode. Experi-



ence with the first beam recirculation through the main superconducting linac will soon be gained.

DESY Peephole?

In 1984, all available space at the PETRA electron-positron collider at the German DESY Laboratory was crammed with extra radiofrequency power in a bid to push the collision energy as high as possible.

In a hectic few months which left their mark on the Laboratory's

electricity bill, PETRA's collision energy went above the 45 GeV design figure, eventually attaining almost 47 GeV (see January/February 1984 issue, page 16).

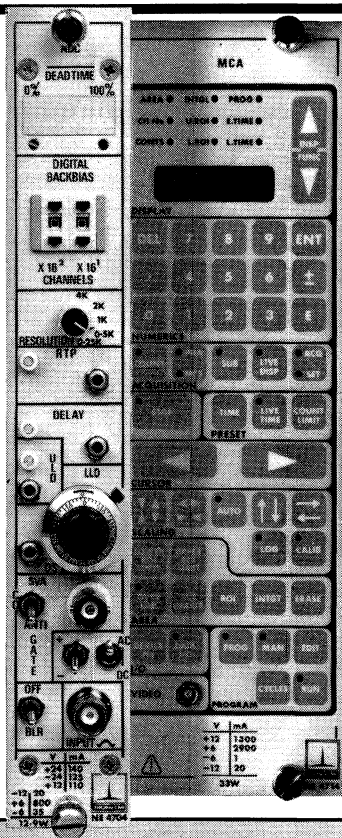
The experiments eagerly scanned for the onset of new behaviour resulting from heavy particles, such as the sixth ('top') quark. However 47 GeV was not high enough to reach the top, so that the sixth quark had to await higher collision energies. The waiting continues.

But the Mark J detector at PETRA did see something else. Looking at produced hadrons accompanied by penetrating muons, Mark J found seven high collision

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energy examples of a broad spread of hadron energy accompanied by a very isolated muon.

Based on what was seen at lower collision energies, only about one such event was expected. Picking up eight was suspiciously interesting, but at the time none of the other three PETRA experiments had anything to report.

The PETRA machine was not able to remain in this high energy region for long, and the matter remained closed for a while. Then the JADE collaboration presented a new analysis of the high energy data, concentrating on the search for isolated muons or electrons. Five examples were found of an isolated muon accompanied by a

broad hadron signal, consistent with the Mark J findings. No such effect was seen with electrons.

The CELLO group found only one example of an isolated muon accompanying a broad spread of hadrons, consistent with what they saw at lower collision energies. The group concluded that the data 'do not support the observations of the Mark J and JADE collaborations of an excess of muon events of this type'.

At a meeting in Santa Monica earlier this year, physicists looked at the possibilities of quarks and leptons heavier than those already known (or, in the case of the 'top' quark, firmly anticipated). Any such particles would have immediate

consequences for the cosy interpretation of modern particle physics in terms of just three 'families', each containing two (known) quarks and a lepton.

Harald Fritzsch admitted that the interpretation of the Mark J and JADE signals was 'unclear'. He hinted that PETRA could have been falling just short of an important new threshold, so that experiments had 'just a short look through the peephole before the slide came down'.

The new TRISTAN electron-positron collider at the Japanese KEK Laboratory should certainly enlarge any such peephole.

Physics monitor

Hadron spectroscopy 1987

With much particle physics research using particle beams to probe the behaviour of the quark constituents deep inside nucleons and other strongly interacting particles (hadrons), it is easy to overlook the progress being made through hadron spectroscopy — the search for and classification of rare particles — and the way it has increased our understanding of quark physics.

One way of remedying this was to attend the stimulating and encouraging Hadron 87 meeting held earlier this year at the Japanese KEK Laboratory, where Jonathan Rosner from Chicago's Enrico Fer-

mi Institute gave the concluding talk.

'Questions that were asked as long as twenty or more years ago are actually being answered,' he observed, thanks to the patient efforts of experimentalists and theorists. We need to be more bold in sharing these pleasures with students, for the study of new spectroscopies... builds on the old'.

A comparison of the 1974 and 1987 classifications of mesons (composed of a quark and an anti-quark) underlined the progress made in recent years. Many conventional spectroscopy labels (radial and angular momentum excitations — as in atomic physics) are needed, while candidates have been found for a variety of exotic states.

Jon Rosner — answering questions from twenty or more years ago.

