Acoustic Test Facility

CSIR-NAL and India's Space Programmes

The Acoustic Test Facility (ATF) comissioned at CSIR-NAL is a national facility for acoustic environment qualification testing of satellites, launch vehicle stages and their subsystems for the ISRO. It has successfully carried out acoustic tests on all ISRO's launch vehicle stages (ASLV, PSLV, GSLV and RLV-TD) as well as satellites (IRS , INSAT series). ATF has exp ertise in the design, development and commissioning of reverberation chamber based acoustic test facilities for spacecraft and launch vehicle ground testing. A new ATF designed and developed by CSIR-NAL was established on April 7, 2011 at ISITE, ISRO with 1550 cu.m reverberation chamber and nitrogen as the medium and a closed loop acoustic drive/ control system. ATF also carries out noise and vibration studies for automobile, white goods and electronic equipment manufacturers. Specialized acoustic studies for aircraft and helicopter development projects have also been undertaken.

Reverberation chamber specification at CSIR-NAL

Acoustic Test Facility at ISITE-ISRO designed by CSIR-NAL

Geometry

Volume (cu.m)	: 1100
Dimensions (l x b x h – mtrs)	: 10.33 x 8.2 x 13

Acoustic parameters

Maximum Overall Sound Pressure Level (OASPL) dB	: 157 (Ref. 20µ Pa)
Frequency range (Hz)	: 25 – 10,000
Spatial Distribution OASPL (dB)	: +/- 1 in central 10% volume

Instrumentation and data recording

Real-Time acoustic measurements	: 11 channel (B&K PULSE)
Vibration measurement	: 192 channel (PROSIG)
Strain measurement	: 16 Channel (PROSIG)

Reverberation Chamber ATF, CSIR-NAL

Clean room facility

Class	: 100,000
Clean room area	: 210 sq. m

Specimen handling system

Electric hoist	: 5 ton – 2 Nos
EOT	: 5 ton– 1 No & 20 ton–1 No.
Specimen transport trolley	: 10 ton with rail system

Major Contributions from CSIR-NAL for Space Programmes

Highly Polished Aluminium Mirrors

Highly polished aluminum mirrors developed by CSIR-NAL help ISRO to get good satellite pictures from space. INSAT satellites use an infra-red detector to get sharp pictures. This detector functions best when its temperature is maintained at 105 K. CSIR-NAL used surface modification techniques to make four highly polished aluminium mirrors with surface smoothness of 2nm to help maintain the optimum detector temperature.

Passive radiative cooler with the four polished mirrors

Jet Noise Generator

ATF has developed a jet noise generator capable of producing high frequency random noise in the frequencies above 2 kHz for which no commercially manufactured generators are available. This device is ideally suited for simulation of the required acoustic environment in reverberation chambers at high frequencies for spacecraft testing. The jet noise generator can also be used to simulate the high frequency noise environment for automobile testing. ATF supplied jet noise generators are currently operational in several acoustic test facilities worldwide, the major ones being those operated by Boeing and Lockheed in the USA, NSPO in Taiwan and Kobe Steel in Japan.

GSLV MKII inter tank truss at ATF

Success of Geosynchronous Satellite Launch Vehicle (GSLV) of ISRO

ATF at CSIR-NAL has been involved in the dynamic environment qualification of stages, subsystems and components from the very beginning of the GSLV programme. 30 major acoustic test programmes on the GSLV were completed at ATF, spreading over the years 1995 to 2013 with a total of 515 blowdowns. Considering the fact that ATF conducts acoustic tests on full scale launch vehicle hardware with some of the hardware being actual systems used for flight, this has been a mammoth task. The GSLV Heat Shield – both metallic as well as CFRP, the Core base shroud, the 1/2 & 2/3 interstages, the strapon nosecones, the L40 engine bay and the strapon nosecone avionic decks are the major stages/subsystems qualified at ATF.

India's Reusable Launch Vehicle-Technology Demonstrator (RLV-TD)

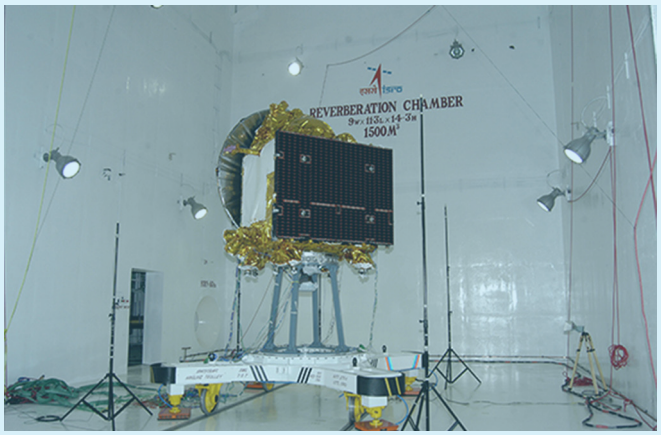
Acoustic tests on the RLV-TD were carried out at the Acoustic test Facility (ATF) of CSIR-NAL during April 2016. These tests were primarily to assess the integrity of the vehicle under acoustic loads during the lift-off phase and during the flight through the denser portions of the atmosphere.

RLV-TD positioned in the reverberation chamber for acoustic test

ISRO's Moon Mission: Chandrayan-1

Acoustic test for Chandrayyan at CSIR- NAL.

ISRO's Mangalyaan- India's First Interplanetary Mission



Acoustic test carried out at ISITE(ISRO)-ATF by CSIR-NAL scientists

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