CENTRE-OF-MASS CORRECTION ISSUES: DETERMINING INTENSITY DEPENDENCY AT A MULTI-PHOTON (MOBLAS-5) STATION.

R. Carman and V. Noyes (1) and T. Otsubo (2)

)Moblas-5 SLR Station – Yarragadee
moblas@midwest.com.au / Fax: +61-899-29-1060
)National Institute of Information and Communications Technology, Japan
Otsubo@nict.go.jp /Fax: +81-299-84-7160

As reported by T. Otsubo and G. Appleby at the workshop in Koetzting, in the drive towards mm ranging accuracy, the effects of signal intensity on centre-of-mass correction values needs to be evaluated. While some work has been done on data sets from single photon (Herstmonceaux) and other C-Spad stations, evaluation of the effect on multi-photon MCP systems still needed to be undertaken.

To determine the effect that varying return energy has on residuals, passes need to be taken using a special tracking regime. It involves varying the return energy via ND wheel, so that the level alternates between high and low throughout the pass. This was not as simple as we had assumed and took some practice to perfect.

So far three test passes have been taken, Lageos-2, Envisat and Ajisai. We have also taken a set of calibrations employing the same methodology.

Getting a significant dynamic separation on the strong/weak returns for Ajisai and Envisat were relatively simple due to the normally strong receive energies associated with these satellites.

However we had to wait for good conditions (post summer dust), to get a good separation on Lageos2.

The passes were processed in three ways:

Firstly, the passes were processed normally and the QL data submitted.

Secondly, the raw data was delogged to give O-C vs time for all returns.

Thirdly, each pass had its strong and weak segments separated and each part was processed separately.

Initial analysis of the passes shows good separation between strong and weak returns. Detailed analysis is as follows:

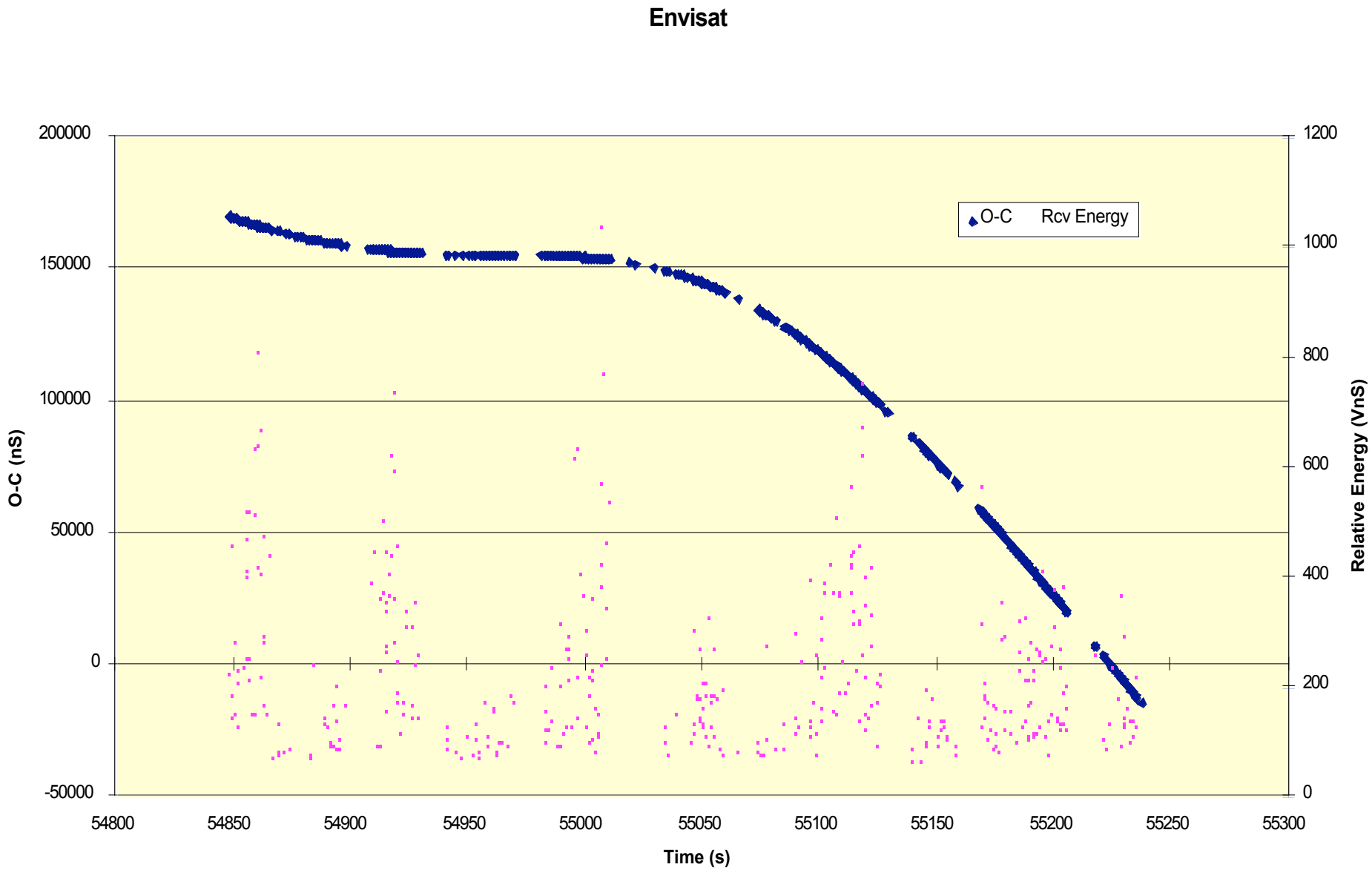

Figure 1. Envisat O-C and Receive Energy 04 May 04

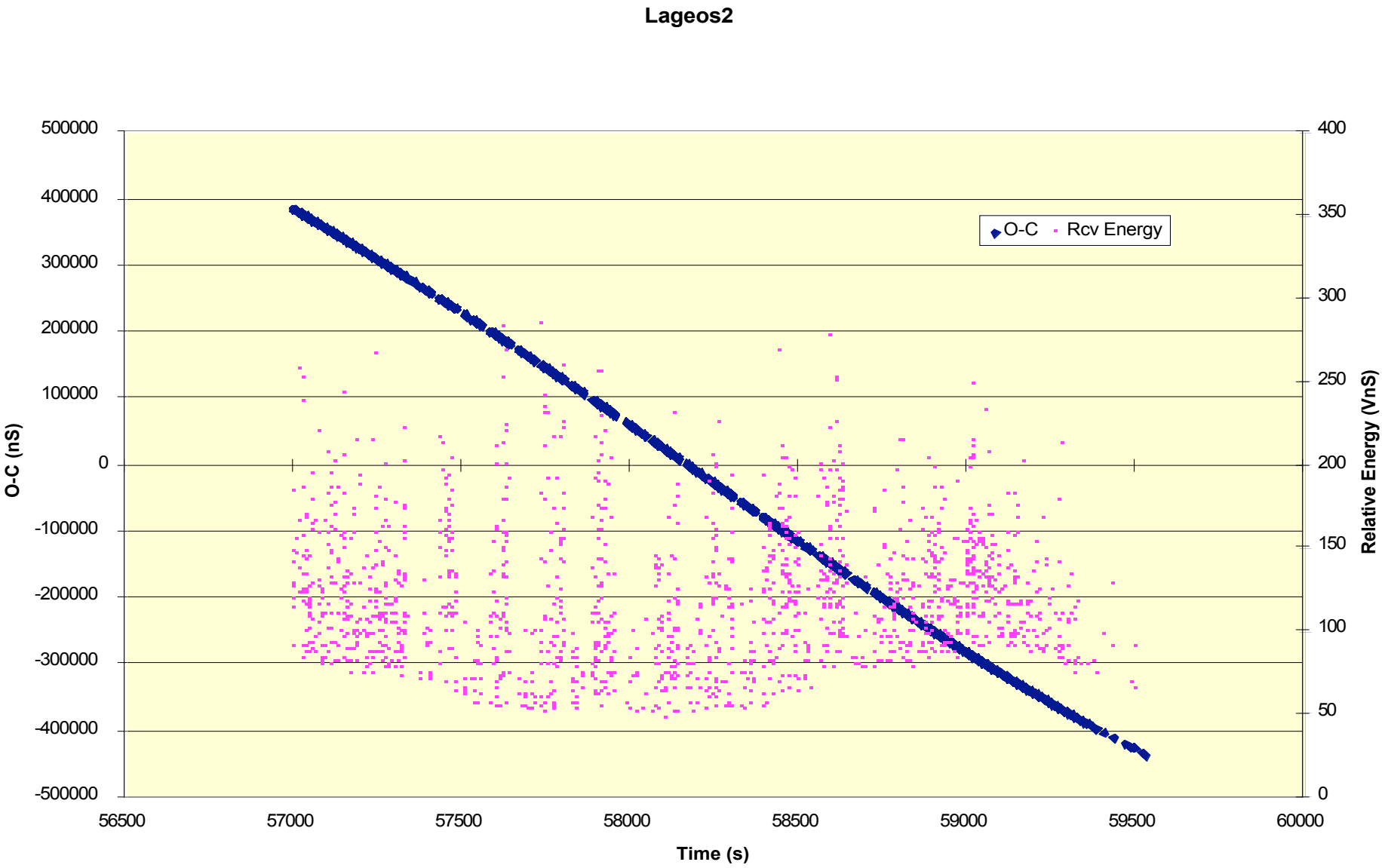

Figure 2. Lageos2 O-C and Receive Energy 04 May 04

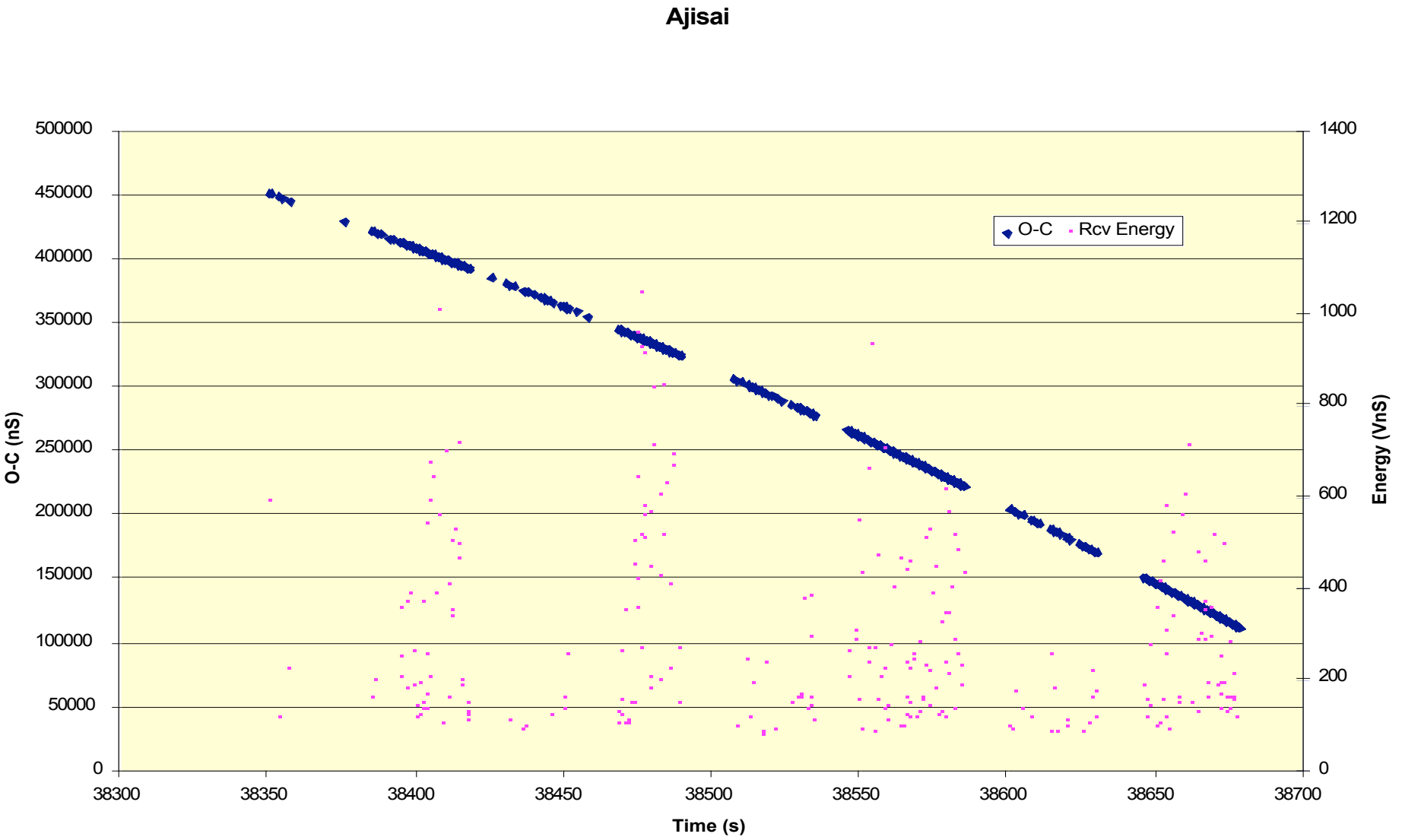

Figure 3. Ajisai O-C and Receive Energy 05 May 04

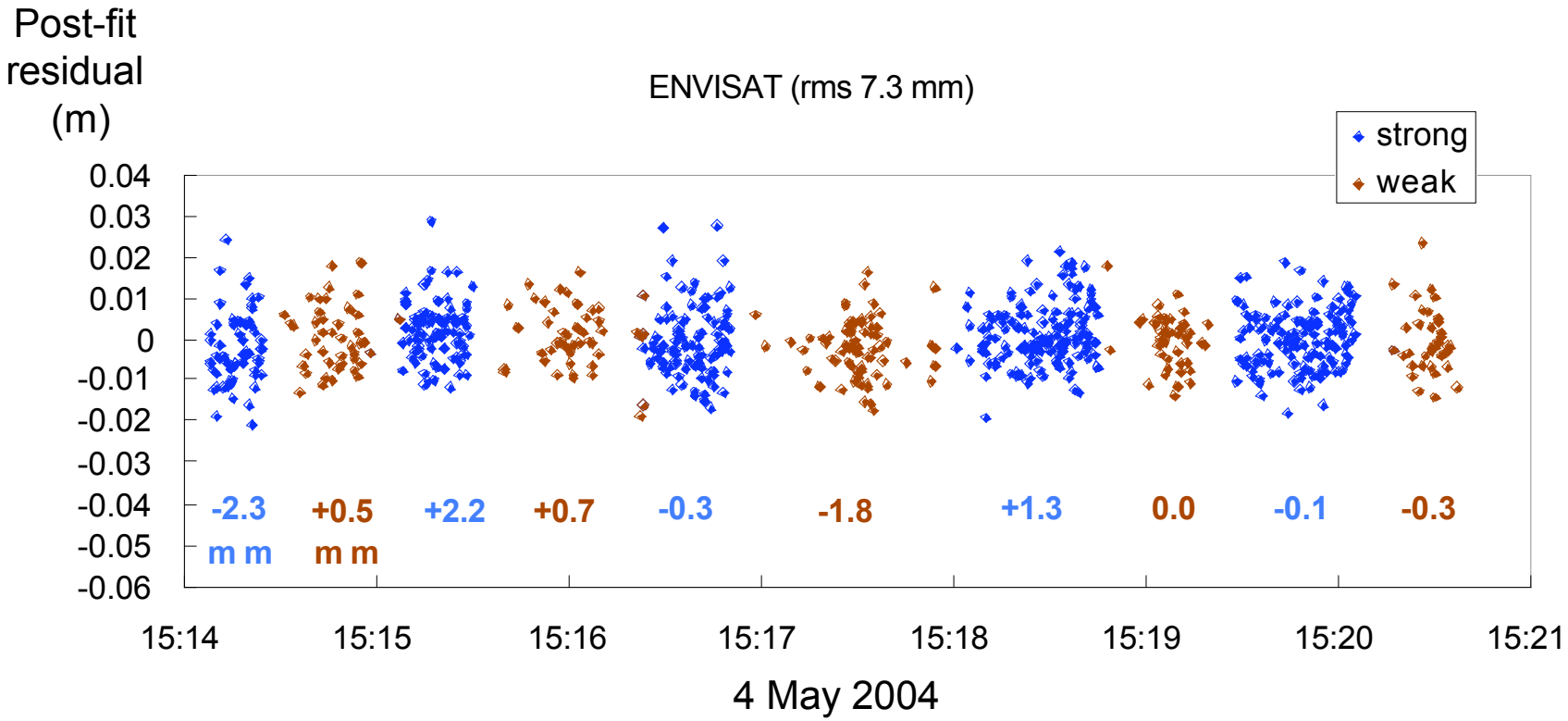

Figure 4. Envisat Post-fit residuals for Strong and Weak return signals

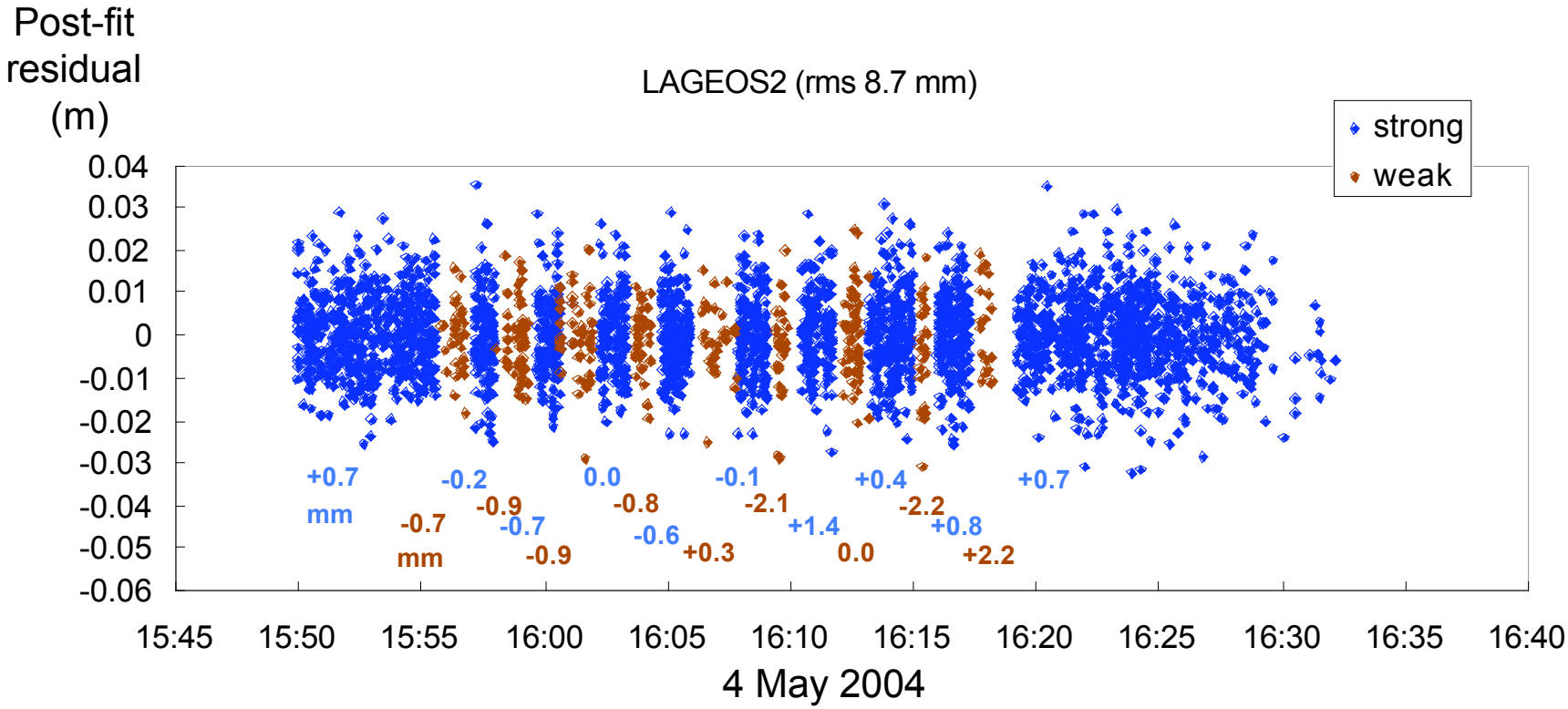

Figure 5. Lageos2 Post-fit residuals for Strong and Weak return signals

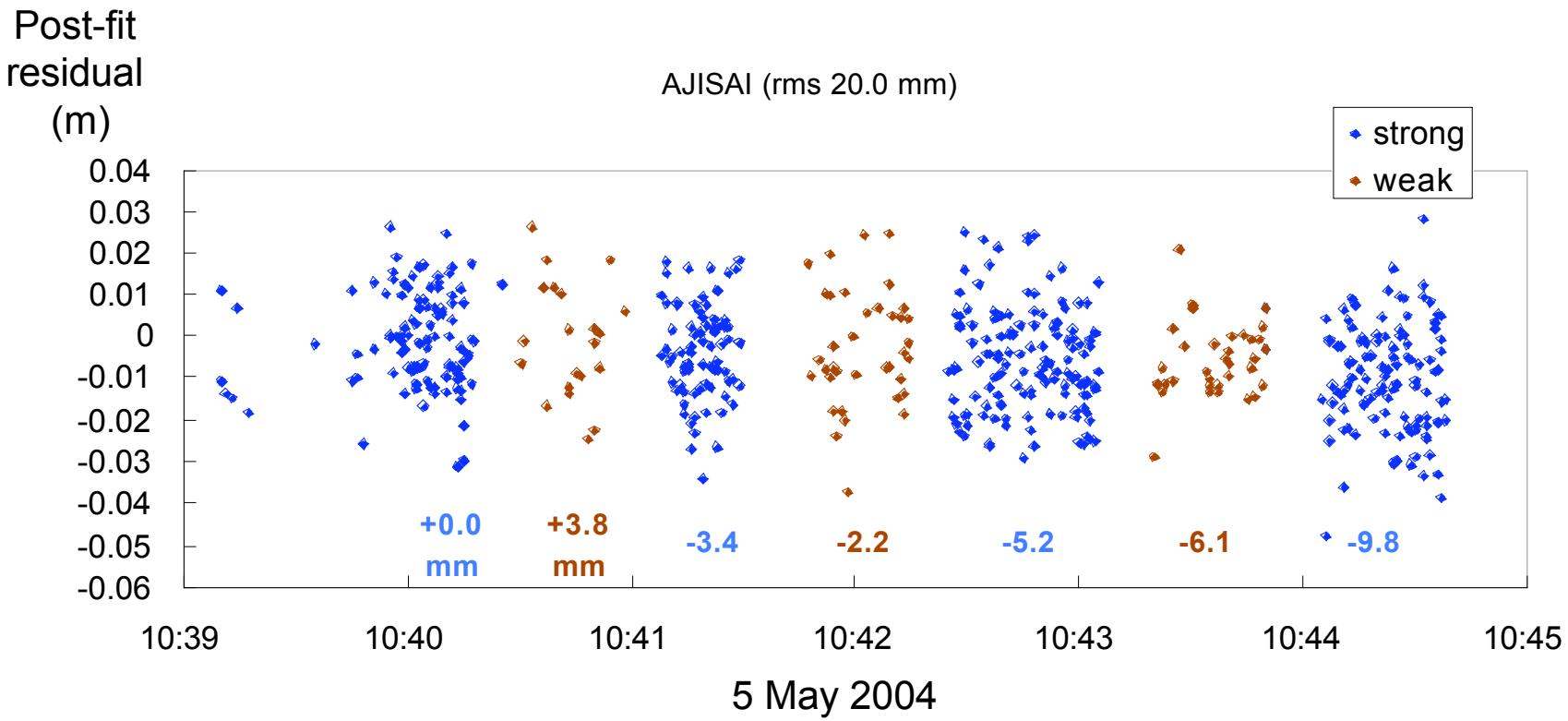

Figure 6. Ajisai Post-fit residuals for Strong and Weak return signals

7090 Data Analysis Summary

Strong Minus Weak

(... zero for ideal system; negative for CSPAD+signature)

LAGEOS-2: +0.6 mm

ENVISAT: +0.3 mm

AJISAI: -3.1 mm

intensity-dependent bias for Yarragadee MOBLAS5

... smaller than 1 mm for small targets!

... 3 mm signature effect seen for AJISAI

Basic Equipment/Settings used

1. Tennelec TC 454 Quad CFD
2. Z-Gate MCP ITT (MCP 3901)
3. Threshold on CFD at 300mv
4. HP 5371B TIU
5. Env/Aji - of Satellite for 10 seconds
6. La2 - of Satellite for 30 seconds

Conclusions

From the analysis of this very limited data, it would appear that strong or weak signal returns would have a very limited effect on C of M correction issues for multi photon systems. Analysis of many more passes would have to be undertaken before a conclusive result could be achieved.