

CERN Courier Archive: 1975

A LOOK BACK TO CERN COURIER VOL. 15, SEPTEMBER 1975, COMPILED BY PEGGIE RIMMER

NEWS

Magnetic monopole

Monopoles, the basic units of magnetism, were first suggested by P A M Dirac in 1931, as the magnetic counterparts of electrons, the basic units of electricity. He predicted that the monopole charge would be at least 68.5 times that of the electron.

In a lecture at CERN at the end of August, E K Shirk described evidence that a Berkeley/Houston group have detected a monopole. Two years ago the team dangled a balloon over Iowa loaded with a stack of plastic (Lexan) plates, nuclear emulsion layers and a Cherenkov counter. They were looking for heavy nuclei in cosmic rays, particularly for 'super-heavy' nuclei around atomic number 114.

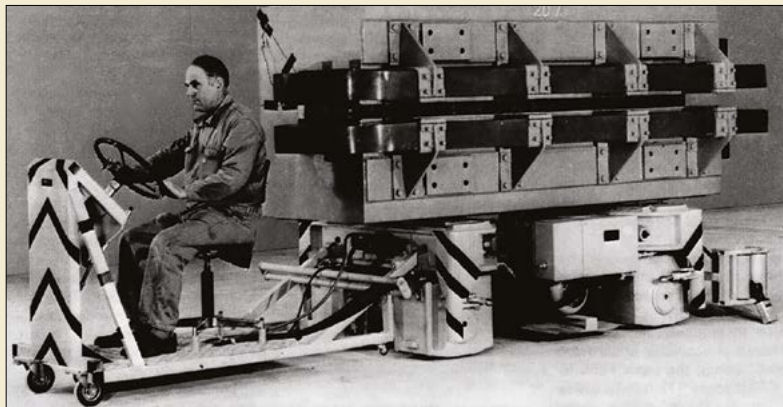
The nuclear emulsion, scanned at Houston, gave data suggesting the passage of a particle with atomic number around 80 and a velocity about half that of light, $0.5c$. The depth and rate of chemical etching in the Lexan stack, measured at Berkeley, gave as best estimate a particle of charge around 137 and a velocity about equal to that of light, contradicting the nuclear emulsion data. Fast film from the Cherenkov counter showed no evidence of a particle with a velocity higher than $0.7c$, in line with the nuclear emulsion data for a low velocity particle.

How then was it possible to explain the etching of the Lexan sheets which indicated a highly ionizing, high velocity particle? A magnetic monopole is predicted to cause ionization at a rate proportional to its charge, g , and its velocity. The etch rate seemed consistent with a monopole with $g = 137$ and a velocity sufficient to penetrate all the plates. This means that it must have an energy over 32 GeV and a mass more than 200 times that of the proton.

It was perhaps the estimate of the particle charge at 137, twice the Dirac prediction, which lent extra weight to the monopole interpretation. Since the result was first announced, a recalibration has taken the charge to 121 and a lot of credulity with it. Nevertheless, it is an intriguing observation which has served to give the high-energy physics world another stir and to bring magnetic monopoles onto the front pages of the newspapers.

● Compiled from text on p261.

AROUND CERN



The versatile transporter which was used to convey the precisely assembled and measured magnets of the Intersecting Storage Rings to their positions in the tunnel. Vehicles of this type are now in common use in the ship building industry.



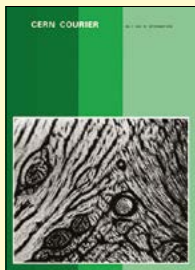
An inflatable mirror made from an aluminised mylar membrane $25\ \mu\text{m}$ thick, which has been developed at the CERN West Workshop. By varying the pressure applied to the membrane the mirror takes up varying quasi-spherical forms. The focal length can thus be varied for use in a Cherenkov counter.



A map of Europe with lines radiating out from CERN to the national centres, which draw some of their research material from the bubble chamber experimental programme.

● Compiled from texts on pp 263, 265 and 266.

Compiler's note



The faith, hope and endurance of physicists were seriously tested during the 48 years between the three illustrious papers on spontaneous symmetry breaking in 1964 and the discovery of the Higgs boson in 2012. This patience is already surpassed by a dogged determination to capture a magnetic monopole, predicted by Dirac in 1931. The latest search with the Monopole and Exotics Detector, MoEDAL, at the LHC has found none, so far. If monopoles are too heavy to be produced by accelerators, a future MoEDAL could be located on a mountaintop to look, once again, for any that might be spattering in from space.

A comparison of the distribution of data from CERN bubble-chamber experiments in the 1970s with that of data generated by the LHC experiments today – the former by land, sea and air, the latter by networks over the Worldwide LHC Computing Grid – shows CERN's

evolution from its eurocentric beginnings to become a source of material for multicontinental high-energy physics research (wlcg-public.web.cern.ch).

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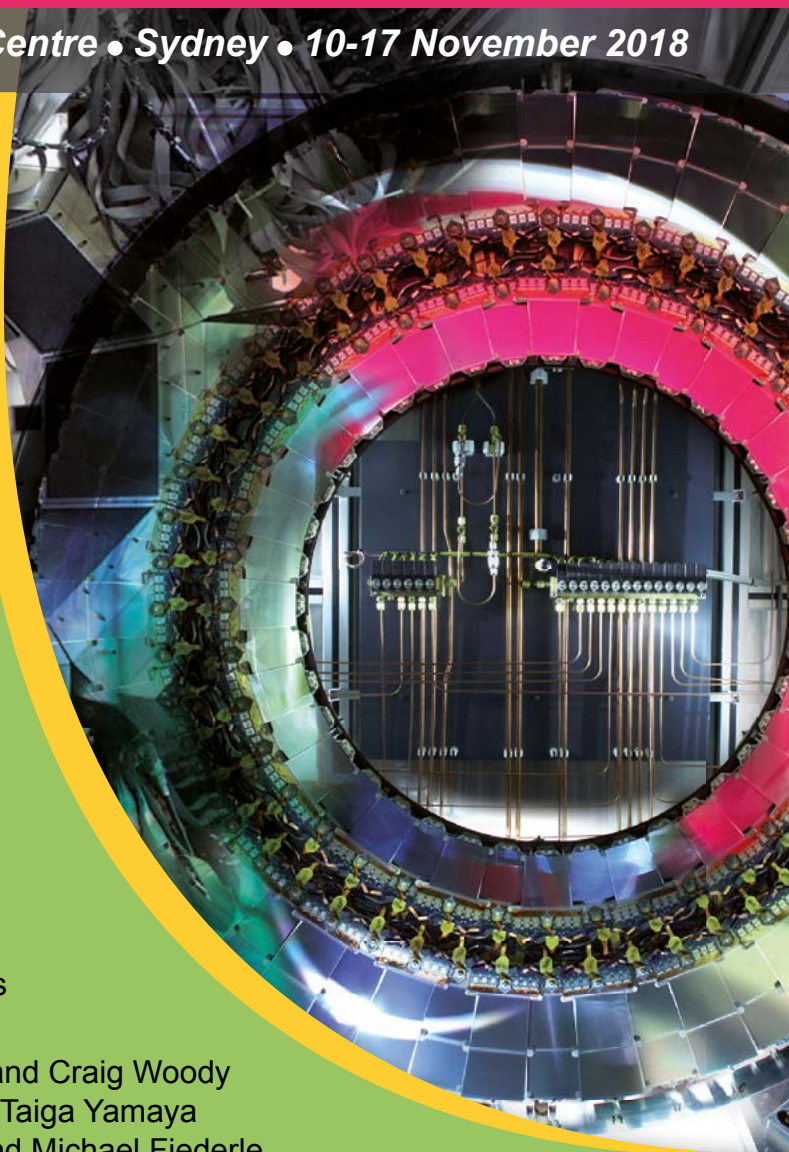
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WELCOME

CERN Courier – digital edition

Welcome to the digital edition of the September 2018 issue of *CERN Courier*.

When is the LHC's birthday?

Ten years ago, on 10 September 2008, two yellow dots on a screen signalled the first time that protons had circulated CERN's Large Hadron Collider (LHC), marking the end of 25 years of design and construction. This issue of the *Courier* reflects on the media extravaganza that surrounded “first-beam day”, and looks ahead as the machine and its experiments prepare for a luminosity upgrade (HL-LHC). The experience gained in organising, building and operating the LHC has been crucial for this upgrade and plans for future colliders, while a recent analysis reveals significant broader societal impact from the HL-LHC. But the LHC has more than one anniversary. Its first ever proton collisions were recorded on 20 November 2009, following the successful repair and consolidation of the machine after an electrical fault forced a pause in commissioning, and on 30 November 2009 the LHC eclipsed the Tevatron to become the world's most powerful collider, reaching an energy of 1.18 TeV per beam. The LHC physics programme began in earnest on 30 March 2010 with collisions at 3.5 TeV per beam and, for many physicists working on the ALICE, ATLAS, CMS and LHCb experiments, this was when the LHC fully came to life. That makes spring 2020 another golden opportunity to take stock of the LHC's immense contributions.

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