TRANSFORMING ULTRAVIOLET SPECTROSCOPY IN THE NEXT TWO DECADES: THE LUVOIR ULTRAVIOLET MULTI-OBJECT SPECTROGRAPH (LUMOS)

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Abstract: The *Large Ultraviolet/Optical/Infrared Surveyor* (*LUVOIR*) will pursue an ambitious program of exoplanetary discovery and characterization, cosmic origins astrophysics, and planetary science [1]. Many of the exoplanet, cosmic origins, and planetary science goals of *LUVOIR* require high-throughput, imaging spectroscopy at ultraviolet through optical wavelengths (100 – 1000 nm). The LUVOIR Ultraviolet Multi-Object Spectrograph [2], LUMOS, supports all of the UV science requirements of *LUVOIR*, from exoplanet host star characterization to tomography of circumgalactic halos to water plumes on outer solar system satellites (**Fig 1**). LUMOS offers point source and multi-object spectroscopy across the UV bandpass, with multiple resolution modes to support different science goals (**Fig 2**). The instrument provides low (R = 10,000), medium (R = 40,000 – 60,000), and high (R > 100,000) resolution modes. A very low resolution mode (R = 500) is available for spectroscopic investigations of extremely faint objects in the FUV. Multi-object imaging spectroscopy over a 2 × 2 arcminute field-of-view (**Fig 3**) is enabled by microshutter arrays (MSA) that build on the heritage NIRSpec on the *James Webb Space Telescope (JWST)*. The spectroscopic capabilities of LUMOS are augmented by an FUV imaging channel (100 – 200nm, 20 milliarcsecond angular resolution, 2 × 2 arcminute field-of-view) offering a complement of narrow- and medium-band filters.

In this talk, we will present an overview the key science drivers for LUMOS, the design and technical implementation path for the instrument, and example science programs that highlight the revolutionary power of a high-throughput multi-object spectrograph for science that requires access to rest-frame UV observations.

References: [1] LUVOIR STDT. (2018) *Study Interim Report (https://arxiv.org/abs/1809.09668).* [2] France, K et al. (2017) *SPIE v10397*.

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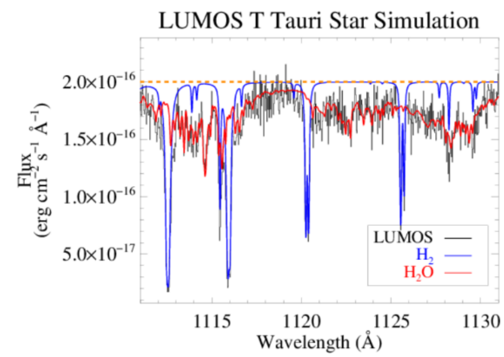

Figure 1 – Simulated LUMOS spectrum of volatiles in a 5 Myr, planet-forming disk.

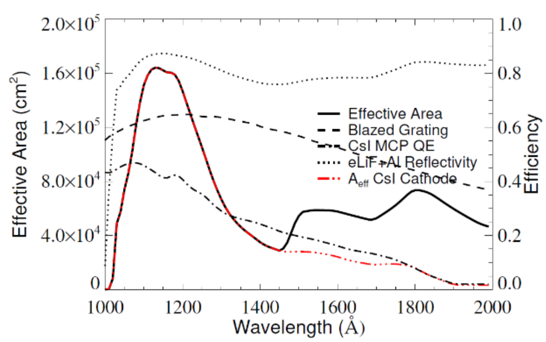

Figure 2 – Effective area and component level efficiencies for the LUMOS far-UV multi-object modes.

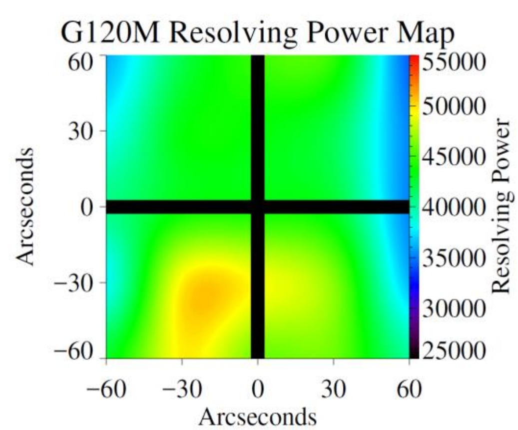

Figure 3 –Spectral resolution map for the LUMOS G120M multi-object mode (100 – 140 nm). Average resolving power R > 40,000 is achieved over the 2´ × 2´ field of view.