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CALIBRATION OF THE RADIATION ENVIRONMENT MONITOR, REM

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The REM has been irradiated with protons in the energy range from 250 MeV to 33 MeV at the new Proton Irradiation Facility at PSI. The measured pulse heights are compared to Monte Carlo simulations and a very good agreement is found.

The Radiation Environment Monitor (REM) is a simple device to be flown on future missions to determine the momentary particle fluxes in orbit which constitute a hazard for modern large scale integrated circuits.

During the irradiation at the PIF facility, the analog signal of the REM Detector Suite was amplified (10x) and fed into a Pulse Height Analyzer (PHA). We used the test input (input capacitance = 2.00pF) of the REM-suite to calibrate the REM instrument. With an energy to create an electron-hole pair of 3.62 eV, a signal of 2.5 mV corresponds to an energy loss of 113.0 keV. This is about the energy loss of minimum ionizing particles in 300 μm Silicon. After fitting the

PHA Channel-No. as function of the input amplitude the energy deposit for a certain PHA-channel may be obtained.

We used the particle code GEANT, version 3.15, from CERN to simulate the measurements. The known energy of the PIF beamline (about 300 MeV) was used as input to the GEANT-code. The protons were traced through the various degraders and the energy deposition in the Si-detectors was calculated. In the figures below, some of the measured spectra are compared to simulations. The agreements are excellent.

