

Linear Ion Trap Mass Spectrometer (LITMS) for *in situ* Astrobiology

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The highly compact Linear Ion Trap Mass Spectrometer (LITMS) combines two powerful approaches to organics analysis, pyrolysis gas-chromatography/mass spectrometry (GCMS) and Mars-ambient laser desorption mass spectrometry (LDMS), linked through a single, highly-miniaturized yet highly-capable linear ion trap mass analyzer. The LITMS instrument is based substantially on the Mars Organic Molecule Analyzer - Mass Spectrometer (MOMA-MS) for the 2020 ExoMars mission, but features further miniaturization and substantial analytical enhancements identified during the MOMA-MS development but not realized due to schedule or mission architecture limitations. In addition to MOMA capabilities (GCMS, LDMS, positive ion detection, tandem mass spectrometry), LITMS enhances the instrument performance by including negative ion detection, a dual frequency RF power supply to increase mass range, precision subsampling of drill cores at fine (≤ 1 mm) spatial scales, and pyrolysis of powdered sample for evolved gas analysis (EGA) of minerals and organics. The LITMS brassboard has been developed with a flight-like design to support Mars-specific environmental testing (pressure, vibration, shock, and limited thermal). Preliminary benchtop EI-mode spectra confirm the operation of the sensor system with highly-promising performance specifications. End-to-end tests of the fully-integrated LITMS, with arm-mounted drilling and Precision Core Sampler (PCS) operation under Mars ambient conditions are scheduled over the next several months, prior to preparation of the system for field deployment in the Atacama Desert.