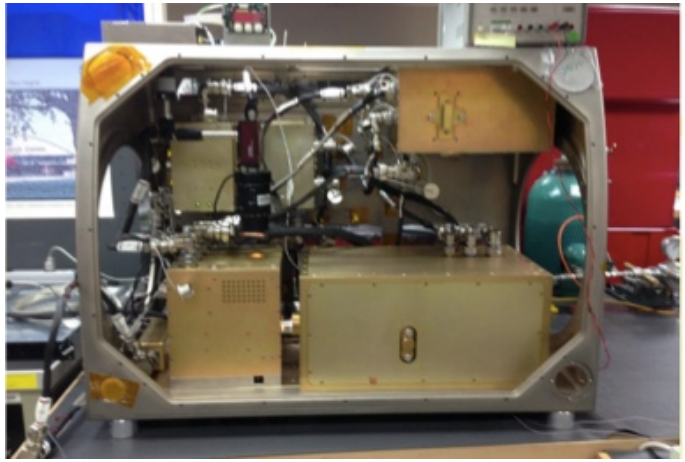
Liquid Crystal Facility (LCF) - Film

PI Team: Dr. Noel Clark, CU-Boulder
Dr. Chris Rosenblatt, CWRU
Dr. Hiroshi Yokoyama, KSU
International collaborators not listed (~6 TBD)
GRC Project Manager: MSI/Nancy R Hall
GRC Project Scientist: USRA/Dr. Padetha Tin
Engineering Lead: James Kolibas, ZIN Technologies, Inc.
Customers/Adaptors: Lightweight materials science, smart self-organizing materials, configurable opto-magnetic shielding



OASIS hardware in MSG simulator

Objective:

- Examine thin, smectic-C films, their 2D topological defects, and nanoparticle inclusions in a microgravity environment
- To extend the OASIS experiments to include observation and manipulation of freely suspended LC films with inclusions of magnetic and of islands and to study the energetics of arrays of small ferromagnetic droplets
- To study different types of the structural evolution of islands on liquid crystal films: Ostwald Ripening, island-island Interactions, and Lehmann Rotation

Experimental Approach:

- Study thin film liquid crystals in several samples
- Control variables: Sample Concentrations (Material properties), Magnetic Field (0-100G, 0-1000 Hz), Chamber Gas Pressure (0-300 kPa), Droplet Dispensing (0-1000 drops/sec)
- Diagnostics: Microscopic video (30 fps), Environmental sensor data

Relevance/Impact:

- TA - 12.1.1.3: Liquid crystal based composite materials for smart materials.
- TA - 12.1.3.3: Rational design of high performance liquid crystal smart materials
- TA - 12.1.5.1: Micro electronic devices of nano and microstructure fabrication for advanced opto electronics.

Project Development Approach:

- EM and Flight Unit approach – OASIS ground unit as a pre-build form/fit
- Science Definition Team with two types of experiments: Bulk and Bubble
- Developed, integrated, and operated by contractor under SpaceDoc

ISS Resource Requirements

Accommodation (carrier)	Microgravity Science Glovebox (MSG)
Upmass (kg) (w/o packing factor)	85 kg
Volume (m^3) (w/o packing factor)	0.07
Power (kw) (peak)	0.650
Crew Time (hrs) (installation/operations)	14
Autonomous Operation	920 hours
Launch/Increment	Inc 72/73

Award	SCR	RDR*	PDR	CDR	FHA	Ops
7/20/2016	4/24/2018	**9/30/2019** (12/1/2018)	3/30/2020 (11/20/2020)	7/20/2021	6/2022	1-2 Q FY23