STATUS REPORT ON THE 6 GeV ELECTRON ACCELERATOR DESY

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The DESY group is working on the construction of a 6 GeV ac electron synchrotron which shall be completed by the end of this year. The main parameters are given in Table 1. investigated. The necessary RF power of 1.5 MW could be supplied by either 4 klystrons or a triode transmitter similar to that used by the CEA group. A 40 MeV linear accelerator

Table 1

Main Parameters for DESY

Magnet	
Focusing, type	AG
Focusing, order	FODO
Field index, n	69.26 and 70.26
Orbit radius	31.70 m
Mean radius	50.42 m
Sectors, numbers	48
Field, at inj	42 Gs
Field, max	8100 Gs
Power input, max	1400 kw
Storage system	choke and condensers
Rise time	10 ms
Weight	Fe 570; Cu 80 t
Aperture	
Width	F : 14.4, D : 9.2 cm
Height	F : 5.6, D : 8.8 cm

Injector System	
Type	linear accelerator
Energy	40 MeV
Injector output	pulse current 125 mA
Injection period	1 turn
Inflector type	pulsed magnet
Acceleration System	
Frequency	499.67 MHz
Accel. cavities	48
Harmonic number	528
Orbit freq. final	0.946 MHz
Gain, av.	750 keV/turn
Input to RF, max	400 kW

The accelerator buildings including two experimental halls have been completed since 1961. A plan view is shown in Fig. 1. The erection of the movable main shield will be finished during September. All magnet units have been assembled and measured, the high-field properties of the magnet agree exactly with the specifications. The result of the low-field measurements is shown in Fig. 2. The statistical fluctuations are small enough, so that an operation of the magnet without corrections might just be possible. Nevertheless, corrections of the dipole, quadrupole and sextupole components of the field are possible by means of dc powered pole-face windings.

Construction and assembly of the RF acceleration units have been completed. Power tests on the RF system have begun. Fig. 3 shows a cutaway view of an RF unit. A double klystron transmitter with a peak power of 400 kW will be used for the acceleration of electrons to an energy of 6 GeV. Possibilities for increasing the energy to 7.5 GeV have been

will be used for the injection. It has been delivered in 1961. Table 2 shows a comparison

Table 2

Linac Properties

	Specified	Measured
Current	125 mA	160 mA
Emittance	20 mm·mrad	1.5 mm·mrad
Energy Spread	1%	1%

between the specified and measured properties of the linac beam. Fig. 4 and 5 show the measured emittance of the beam and the measured energy distribution in the beam. All necessary equipment for the injection has been constructed and tested.

The manufacture of the vacuum chamber has been completed. The design of this chamber is described in a special paper for this conference. Work on the control system of the accelerator is nearly completed. Pick-up coils for inductive measurements of beam position and intensity and an optical beam observation

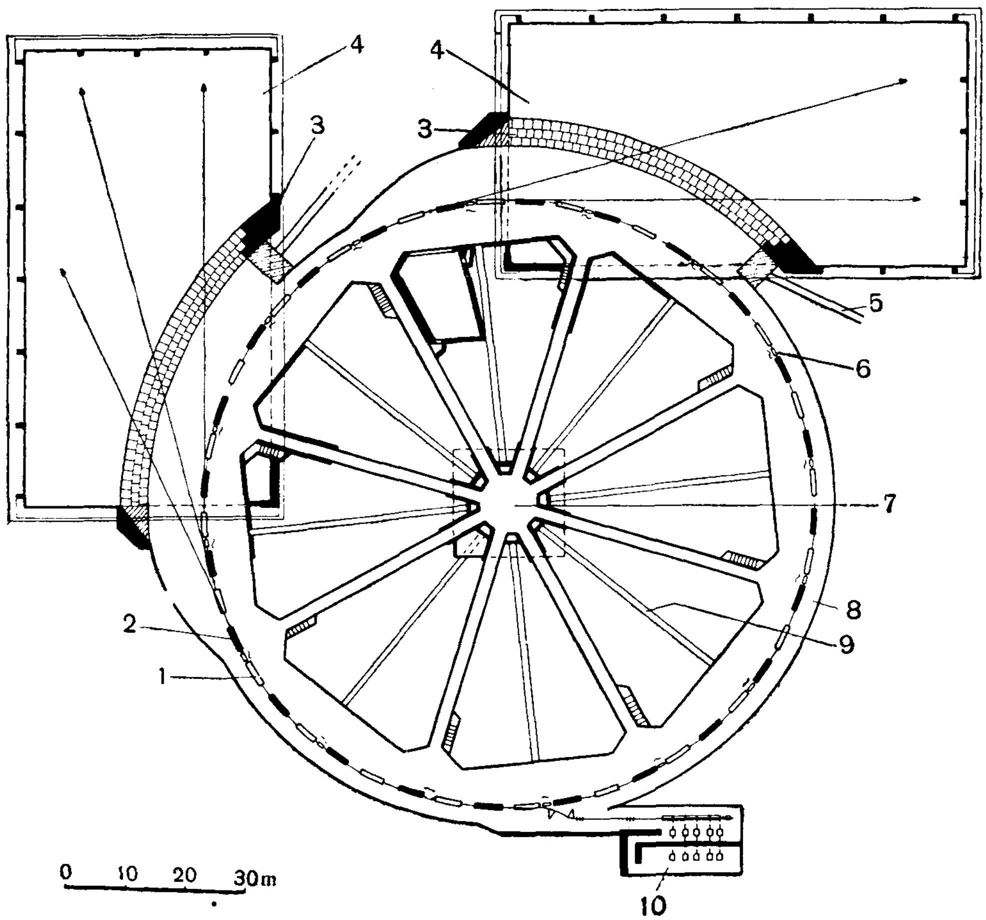

Fig. 1. Plan view of accelerator buildings:
1 — *F*-sector; *2* — *D*-sector; *3* — shielding; *4* — experimental halls; *5* — long beam path; *6* — RF cavity; *7* — central building; *8* — accelerator tunnel; *9* — air duct; *10* — linac building.

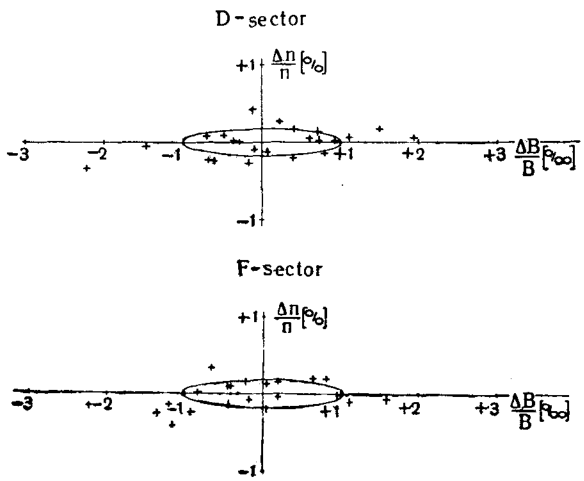

Fig. 2.

system have been tested and assembled. All components for the magnet power supply including a 150-tons air-core choke have been delivered and assembled, power tests on the magnet will be made during August and September. The components necessary for an ejection system similar to that of CEA are being tested and will be ready for operation in the accelerator early in 1964.

Since the intensity of the accelerator will be limited mainly by beam-loading effects in the RF system, extensive investigations have been made with an analog model supplemented by digital computations. One result of these investigations was that there seems to be a good chance to reach higher intensities by prebunching the linac beam on the frequency of the RF system. In this way one avoids the

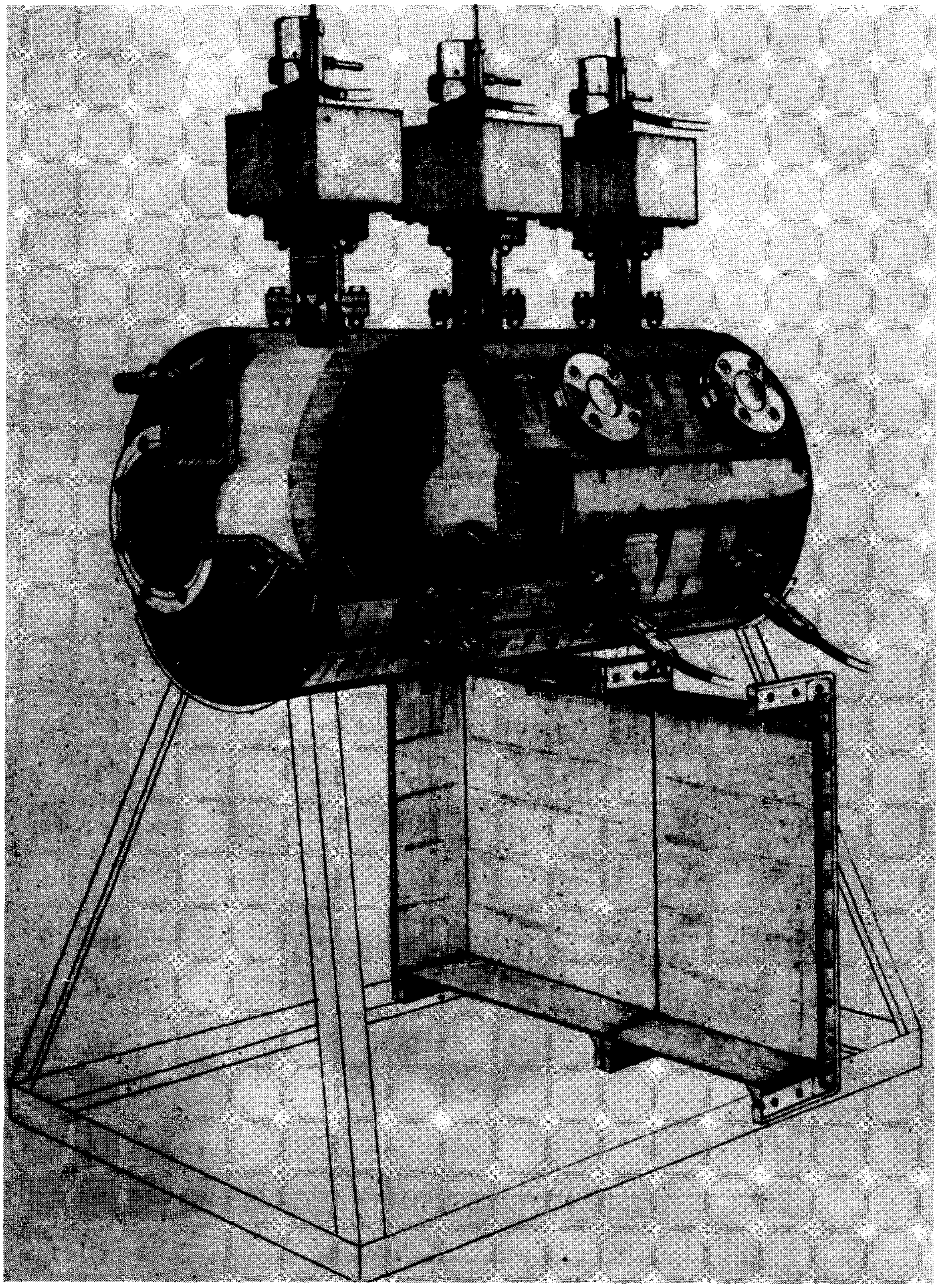

Fig. 3. Construction of the RF acceleration unit.

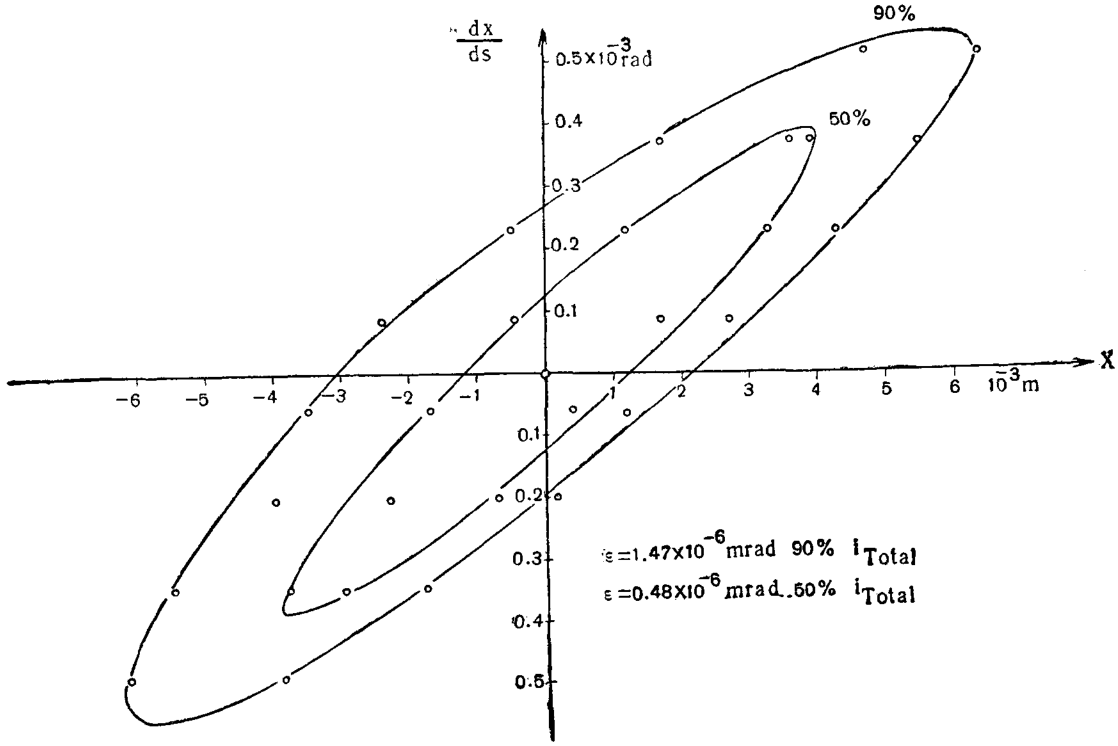

Fig. 4. Emittance of the 40 MeV linac.

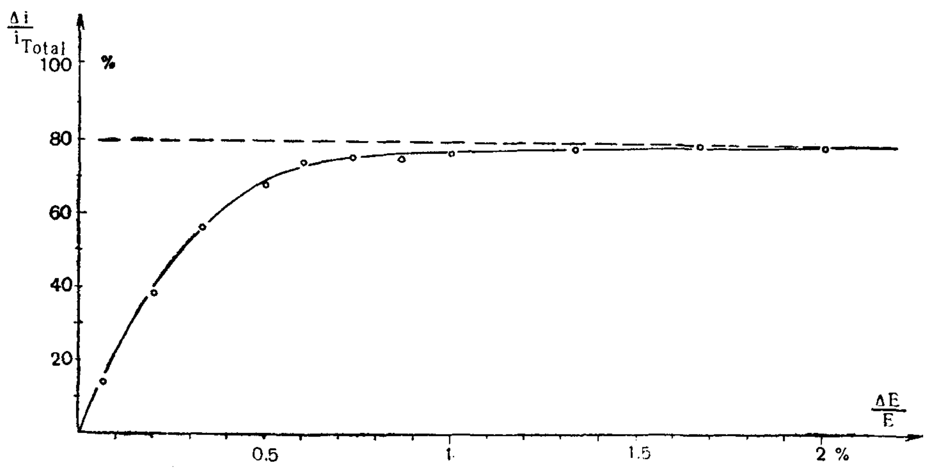

Fig. 5. Energy spread of the linac beam.

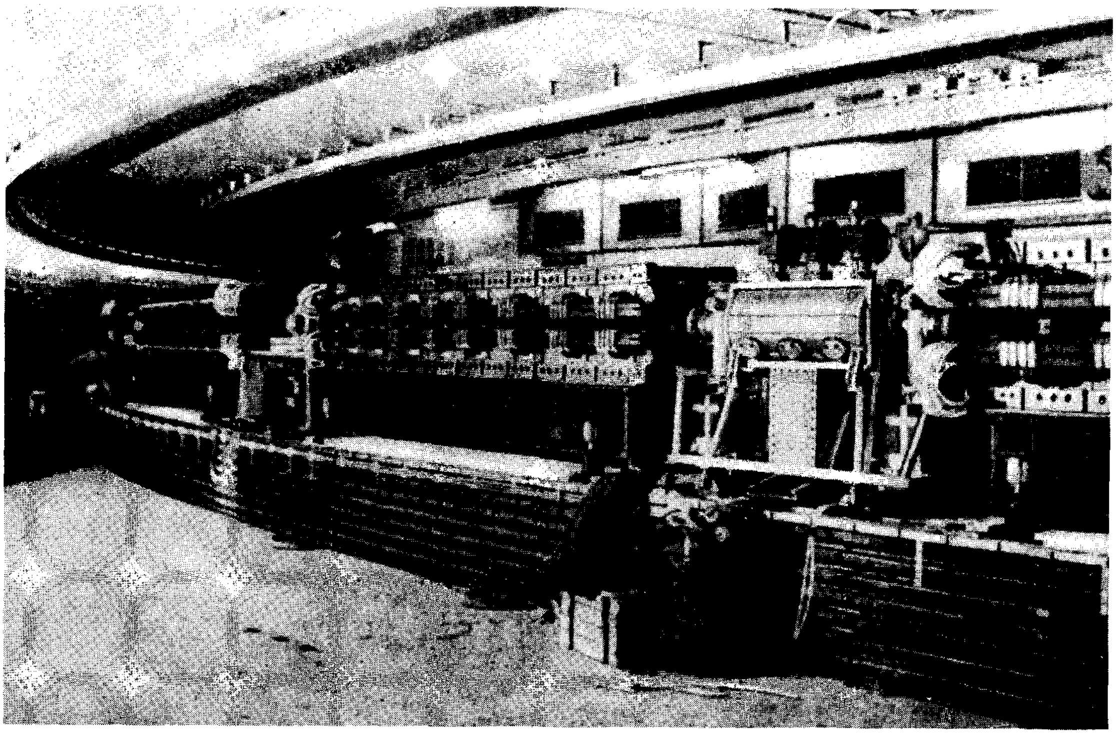

Fig. 6.

occurrence of strong transients in the RF system which produce high particle losses. A prebuncher cavity working on 500 MHz has been constructed and is being tested in the linac. The last figure shows the accelerator in its present state of assembly. The whole design of the accelerator is similar to the Cambridge Electron Accelerator. We have greatly benefited from the experience of the CEA group, and want to acknowledge the generous help and advice given to us by them and accelerator people of many other groups.