Satellite Interleaving and Real-time Normal Point Data-Quantity/Quality Monitoring

Graham Appleby
Matt Wilkinson
SGF Herstmonceux
motivation

• The current ILRS recipe for NP population: Sufficient returns should be achieved such that a NP precision of 1mm is reached

• Or, for stations not able to assess precision: 1000 returns per NP should be the target

• Here we discuss implementation at Herstmonceux of real-time precision measurement towards ‘quicker’ NPs
Single-shot precision on LAGEOS (ILRS)

LAGEOS RMS
from April 1, 2014 through June 30, 2014
Some stats

- For Herstmonceux, working strictly at single photons, expect single-shot precision of \(~10-15\text{mm}\) (from model, Otsubo & Appleby, 2003)

Real data distribution from a pass of LAGEOS at kHz rates; the red curve is the expected distribution.

Sigma \(~14\text{mm}\)

Thus to reach 1 mm precision NP, need

\[N = 14^2 \text{ returns}
\]

\[N \sim 200\]
Actual numbers of returns/NP

Herstmonceux, United Kingdom 7840
number of LAGEOS-1 full rate obs in a normal point, from 20130101 through 20140930
ave 448.57±1732.74 max 21900.00 min 6.00 for 4091 data points

range (km)
In general

• The discussion so far has been about LAGEOS
• Other satellites yield different single-shot precision when working at single-photons
• Especially the flat arrays on GNSS:
• Precision varies from
  ~12 – 40 mm
  – Implies need
    1600 returns/NP
• Only possible at kHz!
Actual numbers of returns/NP

Herstmonceux, United Kingdom 7840

number of GLONASS-130 full rate obs in a normal point, from 20130101 through 20140930

ave 191.25±227.00 max 2518.00 min 6.00 for 177 data points

10/31/14
Track detection

- So need real-time estimate of precision, not just numbers of returns
- Implies good track-detection capability:
And real-time display of availability
Interleaving, with knowledge

Observing on April 14th with kHz
Details

• To be discussed during the clinic sessions
• Will include a movie track detection!
Track detection in (speeded-up) action