

14 Feb. 1999

# Length Saving in TESLA Structure by Relocation of Tuner

by Hartwig Kaiser, DESY

## Proposed new Configuration

The tuner in the present TESLA RF- structure occupies a length of roughly  $\lambda/2$  ( $\lambda =$  RF wave length) in the region of the connecting beam tube which has a total length of  $3\lambda/2$ <sup>1</sup>. By relocating the tuner to a place away from the beam tube region it appears possible to markedly improve the cavity filling factor of TESLA.

The proposed scheme is shown in Fig. 1. Both cavity-ends are joined rigidly to the He vessel in similar fashion as is presently the case only on the input-coupler end of cavity<sup>1</sup>. At a convenient place near one of the ends of the He vessel a gap of ca. 40mm is left in the tank tube and bridged by a bellow. The width of this gap is controlled by a mechanical tuning device outside the He vessel and magnetic shielding, but inside the 4.5K radiation shield. The tuning mechanism, indicated symbolically in Fig.1, must produce no lateral or angular offset at the bellow and allow fine adjustment of gap. In this manner the length of the He tank may be varied in axial direction. The resonator, being attached at both ends to the He tank, must participate in this change of length, i.e. can be tuned. Length in the connecting region between adjacent cavities is no longer consumed by the tuner.

## Consequences of proposed tuner-relocation

In the present TESLA structure with 9-cell resonators, about 40mm of length could be conserved per cavity, since only 2 HOM couplers, 1 main coupler, 1 RF pickup, beam-tube bellow and flanges but no tuner would occupy the connecting region.

In the contemplated super-structure of groups of 4 7-cell cavities with individual tuners but spaced at  $\lambda/2$  and connected with a 114mm dia. beam tube, as proposed by J. Sekutowicz, the present tuner would not fit. This concept *necessarily* needs ridding the connecting zone of the tuner.

Regardless of which structure is chosen for TESLA 500, a length and cost saving will result from the proposed tuner relocation.

The proposed tuner also well fits with contemplated *welded*, and perhaps axially *rigid*(bellow-less)connecting tubes between adjacent resonators. Also, with concepts with more than one resonator in one He-tank.

### Reference:

- 1 TESLA 95-01, March 1995“TESLA Test Facility Design Report“

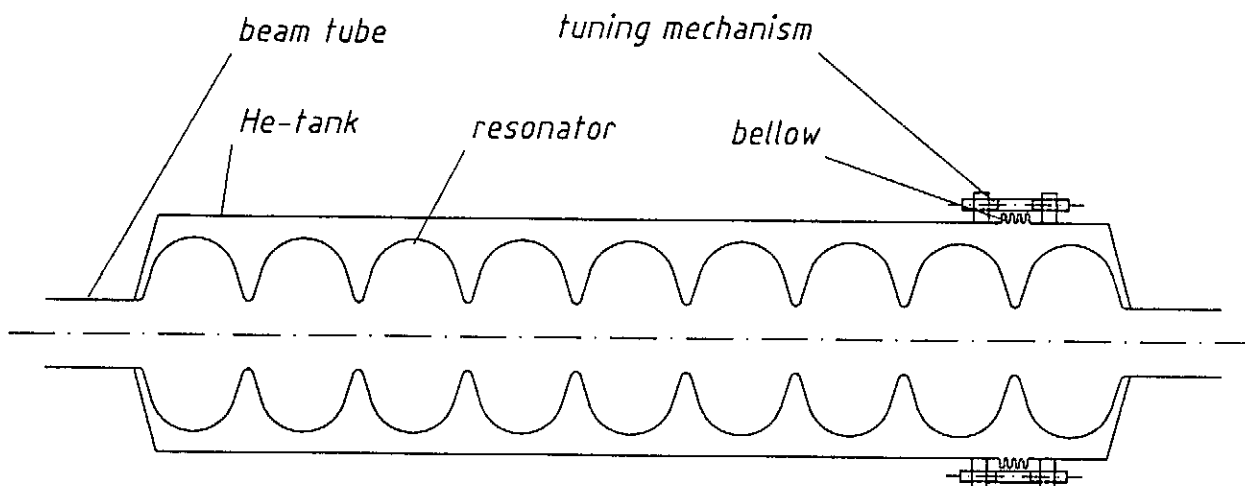


Fig.1 Cavity-He vessel-tuner assembly