

NOVA TEST FACILITY

NANOSAT OPERATION VERIFICATION & ASSESSMENT TEST FACILITY

The Space Dynamics Laboratory's (SDL) advanced NOVA test facility characterizes and verifies subsystem and system performance of small satellites up to 12 kg. The NOVA test facility provides testing to reduce preflight risk and verify requirements and is designed specifically for CubeSat-sized components and systems. NOVA augments SDL's manufacturing, environmental testing, and calibration facilities, offering comprehensive testing capabilities and expertise for this class of small satellites.



Test Facility

CAPABILITIES	FOR TESTING
High-accuracy mass properties testing for measurement of mass, center of gravity (CG) & moments of inertia (MOI)	<ul style="list-style-type: none"> • Component mass, CG & MOI • System mass, CG & MOI
High-accuracy, 3-axis magnetic field generation with real-time closed-loop control & zero-gauss chamber for magnetometer calibration	<ul style="list-style-type: none"> • Accuracy & alignment of magnetometers • Torque & alignment from torque coils & permanent magnets
Single-axis air bearing with high resolution encoder & three-axis air bearing	<ul style="list-style-type: none"> • Reaction wheel, control-moment gyro, momentum wheel, or similar system characterization & performance
Solar illumination simulator & NIST-traceable pyranometer	<ul style="list-style-type: none"> • Solar panel power output verification • System testing using self-generated power (test algorithms, controls, interfaces)
Solar array simulator & battery/charger simulator	<ul style="list-style-type: none"> • System testing using simulated power (test algorithms, controls, interfaces)
Hardware-in-the-loop (HWIL) system testing	<ul style="list-style-type: none"> • Test & verification of system interfaces, algorithms & flight software • Component test stations provide for a high-fidelity HWIL model
Star field simulator with Hipparcos star catalog	<ul style="list-style-type: none"> • Star tracker testing, including static quaternions & simulated slew maneuvers



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The mass properties test station features load cells and kinematic mounts to obtain the measurements needed to verify and refine the calculations from CAD models and to statically balance the spacecraft. Mass can be measured within 2 g and the center of gravity to within 1 mm for spacecraft and components from <1U to 27U. Moments of inertia are available for spacecraft up to 3U.

The ADCS test station includes a 2 m Helmholtz cage with a 60 cm working volume capable of closed-loop control within 10 nT using a calibrated reference magnetometer. A single-axis air bearing inside the cage with a high-resolution encoder enables torque verification for reaction wheels or magnetic actuators, static alignment and pole verification, and basic ADCS algorithm functionality tests. A star field simulator is also available for star tracker testing.

The communications test station includes SDL's Software Defined Nanosatellite Ground Transceiver, a low-cost, reconfigurable ground station solution for UHF and S-band communications. This can readily be used with Cadet and Cadet PLUS radios to command spacecraft over-the-air within the NOVA lab. A GPS reradiator is available to rebroadcast local signals from the visible GPS constellation within the lab. A GPS simulator is available to produce the output of the GPS constellation at any time and location, including in orbit.

The power subsystem test station includes a solar illumination simulator with a continuous AM0 light source to verify the power output of solar arrays to a class BBA (IEC 60904-9). A NIST-traceable pyranometer is used to measure the irradiance in the 3U x 3U target area. A solar array simulator provides a programmable DC power source that simulates the output characteristics of a solar array. The simulator provides up to 2 outputs and up to 1200 W. A battery simulator models battery charge and discharge curves to enable functionality testing for EPS systems.



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