



## **Expected performance of the two flight units of the Neutral Gas Mass Spectrometer for the Luna-Resurs lander in the lunar exosphere**

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In-situ analysis of the chemical composition of the tenuous lunar exosphere improves our understanding of the origin and evolution of celestial bodies. Luna-Resurs (Luna27) is a joint Roscosmos and ESA lunar landing mission to polar latitudes where pristine and widely unprocessed material could still be present. Our instrument is dedicated to analyse the chemical composition (water, volatiles and noble gases) of the lunar regolith and the lunar exosphere.

We developed and built a compact time-of-flight mass spectrometer (neutral gas mass spectrometer, NGMS) that operates in two modes: i) to analyse the constant output of a gas chromatograph, and ii) to analyse the lunar exosphere. Cross-calibration tests of the two flight units with different calibration gases allow for assessment of the performance of the NGMS instruments when operated in exosphere mode. Our measurements indicate that both units quantitatively identify traces of species at  $10^{-16}$  mbar within 1 second integration time when assuming an ambient gas pressure of  $10^{-10}$  mbar. Increasing the integration time will increase this dynamic range furthermore. The mass resolution of up to  $m/\Delta m = 1200$  allows for precise isotope measurements. Analysis of these measurements in context with the molecular structure measurements performed here will lead to enhanced knowledge of the mechanisms of lunar volatiles.