



Latvian Geospatial
Information Agency

Latvia National Report

GNSS permanent base station division

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Report Outline

- LatPos infrastructure status and plans
- GNSS metrology
- RTK Surveying Guidelines
- LatPos fulfillment Technical Standards.











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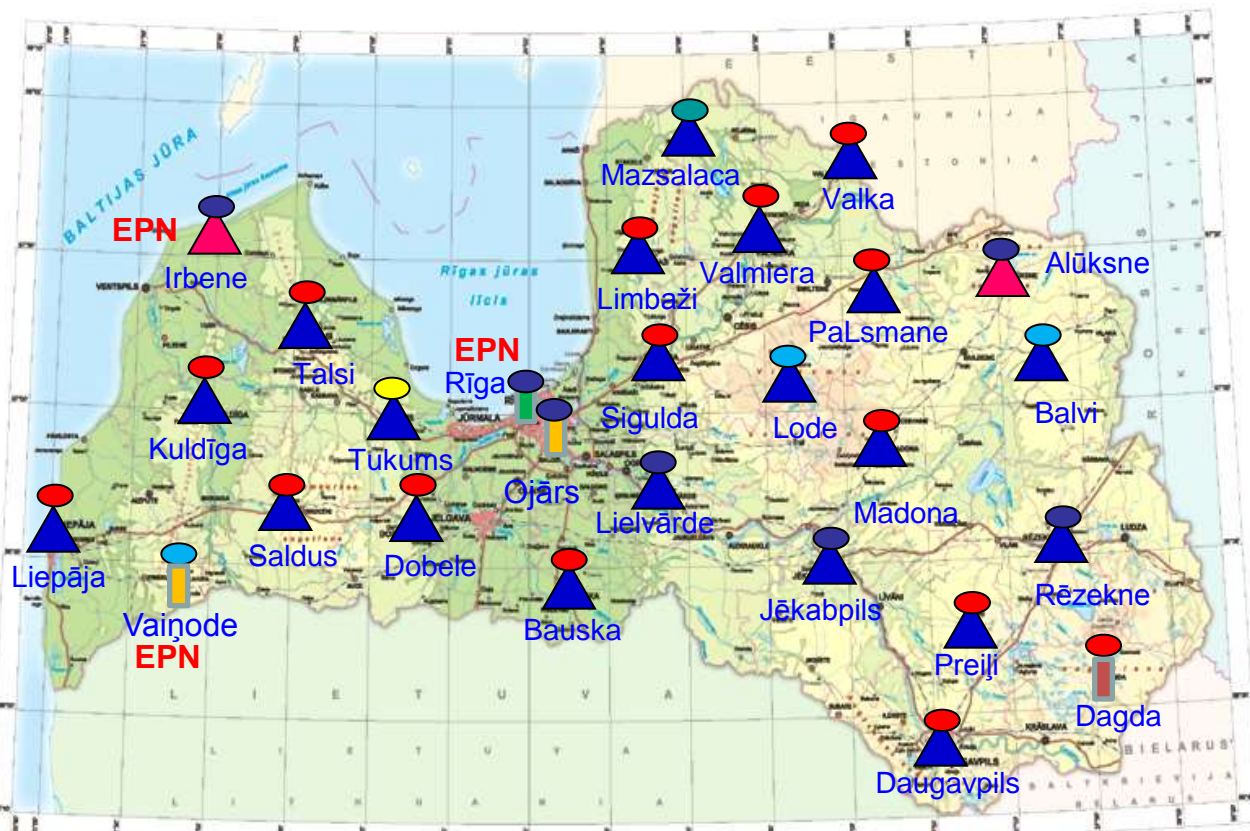
LatPos infrastructure status

Receivers

-  Leica 1200+GNSS (GPS+GLONASS+GALILEO) (2)
-  Leica 1200_GNSS (GPS+GLONASS) (21)
-  Leica GR 10 (2)
-  Leica GR 25 (1)
-  Leica GR 30 (1)

Antenas:

-  AX1202 GG (1)
-  AT504 LEIS (15)
-  AR20 (3) 1 calibrated
-  AR10 (1)
-  AR25 (7) 1 calibrated



LatPos

Base stations 26
+Riga station

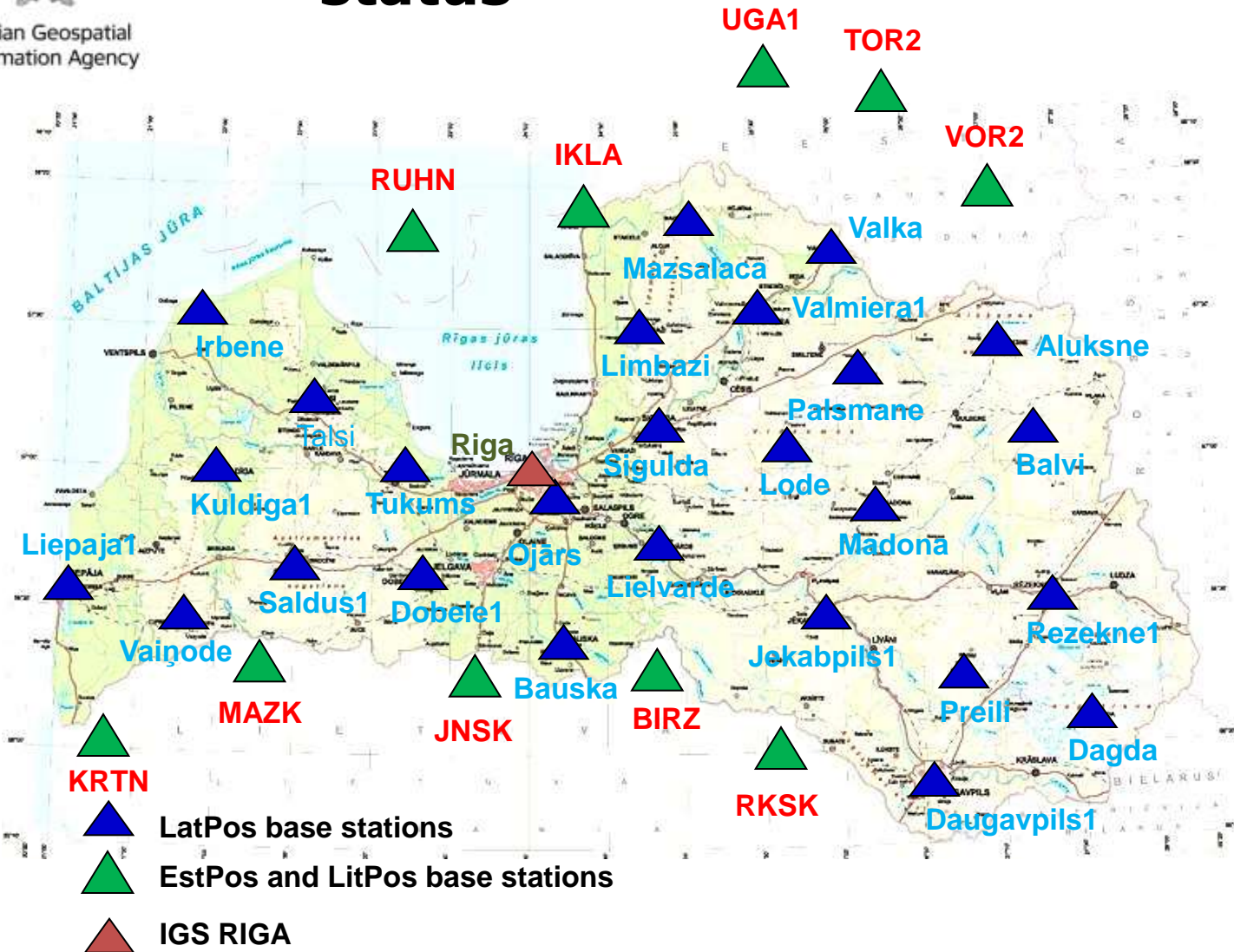
Software

Leica Spider 7.1.



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LatPos infrastructure status

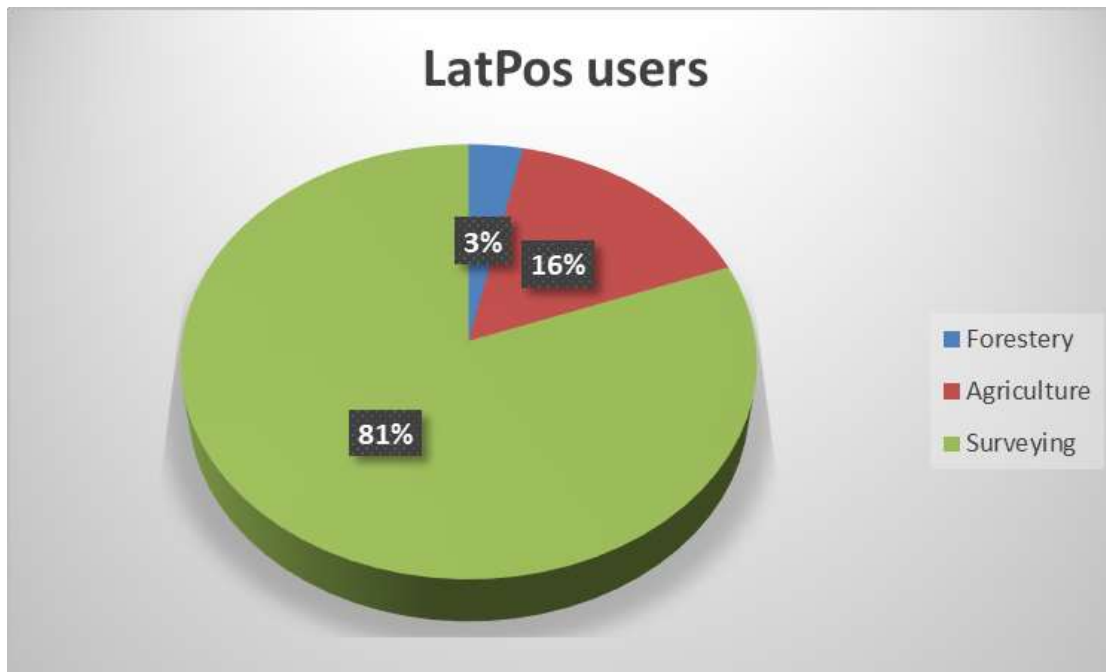




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LatPos infrastructure users

- Total registered 746
- RTK users 529
- Surveyors
- Precise Agriculture
- Forestry





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LatPos infrastructure RTK fees

- Flat rate – **do not hurry!!**
 - Day 19.50 EUR
 - Month 75.04 EUR
 - Year 490.81 EUR
-
- Reduced prices for smaller area
 - All Latvia 100%
 - 12 300 km² 57%
 - 6400 km² 22%





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LatPos infrastructure plans

- Add stations
- Upgrade receivers to 4 GNSS
- Replace antennas with Chockering
- Two independent servers



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GNSS metrology

- 22. **Geodetic works use proven measuring instruments.** The verification of the measuring instruments in accordance with the accuracy requirements specified by the manufacturer shall be carried out at least once a year. Information on measuring instruments used in geodetic works and their inspection documents must be available to the contracting authority and building control institutions.



Leica Geosystems



Leica Geosystems



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RTK Surveying Guidelines

- Under Construction Law
- – Regulations «Geodetic works for construction»
- 5. Measuring instruments and measuring methods
- 21. Measuring instruments used in geodetic works shall be chosen by the performer of geodetic works in accordance with the accuracy requirements specified in the technical task.
- 22. **Geodetic works use proven measuring instruments.** The verification of the measuring instruments in accordance with the accuracy requirements specified by the manufacturer shall be carried out at least once a year. Information on measuring instruments used in geodetic works and their inspection documents must be available to the contracting authority and building control institutions.
- 23. A geodetic worker **chooses** geodetic measurement **methods** that **ensure the accuracy of the measurements required**, eliminate external influences and systematic errors.





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RTK Surveying Guidelines

- Agreement on LatPos data usage
- Simple Rules



8. The geodetic measurements using a GNSS receiver are performed in accordance with the generally adopted technological requirements for global positioning system measurements, which ensure a **direct reception** of the signals transmitted by satellites without any distorting objects (such as trees, buildings, etc.).

9. The length of the geodetic measurement session is selected depending on the required precision and in accordance with the time determined **in the manufacturer's technical requirements** for the specific global positioning receiver. If not provided, the preferable length of the measurement session is selected in accordance with:
- 9.1. Clause 10 of the Terms of Use regarding accumulation of the post-processing data;
 - 9.2. Clause 12 of the Terms of Use regarding the execution of a real-time correction signal reception session.



RTK Surveying Guidelines

- Agreement on LatPos data usage
- Simple Rules

11. In order to receive a real-time correction signal, it is recommended to make measurements **in a single point on at least two separate occasions** with the interval of at least one hour. If the second measurement cannot be performed at least one hour after the first one, it can also be carried out sooner.

12. The minimum requirements for receiving a real-time correction signal to achieve the precision of 2 centimetres in the RTK mode and the precision of 1 meter in the DGPS (*DGPS - Differential Global Position System*) mode are:

12.1. A continuous reception from at least 5 satellites during the entire measurement session;

12.2. PDOP has to be lower than 6;

12.3. An even distribution of satellites with regard to the North-South and East-West directions;

12.4. The height of satellites above the horizon has to be at least 5°;

12.5. The arithmetical mean from **at least 10 measurements** (at least 10 seconds per each point) has to be obtained in the RTK mode. At least 1 measurement to determine the coordinates has to be made in the DGPS mode.

13. The linear error of two independent measurements must not exceed 2 centimetres in the RTK mode and 1 meter in the DGPS mode. If the error is bigger, the points have to be measured repeatedly.



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LatPos fulfillment Technical Standards

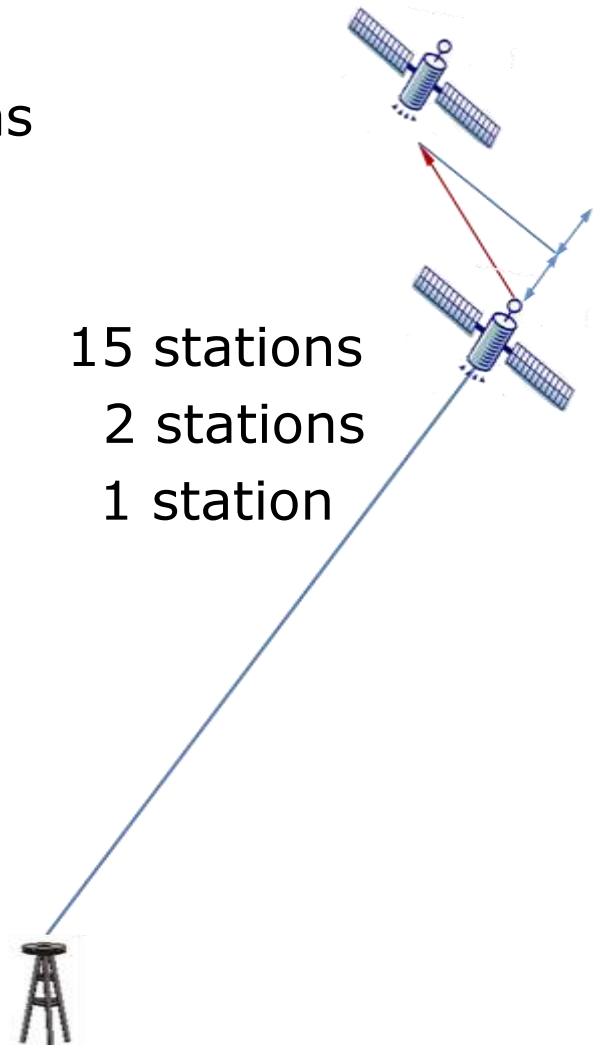
1.1 Global Navigation Satellite Systems

LatPos receives:

- NAVSTAR + GLONASS
- NAVSTAR + GLONASS + GALILEO
- NAVSTAR + GLONASS + BEIDO

- Corrections NAVSTAR + GLONASS

15 stations
2 stations
1 station





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LatPos fulfillment Technical Standards

1.3 EUPOS availability

1.3.1 EUPOS ensures annual system availability of at least 99%, guaranteed by appropriate EUPOS technical and organizational measures.

Site Name	Site Code	Comm Activity	Data Received [%]	GLONASS Tracked	First Epoch	Data Rate	Last Gap	Total no. of Gaps	Max Gap	Age [sec.]	Avrg. Age [sec.]
DOB1	DOB1	receive data	99.9	Yes	17.07.2013 23:48:58	1,000 sec	18.08.2013 16:47:51 [12 ...	190	253 sec. [31.07.2013 15:...	-0.06	-0.14
OJAR	OJAR	receive data	100.0	Yes	17.07.2013 23:47:37	1,000 sec	-	0	-	0.00	-0.10
REZ1	REZ1	receive data	99.9	Yes	17.07.2013 23:48:49	1,000 sec	19.08.2013 09:20:49 [12 ...	278	11576 sec. [19.07.2013 1...	0.02	-0.06
MADO	MADO	receive data	99.9	Yes	17.07.2013 23:48:49	1,000 sec	20.07.2013 13:54:20 [62 ...	11	62 sec. [20.07.2013 13:5...	-0.14	-0.14
TALS	TALS	receive data	100.0	Yes	17.07.2013 23:48:49	1,000 sec	15.08.2013 12:01:42 [15 ...	24	1058 sec. [13.08.2013 15...	-0.14	-0.14
DAU1	DAU1	receive data	99.9	Yes	17.07.2013 23:48:49	1,000 sec	17.08.2013 15:07:43 [27 ...	13	22130 sec. [05.08.2013 0...	-0.06	-0.16
IRBE	IRBE	receive data	100.0	Yes	17.07.2013 23:48:49	1,000 sec	14.08.2013 20:47:04 [30 ...	15	468 sec. [01.08.2013 10:...	-0.16	-0.16
BALV	BALV	receive data	100.0	Yes	17.07.2013 23:48:49	1,000 sec	16.08.2013 20:34:22 [13 ...	19	2317 sec. [13.08.2013 13...	-0.12	-0.14
JEK1	JEK1	receive data	100.0	Yes	17.07.2013 23:48:49	1,000 sec	07.08.2013 02:11:14 [12 ...	104	33284 sec. [21.07.2013 1...	-0.05	-0.16
SIGU	SIGU	receive data	100.0	Yes	17.07.2013 23:48:49	1,000 sec	26.07.2013 23:34:26 [25...	8	254 sec. [26.07.2013 23:...	-0.14	-0.14
LIMB	LIMB	receive data	100.0	Yes	17.07.2013 23:48:49	1,000 sec	20.07.2013 13:31:06 [13 ...	5	30 sec. [20.07.2013 13:0...	-0.11	-0.14
LODE	LODE	receive data	100.0	Yes	17.07.2013 23:48:49	1,000 sec	13.08.2013 06:26:02 [12 ...	57	1190 sec. [28.07.2013 11...	0.01	-0.12
MSLC	MSLC	receive data	99.7	Yes	17.07.2013 23:48:49	1,000 sec	19.08.2013 01:28:20 [10 ...	164	326 sec. [03.08.2013 08:...	-0.11	-0.14
DAGD	DAGD	receive data	100.0	Yes	17.07.2013 23:48:49	1,000 sec	20.07.2013 13:34:02 [17 ...	9	59 sec. [20.07.2013 13:1...	-0.14	-0.14
VAL1	VAL1	receive data	100.0	Yes	17.07.2013 23:48:49	1,000 sec	02.08.2013 09:08:36 [26 ...	6	59 sec. [20.07.2013 13:0...	0.08	-0.14
ALUK	ALUK	receive data	100.0	Yes	17.07.2013 23:48:49	1,000 sec	02.08.2013 20:28:52 [16 ...	13	21 sec. [20.07.2013 13:3...	0.10	-0.13
SLD1	SLD1	connecting	0.0	No	-	0,000 sec	-	0	-	0.00	0.00
PREI	PREI	receive data	100.0	Yes	17.07.2013 23:48:51	1,000 sec	29.07.2013 09:33:41 [13 ...	13	30 sec. [20.07.2013 13:0...	-0.14	-0.10
LIE1	LIE1	receive data	100.0	Yes	17.07.2013 23:48:49	1,000 sec	17.07.2013 23:48:51 [12 ...	1	12 sec. [17.07.2013 23:4...	-0.15	-0.12
KUL1	KUL1	receive data	99.9	Yes	17.07.2013 23:49:03	1,000 sec	14.08.2013 08:00:38 [12 ...	63	253 sec. [30.07.2013 14:...	-0.03	-0.10
PLSM	PLSM	receive data	100.0	Yes	17.07.2013 23:48:49	1,000 sec	17.08.2013 16:40:52 [13...	49	2235 sec. [05.08.2013 09...	-0.04	-0.14
BAUS	BAUS	receive data	100.0	Yes	17.07.2013 23:48:49	1,000 sec	20.07.2013 13:41:01 [17 ...	9	25 sec. [20.07.2013 13:4...	0.10	-0.14
KREI	KREI	receive data	100.0	Yes	17.07.2013 23:47:37	1,000 sec	17.08.2013 18:09:29 [31...]	12	38314 sec. [06.08.2013 0...	-0.10	-0.10
LU__	LU__	receive data	100.0	Yes	17.07.2013 23:47:37	1,000 sec	17.08.2013 00:19:11 [40...	5	21755 sec. [31.07.2013 1...	-0.09	-0.06
VAN_	VAN_	receive data	100.0	Yes	17.07.2013 23:47:37	1,000 sec	17.08.2013 00:19:10 [42...	6	21696 sec. [31.07.2013 1...	-0.10	-0.05
VAIV	VAIV	receive data	99.9	Yes	17.07.2013 23:47:37	1,000 sec	19.08.2013 10:39:57 [72 ...	22	21696 sec. [31.07.2013 1...	-0.10	-0.09
SAL_	SAL_	receive data	99.9	Yes	17.07.2013 23:47:37	1,000 sec	19.08.2013 10:39:57 [74 ...	85	21696 sec. [31.07.2013 1...	0.03	-0.14
LVRD	LVRD	receive data	100.0	Yes	17.07.2013 23:48:49	1,000 sec	16.08.2013 19:01:59 [14 ...	12	18635 sec. [22.07.2013 1...	-0.16	-0.16
RIGA	RIGA	receive data	100.0	No	17.07.2013 23:48:49	1,000 sec	16.08.2013 19:05:31 [15 ...	9	279 sec. [01.08.2013 01:...	-0.18	-0.11
TKMS	TKMS	receive data	99.9	Yes	17.07.2013 23:48:49	1,000 sec	30.07.2013 14:17:23 [16...	19	349 sec. [30.07.2013 12:...	-0.06	-0.15
Birza	BIRZ	receive data	100.0	No	18.07.2013 00:12:52	1,000 sec	16.08.2013 14:46:38 [44 ...	35	1500 sec. [18.07.2013 01...	0.23	0.00
Rokiskis	RKSK	receive data	100.0	No	18.07.2013 00:12:52	1,000 sec	16.08.2013 14:46:38 [47 ...	31	1499 sec. [18.07.2013 01...	0.13	0.01
Dukstas	DKST	receive data	100.0	No	18.07.2013 01:37:34	1,000 sec	16.08.2013 14:46:38 [47 ...	423	16289 sec. [23.07.2013 0...	0.14	0.03
Kretinga	KRTN	receive data	100.0	No	18.07.2013 00:12:52	1,000 sec	16.08.2013 14:46:38 [47 ...	28	1499 sec. [18.07.2013 01...	0.02	0.11
Mazeikiai	MAZK	receive data	99.9	No	18.07.2013 03:12:17	1,000 sec	16.08.2013 14:46:38 [44 ...	49	336 sec. [13.08.2013 04:...	0.04	0.02
Joniski	JNSK	receive data	99.9	No	18.07.2013 00:12:52	1,000 sec	18.08.2013 20:07:19 [14 ...	30	1499 sec. [18.07.2013 01...	0.23	0.00



LatPos fulfillment Technical Standards

- Services over internet and GPRS:

		Rating	Action
1	Data flow format RTCM 3.1	Latest format	Meets requirements
2	Correction type – SITE	Nearest station solution	Meets requirements
3	Correction type – MAC – NETW_MAX	Network solution	Meets requirements
4	Correction type – iMAC – NETW-iMAX	Network solution	Meets requirements
5.	VIRTUAL - RS	Network solution	
6.	Correction type for agriculture CMR+	For Trimble agriculture GNSS receivers.	Meets requirements

Requirement.	Rating	Action
3.3. Distribution data security technological solution	Data distribution using NTRIP, WEB and FTP	Meets requirements
3.4. Real-time monitoring base station	Not installed	2 monitoring stations required
3.5. Data quality monitoring using post-processing	Leica Spider software data completeness checking	Meets requirements
3.6. Post-processing data format	RINEX 2.11 RINEX 3.x ready	Meets requirements



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LatPos fulfillment Technical Standards

3.1 National EUPOS reference station system

- Network density 75 – 100 km
- neighbouring country stations – connected.
- NTRIP caster
- Post processing data HTTP, FTP
- **At least two physical EUPOS monitoring stations – NOT established**



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3.2 EUPOS reference station

- Geodetic receivers
- **Lightning surge protection on the antenna cable – not installed – not infrastructure**
- UPS – for two days uptime
- the horizon at the location of GNSS antenna is free - all stations on roofs
- Coordinates are determined in national system
- **No Antenna calibration**
- All stations with DOMES numbers
- All equipment in metal safe



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LatPos fulfillment Technical Standards

- Receivers
- Antenas



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Thank You for Your attention!