

CERN Courier Archive: 1974

A LOOK BACK TO CERN COURIER VOL. 14, MARCH 1974, COMPILED BY PEGGIE RIMMER

SERPUKHOV

4th joint experiment

The 4th electronics experiment to be carried out under the agreement between CERN and the Institute for High Energy Physics at Serpukhov was installed at the IHEP 76 GeV proton synchrotron in October 1972. It has now gathered a large amount of data.

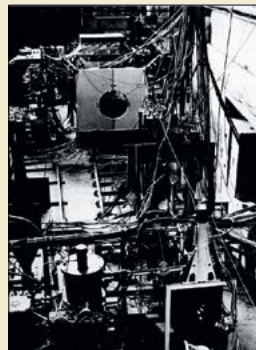
The experiment, involving physicists from Karlsruhe, Pisa, Serpukhov and Vienna, studies the charge exchange interaction $\pi^+ + p \rightarrow n + \text{neutrals}$. The Karlsruhe and Pisa groups had examined this interaction at the CERN PS, detecting γ -rays and neutrons in coincidence. They were interested in carrying the study to higher energies, extending the mass range available for $\pi^0\pi^0$ and searching for higher mass resonances. A Serpukhov group, led by Yu D Prokoshkin,

having completed an optical spark chamber experiment, was interested in gathering higher statistics on the interaction giving a neutron and a single neutral pion.

On the assumption of charge independence for the pion-nucleon interaction, the amplitude for charge exchange is determined by the difference between the amplitudes for elastic π^+p and π^-p scattering. The charge exchange reaction is also considered the most suitable for testing the Regge picture of high-energy interactions, central to many recent theoretical models. From both points of view, the high statistical and systematic accuracy expected in the new experiment is essential.

● Compiled from texts on pp83–84.

The Serpukhov experiment. In the foreground is the hydrogen target which is bombarded by a negative pion beam. Hidden in the concrete blocks on the right is the neutron detector. In the rear is the online gamma detector.



VILLIGEN

First pions at SIN

Protons were accelerated to full energy in the ring cyclotron of the Swiss Institute for Nuclear Research, SIN, for the first time on 18 January. A 590 MeV beam has been extracted and pions have been detected from the first target.

During the coming two months, another pion beam will be installed and three experiments around the first target will be made ready. By midsummer, the area around the second target will become operational together with two more pion beams and the neutron time-of-flight path. Muons from a superconducting solenoid are expected later in the summer and polarised protons by the autumn.

With this "meson factory", Professor W Blaser and his team have added a very important facility to Europe's armoury for nuclear-physics research.

● Compiled from texts on pp85–88.

CERN Muon ring



Under construction, the CERN muon storage ring requires extremely careful assembly since it will be used in an experiment to measure the "g-2" value of the muon anomalous magnetic moment to very high accuracy. The ring will be tested in the summer.

● Compiled from text on p79.

Compiler's Note



By 1979, the anomalous magnetic moment of the muon, $g-2$, had been measured at CERN to an unprecedented precision of 7.3 ppm, differing significantly from the Standard Model (SM) prediction, a discrepancy that could point to physics beyond the SM. More accuracy was required and investigations continued at BNL Brookhaven, with a 0.54 ppm result reported in 2006. However, the uncertainty was still below the five-standard deviation confidence level needed to test theoretical estimates of the hadronic contribution. So in 2013 the BNL ring was transported intact to Fermilab by land, sea and river – a remarkable feat. There, with much new and improved instrumentation, experiment E989 is aiming to reach 0.14 ppm and first-physics data-taking is expected soon.

The IHEP-CERN teams at the U-70 machine observed the eponymous Serpukhov effect, the rise in total cross-sections for K^+p interactions above about 15 GeV. Subsequent measurements at CERN and Fermilab showed this to be a universal high-energy phenomenon for all hadrons, phenomenologically described by Regge theory as the exchange of "objects" called pomerons. Still fashionable, feasible pomeron structure is being studied by various experiments at the LHC.

SIN



The SIN team line up around the ring cyclotron, which they have brought so smoothly into action.



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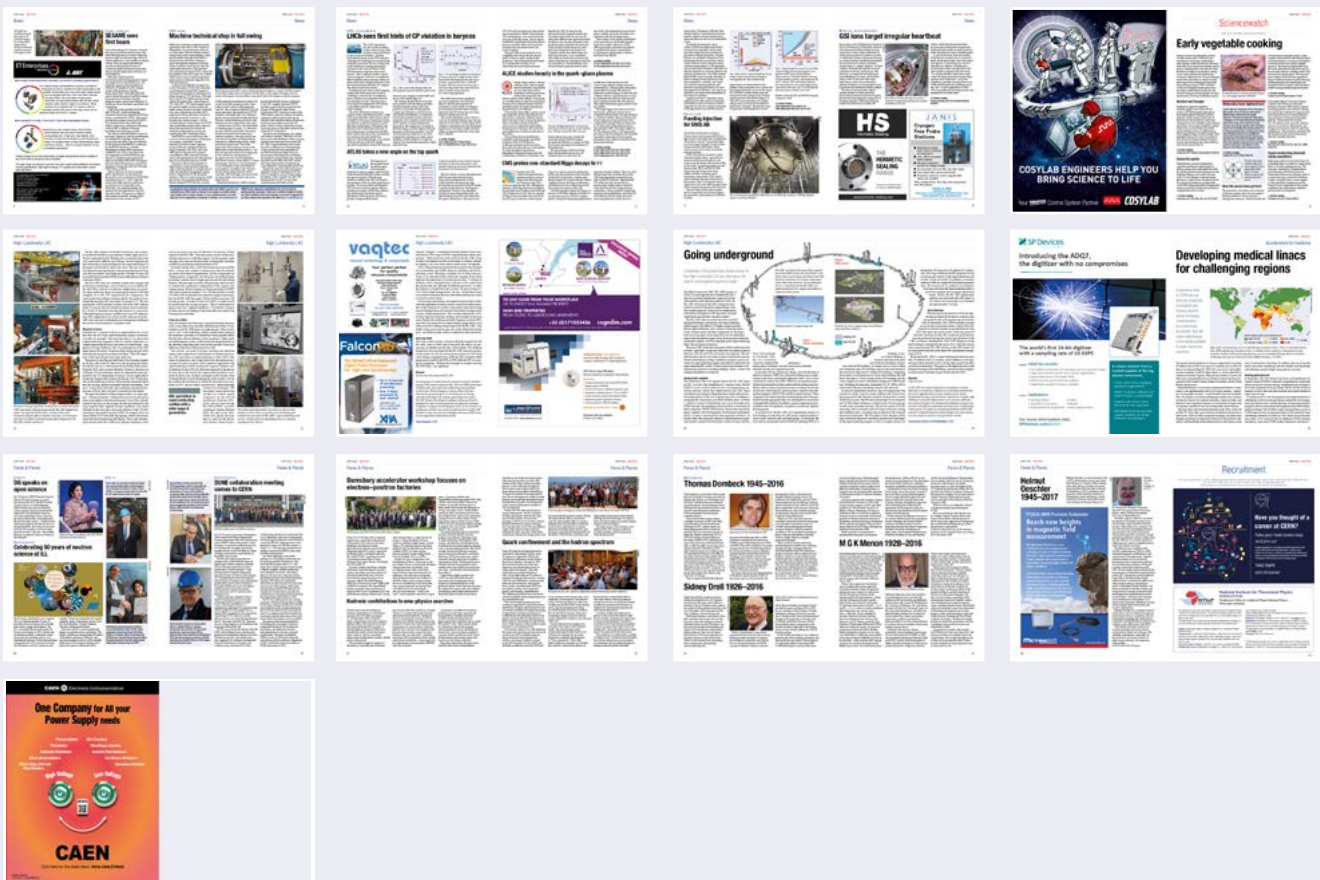
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WELCOME

CERN Courier – digital edition

Welcome to the digital edition of the March 2017 issue of *CERN Courier*.

High-energy physics relies increasingly on international collaboration to plan, build and operate large experimental facilities. The Deep Underground Neutrino Experiment (DUNE) is a case in point. Due to be operational in the US by the early 2020s, driven by a rapidly growing international collaboration, DUNE's vast liquid-argon detectors are being prototyped at CERN as part of the laboratory's recently established Neutrino Platform. Another project that relies on strong US–European collaboration is CERN's High-Luminosity LHC (HL-LHC), which will boost the collision rate and thus discovery potential of the LHC by a factor 10. Building on long-standing partnerships, US laboratories are working closely with CERN to develop the advanced niobium-tin magnets and other superconducting technologies for the HL-LHC, for which civil-engineering work is now ready to begin. Meanwhile, astroparticle physicists from 11 countries are working on the design of the DARWIN observatory, which promises to be the ultimate WIMP dark-matter detector. Perhaps the most extraordinary example of scientific collaboration in recent times is the SESAME light source in Jordan, which has just circulated its first electrons and whose founding members include Iran, Israel and the Palestinian Authority. Finally, we report on a highly interdisciplinary collaboration between particle physicists, medical experts and industry that aims to make radiotherapy more widely available in low- and middle-income countries.

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