# Improved Pointing Knowledge for SCIAMACHY

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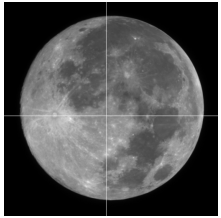


# Mispointing parameter fit

## Measured viewing direction to sun/moon:

- Solar occulation:
  - Elevation: scans over solar disk
  - Azimuth: sun follower (SFD)
- Lunar occultation:
  - SFD for azimuth and elevation
  - *Needed: ROLO reference images*
- Sub-solar pointing:
  - Elevation: SFD
  - Azimuth: Max. intensity at 270°

## Calculated viewing direction to sun/moon:

- Based on attitude information and mirror positions.

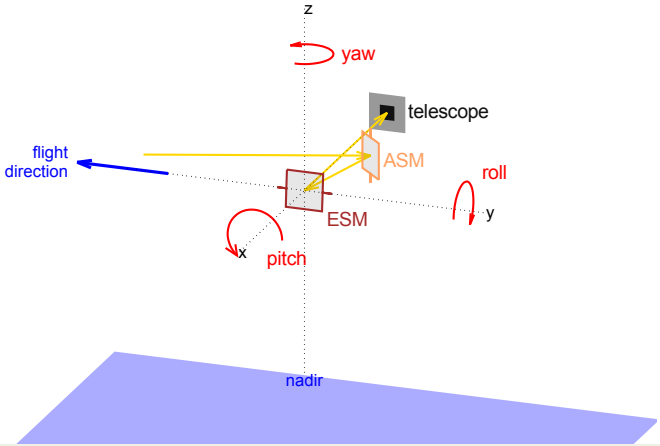
Difference *elevation/azimuth angle offset.*

## Five mispointing parameters:

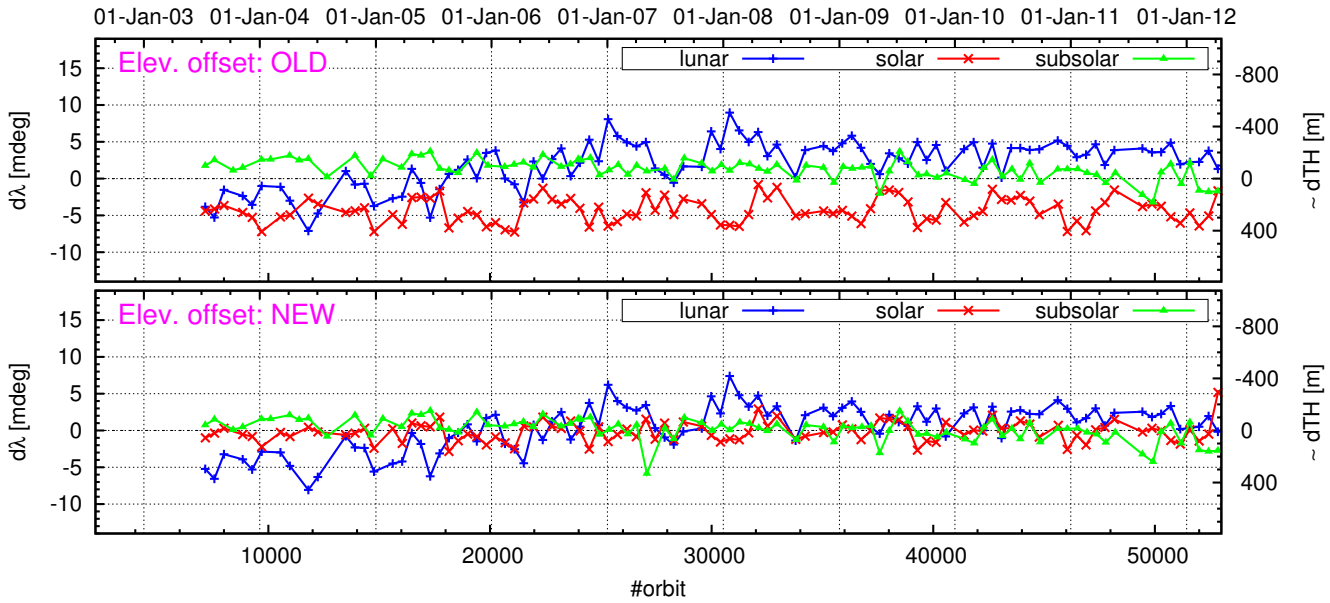
- pitch/roll/yaw *extra*-mispointing angle
- ESM/ASM scan mirror position zero offset

## Fit mispointing parameters:

- Minimize elevation/azimuth offsets for all viewing directions.
- Non-linear Levenberg-Marquad fit
- Evenly distributed measurements selected:
  - 96 lunar occultation state 54
  - 96 solar occulattion state 49
  - 91 sub-solar state 53

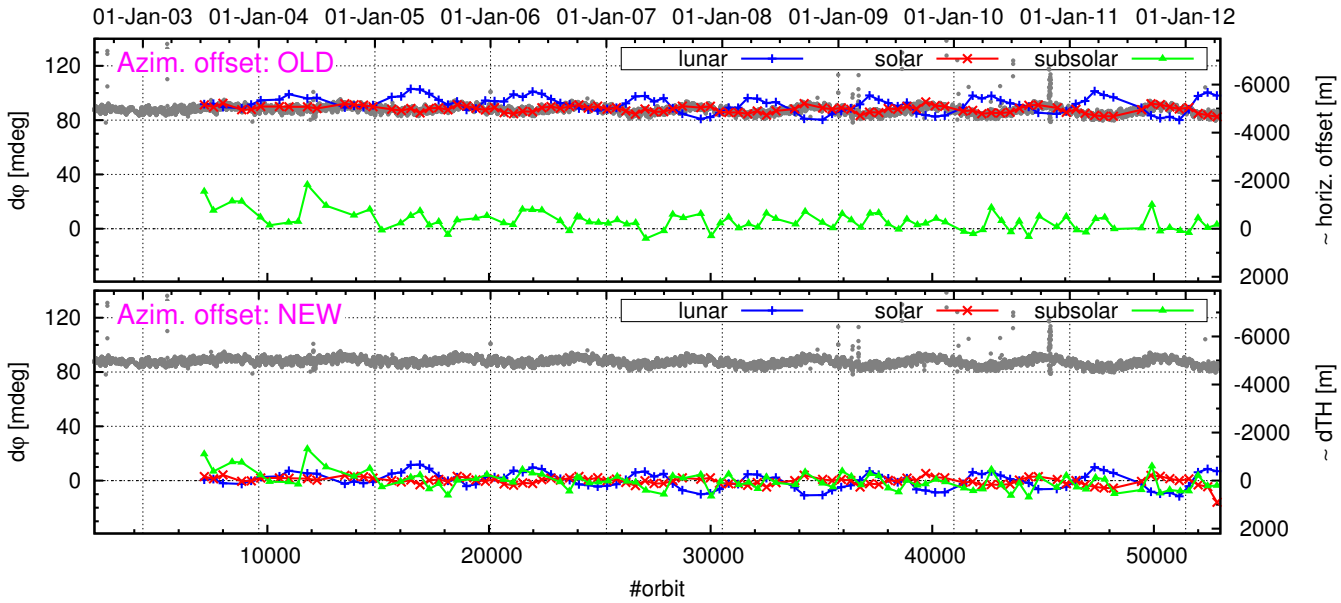


# Fit result elevation angle offset




- EAO minimized for all measurement types.
- Note: Solar and lunar EAO changed in different direction!

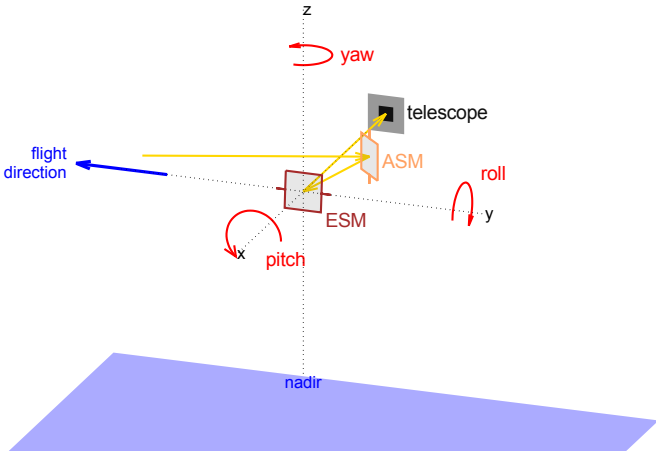
# Fit result azimuth angle offset




- AAO minimized for all measurement types.
- Large offset removed.

# Summary fit results mispointing parameters

| | Old(2007) [mdeg ] | New(fit) [mdeg ] | error [mdeg ] |
|---|---|---|---|
| pitch offs. | -25.4 | -18.9 | 0.6 |
| roll offs. | -18.3 | -24.1 | 0.5 |
| yaw offs. | -218.5 | -224.5 | 1.2 |
| $dpos_{esm}$ | 0.0 | -6.8 | 0.5 |
| $dpos_{asm}$ | 0.0 | -98.4 | 1.4 |




Main effects of mispointing change:

- ASM mirror pos: $\Rightarrow$ Azimuth offset fixed!
- Yaw: Unchanged because of Sub-solar Azimuth.
- Roll: Fixes elevation offset with opposite signs for occultation:
  - Solar occ: $\sim -30^\circ$ azim. angle
  - Lunar occ: $\sim +40^\circ$ azim. angle
- Pitch: Overall adjustment of elevation offset.

Implementation:

- Extra-mispointing angles: replace previous values!
- Mirror position offsets:
  Change zero offset to the mirror position!
  (in calc. of effective scan angle)

$$\alpha^{new}_{ESM,0} = \alpha_{ESM,0} + \frac{1}{2}\, dpos_{esm}$$

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