

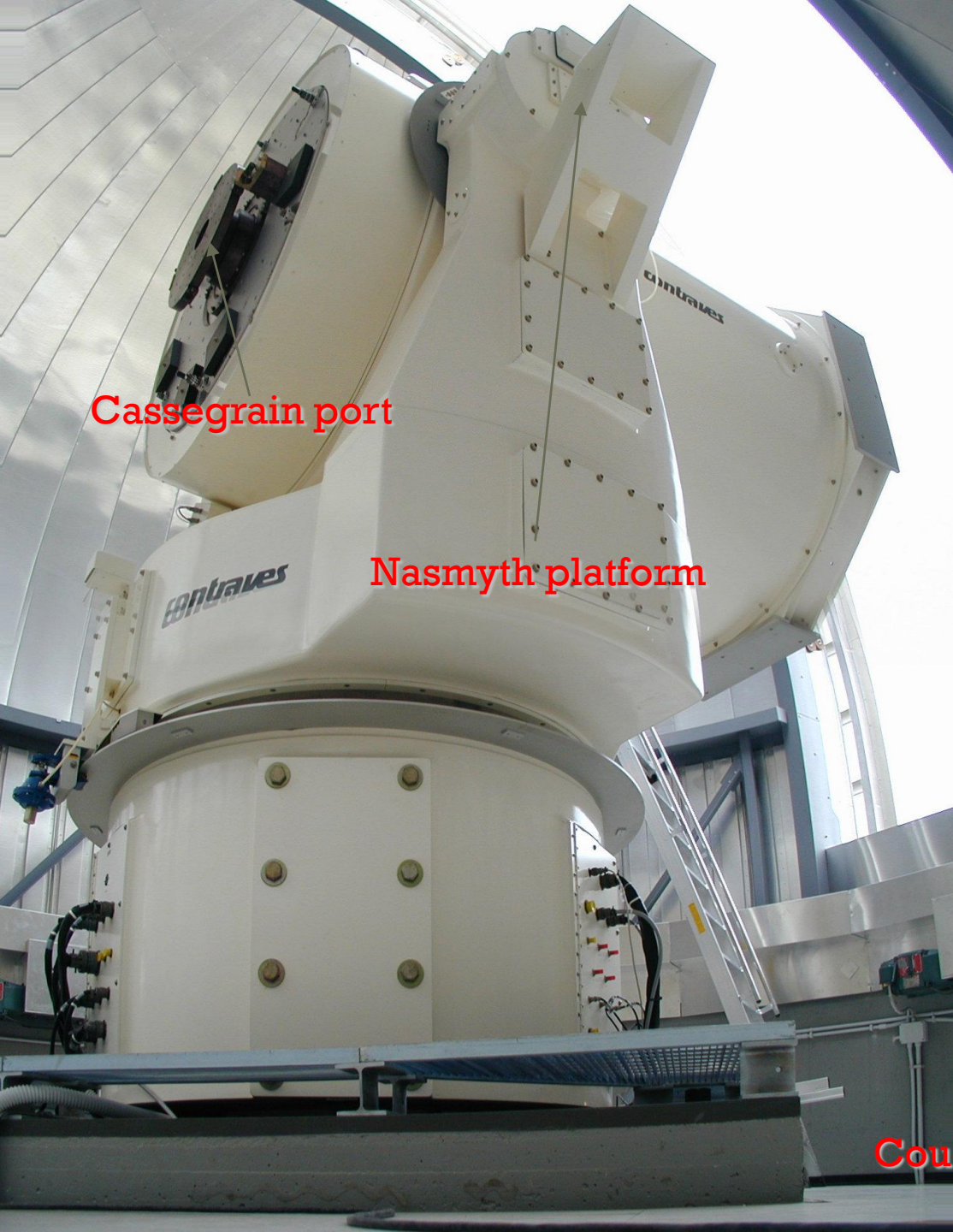
# Revamping LLR @ MLRO

**G. Bianco, V. Luceri, G. Nicoletti**  
Matera Laser Ranging Observatory,  
ASI/CGS, Matera, Italy

ITLW-12, Frascati, 8 November 2012







Cassegrain port

Nasmyth platform

Coudé path



Finder cameras

# MLRO facts

---

- ◉ 152 cm diameter, diffraction limited, alt-az Coudé Cassegrain telescope
- ◉ Shared aperture
- ◉ 10 Hz, 100 mJ, 40 ps @ 532 nm laser
- ◉ MCP/PMT (Photek) + CFD detection

# Issues

---

- MLRO was designed as an LLR capable system, but the production has been very sporadic due to different reasons:
  - LLR is inherently difficult
  - LLR needs a dedicated and competent crew
  - Untimely spare parts procurement



# Why the revamping

---

- MLRO IS a LLR station, what the heck...
- And...



# Critical points

---

- **Divergence:** this is difficult to measure and characterize, at least on MLRO. Thanks to Mark Davis and colleagues at NRL for their efforts!
- **Optical Efficiency:** the MLRO telescope has 7 reflections: a 10% loss on each means a signal loss of 75% (two-way)
- **Seeing**
- **About everything else** (PMT, interference filter, alignments, etc.)

# System improvements

---

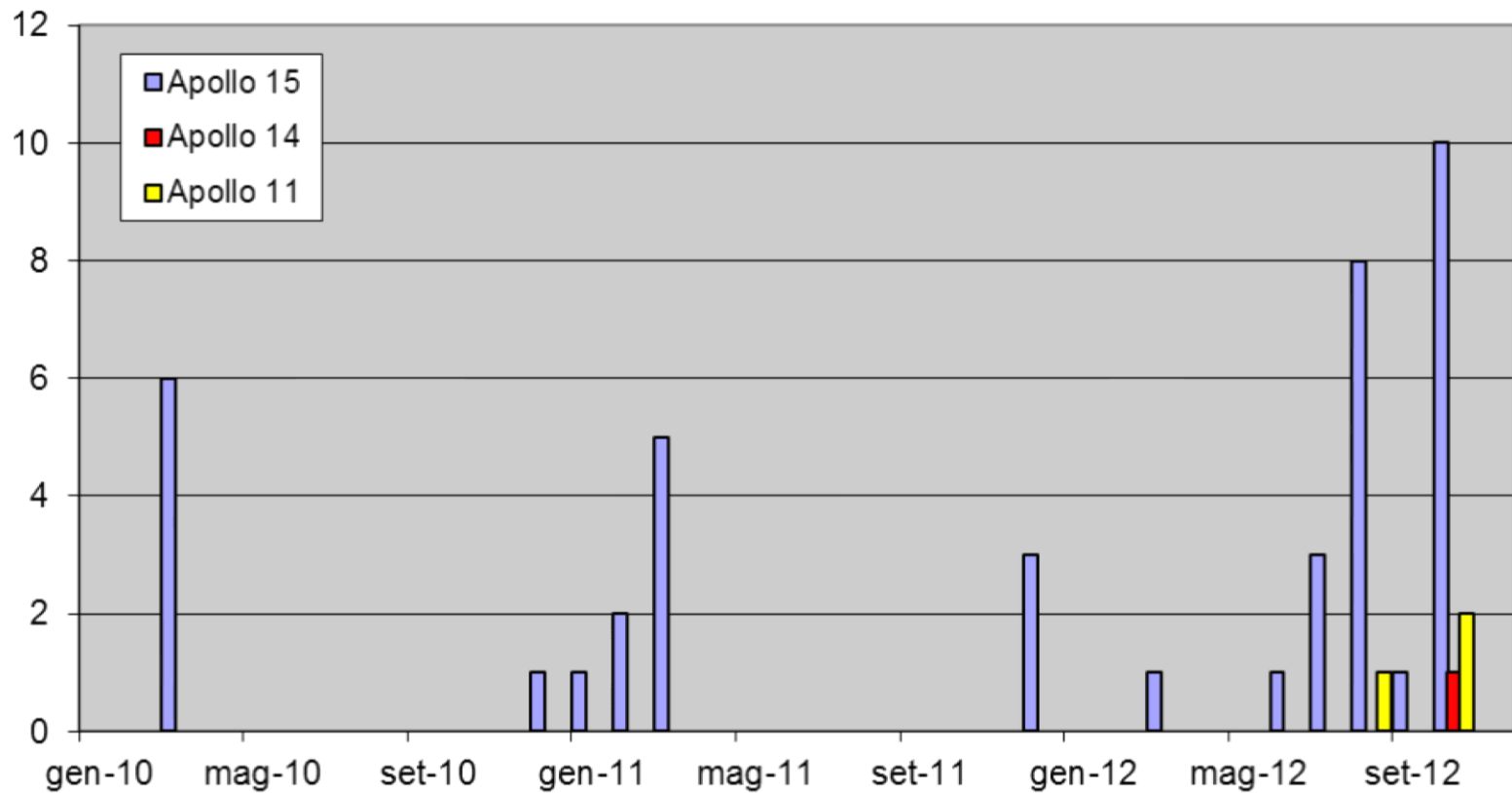
- New MPC PMT from Photek
- New 3 Å filter
- Optical path efficiency monitoring & (more) systematic cleaning
- (More) careful alignments



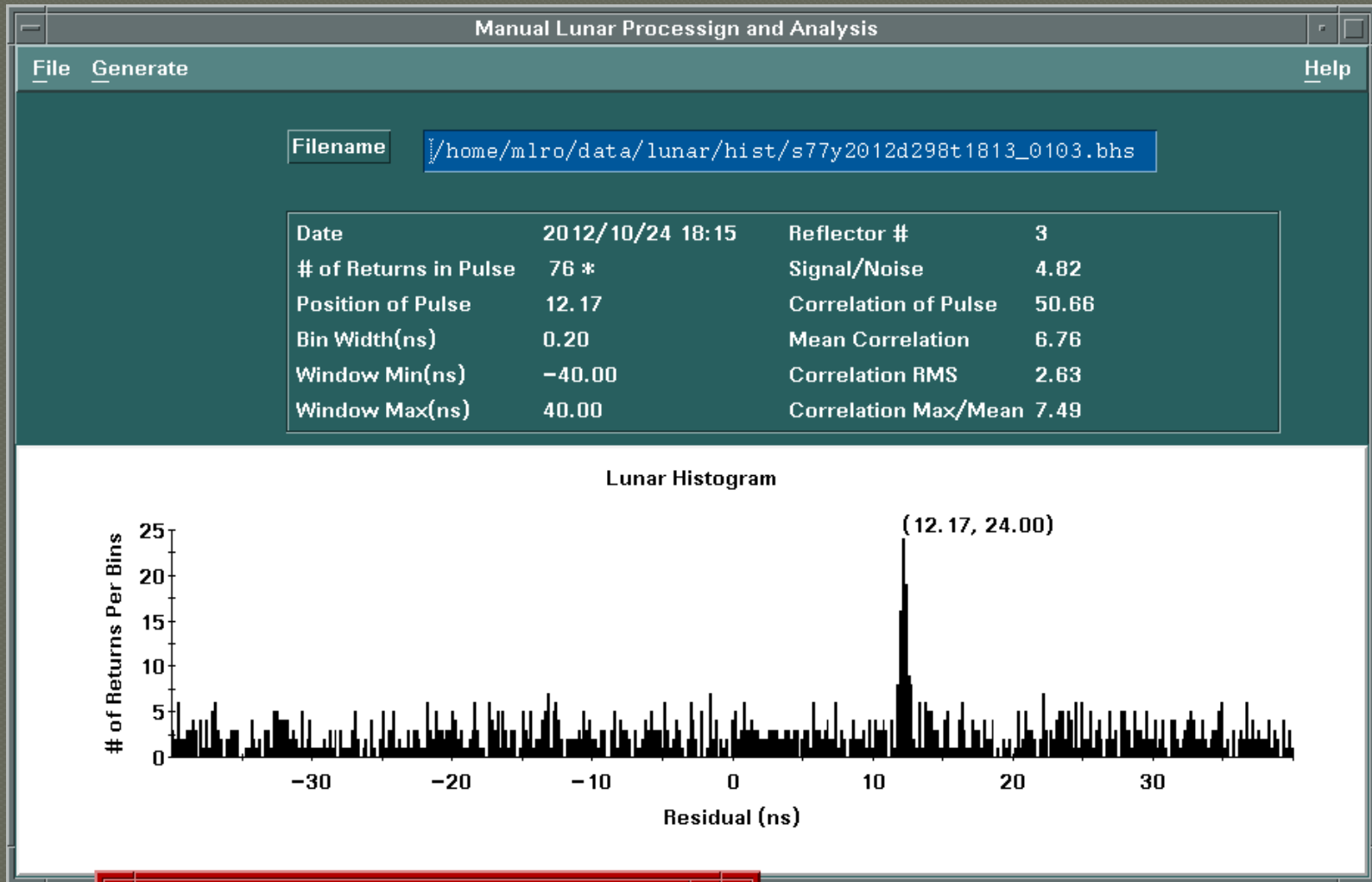


Photo © Paolo Villoresi

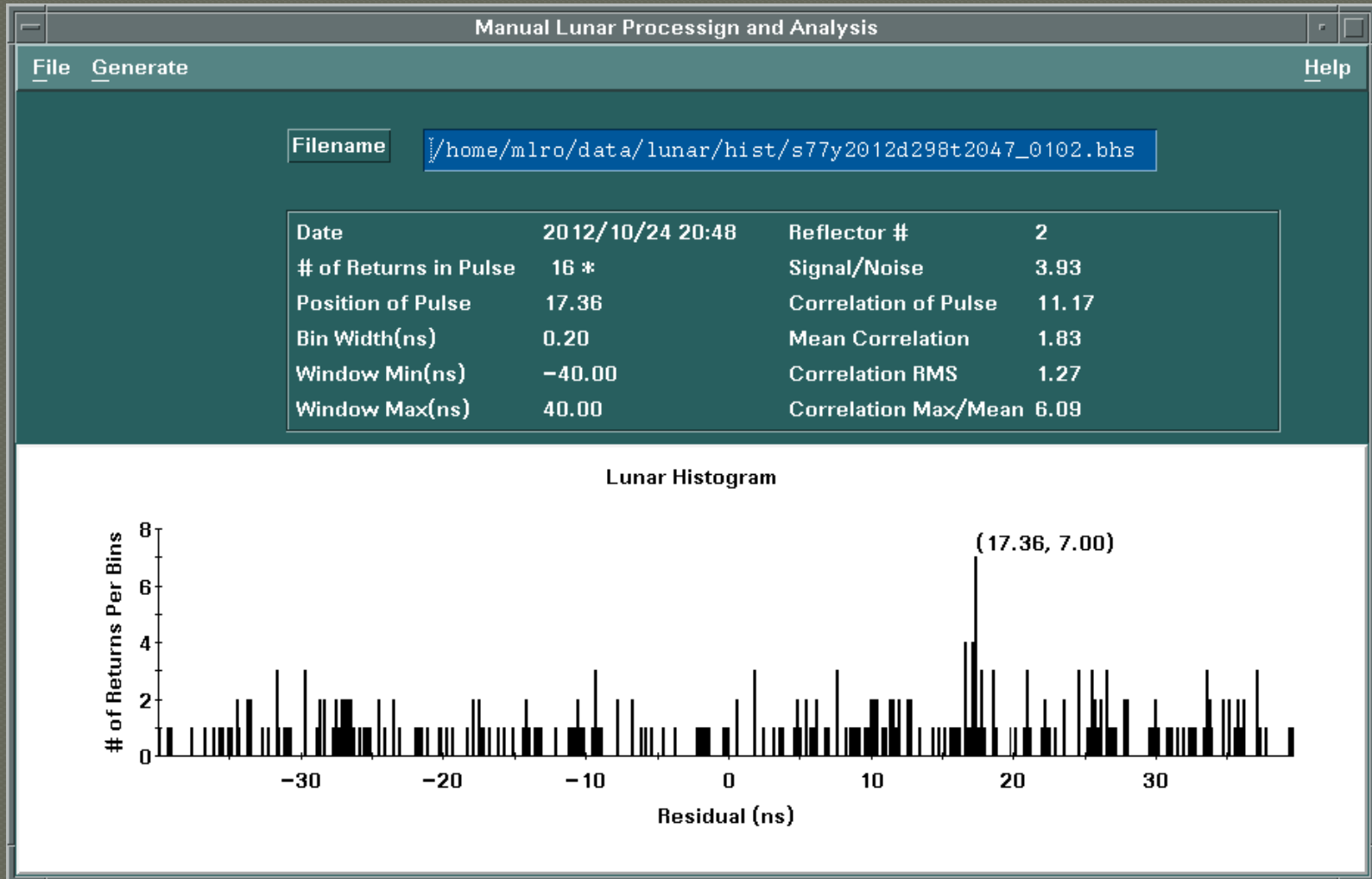
### MLRO LLR Normal points



# Apollo 15

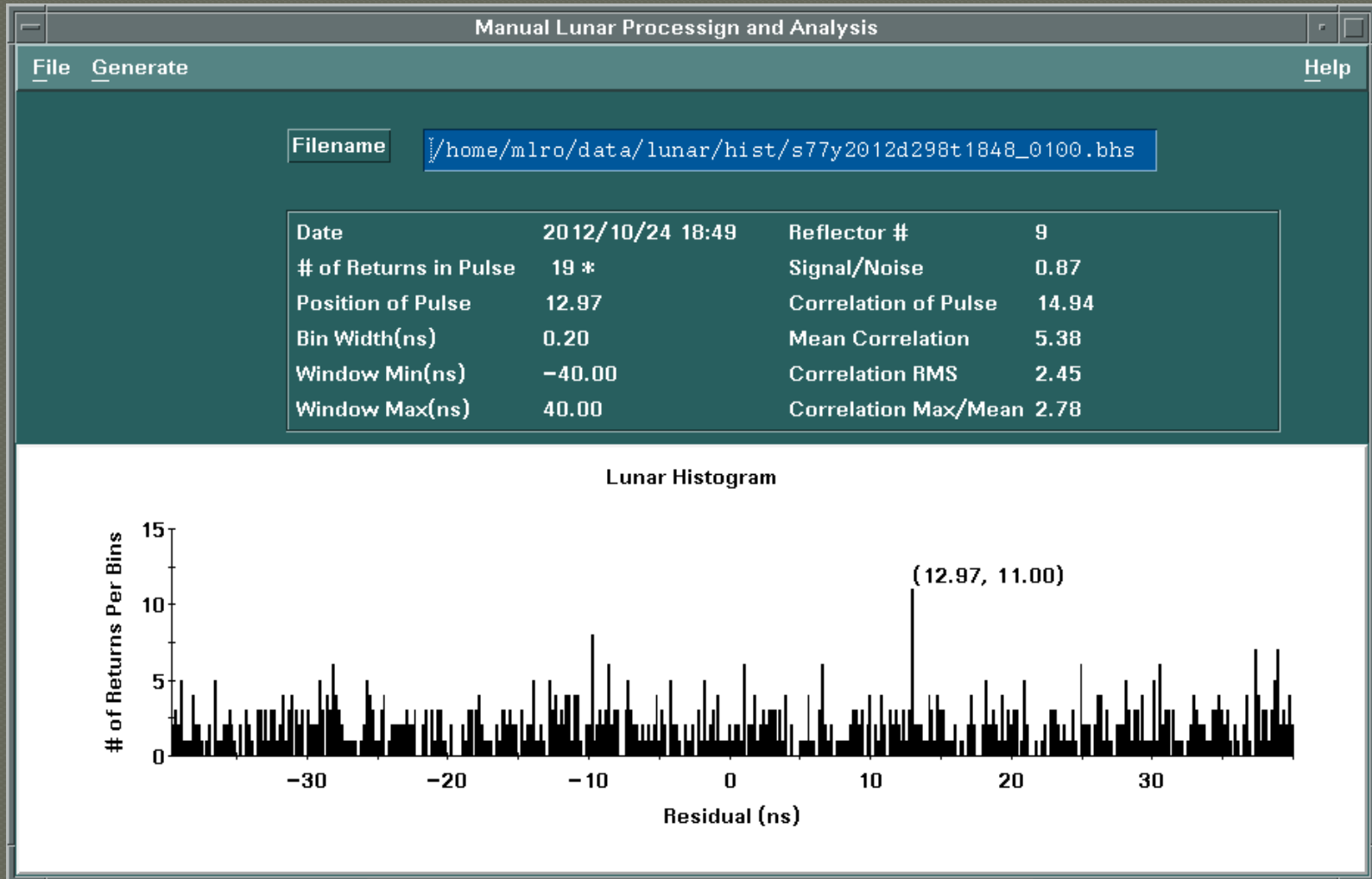


# Apollo 14



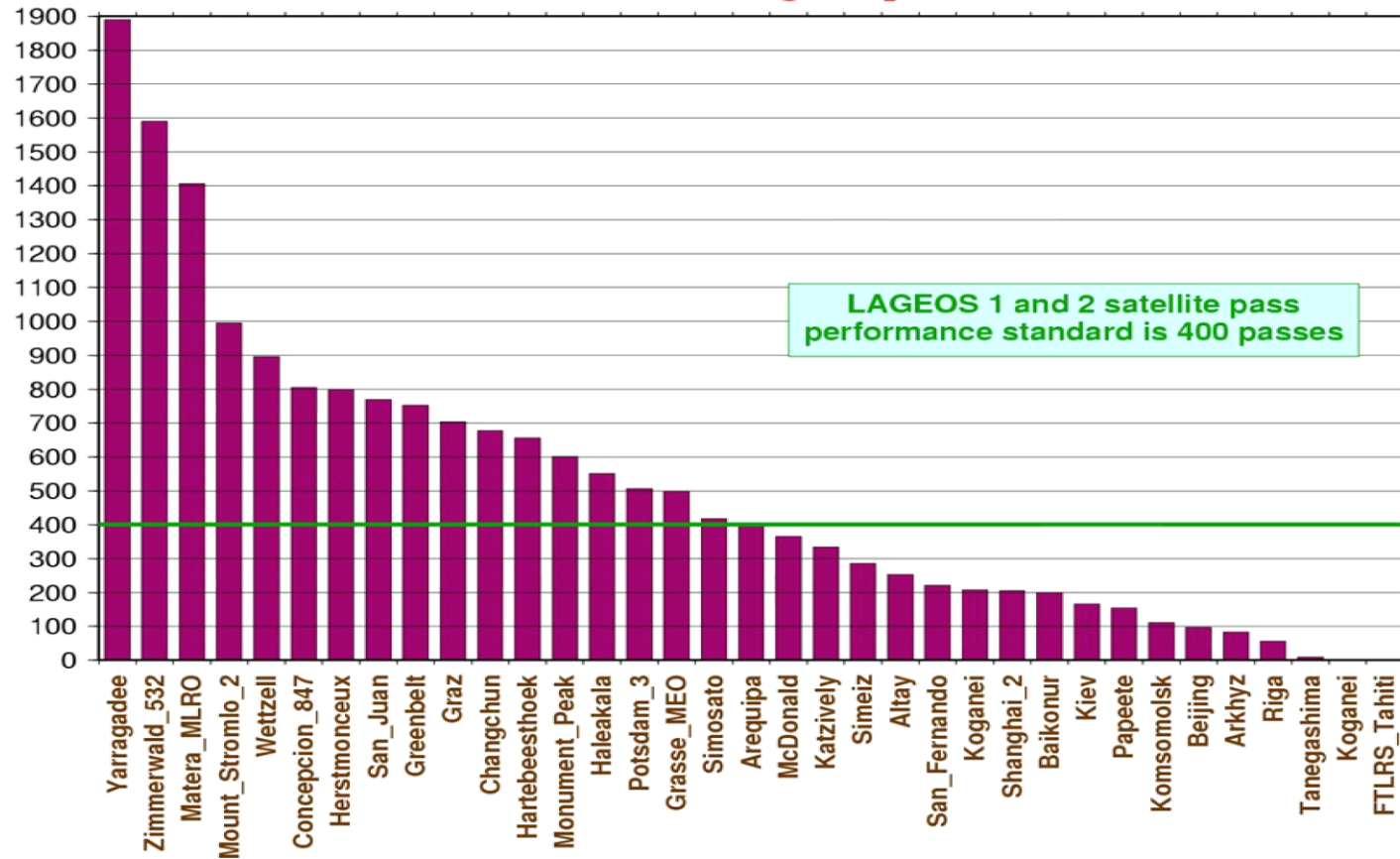


# Apollo 11



# SLR @ MLRO

## LAGEOS 1 and 2 passes from October 1, 2011 through September 30, 2012



# Plans

---

- ◉ Continue operations and improve LLR capability
- ◉ Telescope control system being replaced
- ◉ Main mirror recoating to be done asap
- ◉ MLRO general upgrade under study

# Thank you!

