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Before I begin, John Adams has asked me to convey to you his apologies for being unable to attend and describe the progress of the project in person.

I shall attempt in the short time available to give a brief outline of the salient features of the 300 GeV programme and report on the progress to date.

The programme, as approved by the CERN Council on February 19, 1971, covers a period of 8 years during which time we must design, construct and put into reliable operation, a machine of at least 300 GeV with an intensity of  $10^{13}$  protons per pulse. (Figure 1).

The machine makes use of the existing CERN PS as injector and the West Experimental Area together with its two large detectors, Omega and BEBC. Experiments using this and other detectors are planned to begin in the West Area at the end of 1976. The West Hall will be fed with 200 GeV protons and the neutrino experiments in the West Area with 400 GeV protons. The North Area, which will be used for hadron and electron spectroscopy and muon physics using proton beams up to 400 GeV energy, is scheduled for operation in 1978.

The 8 years of the programme are each characterized by a main activity.

1971	Project team formation
1972	Review machine design
1973	Order main components
1974	Delivery of components
1975	Installation
1976	Testing and commissioning
1977	Operation with West Experimental Area
1978	North area operation

Turning now to the progress to date.

All the major decisions on the SPS programme have now been taken and these include two of particular note.

The first of these was the decision to equip the machine with a full set of conventional magnets allowing operation up to 400 GeV, rather than leaving space for superconducting magnets.

The second major decision concerned the layouts of the two Experimental Areas and the underground neutrino facility. This has enabled the two CERN Laboratories to put forward a complete plan for the SPS experimental facilities.

All the land covering the accelerator zone is now at our disposal together with the land necessary for the hadron and muon zones in the North Experimental Area.

The tunnel, which is being bored in molasse bed-rock at a depth which varies from 25 to 60 m, has now been bored around 3/4 of the machine circumference. The arrival accuracy of the 'Robbins' has been  $\sim \frac{1}{2}$ ". The concrete lining and floor have started in the first half of the machine and the first sextant will be ready to begin installation of services during June. (Figure 2).

The main magnet system is now in the full production phase with 140 dipoles and 40 quadrupoles now delivered. about 120 dipoles have been measured magnetically and are now being prepared for installation. The results of the magnetic measurements show the bending field to be uniform over the whole aperture to within 2 or 3 in  $10^4$ . The bending strength of the dipoles is adjusted by end shimming each magnet so that the rms variation is less than  $2 \times 10^{-4}$  over most of the cycle. (Figures 3 and 4).

Progress on the magnet Power Supply is good. The 380 kV line from a strong point in the French Electricity Network is almost complete and the two 60 MVA transformers are due to be delivered this summer. Half of the power supply components have been delivered and the first of the 12 Rectifier stations has been installed and tested.

The RF System is a 200 MHz travelling wave structure consisting of 2 @ 20 m long cavities. Delivery of the cavities and drift tubes is expected in the Autumn. The power amplifiers have been constructed by industry and are now undergoing their acceptance tests. The low-level RF system is complete and has been tested on the CERN PS. (Figure 5)

The computer assisted Control and beam detection system is now fully specified. Half of the 24 computers required have been delivered, prototypes of the various interface modules and beam detectors have been checked out and the production quantities have begun to arrive. A prototype Control Desk has been built and is in use to develop interactive control devices and associated software.

The Injection and Extraction systems are completely designed and specified. Prototypes or models of each of the special elements have been constructed. These are undergoing lifetime tests while the final components are being manufactured by industry. (Figure 6)

To summarize: the design, prototype and ordering phases of the programme have been completed on time.

However, the delivery of components during the next year is critical. As Dr. Adams noted in the Progress Report to the CERN Council at the end of last year "..... the present period of material shortages, fuel crises and monetary inflations is not the best in which to be building such a large project."

Nevertheless, the manufacturing phase has begun on time and if the deliveries match those in our contracts with industry, we believe we can start experimental research in the West Area using the SPS by the end of 1976.



FIG. 1--Aerial view of CERN site showing location of SPS.



FIG. 2--View of 4.5 metre diameter 'Robbins' boring machine.

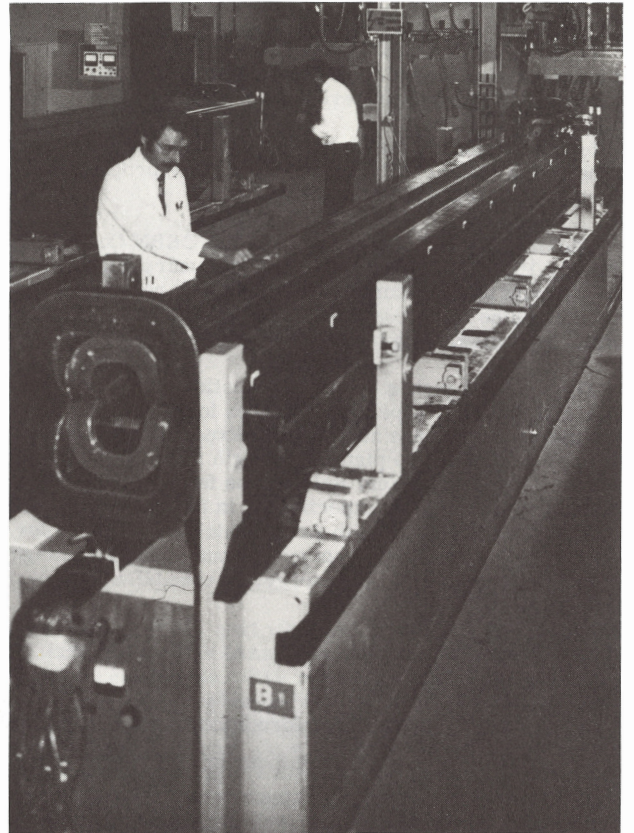


FIG. 3--Assembly of a 6.3 m dipole magnet.

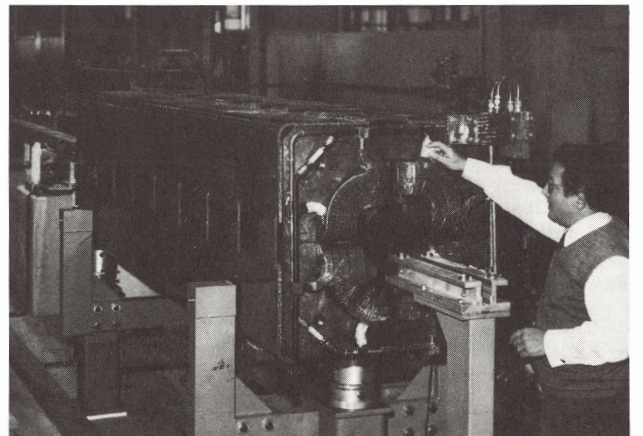


FIG. 4--Quadrupole magnet installed in the Measurements Area.

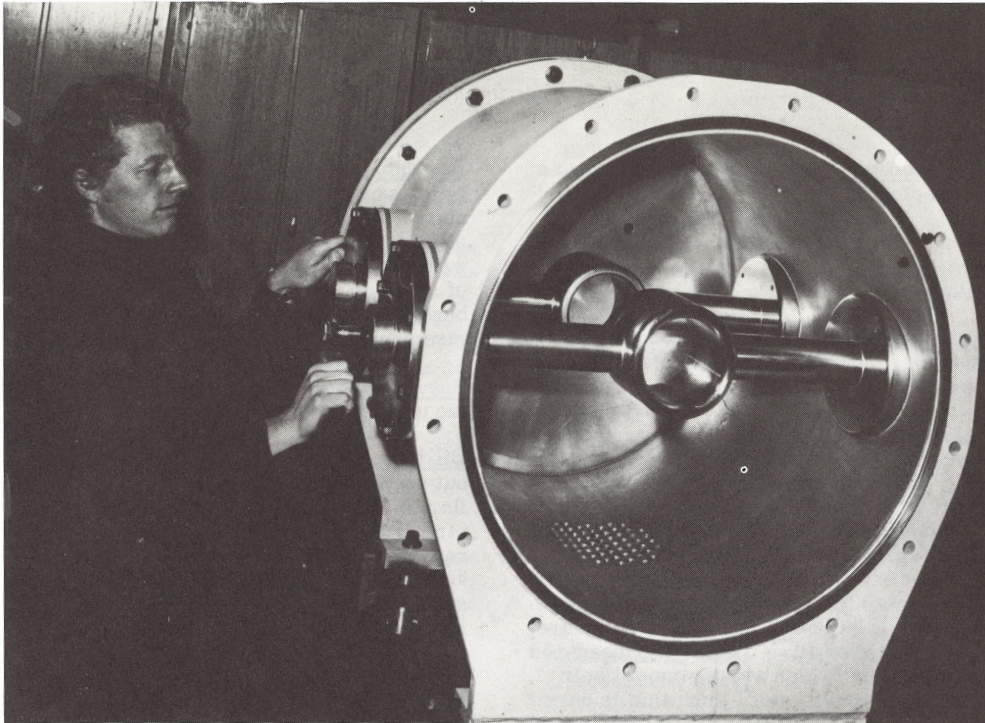


FIG. 5--Short-section prototype of RF Accelerating Cavity.

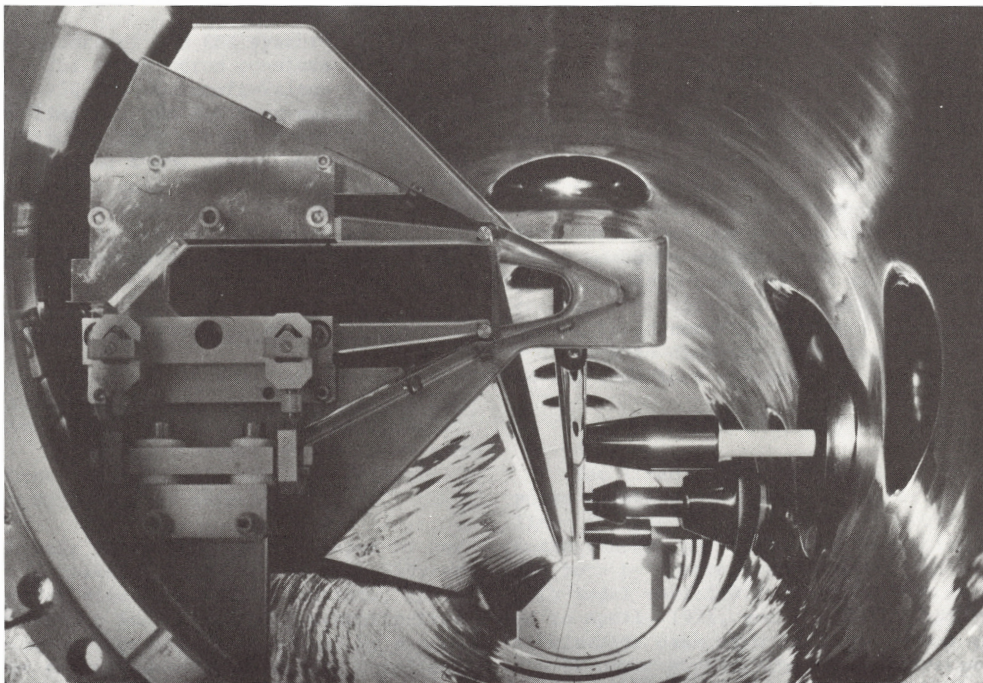


FIG. 6--Prototype Electrostatic Extraction Septum.

## DISCUSSION

Andrei Kolomensky, (Lebedev Institute): (Referring to a slide of rockboring machine)

What is the diameter of the cutting head?

Billinge: 4.5 meters.

Milton White, (Princeton): How important is it to have magnetic measurements of higher-order components of the fields of the magnetic elements before installation?

Billinge: Well, certainly one thing that is very important is to measure them before they go in the ring because after that it is impossible. The important part of the measurement program first of all is to confirm that with the mixing of steel that we really do get the same remnant field in all the magnets to a very high precision. As I mentioned, by comparing every magnet with a standard magnet we actually end shim individual magnets to make their bending strength the same so the random variations in bending strength are down to an r.m.s. of one times  $10^{-4}$ . Also, the measured field does allow one to predict which are the most likely troublesome resonances to occur, and I think this is very worthwhile.

Boyce McDaniel, (Cornell): Will you use the magnetic measurements to determine the location - the order of the magnets in the ring, or just as a check on the specifications?

Billinge: No, we will in fact use the high field characteristic, which of course the end shimming can do very little about. We are now grouping the magnets in groups of five of each type, so that as we begin to install the machine we will make a mixture of the magnets so that appropriate sets of say four magnets within a semi period will have the same bending strength at the 400 GeV level. So we do use the measurements for locating them based on the high field strength.

Boyce McDaniel, (Cornell): What is the ultimate limit of the useable field in your magnets?

Billinge: That depends a little on the present power crisis, but as you know, the basic cross sectional design is very similar to the design of the NAL magnets. The width of the aperture is larger so the corresponding good field width is larger and we have twice as much copper. Now, if one wants to invest in extra power supply and extra power, of course, it presumably will go to the 500 GeV level. It's not clear that is really required.

Lee Teng, (NAL): You said in the D quadrupole you have a round bore tube and in the F quadrupole you have an elliptical one. What is the reason for this?

Billinge: Just the aperture requirements. We use the same quadrupole for D and F. It's a four fold symmetry quadrupole. In fact, the aperture required for the F quadrupole actually protrudes in between the poles - so one can use a compromise size for the two types.