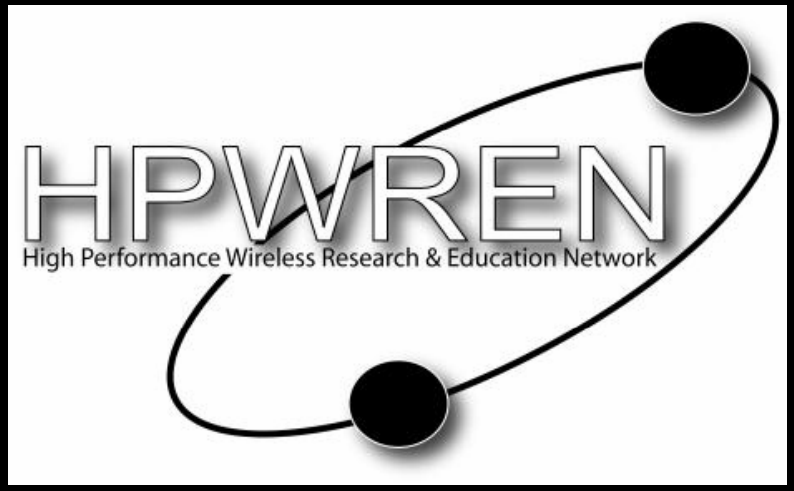
Annual HPWREN Users Meeting



NASA MOBLAS 4

Goddard Space Flight Center
Greenbelt, MD

November 19, 2008

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Howard Donovan

Engineering and Operations Manager

Ron Sebeny

MOBLAS 4 Acting Station Manager

NASA Satellite Laser Ranging Program
Goddard Space Flight Center
Honeywell Technology Solutions Inc.

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NASA SLR Network

- MOBLAS 4 San Diego, California
- MOBALS 5 Yarragadee, Australia
- MOBLAS 6 Hartebeesthoek, South Africa
- MOBLAS 7 GSFC, Greenbelt, Maryland
- MOBLAS 8 Tahiti, French Polynesia
- TLRS-3 Arequipa, Peru
- TLRS-4 Haleakala, Hawaii
- MLRS Fort Davis, Texas

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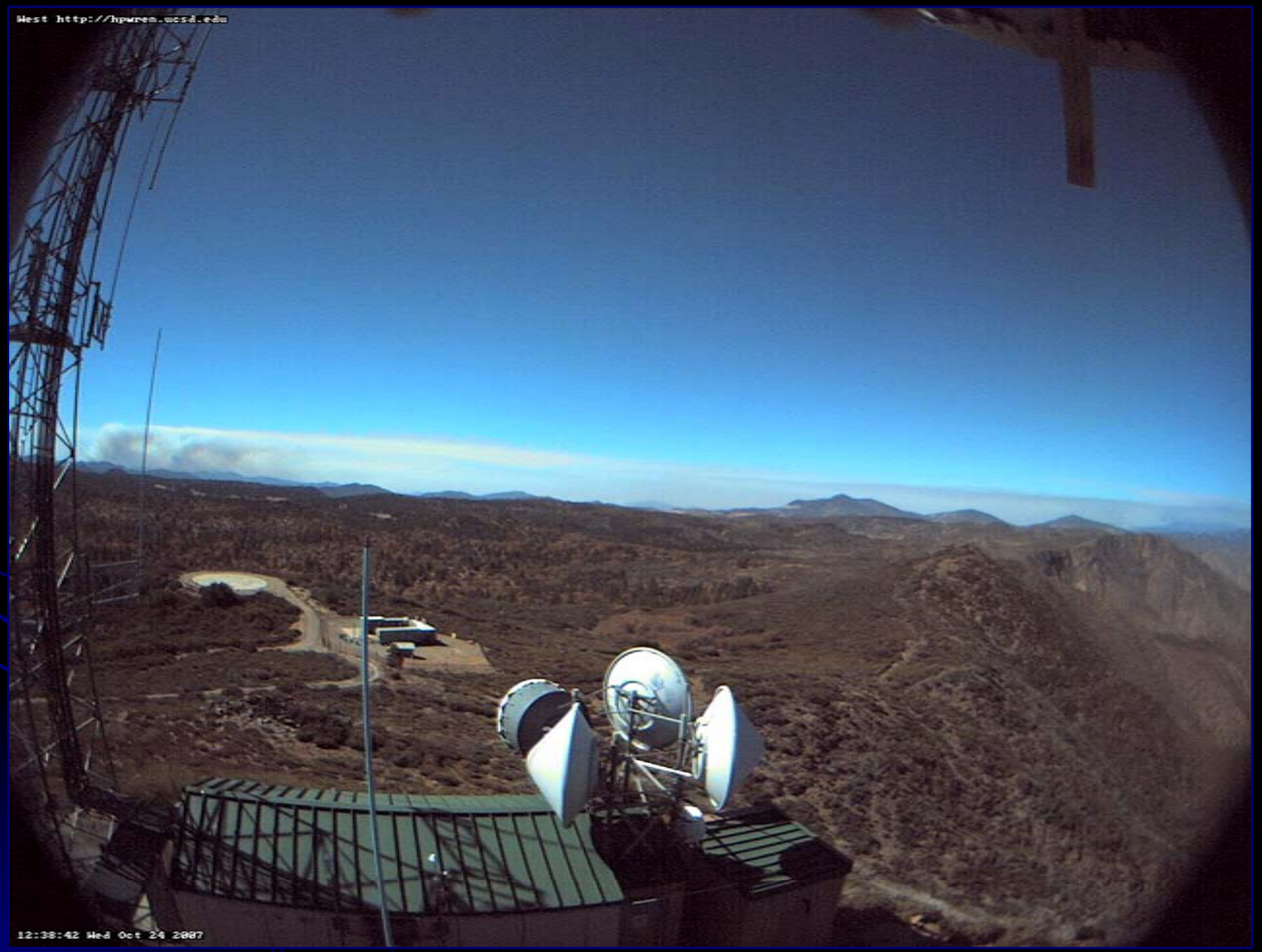
View from HPWREN Mt. Laguna West



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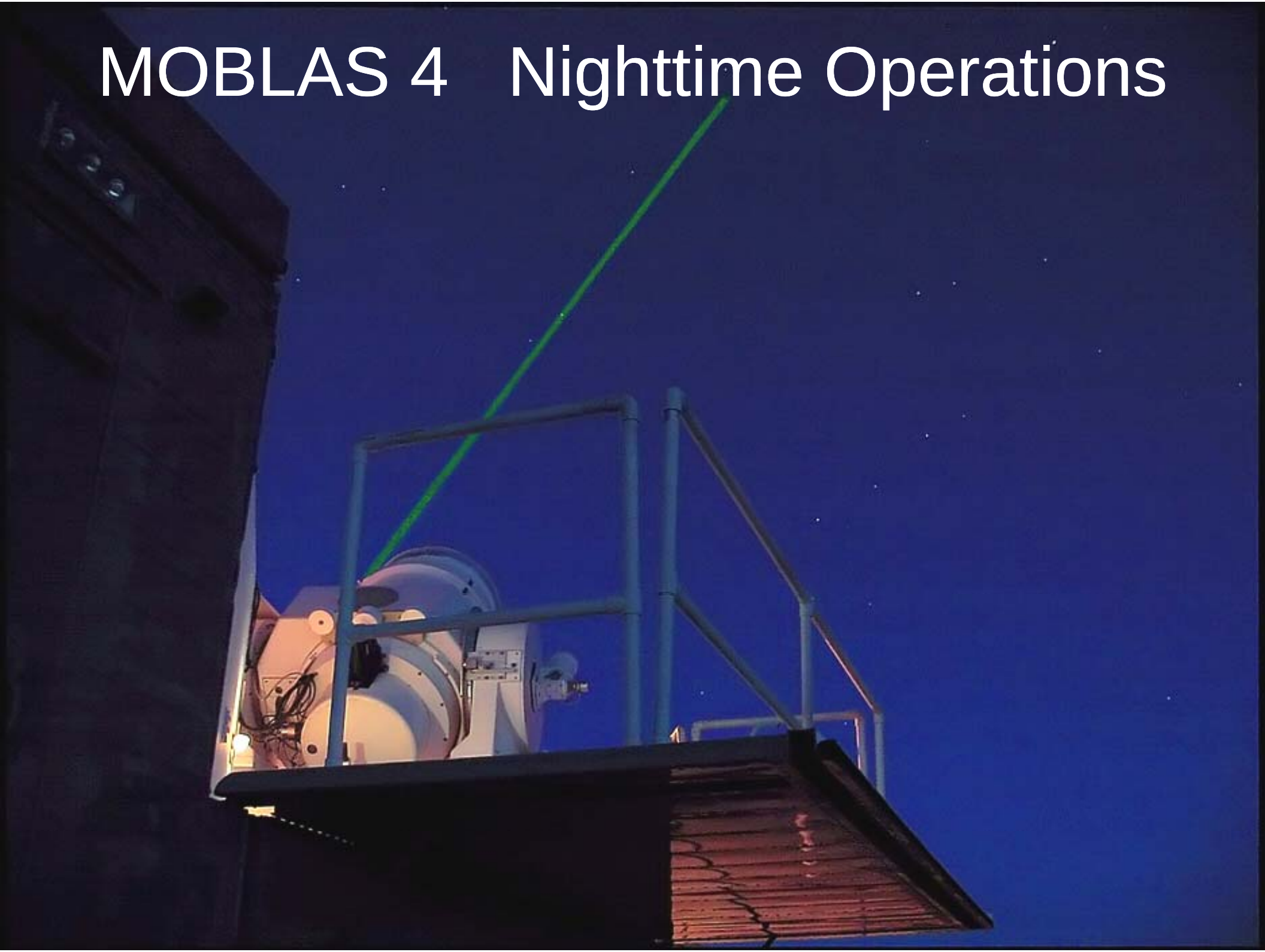
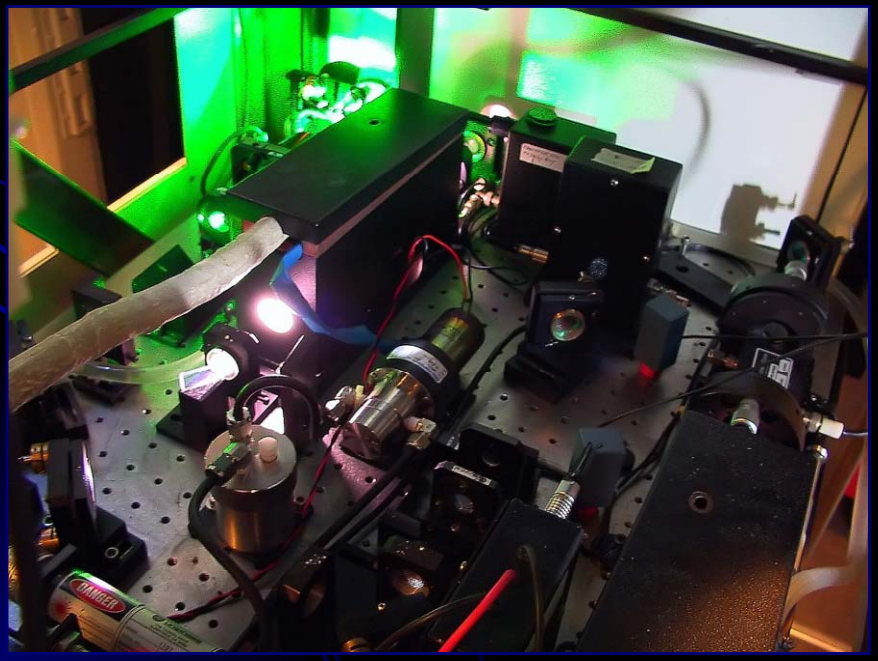
MOBile Laser RAnging System 4
MOBLAS 4, San Diego, CA.

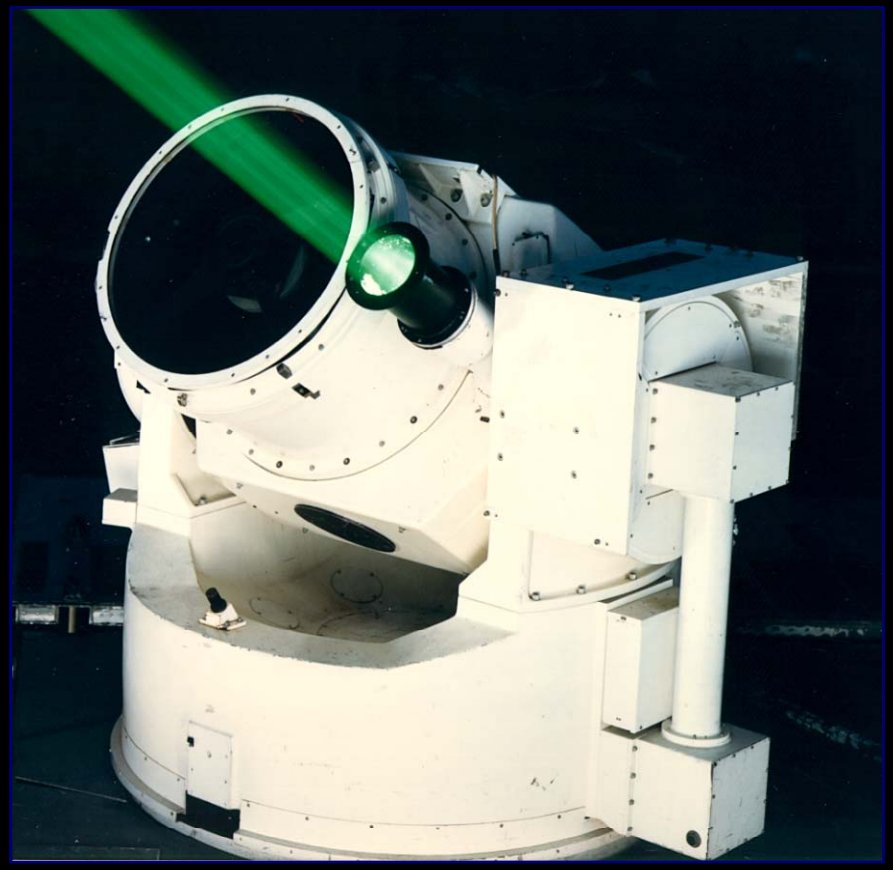
MOBLAS 4 Nighttime Operations



Satellite Laser Ranging

- Measure Time of Flight (TOF)
  - Time Interval Unit (TIU) – High Precision Stop Watch
  - Telescope – 30” Schmidt-Cassigraine
  - Short Pulse Laser – 200 picoseconds or 0.2 X 10^{-12} second





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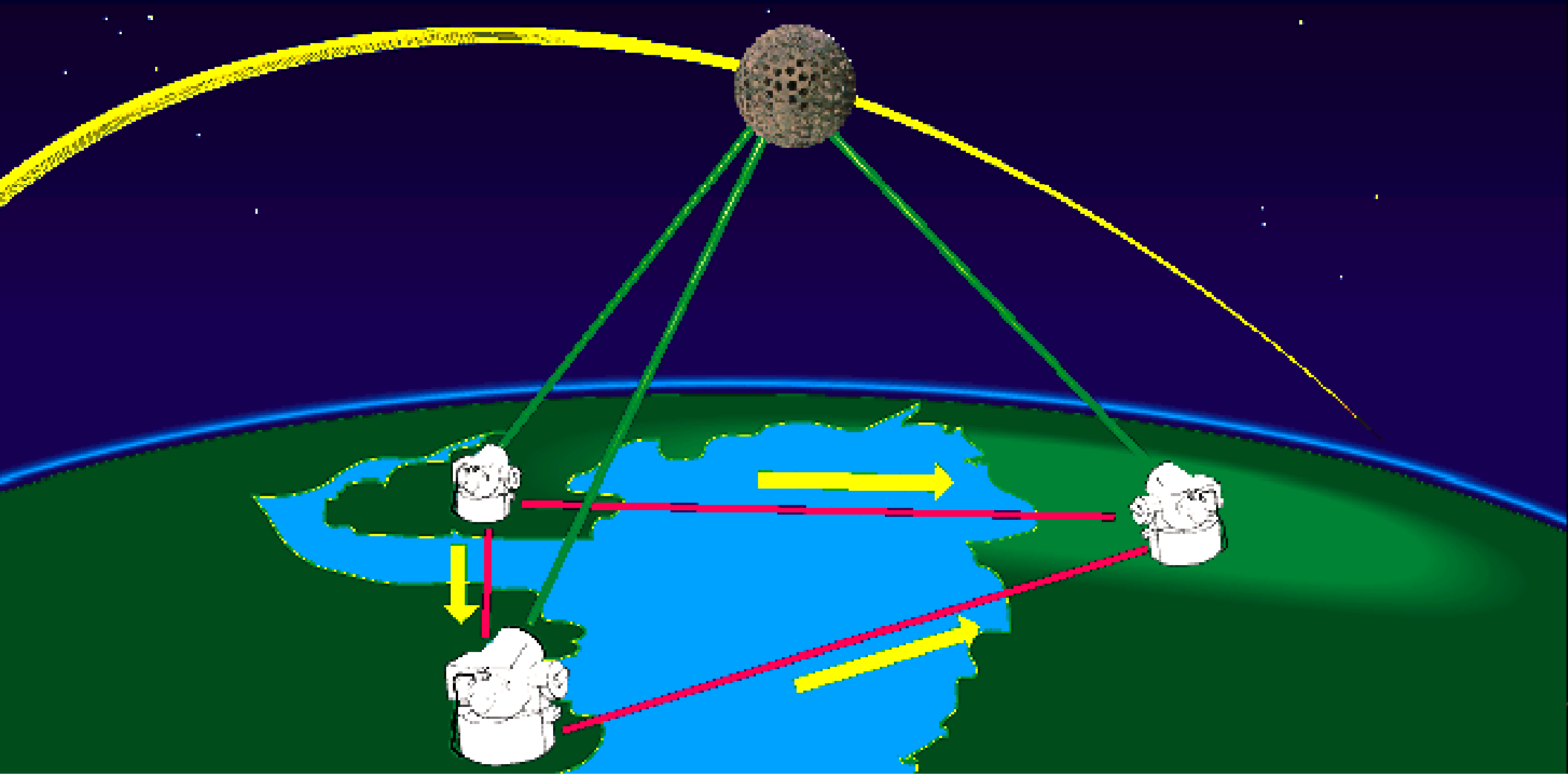
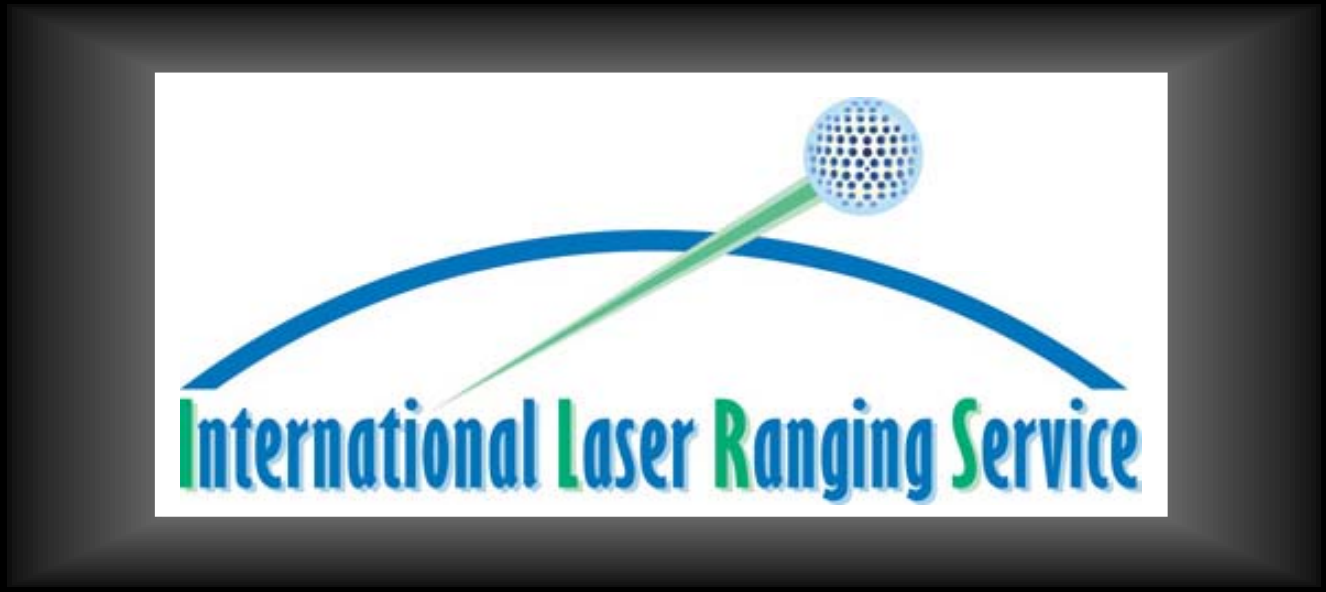
Satellite Laser Ranging

Provides Precision Range Measurement
~5mm over a 6,000 km range (3,700 miles)



International Laser Ranging Service



Provides global satellite and lunar laser ranging data and their related products to support geodetic and geophysical research activities as well as IERS products important to the maintenance of an accurate International Terrestrial Reference Frame (ITRF). The service develops the necessary global standards/specifications and encourages international adherence to its conventions.

http://ilrs.gsfc.nasa.gov/

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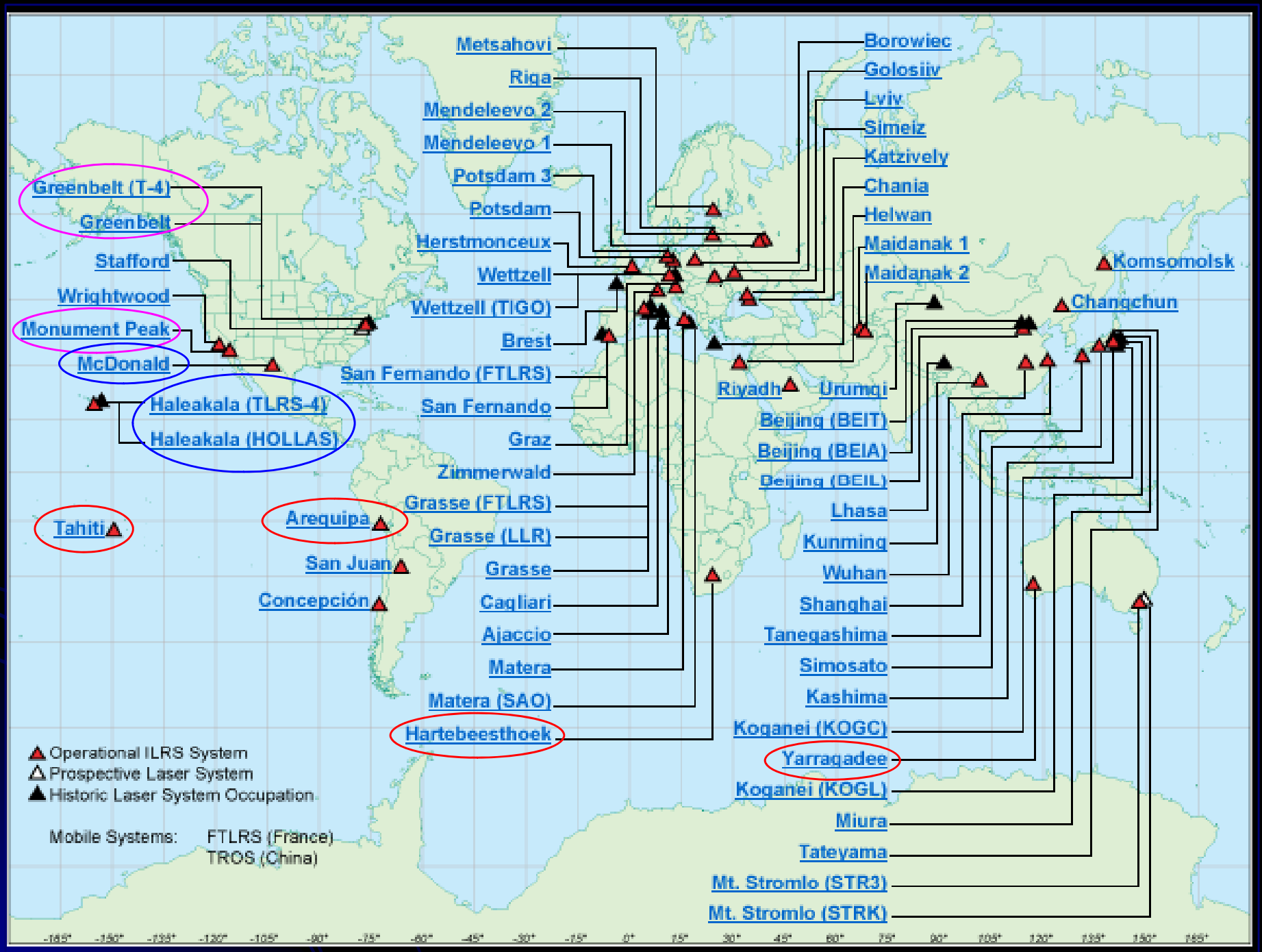

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SLR Science Contributions

- Tectonic Plate Motion
- Gravity Field
- Atmospheric Pressure Loading
- Earth Rotation
- International Terrestrial Reference Frame
- Atmospheric Refraction Model
- Altimeter Calibration
- Geocenter Determination and Monitoring
- Ocean Tides and Sea Level Monitoring
- Land and Ice Topography
- Solid Earth-Core/Mantle Interaction
- Post-Glacial Rebound
- Part of the International Network of Space Geodetic Observatories
  - VLBI, GPS, DORIS and PRARE systems

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NASA SLR Network Activities for 2008

- MOBLAS 8 – Tahiti, French Polynesia
  - Return to Operations – Offline for 18 months
    - Engineering Site Visit
    - 2 Engineers - 8 weeks total
    - System Repair
    - Saturable Absorber Laser Upgrade
    - Controller Computer Upgrade
    - UPS Replacement
    - Oscilloscope Replacement
- MOBLAS 7 – Greenbelt, Maryland (GSFC)
  - Controller Computer Upgrade
  - UPS Replacement

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NASA SLR Network Activities for 2008

- MOBLAS 6 – Hartebeesthoek, South Africa
  - 2 Engineers – 8 weeks total
  - System Repair and Upgrade
  - High Sensitivity Laser Receiver
  - Saturable Absorber Laser Upgrade
  - Controller Computer Upgrade
  - UPS Replacement
  - Oscilloscope Upgrade

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NASA SLR Network Activities for 2008

- MOBLAS 5 – Yarragadee, Australia
  - Controller Computer Upgrade
  - UPS Replacement
  - Oscilloscope Upgrade
- MOBLAS 4 – Monument Peak, California
  - Saturable Absorber Laser Upgrade
  - Controller Computer Upgrade
  - UPS Replacement
  - Oscilloscope Upgrade

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NASA SLR Network Activities for 2008

- TLRS 4 – Haleakala, Hawaii
  - UPS Replacement
  - Oscilloscope Upgrade
  - Controller Computer Upgrade – In Progress
  - Future Upgrade
    - Saturable Absorber Laser Upgrade
- TLRS 3 – Arequipa, Peru
  - UPS Replacement
  - Oscilloscope Upgrade
  - Future Upgrades
    - Controller Computer Upgrade
    - Saturable Absorber Laser Upgrade

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NASA SLR Network Activities for 2008

- MLRS – Fort Davis, Texas
  - Future Upgrade
    - Controller Computer Upgrade
    - Saturable Absorber Laser Upgrade

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Saturable Absorber Upgrade - Before

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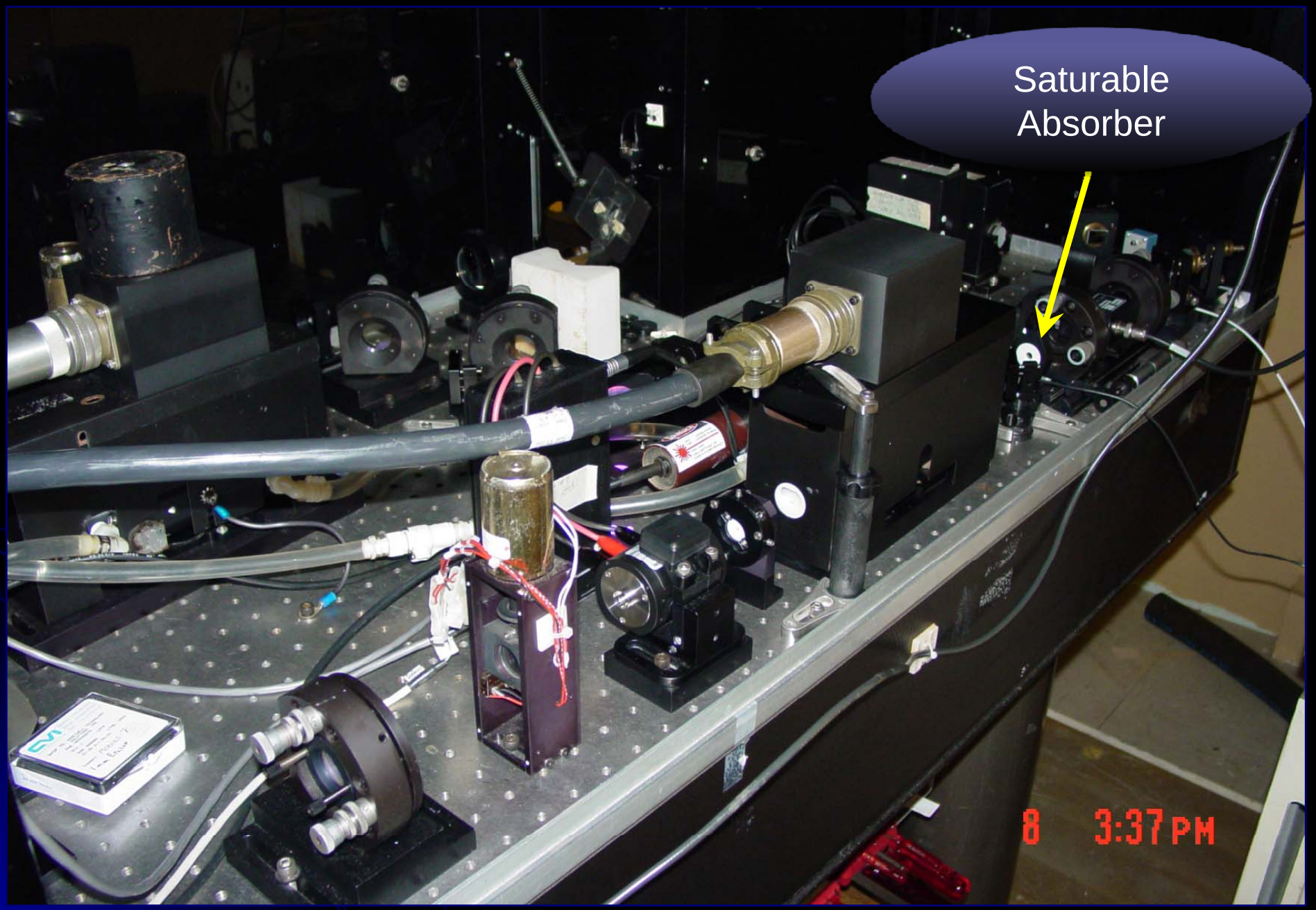
Saturable Absorber Upgrade - After



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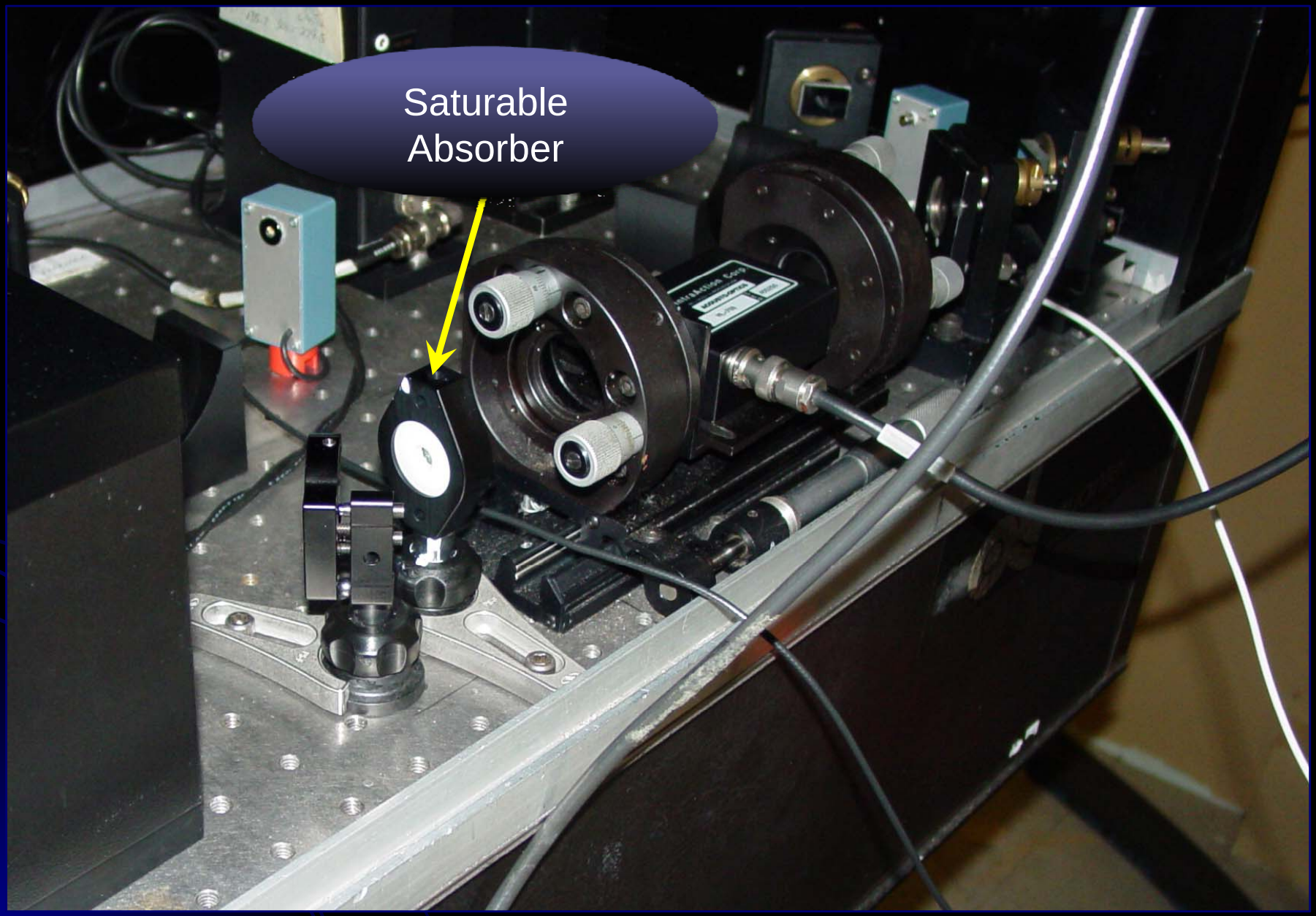
Saturable Absorber Upgrade - After



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Next Generation SLR

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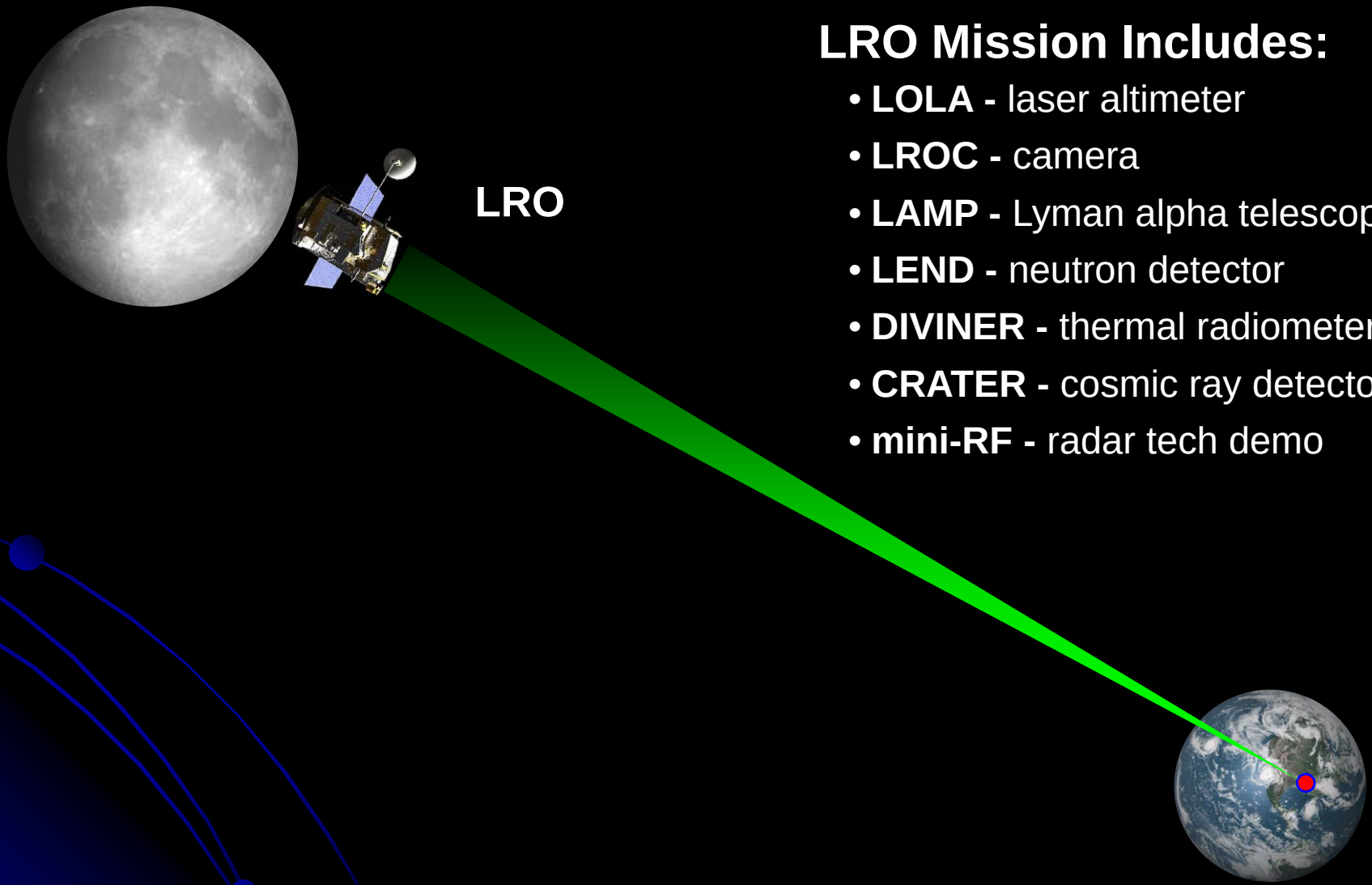
Lunar Reconnaissance Orbiter



LRO Mission Includes:

- **LOLA -** laser altimeter
- **LROC -** camera
- **LAMP -** Lyman alpha telescope
- **LEND -** neutron detector
- **DIVINER -** thermal radiometer
- **CRATER -** cosmic ray detector
- **mini-RF -** radar tech demo

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NGSLR LRO Preparation Status

- NGSLR Preparations Continue
- Completing Ground Calibration Upgrades
- Fine Tuning Point-Ahead Optical System
- Training Initial Operator
  - 2 Additional Operators Hired
  - Completing Training at MOBLAS 7
  - Will then Train at NGSLR
- Colocation with MOBLAS 7
- MOBLAS Enhancement to Track LRO
- LRO Target Launch Date April 24, 2009

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MOBLAS 4 Located in Mt. Laguna

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NASA SLR Uses of the HPWREN

- Internet Access
- Hourly Data Transfer
- Satellite Prediction Transfer
- Critical Go/No-Go Operations
- Software Upgrades
- Remote Status
- Data Research
- ILRS Network Communications
- Emergency
- Electronic Mail
- Sustaining Engineering

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HPWREN Valuable to NASA SLR

- Highly Reliable
- High Bandwidth
- Critical Safety Tool
- Provides Easy Internet Access to Our Remote Location

Congrats and Thanx to HPWREN !

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