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Development of a trigger system for the ESTHER Shock Tube Spectroscopy/Streak-Camera Diagnostic

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A new kinetic shock tube (ESTHER) is being commissioned at Instituto Superior Técnico under funding from the European Space Agency (ESA). Its main goal is to support planetary exploration missions, by studying high speed radiative and chemical processes kinetics relevant to planetary entries. ESTHER is capable to produce shock speeds up to 14 km/s in air and 18 km/s in H₂/He. The main diagnostic is time-dependent spectroscopic measurements radiation emitted and absorbed in the wake of the shock-wave with a streak camera/spectrometer setup located a test section of the shock tube. Since there is an uncertainty on the arrival of the shock-wave at the test section an accurate trigger system is essential for the appropriate operation of this diagnostic. The ESTHER streak camera trigger system proposes the use of four piezo-sensors to measure the rise in pressure at different locations, a signal conditioning system, a FMC fast ADC converter and a FPGA based development board that will include an embedded microprocessor.

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