

Table STM. SPRING Mission Science Traceability Matrix maps the relationship among NASA science goals, SPRING mission aims and mission instrument performance.

NASA Science Goals	SPRING Mission Objectives	Scientific Measurement Requirements		SPRING Instrument	Instrument Functional Requirements	Projected Performance	Mission Functional Requirements	
		Observables	Physical Parameters					
Explore and find locations where life could have existed or could exist today - 2014 NASA Science Plan	1A. Determine if samples have micro texture biosignatures.	Backscattered Electrons	Micro Physical Morphology Textures	MVP-SEM	Sufficient contrast to note mineral and phase chemical zoning		0.2-2 nA current at sample	
Did Mars or Venus host ancient aqueous environments conducive to early life, and is there evidence that life emerged? Important objects for study: Mars and Venus. -Vision & Voyages					Resolve uncoated objects	Environmental SEM mode	Pressure Control to <0.5 Torr Chamber Pressure Control to <1x10 ⁻⁸ Torr	
Explore and observe the objects in the solar system to understand how they formed and evolve - 2014 NASA Science Plan					2A. Determine microtexture evidence of past environment evolution and volcanic history.	FOV Diameter (at 175X)		0.75 mm or greater
					3A. Physical mapping of resources for mechanical properties and health	Resolution (Autofocus)		100 nm in size of better
Beyond Earth, are there contemporary habitats elsewhere in the solar system with necessary conditions organic matter, water, energy, and nutrients to sustain life, and do organisms live there now? Important objects for study: Enceladus, Europa, Mars, and Titan. -Vision & Voyages	1B. Determine if samples have macro texture biosignatures.	Imaging	Macro Physical Morphology Textures	Cameras	Microscopic Vis-IR imager in a position to observe the area around the rover	Spectral resolution, spatial resolution, as good as MER	0.27 mrad/pixel and a FOV of 16° x 16°	
	2B. Macrotextures of past environment and volcanic history							
	3B. Map geological units in study site.							
Advance the understanding of how the chemical and physical processes in our solar system operate, interact and evolve - 2014 Science Plan	1C. Determine if samples have mineral/ organic/ chemical texture biosignatures.	Characteristic X-rays	Elemental Composition	MVP-SEM	Detection precision (major elements) using Energy Dispersive Spectroscopy	Accuracy less than ±5% for major elements, ±25% for minor elements	Mars Surface Access Diverse Units	
	2C. Macrotextures of past environment and volcanic history							
	3C. Determine elemental resources of site units.							
Identify and characterize objects in the solar system that pose threats to Earth, or offer resources for human exploration- 2014 NASA Science Plan	1D. Determine if samples have mineral/organic texture biosignatures.	Spectral Reflectance	Mineral Composition	Spectrometer	Multi to Hyperspectral resolutions to distinguish silica, sulfate, carbonates, mafics and phyllosilicates	300+ Spectral bands		
	2D. Mineral history of past environment and volcanic history.					1.0 mrad/pixel and a FOV of 20° x 20°		
	3D. Determine mineral resources of landing site.							