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Low energy high angular resolution neutral atom detection by means of micro-shuttering techniques

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The neutral sensor ELENA (Emitted Low-Energy Neutral Atoms) for the ESA cornerstone BepiColombo mission (in the SERENA instrument package) is devoted to the sputtering emission detection (energy range: tens eV-few keV) within 1-D (2 deg x 76 deg) nadir cross track slices from the planet surface.

ELENA is a Time-of-Flight (TOF) detector, based on oscillating choppers (operated at frequencies up to a 100 kHz) and mechanical gratings: the incoming neutral particles directly impinge on the detector entrance with a definite timing. This presentation describes the development of the instrument with the new design techniques approached for the neutral particles identification and the nano-technique activities for designing and manufacturing the nano-structure shuttering core of the ELENA sensor.

The new development in this field 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.