

THE SKINNY

MERLIN, or **M**apping **E**xobiology **R**aman Laser **I**Nvestigation

- A Surface Enhanced Raman Spectroscopy (SERS) instrument capable of ppb detection levels of organic compounds in real time

CONOPS and TECHNOLOGY

A sample is robotically inserted into the back-illuminated 5x5mm sapphire viewing port for organic and trace biosignature detection. MERLIN performs 2D high precision mapping across silver nanorod SERS substrates produced with oblique angle thermal vapor deposition.

Rapid/coarse or slow/fine mapping with onboard analytics including database search and matching for immediate feedback on data quality and identification of chemistry.

Gimbal-Less 2-axis MEMS micromirrors for steering

CURRENT TEST READINESS LEVEL (TRL)

- Instrument at TRL4
- Subsystems at TRL6 in June, 2023

COMPARISON TO STATE OF THE ART

MERLIN has orders of magnitude improvement in detection limits compared to other planetary Raman spectrometers due to the incorporation of SERS technology that enhances weak Raman signals with LOD limits for several compounds at <100ppb

POSSIBLE PLANETARY MISSIONS

Abzu / MLE / Enceladus Orbilander

MERLIN was designed for the Abzu mission concept to discover and analyze organics on Mars in situ with a viewing window that connects to ExCALiBR for concentrated organic delivery to the sensor. The hardware and SERS substrate creation techniques are also applicable to the Mars Life Explorer (MLE) to determine organics in ice as well as the Enceladus Orbilander to determine amino acids and lipids in active ice world plumes

Expected Flight SWaP

3U, 8kg, 20W

MERLIN

RAMAN INSTRUMENT



SPECIFICATIONS

PARAMETER	UNIT	VALUE
LASER WAVELENGTH	nm	532
OUTPUT POWER	mW CW	350
SPECTRAL WINDOW	cm ⁻¹	280-3870
SPECTRAL RESOLUTION	>cm ⁻¹	14
MAPPING REGION	mm	5X5
SPOT SIZE AT SAMPLE	um	~200
EXPECTED SENSITIVITY	ppm to ppt	DEPENDENT ON SAMPLE

