

**Methods for High Precision Monitoring the Beam Energy of the Mainz Microtron (MAMI),** TH. DOERK, H. EUTENEUER, K.-H. KAISER, KPH-MAINZ - The width of the energy spectrum of MAMI is less than  $10^{-4}$  at 855 MeV and long term energy drifts, mainly due to temperature effects, are below  $\pm 50$  keV. There are demands for on-line measure and reduce this latter span to  $\pm 1 \cdot 10^{-5}$  for precision nuclear physics experiments. Several possible methods for this purpose are discussed, and a set-up using slender 4th harmonic (9.8 GHz) rf position monitors on the return paths of the third race track microtron (RTM) is presented. Moreover, for a planned experiment with polarized electrons, searching for a  $10^{-7}$  resolution in a parity violation effect, a longitudinal tuning of MAMI is necessary, where the beam energy is insensitive within  $4 \cdot 10^{-8}$  to beam current variations of about 10 nA. Changes of this order of magnitude will surely occur when switching the polarization of the  $10 \mu\text{A}$  electron beam from the laser photocathode gun. The results of beam dynamical calculations are presented, showing that this extreme demand could be satisfied by the superior inherent energy stability of the RTM, by a proper setting of its synchronous phase within a precision of  $\pm 0.02^\circ$ .