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

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ELENA (Emitted Low-Energy Neutral Atoms) is a Time-of-Flight (ToF) system, based on oscillating shutter (operated at frequencies up to a 100 kHz) and mechanical gratings devoted to sputtering emission from planetary surfaces, from E $\sim$20 eV up to E $\sim$5 keV. This new kind of low energetic neutral atoms instrument is one of the four units of the SERENA experiment for the ESA cornerstone BepiColombo mission to Mercury. The low energetic neutral particles that are likely to be detected by ELENA come primarily from ion-sputtering process, and secondarily from back-scattering and from charge exchange. ELENA will resolve intensity, velocity and direction of the incoming particle flux: the entrance of the start section (an aperture of about 1 cm^2consisting of two self-standing silicon nitride (Si_3N_4) membranes, patterned with arrays of long and narrow openings) allows the impinging neutral particles to enter through the shuttering system with a definite timing. Particles are then flown in a ToF chamber, and finally detected by a 1-dimensional array composed by MCPs and a discrete anodes set corresponding to a Field of View (FOV) of 4.5˚x76˚, allowing the reconstruction of both velocity and direction of the incoming events.

This poster will present the new results of the ELENA development in the frame of the scientific items, instrument simulation, laboratory activity and testing. In particular, the ELENA input section and shuttering system will be reported (new deflector system, shuttering functionality test, membranes VUV optical proprieties and particle beam interactions).