Request For Information (RFI) for the GLAST LAT Environmental Tests  
From: Elliott D. Bloom

The GLAST LAT management at the Stanford Linear Accelerator Center, Stanford University requests quotes and information on providing the following testing facilities to support environmental testing of the GLAST Large Area Telescope (LAT). This data will be used for long-range budget and schedule projections and identification of potential environmental test facilities. We expect to perform LAT environmental testing late FY04 to early FY05.

The Large Area Telescope (LAT) instrument is being developed by Stanford University for the NASA Gamma-ray Large Area Telescope (GLAST) mission. The GLAST mission completed SRR in September 2000 and LAT instrument PDR is scheduled for January 8-11, 2002. GLAST is planned for launch on a Delta II 2920 Heavy expendable launch vehicle in early 2006, and it is expected to have a baseline lifetime of five years, with a goal of an additional five-year extended mission.

The GLAST instrument is a 3000 kg, 2.0 m on a side, by 1m tall, imaging gamma-ray telescope. It consists of five main subsystems: electron-positron tracker made of Silicon strip detectors, photon calorimeter made from CsI, a multifaceted scintillation counter anti-coincidence detector (ACD), data acquisition system, and support grid. There are 16 tower units each consisting of a tracker module, a Calorimeter module, and associated electronics. The ACD is a monolith cap on the 16-tower system held in the grid. The Gamma-ray Large Area Space Telescope instrument will identify and study nature's high-energy particle accelerators through observations of active galactic nuclei, pulsars, stellar-mass black holes, supernova remnants, gamma-ray bursts, and diffuse galactic and extragalactic high-energy radiation in the energy range from 20 MeV to 300 GeV and higher. GLAST will use these sources to probe important physical parameters of the Galaxy and the Universe that are not readily measured with other observations. The high-energy gamma rays will be used to search for a variety of fundamentally new phenomena, such as particle dark matter and evaporating black holes.

The LAT test requirements are not well defined pending selection of a space vehicle contractor, so to avoid difference in interpretation of test requirements, approximate test durations are described here and the costing data supplied is requested to be in the form of day rates for facilities including identification of personnel you need for facility operations. We will supply all personnel to operate the LAT instrument. Space vehicle contractor selection impacts the LAT testing even though the LAT is tested prior to integration with the rest of the vehicle. Vehicle contractor input may change test requirements for any environmental test. The assumption is that the LAT program will supply all required cold plates, fixtures, and harnesses that are not already readily available at your facility. Costs may be quoted in current year dollars assuming typical allowances for inflation can be applied. In addition to cost data, the LAT program requests information about the expected availability of facilities in the time frame indicated and general facility information, such as if all test facilities are co-located to avoid having to reconfigure the LAT for transport. For all tests please quote rates for the actual test, plus rates for setup and tear down if they are different.

Schedule Flexibility:

The GLAST schedule has uncertainty at this time when projected out to the years when environmental testing occurs. Moreover, the uncertainty will not decrease dramatically until the first few tower units are into production. Therefore, the lead-time with which environmental test facilities can be scheduled is a critical consideration. Please identify the minimum lead-time with which it is possible to schedule key facilities, especially the thermal vacuum chamber.

Besides considering the case of on-time arrival for the LAT, we would also like you to consider the following test delay scenarios and how you would react to them. Please give an estimate of any cost deltas arising from the delay.

1) The LAT arrives two weeks late with one month’s notice.
2) The LAT arrives 3-6 months late and you are informed about the delay with one month’s notice and informed of the new arrival time one month in advance of the date.

EMI/EMC Testing

The LAT will require EMI/EMC testing to a tailored MIL-STD 461E spec and GEVS-SE. The expected test duration is 1 week including time for setup.

Vibration and acoustic testing will assume the use of the baseline Delta II 2920 Heavy launch vehicle. The launch will occur from the Kennedy Space Center (KSC) and will place GLAST in a 28.5 deg inclination circular orbit, 550 km in altitude. The payload is constrained to fit in a static envelope 3.15~m tall and 2.546~m in diameter. The remainder of the available volume under the shroud is reserved for the spacecraft including the solar arrays.

Random Vibration Testing

The LAT will require vibration capability in excess of 30,000 lb force. Testing is expected to be acceptance level random vibration for generalized random vibration power spectral density per GEVS-SE The number of accelerometers is expected to be less than 50. The expected duration is 1-2 days for set-up, 3 days of test time, and one day to tear down.

Modal Survey

The LAT may require a fixed base modal survey; therefore it should be costed. The expected duration is 1-2 weeks.

Acoustic Testing

The expected duration is one day for setup, one day for the actual test, and one day for tear down. Please advise on the capabilities for vibro-acoustic testing.

Pyro Shock testing.

Please quote pyro shock test rates, level and spectrum TBD pending space vehicle contractor selection.

Thermal Vacuum Testing

The thermal control system uses a combination of passive thermal control (radiators) and active control, i.e., Variable Conductance Heat Pipes, to maintain the required instrument temperature ranges. Spacecraft mounted radiators reject heat from the instrument. Variable conductance heat pipes transport the heat from the instrument to the radiators. Thermostats and heaters provide local thermal control on the instrument. There is limited conductive thermal coupling through mechanical mount of the Grid to the S/C. All six sides of the instrument are covered by MLI.

The GLAST thermal vacuum test plan may include testing heat pipe functionality and effectiveness in the flight configuration and necessitates specific test requirements. These requirements may also be verified in other testing.

Since the terrestrial 1g environment causes the heat pipes to behave differently than in the 0g environment, the SI/grid/heat pipe assembly will need to be inverted (instrument down, grid up) during testing (NB: The assumption is that the LAT program will supply all required cold plates, fixtures, and harnesses, including the LAT inverting harness, that are not already readily available at your facility). This will require a test fixture that will enable the assembly to be inverted in the chamber.
The grid plane containing the heat pipes shall be leveled in the test chamber to within an angle of ~ 0.03 degrees. This requirement means that either the test fixture or its support must have leveling hardware and that theodolites or laser levels and reference scales will be required for setup. Please comment on your capabilities to support the leveling of the payload in the test configuration.

Because the flight radiator assemblies might not be used during testing, additional cold plates may be required to provide conductive cooling in place of the vertical heat pipe radiators to simulate typical on-orbit operation.

The LAT will require a thermal vacuum chamber with minimum dimensions approximately 12 feet in diameter and 12 feet long inside the liquid nitrogen shroud. The chamber should be capable of vacuums of 1 x 10^-6 torr and thermal extremes of at least –50 C to +70C. This is considerably larger than the actual LAT to allow for fixtures and additional cold plates and shrouds. Details of the TVAC testing are TBD and may include thermal balance and multiple thermal cycles. It may be necessary to open the chamber door between thermal balance and thermal cycling. The expected test duration is approximately 28 days.

Please note that this request for information in no way obligates Stanford University to award a contract.

I will need your response by December 5, 2001 in order to incorporate it into our LAT I&T PDR presentation on January 8-11, 2002. Please send your response to this RFI via email to:

Elliott D. Bloom  
GLAST LAT I&T Manager  
elliott@slac.stanford.edu

I would prefer responses via email to speed up the process. If you would like to send hardcopy in addition to email, or if you would prefer to just send hardcopy, please send your response to:

Elliott D. Bloom  
GLAST I&T manager  
MS 98, SLAC  
Stanford University  
Stanford, CA 94309

Thank you for your attention to this matter.