

RF STRUCTURE OF SUPERCONDUCTING CYCLOTRON FOR THERAPY

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Abstract

The full scale model experiments for a rf structure of a superconducting cyclotron¹⁾ for neutron therapy will be described.

Cyclotron design

A three sectors AVF cyclotron with superconducting magnet was designed. The dees are mounted on $\lambda/2$ resonators in the valleys of the magnet, and are connected at the center. The dees are driven from a single rf source in third harmonics mode. The design parameters of the cyclotron are shown in Tabel 1, and the full scale model for the rf structure is shown in Fig. 1.

Measurements

With the coupling-load transmission method the resonant frequency and Q-value of the cavity were measured. The value of Q estimated was more than 5000. Table 2 shows the resonant frequency as the function of the dee stem diameter and the cavity length. The accelerating field strength was measured by the bead perturbation method.

- 1) J. D. Hepburn, C. B. Bigham, H. R. Schneider, Inst. J. Radiation Oncology Biol. Phys. 1977 3, 387.

Table 1. Design parameter for the superconducting cyclotron.

Particle	deuteron, 30 MeV, 50 μ A
Maximum orbit radius	250 mm
Average central field	4.5 T
Rf frequency	100 MHz
Dee voltage	30 kV

Table 2. Resonant frequency of the cavity, A is the dee stem diameter and L is the cavity length.

A	L	Frequency
20 mm	225 mm	108.9 MHz
50	278	122.9
30	278	104.1

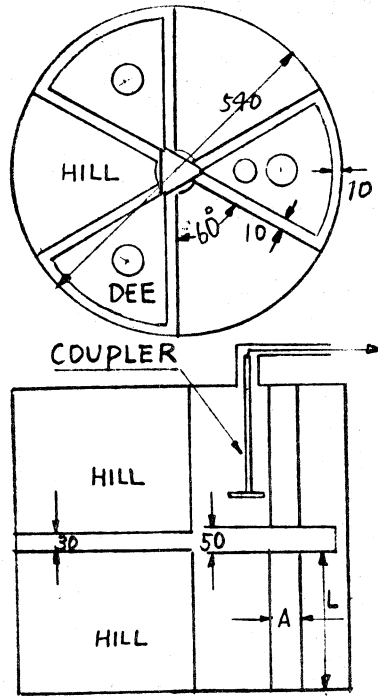


Fig. 1. Full scale model for rf structure of superconducting cyclotron. All are made of copper.