

Rugged Mass Spectrometer and Reduced-Mass Electronics Development in Support of Payload Development on Resource Prospector

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Previously, JPL reported the first testing of vacuum compatible mass spectrometer (MS) electronics for the magnetic sector MS in the RESOLVE payload. Commercial off-the-shelf (COTS) boards were re-packaged and tested in vacuum, with heat rejection achieved by conductive means rather than air-cooled as in the COTS mass spec instrument. We have now completed and delivered two TRL 5 electronics assemblies, containing electronics for running the mass spectrometer high voltage and detector readout. In an effort to reduce the mass of the electronics assembly, we are working to fabricate the electronics enclosure from a woven carbon composite material, leading to an approximately 40% reduction in mass for the revised electronics assembly. The carbon composite structure will house the electronics in the same arrangement as the aluminum structure, and maintain heat rejection through conduction. The mass of the lightened electronics assembly is expected to be 1.47 kg, leading to an overall MS system mass including harnessing of only 3.2 kg. Additionally, we have completed dynamics testing on the MS and gas chromatograph subassemblies, and as a result of this 'shake test' both assemblies can be assigned TRL6 for Resource Prospector, owing to operation in the vacuum environment (the 'relevant environment') and survival of the launch dynamics environment. We present progress in development of the electronics subsystem, including the low-mass electronics, as well as results of the dynamic testing and plans for future system development.