Targets And Return Signal Strength Session Summary

Chair: Tom Murphy

This session consisted of five talks, three of which dealt with target design, testing, and analysis, and two of which dealt with absolute calibration of return signal strengths from laser ranging targets.

D. Arnold presented a summary of analytical results spanning a wide variety of topics, including: range corrections to LAGEOS and LARES; wavelength correction to LAGEOS for 850 and 425 nm light; Apollo lunar array diffraction patterns; hollow cube thermal analysis; retroreflector arrays for high-altitude satellites; diffraction patterns from and thermal analysis of Russian corner cubes; and range corrections associated with multi-photon returns to a single-photon avalanche detector (SPAD).

G. Delle Monache presented an overview of the Space Climatic Facility (SCF) in Frascati—a space/earth/sun simulation facility used to examine the thermal properties of retroreflector arrays in a space environment. The presentation included example thermal images of LAGEOS/LARES corner cubes under simulated space conditions, a description of the SCF's far-field diffraction pattern test capability, preliminary test results of the GPS3 array as part of the ETRUSCO experiment, and plans to test a LAGEOS mock-up in the near future. An invitation was extended to perform thermal tests of other retroreflector systems at the LNF facility.

V. Shargorodsky and V. Vasiliev described a new two-layer nested glass sphere retroreflector target, 17 cm in diameter, 7.5 kg in mass, with a 100,000 m^2 cross-section at 532 nm. The spherical target has been built, and is currently undergoing measurement tests of the return pattern in various conditions. The expected launch date is late 2007. Also presented was a concept possibility for a multi-layer retroreflective sphere that would work at two colors.

T. Murphy presented signal strength results from the APOLLO LLR station, comparing the highest return rates to date with a detailed link budget. Realistic diffraction patterns and de-rating factors were applied to the Apollo arrays. The result was a return signal strength substantially weaker than expected, by a factor of 15. Dust or surface abrasion are likely to blame.

J. Luck and C. Moore presented the results of a study to see if Optus-B or similar targets could be used to calibrate the return strength from other targets. By comparing return strengths from Optus-B and GPS on a variety of nights with similar pointing angles within a given comparison, they found that the measured cross-section ratio agreed with the theoretical ratio to better than 15%—suggesting such inter-comparisons as a viable technique for characterizing the performance of targets in the space environment.