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Low energy high angular resolution neutral atom detection by means of micro-shuttering techniques: the BepiColombo SERENA/ELENA sensor

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The neutral sensor ELENA (Emitted Low-Energy Neutral Atoms) for the ESA cornerstone BepiColombo mission to Mercury (in the SERENA instrument package) is a new kind of low energetic neutral atoms instrument, mostly devoted to sputtering emission from planetary surfaces, from E $\sim$20 eV up to E$\sim$5 keV, within 1-D (2˚x76˚).

ELENA is a Time-of-Flight (TOF) system, based on oscillating shutter (operated at frequencies up to a 100 kHz) and mechanical gratings: the incoming neutral particles directly impinge upon the entrance with a definite timing (START) and arrive to a STOP detector after a flight path.

This poster presents the instrument, with the new design techniques approached for the neutral particles identification and describes the development of crucial elements of this innovative instrumentation: the Start system with the nano-structure shuttering core of the ELENA sensor, the ultrasonic oscillator and position encoder together with the TOF chamber and the Stop system.

This new development allows unprecedented performances in angular resolution

within the timing discrimination constraints for the expected population of the sputtered particles. Such design technologies could be fruitfully exported to different applications for planetary exploration.