Integral-field spectroscopy in the far ultraviolet with INFUSE, a pathfinder for a mode on Habitable Worlds Observatory

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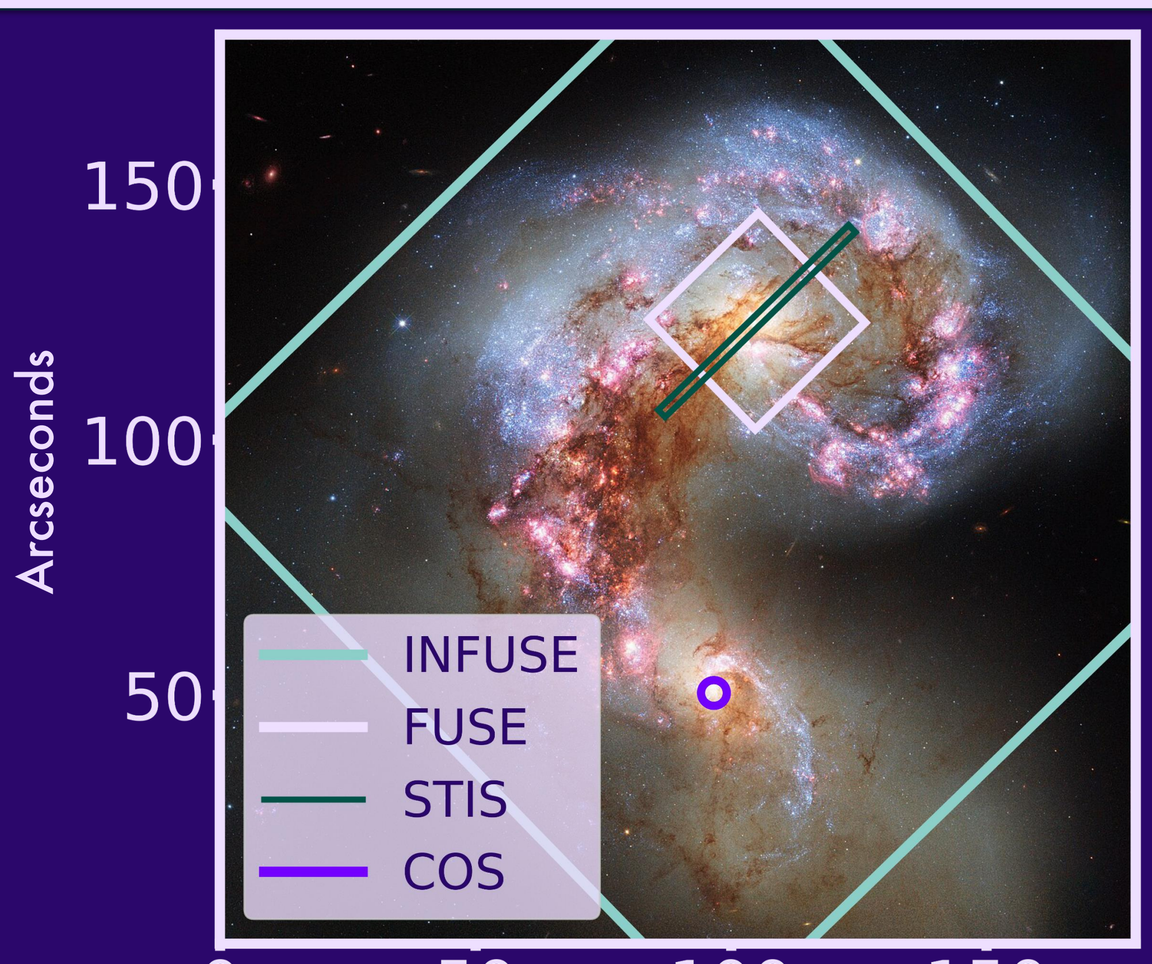
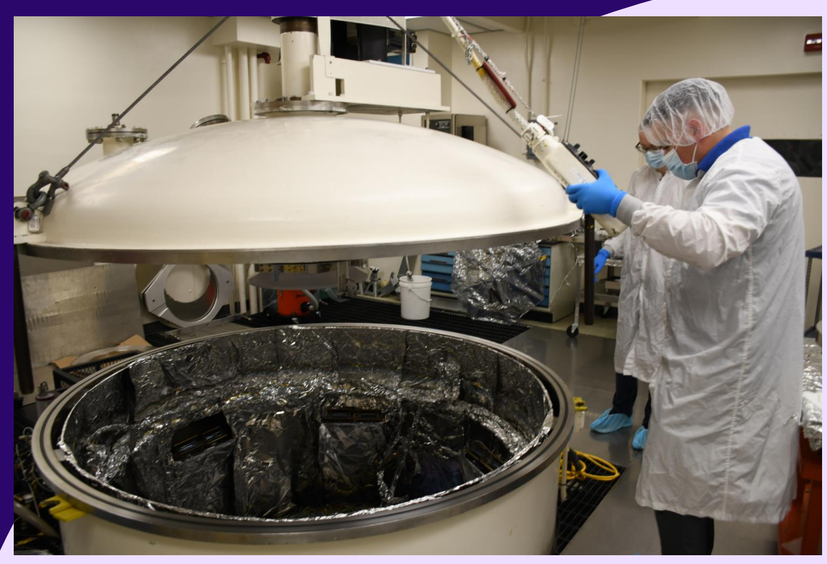
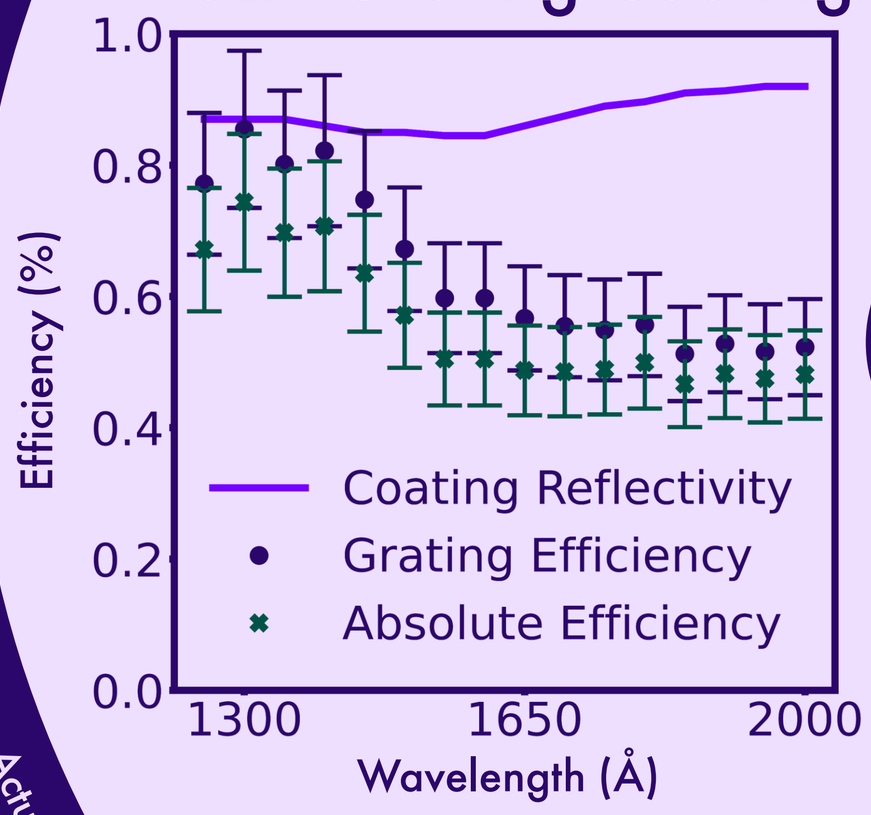
Integral-field spectroscopy greatly increases the observational efficiency for spectral mapping of extended sources. In this image, the INFUSE field-of-view is overlaid on the Antennae Galaxies, along with the field-of-view of other ultraviolet instruments. INFUSE uses an image slicer to produce over 1,000 spectra in a single exposure.





XeLiF Grating Coating



Xenon-enhanced lithium fluoride, an ultraviolet reflective coating developed at Goddard Space Flight Center, has been successfully applied to replica holographic gratings.

Actual size of INFUSE primary – 488 mm diameter active area

Actual size of INFUSE secondary

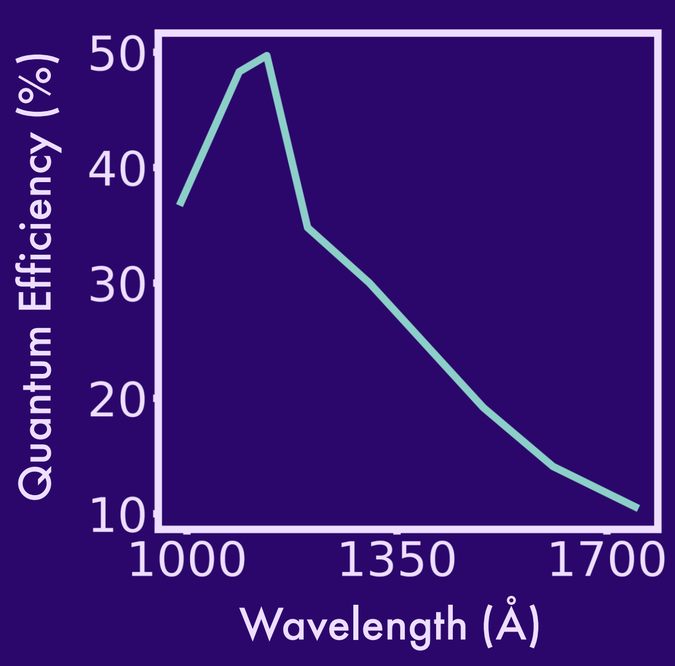
INFUSE uses a secondary mirror coated with enhanced lithium fluoride.

Technology Development For Habitable Worlds

The coatings, detector, and optical design technologies on INFUSE align with multiple NASA COR Technology Gaps requirements set to support Habitable Worlds Observatory

- Large-format photon counting detectors
- Multi-object selection mechanisms and/or integral field capability
- Optical coatings > 50% reflectance at 103 nm

MCP Detector Performance



INFUSE flies a large format cross-strip micro-channel plate detector provided by Sensor Sciences.

Actual size of MCP detector

The detector has high dynamic range and less than 20 micron resolution.

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INFUSE is the first far ultraviolet (1000 – 2000Å) integral field spectrograph. It launched successfully for the first time from White Sands Missile Range on October 29th, 2023, and is due for a second launch in Spring 2025 to demonstrate further advances in mirror coatings. The project is led by graduate students at LASP, seen here recovering the payload.