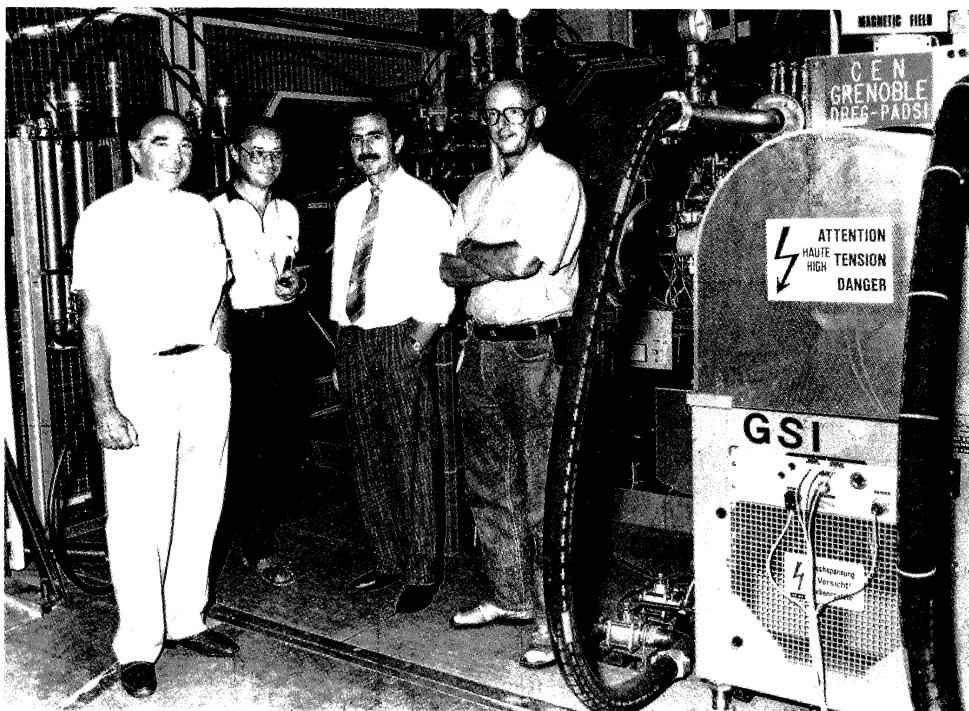


Wrought ions

After overcoming some initial difficult problems with linac breakdown, the ion acceleration tests at CERN are going well. At the time of writing, oxygen ions have been accelerated in two of the Booster rings and fed to the PS. There they have been taken to 160 GeV thus exceeding the previous energy record for oxygen ions of 57 GeV in the Berkeley Bevatron. The PS could have nudged the energy a little higher but this is the role of the SPS which wants to receive ions at 160 GeV. The first injection tests into the SPS are scheduled for September and it is hoped to have three weeks of physics at high ion energies before the end of the year.



beams of oxygen 6+ions of good quality which is crucial for the CERN machines which need at least 10 microamps for their monitoring and control systems. Even when the ions from the source have been taken to an energy of 12.5 MeV per nucleon in the first linac tank and then fully stripped, there still remains a 10 microamp ion beam for the synchrotrons to handle.

Previously available sources would have required a cyclotron to accelerate e.g. oxygen 3+ions and then fully stripping them prior to injection in the CERN machines. The complexity and cost of such an installation would almost certainly have killed the project.

The source is of the ECR (Electron Cyclotron Resonance) type which is now used at a number of Laboratories. It essentially involves a cylinder of rarified gas (oxygen in the case of MINIMAFIOS) which is subjected to short pulses of 10 GHz radiation. A special magnetic

Some of the men behind the successful supply of oxygen ions using CERN's 'old' Linac 1 line up in front of the radiofrequency quadrupole supplied for the project by Berkeley. On the right is the ion source supplied by Grenoble with funding from GSI Darmstadt. Left to right, R. Geller (Grenoble), Charles Hill (CERN), Norbert Angert (GSI Darmstadt), Helmut Haseroth (CERN).

(Photo CERN 9.8.86)

field configuration confines the plasma which is created so that the liberated electrons which are at about 1 keV can resonate. The successive collisions in the gas liberate a high number of ions which can be extracted from the source in the conventional way.

Since April of last year MINIMAFIOS has been exceeding its design requirement providing good quality beams of over 100 microamps of oxygen 6+ions. This has been an important factor in realizing accelerated beam intensities beyond the specified intensity (peak 34 microamps from the Linac rather than 10) so soon after start of the tests at CERN.

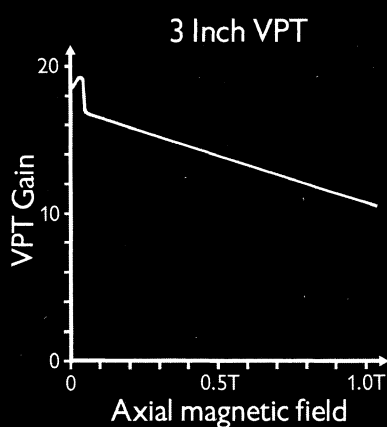
Back to the source

With the hard-won successes of the ion injector, experimenters at CERN hope that they are en route for the quark-gluon plasma. Many developments have contributed to this optimism since the idea of using oxygen ions from the CERN accelerators was first made public by the Berkeley/CERN/GSI (Darmstadt) collaboration in 1982. A vital one was the development of an adequate ion source.

The source, given the name MINIMAFIOS (MINIMachine à Faisceaux Ioniques Strippés, has been developed at the Institut de Recherches Fondamentales at Grenoble. It has to provide comparatively high intensity (80 microamp)

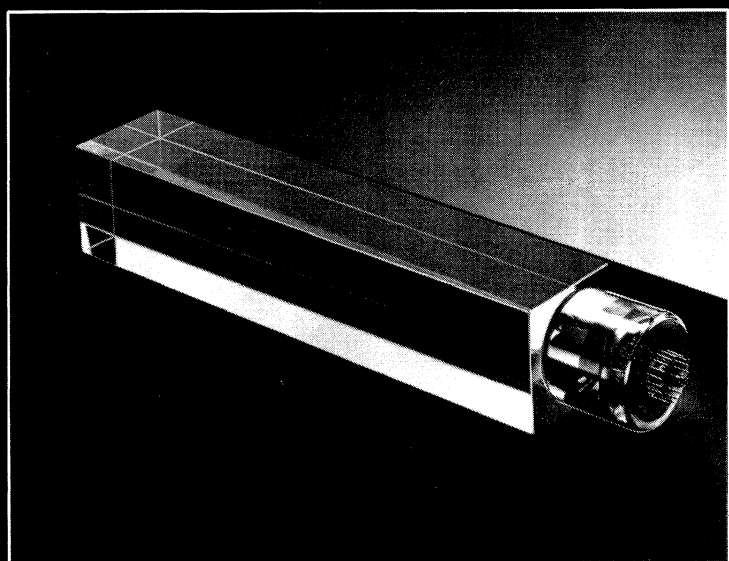
ONE T?

The OPAL and DELPHI end-cap calorimeters at CERN require lead-glass arrays to be read out in full axial fields up to 1.2 tesla. Not a task for conventional PMTs. So, building on our experience in

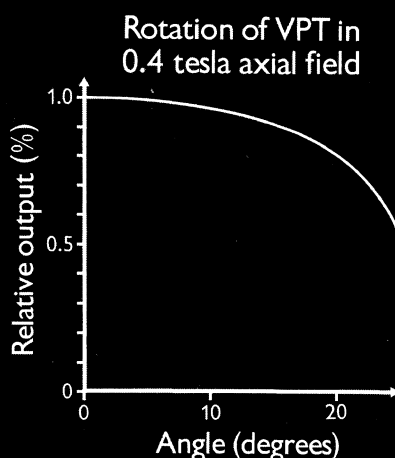


vacuum photo diodes, we developed a family of Vacuum Photo Triodes to do the job. In 1½", 2" and 3" sizes, and with low capacitance to

minimize contribution to preamplifier noise. With gains ≈ 10 at 1 T axial. Even at 20° from axial, gains still high enough to lift the signal well clear of preamplifier noise. We're prepared to discuss versions for fields up to 70° from axial.



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the RAL/OPAL collaboration has achieved normalized energy resolutions of $5\%/\sqrt{E}$ for electrons of above 0.5 GeV energy at 1 T axial field. If your experi-

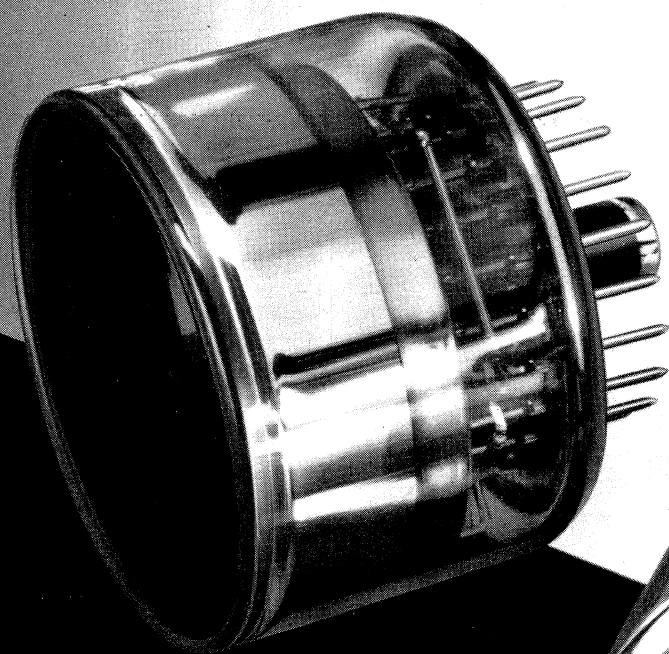
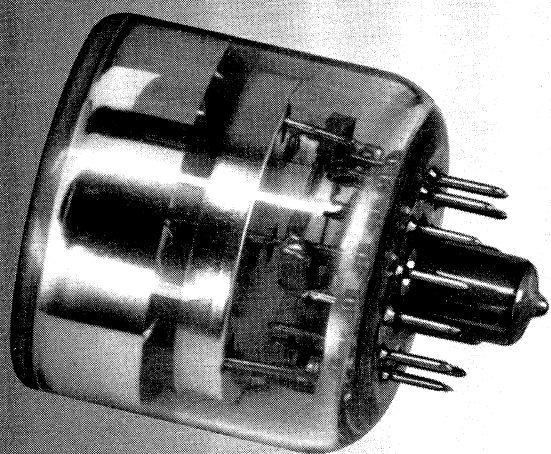
ment involves high magnetic fields, VPTs may be the answer. For further details contact:

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