GCSCH/iw

MPS/SR/Note 73-32 Add.
5.9.1973

Addendum to

PROPOSAL FOR A RESISTIVE, NON-DESTRICTIVE UHF WIDE BAND PICK-UP STATION WITH BEAM POSITION MEASUREMENT

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I am indebted to D.J. Warner for pointing out that the resistive pu-station described in this note gives the indicated high frequency only for relativistic beams. Typically, at the output of a 50 MeV Linac a band width of more than 1 GHz can be obtained. The longitudinal field component of the beam reduces the band width further in the case of low velocity beams. This consideration led to the previous development described by L.R. Evans and D.J. Warner in MPS/LIN/72-6 "Real Time Measurements of Proton Bunch Form."

For the use of this PU type at the input of the Linac, bandwidth can be restored by a supplementary screening which absorbes the field of the beam outside the gap. Fig. 14 a) shows one solution of the screen.

The 4 rings of diameter 1, 2, 3 and 4 cm are fixed by 4 radial supports (of thickness δ).

The beam losses ε_ℓ of this arrangement have been calculated from

$$\varepsilon_\ell = \frac{\int_{V_{grid}} \rho \, dV}{\int_{V_{total}} \rho \, dV}$$

(ρ = space charge density

V_{grid} = volume determined by the screen cross-section multiplied by unit length $\ell = 1$

V_{total} = total cross-section of the vacuum chamber times unit length $\ell = 1$)

where a Gaussian charge density distribution

$$\rho = \rho_o \cdot \ell^{-\alpha r^2} \qquad (r = \text{radius})$$

has been assumed. The relative beam losses ε_ℓ are plotted versus beam diameter d_{95} (d_{95} contains 95% of the beam charge) for two values of the screen thickness δ (see Fig. 14 b). The thickness

$$\delta = 0.1 \text{ mm}$$

gives for a beam with diameter

$$d_{95} = 1{,}8 \text{ cm}$$

beam losses of 2%. The bandwidth of this assembly would be about 1 GHz. Other screen configurations may be still more favourable.

Distribution : (as Note MPS/SR/Note 73-32)

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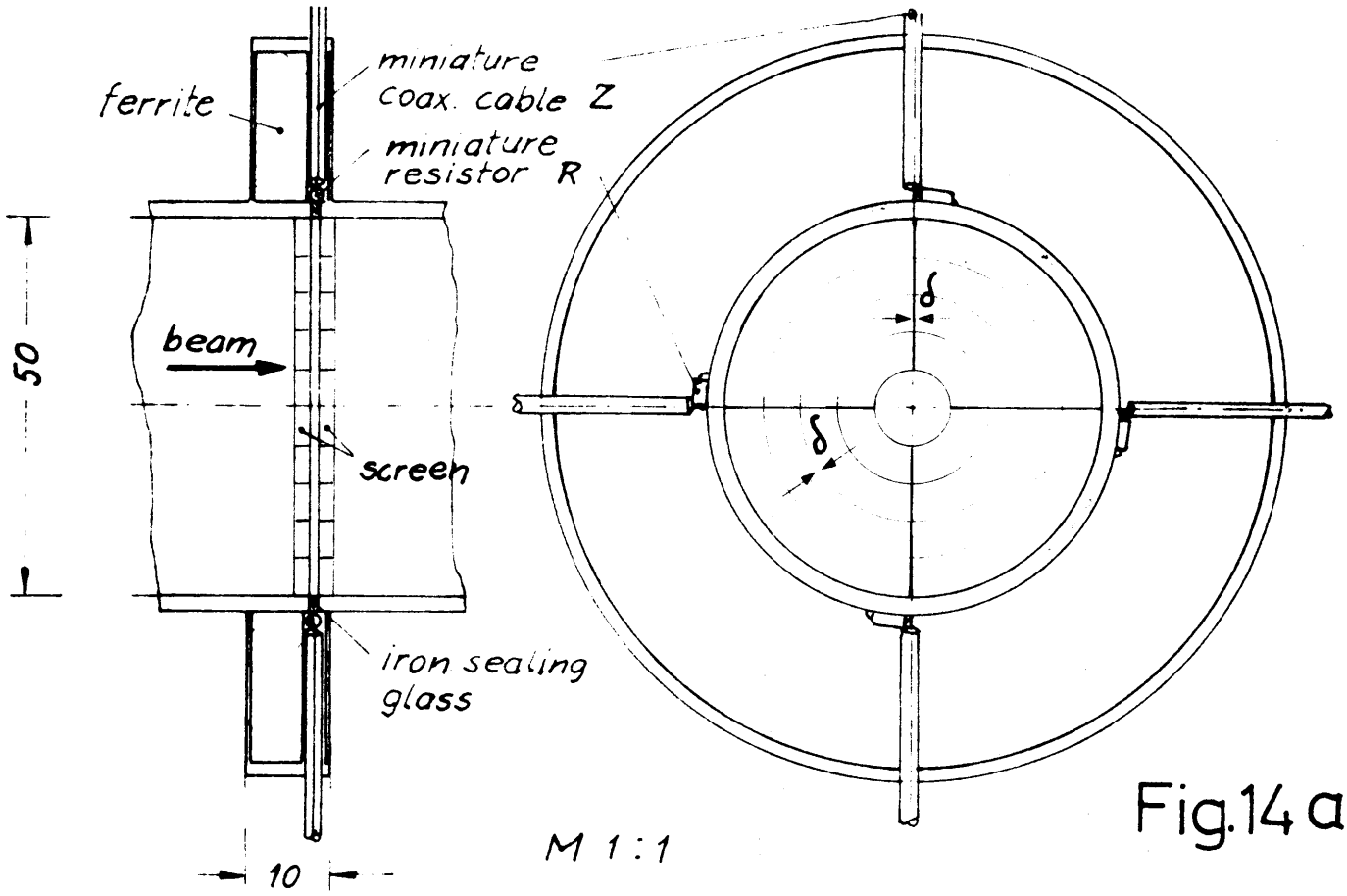

Fig.14 a

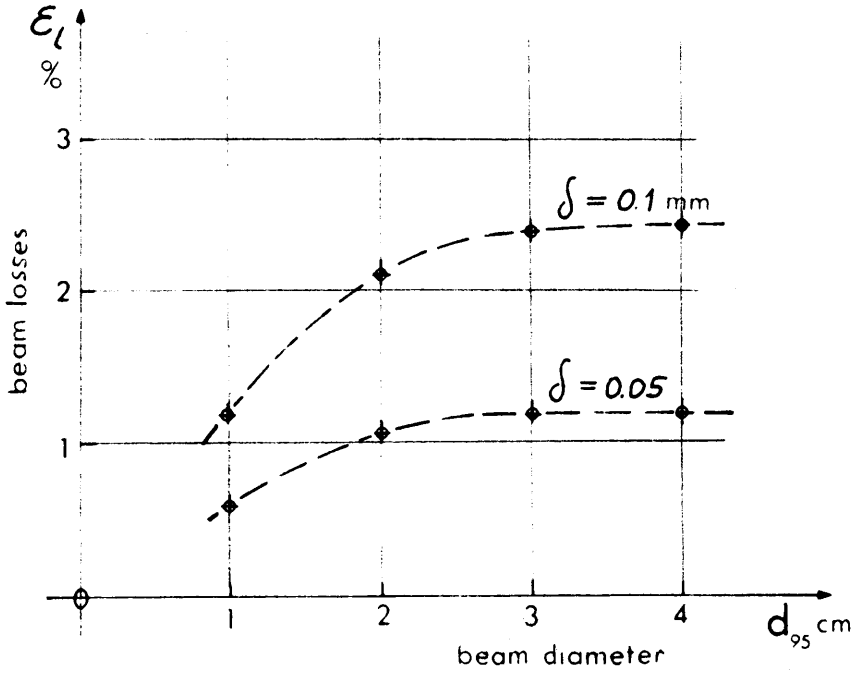

Fig.14 b