

the experiment it climbed slowly during a 'charging' time of twenty hours to 11.3 T before the superconducting property was lost. Similar and even higher figures (11.8 T) were touched during a series of subsequent tests where the charging conditions were varied (the relative strength of the currents in the different coils being changed).

What is dramatic about this achievement is first that such a high field has been reached in a large volume (over 10 T in 6.6 litres) but, more importantly, that short-sample characteristics were closely approached right from the word go. Niobium-titanium, for example, can, when tested in 'short-sample' form, retain its superconducting property in a magnetic field up to a level of between 8 and 9 T. However, it is very difficult to avoid losing the superconducting property at field levels considerably below this when the niobium-titanium is wound into a large coil. The niobium-titanium coil of the HYBUC magnet was operating in a field level of over 8 T.

Obviously any source of heat which takes a region of the coil to a temperature above the temperature at which the coil material is superconducting can cause the superconducting property to be lost. For this reason the construction of such coils has to ensure efficient cooling of the superconductor and has to ensure a rigid mechanical structure so as to eliminate as far as possible mechanical movement of the superconductor which is a potential source of sudden flux jumps and hence of heat.

The magnet designers decided to lean particularly on the second of these considerations. They avoided a Gruyère cheese type of construction, where helium cooling channels are liberally sprinkled all over the coil cross-section to ensure efficient and even cooling, and instead packed conductor of rectangular cross-section

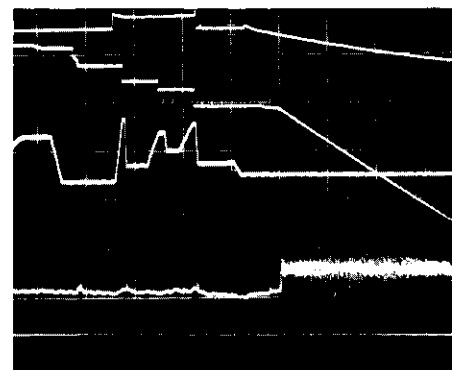
(oxide coated for insulation between turns) close together to form a mechanically extremely rigid coil. This playing down of cooling and emphasizing of mechanical properties seems to have paid handsome dividends and may prove an important clue to developing superconducting magnets further.

A further observation which seems to confirm this interpretation of the success was that very little evidence of 'training' was seen when the magnet was first powered. Often a superconducting magnet only settles down at its peak field levels after being charged many times to lower field levels. This may well be due to the coil settling down mechanically and the relative unimportance of this in the HYBUC coil would thus confirm that exceptional mechanical rigidity has been achieved.

One further technical point — the niobium-titanium conductor is of the twisted filament type. There has been no sign of large scale parasitic magnetization current loops during the tests. Any sign of current loops in the niobium-tin coil disappeared at high field.

PS operation

Operation of the 28 GeV proton synchrotron is becoming more and more complex in the process of increasing the versatility of the machine to supply experiments with particles in a variety of combinations. For example, the protons were distributed during a recent machine cycle as follows: In succession, 1 % of the protons were used onto target No. 1 (providing test beams for counter experiments in the South Hall), 10 % onto target No. 6 (giving a beam to the 80 cm bubble chamber in the North Hall); 2 bunches were used for ejection 58 (providing beam for the first expansion of the



2 m bubble chamber), 1 bunch was used for ejection 74 (giving a test beam for the Gargamelle bubble chamber), 2 bunches were again used for ejection 58 (second expansion of the 2 m bubble chamber), and the remaining beam was used for slow ejection 62 (feeding counter experiments in the East Hall). It is possible to have three fast ejections in less than 150 μ s by using the two fast kickers 13 (for ejection 74) and 97 (for the two ejections from straight section 58). In addition the slow ejection 62 pulse shape has been greatly improved by adding a filter in the sextupole power supply.

In the photograph the top trace comes from the main magnetic field cycle with two flat-tops. The second trace corresponds to the intensity of the protons beam circulating in the PS ring. The third trace shows some 'beam gymnastics' (radial shift) and the bottom trace the pulse shape in the slow ejected beam. (The horizontal scale is 100 ms/square.)

Large Telescope Conference

From 1-5 March CERN was host to a Conference on large telescopes organized by the European Southern Observatory, ESO. It brought together more than a hundred scientists and