

## ***INTEGRAL Time Correlation Error.***

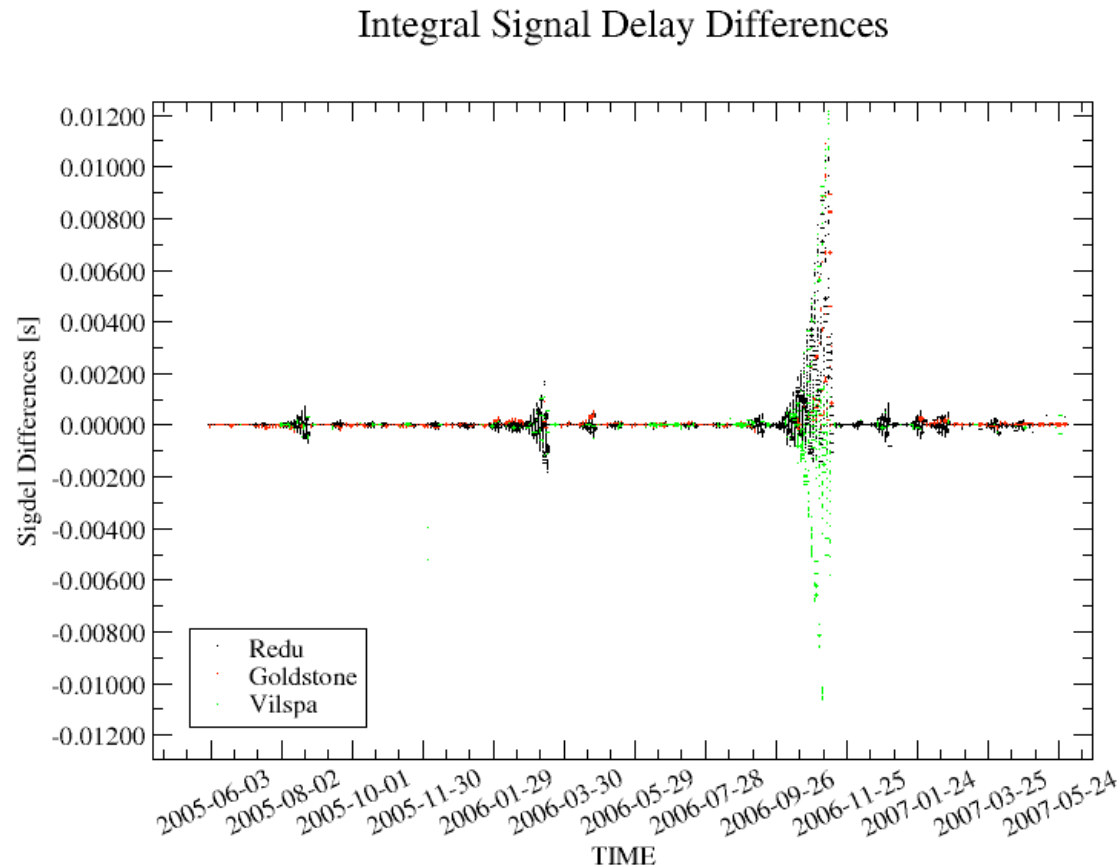
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### Source of problem.

- Time correlation calculation.
  - OBT sample time calculated from: (frame ERT) – (sum of delays.)
  - Delays are:
    - On-board delay, fixed delay.
    - One way light time, variable depends on Satellite location and Ground Station use.
    - Antenna Delay, fixed but different for each Antenna in use.
- Use of orbit file by MCS to calculate one way light time.
  - Normally accurate up to 3 revolutions.
  - Updated every Revolution and passed to IMCS.
  - Latest version not always used by IMCS.

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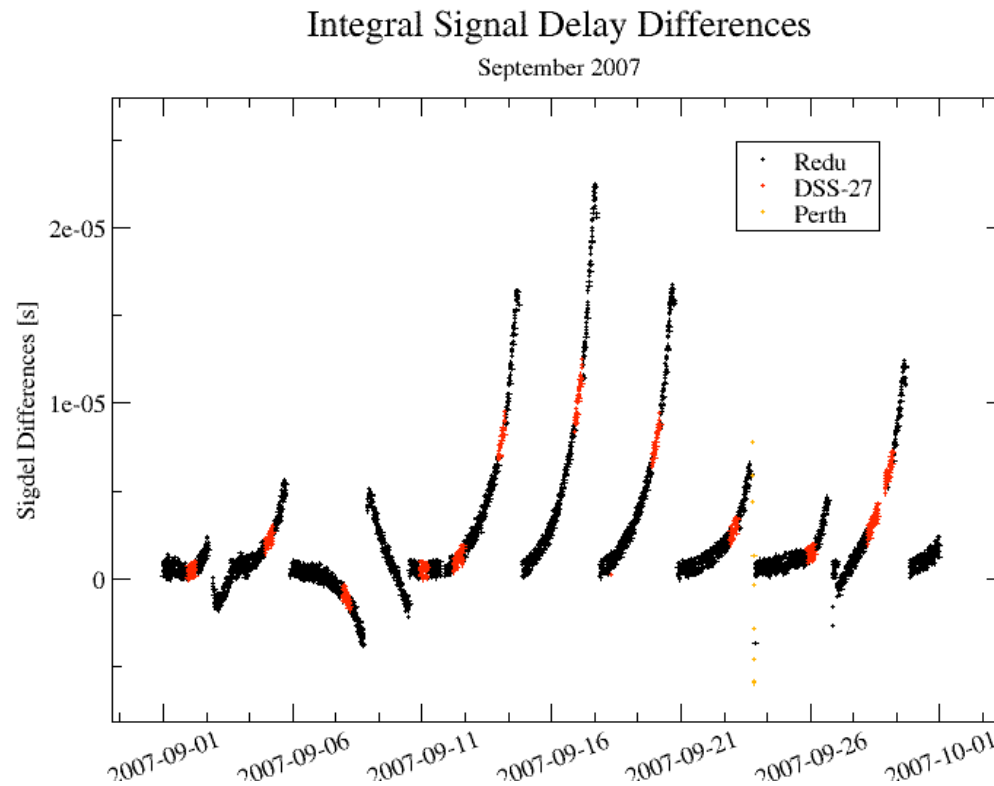
## Magnitude of Errors and affected Periods.



- Errors Since June 2005 to July 2007.
- Worst case approximately 15ms after 50 days without update of orbit file.
- Worst errors are seen at perigee.

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- Fix is to force a read of the orbit file at every transfer.
  - In use since June 2007.
- Monthly comparison of MCS and FD calculated delays.



September 2007,  
Maximum Observed  
Error: 23us

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Reprocessing of historical data.

- Reprocess all data from launch.
- Use reconstituted orbit data => slightly more accurate than using predictions.
- Regenerate all OLFs from launch.
- Complete by ???.
- Fixes all other TCO problems:
  - Incorrect Station delay, launch until now – magnitude 47us
  - Incorrect On-board delay, launch until July 2003 – magnitude 867us.
  - Incorrect On-board delay 20/8/2003 until 28/6/2004 – magnitude 385us
  - Occasional Station timing problems.

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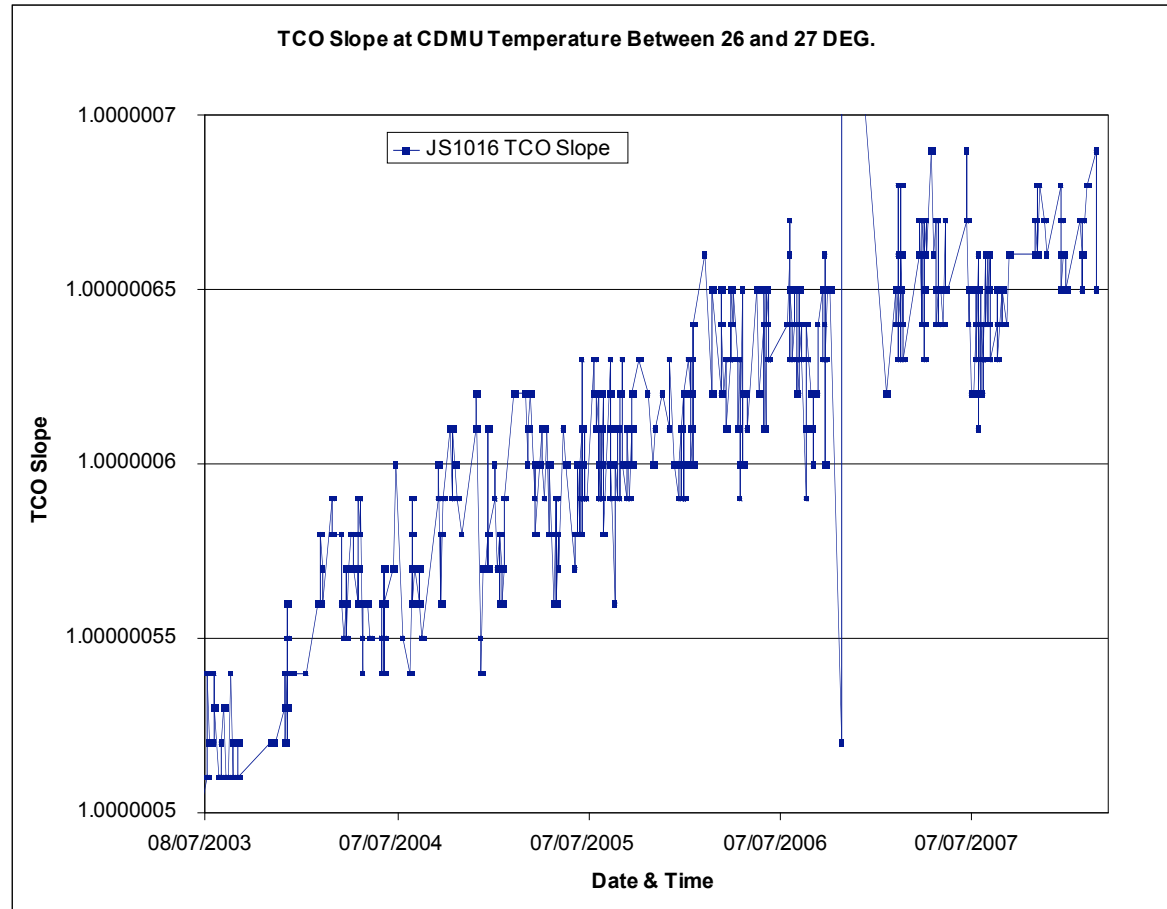
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Reprocessing of historical data.

- Recreated OLFs, for all CRAB revolutions – September 2008.
- Feedback received from SRON.
  - *“We are glad to close this study now satisfactorily and see NO objections for implementing the MOC TCO upgrades!”*
- Recreated OLFs for Revolutions 300 to 350 – April 2008.
- Feedback received from ISDC.
  - *“The largest deviations are now gone, even if smaller deviations have not improved.”* (smaller deviations seem to be due to extrapolating across 4 hours perigee outage, which is unreliable)
  - ESOC FD verified recalculated delay correct to within 1us.
- Next step: re-generate revolutions 450 to 550 – large errors.

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## Oscillator Stability.



- According to ALENIA: Oscillator long term drift within Specs.