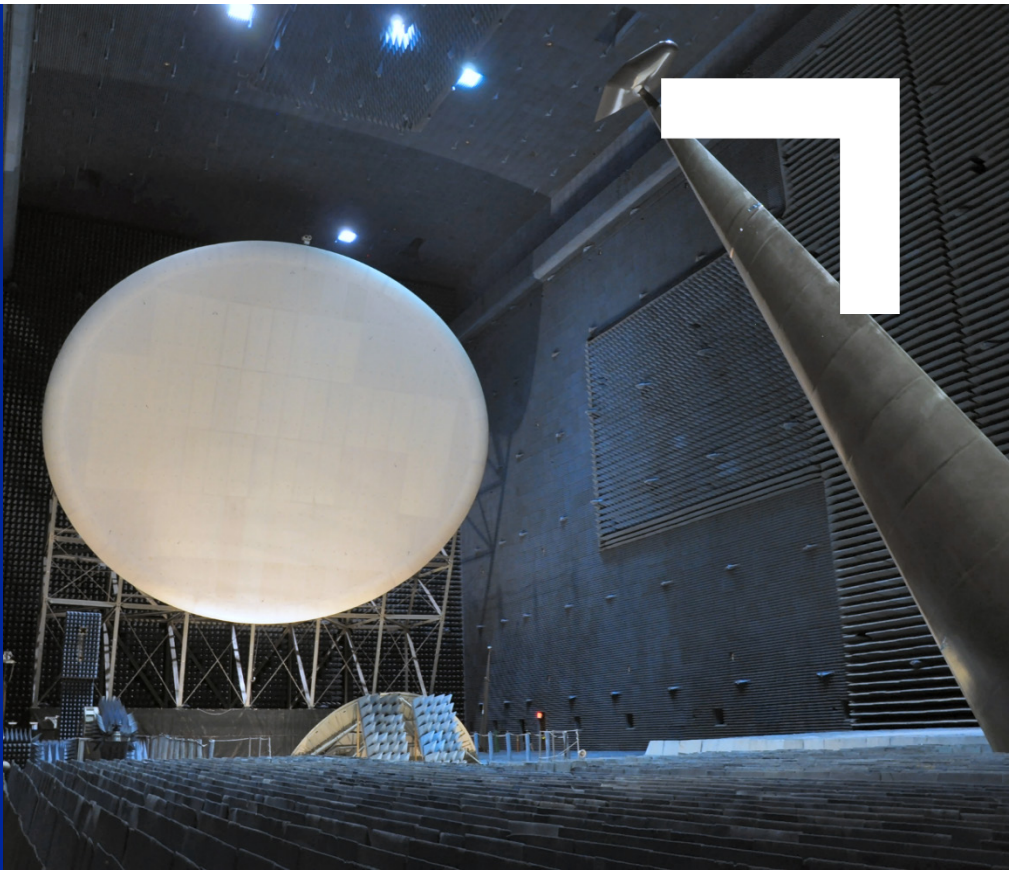


RF Technology and Testing



Northrop Grumman Aeronautics Systems (NGAS) Rancho Bernardo Compact Range

The Northrop Grumman Aeronautics Systems (NGAS) Rancho Bernardo Compact Range Facility, located in San Diego, California, is available to measure Radar Cross Section (RCS) or Antenna Patterns on a variety of Test Articles for internal and external customers. The facility maintains a trained staff of engineers, technicians and support personnel, familiar with measurement systems, target support systems, and data acquisition/processing methods. The facility is currently certified by the National RCS Facilities Certification Program.

RCS and Antenna/Radome Test Fixture Design/Fabrication and Coating services are available on-site in a secure environment. Material Property (Mu/Epsilon) and Transmission/Reflection Testing, primarily for Antennas and Radomes, is available.

NGAS Rancho Bernardo operates a Large Outdoor Antenna Range located near the San Diego International Airport. This Outdoor Range Complex is used primarily for low frequency antenna patterns.

NGAS Rancho Bernardo has teamed with Northrop Grumman Mission Systems to jointly operate a 75 Foot Long Indoor Farfield Anechoic Chamber. This chamber is located within a few miles of the NGAS Rancho Bernardo facility and is used primarily for Antenna and Radome testing.

See Page 2 of this brochure for additional Details/Contact Info on NGAS Rancho Bernardo Supported RF Test Capability.

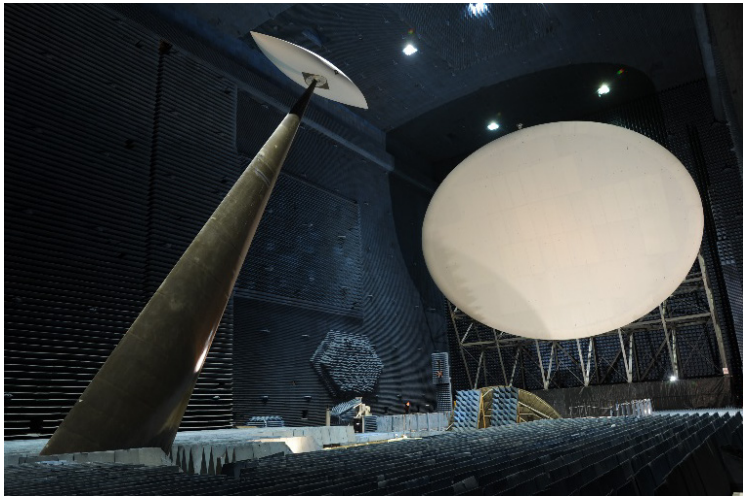


NGAS Rancho Bernardo Compact Range Facility



Outdoor Antenna Range Facility

NGAS Rancho Bernardo Supported Facilities and Services



NGAS Rancho Bernardo Compact Range

Collimated Reflector

- Dual shaped Compact Range reflector system with:
 - Main Reflector-56 ft tall x 74 ft wide (elliptical)
 - Sub-reflector-22 ft x 24 ft

Quiet Zone 30-40 ft wide x 20-28 ft high (elliptical)

RCS Measurement System

- QuarterBranch Radarman II Pulsed RCS measurement system
- Dual receive channels for polarization matrix measurements
- RCS imaging and/or multiple frequency operation

Antenna Measurement System

- Keysight PNA-X antenna measurement system
- ORBIT/FR 959 Data Acquisition/Processing Software

Data Processing/Software

- Full complement of RCS/antenna processing software, ISAR images, global formats, IER, etc.

Pylons, Rotators and Target Handling Equipment

- Pylon-mounted "Top Hat" positioners: 1,500, 3,000, 4,000 and 10,000 lb capacity
- Multiple antenna positioners with capacities from 50 to 30,000 lb
- Model/target preparation and handling areas
- Radio controlled chamber bridge crane with 3K and 10K capacity crane hooks
- Four High bays with 5-ton bridge cranes, 3-phase power

For information contact:

Northrop Grumman Aeronautics Systems
Rancho Bernardo Compact Range Facility

16707 Via Del Campo Court
San Diego, CA 92127
Phone 858-592-2509

Email: RFTest@ngc.com, Website: Northropgrumman.com/air/commercial-aviation/advanced-composite-structures

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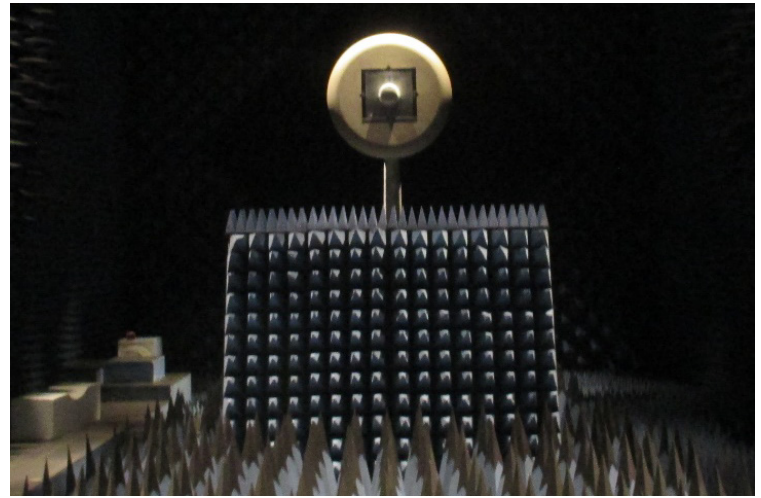
Operations Manager
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Control # RF Tech and Testing 2020



NGMS Farfield Antenna Range

Secure Spray Booth

- 35 ft x 24 ft x 24 ft interior dimensions
- Staffed with personnel experienced in a variety of coatings

Security and Safety

- Secure facility
- Meeting rooms available
- Four secure high bay areas

Outdoor Antenna Range Capability (San Diego CA)

- 830 ft outdoor antenna range
- 40 ft AUT tower with:
 - 10K Az over elevation antenna positioner
 - Roll over Az over EI Model Tower
 - Keysight PNA-X receiver with ORBIT/FR 959 software (Multi-frequency capable, coherent amplitude/phase data)

Farfield Range Capability (NGMS Rancho Carmel)

- 75 foot indoor Rectangular Anechoic Chamber
- Shielded Chamber with
 - Broadband Dual Polarized Receive Antennas
 - Roll over Slide over Az over EI Model Tower
 - Keysight PNA-X receiver with ORBIT/FR 959 software (Multi-frequency capable, coherent amplitude/phase data)

Radomes and Materials

The Northrop Grumman Aeronautics Systems Rancho Bernardo technical staff has extensive experience in RF Design and measurement of a wide range of radomes and materials and can perform Material Property (complex epsilon and mu) and Transmission/Reflection testing on Radomes and Radome materials. Design/Measurement Tools and Fixtures include:

- High Frequency Structure Simulator (HFSS)
- FEKO
- VBROP
- Keysight N1500A Material Measurement Suite
- 67 GHz Keysight PNA, 50 GHz HP8510C
- NRL Arch Fixture
- Waveguide and Coaxial Line Test Fixtures
- Freespace Test Fixtures
- Keysight 85072A X Band Cavity Resonator

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