

# LESSH-PLACED

Lunar Experiment Support System and Handling - Placed

## Fact Sheet: LESSH-Placed

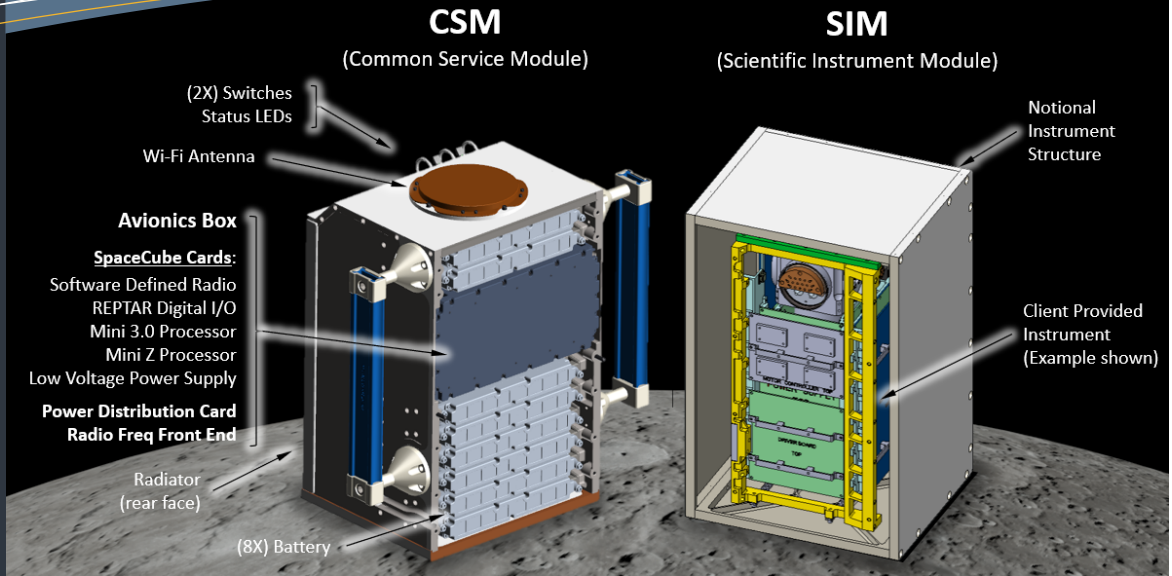
Beginning with Artemis III, NASA plans to deploy science instruments on the moon near a South Pole landing site.

LESSH-Placed is an instrument package that can be deployed by astronauts and re-charged via an Artemis vehicle, enabling extended science operations. An integrated Common Service Module (CSM) bus with a client Scientific Instrument Module (SIM) payload is meant to fill the gap between large, long duration instruments and small, short, handheld ones. LESSH Placed provides astronaut-rated battery power, wireless communications, high speed data processing, and thermal management. Standardizing common services makes instrument development easier. The driving goal of LESSH-Placed is to provide a client instrument with all needed accommodations to conduct lunar surface science.

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## Common Service Module (CSM) Features

### Physical

- Mass/Volume: 18.3 kg, 38 cm x 36 cm x 20 cm
- Dust Mitigation: Coating on outer surfaces to mitigate dust accumulation. Filtered vent for pressure equalization.
- Astronaut Handling: Two outer handles, ISS handrail design.
- Controls: 2 astronaut power switches. LED indicators for battery level, Wi-Fi signal strength, and fault info.

### Power Services

- Battery Capacity: 720 Wh, 28V across eight battery packs (CSM uses 10-30W, depending on operational state)
- External Charging: Rechargeable via LESSH Battery Charger Module (BCM) on multiple vehicles (estimated 4-hour recharge time)

### Data / Processing

- Processing: Xilinx Kintex based FPGA
- Data Storage: 28 GB NAND Flash storage for science & telemetry packets, 4 GB reserved for CSM flight software use

### Communications

- Wireless Interface: Max range: ~200m @ 5.3 GHz, 6.5 Mbps. Max rate: ~10m @ 5.3 GHz, up to 70 Mbps. Assumes performance characteristics of the 802.11n wireless access point on International Space Station or equivalent
- WiFi Antenna: Surface-to-Surface, Dipole-like, line of sight
- Interworking Layer: CCSDS Bundle Protocol v7
- Hardline Interface: 1 Gb Ethernet connection when mated to Battery Charger

### Thermal

- Operating Environments: Lunar South Pole daylight
- Temperature Limits: -30 to 50°C Op, -40 to 60°C Non-Op, 0 to 40°C charging temp
- CSM Heater Services: 28V CSM Software-controlled operational heater service. 28V Battery charging pre-heater string run directly off BCM
- Temperature Sensors: Multiple analog thermistor telemetry channels
- Variable Heat Reject: For varying thermal environments



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## Scientific Instrument Module (SIM) Accommodations

### Physical

- Mass 13.0 kg (nominal with 8 CSM batteries)
- Maximum Volume 37.8 cm x 36.0 cm x 19.8 cm
- Mechanical Interface Insert pattern with 2 shear pins on CSM perimeter as defined in CSM/SIM ICD.
- Dust mitigation Recommend similar coatings as CSM. Seam at interface sealed with tape after assembly.

### Power Services

- Total Available Energy 720 Wh (shared with CSM)  
*Run time is dependent on CSM and SIM processing resources.*
- Available Voltages to SIM Unregulated Battery Bus 28V nominal (24V-33.6V)
- Current Limits Current monitoring and over current protection set at 3A and 5A.
- Available Services 2x switched op power services controlled by CSM

### Command and Data Handling

- Processing Xilinx Zync based (available as instrument control computer)
- Data Storage 4 GB of NAND Flash storage for science data
- Interface SpaceWire, 1553, Serial, RS-422, LVDS

### Thermal

- Operating Environments Lunar South Pole daylight
- SIM Heater Services 1 SIM 28V operational heater service software controlled by CSM
- SIM Temperature Sensors Up to 10 analog thermistor telemetry channels (TBR)
- Radiator Heat Rejection Dependent on instrument requirements / housing size

Block Diagram of LESSH-Placed SIM interfaces

