

TEST OPERATIONS SERVICES — AZUSA, CALIFORNIA

BUILDING 183

THERMAL VACUUM CHAMBERS

- Qty 1: 9' diameter
- Qty 1: 8' diameter
- Qty 1: 4' diameter x 5' length
- Qty 3: 3' diameter x 5' length

THERMAL CHAMBERS

- Qty 2: (4'L x 4'W x 4'H)
- Qty 1: (3'L x 4'W x 4'H)
- Temperature ranges from -120°C to +177°C
- 18°C/minute ramp rate from -73°C to 170°C

SHAKER TABLES

- Qty 2: 48" square UD T-1000 shakers

ELECTROMAGNETIC INTERFERENCE (EMI)/ ELECTROMAGNETIC COMPATIBILITY (EMC) TEST FACILITY

- B183 West EMI Facility, 22'x33'x10' Shielded Chamber
- B183 North EMI Facility, 15'x30'x8' Shielded Chamber

FEATURES

- Central automated data acquisition and control system
- 21,000 sq. ft. of lab and prep space
- Can be secured for classified work
- 12,000 gallon LN2 storage and pumping system
- 300 kVA UPS for sensitive chamber specifications

BUILDING 200A/200

OPTICAL THERMAL VACUUM CHAMBERS

- Qty 1: 20' diameter
- Qty 1: 3' diameter

EMI ENCLOSURES

- Class 10K/100K EMI Tent: 20 ft³
- Class 10K EMI Test Chamber: 486 sq. ft.

ACOUSTICS CHAMBER

- 12 Acoustic Research Systems (ARS) neutron boxes

THERMAL CHAMBER

- Qty 1: 9'x12'x12'
- Temperature ranges from -85°C to +177°C
- 6°C/minute ramp rate from -45°C to +70°C

SHAKER TABLE

- Qty 1: 60" SQUARE UD-T5000 SHAKER
- 50,000 F-LB capacity

PAYLOAD INTEGRATION AREAS

- Class 100 assembly area: 400 sq. ft.
- Class 10K manufacturing integration and test: 1,680 sq. ft.
- Class 10K electrical integration and test: 1,100 sq. ft.
- Class 10K/100K east high bay: 2,700 sq. ft.
- Class 100K west high bay: 6,300 sq. ft.
- Class 100K mass properties room: 630 sq. ft.

FEATURES

- 18,000 gallon LN2 storage and pumping system
- Qty 2: 3-Ton bridge crane
- Qty 2: 2-Ton bridge crane
- Qty 1: 1-Ton bridge crane



TEST OPERATIONS SERVICES — AZUSA, CALIFORNIA

Available for Component, Payload or System Testing

Northrop Grumman's Azusa, California test facility is equipped for space sensor and payload testing. It's environmental testing includes vibration, shock, thermal cycling, space simulation and acoustics.

TESTING CAPABILITIES INCLUDE:

- Real-time automated facility control and data acquisition systems
- Payload handling
- Clean rooms for instrument electrical integration and test
- Certified network of vendors for space-qualified test components
- Flight compatible storage facilities
- AS9100 and ISO 14001-certified processes
- Facility and test equipment design and construction
- 24-hour contamination monitoring

USE BY OUTSIDE CUSTOMERS/ CONTRACTORS

Northrop Grumman's testing services are not limited to internal use; they may also be used directly by outside customers and contractors.

MORE INFORMATION

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TEST OPERATIONS SERVICES – AZUSA, CALIFORNIA



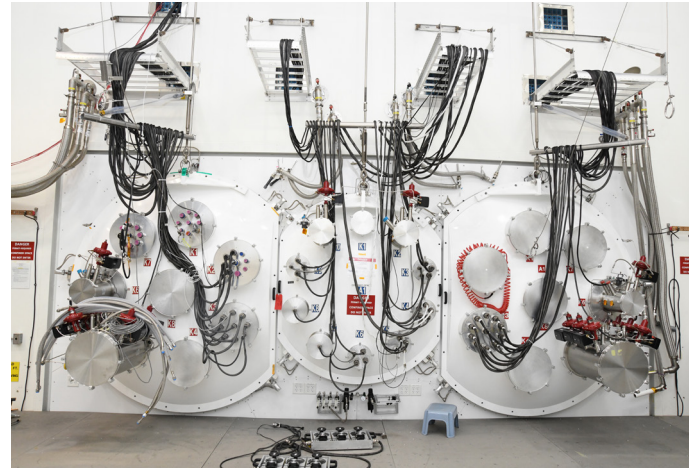
OPTICAL CHAMBER

- Overall volume of 20 ft. diameter by 30 ft. long, with payload envelope of 10'x10'x10' and shroud/optical bench
- Contamination monitoring, Residual Gas Analyzer (RGA) and Quartz Crystal Microbalance (QCM)
- Thermal balance with multiple thermal zones in payload test area, including space simulation environment with a 40K plate for radiation cooling
- Test optics and shrouds temperature controlled by independent nitrogen thermal conditioning unit
- Optical bench and payload mounting area mechanically isolated from Earth and chamber-induced vibration
- 10-7 Torr vacuum ranges



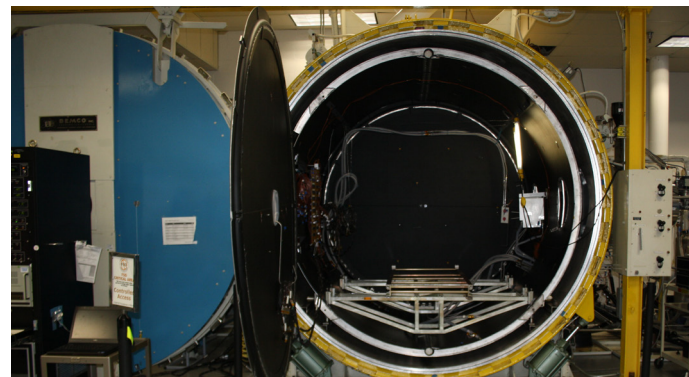
ACOUSTIC SPECIFICATIONS

- 12 Acoustic Research Systems (ARS) neutron boxes
- Flexible stacked configuration (i.e. 6x2, 4x3, etc.)
- Maximum test level of ± 147 dB
- 1' Center-on-center mounting grid $\frac{1}{2}$ "-13 anchors
- Payload maximum dimension (9'L x 9"W x 5'H)
- 12 Control microphones (1 per neutron)
- M+P control and data acquisition (120 monitor channels)
- Class 100,000 clean room
- Separate control room for safe test monitoring



OPTICAL CHAMBER

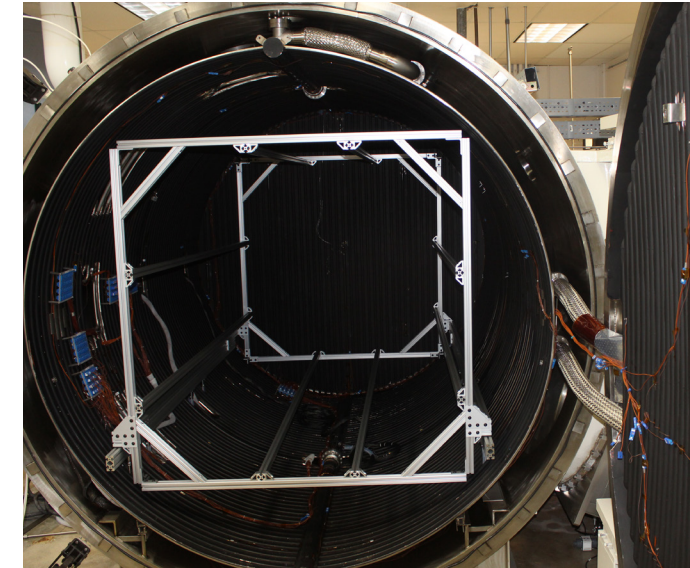
- Modular design with a primary optical test chamber and two Unit Under Test (UUT) ante chambers
- UUT can be installed and configured while test optics remain in vacuum at test conditions isolated from UUT
- Two ante chambers for test articles with usable space of 3'x4'x4' each
- Liquid Nitrogen (LN2) cooled optics and test article thermal shrouds
- Vibration isolated
- 10-7 Torr vacuum ranges
- Contamination monitoring via RGA and QCMs



THERMAL VACUUM CHAMBER SPECIFICATIONS

- 8.5' diameter x 8' length
- Vacuum: 1×10^{-6} Torr
- Cryopump system chamber backed with roots blower and turbo pump
- RGA and 2 TQCMs for contamination monitoring
- Contamination plate located end of chamber
- Individual thermal circuits for thermal shroud and contamination plate
- Thermal circuit range: -165°C to 130°C
- Shroud range: -185°C to 150°C

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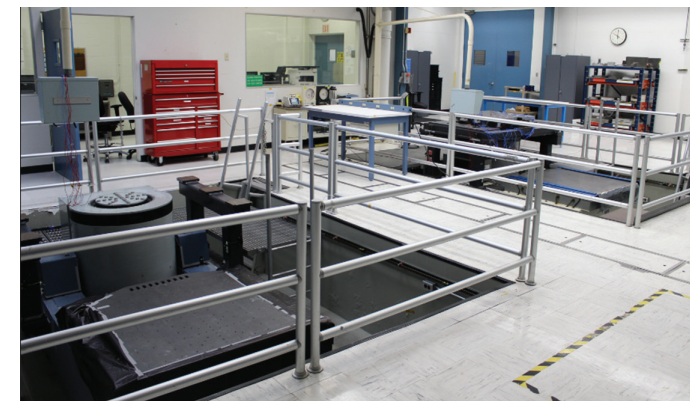


THERMAL VACUUM CHAMBER SPECIFICATIONS

- 9' diameter x 12' length
- Mechanical roughing systems with two Independent cryogenic pumping systems

FEATURES:

- Nitrogen thermal control unit – controls full length shroud and door
- 650 CFM flow rate, -173°C to 150°C control range
- LN2 cooled 40"x60" scavenger panel
- RGA for contamination monitoring
- Pump time to 1×10^{-4} Torr in 2 hours
- Ultimate pressure 2×10^{-8} Torr
- Additional 1" LN2 circuits for thermal plates
- Chamber located in area with code locks/cipher locks
- Portable 10K cleanroom tent as required



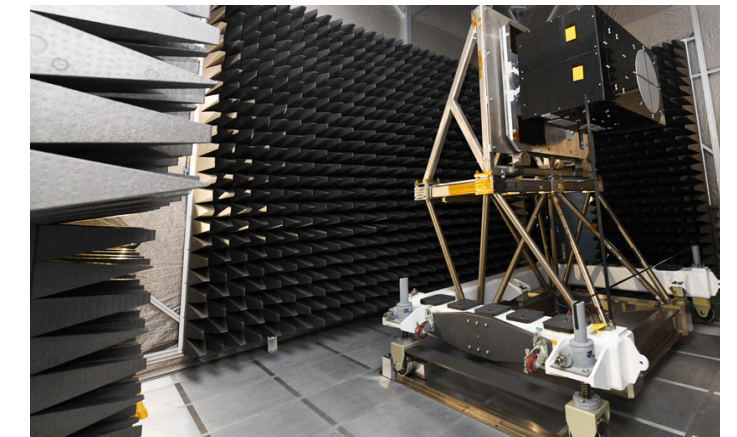
QTY 2: UNHOLTZ DICKIE (UD) T-1000 SHAKER SPECIFICATIONS

- 20,000 F-lbs capacity, 48" square slip tables, 36" square head expander (shared)

- Maximum displacement of 2"
- Qty 2: Spectral dynamics 2570 control systems
- Total channel count – 64 inputs
- Modular capability to record 80Ch of data across two systems or 80 channels on one system

TESTS

- Mass properties (weight and Center of Gravity (CG), torque disturbance) tests as well as shock and vibration
- Random, sine, classical & Shock Response Spectra (SRS) shock, mixed mode vibration available
- Force limited vibration available



EMI/EMC SPECIFICATIONS

- Qty 1: EMI enclosure 20 ft³
- Double wall construction of NOVA Select™ fabric combined with a patented door system and absorber allow this EMI shielded tent to deliver maximum isolation (double layer enclosure shielding effectiveness: -85 to -100 dB on average from 400 MHz to 18 GHz)
- Qty 1: 486 sq. ft
- Qty 1: 22'x33'x10' Shielded chamber
- Access door to main chamber (8'x8') to accommodate large test articles
- ETS-Lindgren RF absorbers (10MHz – 40GHz)
- Walls- FAA-200 FlexSorb
- Floor/ceiling- EHP-24CL FlexSorb
- 15'x30'x8' shielded chamber
- Single access door for entry
- RF anechoic shielded enclosure for shielding/isolating RF/EMI for MIL-STD-461 or other EMC test