Contribution ID: **5** Type: **not specified**

Laser Ranging Space Characterization: an introduction to Satellite Laser Ranging

Thursday, 22 October 2015 10:00 (1 hour)

In Satellite Laser Ranging (SLR), a short laser pulse is transmitted from a ground station to an orbiting satellite and reflected back to the station, which measures the roundtrip time of flight and hence the station-to-satellite range. The first laser returns from an artificial satellite were recorded by a NASA team at Goddard Space Flight Center on 29 October 1964.The satellite, Beacon Explorer 22B, was equipped with a Laser Retroreflector Array (LRA), designed to return a sufficient number of laser photons to their point of origin. In July 1969, the Apollo 11 astronauts placed the first LRA on the surface of the Moon; the number of lunar LRAs was later increased to 5 by Apollo 14 and 15 and two unmanned Soviet Lunakhod missions. Over the intervening decades, the ranging precision has improved from a few meters to a few mm and the number of stations in the global network has increased to about 40. Today, the International Laser Ranging Service (ILRS), formed in 1998, coordinates the tracking operations and data analysis activities of approximately 30 participating countries. SLR is one of four techniques currently in wide use by the space geodetic community; the others are Very Long Baseline Interferometry (VLBI), Global Navigation Satellite Systems (e.g. GPS) , and Doppler Orbitography and Radiopositioning by Satellite (DORIS).

Since the Millennium, a few SLR stations have developed the ability to track satellites in daylight using low energy kHz lasers and single photon returns. This demonstrated capability to extract very low level signals from the solar background has opened the door to precise interplanetary ranging and time transfer through the use of laser transponders, with the promise of further contributions to lunar and solar system science, more precise relativity experiments, and improved lunar and planetary mission operations. A second spinoff of single photon SLR technology has been the development of airborne and spaceborne single photon laser altimeters and 3D imaging lidars, which have demonstrated unprecedented surface measurement rates up to 3.2 million pixels per second.

Primary author: Dr DEGNAN, John J. (Sigma Space Corporation)

Presenter: Dr DEGNAN, John J. (Sigma Space Corporation)