



HERSTMONCEUX CO-LOCATION SURVEY



Reports and results

Surveyed on June 2008
Reported on August 2008



Institut Géographique National
Direction de la Production
Service de géodésie et Nivellement

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Introduction

The ITRF is the result of a combination of the different terrestrial reference frames provided by the four main space geodesy techniques GPS, VLBI, SLR and DORIS. To perform this combination between independent reference frames, it is necessary to have some co-location sites where the various techniques are observing and whose ties have been surveyed in three dimensions. Many co-location sites have been identified and some of them have missing or inconsistent ties.

In this frame of work, it has been decided by Doctor Zuheir Altamimi in charge of the IERS realization at IGN, to survey the Herstmonceux co-location site (United Kingdom) as a matter of priority. Indeed, this site possesses two different space geodesy techniques and the ties between the two GPS antennas and the Laser Ranging Station were dubious.

This document presents the Herstmonceux local tie survey which took place in june 2008, from the observations on site to the computation, with as many details as necessary to fully understand what the resulting SINEX file means.

Acknowledgements

We would like to express our thanks to Mister David Benham and all the team working on the Laser and GPS stations, with a special thanks to Doctor Graham Appleby. Their very nice welcome, their cooperative work on a technical and administrative point of view contributed for a great part to the success of this work.

Thanks also for all the “extras” which made us really enjoy our stay in Herstmonceux.

1. Co-location site description

The Herstmonceux co-location site is located near Hailsham in East Sussex, about 80 km south south east of London, in the grounds of the International Study Centre (ISC) and at the Monks Wood site of NERC's Centre for Ecology and Hydrology (CEH).



On this geodetic site, there is a Satellite Laser Ranging (SLR) station. This is « HERL », a 50 cm aperture telescope. The importance of the site is complemented by the co-location of two IGS permanently operating Global Navigation Satellite System receivers. These are « HERT » (GPS/GLONASS) and « HERS » (GPS) which are about 136 m apart.

The HERL-HERS vector (≈ 12 m) had already been measured in the 90's and checked in 2002, but the HERL-HERT vector (≈ 100 m) remained unmeasured. Furthermore, there was a suspicion of a problem at the several mm level on the HERL-HERS vector.

2. ITRF space geodesy techniques

2.1. SLR station

HERL	DOMES number 13212S001
	
Global view	Detail view
Description : intersection of the Azimuth and Elevation rotation axes	

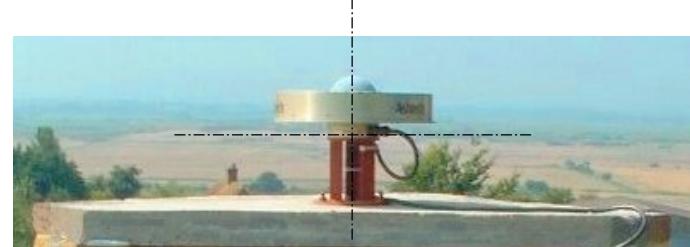
The SLR measurements refer to a point in the telescope where the two rotation axes intersect. Of course, this System Reference Point (SRP) can't be materialized. The piercing point of the horizontal axis (elevation rotation axis) is materialised by a sharp metal piece of 0.0127 m (0.50 inch) in diameter.



The site log is presented in Annex 6.1.

2.2. HERs and HERT IGS stations

HERS	DOMES number 13212M007
	 Detail view
Global view Description : the reference point is 0.0096 m under the ARP.	

HERT (on top of the water tower)	DOMES number 13212M010
	 Detail view
Global view Description : the reference point is the top and centre of the antenna mounting plate.	

The site logs are presented in annex 6.2 and 6.3.

2.3. Other points of interest

2.3.1. Solar pilar

The concrete Solar pilar in the middle of the work was also used. As the screw centred in the black plate was loose, we have not removed the tribrach during all the survey. The use of the four heavy tripods, the translation stage and this pilar ensured a very good stability for six points of our survey network.



2.3.2. SLR calibration target

For his calibration, the SLR shoots on targets. The purpose was also to determine the distance between HERL and the main target located on the water tower. This target is made of two mirror plates (see § 8 of the HERL site log).

The calculated distance from our observations will be published later in a special report.



3. Survey description

3.1. Organisation

The local ties survey of Herstmonceux co-location site has been carried out by Gérald Mathey and Jean-Claude Poyard, with the useful help from the SLR's team. They're both with the « Service de Géodésie et Nivellement » (SGN) of Institut Géographique National (IGN) and mainly deal with metrology and micro-geodesy.

The survey took place from the 23rd to the 26th of June. The weather conditions were ideal during the survey. This was particularly important for our observations on the SLR since this instrument has to be protected from rain or humidity by closing the domed roof. This good weather allowed us to achieve most of the work within two days.

No SLR observations were planned during these days so that we could leave our translation stage in place.

A scaffolding had been erected around the HERL steel mast for a very safe and convenient access.

3.2. Equipment

All the topometric survey instruments and equipments belong to IGN and had been temporarily imported for the purpose of the survey.

3.2.1. Instruments

Two Leica tacheometers (TC2002 and TDA5005) were used for this work. These instruments, which are regularly calibrated by IGN's calibration unit, were associated with six Leica accurate prisms. They have a standard deviation of 0.15 mgon for horizontal and vertical angles and 1 mm + 1 ppm for distances.

The altimetric observations were performed with a Leica electronic level (NA3003) linked with invar bar code levelling rods. This equipment, also regularly calibrated, has a resolution of 0.01 mm.

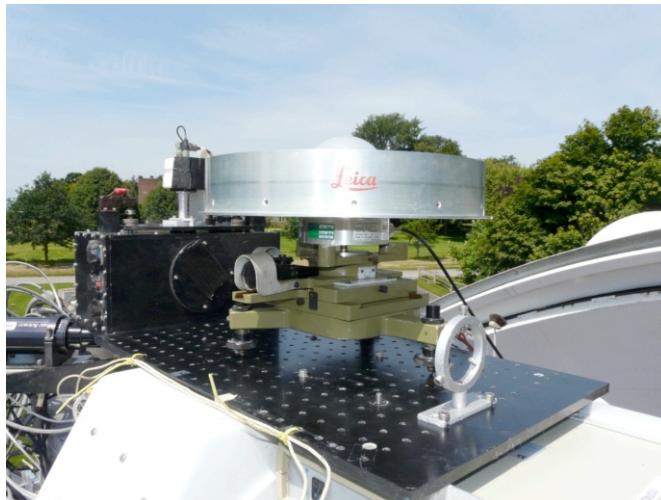
Finally, the GPS observations were done with Leica SR530 receivers and Leica AT504 choke ring antennas.

All these instruments allowed the observations to be recorded electronically on PCMCIA cards or REC modules and were then downloaded to a laptop PC for processing.

3.2.2. Equipment and accessories

Several very useful accessories have been also brought for this kind of field work, among which :

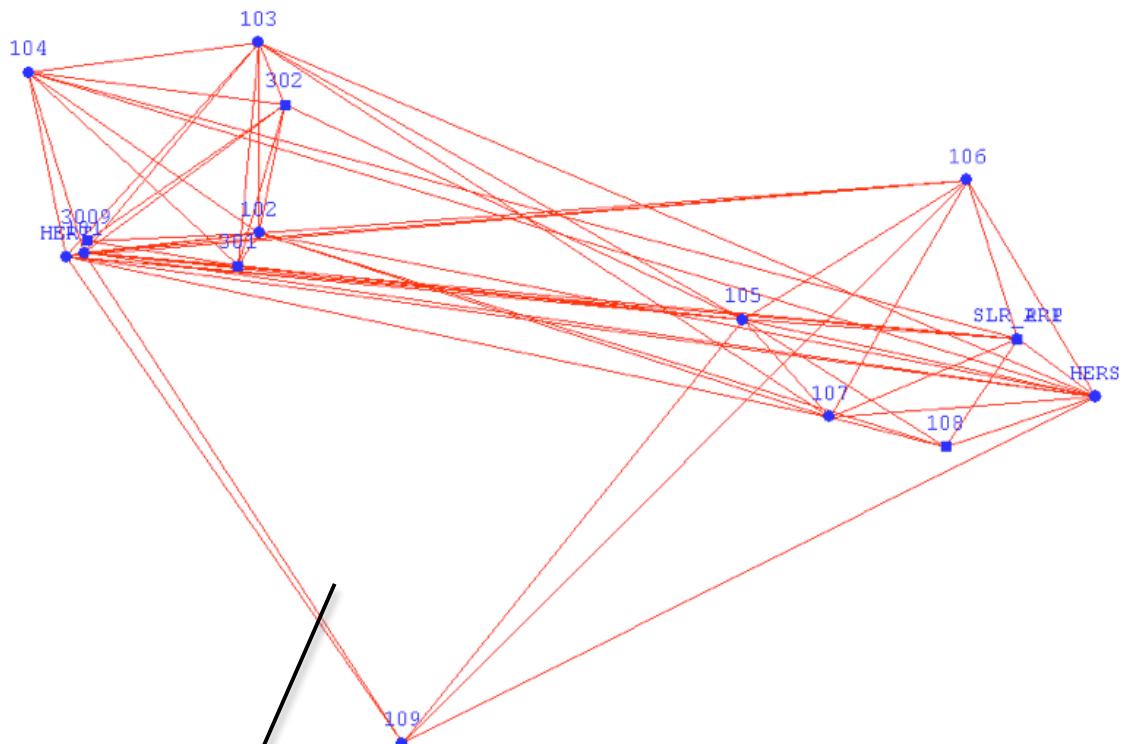
- heavy tripods, in order to ensure the stability of temporary stations
- a translation stage in order to centre a target on the telescope rotation axis (see picture hereafter)



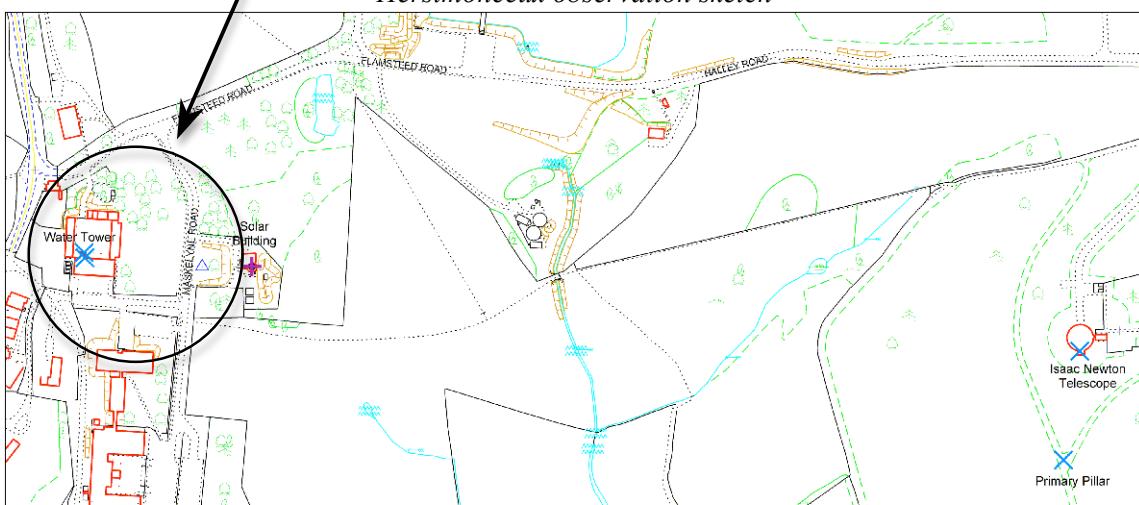
- 0.5 m, 1.8 m and 3.0 m long invar staffs that are all calibrated and associated to each other
- calibrated trefoil targets and prisms
- regularly calibrated tribrachs

3.3. Herstmonceux observations polygon

All the survey was conducted in order to provide the highest accuracy in the determination of the 3D vectors between the observing instruments. During the survey, we were faced with two difficulties. The first one was to place our stations between trees and buildings so that they could intersect as many points as possible and be directly visible from each other. The worst issue was how to carry out the levelling. As the levelling was hard to manage, the strategy has been to mix GPS and conventional observations.



Herstmonceux observation sketch



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3.4. Survey method

All the visible lines of sight have been observed with the tacheometers. Horizontal directions and zenith angles were observed in data sets, each set consisting in one reading in both direct and reverse theodolite positions. Any observed angle was rejected if the difference between the two measurements was greater than 1.5 mgon. Distance measurements were observed over each line once in both direct and reverse positions. Meteorological data (atmospheric pressure and temperature) used to correct the distances, were recorded at the beginning of each station occupation.

As far as direct levelling is concerned, forward and backward runs were observed between each benchmark. At the beginning of each day of work, the instrument collimation was checked. The electronic level instrument was set to perform two readings on a bar code staff, and measurements were repeated if the difference between the two readings was inconsistent (i.e. greater than 0.1 mm). In the same way, we checked the difference between two runs but as the levelling was hard, a third run was completed only if the difference between two runs was greater than 0.6 mm.

The IGS GPS station HERT, located on the top of the water tower, was too high to be levelled by spirit levelling. Therefore, indirect levelling was done between the benchmark on the ground and a station (101) close to the GPS. Then a spirit levelling between this station 101 and HERT has been done.

3.4.1. SLR

The reference point has been determined in two successive steps : the first one to materialize its planimetric position, the second one to get the height difference between the reference point and the planimetric materialization.

- In a first time, the SLR vertical axis had to be determined. To measure its position, from one theodolite set up on a tripod, a target on the two axis translation stage was sighted and the position of the target read on the micrometer. The SLR was then rotated 180° around the vertical axis, and the target rotated towards the theodolite. The target was then shifted using the translation stage, until it was sighted from the same theodolite direction. The new target position was read on the micrometer. Then the translation stage was adjusted by half the difference of the two readings. The same thing was done with the SLR telescope oriented at 90° from the original position. At last, we checked that the target doesn't move, when sighted with the theodolite, as the telescope rotates around its vertical axis.
- The vertical eccentricity was determined by direct levelling between the translation stage and the top of the sharp metal piece of 0.0127 m (0.50 inch) in diameter, which is the materialization of the elevation rotation axis.

3.4.2. GPS antenna intersections

As we could not remove the HERC and HERT GPS antennas, their reference point had to be determined indirectly.

For the planimetric position, from each survey station aiming at the antennas, the right and left sides of an element theoretically centred on the phase centre of the antenna have been observed. This element was chosen so that it is well defined for the operator e.g. in the adjustment, the mean direction of two observations from a same station, was used to process the planimetric position.

As far as the altimetric position is concerned, the zenith angles have been measured on a well defined element of the antenna. Then, the resulting position has been reduced to the reference point using the manufacturer values.

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3.4.3. Levelling

The spirit levelling from the piercing SLR point to HERS (among roof and scaffolding) was « very interesting » (and almost acrobatic); even if it was not so accurate as it should be in ordinary conditions, the two runs performed were accurate enough to validate our data.

3.4.4. GPS observations

GPS observations have been carried out during many sessions, in order to orientate and reinforce the survey. For HERS and HERT, we used the IGS data. For our stations, the GPS observations were carried out with the following specifications :

- Cut-off angle 10°
- Sampling 30 sec

The following table sums up the GPS observations.

Point	Start (UT)	End (UT)	Ant. Height (m)	Ant. Type
HERS_ARP	Daily RINEX file DOY 176 to 178		0.0096	ASH700936E
HERT Centre antenna mounting plate	Daily RINEX file DOY 176 to 178		0.000	LEIAT504GG
SLR_ARP	DOY 176 10 :58	DOY 176 16 :21	0.557	LEIAT504
101 Temporary point	DOY 176 11 :32	DOY 177 08 :16	0.000	LEIAT504
102 Temporary point	DOY 178 11 :55	DOY 178 14 :31	0.000	LEIAT504
103 Temporary point	DOY 177 15 :43	DOY 177 19 :22	0.000	LEIAT504
104 Temporary point	DOY 178 12 :03	DOY 178 14 :25	0.000	LEIAT504
105 Temporary point	DOY 176 16 :40	DOY 177 07 :41	0.000	LEIAT504
106 Temporary point	DOY 177 12 :53	DOY 177 15 :30	0.000	LEIAT504
107 Temporary point	DOY 177 15 :35	DOY 177 17 :17	0.000	LEIAT504
109 Temporary point	DOY 177 13 :06	DOY 177 15 :35	0.000	LEIAT504

All antenna heights are related to the GPS antenna reference point.

The antenna references were written down during the field work.

HERT : Leica AT504 n°755267 serial 200429 (*antenna reference in site log LEIAT504GG*)

HERS : Ashtech n°16688 serial 701945-01 (*antenna reference in site log ASH700936E*)

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4. Computations

4.1. On-site validation

The control network has been pre processed on site in order to point out any problems in the observations. The observations have been checked in a local coordinate system.

The outliers have been detected and the precision has been estimated in order to check if the requirements of such a survey could be met.

The levelling observations have been also checked on site and validated by a global adjustment.

4.2. GPS network

The GPS baselines have not been processed on site but at the office with the scientific software Bernese version 5.0 of the University of Berne. This software incorporates the movements of the poles, information on satellites, the ocean overload FES2004 model, as well as specific changes in the position of the phase centers and reference points of antennas and satellite receivers. In addition, this software models precisely tropospheric parameters from closest permanent IGS stations.

The corresponding Bernese report files are given in annex 6.4.

4.3. Global Adjustment

Back at the office, the final computation has been carried out by a 3D Least Squares Adjustment with the Microsearch GeoLab 2001 version 9.20.0 software. The input files were developed from :

- All the terrestrial observations : horizontal and zenith angles, distances, spirit levelling, planimetric and altimetric centring.
- An extracted covariance matrix of the GPS baselines (also used for orientation).
- HERS coordinates have been constrained at 1 mm to his ITRF2005 (epoch 2008:177) values (annex 6.5).

The a priori standard deviations used for the different observations with tacheometres are :

- 0.6 mgon for horizontal angles
- 0.8 mgon for vertical angles
- 1mm+1ppm for distances on prism
- 2mm+1ppm for distances on reflective tape

(These are the values used for most of the targets in our Microsearch GeoLab computation file).

This adjustment gives us coordinates and a covariance matrix of all points of the Herstmonceux network (annex 6.7).

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5. Results

5.1. Station name table translation

Here is an extract of the Microsearch GeoLab input file with the main points description.

*****POINTS DESCRIPTION*****

*SLR (CDP number 7840)

*SLR_SRP : (DOMES 13212S001) = intersection of the rotation axes of the telescope (= System Reference Point)

*SLR_HAXIS_UP : top of the sharped piece on the side of the telescope (used for levelling only)

*SLR_ARP : ARP of the antenna on the translation stage (centred on the vertical axis)

*SLR_PRI : PRISM on the translation stage (centred on the vertical axis)

*PERMANENT GPS

*HERS : MARKER (DOMES 13212M007) (= IGS reference point)

*HERS_ARP : ANTENNA AXIS AT ARP (i.e. 0.0096 m above marker)

*HERS_BCR : ANTENNA AXIS BOTTOM OF CHOKE RINGS (i.e. 0.0350 m above HERS_ARP)(used for indirect levelling)

*HERT : (DOMES 13212M010) (= IGS reference point) = ANTENNA AXIS AT ARP

*HERT_BCR : ANTENNA AXIS BOTTOM OF CHOKE RINGS (i.e. 0.0345 m above HERT_ARP)(used for indirect levelling)

The following list sums up the most important names used in this process.

Point Description	Used name or code	Computation name
SLR station <ul style="list-style-type: none"> System Reference Point (SRP) Top and axis of the translation stage 	13212S001 / (CDP number 7840)	SLR_SRP SLR_ARP
HERS permanent GPS <ul style="list-style-type: none"> HERS IGS reference point Antenna ARP 	13212M007	HERS HERS_ARP
HERT permanent GPS <ul style="list-style-type: none"> HERT IGS reference point 	13212M010	HERT

5.2. Adjusted coordinates and confidence regions

The results of the adjustment are the coordinates of all points as well as their confidence ellipsoids in the ITRF2005 at the mean epoch of the observations (i.e. epoch 2008 :177).

Here is a table with the 3D coordinates and confidence region at 95% of the 3 main points of interest.

Adjusted XYZ Coordinates:

CODE	FFF	STATION	X-COORDINATE	Y-COORDINATE	Z-COORDINATE	STD DEV
			STD DEV	STD DEV	STD DEV	
XYZ	HERS		4033470.0723 0.0012	23672.9479 0.0012	4924301.3558 m 0.0012	0
XYZ	HERT		4033460.8868 0.0014	23537.8563 0.0013	4924318.3033 m 0.0014	0
XYZ	SLR_SRP		4033463.5731 0.0013	23662.6772 0.0014	4924305.2959 m 0.0013	0

=====
HERSTMONCEUX LASER TIES - JUNE 2008 SURVEY
Microsearch GeoLab, V2001.9.20.0 WGS 84 UNITS: m,GRAD Page 0025
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2-D and 1-D Station Confidence Regions (95.000 and 95.000 percent):

STATION	MAJOR SEMI-AXIS	AZ	MINOR SEMI-AXIS	VERTICAL
HERS	0.0030	171	0.0030	0.0024
HERT	0.0033	5	0.0032	0.0028
SLR_SR	0.0033	73	0.0033	0.0027

=====
HERSTMONCEUX LASER TIES - JUNE 2008 SURVEY
Microsearch GeoLab, V2001.9.20.0 WGS 84 UNITS: m,GRAD Page 0026
=====

3D Station Confidence Regions (95.000 percent):

STATION	MAJ-SEMI (AZ,VANG)	MED-SEMI (AZ,VANG)	MIN-SEMI (AZ,VANG)
HERS	0.0035 (32, 89)	0.0035 (171, 0)	0.0035 (261, 0)
HERT	0.0039 (183, 84)	0.0038 (5, 6)	0.0036 (275, 0)
SLR_SR	0.0038 (90, 88)	0.0038 (253, 2)	0.0037 (343, 1)

The whole covariance matrix was computed. It was possible to extract from it the covariance submatrix and the vectors (see Annex 6.8) for the following points of interest :

- SLR reference point 13212S001
- HERs reference point 13212M007
- HERT reference point 13212M010

ITRF2005 epoch 2008:177 Coordinates			
Vector	X	Y	Z
HERS --> HERT	-9.1855	-135.0916	16.9475
SLR_SR --> HERs	6.4992	10.2707	-3.9401
SLR_SR --> HERT	-2.6863	-124.8209	13.0074

Then this covariance submatrix has been converted into the SINEX format using the « geotosnx » tool provided by Z. Altamimi. The resulting SINEX file (13212 IGN 2008-177.SNX) is presented in annex 6.9.

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6.1. HERL site log (extract)

The complete version of the site log is available at :
http://ilrs.gsfc.nasa.gov/stations/sitelist/HERL_sitelog.html

ILRS Site and System Information Form
 International Laser Ranging Service

0. Form

Prepared by (Full Name)	:	Philip Gibbs
Preparer E-mail	:	pgib@nerc.ac.uk
Date Prepared	:	2004-10-04
Report Type	:	UPDATE
Format Version	:	1.0

1. Identification of the Ranging System Reference Point (SRP)

Site Name	:	Herstmonceux
IERS DOMES Number	:	13212S001
CDP Pad ID	:	7840
Subnetwork	:	EUROLAS
Description	:	AZ EL INTERSECT
Monument Description	:	N.A.
Monument Inscription	:	N.A.
Mark Description	:	N.A.
Date Installed	:	1982-01-01
Date Removed	:	(yyyy-mm-dd)
Geologic Characteristic	:	CLAYS/SANDSTONES
Additional Information	:	Local geology: The site is bounded to the south by old, but now drained, marshland with the English Channel about 6 km away. The underlying structure is interbedded clays and sandstones called the Hastings Beds. There is no history of seismic activity in the area.

2. Site Location Information

City or Town	:	Hailsham
State or Province	:	East Sussex
Country	:	UK
Tectonic Plate	:	Eurasian
Approximate Position		
X coordinate	[m]:	4033463.1
Y coordinate	[m]:	23662.8
Z coordinate	[m]:	4924305.6
Latitude	[deg]:	50.8674 N
Longitude	[deg]:	0.3361 E
Elevation	[m]:	75
Additional Information	:	The site is located in the grounds of Herstmonceux Castle

3. General System Information

3.01 System Name	:	Herstmonceux
4-Character Code	:	HERL
CDP System Number	:	35
CDP Occupation Number	:	01
Eccentricity to SRP (if Not Identical With SRP)		
North	[m]:	0
East	[m]:	0
Up	[m]:	0
Date Measured	:	N.A.
Date Installed	:	1982-01-01
Date Removed	:	(yyyy-mm-dd)
Additional Information	:	(multiple lines)

4. Telescope Information

4.01 Receiving Telescope Type	:	CASSEGRAIN
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Aperture [m]: 0.5
Mount : AZ-EL
Xmitting Telescope Type : REFRACTOR
Aperture [m]: 0.1
Tracking Camera Type : TV thro main tel / TV on Celestron
Model :
Manufacturer :
Field of View [deg]: 0.06 / 0.6
Minimum Magnitude [mag]: ~10 / ~8
Transmit/Receive Path : SEPARATE
Transmit/Receive Switch : NONE
Max Slew Rate Az [deg/s]: 20
Max Slew Rate El [deg/s]: 5
Max Used Tracking Rate Az : 20
Max Used Tracking Rate El : 5
Telescope Shelter : EYE-LID DOME, see additional information
Daylight Filter Type : Oven controlled spectral filter
Dayl. Filt. Bandwidth [nm]: 0.15
Adjustable Attenuation : NO
Transmit Efficiency : 0.7
Receive Efficiency : 0.7
Date Installed : 1998-06-26
Date Removed : (yyyy-mm-dd)
Additional Information : The dome's hemisphere is divided into 4 segments (like segments of an orange) the bottom two of which are fixed to a circular rail and the top two open by sliding over the bottom two. The whole structure can be rotated manually, normally only necessary to protect the telescope/observer from the wind since this scheme means that all the sky above 30 degrees elevation is available with the dome in any position. In normal operation the lowest part of the opening are East and West to provide access to the ground targets.

5. Laser System Information

5.01 Laser Type : ND:YAG
Number of Amplifiers : 2
Primary Wavelength [nm]: 1064
Primary Maximum Energy [mJ]: Not used for ranging
Secondary Wavelength [nm]: 532
Secondary Max. Energy [mJ]: ~20
Xmit Energy Adjustable : NO
Pulse Width (FWHM) [ps]: ~100
Max. Repetition Rate [Hz]: 13
Fullw. Beam Divergence ["]: 5-200
Final Beam Diameter [m]: 0.03
Eyesafe : NO
Eyesafe Standard : British Standard 4803
Date Installed : 1982-01-01
Date Removed : (yyyy-mm-dd)
Additional Information : An observer is always present at the telescope during ranging and using a slaved radar system to detect aircraft close to the beam and kill the laser. For terrestrial calibration we insert a very large ND filter to render the beam eyesafe.

6. Receiver System

(...)

7. Tracking Capabilities

(...)

8. Calibration

8.01 Calibration Type : PRE+POST
Target Location : EXTERNAL
Target Type : see additional information
Target Structure : BRICK BUILDING, see additional information
Target Distance [m]: 120
Date Measured : 1993-06-09 -remeasured 2002
Accuracy (mm) [mm]: 2-3
Verification : 4 other targets
Return-rate Controlled : YES

Mode of Operation : SINGLE
 Average Cal Interval [min]: 60 see additional information
 Single Shot RMS [mm]: 9
 Edit Criterion 1st Chain : ITERATIVE 2.5 SIGMA
 Edit Criterion 2nd Chain : N.A.
 Application of Cal Data : LINEAR FIT
 Date Installed : 1982-01-01
 Date Removed : (yyyy-mm-dd)
 Additional Information : Targets are made of two polished steel sheets at right angles so as to translate the beam horizontally from the emitter telescope to the receiving telescope. The 2 polished sheets are mounted on brick building about 30 feet above the ground, 120m from dome. A secondary target of 2 polished sheets is mounted on standard concrete survey pillar about 3 feet above the ground at 600m.
 We will always attempt to get calibrations before and after satellite but when there are several satellites back-to-back we will calibrate before and after the batch. The realtime system gives alarm messages should the time since last calibration exceed 60 minutes

9. Time and Frequency Standards

(...) Preprocessing Information

(...) Aircraft Detection

(...) Meteorological Instrumentation

(...)

13. Local Ties, Eccentricities, and Collocation Information

13.01 Collocated Permanent Geodetic Systems

GPS : IGS+EUREF
 Date Installed : (yyyy-mm-dd)
 Date Removed : (yyyy-mm-dd)
 Additional Information : (multiple lines)
 GLONASS : IGS+EUREF+IGLOS
 Date Installed : 2003-03-01
 Date Removed : (yyyy-mm-dd)
 Additional Information : (multiple lines)
 DORIS : NO
 Date Installed : (yyyy-mm-dd)
 Date Removed : (yyyy-mm-dd)
 Additional Information : (multiple lines)
 PRARE : NO
 Date Installed : (yyyy-mm-dd)
 Date Removed : (yyyy-mm-dd)
 Additional Information : (multiple lines)
 VLBI : NO
 Date Installed : (yyyy-mm-dd)
 Date Removed : (yyyy-mm-dd)
 Additional Information : (multiple lines)
 Gravimeter : NO
 Date Installed : (yyyy-mm-dd)
 Date Removed : (yyyy-mm-dd)
 Additional Information : (multiple lines)
 etc

13.02.01 Local Ties from the SRP to Other Monuments or Systems on Site

Monument Name : HER
 Instrumentation Type : GPS
 Instrumentation Status : PERMANENT
 DOMES Number : 13212M007
 CDP Number : (XXXX)
 Differential Components (ITRS)
 dx [m]: +6.505 +- 0.002
 dy [m]: +10.278 +- 0.002

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dz [m]: -3.945 +- 0.002
 Date Measured : 1992-07-29
 Determined by : UK Ordnance Survey
 Date Installed : 1998-07-01
 Date Removed : (yyyy-mm-dd)
 Additional Information : IGS code for the GPS is HER

13.02.02 Local Ties from the SRP to Other Monuments or Systems on Site

Monument Name : HERT
 Instrumentation Type : GPS+GLONASS
 Instrumentation Status : PERMANENT
 DOMES Number : 13212M010
 CDP Number : (XXXX)
 Differential Components (ITRS)
 dx [m]: -2.674 +- 0.002
 dy [m]: -124.815 +- 0.002
 dz [m]: +12.995 +- 0.002
 Date Measured : 2003-03-12
 Determined by : GPS CAMPAIGN/TRIANGULATION
 Date Installed : 2003-03-01
 Date Removed : (yyyy-mm-dd)
 Additional Information : IGS code for the GPS is HERT

14. Local Events Possibly Affecting Computed Position (...)

15. On-Site, Point of Contact Agency Information

Agency : Natural Environment Research Council
 Mailing Address : NERC Space Geodesy Facility
 : Herstmonceux Castle
 : Hailsham
 : East Sussex BN27 1RN
 Primary Contact
 Contact Name : Dr Graham Appleby
 Telephone (primary) : +44 (0)1323 833888
 Telephone (secondary) : +44 (0)1487 772477
 Fax : +44 (0)1323 833929/+44 (0)1487773467
 E-mail : gapp@nerc.ac.uk
 Secondary Contact
 Contact Name : Philip Gibbs
 Telephone (primary) : +44 (0)1323 833888
 Telephone (secondary) :
 Fax : +44 (0)1323 833929
 E-mail : pgib@nerc.ac.uk
 Additional Information : (multiple lines)

16. Responsible Agency (if different from 15.)

Agency : (multiple lines)
 Mailing Address : (multiple lines)
 Primary Contact
 Contact Name :
 Telephone (primary) :
 Telephone (secondary) :
 Fax :
 E-mail :
 Secondary Contact
 Contact Name :
 Telephone (primary) :
 Telephone (secondary) :
 Fax :
 E-mail :
 Additional Information : (multiple lines)

17. More Information

URL for More Information : <http://nercslr.nmt.ac.uk/>
 Hardcopy on File
 Site Map : NO
 Site Diagram : NO
 Horizon Mask : NO
 Monument Description : NO
 Site Pictures : NO
 Additional Information : (multiple lines)

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6.2. HERs site log (extract)

The complete version of the site log is available at :
http://igscb.jpl.nasa.gov/igscb/station/log/hers_20020529.log

HERS Site Information Form
 International GPS Service
 See Instructions at:
 ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0. Form

Prepared by (full name) : A.T.Sinclair
 Date Prepared : 1993-06-03
 Report Type : Revised 29 May 2002 Robert Sherwood
 If Update:
 Previous Site Log : hers0109.log
 Modified/Added Sections : (n.n,n.n,...)

1. Site Identification of the GNSS Monument

Site Name : Herstmonceux
Four Character ID : HERs
 Monument Inscription :
IERS DOMES Number : 13212M007
 CDP Number : 7840
 Monument Description : STEEL MAST
 Height of the Monument : 8
 Monument Foundation : CONCRETE BLOCK
 Foundation Depth : 5
 Marker Description : (CHISELLED CROSS/DIVOT/BRASS NAIL/etc)
 Date Installed : 1991-09-01
 Geologic Characteristic : (BEDROCK/CLAY/CONGLOMERATE/GRAVEL/SAND/etc)
 Bedrock Type : (IGNEOUS/METAMORPHIC/SEDIMENTARY)
 Bedrock Condition : (FRESH/JOINTED/WEATHERED)
 Fracture Spacing : (1-10 cm/10-50 cm/50-200 cm/over 200 cm)
 Fault zones nearby : (YES/NO/Name of the zone)
 Distance/activity : (multiple lines)
 Additional Information : Located in grounds of Herstmonceux Castle a few meters from the UK SLR Facility

2. Site Location Information

City or Town : Hailsham
 State or Province : East Sussex
 Country : England
 Tectonic Plate : Eurasian
 Approximate Position (ITRF)
 X coordinate (m) : 4033470.3
 Y coordinate (m) : 23672.7
 Z coordinate (m) : 4924301.2
 Latitude (N is +) : +505202.28
 Longitude (E is +) : +0002010.32
 Elevation (m,ellips.) : 76.499
 Additional Information : (multiple lines)

3. GNSS Receiver Information

(...)

4. GNSS Antenna Information

4.1 Antenna Type : AOAD/M_B
 Serial Number : 102
 Antenna Reference Point : BCR
 Marker->ARP Up Ecc. (m) : 0.200
 Marker->ARP North Ecc(m) : (F8.4)
 Marker->ARP East Ecc(m) : (F8.4)
 Alignment from True N :

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Antenna Radome Type	: NONE
Radome Serial Number	:
Antenna Cable Type	: (vendor & type number)
Antenna Cable Length	: (m)
Date Installed	: 1991-09-01
Date Removed	: 1998-01-01T00:00Z
Additional Information	: (multiple lines)
 4.2 Antenna Type	: ASH700936E
Serial Number	: CR14108
Antenna Reference Point	: BPA
Marker->ARP Up Ecc. (m)	: 0.0096
Marker->ARP North Ecc(m)	: (F8.4)
Marker->ARP East Ecc(m)	: (F8.4)
Alignment from True N	:
Antenna Radome Type	: NONE
Radome Serial Number	:
Antenna Cable Type	: ASHTECH SUPPLIED
Antenna Cable Length	: 30
Date Installed	: 1998-02-18T00:00Z
Date Removed	: 1998-06-29T14:00Z
Additional Information	: (multiple lines)
 4.3 Antenna Type	: ASH700936E
Serial Number	: CR16688
Antenna Reference Point	: BPA
Marker->ARP Up Ecc. (m)	: 0.0096
Marker->ARP North Ecc(m)	: 0.0000
Marker->ARP East Ecc(m)	: 0.0000
Alignment from True N	:
Antenna Radome Type	: NONE
Radome Serial Number	:
Antenna Cable Type	: ASHTECH SUPPLIED
Antenna Cable Length	: 30
Date Installed	: 1998-07-01T00:00Z
Date Removed	: 2001-06-18T11:00Z
Additional Information	: The antenna (reference position unchanged from above) is mounted at the top of an 8-meter, open lattice, cross-braced steel mast set in a concrete base. The plane of the choker is above local trees and buildings. : Antenna unchanged. On 18-Aug-2000 ~10:30UT : a second nearby GPS antenna (1m away from and below the HERS choker) mounted on the same mast was removed and relocated elsewhere on site : Antenna removed because : of non-uniform directional response and : sent to Ashtech for repair (IGSMAIL 3373)
 4.4 Antenna Type	: ASH700936E
Serial Number	: CR16688
Antenna Reference Point	: BPA
Marker->ARP Up Ecc. (m)	: 0.0096
Marker->ARP North Ecc(m)	: 0.0000
Marker->ARP East Ecc(m)	: 0.0000
Alignment from True N	:
Antenna Radome Type	: NONE
Radome Serial Number	:
Antenna Cable Type	: ASHTECH SUPPLIED
Antenna Cable Length	: 30
Date Installed	: 2001-08-08T15:00Z
Date Removed	: (CCYY-MM-DDThh:mmZ)
Additional Information	: Antenna unchanged. Repaired antenna (4.4) : remounted on monument. Data resubmission : restarted 03-Sep-2001 (IGSMAIL 3503)

(...)

5. Surveyed Local Ties

5.1 Tied Marker Name	: SLR intersection
Tied Marker Usage	: SLR
Tied Marker CDP Number	: 7840
Tied Marker DOMES Number	: 13212S001

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Differential Components from GNSS Marker to the tied monument (ITRS)

dx (m)	:	-6.505
dy (m)	:	-10.278
dz (m)	:	+3.945
Accuracy (mm)	:	2
Survey method	:	(GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
Date Measured	:	1992-07-29
Additional Information	:	(multiple lines)

(...)

6. Frequency Standard

(...)

7. Collocation Information

7.1	Instrumentation Type	:	SLR
	Status	:	PERMANENT
	Effective Dates	:	1984-09-01/CCYY-MM-DD
	Notes	:	(multiple lines)
7.2	Instrumentation Type	:	GPS/GLONASS
	Status	:	PERMANENT
	Effective Dates	:	1999-12-01/CCYY-MM-DD
	Notes	:	IGLOS site name HERP

(...)

8. Meteorological Instrumentation

(...)

9. Local Ongoing Conditions Possibly Affecting Computed Position

(...)

10. Local Episodic Effects Possibly Affecting Data Quality

(...)

11. On-Site, Point of Contact Agency Information

Agency	:	NERC Space Geodesy Facility
Preferred Abbreviation	:	NSGF
Mailing Address	:	Herstmonceux Castle, Hailsham, East Sussex BN27 1RP, England
Primary Contact		
Contact Name	:	Robert Sherwood
Telephone (primary)	:	+44 (0)1323 833888
Telephone (secondary)	:	
Fax	:	+44 (0)1323 833929
E-mail	:	slr@slrb.rgo.ac.uk
Secondary Contact		
Contact Name	:	
Telephone (primary)	:	
Telephone (secondary)	:	
Fax	:	
E-mail	:	
Additional Information	:	(multiple lines)

12. Responsible Agency (if different from 11.)

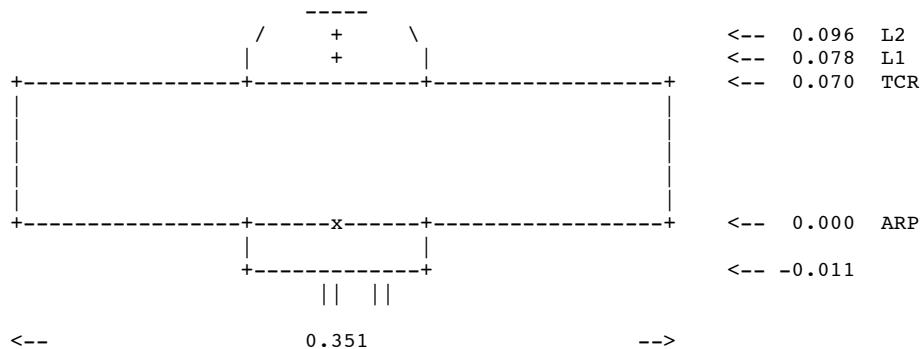
Agency	:	(multiple lines)
Preferred Abbreviation	:	(A10)
Mailing Address	:	(multiple lines)
Primary Contact		
Contact Name	:	
Telephone (primary)	:	

Telephone (secondary) :
Fax :
E-mail :
Secondary Contact
Contact Name :
Telephone (primary) :
Telephone (secondary) :
Fax :
E-mail :
Additional Information : (multiple lines)

13. More Information

URL for More Information :
Hardcopy on File
Site Map : (Y or URL)
Site Diagram : (Y)
Horizon Mask : (Y)
Monument Description : (Y)
Site Pictures : (Y)
Additional Information : (multiple lines)
Antenna Graphics with Dimensions

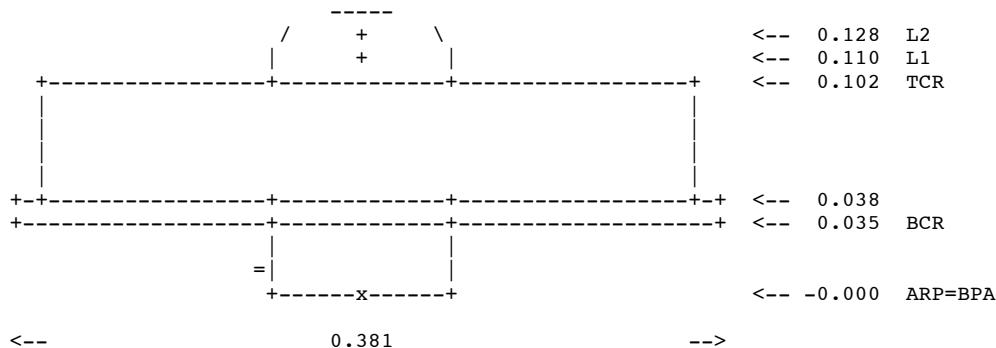
ROGUE: DORNE MARGOLIN B (Allen Osborne Design)



ARP: Antenna Reference Point
L1 : L1 Phase Center
TCR: Top of Chokering

L2 : L2 Phase Center
BCR: Bottom of Chokering

ASHTECH: ASH700936E



ARP: Antenna Reference Point
L1 : L1 Phase Center
TCR: Top of Chokering

BPA: Bottom of Pre-Amplifier
L2 : L2 Phase Center
BCR: Bottom of Chokering

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6.3. HERT site log (extract)

The complete version of the site log is available at :
http://igscb.jpl.nasa.gov/igscb/station/log/hert_20080128.log

International GPS Service
 HERT Site Information Form
 See Instructions at:
ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0. Form

Prepared by (full name) : Rob Sherwood
 Date Prepared : 2008-01-28
 Report Type : UPDATE
 If Update:
 Previous Site Log : hert_20071204.log
 Modified/Added Sections : 3.2,3.3

1. Site Identification of the GNSS Monument

Site Name : Water Tower monument
Four Character ID : HERT
 Monument Inscription :
IERS DOMES Number : 13212M010
 CDP Number : (A4)
 Monument Description : BRICK/CONCRETE PILLAR
 Height of the Monument : 0.5
 Monument Foundation : ROOF
 Foundation Depth : 5
 Marker Description : Centre antenna mounting plate
 Date Installed : 2003-03-01
 Geologic Characteristic : (BEDROCK/CLAY/CONGLOMERATE/GRAVEL/SAND/etc)
 Bedrock Type : (IGNEOUS/METAMORPHIC/SEDIMENTARY)
 Bedrock Condition : (FRESH/JOINTED/WEATHERED)
 Fracture Spacing : (1-10 cm/10-50 cm/50-200 cm/over 200 cm)
 Fault zones nearby : (YES/NO/Name of the zone)
 Distance/activity : (multiple lines)
 Additional Information : (multiple lines)
 Located in grounds of Herstmonceux Castle

2. Site Location Information

City or Town : Hailsham
 State or Province : East Sussex
 Country : England
 Tectonic Plate : Eurasian
 Approximate Position (ITRF)
 X coordinate (m) : 4033461.0378
 Y coordinate (m) : 23537.6625
 Z coordinate (m) : 4924318.1656
 Latitude (N is +) : +505202.9218
 Longitude (E is +) : +0002003.6651
 Elevation (m,ellips.) : 83.346
 Additional Information : (multiple lines)

3. GNSS Receiver Information

(...)

4. GNSS Antenna Information

4.1 Antenna Type : ASH701946.2 NONE
 Serial Number : CR3 19993603
 Antenna Reference Point : BPA
 Marker->ARP Up Ecc. (m) : 000.0000
 Marker->ARP North Ecc(m) : 000.0000
 Marker->ARP East Ecc(m) : 000.0000
 Alignment from True N : 0
 Antenna Radome Type : NONE
 Radome Serial Number :

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Antenna Cable Type : ASHTECH SUPPLIED
 Antenna Cable Length : 30
 Date Installed : 2003-03-12
 Date Removed : 2007-12-04
 Additional Information : (multiple lines)

4.2 Antenna Type : LEIAT504GG NONE
 Serial Number : 200429
 Antenna Reference Point : BPA
 Marker->ARP Up Ecc. (m) : 0.0000
 Marker->ARP North Ecc(m) : 0.0000
 Marker->ARP East Ecc(m) : 0.0000
 Alignment from True N : 0
 Antenna Radome Type : NONE
 Radome Serial Number :
 Antenna Cable Type : LEICA
 Antenna Cable Length : 30
 Date Installed : 2007-12-04T12:30Z
 Date Removed : (CCYY-MM-DDThh:mmZ)
 Additional Information : (multiple lines)

(...)

5. Surveyed Local Ties

5.1 Tied Marker Name : SLR intersection
 Tied Marker Usage : SLR
 Tied Marker CDP Number : 7840
 Tied Marker DOMES Number : 13212S001
 Differential Components from GNSS Marker to the tied monument (ITRS)
 dx (m) : +2.6742
 dy (m) : +124.8155
 dz (m) : -12.9946
 Accuracy (mm) : 5
 Survey method : GPS CAMPAIGN/TRIANGULATION
 Date Measured : 2003-03-12
 Additional Information :

5.2 Tied Marker Name : HER'S
 Tied Marker Usage : GPS
 Tied Marker CDP Number : (A4)
 Tied Marker DOMES Number : 13212M007
 Differential Components from GNSS Marker to the tied monument (ITRS)
 dx (m) : +9.1822
 dy (m) : +135.0895
 dz (m) : -16.9346
 Accuracy (mm) : 5
 Survey method : GPS CAMPAIGN/TRIANGULATION
 Date Measured : 2003-03-12
 Additional Information : (multiple lines)

(...)

6. Frequency Standard

(...)

7. Collocation Information

7.1 Instrumentation Type : SLR
 Status : PERMANENT
 Effective Dates : 1984-09-01/CCYY-MM-DD
 Notes : (multiple lines)

7.2 Instrumentation Type : GPS
 Status : PERMANENT
 Effective Dates : 1992-03-24/CCYY-MM-DD)
 Notes : IGS GPS site HER'S

(...)

8. Meteorological Instrumentation

(...)

9. Local Ongoing Conditions Possibly Affecting Computed Position
(...)

10. Local Episodic Effects Possibly Affecting Data Quality
(...)

11. On-Site, Point of Contact Agency Information

Agency : NERC Space Geodesy Facility
Preferred Abbreviation : NSGF
Mailing Address : Herstmonceux Castle, Hailsham,
Primary Contact
 Contact Name : Rob Sherwood
 Telephone (primary) : +44 (0)1323 833888
 Telephone (secondary) :
 Fax : +44 (0)1323 833929
 E-mail : rshe@nerc.ac.uk
Secondary Contact
 Contact Name :
 Telephone (primary) :
 Telephone (secondary) :
 Fax :
 E-mail :
Additional Information : (multiple lines)

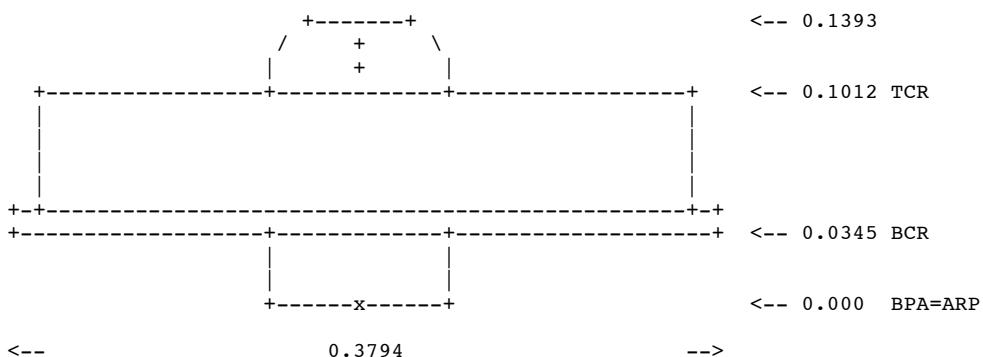
12. Responsible Agency (if different from 11.)

Agency : (multiple lines)
Preferred Abbreviation : (A10)
Mailing Address : (multiple lines)
Primary Contact
 Contact Name :
 Telephone (primary) :
 Telephone (secondary) :
 Fax :
 E-mail :
Secondary Contact
 Contact Name :
 Telephone (primary) :
 Telephone (secondary) :
 Fax :
 E-mail :
Additional Information : (multiple lines)

13. More Information

Primary Data Center : BKG
Secondary Data Center : OLG
URL for More Information :
 Hardcopy on File
 Site Map : (Y or URL)
 Site Diagram : (Y)
 Horizon Mask : (Y)
 Monument Description : (Y)
 Site Pictures : (Y)
Additional Information : (multiple lines)
Antenna Graphics with Dimensions

LEIAT504
LEIAT504GG



6.4. Bernese Version5.0. report files

(HersALL Output File)

```
=====
Program : ADDNEQ2                                Bernese GPS Software Version 5.0
Purpose : Combination of normal equations
Campaign: ${P}/HERS
Date   : 14-Aug-2008 09:40
=====
Default session : 1660 year 2008
User name      : rgpadmin
```

INPUT AND OUTPUT FILENAMES

```
-----
Session table          : ${P}/HERS/STA/SESSIONS.SES
Variance rescaling factors    : ---
Station coordinates       : ${P}/HERS/STA/HERS.CRD
Station velocities        : ---
Station information       : ${P}/HERS/STA/HERS.STA
Troposphere estimates     : ---
Ionosphere master file   : ---
Differential code biases  : ---
Earth rotation parameters : ---
Geocenter coordinates     : ---
Var-covar wrt coord.      : ---
Full var-covar matrix     : ${P}/HERS/OUT/HERSALL.COV
General constants         : ${X}/GEN/CONST.
Geodetic datum            : ${X}/GEN/DATUM.
Phase center variations   : ${X}/GEN/PHAS_EPN.I05
Satellite information     : ${X}/GEN/SATELLIT.I01
Satellite problems        : ${X}/GEN/SAT_2008.CRX
Subdaily pole model       : ${X}/GEN/IERS2000.SUB
Nutation model            : ${X}/GEN/IAU2000.NUT
SINEX general input file  : ${X}/GEN/SINEXIGN.DCALS
IONEX control file        : ${X}/GEN/IONEX.
Scratch file              : ${U}/WORK/ADDNEQ2.SCR
Program output             : ${P}/HERS/OUT/HERSALL.OUT
Error message              : ${U}/WORK/ERROR.MSG
Resulting normal equations: ---
SINEX                      : ${P}/HERS/SOL/HERSALL.SNX
Station coordinate results : ${P}/HERS/STA/HERSALL.CRD
Station velocity results   : ---
Troposphere estimates      : ${P}/HERS/ATM/HERSALL.TR
Troposphere SINEX          : ${P}/HERS/ATM/HERSALL.TRO
Ionosphere models          : ---
IONEX                      : ---
Code bias results          : ---
Orbital elements           : ---
Bernese ERP file           : ---
IERS ERP file              : ---
Geocenter coordinates       : ---
Station residuals           : ---
Weekly summary file         : ---
```

INPUT NORMAL EQUATION FILES

```
-----
File Name
-----
1 ${P}/HERS/SOL/XXXX1760.NQ0
2 ${P}/HERS/SOL/XXXX1770.NQ0
3 ${P}/HERS/SOL/XXXX1780.NQ0
```

Main characteristics of normal equation files:

File	From	To	Number of observations / parameters / degree of freedom
1	2008-06-24 00:02:00	2008-06-24 23:59:30	58368 911 57457
2	2008-06-25 00:02:00	2008-06-25 23:59:00	59856 1007 58849
3	2008-06-26 00:02:00	2008-06-26 23:59:00	65300 1118 64182
Total	2008-06-24 00:02:00	2008-06-26 23:59:00	183524

Number of parameters:

Parameter type	1	2	3
Station coordinates	42	48	48
Total number of explicit parameters	42	48	48
Total number of implicit parameters	869	959	1070

Total number of adjusted parameters	911	1007	1118
-------------------------------------	-----	------	------

A PRIORI INFORMATION

Number of parameters in combined NEQ less than: 8000

A priori sigma of unit weight: 0.0010 m

Check comparison of individual solutions:

Maximum residuals accepted in north: 15.0 mm
Maximum residuals accepted in east: 15.0 mm
Maximum residuals accepted in up: 30.0 mm

Maximum component rms accepted in north: 10.0 mm
Maximum component rms accepted in east: 10.0 mm
Maximum component rms accepted in up: 20.0 mm

A PRIORI INFORMATION

A priori sigma of unit weight: 0.0010 m

Station coordinates and velocities:

Local geodetic datum:	Shifts to WGS-84				Rotations to WGS-84	
Datum name	Ell. param./ Scale	IGS05	A = 6378137.000 m 1/F = 298.2572221 SC = 0.00000D+00	DX = 0.0000 m DY = 0.0000 m DZ = 0.0000 m	RX = 0.00000 arcsec RY = 0.00000 arcsec RZ = 0.00000 arcsec	

A priori station coordinates: \${P}/HERS/STA/HERS.CRD

station coordinates	local geodetic datum	A priori station coordinates				A priori		
		WGS-84				Ellipsoidal in		
num	Station name	obs	e/f/h	X (m)	Y (m)	Z (m)	Latitude	
Longitude		Height (m)						
1	HERS 13212M007	Y	ESTIM	4033470.0720	23672.9480	4924301.3560	50 52	2.331396 0
20	10.580438	76.4987						
2	105_ 105	Y	ESTIM	4033459.5559	23626.6099	4924304.1410	50 52	2.659060 0
20	8.214018	71.8507						
3	101_ 101	Y	ESTIM	4033460.7094	23540.2401	4924318.9714	50 52	2.945666 0
20	3.797008	83.7637						
4	BEAU 19991M001	Y	ESTIM	4153594.2341	150985.9682	4821871.1132	49 25	46.812376 2
4	54.565763	128.9041						
5	CAEN 19994M001	Y	ESTIM	4177020.3138	-33326.5304	4803950.4711	49 10	57.730363 - 0
27	25.657422	113.5757						
6	COUD 19868M001	Y	ESTIM	4016631.3784	166529.0588	4935195.0406	51 1	22.614704 2
22	26.819451	56.8173						
7	DGLG 10017M002	Y	ESTIM	4019247.0096	164574.1604	4933144.4560	50 59	37.156514 2
20	41.109712	56.7686						
8	EPRN 19832M001	Y	ESTIM	4174218.3130	-26700.0834	4806412.6219	49 12	59.631519 - 0
21	59.339816	115.4293						
9	LETO 19882M001	Y	ESTIM	4062328.5276	114824.4420	4899382.9893	50 30	49.993722 1
37	8.661234	62.1485						
10	FOUC 19834M001	Y	ESTIM	4119898.9966	113693.6729	4851652.9159	49 50	31.058920 1
34	50.686373	237.5543						
11	LIL2 10051M003	Y	ESTIM	4049340.6504	221853.1272	4906448.9828	50 36	48.638499 3
8	9.440087	96.2355						
12	LENE 19801M001	Y	ESTIM	4179490.8443	66169.5081	4801576.9014	49 8	57.415242 0
54	25.302190	188.6647						

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13	LMCU	10051M002	Y	ESTIM	4047063.6818	217535.1865	4908525.9490	50	38	34.008584	3
4	36.355250	111.1192									
14	SLR	SLR_ARP	Y	ESTIM	4033463.9090	23662.6771	4924305.7150	50	52	2.576632	0
20	10.057069	75.9523									
15	103	103	Y	ESTIM	4033435.2809	23562.9464	4924331.6999	50	52	3.840579	0
20	4.965729	77.6728									
16	106	106	Y	ESTIM	4033443.8639	23655.9174	4924314.2127	50	52	3.254332	0
20	9.717412	69.8683									
17	107	107	Y	ESTIM	4033469.3509	23638.0756	4924295.9721	50	52	2.244673	0
20	8.797400	71.7383									
18	109	109	Y	ESTIM	4033503.3441	23582.1578	4924269.2860	50	52	0.854605	0
20	5.927793	72.2852									
19	HERT	13212M010	Y	ESTIM	4033460.8839	23537.8550	4924318.2988	50	52	2.927899	0
20	3.674990	83.3433									
20	102	102	Y	ESTIM	4033454.6894	23563.1527	4924315.8820	50	52	3.030322	0
20	4.970481	77.6525									
21	104	104	Y	ESTIM	4033438.6848	23532.7233	4924329.2654	50	52	3.709846	0
20	3.419195	77.8212									
22	BMHG	19833M001	Y	ESTIM	4134869.4388	-132082.4919	4838513.8792	49	39	33.126458	- 1
49	46.594611	231.2619									
23	HEAU	10055M004	Y	ESTIM	4141610.4870	-128560.6234	4832821.9895	49	34	50.383360	- 1
46	40.655018	188.6253									

A priori sigma:

Station coordinates a priori sigma in local geodetic datum			Station velocities a priori sigma in local geodetic datum		
num	Station name	N (m)	E (m)	U (m)	N (m/year)
1	HERS 13212M007	0.00100	0.00100	0.00100	

STATION INFORMATION MODIFICATIONS: \${P}/HERS/STA/HERS.STA

num	Station name	Changed entry	old value	new value	Remark
1	HERS 13212M007	:	Antenna number	0	16688 LOG
2	HERS 13212M007	:	Antenna number	0	16688 LOG
2	HERT 13212M010	:	Receiver type	SIMULA	--> LEICA GRX1200GGPRO LOG
3	HERS 13212M007	:	Antenna number	0	16688 LOG
3	HERT 13212M010	:	Receiver type	SIMULA	--> LEICA GRX1200GGPRO LOG

SUMMARY OF RESULTS

Number of parameters:

Parameter type	Adjusted	explicitly / implicitly (pre-eliminated)	Deleted	Singular
Station coordinates / velocities	129	24	105 (before stacking)	0 0
Previously pre-eliminated parameters	2898		2898	
Total number	3027	24	3003	0 0

Statistics:

Total number of explicit parameters	24
Total number of implicit parameters	3003
Total number of adjusted parameters	3027
Total number of observations	183524
Degree of freedom (DOF)	180497

A posteriori RMS of unit weight	0.00115 m
Chi**2/DOF	1.32

Total number of observation files	43
Total number of stations	8
Total number of satellites	0

Station inconsistencies:

No inconsistencies detected

Station coordinates and velocities:

Sol To	Station name	Typ	Correction	Estimated value	RMS error	A priori value	Unit	From
			MJD	Num	Abb			
00:02:00	1 101_ 101	X	0.0055	4033460.7149	0.0016	4033460.7094	meters	2008-06-24
		Y	0.0000	23540.2401	0.0012	23540.2401	meters	2008-06-24
00:02:00	1 101_ 101	Z	0.0023	4924318.9737	0.0017	4924318.9714	meters	2008-06-24
00:02:00	1 101_ 101		54641.5005		3 #CRD			
00:02:00	1 102_ 102	X	0.0073	4033454.6967	0.0035	4033454.6894	meters	2008-06-26
		Y	-0.0005	23563.1522	0.0015	23563.1527	meters	2008-06-26
00:02:00	1 102_ 102	Z	0.0043	4924315.8863	0.0040	4924315.8820	meters	2008-06-26
00:02:00	1 102_ 102		54643.5003		6 #CRD			
00:02:00	1 103_ 103	X	0.0038	4033435.2847	0.0058	4033435.2809	meters	2008-06-25
		Y	0.0006	23562.9470	0.0015	23562.9464	meters	2008-06-25
00:02:00	1 103_ 103	Z	0.0016	4924331.7015	0.0047	4924331.6999	meters	2008-06-25
00:02:00	1 103_ 103		54642.5003		9 #CRD			
00:02:00	1 105_ 105	X	0.0056	4033459.5615	0.0019	4033459.5559	meters	2008-06-24
		Y	-0.0002	23626.6097	0.0012	23626.6099	meters	2008-06-24
00:02:00	1 105_ 105	Z	0.0027	4924304.1437	0.0021	4924304.1410	meters	2008-06-24
00:02:00	1 105_ 105		54642.5003		12 #CRD			
00:02:00	1 109_ 109	X	0.0073	4033503.3514	0.0027	4033503.3441	meters	2008-06-25
		Y	0.0012	23582.1590	0.0015	23582.1578	meters	2008-06-25
00:02:00	1 109_ 109	Z	0.0036	4924269.2896	0.0032	4924269.2860	meters	2008-06-25
00:02:00	1 109_ 109		54642.5003		15 #CRD			
00:02:00	1 HER 13212M007	X	0.0015	4033470.0735	0.0011	4033470.0720	meters	2008-06-24
		Y	-0.0006	23672.9474	0.0011	23672.9480	meters	2008-06-24
00:02:00	1 HER 13212M007	Z	-0.0012	4924301.3548	0.0011	4924301.3560	meters	2008-06-24
00:02:00	1 HER 13212M007		54642.5003		18 #CRD			
00:02:00	1 HERT 13212M010	X	0.0072	4033460.8911	0.0013	4033460.8839	meters	2008-06-25
		Y	0.0016	23537.8566	0.0012	23537.8550	meters	2008-06-25
00:02:00	1 HERT 13212M010	Z	0.0037	4924318.3025	0.0013	4924318.2988	meters	2008-06-25
00:02:00	1 HERT 13212M010		54643.0003		21 #CRD			
00:02:00	1 SLR_ SLR_ARP	X	0.0056	4033463.9146	0.0019	4033463.9090	meters	2008-06-24
		Y	-0.0001	23662.6770	0.0013	23662.6771	meters	2008-06-24
00:02:00	1 SLR_ SLR_ARP	Z	0.0020	4924305.7170	0.0022	4924305.7150	meters	2008-06-24
00:02:00	1 SLR_ SLR_ARP		54641.5005		24 #CRD			

Station coordinates and velocities:

Reference epoch: 2008-06-25 12:00:00

Station name 2-D ellipse	Typ	A priori value	Estimated value	Correction	RMS error	3-D ellipsoid		
101_ 101	X	4033460.7094	4033460.7149	0.0055	0.0016			
	Y	23540.2401	23540.2401	0.0000	0.0012			
	Z	4924318.9714	4924318.9737	0.0023	0.0017			
89.8	U	83.7637	83.7690	0.0052	0.0020	0.0020	1.1	
	N	50 52 2.945666	50 52 2.945576	-0.0028	0.0013	0.0012	89.9	0.0012
	E	0 20 3.797008	0 20 3.797005	-0.0001	0.0012	0.0013	-0.2	0.0013
102_ 102	X	4033454.6894	4033454.6967	0.0073	0.0035			
	Y	23563.1527	23563.1522	-0.0005	0.0015			
	Z	4924315.8820	4924315.8863	0.0043	0.0040			
105.1	U	77.6525	77.6604	0.0079	0.0050	0.0050	1.0	
	N	50 52 3.030322	50 52 3.030226	-0.0030	0.0017	0.0014	105.2	0.0014
	E	0 20 4.970481	0 20 4.970454	-0.0005	0.0014	0.0018	-0.6	0.0018
103_ 103	X	4033435.2809	4033435.2847	0.0038	0.0058			
	Y	23562.9464	23562.9470	0.0006	0.0015			
	Z	4924331.6999	4924331.7015	0.0016	0.0047			
	U	77.6728	77.6764	0.0037	0.0071	0.0072	12.5	

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		N	50 52	3.840579	50 52	3.840517	-0.0019	0.0023	0.0015	86.7	0.0015
93.0		E	0 20	4.965729	0 20	4.965760	0.0006	0.0015	0.0017	-1.8	0.0023
105_	105	X		4033459.5559		4033459.5615	0.0056	0.0019			
		Y		23626.6099		23626.6097	-0.0002	0.0012			
		Z		4924304.1410		4924304.1437	0.0027	0.0021			
		U		71.8507		71.8563	0.0056	0.0025	0.0025	0.6	
93.3		N	50 52	2.659060	50 52	2.658975	-0.0026	0.0014	0.0012	93.3	0.0012
		E	0 20	8.214018	0 20	8.214006	-0.0002	0.0012	0.0014	0.0	0.0014
109_	109	X		4033503.3441		4033503.3514	0.0073	0.0027			
		Y		23582.1578		23582.1590	0.0012	0.0015			
		Z		4924269.2860		4924269.2896	0.0036	0.0032			
		U		72.2852		72.2926	0.0074	0.0038	0.0038	2.6	
105.5		N	50 52	0.854605	50 52	0.854495	-0.0034	0.0017	0.0014	106.2	0.0014
		E	0 20	5.927793	0 20	5.927854	0.0012	0.0015	0.0017	1.6	0.0017
HERS	13212M007	X		4033470.0720		4033470.0735	0.0015	0.0011			
		Y		23672.9480		23672.9474	-0.0006	0.0011			
		Z		4924301.3560		4924301.3548	-0.0012	0.0011			
		U		76.4987		76.4987	0.0000	0.0011	0.0011	0.4	
85.6		N	50 52	2.331396	50 52	2.331333	-0.0019	0.0011	0.0011	85.6	0.0011
		E	0 20	10.580438	0 20	10.580407	-0.0006	0.0011	0.0011	-0.4	0.0011
HERT	13212M010	X		4033460.8839		4033460.8911	0.0072	0.0013			
		Y		23537.8550		23537.8566	0.0016	0.0012			
		Z		4924318.2988		4924318.3025	0.0037	0.0013			
		U		83.3433		83.3508	0.0074	0.0014	0.0014	1.8	
91.8		N	50 52	2.927899	50 52	2.927795	-0.0032	0.0012	0.0012	91.8	0.0012
		E	0 20	3.674990	0 20	3.675072	0.0016	0.0012	0.0012	-0.1	0.0012
SLR_	SLR_ARP__	X		4033463.9090		4033463.9146	0.0056	0.0019			
		Y		23662.6771		23662.6770	-0.0001	0.0013			
		Z		4924305.7150		4924305.7170	0.0020	0.0022			
		U		75.9523		75.9574	0.0051	0.0025	0.0025	1.8	
88.7		N	50 52	2.576632	50 52	2.576533	-0.0031	0.0014	0.0013	88.3	0.0013
		E	0 20	10.057069	0 20	10.057063	-0.0001	0.0013	0.0014	-1.3	0.0014

Comparison of Individual Solutions:

101_N	1.31	-1.31		
101_E	0.34	-0.34		
101_U	0.05	0.05		
102_N	1.22		-1.22	
102_E	0.87		-0.87	
102_U	0.02		0.02	
103_N	1.36		-1.36	
103_E	0.01		-0.01	
103_U	0.02		0.02	
105_N	1.31	-1.31		
105_E	0.34	-0.34		
105_U	0.05	0.05		
109_N	1.37		-1.37	
109_E	0.01		-0.01	
109_U	0.04		0.04	
HERS_N	1.58	-1.31	-1.35	-1.22
HERS_E	0.50	-0.34	-0.46	-0.42
HERS_U	0.04	0.05	0.03	0.01
HERT_N	1.86		-1.39	-1.23
HERT_E	1.44		0.46	-1.36
HERT_U	0.09		0.06	0.07
SLR_N	1.31	-1.31		
SLR_E	0.34	-0.34		
SLR_U	0.05	0.05		

(HERSALL Sinex Output File)

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%=SNX 1.00 IGN 08:227:34846 SGN 08:176:00120 08:178:86340 P 00024 0 X
*-----
+FILE/REFERENCE
*INFO_TYPE INFO
DESCRIPTION IGN weekly results SINEX format v0.05
OUTPUT Service de Geodesie et Nivellement - IGN - France
CONTACT rgadmin@ign.fr
SOFTWARE Bernese GPS Software 5.0
HARDWARE AMD64 - Linux Debian
INPUT RGP/EPN/IGS GNSS tracking data
-FILE/REFERENCE
*-----
+INPUT/ACKNOWLEDGMENTS
*AGY DESCRIPTION
IGN Institut Geographique National - France
EPN European Permanent Network
-INPUT/ACKNOWLEDGMENTS
*-----
+SOLUTION/STATISTICS
* STATISTICAL PARAMETER VALUE(S)
NUMBER OF OBSERVATIONS 183524
NUMBER OF UNKNOWNS 3027
NUMBER OF DEGREES OF FREEDOM 180497
SAMPLING INTERVAL (SECONDS) 120
PHASE MEASUREMENTS SIGMA 0.00100
VARIANCE FACTOR 1.318238210350058
-SOLUTION/STATISTICS
*-----
+SITE/ID
*CODE PT DOMES T STATION DESCRIPTION APPROX_LON APPROX_LAT APP_H
101 A 101 P 101_ 101_____ 0 20 3.8 50 52 2.9 83.8
102 A 102 P 102_ 102_____ 0 20 5.0 50 52 3.0 77.7
103 A 103 P 103_ 103_____ 0 20 5.0 50 52 3.8 77.7
105 A 105 P 105_ 105_____ 0 20 8.2 50 52 2.7 71.9
109 A 109 P 109_ 109_____ 0 20 5.9 50 52 0.9 72.3
HERS A 13212M007 P HERS 13212M007 0 20 10.6 50 52 2.3 76.5
HERT A 13212M010 P HERT 13212M010 0 20 3.7 50 52 2.9 83.3
SLR A SLR_ARP P SLR_ SLR_ARP 0 20 10.1 50 52 2.6 76.0
-SITE/ID
*-----
+SITE/RECEIVER
*SITE PT SOLN T DATA_START DATA_END DESCRIPTION S/N FIRMWARE
101 A 0001 P 08:176:00120 08:176:86370 LEICA SR530 -----
102 A 0001 P 08:178:00120 08:178:86340 LEICA SR530 -----
103 A 0001 P 08:177:00120 08:177:86340 LEICA SR530 -----
105 A 0001 P 08:176:00120 08:176:86370 LEICA SR530 -----
109 A 0001 P 08:177:00120 08:177:86340 LEICA SR530 -----
HERS A 0001 P 08:176:00120 08:178:86340 ASHTECH Z-KII3 -----
HERT A 0001 P 08:177:00120 08:178:86340 LEICA GRX1200GGPRO -----
SLR A 0001 P 08:176:00120 08:176:86370 LEICA SR530 -----
-SITE/RECEIVER
*-----
+SITE/ANTENNA
*SITE PT SOLN T DATA_START DATA_END DESCRIPTION S/N
101 A 0001 P 08:176:00120 08:176:86370 LEIAT504 NONE -----
102 A 0001 P 08:178:00120 08:178:86340 LEIAT504 NONE -----
103 A 0001 P 08:177:00120 08:177:86340 LEIAT504 NONE -----
105 A 0001 P 08:176:00120 08:176:86370 LEIAT504 NONE -----
109 A 0001 P 08:177:00120 08:177:86340 LEIAT504 NONE -----
HERS A 0001 P 08:176:00120 08:178:86340 ASH700936E NONE 16688
HERT A 0001 P 08:177:00120 08:178:86340 LEIAT504GG NONE -----
SLR A 0001 P 08:176:00120 08:176:86370 LEIAT504 NONE -----
-SITE/ANTENNA
*-----
+SITE/GPS_PHASE_CENTER
* UP NORTH_ EAST_ UP NORTH_ EAST_
*DESCRIPTION S/N L1->ARP(M) L2->ARP(M)
ASH700936E NONE 16688 0.0917 0.0002 -.0001 0.1207 -.0006 0.0001 IGS05_1402
LEIAT504 NONE ----- 0.0912 0.0001 -.0003 0.1173 -.0001 0.0001 IGS05_1402
LEIAT504GG NONE ----- 0.0903 0.0008 0.0009 0.1191 -.0001 -.0001 IGS05_1402
-SITE/GPS_PHASE_CENTER
*-----
+SITE/ECCENTRICITY
* UP NORTH_ EAST_
*SITE PT SOLN T DATA_START DATA-END AXE ARP->BENCHMARK(M)
101 A 0001 P 08:176:00120 08:176:86370 UNE 0.0000 0.0000 0.0000
102 A 0001 P 08:178:00120 08:178:86340 UNE 0.0000 0.0000 0.0000
103 A 0001 P 08:177:00120 08:177:86340 UNE 0.0000 0.0000 0.0000
105 A 0001 P 08:176:00120 08:176:86370 UNE 0.0000 0.0000 0.0000
109 A 0001 P 08:177:00120 08:177:86340 UNE 0.0000 0.0000 0.0000
HERS A 0001 P 08:176:00120 08:178:86340 UNE 0.0096 0.0000 0.0000
HERT A 0001 P 08:177:00120 08:178:86340 UNE 0.0000 0.0000 0.0000
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SLR_ A 0001 P 08:176:00120 08:176:86370 UNE 0.0000 0.0000 0.0000
-SITE/ECCENTRICITY

*-----

+SOLUTION/EPOCHS

CODE	PT	SOLN	T	_DATA_START_	_DATA_END_	MEAN_EPOCH
101_	A	0001	P	08:176:00120	08:176:86370	08:176:43245
102_	A	0001	P	08:178:00120	08:178:86340	08:178:43230
103_	A	0001	P	08:177:00120	08:177:86340	08:177:43230
105_	A	0001	P	08:176:00120	08:176:86370	08:176:43245
109_	A	0001	P	08:177:00120	08:177:86340	08:177:43230
HERS	A	0001	P	08:176:00120	08:178:86340	08:177:43230
HERT	A	0001	P	08:177:00120	08:178:86340	08:178:00030
SLR_	A	0001	P	08:176:00120	08:176:86370	08:176:43245

-SOLUTION/EPOCHS

*-----

+SOLUTION/ESTIMATE

INDEX	TYPE	CODE	PT	SOLN	REF_EPOCH	UNIT	S	ESTIMATED_VALUE	STD_DEV
1	STAX	101_	A	0001	08:176:43245	m	0	0.403346071486178E+07	.160078E-02
2	STAY	101_	A	0001	08:176:43245	m	0	0.235402400706956E+05	.119623E-02
3	STAZ	101_	A	0001	08:176:43245	m	0	0.492431897368620E+07	.171499E-02
4	STAX	102_	A	0001	08:178:43230	m	0	0.403345469669024E+07	.348901E-02
5	STAY	102_	A	0001	08:178:43230	m	0	0.235631522060222E+05	.145378E-02
6	STAZ	102_	A	0001	08:178:43230	m	0	0.492431588625275E+07	.399860E-02
7	STAX	103_	A	0001	08:177:43230	m	0	0.403343528469378E+07	.577589E-02
8	STAY	103_	A	0001	08:177:43230	m	0	0.235629470115702E+05	.147090E-02
9	STAZ	103_	A	0001	08:177:43230	m	0	0.492433170154016E+07	.468538E-02
10	STAX	105_	A	0001	08:176:43245	m	0	0.403345956149209E+07	.188709E-02
11	STAY	105_	A	0001	08:176:43245	m	0	0.236266096910364E+05	.122459E-02
12	STAZ	105_	A	0001	08:176:43245	m	0	0.492430414367236E+07	.207786E-02
13	STAX	109_	A	0001	08:177:43230	m	0	0.403350335137908E+07	.265847E-02
14	STAY	109_	A	0001	08:177:43230	m	0	0.235821590198540E+05	.146804E-02
15	STAZ	109_	A	0001	08:177:43230	m	0	0.492426928960137E+07	.322116E-02
16	STAX	HERS	A	0001	08:177:43230	m	0	0.403347007353551E+07	.114553E-02
17	STAY	HERS	A	0001	08:177:43230	m	0	0.236729473981289E+05	.114145E-02
18	STAZ	HERS	A	0001	08:177:43230	m	0	0.492430135480628E+07	.114629E-02
19	STAX	HERT	A	0001	08:178:00030	m	0	0.403346089107272E+07	.128543E-02
20	STAY	HERT	A	0001	08:178:00030	m	0	0.235378566352317E+05	.115749E-02
21	STAZ	HERT	A	0001	08:178:00030	m	0	0.492431830252664E+07	.131893E-02
22	STAX	SLR_	A	0001	08:176:43245	m	0	0.403346391457997E+07	.190489E-02
23	STAY	SLR_	A	0001	08:176:43245	m	0	0.236626770141141E+05	.126158E-02
24	STAZ	SLR_	A	0001	08:176:43245	m	0	0.492430571701576E+07	.218347E-02

-SOLUTION/ESTIMATE

*-----

+SOLUTION/APRIORI

INDEX	TYPE	CODE	PT	SOLN	REF_EPOCH	UNIT	S	APRIORI_VALUE	STD_DEV
1	STAX	101_	A	0001	08:176:43245	m	0	0.403346070940000E+07	.363076E+01
2	STAY	101_	A	0001	08:176:43245	m	0	0.235402401000000E+05	.363076E+01
3	STAZ	101_	A	0001	08:176:43245	m	0	0.492431897140000E+07	.363076E+01
4	STAX	102_	A	0001	08:178:43230	m	0	0.403345468940000E+07	.363076E+01
5	STAY	102_	A	0001	08:178:43230	m	0	0.235631527000000E+05	.363076E+01
6	STAZ	102_	A	0001	08:178:43230	m	0	0.492431588200000E+07	.363076E+01
7	STAX	103_	A	0001	08:177:43230	m	0	0.403343528090000E+07	.363076E+01
8	STAY	103_	A	0001	08:177:43230	m	0	0.235629464000000E+05	.363076E+01
9	STAZ	103_	A	0001	08:177:43230	m	0	0.492433169990000E+07	.363076E+01
10	STAX	105_	A	0001	08:176:43245	m	0	0.403345955590000E+07	.363076E+01
11	STAY	105_	A	0001	08:176:43245	m	0	0.236266099000000E+05	.363076E+01
12	STAZ	105_	A	0001	08:176:43245	m	0	0.492430414100000E+07	.363076E+01
13	STAX	109_	A	0001	08:177:43230	m	0	0.403350334410000E+07	.363076E+01
14	STAY	109_	A	0001	08:177:43230	m	0	0.235821578000000E+05	.363076E+01
15	STAZ	109_	A	0001	08:177:43230	m	0	0.492426928600000E+07	.363076E+01
16	STAX	HERS	A	0001	08:177:43230	m	0	0.403347007200000E+07	.114721E-02
17	STAY	HERS	A	0001	08:177:43230	m	0	0.236729480000000E+05	.114353E-02
18	STAZ	HERS	A	0001	08:177:43230	m	0	0.492430135600000E+07	.114753E-02
19	STAX	HERT	A	0001	08:178:00030	m	0	0.403346088390000E+07	.363076E+01
20	STAY	HERT	A	0001	08:178:00030	m	0	0.235378550000000E+05	.363076E+01
21	STAZ	HERT	A	0001	08:178:00030	m	0	0.492431829880000E+07	.363076E+01
22	STAX	SLR_	A	0001	08:176:43245	m	0	0.403346390900000E+07	.363076E+01
23	STAY	SLR_	A	0001	08:176:43245	m	0	0.236626771000000E+05	.363076E+01
24	STAZ	SLR_	A	0001	08:176:43245	m	0	0.492430571500000E+07	.363076E+01

-SOLUTION/APRIORI

*-----

+SOLUTION/MATRIX_ESTIMATE L COVA

*PARA1	PARA2	PARA2+0	PARA2+1	PARA2+2
1	1	0.25625070310160E-05		
2	1	0.12801082541389E-07	0.14309563253904E-05	
3	1	0.11347750827732E-05	0.13241823801018E-07	0.29411916063253E-05
4	1	0.13123521665250E-05	0.43987564776035E-09	0.42869346321369E-08
4	4	0.12173209015934E-04		
5	1	0.55564489950341E-09	0.13028844449477E-05	-0.44553801386393E-09
5	4	-0.51380468553714E-07	0.21134861472524E-05	
6	1	0.31242727061036E-08	-0.12620171980171E-08	0.13111871902949E-05
6	4	0.10859162712058E-04	0.36907856320283E-06	0.15988787666888E-04
7	1	0.13066510758506E-05	-0.16267835823001E-08	0.55549445838288E-08
7	4	0.13851480653957E-05	-0.20113889571606E-08	0.75680149653203E-07
7	7	0.33360926655032E-04		
8	1	0.16272135004231E-08	0.13029636016266E-05	-0.81218070303953E-09
8	4	0.14741402480187E-08	0.13114741288710E-05	-0.29098933589102E-09

8	7	-0.53102615952537E-06	0.21635458244672E-05	
9	1	0.24387899742704E-09	-0.14243700336032E-08	0.13110160720319E-05
9	4	0.70648797585901E-07	-0.32258265408258E-09	0.14113694418335E-05
9	7	0.24127587234573E-04	-0.48193695181753E-06	0.21952792396040E-04
10	1	0.17170068322277E-05	0.60531344462095E-08	0.37007030856875E-06
10	4	0.13119202509838E-05	-0.60960470866716E-09	0.32535543701389E-08
10	7	0.13062430030787E-05	0.46150429515656E-09	0.37423702246295E-09
10	10	0.35611191641921E-05		
11	1	0.67400207142544E-08	0.13457035303632E-05	0.54849847726809E-08
11	4	0.54632966703788E-09	0.13031524848994E-05	-0.12096789263879E-08
11	7	-0.152116137686963E-08	0.13032317299331E-05	-0.13723050650473E-08
11	10	-0.7006568480981E-08	0.14996101655987E-05	
12	1	0.36799746698816E-06	0.51622186307614E-08	0.18203986692144E-05
12	4	0.42866675044008E-08	-0.11920643989753E-08	0.13111443430770E-05
12	7	0.55558189462681E-08	-0.15587401567172E-08	0.13109733232474E-05
12	10	0.20374156115559E-05	0.22909133513968E-07	0.43175172369000E-05
13	1	0.13119390066709E-05	0.90511559694894E-09	0.33755442675937E-08
13	4	0.13899754011314E-05	0.73485565607094E-09	0.72342791293816E-07
13	7	0.15353691485407E-05	0.43933840604769E-08	0.20812077574575E-06
13	10	0.13115067213120E-05	0.10115955031278E-08	0.33750408068173E-08
13	13	0.70674839016999E-05		
14	1	0.10418205705614E-08	0.13028619238479E-05	-0.57897300548777E-09
14	4	0.87894533395082E-09	0.13113662745583E-05	-0.10012912341058E-09
14	7	-0.21841080441076E-08	0.13271653740577E-05	0.36135767628806E-09
14	10	-0.12358206462173E-09	0.13031299931800E-05	-0.13254820049881E-08
14	13	-0.29318055965055E-06	0.21551347930831E-05	
15	1	0.21800183247331E-08	-0.14694227735658E-08	0.13103604549977E-05
15	4	0.72261305409420E-07	-0.29208434288816E-09	0.14100904256418E-05
15	7	0.22132807447590E-06	0.31539313031328E-08	0.16099919778469E-05
15	10	0.23097147858625E-08	-0.14172365784026E-08	0.13103177540020E-05
15	13	0.55601643125371E-05	0.14269617096566E-07	0.10375859874771E-04
16	1	0.13122494872593E-05	0.98719694436618E-09	0.45056439925606E-08
16	4	0.13123334151718E-05	0.733322319015123E-09	0.38530994389465E-08
16	7	0.13066528390492E-05	0.18046805624955E-08	0.97263493185672E-09
16	10	0.13118171376537E-05	0.10937639743336E-08	0.45050559769095E-08
16	13	0.13119198187744E-05	0.12194128696338E-08	0.29083722990395E-08
16	16	0.13122309339191E-05		
17	1	0.73038197230434E-09	0.13029172762613E-05	-0.81342228399178E-09
17	4	0.36055454742349E-09	0.13028668705553E-05	-0.13709158617569E-08
17	7	-0.17058401360327E-08	0.13029459920969E-05	-0.15330790139939E-08
17	10	-0.43499075066515E-09	0.13031853224193E-05	-0.15599552394308E-08
17	13	0.82588865352792E-09	0.13028443315727E-05	-0.15781932711163E-08
17	16	0.90785650162293E-09	0.13028997214188E-05	
18	1	0.30691805406530E-08	-0.44224803340972E-09	0.13121806631349E-05
18	4	0.35794962904696E-08	-0.18275913456040E-09	0.13129853885287E-05
18	7	0.48519171616223E-08	-0.55047169299402E-09	0.13128155682979E-05
18	10	0.31978451898280E-08	-0.38970592593332E-09	0.13121373131781E-05
18	13	0.26671734220375E-08	-0.31664617140710E-09	0.13121579895248E-05
18	16	0.37986725118512E-08	-0.55123682423945E-09	0.13139804211883E-05
19	1	0.13120025062616E-05	0.10945182461588E-08	0.43867369979166E-08
19	4	0.14746510408587E-05	0.1119644975384E-08	0.14900192503825E-06
19	7	0.14706705396301E-05	0.18572170880823E-08	0.14750584443083E-06
19	10	0.13115701302664E-05	0.12010826207941E-08	0.43860914154093E-08
19	13	0.14749981540720E-05	0.12514666843113E-08	0.14875657465470E-06
19	16	0.13119839054520E-05	0.10152010756144E-08	0.36797582509254E-08
19	19	0.16523332279895E-05		
20	1	0.74685202442294E-09	0.13028032544050E-05	-0.77566443001489E-09
20	4	0.93416138923043E-09	0.13204062720343E-05	0.90330908310680E-09
20	7	-0.21912598813297E-08	0.13208246423731E-05	0.15339057305375E-09
20	10	-0.41842044255668E-09	0.13030712799480E-05	-0.15221333050323E-08
20	13	0.79357385753172E-09	0.13207096202628E-05	0.26832433484195E-09
20	16	0.92433171006399E-09	0.13027856969789E-05	-0.51345916223290E-09
20	19	0.11493238013498E-08	0.13397729152320E-05	
21	1	0.29871349933886E-08	-0.29333639731020E-09	0.13118569178701E-05
21	4	0.14906791227755E-06	0.19462246698291E-08	0.15172465668627E-05
21	7	0.15353170887153E-06	0.14781461530695E-08	0.15198632744239E-05
21	10	0.31156615957325E-08	-0.24078322108198E-09	0.13118134933383E-05
21	13	0.14895352091397E-06	0.16238816815115E-08	0.15179117864916E-05
21	16	0.37164686167854E-08	-0.40229541482710E-09	0.13136563061873E-05
21	19	0.30899720929000E-06	0.35394049541180E-08	0.17395892051252E-05
22	1	0.16957182946612E-05	0.7046452437750E-08	0.35115130045299E-06
22	4	0.13125873697655E-05	0.15778727291170E-08	0.27393182671886E-08
22	7	0.13069032639872E-05	0.26498037394357E-08	-0.14167084357739E-09
22	10	0.16309022064350E-05	0.51770962988954E-08	0.29367717809187E-06
22	13	0.13121747677957E-05	0.20641573379344E-08	0.17949737598051E-08
22	16	0.13124850372108E-05	0.17527748814099E-08	0.26845678740284E-08
22	19	0.13122381308323E-05	0.17691473836630E-08	0.26027193167526E-08
22	22	0.36286102814392E-05		
23	1	0.61644561085905E-08	0.13431795151591E-05	0.51089673406801E-08
23	4	0.36621276248934E-09	0.13024245212320E-05	-0.12725370676469E-08
23	7	-0.16994093495910E-08	0.13025035929952E-05	-0.14346699276934E-08
23	10	0.24565243724160E-08	0.13366915754526E-05	0.28606209834078E-08
23	13	0.83131912095318E-09	0.13024019819612E-05	-0.14798097645952E-08
23	16	0.91334481254335E-09	0.13024573342015E-05	-0.45306235920010E-09
23	19	0.10206430375373E-08	0.13023433513602E-05	-0.30419602879761E-09
23	22	0.84410365800951E-07	0.15915846660074E-05	
24	1	0.34891591445069E-06	0.50778260684346E-08	0.18012613665251E-05

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24      4   0.37613888331534E-08   0.18781998472089E-09   0.13109798190974E-05
24      7   0.50304682309400E-08   -0.17915549760795E-09   0.13108098011925E-05
24     10   0.28954424351065E-06   0.40179721042079E-08   0.17133920974877E-05
24     13   0.28505328414087E-08   0.54200431603608E-10   0.13101534903369E-05
24     16   0.39803711254111E-08   -0.18006057605931E-09   0.13119735568716E-05
24     19   0.38616337711495E-08   -0.14237067151661E-09   0.13116499675823E-05
24     22   0.22261114761197E-05   0.90371901051201E-07   0.47675223359656E-05

```

-SOLUTION/MATRIX_ESTIMATE L COVA

*

+SOLUTION/MATRIX_APRIORI L COVA

*PARA1	PARA2	PARA2+0	PARA2+1	PARA2+2
1	1	0.13182382103501E+02		
2	1	0.00000000000000E+00	0.13182382103501E+02	
3	1	0.00000000000000E+00	0.00000000000000E+00	0.13182382103501E+02
4	4	0.13182382103501E+02		
5	4	0.00000000000000E+00	0.13182382103501E+02	
6	4	0.00000000000000E+00	0.00000000000000E+00	0.13182382103501E+02
7	7	0.13182382103501E+02		
8	7	0.00000000000000E+00	0.13182382103501E+02	
9	7	0.00000000000000E+00	0.00000000000000E+00	0.13182382103501E+02
10	10	0.13182382103501E+02		
11	10	0.00000000000000E+00	0.13182382103501E+02	
12	10	0.00000000000000E+00	0.00000000000000E+00	0.13182382103501E+02
13	13	0.13182382103501E+02		
14	13	0.00000000000000E+00	0.13182382103501E+02	
15	13	0.00000000000000E+00	0.00000000000000E+00	0.13182382103501E+02
16	16	0.13160993905120E-05		
17	16	0.49565966712392E-10	0.13076544787649E-05	
18	16	0.17398247374633E-08	0.10211252297369E-10	0.13168224881388E-05
19	19	0.13182382103501E+02		
20	19	0.00000000000000E+00	0.13182382103501E+02	
21	19	0.00000000000000E+00	0.00000000000000E+00	0.13182382103501E+02
22	22	0.13182382103501E+02		
23	22	0.00000000000000E+00	0.13182382103501E+02	
24	22	0.00000000000000E+00	0.00000000000000E+00	0.13182382103501E+02

-SOLUTION/MATRIX_APRIORI L COVA

%ENDSNX

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6.5. Coordinates and Discontinuities

Extract of coordinates (at epoch 2008 :177) from the ITRF website.

DATA SET EXPRESSED IN ITRF2005 FRAME STATION POSITIONS AND VELOCITIES AT EPOCH 2008/06/25										
DOMES NB	SITE NAME	ID	SOLN	X/Vx	Y/Vy	Z/Vz	SIGMA x/vx	SIGMA y/vy	SIGMA z/vz	
				m-m/y	m-m/y	m-m/y	m-m/y	m-m/y	m-m/y	
13212M007	HERSTMONCEUX	HERS	1	4033470.078	23672.950	4924301.355	0.003	0.002	0.004	
				-0.0119	0.0172	0.0113	0.0002	0.0002	0.0002	
13212M007	HERSTMONCEUX	HERS	2	4033470.076	23672.952	4924301.356	0.003	0.002	0.003	
				-0.0119	0.0172	0.0113	0.0002	0.0002	0.0002	
13212M007	HERSTMONCEUX	HERS	4	4033470.072	23672.948	4924301.356	0.001	0.001	0.001	
				-0.0119	0.0172	0.0113	0.0002	0.0002	0.0002	
13212M010	HERSTMONCEUX	HERT	1	4033460.886	23537.857	4924318.296	0.001	0.001	0.002	
				-0.0119	0.0172	0.0113	0.0002	0.0002	0.0002	

We used the following extract of the IGS-Discontinuities for the choice of the HERs constrained coordinates in the computation input file according to our observation period (solution number 4).

```
HERS A 1 P 00:000:00000 98:182:00000 P - Antenna & Receiver Change
HERS A 2 P 98:182:00000 99:110:43200 P - Start Antenna Problem
HERS A 3 P 99:110:43200 01:220:00000 P - End Antenna Problem
HERS A 4 P 01:220:00000 00:000:00000 P -
```

6.6. Herstmonceux network adjustment input file

```

TITLE HERSTMONCEUX LASER TIES - JUNE 2008 SURVEY
COMP ADJ
ELIP WGS 84           6378137.0000  6356752.3142      0.0      0.0      0.0
MAXI                 10
CONF YES YES YES NO
PSOL NO  YES
PMIS NO  NO
PRES YES NO
PADJ NO  NO  YES NO  YES NO  NO  NO
VARF YES YES NO
RTST TAU MAX
LUNT m    1.000000000000
CONV   0.00010
CLEV   95.000
ANGT GRD
LDEC 4

*****POINTS DESCRIPTION*****

*SLR (CDP number 7840)

*SLR_SRP : (DOMES 13212S001) = intersection of the rotation axes of the
*telescope (= System Reference Point)
*SLR_HAXIS_UP : top of the sharped piece on the side of the telescope(used for levelling only)
*SLR_ARP : ARP of the antenna on the translation stage (centred on the vertical axis)
*SLR_PRI : PRISM on the translation stage (centred on the vertical axis)

*PERMANENT GPS

*HERS : MARKER (DOMES 13212M007) (= IGS reference point)
*HERS_ARP : ANTENNA AXIS AT ARP (i.e. 0.0096 m above marker)
*HERS_BCR : ANTENNA AXIS BOTTOM OF CHOKE RINGS (i.e. 0.0350 m above HERS_ARP)(used for indirect levelling)

*HERT : (DOMES 13212M010) (= IGS reference point) = ANTENNA AXIS AT ARP
*HERT_BCR : ANTENNA AXIS BOTTOM OF CHOKE RINGS (i.e. 0.0345 m above HERT_ARP)

*TEMPORARY MARKS
*101 : ARP of the GPS Leica AT504 CHOKE RING Antenna
*102 : ARP of the GPS Leica AT504 CHOKE RING Antenna
*103 : ARP of the GPS Leica AT504 CHOKE RING Antenna
*104 : ARP of the GPS Leica AT504 CHOKE RING Antenna
*105 : ARP of the GPS Leica AT504 CHOKE RING Antenna;
*(this point is on the SOLAR PILAR but as the screw was loose; this is a temporary point)
*106 : ARP of the GPS Leica AT504 CHOKE RING Antenna
*107 : ARP of the GPS Leica AT504 CHOKE RING Antenna
*108 : theodolite optical axis (intersection of the rotation axes of the theodolite),
*also centre of prism (no GPS on this point under trees)
*109 : ARP of the GPS Leica AT504 CHOKE RING Antenna

*TEMPORARY STATIONS FOR THE DETERMINATION OF THE WATER TOWER CALIBRATION TARGET
*301 : theodolite (intersection of the rotation axes of the theodolite)
*302 : theodolite (intersection of the rotation axes of the theodolite)

*REFLECTIVE TAPES ON THE WATER TOWER CALIBRATION TARGET
*(3001 to 3008 numbered from left to right and top to bottom)
*3001 : REFLECTIVE TAPE ON THE UPPER LEFT CORNER OF THE LEFT PANNEL
*3002 : REFLECTIVE TAPE ON THE UPPER RIGHT CORNER OF THE LEFT PANNEL
*3003 : REFLECTIVE TAPE ON THE UPPER LEFT CORNER OF THE RIGHT PANNEL
*3004 : REFLECTIVE TAPE ON THE UPPER RIGHT CORNER OF THE RIGHT PANNEL
*3005 : REFLECTIVE TAPE ON THE UPPER LEFT CORNER OF THE LEFT PANNEL
*3006 : REFLECTIVE TAPE ON THE UPPER RIGHT CORNER OF THE LEFT PANNEL
*3007 : REFLECTIVE TAPE ON THE UPPER LEFT CORNER OF THE RIGHT PANNEL
*3008 : REFLECTIVE TAPE ON THE UPPER RIGHT CORNER OF THE RIGHT PANNEL
*3009 : SCREW (approximate centre of the calibration target)

*****LEVELLING POINTS DESCRIPTIONS*****
*105_SPIT : spit on the ground just near the SOLAR PILAR (105)
*SLR_SPIGOT : SPIGOT on the south-east corner of the laser pedestal
*N102 : top of a special device for levelling (2 cm half sphere) on the (top of) heavy tripod 102
*N103 : top of a special device for levelling (2 cm half sphere) on the (top of) heavy tripod 103
*N104 : top of a special device for levelling (2 cm half sphere) on the (top of) heavy tripod 104

*****POINTS COORDINATES*****

*FORCED ITRF2005 EPOCH 2008:177 COORDINATES
3DC
XYZ 000 HERS          4033470.072        23672.948        4924301.356
COV CT DTAG            1
ELEM                  0.000001       0.000001       0.000001

```

*OTHER POINTS APPROXIMATE COORDINATES

*PLH	000 101	N 50 52	2.94084 E	0 20	3.78990	83.76187 m	0
PLH	000 102	N 50 52	3.02565 E	0 20	4.96302	77.66590 m	0
PLH	000 103	N 50 52	3.83562 E	0 20	4.95879	77.67780 m	0
PLH	000 104	N 50 52	3.70790 E	0 20	3.41589	77.66783 m	0
*PLH	000 105	N 50 52	2.65434 E	0 20	8.20647	71.84557 m	0
PLH	000 106	N 50 52	3.24977 E	0 20	9.70987	69.89054 m	0
PLH	000 107	N 50 52	2.24179 E	0 20	8.79059	71.56674 m	0
PLH	000 108	N 50 52	2.11605 E	0 20	9.56840	69.17948 m	0
*PLH	000 109	N 50 52	0.84986 E	0 20	5.92079	72.29510 m	0
PLH	000 301	N 50 52	2.88500 E	0 20	4.81813	76.97828 m	0
PLH	000 302	N 50 52	3.57078 E	0 20	5.13672	77.80912 m	0
*PLH	000 HERT	N 50 52	2.92341 E	0 20	3.66761	83.33648 m	0
*PLH	000 HERT_BCR	N 50 52	2.92341 E	0 20	3.66761	83.37102 m	0
PLH	000 3001	N 50 52	2.97839 E	0 20	3.82919	83.05259 m	0
PLH	000 3002	N 50 52	2.99291 E	0 20	3.80908	83.09292 m	0
PLH	000 3003	N 50 52	2.99325 E	0 20	3.80917	83.09310 m	0
PLH	000 3004	N 50 52	3.00647 E	0 20	3.83150	83.06353 m	0
PLH	000 3005	N 50 52	2.97889 E	0 20	3.82882	82.81387 m	0
PLH	000 3006	N 50 52	2.99310 E	0 20	3.80801	82.85515 m	0
PLH	000 3007	N 50 52	2.99336 E	0 20	3.80809	82.85480 m	0
PLH	000 3008	N 50 52	3.00668 E	0 20	3.83037	82.82487 m	0
PLH	000 3009	N 50 52	2.99315 E	0 20	3.80846	82.94736 m	0
PLH	110 N102	N 50 52	3.02630 E	0 20	4.96283	77.49781 m	0
PLH	110 N103	N 50 52	3.83476 E	0 20	4.95851	77.50985 m	0
PLH	110 N104	N 50 52	3.70786 E	0 20	3.41600	77.49963 m	0
PLH	110 105_SPIT	N 50 52	2.65443 E	0 20	8.20651	70.44245 m	0
PLH	110 SLR_SPIGOT	N 50 52	2.57209 E	0 20	10.04971	73.57224 m	0
*PLH	000 HER_S_ARP	N 50 52	2.32692 E	0 20	10.57299	76.49697 m	0
*PLH	000 HER_S_BCR	N 50 52	2.32692 E	0 20	10.57299	76.53199 m	0
*PLH	000 SLR_ARP	N 50 52	2.57204 E	0 20	10.04974	76.00000 m	0
*PLH	000 SLR_PRI	N 50 52	2.57204 E	0 20	10.04974	76.11070 m	0

*****CENTRING EQUATIONS*****

*HERT_BCR centred and 3.45 cm above HERT with leica AT504GG
3DD

PLH	000 HERT	n 50 52	2.923340 e	0 20	3.667650	83.3000
PLH	000 HERT_BCR	n 50 52	2.923340 e	0 20	3.667650	83.3345
COV	LG DIAG	0.00000	1.00000	0.00000	1.00000	0.00000
ELEM		0.00000004		0.00000004		0.00000009

*HERS_ARP centred and 9.6 mm above HER
*HERS_BCR centred and 35.0 mm above HER_S_ARP with ASHTECH700936E
3DD

PLH	000 HER_S	n 50 52	2.326920 e	0 20	10.572990	76.48000
PLH	000 HER_S_ARP	n 50 52	2.326920 e	0 20	10.572990	76.48960
PLH	000 HER_S_BCR	n 50 52	2.326920 e	0 20	10.572990	76.52460
COV	LG DIAG	0.00000	1.00000	0.00000	1.00000	0.00000
ELEM		0.00000004		0.00000004		0.00000009
ELEM		0.00000004		0.00000004		0.00000009

*SLR_PRI centred and 0.1107 m above SLR_ARP
3DD

PLH	000 SLR_ARP	N 50 52	2.57204 E	0 20	10.04974	76.00000 m	0
PLH	000 SLR_PRI	N 50 52	2.57204 E	0 20	10.04974	76.11070 m	0
COV	LG DIAG	0.00000	1.00000	0.00000	1.00000	0.00000	
ELEM		0.00000004		0.00000004		0.00000009	

*SLR centring equations
2DD

PL	000 SLR_HAXIS_UP	n 50 52	2.572040 e	0 20	10.049740	
PL	000 SLR_SR	n 50 52	2.572040 e	0 20	10.049740	
PL	000 SLR_PRI	n 50 52	2.572040 e	0 20	10.049740	
COV	LG DIAG	0.00000	1.00000	0.00000	1.00000	0.00000
ELEM		0.00000004		0.00000004		0.00000004
ELEM		0.00000004		0.00000004		0.00000009

HIST NEW

***** SINEX imported from HersV3.2_Bernese5.SNX
*

3DC						
XYZ	101	4033460.7149	23540.2401	4924318.9737 m	0	
XYZ	105	4033459.5615	23626.6097	4924304.1437 m	0	
XYZ	109	4033503.3514	23582.1590	4924269.2896 m	0	
XYZ	HERS	4033470.0735	23672.9474	4924301.3548 m	0	
XYZ	HERT	4033460.8911	23537.8566	4924318.3025 m	0	
XYZ	SLR_ARP	4033463.9146	23662.6770	4924305.7170	0	
COV	CT UPPR	0.00000	3.0000	0.00000	1.00000	0.00000
ELEM		2.562507291091500e-06	1.280108263887100e-08	1.134775084043400e-06	m	
ELEM		1.717007092249100e-06	6.740020833088500e-09	3.679974682869700e-07	m	
ELEM		1.311939297210600e-06	1.041820660604400e-09	2.180047821951600e-09	m	

ELEM	1.312249747378000e-06	7.303820544744000e-10	3.069181713565200e-09	m
ELEM	1.312002798834600e-06	7.468521190976500e-10	2.987165440387700e-09	m
ELEM	1.695718554815500e-06	6.164456191709900e-09	3.489159156460200e-07	m
ELEM	1.430956582895000e-06	1.324182340848300e-08	6.053134313568100e-09	m
ELEM	1.345703787924000e-06	5.162218090963300e-09	9.051159312780000e-10	m
ELEM	1.302862184587500e-06	-1.469422824503200e-09	9.871970772453900e-10	m
ELEM	1.302917533767200e-06	-4.422483738966200e-10	1.094518377856400e-09	m
ELEM	1.302803515411300e-06	-2.933363822939100e-10	7.046452737636700e-09	m
ELEM	1.343179772576000e-06	5.077825801461700e-09	0.000000000000000e+00	m
ELEM	2.941191867020300e-06	3.700703098931600e-07	5.484984390873800e-09	m
ELEM	1.820398929942900e-06	3.375573260266500e-09	-5.789731062134700e-10	m
ELEM	1.310360755437800e-06	4.505645449966500e-09	-8.134226977013100e-10	m
ELEM	1.312180924248100e-06	4.386767587585300e-09	-7.756644515085900e-10	m
ELEM	1.311857220001300e-06	3.511513016759500e-07	5.108966946368100e-09	m
ELEM	1.801261627221100e-06	0.000000000000000e+00	0.000000000000000e+00	m
ELEM	3.561119424059200e-06	-7.006568959179600e-09	2.037415612818100e-06	m
ELEM	1.311507011758600e-06	-1.235822077684600e-10	2.309744303017200e-09	m
ELEM	1.311817397686800e-06	-3.439908988215600e-10	3.197846388383900e-09	m
ELEM	1.311570422746000e-06	-4.184205813038800e-10	3.115692062463500e-09	m
ELEM	1.630902466505900e-06	2.456524225383800e-09	2.895442447337400e-07	m
ELEM	1.499610423206000e-06	2.290913298391300e-08	1.011595862192900e-09	m
ELEM	1.303130253973300e-06	-1.417236614969500e-09	1.093764128346500e-09	m
ELEM	1.303185579978200e-06	-3.897062559712400e-10	1.201082777414400e-09	m
ELEM	1.3030715141008000e-06	-2.407831915372600e-10	5.177096619994300e-09	m
ELEM	1.336691832922700e-06	4.017971847727700e-09	0.000000000000000e+00	m
ELEM	4.317517497526800e-06	3.375069798363100e-09	-1.325482255112100e-09	m
ELEM	1.310318054432100e-06	4.505057434216000e-09	-1.559955800675300e-09	m
ELEM	1.312137574282800e-06	4.386122004014400e-09	-1.522133476079800e-09	m
ELEM	1.311813795459500e-06	2.936771793167900e-07	2.860620441666400e-09	m
ELEM	1.713392358178400e-06	0.000000000000000e+00	0.000000000000000e+00	m
ELEM	7.067484230508800e-06	-2.931805592807400e-07	5.560164378885300e-06	m
ELEM	1.311920109325600e-06	8.258889679675100e-10	2.667202296642800e-09	m
ELEM	1.474998483945600e-06	7.935742219601500e-10	1.489535868313200e-07	m
ELEM	1.312175058379500e-06	8.313194386595400e-10	2.850561713451200e-09	m
ELEM	2.155135057071300e-06	1.426961738607000e-08	1.219412995228400e-09	m
ELEM	1.302844592308800e-06	-3.166462195485500e-10	1.251466840187400e-09	m
ELEM	1.320709884543100e-06	1.623882038511300e-09	2.064157632550100e-09	m
ELEM	1.302402242608700e-06	5.420045763886200e-11	0.000000000000000e+00	m
ELEM	1.037586022596200e-05	2.908401962825800e-09	-1.578193348741100e-09	m
ELEM	1.312158290361300e-06	1.487566413793800e-07	2.683247052727100e-10	m
ELEM	1.517912137751300e-06	1.795003174180000e-09	-1.479809819638700e-09	m
ELEM	1.310153790718000e-06	0.000000000000000e+00	0.000000000000000e+00	m
ELEM	1.312231194034400e-06	9.078566187290900e-10	3.798673829883000e-09	m
ELEM	1.311984198037400e-06	9.243318403707300e-10	3.716499231286700e-09	m
ELEM	1.312485297376000e-06	9.133449308008300e-10	3.980372478577000e-09	m
ELEM	1.302899978921300e-06	-5.512371864446200e-10	1.015201187170600e-09	m
ELEM	1.302785957981600e-06	-4.022954266965500e-10	1.752775165706500e-09	m
ELEM	1.302457591616500e-06	-1.80060845280500e-10	0.000000000000000e+00	m
ELEM	1.313980682659200e-06	3.679788723573300e-09	-5.134591309821200e-10	m
ELEM	1.313656608716800e-06	2.684568970308000e-09	-4.530627017813700e-10	m
ELEM	1.311973817943200e-06	0.000000000000000e+00	0.000000000000000e+00	m
ELEM	1.652333560298700e-06	1.149323971498400e-09	3.089972772397200e-07	m
ELEM	1.312238423449100e-06	1.020643152576900e-09	3.861664239025900e-09	m
ELEM	1.339973179781800e-06	3.539405403725900e-09	1.769147683097300e-09	m
ELEM	1.302343612274300e-06	-1.423705661339800e-10	0.000000000000000e+00	m
ELEM	1.739589558397600e-06	2.602749680635700e-09	-3.041960179776700e-10	m
ELEM	1.311650269654000e-06	0.000000000000000e+00	0.000000000000000e+00	m
ELEM	3.628610541567900e-06	8.441036608323700e-08	2.226111477168400e-06	m
ELEM	1.591584923324200e-06	9.037190077892099e-08	0.000000000000000e+00	m
ELEM	4.767522596509200e-06	0.000000000000000e+00	0.000000000000000e+00	m

HIST GEN GPS baselines

*****SPIRIT LEVELLING*****

HIST NEW

*OHDF	105_SPIT	N104	7.05832	0.00026
OHDF	N104	N103	0.01063	0.00010
OHDF	N103	N102	-0.01185	0.00010
OHDF	N102	N103	0.01224	0.00010
OHDF	N103	N104	-0.00997	0.00010
OHDF	N104	105_SPIT	-7.05721	0.00026
OHDF	105_SPIT	N104	7.05763	0.00032
*OHDF	N104	105_SPIT	-7.05600	0.00030

*height differences between the special device for levelling (2 cm half sphere) on the (top of)

*heavy tripod and the ARP

OHDF	N104	104	0.16810	0.00010
OHDF	N103	103	0.16810	0.00010
OHDF	N102	102	0.16810	0.00010
OHDF	105_SPIT	105	1.40320	0.00020

*As the antenna HEROS is not really horizontal, we calculate that our measurement should be corrected
*by +1.2mm (std dev 0.5mm)

OHDF	SLR_SPIGOT	HERS_ARP	2.92424	0.00050
OHDF	HERS_ARP	SLR_SPIGOT	-2.92448	0.00050
OHDF	SLR_SPIGOT	SLR_HAXIS_UP	1.83820	0.00010
OHDF	SLR_HAXIS_UP	SLR_SPIGOT	-1.83864	0.00010
OHDF	SLR_ARP	SLR_HAXIS_UP	-0.55126	0.00010
OHDF	SLR_HAXIS_UP	SLR_ARP	0.55083	0.00010

*Then SLR_ARP above SLR_SRP = 0.55105+0.00635 = 0.5574 m
*or/and SLR_PRI above SLR_SRP = 0.5574+0.1107 = 0.6681m

OHDF	SLR_SPIGOT	105_SPIT	-3.12947	0.00024
OHDF	105_SPIT	SLR_SPIGOT	3.12970	0.00024
OHDF	101	HERT	-0.42490	0.00030

*MEASURE WITH CALLIPER GAUGE
*(diameter SLR SHARPED PIECE = 0.0127 m or 0.5 inch divided by 2 = 0.00635 m)
OHDF SLR_HAXIS_UP SLR_SRP -0.00635 0.00010

HIST GEN Spirit Levelling

*****TOPOMETRIC SURVEY*****

*HORIZONTAL ANGLES

SIGM AH 6
HIST NEW

*HEIGHTS of INSTRUMENTS (HI), PRISMS or TARGETS (HT)
*means that the theodolite optical axis (intersection of the rotation axes), also centre of target is
*0.0503 m above the ARP

HI	101	0.0503 m
HT	101	0.0503 m
HI	102	0.0503 m
HT	102	0.0503 m
HI	103	0.0503 m
HT	103	0.0503 m
HI	104	0.0503 m
HT	104	0.0503 m
HI	105	0.0503 m
HT	105	0.0503 m
HI	106	0.0503 m
HT	106	0.0503 m
HI	107	0.0503 m
HT	107	0.0503 m
HI	109	0.0503 m
HT	109	0.0503 m
*HT	SLR	0.6681 m

DSET AH

DIR	101	HERS	1 82	87.0
DIR	101	SLR_PRI	398 69	40.0
DIR	101	105	399 28	85.0
DIR	101	106	387 54	78.0
DIR	101	102	385 54	18.0
DIR	101	103	336 76	23.0
DIR	101	104	273 73	39.0
DIR	101	109	56 32	23.0
*DIR	101	HERT	178 69	27.5
DIR	101	3001	330 2	27.0
DIR	101	3005	329 36	16.0

DSET AH

DIR	102	104	15 92	39.0
DIR	102	103	76 96	90.0
DIR	102	107	197 10	26.0
DIR	102	106	172 43	66.0
DIR	102	101	369 93	80.0
DIR	102	HERT	369 28	4.5
DIR	102	3001	372 99	33.0
DIR	102	3002	374 32	74.0
DIR	102	3003	374 35	53.0
DIR	102	3004	375 47	34.0
DIR	102	3008	375 49	46.0
DIR	102	3007	374 36	85.0
DIR	102	3005	373 3	63.0
DIR	102	3006	374 34	50.0
DIR	102	3009	374 34	89.0

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DSET AH

DIR	106	101	0 0	0.0
DIR	106	HERT	399 81	72.0
DIR	106	102	0 49	68.0

DIR	106	109	355	21	2.0
DIR	106	HERS	271	21	69.5
DIR	106	105	369	63	74.0
DIR	106	107	338	56	9.0
DIR	106	SLR_PRI	285	67	52.0
DSET AH					
DIR	107	102	398	21	83.0
DIR	107	105	31	78	10.0
DIR	107	106	111	61	39.0
DIR	107	108	194	21	50.0
DIR	107	SLR_PRI	153	27	80.0
DIR	107	HERS	173	49	53.5
DSET AH					
DIR	108	102	0	0	0.0
DIR	108	105	16	28	9.0
DIR	108	107	396	66	32.0
DIR	108	SLR_PRI	118	23	15.0
DIR	108	HERS	160	35	0.0
DSET AH					
DIR	104	SLR_PRI	0	0	0.0
DIR	104	101	64	12	47.0
DSET AH					
DIR	104	103	295	55	31.0
DIR	104	SLR_PRI	320	65	52.0
DIR	104	HERS	322	67	38.0
DIR	104	102	342	57	96.0
DIR	104	3004	380	99	64.0
DIR	104	HERT	391	08	00.0
DIR	104	HERT_BCR	391	07	99.5
DSET AH					
DIR	103	102	2	66	40.0
DIR	103	101	46	84	87.0
DIR	103	3001	47	12	18.0
DIR	103	3005	47	15	2.0
DIR	103	3004	48	10	34.0
DIR	103	3008	48	14	24.0
DIR	103	HERT	49	37	58.5
DIR	103	HERT_BCR	49	37	49.5
DIR	103	104	94	59	26.0
DIR	103	105	336	8	49.0
DSET AH					
DIR	105	106	145	43	46.0
DIR	105	109	324	5	27.0
DIR	105	103	14	24	89.0
DIR	105	107	234	52	58.0
DIR	105	SLR_PRI	185	52	14.0
DIR	105	HERS	194	73	97.0
DIR	105	108	216	57	83.0
DIR	105	101	387	54	14.0
DIR	105	HERT	386	98	33.5
DIR	105	HERT_BCR	386	98	35.5
DSET AH					
DIR	109	HERT	18	09	64.5
DIR	109	HERT_BCR	18	09	58.0
DIR	109	101	19	98	4.0
DIR	109	105	99	45	98.0
DIR	109	106	106	41	54.0
DIR	109	3001	21	2	81.0
DIR	109	3005	21	2	96.0
DIR	109	3004	21	43	19.0
DIR	109	3008	21	41	98.0
DSET AH					
DIR	302	105	0	0	0.0
DIR	302	102	84	60	42.9
DIR	302	101	131	41	55.6
DIR	302	104	179	91	8.3
DIR	302	103	246	34	54.0
DIR	302	3001	132	38	14.1
DIR	302	3002	133	58	41.2
DIR	302	3003	133	59	84.5
DIR	302	3004	133	78	0.6
DIR	302	3008	133	81	67.0
DIR	302	3007	133	62	63.7
DIR	302	3006	133	61	47.5
DIR	302	3005	132	41	55.0
DIR	302	3009	133	60	70.6
DIR	302	301	90	13	96.3

DSET AH

DIR	301	105	0	0	0.0
DIR	301	101	198	62	86.0
DIR	301	104	240	78	8.7
DIR	301	103	299	12	14.0
DIR	301	302	311	37	90.3
DIR	301	102	329	96	7.5
DIR	301	3001	202	60	84.9
DIR	301	3002	203	83	59.1
DIR	301	3003	203	86	98.4
DIR	301	3004	205	41	17.9
DIR	301	3005	202	65	57.0
DIR	301	3006	203	84	37.2
DIR	301	3007	203	86	89.0
DIR	301	3008	205	41	76.6
DIR	301	3009	203	85	32.6

HIST GEN Horizontal Directions

*VERTICAL ANGLES

SIGM ZA	8
SIGM ZB	10
SIGM ZC	25

HIST NEW

ZANG ZC	101	HERS_BCR	+103	45	32.0
ZANG ZA	101	SLR_PRI	+104	0	35.0
ZANG ZA	101	105	+108	68	55.0
ZANG ZA	101	106	+107	56	69.0
ZANG ZA	101	102	+116	43	43.0
ZANG ZA	101	103	+110	69	59.0
ZANG ZA	101	104	+115	33	50.0
ZANG ZA	101	109	+109	42	36.0
ZANG ZB	101	3001	+131	80	30.0
ZANG ZB	101	3005	+139	42	1.0
ZANG ZA	102	104	+ 99	99	55.0
ZANG ZA	102	103	+ 99	96	90.0
ZANG ZA	102	107	+104	92	49.0
ZANG ZA	102	106	+105	30	54.0
ZANG ZA	102	101	+ 83	56	74.0
ZANG ZC	102	HERT	+ 86	19	59.0
ZANG ZB	102	3001	+ 84	99	76.0
ZANG ZB	102	3002	+ 85	12	35.0
ZANG ZB	102	3003	+ 85	12	9.0
ZANG ZB	102	3004	+ 84	91	4.0
ZANG ZB	102	3008	+ 85	57	36.0
ZANG ZB	102	3007	+ 85	77	2.0
ZANG ZB	102	3005	+ 85	64	79.0
ZANG ZB	102	3006	+ 85	77	8.0
ZANG ZB	102	3009	+ 85	52	8.0
ZANG ZA	106	101	+ 92	43	53.0
ZANG ZC	106	HERT_BCR	+ 92	81	92.5
ZANG ZA	106	102	+ 94	69	46.0
ZANG ZA	106	109	+ 98	54	36.0
ZANG ZC	106	HERS_BCR	+ 87	49	31.0
ZANG ZA	106	105	+ 96	41	57.0
ZANG ZA	106	107	+ 97	3	47.0
ZANG ZA	106	SLR_PRI	+ 82	67	58.0
ZANG ZA	107	102	+ 95	7	45.0
ZANG ZA	107	105	+ 98	96	34.0
ZANG ZA	107	106	+102	96	55.0
ZANG ZA	107	108	+109	80	60.0
ZANG ZA	107	SLR_PRI	+ 89	45	55.0
*ZANG ZC	107	HERS_BCR	+ 91	9	82.0
ZANG ZA	108	102	+ 94	25	60.0
ZANG ZA	108	105	+ 94	50	67.0
ZANG ZA	108	107	+ 90	19	36.0
ZANG ZA	108	SLR_PRI	+ 75	40	45.0
ZANG ZC	108	HERS_BCR	+ 78	26	82.5
ZANG ZA	104	101	+ 84	66	44.0
ZANG ZA	104	103	+ 99	98	0.0
ZANG ZA	104	SLR_PRI	+100	78	0.0
ZANG ZC	104	HERS_BCR	+100	51	56.0
ZANG ZA	104	102	+100	0	27.0
ZANG ZB	104	3004	+ 85	55	25.0
ZANG ZC	104	HERT	+ 85	77	41.5
ZANG ZC	104	HERT_BCR	+ 85	69	57.0

ZANG ZA 103	102	+100 3	4.0
ZANG ZA 103	101	+ 89 30	57.0
ZANG ZB 103	3001	+ 90 24	93.0
ZANG ZB 103	3005	+ 90 67	93.0
ZANG ZB 103	3004	+ 90 3	16.0
ZANG ZB 103	3008	+ 90 47	39.0
ZANG ZC 103	HERT	+ 90 62	96.0
ZANG ZC 103	HERT_BCR	+ 90 57	44.0
ZANG ZA 103	104	+100 2	7.0
ZANG ZA 103	105	+105 5	87.0
ZANG ZA 105	106	+103 58	57.0
ZANG ZA 105	109	+ 99 60	7.0
ZANG ZA 105	103	+ 94 94	23.0
ZANG ZA 105	107	+101 3	65.0
ZANG ZA 105	SLR_PRI	+ 92 67	46.0
ZANG ZA 105	108	+105 49	40.0
ZANG ZA 105	101	+ 91 31	84.0
ZANG ZC 105	HERT	+ 91 87	33.0
ZANG ZC 105	HERT_BCR	+ 91 84	97.0
ZANG ZC 109	HERT	+ 91 5	93.0
ZANG ZC 109	HERT_BCR	+ 91 3	22.5
ZANG ZA 109	101	+ 90 57	47.0
ZANG ZA 109	105	+100 40	0.0
ZANG ZA 109	106	+101 46	11.0
ZANG ZB 109	3001	+ 91 25	61.0
ZANG ZB 109	3005	+ 91 45	4.0
ZANG ZB 109	3004	+ 91 32	67.0
ZANG ZB 109	3008	+ 91 51	88.0
ZANG ZA 302	105	105 65	75.6
ZANG ZA 302	102	100 34	40.7
ZANG ZA 302	101	88 45	83.6
ZANG ZA 302	104	100 17	5.9
ZANG ZA 302	103	100 58	5.8
ZANG ZB 302	3001	89 48	16.4
ZANG ZB 302	3002	89 42	34.9
ZANG ZB 302	3003	89 42	18.5
ZANG ZB 302	3004	89 28	14.3
ZANG ZB 302	3008	89 76	28.5
ZANG ZB 302	3007	89 89	50.5
ZANG ZB 302	3006	89 89	66.4
ZANG ZB 302	3005	89 95	20.7
ZANG ZB 302	3009	89 71	9.8
ZANG ZA 302	301	102 39	32.3
ZANG ZA 301	105	104 84	59.2
ZANG ZA 301	101	79 21	33.9
ZANG ZA 301	104	98 73	99.9
ZANG ZA 301	103	98 38	32.5
ZANG ZA 301	302	97 60	71.8
ZANG ZA 301	102	91 0	50.4
ZANG ZB 301	3001	80 82	43.6
ZANG ZB 301	3002	81 12	14.9
ZANG ZB 301	3003	81 12	5.7
ZANG ZB 301	3004	80 88	93.7
ZANG ZB 301	3005	81 54	94.4
ZANG ZB 301	3006	81 83	43.0
ZANG ZB 301	3007	81 83	56.6
ZANG ZB 301	3008	81 61	62.4
ZANG ZB 301	3009	81 55	64.0

HIST GEN Zenith Angles

*DISTANCES

SIGM DP	0.001	m
SIGM DI	0.002	m

HIST NEW

DIST DP 101	SLR_PRI	123.18425
DIST DP 101	105	87.63268
DIST DP 101	106	116.98380
DIST DP 101	102	23.88103
DIST DP 101	103	36.38773
DIST DP 101	109	77.73740
DIST DP 101	104	25.54440
DIST DP 102	104	36.87574
DIST DP 102	103	25.02973
DIST DP 102	106	93.40667
DIST DP 102	101	23.88137
DIST DI 102	3001	22.85216
DIST DI 102	3002	23.21682

DIST DI 102	3003	23.21442
DIST DI 102	3004	22.77461
DIST DI 102	3008	22.74211
DIST DI 102	3007	23.18272
DIST DI 102	3005	22.80521
DIST DI 102	3006	23.18382
DIST DP 106	101	116.98400
DIST DP 106	102	93.40701
DIST DP 106	109	104.86121
DIST DP 106	105	34.73748
DIST DP 106	107	36.00194
DIST DP 106	SLR_PRI	22.81179
DIST DP 107	102	78.90784
DIST DP 107	105	17.11974
DIST DP 107	106	36.00189
DIST DP 107	108	15.88638
DIST DP 107	SLR_PRI	27.02317
DIST DP 108	102	94.72997
DIST DP 108	105	31.51785
DIST DP 108	107	15.88653
DIST DP 108	SLR_PRI	18.29280
DIST DP 104	101	25.54440
DIST DP 104	103	30.42879
DIST DP 104	SLR_PRI	134.39992
DIST DP 104	102	36.87603
DIST DP 103	102	25.02973
DIST DP 103	101	36.38759
DIST DI 103	3001	34.89993
DIST DI 103	3005	34.85723
DIST DP 103	104	30.42883
DIST DP 103	105	73.48314
DIST DP 105	106	34.73668
DIST DP 105	109	71.46568
DIST DP 105	103	73.48355
DIST DP 105	107	17.11924
DIST DP 105	SLR_PRI	36.37477
DIST DP 105	108	31.51744
DIST DP 105	101	87.63351
DIST DP 109	101	77.73747
DIST DP 109	105	71.46648
DIST DP 109	106	104.86129
DIST DP 302	105	66.63653
DIST DP 302	102	17.18445
DIST DP 302	101	33.29599
DIST DP 302	104	33.91594
DIST DP 302	103	8.89300
DIST DI 302	3001	31.88043
DIST DI 302	3002	31.95104
DIST DI 302	3006	31.92624
DIST DI 302	3005	31.83953
DIST DP 301	105	66.83442
DIST DP 301	101	21.30712
DIST DP 301	104	37.40412
DIST DP 301	103	29.51322
DIST DP 301	102	5.24043
DIST DI 301	3001	20.47417
DIST DI 301	3002	20.92097
DIST DI 301	3003	20.92307
DIST DI 301	3004	20.57797
DIST DI 301	3005	20.41632
DIST DI 301	3006	20.87802
DIST DI 301	3007	20.87542
DIST DI 301	3008	20.53092

HIST GEN Distances

HIST ALL All Observations

END

6.7. Herstmonceux network adjustment output file

```
=====
HERSTMONCEUX LASER TIES - JUNE 2008 SURVEY
Microsearch GeoLab, V2001.9.20.0          WGS 84      UNITS: m,GRAD Page 0001
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Fri Feb 13 13:14:39 2009

Input file: D:\PMM\Herstmonceux\Glb_Herst\Glb_EnglishV5\Herstout_EnglishV5.iob
 Output file: D:\PMM\Herstmonceux\Glb_Herst\Glb_EnglishV5\Herstout_EnglishV5.lst
 Options file: C:\Program Files\Microsearch\GeoLab\default.gpj

PARAMETERS		OBSERVATIONS	
Description	Number	Description	Number
No. of Stations	34	Directions	112
Coord Parameters	92	Distances	76
Free Latitudes	29	Azimuths	0
Free Longitudes	29	Vertical Angles	0
Free Heights	34	Zenithal Angles	109
Fixed Coordinates	10	Angles	0
Astro. Latitudes	0	Heights	0
Astro. Longitudes	0	Height Differences	20
Geoid Records	0	Auxiliary Params.	0
All Aux. Pars.	12	2-D Coords.	0
Direction Pars.	12	2-D Coord. Diffs.	4
Scale Parameters	0	3-D Coords.	21
Constant Pars.	0	3-D Coord. Diffs.	12
Rotation Pars.	0		
Translation Pars.	0		
Total Parameters	104	Total Observations	354
Degrees of Freedom = 250			

SUMMARY OF SELECTED OPTIONS

OPTION	SELECTION
Computation Mode	Adjustment
Maximum Iterations	10
Convergence Criterion	0.00010
Residual Rejection Criterion	Tau Max
Confidence Region Types	1D 2D 3D Station
Variance Factor (VF) Known	Yes
Scale Covariance Matrix With VF	Yes
Scale Residual Variances With VF	No
Force Convergence in Max Iters	No
Distances Contribute To Heights	No
Compute Full Inverse	Yes
Optimize Band Width	Yes
Generate Initial Coordinates	Yes
Re-Transform Obs After 1st Pass	Yes
Geoid Interpolation Method	Bi-Quadratic

=====
HERSTMONCEUX LASER TIES - JUNE 2008 SURVEY
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=====

Adjusted PLH Coordinates:

CODE	FFF	STATION	LATITUDE	LONGITUDE		ELIP-HEIGHT	STD DEV	
			STD	DEV	STD	DEV		
PLH	000	101	N 50 52	2.94535	E 0 20	3.79732	83.7730 m	0
				0.0014		0.0013	0.0014	
PLH	000	102	N 50 52	3.03015	E 0 20	4.97045	77.6770 m	0
				0.0013		0.0013	0.0014	
PLH	000	103	N 50 52	3.84013	E 0 20	4.96624	77.6889 m	0
				0.0014		0.0013	0.0014	
PLH	000	104	N 50 52	3.71241	E 0 20	3.42333	77.6789 m	0
				0.0014		0.0013	0.0014	
PLH	000	105	N 50 52	2.65882	E 0 20	8.21391	71.8567 m	0
				0.0013		0.0013	0.0014	
PLH	110	105_SPIT	N 50 52	2.65443	E 0 20	8.20651	70.4535 m	0
				0.0000		0.0000	0.0014	
PLH	000	106	N 50 52	3.25424	E 0 20	9.71732	69.9016 m	0
				0.0013		0.0013	0.0014	
PLH	000	107	N 50 52	2.24627	E 0 20	8.79803	71.5778 m	0
				0.0013		0.0013	0.0014	
PLH	000	108	N 50 52	2.12052	E 0 20	9.57583	69.1906 m	0
				0.0013		0.0013	0.0014	
PLH	000	109	N 50 52	0.85435	E 0 20	5.92817	72.3062 m	0
				0.0014		0.0014	0.0014	
PLH	000	3001	N 50 52	2.98290	E 0 20	3.83661	83.0638 m	0
				0.0014		0.0013	0.0014	
PLH	000	3002	N 50 52	2.99742	E 0 20	3.81644	83.1043 m	0
				0.0014		0.0016	0.0014	
PLH	000	3003	N 50 52	2.99775	E 0 20	3.81657	83.1044 m	0
				0.0014		0.0016	0.0014	
PLH	000	3004	N 50 52	3.01098	E 0 20	3.83893	83.0746 m	0
				0.0014		0.0013	0.0014	
PLH	000	3005	N 50 52	2.98339	E 0 20	3.83624	82.8250 m	0
				0.0014		0.0013	0.0014	
PLH	000	3006	N 50 52	2.99761	E 0 20	3.81544	82.8662 m	0
				0.0014		0.0015	0.0014	
PLH	000	3007	N 50 52	2.99787	E 0 20	3.81550	82.8660 m	0
				0.0014		0.0015	0.0014	
PLH	000	3008	N 50 52	3.01118	E 0 20	3.83780	82.8359 m	0
				0.0014		0.0014	0.0014	
PLH	000	3009	N 50 52	2.99766	E 0 20	3.81589	82.9585 m	0
				0.0014		0.0015	0.0014	
PLH	000	301	N 50 52	2.88950	E 0 20	4.82556	76.9893 m	0
				0.0014		0.0013	0.0014	
PLH	000	302	N 50 52	3.57528	E 0 20	5.14417	77.8202 m	0
				0.0014		0.0013	0.0014	
PLH	000	HERS	N 50 52	2.33138	E 0 20	10.58043	76.4986 m	0
				0.0012		0.0012	0.0012	
PLH	000	HERS_ARP	N 50 52	2.33138	E 0 20	10.58043	76.5079 m	0
				0.0013		0.0013	0.0013	
PLH	000	HERS_BCR	N 50 52	2.33138	E 0 20	10.58043	76.5435 m	0
				0.0013		0.0013	0.0013	
PLH	000	HERT	N 50 52	2.92792	E 0 20	3.67506	83.3486 m	0
				0.0014		0.0013	0.0014	
PLH	000	HERT_BCR	N 50 52	2.92792	E 0 20	3.67505	83.3832 m	0
				0.0014		0.0013	0.0014	
PLH	110	N102	N 50 52	3.02630	E 0 20	4.96283	77.5089 m	0
				0.0000		0.0000	0.0014	
PLH	110	N103	N 50 52	3.83476	E 0 20	4.95851	77.5209 m	0
				0.0000		0.0000	0.0014	
PLH	110	N104	N 50 52	3.70786	E 0 20	3.41600	77.5107 m	0
				0.0000		0.0000	0.0014	
PLH	000	SLR_ARP	N 50 52	2.57650	E 0 20	10.05717	75.9727 m	0
				0.0013		0.0013	0.0014	
PLH	000	SLR_HAXIS_UP	N 50 52	2.57650	E 0 20	10.05717	75.4216 m	0
				0.0013		0.0013	0.0014	
PLH	000	SLR_PRI	N 50 52	2.57650	E 0 20	10.05717	76.0836 m	0
				0.0013		0.0013	0.0014	
PLH	110	SLR_SPIGOT	N 50 52	2.57209	E 0 20	10.04971	73.5832 m	0
				0.0000		0.0000	0.0013	
PLH	000	SLR_SR_P	N 50 52	2.57650	E 0 20	10.05717	75.4153 m	0
				0.0013		0.0014	0.0014	

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Adjusted XYZ Coordinates:

		X-COORDINATE STD DEV	Y-COORDINATE STD DEV	Z-COORDINATE STD DEV	
CODE	FFF STATION				
XYZ	101	4033460.7228 0.0014	23540.2463 0.0013	4924318.9724 m 0.0014	0
XYZ	102	4033454.7090 0.0014	23563.1523 0.0013	4924315.8976 m 0.0014	0
XYZ	103	4033435.3018 0.0014	23562.9565 0.0013	4924331.7037 m 0.0014	0
XYZ	104	4033438.5330 0.0014	23532.8033 0.0013	4924329.2051 m 0.0014	0
XYZ	105	4033459.5655 0.0013	23626.6079 0.0013	4924304.1410 m 0.0013	0
XYZ	105_SPIT	4033458.7859 0.0009	23626.4586 0.0000	4924302.9669 m 0.0011	0
XYZ	106	4033443.8871 0.0013	23655.9157 0.0013	4924314.2367 m 0.0013	0
XYZ	107	4033469.2113 0.0013	23638.0871 0.0013	4924295.8788 m 0.0013	0
XYZ	108	4033470.6297 0.0013	23653.3058 0.0013	4924291.5746 m 0.0013	0
XYZ	109	4033503.3634 0.0014	23582.1652 0.0014	4924269.2974 m 0.0014	0
XYZ	3001	4033459.3707 0.0014	23541.0068 0.0013	4924319.1546 m 0.0014	0
XYZ	3002	4033459.0504 0.0014	23540.6105 0.0016	4924319.4694 m 0.0014	0
XYZ	3003	4033459.0424 0.0014	23540.6129 0.0016	4924319.4759 m 0.0014	0
XYZ	3004	4033458.7042 0.0014	23541.0482 0.0013	4924319.7106 m 0.0014	0
XYZ	3005	4033459.2081 0.0014	23540.9986 0.0013	4924318.9791 m 0.0014	0
XYZ	3006	4033458.8959 0.0014	23540.5899 0.0015	4924319.2882 m 0.0014	0
XYZ	3007	4033458.8895 0.0014	23540.5911 0.0015	4924319.2931 m 0.0014	0
XYZ	3008	4033458.5487 0.0014	23541.0252 0.0014	4924319.5295 m 0.0014	0
XYZ	3009	4033458.9528 0.0014	23540.5990 0.0015	4924319.3608 m 0.0014	0
XYZ	301	4033457.6629 0.0014	23560.3361 0.0013	4924312.6213 m 0.0014	0
XYZ	302	4033441.7126 0.0014	23566.4734 0.0013	4924326.6404 m 0.0014	0
XYZ	HERS	4033470.0723 0.0012	23672.9479 0.0012	4924301.3558 m 0.0012	0
XYZ	HERS_ARP	4033470.0782 0.0013	23672.9479 0.0013	4924301.3630 m 0.0013	0
XYZ	HERS_BCR	4033470.1006 0.0013	23672.9480 0.0013	4924301.3906 m 0.0013	0
XYZ	HERT	4033460.8868 0.0014	23537.8563 0.0013	4924318.3033 m 0.0014	0
XYZ	HERT_BCR	4033460.9085 0.0014	23537.8564 0.0013	4924318.3301 m 0.0014	0
XYZ	N102	4033454.6960 0.0009	23563.0031 0.0000	4924315.6922 m 0.0011	0
XYZ	N103	4033435.3254 0.0009	23562.8055 0.0000	4924331.4687 m 0.0011	0
XYZ	N104	4033438.5368 0.0009	23532.6600 0.0000	4924328.9859 m 0.0011	0
XYZ	SLR_ARP	4033463.9249 0.0013	23662.6792 0.0013	4924305.7283 m 0.0013	0
XYZ	SLR_HAXIS_UP	4033463.5771 0.0013	23662.6772 0.0013	4924305.3009 m 0.0013	0
XYZ	SLR_PRI	4033463.9949 0.0013	23662.6796 0.0013	4924305.8143 m 0.0013	0
XYZ	SLR_SPIGOT	4033462.5235 0.0009	23662.5251 0.0000	4924303.7888 m 0.0010	0
XYZ	SLR_SR_P	4033463.5731 0.0013	23662.6772 0.0014	4924305.2959 m 0.0013	0

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HERSTMONCEUX LASER TIES - JUNE 2008 SURVEY
Microsearch GeoLab, V2001.9.20.0          WGS 84      UNITS: m,GRAD Page 0004
=====
Residuals (critical value = 3.924, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.

      OBSERVATION   RESIDUAL   STD RES
TYPE AT      FROM        TO      STD DEV  STD DEV  PPM
-----      -----
XCT HERS           4033470.07200 -0.0004 -2.2192
                  0.0004  0.0002
YCT HERS           23672.94800 -0.0001 -0.2758
                  0.0010  0.0005
ZCT HERS           4924301.35600 0.0000  0.0074
                  0.0012  0.0005
ELAT      HERT      HERT_BCR    0 00  0.00000  0.0000  0.0000
                  0.0002 -0.0000 1391.82
ELON      HERT      HERT_BCR    0 00  0.00000 -0.0001 -0.6794
                  0.0002  0.0001 2274.13
EHGT      HERT      HERT_BCR    0.03450  0.0000 19.7351
                  0.0003  0.0000 499.62
                  ^^^^^^
ELAT      HERS      HERS_ARP    0 00  0.00000  0.0000  0.0000
                  0.0002  0.0000  0.00*
ELON      HERS      HERS_ARP    0 00  0.00000  0.0000  0.0000
                  0.0002  0.0000  0.00*
EHGT      HERS      HERS_ARP    0.00960 -0.0003 -0.0003
                  0.0003  0.0000 30835.36*
ELAT      HERS      HERS_BCR    0 00  0.00000 -0.0000 -0.0000
                  0.0002  0.0000  0.00*
ELON      HERS      HERS_BCR    0 00  0.00000 -0.0000 -0.0000
                  0.0002  0.0000  0.00*
EHGT      HERS      HERS_BCR    0.04460  0.0003  0.0003
                  0.0003  0.0000 5618.82*
ELAT      SLR_ARP   SLR_PRI     0 00  0.00000  0.0000  0.0127
                  0.0002  0.0001 16.75
ELON      SLR_ARP   SLR_PRI     0 00  0.00000  0.0000  0.0000
                  0.0002 -0.0000 24.08
EHGT      SLR_ARP   SLR_PRI     0.11070  0.0002  1.3649
                  0.0003  0.0002 1873.65
ELAT      SLR_HAXIS_UP SLR_SRPO 0 00  0.00000  0.0000  0.0000
                  0.0002  0.0000  0.00*
ELON      SLR_HAXIS_UP SLR_SRPO 0 00  0.00000 -0.0000 -0.0000
                  0.0002  0.0000  0.00*
ELAT      SLR_HAXIS_UP SLR_PRI    0 00  0.00000 -0.0000 -0.0000
                  0.0002 -0.0000 0.00
ELON      SLR_HAXIS_UP SLR_PRI    0 00  0.00000  0.0000  0.0000
                  0.0002  0.0000  0.00
XCT      101           4033460.71490 -0.0070 -13.6983
                  0.0006  0.0005
                  ^^^^^^
YCT      101           23540.24010  0.0061  3.3267
                  0.0021  0.0018
ZCT      101           4924318.97370  0.0040  1.2507
                  0.0034  0.0032
XCT      105           4033459.56150 -0.0048 -45.0325
                  0.0004  0.0001
                  ^^^^^^
YCT      105           23626.60970 -0.0018 -0.9653
                  0.0021  0.0019
ZCT      105           4924304.14370  0.0004  0.0926
                  0.0041  0.0039
XCT      109           4033503.35140 -0.0044 -2.4095
                  0.0018  0.0018
YCT      109           23582.15900  0.0062  2.6832
                  0.0025  0.0023
ZCT      109           4924269.28960  0.0137  2.2734
                  0.0061  0.0060
XCT      HERS           4033470.07350  0.0015  2.2466
                  0.0008  0.0007
YCT      HERS           23672.94740  0.0005  0.2755
                  0.0020  0.0018
ZCT      HERS           4924301.35480 -0.0000 -0.0046
                  0.0024  0.0021
XCT      HERT           4033460.89110  0.0039  5.9471
                  0.0008  0.0006
                  ^^^^^^
YCT      HERT           23537.85660 -0.0002 -0.1375
```

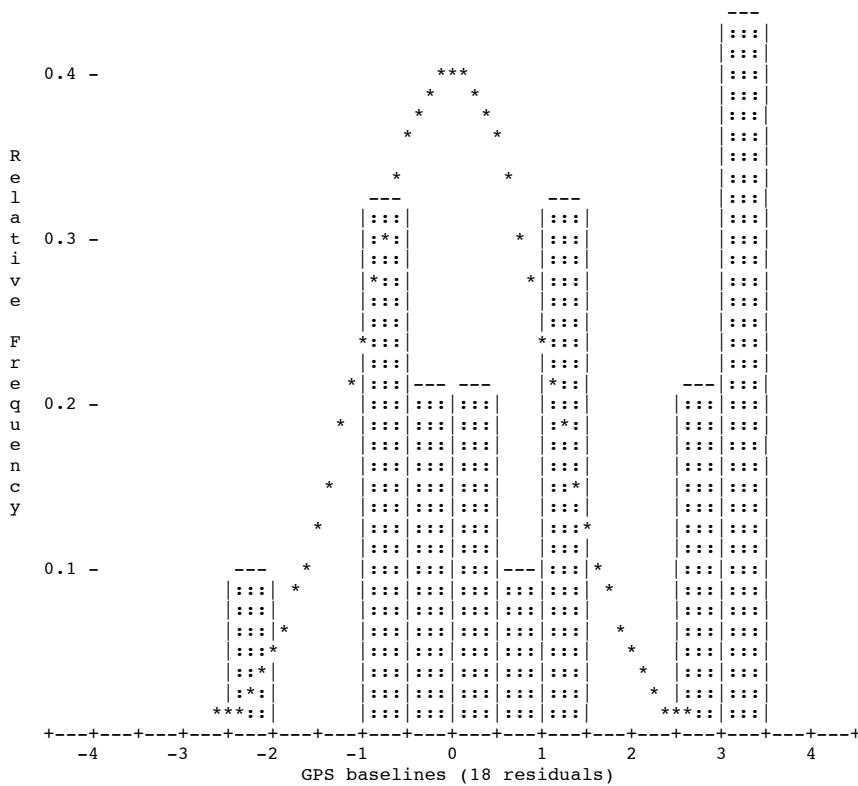
=====
HERSTMONCEUX LASER TIES - JUNE 2008 SURVEY
Microsearch GeoLab, V2001.9.20.0 WGS 84 UNITS: m,GRAD Page 0005
=====

Residuals (critical value = 3.924, N,E,Up for 3D):

NOTE: Observation values shown are reduced to mark-to-mark.

TYPE	AT	FROM	TO	OBSERVATION	RESIDUAL	STD RES
				STD DEV	STD DEV	PPM
ZCT	HERT			0.0020	0.0018	
XCT	SLR_ARP			4924318.30250	-0.0021	-0.8722
				0.0027	0.0024	
YCT	SLR_ARP			4033463.91460	-0.0009	-1.0532
				0.0007	0.0008	
ZCT	SLR_ARP			23662.67700	0.0022	1.1132
				0.0022	0.0020	
ZCT	SLR_ARP			4924305.71700	0.0153	3.7415
				0.0042	0.0041	

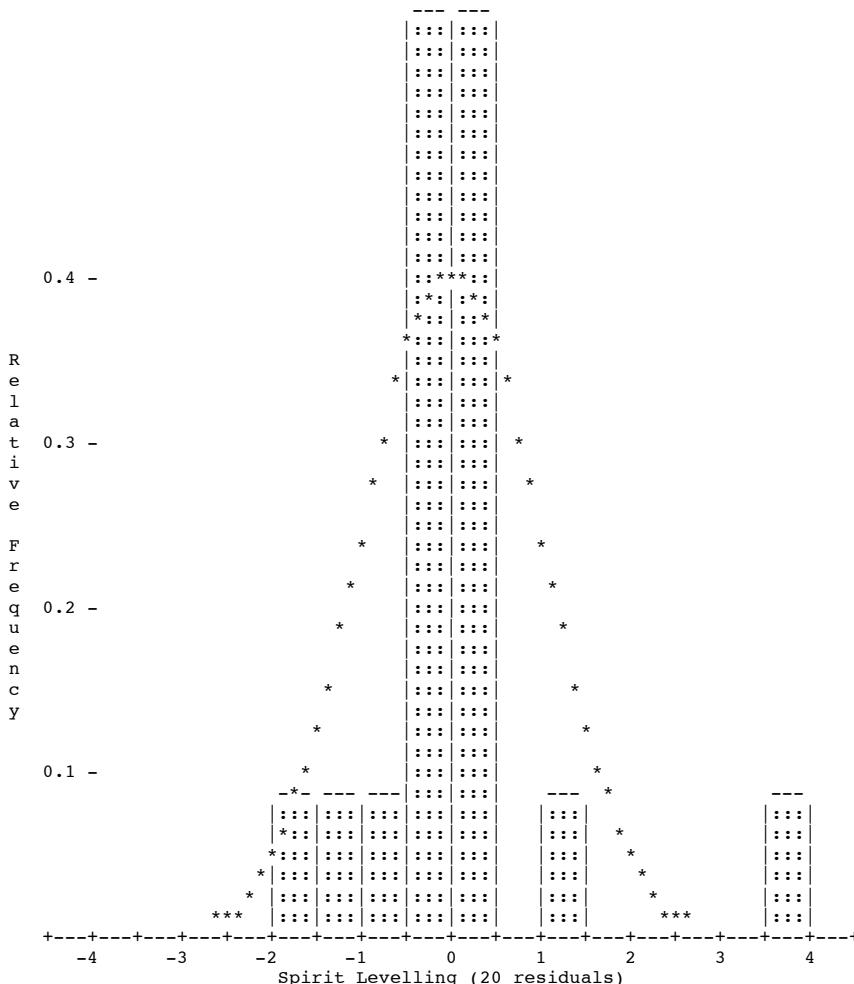
=====
HERSTMONCEUX LASER TIES - JUNE 2008 SURVEY
Microsearch GeoLab, V2001.9.20.0 WGS 84 UNITS: m,GRAD Page 0006
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HERSTMONCEUX LASER TIES - JUNE 2008 SURVEY
Microsearch GeoLab, V2001.9.20.0          WGS 84      UNITS: m,GRAD Page 0007
=====
Residuals (critical value = 3.924, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.

      OBSERVATION   RESIDUAL   STD RES
      STD DEV     STD DEV    PPM
-----+-----+-----+-----+
TYPE AT      FROM        TO
-----+-----+-----+-----+
OHDF       N104        N103      0.01063  -0.0004  -0.0004
          .           .         0.0001  0.0000  13.21*
OHDF       N103        N102      -0.01185  -0.0002  -0.0002
          .           .         0.0001  0.0000  7.79*
OHDF       N102        N103      0.01224  -0.0002  -0.0002
          .           .         0.0001  0.0000  7.82*
OHDF       N103        N104      -0.00997  -0.0003  -0.0003
          .           .         0.0001  0.0000  8.49*
OHDF       N104        105_SPIT  -7.05721  0.0000  0.0111
          .           .         0.0003  0.0002  0.02
OHDF      105_SPIT     N104      7.05763  -0.0004  -1.5607
          .           .         0.0003  0.0003  4.25
OHDF       N104        104       0.16810  0.0001  0.0001
          .           .         0.0001  0.0000  388.65*
OHDF       N103        103       0.16810  -0.0001  -0.0001
          .           .         0.0001  0.0000  513.62*
OHDF       N102        102       0.16810  0.0000  0.0000
          .           .         0.0001  0.0000  2.42*
OHDF      105_SPIT     105       1.40320  -0.0000  -0.1308
          .           .         0.0002  0.0001  11.14
OHDF      SLR_SPIGOT   HERS_ARP  2.92424  0.0005  1.3523
          .           .         0.0005  0.0004  39.61
OHDF      HERS_ARP     SLR_SPIGOT  -2.92448  -0.0003  -0.7268
          .           .         0.0005  0.0004  21.29
OHDF      SLR_SPIGOT   SLR_HAXIS_UP 1.83820  0.0002  0.0002
          .           .         0.0001  0.0000  122.64*
OHDF      SLR_HAXIS_UP SLR_SPIGOT  -1.83864  0.0002  0.0002
          .           .         0.0001  0.0000  115.29*
OHDF      SLR_ARP      SLR_HAXIS_UP  -0.55126  0.0002  0.0002
          .           .         0.0001  0.0000  377.83*
OHDF      SLR_HAXIS_UP SLR_ARP    0.55083  0.0002  0.0002
          .           .         0.0001  0.0000  402.50*
OHDF      SLR_SPIGOT   105_SPIT   -3.12947  -0.0002  -1.3404
          .           .         0.0002  0.0002  6.78
OHDF      105_SPIT     SLR_SPIGOT  3.12970  0.0000  0.0874
          .           .         0.0002  0.0002  0.44
OHDF      101          HERT      -0.42490  0.0006  3.6223
          .           .         0.0003  0.0002  227.77
OHDF      SLR_HAXIS_UP SLR_SR_P   -0.00635  0.0000  0.0000
          .           .         0.0001  0.0000  0.00*
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Microsearch GeoLab, V2001.9.20.0 WGS 84 UNITS: m,GRAD Page 0009
=====

Residuals (critical value = 3.924, N,E,Up for 3D):

NOTE: Observation values shown are reduced to mark-to-mark.

TYPE AT	FROM	TO	OBSERVATION		RESIDUAL	STD RES
			STD	DEV		
DIR	101	HERS	1 82	87.0	0.8	0.2
				6.0	5.4	
DIR	101	SLR_PRI	398 69	40.0	10.0	1.8
				6.0	5.4	
DIR	101	105	399 28	85.0	-0.6	-0.1
				6.0	5.4	
DIR	101	106	387 54	78.0	-7.6	-1.4
				6.0	5.4	
DIR	101	102	385 54	18.0	26.8	2.1
				13.4	12.7	
DIR	101	103	336 76	23.0	4.7	1.0
				6.0	4.9	
DIR	101	104	273 73	39.0	-5.5	-1.3
				6.0	4.2	

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DIR	101	109	56 32	23.0	-7.7	-1.6
				6.0	4.7	
DIR	101	3001	330 2	27.0	0.2	0.6
				6.0	0.3	
DIR	101	3005	329 36	16.0	0.2	0.8
				6.0	0.3	
DIR	102	104	15 92	39.0	4.8	0.9
				6.0	5.2	
DIR	102	103	76 96	90.0	-8.1	-1.7
				6.0	4.7	
DIR	102	107	197 10	26.0	5.6	1.2
				6.0	4.7	
DIR	102	106	172 43	66.0	1.5	0.3
				6.0	4.8	
DIR	102	101	369 93	80.0	-4.9	-1.0
				6.0	4.9	
DIR	102	HERT	369 28	4.5	-9.5	-2.7
				6.0	3.5	
DIR	102	3001	372 99	33.0	-15.5	-1.7
				10.0	9.0	
DIR	102	3002	374 32	74.0	-0.9	-0.2
				6.0	4.2	
DIR	102	3003	374 35	53.0	5.2	1.3
				6.0	4.2	
DIR	102	3004	375 47	34.0	5.9	1.3
				6.0	4.6	
DIR	102	3008	375 49	46.0	-4.7	-1.0
				6.0	4.5	
DIR	102	3007	374 36	85.0	-4.5	-1.0
				6.0	4.5	
DIR	102	3005	373 3	63.0	8.2	1.8
				6.0	4.6	
DIR	102	3006	374 34	50.0	5.6	1.3
				6.0	4.5	
DIR	102	3009	374 34	89.0	1.2	0.3
				6.0	4.5	
DIR	106	101	0 0	0.0	6.2	1.2
				6.0	5.3	
DIR	106	HERT	399 81	72.0	7.0	1.3
				6.0	5.3	
DIR	106	102	0 49	68.0	4.9	0.9
				6.0	5.3	
DIR	106	109	355 21	2.0	1.1	0.2
				6.0	5.1	
DIR	106	HERS	271 21	69.5	-8.8	-2.5
				6.0	3.5	
DIR	106	105	369 63	74.0	-7.1	-1.5
				6.0	4.8	
DIR	106	107	338 56	9.0	-4.8	-1.1
				6.0	4.5	
DIR	106	SLR_PRI	285 67	52.0	1.5	0.5
				6.0	2.8	
DIR	107	102	398 21	83.0	-8.0	-1.8
				6.0	4.5	
DIR	107	105	31 78	10.0	-2.8	-0.7

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Residuals (critical value = 3.924, N,E,Up for 3D):

NOTE: Observation values shown are reduced to mark-to-mark.

TYPE	AT	FROM	TO	OBSERVATION		STD RES	PPM
				STD	DEV		
DIR	107	106	111 61	39.0	3.2	0.7	
				6.0	4.4		
DIR	107	108	194 21	50.0	-3.1	-0.8	
				6.0	4.0		
DIR	107	SLR_PRI	153 27	80.0	2.7	0.7	
				6.0	3.9		
DIR	107	HERS	173 49	53.5	8.0	1.7	
				6.0	4.7		
DIR	108	102	0 0	-0.0	-2.0	-0.4	
				6.0	4.5		
DIR	108	105	16 28	9.0	10.7	2.2	
				6.0	4.8		
DIR	108	107	396 66	32.0	-5.7	-1.4	
				6.0	4.0		
DIR	108	SLR_PRI	118 23	15.0	-2.7	-1.1	
				6.0	2.3		
DIR	108	HERS	160 35	0.0	-0.5	-0.1	
				6.0	3.0		
DIR	104	SLR_PRI	0 0	0.0	-5.5	-1.5	

DIR	104	101	64 12	6.0	3.7	
				47.0	5.5	1.5
				6.0	3.7	
DIR	104	103	295 55	31.0	-7.0	-1.6
				6.0	4.3	
DIR	104	SLR_PRI	320 65	52.0	4.1	0.8
				6.0	5.1	
DIR	104	HERS	322 67	38.0	5.1	1.0
				6.0	5.1	
DIR	104	102	342 57	96.0	-1.9	-0.4
				6.0	5.0	
DIR	104	3004	380 99	64.0	0.9	0.3
				6.0	3.2	
DIR	104	HERT	391 8	0.0	-1.7	-0.4
				6.0	4.2	
DIR	104	HERT_BCR	391 7	99.5	0.5	0.1
				6.0	4.0	
DIR	103	102	2 66	40.0	-5.4	-1.1
				6.0	4.9	
DIR	103	101	46 84	87.0	23.8	2.5
				10.0	9.6	
DIR	103	3001	47 12	18.0	7.2	1.3
				6.0	5.4	
DIR	103	3005	47 15	2.0	8.0	1.5
				6.0	5.4	
DIR	103	3004	48 10	34.0	2.2	0.5
				6.0	4.8	
DIR	103	3008	48 14	24.0	6.7	1.7
				6.0	4.0	
DIR	103	HERT	49 37	58.5	-16.1	-3.2
				6.0	5.1	
DIR	103	HERT_BCR	49 37	49.5	-5.6	-1.2
				6.0	4.8	
DIR	103	104	94 59	26.0	0.5	0.1
				6.0	4.7	
DIR	103	105	336 8	49.0	-6.2	-1.3
				6.0	4.6	
DIR	105	106	145 43	46.0	5.8	1.3
				6.0	4.4	
DIR	105	109	324 5	27.0	8.9	2.0
				6.0	4.5	
DIR	105	103	14 24	89.0	-8.5	-1.7
				6.0	5.1	
DIR	105	107	234 52	58.0	-3.8	-0.9
				6.0	4.3	
DIR	105	SLR_PRI	185 52	14.0	-2.9	-0.6
				6.0	4.5	
DIR	105	HERS	194 73	97.0	-0.8	-0.2
				6.0	5.1	

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Residuals (critical value = 3.924, N,E,Up for 3D):

NOTE: Observation values shown are reduced to mark-to-mark.

TYPE AT	FROM	TO	OBSERVATION RESIDUAL STD RES		
			STD DEV	STD DEV	PPM
DIR	105	108	216 57	83.0	4.3 0.9
				6.0	4.8
DIR	105	101	387 54	14.0	-8.9 -1.7
				6.0	5.4
DIR	105	HERT	386 98	33.5	3.7 0.7
				6.0	5.3
DIR	105	HERT_BCR	386 98	35.5	2.0 0.4
				6.0	5.3
DIR	109	HERT	18 9	64.5	-4.5 -0.8
				6.0	5.4
DIR	109	HERT_BCR	18 9	58.0	1.7 0.3
				6.0	5.4
DIR	109	101	19 98	4.0	-2.2 -0.4
				6.0	5.5
DIR	109	105	99 45	98.0	3.8 0.8
				6.0	4.9
DIR	109	106	106 41	54.0	-0.1 -0.0
				6.0	5.0
DIR	109	3001	21 2	81.0	-2.3 -0.4
				6.0	5.4
DIR	109	3005	21 2	96.0	-1.0 -0.2
				6.0	5.5
DIR	109	3004	21 43	19.0	4.9 0.9
				6.0	5.5
DIR	109	3008	21 41	98.0	-0.3 -0.1
				6.0	5.2

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DIR	302	105	0 0	-0.0	-1.8	-0.7
				6.0	2.5	
DIR	302	102	84 60	42.9	1.5	0.4
				6.0	4.4	
DIR	302	101	131 41	55.6	11.3	2.1
				6.0	5.4	
DIR	302	104	179 91	8.3	7.6	1.6
				6.0	4.9	
DIR	302	103	246 34	54.0	1.9	1.0
				6.0	1.9	
DIR	302	3001	132 38	14.1	-2.4	-0.5
				6.0	5.3	
DIR	302	3002	133 58	41.2	-15.8	-2.5
				10.0	6.3	
DIR	302	3003	133 59	84.5	-16.7	-2.8
				10.0	6.0	
DIR	302	3004	133 78	0.6	-1.5	-0.3
				6.0	4.8	
DIR	302	3008	133 81	67.0	-2.0	-0.4
				6.0	4.4	
DIR	302	3007	133 62	63.7	-0.3	-0.1
				6.0	2.5	
DIR	302	3006	133 61	47.5	-3.3	-1.3
				6.0	2.6	
DIR	302	3005	132 41	55.0	-4.4	-0.8
				6.0	5.4	
DIR	302	3009	133 60	70.6	-0.5	-0.3
				6.0	1.9	
DIR	302	301	90 13	96.3	5.5	1.3
				6.0	4.2	
DIR	301	105	0 0	-0.0	1.3	0.4
				6.0	3.2	
DIR	301	101	198 62	86.0	-1.4	-0.3
				6.0	4.3	
DIR	301	104	240 78	8.7	-3.7	-0.7
				6.0	5.1	
DIR	301	103	299 12	14.0	5.3	1.1
				6.0	4.7	
DIR	301	302	311 37	90.3	19.9	1.2
				17.1	16.2	
DIR	301	102	329 96	7.5	-42.9	-2.3
				24.7	18.9	
DIR	301	3001	202 60	84.9	5.4	1.8

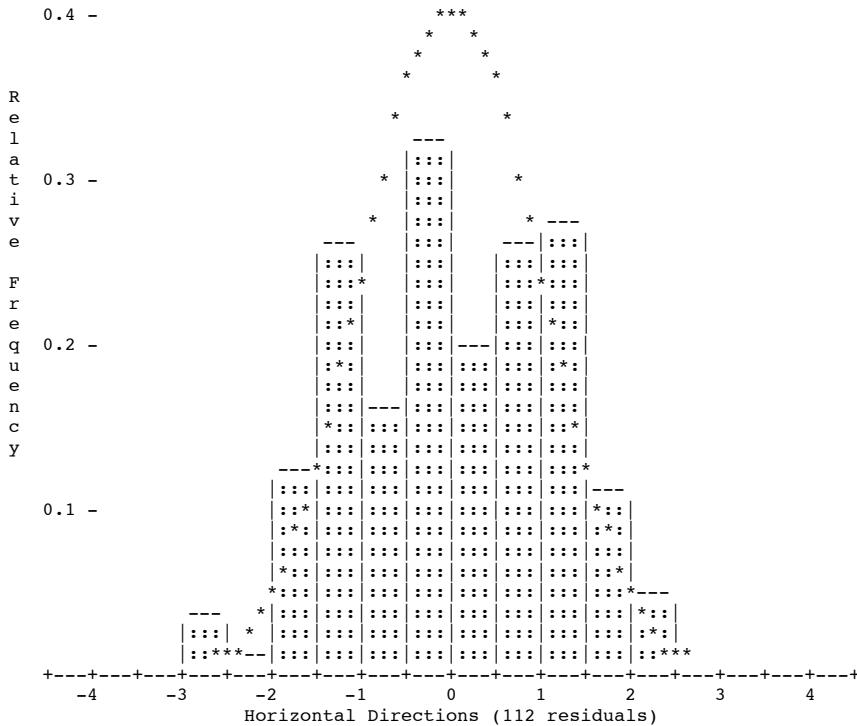
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Microsearch GeoLab, V2001.9.20.0 WGS 84 UNITS: m,GRAD Page 0012
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Residuals (critical value = 3.924, N,E,Up for 3D):

NOTE: Observation values shown are reduced to mark-to-mark.

TYPE	AT	FROM	TO	OBSERVATION		RESIDUAL	STD RES
				STD	DEV		
---	---	---	---	6.0	2.9	---	---
DIR	301	3002	203 83	59.1	3.7	1.2	
				6.0	3.1		
DIR	301	3003	203 86	98.4	-1.6	-0.5	
				6.0	3.0		
DIR	301	3004	205 41	17.9	-5.7	-1.4	
				6.0	4.1		
DIR	301	3005	202 65	57.0	-5.9	-1.6	
				6.0	3.7		
DIR	301	3006	203 84	37.2	-3.3	-1.0	
				6.0	3.2		
DIR	301	3007	203 86	89.0	4.1	1.3	
				6.0	3.1		
DIR	301	3008	205 41	76.6	2.8	0.8	
				6.0	3.5		
DIR	301	3009	203 85	32.6	-0.8	-0.3	
				6.0	3.0		

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=====

Residuals (critical value = 3.924, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.

TYPE	AT	FROM	TO	OBSERVATION RESIDUAL			STD RES PPM
				STD DEV	STD DEV	PPM	
ZANG		101	HERS_BCR	103 42	93.7	-27.6	-1.1
					25.0	24.9	
ZANG		101	SLR_PRI	103 97	75.6	3.8	0.5
					8.0	7.9	
ZANG		101	105	108 68	55.0	14.8	1.9
					8.0	7.9	
ZANG		101	106	107 56	69.0	-2.0	-0.3
					8.0	7.9	
ZANG		101	102	116 43	43.0	15.9	2.1
					8.0	7.5	
ZANG		101	103	110 69	59.0	10.5	1.4
					8.0	7.8	
ZANG		101	104	115 33	50.0	-10.9	-1.5
					8.0	7.4	
ZANG		101	109	109 42	36.0	-17.8	-2.4
					8.0	7.4	
ZANG		101	3001	130 0	32.2	-1.1	-1.0
					10.0	1.1	
ZANG		101	3005	137 87	81.0	-2.9	-2.4
					10.0	1.2	
ZANG		102	104	99 99	55.0	-13.7	-1.8
					8.0	7.8	
ZANG		102	103	99 96	90.0	-8.6	-1.1
					8.0	7.7	
ZANG		102	107	104 92	49.0	-11.7	-1.5
					8.0	7.8	
ZANG		102	106	105 30	54.0	-5.4	-0.7
					8.0	7.8	
ZANG		102	101	83 56	74.0	-1.2	-0.2
					8.0	7.5	
ZANG		102	HERT	86 7	63.1	-56.8	-2.4
					25.0	24.2	

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ZANG	102	3001	84 86	14.2	26.0	1.9
ZANG	102	3002	84 98	14.1	13.8	
ZANG	102	3002		94.1	2.6	0.3
ZANG	102	3003		10.0	7.9	
ZANG	102	3003	84 98	68.0	-3.6	-0.4
ZANG	102	3004		10.0	7.9	
ZANG	102	3004	84 77	37.8	5.8	0.7
ZANG	102	3008		10.0	8.2	
ZANG	102	3008	85 43	64.4	-1.8	-0.2
ZANG	102	3008		10.0	8.3	
ZANG	102	3007	85 63	55.8	-10.1	-1.3
ZANG	102	3007		10.0	7.9	
ZANG	102	3005	85 51	11.0	7.2	0.8
ZANG	102	3006	85 63	10.0	9.6	
ZANG	102	3006		61.9	-7.0	-0.9
ZANG	102	3009	85 38	10.0	7.9	
ZANG	102	3009		63.8	15.4	1.9
ZANG	106	101	92 43	10.0	7.9	
ZANG	106	101		53.0	12.5	1.6
ZANG	106	HERT_BCR	92 79	8.0	7.9	
ZANG	106	HERT_BCR		25.9	-14.8	-0.6
ZANG	106	102	94 69	25.0	24.9	
ZANG	106	102		46.0	-3.9	-0.5
ZANG	106	109	98 54	8.0	7.8	
ZANG	106	109		36.0	30.6	2.4
ZANG	106	HERS_BCR	87 40	12.8	12.6	
ZANG	106	HERS_BCR		1.7	-71.5	-3.1
ZANG	106	105	96 41	25.0	23.4	
ZANG	106	105		57.0	4.3	0.6
ZANG	106	107	97 3	8.0	7.2	
ZANG	106	107		47.0	-3.4	-0.5
ZANG	106	SLR_PRI	82 54	8.0	5.3	0.9
ZANG	106	SLR_PRI		6.7	5.9	
ZANG	107	102	95 7	8.0	7.8	
ZANG	107	102		45.0	-2.1	-0.3
ZANG	107	105	98 96	8.0	1.8	0.3
ZANG	107	105		34.0	0.3	

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Residuals (critical value = 3.924, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.

TYPE AT	FROM	TO	OBSERVATION		RESIDUAL	STD RES	PPM
			STD DEV	STD DEV			
ZANG	107	106	102 96	8.0	6.6		
ZANG	107	106		55.0	1.8	0.2	
ZANG	107	108	109 60	8.0	7.3		
ZANG	107	108		67.3	-6.7	-1.0	
ZANG	107	SLR_PRI	89 33	8.0	6.4		
ZANG	107	SLR_PRI		86.6	-3.9	-0.6	
ZANG	108	102	94 28	8.0	7.0		
ZANG	108	102		96.7	3.4	0.4	
ZANG	108	105	94 60	8.0	7.8		
ZANG	108	105		79.4	0.6	0.1	
ZANG	108	107	90 39	8.0	7.4		
ZANG	108	107		28.7	1.1	0.2	
ZANG	108	SLR_PRI	75 40	8.0	6.4		
ZANG	108	SLR_PRI		45.0	-7.8	-1.3	
ZANG	108	HERS_BCR	78 26	8.0	9.3	-0.4	
ZANG	108	HERS_BCR		82.5	21.7		
ZANG	104	101	84 66	25.0	2.5	0.3	
ZANG	104	101		44.0	7.4		
ZANG	104	103	99 98	8.0	7.3	1.0	
ZANG	104	103		0.0	7.7		
ZANG	104	SLR_PRI	100 75	8.0	7.9		
ZANG	104	SLR_PRI		61.8	-1.7	-0.2	
ZANG	104	HERS_BCR	100 49	8.0	10.0		
ZANG	104	HERS_BCR		37.2	-10.0	-0.4	
ZANG	104	102	100 0	25.0	24.9		
ZANG	104	102		27.0	-7.9	-1.0	
ZANG	104	3004	85 42	8.0	7.8		
ZANG	104	3004		12.4	-5.5	-0.7	
ZANG	104	HERT	85 65	10.0	8.3		
ZANG	104	HERT		11.1	-54.0	-2.2	
ZANG	104	HERT_BCR	85 57	25.0	24.1		
ZANG	104	HERT_BCR		27.3	6.3	0.3	
ZANG	103	102	100 3	25.0	23.3		
ZANG	103	102		4.0	0.1	0.0	
ZANG	103	101	89 30	8.0	7.7		
ZANG	103	101		57.0	1.9	0.2	
ZANG	103	3001	90 15	8.0	7.8		
ZANG	103	3001		86.4	-1.5	-0.2	
ZANG	103	3005	90 58	10.0	9.8		
ZANG	103	3005		84.4	9.1	0.9	

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ZANG	103	3004	89 93	10.0	9.8	
				91.9	-17.0	-1.8
				10.0	9.2	
ZANG	103	3008	90 38	13.1	-11.2	-1.2
				10.0	9.2	
ZANG	103	HERT	90 54	68.2	-23.4	-1.0
				25.0	24.6	
ZANG	103	HERT_BCR	90 49	16.4	-7.3	-0.3
				25.0	24.3	
ZANG	103	104	100 2	7.0	-3.4	-0.4
				8.0	7.7	
ZANG	103	105	105 5	87.0	3.7	0.5
				8.0	7.8	
ZANG	105	106	103 58	57.0	6.2	0.9
				8.0	7.2	
ZANG	105	109	99 60	7.0	8.1	1.1
				8.0	7.3	
ZANG	105	103	94 94	23.0	-1.0	-0.1
				8.0	7.8	
ZANG	105	107	101 3	65.0	-4.5	-0.7
				8.0	6.6	
ZANG	105	SLR_PRI	92 58	71.6	2.4	0.3
				8.0	7.4	
ZANG	105	108	105 39	27.6	3.2	0.4
				8.0	7.4	
ZANG	105	101	91 31	84.0	15.6	2.0
				8.0	7.9	
ZANG	105	HERT	91 83	79.6	-7.4	-0.3
				25.0	24.9	

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 HERSTMONCEUX LASER TIES - JUNE 2008 SURVEY
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Residuals (critical value = 3.924, N,E,Up for 3D):

NOTE: Observation values shown are reduced to mark-to-mark.

TYPE	AT	FROM	TO	OBSERVATION		STD RES
				STD	DEV	
ZANG	105	HERT_BCR	91 81	43.7	-1.0	-0.0
				25.0	24.8	
ZANG	109	HERT	91 1	89.3	-15.0	-0.6
				25.0	24.8	
ZANG	109	HERT_BCR	90 99	18.9	-8.5	-0.3
				25.0	24.7	
ZANG	109	101	90 57	47.0	-6.8	-0.9
				8.0	7.4	
ZANG	109	105	100 40	0.0	-8.2	-1.1
				8.0	7.3	
ZANG	109	106	101 46	11.0	5.9	0.8
				8.0	7.6	
ZANG	109	3001	91 21	55.4	7.4	0.8
				10.0	9.6	
ZANG	109	3005	91 40	98.1	5.7	0.6
				10.0	9.6	
ZANG	109	3004	91 28	64.9	10.5	1.1
				10.0	9.5	
ZANG	109	3008	91 47	85.7	4.6	0.5
				10.0	9.5	
ZANG	302	105	105 70	54.2	5.6	0.7
				8.0	7.8	
ZANG	302	102	100 53	4.0	-2.6	-0.4
				8.0	7.2	
ZANG	302	101	88 55	29.8	-9.0	-1.2
				8.0	7.7	
ZANG	302	104	100 26	50.0	-4.0	-0.5
				8.0	7.7	
ZANG	302	103	100 94	6.0	5.2	1.1
				8.0	5.0	
ZANG	302	3001	89 48	16.4	0.5	0.0
				10.0	9.7	
ZANG	302	3002	89 42	34.9	2.5	0.3
				10.0	8.8	
ZANG	302	3003	89 42	18.5	12.9	1.5
				10.0	8.8	
ZANG	302	3004	89 28	14.3	0.0	0.0
				10.0	9.0	
ZANG	302	3008	89 76	28.5	-16.6	-1.8
				10.0	9.0	
ZANG	302	3007	89 89	50.5	5.8	0.7
				10.0	8.8	
ZANG	302	3006	89 89	66.4	9.2	1.0
				10.0	8.8	
ZANG	302	3005	89 95	20.7	6.1	0.6
				10.0	9.7	
ZANG	302	3009	89 71	9.8	-5.9	-0.7
				10.0	8.8	

ZANG	302	301	102 39	32.3	-3.6	-0.5
ZANG	301	105	104 89	36.9	-1.5	-0.2
ZANG	301	101	79 35	58.5	-5.5	-0.7
ZANG	301	104	98 82	55.9	-8.9	-1.2
ZANG	301	103	98 49	17.2	6.6	0.9
ZANG	301	302	97 60	71.8	5.5	0.7
ZANG	301	102	91 61	8.1	-4.5	-1.2
ZANG	301	3001	80 82	43.6	-0.3	-0.0
ZANG	301	3002	81 12	14.9	-4.1	-0.5
ZANG	301	3003	81 12	5.7	-5.5	-0.7
ZANG	301	3004	80 88	93.7	30.7	1.6

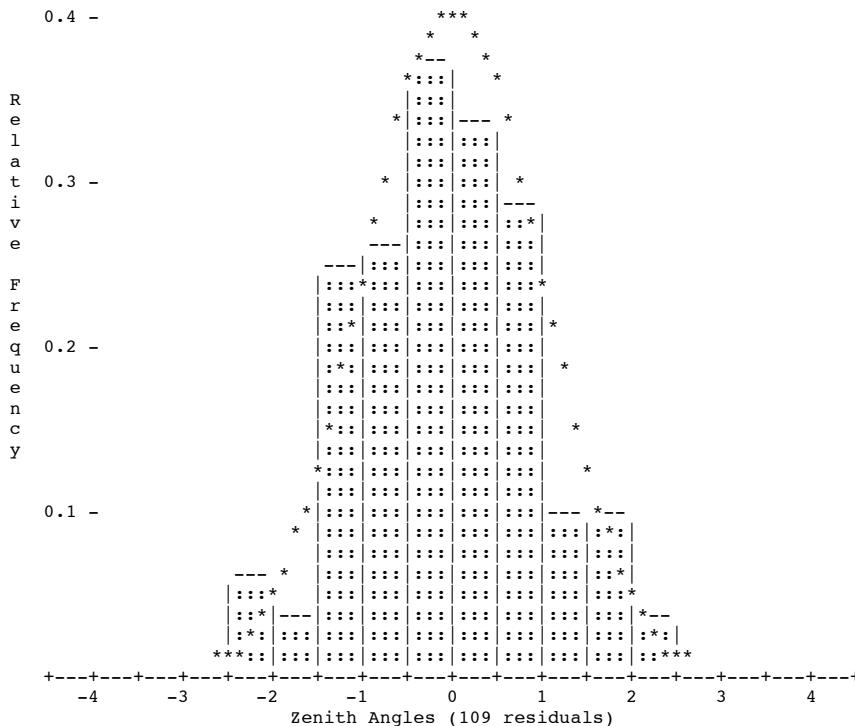
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HERSTMONCEUX LASER TIES - JUNE 2008 SURVEY
Microsearch GeoLab, V2001.9.20.0 WGS 84 UNITS: m,GRAD Page 0017
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Residuals (critical value = 3.924, N,E,Up for 3D):

NOTE: Observation values shown are reduced to mark-to-mark.

TYPE	AT	FROM	TO	OBSERVATION		RESIDUAL	STD RES
				STD	DEV		
ZANG	301	3005		81 54	94.4	52.8	2.6
ZANG	301	3006		81 83	43.0	0.2	0.0
ZANG	301	3007		81 83	56.6	5.3	0.7
ZANG	301	3008		81 61	62.4	18.6	2.4
ZANG	301	3009		81 55	64.0	-10.1	-1.4

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HERSTMONCEUX LASER TIES - JUNE 2008 SURVEY
Microsearch GeoLab, V2001.9.20.0 WGS 84 UNITS: m,GRAD Page 0018
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HERSTMONCEUX LASER TIES - JUNE 2008 SURVEY
Microsearch GeoLab, V2001.9.20.0          WGS 84      UNITS: m,GRAD Page 0019
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Residuals (critical value = 3.924, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.

      OBSERVATION RESIDUAL STD RES
TYPE AT   FROM     TO       STD DEV STD DEV PPM
-----  -----
DIST      101     SLR_PRI  123.18110 0.0008  0.8194
          0.0010  0.0010  6.40
DIST      101     105      87.63268 0.0009  0.9546
          0.0010  0.0010  10.49
DIST      101     106      116.98380 0.0003  0.3211
          0.0010  0.0010  2.65
DIST      101     102      23.88103 0.0001  0.0789
          0.0010  0.0010  3.24
DIST      101     103      36.38773 0.0000  0.0284
          0.0010  0.0010  0.76
DIST      101     109      77.73740 -0.0005 -0.5341
          0.0010  0.0009  6.26
DIST      101     104      25.54440 -0.0005 -0.4965
          0.0010  0.0010  18.93
DIST      102     104      36.87574 -0.0001 -0.1079
          0.0010  0.0010  2.82
DIST      102     103      25.02973 0.0005  0.4931
          0.0010  0.0010  19.21
DIST      102     106      93.40667 0.0006  0.6154
          0.0010  0.0010  6.32
DIST      102     101      23.88137 -0.0003 -0.2678
          0.0010  0.0010  11.00
DIST      102     3001     22.86396 0.0000  0.0201
          0.0020  0.0020  1.75
DIST      102     3002     23.22852 0.0037  1.9705
          0.0020  0.0019  161.24
DIST      102     3003     23.22612 0.0033  1.7608
          0.0020  0.0019  143.56
DIST      102     3004     22.78647 -0.0029 -1.4781
          0.0020  0.0020  128.72
DIST      102     3008     22.75346 -0.0039 -1.9878
          0.0020  0.0020  172.23
DIST      102     3007     23.19392 0.0012  0.6001
          0.0020  0.0019  50.16
DIST      102     3005     22.81651 -0.0015 -0.7637
          0.0020  0.0020  66.55
DIST      102     3006     23.19502 0.0017  0.8957
          0.0020  0.0019  74.97
DIST      106     101      116.98400 0.0001  0.1136
          0.0010  0.0010  0.94
DIST      106     102      93.40701 0.0003  0.2609
          0.0010  0.0010  2.68
DIST      106     109      104.86121 0.0010  1.1409
          0.0010  0.0009  10.01
DIST      106     105      34.73748 -0.0002 -0.1912
          0.0010  0.0010  5.33
DIST      106     107      36.00194 0.0007  0.7035
          0.0010  0.0010  18.84
DIST      106     SLR_PRI  22.82536 0.0003  0.3092
          0.0010  0.0010  13.06
DIST      107     102      78.90784 -0.0010 -1.0585
          0.0010  0.0010  12.75
DIST      107     105      17.11974 -0.0002 -0.2491
          0.0010  0.0010  14.11
DIST      107     106      36.00189 0.0007  0.7553
          0.0010  0.0010  20.23
DIST      107     108      15.87874 0.0004  0.3898
          0.0010  0.0010  23.54
DIST      107     SLR_PRI  27.03151 0.0003  0.3550
          0.0010  0.0010  12.65
DIST      108     102      94.72545 -0.0010 -1.0650
          0.0010  0.0009  10.61
DIST      108     105      31.51355 0.0000  0.0137
          0.0010  0.0010  0.42
DIST      108     107      15.87889 0.0002  0.2334
          0.0010  0.0010  14.09
DIST      108     SLR_PRI  18.29280 0.0009  0.9220
          0.0010  0.0010  48.83
DIST      104     101      25.54440 -0.0005 -0.4965
```

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HERSTMONCEUX LASER TIES - JUNE 2008 SURVEY
Microsearch GeoLab, V2001.9.20.0          WGS 84      UNITS: m,GRAD Page 0020
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Residuals (critical value = 3.924, N,E,Up for 3D):
NOTE: Observation values shown are reduced to mark-to-mark.

OBSERVATION RESIDUAL STD RES
TYPE AT    FROM     TO      STD DEV STD DEV PPM
-----  -----
DIST      104      103      0.0010  0.0010  18.93
          0.0010  -0.0002  -0.2235
          0.0010  0.0010   7.13
DIST      104      SLR_PRI  134.39931 0.0004  0.4690
          0.0010  0.0010   3.33
DIST      104      102      36.87603 -0.0004  -0.4089
          0.0010  0.0010   10.68
DIST      103      102      25.02973  0.0005  0.4931
          0.0010  0.0010   19.21
DIST      103      101      36.38759  0.0002  0.1731
          0.0010  0.0010   4.60
DIST      103      3001     34.90764  0.0005  0.2729
          0.0020  0.0020   15.46
DIST      103      3005     34.86460  0.0005  0.2557
          0.0020  0.0020   14.52
DIST      103      104      30.42883 -0.0003  -0.2647
          0.0010  0.0010   8.44
DIST      103      105      73.48314  0.0011  1.1327
          0.0010  0.0010   14.78
DIST      105      106      34.73668  0.0006  0.6355
          0.0010  0.0010   17.70
DIST      105      109      71.46568  0.0010  1.0484
          0.0010  0.0009  13.55
DIST      105      103      73.48355  0.0007  0.7050
          0.0010  0.0010   9.20
DIST      105      107      17.11924  0.0003  0.2666
          0.0010  0.0010  15.10
DIST      105      SLR_PRI  36.38058  0.0006  0.6265
          0.0010  0.0010  16.57
DIST      105      108      31.51314  0.0004  0.4419
          0.0010  0.0010  13.43
DIST      105      101      87.63351  0.0001  0.0927
          0.0010  0.0010  1.02
DIST      109      101      77.73747 -0.0006  -0.6109
          0.0010  0.0009  7.16
DIST      109      105      71.46648  0.0002  0.1820
          0.0010  0.0009  2.35
DIST      109      106      104.86129 0.0010  1.0540
          0.0010  0.0009  9.25
DIST      302      105      66.64101  0.0006  0.6212
          0.0010  0.0010  8.87
DIST      302      102      17.18480  0.0007  0.7671
          0.0010  0.0010  43.21
DIST      302      101      33.28696  0.0004  0.4085
          0.0010  0.0010  11.90
DIST      302      104      33.91611  0.0009  0.9280
          0.0010  0.0010  26.33
DIST      302      103      8.89360  0.0005  0.5199
          0.0010  0.0010  56.12
DIST      302      3001     31.88043  0.0005  0.2385
          0.0020  0.0020  14.80
DIST      302      3002     31.95104  0.0007  0.3407
          0.0020  0.0019  20.51
DIST      302      3006     31.92624 -0.0001  -0.0731
          0.0020  0.0019  4.46
DIST      302      3005     31.83953 -0.0001  -0.0286
          0.0020  0.0020  1.78
DIST      301      105      66.83826  0.0010  1.0068
          0.0010  0.0010  14.35
DIST      301      101      21.29104 -0.0001  -0.0797
          0.0010  0.0010  3.66
DIST      301      104      37.40316  0.0005  0.4773
          0.0010  0.0010  12.24
DIST      301      103      29.51198  0.0011  1.1487
          0.0010  0.0010  37.67
DIST      301      102      5.23358 -0.0000  -0.0085
          0.0010  0.0010  1.59
DIST      301      3001     20.47417  0.0008  0.4142
          0.0020  0.0020  40.20
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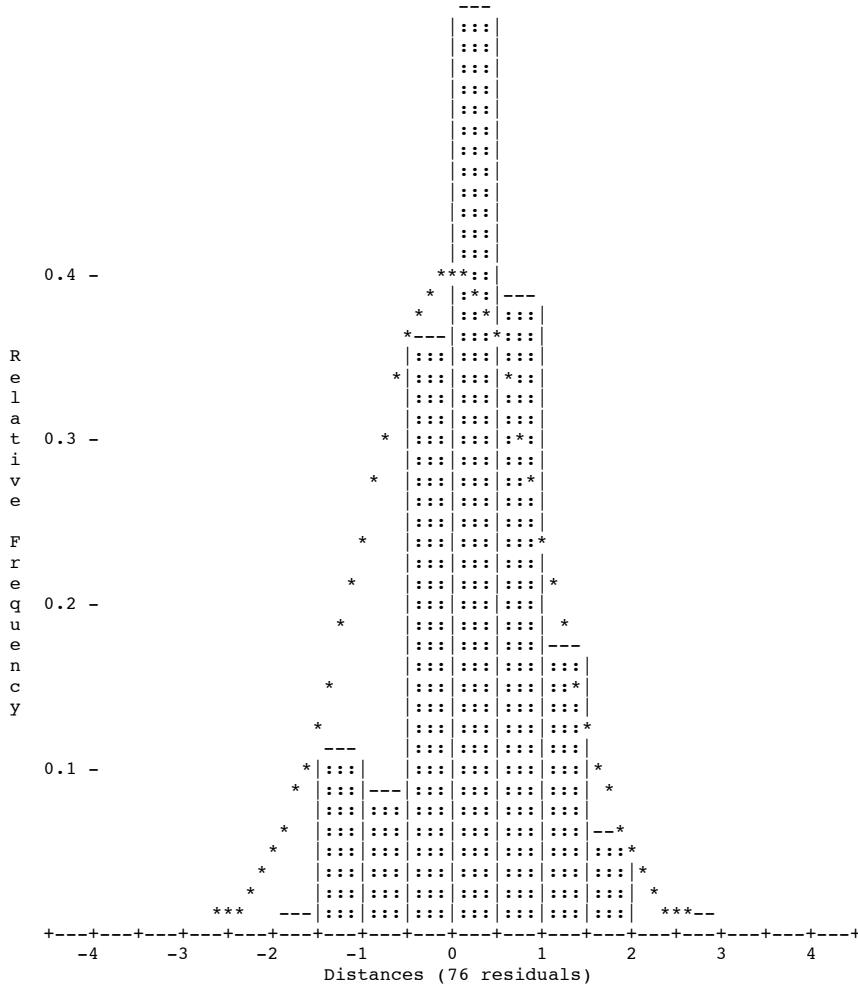
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HERSTMONCEUX LASER TIES - JUNE 2008 SURVEY
Microsearch GeoLab, V2001.9.20.0 WGS 84 UNITS: m,GRAD Page 0021
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Residuals (critical value = 3.924, N,E,Up for 3D):

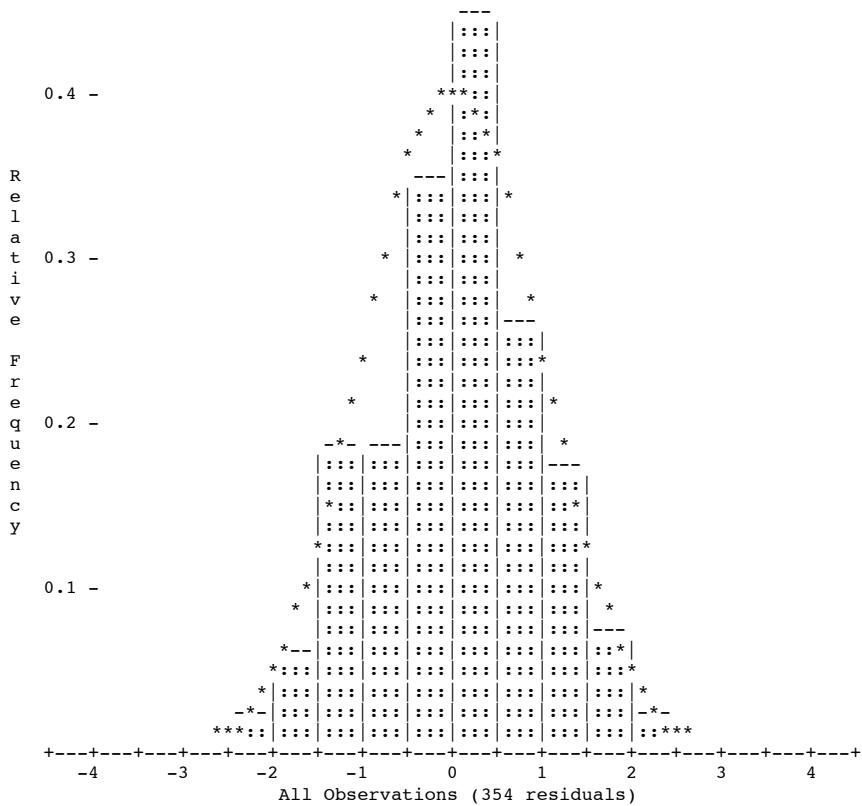
NOTE: Observation values shown are reduced to mark-to-mark.

TYPE	AT	FROM	TO	OBSERVATION		RESIDUAL	STD RES
				STD	DEV		
DIST		301	3002	20.92097	0.0057	2.9718	
				0.0020	0.0019	270.52	
DIST		301	3003	20.92307	0.0029	1.5282	
				0.0020	0.0019	138.64	
DIST		301	3004	20.57797	-0.0021	-1.0528	
				0.0020	0.0020	101.43	
DIST		301	3005	20.41632	-0.0018	-0.9255	
				0.0020	0.0020	90.09	
DIST		301	3006	20.87802	-0.0002	-0.0828	
				0.0020	0.0019	7.71	
DIST		301	3007	20.87542	0.0024	1.2470	
				0.0020	0.0019	116.00	
DIST		301	3008	20.53092	-0.0024	-1.2032	
				0.0020	0.0020	115.56	

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HERSTMONCEUX LASER TIES - JUNE 2008 SURVEY
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S T A T I S T I C S S U M M A R Y

Residual Critical Value Type	Tau Max
Residual Critical Value	3.9236
Number of Flagged Residuals	4
Convergence Criterion	0.0001
Final Iteration Counter Value	5
Confidence Level Used	95.0000
Estimated Variance Factor	1.9181
Number of Degrees of Freedom	250

Chi-Square Test on the Variance Factor:

1.6217e+00 < 1.0000 < 2.3044e+00 ?
***** THE TEST FAILS *****

NOTE: All confidence regions were computed using the following factors:

Variance factor used	=	1.9181
1-D expansion factor	=	1.9600
2-D expansion factor	=	2.4477
3-D expansion factor	=	2.7955

Note that, for relative confidence regions, precisions are computed from the ratio of the major semi-axis and the spatial distance between the two stations.

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HERSTMONCEUX LASER TIES - JUNE 2008 SURVEY
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2-D and 1-D Station Confidence Regions (95.000 and 95.000 percent):			
STATION	MAJOR SEMI-AXIS	AZ	MINOR SEMI-AXIS
101	0.0034	7	0.0032
102	0.0033	17	0.0032
103	0.0034	34	0.0032
104	0.0035	14	0.0032
105	0.0032	100	0.0031
105_SPIT	0.0000	0	0.0000
106	0.0032	127	0.0031
107	0.0032	101	0.0031
108	0.0033	88	0.0031
109	0.0036	125	0.0033
3001	0.0034	14	0.0032
3002	0.0038	89	0.0034
3003	0.0039	89	0.0034
3004	0.0034	8	0.0032
3005	0.0034	13	0.0032
3006	0.0036	76	0.0034
3007	0.0036	77	0.0034
3008	0.0034	26	0.0033
3009	0.0036	79	0.0034
301	0.0033	18	0.0032
302	0.0034	25	0.0032
HERS	0.0030	171	0.0030
HERS_ARP	0.0031	171	0.0031
HERS_BCR	0.0031	171	0.0031
HERT	0.0033	5	0.0032
HERT_BCR	0.0034	4	0.0032
N102	0.0000	0	0.0000
N103	0.0000	0	0.0000
N104	0.0000	0	0.0000
SLR_ARP	0.0032	72	0.0032
SLR_HAXIS_UP	0.0032	73	0.0032
SLR_PRI	0.0032	73	0.0031
SLR_SPIGOT	0.0000	0	0.0000
SLR_SRTP	0.0033	73	0.0033

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HERSTMONCEUX LASER TIES - JUNE 2008 SURVEY
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3D Station Confidence Regions (95.000 percent):
STATION      MAJ-SEMI (AZ,VANG)      MED-SEMI (AZ,VANG)      MIN-SEMI (AZ,VANG)
-----
101          0.0039 (187, 15)        0.0038 ( 8, 75)        0.0036 (277, 0)
102          0.0038 (191, 84)        0.0038 ( 17, 6)         0.0037 (287, 1)
103          0.0039 (214, 7)         0.0038 ( 42, 83)        0.0037 (304, 1)
104          0.0040 (194, 3)         0.0038 ( 20, 87)        0.0036 (284, 0)
105          0.0038 (154, 89)        0.0037 (280, 0)         0.0036 ( 10, 1)
105_SPIT     0.0038 ( 0, 90)        0.0000 ( 90, 0)         0.0000 ( 0, 0)
106          0.0038 (203, 90)        0.0037 (307, 0)         0.0036 ( 37, 0)
107          0.0038 (128, 89)        0.0037 (281, 1)         0.0036 ( 11, 0)
108          0.0038 (103, 89)        0.0037 (268, 1)         0.0035 (358, 0)
109          0.0041 (125, 13)        0.0040 (303, 77)        0.0038 ( 35, 1)
3001         0.0039 (194, 7)         0.0038 ( 19, 83)        0.0036 (284, 1)
3002         0.0044 (269, 0)         0.0039 (178, 78)        0.0039 (359, 12)
3003         0.0044 (269, 0)         0.0039 (179, 78)        0.0039 (359, 12)
3004         0.0039 (187, 73)        0.0039 ( 8, 17)         0.0037 (278, 0)
3005         0.0039 (193, 8)         0.0038 ( 17, 81)        0.0036 (283, 1)
3006         0.0041 (256, 1)         0.0039 (160, 81)        0.0039 (346, 9)
3007         0.0041 (257, 1)         0.0039 (162, 81)        0.0039 (347, 9)
3008         0.0039 (204, 50)        0.0039 ( 27, 40)        0.0038 (296, 2)
3009         0.0041 (259, 0)         0.0039 (166, 81)        0.0039 (349, 9)
301          0.0038 (192, 81)        0.0038 ( 18, 9)         0.0037 (288, 1)
302          0.0039 (205, 16)        0.0038 ( 28, 74)        0.0037 (295, 1)
HERS          0.0035 ( 32, 89)        0.0035 (171, 0)         0.0035 (261, 0)
HERS_ARP     0.0036 (101, 90)        0.0035 (351, 0)         0.0035 (261, 0)
HERS_BCR     0.0036 ( 64, 90)        0.0035 (171, 0)         0.0035 (261, 0)
HERT          0.0039 (183, 84)        0.0038 ( 5, 6)         0.0036 (275, 0)
HERT_BCR    0.0041 (182, 86)        0.0039 ( 4, 4)         0.0036 (274, 0)
N102         0.0038 ( 0, 90)         0.0000 ( 90, 0)         0.0000 ( 0, 0)
N103         0.0038 ( 0, 90)         0.0000 ( 90, 0)         0.0000 ( 0, 0)
N104         0.0038 ( 0, 90)         0.0000 ( 90, 0)         0.0000 ( 0, 0)
SLR_ARP     0.0038 (114, 90)        0.0037 (252, 0)         0.0036 (342, 0)
SLR_HAXIS_UP 0.0038 (123, 90)        0.0037 (253, 0)         0.0037 (343, 0)
SLR_PRI     0.0038 (140, 90)        0.0036 (253, 0)         0.0036 (343, 0)
SLR_SPIGOT   0.0038 ( 0, 90)         0.0000 ( 90, 0)         0.0000 ( 0, 0)
SLR_SR_P     0.0038 ( 90, 88)        0.0038 (253, 2)         0.0037 (343, 1)
```

Fri Feb 13 13:14:50 2009

6.8. Global Covariance Matrix

```

*
* Extracted coordinates follow: (extracted on Wed Aug 27 18:08:17 2008)
* Source (GeoLab adjustment): Herstout_EnglishV4
* Variance factor of adjustment = 1.918113
* Variance factor used in computing covariance matrix = 1.918113
* Number of degrees of freedom of adjustment = 250
* Number of stations in adjusted network = 34
* Number of stations extracted = 3
*
3DC
XYZ      HERS          4033470.0723      23672.9479      4924301.3558 m      0
XYZ      HERT          4033460.8868      23537.8563      4924318.3033 m      0
XYZ      7840          4033463.5731      23662.6772      4924305.2959 m      0
COV  CT UPPR
ELEM   1.529569154798e-06   2.09400798102244e-10   8.96902027541086e-10
ELEM   1.52939202682553e-06   1.73845794913357e-10   1.01706720414321e-09
ELEM   1.5295560689546e-06   2.5180477775549e-10   9.0283953220873e-10
ELEM   1.52735488223474e-06   -1.42224955841168e-10   2.93646042945672e-10
ELEM   1.52728124089537e-06   -9.78607816337379e-11   2.24075556444967e-10
ELEM   1.52730463740893e-06   -1.52300367474526e-10
ELEM   1.52997974935181e-06   1.02488270398422e-09   -1.05353006976177e-10
ELEM   1.52973743608859e-06   8.72589033776134e-10   -9.00524469194797e-11
ELEM   1.52988270311788e-06
ELEM   1.92551078379049e-06   -1.28241124043539e-08   5.59036305714059e-08
ELEM   1.65341130277219e-06   -4.46904188300707e-09   1.17531526558914e-07
ELEM   1.66292083920179e-06   1.08883935478845e-08   4.42055194271583e-09
ELEM   1.58274560668199e-06   -3.19658947469418e-09
ELEM   1.92518576014196e-06   1.11631723677041e-07   4.23855570813135e-09
ELEM   1.69293395279332e-06
ELEM   1.81195749469834e-06   -1.03892456903949e-08   2.62278718970496e-08
ELEM   1.83085016503794e-06   9.08797803453425e-09
ELEM   1.821762265894e-06
*
* End of extracted coordinates
*
```

6.9. SINEX file

```
%=SNX 1.00 IGN 08:240:00000 IGN 08:177:00000 08:177:00000 C 00009
*-----
+FILE/COMMENT
* File created by geotosnx software (Z.Altamimi)
* Original input file: HerstV4.cov
* Matrix Scaling Factor used: 1.0000000000
-FILE/COMMENT
*-----
+SITE/ID
*CODE PT __DOMES__ T __STATION DESCRIPTION__ APPROX_LON APPROX_LAT APP_H
HERS A 13212M007 13212M007 0 20 10.5 50 52 02.3 76.5
HERT A 13212M010 13212M010 0 20 03.6 50 52 02.9 83.3
7840 A 13212S001 13212S001 0 20 10.0 50 52 02.5 75.4
-SITE/ID
*-----
+SOLUTION/EPOCHS
*Code PT SOLN T Data_start Data_end Mean_epoch_
-SOLUTION/EPOCHS
*-----
+SOLUTION/ESTIMATE
*INDEX TYPE__ CODE PT SOLN __REF_EPOCH__ UNIT S __ESTIMATED VALUE__ STD_DEV__
 1 STAX HERS A 1 08:177:00000 m 2 0.403347007230000E+07 0.12368E-02
 2 STAY HERS A 1 08:177:00000 m 2 0.236729479000000E+05 0.12359E-02
 3 STAZ HERS A 1 08:177:00000 m 2 0.492430135580000E+07 0.12369E-02
 4 STAX HERT A 1 08:177:00000 m 2 0.403346088680000E+07 0.13876E-02
 5 STAY HERT A 1 08:177:00000 m 2 0.235378563000000E+05 0.12895E-02
 6 STAZ HERT A 1 08:177:00000 m 2 0.492431830330000E+07 0.13875E-02
 7 STAX 7840 A 1 08:177:00000 m 2 0.403346357310000E+07 0.13461E-02
 8 STAY 7840 A 1 08:177:00000 m 2 0.236626772000000E+05 0.13531E-02
 9 STAZ 7840 A 1 08:177:00000 m 2 0.492430529590000E+07 0.13497E-02
-SOLUTION/ESTIMATE
*-----
+SOLUTION/MATRIX_ESTIMATE L COVA
*PARA1 PARA2 __PARA2+0__ PARA2+1 PARA2+2
 1 1 0.152956915479800E-05
 2 1 0.209400798102244E-09 0.152735488223474E-05
 3 1 0.896902027541086E-09 -1.42224955841168E-09 0.152997974935181E-05
 4 1 0.152939202682553E-05 0.293646042945672E-09 0.102488270398422E-08
 4 4 0.192551078379049E-05
 5 1 0.173845794913357E-09 0.152728124089537E-05 -.105353006976177E-09
 5 4 -1.28241124043539E-07 0.166292083920179E-05
 6 1 0.101706720414321E-08 -9.78607816337379E-10 0.152973743608859E-05
 6 4 0.559036305714059E-07 0.108883935478845E-07 0.192518576014196E-05
 7 1 0.152955606895460E-05 0.224075556444967E-09 0.872589033776134E-09
 7 4 0.165341130277219E-05 0.442055194271583E-08 0.111631723677041E-06
 7 7 0.181195749469834E-05
 8 1 0.25180477775549E-09 0.152730463740893E-05 -.900524469194797E-10
 8 4 -.446904188300707E-08 0.158274560668199E-05 0.423855570813135E-08
 8 7 -.103892456903949E-07 0.183085016503794E-05
 9 1 0.902839532208730E-09 -.152300367474526E-09 0.152988270311788E-05
 9 4 0.117531526558914E-06 -.319658947469418E-08 0.169293395279332E-05
 9 7 0.262278718970496E-07 0.908797803453425E-08 0.182176226589400E-05
-SOLUTION/MATRIX_ESTIMATE L COVA
%ENDSNX
```