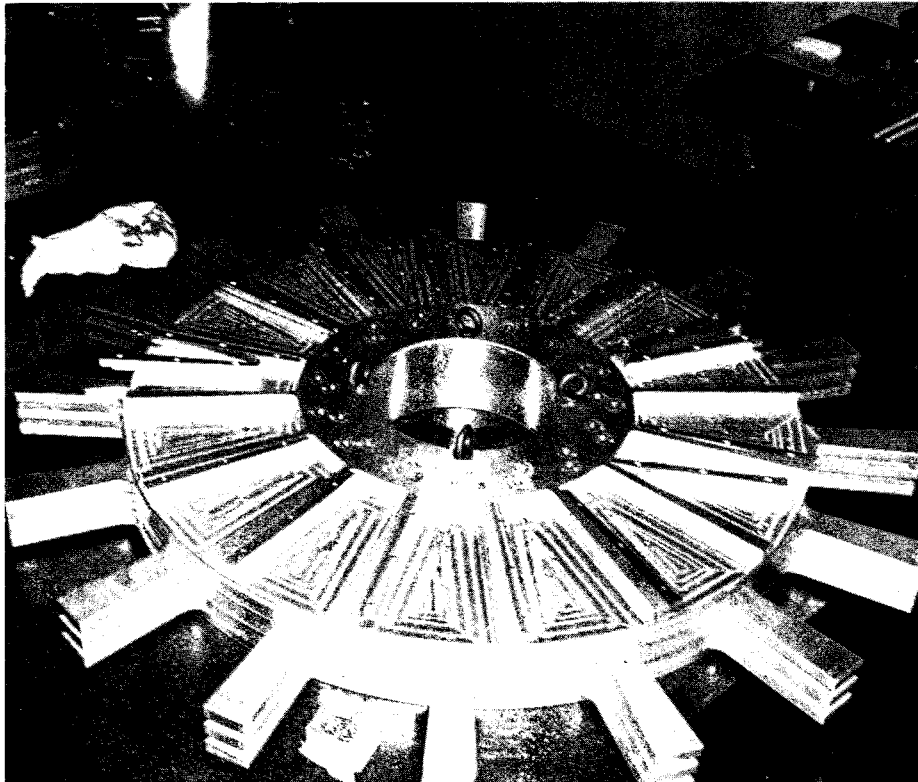


The rotor for the 1:1 scale model of the rotating capacitor during assembly. The model was successfully tested towards the end of last year. The photograph shows the three sets of sixteen rotor blades (machined from a single block of dur aluminium) and, on the hub, the inlet and outlet holes for the cooling water which flows through the blades.

(Photo H. Beger)



Other elements of the r.f. system and other components for the improvement programme are well advanced. The first part of the new extraction channel is ready for tests. Manufacture of the support for the new ion source (which is introduced into the machine from below through a hole in the yoke) is beginning. A new vacuum tank has been ordered. The materials for the new magnet coils are arriving at CERN and winding of the coils will begin in February.

If all goes well, it is expected that the shutdown for installation of all these components will begin at the end of this year and will probably last about eight months. Magnetic measurements are likely to be the bottleneck and will be speeded by the use of an on-line computer. They will involve re-shimming of the central region where the magnet yoke will be pierced for the ion source and of the extraction channel region (to ensure

that the channel itself does not perturb the nearby orbits).

By the end of 1972 a refurbished synchro-cyclotron will continue to serve as a top-quality machine in Europe covering the medium energy region, particularly until the 'next generation' cyclotron being built by the Swiss Institute for Nuclear Research at Villigen (see vol. 9, page 139) comes into action.

ISR Ring I does it again

Commissioning tests on Ring I of the Intersecting Storage Rings (see vol. 10, page 343) began again on 11 January. This time the vacuum system was baked out all around the ring (giving an average pressure of a few 10^{-10} torr) and the clearing electrodes (to sweep out liberated electrons) were installed. It was hoped that this

* **Stop press: Ring 2 brought into action 25 January. First collisions observed 27 January. Full story in next issue.**

would bring about a major improvement in the rate at which the more intense stored beams decayed.

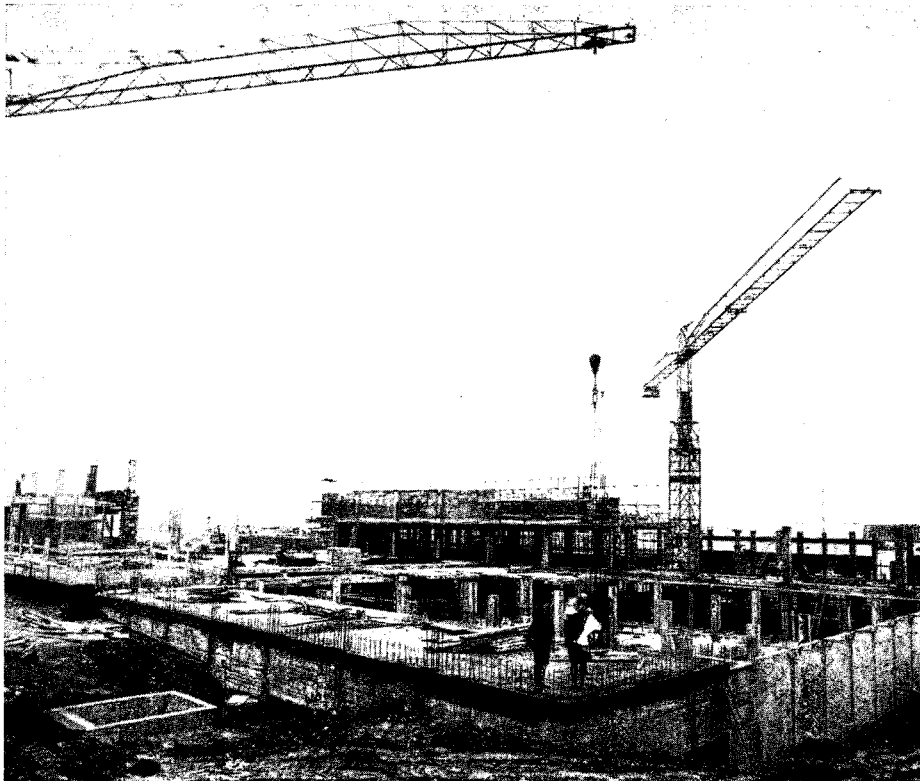
Right from the start, with stored beams of 0.5 A, the decay rate was unmeasurably small (below 10^{-4} per minute). Later, with the injection of 20 bunches from the PS, currents at the 2 A level were achieved with decay rates in the 10^{-3} per minute region the best being 6×10^{-4} per minute. The highest stacked current climbed to 3 A.

Though inevitably there were some instances of erratic behaviour, the ISR team regards the January tests as a breakthrough in that they have stacked and stored beams which would be usable for experiments. They have not run into any fundamental limitation on intensity and lifetime at the levels investigated. The slow, steady work of refinement continues. Ring 2 tests start at the end of the month and the next major hurdle will be to check that there are no serious problems coming from beam-beam interactions when both rings are in action.

In the course of these further ISR tests, the PS team did sterling work in keeping up the supply of protons. There was some trouble with the PS magnet power supply but inventive measures (lifting lids and blowing cold air on components which were becoming uncomfortably hot) kept the machine ticking over for the duration of the tests.

New computer home

Construction of a new building for the Data Handling Division (located between the new restaurant and the Booster) is well advanced. The total floor area of the main Building will be 3500 m² with the biggest part (2500 m²) taken up by a large hall 6 m in height which will be the new



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home for the central computers. (The growth of the computer system to include a CDC 7600 was described in vol. 10, page 348.) There will in addition be two wings providing 1500 m² of office and equipment area.

The most unusual feature of the building is connected with the need for careful temperature and humidity control of the environment in which the computers operate. A very powerful air-conditioning system for the hall (absorbing about 25 % of the cost of the building) is to be installed. It will cope with the heat given off by the computers retaining a constant temperature and humidity in both summer and winter.

The Technical Services and Buildings Division drew up the plans for the air-conditioning plant on the lines of other large installations already in existence. The air circuit selected is of the 'ceiling to ceiling' type as opposed to 'floor to ceiling' (which would introduce more of a dust problem to which computer tapes are very susceptible) or 'ceiling to floor' (which would involve an air-flow in the opposite direction to that normal for cooling the computers). The system is being supplied by 'Applications Electriques SA' of Geneva in collaboration with Bergeon of France; the civil engineering work is in the hands of 'Société Aixoise de Construction'. The building is scheduled for completion in January 1972.

Emittance measurements at the ISR

Beam emittance measuring equipment has been installed in the ISR rings and in the transfer lines linking the PS to the storage rings. The measurements provided are mainly used to match the focusing properties of the magnet system to the beam emittance. The equipment has been in use for several months and was employed especially during the first tests on injection into the ISR in November 1970.

The operating principle is based on secondary emission from very thin aluminium foils arranged in parallel strips which are placed in the proton beam during a measurement. A positive signal, generated when the protons pass through the foils and proportional to the number of protons, is obtained from each strip; the secondary electrons which are liberated are swept away by clearing electrodes. The signals from all the foils define the beam intensity profile in the horizontal and vertical planes.

Since they are used in ultra high vacuum the units have to withstand bake-out at 300 °C, and they must therefore be of rather special construction. The aluminium strips are stretched by springs and fitted on a special ceramic support. Each measuring unit is secured at the end of a pivoting arm allowing it to be moved

The building to house the new central computer complex taking shape on the ISR site.

in and out of the beam or to have its position adjusted by half the foil spacing so that spatial resolution can be improved a factor of two when a measurement is made on a second beam pulse.

The measurements are usually made during a single beam pulse in one of the transfer lines or in the rings, where the beam is allowed to circulate only once (a beam stopper being lowered after the first revolution). The measuring units are sensitive to a current of 2×10^{10} protons/cm², and can equally well be used for fast beam pulses (up to 2 μs) consisting of either a few or all of the twenty bunches of protons from the PS and for long pulses (over 100 ms) for measurements on slow ejection. In the latter case, it is possible to make a series of measurements during a single ejection at times separated by 10 to 20 ms, so that fluctuations in emittance can be observed (provision for this measurement is, however, limited to the transfer of slow ejection pulses from the PS towards the West Experimental Hall).

The spatial resolution of the measurements is given by the space between the strips, which varies between 3 and 5 mm according to the unit concerned. With the interpolation technique mentioned above this can be improved by a factor of two and the results can be further interpolated numerically.

With the present system the signals provided by each strip are amplified and converted to numerical form, the numerical signals being collected in succession. They are then sent to an oscilloscope which produces a histogram like the one shown in the figure.

In its final version, the system will be directly connected to a computer which will process the signals to give an immediate reading of the beam emittance at various points, either displayed on a cathode-ray tube or