



LMM-Emulator

Light Microscopy Module (LMM) – Emulator

The Light Microscopy Module (LMM) is a microscope facility developed at Glenn Research Center (GRC) that provides researchers with powerful imaging capability onboard the International Space Station (ISS). LMM has the ability to have its hardware reconfigured on-orbit to accommodate a wide variety of investigations, with the capability of remotely acquiring and downloading digital images across multiple levels of magnification.

The KSC Payload Development Team, in collaboration with colleagues at GRC, has now establish a ground-based “LMM Emulator” in KSC’s Space Station Processing Facility (SSPF) that precisely mimics images obtained by LMM on ISS during ground-based control experiments at KSC. It consists of a modified commercial off-the-shelf (COTS) Leica RXA microscope. Currently, demonstrated imaging techniques use a high resolution black and white camera with filters capable of bright field, epifluorescent (EPI), and fluorescent microscopy. Investigators can choose from standard Leica objective lenses of different magnification.

Objectives

- Objectives are housed vertically in front of the stage.
- Available: 2.5x, 10x, 20x (Dry), 20x and 40x (Phase Contrast) and 63x, 100x Oil Immersion.

Camera

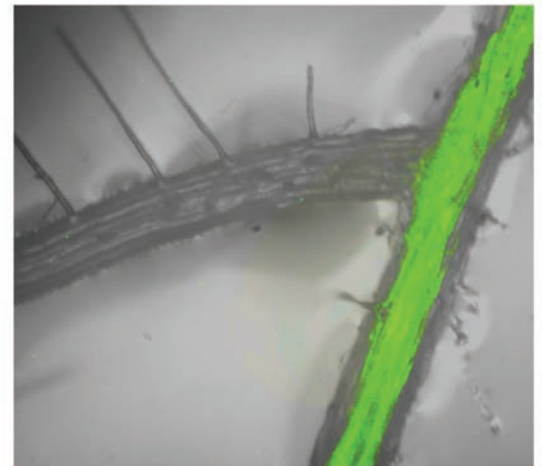
- Low noise peltier cooled CCD progressive sensor.
- Exposure time can extend to 4200s (≈ 71 min).
- 1280 x 1024 pixel resolution.
- 12fps max frame rate at full resolution.

Stage

- Motorized xy-stage with a $0.3\mu\text{m}$ increment of movement.
- Motorized z-focus drive.

Additional Feature

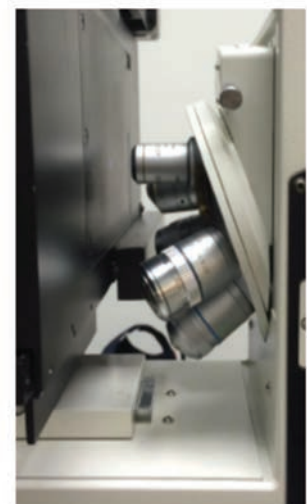
- Vibration dampened optical table.



Pseudo colored, extended focus composite using Z-focal plane images of root and root hairs from GFP-tagged Arabidopsis, (image provided by Dr. Rob Ferl, UF).



LMM emulator displayed in the vertical position.



Enhanced objective and vertical stage view.

Points of Contact: Howard G. Levine, Ph.D. | Email: howard.g.levine@nasa.gov
Trent M. Smith | Email: trent.m.smith@nasa.gov