



Federal Agency for
Cartography and Geodesy



EPN Real-Time Analysis Status Report

Wolfgang Söhne

Federal Agency for Cartography and Geodesy



- **TERC, VEN1: from proposed to EPN**
- **GOPE: RTCM 3.0 instead of RTCM 2.2**
- **TORI: directly from IP port**
- **CFRM, CLIB, CPAR, CRAK, CTAB: new RT since GPS week 1572 (RTCM 3.0, GPS only, proposed)**



- **Action Item 4c) was: „*CB and WS will install a link in the EPNCB website to the RT website available at the BKG website. The TWG will then be informed by email. WS will report at the next TWG*” (Deadline: *asap / next TWG*)**
- **Link has been introduced February, 09**




- **Some new (semi-dynamic) web pages developed by GW**
- **Describing „EUREF & IGS products“**
 - Observations
 - Clocks and orbits
 - Ephemeris
- **Implemented on BKG GDC webpage**
- **Still under development**

- NTRIP
Homepage ▶
- GREF, EUREF, IGS
Monitor ▶
- EUREF & IGS
Products ▶
- Registration ▶

GPS - GLONASS - Galileo Monitoring Data and Products

operating GNSS receivers establish organizations. The GDC supports international trading and transferring related data.

Our **FTP-Access** allows a quick download of files stored at GDC.

 A service of Federal Agency of Cartography and Geodesy

18/01/2010
Displaying daily and hourly data availability is now faster.

GNSS Data Center - Windows Internet Explorer

http://igs.bkg.bund.de/ntrip/orbits

common effort of EUREF and IGS:

Details of Streams Disseminated for EUREF and IGS

Caster IP:Port	Mountpoint & Input Streams	Ref. Point	GNSS	Messages	Orbits	Reference System	Analysis Center & SW	Register for access
www.igs-ip.net:2101	CLK00	CoM	GPS	1059, 1060	IGS Ultra Rapid	ITRF2005	BKG RTNet + BNS	Registration
www.igs-ip.net:2101	CLK01	CoM	GPS GLO	1059, 1060 1065, 1066	IGS Ultra Rapid	ITRF2005	BKG RTNet + BNS	Registration
www.igs-ip.net:2101	CLK10	APC	GPS	1059, 1060	IGS Ultra Rapid	ITRF2005	BKG RTNet + BNS	Registration
www.igs-ip.net:2101	CLK11	APC	GPS GLO	1059, 1060 1065, 1066	IGS Ultra Rapid	ITRF2005	BKG RTNet + BNS	Registration
www.igs-ip.net:2101	CLK20	APC	GPS	1059, 1060	IGS Ultra Rapid	ITRF2005	GSOC/DLR RETICLE	Registration
www.euref-ip.net:2101	CLK41	APC	GPS GLO	1059, 1060 1065, 1066	IGS Ultra Rapid	ETRF2000	BKG RTNet + BNS	Registration
www.igs-ip.net:2101	CLK42	APC	GPS GLO	1059, 1060 1065, 1066	IGS Ultra Rapid	NAD83	BKG RTNet + BNS	Registration
www.igs-ip.net:2101	CLK43	APC	GPS GLO	1059, 1060 1065, 1066	IGS Ultra Rapid	GDA94	BKG RTNet + BNS	Registration
www.igs-ip.net:2101	CLK44	APC	GPS GLO	1059, 1060 1065, 1066	IGS Ultra Rapid	SIRGAS2000	BKG RTNet + BNS	Registration
gnss.gsoc.dlr.de:2101	CLKA1	APC	GPS	1059, 1060	IGS Ultra Rapid	ITRF2005	GSOC/DLR RETICLE	andre.hauschild(at)dlr.de
gnss.gsoc.dlr.de:2101	CLKC1	CoM	GPS	1059, 1060	IGS Ultra Rapid	ITRF2005	GSOC/DLR RETICLE	andre.hauschild(at)dlr.de
wox.geopp.de:2101	RTCMSSR	APC	GPS GLO	1057, 1058 1059, 1063 1064, 1065	Dynamic GNSMART	ITRF2005	Geo++ GNSMART	support(at)geopp.de
wox.geopp.de:2101	RTCMSSR1060	APC	GPS GLO	1059, 1060 1065, 1066	Dynamic GNSMART	ITRF2005	Geo++ GNSMART	support(at)geopp.de

Note that CoM stands for Center of Mass and APC for Antenna Phase Center. The RTCM v3 streams listed above may be used i.e. to support real-time Precise Point Positioning (PPP) applications. Daily comparisons of clocks from different Analysis Centers are carried out off-line and made available for download from <ftp://cddis.nasa.gov/gps/products/rtp>, <ftp://igsdepot.ensg.eu/pub/igs/products> and <ftp://nfs.kasi.re.kr/ans/products/rtp>

Fertig

Internet 100%

GNSS Data Center - Windows Internet Explorer

http://igs.bkg.bund.de/ntrip/orbits

File Bearbeiten Ansicht Favoriten Extras ?

Konvertieren Auswählen

GNSS Data Center

Seite Extras

<http://cddis.nasa.gov/gps/products/rtp>, <http://igsdepot.ensg.eu/pub/igs/products> and <http://nfs.kasi.re.kr/gps/products/rtp>.

2.1 Coordinate Transformations

Some of the above listed streams refer to regional or national coordinate reference systems. The following Helmert transformation parameters are used for transformations from ITRF2005/IGS05.

Helmert Transformation Parameters for Transformation to Regional Systems

Regional System	Tx, Ty, Tz (m)	dTx, dTy, dTz (m/y)	Rx, Ry, Rz (mas)	dRx, dRy, dRz (mas/y)	S (10 ⁻⁹) dS (10 ⁻⁹ /y)	T0 for Rates
ETRF2000	0.0541 0.0502 -0.0538	-0.0002 0.0001 -0.0018	0.891 5.390 -8.712	0.081 0.490 -0.792	0.40 0.08	2000.0
NAD83	0.9963 -1.9024 -0.5219	0.0005 -0.0006 -0.0013	25.915 9.426 11.599	0.067 -0.757 -0.051	0.78 0.10	1997.0
GDA94	0.07167 0.00486 -0.04711	-0.00342 0.00055 0.00136	9.1362 9.3086 9.1599	1.4652 1.1005 1.1480	-8.239 -0.212	2000.0
SIRGAS2000	-0.0051 -0.0065 -0.0099	- - -	0.150 0.020 0.021	- - -	- -	no rates

References:

ETRF2000: Claude Boucher, Zuheir Altamimi 2008: 'Specifications for reference frame fixing in the analysis of EUREF GPS campaign', see <http://etrs89.ensg.ign.fr/memo-V7.pdf>.

NAD83: Chris Pearson, Robert McCaffrey, Julie L. Elliott, Richard Snay 2010: 'HTDP 3.0: Software for Coping with the Coordinate Changes Associated with Crustal Motion', Journal of Surveying Engineering.'

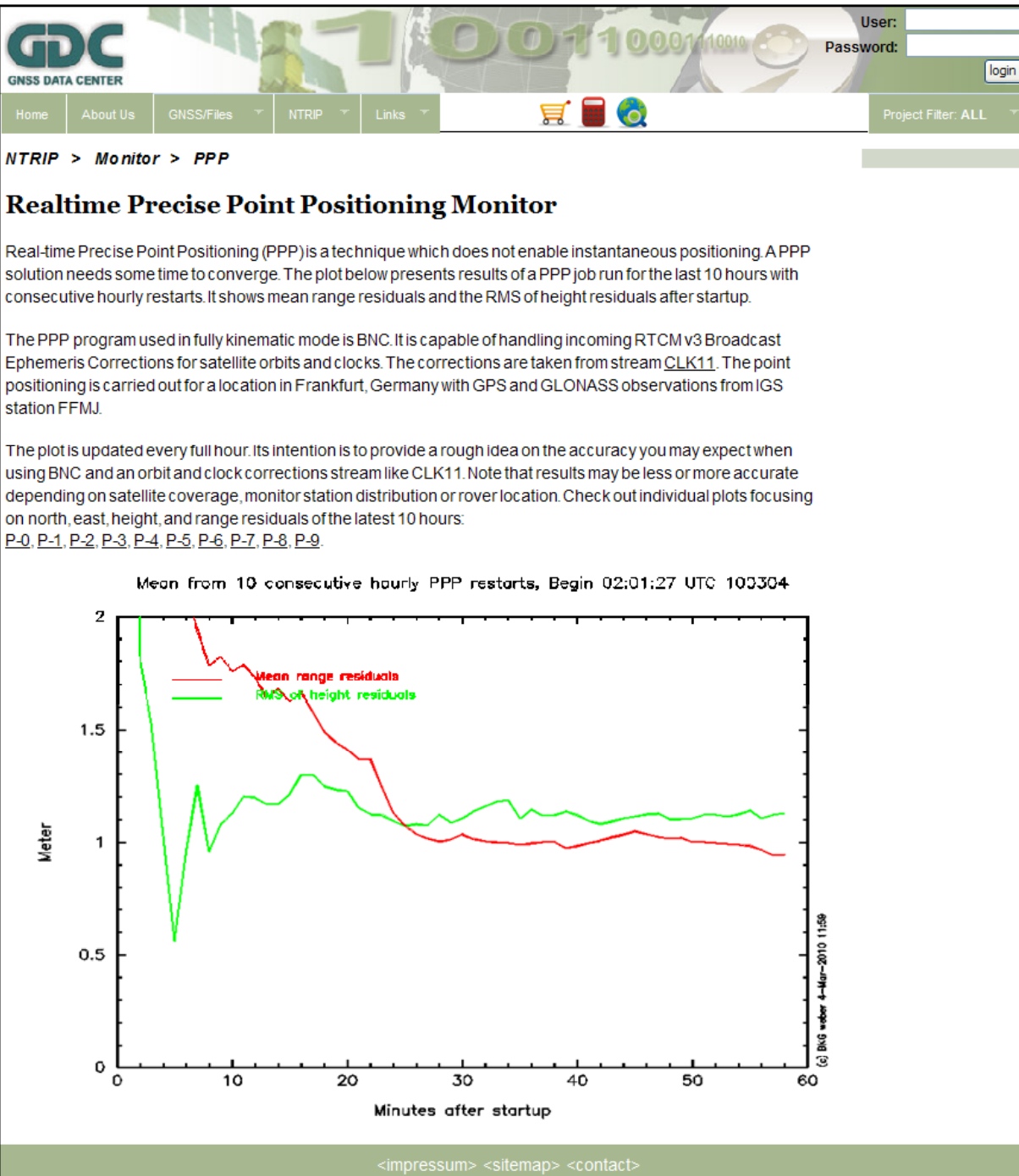
GDA94: Personal communication with Geoscience Australia, Canberra, Australia.

SIRGAS2000: Personal communication with CGED-Coordenacao de Geodesia, IBGE/DGC - Diretoria de Geociencias, Brazil.

3. Tools for Decoding RTCM v3 Ephemeris Correctors

As the RTCM v3 messages disseminated by EUREF and IGS follow a premature definition, they can not yet be

Internet 100%





- **Necessity of**
 - **Distributed workload**
 - **Distributed network of broadcasters**
- **Two different views**
 - **Broadcasters from list of “established” DCs**
 - Likely to be broadcasters for a longer time span
 - Needs longer time to be established
 - **Broadcasters from list of users or user groups**
 - Mutually easy to install
 - Durability open issue



- **106 EPN RT data streams**
 - 57 coming from 14 different broadcasters (via relay option)
 - 3 via UDP relay
 - 46 coming directly from > 20 station managers (via NtripServers) using
 - Receiver implemented NtripServer
 - External NtripServer, e.g. from BKG

EUREF Permanent GNSS Network > Data & Products > Data Access > Real-time > Broadcasters - Windows Internet Explorer

http://www.epncb.oma.be/_dataproduts/data_access/real_time/broadcasters.php

Datei Bearbeiten Ansicht Favoriten Extras ?
Konvertieren Auswählen

EUREF Permanent GNSS Network > Data & Products ...

Seite Extras

ORGANISATION

Creation, Management, Structure, Relation to IGS, Projects, Guidelines, FAQ

TRACKING NETWORK

Maps, Stations, Equipment & calibration, Station coordinates, Site log validation & submission

DATA & PRODUCTS

Data access, Analysis centres, Products, Time series, ETRS89/ITRS transformation, Formats

NEWS & MAILS

News, Mails, Calendar, Papers, Workshops, Web site history

FTP & WEB ACCESS

Anonymous FTP, Web site index, Related links

[DATA & PRODUCTS](#) > [DATA ACCESS](#) > [REAL-TIME](#) > [BROADCASTERS](#)

BROADCASTERS

The BKG started operating the first EUREF-IP Broadcaster in 2002. However, the aim is to set up a well-distributed network of Ntrip Broadcasters supporting real-time GNSS applications in various regions.

If you want to run a Broadcaster in your area to provide access to EPN stations and would like to see it operated within the context of EUREF-IP, please contact the [EPN CB](#).

Today, the following Ntrip Broadcasters participate in EUREF-IP:

NtripCaster	IP:Port	Operator & Registration Link	Country
EUREF-IP	www.euref-ip.net:2101	BKG	Germany
ASI - eGeos	192.106.234.7:2101	ASI	Italy
EUREF-IP.BE	www.euref-ip.be:2101	ROB	Belgium
FreDNet	caster.crs.inogs.it:2110	CRS/OGS	Italy
Zememericky Urad	czeposr.cuzk.cz:2101	CZEPOS	Czech Republic
Satellite Geodetic Observatory	82.131.181.15:2101	FOMI	Hungary
CATNET-IP	catnet-ip.icc.es:8080	ICC	Spain
Instituto Geografico Portugues	62.48.187.123:2101	IGEO	Portugal
RGP-IP	rgpdata.ign.fr:80	IGN	France
Instituto Geografico Nacional	ergnss-ip.ign.es:2101	IGNE	Spain
Geodeettinen Laitos	caster.fgi.fi:80	Nordic-iDiff	Finland
Lantmateriet	194.16.178.79:80	SWEPOS	Sweden
Federal Office of Topography Swisstopo	www3.swisstopo.ch:8080	SWIPOS	Switzerland
University of Padova	147.162.229.36:80	UniPD	Italy
SATREF	193.156.101.72:2103	Statens Kartverk	Norway

EPN Central Bureau - Royal Observatory of Belgium

Disclaimer and Copyright

Feb 09, 2010

Fertig

Internet

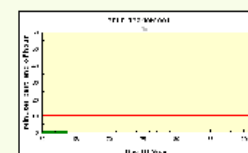
100%

(secondary)

Header of the RINEX observation files

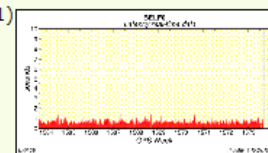
[DOWNLOAD DATA](#)

DATA LATENCY



STREAM : BELFO
FORMAT : RTCM 3.1 - 1004(1),1006(15),1008(15),1012(1)
ACCESS : free
DOWNLOAD : available from www.euref-ip.net:2101

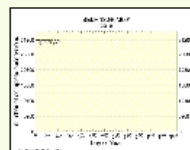
DATA LATENCY



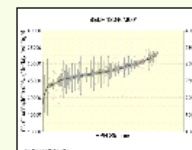
Download [software](#).
Full list of EPN stations providing real-time data available from [Data Access > Real-time web page](#).

A schematic diagram of a 2D lattice structure. The lattice is composed of yellow squares arranged in a grid. A red line highlights a specific path or boundary within the lattice. The diagram is labeled with "A(1) = 20.18%" at the top and "E(1) = 1.0" at the bottom. The axes are labeled "x" and "y".

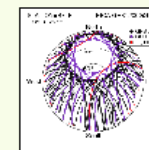
Ratio observed/predicted
number of observations



Yearly tracking
performance (TEQC)



Tracking performance (TEQC) compared to other EPN stations



Snapshots of satellite tracking

METEO DATA: none

SATELLITE SYSTEM: GPS+GLONASS

BY

LAC	FROM (GPSWEEK)	TO (GPSWEEK)
BKG	1412	now
IGE	1412	now
ROB	1412	now



- **Announced by EUREF and IGS mails on February, 27 by GW**
- **Can use RT orbit and clock correction streams of www.euref-ip.net**
- **Using phase and code observation**
- **Static and kinematic option**
- **Use of GLONASS possible**
- **Estimation of ZTD possible**
- **Algorithms implemented by Leos Mervart**

BKG Ntrip Client (BNC) Version 2.0

File Help

Proxy General RINEX Observations RINEX Ephemeris Broadcast Corrections Feed Engine Serial Output Outages Miscellaneous PPP Client

Mountpoint

Options ☒ Static ☒ Use phase obs ☒ Estimate tropo ☐ Use GLONASS

Ref. coordinates X Y Z

NMEA output File (full path) Port

Coordinates from Precise Point Positioning (PPP).

	Streams:	resource loader / mountpoint	decoder	lat	long	nmea	ntrip	bytes
1	www.igs-ip.net:2101/CLK10		RTCM_3.0	50.00	10.00	no	1	10.79 kB
2	www.igs-ip.net:2101/MOB50		RTCM_3.0	-37.83	144.98	no	1	29.362 kB
3	www.igs-ip.net:2101/RTCM3EPH		RTCM_3	50.09	8.66	no	1	27.653 kB

Log	Throughput	Latency	PPP	
10-01-06 08:04:39 MOB50: PPP 08:04:32.0 8	-4130636.774 +- 0.150	2894953.333 +- 0.130	-3890530.113 +- 0.111	0.012 +- 0.010
10-01-06 08:04:40 MOB50: PPP 08:04:53.0 8	-4130636.798 +- 0.156	2894953.554 +- 0.136	-3890530.137 +- 0.110	0.013 +- 0.010
10-01-06 08:04:41 MOB50: PPP 08:04:54.0 8	-4130636.827 +- 0.154	2894953.578 +- 0.134	-3890530.162 +- 0.108	0.014 +- 0.010
10-01-06 08:04:42 MOB50: PPP 08:04:55.0 8	-4130636.854 +- 0.152	2894953.601 +- 0.133	-3890530.188 +- 0.107	0.015 +- 0.010
10-01-06 08:04:42 MOB50: PPP 08:04:56.0 8	-4130636.880 +- 0.150	2894953.624 +- 0.131	-3890530.213 +- 0.106	0.015 +- 0.010
10-01-06 08:04:44 MOB50: PPP 08:04:57.0 8	-4130636.898 +- 0.148	2894953.640 +- 0.129	-3890530.233 +- 0.105	0.016 +- 0.010
10-01-06 08:04:45 MOB50: PPP 08:04:58.0 8	-4130636.919 +- 0.147	2894953.658 +- 0.128	-3890530.256 +- 0.104	0.017 +- 0.010
10-01-06 08:04:46 MOB50: Mean latency 1.37 sec, min 0.57, max 1.8, rms 0.28, 60 epochs				
10-01-06 08:04:46 MOB50: PPP 08:04:59.0 8	-4130636.936 +- 0.145	2894953.673 +- 0.127	-3890530.276 +- 0.103	0.018 +- 0.010
10-01-06 08:04:47 MOB50: PPP 08:05:00.0 8	-4130636.952 +- 0.143	2894953.688 +- 0.125	-3890530.295 +- 0.102	0.019 +- 0.010
10-01-06 08:04:48 MOB50: PPP 08:05:01.0 8	-4130636.965 +- 0.142	2894953.700 +- 0.124	-3890530.310 +- 0.101	0.020 +- 0.010
10-01-06 08:04:49 MOB50: PPP 08:05:02.0 8	-4130636.974 +- 0.140	2894953.708 +- 0.122	-3890530.328 +- 0.100	0.021 +- 0.010
10-01-06 08:04:50 MOB50: PPP 08:05:03.0 8	-4130636.986 +- 0.139	2894953.719 +- 0.121	-3890530.349 +- 0.099	0.022 +- 0.010

Add Stream Delete Stream Start Stop

Help=Shift+F1

BKG Ntrip Client (BNC) Version 2.0

File Help

Proxy General RINEX Observations RINEX Ephemeris Broadcast Corrections Feed Engine Serial Output Outages Miscellaneous **PPP Client**

Mountpoint

Options ☒ Static ☒ Use phase obs ☒ Estimate tropo ☐ Use GLONASS

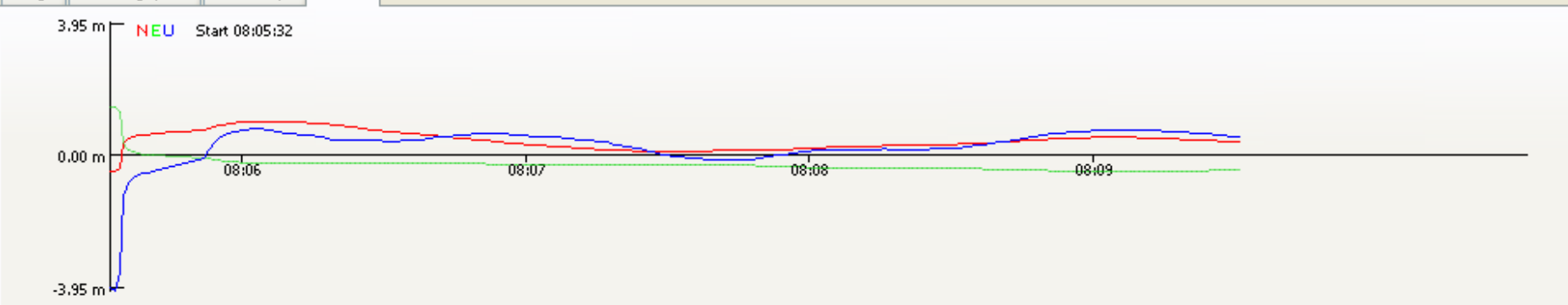
Ref. coordinates X Y Z

NMEA output File (full path) Port

Coordinates from Precise Point Positioning (PPP).

	Streams: resource loader / mountpoint	decoder	lat	long	nmea	ntrip	bytes
1	www.igs-ip.net:2101/CLK10	RTCM_3.0	50.00	10.00	no	1	27.125 kB
2	www.igs-ip.net:2101/MOB50	RTCM_3.0	-37.83	144.98	no	1	66.979 kB
3	www.igs-ip.net:2101/RTCM3EPH	RTCM_3	50.09	8.66	no	1	64.356 kB

Log Throughput Latency **PPP**



Add Stream Delete Stream Start Stop

Help=Shift+F1



Fed
Car

BKG Ntrip Client (BNC) Version 2.0

File Help

Observations RINEX Ephemeris Broadcast Corrections Feed Engine Serial Output Outages Miscellaneous **PPP Client**

Mountpoint:

Options: ☒ Static ☒ Use phase obs ☒ Estimate tropo ☐ Use GLONASS

Ref. coordinates: X Y Z

NMEA File (full path): Port:

Coordinates from Precise Point Positioning (PPP).

	Streams:	resource loader / mountpoint	decoder	lat	long	nmea	ntrip	bytes
1	www.igs-ip.net:2101/ADIS0		RTCM_3.0	9.03	38.74	no	1	435.486 kB
2	www.igs-ip.net:2101/CLK10		RTCM_3.0	50.00	10.00	no	1	200.276 kB
3	www.igs-ip.net:2101/RTCM3EPH		RTCM_3	50.09	8.66	no	1	466.91 kB

Log Throughput Latency **PPP**

Add Stream Delete Stream Start Stop Help=Shift+F1



BKG Ntrip Client (BNC) Version 2.0

File Help

Proxy General RINEX Observations RINEX Ephemeris Broadcast Corrections Feed Engine Serial Output Outages

Logfile (full path)

Append files ☐

Reread configuration

Auto start ☐

General settings for logfile, file handling, configuration on-the-fly, and auto-start.

	Streams:	resource loader / mountpoint	decoder	lat	long	nmea	ntrip	bytes
1		www.igs-ip.net:2101/ADIS0	RTCM_3.0	9.03	38.74	no	1	1.65575 MB
2		www.igs-ip.net:2101/CLK10	RTCM_3.0	50.00	10.00	no	1	793.681 kB
3		www.igs-ip.net:2101/RTCM3EPH	RTCM_3	50.09	8.66	no	1	1.92217 MB

Log Throughput Latency PPP

Start 12:03:41

0.05 m

0.00 m

-0.05 m

13:59 14:00 14:01 14:02 14:03

Add Stream Delete Stream Start Stop Help=Shift+F1

BKG Ntrip Client (BNC) Version 2.0

File Help

Observations RINEX Ephemeris Broadcast Corrections Feed Engine Serial Output

Mountpoint BOGIO

Options ☒ Static ☒ Use phase obs ☒ Estimate tropo ☐ Use GLONASS

Ref. coordinates 3633815.258 X 1397454.204 Y 5035281.209 Z

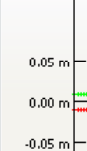
NMEA File (full path) D:/soehne/Realtime/Programme/BNC20A/BOGIA.dat

Coordinates from Precise Point Positioning (PPP).

Streams:		resource loader / mountpoint	decoder	lat	long
1	www.igs-ip.net:2101/BOGIO		RTCM_2.1	52.48	21.04
2	www.igs-ip.net:2101/CLK10		RTCM_3.0	50.00	10.00
3	www.igs-ip.net:2101/RTCM3EPH		RTCM_3	50.09	8.66

Log Throughput Latency PPP

Start 08:44:52



Add Stream Delete Stream Start Stop

Help=Shift+F1

BKG Ntrip Client (BNC) Version 2.0

File Help

Observations RINEX Ephemeris Broadcast Corrections Feed Engine Serial Output Outages Miscellaneous PPP Client

Mountpoint BOGIO

Options ☒ Static ☒ Use phase obs ☒ Estimate tropo ☐ Use GLONASS

Ref. coordinates 3633815.258 X 1397454.204 Y 5035281.209 Z

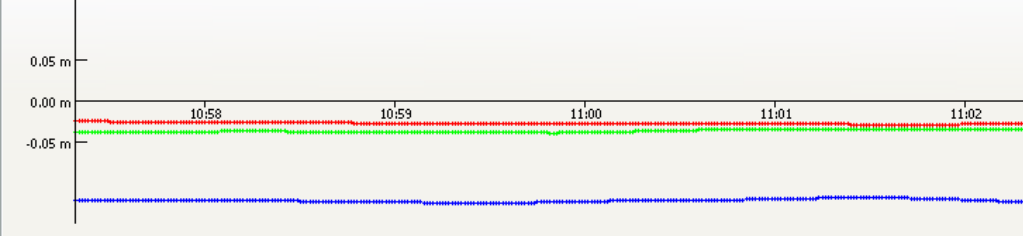
NMEA File (full path) D:/soehne/Realtime/Programme/BNC20B/BOGIB.dat Port

Coordinates from Precise Point Positioning (PPP).

Streams:		resource loader / mountpoint	decoder	lat	long	nmea	ntrip	bytes
1	www.igs-ip.net:2101/BOGIO		RTCM_2.1	52.48	21.04	no	1	3.17306 MB
2	www.igs-ip.net:2101/CLK10		RTCM_3.0	50.00	10.00	no	1	506.285 kB
3	www.igs-ip.net:2101/RTCM3EPH		RTCM_3	50.09	8.66	no	1	1.27605 MB

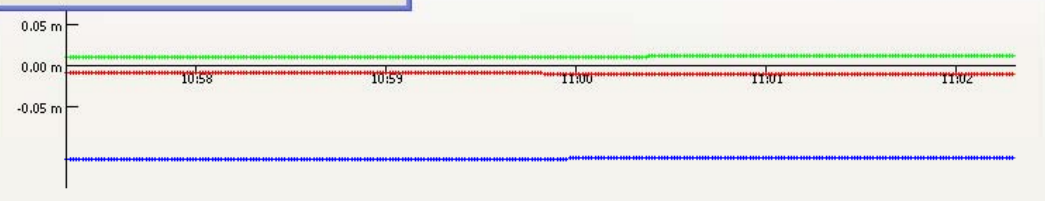
Log Throughput Latency PPP

Start 09:45:12



Add Stream Delete Stream Start Stop

Help=Shift+F1



Add Stream Delete Stream Start Stop

Help=Shift+F1