

# Saturable Absorber Laser Upgrade

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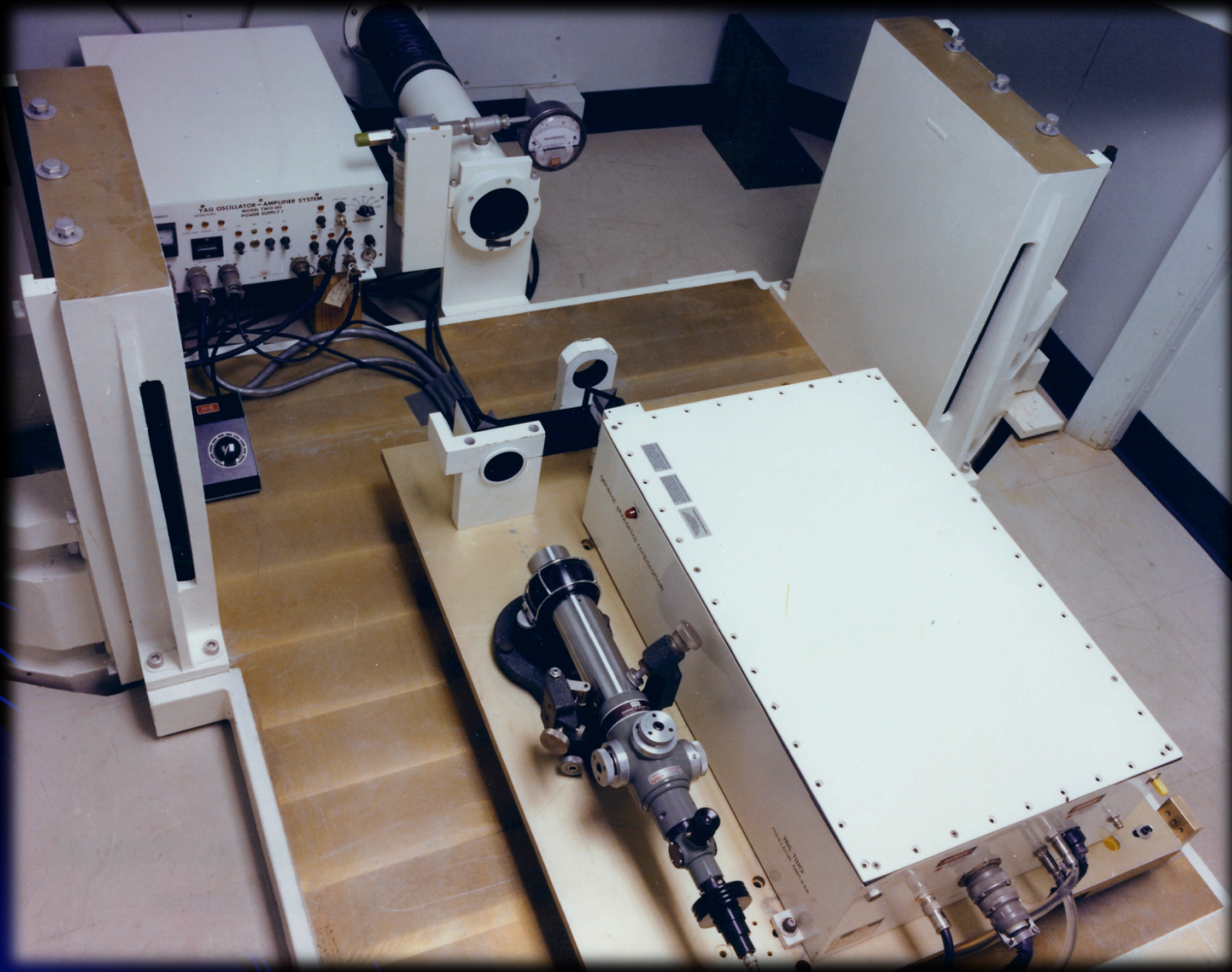
# MOBile Laser RAnging System 7 MOBLAS 7 GSFC Greenbelt, MD



# Moblas 7 – The Early Days



# Early Moblas Laser - General Photonics



# Continuum Laser circa 1983



# Laser Prior to Upgrade

Flowing Dye Cell  
And Reservoir

# Rational for Upgrade

- Improve reliability
- Reduce hazardous materials
- Reduce operational costs
  - Reduce upgrade costs as well
    - Plug and play upgrades have been cost prohibitive in past.
    - All upgrades have come through in-house efforts.

# Saturable Absorber Selection

## Two Types Investigated

- SAM (Saturable Absorber Mirror)
  - Unstable pulse
  - Only nanojoule energy
- Cr<sup>4+</sup>: YAG
  - Produced millijoule energy
  - Very stable pulse



# Cr<sup>4+</sup>: YAG Saturable Absorber



- 7.5 mm X 7.5 mm X 4 mm
- Coated for 1064nm

# Etalon Thickness vs. Pulse Width

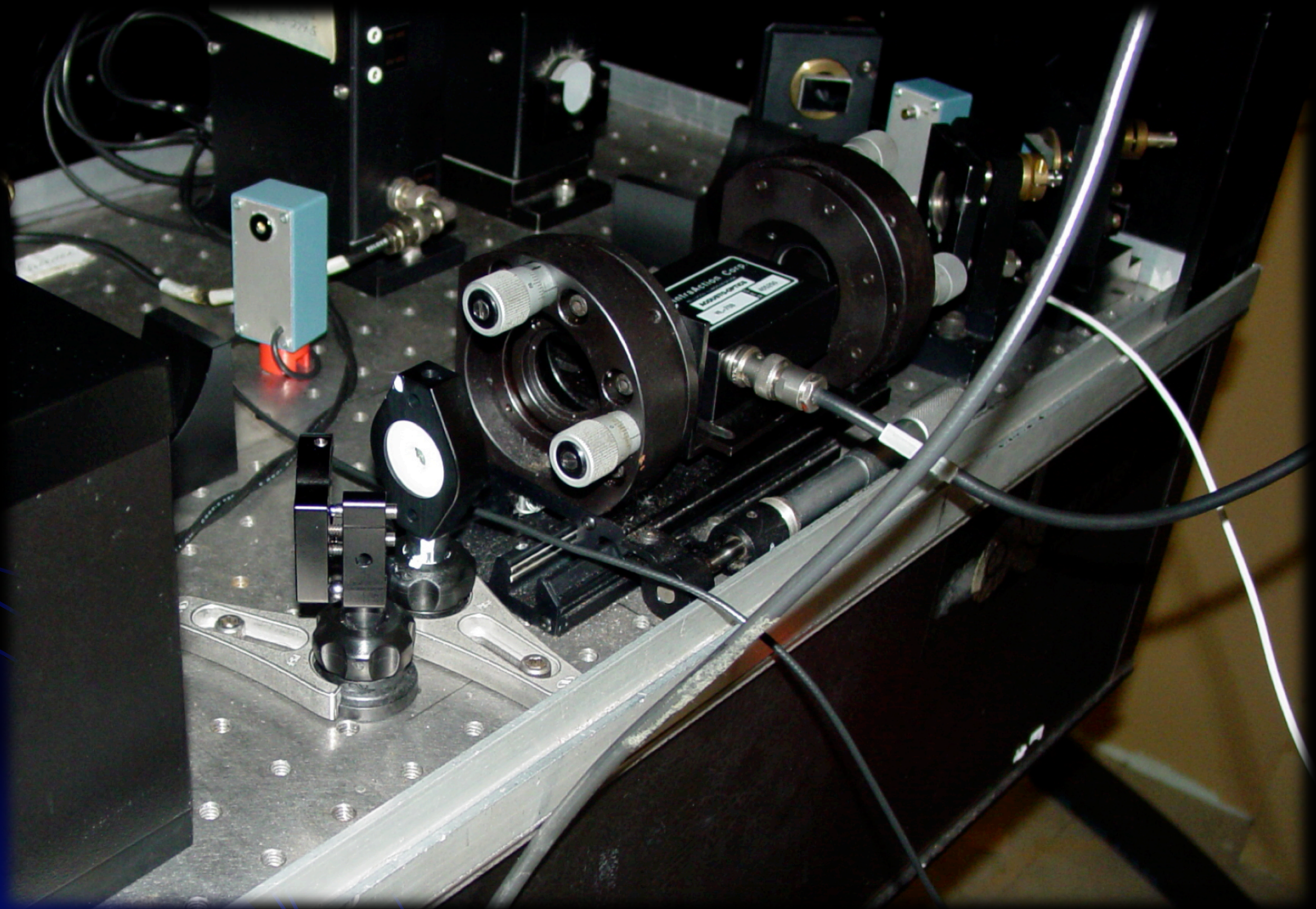
Etalon Thickness (mm)	PulseWidth-1064nm (psec)	PulseWidth-532nm (psec)
5	348	238
3	289	218
2	260	160
<b>1</b>	<b>230</b>	<b>140</b>
0.5	179	115
0.25	153	105

# Upgraded Laser

Saturable  
Absorber



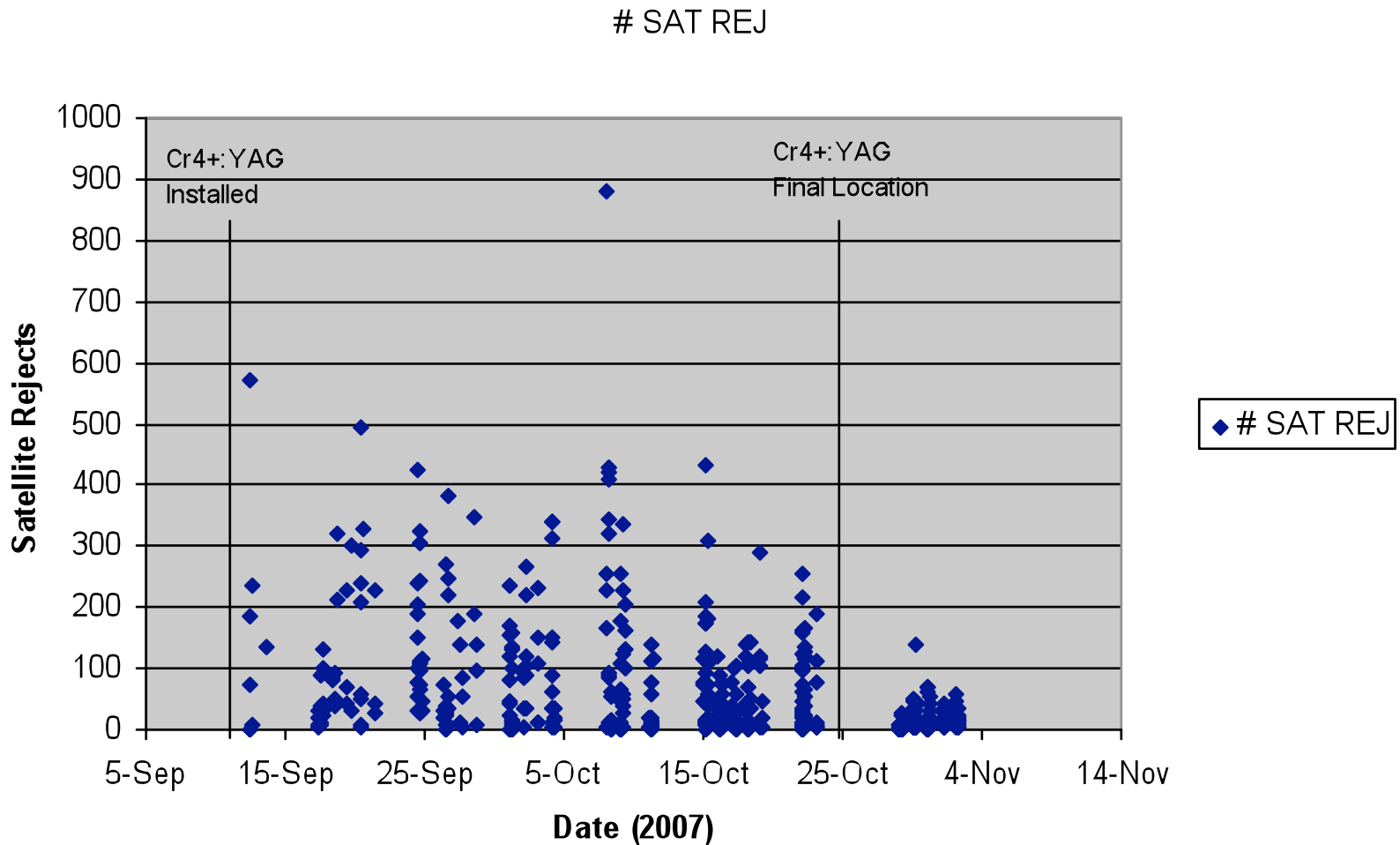
# Saturable Absorber in Oscillator Cavity



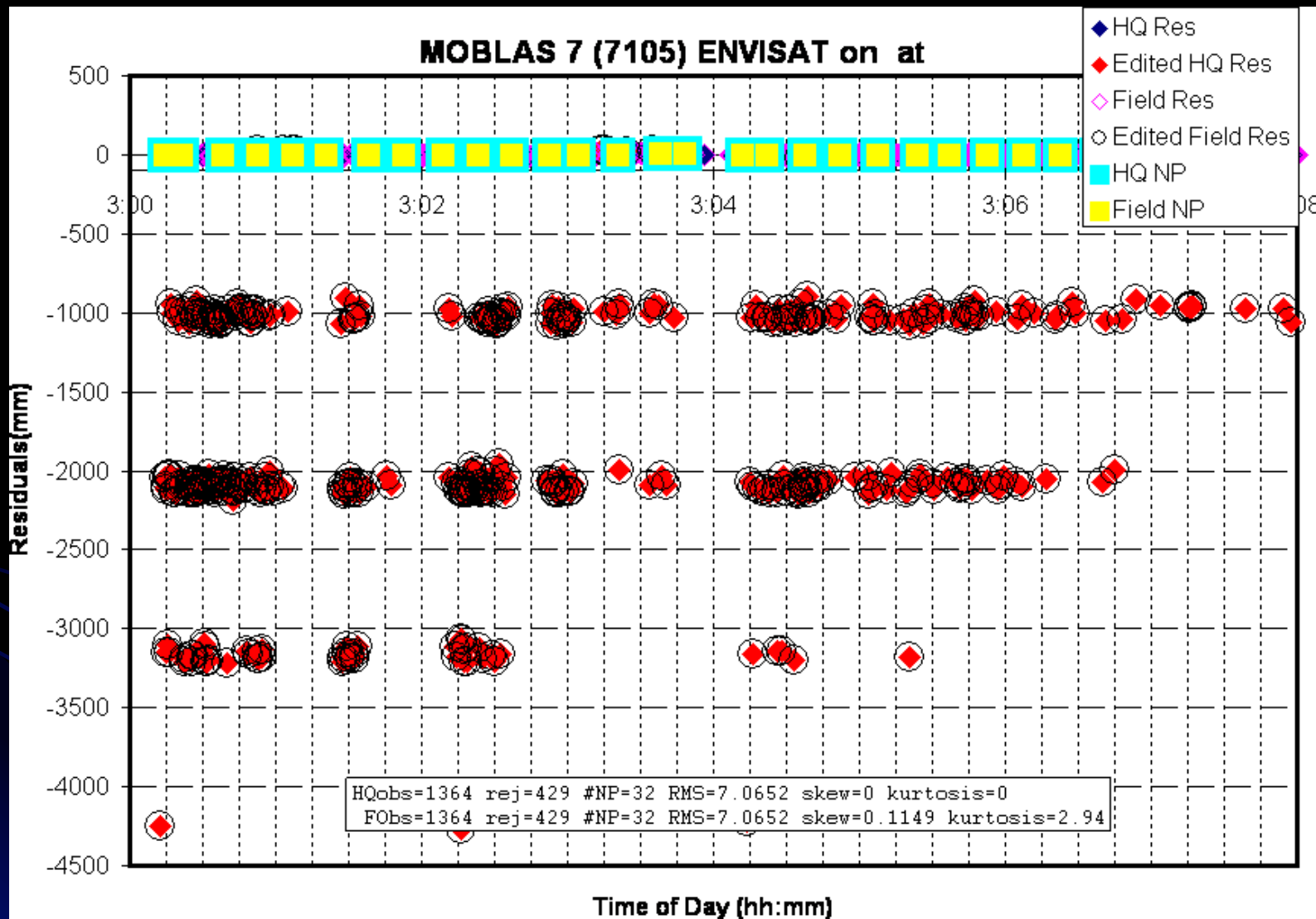
# First Operational Use

- Increased laser energy stability
- Reduced laser warm-up period
- Reduced optical alignment needs
- Improved pulse slicing...

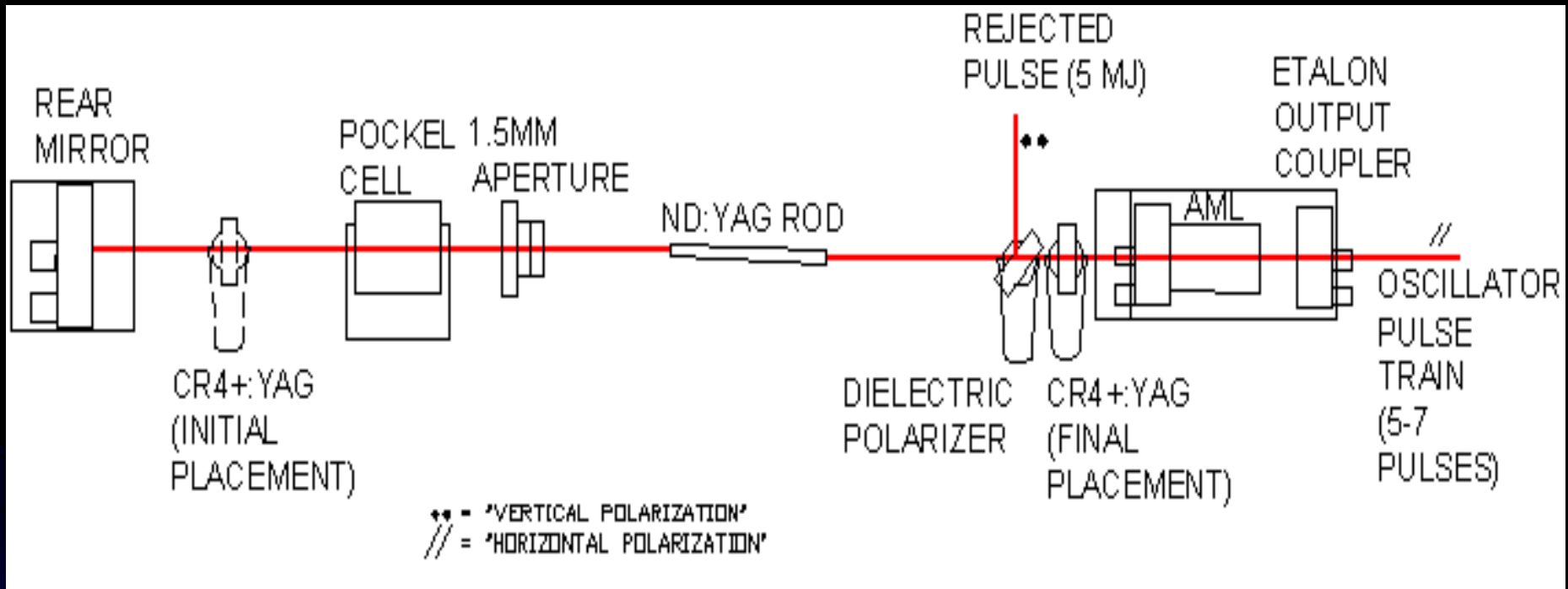
# Initial Moblas 7 Data Rejects



# Initial Moblas 7 SLR Data



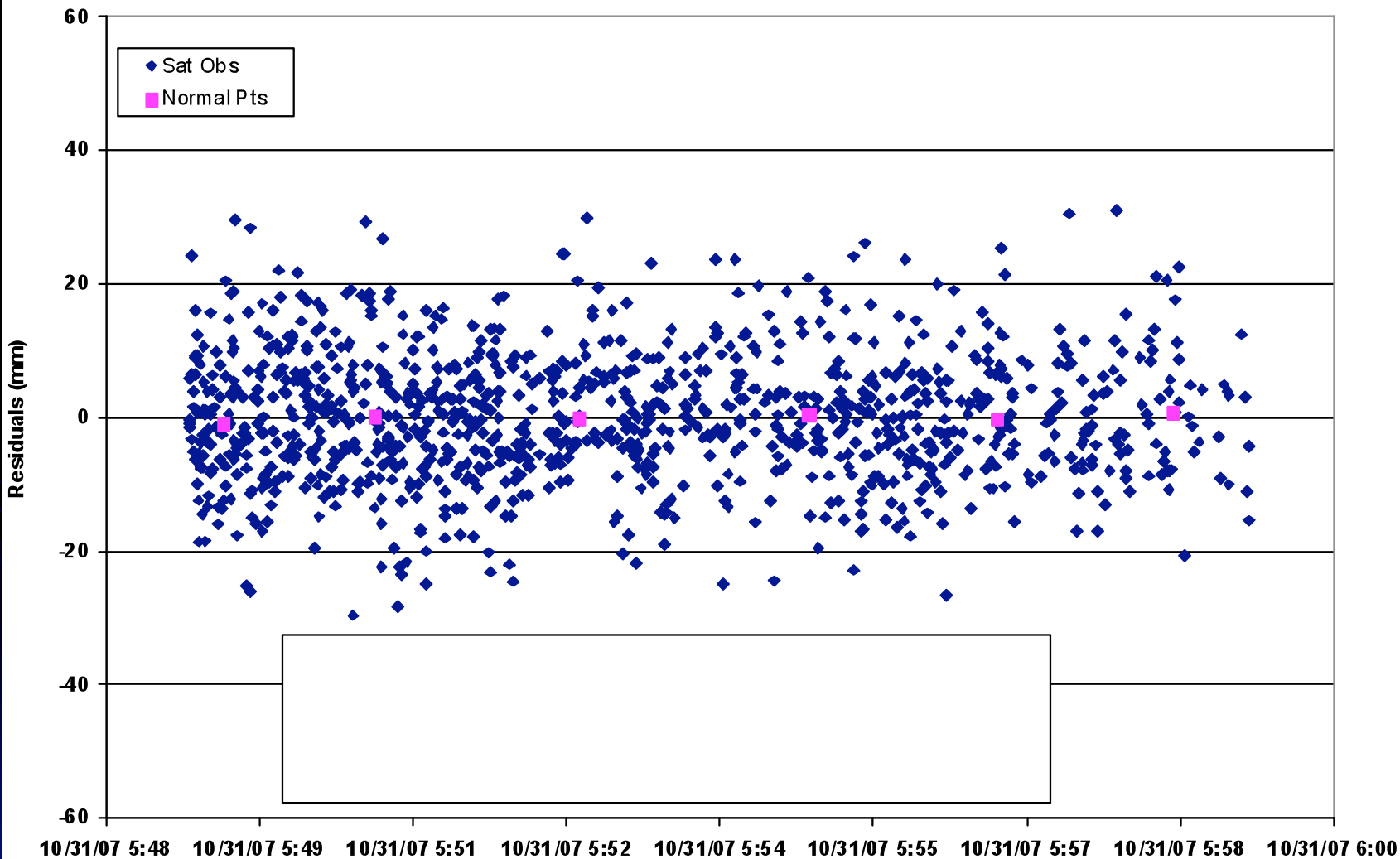
# Oscillator Cavity Layout – Initial/Final





# Post Upgrade Data Results

Moblas-7 Saturable Absorber  
Lageos-2 10/31/07 05:49



# Saturable Absorber Benefits

- Increased laser stability
  - Improved system delay stability
  - No dye concentration variation
- Elimination of hazardous chemicals
  - Chlorobenzene and laser dye
- Reduced laser maintenance
  - 15 minute warm-up
  - Weekly to Monthly alignment optimization instead of daily
  - No dye changes
  - SA optic is permanent
- Reduced operational budget
  - No special HazMat PPE
  - No disposal of HazMat waste materials
  - Removal of fume hood and chemical mixing station
  - Elimination of supporting materials and spares
    - Glass jars, funnels, filter paper, syringes, dye, etc

# Remaining Efforts

- Complete remaining Moblas Installation
  - Moblas 6 – In process now
  - Moblas 5 – Planned for later 2008
- Complete design for TLRS systems
- Perform installations at TLRS
- Coordinate upgrade with MLRS

# 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

# Thank!