Federal Agency for
Cartography and Geodesy

EPN real-time analysis status report

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Federal Agency for Cartography and Geodesy

IGS-RT PP – clock&orbit correction status

- **7 Analysis centers (DLR, ESOC, NRCan, BKG, GFZ, GMV, TUVienna) contributing to orbit and clock combination**
  - **Each with individual software**
  - **Some contributing with two different solutions**
- **Clock & orbit combination in post-processing as well as in real-time**
- **New product-related Ntrip broadcaster set up: products.igs-ip.net**

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IGS-RT PP – clock&orbit correction status

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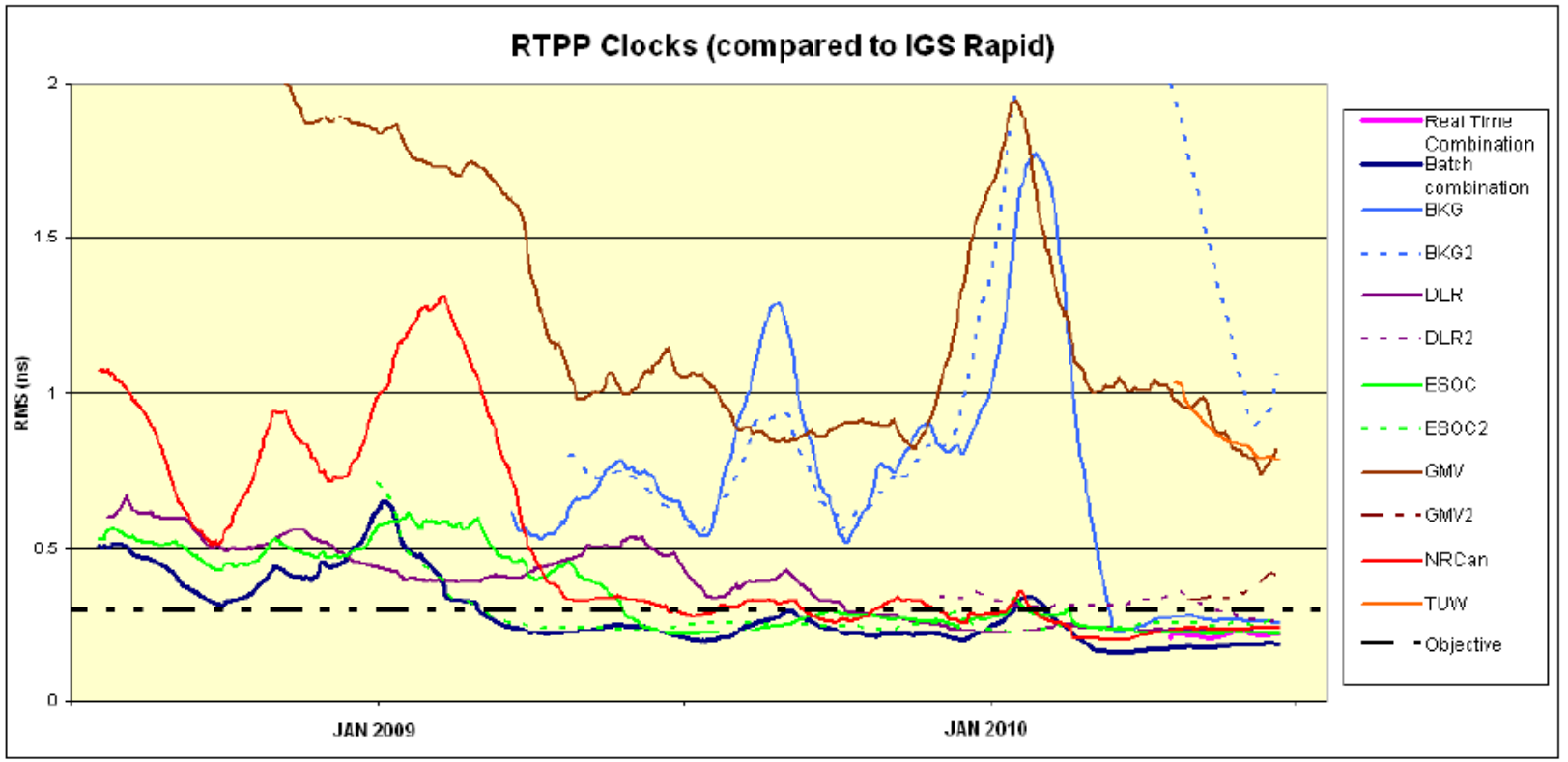
Sourcetable

- CAS;products.igs-ip.net;2101;IGS-IP;BKG;0;DEU;50.12;8.69;http://products.igs-ip.net/home
- CAS;rtcm-ntrip.org;2101;NtripInfoCaster;BKG;0;DEU;50.12;8.69;http://www.rtcm-ntrip.org/home
- NET;Misc;BKG;B;N;http://igs.bkg.bund.de/root_ftp/NTRIP/streams/streamlist_igs-ip.htm;http://igs.bkg.bund.de/index_ntrip_reg.htm;none
- STR;CLK00;BRDC_CoM_ITRF;RTCM 3.0;1059(5),1060(5);0;GPS;Misc;DEU;50.00;10.00;0;1;RTNet;none;B;N;1800;BKG
- STR;CLK01;BRDC_CoM_ITRF;RTCM 3.0;1059(5),1060(5),1065(5),1066(5);0;GPS+GLO;Misc;DEU;50.00;10.00;0;1;RTNet;none;B;N;1800;BKG
- STR;CLK10;BRDC_APC_ITRF;RTCM 3.0;1059(5),1060(5);0;GPS;Misc;DEU;50.00;10.00;0;1;RTNet;none;B;N;1800;BKG
- STR;CLK11;BRDC_APC_ITRF;RTCM 3.0;1059(5),1060(5),1065(5),1066(5);0;GPS+GLO;Misc;DEU;50.00;10.00;0;1;RTNet;none;B;N;1800;BKG
- STR;CLK20;BRDC_APC_ITRF;RTCM 3.0;1059(10),1060(10);0;GPS;Misc;DEU;50.00;10.00;0;1;RETICLE;none;B;N;1800;gnss.gsoc.dlr.de:2101/CLKA1(1)
- STR;CLK30;BRDC_CoM_ITRF;RTCM 3.0;1059(10),1060(10);0;GPS;Misc;DEU;50.00;10.00;0;1;RETINA;none;B;N;1800;IGS Combination
- STR;CLK31;BRDC_APC_ITRF;RTCM 3.0;1059(10),1060(10);0;GPS;Misc;DEU;50.00;10.00;0;1;RETINA;none;B;N;1800;IGS Combination
- STR;CLK42;BRDC_APC_NAD83;RTCM 3.0;1059(5),1060(5),1065(5),1066(5);0;GPS+GLO;Misc;DEU;50.00;10.00;0;1;RTNet;none;N;N;1800;BKG
- STR;CLK43;BRDC_APC_GDA94;RTCM 3.0;1059(5),1060(5),1065(5),1066(5);0;GPS+GLO;Misc;DEU;50.00;10.00;0;1;RTNet;none;N;N;1800;BKG
- STR;CLK44;BRDC_APC_SIRGAS2000;RTCM 3.0;1059(5),1060(5),1065(5),1066(5);0;GPS+GLO;Misc;DEU;50.00;10.00;0;1;RTNet;none;N;N;1800;BKG
- STR;CLK45;BRDC_APC_SIRGAS95;RTCM 3.0;1059(5),1060(5),1065(5),1066(5);0;GPS+GLO;Misc;DEU;50.00;10.00;0;1;RTNet;none;N;N;1800;BKG
- STR;CLK50;BRDC_CoM_ITRF;RTCM 3.0;1059(10),1060(10);0;GPS;Misc;DEU;50.00;10.00;0;1;RETINA;none;B;N;1800;ESA/ESOC
- STR;CLK51;BRDC_APC_ITRF;RTCM 3.0;1059(10),1060(10);0;GPS;Misc;DEU;50.00;10.00;0;1;RETINA;none;B;N;1800;ESA/ESOC
- STR;CLK52;BRDC_CoM_ITRF;RTCM 3.0;1059(10),1060(10);0;GPS;Misc;DEU;50.00;10.00;0;1;RETINA;none;B;N;1800;ESA/ESOC2
- STR;CLK53;BRDC_APC_ITRF;RTCM 3.0;1059(10),1060(10);0;GPS;Misc;DEU;50.00;10.00;0;1;RETINA;none;B;N;1800;ESA/ESOC2
- STR;CLK60;BRDC_CoM_ITRF;RTCM 3.0;1059(10),1060(10);0;GPS;Misc;DEU;50.00;10.00;0;1;RTIGSMR;none;B;N;1800;TUW
- STR;CLK61;BRDC_APC_ITRF;RTCM 3.0;1059(10),1060(10);0;GPS;Misc;DEU;50.00;10.00;0;1;RTIGSMR;none;B;N;1800;TUW
- STR;CLK70;BRDC_CoM_ITRF;RTCM 3.0;1060(10);0;GPS;Misc;DEU;53.00;13.00;0;1;EPOS-RT;none;N;N;4800;GFZ GPS ZD solution
- STR;CLK71;BRDC_APC_ITRF;RTCM 3.0;1060(10);0;GPS;Misc;DEU;53.00;13.00;0;1;EPOS-RT;none;N;N;4800;GFZ GPS ZD solution
- STR;CLK72;BRDC_CoM_ITRF;RTCM 3.0;1060(10);0;GPS;Misc;DEU;53.00;13.00;0;1;EPOS-RT;none;N;N;4800;GFZ GPS ED solution
- STR;CLK73;BRDC_APC_ITRF;RTCM 3.0;1060(10);0;GPS;Misc;DEU;53.00;13.00;0;1;EPOS-RT;none;N;N;4800;GFZ GPS ED solution
- STR;CLK80;BRDC_APC_ITRF;RTCM 3.0;1059(5),1060(5);0;GPS;Misc;ESP;-15.68;128.76;0;1;magicGNSS;none;B;N;520;igs-ip.gmv.com:2101/GMVAPC(1)
- STR;CLK81;BRDC_CoM_ITRF;RTCM 3.0;1059(5),1060(5);0;GPS;Misc;ESP;-15.68;128.76;0;1;magicGNSS;none;B;N;520;igs-ip.gmv.com:2101/GMVCOM(1)
- STR;RTCM3EPH;Assisted-GNSS;RTCM 3;1019(1),1020(1);0;GPS+GLO;Misc;DEU;50.09;8.66;0;1;BNS;none;B;N;2200;BKG

→ ETRS89-related correction stream on www.euref-ip.net (CLK41)

IGS-RT PP – clock correction accuracy

Clock Performance



Agrotis, 2010

IGS-RT PP – clock correction accuracy

Real Time Clock Report - Week 1609 - Day 2 - (Nov 9, 2010)

Prepared by ESOC RTPP group - Contacts:
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Pedro Alfaro pedro.alfaro (at) esa.int

Results of the Real Time Analysis Centre comparisons against the IGS rapid solution:

This report (igt16092.sum.Z) and combination clock product (igt16092.clk.Z) are available in directory:
ftp://cddis.nasa.gov/gps/products/rtpp/1609

Summary Table

AC	PFX	nSats	OrbRMS(mm)	nSatClk	nUsed	SatRMS(ns)	SatSig(ns)	nStaClk	nUsed	StaRMS(ns)	StaSig(ns)
comb	igt	31	0.0	8890	8884	0.53	0.10	0	0	0.00	0.00
rtcomb	igc	31	63.7	8928	8922	0.67	0.14	0	0	0.00	0.00
bkg	rtn	31	61.5	8928	8922	0.73	0.12	0	0	0.00	0.00
bkg2	rt2	50	192.4	8556	8553	0.84	0.31	0	0	0.00	0.00
dlr	dlt	31	59.2	8928	8922	0.60	0.13	0	0	0.00	0.00
dlr2	d2t	31	59.2	8928	8922	0.50	0.14	0	0	0.00	0.00
esoc	est	31	59.2	8866	8860	0.37	0.17	8856	8638	3.15	0.37
esoc2	e2t	31	61.5	8928	8922	0.63	0.13	8048	7768	4.24	0.42
nrc	emt	30	45.2	8639	8633	0.32	0.14	8846	8618	0.89	0.29
gmv	gmt	31	55.9	8899	8893	0.62	0.14	0	0	0.00	0.00
gfz	gft	30	84.1	8061	8055	1.25	0.41	0	0	0.00	0.00
tuw	TUW	31	55.0	8863	8857	0.79	0.56	9257	8801	16023.51	6456.07

IGS-RT PP – redundancy concept

- **Stations / network**
  - **Each station hosted at 2 or more casters**
- **Distribution / broadcasters**
  - **Each RDC should have onsite and off site caster**
- **Analysis centers**
  - **Each AC should implement data acquisition plan**
  - **Computational redundancy**
- **Combination**
  - **2 or more combination centres**
  - **2 or more correction distribution points**

IGS-RT PP – state space representation concept

- **SSR three steps approach**
  - **Precise orbits and clocks**
  - **Global ionospheric messages**
  - **Troposphere, system biases, carrier phase ambiguities**
- **Sequential approach corresponds to**
  - **Different levels of networks used (global, regional, local)**
  - **Different levels of accuracy (regional nnetwork on top of global network)**
- **To be formulated in terms of RTCMv3 messages**

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- **Decision about proposed messages pending (next RTCM meeting Feb 2011)**

IGS-RT PP – ambiguity fixing

- **New working group „ambiguity fixing“ established (chair: M. Ge, GFZ)**
  - **Collect and discuss existing approaches of the various real-time (zero difference, single difference) ambiguity fixing methods developed and implemented so far for PPP**
  - **Select suitable approaches for PPP in real-time**
  - **Regional networks are mentioned as necessary especially for the aspect of reducing convergence time**

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RT analysis – PPP

- **BKG Ntrip Client (BNC)**
  - **Current version 2.4**
  - **PPP option**
    - **GPS and GLONASS**
    - **Estimate troposphere parameter**
    - **Static and kinematic mode**
    - **Smoothing (averaging) option (coordinates and troposphere)**
    - **„Quickstart“ function (useful for kinematic mode)**
    - **Visualisation included**

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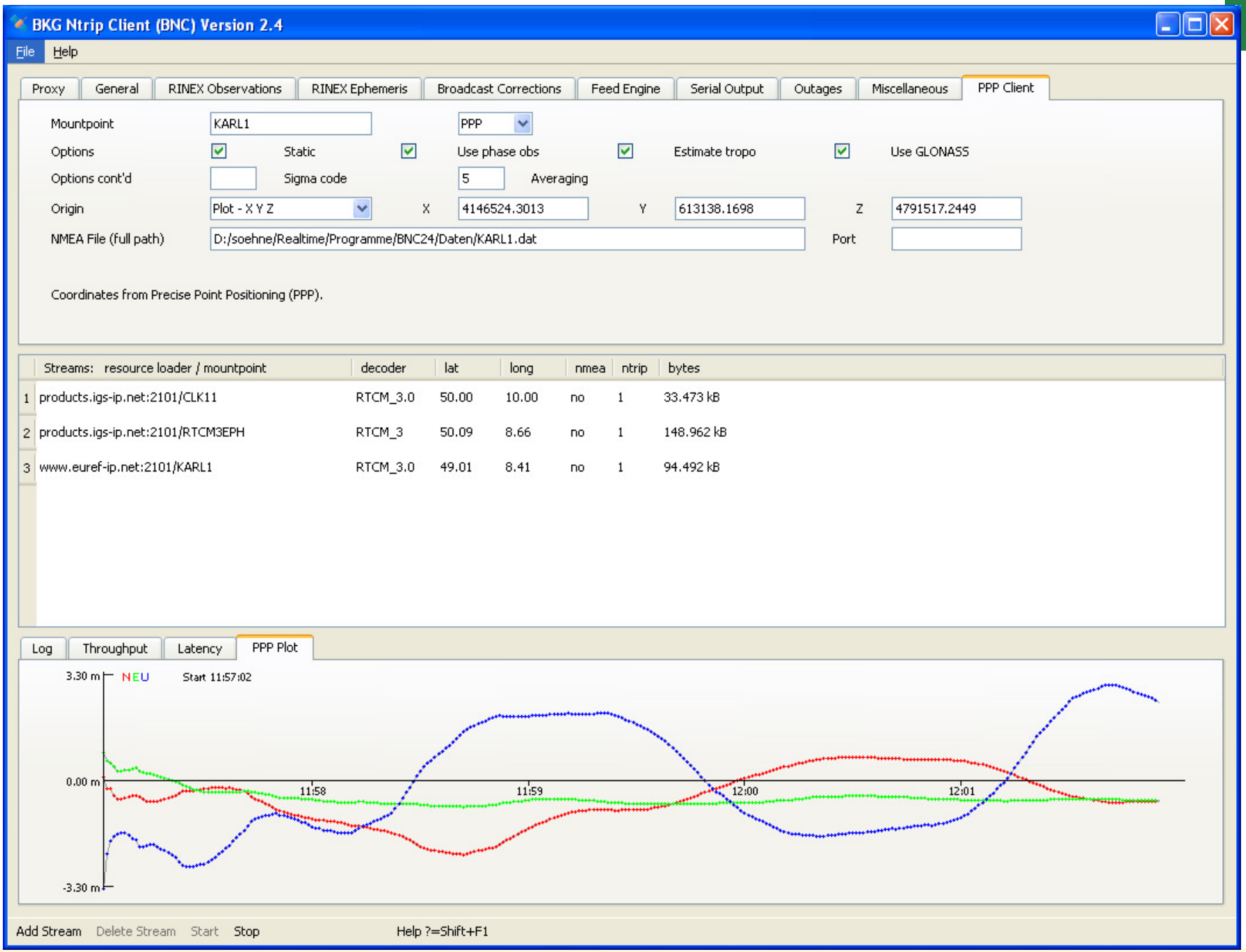
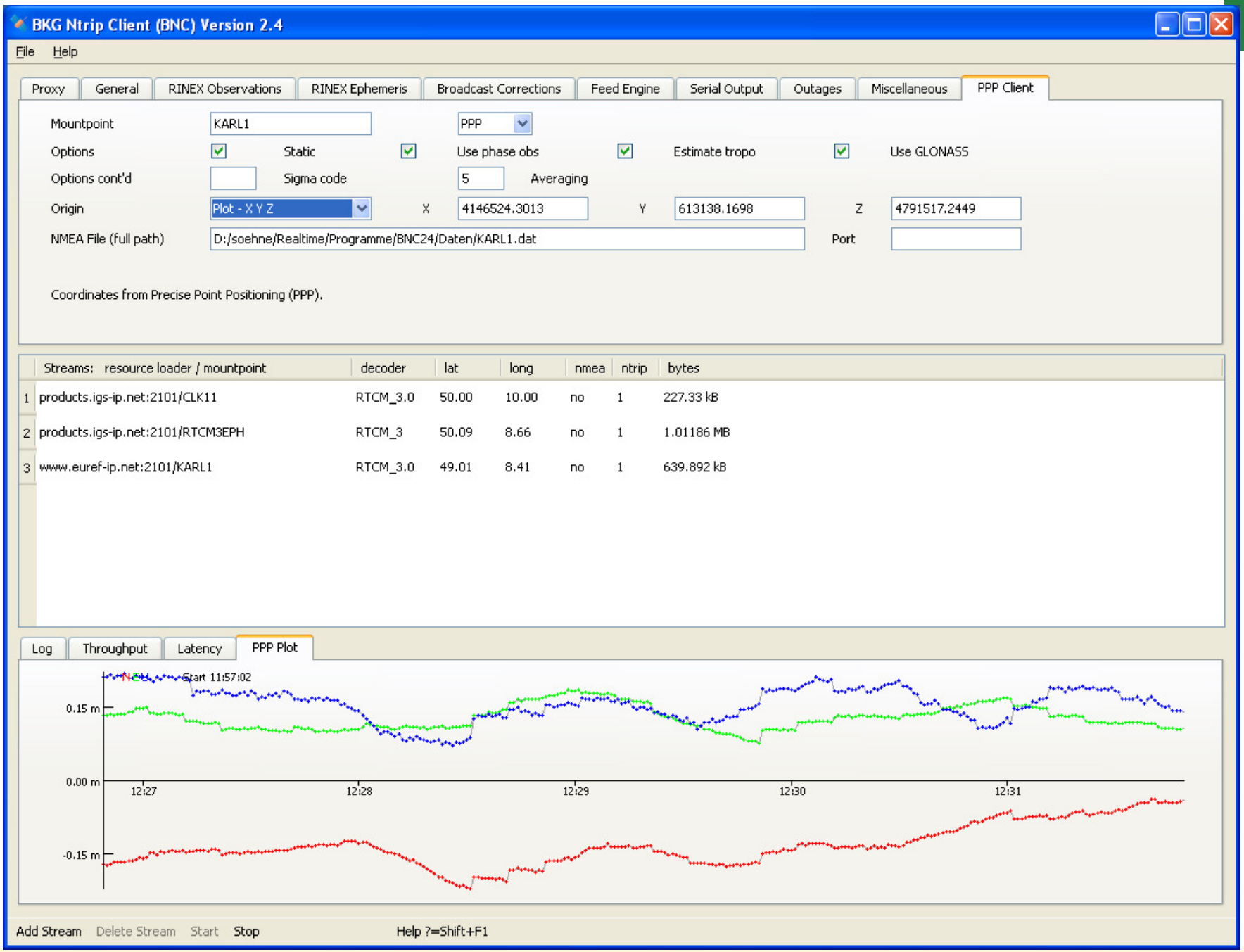
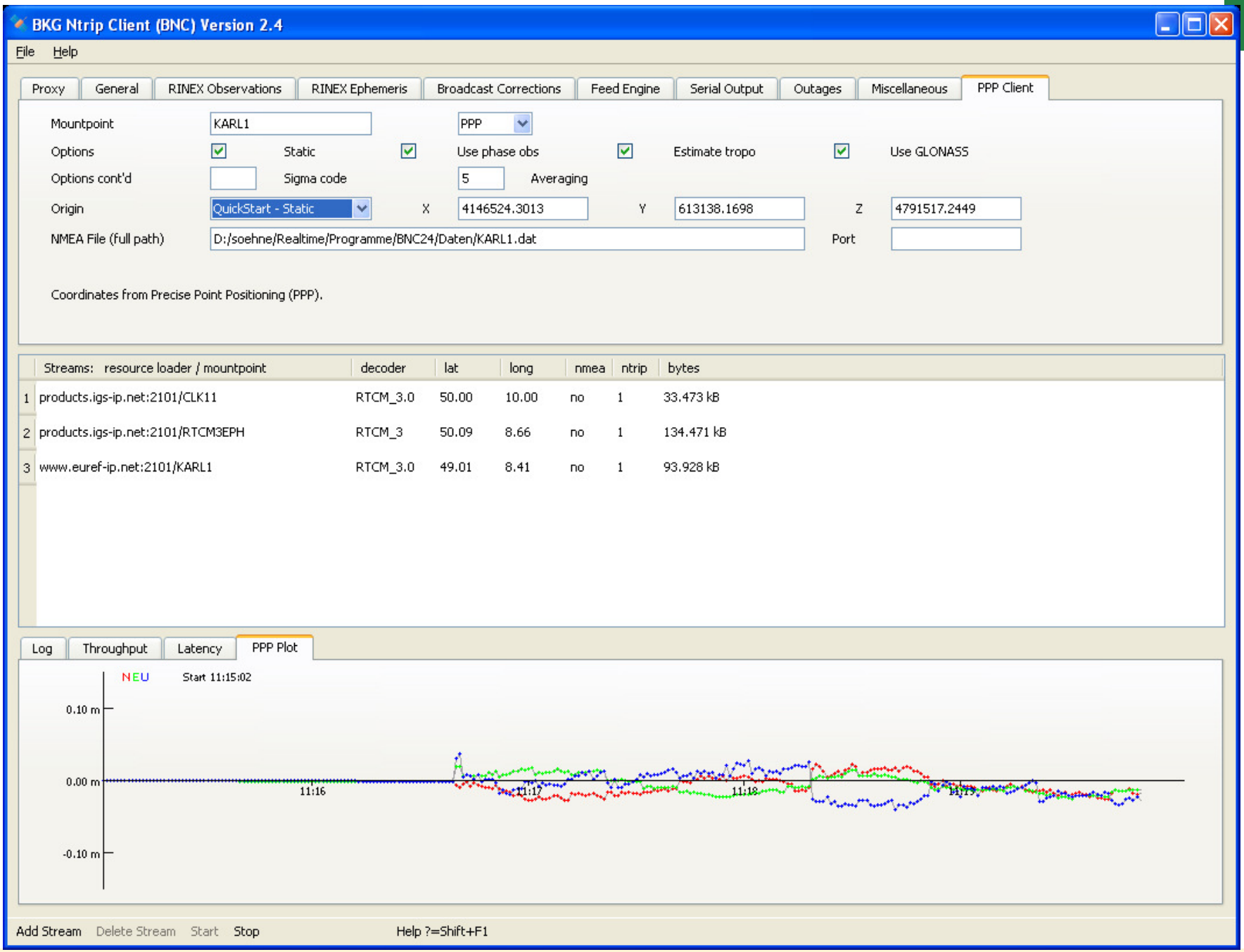
RT analysis – PPP



RT analysis – PPP



RT analysis – PPP



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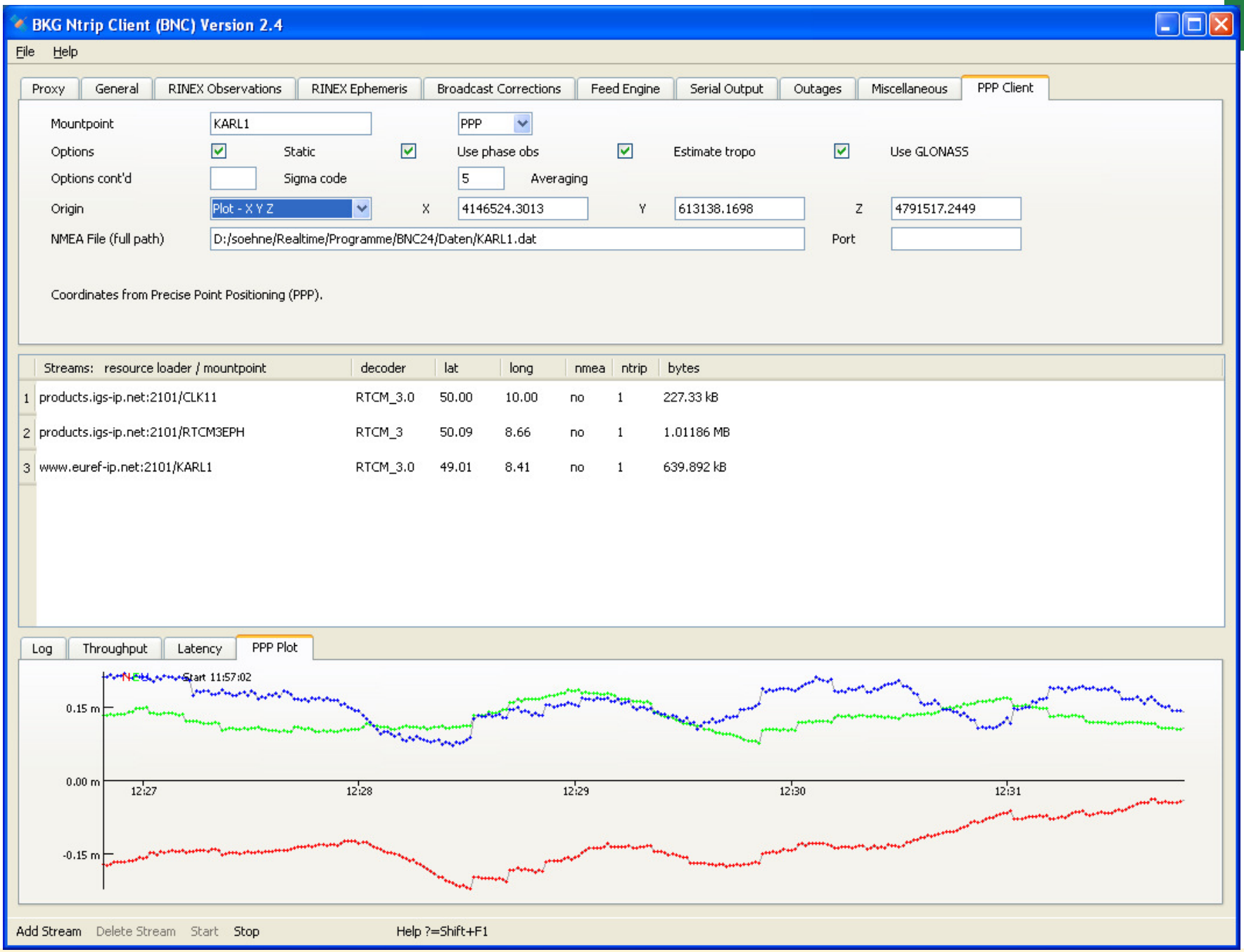

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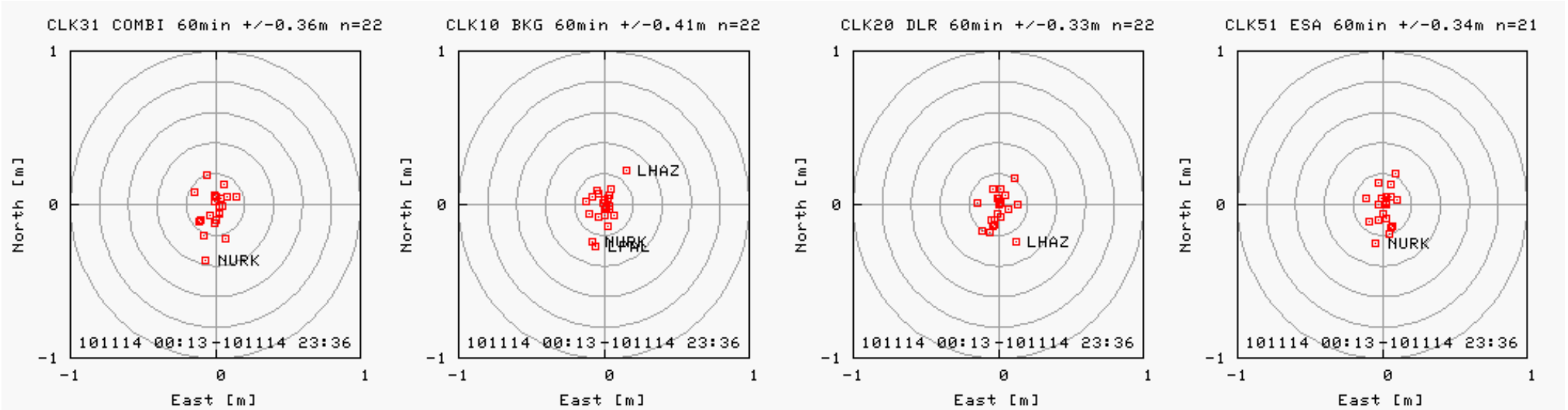
RT analysis – PPP performance



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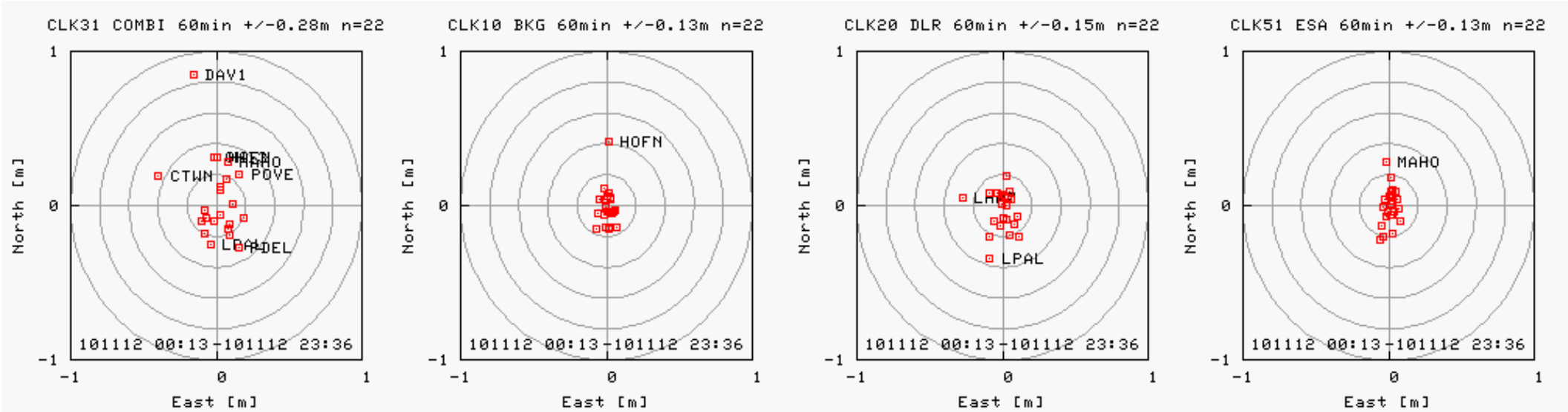
RT analysis – PPP performance



→ **http://igs.bkg.bund.de/ntrip/ppp**