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A PRELIMINARY STUDY OF A VOLTAGE MULTIPLYING STRUCTURE FOR ELECTRON ACCELERATION

A. Fiebig, G. Nassibian, Ch. Schieblich

A B S T R A C T

The behaviour of a voltage multiplying structure has been calculated and the results confirmed by measurements on a 3 GHz model.

For a room temperature device it is shown that voltage multiplication factors of 10 or more are possible with drive beams of a few amperes, well within the possibilities of present day accelerators.

The short duration of the voltage peak should be a favourable feature for reaching high accelerating fields.

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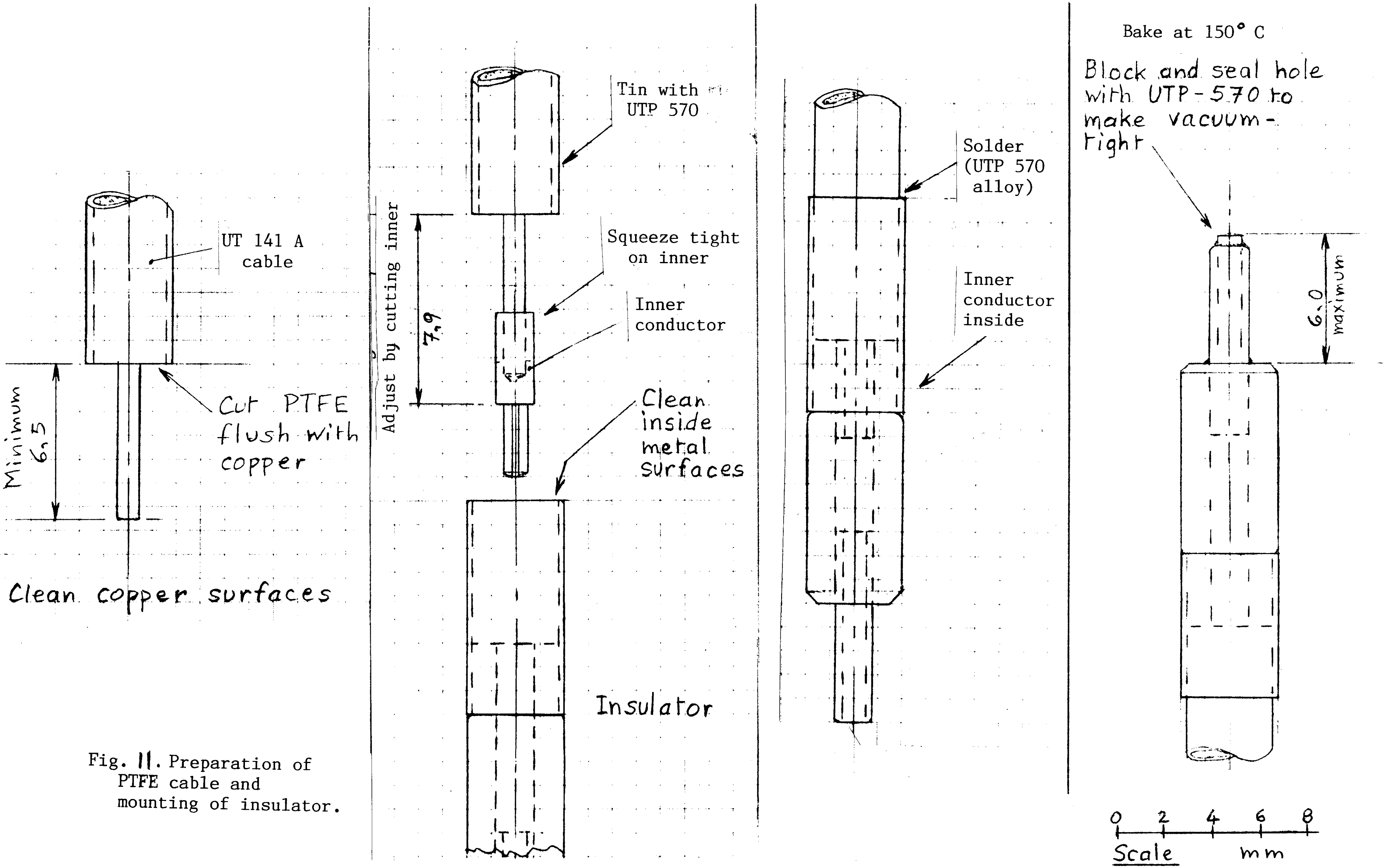


Fig. 11. Preparation of PTFE cable and mounting of insulator.

If it is assumed that $\sigma_y^* \ll \sigma_x^*$, that $\sigma_x^{*2}/\beta_x^* = \sigma_x^2/\beta_x$, i.e., that the dispersion at the crossing points η^* vanishes, and that $\Delta\nu_x$ is at the maximum permissible value $\Delta\nu$, (3) and (4) may be combined:

$$\nu^3 = \frac{2\pi C_q \; R \gamma^3 \; k_b \; \Delta\nu}{\rho N r_e} \qquad (5)$$

If k_b is replaced by (1) one finds

$$\nu^3 = \frac{4\pi^2 C_q \; \Delta\nu \; R\gamma^3 \; P_b \; h}{N r_e \rho \; P_d \; \eta \; Q} \qquad (6)$$

Now P_b and N are related by:

$$P_b = \frac{2 N c U_s}{C} \qquad (7)$$

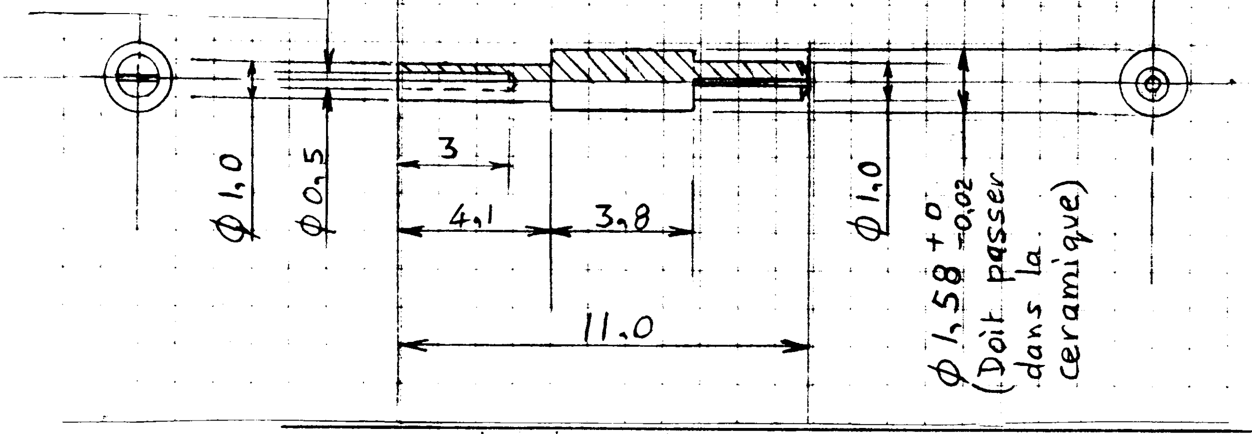
Here, U_s is the synchrotron radiation energy loss per turn, and C is the machine circumference.
If (7) is used in (6), and h substituted from (2), the following relation is obtained:
($V_e = U_s / \sin\phi_s$ is also used):

$$\nu = \frac{8\pi^2 C_q \, c \, E_o}{r_e} \; \frac{\Delta\nu \; \nu_s^2 \tan\phi_s \; \gamma^4}{\rho \, P_d \, \eta \, Q} \left(\frac{2\pi R}{C}\right) \qquad (8)$$

This becomes numerically:

$$\nu = 3873.035 \, \frac{\Delta\nu \;\; \nu_s^2 \;\; \tan\phi_s \;\; E^4\,(\mathrm{GeV})}{\rho\,(\mathrm{km}) \;\; P_d\,(\mathrm{MW}) \;\; \eta \;\; Q} \left(\frac{2\pi R}{C}\right) \qquad (9)$$

a) For Mg O cable



b) For PTFE cable

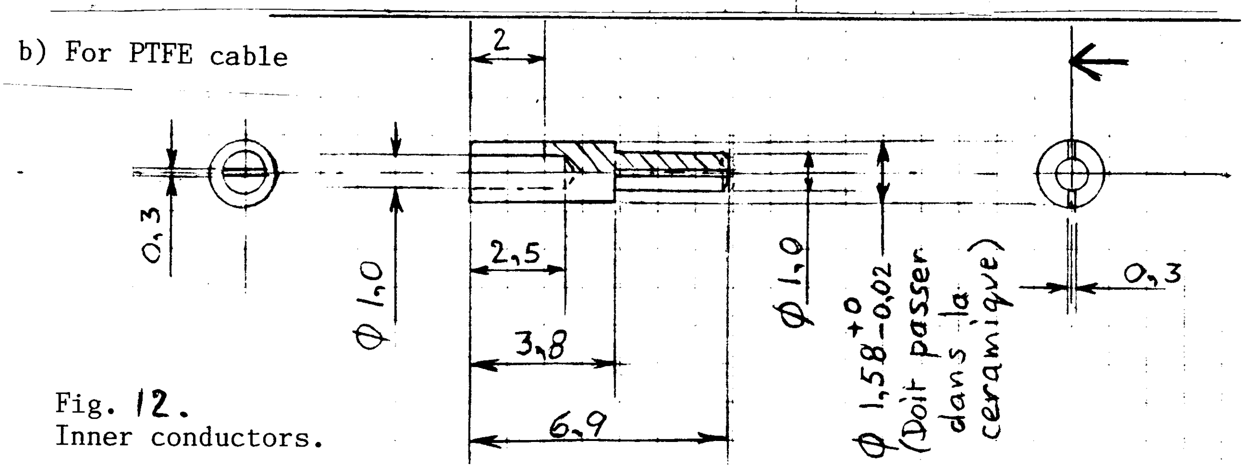


Fig. 12.
Inner conductors.

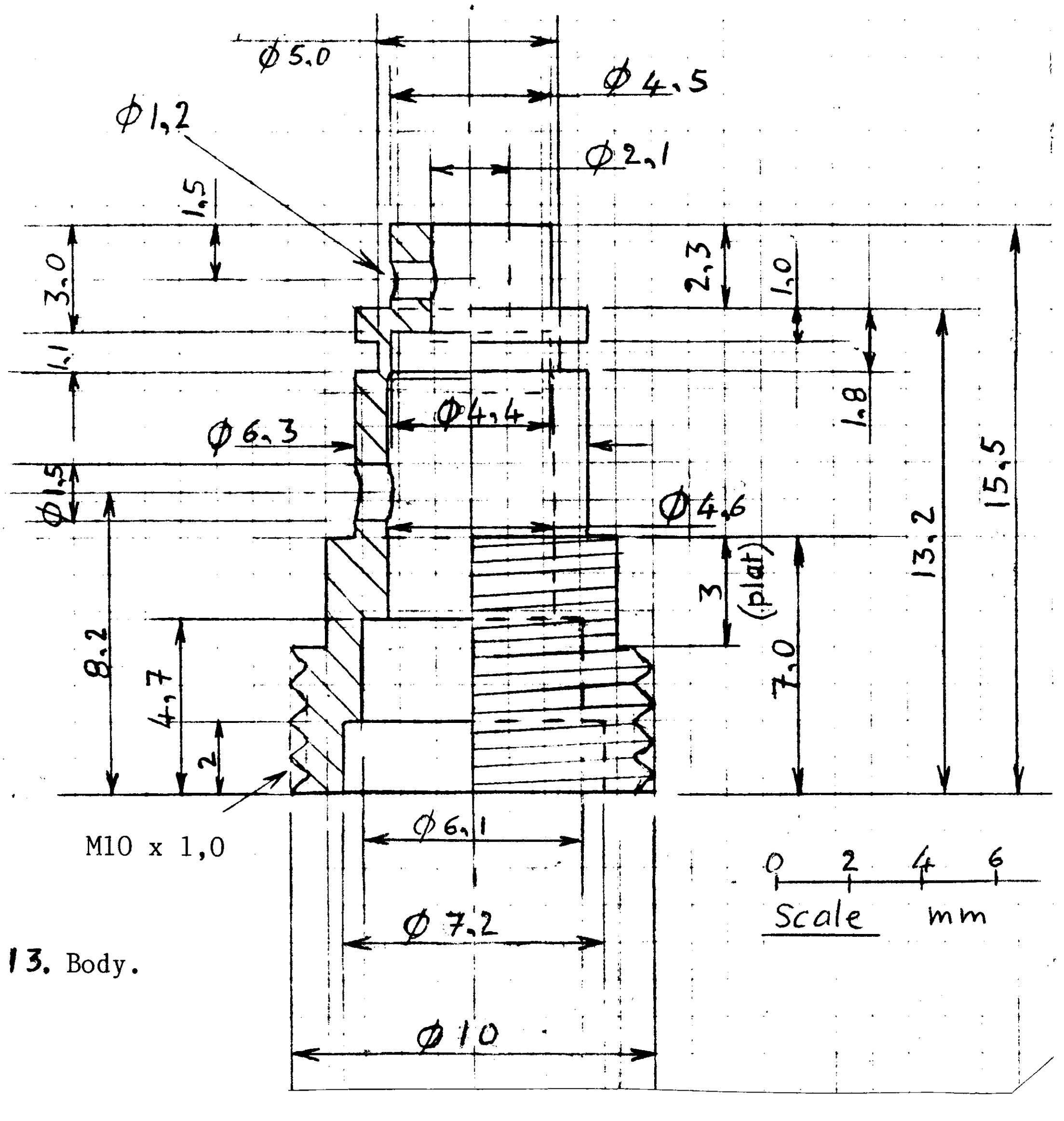


Fig. 13. Body.

Design and Performance of the AAC Stack Core Cooling System.

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Abstract.

The ACOL project aimed at higher antiproton stacking rates and integrated collider luminosities by the addition of a new AC collector ring, with bunch rotation and stochastic pre-cooling, and by major changes to the stochastic cooling systems of the existing AA mahine. These included the installation of a new 2-4GHz momentum cooling system and 4-8GHz transverse cooling system for the Stack Core. The option to leave the original 1-2GHz systems in place was also taken. We describe here the design and performance of the new Stack Core slotted pick-up and kicker structures, including the UHV feedthroughs, and the special problems of the old 1-2GHz kicker, which also became the new stack tail kicker with stringent requirements of symmetry and common mode rejection. The amplifier chains and the methods of diagnostics and measurement are reviewed, and performances are given in terms of beam transfer functions, cooling times and ultimate transverse emittances.

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