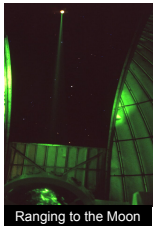
Forty-Four Years of LASER Ranging at Haleakala

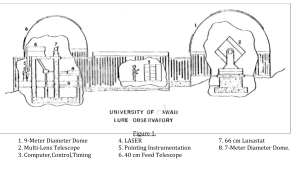
University of Hawai`i Institute for Astronomy, Maui Division
NASA Goddard Space Flight Center Space Geodesy Project

D. O'Gara, C. Foreman, J. Kamibayashi, R. Ratkowski, M.Maberry
University of Hawaii IfA, Haleakala Observatories, Maui

Lunar Laser Ranging (LURE) 1974 - 1990


LURE Observatory


Ranging to the Moon

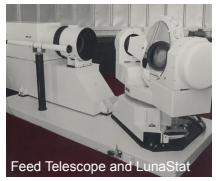



Apollo 11 RRA

LURE Observatory (HOLLAS) was built in 1974. The 2-domed building housed the laser beam director in the south dome, and the Multi-Lens receive telescope in the north dome.

Most productive Lunar Ranging years were from 1985-1990. Principal Investigators during 1974-1990 were Dr. William Carter, Dr. Sol Cushman and Mr. Lou Macknik.

Satellite Laser Ranging 1979 - 2004


Feed Telescope and LunaStat

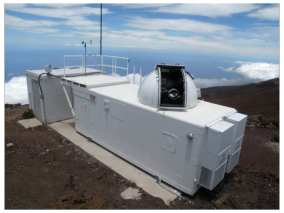
With the launch of artificial earth satellites designed for geodetic studies, LURE was modified so the laser transmitter (LunaStat) could be used as a transmit/receive telescope. The Multi-Lens telescope would be used for Lunar Ranging only.

The control computer system at LURE before the 1998 controller upgrade.

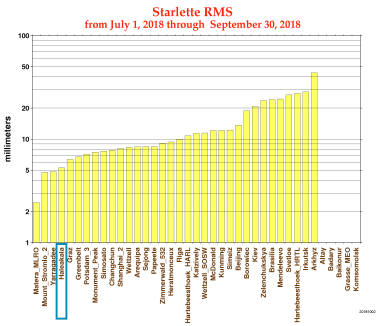
This DEC PDP11-73 system was one of the last working DEC systems in the state of Hawaii when decommissioned in 1999.

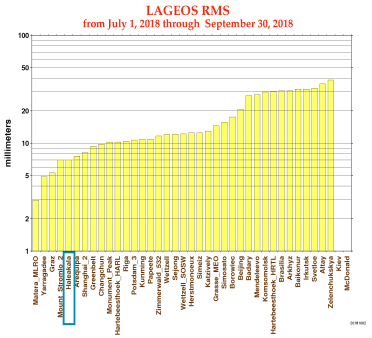
TLRS-4 2006 - Present

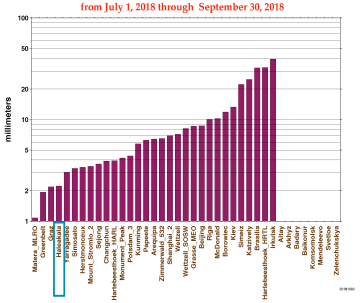
LURE was closed in late 2004 to make room for the Pan-STARRS telescopes. The mothballed TLRS-4 system at Goddard SFC was re-furbished with the latest hardware and software and moved to Maui in September 2006 to a site about 130 meters from the LURE site.
Since the 2006 installation, several system upgrades have been installed which have improved system performance and reliability.

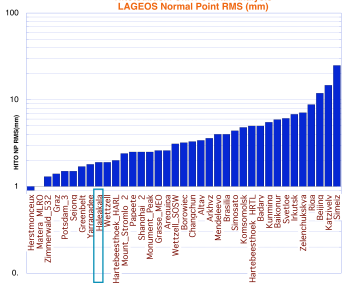


In 2010 the laser "Saturable Absorber" upgrade made laser operations safer and more stable by removing the flowing dye cell from the system. Tuning the laser became a monthly task rather than a daily task. And we no longer had to handle the hazardous MonoChloroBenzene. In 2017 the system time of flight hardware was upgraded to a Cybioms Event Timer, retiring the venerable HP-5370B (in use at Maui since ~1983). In combination these upgrades enable TLRS-4 to produce some of the most precise single-shot measurements in the ILRS. (See the plots below)





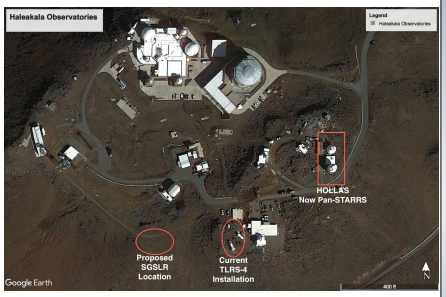




Space Geodesy SLR (SGSLR) Future


SGSLR @ GSFC

Haleakala is selected to be one of the early SGSLR installations, with construction planned to begin in the 2020 timeframe.



The Haleakala SGSLR site will be tied to the VLBI site at Koke`e Park on Kauai (approx. 386 km distant) via multiple high performance GNSS installations located at both sites.

TLRS-4 Operations Crew


Craig Foreman
Laser Tech/
Obs.Foreman


Rob Ratkowski
Ranging Safety


Jake Kamibayashi
Elec. Tech


Dan O'Gara
Site Manager

21st International Workshop on Laser Ranging
Canberra ACT, Australia
November 5 - 9, 2018

Email: ogara@ifa.hawaii.edu
Website: http://www.ifa.hawaii.edu/