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Electron-Proton and High Energy Telescopes for Solar Orbiter

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The Energetic Particle Detector (EPD) suite for ESA's Solar Orbiter will provide key measurements to address particle acceleration at and near the Sun. The EPD suite consists of five sensors (STEIN, SIS, EPT, LET and HET). The University of Kiel in Germany is responsible for the design, development, and build of EPT and HET which are presented here. The Electron Proton Telescope (EPT) is designed to cleanly separate and measure electrons in the energy range from 20 - 400 keV and protons from 20 - 7000 keV. The Solar Orbiter EPT electron measurements from 20 - 400 keV will cover the gap with some overlap between suprathermal electrons measured by STEIN and high energy electrons measured by HET. The proton measurements from 20 -7000 keV will cover the gap between STEIN and LET. The Electron and Proton Telescope relies on the magnet/foil-technique. The High-Energy Telescope (HET) on ESA's Solar Orbiter mission, will measure electrons from 300 keV up to about 30 MeV, protons from 10 –100 MeV, and heavy ions from $\sim$20 to 200 MeV/nuc. Thus, HET covers the energy range which is of specific interest for studies of the space environment and will perform the measurements needed to understand the origin of high-energy events at the Sun which occasionally accelerate particles to such high energies that they can penetrate the Earth's atmosphere and be measured at ground level (ground-level events). These measurement capabilities are reached by a combination of solid-state detectors and a scintillator calorimeter which allows use of the dE/dx vs. total E technique for particle identification and energy measurement. The upper limits on energy listed above refer to particles (ions) stopping in the scintillator and careful modeling of HET properties will allow discrimination of forward/backward penetrating particles in a wider energy range. Here we present the current development status of EPT-HET units focusing on the test and calibration results obtained with the demonstration models and present plans for future activities.