

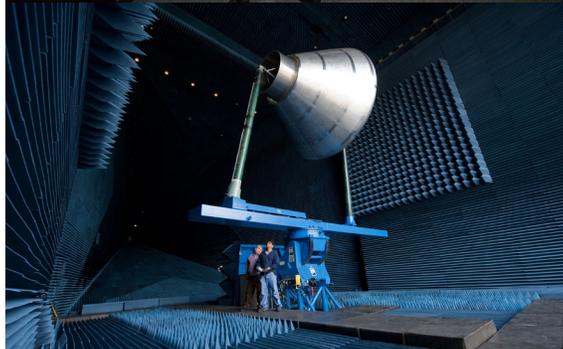
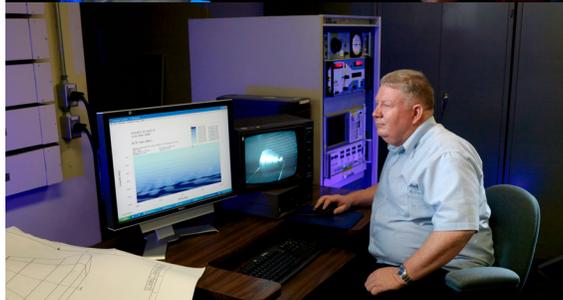
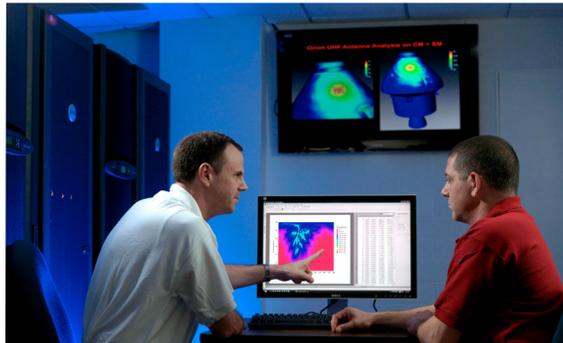


Spacecraft Communications

Space vehicle communications systems are unlike other spacecraft systems, because they interface not only with other equipment on the space vehicle but also with external equipment that is remotely located. Johnson Space Center (JSC) offers expertise and unique facilities in which multi-element spacecraft communications systems are interfaced with relay satellites and ground elements for end-to-end testing in a controlled radio frequency environment. JSC also provides for design, development, and testing of spacecraft communication systems, including evaluation of electromagnetic radiation properties of antennas and other radiating objects.

Services Provided

- Antenna performance characterization
 - Measurement of near-and-far-field antenna radiation distribution patterns
 - Radar cross-section calculations
- Design and development of microwave devices and antennae
 - Verification of microwave and antenna measurements
- Design, development, and testing of RFID and other wireless technologies
- Design, development, and testing of GPS equipment with live GPS satellite signals
- Communication and tracking system analysis and integration
 - Dynamic and static link budget and RF coverage analysis
 - Multipath/differentiation/reflection analysis
 - Signal propagation effects
 - IP/Com Stack
 - Traffic model/timing/delays
- Communication systems simulation and modeling
- Communication verification testing between relay satellites, ground terminals, and the spacecraft
 - RF characterization testing for payloads, satellites, and other manned and unmanned vehicles
 - RF anomaly resolution testbed – prelaunch, real-time, and postflight
 - TDRSS Network verification/validation tests, TDRS checkout, TDRSS Network Firmware checkouts



Antenna/Radio Frequency Design and Testing

Computational Electromagnetics (CEM) Laboratory

The CEM Laboratory is used for full-wave, frequency domain electromagnetic simulations. Services include, but are not limited to, the following:

- Design and development of microwave devices and antennas
- Near-field and far-field analysis
- Radar cross-section calculations
- Antenna coupling analysis
- Verification of microwave and antenna measurements

Antenna Test Facility (ATF)

The ATF is used to test antenna radiation distribution pattern performance for spaceflight applications in electromagnetic environments conditioned to simulate free space. The antenna ranges are used to acquire radiation performance data by taking radiation pattern measurements. The ATF has one anechoic chamber and an outdoor antenna range. The anechoic chamber houses two antenna test facilities: the Far-Field Test Facility and the Near-Field Test Facility.

- Frequency range: 200 MHz to 40 GHz
- Dimensions: 150 feet long with cross section approximately 40 x 40 feet
- Maximum antenna size is approximately 28 feet
- Facility includes single (600 lb load max) and dual (1200 lb load max) positioner configurations

Wireless and Radio Frequency Identification (WRFID) Laboratory

The WRFID laboratory provides capabilities for the design, development, testing, and analysis of RFID and other wireless technologies for space applications.

Communication and Tracking Systems

Electronic Systems Test Laboratory (ESTL)

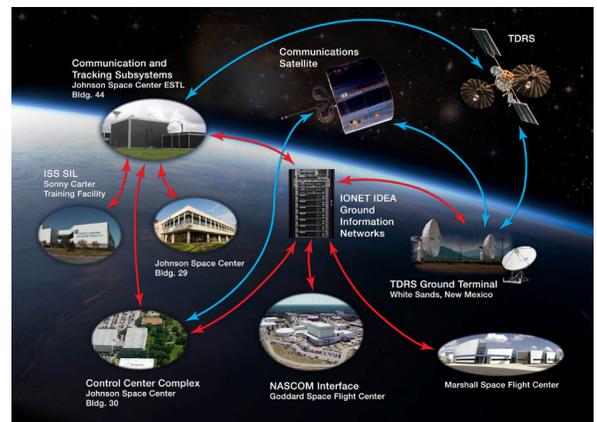
In the ESTL facility, multi-element crewed spacecraft communications systems are interfaced with relay satellites and ground elements for end-to-end testing in a controlled RF environment. This facility is used for design evaluation, RF interface compatibility, and system performance verification testing of spacecraft RF communications systems and their interfaces with external (e.g., ground stations, relay satellites, detached payloads) elements.

Communication Systems Simulation Laboratory (CSSL)

The CSSL consists of state-of-the-art computer-aided design and analysis tools utilized to model and simulate the performance of both proposed and actual spacecraft communication systems, subsystems, components, and parts. CSSL services include RF coverage and compatibility, end-to-end communication system performance, system design and verification, signal analysis, network simulation, and anomaly resolution. The CSSL also supports JSC spectrum management activities.

High Definition Motion Imaging Laboratory

The HD Motion Imaging Laboratory provides high-fidelity HD evaluation, analysis and verification testing of spacecraft video, ground facilities processing equipment, and imaging systems.



ESTL external interfaces

Global Positioning System Laboratory (GPSL)
 The GPSL is a design, development, testing and evaluation facility allowing testing of GPS equipment with live GPS satellite signals via rooftop antennas and antenna positioner.

We have developed customer-friendly agreements to streamline business relationships and are eager to share our unique facilities and expertise with new customers. We invite your inquiries regarding application or adaptation of our capabilities to satisfy your special requirements. Briefings on general or specific subjects of mutual interest can be arranged at JSC or at your business site.



For the benefit of all

For more information:
<http://jsceng.nasa.gov>

Point of contact:
 Associate Director
 JSC Engineering Directorate
 281.484.8991
jsc-ea-partnerships@mail.nasa.gov