Using Multi-system receivers for Accuracy positioning

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Accuracy Positioning with Multi-System GNSS receivers

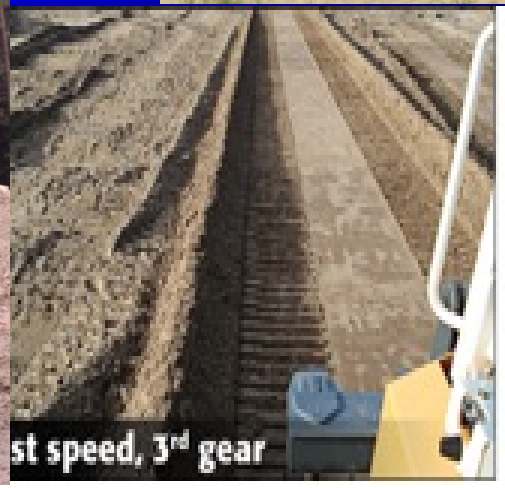
- - GIS application;
- DGPS, RTK
- - Survey application;
- RTK
- - Machine control application;

RTK

- - Agricultural application.

StandAlone, DGPS, RTK

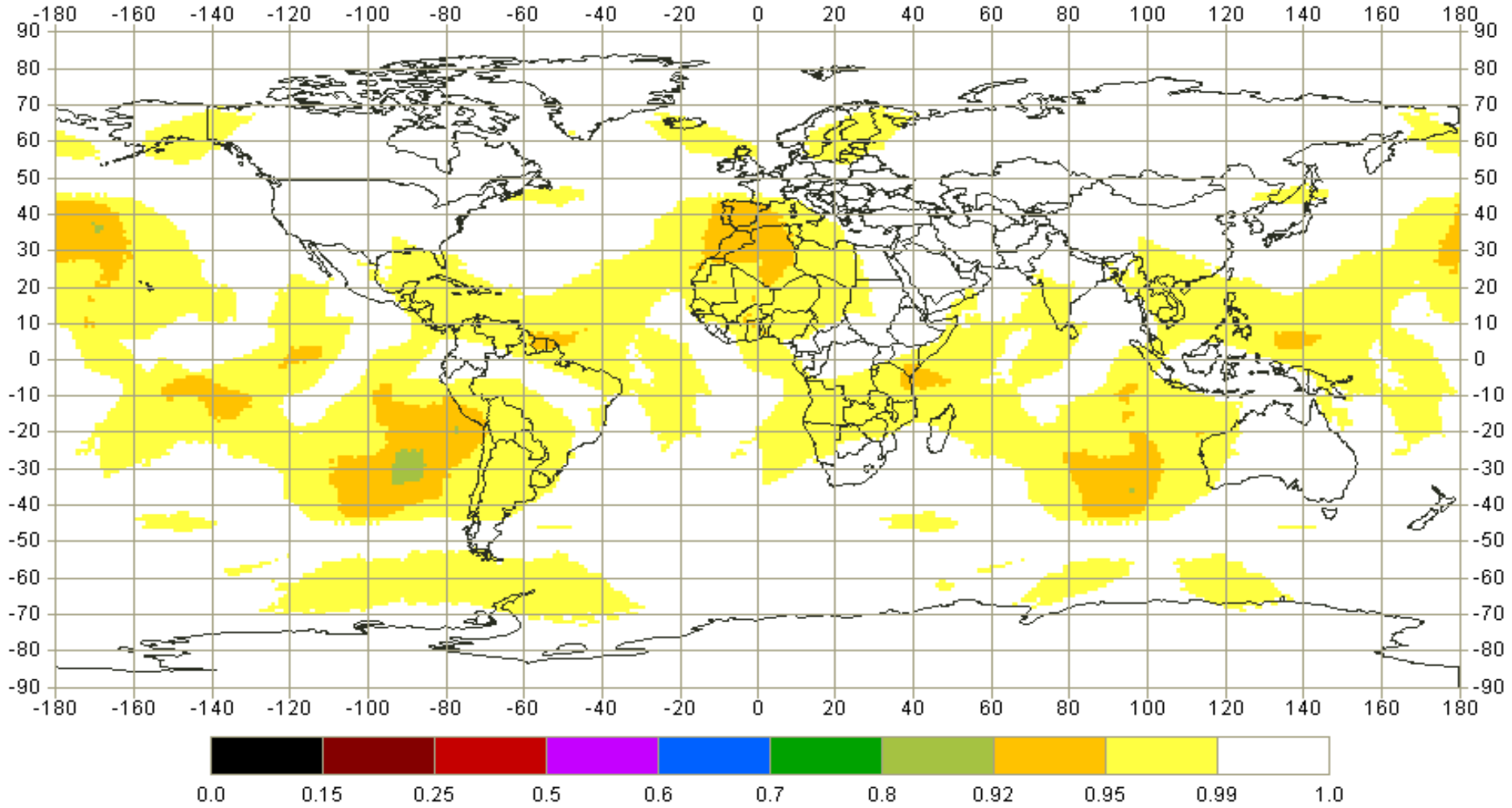
Machine Control of dozers, graders and excavators with GNSS receivers



Agriculture with GNSS receivers

Current status of GLONASS

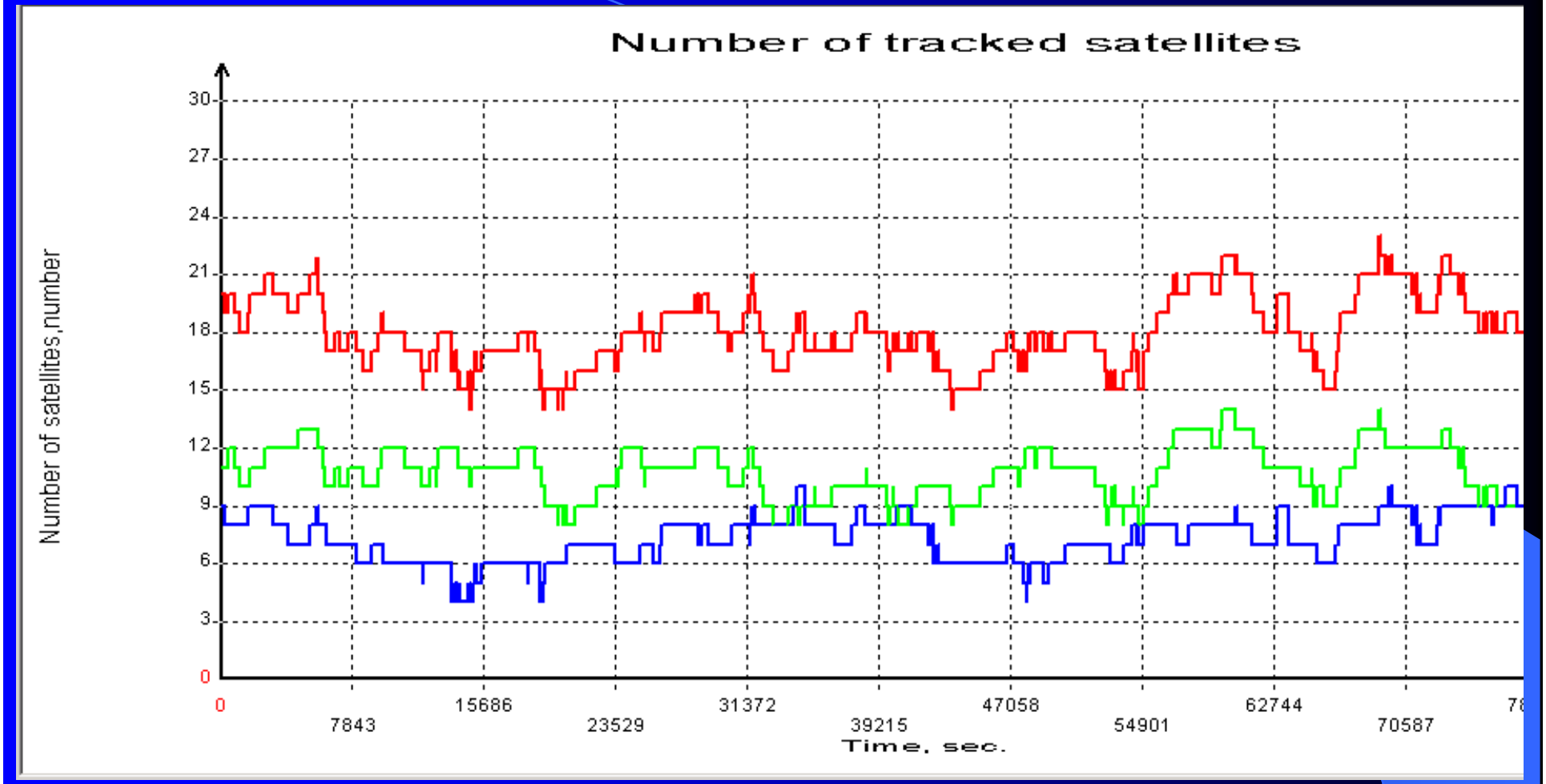
Integral availability of GLONASS navigation (PDOP≤6) during the 24 hours period (mask angle ≥5°)



Note: availability is calculated using a current almanac for the 24 hours period as percentage of time during which the condition PDOP≤6 is valid at mask angles ≥5°, where PDOP is a position (three-dimensional) dilution of precision. Step of calculation: 4 minutes in duration and 1 degree over the surface

Ref: http://www.glonass-ianc.rsa.ru

GLONASS: 24/7 global service?



All-in-view mode, 0 elevation mask, test site: Moscow:

- Up to 23 GPS+GLONASS satellites can be tracked
- Up to 10 GLONASS satellites can be visible simultaneously.

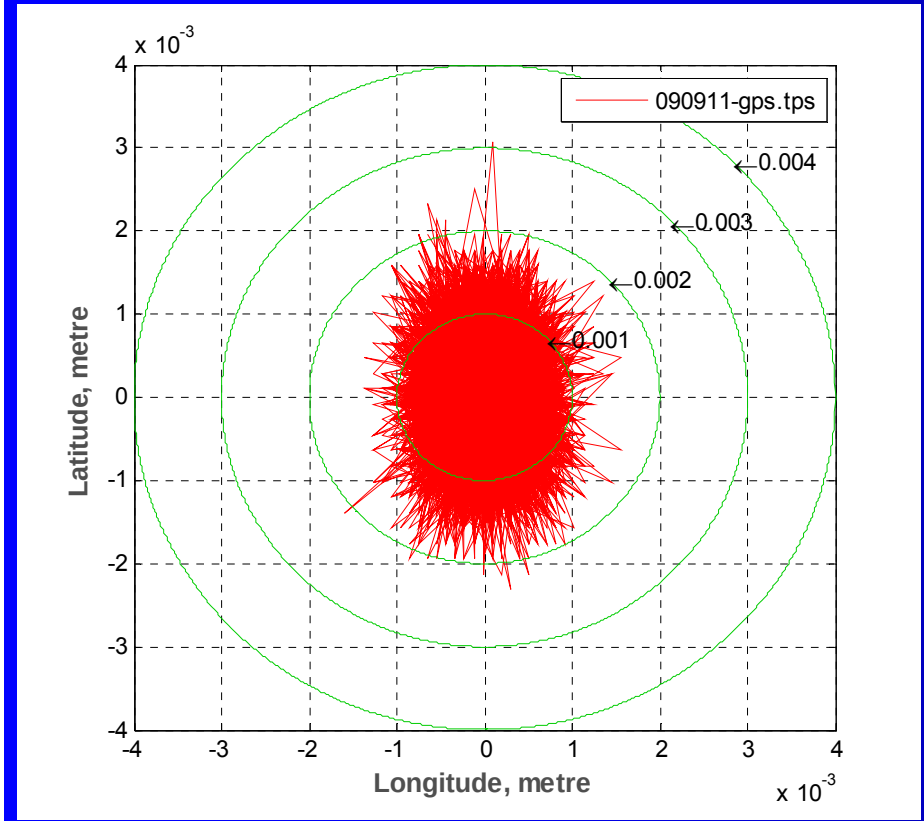
GLONASS RTK positioning performances

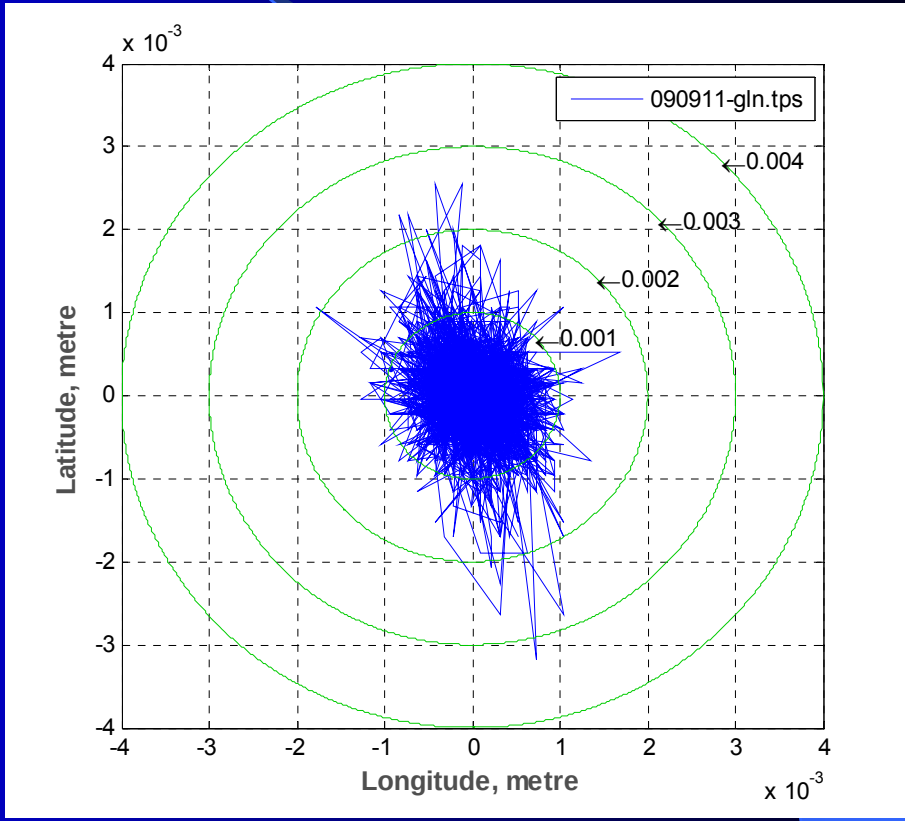
RTK GPS-only solution:

At all epochs (GPS SVs: $6 \leq SV \leq 12$)

RTK GLONASS-only solution:

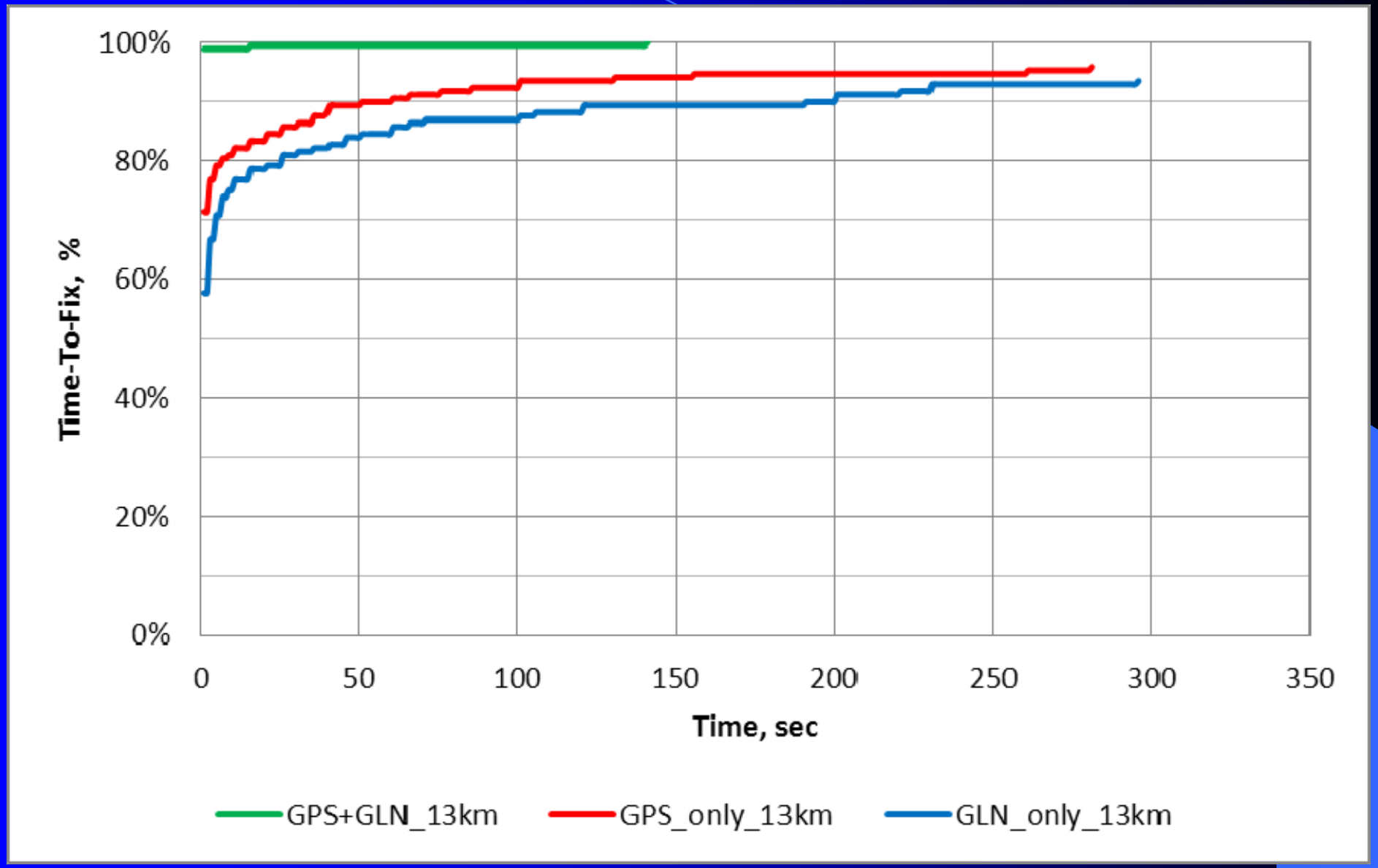
At a subset of all epochs when total number of GLONASS SVs ≥ 7



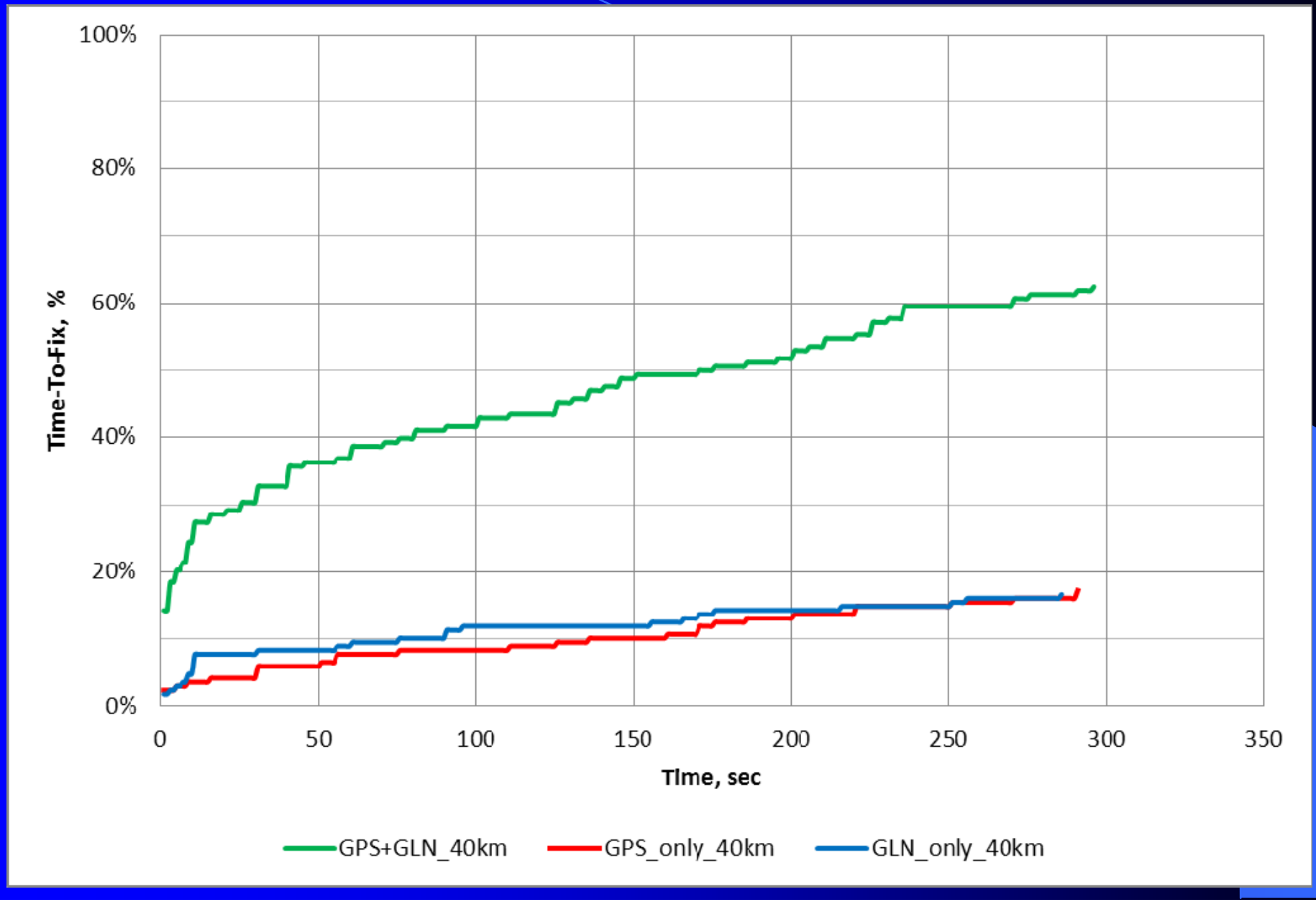


Accuracy of GLONASS RTK positioning is the same as GPS RTK accuracy provided enough number of GLONASS satellites are available for positioning

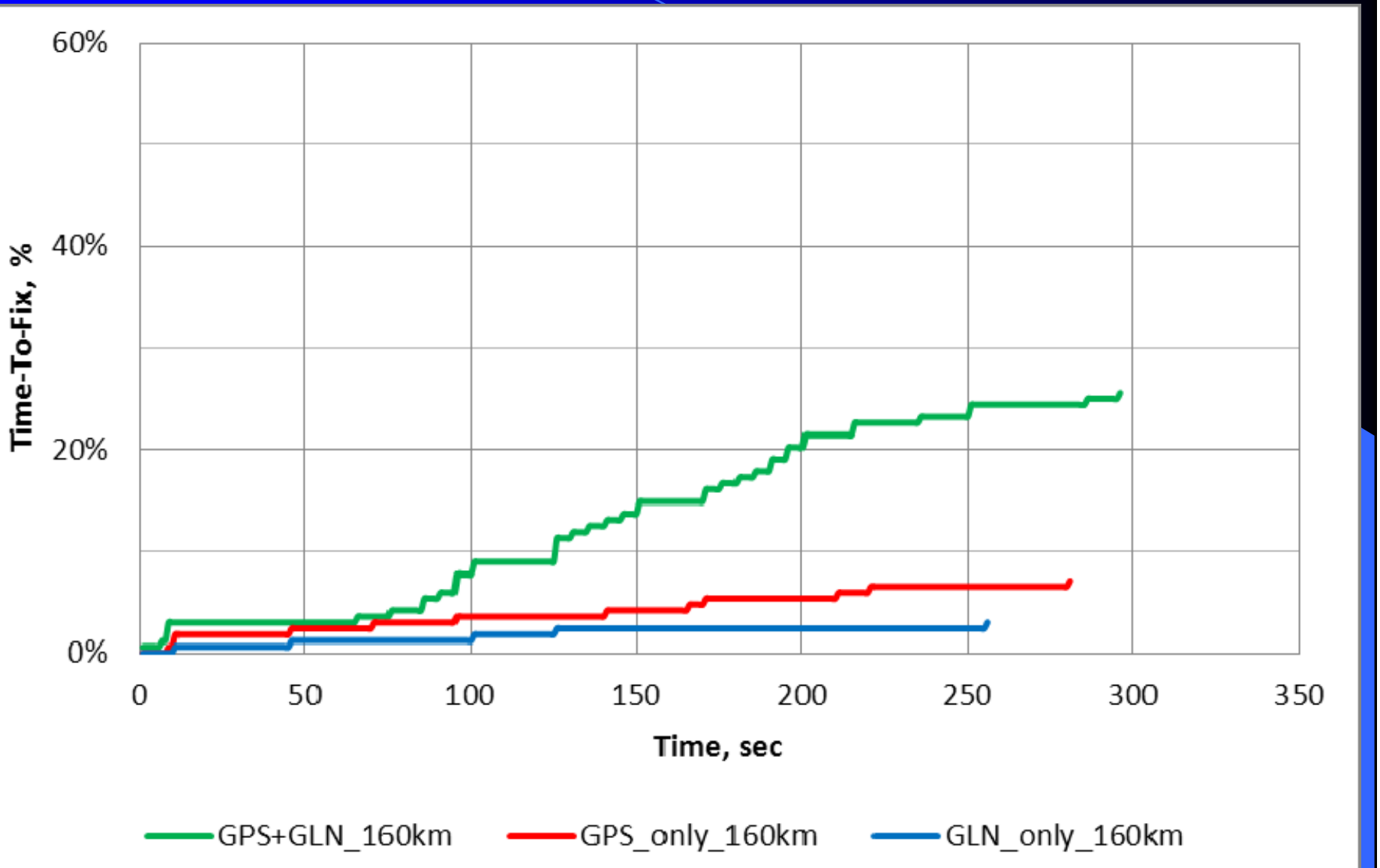
Example for Probability Time-to-Fix of ambiguities for short baseline RTK



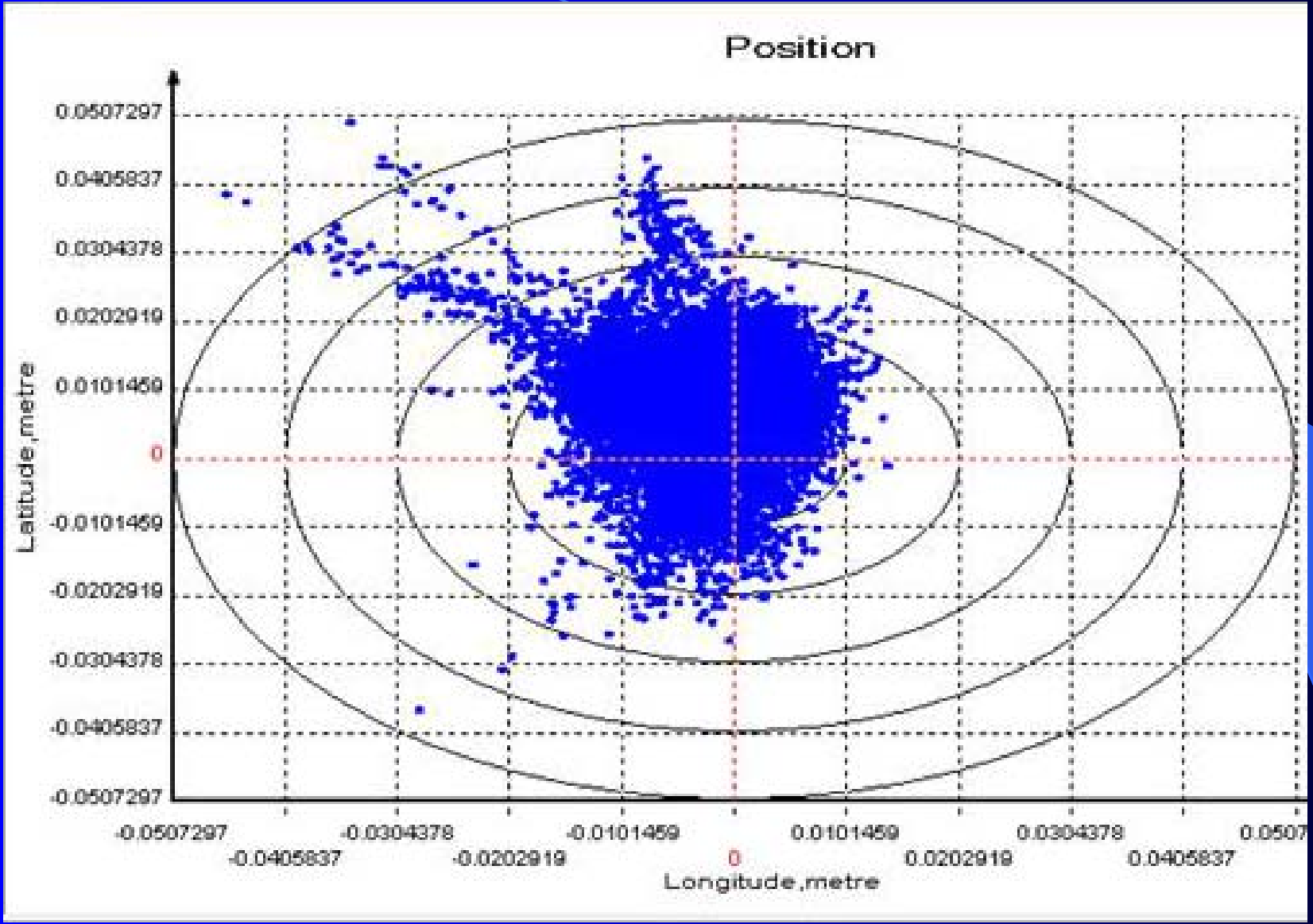
Example for Probability Time-to-Fix of ambiguities for medium baseline RTK



Example for Probability Time-to-Fix of ambiguities for long baseline RTK

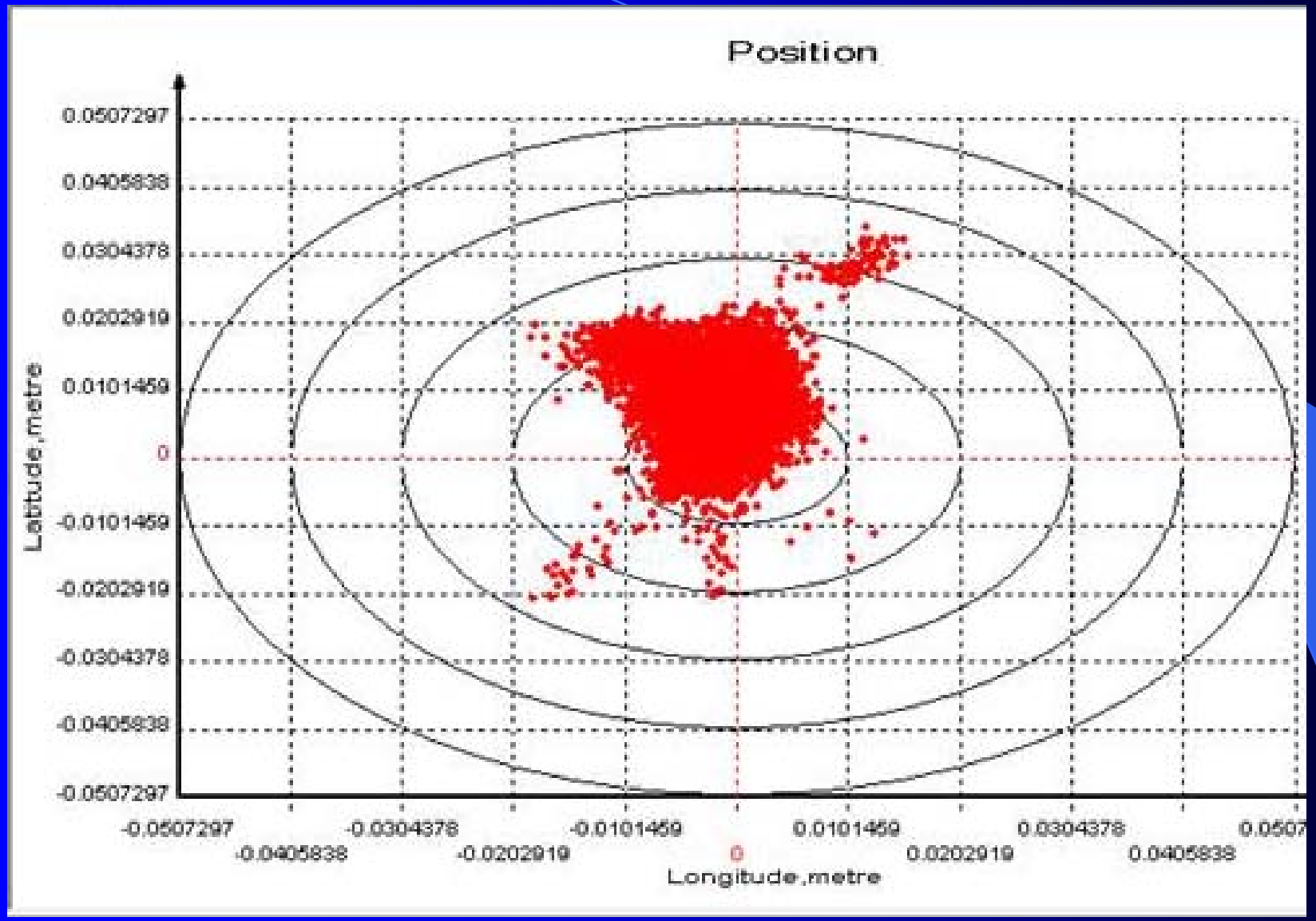


Example for RTK solution with GLONASS only



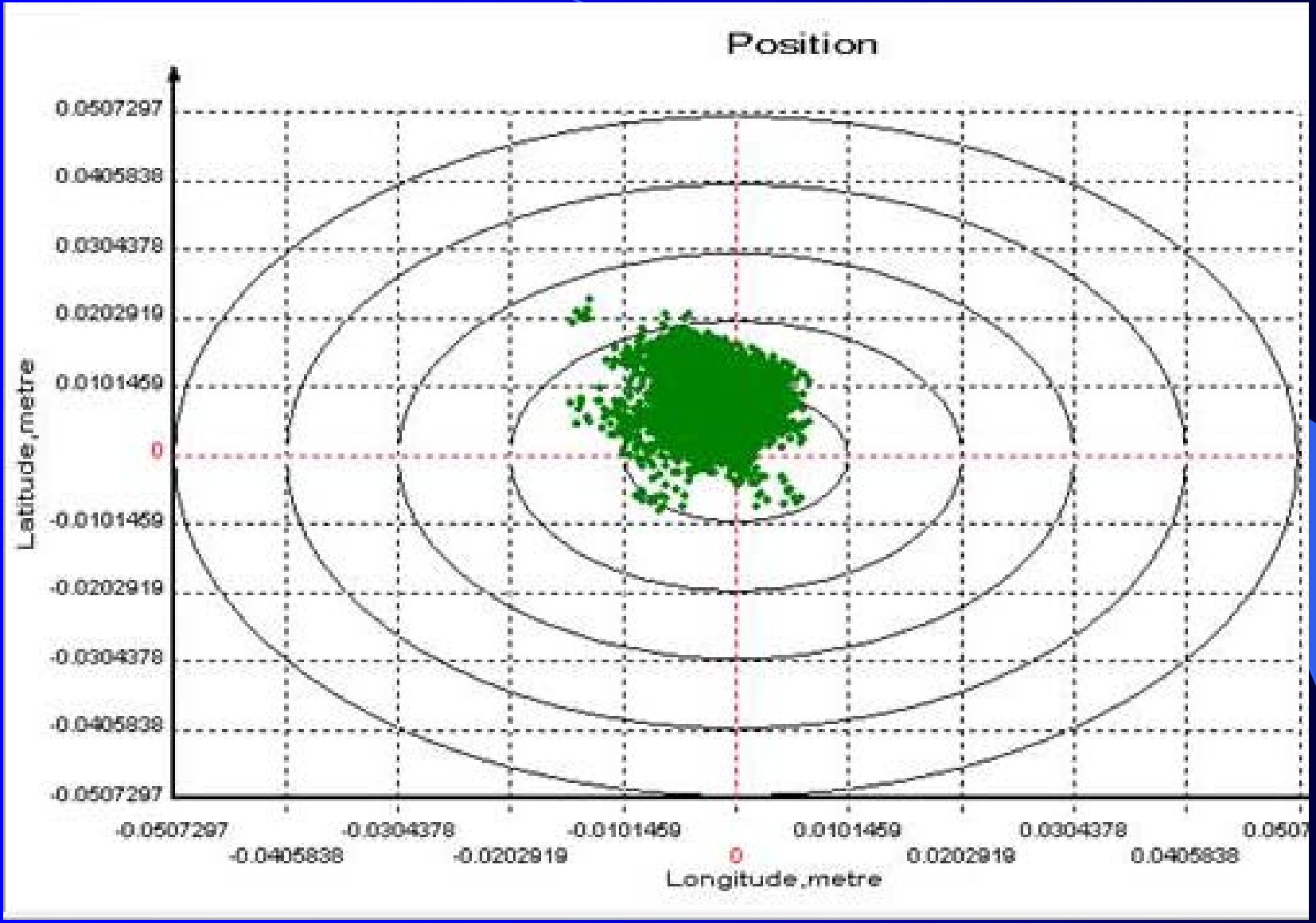
HRMS=0.0067m

Example for RTK solution with GPS only



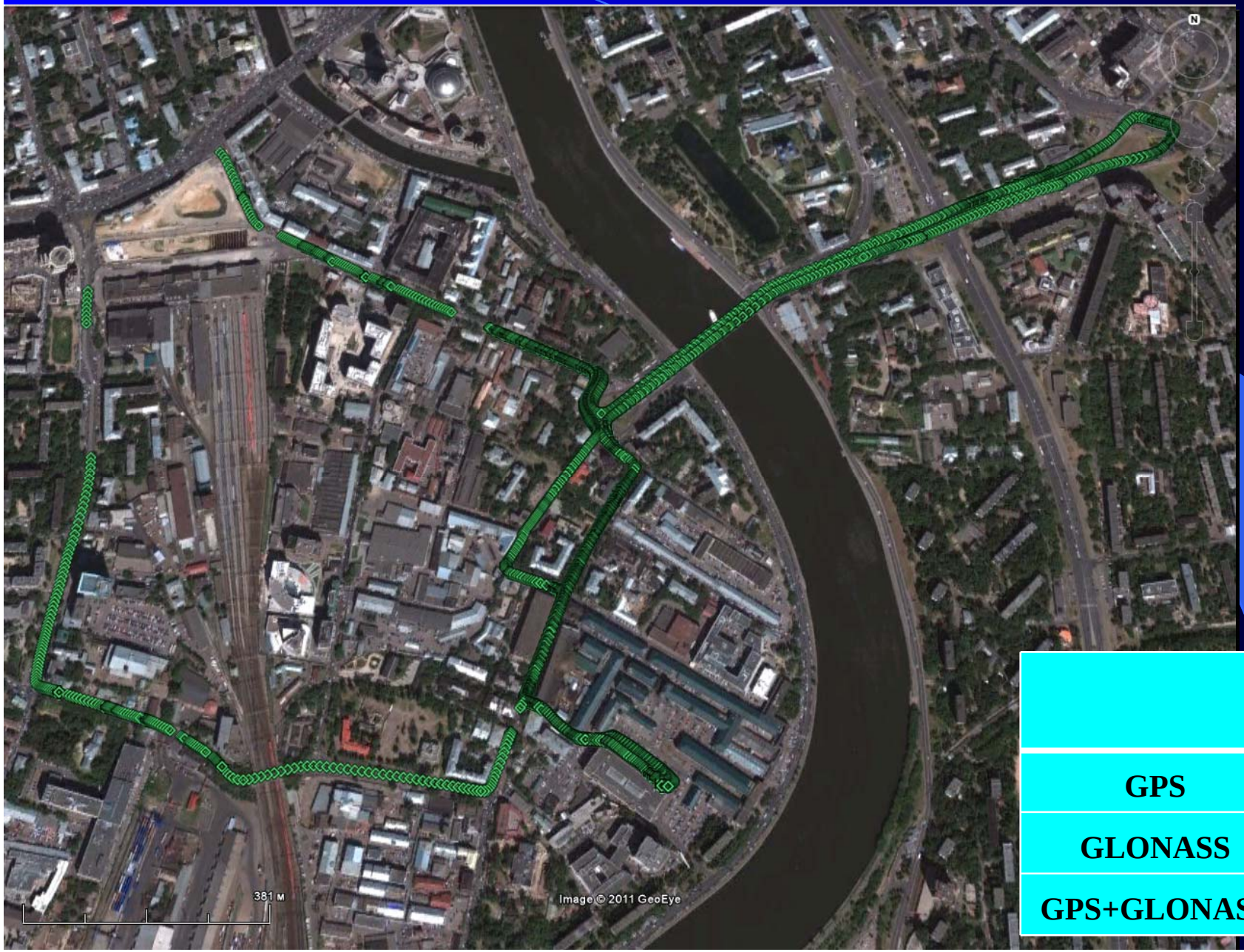
HRMS=0.0048m

Example for RTK solution with GPS/GLONASS



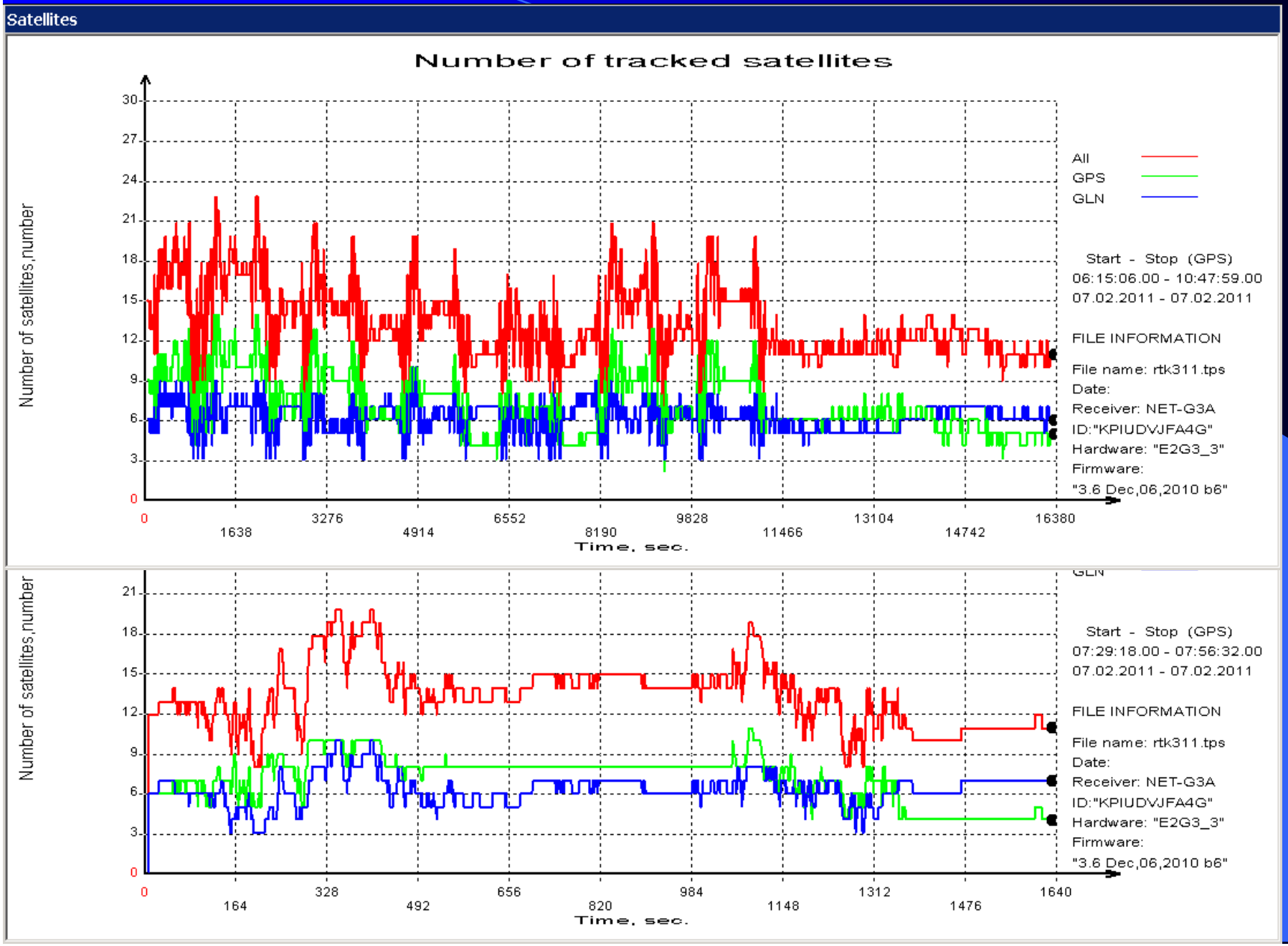
HRMS=0.0029m

GPS/GLONASS RTK solution in the town



	% fix solution
GPS	52
GLONASS	39
GPS+GLONASS	92

Satellites of GNSS enough?



Summary

- As it was predicted in 2005, GLONASS has achieved a great progress over last six years. There are 23 GLONASS-M satellites orbiting. There are no first generation GLONASS satellites working. The first GLONASS-K with CDMA signals in L3 band is launched.
- GLONASS has become a must in order to overcome the problem associated with not enough number of GPS satellites when working at sites having obstructed view or even under open sky at certain periods of time.
- At present, GLONASS may not be considered just as a GPS augmentation system but rather as a solo global navigation system that provides 24/7 service.
- Before 2006 the some companies are made the GPS/GLONASS receivers. Since 2006, GPS/GLONASS receivers started to be produced by many manufacturers.
- The problem of so-called “GLONASS biases” in carrier phase differences is present for FDMA signals. RTCM SC-104 has taken a leading role in resolving problem for more optimum processing of GLONASS carrier phase observables. This problem not be present for new GLONASS CDMA signals.