



Leica Spider Software

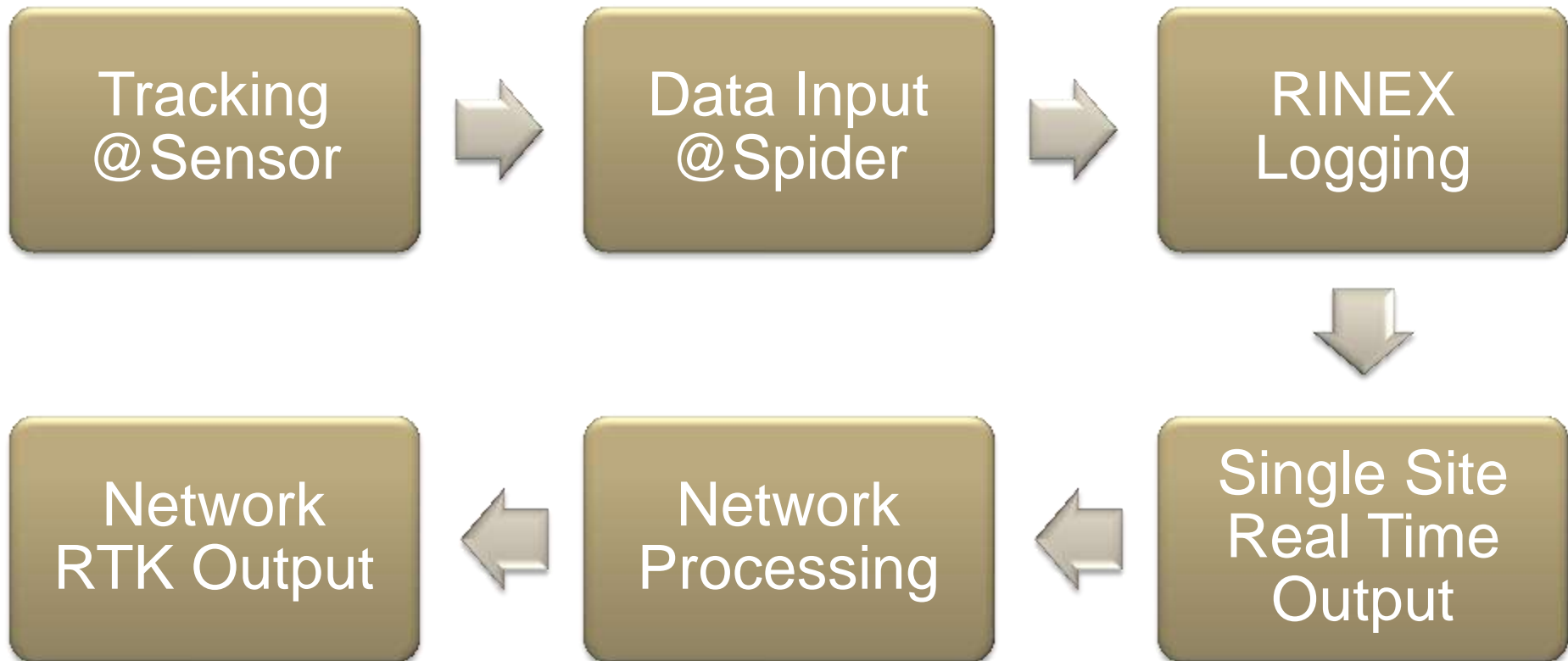
The all in one solution for
GNSS networks and
monitoring projects

Spider Software Suite

G4 Network RTK with Galileo and BeiDou

GNSS Signals

Spider Signals Processing Chain



Data Input in GNSS Spider

Galileo, BeiDou and QZSS



- **Supported as data input for observations**
 - Active Leica receivers
 - Passive LB2 streams
 - Passive RTCM 3.x (Extended), i.e. MSM4, MSM5
- **Supported as data input for ephemeris**
 - Active Leica receivers
 - Passive LB2 streams

Data Input in GNSS Spider

Active Receivers



Tracking settings for active receivers ... simplified

General

Power AutoOn:

Delay on tuning sensor off: s

Tracking:

Elevation mask:

Code smoothing:

Satellite System:

Frequencies:

GPS L2 tracking:

Use Doppler:



General

Power AutoOn:

Delay on tuning sensor off: s

Tracking:

Elevation mask:

Code smoothing:

Enabled satellite systems: GPS GLO GAL
 BDS QZSS

Site Name	Site Code	Power AutoOn	Elevation Mask	Code Smoothing	GPS	GLO	GAL	BDS	QZSS
GR25_129 (REFD)	0129	ExtPowerLow/PowerFail	0	Smoothed	L1/L2P(Y)/L2C/L5	L1/L2P/L2C	E1/E5a/E5b/E5ab	B1/B2/-	-/-/-
GR10_140 (REFC)	GR10	ExtPowerLow/PowerFail	0	Not smoothed	L1/L2P(Y)/L2C/L5	L1/L2P/L2C	E1/E5a/E5b/E5ab	-/-/-	-/-/-
System 1200 ME3	1200	ExtPowerLow/PowerFail	0	Not smoothed	L1/L2P(Y)/-/-	L1/L2P/-	-/-/-/-	-/-/-	-/-/-
System 1200 ME2	REFD	ExtPowerLow/PowerFail	10	Smoothed	L1/L2P(Y)/-/-	-/-/-	-/-/-/-	-/-/-	-/-/-
System 500	S500	ExtPowerLow/PowerFail	10	-	L1/L2P(Y)/-/-	-/-/-	-/-/-/-	-/-/-	-/-/-

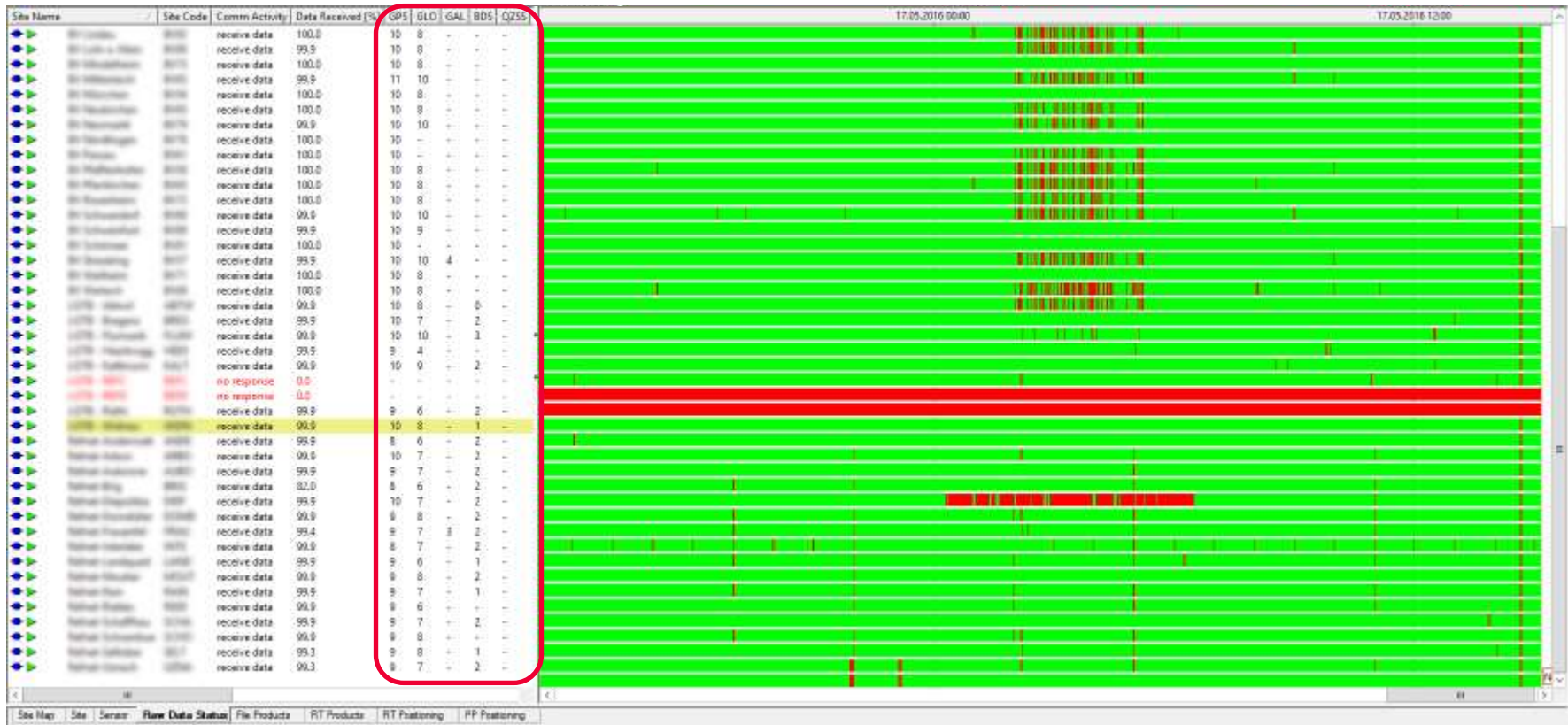
- when it has to be **right**

Data Input in GNSS Spider

Visualization of Data Input



Raw Data Status Tab ... simplified and extended

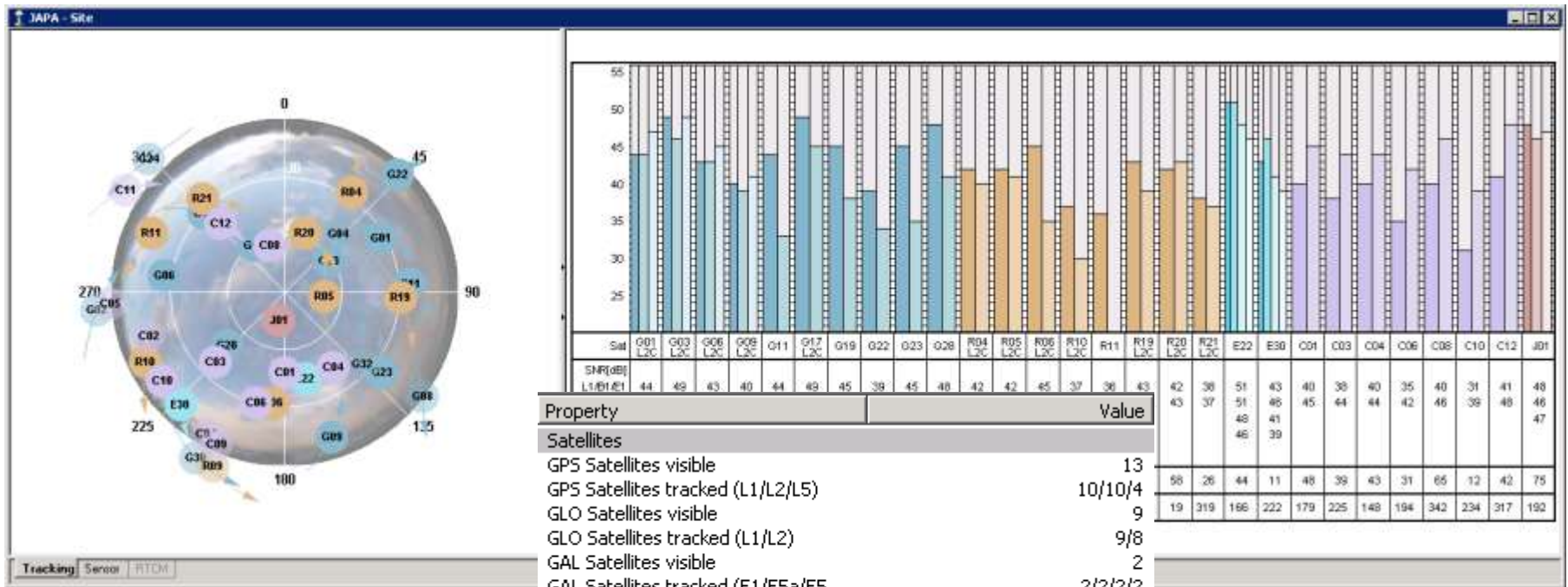


Data Input in GNSS Spider

Visualization of Data Input



Site Window showing 5 constellations



Network Processing

Processing Kernel Facts



Key benefits of Leica GNSS Spider

- No external information required
- Processes independently on local host
- Mixed manufacturer receivers can be processed

Processing load increases with additional constellations

- Current Galileo constellation: +30%
- Full Galileo constellation: +50%

... compared to GPS & GLONASS processing

Network Processing

Licensing



License Option Requirements

- **BeiDou:** 812422 “Spider Network RTK BeiDou option”
- **Galileo:** 812423 “Spider Network RTK Galileo option”
- **QZSS:** no additional license

Extends existing GPS & GLONASS capabilities

Network Processing

5-GNSS Network Visualization



Contents	Site ...	Cluster/C...	Fixed...	GPS	GLO	GAL	BDS	QZSS	Last Up...	G10	G12	G13	G15	G17	G18	G19	G20	G24	G28	R04	R05	R06	R14	R15	R16	R23	R24	E02	E08	E12	E24	C05	C08	C13	C14	
Network	BREG	LGTB-CH	22 / 23	9 / 9	6 / 7	4 / 4	3 / 3	-	11:20:17																											
Clusters	BV92	LGTB-CH	15 / 16	9 / 9	6 / 7	-	-	-	11:20:29																											
LGTB-CH	KALT	LGTB-CH	22 / 24	9 / 9	7 / 8	4 / 4	2 / 3	-	11:20:20																											
Cells	ABTW	LGTB-CH	24 / 25	9 / 9	7 / 8	4 / 4	4 / 4	-	11:20:15																											
	FLUM	LGTB-CH	22 / 23	9 / 9	6 / 7	3 / 3	4 / 4	-	11:19:55																											
	RUTH	LGTB-CH	16 / 23	5 / 9	5 / 6	3 / 4	4 / 4	-	11:19:15																											
	FRAU	LGTB-CH	24 / 25	9 / 9	7 / 8	4 / 4	4 / 4	-	11:19:34																											
	RAIN	LGTB-CH	24 / 25	9 / 9	7 / 8	4 / 4	4 / 4	-	11:18:35																											
	SCHA	LGTB-CH	24 / 25	9 / 9	7 / 8	4 / 4	4 / 4	-	11:19:34																											
	WIDN	LGTB-CH	23 / 24	9 / 9	7 / 8	4 / 4	3 / 3	-	11:20:37																											
	ANDE	LGTB-CH	22 / 23	8 / 8	7 / 7	4 / 4	3 / 4	-	11:19:55																											
	AUBO	LGTB-CH	19 / 23	9 / 9	7 / 8	3 / 3	0 / 3	-	11:20:15																											
	BRIG	LGTB-CH	-	-	-	-	-	-	-																											
	DOMD	LGTB-CH	25 / 25	9 / 9	8 / 8	4 / 4	4 / 4	-	11:20:12																											
	INTE	LGTB-CH	-	-	-	-	-	-	-																											
	MOUT	LGTB-CH	25 / 25	9 / 9	8 / 8	4 / 4	4 / 4	-	11:19:28																											
	RIDD	LGTB-CH	15 / 15	9 / 9	6 / 6	-	-	-	11:19:15																											
	SCHO	LGTB-CH	20 / 21	9 / 9	8 / 8	3 / 3	0 / 1	-	11:19:14																											
	SELT	LGTB-CH	24 / 26	9 / ...	8 / 8	4 / 4	3 / 4	-	11:20:33																											
	LAND	LGTB-CH	24 / 24	9 / 9	7 / 7	4 / 4	4 / 4	-	11:17:51																											

Net Config RT Products Map View Rover Status **Sat Status** Sat History

Sat Status: Current processing

Network Processing

5-GNSS Network Visualization



New Toolbar



Sat History: Processing over time



Network RTK Output

Multi-GNSS Real-Time Output

Galileo, BeiDou, QZSS and GPS-L5 Support for Network Server Real-Time Products

- Single Site, i-MAX, Virtual RS
- RTCM 3.2 with MSM4 and MSM5
- Observations only
- Flexible constellation selection
- MAC and FKP not yet standardized

The screenshot shows the configuration interface for the Network Server, specifically the 'Messages' tab. The 'Satellite system' section is highlighted with a red box, indicating the selection of satellite systems. The 'Messages' section includes the following settings:

- Message type: i-MAX RTCM 3x (MSM4)
- RTCM version: 3x
- End of message: Nothing
- Target Coordinate System: None
- Satellite system: GPS GLO GAL BDS QZSS
- Code Smoothing: [Dropdown]
- Send NULLANTENNA
- Emulate Leica receiver

G4 Rover Positioning

Leica Investigation



Detailed Case Study

- Real Life data (Constellation, Purchasable Products)
- 3 Cases (Open Sky, Multipath, Canopy)

References:

- The Benefits of Galileo for High-Precision RTK, X. Luo, J. Chen, B. Richter, F. Takac, ENC 2017
- <http://gpsworld.com/how-galileo-benefits-high-precision-rtk>





G4 Rover Positioning

Summary of Leica Investigations

- **Under open sky conditions**
 - On average 3 Galileo satellites used for positioning
 - Improved precision, particularly over long baselines
- **Under multipath conditions**
 - Reduced time to fix
 - Higher accuracy and reliability (2D and 1D)
- **Under canopy conditions**
 - Higher availability without degrading reliability
 - Improved accuracy, particularly for height (1D)



Post-Processing Services

Web Portal Services

- Galileo and BeiDou support via RINEX v3
- **Provided Services**
 - RINEX Download Service
 - Online Coordinate Computation Service
- **Combined with major modernization**
 - Services included in common SBC portal

Post-Processing Services

RINEX Download – Requests & Results



The screenshot displays the Leica Business Center interface for RINEX Data. It features a map of a region with several points marked. A table on the right lists selected data requests, and a 'RINEX Data Preview' window is open in the foreground.

RINEX Data Preview
Requested by Markus Roland on 2017-09-11 17:48:31

Time Period: 2017-09-11 8:00	Duration: 01:00 h
Sites: KALT, FLUM, RUTH CB	12 Files, 7.54 MB
#1 kalt254g00.rnx.zip, 582.96 kb ✓ 2017-09-11 08:00 - 08:15	KALT (75601L001), GPS, GLONASS, Galileo, BeiDou 47° 12' 31" N, 9° 01' 54" E, 487.0m
#2 kalt254g15.rnx.zip, 544.06 kb ✓ 2017-09-11 08:15 - 08:30	KALT (75601L001), GPS, GLONASS, Galileo, BeiDou 47° 12' 31" N, 9° 01' 54" E, 487.0m
#3 kalt254g30.rnx.zip, 574.42 kb ✓ 2017-09-11 08:30 - 08:45	KALT (75601L001), GPS, GLONASS, Galileo, BeiDou 47° 12' 31" N, 9° 01' 54" E, 487.0m
#4 kalt254g45.rnx.zip, 543.85 kb ✓ 2017-09-11 08:45 - 09:00	KALT (75601L001), GPS, GLONASS, Galileo, BeiDou 47° 12' 31" N, 9° 01' 54" E, 487.0m
#5 flum254g00.rnx.zip, 744.14 kb ✓ 2017-09-11 08:00 - 08:15	FLUM (75609L001), GPS, GLONASS, Galileo, BeiDou 47° 04' 26" N, 9° 16' 05" E, 2004.7m
#6 flum254g15.rnx.zip, 721.23 kb ✓ 2017-09-11 08:15 - 08:30	FLUM (75609L001), GPS, GLONASS, Galileo, BeiDou 47° 04' 26" N, 9° 16' 05" E, 2004.7m
#7 flum254g30.rnx.zip, 720.12 kb ✓ 2017-09-11 08:30 - 08:45	FLUM (75609L001), GPS, GLONASS, Galileo, BeiDou 47° 04' 26" N, 9° 16' 05" E, 2004.7m
#8 flum254g45.rnx.zip, 715.02 kb ✓ 2017-09-11 08:45 - 09:00	FLUM (75609L001), GPS, GLONASS, Galileo, BeiDou 47° 04' 26" N, 9° 16' 05" E, 2004.7m
#9 ruth254g00.rnx.zip, 595.58 kb ✓	RUTH (75607L001), GPS, GLONASS, Galileo, BeiDou

- when it has to be right

Post-Processing Services

RINEX Download – Requests & Results



The screenshot shows the Spider Business Center interface. The main content area is titled "Results" and is divided into two sections: "RINEX Data Results" and "Coordinate Computation Results".

RINEX Data Results	Coordinate Computation Results
1. Date of Request: 2017-05-11 17:49 Sites: RALT, PLUM, NUTH (3)	Requested Start Time: 2017-05-11 08:00 Duration: 01:00:00, 12 Files (7.5 MB)
2. Date of Request: 2017-05-07 09:59 Sites: HEEB (1)	Requested Start Time: 2017-05-06 10:00 Duration: 01:00:00, 4 Files (1.4 MB)

Each row in the table has a "Download All" button on the right side. A pagination control shows "1" in a blue box, indicating the first page of results.

- Immediately available – no waiting
- One-Click download

Post-Processing Services

GNSS Post-Processing – Requests & Results



Home / Post Processing / Computation

Computation

By uploading rover files and clicking on "Process", precise coordinates will be computed and delivered in the selected target coordinate system. Maximum distance from rover to reference station is 50 km. Maximum upload size is 150 mb.

Add Rover Data ¹ Target System: utm32 (CH) ²

Selected: 28 Markers, 1 Files (3.48 MB)

Process

<input checked="" type="checkbox"/>	02400800_17e 3 MB	<input type="checkbox"/>	0240321_14132400 - ...
<input type="checkbox"/>	Stop and Go	<input type="checkbox"/>	GS0001 - GS0001
<input type="checkbox"/>	LEIGS16 NONE	<input type="checkbox"/>	GS0002 - GS0002
<input type="checkbox"/>	LEICA GS16	<input type="checkbox"/>	GS0003 - GS0003
<input type="checkbox"/>	2017-03-21 14:13:24 (GPS)	<input type="checkbox"/>	GS0004 - GS0004
		<input type="checkbox"/>	GS0005 - GS0005
		<input type="checkbox"/>	GS0006 - GS0006

Lat: 48° 05' 05" Lon: 10° 07' 28"

Post-Processing Services

GNSS Post-Processing – Requests & Results



Results

RINEX Data Results

Coordinate Computation Results

59. Processed at **2017-05-02 15:08:56**

1 File(s), 27 Point(s)



[Show File Details](#)

Full Report

Point	Observation Time	Local Grid (E,N,h,H) (UTM32 (CH))	WGS84 Geodetic	Quality	
GS0001	2017-03-21 15:13:50, <1 min	546564.9627 m ± 0.0286 m 5250778.4963 m ± 0.0340 m 451.5086 m ± 0.0141 m -	47° 24' 31.6692" ± 0.0286 m 9° 37' 1.9740" ± 0.0340 m 451.5086 m ± 0.0141 m	0.0466 m Phase Fixed	
GS0002	2017-03-21 15:14:45, <1 min	546526.5382 m ± 0.0058 m 5250764.6195 m ± 0.0051 m 451.5597 m ± 0.0087 m -	47° 24' 31.2300" ± 0.0058 m 9° 37' 0.1344" ± 0.0051 m 451.5597 m ± 0.0087 m	0.0116 m Phase Fixed	

Post-Processing Services

GNSS Post-Processing – Requests & Results



Request:

- RINEX v2, v3
- Static, Stop&Go, Kinematic
- Re-occupation
- Data Validation

Results:

- WGS84 (Geodetic, Cartesian)
- Local grid coordinates
- Full stochastics
- Reports in HTML and PDF
- Down to baseline level
- Trajectory (Map, CSV, KML)

Post-Processing Services

GNSS Post-Processing – Report



GNSS Processing Report - Summary
 Point Results
 @ REFID

GNSS Processing Report - Summary

Request Details

General

Processed at: 2017-09-11 18:28:40
SBC version: 7.0.0.396

User Details

User name: rmarliu
Name: Markus Roland
Company: Leica Geosystems
Email: markus.roland@leica-geosystems.com

Point Results

Point ID	Solution Type	Occupations / Baselines	WGS84 Latitude	WGS84 Longitude	WGS84 Ellip. Height (m)	SD Latitude	SD Longitude	SD Height
REFD	Phase Fixed	1/4	47° 24' 32.4252"	9° 37' 3.1404"	472.1613 m	0.0049 m	0.0021 m	0.0048 m

Point ID	Solution Type	Occupations / Baselines	WGS84 Cartesian X	WGS84 Cartesian Y	WGS84 Cartesian Z	SD X	SD Y	SD Z
REFD	Phase Fixed	1/4	4263858.1453 m	722520.2571 m	4673004.7904 m	0.0048 m	0.0023 m	0.0049 m

REFD - 2017-09-11 11:59:42

Point Occupation Results

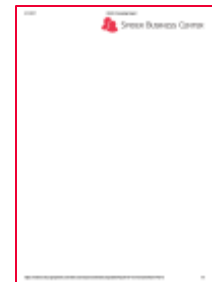
Marker Name:	REFD	Receiver Type / SN:	LEIAR10 NONE /
		Antenna Type / SN:	LEICA GAX1200GGPRO / 356538
Occupation Start:	2017-09-11 11:59:42	Occupation End:	2017-09-11 12:59:40

Averaged Point Summary: REFD

Weighted Average:	Yes		
WGS84 Latitude:	47° 24' 32.4252"	SD Latitude:	0.0049 m
WGS84 Longitude:	9° 37' 3.1404"	SD Longitude:	0.0021 m
WGS84 Ellip. Height:	472.1613 m	SD Height:	0.0048 m
WGS84 Cartesian X:	4263858.1453 m	SD X:	0.0048 m
WGS84 Cartesian Y:	722520.2571 m	SD Y:	0.0023 m
WGS84 Cartesian Z:	4673004.7904 m	SD Z:	0.0049 m
Easting:	-	SD Easting:	-
Northing:	-	SD Northing:	-
Ellip. Height:	-	SD Height:	-
Ortho. Height:	-		

Baseline Summary REFD

Point ID	Reference	Baseline Length (m)	3D QC (m)	ΔX	ΔY	ΔZ	X	Y	Z



PDF

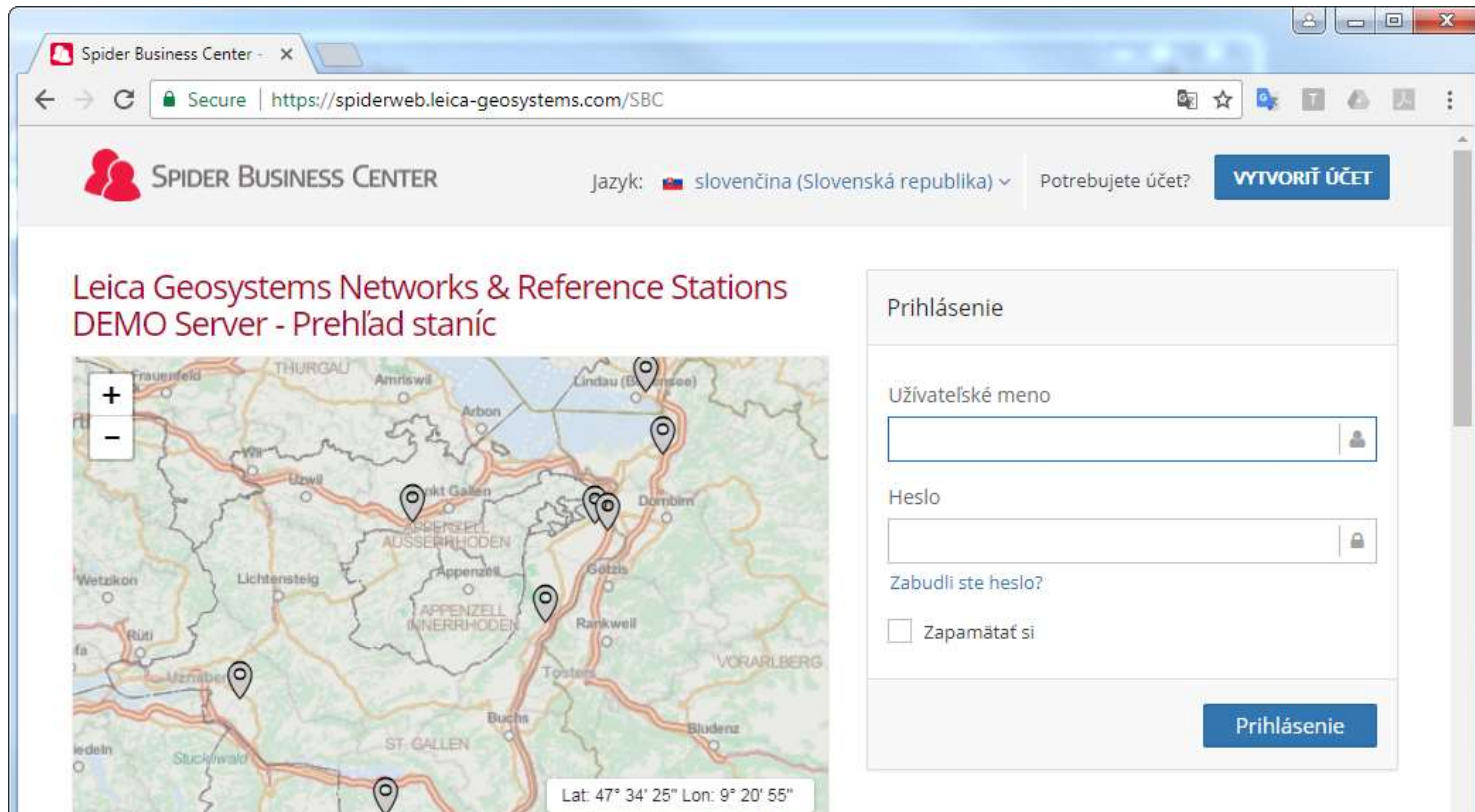
- when it has to be right



Post-Processing Services Web Portal Services



Try it out yourself <https://spiderweb.leica-geosystems.com/SBC>





THANK YOU FOR YOUR ATTENTION!

The best answers combine the smartest solutions

The Leica Spider family of products provide all you need for smart solutions. From single base stations to comprehensive infrastructure RTK networks.



GNSS Networks and Reference Stations **Smart Solutions from Leica Geosystems**