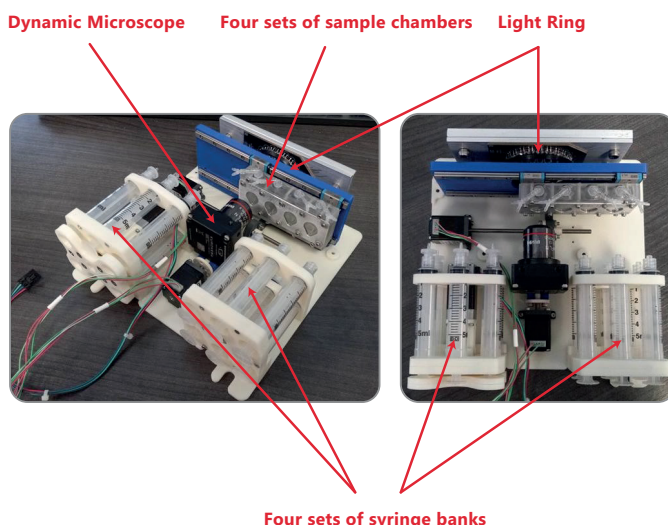


AEROSPACE TECHNOLOGY

PHARMACEUTICAL IN-SPACE LABORATORY – BIO-CRYSTAL OPTIMIZATION EXPERIMENTS SMALL MOLECULE ACCELERATED LABORATORY FOR STRUCTURE (PIL-BOX SMALS)

PRODUCT DESCRIPTION

Redwire's Pharmaceutical In-space Laboratory – Bio-crystal Optimization Xperiments Small Molecule Accelerated Laboratory for Structure (PIL-BOX SMALS) provides services in microgravity to pharmaceutical, agricultural, cosmetics, food companies, and institutional researchers seeking to use target molecules in their crystalline state to reformulate existing products and/or develop formulations for new products. PIL-BOX SMALS not only enables real-time observation of crystal growth in multiple automated mixing experiments, it is able to handle solvents used in small molecule synthesis. This allows for real-time process optimization, identification of causal relationships, and the immediate evaluation of the success of the synthesis process. PIL-BOX SMALS contains an automated, high-resolution brightfield microscope that provides real-time observations of crystal growth and morphology. This provides researchers with empirical data they can immediately compare with data derived from ground experiments.



APPLICATIONS

+ Fluid Processing

PIL-BOX SMALS includes a triple-contained, volatile fluid handling cassette.

+ Dynamic Microscopy

PIL-BOX SMALS includes a brightfield microscope allowing for near real-time observations.

+ Syringe based

PIL-BOX SMALS includes several syringe banks for up to 4 experiments per cassette.

MARKETS SERVED

- + In-space manufacturing
- + Regenerative medicine

- + Bioengineering
- + Crystalline biopharmaceuticals

- + Pharmaceuticals
- + Agriculture

PARAMETERS

- + Six different PIL-BOX platforms in both the Advanced Space Experiment Processor (ADSEP) facility and Multi-use Variable-gravity Platform (MVP) facilities and a handheld option.
- + Four ADSEP options: PIL-BOX Syringe Cassette (SC), PIL-BOX Fluidics Cassette (FC), PIL-BOX Dynamic Microscopy Cassette (DMC), and PIL-BOX SMALS can be processed three at a time in a processing temperature (8–40°C). They are independently monitored and controlled.
- + One MVP option: PIL-BOX Crystal Module (CM) can process up to six experiments at a time, with another six control modules processed at 1g.
- + The manual handheld device utilizes two syringes that can be processed in the aisle by a crew member.
- + The automated versions in ADSEP and MVP will have autonomous control via timeline or direct command and near real-time download capabilities of facility data.
- + Cassette and module interfaces with the processing facility through blind-mating power/data connector can be swapped to allow for multiple cassettes/modules to be processed per ISS increment.

OTHERS FEATURES

Pharmaceutical In-space Laboratory - Bio-crystal Optimization Xperiment (PIL-BOX) Comparison Table						
Hardware Platform	Handled Device ⁴	PIL-BOX SC	PIL-BOX FC	PIL-BOX DMC	PIL-BOX SMALS	PIL-BOX CM
Incubation Facility	Stand Alone	ADSEP	ADSEP	ADSEP	ADSEP	MVP
Default Injection & Mixing Method	Manual	Autonomous ¹	Autonomous ¹	Autonomous ¹	Autonomous ¹	Semi-autonomous
Optimizable Variables	Solution Concentrations	Solution Concentrations; Temperature Ramps	Solution Concentrations; Temperature Ramps	Solution Concentrations; Temperature Ramps	Solution Concentrations; Temperature Ramps	Solution Concentrations; Temperature Ramps; Variable g-Levels
Default Transport Stowage Temperature	-80°C to Ambient	4°C to Ambient ^{2,3}	4°C to Ambient ^{2,3}	4°C to Ambient ^{2,3}	4°C to Ambient ^{2,3}	-80°C to Ambient
Imaging	Crew Observation	Crew Observation	Crew Observation	Real-time Microscopic Imaging	Real-time Microscopic Imaging	Real-time Microscopic Imaging
Number of Optimization Samples	1	10	12	4	4	12
Optimization Sample Volume	1 - 50 mL	1 - 2 mL	1 - 30 mL	1 - 2 mL	1 - 2 mL	1 - 2 mL
Manufacturing Volume	100 - 250 mL	100 - 250 mL	250 - 750 mL	20 - 50 mL	20 - 50 mL	10 - 30 mL
Gravity Level	µg	µg	µg	µg	µg	µg - 2g
Temperature Control	no	4°C - 40 °C	4°C - 40 °C	4°C - 40 °C	4°C - 40 °C	14°C - 40 °C
Hardware Provided Levels of Containment	1	3	3	3	3	3
Notes:	<ol style="list-style-type: none"> 1. Hardware design can be customized such that experiment initiation/termination can be manual, semi-autonomous, or autonomous with respect to crew time. 2. Hardware design can be customized such that the solution container (e.g. syringe, fluidic stage, etc.) that require temperature control for transport can be installed into or removed from the hardware platform by crew member as required. This will require additional crew time and cold stowage resource allocation. 3. ADSEP supports powered ascent with temperature control of the cassettes to as low as 4°C. Powered launch is conditional on experiments specific CG and Mass analyses of hardware configuration. 4. The handheld device developed with funds under a ISS-NL contract prior to this SBIR Phase I contract. The design has been repurposed for automated use in the PIL-BOX SC platform, but is a acceptable option in it's handheld form. 					

This product is export controlled from the United States. Contact Redwire for more information.



HERITAGE

Redwire is a new leader in mission critical space solutions and high reliability components for the next generation space economy. With decades of flight heritage combined with the agile and innovative culture of commercial space platform, Redwire is uniquely positioned to assist its customers in solving the complex challenges of the future space missions. For more information, please visit www.redwirespace.com

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