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

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Matt Wilkinson
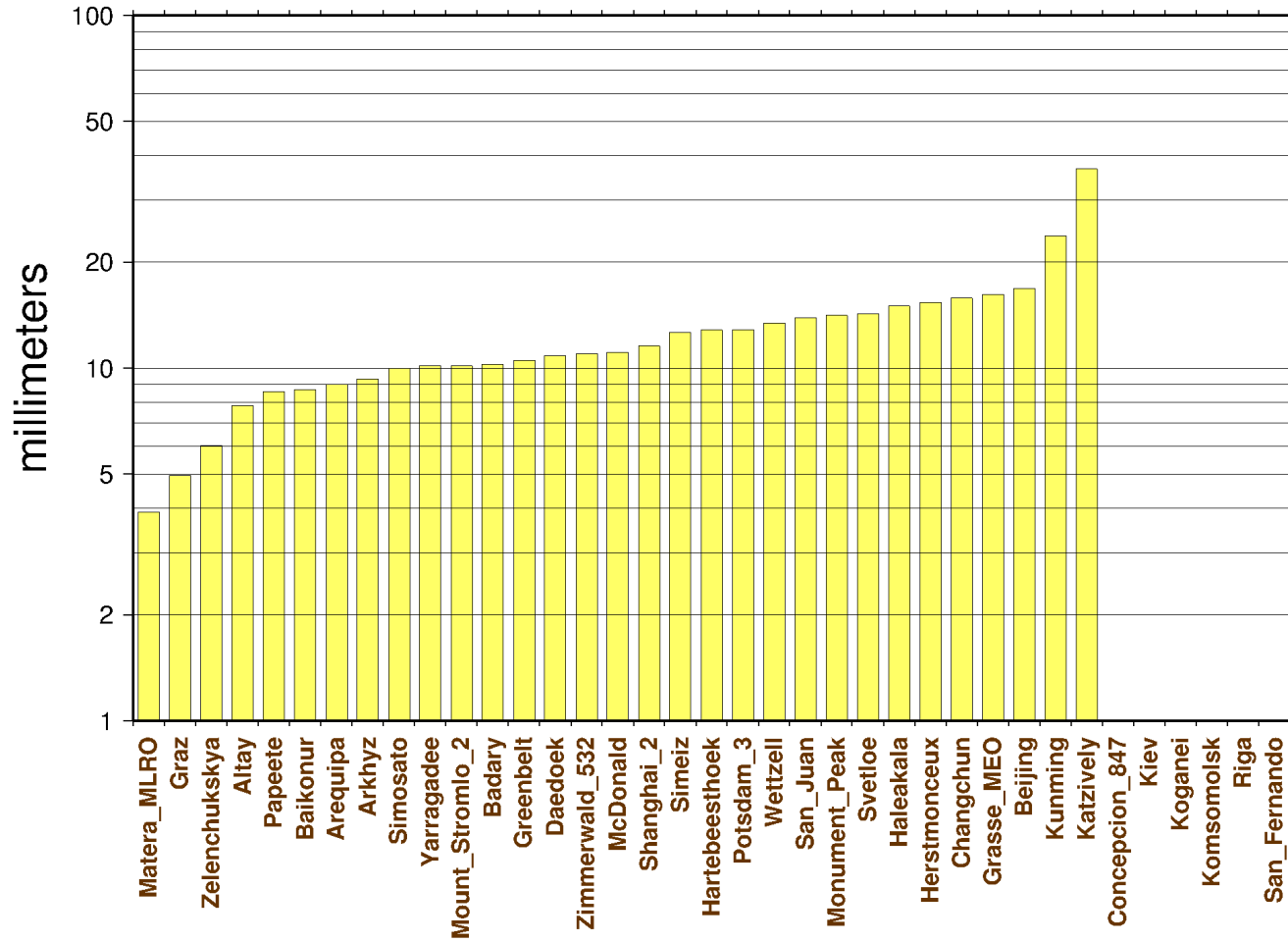
SGF Herstmonceux

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

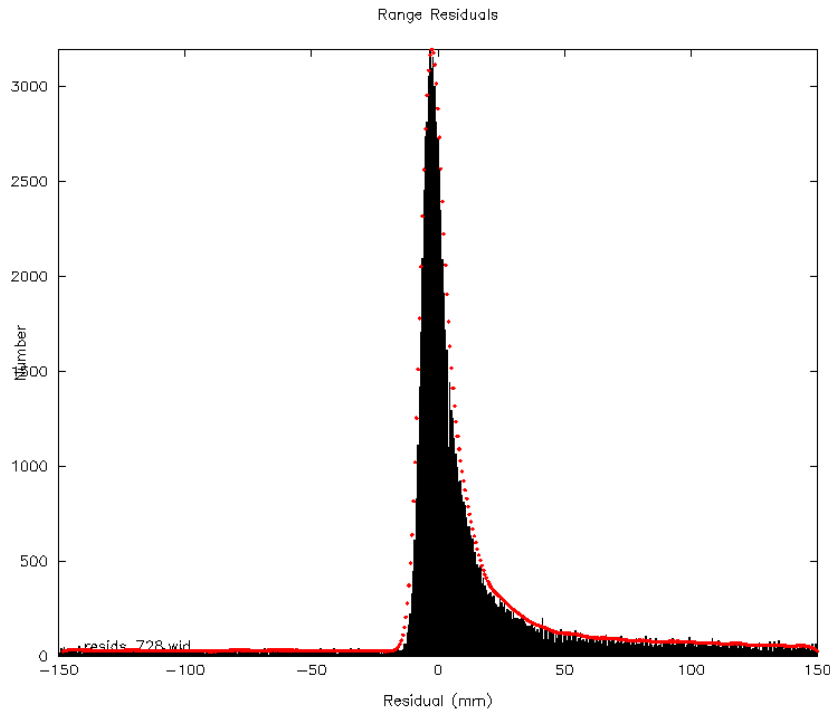# Single-shot precision on LAGEOS (ILRS)

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

Some stats

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

Range Residuals

Real data distribution from a pass of LAGEOS at kHz rates; the red curve is the expected distribution. Sigma ~14mm
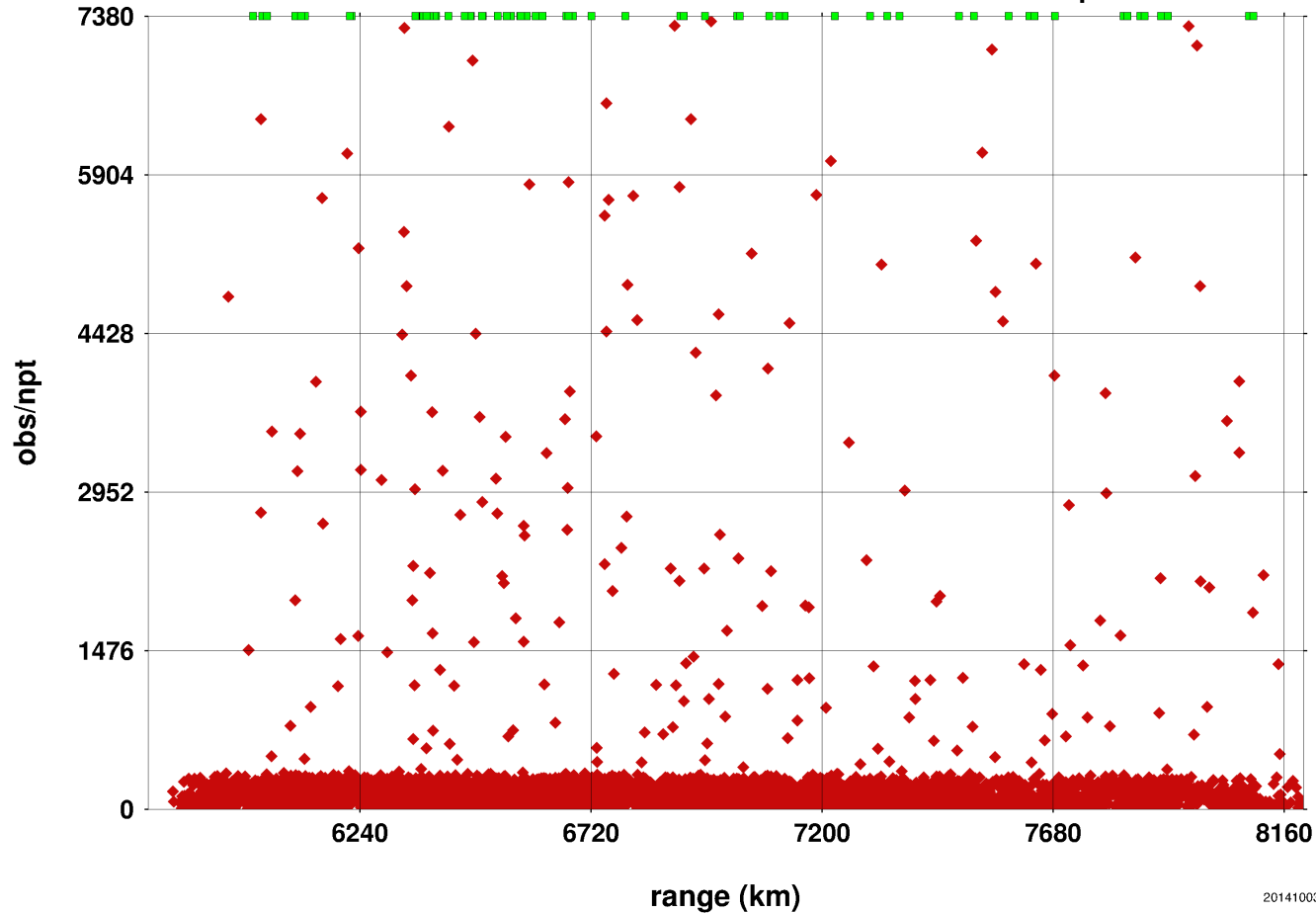
Thus to reach 1 mm precision NP, need
N = 14^2 returns
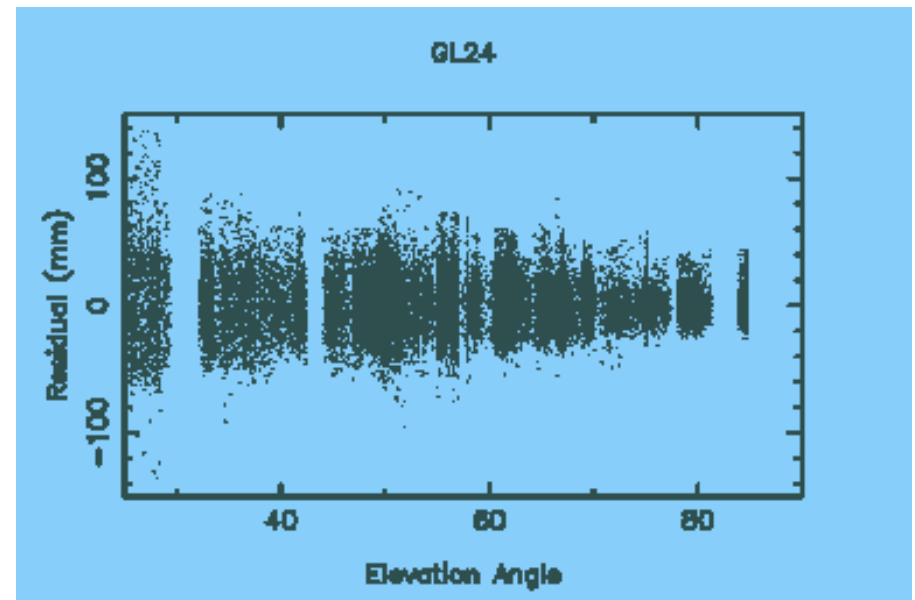**N ~ 200**

Actual numbers of returns/NP

Herstmonceux, United Kingdom 7840

number of LAGEOS-1 full rate obs in a normal point, from 20131001 through 20140930

ave 448.57±1732.74 max 21900.00 min 6.00 for 4091 data points

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
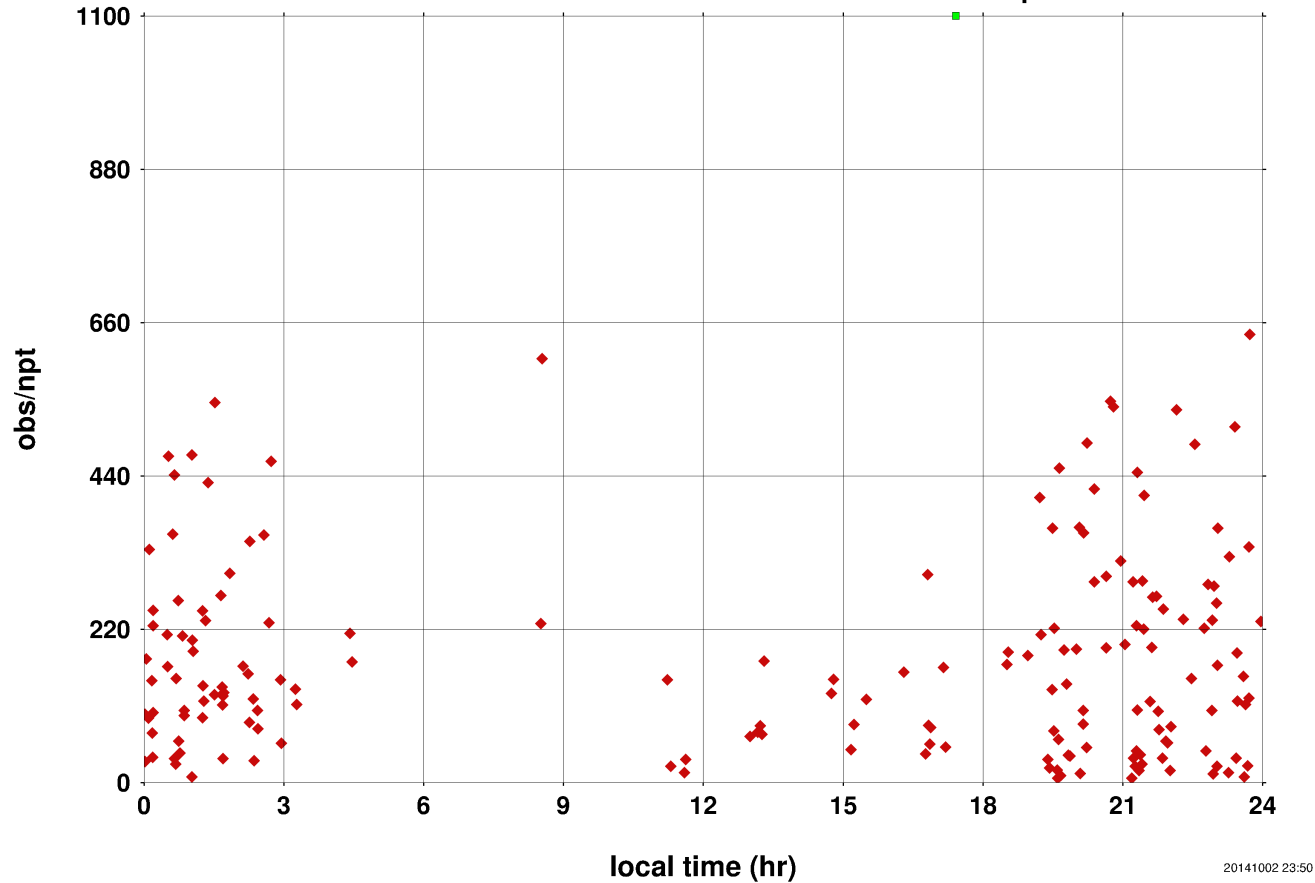
- Only possible at kHz! :

Actual numbers of returns/NP

Herstmonceux, United Kingdom 7840

number of GLONASS-130 full rate obs in a normal point, from 20131001 through 20140930

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

20141002 23:50

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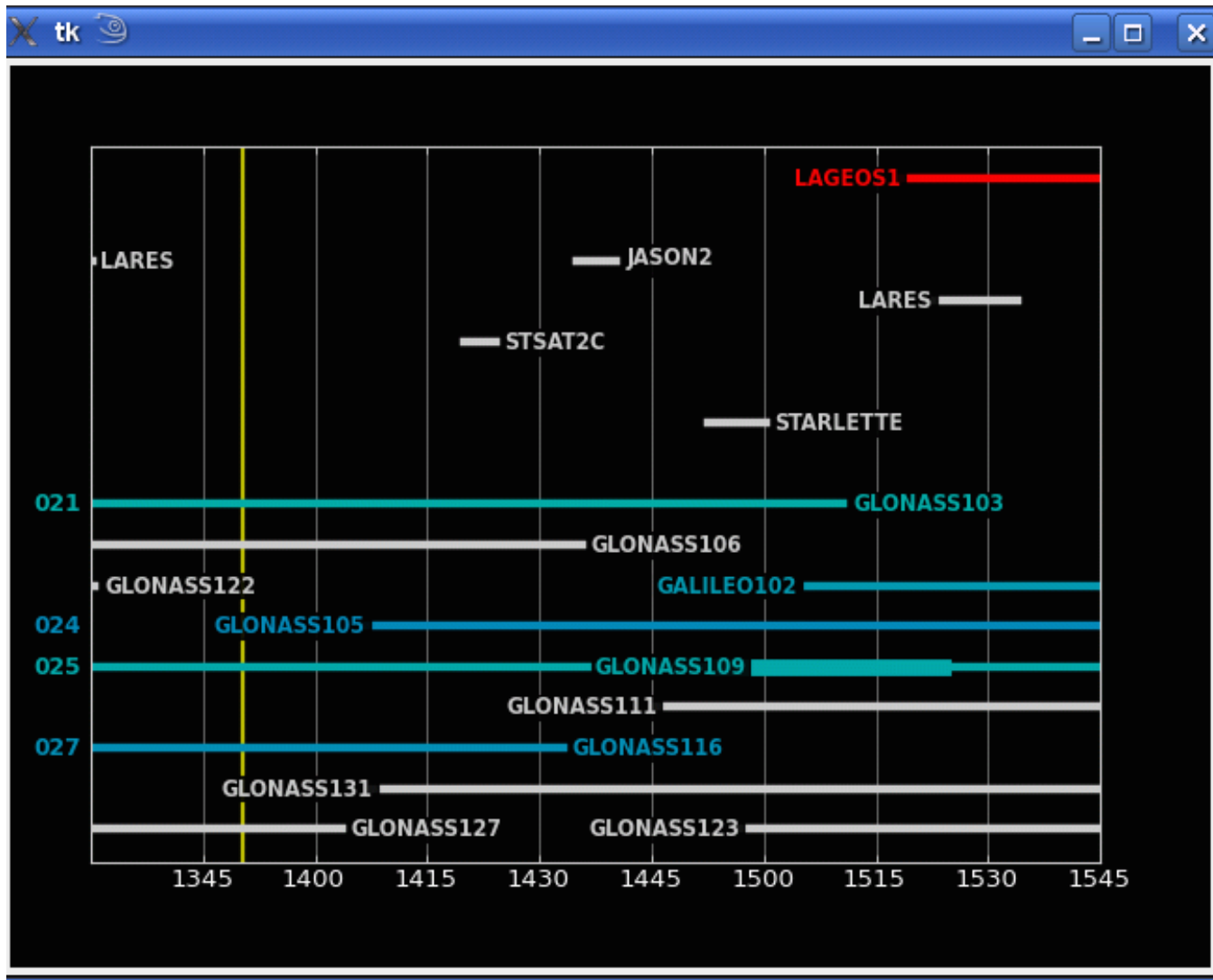
Track detection

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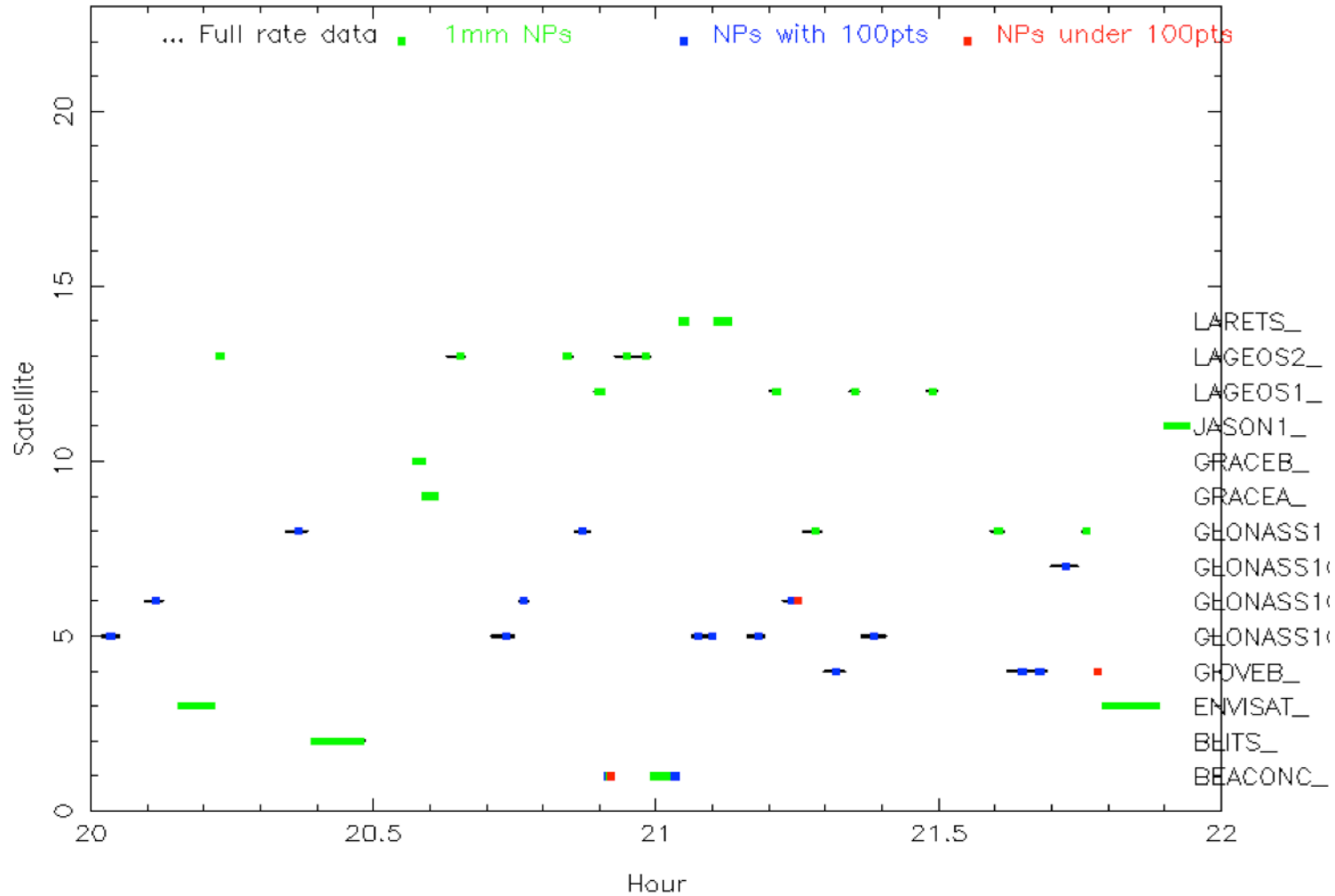- Implies good track-detection capability:
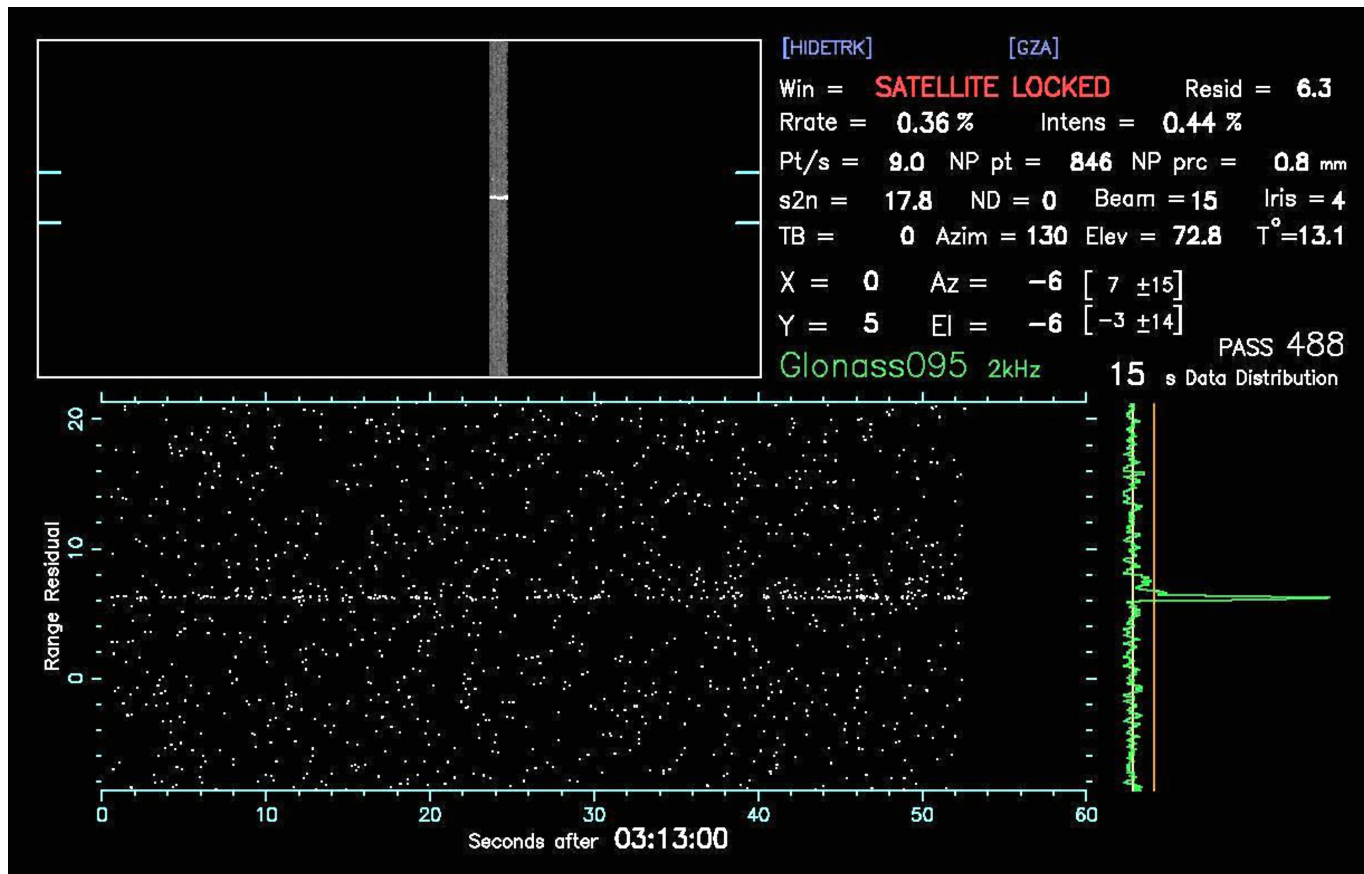
And real-time display of availability

Interleaving, with knowledge

Observing on April 14th with kHz

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Details

- To be discussed during the clinic sessions:
- Need for realtime track-detection – n and fit-sigma
- Need for realtime knowledge of NP time-boundaries
- Realtime count of number returns/NP and NP precision (sigma/root(n))
- Display to operator – can move to another sat when precision better than 1mm