RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

IGN
INSTITUT NATIONAL DE L'INFORMATION GÉOGRAPHIQUE ET FORESTIÈRE

SERVICE
DE GEODESIE
ET DE METROLOGIE

Damien Pesce

ITRF local tie survey at Malé – Maldives

DIFFUSION OUVERTE

DT • 600 82 8691
version 1
Date de création 28/10/2021

Résumé / Abstract

The ITRF2020 realization (most recent frame of the International Terrestrial Reference System) computed by the ITRS product Centre (IGN Geodesy research team from IPGP) are the result of the reference frames combination from four space geodesy techniques (i.e. GNSS, DORIS, SLR and VLBI). One way to achieve one common frame consists in adding to the combination results from co-located sites local tie surveys. The Maldives Meteorological Service at the Male airport is equipped with a DORIS station and a GNSS station. This report describes the local tie survey carried out in September 2021 during the DORIS station installation on site and provides the associated results.

Remerciements / Acknowledgements

On behalf of CNES and IGN, we would like to acknowledge the staff from The Maldives Meteorological Service for all the essential logistics works, for their welcome and help.

1 Introduction

1.1 Context

The International Terrestrial Reference Frame (ITRF) is the result of a combination of different terrestrial reference frames provided by the four space geodetic techniques (i.e. GNSS, DORIS, SLR and VLBI). To perform this combination between independent reference frames, local tie surveys between co-located space geodetic instruments, precisely measured and expressed in three dimensions are necessary.
One way to improve the ITRS realization consists in adding to the combination tie vectors from new co-located sites or to improve the local tie accuracy on former sites.
To this end, missing or old local ties have to be surveyed. In charge of the DORIS network maintenance, IGN carries out local tie surveys as soon as a DORIS station is co-located.
This document presents the local tie survey performed at Malé in Maldives, which took place on September 2021 during DORIS renovation works on site.
The goals were the following:

- Assign coordinates to the reference point of the new DORIS antenna ;
- Provide tie vectors between instrument reference points (i.e. DORIS, GNSS and tide gauge marker) ;
- Produce a survey result file in SINEX format.

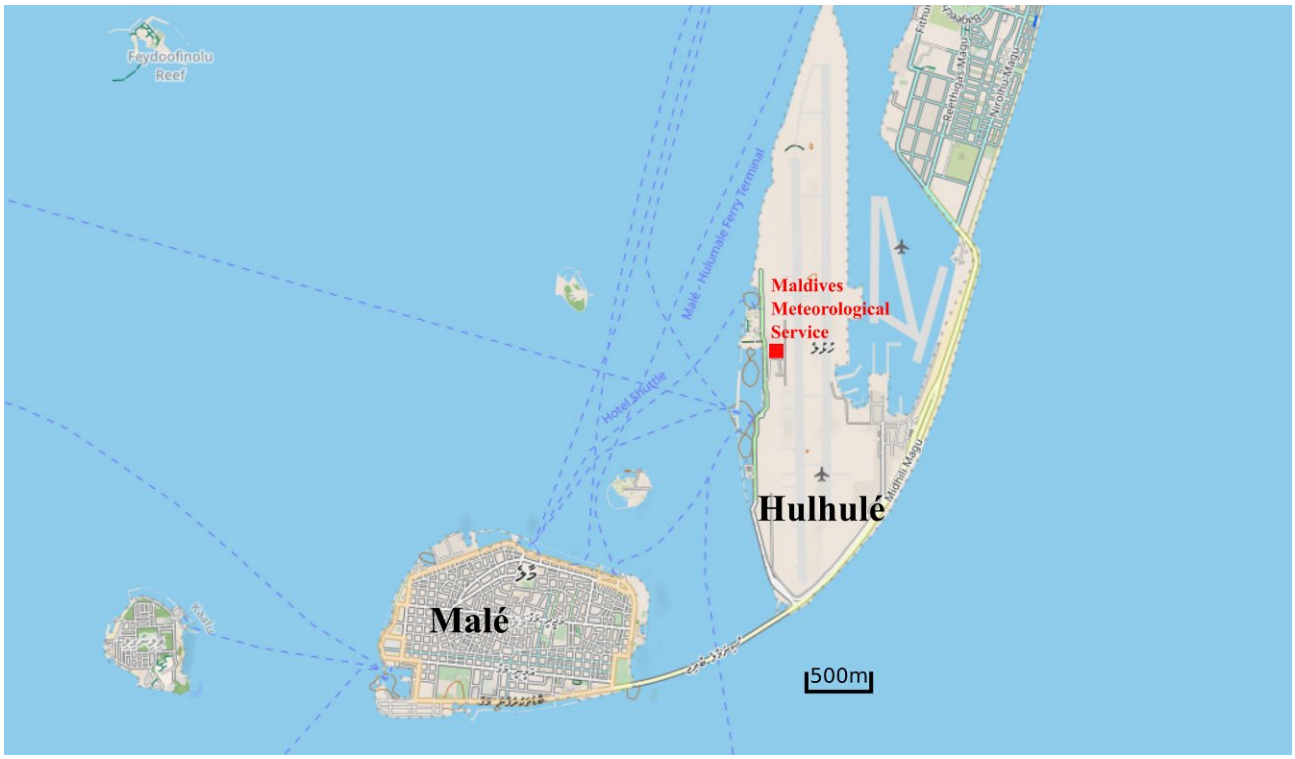
1.2 Glossary

ARP: Antenna Reference Point
CNES: Centre National d'Études Spatiales (France)
DOMES: ITRF product center site numbering
DORIS: Doppler Orbitography and Radiopositioning Integrated by Satellite
GGOS: Global Geodetic Observing System
GNSS: Global Navigation Satellite System
HIGP: Hawaii Institute of Geophysics and Planetology
IDS: International DORIS Service
IERS: International Earth Rotation and Reference Systems Service
IGN: Institut National de l'Information Géographique et Forestière (France)
IGS: International GNSS Service
ITRF: International Terrestrial Reference Frame
MMS : Maldives Meteorological Service
PGF: Pacific GPS Facility
SINEX: Solution INdependent Exchange
SLR: Satellite Laser Ranging
VLBI: Very Long Baseline Interferometry

2 Co-location site description

2.1 Site information

The site is located west of Malé international airport on Hulhulé Island on north east of Malé Island the capital of Maldives. The site is a weather station owned by the Maldives Meteorological Service (MMS).



Location map (extract OpenStreetMap)

2.2 Co-located points

The weather station is equipped with a GNSS station (HULE) operated by Pacific GPS Facility - Hawaii Institute of Geophysics and Planetology (HIGP), a former DORIS station (MALB) decommissioned just before the survey and a new DORIS station (MALC). The GNSS antenna is mounted on a deep drilled braced monument (stainless steel tripod). DORIS antennas are mounted on 2 m high rigid metal masts. DORIS antennas have a witness mark centred under antenna axis.

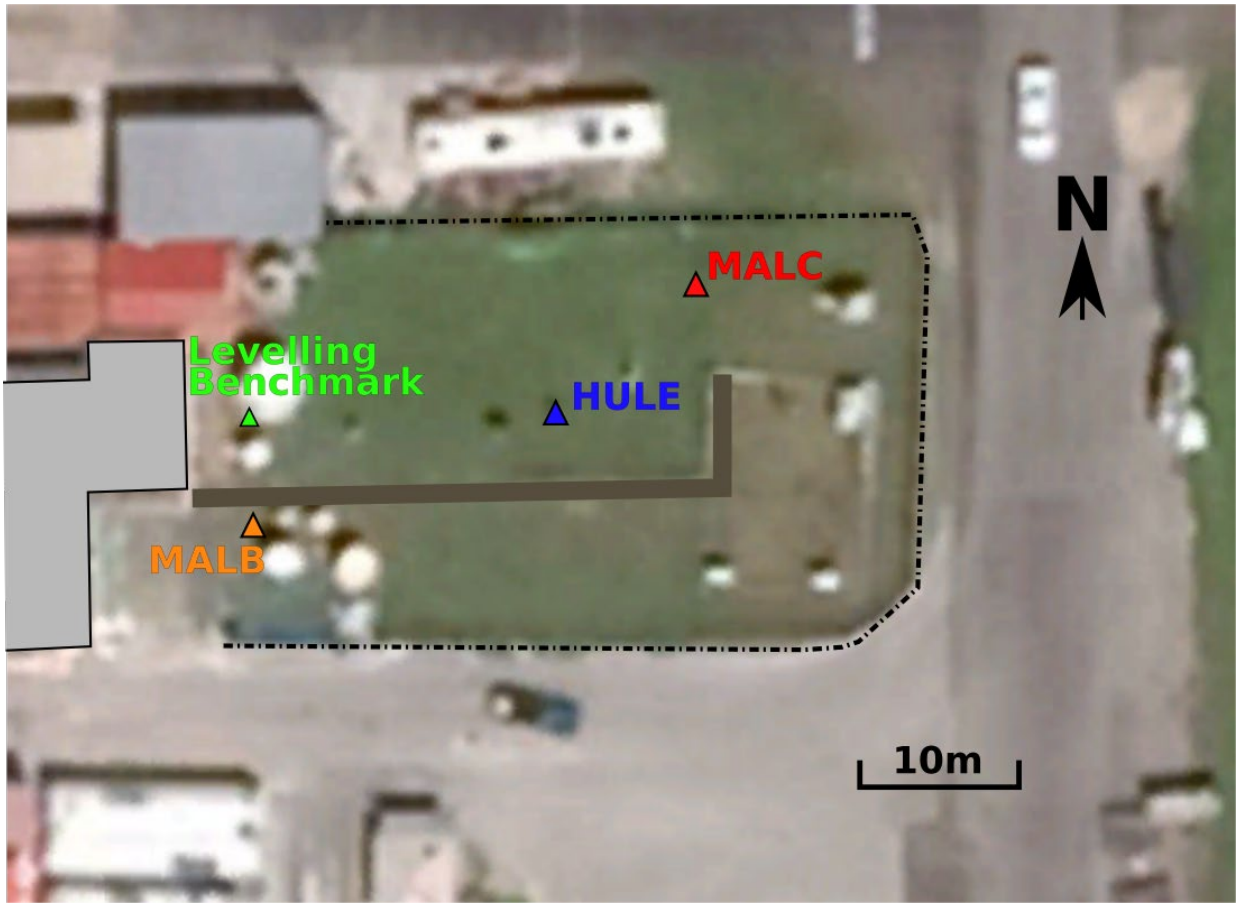
The following table sums up the geodetic techniques co-located on site.

Technique Name	DOMES n°	Description	Acronym / N°
GNSS	22901M003	Antenna mount reference point / tripod	HULE
DORIS	22901S002	DORIS antenna reference point	MALB
DORIS	22901M002	DORIS MALB witness mark / Concrete block	-
DORIS	22901S003	DORIS antenna reference point	MALC
DORIS	22901M004	DORIS MALC witness mark / Concrete block	-

For DORIS, further details can be found at:

https://ids-doris.org/doris-system/tracking-network/site-logs.html

In addition, a levelling benchmark (expansion anchor embedded into a concrete block) is used by HIGP for the tide gauge. It was included in the site survey.



Site map: Points location (Google Earth)

3 Local tie survey description

3.1 Organization

The local tie was performed by Damien Pesce (IGN) with the help of Moosa Saeed (MMS) from September 22nd to 24th 2021.

3.2 Equipment – Instruments characteristics

The following section provides the characteristics of the surveying equipment that was used. The surveying instruments belong to IGN. The equipment is regularly checked and calibrated at IGN.

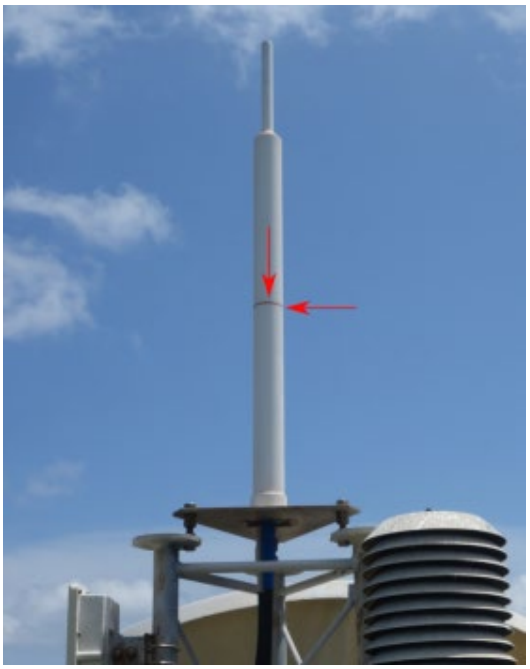
Equipment	Trademark, Serial ref. n°	Specifications, accuracy
Total station	Leica TM50 s/n 09856	EDM st. dev. 0.6 mm + 1 ppm Angular st. dev. 0.15 mgon (0.5")
Prism set Reflector & tribrach	Leica GPF121	Dist. Corr. 0.0 mm
Reflector mini pole	Leica GLS14 (n° 40911)	H = 0.200 m
Mini-reflector	Leica GMP101	Dist. Corr. 17.5 mm
Pocket weather tracker (meteorological station)	Kestrel 4500NV s/n 672710	Temp. st. dev. 0.5°C Pressure st. dev. 1 hPa
GNSS unit Leica	Receiver: Leica GX 1230+ GNSS Antenna: Leica AX1203+ GNSS	Theoretical static post-processing accuracies: Horiz. 5 mm + 0.5 ppm Vert. 6 mm + 0.5 ppm

NB.: All these survey instruments allowed the observations to be recorded electronically on memory cards or storage devices and then downloaded to a laptop PC for on-site checking.

3.3 Co-located points

3.3.1 DORIS station – MALB

The DORIS station was installed on January 2005 and was removed during the local tie survey right before the installation of the new DORIS station MALC.

Acronym : MALB	DOMES number : 22901S002
 Overview	 Close-up view
Description: The reference point is located 0.390 m above the antenna base-mounting surface on the antenna vertical axis.	

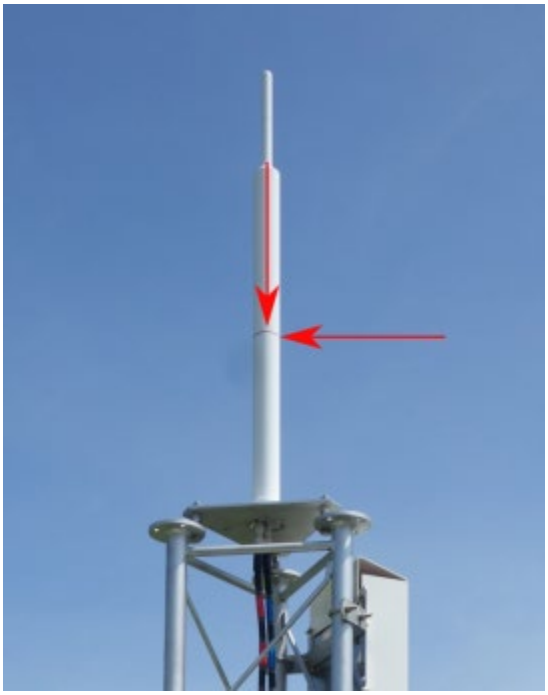
3.3.2 DORIS station – marker

A mark on top of threaded rod embedded vertically down the DORIS reference point on the concrete block is used as a witness mark.

Acronym : DORIS marker	DOMES number : 22901M002
 Overview	 Close-up view
Description : The marker is located 2.370m underneath the antenna reference point	

3.3.3 DORIS station – MALC

The DORIS station was installed on September 2021 before the local tie survey.

Acronym : MALC	DOMES number : 22901S003
Overview 	 Close-up view
Description: The reference point is located 0.390 m above the antenna base-mounting surface on the antenna vertical axis.	

3.3.4 DORIS station – marker

A witness mark is embedded in the concrete block vertically down the DORIS reference point.

Acronym : DORIS marker	DOMES number : 22901M004
 Overview	 Close-up view
Description : The marker is located 2.425 m underneath the antenna reference point	

3.3.5 GNSS station – HULE

HULE is managed by Pacific GPS Facility - Hawaii Institute of Geophysics and Planetology.

Acronym : HULE	DOMES number : 22901M003
 Overview	 Close-up view
Description: The reference point on the antenna mount coincides with the ARP.	

3.3.6 Leveling Benchmark

HIGP has tied a benchmark to the tide gauge by leveling (GLOSS N° 28).

Overview

Close-up view

Description: Top and axis of the expansion anchor.

3.4 Observation polygon

All surveying operations have been carried out in such a way to provide the highest accuracy for the 3D vectors determination between reference points. But IGS alignment and orientations are not optimal because one of the two GNSS receivers was out of order upon arrival in Malé and the HULE GNSS station was only collecting L1 frequency due to an antenna problem.

3.4.1 Total station figure

Observations were done by total station from 4 stations on tripod (number 1 to 4) on the ground around the site, from 2 stations on pillars located on eastern side of the site (number 5 and 6) and a total station was installed on the new DORIS antenna plate before the antenna installation (point number 250).

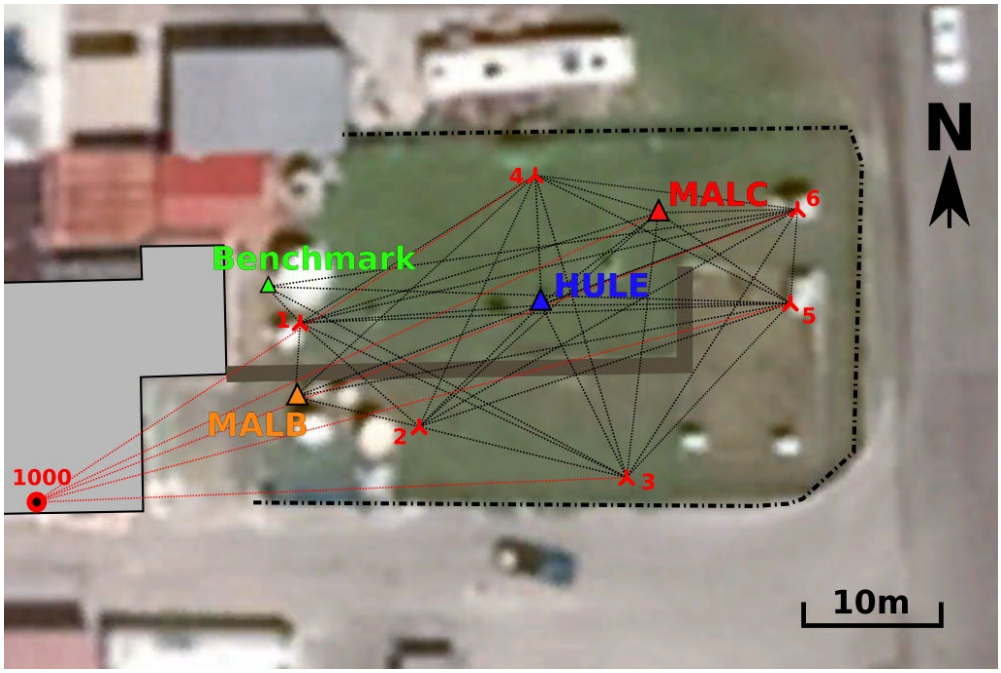
Stations 1, 2 and 3 were suspected to have moved slightly during the few days of work. In the second part of the survey, they were replaced by stations 11, 21 and 31.

Point 250; total station on MALC mast

3.4.2 GNSS orientation

Usually, two references placed as far as possible from the site were used to constrain the polygon direction. A problem with one of the GNSS receivers and the site environment (surrounded by restricted access areas and buildings) meant that only a reference was available at 36m away from

HULE. This reference, named 1000, is a temporary point located on the roof terrace of the MMS building.



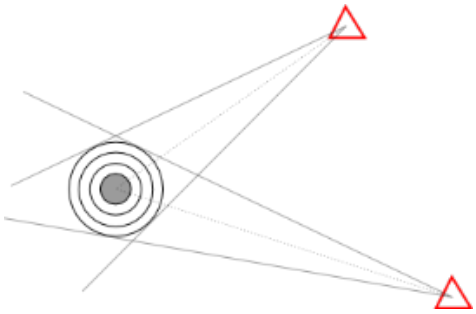
Survey network

3.5 Survey method

All the visible lines of sight were observed with total station. Horizontal directions and zenith angles were observed in data sets, each set consisting in one reading in both direct and reverse theodolite positions. Distance measurements were observed at least once over each line. Meteorological data (atmospheric pressure and temperature) used to correct distances measurements, were recorded at each station.
For a small figure like this one, conventional terrestrial observations are more accurate than GNSS measurements. The GNSS observations are only used to get the polygon orientation.

3.5.1 GNSS antenna reference points

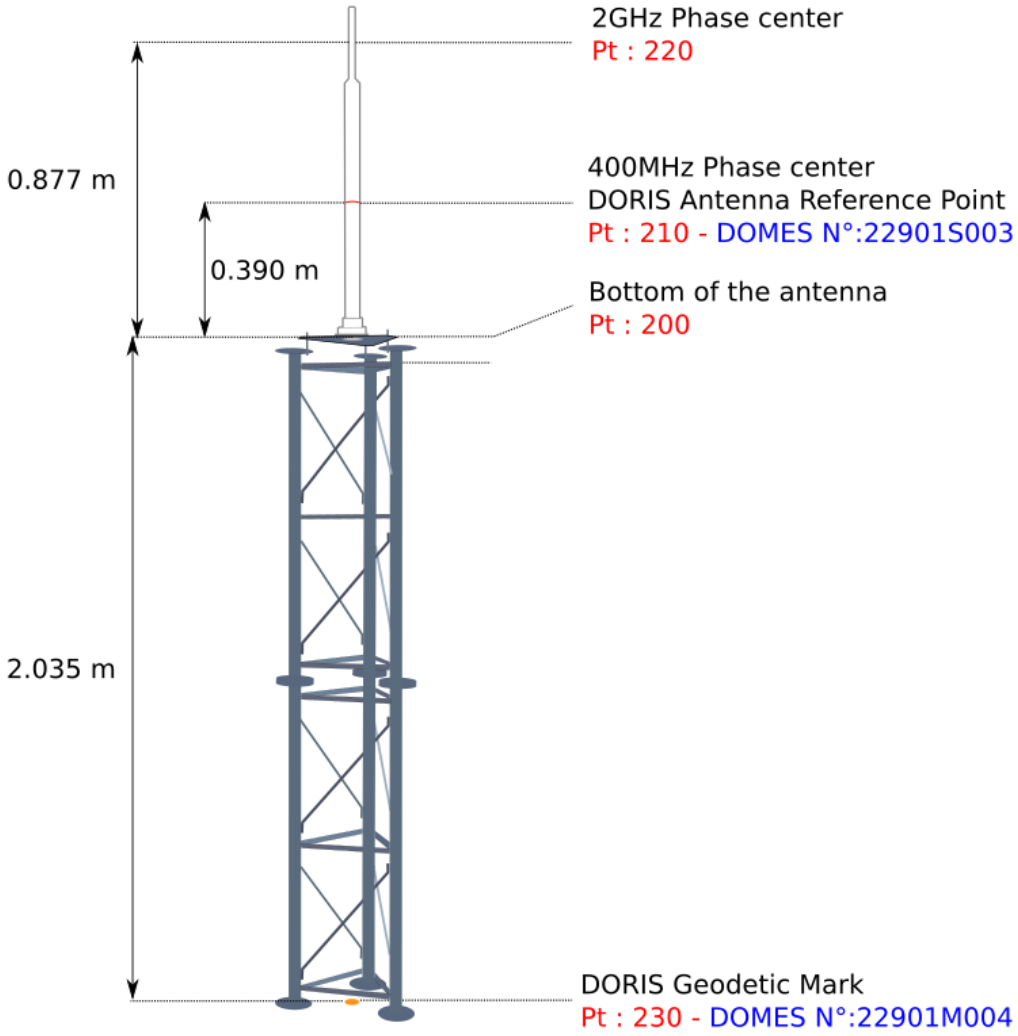
The reference points have been determined indirectly for GNSS antennas. From each surveying station aiming at the antenna, right and left tangents on the bottom of the antenna or on the bottom of radom were observed. In the adjustment, horizontal and vertical angle observations were averaged.



Top view

3.5.2 DORIS antenna reference point

An indirect approach was used to determine the DORIS antenna reference point. From each surveying station aiming at the antenna, right and left tangents to the DORIS antenna close to the ARP (red circle n°110 and 210), close to 2 GHz phase centre (point 120 and 220) and close to antenna base (n°100 and 200) were observed. In the adjustment, horizontal and vertical angle observations were averaged to get the position for the ARP point. For the two other points, only horizontal angle observations were averaged because vertical positions of those points are not precisely defined.
A prism on mini-pole placed on the top the support plate was observed from each station to determine a more accurate height of the bottom of antenna (points 141 to 146 and 241 to 246)
The height between DORIS mark (n°130 and 230) and the top of the support plate was measured. And the heights between antenna bottom and phase centres come from the antenna manufacturer.



MALC antenna heights sketch

3.5.3 Geodetic marker

The Doris witness marks and the benchmark were observed thanks to prisms on mini-pole (height 0.200m).

3.5.4 GNSS observations

GNSS observations were carried out in order to align the terrestrial survey network to IGS14 reference frame.
There were two problems for GNSS observations:

- The HULE station only receives the GPS frequency L1 due to an antenna problem. We didn't have IGS coordinates of this station and it's not possible to process accurate long baselines with only L1.

- One of the GNSS receiver shipped for the survey went down. Only one receiver was available.

The point 1000 was observed for 3 and half days and point 6 was observed for 22 hours.
GPS and Glonass constellations were recorded with a sampling rate of 30s.
With these data, it's possible to obtain IGS coordinates to points 1000 and 6. And it is also possible to processed baselines from these points to HULE.

4 Computation and data analysis

4.1 On site validation

Total station observations were checked on site and converted into the adjustment format. GNSS data were validated after a quick baselines calculation.

4.2 GNSS network

4.2.1 IGS alignment

As HULE is not including in the IGS network, the first step of processing was to get coordinates for a point of the survey in IGS14 reference frame.
4 sessions of observations of point 1000 with the 12 nearest IGS stations were calculated with the scientific software Bernese version 5.2 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 centres and reference points of antennas at ground stations and satellites.
A session of 22 hours of observations of point 6 was also calculated with the same way.
Then the GNSS baselines from points 1000 and 6 to HULE were processed with Leica Infinity software version 3.3.1. The IGS14 precise ephemerides were used as well as the IGS antenna phase offset files. Only L1 GPS frequency was used for this process.
The computation produced HULE, point 1000 and point 6 coordinates in IGS14 epoch 2021.73 (i.e. 24/09/2021). The corresponding report files are shown in appendix 6.1.

4.2.2 Orientation points

Two azimuths were calculated from the IGS coordinate, HULE to point 100 and point6 to point 1000.
The estimated accuracies are respectively 2mm at 36m and 4mm at 54m.

4.3 Final adjustment

The data was processed using 3D least-square adjustment with IGN COMP3d version 5.20 software. The input file (see appendix 6.2) comes from:

- Total station observations : horizontal and zenith angles, distances;
- Height differences between points of the same stations;
- Centring equations : relative position between points;
- Azimuths;
- HULE reference point coordinates, constrained at 1 mm to its IGS14 epoch 2021.73 values.

The computations are done in UTM 43N projection.
The a priori standard deviations used for most of the observations with total station are:

- 0.45 mgon for horizontal angles
- 0.5 mgon for vertical angles,
- 0.4 mm for distances on prism.

This adjustment provides coordinates and a covariance matrix of our survey work (appendix 6.3.2).
The terrestrial adjustment was processed taking into account the mean vertical deflection from the geoid model EGM08.
Vertical deflection: east-west (η) = 16.4 arcsec and north-south (ξ) = -5.2 arcsec

5 Results

5.1 Adjusted coordinates and confidence intervals

The results of the adjustment are the coordinates of all points and their confidence ellipsoids in the IGS14 at epoch of the observations (i.e. epoch 2021.73).
The table below provides the 3D coordinates.

Cartesian Coordinates IGS14 epoch 2020.73			
Point – *process nb*	X (m)	Y (m)	Z (m)
MALB - *110*	1803682.4572	6100015.3925	463193.5260
MALC - *210*	1803659.2436	6100021.1594	463205.3014
MALB mark - *130*	1803681.7854	6100013.1224	463193.3528
MALC mark - *230*	1803658.5585	6100018.8410	463205.1255
HULE - *300*	1803666.6126	6100018.8472	463199.3377
Tide gauge mark - 50	1803683.4158	6100011.7514	463200.4615

The table below provide confidence ellipsoid (3D) at 2.5σ. (That means the results have 90% of probability to be inside the ellipsoid)

3D confidence regions 2.5 σ (90 percent)			
Point – *process nb*	½ axis (mm)	Azimuth (gr)	Tilt (gr)
MALB - *110*	3	179.3553	0.1318
	2.5	79.3859	14.5404
	2.5	78.7884	85.4589
MALC - *210*	2.8	157.3681	199.3532
	2.5	57.2510	11.3992
	2.5	60.9376	88.5821
MALB mark - *130*	3.25	179.5583	0.0572
	2.8	79.5589	199.3902
	2.5	73.6047	99.3875
MALC mark - *230*	2.8	162.5349	199.9430
	2.8	62.5344	199.4224
	2.5	68.7945	99.4196

HULE - *300*	2.5	127.5684	6.0618
	2.5	163.8590	95.5618
	2.5	174.3294	192.2106
Tide gauge mark - 50	3.25	6.4747	199.7470
	2.8	106.4655	197.6880
	2.5	113.4118	97.6742

The whole covariance matrix was computed. Covariance submatrix for the main points of interest was extracted from it for the next ITRF solution computation. Finally, this covariance submatrix was converted into SINEX format. The resulting SINEX file (22901_IGN_2021-267_v10.SNX) is provided in appendix 6.3.2.

5.2 Vectors

The following table shows vectors in Cartesian coordinate system (IGS14 ep.2021.73):

	ΔX (m)	ΔY (m)	ΔZ (m)
MALB → MALC	-23.214	5.767	11.775
MALB → MALB mark	-0.672	-2.270	-0.173
MALC → MALC mark	-0.685	-2.318	-0.176
MALB → HULE	-15.845	3.455	5.812
MALC → HULE	7.369	-2.312	-5.964

The following table shows vectors from tide gauge mark in Cartesian coordinate system (IGS14 ep.2021.73) and height differences:

	ΔX (m)	ΔY (m)	ΔZ (m)	Height differences (m)
Tide gauge mark → MALC	-24.172	9.408	4.840	2.516
Tide gauge mark → MALB	-0.959	3.641	-6.936	2.704
Tide gauge mark → HULE	-16.803	7.096	-1.124	1.952

6 Annexes

6.1 GNSS process report

6.1.1 IGS alignment – points 1000 and 6 (Bernese 5.2 software)

Example of daily computation:

```
--------------------------------------------------------------------------------
IGN                     CALCUL GNSS EN LIGNE                    18-OCT-21 07:14
                             BERNESE 5.2
                           COMPTE-RENDU
--------------------------------------------------------------------------------

IDENTIFIANT DU CALCUL :
ORBITES            : igs21764.sp3.Z igl21764.sp3.Z igs21763.sp3.Z igl21763.sp3.Z
ROTATION TERRESTRE : igs21767.erp.Z
------------------------------
Systeme de reference du calcul d'apres les ephemerides : IGS14

I/  ELEMENTS EN ENTREE
------------------------------------------------------------
ENTREE NUMERO :  1 / 1
------------------
FICHIER RINEX : 10002650.21o
EN-TETE NOM STATION : 1000
EN-TETE NUMERO      : 99999S999
EN-TETE RECEPTEUR   : LEICA GX1230+ GNSS
EN-TETE ANTENNE     : LEIAX1203+GNSS  NONE
EN-TETE POSITION    :   1803701.0775   6100014.7616    463186.7285
EN-TETE ANT H/E/N   :         0.0000         0.0000         0.0000

ELEMENTS RETENUS
----------------
RECEPTEUR: LEICA GX1230+ GNSS   :: RECONNU IGS  : NON -> DEFAUT : SIMULA
*antenne : radome sans indication = 'NONE' (DEFAUT)
ANTENNE  :>LEIAX1203+GNSS  NONE<:: RECONNUE IGS : OUI

ANTENNE CENTRES DE PHASE N/E/H :
LEIAX1203+GNSS  NONE L01 0    -1.03     1.35    58.32
LEIAX1203+GNSS  NONE L02 0    -0.20    -2.38    55.54

ANTENNE ARP N/E/H   :      0.0000  0.0000  0.0000

NOMBRE D'EPOQUES    : 1865
DATE DEBUT          : 22/09/21 12:21:00.0000000
DATE FIN            : 23/09/21 03:53:00.0000000

MISE A JOUR RINEX   : D:\GPSDATA52\ONLINE\RAW\tmp_0.RNX -> 10002650.21o

*Eléments du contrôle qualité a priori :
*Observations reçues/attendues : 99% (18070/18287)
*Multitrajets 1 et 2 (mètres) : 0.27 0.29

STATION    :  1000
POSITION APPROCHEE (RINEX)  :    1803701.0775    6100014.7616     463186.7285
                              E 073 31 39.664748  N 04 11 33.516595  -88.2750
POSITION APPROCHEE (teqc)   :    1803675.0350     6100043.3097    463183.4525
                              E 073 31 40.737023  N 04 11 33.362643  -68.5759

II/ 1000 : STATIONS DE REFERENCE DANS UN RAYON DE 5000 km  (MAX : 10)
------------------------------------------------------------------------
 1 sgoc :  763387m
      Donnees manquantes
 2 iisc : 1071648m
      iisc2650.21d.gz iisc2660.21d.gz => IISC2650.21O
 3 dgar : 1271835m
```

```
     dgar2650.21d.gz dgar2660.21d.gz => DGAR2650.21O
 4 hyde : 1558237m
     hyde2650.21d.gz hyde2660.21d.gz => HYDE2650.21O
 5 seyg : 2217543m
     seyg2650.21d.gz seyg2660.21d.gz =>
 6 sey2 : 2222437m
     sey22650.21d.gz sey22660.21d.gz => SEY22650.21O
 7 pbri : 2256357m
     Donnees manquantes
 8 lck4 : 2616644m
     Donnees manquantes
 9 lck3 : 2616649m
     Donnees manquantes
10 squo : 2686103m
     Donnees manquantes
11 yibl : 2716073m
     Donnees manquantes
12 anmg : 3081726m
     Donnees manquantes
13 cusv : 3115804m
     cusv2650.21d.gz cusv2660.21d.gz => CUSV2650.21O
14 cuut : 3115807m
     Donnees manquantes
15 coco : 3119599m
     Donnees manquantes
16 cmum : 3164785m
     Donnees manquantes
17 vacs : 3191893m
     Donnees manquantes
18 ntus : 3327958m
     Donnees manquantes
19 lhaz : 3333910m
     Donnees manquantes
20 reun : 3384544m
     reun2650.21d.Z reun2660.21d.Z =>
21 bhr3 : 3408030m
     Donnees manquantes
22 bhr4 : 3408030m
     Donnees manquantes
23 djig : 3433519m
     djig2650.21d.gz djig2660.21d.gz =>
24 mayg : 3596960m
     mayg2650.21d.Z mayg2660.21d.Z => MAYG2650.21O
25 mal2 : 3736633m
     Donnees manquantes
26 abpo : 3801043m
     abpo2650.21d.gz abpo2660.21d.gz => ABPO2650.21O
27 kuwt : 3813368m
     Donnees manquantes
28 adis : 3820396m
     Donnees manquantes
29 bako : 3827082m
     bako2650.21d.gz bako2660.21d.gz => BAKO2650.21O
30 cibg : 3827091m
     Donnees manquantes
31 xmis : 3854064m
     Donnees manquantes
32 kitg : 3865285m
     kitg2650.21d.gz kitg2660.21d.gz =>
33 kit3 : 3865450m
     Donnees manquantes
34 voim : 4030691m
     Donnees manquantes
35 tash : 4062422m
     Donnees manquantes
36 tehn : 4093404m
     tehn2650.21d.gz tehn2660.21d.gz => TEHN2650.21O
37 tala : 4161610m
     Donnees manquantes
38 hamd : 4184379m
     Donnees manquantes
39 pol2 : 4185842m
     pol22650.21d.gz pol22660.21d.gz => POL22650.21O
DONNEES DISPONIBLES : 10 (/ 10)
```

```
III/ TRAITEMENT
-------------------------------------------------------------
LOGICIEL : Bernese GNSS Software Version 5.2

PHASE 1 : RESOLUTION DES AMBIGUITES
LIGNE DE BASE  Dist(km)  AMBIGUITES         RESOLUES
 1000 DGAR   1271.8      136              50 ( 36.8%)
 1000 IISC   1071.6      108              54 ( 50.0%)
 ABPO MAYG    721.3      120              60 ( 50.0%)
 BAKO CUSV   2330.0      140              50 ( 35.7%)
 CUSV HYDE   2377.3      80              54 ( 67.5%)
 DGAR SEY2   1885.0      118              54 ( 45.8%)
 HYDE IISC    497.6      110              64 ( 58.2%)
 HYDE POL2   2801.7      94              58 ( 61.7%)
 MAYG SEY2   1434.7      118              56 ( 47.5%)
 POL2 TEHN   2143.5      74              56 ( 75.7%)
AMBIGUITES L1 L2    : 1098   RESOLUES : 556 (50.6%)
PHASE 2 : TRAITEMENT FINAL (AMBIGUITES RESOLUES FIXEES)
FACTEUR DE VARIANCE :      2.41
SIGMA_0             :    0.0016 M
PRECISION INTERNE ESTIMEE (MILLIMETRES) :
1000 99999S999
          SX :   0.9  SY :   2.1  SZ :   0.7
          SN :   0.6  SE :   0.7  SH :   2.2

IV/ RESULTATS
-------------------------------------------------------------
==================================  ITRF2014  ==================================
POSITION ITRF2014   EPOQUE 2021.720 (20/09/21) :
1000 99999S999
     X:   1803699.9812  Y:    6100013.7601  Z:   463186.8012
POSITION ITRF2014  COORDONNEES GEOGRAPHIQUES :
1000 99999S999
LONGITUDE    73.527691563 °  LATITUDE    4.192644995 °  HELL    -89.5374
          E 073 31 39.689628          N 04 11 33.521981         -89.5374
================================================================================
QUALITE DE LA MISE EN REFERENCE IGS14 : RESIDUS N E HE (MILLIMETRES)
 ------------------------------------------------------
 |      NOM         |        N         E        HE   |   |
 ------------------------------------------------------
 |                  |                                |   |
 | ABPO 33302M001   |       0.21    -10.09    -15.94 |   |
 | BAKO 23101M002   |       1.73      0.97      6.14 |   |
 | CUSV 21904S001   |      -3.42      9.00     -4.18 |   |
 | DGAR 30802M001   |      -1.75     -1.55    -13.73 |   |
 | HYDE 22307M001   |      -0.18      0.03      0.83 |   |
 | IISC 22306M002   |      -1.69      2.05     12.57 |   |
 | MAYG 90101M001   |       1.36     13.49     -4.28 |   |
 | POL2 12348M001   |       1.19     -6.23     -6.52 |   |
 | SEY2 39801M006   |       4.53     -7.84     28.43 |   |
 | TEHN 20404M002   |      -2.88     -1.73     -3.35 |   |
 |                  |                                |   |
 ------------------------------------------------------
 |       EMQ        |       2.42      7.27     13.07 |   |
 ------------------------------------------------------


EXACTITUDE ESTIMEE (2*SIGMA) :
-----------------------------
1000            E_N :   7.6 mm     E_E :  15.5 mm     E_H :  28.5 mm
--------------------------------------------------------------------------------
IGN                     CALCUL GNSS EN LIGNE                    18-OCT-21 07:18
                        FIN DU COMPTE-RENDU
```

Statistics on adjusment :

INDIVIDUAL SOLUTIONS STATISTICS

	Domes	#	Rms N	Min N	Max N	Rms E	Min E	Max E	Rms U	Min U	Max U
1000	-	5	1.4	-1.3	2.2	2.6	-1.9	3.4	10.3	-9.5	13.1
6	-	1	1.1	-1.1	-1.1	2.9	-2.9	-2.9	7.6	-7.6	-7.6
ABPO	33302M001	6	4.8	-6.8	7.1	1.8	-2.9	2.6	4.7	-6.4	6
BAKO	23101M002	6	3.2	-3	5.4	8.3	-14.1	9.4	26.2	-28.9	42
CHUM	25601M001	2	5	-4.4	2.3	3.9	-1.9	3.5	6.7	-2.4	6.2
CUSV	21904S001	6	1.1	-1.6	1	3.3	-5.2	3.7	13.5	-26.3	9.3
DGAR	30802M001	6	2	-1.2	3.2	3.6	-5	6.2	12.4	-13.9	17.8
HYDE	22307M001	6	1.5	-1	2.9	2.5	-4.6	3.3	7.1	-8.1	9.2
IISC	22306M002	6	1.2	-1.1	1.6	2.5	-4.1	3.5	6.3	-6.4	10.6
MAYG	90101M001	6	4.1	-6.5	5.5	2	-1.7	3.3	2.1	-3.3	1.3
POL2	12348M001	4	2.2	-1.3	2.8	4.8	-5.1	6.1	3	-3.9	2.8
SEY2	39801M006	6	2.7	-4.4	3.2	3.5	-4.2	4.5	6.7	-10.1	7.2
TEHN	20404M002	6	5.3	-6.6	6.6	3.7	-3.8	4.2	10.6	-13.3	14.5

Helmert IGS Alignment

```
================================================================================
Bernese GNSS Software, Version 5.2
--------------------------------------------------------------------------------
Program        : HELMR1
Purpose        : Helmert Transformation
--------------------------------------------------------------------------------
Campaign       : ${P}\ONLINE
Default session: 2660 year 2021
Date           : 18-Oct-2021 16:23:04
User name      : bernese
================================================================================
XXXX2660 helmert final
--------------------------------------------------------------------------------
FILE 1: IGS21764.CRD: IGS14 from IGS21P39.ssc
FILE 2: ADD_FREE.CRD:
TRANSFORMATION IN EQUATORIAL SYSTEM (X, Y, Z):
RESIDUALS IN LOCAL SYSTEM (NORTH, EAST, UP)
------------------------------------------------------------------------
| NUM |      NAME        | FLG |     RESIDUALS IN MILLIMETERS   |   |
------------------------------------------------------------------------
|     |                  |     |                                |   |
|   1 | ABPO 33302M001   | I A |       3.29    -19.82    -14.41 | * |
|   9 | BAKO 23101M002   | I A |      -6.87      7.80    -58.19 | * |
|  20 | CHUM 25601M001   | I A |       2.56     -7.32      0.34 |   |
|  26 | CUSV 21904S001   | I A |      -5.03      9.47     -2.30 |   |
|  28 | DGAR 30802M001   | I A |      -0.94     -6.42     -4.44 |   |
|  47 | HYDE 22307M001   | I A |      -0.98      0.28      3.52 |   |
|  47 | IISC 22306M002   | I A |      -2.72      1.26     13.34 |   |
|  65 | MAYG 90101M001   | I A |       5.23      4.44     -5.06 |   |
|  90 | POL2 12348M001   | I A |      -0.69     -2.75     -1.55 |   |
| 103 | SEY2 39801M006   | I A |       5.26    -13.99     19.87 | * |
| 112 | TEHN 20404M002   | I A |       1.01     -1.57     -3.87 |   |
|     |                  |     |                                |   |
------------------------------------------------------------------------
|     | RMS / COMPONENT  |     |       3.16      5.55      6.08 |   |
|     | MEAN             |     |      -0.20     -0.33      0.00 |   |
|     | MIN              |     |      -5.03     -7.32     -5.06 |   |
|     | MAX              |     |       5.23      9.47     13.34 |   |
------------------------------------------------------------------------
NUMBER OF PARAMETERS  :     7
NUMBER OF COORDINATES :    24
RMS OF TRANSFORMATION :    5.66 MM
PARAMETERS:
```

```
TRANSLATION IN  X     :         -50.03     +-  7.03    MM
TRANSLATION IN  Y     :         -23.35     +-  5.28    MM
TRANSLATION IN  Z     :           5.13     +-  5.74    MM
ROTATION AROUND X-AXIS:  -  0  0  0.000536 +-  0.000193 "
ROTATION AROUND Y-AXIS:  -  0  0  0.000364 +-  0.000165 "
ROTATION AROUND Z-AXIS:     0  0  0.000868 +-  0.000248 "
SCALE FACTOR          :           0.00094  +-  0.00075 MM/KM
NUMBER OF ITERATIONS  :     3
```

6.1.2 HULE process (Infinity Leica Software)

Baseline 6 - HULE

Filtres	**Sélectionné**	**Utilisé**
Angle de coupure:	0*	0*
Fréquence:	L1/E1/B1	L1
Fréquence d'échantillonnage:	Utiliser tout	30,00 s
Système satellitaire:	GPS/GLONASS/Galileo/Beidou	GPS
Type d'éphéméride:	Précises	Précises
Jeu de calibration d'antennes:	NGS Absolu	NGS Absolu

Stratégie de Traitement		
Type de solution:	Fixé sur la phase	Fixé sur la phase
Optimisation de solution:	Automatique	Aucun
Fréquence à utiliser pour iono réduit:	Automatique	Automatique
Modèle troposphérique:	VMF avec modèle GPT2	VMF avec modèle GPT2
Modèle ionosphérique:	Automatique	Calculé
Autoriser la solution Widelane:	Automatique	Non

Baseline results: 6 - HULE

Acquisition

Heure de début - 27/09/2021 08:00:12 -
Heure de fin: 28/09/2021 01:59:12

Durée: 17:59:00

Antennas

	Définir comme référence - 6	**Définir comme mobile - HULE**			
Nom de récepteur / NS:	LEICA GX1230+ GNSS / 481521	NetR9 / 5433R49280			
Nom d'Antenne / NS:	LEIAX1203+GNSS / -	TRM59900.00 SCIS / -			
Décalage de porteuse:	0,000 m	-			
Lecture altimétrique:	-0,050 m	0,000 m			
Hauteur d'antenne:	-0,050 m	0,000 m			

Phase centre offset

	Définir comme référence - LEIAX1203+GNSS		**Définir comme mobile - TRM59900.00 SCIS**	
GPS	**L1**	**L2**	**L1**	**L2**
Est	0,001 m	-0,002 m	0,000 m	0,000 m
Nord	-0,001 m	0,000 m	0,001 m	0,000 m
Haut	0,058 m	0,056 m	0,111 m	0,125 m
GLONASS	**L1**	**L2**	**L1**	**L2**
Est	0,001 m	-0,002 m	0,000 m	0,000 m
Nord	-0,001 m	0,000 m	0,001 m	0,000 m
Haut	0,058 m	0,056 m	0,111 m	0,125 m

Coordinates

	6	**HULE**		**6**	**HULE**
Classe du point:	Contrôle	PT Fixé			
Latitude WGS84:	4* 11' 34,14501" N	4* 11' 33,93975" N	Est:	336 636,981 m	336 619,998 m
Longitude WGS84:	73* 31' 41,32448" E	73* 31' 40,77412" E	Nord:	463 594,110 m	463 587,837 m
Hauteur ellipsoïdale WGS84:	-92,479 m	-93,208 m	Altitude ortho:	4,506 m	3,776 m
X WGS84 Cartésien:	1 803 650,404 m	1 803 666,605 m			
Y WGS84 Cartésien:	6 100 023,901 m	6 100 018,833 m			
Z WGS84 Cartésien:	463 205,672 m	463 199,331 m			

Vector and baseline quality- WGS84

ΔLatitude:	-0* 00' 00,20526"	ET ΔLatitude:	0,000 m		

ΔLongitude:	-0* 00' 00,55036"	ET ΔLongitude:	0,000 m		
ΔAltitude:	-0,729 m	ET ΔAltitude:	0,000 m		
ΔX:	16,201 m	ET ΔX:	0,000 m		
ΔY:	-5,068 m	ET ΔY:	0,000 m		
ΔZ:	-6,341 m	ET ΔZ:	0,000 m		
Dist. pente:	18,121 m	ET Dist. pente:	0,000 m		

M0:	0,223 m	CQ 1D:	0,000 m		
Q11:	0,00000007	CQ 2D:	0,000 m		
Q12:	0,00000006	CQ 3D:	0,000 m		
Q22:	0,00000024				
Q13:	0,00000000				
Q23:	0,00000002				
Q33:	0,00000004				

Fréquence:	L1	GDOP:	1,3 - 5,1	SV GPS:	12/13
Optimisation de solution:	Aucun	PDOP:	1,2 - 4,4	SV GLONASS:	-
Type de solution:	Fixé sur la phase	HDOP:	0,6 - 1,3	SV Beidou:	-
		VDOP:	1,0 - 4,1	SV Galileo:	-
				SV QZSS:	-
Type d'éphéméride:					
GPS	Précises				

Baseline 1000 - HULE

Filtres	Sélectionné	Utilisé
Angle de coupure:	0*	0*
Fréquence:	L1/E1/B1	L1
Fréquence d'échantillonnage:	Utiliser tout	30,00 s
Système satellitaire:	GPS/GLONASS/Galileo/Beidou	GPS
Type d'éphéméride:	Précises	Précises
Jeu de calibration d'antennes:	NGS Absolu	NGS Absolu

Stratégie de Traitement		
Type de solution:	Fixé sur la phase	Fixé sur la phase
Optimisation de solution:	Automatique	Aucun
Fréquence à utiliser pour iono réduit:	Automatique	Automatique
Modèle troposphérique:	VMF avec modèle GPT2	VMF avec modèle GPT2
Modèle ionosphérique:	Automatique	Calculé
Autoriser la solution Widelane:	Automatique	Non

Baseline results: 1000 - HULE

Acquisition

Heure de début - 23/09/2021 06:30:12 -
Heure de fin: 24/09/2021 06:02:12

Durée: 23:32:00

Antennas

	Définir comme référence - 1000	Définir comme mobile - HULE
Nom de récepteur / NS:	LEICA GX1230+ GNSS / 481521	NetR9 / 5433R49280
Nom d'Antenne / NS:	LEIAX1203+GNSS / -	TRM59900.00 SCIS / -

Phase centre offset

	Définir comme référence - LEIAX1203+GNSS		Définir comme mobile - TRM59900.00 SCIS	
GPS	L1	L2	L1	L2

Est	0,001 m	-0,002 m	0,000 m	0,000 m
Nord	-0,001 m	0,000 m	0,001 m	0,000 m
Haut	0,058 m	0,056 m	0,111 m	0,125 m
GLONASS	L1	L2	L1	L2
Est	0,001 m	-0,002 m	0,000 m	0,000 m
Nord	-0,001 m	0,000 m	0,001 m	0,000 m
Haut	0,058 m	0,056 m	0,111 m	0,125 m

Coordinates

	1000	HULE		1000	HULE
Classe du point:	Contrôle	PT Fixé			
Latitude WGS84:	4* 11' 33,52198" N	4* 11' 33,93998" N	Est:	336 586,534 m	336 619,993 m
Longitude WGS84:	73* 31' 39,68976" E	73* 31' 40,77398" E	Nord:	463 575,069 m	463 587,844 m
Hauteur ellipsoïdale WGS84:	-89,546 m	-93,188 m	Altitude ortho:	7,436 m	3,796 m
X WGS84 Cartésien:	1 803 699,975 m	1 803 666,614 m			
Y WGS84 Cartésien:	6 100 013,753 m	6 100 018,850 m			
Z WGS84 Cartésien:	463 186,801 m	463 199,339 m			

Vector and baseline quality- WGS84

ΔLatitude:	0* 00' 00,41799"	ET ΔLatitude:	0,000 m		
ΔLongitude:	0* 00' 01,08421"	ET ΔLongitude:	0,000 m		
ΔAltitude:	-3,643 m	ET ΔAltitude:	0,000 m		
ΔX:	-33,361 m	ET ΔX:	0,000 m		
ΔY:	5,097 m	ET ΔY:	0,000 m		
ΔZ:	12,539 m	ET ΔZ:	0,000 m		
Dist. pente:	36,002 m	ET Dist. pente:	0,000 m		

M0:	0,219 m	CQ 1D:	0,000 m
Q11:	0,00000005	CQ 2D:	0,000 m
Q12:	0,00000005	CQ 3D:	0,000 m
Q22:	0,00000019		
Q13:	0,00000000		

Q23:	0,00000001		
Q33:	0,00000003		

Fréquence:	L1	GDOP:	1,4 - 5,1	SV GPS:	12/13
Optimisation de solution:	Aucun	PDOP:	1,3 - 4,3	SV GLONASS:	-
Type de solution:	Fixé sur la phase	HDOP:	0,6 - 1,4	SV Beidou:	-
		VDOP:	1,1 - 4,1	SV Galileo:	-
				SV QZSS:	-
Type d'éphéméride:					
GPS	Précises				

6.1.3 GNSS process results

Bernese results

IGS14 epoch 2021.73

	UTM 43N		Ellipsoid height (m)	Cartesian geocentric		
	E (m)	N (m)		X (m)	Y (m)	Z (m)
6	336 636.981	463 594.110	-92.479	1 803 650.404	6 100 023.901	463 205.672
1000	336 586.534	463 575.069	-89.546	1 803 699.975	6 100 013.754	463 186.801

Infinity results

IGS14 epoch 2021.73

	UTM 43N		Ellipsoid height (m)	Cartesian geocentric		
	E (m)	N (m)		X (m)	Y (m)	Z (m)
HULE	336 619.994	463 587.843	-93.192	1 803 666.612	6 100 018.847	463 199.338

6.2 Adjustment input files

6.2.1 Approximate coordinates file

```
**coordinates UTM43N ITRF2014 ep 2021.73

*Temporary stations on tripod
0 1   336602.4   463585.9  -93  0  0  0  16.4 -5.2
0 11  336602.4   463585.9  -93  0  0  0  16.4 -5.2
0 2   336611.9   463577.9  -93  0  0  0  16.4 -5.2
0 21  336611.9   463577.9  -93  0  0  0  16.4 -5.2
0 3   336623.3   463577.2  -93  0  0  0  16.4 -5.2
0 31  336623.3   463577.2  -93  0  0  0  16.4 -5.2
0 4   336616.96  463595.57  -93  0  0  0 16.4 -5.2
*Temporary stations on pier
0 5   336634.98  463588.41  -91  0  0  0 16.4 -5.2
0 6   336634.89  463594.74  -92.479  0  0  0.1 16.4 -5.2
*Temporary orientation point
8 1000 336585.93  463575.49   -89.5  0  0  0 16.4 -5.2

**Station DORIS MALB  100= Bottom of antenna; 110=ARP; 120= 2GHz phase centre
0  100     336602.8415 463581.2335 -92.8218 0 0 0 16.4 -5.2
0 110  336602.841  463581.233  -92.4296  0.002  0.002  0.003 16.4 -5.2
0 120 336602.085  463580.667  -91.9 0 0 0 16.4 -5.2
*prism with mini-pole on the antenna mount (plate), levelling use
0  141     336602.9061 463581.2697 -92.6217 0 0 0 16.4 -5.2
0  142     336602.8325 463581.1570 -92.6218 0 0 0 16.4 -5.2
0  143     336602.8753 463581.1631 -92.6218 0 0 0 16.4 -5.2
0  144     336602.8311 463581.1588 -92.6218 0 0 0 16.4 -5.2
0  145     336602.7848 463581.2951 -92.6218 0 0 0 16.4 -5.2
0  146     336602.7705 463581.2802 -92.6218 0 0 0 16.4 -5.2
*MALB witness mark 130=mark, 131=prism with mini-pole on mark
0  131     336602.8417 463581.2332 -94.6033 0 0 0 16.4 -5.2
0  130     336602.8417 463581.2332 -94.8033 0 0 0 16.4 -5.2

**GNSS station HULE 300=ARP; 310=bottom of the radom
1 300 336619.994  463587.843   -93.192  0.001  0.001  0.001 16.4 -5.2
0  310     336619.0251 463587.0842 -93.1463 0 0 0 16.4 -5.2

**Station DORIS MALC  200= Bottom of antenna; 210=ARP; 220= 2GHz phase centre
0 200 336626.7579 463593.0086 -93.0058 0 0 0 16.4 -5.2
0 210 336625.13  463594.76   -91  0  0  0 16.4 -5.2
0 220 336625.13  463594.76   -90.6  0  0  0 16.4 -5.2
*prism with mini-pole on the antenna mount (plate), levelling use
0  231     336626.7576 463593.0096 -94.8401 0 0 0 16.4 -5.2
0  241     336626.7380 463593.0985 -92.8058 0 0 0 16.4 -5.2
0  242     336626.7138 463593.0615 -92.8058 0 0 0 16.4 -5.2
0  243     336626.8238 463593.0110 -92.8058 0 0 0 16.4 -5.2
0  244     336626.7480 463593.1195 -92.8058 0 0 0 16.4 -5.2
0  245     336626.6968 463592.9573 -92.8058 0 0 0 16.4 -5.2
0  246     336626.7481 463593.0877 -92.8058 0 0 0 16.4 -5.2
*total station on Doris antenna mount
0  250     336626.7585 463593.0086 -92.7519 0 0 0 16.4 -5.2
*MALC witness mark 230=mark, 231=prism with mini-pole on mark
0  230     336626.7576 463593.0096 -95.0401 0 0 0 16.4 -5.2
0  231     336626.7576 463593.0096 -94.8401 0 0 0 16.4 -5.2

** Tide gauge benchmark 50=benchmark; 51=prism with mini-pole on mark
0  51     336600.9031 463588.3885 -94.8340  0 0 0 16.4 -5.2
0  50     336600.9031 463588.3885 -95.0340  0 0 0 16.4 -5.2
```

6.2.2 Observations file

```
**Azimuths:

**estimatied accuracy 2mm at 36m
8 300  1000 276.6601 0.0035 0.0 0.0 0.0
**estimatied accuracy 4mm at 54m
8   6  1000 276.9035 0.0047 0 0 0

**Centrering:

9 110 100 0 0.001 0 0 0
9 110 120 0 0.001 0 0 0
9 110 130 0 0.002 0 0 0
4 110 100 -0.390 0.002 0 0 0
4 100 120 0.877  0.002 0 0 0
4 100 130 -1.9805  0.001 0 0 0

9 131 130 0 0.0004 0 0 0
4 131 130 -0.2  0.0001 0 0 0

4 100 141 0.2 0.0001 0 0 0
4 100 142 0.2 0.0001 0 0 0
4 100 143 0.2 0.0001 0 0 0
4 100 144 0.2 0.0001 0 0 0
4 100 145 0.2 0.0001 0 0 0
4 100 146 0.2 0.0001 0 0 0


9 210 200 0 0.001 0 0 0
9 210 220 0 0.001 0 0 0
9 210 230 0 0.002 0 0 0
9 210 250 0 0.001 0 0 0
4 210 200 -0.390 0.002 0 0 0
4 200 220 0.877  0.002 0 0 0
4 200 230 -2.0350  0.001 0 0 0
4 200 250 0.254 0.001 0 0 0

9 231 230 0 0.0004 0 0 0
4 231 230 -0.2  0.0001 0 0 0

4 200 241 0.2 0.0001 0 0 0
4 200 242 0.2 0.0001 0 0 0
4 200 243 0.2 0.0001 0 0 0
4 200 244 0.2 0.0001 0 0 0
4 200 245 0.2 0.0001 0 0 0
4 200 246 0.2 0.0001 0 0 0

9 300 310 0 0.0004 0 0 0
4 300 310 0.033 0.001 0 0 0

9 51 50 0 0.00045 0 0 0
4 51 50 -0.2  0.0002 0 0 0


*Données reduites
* D:\DORIS\Male\topo\brutes\22.09.obs
* fichier créé le 22/09/2021 à 09:37:49

*Tours d'horizon
* Station n°1 1
* Temperature : 31.0 °C - Pression : 756.8 mmHg - Correction meteo : 18.7 ppm
* Date/heure debut :
* Date/heure fin   :
* Numero de cycle : 0
```

```
       7      1      5        0            0.00045     0.0002 0      0
       5      1      2       47.1699          0.00045   0.0002 0      0
       5      1      3       30.203           0.00045   0.0002 0      0
       5      1      131    104.1989      0.00045       0.0002 0      0
       5      1      141    103.3275      0.00045       0.0002 0      0
       5      1      51     258.1008      0.00045       0.0002 0      0
*      5      1      101    103.828           0.00045   0.0002 0      0
*      5      1      102    104.5677      0.00045       0.0002 0      0
       5      1      100    104.19785     0.00045       0.0002 0      0
*      5      1      111    103.8334      0.00045       0.0002 0      0
*      5      1      112    104.5745      0.00045       0.0002 0      0
       5      1      110    104.20395     0.00045       0.0002 0      0
*      5      1      311    396.9503      0.00045       0.0002 0      0
*      5      1      312    398.5773      0.00045       0.0002 0      0
       5      1      310    397.7638      0.00045       0.0002 0      0
*      5      1      127    104.3614      0.00045       0.0002 0      0
       5      1      4      367.509           0.00045   0.0002 0      0
       5      1      6      388.3055      0.00045       0.0002 0      0

       6      1      5       98.0003      0.0005 0.0002 0      -0.05
       6      1      2      100.3517      0.0005 0.0002 0      0
       6      1      3      100.3162      0.0005 0.0002 0      0
       6      1      131    111.6927      0.0005 0.0002 0      0
       6      1      141     85.0262      0.0005 0.0002 0      0
       6      1      51     122.6541      0.0005 0.0002 0      0
*      6      1      101     87.1463      0.0005 0.0002 0      0
*      6      1      102     87.1537      0.0005 0.0002 0      0
*      6      1      111     82.6889      0.0005 0.0002 0      0
*      6      1      112     82.6936      0.0005 0.0002 0      0
       6      1      110     82.69125   0.0005  0.0002 0      0
*      6      1      311     97.677           0.0005    0.0002 0      0
*      6      1      312     97.6856      0.0005 0.0002 0      0
       6      1      310     97.6813      0.0005 0.001  0      0
*      6      1      127     76.8178      0.0005 0.0002 0      0
       6      1      4      101.224           0.0005    0.0002 0      0
       6      1      6       97.5891      0.0005 0.0002 0      0


3 1                2                  10.4952     0.0004 0.0000   0.0000   0.0000
3 1                3                  24.0034     0.0004 0.0000   0.0000   0.0000
3 1                131                 4.7601     0.0004 0.0000   0.0000   0.0000
3 1                141                 4.7736     0.0004 0.0000   0.0000   0.0000
3 1                51                  3.4441     0.0004 0.0000   0.0000   0.0000
3 1                4                  18.3273     0.0004 0.0000   0.0000   0.0000
3 1                6                  33.8906     0.0004 0.0000   0.0000   0.0000

* Station n°2 2
* Temperature : 31.2 °C - Pression : 757.1 mmHg - Correction meteo : 18.8 ppm
* Date/heure debut :
* Date/heure fin   :
* Numero de cycle : 0

7 2                6                    0.0000     0.00045  0.0002   0.0000   0.0000
5 2                4                  360.7291     0.00045  0.0002   0.0000   0.0000
5 2                5                   12.7339     0.00045  0.0002   0.0000   0.0000
*5 2                101                248.7995     0.00045  0.0002   0.0000   0.0000
*5 2                102                249.2777     0.00045  0.0002   0.0000   0.0000
5 2                100                249.0386     0.00045  0.0002   0.0000   0.0000
*5 2                111                248.8264     0.00045  0.0002   0.0000   0.0000
*5 2                112                249.2396     0.00045  0.0002   0.0000   0.0000
5 2                110                249.0330     0.00045  0.0002   0.0000   0.0000
*5 2                121                248.9419     0.00045  0.0002   0.0000   0.0000
*5 2                122                249.1106     0.00045  0.0002   0.0000   0.0000
5 2                120                249.02625    0.00045  0.0002   0.0000   0.0000
5 2                131                249.0329     0.00045  0.0002   0.0000   0.0000
```

```
5 2                142                248.4596     0.00045  0.0002   0.0000   0.0000
5 2                1                  277.6604     0.00045  0.0002   0.0000   0.0000
5 2                3                   48.1812     0.00045  0.0002   0.0000   0.0000

6 2                6                   97.0352     0.0005  0.0002   0.0000   0.0000
6 2                4                  101.0377     0.0005  0.0002   0.0000   0.0000
6 2                5                   97.3321     0.0005  0.0002   0.0000   -0.0500
*6 2                101                 92.5622     0.0005  0.0002   0.0000   0.0000
*6 2                102                 92.5615     0.0005  0.0002   0.0000   0.0000
*6 2                111                 89.7711     0.0005  0.0002   0.0000   0.0000
*6 2                112                 89.7702     0.0005  0.0002   0.0000   0.0000
6 2                110                 89.7706     0.0005  0.0002   0.0000   0.0000
*6 2                121                 86.2707     0.0005  0.0002   0.0000   0.0000
*6 2                122                 86.2702     0.0005  0.0002   0.0000   0.0000
6 2                131                106.1215     0.0005  0.0002   0.0000   0.0000
6 2                142                 91.1824     0.0005  0.0002   0.0000   0.0000
6 2                1                   99.6428     0.0005  0.0002   0.0000   0.0000
6 2                3                  100.2745     0.0005  0.0002   0.0000   0.0000

3 2                6                   28.8243     0.0004 0.0000   0.0000   0.0000
3 2                4                   18.0333     0.0004 0.0000   0.0000   0.0000
3 2                131                  8.4452     0.0004 0.0000   0.0000   0.0000
3 2                142                  8.4777     0.0004 0.0000   0.0000   0.0000
3 2                1                   10.4962     0.0004 0.0000   0.0000   0.0000
3 2                3                   14.1503     0.0004 0.0000   0.0000   0.0000

* Station n°3 2.1
* Temperature : 31.8 °C - Pression : 757.1 mmHg - Correction meteo : 19.3 ppm
* Date/heure debut :
* Date/heure fin   :
* Numero de cycle : 0

7 2                6                    0.0000     0.00045  0.0002   0.0000   0.0000
5 2                3                   48.1818     0.00045  0.0002   0.0000   0.0000
5 2                5                   12.7315     0.00045  0.0002   0.0000   0.0000
*5 2                301                382.8812     0.00045  0.0002   0.0000   0.0000
*5 2                302                383.6114     0.00045  0.0002   0.0000   0.0000
5 2                300                383.2463     0.00045  0.0002   0.0000   0.0000

6 2                6                   97.0347     0.0005  0.0002   0.0000   0.0000
6 2                3                  100.2758     0.0005  0.0002   0.0000   0.0000
6 2                5                   97.3322     0.0005  0.0002   0.0000   -0.0500
*6 2                301                 96.5590     0.0005  0.0002   0.0000   0.0000
*6 2                302                 96.5603     0.0005  0.0002   0.0000   0.0000
6 2                300                 96.55965     0.0005 0.0008   0.0000   0.0000

3 2                6                   28.8243     0.0004 0.0000   0.0000   0.0000
3 2                3                   14.1503     0.0004 0.0000   0.0000   0.0000

* Station n°4 4
* Temperature : 33.1 °C - Pression : 757.1 mmHg - Correction meteo : 20.5 ppm
* Date/heure debut :
* Date/heure fin   :
* Numero de cycle : 0

*7 4                1001                0.0000     0.00045  0.0002   0.0000   0.0000
*5 4                1002                0.2779     0.00045  0.0002   0.0000   0.0000
7 4                1000                0.13895     0.00045  0.0002   0.0000   0.0000
5 4                3                  317.2312     0.00045  0.0002   0.0000   0.0000
5 4                5                  265.6449     0.00045  0.0002   0.0000   0.0000
5 4                6                  244.0607     0.00045  0.0002   0.0000   0.0000
5 4                2                  364.2107     0.00045  0.0002   0.0000   0.0000
5 4                1                    1.4844     0.00045  0.0002   0.0000   0.0000
*5 4                301                332.7481     0.00045  0.0002   0.0000   0.0000
*5 4                302                333.7356     0.00045  0.0002   0.0000   0.0000
5 4                300                333.24185     0.00045  0.0002   0.0000   0.0000
```

```
*5 4                 101                 389.5638     0.00045  0.0002   0.0000   0.0000
*5 4                 102                 389.7526     0.00045  0.0002   0.0000   0.0000
5 4                 100                389.6582     0.00045  0.0002   0.0000   0.0000
*5 4                 111                 389.5759     0.00045  0.0002   0.0000   0.0000
*5 4                 112                 389.7400     0.00045  0.0002   0.0000   0.0000
5 4                 110                389.65795     0.00045  0.0002   0.0000   0.0000
*5 4                 121                 389.6228     0.00045  0.0002   0.0000   0.0000
*5 4                 122                 389.6903     0.00045  0.0002   0.0000   0.0000
5 4                 120                389.65655     0.00045  0.0002   0.0000   0.0000
5 4                 143                389.4327     0.00045  0.0002   0.0000   0.0000

*6 4                 1001                 92.6315     0.0005  0.0002   0.0000   0.0000
*6 4                 1002                 92.6338     0.0005  0.0002   0.0000   0.0000
6 4                 3                    99.2794     0.0005  0.0002   0.0000   0.0000
6 4                 5                    95.1808     0.0005  0.0002   0.0000   0.0000
6 4                 6                    94.2493     -0.0005  0.0002   0.0000   -0.0500
6 4                 2                    98.9591     0.0005  0.0002   0.0000   0.0000
6 4                 1                    98.7724     0.0005  0.0002   0.0000   0.0000
*6 4                 301                  93.1410     0.0005  0.0002   0.0000   0.0000
*6 4                 302                  93.1439     0.0005  0.0002   0.0000   0.0000
6 4                 300                  93.1425     0.0005 0.0008   0.0000   0.0000
*6 4                 101                  96.1385     0.0005  0.0002   0.0000   0.0000
*6 4                 102                  96.1382     0.0005  0.0002   0.0000   0.0000
*6 4                 111                  95.0426     0.0005  0.0002   0.0000   0.0000
*6 4                 112                  95.0432     0.0005  0.0002   0.0000   0.0000
6 4                 110                  95.0429     0.0005  0.0002   0.0000   0.0000
*6 4                 121                  93.6120     0.0005  0.0002   0.0000   0.0000
*6 4                 122                  93.6118     0.0005  0.0002   0.0000   0.0000
6 4                 143                  95.6204     0.0005  0.0002   0.0000   0.0000

3 4                 3                    20.6274     0.0004 0.0000   0.0000   0.0000
3 4                 5                    18.8114     0.0004 0.0000   0.0000   0.0000
3 4                 2                    18.0334     0.0004 0.0000   0.0000   0.0000
3 4                 1                    18.3274     0.0004 0.0000   0.0000   0.0000
3 4                 143                  21.3124     0.0004 0.0000   0.0000   0.0000

* Station n°5 3
* Temperature : 31.1 °C - Pression : 757.1 mmHg - Correction meteo : 18.7 ppm
* Date/heure debut :
* Date/heure fin   :
* Numero de cycle : 0

*7 3                 1001                  0.0000     0.00045  0.0002   0.0000   0.0000
*5 3                 1002                  0.2786     0.00045  0.0002   0.0000   0.0000
7 3                 1000                  0.1393     0.00045  0.0002   0.0000   0.0000
*5 3                 311                  71.7869     0.00045  0.0002   0.0000   0.0000
*5 3                 312                  73.8537     0.00045  0.0002   0.0000   0.0000
5 3                 310                  72.8203     0.00045  0.0002   0.0000   0.0000
5 3                 4                    83.3504     0.00045  0.0002   0.0000   0.0000
5 3                 5                   150.5423     0.00045  0.0002   0.0000   0.0000
5 3                 6                   138.8216     0.00045  0.0002   0.0000   0.0000
*5 3                 101                  18.0103     0.00045  0.0002   0.0000   0.0000
*5 3                 102                  18.1892     0.00045  0.0002   0.0000   0.0000
5 3                 100                 18.09975     0.00045  0.0002   0.0000   0.0000
*5 3                 111                  18.0209     0.00045  0.0002   0.0000   0.0000
*5 3                 112                  18.1752     0.00045  0.0002   0.0000   0.0000
5 3                 110                 18.09805     0.00045  0.0002   0.0000   0.0000
*5 3                 121                  18.0633     0.00045  0.0002   0.0000   0.0000
*5 3                 122                  18.1273     0.00045  0.0002   0.0000   0.0000
5 3                 120                 18.0953     0.00045  0.0002   0.0000   0.0000
5 3                 131                 18.0968     -0.00045  0.0002   0.0000   0.0000
5 3                 144                 17.8886     0.00045  0.0002   0.0000   0.0000
5 3                 51                  33.5376     -0.00045  0.0002   0.0000   0.0000

*6 3                 1001                 92.9961     0.0005  0.0002   0.0000   0.0000
*6 3                 1002                 92.9963     0.0005  0.0002   0.0000   0.0000
```

```
*6 3                311                 96.4594     0.0005  0.0002   0.0000   0.0000
*6 3                312                 96.4507     0.0005  0.0002   0.0000   0.0000
6 3                310                 96.45505     0.0005 0.0008   0.0000   0.0000
6 3                4                  100.7186     0.0005  0.0002   0.0000   0.0000
6 3                5                   95.1586     0.0005  0.0002   0.0000   0.0000
6 3                6                   95.8718     -0.0005  0.0002   0.0000   -0.0500
*6 3                101                 97.0518     0.0005  0.0002   0.0000   0.0000
*6 3                102                 97.0516     0.0005  0.0002   0.0000   0.0000
*6 3                111                 95.9867     0.0005  0.0002   0.0000   0.0000
*6 3                112                 95.9852     0.0005  0.0002   0.0000   0.0000
6 3                110                 95.98605     0.0005  0.0002   0.0000   0.0000
*6 3                121                 94.6419     0.0005  0.0002   0.0000   0.0000
*6 3                122                 94.6421     0.0005  0.0002   0.0000   0.0000
6 3                131                 102.1149     0.0005  0.0002   0.0000   0.0000
6 3                144                 96.5252     0.0005  0.0002   0.0000   0.0000
6 3                51                  102.5496     0.0005  0.0002   0.0000   0.0000

3 3                4                   20.6264     0.0004 0.0000   0.0000   0.0000
3 3                5                   15.6633     0.0004 0.0000   0.0000   0.0000
3 3                131                 22.5684     0.0004 0.0000   0.0000   0.0000
3 3                144                 22.5824     0.0004 0.0000   0.0000   0.0000
3 3                51                  26.9835     0.0004 0.0000   0.0000   0.0000

* Station n°6 5
* Temperature : 31.4 °C - Pression : 756.8 mmHg - Correction meteo : 19.1 ppm
* Date/heure debut :
* Date/heure fin   :
* Numero de cycle : 0

*7 5                1001                 0.0000     0.00045  0.0002   0.0000   0.0000
*5 5                1002                 0.2123     0.00045  0.0002   0.0000   0.0000
7 5                1000                 0.10615     0.00045  0.0002   0.0000   0.0000
5 5                3                  364.1821     0.00045  0.0002   0.0000   0.0000
5 5                4                   45.4013     0.00045  0.0002   0.0000   0.0000
5 5                2                  395.9702     0.00045  0.0002   0.0000   0.0000
5 5                1                   13.7314     0.00045  0.0002   0.0000   0.0000
*5 5                311                 15.1275     0.00045  0.0002   0.0000   0.0000
*5 5                312                 16.7268     0.00045  0.0002   0.0000   0.0000
5 5                310                 15.92715     0.00045  0.0002   0.0000   0.0000
5 5                6                  122.1579     0.00045 0.00045   0.0000   0.0000
*5 5                101                  4.6641     0.00045  0.0002   0.0000   0.0000
*5 5                102                  4.7854     0.00045  0.0002   0.0000   0.0000
5 5                100                  4.72475     0.00045  0.0002   0.0000   0.0000
*5 5                111                  4.6715     0.00045  0.0002   0.0000   0.0000
*5 5                112                  4.7767     0.00045  0.0002   0.0000   0.0000
5 5                110                  4.7241     0.00045  0.0002   0.0000   0.0000
*5 5                121                  4.7009     0.00045  0.0002   0.0000   0.0000
*5 5                122                  4.7441     0.00045  0.0002   0.0000   0.0000
5 5                120                  4.7225     0.00045  0.0002   0.0000   0.0000
5 5                131                  4.7247     0.00045  0.0002   0.0000   0.0000
5 5                145                  4.8602     0.00045  0.0002   0.0000   0.0000
5 5                51                  18.4422     0.00045  0.0002   0.0000   0.0000

*6 5                1001                 96.1309     0.0005  0.0002   0.0000   0.0000
*6 5                1002                 96.1325     0.0005  0.0002   0.0000   0.0000
6 5                3                  104.8375     0.0005  0.0002   0.0000   0.0000
6 5                4                  104.8183     0.0005  0.0002   0.0000   0.0000
6 5                2                  102.7888     0.0005  0.0002   0.0000   0.0000
6 5                1                  102.0956     0.0005  0.0002   0.0000   0.0000
*6 5                311                101.8801     0.0005  0.0002   0.0000   0.0000
*6 5                312                101.8715     0.0005  0.0002   0.0000   0.0000
6 5                310                101.8758     0.0005 0.0008   0.0000   0.0000
6 5                6                   97.8176     0.0005 0.00045   0.0000   0.0000
*6 5                101                100.2695     0.0005  0.0002   0.0000   0.0000
*6 5                102                100.2697     0.0005  0.0002   0.0000   0.0000
*6 5                111                 99.5493     0.0005  0.0002   0.0000   0.0000
```

```
*6 5                 112                  99.5484     0.0005  0.0002   0.0000   0.0000
6 5                 110                 99.54885     0.0005  0.0002   0.0000   0.0000
*6 5                 121                  98.6278     0.0005  0.0002   0.0000   0.0000
*6 5                 122                  98.6274     0.0005  0.0002   0.0000   0.0000
6 5                 131                 103.7230     0.0005  0.0002   0.0000   0.0000
6 5                 145                  99.9177     0.0005  0.0002   0.0000   0.0000
6 5                 51                  104.1772     0.0005  0.0002   0.0000   0.0000

3 5                 3                    15.6633     0.0004 0.0000   0.0000   0.0000
3 5                 4                    18.8114     0.0004 0.0000   0.0000   0.0000
3 5                 2                    25.7485     0.0004 0.0000   0.0000   0.0000
3 5                 1                    32.4906     0.0004 0.0000   0.0000   0.0000
3 5                 6                     6.2441     0.0004 0.0000   0.0000   0.0000
3 5                 131                  33.1686     0.0004 0.0000   0.0000   0.0000
3 5                 145                  33.1576     0.0004 0.0000   0.0000   0.0000
3 5                 51                   34.6177     0.0004 0.0000   0.0000   0.0000

* Station n°7 6
* Temperature : 31.9 °C - Pression : 756.8 mmHg - Correction meteo : 19.5 ppm
* Date/heure debut :
* Date/heure fin   :
* Numero de cycle : 0

*7 6                 1001                   0.0000     0.00045  0.0002   0.0000   0.0000
*5 6                 1002                   0.2027     0.00045  0.0002   0.0000   0.0000
7 6                 1000                  0.10135     0.00045  0.0002   0.0000   0.0000
5 6                 5                    329.0972     0.00045 0.00045   0.0000   0.0000
5 6                 4                     30.7569     0.00045  0.0002   0.0000   0.0000
5 6                 3                    359.3980     0.00045  0.0002   0.0000   0.0000
5 6                 2                    390.1785     0.00045  0.0002   0.0000   0.0000
5 6                 1                     8.9764     0.00045  0.0002   0.0000   0.0000
*5 6                 301                   0.3469     0.00045  0.0002   0.0000   0.0000
*5 6                 302                   0.8045     0.00045  0.0002   0.0000   0.0000
5 6                 300                   0.5757     0.00045  0.0002   0.0000   0.0000
*5 6                 101                   0.7232     0.00045  0.0002   0.0000   0.0000
*5 6                 102                   0.8373     0.00045  0.0002   0.0000   0.0000
5 6                 100                  0.78025     0.00045  0.0002   0.0000   0.0000
*5 6                 111                   0.7296     0.00045  0.0002   0.0000   0.0000
*5 6                 112                   0.8286     0.00045  0.0002   0.0000   0.0000
5 6                 110                   0.7791     0.00045  0.0002   0.0000   0.0000
*5 6                 121                   0.7584     0.00045  0.0002   0.0000   0.0000
*5 6                 122                   0.7987     0.00045  0.0002   0.0000   0.0000
5 6                 120                  0.77855     0.00045  0.0002   0.0000   0.0000
5 6                 146                   0.9027     0.00045  0.0002   0.0000   0.0000
5 6                 51                   14.1391     0.00045  0.0002   0.0000   0.0000

*6 6                 1001                  96.5557     0.0005  0.0002   0.0000   0.0000
*6 6                 1002                  96.5559     0.0005  0.0002   0.0000   0.0000
6 6                 5                    102.1761     0.0005 0.00045   0.0000   0.0000
6 6                 4                    105.9254     0.0005  0.0002   0.0000   0.0000
6 6                 3                    104.2688     0.0005  0.0002   0.0000   0.0000
6 6                 2                    102.9639     0.0005  0.0002   0.0000   0.0000
6 6                 1                    102.4113     0.0005  0.0002   0.0000   0.0000
*6 6                 301                   102.5662     0.0005  0.0002   0.0000   0.0000
*6 6                 302                   102.5639     0.0005  0.0002   0.0000   0.0000
6 6                 300                  102.56505     0.0005 0.0008   0.0000   0.0000
*6 6                 101                   100.6382     0.0005  0.0002   0.0000   0.0000
*6 6                 102                   100.6381     0.0005  0.0002   0.0000   0.0000
*6 6                 111                    99.9630     0.0005  0.0002   0.0000   0.0000
*6 6                 112                    99.9630     0.0005  0.0002   0.0000   0.0000
6 6                 110                    99.9630     0.0005  0.0002   0.0000   0.0000
*6 6                 121                    99.0968     0.0005  0.0002   0.0000   0.0000
*6 6                 122                    99.0967     0.0005  0.0002   0.0000   0.0000
6 6                 146                  100.3085     0.0005  0.0002   0.0000   0.0000
6 6                 51                   104.4517     0.0005  0.0002   0.0000   0.0000
```

```
3 6                5                    6.2441     0.0004 0.0000   0.0000   0.0000
3 6                4                   17.6033     0.0004 0.0000   0.0000   0.0000
3 6                3                   20.9474     0.0004 0.0000   0.0000   0.0000
3 6                2                   28.8246     0.0004 0.0000   0.0000   0.0000
3 6                1                   33.8907     0.0004 0.0000   0.0000   0.0000
3 6                146                 35.3662     0.0004 0.0000   0.0000   0.0000
3 6                51                  35.5427     -0.0004 0.0000   0.0000   0.0000

* D:\DORIS\Male\topo\brutes\23-09.obs
* fichier créé le 24/09/2021 à 15:51:31

*Tours d'horizon
* Station n°1 250
* Temperature : 31.0 °C - Pression : 755.6 mmHg - Correction meteo : 19.2 ppm
* Date/heure debut :
* Date/heure fin   :
* Numero de cycle : 0

*7 250              1001                 0.0000    0.0016 0.0000   0.0000   0.0000
*5 250              1002                 0.2503    0.0016 0.0000   0.0000   0.0000
7 250              1000                0.12515    0.0016 0.0000   0.0000   0.0000
5 250              3                 334.7300     0.0016 0.0000   0.0000   0.0000
5 250              5                 265.1649     0.0016 0.0000   0.0000   0.0000
*5 250              301                385.2186    0.0016 0.0000   0.0000   0.0000
*5 250              302                386.0703    0.0016 0.0000   0.0000   0.0000
5 250              300               385.64445    0.0016 0.0000   0.0000   0.0000
5 250              6                 224.8961     0.0016 0.0000   0.0000   0.0000
5 250              1                   8.7970     0.0016 0.0000   0.0000   0.0000
5 250              4                  45.8570     0.0016 0.0000   0.0000   0.0000

*6 250              1001                95.4736    0.0024 0.0000   0.0000   0.0000
*6 250              1002                95.4723    0.0024 0.0000   0.0000   0.0000
6 250              3                 104.0347     0.0024 0.0000   0.0000   0.0000
6 250              5                  99.4658     0.0024 0.0000   0.0000   0.0000
*6 250              301                102.7967    0.0024 0.0000   0.0000   0.0000
*6 250              302                102.7944    0.0024 0.0000   0.0000   0.0000
6 250              300               102.79555    0.0024 0.0004   0.0000   0.0000
6 250              6                  97.9264     0.0024 0.0000   0.0000   0.0000
6 250              1                 102.5164     0.0024 0.0000   0.0000   0.0000
6 250              4                 109.9119     0.0024 0.0000   0.0000   0.0000

3 250              3                  17.4023     0.0004 0.0000   0.0000   0.0000
3 250              5                  10.4652     0.0004 0.0000   0.0000   0.0000
3 250              6                   9.2637     0.0004 0.0000   0.0000   0.0000
3 250              1                  24.8425     0.0004 0.0000   0.0000   0.0000
3 250              4                   8.6122     0.0004 0.0000   0.0000   0.0000


*Données reduites
* D:\DORIS\Male\topo\brutes\25092021.obs
* fichier créé le 25/09/2021 à 08:56:14

*Tours d'horizon
* Station n°1 11
* Temperature : 31.3 °C - Pression : 757.3 mmHg - Correction meteo : 18.8 ppm
* Date/heure debut :
* Date/heure fin   :
* Numero de cycle : 0

7 11               6                    0.0000     0.00045  0.0002   0.0000   0.0000
5 11               21                  59.0640     0.00045  0.0002   0.0000   0.0000
5 11               4                  379.2045     0.00045  0.0002   0.0000   0.0000
5 11               131                115.8412     0.00045  0.0002   0.0000   0.0000
*5 11               311                  8.6345     0.00045  0.0002   0.0000   0.0000
*5 11               312                 10.2601     0.00045  0.0002   0.0000   0.0000
5 11               310                  9.4473     0.00045  0.0002   0.0000   0.0000
```

```
*5 11              201              395.5627     0.00045  0.0002   0.0000   0.0000
*5 11              202              395.7179     0.00045  0.0002   0.0000   0.0000
5 11              200              395.6403     0.00045  0.0002   0.0000   0.0000
*5 11              211              395.5721     0.00045  0.0002   0.0000   0.0000
*5 11              212              395.7091     0.00045  0.0002   0.0000   0.0000
5 11              210              395.6406     0.00045  0.0002   0.0000   0.0000
*5 11              221              395.6133     0.00045  0.0002   0.0000   0.0000
*5 11              222              395.6691     0.00045  0.0002   0.0000   0.0000
5 11              220              395.6412     0.00045  0.0002   0.0000   0.0000
5 11              231              395.6369     0.00045  0.0002   0.0000   0.0000
5 11              241              395.4040     0.00045  0.0002   0.0000   0.0000
5 11              31                41.9567     -0.00045  0.0002   0.0000   0.0000
5 11              5                 11.6913     0.00045  0.0002   0.0000   0.0000

6 11              6                 97.6738     0.0005  0.0002   0.0000   -0.0500
6 11              21               100.6168     0.0005  0.0002   0.0000   0.0000
6 11              4                101.2081     0.0005  0.0002   0.0000   0.0000
6 11              131              111.6419     0.0005  0.0002   0.0000   0.0000
*6 11              311               97.6577     0.0005  0.0002   0.0000   0.0000
*6 11              312               97.6665     0.0005  0.0002   0.0000   0.0000
6 11              310               97.6621     0.0005 0.0008   0.0000   0.0000
*6 11              201               98.0662     0.0005  0.0002   0.0000   0.0000
*6 11              202               98.0663     0.0005  0.0002   0.0000   0.0000
*6 11              211               97.1247     0.0005  0.0002   0.0000   0.0000
*6 11              212               97.1229     0.0005  0.0002   0.0000   0.0000
6 11              210               97.1238     0.0005  0.0002   0.0000   0.0000
*6 11              221               95.9019     0.0005  0.0002   0.0000   0.0000
*6 11              222               95.9022     0.0005  0.0002   0.0000   0.0000
6 11              231              102.8228     0.0005  0.0002   0.0000   0.0000
6 11              241               97.6105     0.0005  0.0002   0.0000   0.0000
6 11              31               100.2914     -0.0005  0.0002   0.0000   0.0000
6 11              5                 97.8947     0.0005  0.0002   0.0000   0.0000

3 11              21                10.4122     0.0004 0.0000   0.0000   0.0000
3 11              4                 18.3333     0.0004 0.0000   0.0000   0.0000
3 11              131                4.7541     0.0004 0.0000   0.0000   0.0000
3 11              231               24.8525     0.0004 0.0000   0.0000   0.0000
3 11              241               24.8525     0.0004 0.0000   0.0000   0.0000
3 11              31                24.0105     -0.0004 0.0000   0.0000   0.0000
3 11              5                 32.4956     0.0004 0.0000   0.0000   0.0000

* Station n°2 21
* Temperature : 30.8 °C - Pression : 757.4 mmHg - Correction meteo : 18.4 ppm
* Date/heure debut :
* Date/heure fin   :
* Numero de cycle : 0

7 21              6                  0.0000     0.00045  0.0002   0.0000   0.0000
5 21              5                 12.7144     0.00045  0.0002   0.0000   0.0000
5 21              31                48.1703     -0.00045  0.0002   0.0000   0.0000
5 21              131              248.8698     0.00045  0.0002   0.0000   0.0000
*5 21              301              383.1869     0.00045  0.0002   0.0000   0.0000
*5 21              302              383.9162     0.00045  0.0002   0.0000   0.0000
5 21              300              383.55155     0.00045  0.0002   0.0000   0.0000
*5 21              201              386.9604     0.00045  0.0002   0.0000   0.0000
*5 21              202              387.1435     0.00045  0.0002   0.0000   0.0000
5 21              200              387.05195     0.00045  0.0002   0.0000   0.0000
*5 21              211              386.9711     0.00045  0.0002   0.0000   0.0000
*5 21              212              387.1344     0.00045  0.0002   0.0000   0.0000
5 21              210              387.05275     0.00045  0.0002   0.0000   0.0000
*5 21              221              387.0205     0.00045  0.0002   0.0000   0.0000
*5 21              222              387.0869     0.00045  0.0002   0.0000   0.0000
5 21              220              387.0537     0.00045  0.0002   0.0000   0.0000
5 21              231              387.0477     0.00045  0.0002   0.0000   0.0000
5 21              242              386.8445     0.00045  0.0002   0.0000   0.0000
5 21              4                360.9008     -0.00045  0.0002   0.0000   0.0000
```

```
5 21              11                277.7059     0.00045  0.0002   0.0000   0.0000

6 21              6                  97.0481     0.0005   0.0002   0.0000   -0.0500
6 21              5                  97.1005     0.0005   0.0002   0.0000   0.0000
6 21              31                100.0383     -0.0005  0.0002   0.0000   0.0000
6 21              131               105.8292     0.0005   0.0002   0.0000   0.0000
*6 21              301                96.3046     0.0005   0.0002   0.0000   0.0000
*6 21              302                96.3073     0.0005   0.0002   0.0000   0.0000
6 21              300                96.30595    0.0005 0.0008   0.0000   0.0000
*6 21              201                97.4073     0.0005   0.0002   0.0000   0.0000
*6 21              202                97.4079     0.0005   0.0002   0.0000   0.0000
*6 21              211                96.3069     0.0005   0.0002   0.0000   0.0000
*6 21              212                96.3056     0.0005   0.0002   0.0000   0.0000
6 21              210                96.30625    0.0005   0.0002   0.0000   0.0000
*6 21              221                94.8681     0.0005   0.0002   0.0000   0.0000
*6 21              222                94.8683     0.0005   0.0002   0.0000   0.0000
6 21              231               103.0201     0.0005   0.0002   0.0000   0.0000
6 21              242                96.8777     0.0005   0.0002   0.0000   0.0000
6 21              4                 100.8698     0.0005   0.0002   0.0000   0.0000
6 21              11                 99.3785     0.0005   0.0002   0.0000   0.0000

3 21              5                  25.8275     0.0004 0.0000   0.0000   0.0000
3 21              31                 14.2433     -0.0004 0.0000   0.0000   0.0000
3 21              131                 8.3492     0.0004 0.0000   0.0000   0.0000
3 21              231                21.0924     0.0004 0.0000   0.0000   0.0000
3 21              242                21.0954     0.0004 0.0000   0.0000   0.0000
3 21              4                  18.0473     0.0004 0.0000   0.0000   0.0000
3 21              11                 10.4122     0.0004 0.0000   0.0000   0.0000

* Station n°3 31
* Temperature : 31.6 °C - Pression : 757.2 mmHg - Correction meteo : 19.1 ppm
* Date/heure debut :
* Date/heure fin   :
* Numero de cycle : 0

*7 31              R                    0.0000     0.00045  0.0002   0.0000   0.0000
*5 31              1001               398.8853     0.00045  0.0002   0.0000   0.0000
*5 31              1002               399.1623     0.00045  0.0002   0.0000   0.0000
7 31              1000               399.0238     0.00045  0.0002   0.0000   0.0000
5 31              11                  29.1473     0.00045  0.0002   0.0000   0.0000
5 31              21                  16.6368     0.00045  0.0002   0.0000   0.0000
5 31              4                   82.2393     0.00045  0.0002   0.0000   0.0000
5 31              131                 16.9650     0.00045  0.0002   0.0000   0.0000
*5 31              311                70.6517     0.00045  0.0002   0.0000   0.0000
*5 31              312                72.7208     0.00045  0.0002   0.0000   0.0000
5 31              310                71.68625    0.00045  0.0002   0.0000   0.0000
*5 31              201               108.7781     0.00045  0.0002   0.0000   0.0000
*5 31              202               109.0011     0.00045  0.0002   0.0000   0.0000
5 31              200               108.8896     0.00045  0.0002   0.0000   0.0000
*5 31              211               108.7903     0.00045  0.0002   0.0000   0.0000
*5 31              212               108.9894     0.00045  0.0002   0.0000   0.0000
5 31              210               108.88985    0.00045  0.0002   0.0000   0.0000
*5 31              221               108.8502     0.00045  0.0002   0.0000   0.0000
*5 31              222               108.9301     0.00045  0.0002   0.0000   0.0000
5 31              220               108.89015    0.00045  0.0002   0.0000   0.0000
5 31              231               108.8871     0.00045  0.0002   0.0000   0.0000
5 31              243               109.1286     0.00045  0.0002   0.0000   0.0000
5 31              5                 149.4966     0.00045  0.0002   0.0000   0.0000

*6 31              R                   95.6747     0.0005   0.0002   0.0000   0.0000
*6 31              1001                92.9939     0.0005   0.0002   0.0000   0.0000
*6 31              1002                92.9947     0.0005   0.0002   0.0000   0.0000
6 31              11                  99.6816     0.0005   0.0002   0.0000   0.0000
6 31              21                  99.9152     0.0005   0.0002   0.0000   0.0000
6 31              4                  100.7035     0.0005   0.0002   0.0000   0.0000
6 31              131                102.1019     0.0005   0.0002   0.0000   0.0000
```

```
*6 31                311                  96.4312     0.0005  0.0002   0.0000   0.0000
*6 31                312                  96.4224     0.0005  0.0002   0.0000   0.0000
6 31                310                  96.4268     0.0005 0.0008   0.0000   0.0000
*6 31                201                  96.8076     0.0005  0.0002   0.0000   0.0000
*6 31                202                  96.8076     0.0005  0.0002   0.0000   0.0000
*6 31                211                  95.4499     0.0005  0.0002   0.0000   0.0000
*6 31                212                  95.4490     0.0005  0.0002   0.0000   0.0000
6 31                210                  95.4494     0.0005  0.0002   0.0000   0.0000
*6 31                221                  93.7059     0.0005  0.0002   0.0000   0.0000
*6 31                222                  93.7056     0.0005  0.0002   0.0000   0.0000
6 31                231                 103.5971     0.0005  0.0002   0.0000   0.0000
6 31                243                  96.1433     0.0005  0.0002   0.0000   0.0000
6 31                5                    95.1360     0.0005  0.0002   0.0000   0.0000

3 31                11                   23.9995     0.0004 0.0000   0.0000   0.0000
3 31                21                   14.2413     0.0004 0.0000   0.0000   0.0000
3 31                4                    20.6114     0.0004 0.0000   0.0000   0.0000
3 31                131                  22.5654     0.0004 0.0000   0.0000   0.0000
3 31                231                  17.3793     0.0004 0.0000   0.0000   0.0000
3 31                243                  17.3933     0.0004 0.0000   0.0000   0.0000
3 31                5                    15.6513     0.0004 0.0000   0.0000   0.0000

* Station n°4 4
* Temperature : 30.6 °C - Pression : 757.3 mmHg - Correction meteo : 18.2 ppm
* Date/heure debut :
* Date/heure fin   :
* Numero de cycle : 0

*7 4                 R                     0.0000     0.00045  0.0002   0.0000   0.0000
*5 4                 1001                  5.6388     0.00045  0.0002   0.0000   0.0000
*5 4                 1002                  5.9181     0.00045  0.0002   0.0000   0.0000
7 4                 1000                  5.77845    0.00045  0.0002   0.0000   0.0000
5 4                 131                 395.2954     0.00045  0.0002   0.0000   0.0000
5 4                 6                   249.6984     0.00045  0.0002   0.0000   0.0000
*5 4                 301                  338.3876     0.00045  0.0002   0.0000   0.0000
*5 4                 302                  339.3760     0.00045  0.0002   0.0000   0.0000
*5 4                 300                  338.8818     0.00045  0.0002   0.0000   0.0000
5 4                 21                  370.1750     0.00045  0.0002   0.0000   0.0000
5 4                 31                  322.8533     0.00045  0.0002   0.0000   0.0000
*5 4                 201                  260.4025     0.00045  0.0002   0.0000   0.0000
*5 4                 202                  260.8560     0.00045  0.0002   0.0000   0.0000
5 4                 200                 260.62925     0.00045  0.0002   0.0000   0.0000
*5 4                 211                  260.4296     0.00045  0.0002   0.0000   0.0000
*5 4                 212                  260.8331     0.00045  0.0002   0.0000   0.0000
5 4                 210                 260.63135     0.00045  0.0002   0.0000   0.0000
*5 4                 221                  260.5538     0.00045  0.0002   0.0000   0.0000
*5 4                 222                  260.7165     0.00045  0.0002   0.0000   0.0000
5 4                 220                 260.63515     0.00045  0.0002   0.0000   0.0000
5 4                 231                 260.6223     0.00045  0.0002   0.0000   0.0000
5 4                 244                 259.8529     0.00045  0.0002   0.0000   0.0000
5 4                 11                    7.1195     0.00045  0.0002   0.0000   0.0000

*6 4                 R                    95.3517     0.0005  0.0002   0.0000   0.0000
*6 4                 1001                 92.6348     0.0005  0.0002   0.0000   0.0000
*6 4                 1002                 92.6351     0.0005  0.0002   0.0000   0.0000
6 4                 131                 101.5476     0.0005  0.0002   0.0000   0.0000
6 4                 6                    94.0724     0.0005  0.0002   0.0000   0.0000
*6 4                 301                  94.1592     0.0005  0.0002   0.0000   0.0000
*6 4                 302                  93.1393     0.0005  0.0002   0.0000   0.0000
*6 4                 300                  93.64925     0.0005  0.0002   0.0000   0.0000
6 4                 21                   99.1268     0.0005  0.0002   0.0000   0.0000
6 4                 31                   99.2942     0.0005  0.0002   0.0000   0.0000
*6 4                 201                  91.7944     0.0005  0.0002   0.0000   0.0000
*6 4                 202                  91.7944     0.0005  0.0002   0.0000   0.0000
*6 4                 211                  89.1030     0.0005  0.0002   0.0000   0.0000
*6 4                 212                  89.0993     0.0005  0.0002   0.0000   0.0000
```

```
6 4                 210                  89.10115     0.0005  0.0002   0.0000   0.0000
*6 4                 221                   85.6655     0.0005  0.0002   0.0000   0.0000
*6 4                 222                   85.6654     0.0005  0.0002   0.0000   0.0000
6 4                 231                 105.6225     0.0005  0.0002   0.0000   0.0000
6 4                 244                  90.4406     0.0005  0.0002   0.0000   0.0000
6 4                 11                   98.7891     0.0005  0.0002   0.0000   0.0000

3 4                 131                  21.2454     0.0004 0.0000   0.0000   0.0000
3 4                 6                    17.6033     0.0004 0.0000   0.0000   0.0000
*3 4                 301                  18.8123     0.0004 0.0000   0.0000   0.0000
3 4                 21                   18.0473     0.0004 0.0000   0.0000   0.0000
3 4                 31                   20.6124     0.0004 0.0000   0.0000   0.0000
3 4                 231                   8.5407     0.0004 0.0000   0.0000   0.0000
3 4                 244                   8.5632     0.0004 0.0000   0.0000   0.0000
3 4                 11                   18.3333     0.0004 0.0000   0.0000   0.0000

* Station n°5 6
* Temperature : 30.0 °C - Pression : 757.1 mmHg - Correction meteo : 17.8 ppm
* Date/heure debut :
* Date/heure fin   :
* Numero de cycle : 0

*7 6                 R                      0.0000     0.00045  0.0002   0.0000   0.0000
*5 6                 1001                   2.1691     0.00045  0.0002   0.0000   0.0000
*5 6                 1002                   2.3694     0.00045  0.0002   0.0000   0.0000
7 6                 1000                  2.26925     0.00045  0.0002   0.0000   0.0000
5 6                 11                   11.1382     0.00045  0.0002   0.0000   0.0000
5 6                 21                  392.4928     0.00045  0.0002   0.0000   0.0000
5 6                 5                   331.2616     0.00045 0.00045   0.0000   0.0000
5 6                 4                    32.9244     0.00045  0.0002   0.0000   0.0000
5 6                 231                  22.8963     0.00045  0.0002   0.0000   0.0000
5 6                 246                  23.4354     0.00045  0.0002   0.0000   0.0000
*5 6                 201                   22.6798     0.00045  0.0002   0.0000   0.0000
*5 6                 202                   23.0989     0.00045  0.0002   0.0000   0.0000
5 6                 200                  22.88935     0.00045  0.0002   0.0000   0.0000
*5 6                 211                   22.7008     0.00045  0.0002   0.0000   0.0000
*5 6                 212                   23.0736     0.00045  0.0002   0.0000   0.0000
5 6                 210                   22.8872     0.00045  0.0002   0.0000   0.0000
*5 6                 221                   22.8085     0.00045  0.0002   0.0000   0.0000
*5 6                 222                   22.9600     0.00045  0.0002   0.0000   0.0000
5 6                 220                  22.88425     0.00045  0.0002   0.0000   0.0000
*5 6                 311                    2.0218     0.00045  0.0002   0.0000   0.0000
*5 6                 312                    3.4687     0.00045  0.0002   0.0000   0.0000
5 6                 310                   2.74525     0.00045  0.0002   0.0000   0.0000

*6 6                 R                      98.9299     0.0005  0.0002   0.0000   0.0000
*6 6                 1001                   96.5574     0.0005  0.0002   0.0000   0.0000
*6 6                 1002                   96.5566     0.0005  0.0002   0.0000   0.0000
6 6                 11                   102.4192     0.0005  0.0002   0.0000   0.0000
6 6                 21                   103.0616     0.0005  0.0002   0.0000   0.0000
6 6                 5                    102.1754     0.0005 0.00045   0.0000   0.0000
6 6                 4                    105.9256     0.0005  0.0002   0.0000   0.0000
6 6                 231                  116.0783     0.0005  0.0002   0.0000   0.0000
6 6                 246                  102.4394     0.0005  0.0002   0.0000   0.0000
*6 6                 201                   103.7002     0.0005  0.0002   0.0000   0.0000
*6 6                 202                   103.7004     0.0005  0.0002   0.0000   0.0000
*6 6                 211                   101.1382     0.0005  0.0002   0.0000   0.0000
*6 6                 212                   101.1417     0.0005  0.0002   0.0000   0.0000
6 6                 210                  101.13995     0.0005  0.0002   0.0000   0.0000
*6 6                 221                    97.8531     0.0005  0.0002   0.0000   0.0000
*6 6                 222                    97.8531     0.0005  0.0002   0.0000   0.0000
*6 6                 311                   102.4533     0.0005  0.0002   0.0000   0.0000
*6 6                 312                   102.4478     0.0005  0.0002   0.0000   0.0000
6 6                 310                  102.45055     0.0005 0.0008   0.0000   0.0000

3 6                 11                    33.8966     0.0004 0.0000   0.0000   0.0000
```

```
3 6                21                  28.8915     0.0004 0.0000   0.0000   0.0000
3 6                5                    6.2441     0.0004 0.0000   0.0000   0.0000
3 6                4                   17.6033     0.0004 0.0000   0.0000   0.0000
3 6                231                  9.5622     0.0004 0.0000   0.0000   0.0000
3 6                246                  9.2732     0.0004 0.0000   0.0000   0.0000

* Station n°6 5
* Temperature : 31.2 °C - Pression : 757.1 mmHg - Correction meteo : 18.8 ppm
* Date/heure debut :
* Date/heure fin   :
* Numero de cycle : 0

*7 5                R                     0.0000     0.00045  0.0002   0.0000   0.0000
*5 5                1001                  1.2612     0.00045  0.0002   0.0000   0.0000
*5 5                1002                  1.4728     0.00045  0.0002   0.0000   0.0000
7 5                1000                  1.3670     0.00045  0.0002   0.0000   0.0000
5 5                31                  365.4854     0.00045  0.0002   0.0000   0.0000
5 5                4                    46.6628     0.00045  0.0002   0.0000   0.0000
5 5                131                   5.9855     0.00045  0.0002   0.0000   0.0000
*5 5                311                  16.3843     0.00045  0.0002   0.0000   0.0000
*5 5                312                  17.9843     0.00045  0.0002   0.0000   0.0000
5 5                310                   17.1843     0.00045  0.0002   0.0000   0.0000
*5 5                201                  55.1225     0.00045  0.0002   0.0000   0.0000
*5 5                202                  55.4932     0.00045  0.0002   0.0000   0.0000
5 5                200                   55.30785    0.00045  0.0002   0.0000   0.0000
*5 5                211                  55.1413     0.00045  0.0002   0.0000   0.0000
*5 5                212                  55.4707     0.00045  0.0002   0.0000   0.0000
5 5                210                   55.306     0.00045  0.0002   0.0000   0.0000
*5 5                221                  55.2367     0.00045  0.0002   0.0000   0.0000
*5 5                222                  55.3710     0.00045  0.0002   0.0000   0.0000
5 5                220                   55.30385    0.00045  0.0002   0.0000   0.0000
5 5                21                  397.3587     0.00045  0.0002   0.0000   0.0000
5 5                11                   14.9810     0.00045  0.0002   0.0000   0.0000
5 5                245                  54.8426     0.00045  0.0002   0.0000   0.0000
5 5                6                   123.4145     0.00045  0.0002   0.0000   0.0000

*6 5                R                    98.5628     0.0005  0.0002   0.0000   0.0000
*6 5                1001                 96.1299     0.0005  0.0002   0.0000   0.0000
*6 5                1002                 96.1312     0.0005  0.0002   0.0000   0.0000
6 5                31                  104.8624     0.0005  0.0002   0.0000   0.0000
6 5                4                   104.8141    -0.0005  0.0002   0.0000   0.0000
6 5                131                 103.7241     0.0005  0.0002   0.0000   0.0000
*6 5                311                  101.8807    0.0005  0.0002   0.0000   0.0000
*6 5                312                  101.8716    0.0005  0.0002   0.0000   0.0000
6 5                310                  101.8716     0.0005 0.0008   0.0000   0.0000
*6 5                201                  101.9712    0.0005  0.0002   0.0000   0.0000
*6 5                202                  101.9712    0.0005  0.0002   0.0000   0.0000
*6 5                211                   99.7084    0.0005  0.0002   0.0000   0.0000
*6 5                212                   99.7091    0.0005  0.0002   0.0000   0.0000
6 5                210                   99.7088    0.0005  0.0002   0.0000   0.0000
*6 5                221                   96.7887    0.0005  0.0002   0.0000   0.0000
*6 5                222                   96.7912    0.0005  0.0002   0.0000   0.0000
6 5                21                  102.8974     0.0005  0.0002   0.0000   0.0000
6 5                11                  102.1038     0.0005  0.0002   0.0000   0.0000
6 5                245                 100.8599     0.0005  0.0002   0.0000   0.0000
6 5                6                    97.8183     0.0005  0.0002   0.0000   0.0000

3 5                31                   15.6513     0.0004 0.0000   0.0000   0.0000
3 5                4                    18.8114     0.0004 0.0000   0.0000   0.0000
3 5                131                  33.1696     0.0004 0.0000   0.0000   0.0000
3 5                21                   25.8275     0.0004 0.0000   0.0000   0.0000
3 5                11                   32.4956     0.0004 0.0000   0.0000   0.0000
3 5                245                  10.4882     0.0004 0.0000   0.0000   0.0000
3 5                6                     6.2441     0.0004 0.0000   0.0000   0.0000
```

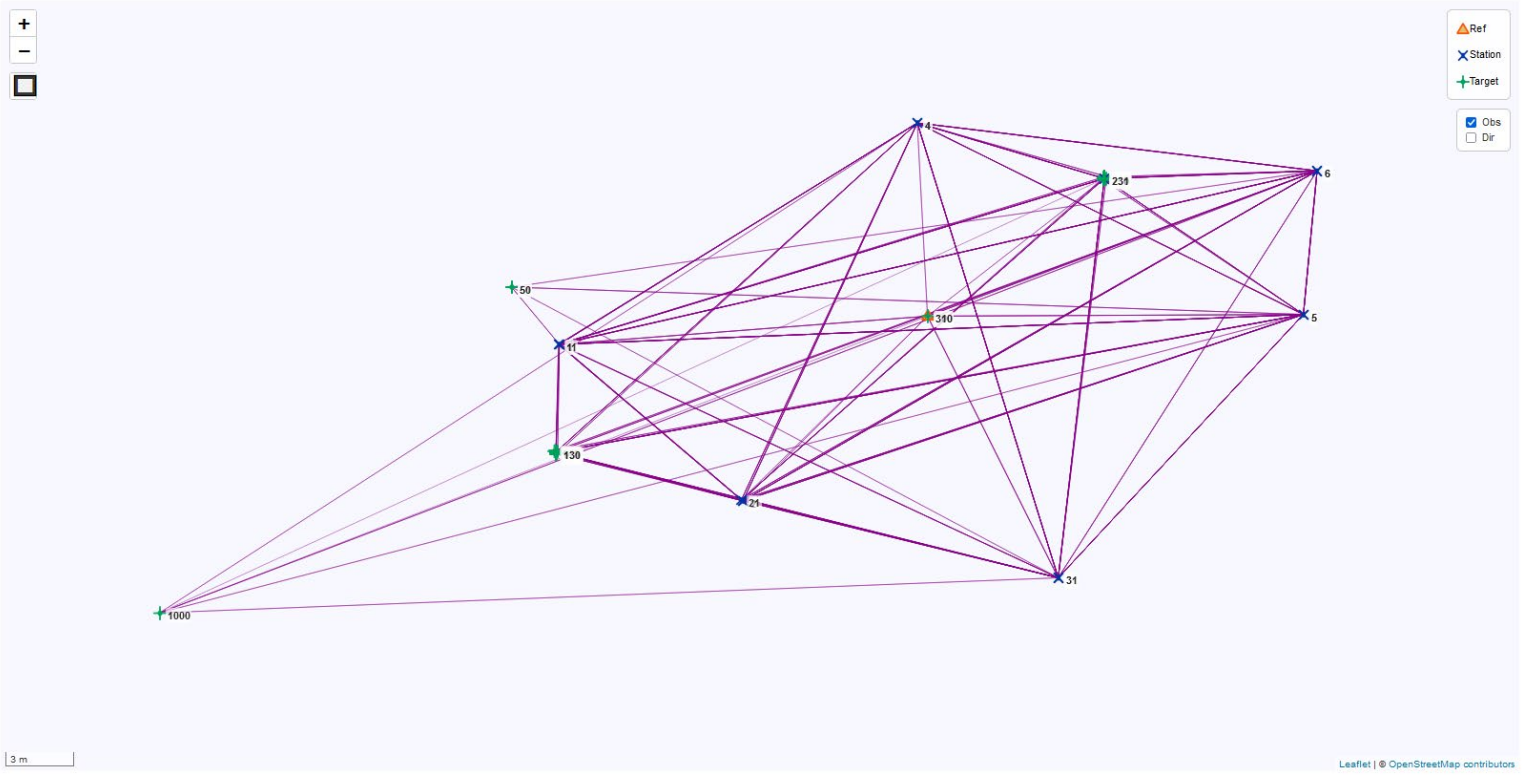
6.3 Adjustment output files

6.3.1 COMP3D computation report

Version: COMP3D v5.21rc3-win
Commit: v5.21rc3
Options: QT GUI SIM RES AUTO

Project configuration

Name: calcul3
Description: HULE coordinates ITRF 2014 ep 2021.73 2 Azimuts from Infinity baselines
Root COR file: calcul3.cor
Root OBS file: calcul3.obs
Unit: Grad
Decimal places number: 4
Computation nature: Compensation
Normal matrix inversion: Yes
Internal constraints: No
Refraction coefficient: 0.1200
Georeferencing: Yes
Projection definition: EPSG:32643
Projection center: E=336602 N=463580
Convergence criterion: 0.001000
Maximum iterations: 100
Ellipsoidal heights: Yes



Computation information

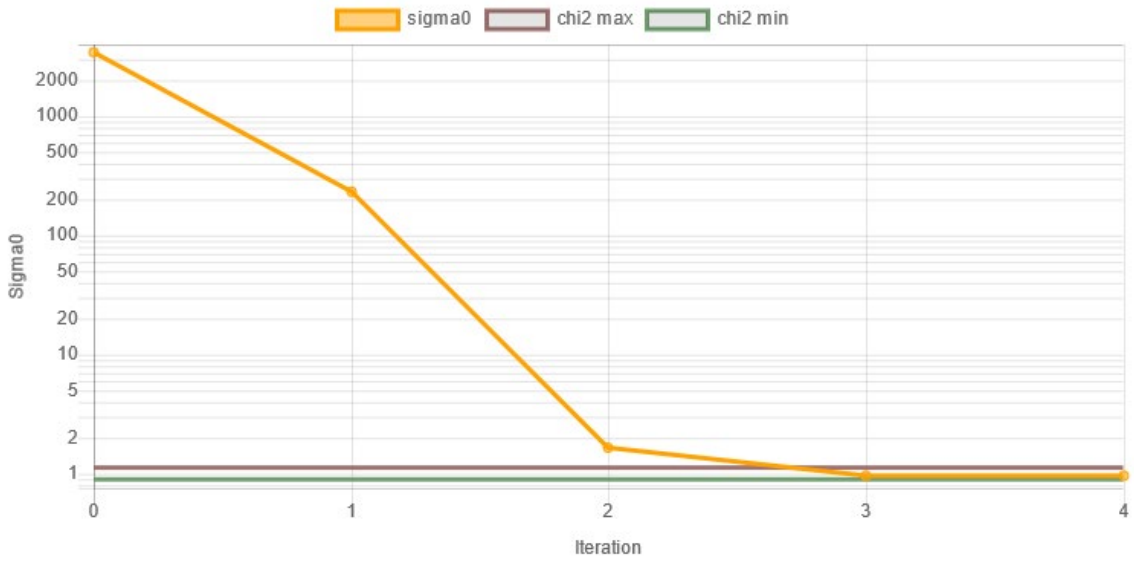
Compensation done: Yes
Initial σ0: 3433.7134
Final σ0: 0.9623
Iterations: 4
Computation interruption: No
Rank default: 0
Computation start: 2022-May-23 11:28:17.458283
Computation duration: 00:00:00.014976

Sphere radius: 6356979.79 m
Total observations number: 402
Active observations number: 389
Parameters: 124
Normal matrix inversion:Yes
Internal constraints: No
Using vertical deflection: Yes
User proj def:EPSG:32643
Stereo def:+proj=sterea +lat_0=4.1926898566295 +lon_0=73.5278308268105 +k_0=1 +x_0=0 +y_0=0
LatLong def:+proj=latlong
Geocent def:+proj=geocent

Cartesian Global to Geocentric:

	-0.9589575792383719	-0.02073057964467873	0.28279074293349393		1803710.3720231839
Geocentr =	0.28354957453905977	-0.0701103025973008	0.9563912297007084	* Global +	6100103.429230246
	0	0.9973238132809777	0.07311095309657406		463198.29486176017

σ0 evolution



χ² test: 😅

Confidence: 99%
Degrees of freedom: 265
Test: 0.8988 < 0.9623 < 1.1248 ?
Test passed: Yes !
Biggest ellipsoid: 0.0022m

Observations

Code	From	To	Measure	Distance	Total σ	Normalized residual	Residual	Residual mm	A posteriori σ	Standard residual	Résidu normé	Redondancy	∇
coord_x	300	300	17.9805	0.0000	0.0010	0.0	0.0000	0.0	0.0010	0.0	-	0	-
coord_y	300	300	7.8773	0.0000	0.0010	0.0	0.0000	0.0	0.0010	0.0	-	0	-
coord_z	300	300	-93.1920	0.0000	0.0010	0.0	0.0000	0.0	0.0010	0.0	-	0	-
azim	300	1000	276.6601	36.0080	0.0035	0.3	0.0009	0.5	0.0028	0.3	0.4	36	0.0241
azim	6	1000	276.9035	54.0044	0.0047	-0.3	-0.0016	-1.3	0.0028	-0.6	-0.4	64	0.0241
dE	110	100	0.0000	0.3922	0.0010	0.5	0.0005	0.5	0.0003	1.7	0.5	93	0.0043
dN	110	100	0.0000	0.3922	0.0010	0.5	0.0005	0.5	0.0002	2.4	0.6	95	0.0042
dE	110	120	0.0000	0.4848	0.0010	-0.7	-0.0007	-0.7	0.0004	-1.6	-0.8	81	0.0046
dN	110	120	0.0000	0.4848	0.0010	-0.8	-0.0008	-0.8	0.0002	-3.7	-0.9	95	0.0042
dE	110	130	0.0000	2.3737	0.0020	0.3	0.0007	0.7	0.0005	1.5	0.4	95	0.0084
dN	110	130	0.0000	2.3737	0.0020	0.1	0.0002	0.2	0.0004	0.4	0.1	95	0.0084
den	110	100	-0.3900	0.3922	0.0020	-1.1	-0.0022	-2.2	0.0002	-10.9	-1.1	99	0.0082
den	100	120	0.8770	0.8770	0.0020	0.0	0.0000	0.0	0.0020	0.0	-	0	-
den	100	130	-1.9805	1.9815	0.0010	-1.0	-0.0010	-1.0	0.0002	-5.0	-1.0	96	0.0042
dE	131	130	0.0000	0.2000	0.0004	-0.1	-0.0000	-0.0	0.0004	-0.1	-0.4	4	0.0084
dN	131	130	0.0000	0.2000	0.0004	-0.0	-0.0000	-0.0	0.0004	-0.0	-0.1	4	0.0084
den	131	130	-0.2000	0.2000	0.0001	0.1	0.0000	0.0	0.0001	0.1	-	1	-
den	100	141	0.2000	0.2133	0.0001	0.2	0.0000	0.0	0.0001	0.2	0.6	9	0.0014
den	100	142	0.2000	0.2143	0.0001	-0.3	-0.0000	-0.0	0.0001	-0.3	-1.0	8	0.0014
den	100	143	0.2000	0.2147	0.0001	-0.1	-0.0000	-0.0	0.0001	-0.1	-0.2	6	0.0017
den	100	144	0.2000	0.2138	0.0001	0.0	0.0000	0.0	0.0001	0.0	0.1	5	0.0018
den	100	145	0.2000	0.2168	0.0001	0.2	0.0000	0.0	0.0001	0.2	1.0	4	0.0021
den	100	146	0.2000	0.2173	0.0001	-0.0	-0.0000	-0.0	0.0001	-0.0	-0.2	4	0.0021
dE	210	200	0.0000	0.3896	0.0010	0.0	0.0000	0.0	0.0003	0.0	0.0	91	0.0043
dN	210	200	0.0000	0.3896	0.0010	0.3	0.0003	0.3	0.0002	1.4	0.3	96	0.0042
dE	210	220	0.0000	0.4874	0.0010	-0.0	-0.0000	-0.0	0.0003	-0.1	-0.0	91	0.0043

dN	210	220	0.0000	0.4874	0.0010	-0.4	-0.0004	-0.4	0.0002	-2.2	-0.4	96	0.0042
dE	210	230	0.0000	2.4239	0.0020	-0.1	-0.0003	-0.3	0.0005	-0.6	-0.1	94	0.0084
dN	210	230	0.0000	2.4239	0.0020	0.6	0.0013	1.3	0.0004	2.9	0.7	95	0.0084
dE	210	250	0.0000	0.1357	0.0010	0.7	0.0007	0.7	0.0003	2.4	0.7	92	0.0043
dN	210	250	0.0000	0.1357	0.0010	0.3	0.0003	0.3	0.0002	1.6	0.3	96	0.0042
den	210	200	-0.3900	0.3896	0.0020	0.2	0.0004	0.4	0.0002	2.3	0.2	99	0.0082
den	200	220	0.8770	0.8770	0.0020	0.0	0.0000	0.0	0.0020	0.0	-	0	-
den	200	230	-2.0350	2.0343	0.0010	0.7	0.0007	0.7	0.0002	3.1	0.7	95	0.0042
den	200	250	0.2540	0.2539	0.0010	-0.1	-0.0001	-0.1	0.0002	-0.4	-0.1	95	0.0042
dE	231	230	0.0000	0.2000	0.0004	0.0	0.0000	0.0	0.0004	0.0	0.1	4	0.0084
dN	231	230	0.0000	0.2000	0.0004	-0.1	-0.0001	-0.1	0.0004	-0.1	-0.7	4	0.0084
den	231	230	-0.2000	0.2000	0.0001	-0.1	-0.0000	-0.0	0.0001	-0.1	-	1	-
den	200	241	0.2000	0.2202	0.0001	-0.1	-0.0000	-0.0	0.0001	-0.1	-0.4	5	0.0018
den	200	242	0.2000	0.2115	0.0001	0.1	0.0000	0.0	0.0001	0.1	0.6	6	0.0017
den	200	243	0.2000	0.2106	0.0001	0.1	0.0000	0.0	0.0001	0.1	0.5	6	0.0016
den	200	244	0.2000	0.2289	0.0001	-0.1	-0.0000	-0.0	0.0001	-0.1	-0.3	9	0.0014
den	200	245	0.2000	0.2153	0.0001	-0.2	-0.0000	-0.0	0.0001	-0.2	-0.5	9	0.0014
den	200	246	0.2000	0.2153	0.0001	0.0	0.0000	0.0	0.0001	0.0	0.1	9	0.0014
dE	300	310	0.0000	0.0330	0.0004	0.4	0.0002	0.2	0.0003	0.6	0.5	59	0.0021
dN	300	310	0.0000	0.0330	0.0004	-1.1	-0.0004	-0.4	0.0002	-1.9	-1.4	65	0.0020
den	300	310	0.0330	0.0330	0.0010	-0.1	-0.0000	-0.0	0.0001	-0.1	-0.3	3	0.0022
dE	51	50	0.0000	0.2000	0.0004	-0.0	-0.0000	-0.0	0.0005	-0.0	-	0	-
dN	51	50	0.0000	0.2000	0.0004	0.0	0.0000	0.0	0.0004	0.0	-	0	-
den	51	50	-0.2000	0.2000	0.0002	0.0	0.0000	0.0	0.0002	0.0	-	0	-
tour	1	5	0.0000	32.4910	0.0008	-0.2	-0.0002	-0.1	0.0004	-0.4	-0.3	72	0.0041
hz	1	2	47.1699	10.4955	0.0017	-1.4	-0.0022	-0.4	0.0008	-2.9	-1.5	79	0.0077
hz	1	3	30.2030	24.0031	0.0010	-0.1	-0.0001	-0.0	0.0005	-0.2	-0.1	74	0.0047
hz	1	131	104.1989	4.7600	0.0032	-0.8	-0.0026	-0.2	0.0020	-1.3	-1.1	60	0.0167
hz	1	141	103.3275	4.7735	0.0032	-0.0	-0.0000	-0.0	0.0032	-0.0	-	0	-
hz	1	51	258.1008	3.4445	0.0044	-1.0	-0.0046	-0.2	0.0038	-1.2	-2.1	24	0.0365
hz	1	100	104.1979	4.7677	0.0032	0.7	0.0021	0.2	0.0028	0.8	1.4	23	0.0270

hz	1	110	104.2040	4.8585	0.0032	0.7	0.0021	0.2	0.0027	0.8	1.3	26	0.0255
hz	1	310	397.7638	16.1064	0.0012	-0.1	-0.0001	-0.0	0.0007	-0.2	-0.1	70	0.0061
hz	1	4	367.5090	18.3275	0.0011	1.0	0.0011	0.3	0.0005	2.2	1.1	79	0.0053
hz	1	6	388.3055	33.8908	0.0008	0.4	0.0003	0.2	0.0005	0.7	0.4	70	0.0041
zen	1	5	98.0003	32.4894	0.0009	1.4	0.0012	0.6	0.0002	5.3	1.4	93	0.0038
zen	1	2	100.3517	10.4955	0.0017	1.4	0.0024	0.4	0.0007	3.5	1.5	84	0.0077
zen	1	3	100.3162	24.0031	0.0010	1.2	0.0012	0.5	0.0003	3.5	1.3	89	0.0045
zen	1	131	111.6927	4.7600	0.0032	-0.7	-0.0022	-0.2	0.0018	-1.3	-0.8	69	0.0157
zen	1	141	85.0262	4.7735	0.0032	0.4	0.0014	0.1	0.0023	0.6	0.6	49	0.0186
zen	1	51	122.6541	3.4445	0.0042	-0.2	-0.0010	-0.1	0.0033	-0.3	-0.4	39	0.0275
zen	1	110	82.6912	4.8585	0.0031	1.1	0.0036	0.3	0.0020	1.8	1.5	60	0.0165
zen	1	310	97.6813	16.1064	0.0045	-0.4	-0.0017	-0.4	0.0011	-1.5	-0.4	94	0.0189
zen	1	4	101.2240	18.3275	0.0012	1.4	0.0017	0.5	0.0004	4.2	1.5	89	0.0052
zen	1	6	97.5891	33.8908	0.0009	-0.7	-0.0006	-0.3	0.0002	-2.7	-0.7	93	0.0037
dist	1	2	10.4952	10.4955	0.0004	0.7	0.0003	0.3	0.0002	1.8	0.8	85	0.0018
dist	1	3	24.0034	24.0031	0.0004	-0.8	-0.0003	-0.3	0.0002	-2.1	-0.9	86	0.0018
dist	1	131	4.7601	4.7600	0.0004	-0.3	-0.0001	-0.1	0.0002	-0.7	-0.4	79	0.0018
dist	1	141	4.7736	4.7735	0.0004	-0.2	-0.0001	-0.1	0.0004	-0.2	-0.6	8	0.0058
dist	1	51	3.4441	3.4445	0.0004	0.9	0.0004	0.4	0.0002	1.5	1.1	64	0.0020
dist	1	4	18.3273	18.3275	0.0004	0.5	0.0002	0.2	0.0001	1.4	0.5	88	0.0017
dist	1	6	33.8906	33.8908	0.0004	0.5	0.0002	0.2	0.0001	1.5	0.5	89	0.0017
tour	2	6	0.0000	28.8242	0.0009	0.3	0.0003	0.1	0.0005	0.6	0.4	67	0.0045
hz	2	4	360.7291	18.0329	0.0012	-0.2	-0.0002	-0.1	0.0006	-0.3	-0.2	74	0.0055
hz	2	5	12.7339	25.7487	0.0009	-1.8	-0.0017	-0.7	0.0005	-3.2	-2.2	68	0.0047
hz	2	100	249.0386	8.4626	0.0020	0.1	0.0002	0.0	0.0014	0.2	0.2	48	0.0116
hz	2	110	249.0330	8.5168	0.0020	0.5	0.0009	0.1	0.0014	0.7	0.7	50	0.0113
hz	2	120	249.0263	8.6081	0.0020	0.1	0.0002	0.0	0.0016	0.1	0.2	37	0.0132
hz	2	131	249.0329	8.4454	0.0020	1.9	0.0038	0.5	0.0012	3.0	2.5	60	0.0104
hz	2	142	248.4596	8.4778	0.0020	-0.0	-0.0000	-0.0	0.0020	-0.0	-	0	-
hz	2	1	277.6604	10.4955	0.0017	0.3	0.0005	0.1	0.0009	0.6	0.4	70	0.0081
hz	2	3	48.1812	14.1506	0.0013	0.2	0.0003	0.1	0.0007	0.3	0.2	70	0.0066

zen	2	6	97.0352	28.8242	0.0009	0.0	0.0000	0.0	0.0003	0.1	0.0	93	0.0040
zen	2	4	101.0377	18.0329	0.0012	1.6	0.0019	0.5	0.0004	4.9	1.6	90	0.0052
zen	2	5	97.3321	25.7466	0.0010	1.3	0.0013	0.5	0.0003	4.7	1.3	92	0.0042
zen	2	110	89.7706	8.5168	0.0020	-0.9	-0.0017	-0.2	0.0011	-1.5	-1.1	67	0.0100
zen	2	131	106.1215	8.4454	0.0020	-0.0	-0.0001	-0.0	0.0010	-0.1	-0.0	76	0.0095
zen	2	142	91.1824	8.4778	0.0020	-0.7	-0.0015	-0.2	0.0013	-1.1	-1.0	59	0.0107
zen	2	1	99.6428	10.4955	0.0017	1.9	0.0032	0.5	0.0007	4.6	2.0	84	0.0077
zen	2	3	100.2745	14.1506	0.0014	0.9	0.0012	0.3	0.0005	2.2	0.9	85	0.0062
dist	2	6	28.8243	28.8242	0.0004	-0.3	-0.0001	-0.1	0.0001	-1.0	-0.4	89	0.0017
dist	2	4	18.0333	18.0329	0.0004	-1.0	-0.0004	-0.4	0.0001	-3.2	-1.0	91	0.0017
dist	2	131	8.4452	8.4454	0.0004	0.5	0.0002	0.2	0.0002	1.2	0.6	83	0.0018
dist	2	142	8.4777	8.4778	0.0004	0.2	0.0001	0.1	0.0004	0.2	1.0	3	0.0102
dist	2	1	10.4962	10.4955	0.0004	-1.8	-0.0007	-0.7	0.0002	-4.6	-2.0	85	0.0018
dist	2	3	14.1503	14.1506	0.0004	0.7	0.0003	0.3	0.0002	1.8	0.8	86	0.0018
tour	2	6	0.0000	28.8242	0.0009	0.0	0.0000	0.0	0.0006	0.0	0.0	58	0.0048
hz	2	3	48.1818	14.1506	0.0013	-0.5	-0.0006	-0.1	0.0007	-0.9	-0.6	71	0.0065
hz	2	5	12.7315	25.7487	0.0009	0.5	0.0004	0.2	0.0006	0.7	0.6	62	0.0049
hz	2	300	383.2463	11.3346	0.0016	-0.2	-0.0003	-0.1	0.0009	-0.4	-0.3	65	0.0080
zen	2	6	97.0347	28.8242	0.0009	0.6	0.0005	0.2	0.0003	2.1	0.6	93	0.0040
zen	2	3	100.2758	14.1506	0.0014	-0.1	-0.0001	-0.0	0.0005	-0.2	-0.1	85	0.0062
zen	2	5	97.3322	25.7466	0.0010	1.2	0.0012	0.5	0.0003	4.3	1.2	92	0.0042
zen	2	300	96.5597	11.3346	0.0050	-0.1	-0.0004	-0.1	0.0016	-0.2	-0.1	90	0.0216
dist	2	6	28.8243	28.8242	0.0004	-0.3	-0.0001	-0.1	0.0001	-1.0	-0.4	89	0.0017
dist	2	3	14.1503	14.1506	0.0004	0.7	0.0003	0.3	0.0002	1.8	0.8	86	0.0018
tour	4	1000	0.1389	39.5063	0.0008	0.5	0.0004	0.2	0.0006	0.6	0.7	47	0.0047
hz	4	3	317.2312	20.6268	0.0011	-0.2	-0.0002	-0.1	0.0005	-0.4	-0.2	76	0.0050
hz	4	5	265.6449	18.8115	0.0011	-0.5	-0.0005	-0.2	0.0005	-1.0	-0.5	78	0.0052
hz	4	6	244.0607	17.6033	0.0012	-0.2	-0.0002	-0.1	0.0006	-0.3	-0.2	78	0.0055
hz	4	2	364.2107	18.0329	0.0012	0.5	0.0006	0.2	0.0006	1.0	0.6	77	0.0054
hz	4	1	1.4844	18.3275	0.0011	1.2	0.0014	0.4	0.0006	2.5	1.4	76	0.0054
hz	4	300	333.2418	8.4347	0.0020	0.6	0.0011	0.2	0.0016	0.7	1.0	35	0.0137

hz	4	100	389.6582	21.2774	0.0010	-0.8	-0.0009	-0.3	0.0006	-1.4	-1.0	64	0.0054
hz	4	110	389.6580	21.3050	0.0010	-0.9	-0.0009	-0.3	0.0006	-1.5	-1.1	66	0.0053
hz	4	120	389.6565	21.3493	0.0010	-0.0	-0.0000	-0.0	0.0009	-0.0	-0.0	33	0.0074
hz	4	143	389.4327	21.3124	0.0010	-0.0	-0.0000	-0.0	0.0010	-0.0	-	0	-
zen	4	3	99.2794	20.6268	0.0011	0.9	0.0010	0.3	0.0004	2.8	1.0	89	0.0049
zen	4	5	95.1808	18.8115	0.0012	0.2	0.0002	0.1	0.0003	0.7	0.2	92	0.0050
zen	4	6	94.2493	17.5987	0.0012	3.6	0.0044	1.2	-	-	-	-	-
zen	4	2	98.9591	18.0329	0.0012	1.2	0.0015	0.4	0.0004	3.8	1.3	90	0.0052
zen	4	1	98.7724	18.3275	0.0012	1.8	0.0021	0.6	0.0004	5.3	1.9	89	0.0052
zen	4	300	93.1425	8.4347	0.0065	0.1	0.0005	0.1	0.0021	0.2	0.1	90	0.0283
zen	4	110	95.0429	21.3050	0.0011	-0.0	-0.0000	-0.0	0.0005	-0.0	-0.0	82	0.0050
zen	4	143	95.6204	21.3124	0.0011	-0.2	-0.0002	-0.1	0.0005	-0.4	-0.2	76	0.0051
dist	4	3	20.6274	20.6268	0.0004	-1.5	-0.0006	-0.6	0.0001	-4.8	-1.6	90	0.0017
dist	4	5	18.8114	18.8115	0.0004	0.2	0.0001	0.1	0.0001	0.8	0.2	92	0.0017
dist	4	2	18.0334	18.0329	0.0004	-1.2	-0.0005	-0.5	0.0001	-4.0	-1.3	91	0.0017
dist	4	1	18.3274	18.3275	0.0004	0.2	0.0001	0.1	0.0001	0.6	0.2	88	0.0017
dist	4	143	21.3124	21.3124	0.0004	0.0	0.0000	0.0	0.0004	0.0	-	0	-
tour	3	1000	0.1393	39.4299	0.0008	1.2	0.0009	0.6	0.0006	1.5	1.8	41	0.0050
hz	3	310	72.8203	12.6957	0.0015	-1.1	-0.0015	-0.3	0.0010	-1.5	-1.5	52	0.0083
hz	3	4	83.3504	20.6268	0.0011	-2.2	-0.0024	-0.8	0.0005	-4.7	-2.5	77	0.0050
hz	3	5	150.5423	15.6633	0.0013	0.7	0.0009	0.2	0.0006	1.5	0.9	74	0.0060
hz	3	6	138.8216	20.9479	0.0011	-0.9	-0.0010	-0.3	0.0006	-1.7	-1.1	72	0.0051
hz	3	100	18.0998	22.5803	0.0010	0.6	0.0006	0.2	0.0006	1.0	0.8	64	0.0052
hz	3	110	18.0981	22.6019	0.0010	0.5	0.0005	0.2	0.0006	0.9	0.6	65	0.0052
hz	3	120	18.0953	22.6381	0.0010	0.5	0.0005	0.2	0.0006	0.7	0.6	59	0.0054
hz	3	131	18.0968	22.5688	0.0010	2.7	0.0028	1.0	-	-	-	-	-
hz	3	144	17.8886	22.5824	0.0010	-0.0	-0.0000	-0.0	0.0010	-0.0	-	0	-
hz	3	51	33.5376	26.9829	0.0009	-6.7	-0.0062	-2.6	-	-	-	-	-
zen	3	310	96.4550	12.6957	0.0045	0.0	0.0001	0.0	0.0014	0.1	0.0	90	0.0195
zen	3	4	100.7186	20.6268	0.0011	1.0	0.0011	0.4	0.0004	3.1	1.1	89	0.0049
zen	3	5	95.1586	15.6633	0.0013	1.8	0.0024	0.6	0.0005	4.9	2.0	86	0.0058

zen	3	6	95.8718	20.9446	0.0011	11.1	0.0123	4.1	-	-	-	-	-
zen	3	110	95.9861	22.6019	0.0011	0.1	0.0001	0.0	0.0005	0.2	0.1	81	0.0048
zen	3	131	102.1149	22.5688	0.0011	-0.1	-0.0001	-0.0	0.0004	-0.3	-0.1	86	0.0047
zen	3	144	96.5252	22.5824	0.0011	0.1	0.0001	0.0	0.0005	0.2	0.1	76	0.0050
zen	3	51	102.5496	26.9829	0.0010	0.0	0.0000	0.0	0.0005	0.1	0.0	77	0.0046
dist	3	4	20.6264	20.6268	0.0004	1.0	0.0004	0.4	0.0001	3.2	1.1	90	0.0017
dist	3	5	15.6633	15.6633	0.0004	0.1	0.0000	0.0	0.0001	0.3	0.1	87	0.0018
dist	3	131	22.5684	22.5688	0.0004	1.0	0.0004	0.4	0.0002	2.5	1.1	83	0.0018
dist	3	144	22.5824	22.5824	0.0004	-0.0	-0.0000	-0.0	0.0004	-0.0	-	0	-
dist	3	51	26.9835	26.9829	0.0004	-1.4	-0.0006	-0.6	0.0002	-2.5	-1.7	67	0.0020
tour	5	1000	0.1061	51.5819	0.0007	-0.8	-0.0006	-0.5	0.0004	-1.5	-1.0	72	0.0034
hz	5	3	364.1821	15.6633	0.0013	0.5	0.0006	0.1	0.0005	1.1	0.5	83	0.0057
hz	5	4	45.4013	18.8115	0.0011	-0.4	-0.0005	-0.1	0.0004	-1.1	-0.4	88	0.0049
hz	5	2	395.9702	25.7487	0.0009	0.9	0.0008	0.3	0.0004	2.3	1.0	85	0.0042
hz	5	1	13.7314	32.4910	0.0008	0.6	0.0005	0.3	0.0004	1.5	0.7	82	0.0038
hz	5	310	15.9271	16.4044	0.0012	-0.2	-0.0002	-0.1	0.0006	-0.4	-0.2	76	0.0058
hz	5	6	122.1579	6.2442	0.0050	-0.4	-0.0019	-0.2	0.0012	-1.5	-0.4	94	0.0213
hz	5	100	4.7248	33.1131	0.0008	-0.2	-0.0001	-0.1	0.0004	-0.4	-0.2	76	0.0039
hz	5	110	4.7241	33.1141	0.0008	-0.4	-0.0004	-0.2	0.0004	-0.9	-0.5	77	0.0039
hz	5	120	4.7225	33.1219	0.0008	-0.2	-0.0001	-0.1	0.0004	-0.3	-0.2	75	0.0040
hz	5	131	4.7247	33.1693	0.0008	-1.0	-0.0009	-0.5	0.0004	-2.4	-1.2	80	0.0038
hz	5	145	4.8602	33.1576	0.0008	0.0	0.0000	0.0	0.0008	0.0	-	0	-
hz	5	51	18.4422	34.6174	0.0008	1.6	0.0013	0.7	0.0005	2.8	1.9	69	0.0041
zen	5	3	104.8375	15.6633	0.0013	1.2	0.0016	0.4	0.0005	3.3	1.3	86	0.0058
zen	5	4	104.8183	18.8115	0.0012	0.7	0.0008	0.2	0.0003	2.5	0.7	92	0.0050
zen	5	2	102.7888	25.7487	0.0010	1.6	0.0016	0.6	0.0003	5.7	1.6	92	0.0042
zen	5	1	102.0956	32.4910	0.0009	1.2	0.0011	0.6	0.0002	4.8	1.3	93	0.0038
zen	5	310	101.8758	16.4044	0.0036	-0.4	-0.0015	-0.4	0.0011	-1.4	-0.4	91	0.0155
zen	5	6	97.8176	6.2442	0.0051	0.6	0.0028	0.3	0.0010	2.8	0.6	96	0.0213
zen	5	110	99.5489	33.1141	0.0009	0.1	0.0001	0.1	0.0003	0.4	0.2	88	0.0039
zen	5	131	103.7230	33.1693	0.0009	0.9	0.0008	0.4	0.0002	3.3	0.9	93	0.0038

zen	5	145	99.9177	33.1576	0.0009	0.9	0.0008	0.4	0.0004	2.2	1.0	84	0.0039
zen	5	51	104.1772	34.6174	0.0009	0.1	0.0001	0.0	0.0004	0.2	0.1	83	0.0039
dist	5	3	15.6633	15.6633	0.0004	0.1	0.0000	0.0	0.0001	0.3	0.1	87	0.0018
dist	5	4	18.8114	18.8115	0.0004	0.2	0.0001	0.1	0.0001	0.8	0.2	92	0.0017
dist	5	2	25.7485	25.7487	0.0004	0.5	0.0002	0.2	0.0001	1.4	0.5	88	0.0017
dist	5	1	32.4906	32.4910	0.0004	0.9	0.0004	0.4	0.0001	2.9	1.0	89	0.0017
dist	5	6	6.2441	6.2442	0.0004	0.2	0.0001	0.1	0.0001	0.9	0.3	91	0.0017
dist	5	131	33.1686	33.1693	0.0004	1.7	0.0007	0.7	0.0001	5.1	1.8	89	0.0017
dist	5	145	33.1576	33.1576	0.0004	-0.0	-0.0000	-0.0	0.0004	-0.0	-	0	-
dist	5	51	34.6177	34.6174	0.0004	-0.7	-0.0003	-0.3	0.0002	-1.3	-0.8	70	0.0020
tour	6	1000	0.1013	54.0044	0.0007	-0.8	-0.0006	-0.5	0.0004	-1.6	-1.0	72	0.0033
hz	6	5	329.0972	6.2442	0.0050	-0.4	-0.0021	-0.2	0.0012	-1.9	-0.4	95	0.0212
hz	6	4	30.7569	17.6033	0.0012	-0.7	-0.0009	-0.2	0.0004	-2.2	-0.8	88	0.0051
hz	6	3	359.3980	20.9479	0.0011	1.0	0.0011	0.4	0.0004	2.5	1.1	83	0.0048
hz	6	2	390.1785	28.8242	0.0009	-0.4	-0.0003	-0.2	0.0004	-1.0	-0.4	84	0.0040
hz	6	1	8.9764	33.8908	0.0008	0.6	0.0005	0.3	0.0004	1.5	0.7	81	0.0038
hz	6	300	0.5757	18.1202	0.0012	1.2	0.0014	0.4	0.0006	2.2	1.5	69	0.0057
hz	6	100	0.7802	35.3170	0.0008	-0.3	-0.0002	-0.1	0.0004	-0.5	-0.3	76	0.0038
hz	6	110	0.7791	35.3157	0.0008	0.4	0.0003	0.2	0.0004	0.8	0.4	77	0.0038
hz	6	120	0.7785	35.3202	0.0008	-0.2	-0.0002	-0.1	0.0004	-0.4	-0.2	71	0.0039
hz	6	146	0.9027	35.3662	0.0008	0.0	0.0000	0.0	0.0008	0.0	-	0	-
hz	6	51	14.1391	35.5451	0.0008	-0.3	-0.0002	-0.1	0.0005	-0.5	-0.3	68	0.0040
zen	6	5	102.1761	6.2442	0.0051	0.7	0.0035	0.3	0.0010	3.5	0.7	96	0.0213
zen	6	4	105.9254	17.6033	0.0012	0.9	0.0011	0.3	0.0004	3.2	0.9	92	0.0052
zen	6	3	104.2688	20.9479	0.0011	-1.0	-0.0011	-0.4	0.0004	-2.9	-1.1	88	0.0048
zen	6	2	102.9639	28.8242	0.0009	1.2	0.0011	0.5	0.0003	4.4	1.2	93	0.0040
zen	6	1	102.4113	33.8908	0.0009	0.6	0.0005	0.3	0.0002	2.3	0.6	93	0.0037
zen	6	300	102.5650	18.1202	0.0033	-0.3	-0.0009	-0.3	0.0010	-0.9	-0.3	91	0.0142
zen	6	110	99.9630	35.3157	0.0009	-0.7	-0.0006	-0.3	0.0003	-2.0	-0.7	89	0.0037
zen	6	146	100.3085	35.3662	0.0009	-0.1	-0.0001	-0.1	0.0003	-0.4	-0.2	85	0.0038
zen	6	51	104.4517	35.5451	0.0009	0.1	0.0001	0.1	0.0004	0.3	0.1	83	0.0039

dist	6	5	6.2441	6.2442	0.0004	0.2	0.0001	0.1	0.0001	0.9	0.3	91	0.0017
dist	6	4	17.6033	17.6033	0.0004	-0.1	-0.0000	-0.0	0.0001	-0.3	-0.1	91	0.0017
dist	6	3	20.9474	20.9479	0.0004	1.2	0.0005	0.5	0.0001	3.4	1.3	87	0.0018
dist	6	2	28.8246	28.8242	0.0004	-1.1	-0.0004	-0.4	0.0001	-3.3	-1.2	89	0.0017
dist	6	1	33.8907	33.8908	0.0004	0.2	0.0001	0.1	0.0001	0.7	0.3	89	0.0017
dist	6	146	35.3662	35.3662	0.0004	-0.0	-0.0000	-0.0	0.0004	-0.0	-	0	-
dist	6	51	35.5427	35.5451	0.0004	6.0	0.0024	2.4	-	-	-	-	-
tour	250	1000	0.1252	45.3595	0.0016	1.0	0.0016	1.1	0.0007	2.3	1.1	81	0.0073
hz	250	3	334.7300	17.4024	0.0016	1.9	0.0031	0.8	0.0008	3.7	2.2	74	0.0076
hz	250	5	265.1649	10.4650	0.0016	-0.2	-0.0003	-0.1	0.0010	-0.3	-0.3	58	0.0086
hz	250	300	385.6445	9.7517	0.0016	-2.2	-0.0036	-0.6	0.0011	-3.2	-3.2	50	0.0093
hz	250	6	224.8961	9.2635	0.0016	-0.0	-0.0001	-0.0	0.0012	-0.1	-0.1	45	0.0098
hz	250	1	8.7970	24.8426	0.0016	-2.3	-0.0036	-1.4	0.0007	-4.9	-2.6	79	0.0074
hz	250	4	45.8570	8.6124	0.0016	1.9	0.0030	0.4	0.0012	2.5	2.8	46	0.0097
zen	250	3	104.0347	17.4024	0.0024	-0.5	-0.0011	-0.3	0.0008	-1.5	-0.5	90	0.0104
zen	250	5	99.4658	10.4650	0.0024	0.5	0.0013	0.2	0.0012	1.1	0.6	76	0.0113
zen	250	300	102.7956	9.7517	0.0050	0.3	0.0013	0.2	0.0020	0.6	0.3	83	0.0225
zen	250	6	97.9264	9.2635	0.0024	1.0	0.0023	0.3	0.0013	1.8	1.2	70	0.0118
zen	250	1	102.5164	24.8426	0.0024	0.6	0.0014	0.5	0.0005	2.6	0.6	95	0.0101
zen	250	4	109.9119	8.6124	0.0024	-1.5	-0.0036	-0.5	0.0014	-2.6	-1.9	66	0.0121
dist	250	3	17.4023	17.4024	0.0004	0.2	0.0001	0.1	0.0002	0.4	0.2	84	0.0018
dist	250	5	10.4652	10.4650	0.0004	-0.4	-0.0002	-0.2	0.0002	-1.0	-0.5	80	0.0018
dist	250	6	9.2637	9.2635	0.0004	-0.5	-0.0002	-0.2	0.0002	-1.0	-0.5	78	0.0019
dist	250	1	24.8425	24.8426	0.0004	0.1	0.0001	0.1	0.0002	0.3	0.2	77	0.0019
dist	250	4	8.6122	8.6124	0.0004	0.5	0.0002	0.2	0.0002	1.0	0.6	78	0.0019
tour	11	6	0.0000	33.8964	0.0008	0.4	0.0003	0.2	0.0004	0.9	0.5	78	0.0038
hz	11	21	59.0640	10.4116	0.0017	-0.9	-0.0015	-0.2	0.0008	-1.9	-1.0	76	0.0079
hz	11	4	379.2045	18.3337	0.0011	0.7	0.0009	0.2	0.0005	1.9	0.8	84	0.0051
hz	11	131	115.8412	4.7542	0.0032	-0.5	-0.0017	-0.1	0.0020	-0.8	-0.7	59	0.0170
hz	11	310	9.4473	16.1113	0.0012	0.1	0.0001	0.0	0.0006	0.1	0.1	73	0.0060
hz	11	200	395.6403	24.8389	0.0010	-0.9	-0.0009	-0.3	0.0005	-1.7	-1.1	73	0.0046

hz	11	210	395.6406	24.8534	0.0010	-0.5	-0.0005	-0.2	0.0005	-1.0	-0.6	74	0.0046
hz	11	220	395.6412	24.8800	0.0010	-0.0	-0.0000	-0.0	0.0005	-0.1	-0.1	73	0.0046
hz	11	231	395.6369	24.8526	0.0010	-0.3	-0.0003	-0.1	0.0005	-0.5	-0.3	75	0.0046
hz	11	241	395.4040	24.8525	0.0010	-0.0	-0.0000	-0.0	0.0010	-0.0	-	0	-
hz	11	31	41.9567	23.9993	0.0010	-111.3	-0.1091	-41.1	-	-	-	-	-
hz	11	5	11.6913	32.4957	0.0008	1.1	0.0009	0.5	0.0004	2.4	1.3	78	0.0039
zen	11	6	97.6738	33.8945	0.0009	0.6	0.0005	0.3	0.0002	2.1	0.6	93	0.0037
zen	11	21	100.6168	10.4116	0.0017	1.4	0.0023	0.4	0.0007	3.1	1.5	81	0.0078
zen	11	4	101.2081	18.3337	0.0012	1.3	0.0015	0.4	0.0004	3.8	1.4	88	0.0052
zen	11	131	111.6419	4.7542	0.0032	0.5	0.0017	0.1	0.0018	0.9	0.6	68	0.0158
zen	11	310	97.6621	16.1113	0.0037	0.1	0.0005	0.1	0.0011	0.5	0.1	91	0.0158
zen	11	210	97.1238	24.8534	0.0010	0.4	0.0004	0.1	0.0004	0.9	0.4	84	0.0045
zen	11	231	102.8228	24.8526	0.0010	-0.1	-0.0001	-0.0	0.0004	-0.1	-0.1	82	0.0046
zen	11	241	97.6105	24.8525	0.0010	-0.3	-0.0004	-0.1	0.0005	-0.8	-0.4	79	0.0047
zen	11	31	100.2914	23.9993	0.0010	26.5	0.0274	10.3	-	-	-	-	-
zen	11	5	97.8947	32.4957	0.0009	0.5	0.0004	0.2	0.0002	1.7	0.5	93	0.0038
dist	11	21	10.4122	10.4116	0.0004	-1.4	-0.0006	-0.6	0.0002	-3.4	-1.5	83	0.0018
dist	11	4	18.3333	18.3337	0.0004	1.1	0.0004	0.4	0.0001	3.0	1.1	87	0.0018
dist	11	131	4.7541	4.7542	0.0004	0.3	0.0001	0.1	0.0002	0.7	0.4	80	0.0018
dist	11	231	24.8525	24.8526	0.0004	0.2	0.0001	0.1	0.0002	0.4	0.2	77	0.0019
dist	11	241	24.8525	24.8525	0.0004	0.0	0.0000	0.0	0.0004	0.0	-	0	-
dist	11	31	24.0105	23.9993	0.0004	-28.1	-0.0112	-11.2	-	-	-	-	-
dist	11	5	32.4956	32.4957	0.0004	0.3	0.0001	0.1	0.0001	1.0	0.3	89	0.0017
tour	21	6	0.0000	28.8913	0.0009	-1.5	-0.0013	-0.6	0.0005	-2.8	-1.7	74	0.0043
hz	21	5	12.7144	25.8275	0.0009	-1.6	-0.0015	-0.6	0.0005	-3.1	-1.9	73	0.0045
hz	21	31	48.1703	14.2404	0.0013	-142.9	-0.1921	-43.0	-	-	-	-	-
hz	21	131	248.8698	8.3487	0.0020	0.8	0.0016	0.2	0.0013	1.3	1.1	58	0.0107
hz	21	300	383.5516	11.3829	0.0016	-0.3	-0.0004	-0.1	0.0009	-0.4	-0.3	66	0.0079
hz	21	200	387.0519	21.0848	0.0011	0.5	0.0006	0.2	0.0007	0.9	0.7	62	0.0055
hz	21	210	387.0528	21.1036	0.0011	0.4	0.0004	0.1	0.0006	0.6	0.5	64	0.0054
hz	21	220	387.0537	21.1372	0.0011	0.3	0.0004	0.1	0.0007	0.6	0.4	62	0.0055

hz	21	231	387.0477	21.0925	0.0011	1.8	0.0019	0.6	0.0006	3.2	2.1	70	0.0052
hz	21	242	386.8445	21.0954	0.0011	-0.0	-0.0000	-0.0	0.0011	-0.0	-	0	-
hz	21	4	360.9008	18.0471	0.0012	2.9	0.0034	1.0	-	-	-	-	-
hz	21	11	277.7059	10.4116	0.0017	0.4	0.0007	0.1	0.0010	0.7	0.5	67	0.0084
zen	21	6	97.0481	28.8889	0.0009	-0.4	-0.0004	-0.2	0.0003	-1.5	-0.4	92	0.0040
zen	21	5	97.1005	25.8275	0.0010	1.0	0.0010	0.4	0.0003	3.5	1.1	91	0.0043
zen	21	31	100.0383	14.2404	0.0014	33.1	0.0461	10.3	-	-	-	-	-
zen	21	131	105.8292	8.3487	0.0020	0.3	0.0005	0.1	0.0010	0.5	0.3	74	0.0096
zen	21	300	96.3059	11.3829	0.0050	0.5	0.0026	0.5	0.0016	1.7	0.6	90	0.0215
zen	21	210	96.3063	21.1036	0.0011	0.5	0.0005	0.2	0.0005	1.2	0.5	82	0.0050
zen	21	231	103.0201	21.0925	0.0011	0.2	0.0003	0.1	0.0005	0.5	0.3	80	0.0051
zen	21	242	96.8777	21.0954	0.0011	0.5	0.0006	0.2	0.0005	1.1	0.6	77	0.0052
zen	21	4	100.8698	18.0471	0.0012	1.5	0.0019	0.5	0.0004	4.6	1.6	89	0.0052
zen	21	11	99.3785	10.4116	0.0017	1.4	0.0025	0.4	0.0007	3.3	1.6	81	0.0078
dist	21	5	25.8275	25.8275	0.0004	0.0	0.0000	0.0	0.0001	0.1	0.0	87	0.0018
dist	21	31	14.2433	14.2404	0.0004	-7.3	-0.0029	-2.9	-	-	-	-	-
dist	21	131	8.3492	8.3487	0.0004	-1.2	-0.0005	-0.5	0.0002	-2.8	-1.3	82	0.0018
dist	21	231	21.0924	21.0925	0.0004	0.2	0.0001	0.1	0.0002	0.4	0.2	79	0.0018
dist	21	242	21.0954	21.0954	0.0004	-0.0	-0.0000	-0.0	0.0004	-0.0	-	0	-
dist	21	4	18.0473	18.0471	0.0004	-0.6	-0.0002	-0.2	0.0001	-1.7	-0.6	90	0.0017
dist	21	11	10.4122	10.4116	0.0004	-1.4	-0.0006	-0.6	0.0002	-3.4	-1.5	83	0.0018
tour	31	1000	399.0238	39.4322	0.0008	0.2	0.0002	0.1	0.0006	0.3	0.4	40	0.0050
hz	31	11	29.1473	23.9993	0.0010	1.3	0.0013	0.5	0.0005	2.5	1.6	72	0.0047
hz	31	21	16.6368	14.2404	0.0013	-1.2	-0.0016	-0.4	0.0007	-2.3	-1.4	73	0.0064
hz	31	4	82.2393	20.6116	0.0011	0.4	0.0004	0.1	0.0005	0.8	0.4	80	0.0049
hz	31	131	16.9650	22.5659	0.0010	-0.6	-0.0006	-0.2	0.0005	-1.1	-0.7	72	0.0049
hz	31	310	71.6863	12.6821	0.0015	0.4	0.0006	0.1	0.0010	0.6	0.6	51	0.0083
hz	31	200	108.8896	17.3721	0.0012	-0.0	-0.0000	-0.0	0.0009	-0.0	-0.1	46	0.0072
hz	31	210	108.8898	17.3953	0.0012	-0.2	-0.0002	-0.1	0.0008	-0.3	-0.3	51	0.0068
hz	31	220	108.8902	17.4364	0.0012	-0.4	-0.0004	-0.1	0.0009	-0.5	-0.5	46	0.0072
hz	31	231	108.8871	17.3799	0.0012	0.8	0.0009	0.3	0.0007	1.3	1.0	65	0.0060

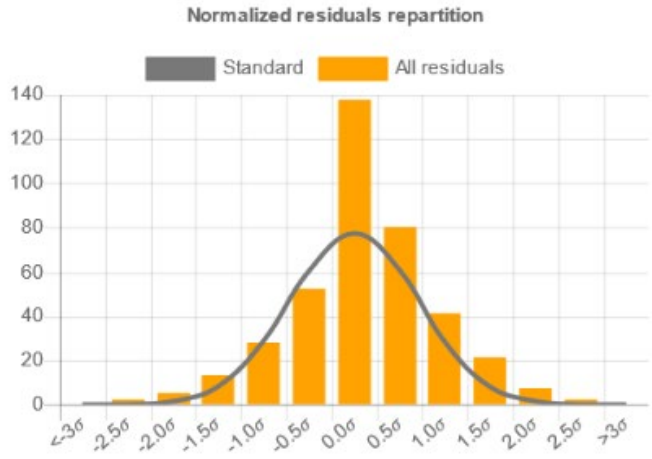
hz	31	243	109.1286	17.3933	0.0012	-0.0	-0.0000	-0.0	0.0012	-0.0	-	0	-
hz	31	5	149.4966	15.6512	0.0013	-1.3	-0.0016	-0.4	0.0007	-2.3	-1.5	68	0.0063
zen	31	11	99.6816	23.9993	0.0010	-0.1	-0.0001	-0.1	0.0004	-0.4	-0.1	87	0.0045
zen	31	21	99.9152	14.2404	0.0014	0.3	0.0005	0.1	0.0006	0.8	0.4	81	0.0064
zen	31	4	100.7035	20.6116	0.0011	1.3	0.0014	0.5	0.0004	3.7	1.3	88	0.0049
zen	31	131	102.1019	22.5659	0.0011	-0.8	-0.0009	-0.3	0.0004	-2.1	-0.9	84	0.0047
zen	31	310	96.4268	12.6821	0.0045	-0.1	-0.0005	-0.1	0.0014	-0.3	-0.1	90	0.0195
zen	31	210	95.4494	17.3953	0.0012	-0.3	-0.0004	-0.1	0.0006	-0.7	-0.4	78	0.0057
zen	31	231	103.5971	17.3799	0.0012	-0.1	-0.0002	-0.0	0.0006	-0.3	-0.2	75	0.0059
zen	31	243	96.1433	17.3933	0.0012	0.5	0.0006	0.2	0.0007	0.9	0.5	72	0.0060
zen	31	5	95.1360	15.6512	0.0013	0.7	0.0009	0.2	0.0005	1.8	0.8	85	0.0058
dist	31	11	23.9995	23.9993	0.0004	-0.6	-0.0002	-0.2	0.0002	-1.4	-0.6	83	0.0018
dist	31	21	14.2413	14.2404	0.0004	-2.3	-0.0009	-0.9	0.0002	-5.2	-2.6	80	0.0018
dist	31	4	20.6114	20.6116	0.0004	0.6	0.0002	0.2	0.0001	1.6	0.6	87	0.0018
dist	31	131	22.5654	22.5659	0.0004	1.2	0.0005	0.5	0.0002	2.7	1.3	81	0.0018
dist	31	231	17.3793	17.3799	0.0004	1.4	0.0006	0.6	0.0002	2.9	1.6	76	0.0019
dist	31	243	17.3933	17.3933	0.0004	-0.0	-0.0000	-0.0	0.0004	-0.0	-	0	-
dist	31	5	15.6513	15.6512	0.0004	-0.4	-0.0001	-0.1	0.0002	-0.8	-0.4	81	0.0018
tour	4	1000	5.7785	39.5063	0.0008	0.4	0.0003	0.2	0.0006	0.6	0.7	44	0.0048
hz	4	131	395.2954	21.2461	0.0010	0.1	0.0001	0.0	0.0006	0.1	0.1	72	0.0051
hz	4	6	249.6984	17.6033	0.0012	1.4	0.0016	0.4	0.0006	2.9	1.5	78	0.0055
hz	4	21	370.1750	18.0471	0.0012	-1.3	-0.0015	-0.4	0.0006	-2.4	-1.5	72	0.0056
hz	4	31	322.8533	20.6116	0.0011	-1.1	-0.0012	-0.4	0.0006	-1.9	-1.3	68	0.0053
hz	4	200	260.6293	8.5761	0.0019	0.5	0.0010	0.1	0.0012	0.8	0.6	62	0.0101
hz	4	210	260.6313	8.6339	0.0019	0.5	0.0009	0.1	0.0012	0.8	0.6	64	0.0100
hz	4	220	260.6352	8.7303	0.0019	0.1	0.0003	0.0	0.0012	0.2	0.2	62	0.0101
hz	4	231	260.6223	8.5404	0.0019	0.5	0.0011	0.1	0.0012	0.9	0.7	63	0.0100
hz	4	244	259.8529	8.5632	0.0020	0.0	0.0000	0.0	0.0020	0.0	-	0	-
hz	4	11	7.1195	18.3337	0.0011	-0.6	-0.0007	-0.2	0.0006	-1.1	-0.7	70	0.0056
zen	4	131	101.5476	21.2461	0.0011	-0.1	-0.0001	-0.0	0.0004	-0.2	-0.1	89	0.0048
zen	4	6	94.0724	17.6033	0.0012	1.0	0.0012	0.3	0.0004	3.5	1.1	92	0.0052

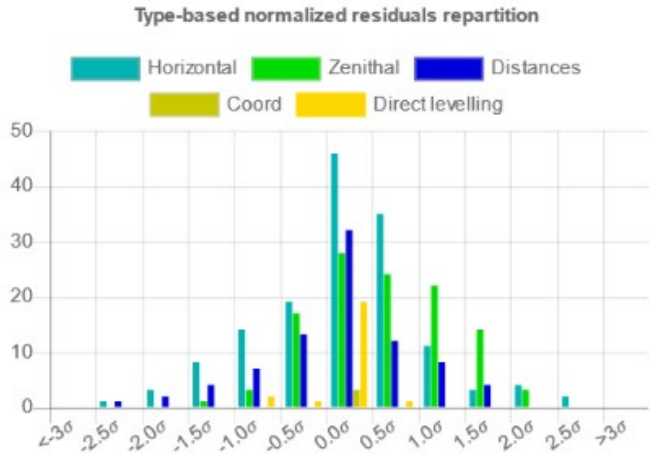
zen	4	21	99.1268	18.0471	0.0012	1.4	0.0017	0.5	0.0004	4.2	1.5	89	0.0052
zen	4	31	99.2942	20.6116	0.0011	1.0	0.0011	0.3	0.0004	2.8	1.0	88	0.0049
zen	4	210	89.1012	8.6339	0.0020	0.8	0.0016	0.2	0.0010	1.6	1.0	72	0.0095
zen	4	231	105.6225	8.5404	0.0020	-0.2	-0.0004	-0.1	0.0011	-0.3	-0.2	67	0.0099
zen	4	244	90.4406	8.5632	0.0020	-0.3	-0.0005	-0.1	0.0012	-0.4	-0.3	63	0.0103
zen	4	11	98.7891	18.3337	0.0012	1.2	0.0014	0.4	0.0004	3.5	1.3	88	0.0052
dist	4	131	21.2454	21.2461	0.0004	1.7	0.0007	0.7	0.0001	4.9	1.9	88	0.0018
dist	4	6	17.6033	17.6033	0.0004	-0.1	-0.0000	-0.0	0.0001	-0.3	-0.1	91	0.0017
dist	4	21	18.0473	18.0471	0.0004	-0.6	-0.0002	-0.2	0.0001	-1.7	-0.6	90	0.0017
dist	4	31	20.6124	20.6116	0.0004	-1.9	-0.0008	-0.8	0.0001	-5.3	-2.1	87	0.0018
dist	4	231	8.5407	8.5404	0.0004	-0.8	-0.0003	-0.3	0.0002	-1.8	-0.9	78	0.0019
dist	4	244	8.5632	8.5632	0.0004	0.1	0.0000	0.0	0.0004	0.1	0.3	3	0.0091
dist	4	11	18.3333	18.3337	0.0004	1.1	0.0004	0.4	0.0001	3.0	1.1	87	0.0018
tour	6	1000	2.2692	54.0044	0.0007	0.2	0.0001	0.1	0.0004	0.3	0.2	59	0.0037
hz	6	11	11.1382	33.8964	0.0008	0.2	0.0002	0.1	0.0004	0.4	0.3	71	0.0040
hz	6	21	392.4928	28.8913	0.0009	-0.1	-0.0001	-0.0	0.0004	-0.2	-0.1	75	0.0042
hz	6	5	331.2616	6.2442	0.0050	0.4	0.0020	0.2	0.0012	1.7	0.4	94	0.0213
hz	6	4	32.9244	17.6033	0.0012	0.2	0.0002	0.1	0.0004	0.5	0.2	86	0.0052
hz	6	231	22.8963	9.5629	0.0018	0.2	0.0003	0.1	0.0011	0.3	0.2	65	0.0093
hz	6	246	23.4354	9.2732	0.0018	-0.0	-0.0000	-0.0	0.0018	-0.0	-	0	-
hz	6	200	22.8894	9.2759	0.0018	0.0	0.0000	0.0	0.0011	0.0	0.0	65	0.0093
hz	6	210	22.8872	9.2608	0.0018	0.1	0.0003	0.0	0.0011	0.2	0.2	66	0.0092
hz	6	220	22.8843	9.2649	0.0018	0.1	0.0002	0.0	0.0011	0.2	0.2	65	0.0093
hz	6	310	2.7452	18.1189	0.0012	-1.0	-0.0012	-0.3	0.0006	-1.9	-1.2	71	0.0056
zen	6	11	102.4192	33.8964	0.0009	0.7	0.0007	0.3	0.0002	2.8	0.8	93	0.0037
zen	6	21	103.0616	28.8913	0.0009	1.1	0.0010	0.5	0.0003	3.8	1.1	92	0.0040
zen	6	5	102.1754	6.2442	0.0051	0.8	0.0042	0.4	0.0010	4.2	0.8	96	0.0213
zen	6	4	105.9256	17.6033	0.0012	0.7	0.0009	0.3	0.0004	2.6	0.8	92	0.0052
zen	6	231	116.0783	9.5629	0.0018	0.1	0.0001	0.0	0.0010	0.1	0.1	68	0.0091
zen	6	246	102.4394	9.2732	0.0019	0.1	0.0001	0.0	0.0011	0.1	0.1	65	0.0095
zen	6	210	101.1399	9.2608	0.0019	-0.5	-0.0010	-0.1	0.0010	-1.0	-0.6	72	0.0090
zen	6	310	102.4506	18.1189	0.0033	-0.7	-0.0022	-0.6	0.0010	-2.3	-0.7	91	0.0142

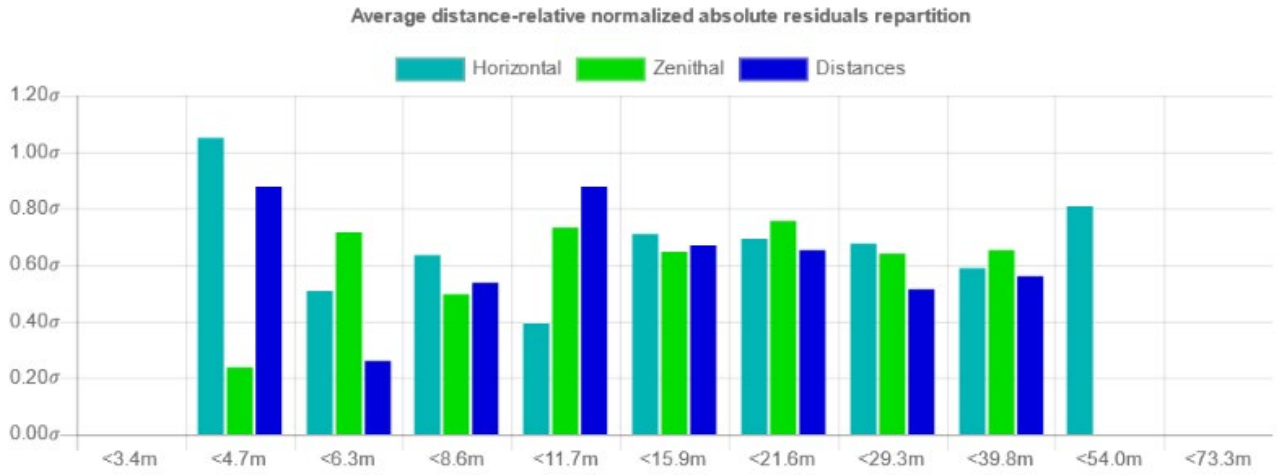
dist	6	11	33.8966	33.8964	0.0004	-0.6	-0.0002	-0.2	0.0001	-1.6	-0.6	86	0.0018
dist	6	21	28.8915	28.8913	0.0004	-0.5	-0.0002	-0.2	0.0001	-1.4	-0.6	86	0.0018
dist	6	5	6.2441	6.2442	0.0004	0.2	0.0001	0.1	0.0001	0.9	0.3	91	0.0017
dist	6	4	17.6033	17.6033	0.0004	-0.1	-0.0000	-0.0	0.0001	-0.3	-0.1	91	0.0017
dist	6	231	9.5622	9.5629	0.0004	1.7	0.0007	0.7	0.0002	3.6	2.0	78	0.0019
dist	6	246	9.2732	9.2732	0.0004	0.0	0.0000	0.0	0.0004	0.0	-	0	-
tour	5	1000	1.3670	51.5819	0.0007	-1.7	-0.0012	-1.0	0.0004	-2.9	-2.1	65	0.0035
hz	5	31	365.4854	15.6512	0.0013	-0.6	-0.0007	-0.2	0.0006	-1.2	-0.7	77	0.0059
hz	5	4	46.6628	18.8115	0.0011	-1.5	-0.0017	-0.5	0.0004	-4.1	-1.6	86	0.0050
hz	5	131	5.9855	33.1693	0.0008	-1.7	-0.0014	-0.7	0.0004	-3.6	-2.0	77	0.0039
hz	5	310	17.1843	16.4044	0.0012	2.3	0.0028	0.7	0.0006	4.7	2.7	75	0.0058
hz	5	200	55.3079	10.4708	0.0017	0.2	0.0003	0.0	0.0011	0.2	0.2	58	0.0090
hz	5	210	55.3060	10.4652	0.0017	0.4	0.0007	0.1	0.0010	0.6	0.5	60	0.0088
hz	5	220	55.3038	10.4785	0.0017	0.3	0.0005	0.1	0.0011	0.5	0.4	58	0.0090
hz	5	21	397.3587	25.8275	0.0009	0.8	0.0008	0.3	0.0004	1.8	0.9	79	0.0043
hz	5	11	14.9810	32.4957	0.0008	2.3	0.0019	1.0	0.0004	4.6	2.6	76	0.0040
hz	5	245	54.8426	10.4882	0.0017	-0.0	-0.0000	-0.0	0.0017	-0.0	-	0	-
hz	5	6	123.4145	6.2442	0.0025	0.7	0.0018	0.2	0.0012	1.4	0.8	76	0.0117
zen	5	31	104.8624	15.6512	0.0013	0.6	0.0008	0.2	0.0005	1.6	0.7	85	0.0058
zen	5	4	104.8141	18.8115	0.0012	4.3	0.0050	1.5	-	-	-	-	-
zen	5	131	103.7241	33.1693	0.0009	-0.3	-0.0003	-0.2	0.0002	-1.3	-0.4	93	0.0038
zen	5	310	101.8716	16.4044	0.0036	0.7	0.0027	0.7	0.0011	2.5	0.8	91	0.0155
zen	5	210	99.7088	10.4652	0.0017	-0.7	-0.0012	-0.2	0.0009	-1.4	-0.8	75	0.0081
zen	5	21	102.8974	25.8275	0.0010	1.3	0.0013	0.5	0.0003	4.5	1.4	91	0.0043
zen	5	11	102.1038	32.4957	0.0009	1.5	0.0014	0.7	0.0002	5.8	1.6	93	0.0038
zen	5	245	100.8599	10.4882	0.0017	-0.4	-0.0008	-0.1	0.0010	-0.8	-0.5	68	0.0085
zen	5	6	97.8183	6.2442	0.0025	0.8	0.0021	0.2	0.0010	2.1	0.9	84	0.0114
dist	5	31	15.6513	15.6512	0.0004	-0.4	-0.0001	-0.1	0.0002	-0.8	-0.4	81	0.0018
dist	5	4	18.8114	18.8115	0.0004	0.2	0.0001	0.1	0.0001	0.8	0.2	92	0.0017
dist	5	131	33.1696	33.1693	0.0004	-0.8	-0.0003	-0.3	0.0001	-2.4	-0.8	89	0.0017
dist	5	21	25.8275	25.8275	0.0004	0.0	0.0000	0.0	0.0001	0.1	0.0	87	0.0018
dist	5	11	32.4956	32.4957	0.0004	0.3	0.0001	0.1	0.0001	1.0	0.3	89	0.0017

dist	5	245	10.4882	10.4882	0.0004	-0.0	-0.0000	-0.0	0.0004	-0.0	-	0	-
dist	5	6	6.2441	6.2442	0.0004	0.2	0.0001	0.1	0.0001	0.9	0.3	91	0.0017

Residual repartition







Pseudo random propositions

System redundancy: 251

Observations sigmas may be multiplied by:
Horizontal angles: 0.9705
Zenith angles: 0.9710
Distances: 0.9568

Biggest residuals

Code	From	To	Measure	Distance	Total σ	Normalized residual	Residual	Residual mm	A posteriori σ	Standard residual	Résidu normé	Redondancy	∇	Faute probable
hz	250	300	385.6445	9.7517	0.0016	-2.2	-0.0036	-0.6	0.0011	-3.2	-3.2	50	0.0093	0.0072
hz	250	4	45.8570	8.6124	0.0016	1.9	0.0030	0.4	0.0012	2.5	2.8	46	0.0097	-0.0065
hz	5	310	17.1843	16.4044	0.0012	2.3	0.0028	0.7	0.0006	4.7	2.7	75	0.0058	-0.0038
hz	5	11	14.9810	32.4957	0.0008	2.3	0.0019	1.0	0.0004	4.6	2.6	76	0.0040	-0.0026
dist	31	21	14.2413	14.2404	0.0004	-2.3	-0.0009	-0.9	0.0002	-5.2	-2.6	80	0.0018	0.0012
hz	250	1	8.7970	24.8426	0.0016	-2.3	-0.0036	-1.4	0.0007	-4.9	-2.6	79	0.0074	0.0046
hz	3	4	83.3504	20.6268	0.0011	-2.2	-0.0024	-0.8	0.0005	-4.7	-2.5	77	0.0050	

Compensated coordinates

Name	E comp	N comp	Eh comp	ΔE	ΔN	ΔZ	σX init	σY init	σZ init	η	ξ	Active obs
1	336603.9421	463586.6695	-93.7447	1.5421	0.7695	-0.7447				16.4	-5.2	43
11	336603.9377	463586.6646	-93.7492	1.5377	0.7646	-0.7492				16.4	-5.2	41
2	336611.9480	463579.8838	-93.8039	0.0480	1.9838	-0.8039				16.4	-5.2	46
21	336611.8589	463579.9093	-93.8512	-0.0411	2.0093	-0.8512				16.4	-5.2	40
3	336625.6921	463576.5201	-93.8663	2.3921	-0.6799	-0.8663				16.4	-5.2	42
31	336625.6933	463576.5363	-93.8713	2.3933	-0.6637	-0.8713				16.4	-5.2	34
4	336619.5804	463596.2182	-94.0985	2.6204	0.6482	-1.0985				16.4	-5.2	80
5	336636.3905	463587.8974	-92.6774	1.4105	-0.5126	-1.6774				16.4	-5.2	88
6	336636.9794	463594.1098	-92.4636	2.0894	-0.6302	0.0154				16.4	-5.2	80
1000	336586.5338	463575.0675	-89.5000	0.6038	-0.4225	-			-	16.4	-5.2	11
100	336603.8105	463581.9920	-92.8325	0.9690	0.7585	-0.0107				16.4	-5.2	17
110	336603.8100	463581.9914	-92.4403	0.9690	0.7584	-0.0107				16.4	-5.2	19
120	336603.8094	463581.9906	-91.9555	1.7244	1.3236	-0.0555				16.4	-5.2	8
141	336603.8751	463582.0281	-92.6325	0.9690	0.7584	-0.0108				16.4	-5.2	4
142	336603.8015	463581.9154	-92.6325	0.9690	0.7584	-0.0107				16.4	-5.2	4

143	336603.8443	463581.9215	-92.6325	0.9690	0.7584	-0.0107				16.4	-5.2	4
144	336603.8001	463581.9172	-92.6325	0.9690	0.7584	-0.0107				16.4	-5.2	4
145	336603.7539	463582.0535	-92.6324	0.9691	0.7584	-0.0106				16.4	-5.2	4
146	336603.7395	463582.0386	-92.6325	0.9690	0.7584	-0.0107				16.4	-5.2	4
131	336603.8106	463581.9917	-94.6140	0.9689	0.7585	-0.0107				16.4	-5.2	29
130	336603.8105	463581.9917	-94.8140	0.9688	0.7585	-0.0107				16.4	-5.2	6
300	336619.9940	463587.8430	-93.1920	-0.0000	-0.0000	0.0000	0.0010	0.0010	0.0010	16.4	-5.2	17
310	336619.9942	463587.8426	-93.1590	0.9691	0.7584	-0.0127				16.4	-5.2	17
200	336627.7269	463593.7669	-93.0181	0.9690	0.7583	-0.0123				16.4	-5.2	18
210	336627.7269	463593.7666	-92.6285	2.5969	-0.9934	-1.6285				16.4	-5.2	21
220	336627.7270	463593.7662	-92.1411	2.5970	-0.9938	-1.5411				16.4	-5.2	9
241	336627.7071	463593.8568	-92.8181	0.9691	0.7583	-0.0123				16.4	-5.2	4
242	336627.6829	463593.8198	-92.8181	0.9691	0.7583	-0.0123				16.4	-5.2	4
243	336627.7929	463593.7693	-92.8181	0.9691	0.7583	-0.0123				16.4	-5.2	4
244	336627.7170	463593.8778	-92.8181	0.9690	0.7583	-0.0123				16.4	-5.2	4
245	336627.6659	463593.7156	-92.8181	0.9691	0.7583	-0.0123				16.4	-5.2	4
246	336627.7172	463593.8461	-92.8181	0.9691	0.7584	-0.0123				16.4	-5.2	4
250	336627.7276	463593.7669	-92.7642	0.9691	0.7583	-0.0123				16.4	-5.2	21
230	336627.7265	463593.7679	-95.0524	0.9689	0.7583	-0.0123				16.4	-5.2	6
231	336627.7265	463593.7680	-94.8524	0.9689	0.7584	0.1677				16.4	-5.2	18
51	336601.8719	463589.1470	-94.9444	0.9688	0.7585	-0.0104				16.4	-5.2	13
50	336601.8719	463589.1470	-95.1444	0.9688	0.7585	-0.1104				16.4	-5.2	3

Confidence ellipsoids

Name	1/2 Axis (mm)	Bearing (gr)	Tilt (gr)
1	1.2	198.1539	199.9811
	1.0	98.7226	97.8826
	1.0	98.1533	2.1173
11	1.2	197.8995	0.1032
	1.0	100.6330	97.5971
	1.0	97.8956	2.4007
2	1.1	148.6185	199.9425
	1.0	48.5626	49.1138
	1.0	48.6776	50.8861
21	1.1	148.7879	199.8994
	1.0	48.7471	175.4285
	1.0	49.0355	75.4282
3	1.1	66.3087	0.1826
	1.0	109.0900	99.7667
	1.0	166.3092	0.1453
31	1.1	65.8755	0.2171
	1.0	125.6815	99.6321
	1.0	165.8765	0.2970
4	1.0	88.5732	199.5366
	1.0	141.8036	100.6913
	1.0	188.5770	199.4871
5	1.2	2.7913	0.0765
	1.0	105.5636	98.2430
	1.0	102.7892	1.7554
6	1.3	179.9939	0.0323
	1.0	80.3051	93.4093
	1.0	79.9905	193.4094
1000	1.8	176.6708	0.0000
	1.4	76.6708	0.0000
100	1.2	179.3238	199.9749
	1.0	79.3256	195.4756
	1.0	78.9713	95.4756
110	1.2	179.3553	0.1318
	1.0	79.3859	14.5404
	1.0	78.7884	85.4589
120	2.2	63.0669	99.9845
	1.2	174.6594	199.9972
	1.1	74.6594	0.0152
141	1.3	182.5530	199.2398
	1.0	82.5849	197.3299
	1.0	64.9057	97.2237
142	1.3	174.1787	0.2603

	1.1	74.1730	198.5935
	1.0	85.8256	98.5696
	1.3	180.6730	0.0064
143	1.1	80.6731	199.7138
	1.0	79.2529	99.7137
	1.3	177.9043	0.0296
144	1.1	77.9044	199.6329
	1.0	72.7849	99.6317
	1.3	180.4165	0.0190
145	1.1	80.4166	199.5358
	1.0	77.8126	99.5354
	1.3	179.4109	0.0179
146	1.1	79.4110	199.5393
	1.0	76.9363	99.5390
	1.2	179.5596	0.0748
131	1.0	80.2401	93.0343
	1.0	79.5513	193.0347
	1.3	179.5583	0.0572
130	1.1	79.5589	199.3902
	1.0	73.6047	99.3875
	1.0	106.9570	198.9477
300	1.0	114.8326	98.8841
	1.0	11.9581	196.9875
	1.1	60.8461	0.0571
310	1.0	160.8461	0.0040
	1.0	65.3208	99.9428
	1.1	156.1507	199.9916
200	1.0	56.1503	2.9304
	1.0	56.3330	97.0695
	1.1	157.3681	199.3532
210	1.0	57.2510	11.3992
	1.0	60.9376	88.5821
	2.2	57.8103	99.9862
220	1.1	156.1554	0.0004
	1.0	56.1554	0.0138
	1.1	160.6408	199.9925
241	1.1	60.6407	199.5539
	1.0	61.7130	99.5538
	1.1	166.5196	0.0450
242	1.1	66.5199	199.4587
	1.0	61.2436	99.4568
	1.1	174.1027	0.1687
243	1.1	74.1046	199.3057
	1.0	58.9335	99.2855
244	1.1	148.4794	199.1192

	1.0	48.4457	2.4385
	1.0	70.5333	97.4072
245	1.1	154.1865	0.0912
	1.0	54.1851	198.9833
	1.0	59.8835	98.9793
246	1.1	142.4562	199.7252
	1.1	42.4521	0.9566
	1.0	60.2663	99.0047
250	1.1	160.6293	199.8895
	1.0	60.0034	88.8720
	1.0	60.6488	188.8725
230	1.1	162.5349	199.9430
	1.1	62.5344	199.4224
	1.0	68.7945	99.4196
231	1.1	162.4644	199.8820
	1.0	62.3450	50.3522
	1.0	62.5811	49.6476
51	1.3	6.4742	199.6813
	1.0	104.9232	87.0978
	1.0	106.5397	187.1019
50	1.3	6.4747	199.7470
	1.1	106.4655	197.6880
	1.0	113.4118	97.6742

Confidence semi-intervals

Name	σX (mm)	σY (mm)	σZ (mm)
1	1.0	1.2	1.0
11	1.0	1.2	1.0
2	1.0	1.0	1.0
21	1.0	1.0	1.0
3	1.1	1.0	1.0
31	1.1	1.0	1.0
4	1.0	1.0	1.0
5	1.0	1.2	1.0
6	1.0	1.2	1.0
1000	1.5	1.8	-
100	1.0	1.2	1.0
110	1.0	1.2	1.0
120	1.1	1.2	2.2
141	1.0	1.3	1.0
142	1.1	1.2	1.0
143	1.1	1.3	1.0
144	1.1	1.3	1.0
145	1.1	1.3	1.0
146	1.1	1.3	1.0
131	1.0	1.2	1.0

130	1.1	1.3	1.0
300	1.0	1.0	1.0
310	1.0	1.0	1.1
200	1.0	1.1	1.0
210	1.0	1.1	1.0
220	1.0	1.1	2.2
241	1.1	1.1	1.0
242	1.1	1.1	1.0
243	1.1	1.1	1.0
244	1.1	1.1	1.0
245	1.1	1.1	1.0
246	1.1	1.1	1.0
250	1.0	1.0	1.0
230	1.1	1.1	1.0
231	1.0	1.1	1.0
51	1.0	1.3	1.0
50	1.1	1.3	1.1

6.3.2 Sinex file : 22901_IGN_2021-267_v11.SNX

```
%=SNX 2.10 IGN 22:152:40162 IGN 21:267:00000 21:267:00000 C 00009
*-------------------------------------------------------------------------------
+FILE/COMMENT
* File created by COMP3D v5.21rc3-win
* Original computation file: calcul3.comp
* Matrix Scalling Factor used:          0.9257
-FILE/COMMENT
*-------------------------------------------------------------------------------
+SITE/ID
*CODE PT __DOMES__ T _STATION DESCRIPTION__ APPROX_LON_ APPROX_LAT_ _APP_H_
 MALB  A 22901S002 D                       73 31 40.2   4 11 33.7   -92.4
 HULE  A 22901M003 P                       73 31 40.8   4 11 33.9   -93.2
 MALC  A 22901S003 D                       73 31 41.0   4 11 34.1   -92.6
-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   MALB  A    1 21:267:00000 m    2 0.180368245712260E+07 0.10331E-02
     2 STAY   MALB  A    1 21:267:00000 m    2 0.610001539239148E+07 0.10375E-02
     3 STAZ   MALB  A    1 21:267:00000 m    2 0.463193526041004E+06 0.12067E-02
     4 STAX   HULE  A    1 21:267:00000 m    2 0.180366661261266E+07 0.96215E-03
     5 STAY   HULE  A    1 21:267:00000 m    2 0.610001884719852E+07 0.96215E-03
     6 STAZ   HULE  A    1 21:267:00000 m    2 0.463199337650831E+06 0.96215E-03
     7 STAX   MALC  A    1 21:267:00000 m    2 0.180365924353773E+07 0.10341E-02
     8 STAY   MALC  A    1 21:267:00000 m    2 0.610002115928768E+07 0.10349E-02
     9 STAZ   MALC  A    1 21:267:00000 m    2 0.463205301399822E+06 0.10514E-02
-SOLUTION/ESTIMATE
*-------------------------------------------------------------------------------
+SOLUTION/MATRIX_ESTIMATE L COVA
*PARA1 PARA2 ____PARA2+0__________ ____PARA2+1__________ ____PARA2+2__________
     1     1 0.106726791062188E-05
     2     1 -.755725857689471E-08 0.107647503093150E-05
     3     1 0.131670370363311E-06 -.701372735348168E-07 0.145612068502370E-05
```

```
     4     1 0.925730076419123E-06 0.171880130056481E-12 0.241598265767129E-12
     4     4 0.925730720179698E-06
     5     1 -.217718211871016E-11 0.925731301474085E-06 0.817077965901066E-12
     5     4 -.709390093325477E-20 0.925730720179680E-06
     6     1 -.166433844422430E-12 0.444368122050075E-13 0.925730782641078E-06
     6     4 0.428016336159439E-19 -.373356241281935E-19 0.925730720179998E-06
     7     1 0.915977163198907E-06 0.521362659239032E-07 -.178798003659201E-06
     7     4 0.925731030219998E-06 0.104854854757927E-11 0.801562548634207E-13
     7     7 0.106936665299794E-05
     8     1 0.459154442404024E-07 0.103037881635606E-05 0.776873473378892E-07
     8     4 -.730290876938531E-13 0.925730473197137E-06 -.188806151689903E-13
     8     7 -.948459623772027E-08 0.107102392959283E-05
     9     1 -.985343363085648E-07 0.540579218695239E-07 0.735671911762374E-06
     9     4 -.243909322510785E-12 -.824895371037646E-12 0.925730657121177E-06
     9     7 0.618720562656740E-07 -.205157372011345E-07 0.110553498432997E-05
-SOLUTION/MATRIX_ESTIMATE L COVA
%ENDSNX
```

Diffusion interne		
Direction / Service	**Fonction**	**Adresse électronique**
DOT	Directeur	philippe.gerbe@ign.fr
DOT	Directeur adjoint	didier.moisset@ign.fr
DP / SDPU	MO géodésie	laurent.toustou@ign.fr
DP / SDPU	MO géodésie	thierry.duquesnoy@ign.fr
ENSG	CDoS	cdos@ensg.eu
ENSG	Centre de compétences géodésie	isabelle.panet@ensg.eu
ENSG	Chef du centre de compétences	serge.botton@ensg.eu
DOT / SGM	Chef de Service	bruno.garayt@ign.fr
DOT / SGM	Responsable documentation	xavier.della-chiesa@ign.fr
DOT / SGM	Responsable Produits & Qualité	olivier.jamet@ign.fr
DOT / SGM	Chefs de départements	chefs.sgm@ign.fr
DOT / SGM	Damien Pesce	damien.pesce@ign.fr
DOT / SGM	Sebastien Saur	sebastien.saur@ign.fr
DOT / SGM	Archives ITRF	itrf@ign.fr

Diffusion externe		
Organisme	**Fonction ou Prénom Nom**	**Adresse électronique**
CNES / DOA / MDA / OC	Thierry Guinle	thierry.guinle@cnes.fr
CNES / DOA / MDA / OC	Jean-Pierre Chauveau	jean-pierre.chauveau@cnes.fr
CNES / DTN / TSA / IS	Laurent Tessariol	laurent.tessariol@cnes.fr
CNES / DTN / TSA / IS	Vincent Garcia	vincent.garcia@cnes.fr
CNES / DOA / MDA / TA	Pascale Ferrage	pascale.ferrage@cnes.fr

Mots-clé

DORIS ; GNSS ; Tide Gauge

Résumé

Les réalisations ITRF2014 et ITRF2020 (dernière en date et futur de l'International Terrestrial Reference System) calculées par l'équipe géodésie IGN de l'IPGP est le résultat de la combinaison des référentiels terrestres issus des quatre techniques de géodésie spatiale (à savoir GNSS, DORIS, SLR et VLBI). Pour réaliser un repère unique, un moyen consiste à ajouter dans la combinaison les résultats de rattachements sur des sites co-localisés. Le service météorologique des Maldives à l'aéroport de Malé est équipé d'une station DORIS et d'une station GNSS en attente de rénovation. Le présent rapport décrit le rattachement de précision réalisé en septembre 2021 sur ce site lors de la rénovation de la station DORIS et les résultats obtenus.

Matériel

Système d'exploitation	**Logiciel**
Windows 10 Professionnel	Microsoft Office

Validation

	Fonction	**Nom**	**Visa**
Rédacteur principal	Technicien d'études	Damien Pesce	28/10/2021
Commanditaire	Chef de département	Sébastien Saur	15/11/2021
Correcteur	Responsable SONEL	Thomas Donal	12/01/2022
Correcteur	Expert	Jérôme Saunier	22/02/2022
Vérificateur	Responsable qualité	Olivier Jamet	30/05/2022
Approbateur	Chef de service	Bruno Garayt	01/07/2022