MSFI

Multi Spectral Fluorescence Imager (MSFI)*

Space Administration

**Currently under development*

Genetic transformation with *in vivo* reporter genes for fluorescent proteins can be performed on a variety of organisms to address fundamental biological questions. Model organisms that may utilize an ISS imager include unicellular organisms (*Saccharomyces cerevisiae*), plants (*Arabidopsis thaliana*), and invertebrates (*Caenorhabditis elegans*).

The multispectral fluorescence imager (MSFI) will have the capability to accommodate 10 cm x 10 cm Petri plates, various sized multi-well culture plates, and other custom culture containers. Features will include programmable temperature and light cycles, ethylene scrubbing (< 25 ppb), CO_2 control (between 400 ppm and ISS-ambient levels in units of 100 ppm) and sufficient airflow to prevent condensation that would interfere with imaging.

Magnification: Capable of capturing high-resolution (>20µm per pixel, approximately 1200 ppi) images and single field of view (macro image) from a fixed reference point, with dissection scope level magnification.

Imaging: Capabilities for visible light (bright field, broad spectrum white light) imaging and red-shifted EGFP imaging with excitation at 484 nm and emission at 507 nm. Specialized features include (1) imaging the most common GFP-derived variants, (2) imaging other fluorescent biomarkers (OFP and RFP classes), (3) rapid ability to switch between excitation wavelengths and between emission wavelengths, (4) dark-cycle IR imaging illumination, chlorophyll fluorescence, and (5) the ability to collect multispectral emission to deconvolute information for many spectral bands and perform full-multispectral analysis.

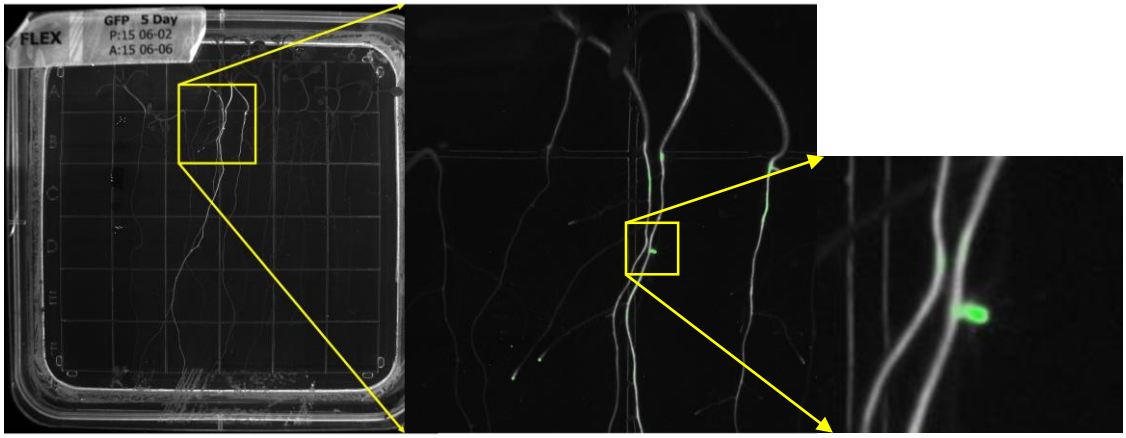
Image Capture System: Imaging capabilities to include high-sensitivity, high-resolution, and programmable time lapse in addition, to minimizing distortion with a pixel size varying by ≤10%.

Data Storage: Internal, time stamped data collection and storage with the option to downlink data retrieval for near-real time evaluation by the investigator team.

Internal Environmental Conditions

Temperature: 18°C - 37°C
Relative Humidity: Ambient ISS environment
Lighting (at 10 cm beneath the light cap)

- Broad-spectrum white light 0-100 µmol $m^{-2}s^{-1}$ (400-750 nm)
- Darkness: <1 µmol $m^{-2}s^{-1}$
- Red light: 0-100 µmol $m^{-2}s^{-1}$ (630-660 nm)
- Blue light: 0-50 µmol $m^{-2}s^{-1}$ (400-500 nm)
- Green light 0-30 µmol $m^{-2}s^{-1}$ (520-530 nm)



Arabidopsis thaliana seedlings growing on a 10 cm x 10 cm Petri plate demonstrating MSFI's ability to image the entire growth area (left). Close up of *Arabidopsis* roots showing fluorescence of Green Fluorescent Protein within roots.

Points of Contact:
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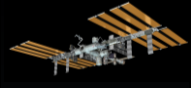

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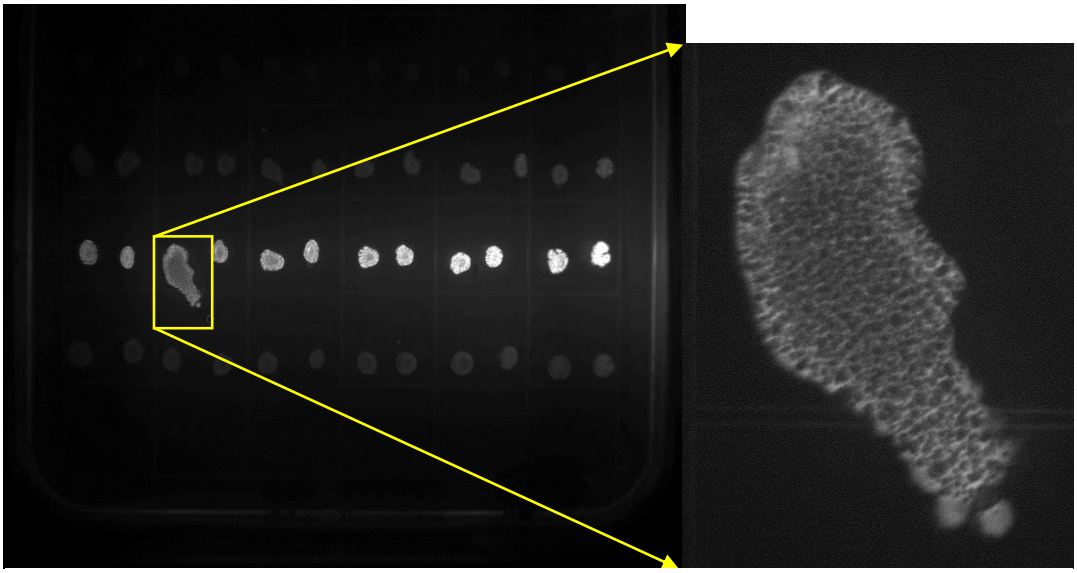
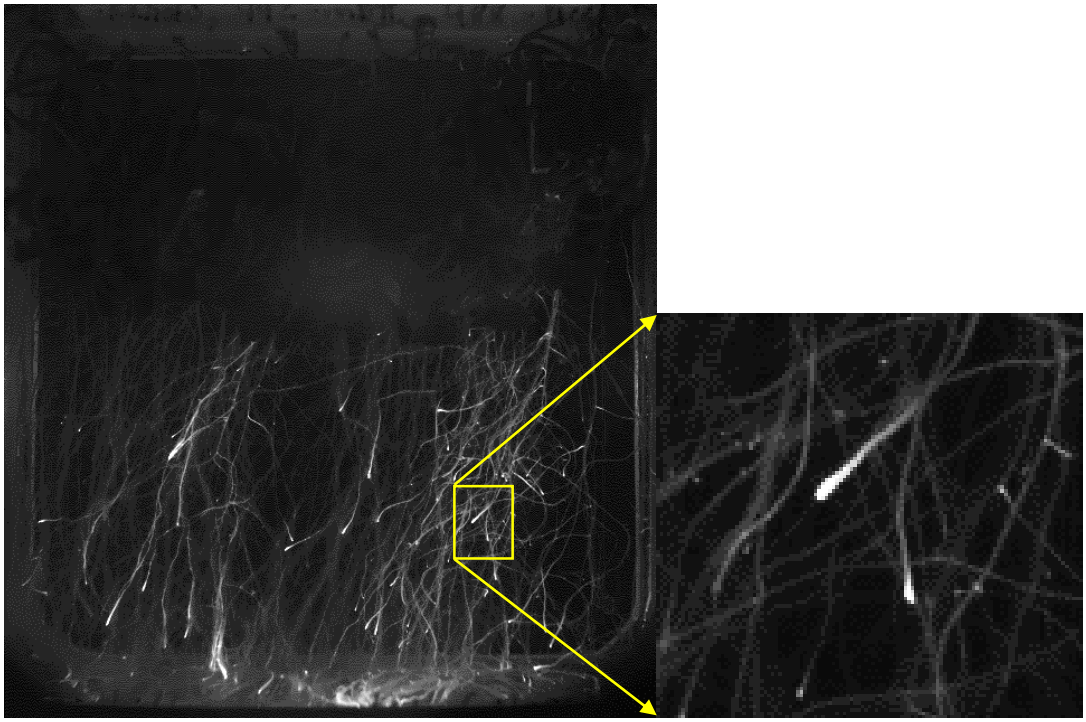


E.coli growing on a 10 cm x 10 cm Petri plate demonstrating MSFI's ability to image the entire growth area (left). Close up of *E.coli* showing fluorescence of Red Fluorescent Protein.



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