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Futuna ITRF site co-location survey



May 2012

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Résumé

La réalisation ITRF2008 (dernière en date de l'International Terrestrial Reference System) calculée par le Laboratoire de Recherche en Géodésie (LAREG) de l'IGN est le résultat de la combinaison des référentiels terrestres issus des quatre techniques de géodésie spatiale (c'est à dire GNSS, SLR, DORIS et VLBI). Pour réaliser un repère unique, un moyen consiste à ajouter dans la combinaison les résultats de rattachements sur des sites co-localisés. La station météorologique de Futuna (Polynésie Française) dispose d'une station DORIS et d'une station GNSS permanente, intégrée dans le réseau de l'IGS. Le présent rapport décrit le rattachement de précision réalisé en mai 2012 sur ce site suite à l'installation d'une station GNSS REGINA et la rénovation de la station DORIS .

The ITRF2008 realization (latest frame of the International Terrestrial Reference System) computed by the Laboratoire de Recherche en Géodésie (LAREG) at IGN is the result of the combination of reference frame from four space geodesy techniques (i.e. GNSS, SLR, DORIS et VLBI). One way to realize one common frame consists in adding results in the combination from local ties at co-location sites. At the weather station of Futuna (French Polynesia) a DORIS station and a permanent GNSS station, included in IGS network, are installed. This report describes the local tie survey conducted in May 2012 at Futuna, following the installation of REGINA and DORIS stations.

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1. Introduction

1.1. Subject

The International Terrestrial Reference Frame (ITRF) is the result of a combination of different terrestrial reference frames provided by the four space geodetic techniques:

- Very Long Baseline Interferometry (VLBI)
- Satellite Laser Ranging (SLR)
- Global Navigation Satellite System (GNSS)
- Doppler Orbitography and Radiopositioning Integrated by Satellite (DORIS)

To perform this combination between independent reference frames, it is necessary to have some co-location sites where the various techniques are operating, from which tie vectors between their reference points have been surveyed in three dimensions.

The local ties survey accuracy as stated by GGOS should be 1 mm.

As far as a REGINA or DORIS site is co-located, a local tie is carried out by IGN with the two objectives:

- assign coordinates to new instruments reference points;
- provide tie vectors between instruments reference points (i.e. DORIS, GNSS, SLR, VLBI, tide gauge);

This document presents the local tie survey at Futuna (French Polynesia), which took place in May 2012 within the framework of the REGINA station installation and the DORIS station renovation.

1.2. Glossary

CNES : Centre National d'Études Spatiales (France)
DITTT : Direction des Infrastructures, de la Topographie et des Transports Terrestres de Nouvelle Calédonie.
DOMES : Directory of MERIT Sites
DORIS : Détermination d'Orbite et Radio positionnement Intégré par Satellite
GNSS : Global Navigation Satellite System
IDS : International DORIS Service
IGN : Institut National de l'Information Géographique et Forestière (France)
IGS : International GNSS Service
IRD : Institut de Recherche pour le Développement (France)
REGINA : REseau Gnss pour l'IGS et la NAvigation
SHOM : Service hydrographique et océanographique de la marine (France)
SINEX : Solution INdependent Exchange
SONEL : Système d'Observation du Niveau des Eaux Littorales

Acknowledgements

On behalf of CNES and IGN, we would like to acknowledge the staff of Meteo-France and especially Philippe Frayssinet for their logistical support. Our special thanks to Michel Bettin, from the Territorial Delegation of Wallis and Futuna (government service), who has supplied an efficient assistance to ensure the success of the mission. We thank Stephane Calmant, IRD, who provided GNSS informations on this site, and the Bureau Géodésie Nivellement from DITTT, who provided geodetic informations.

2. Co-location site description

2.1. Site description

The local ties survey was performed at the weather station of Futuna island, French overseas collectivity, located in French Polynesia, Pacific Ocean.



The weather station located at Maopo'opo belongs to Météo-France, the French national meteorological and climatological agency.

▪Address



Météo France

Station météorologique de Maopoopo
Malae - ALO
98620 Futuna
Territoire de Wallis-et-Futuna
France

▪Closer view



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This site includes two distinct space geodetic techniques :

- a GNSS station
- a DORIS station



azimuth 80°

In addition to that, few geodetic benchmarks are setup nearby these instruments.
A permanent tide gauge is operating at Leava bay at a distance of 4,5 km from the weather station. This tide gauge is co-located with a permanent GNSS station.

2.2. Points description

2.2.1. GNSS station – FTNA

A permanent GNSS station was installed during the campaign (replacing the former GPS station FTNA, keeping the same acronym). This station is dedicated to the GNSS real time Network for IGS and Navigation (REGINA) project. The antenna is a Trimble TRM 59800.00 type without radome. This antenna is mounted on top of a pipe partly embedded in a concrete pillar and anchored into the coral ground. The reference point is the top and center of the pipe, combined with the BPA (Bottom of the Pre-Amp).

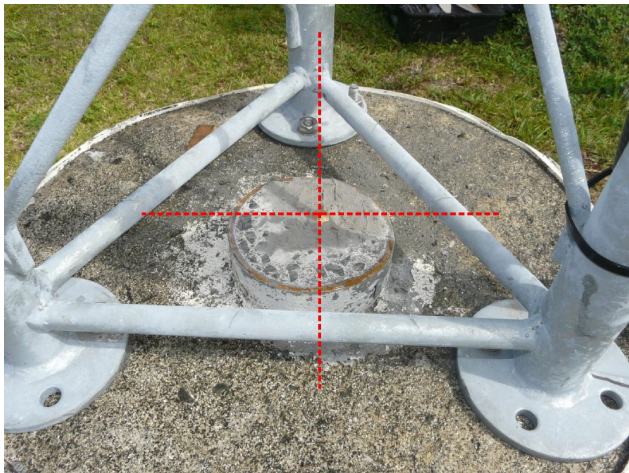
Acronym : FTNA	DOMES number : 92902S002
	
General view	Close-up view (reference point)
Description : antenna monument and reference point. Antenna height is 0,000 m . See sitelog in appendix 6.2.	

For more details, refer to the IGS website : www.igs.org.

2.2.2. DORIS station – FUUB

The DORIS station was renovated during the campaign. Initially set up on December 2000, the current antenna is installed on a 2 m high very rigid metal tower fixed on a concrete pillar and anchored into the coral ground, and bears the acronym «FUUB». The antenna reference point is the intersection of the antenna axis with the red disk. A domed brass mark is embedded on the concrete pillar vertically down to the antenna.

Acronym : FUUB	DOMES number : 92902S003
	
General view	Close-up view (reference point)
Description : DORIS antenna and reference point. See sitelog in appendix 6.1.	

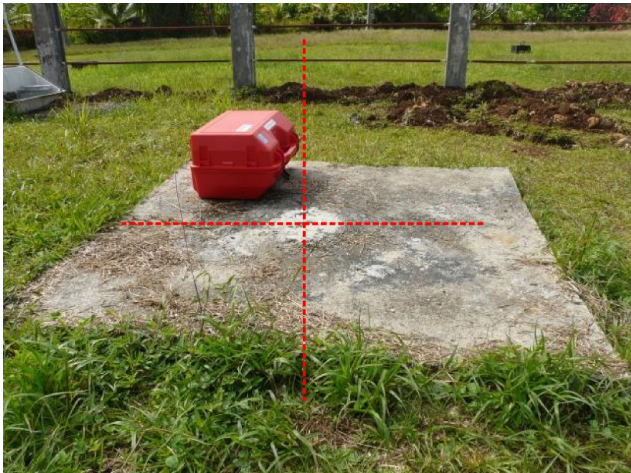
Acronym : DORIS marker	DOMES number : 92902M002
	
General view	Close-up view
Description : domed brass mark embedded on top of the concrete pillar vertically down to the DORIS antenna.	

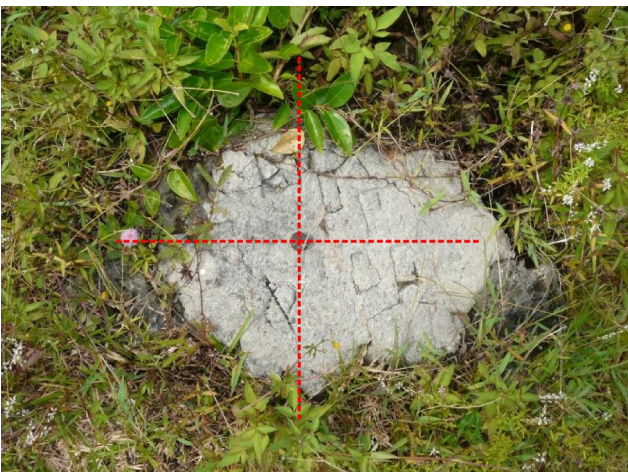
For more details, refer to the IDS website : www.ids-doris.org.

2.2.3. Benchmarks

▪ Geodetic points

Two geodetic benchmarks, part of the Réseau Géodésique de Wallis et Futuna, have been included in the local tie survey.

Geodetic point «HORN»	RGWF96 registration number: 4902-01a
	
General view	Close-up view
The point is a domed brass mark embedded in a concrete block and included in the local geodetic network RGWF96, Réseau Géodésique de Wallis et Futuna. This point is registered as 4902-01a and called also «HORN». For more details, refer to the description sheet in appendix 6.4.	

Geodetic point «SHOM»	RGWF96 registration number: 4902-01c
	
General view	Close-up view
The point is a iron mark embedded in a concrete block and included in the local geodetic network RGWF96, Réseau Géodésique de Wallis et Futuna. This point is registered as 4902-01c and called also «SHOM». For more details, refer to the description sheet in appendix 6.4.	

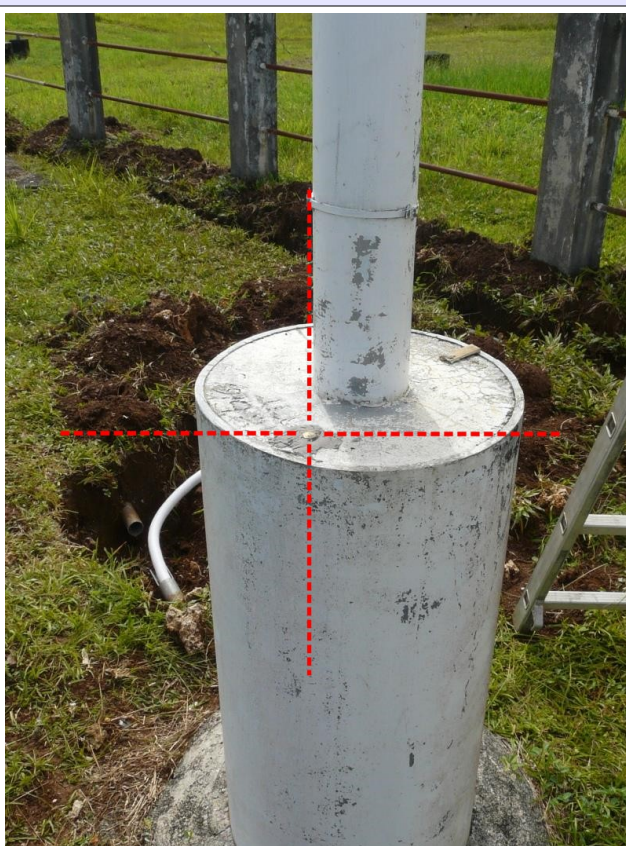
■ Survey control points

During the campaign, five survey control points have been implanted. These points allow to facilitate ties survey afterwards and to control the stability of the monuments.

Survey control point «100»



General view



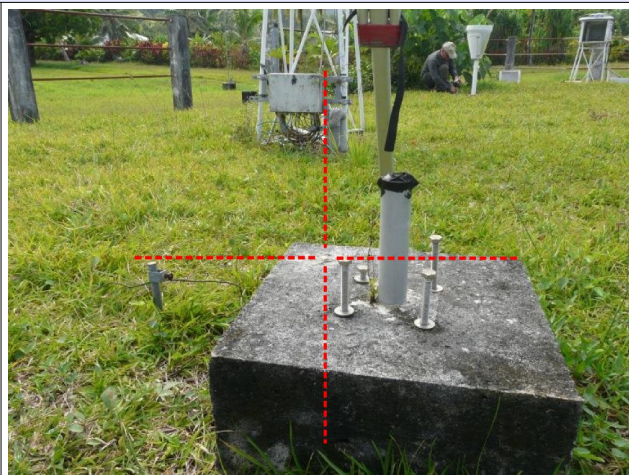
Close-up view

The survey control point is a brass mark embedded in the concrete pillar supporting the pipe on which the GNSS antenna FTNA is mounted.

Survey control point «200 »



General view



Close-up view

The survey control point is a brass mark embedded in a concrete block in the north-west part of the weather instruments enclosure.

Survey control point «300 »



General view



Close-up view

The survey control point is a brass mark embedded in a concrete block in the north part of the weather instruments enclosure.

Survey control point «400 »



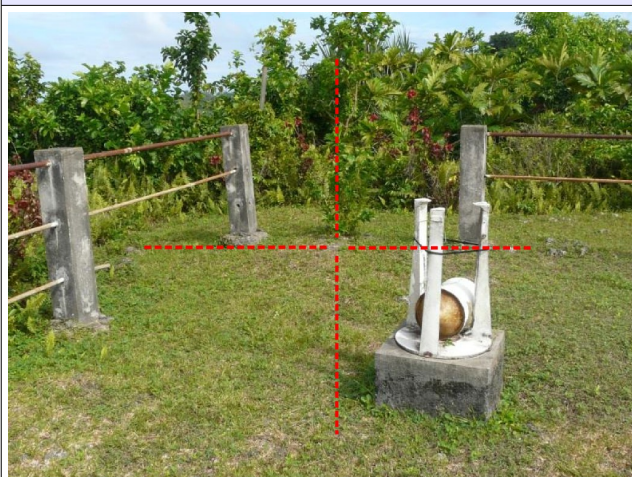
General view



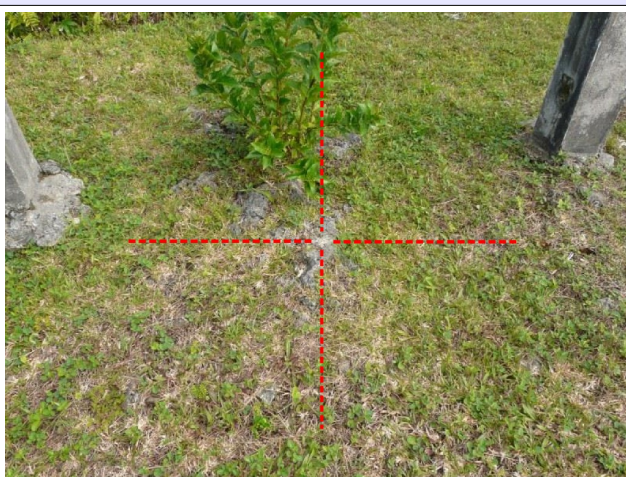
Close-up view

The survey control point is a brass mark embedded in a concrete block in the east part of the weather instruments enclosure.

Survey control point «500 »



General view



The survey control point is a brass mark embedded in rock in the south-west part of the weather instruments enclosure.

2.2.4. Sea level observatory.

4,5 km away from the weather station, in Leava bay is installed a permanent tide gauge co-located with a permanent GNSS station with acronym FTTG.

These installations contribute to the tsunami chance monitoring in the Pacific and to follow the evolution of the sea level.

The GNSS station FTTG has been tied to the GNSS station FTNA by GNSS baseline process.

- **Tide Gauge of Futuna**

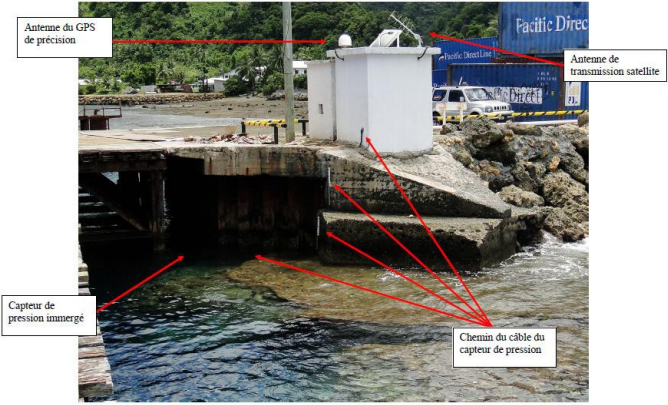


source REFMAR-SHOM

For more details, refer to the SHOM website or SONEL website :

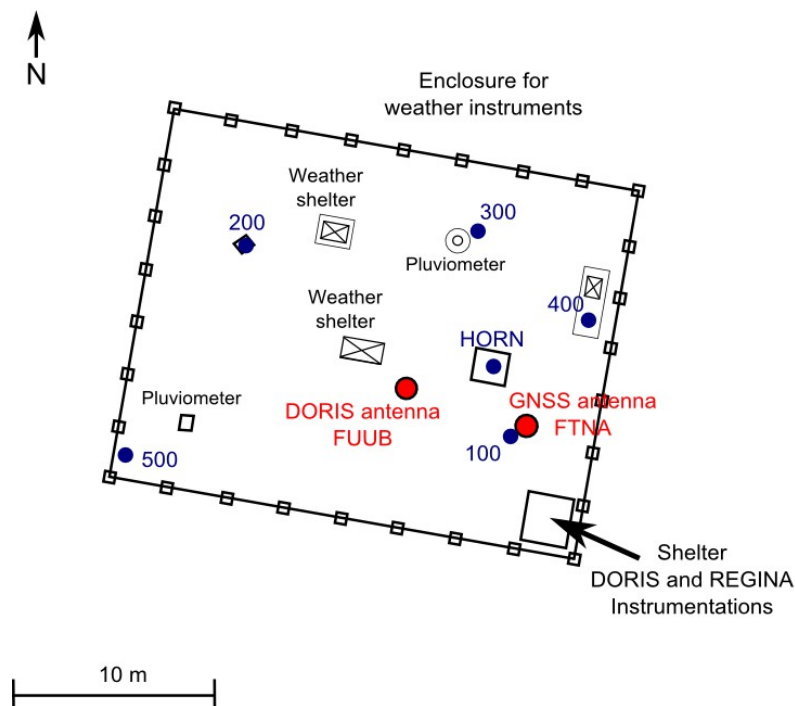
- refmar.shom.fr/fr/leava
- www.sonel.org

• GNSS station – FTTG

Acronym : FTTG	DOMES number : 92903M001
 source REFMAR-SHOM General view	 source REFMAR-SHOM Close-up view
The GNSS antenna is installed on the roof of the shelter of the tide gauge instrumentations. Antenna height is 0,000 m. See sitelog in appendix 6.3. For more details, refer to SONEL website : www.sonel.org	

2.3. Global views

2.3.1. Site sketch



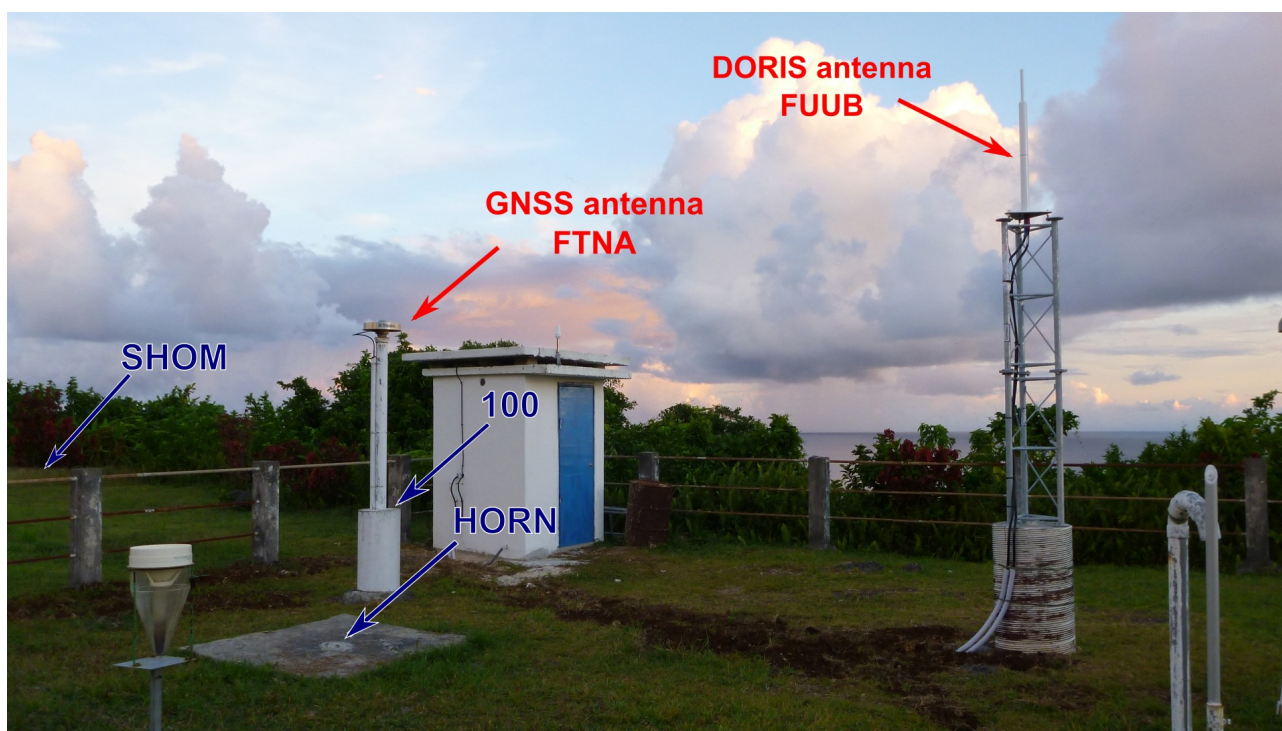
SHOM

The weather station : points of interest.

2.3.2. Site pictures



View from FTNA, azimuth 315°



View from the enclosure center, azimuth 140°

2.3.3. Co-located site



3. Survey description

3.1. Organization

The local tie survey was conducted during the DORIS station renovation and GNSS station installation, part of the REGINA network.

The survey took place from May 16th to May 20th, 2012 and was carried out by Thomas Donal (IGN), Jean-Claude Poyard (IGN) and Jean-Paul Cardaliaguet (CNES).
The topometric survey was operated May 18th, 2012.

3.2. Equipment

All the survey instruments used for this project belong to IGN, except GNSS REGINA instrumentations which belong to CNES.

3.2.1. GNSS REGINA permanent station

Type	Model	Quantity
GNSS antenna	Trimble chokering TRM 59800.00	1
GNSS receiver	Trimble NetR9	1

3.2.2. Survey instruments

The Leica total station used for the survey, is yearly calibrated at IGN's calibration unit. It has a standard deviation of 0.3 mgon for angles and 1mm + 1.5 ppm for distances.

Type	Model	Quantity
GNSS receiver	Leica GX1230GG	2
GNSS antenna	Leica AX1202GG	2
Total station	Leica TCRA 1201+	1

3.2.3. Survey accessories

Four Leica accurate reflectors calibrated with the total station were used for distances.

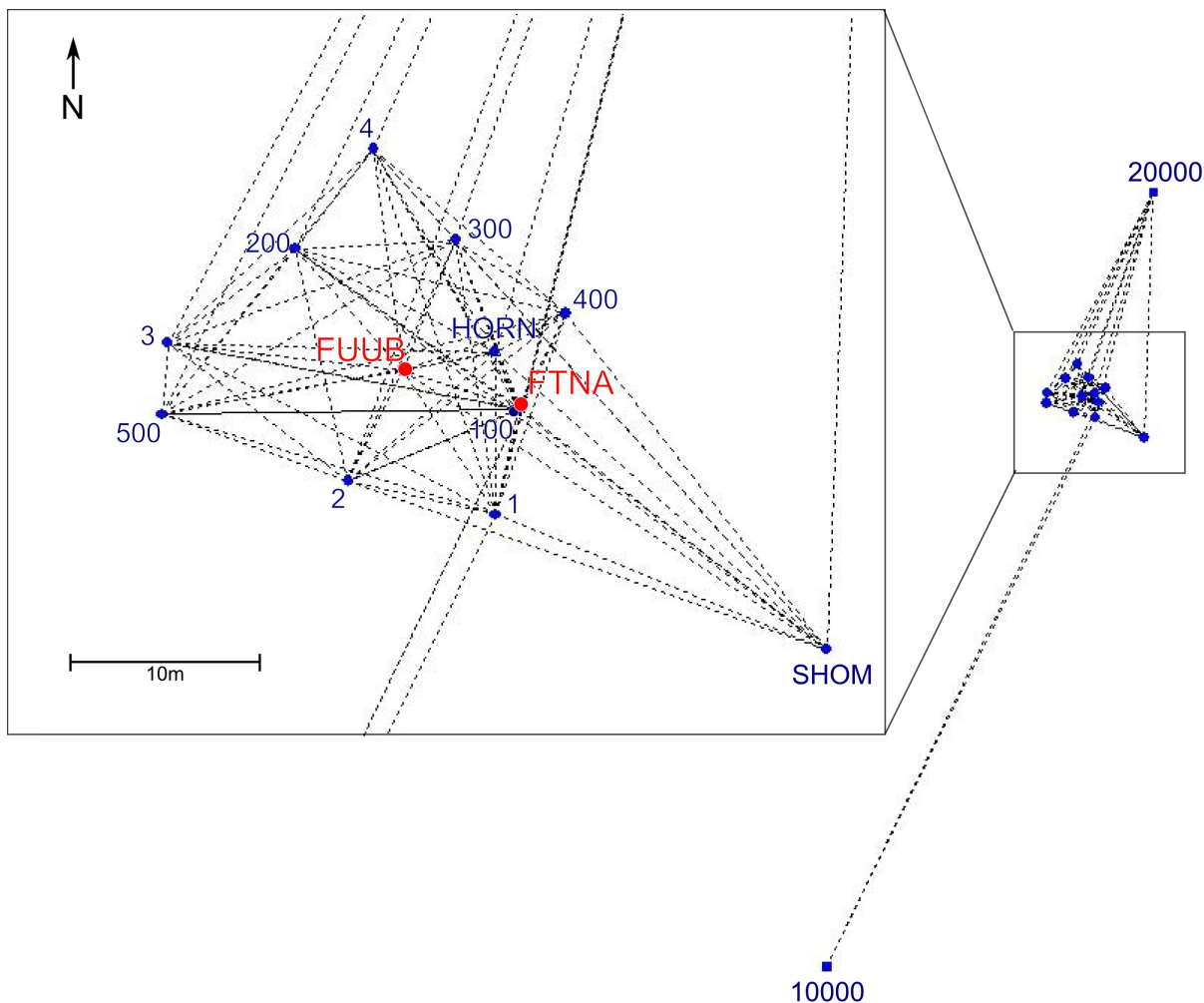
Type	Model	Quantity
Reflector	Leica GPH1P	4
Mini reflector	Leica GMP101	1
Carrier with optical plummet	Leica GZR3	2
Carrier with laser plummet	Leica SNLL121	2
Tripod	Leica wooden tripod	5
Meteo station	Kestrel 4500	1
Reflector pole	Leica GLS14	1
Geodetic platform	IGN	4



Survey operation

3.3. Polygon network

All the survey was conducted in order to provide the highest accuracy in the determination of the 3D vectors between the observing reference points.



General polygon network sketch

Observations were done by the total station from four temporary stations (1, 2, 3 and 4), two geodetic points (HORN and SHOM), four control points (200, 300, 400 and 500) and from the top of the FTNA pipe monument.

3.4. Survey method

All the visible lines of sight have been observed with the 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 twice over each line. Meteorological data (atmospheric pressure and temperature) used to correct the distances, were recorded during the operation.

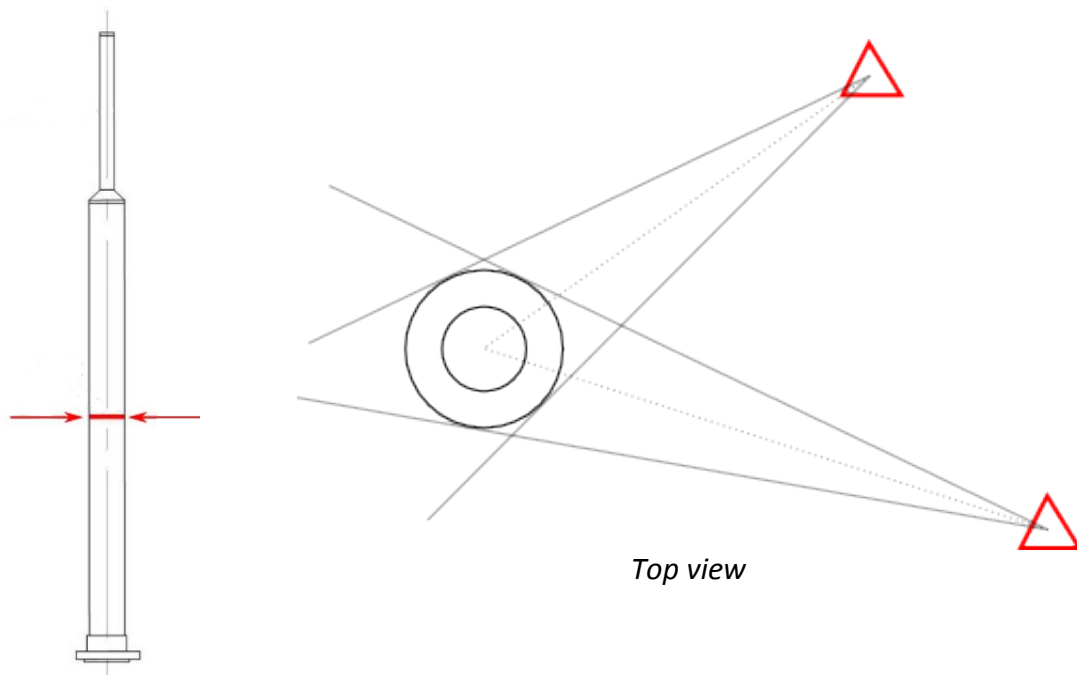
The survey strategy mixed GNSS and conventional observations. The GNSS observations are used to get the polygon bearing.

3.4.1. Permanent stations reference point

FUUB reference point :

As we could not remove the DORIS antenna, the reference point had to be determined indirectly.

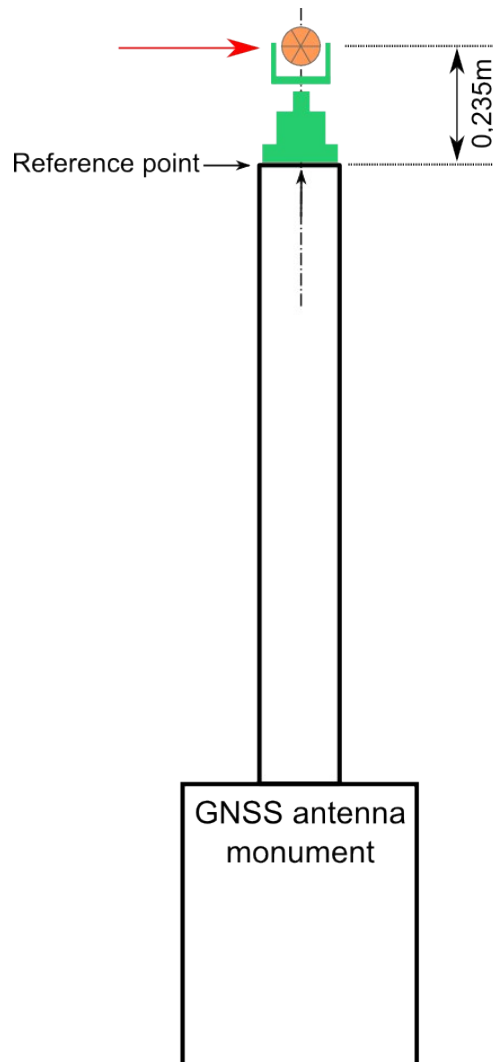
From each survey station aiming at the antenna, right and left tangents to the DORIS antenna close to the ARP (red circle) were observed. In the adjustment, horizontal and zenithal angle observations were simply averaged to get its planimetric and altimetric positions.



FTNA reference point :

From each survey station aiming FTNA, the prism installed on the pipe was observed. Vertical offset from the center of the prism to the reference point is accurately known (see below).

In addition, observations were done by total station from that point.



3.4.2. GNSS observations

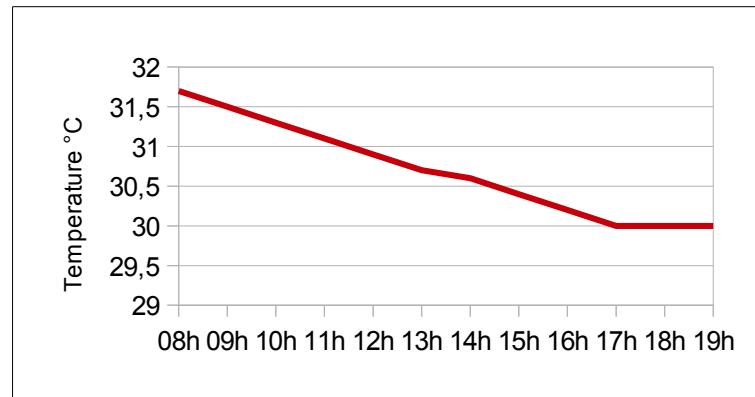
GNSS observations have been carried out in order to determine the orientation of the survey network. Orientations were realized by the baselines from FTNA to station 10000 and station 20000. These two stations were temporary setup as far away as possible from the site.

In addition, GNSS observations have been carried out to tie the permanent GNSS station FTTG to FTNA.

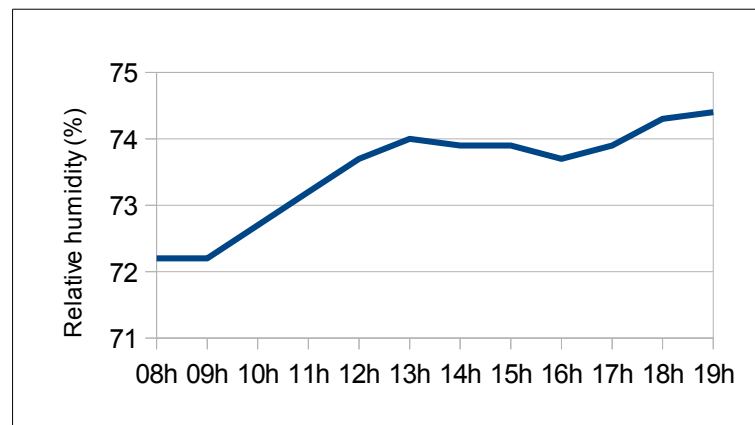
3.5. Weather data

The climate in Futuna is tropical.

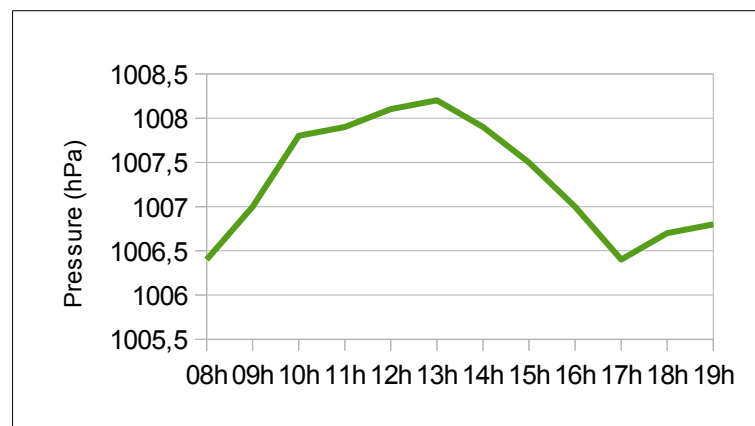
The following graphics show weather conditions on site during the topometric survey operation, i.e. on May 18th 2012, from 8 am to 7pm.



Data record by weather tracker Kesterl 4500.



Data record by weather tracker Kesterl 4500.



Data record by weather tracker Kesterl 4500.

On May 18th, the weather was hot and humid. These data have been taken into account to correct distance measurements.

4. Computation

4.1. Determination of FTNA coordinates in IGb08

The resulting coordinates are expressed in IGb08 at the mid-epoch of a GNSS data set, i.e. epoch 2012:186 (04/07/2012).

In summary, the computation process was the following: a first step to provide loosely constrained solutions, and a second step to combine these solutions in order to get final coordinates in the properly defined reference frame.

The use of a high level software *Bernese GNSS Software V5* is required with a thoroughly fixed parameterization.

The processing of a GNSS data set in ITRF is achieved by the use of IGS data and products expressed in ITRF2008 via IGb08 reference frame:

- Ephemeris and Earth Orientation Parameters.
- GNSS observations, coordinates and velocities of IGS reference stations. Basically the observation data of about 15 IGS stations in a 5000 km radius from Futuna are available daily.
- Antenna calibration stemming from igs08.atx.

The computation is validated with respect to the following points:

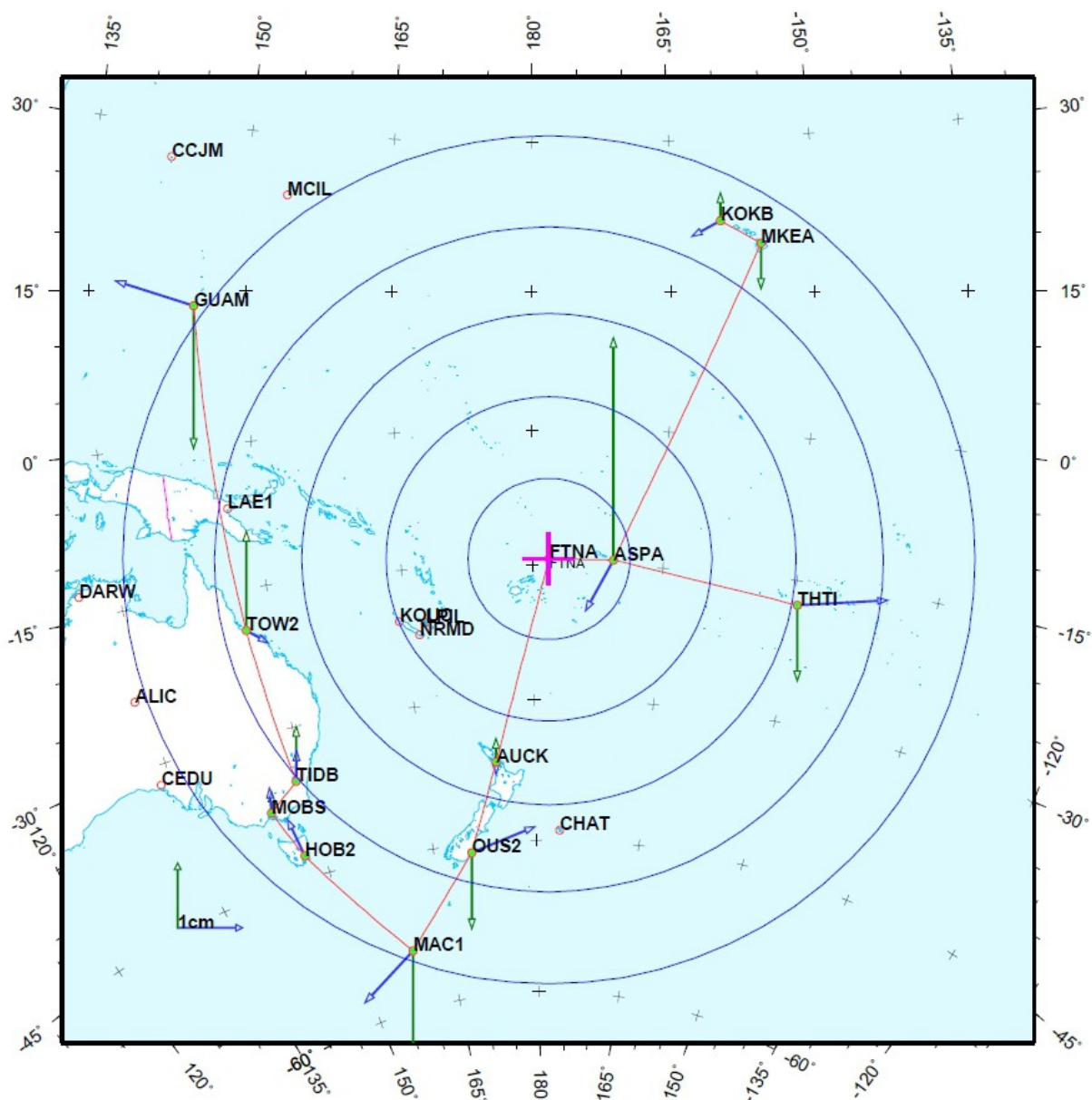
- Assessment of the Root Mean Square errors of the combined solution.
- Assessment of consistency between the daily solutions (repeatability).
- Assessment of alignment of the combined solution to the IGS08 reference frame.

4.1.1. Daily processing steps

7 daily data sessions have been processed, from 01st July 2012 to 07 July 2012 based on a network integer ambiguity fixed solution from ionosphere free double difference processing using IGS precise ephemeris and earth orientation parameters.

Each daily solution has been validated according to :

- Ambiguity integer fixed results
- Variance factor range
- Helmert adaptation from IGS stations computed coordinates to actual ones



Baselines provided from session 05/07/2012 (Shortest strategy)

4.1.2. Session Combination

Daily normal equations were merged in a least squares process in order to provide a final reference free combined solution. The residuals of the individual solutions with respect to the combined one have been computed and checked. The Root Mean Square errors and the consistency between the daily solutions (repeatability) were assessed.

◦ Root Mean Square errors

Next table shows the Root Mean Square errors of the combined solution (**mm** in North, East and Up component).

Station	DOMES number	E RMS	N RMS	U RMS
ASPA	50503S006	1.2	1.1	2.1
AUCK	50209M001	1.0	1.1	2.2
FTNA	92902S002	1.1	1.1	2.1
GUAM	50501M002	1.4	1.9	4.8
HOB2	50116M004	1.3	1.2	2.0
KOKB	40424M004	1.9	1.9	1.8
KOUC	92727S001	1.1	1.0	2.2
LPIL	92732S001	1.0	1.0	2.3
MAC1	50135M001	1.1	1.5	1.9
MKEA	40477M001	1.9	1.8	1.8
MOBS	50182M001	1.4	1.1	2.0
NRMD	92701M005	1.0	1.0	2.2
OUS2	50212M002	1.0	1.3	2.0
THTI	92201M009	1.7	1.1	1.8
TIDB	50103M108	1.3	1.1	2.0
TOW2	50140M001	1.4	1.1	2.0

◦ Repeatability

Next table shows statistics about shifts between the daily solutions and the adjusted solution (**mm** in North, East and Up component).

Station	DOMES number	RMS N	Min N	Max N	RMS E	Min E	Max E	RMS U	Min U	Max U
ASPA	50503S006	1.2	-2.0	1.3	3.3	-4.0	4.8	5.5	-9.4	8.0
AUCK	50209M001	2.2	-2.5	4.2	1.6	-1.9	2.8	5.1	-4.9	10.2
FTNA	92902S002	1.5	-1.8	2.7	3.4	-4.1	4.3	6.7	-10.9	6.5
GUAM	50501M002	8.9	-8.2	3.5	7.7	-6.4	4.2	7.5	1.7	7.3
HOB2	50116M004	0.8	0.3	0.7	1.6	-1.6	-0.4	3.9	-3.9	-0.4
KOKB	40424M004	1.6	-2.6	2.0	4.5	-5.2	6.7	6.1	-9.9	6.2
KOUC	92727S001	0.4	-0.3	0.6	2.0	-2.4	2.9	5.0	-7.9	4.0
LPIL	92732S001	0.9	-1.0	1.3	1.6	-2.1	1.4	3.9	-5.0	4.9
MAC1	50135M001	2.7	-2.1	1.6	1.9	-1.9	-0.1	4.5	-3.8	-2.4
MKEA	40477M001	3.2	-6.4	4.1	3.8	-3.6	4.8	8.8	-9.4	16.4
MOBS	50182M001	2.1	-3.8	1.7	2.7	-2.6	5.2	4.9	-5.4	9.2
NRMD	92701M005	1.1	-0.8	2.1	1.5	-1.8	1.9	4.8	-6.9	5.4
OUS2	50212M002	3.1	-3.1	5.8	2.6	-2.6	5.0	5.3	-7.8	5.9
THTI	92201M009	2.0	-3.0	2.9	5.3	-6.0	9.6	8.7	-9.8	15.2
TIDB	50103M108	1.2	-1.7	2.1	2.8	-2.4	4.5	5.7	-10.1	9.1
TOW2	50103M108	2.9	-3.5	5.5	1.1	-1.2	1.4	2.7	-4.6	3.6

◦ IGb08 epoch alignment

The combined solution has been Helmert-aligned to IGS08 at mid-epoch of data set, i.e. 2012:186. Residuals have been checked to assess consistency of this solution. Due to their significant residuals, stations in italic were not taken into account to establish Helmert parameters.

Station	DOMES number	Residuals (mm)		
		North	East	Vertical
<i>ASPA</i>	<i>50503S006</i>	-7.3	-11.7	46.4
AUCK	50209M001	1.7	-0.3	6.6
<i>GUAM</i>	<i>50501M002</i>	3.7	-35.8	-46.8
HOB2	50116M004	1.9	-2.7	-2.7
KOKB	40424M004	-2.8	0.2	-3.3
MAC1	50135M001	-5.4	-4.8	-12.1
MKEA	40477M001	-3.6	3.1	-10.5
MOBS	50182M001	0.1	-3.2	-2.2
NRMD	92701M005	4.9	9.0	-0.3
OUS2	50212M002	7.1	9.4	-5.3
THTI	92201M009	5.9	0.9	11.2
TIDB	50103M108	0.2	-4.5	6.9
TOW2	50140M001	-6.6	-8.0	11.7
<i>LPIL</i>	<i>92732S001</i>	-13.5	-7.1	-2.2
<i>KOUC</i>	<i>92727S001</i>	-20.9	-16.9	-15.3
RMS	COMPONENT	4.6	5.5	8.1

4.1.3. Coordinates expressed in IGb08 at epoch 2012:186

Station	DOMES number	X (m)	Y (m)	Z (m)
ASPA	50503S006	-6100260.0890	-996503.0725	-1567977.4967
AUCK	50209M001	-5105681.3453	461564.0116	-3782181.2410
FTNA	92902S002	-6178322.4511	-202694.9628	-1566024.4520
GUAM	50501M002	-5071312.7618	3568363.6098	1488904.3841
HOB2	50116M004	-3950071.9612	2522415.3068	-4311637.7203
KOKB	40424M004	-5543838.2675	-2054586.2859	2387810.2091
KOUC	92727S001	-5751222.9658	1617967.3609	-2225743.5178
LPIL	92732S001	-5813728.7089	1314042.4659	-2262941.4390
MAC1	50135M001	-3464038.7513	1334173.0640	-5169224.0311
MKEA	40477M001	-5464105.3076	-2495165.9123	2148291.4457
MOBS	50182M001	-4130636.4700	2894953.1100	-3890530.5858
NRMD	92701M005	-5743537.9527	1380503.9897	-2397896.3322
OUS2	50212M002	-4387890.9430	733420.7040	-4555176.1866
THTI	92201M009	-5246415.8238	-3077259.6246	-1913841.9620
TIDB	50103M108	-4460996.6843	2682557.0800	-3674442.9776
TOW2	50140M001	-5054583.1654	3275504.2181	-2091538.8679

Cartesians coordinates, IGb08/ITRF08, epoch 2012:186 (04/07/2012)

4.2. Local GNSS network

The local GNSS baselines (see paragraph 3.4.2) were processed with Leica Geo Office V8.3 software using IGS08 precise ephemeris and the original set of « absolute » GNSS antenna calibrations (igs08.atx).

The corresponding LGO report file is provided in appendix 6.5.

4.3. Global adjustment

The final computation has been carried out by a Least Squares 3D Adjustment with the Microsearch Geolab version 2001.9.20.0 software. The input file (see appendix 6.6) comes from :

- Total station observations : horizontal and zenith angles, distances,
- Centring equations : relative position between points,
- Azimuths issued from the GNSS baselines process,
- FTNA coordinates have been constrained at 1 mm to its IGB08 (epoch 2012:186, 04/07/2012) values.

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

- 0.8 mgon for horizontal and vertical angles,
- 1 mm for distances on prism,

These are the values used for most of the targets in our Microsearch Geolab computation input file.

This adjustment provided coordinates and a covariance matrix of our survey work (appendix 6.7).

Geoid slope is not significant around Futuna. The undulations of the EGM08 geoid model has not been taken into account in the process.

5. Results

5.1. Station name translation table

The following list sums up the most interesting points appearing on the Microsearch Geolab input file.

Point description	Used name or code	Computation name
DORIS stations → DORIS antenna reference point → DORIS pillar/domed mark → Ex-DORIS antenna reference point	92902S003 92902M002 92902S001	FUUB FUUB_marker FUTB
GNSS permanent stations → FTNA reference point → FTTG reference point	92902S002 92903M001	FTNA FTTG
Local geodetic points → «HORN» → «SHOM»	4902-01a 4902-01c	HORN SHOM
Survey control points → 100 → 200 → 300 → 400 → 500	- - - - -	100 200 300 400 500

5.2. Adjusted coordinates and confidence regions

The results of the adjustment are the coordinates of all points and their confidence ellipsoids in the IGB08/ITRF2008 at the mean epoch of the observations (i.e. epoch 2012 :186).

The table below provides the 3D coordinates and confidence region at 95 % of the points of interest.

FUTUNA (FRANCE) REGINA-DORIS TIES - MAY 2012 SURVEY				
Microsearch GeoLab, V2001.9.20.0		GRS 80		UNITS: m,GRAD
=====				
Adjusted XYZ Coordinates:				
CODE FFF	STATION	X-COORDINATE STD DEV	Y-COORDINATE STD DEV	Z-COORDINATE STD DEV
----	-----	-----	-----	-----
XYZ	100	-6178320.7981 0.0011	-202694.7740 0.0011	-1566024.0636 0.0011
XYZ	200	-6178322.5545 0.0011	-202683.7784 0.0011	-1566016.2568 0.0011
XYZ	300	-6178322.1975 0.0011	-202691.7238 0.0011	-1566015.7627 0.0011
XYZ	400	-6178321.1185 0.0011	-202697.1457 0.0011	-1566019.2860 0.0011
XYZ	500	-6178320.7112 0.0011	-202677.0882 0.0011	-1566024.1440 0.0011
XYZ	FTNA	-6178322.4511 0.0010	-202694.9628 0.0010	-1566024.4520 0.0010
XYZ	FTTG	-6178749.5672 0.0023	-198466.9581 0.0023	-1564756.2386 0.0023
XYZ	FUTB	-6178323.3545 0.0024	-202689.1766 0.0024	-1566022.6788 0.0024
XYZ	FUUB	-6178323.9509 0.0011	-202689.1876 0.0011	-1566022.8224 0.0011
XYZ	FUUB_marker	-6178321.6421 0.0011	-202689.1124 0.0011	-1566022.2330 0.0011
XYZ	HORN	-6178320.8642 0.0011	-202693.6364 0.0011	-1566021.1500 0.0011
XYZ	SHOM	-6178316.9393 0.0018	-202709.9807 0.0015	-1566035.4296 0.0016
=====				
FUTUNA (FRANCE) REGINA-DORIS TIES - MAY 2012 SURVEY				
Microsearch GeoLab, V2001.9.20.0		GRS 80		UNITS: m,GRAD
=====				
2-D and 1-D Station Confidence Regions (95.000 and 95.000 percent):				
STATION	MAJOR SEMI-AXIS	AZ	MINOR SEMI-AXIS	VERTICAL
-----	-----	-----	-----	-----
100	0.0025	172	0.0025	0.0020
200	0.0025	40	0.0025	0.0020
300	0.0025	123	0.0025	0.0020
400	0.0025	39	0.0025	0.0020
500	0.0026	179	0.0025	0.0020
FTNA	0.0024	0	0.0024	0.0019
FTTG	0.0054	0	0.0054	0.0043
FUTB	0.0054	132	0.0054	0.0044
FUUB	0.0025	132	0.0025	0.0020
FUUB_marker	0.0025	91	0.0025	0.0020
HORN	0.0025	165	0.0025	0.0020
SHOM	0.0036	49	0.0035	0.0065

```
=====
                        FUTUNA (FRANCE) REGINA-DORIS TIES - MAY 2012 SURVEY
Microsearch GeoLab, V2001.9.20.0                      GRS 80          UNITS: m, GRAD
=====
Adjusted PLH Coordinates:

CODE FFF STATION          LATITUDE      LONGITUDE    ELIP-HEIGHT
                        STD DEV          STD DEV      STD DEV
-----
PLH  000 100              S 14 18  28.09173 W178  7  15.40986      83.1561 m
                        0.0011          0.0011      0.0011
PLH  000 200              S 14 18  27.83438 W178  7  15.77847      82.5785 m
                        0.0011          0.0011      0.0011
PLH  000 300              S 14 18  27.81958 W178  7  15.51311      82.3631 m
                        0.0011          0.0011      0.0011
PLH  000 400              S 14 18  27.93790 W178  7  15.33111      82.3611 m
                        0.0011          0.0011      0.0011
PLH  000 500              S 14 18  28.09962 W178  7  15.99957      82.5299 m
                        0.0011          0.0011      0.0011
PLH  000 FTNA             S 14 18  28.09064 W178  7  15.40537      84.8590 m
                        0.0010          0.0010      0.0010
PLH  000 FTTG             S 14 17  45.77710 W178  9  36.86727      52.2964 m
                        0.0023          0.0023      0.0023
PLH  000 FUTB             S 14 18  28.02900 W178  7  15.59932      85.1118 m
                        0.0024          0.0024      0.0024
PLH  000 FUUB             S 14 18  28.02873 W178  7  15.59960      85.7252 m
                        0.0011          0.0011      0.0011
PLH  000 FUUB_marker     S 14 18  28.02872 W178  7  15.59959      83.3412 m
                        0.0011          0.0011      0.0011
PLH  000 HORN             S 14 18  27.99964 W178  7  15.44787      82.4639 m
                        0.0011          0.0011      0.0011
PLH  000 SHOM             S 14 18  28.47707 W178  7  14.89850      82.7111 m
                        0.0015          0.0015      0.0019
=====
```

From the whole covariance matrix, the covariance submatrix for the 3 main points of interest i.e. FUUB, FUTB and FTNA for the ITRF2014 computation has been extracted. Finally, this covariance submatrix has been converted into the SINEX format using the « geotosnx » tool provided by Z. Altamimi. The resulting SINEX file (92902_IGN_2012-139_V10.SNX) is presented in appendix 6.8.

5.3. Vectors between points of interest

Differential components between points of interest in the ITRS :

	dX (m)	dY (m)	dZ (m)	Accuracy (m)
FTNA → FUUB	-1,500	5,775	1,630	0,001
FTNA → FUTB	-0,903	5,786	1,629	0,001
FUUB → FUTB	0,597	0,011	0,144	0,001

6. Appendixes

6.1. «FUUB» DORIS station site log

FUTUNA DORIS site description form

0. Form

Prepared by : SIMB (DORIS installation and maintenance department)
Date prepared : 11/04/2013
Report type : UPDATE

1. Site location information

Site name : FUTUNA
Site DOMES number : 92902
Host agency : MÃ©tÃ©o-France
City : Malae
State or province : Futuna
Country : FRANCE (Wallis and Futuna)
Tectonic plate : PCFC
Geological information : Coral plateau

Geographical coordinates (ITRF) :
North Latitude : -14 deg 18' 28''
East Longitude : -178 deg 7' 16''
Ellipsoid height : 85 m
Approximate altitude : 39 m

2. DORIS antenna and reference point information

2.1

Four character ID : FUTB
Antenna model : Starec 52291 type
Antenna serial number : 77
IERS DOMES number : 92902S001
CNES/IGN number : 929021
DORIS SSALTO number : 96
Date installed (dd/mm/yy) : 13/12/2000
Date removed (dd/mm/yy) : 17/05/2012
Antenna support type : Triangular plate on top of a steel pipe
Installed on : Pipe partly embeded in a concrete pillar and anchored into the coral ground.
Height above ground mark : 0.499 m
Ground mark type : Domed mark in the lower triangular plate
Ground mark DOMES number : 92902M001
Notes :

2.2

Four character ID : FUUB
Antenna model : Starec 52291 type
Antenna serial number : 144
IERS DOMES number : 92902S003
CNES/IGN number : 929022
DORIS SSALTO number : 298
Date installed (dd/mm/yy) : 17/05/2012
Date removed (dd/mm/yy) :
Antenna support type : 2 m high very rigid metal tower
Installed on : Concrete pillar 0.8 m high
Height above ground mark : 2.384 m
Ground mark type : Hexagonal brass mark on top of DORIS concrete pillar
Ground mark DOMES number : 92902M002
Notes :

3. DORIS beacons information

3.1

Beacon serial number : 9904127
Beacon model : 2.0
USO serial number : 3.124
4 Char. ID of the REF point : FUTB
Date installed (dd/mm/yy) : 13/12/2000
Date removed (dd/mm/yy) : 17/05/2012

3.2

Beacon serial number : 2819056
Beacon model : 3.0
USO serial number : 3.408
4 Char. ID of the REF point : FUUB
Date installed (dd/mm/yy) : 17/05/2012
Date removed (dd/mm/yy) :

4. ITRF coordinates and velocities of the current DORIS ref. point (FUUB)

Solution : ITRF2008
Epoch : 2005.0

X = -6178323.900 m Y = -202689.617 m Z = -1566023.046 m
Sig X = 0.002 m Sig Y = 0.002 m Sig Z = 0.002 m

VX = -0.0104 m/y VY = 0.0593 m/y VZ = 0.0328 m/y
Sig VX = 0.0005 m/y Sig VY = 0.0008 m/y Sig VZ = 0.0004 m/y

5. IERS colocation information

5.1

Instrument type : GNSS
Status : Permanent
DOMES number of the
instrument ref. point : 92902S002
Notes : Permanent GNSS station REGINA (FTNA)

6. Tide Gauge colocation information

7. Local site ties

7.1

Point description : Antenna reference point of REGINA station (FTNA)
DOMES number : 92902S002
Differential components from the current DORIS ref. point (FUUB)
to the above point (in the ITRS) :
dX (m) : 1.500
dY (m) : -5.775
dZ (m) : -1.630
Accuracy (m) : 0.001
Date measured : 19/05/2012
Additional information : Survey by IGN-F 2012

7.2

Point description : DORIS starec antenna reference point (FUTB)
DOMES number : 92902S001
Differential components from the current DORIS ref. point (FUUB)
to the above point (in the ITRS) :
dX (m) : 0.597
dY (m) : 0.011
dZ (m) : 0.144
Accuracy (m) : 0.001
Date measured : 19/05/2012
Additional information : Survey by IGN-F 2012

7.3

Point description : Hexagonal brass mark, top of DORIS concrete pillar
DOMES number : 92902M002

Differential components from the current DORIS ref. point (FUUB)
to the above point (in the ITRS) :
dX (m) : 2.309
dY (m) : 0.075
dZ (m) : 0.589
Accuracy (m) : 0.001
Date measured : 19/05/2012
Additional information : Survey by IGN-F 2012

7.4

Point description : Mark labelled "HORN" on concrete slab
DOMES number : 92902M999
Differential components from the current DORIS ref. point (FUUB)
to the above point (in the ITRS) :
dX (m) : 3.087
dY (m) : -4.449
dZ (m) : 1.672
Accuracy (m) : 0.001
Date measured : 19/05/2012
Additional information : Survey by IGN-F 2012

8. Meteorological Instrumentation

8.1 Humidity sensor

Model :
Manufacturer :
Accuracy :
Notes : No humidity sensor

8.2 Pressure sensor

Model :
Manufacturer :
Accuracy :
Height : m below the current DORIS ref. point (FUUB)
Notes : No pressure sensor

8.3 Temperature sensor

Model :
Manufacturer :
Accuracy :
Notes : No temperature sensor

9. DORIS network contacts

Primary contact:

Name : Jerome SAUNIER
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: 94165 SAINT-MANDE Cedex FRANCE
Telephone : + 33 1 43 98 83 63
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: 31401 TOULOUSE Cedex FRANCE
Telephone : + 33 5 61 27 40 72
Fax : + 33 5 61 28 25 95
E-mail : simb (.) doris (@) cnes.fr

6.2. «FTNA» GNSS station site log

FTNA Site Information Form (site log)
International GNSS Service
See Instructions at:
ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0. Form

Prepared by (full name) : Jean-Paul CARDALIAGUET
Date Prepared : 2015-02-10
Report Type : UPDATE
If Update:
Previous Site Log : ftna_20140402.log
Modified/Added Sections : 5.1,5.2,5.3,5.4,7.3,7.4

1. Site Identification of the GNSS Monument

Site Name : Futuna
Four Character ID : FTNA
Monument Inscription :
IERS DOMES Number : 92902S002
CDP Number :
Monument Description : Pillar
Height of the Monument : 2.5 m
Monument Foundation : Pipe partly embedded in a concrete pillar
Foundation Depth :
Marker Description : Domed mark in the lower triangular plate
Date Installed : 1996-09-01T00:00Z
Geologic Characteristic :
Bedrock Type :
Bedrock Condition :
Fracture Spacing :
Fault zones nearby :
Distance/activity :
Additional Information :

2. Site Location Information

City or Town : Maopo'opo
State or Province : Wallis and Futuna
Country : Wallis And Futuna
Tectonic Plate : PACIFIC
Approximate Position (ITRF)
X coordinate (m) : -6178322.4459
Y coordinate (m) : -202694.9925
Z coordinate (m) : -1566024.4684
Latitude (N is +) : -141828.09064
Longitude (E is +) : -1780715.40537
Elevation (m,ellips.) : 84.859
Additional Information : IGS08 EPOCH 2012.0

3. GNSS Receiver Information

- 3.1 Receiver Type : ASHTECH Z-XII3
Satellite System : GPS
Serial Number : 221
Firmware Version : 1F50
Elevation Cutoff Setting : 5 deg
Date Installed : 1998-09-25T00:00Z
Date Removed : 2012-05-20T00:00Z
Temperature Stabiliz. : (deg C) ± (deg C)
Additional Information :
- 3.2 Receiver Type : TRIMBLE NETR9
Satellite System : GPS+GLO+GAL
Serial Number : 77907
Firmware Version : 4.42
Elevation Cutoff Setting : 3 deg

```

Date Installed      : 2012-05-20T00:00Z
Date Removed       : 2012-09-19T08:00Z
Temperature Stabiliz. : 25 ± 30
Additional Information :

3.3 Receiver Type   : TRIMBLE NETR9
Satellite System    : GPS+GLO+GAL+SBAS
Serial Number       : 77907
Firmware Version    : 4.60
Elevation Cutoff Setting : 3 deg
Date Installed      : 2012-09-19T08:00Z
Date Removed       : 2014-04-02T07:50Z
Temperature Stabiliz. : 25 ± 30
Additional Information :

3.4 Receiver Type   : TRIMBLE NETR9
Satellite System    : GPS+GLO+GAL+BDS+QZSS+SBAS
Serial Number       : 77907
Firmware Version    : 4.85
Elevation Cutoff Setting : 3 deg
Date Installed      : 2014-04-02T08:00Z
Date Removed       : CCYY-MM-DDThh:mmZ
Temperature Stabiliz. : 25 ± 30
Additional Information :

3.x Receiver Type   : (A20, from rcvr_ant.tab; see instructions)
Satellite System    : (GPS+GLO+GAL+BDS+QZSS+SBAS)
Serial Number       : (A20, but note the first A5 is used in SINEX)
Firmware Version    : (A11)
Elevation Cutoff Setting : (deg)
Date Installed      : (CCYY-MM-DDThh:mmZ)
Date Removed       : (CCYY-MM-DDThh:mmZ)
Temperature Stabiliz. : (none or tolerance in degrees C)
Additional Information : (multiple lines)

4. GNSS Antenna Information

4.1 Antenna Type     : ASH700936A_M      SNOW
Serial Number        : 71
Antenna Reference Point : BPA
Marker->ARP Up Ecc. (m) : 0.0000
Marker->ARP North Ecc(m) : 0.0000
Marker->ARP East Ecc(m) : 0.0000
Alignment from True N : 0 deg
Antenna Radome Type   : SNOW
Radome Serial Number  :
Antenna Cable Type    :
Antenna Cable Length  : 30 m
Date Installed        : 1998-09-25T00:00Z
Date Removed         : 2012-05-20T00:00Z
Additional Information :

4.2 Antenna Type     : TRM59800.00      NONE
Serial Number        : 64069
Antenna Reference Point : BPA
Marker->ARP Up Ecc. (m) : 0.0000
Marker->ARP North Ecc(m) : 0.0000
Marker->ARP East Ecc(m) : 0.0000
Alignment from True N : 0 deg
Antenna Radome Type   : NONE
Radome Serial Number  :
Antenna Cable Type    : TRIMBLE
Antenna Cable Length  : 30 m
Date Installed        : 2012-05-20T08:00Z
Date Removed         : CCYY-MM-DDThh:mmZ
Additional Information : Trimble cable (30m)

4.x Antenna Type     : (A20, from rcvr_ant.tab; see instructions)
Serial Number        : (A*, but note the first A5 is used in SINEX)
Antenna Reference Point : (BPA/BCR/XXX from "antenna.gra"; see instr.)
Marker->ARP Up Ecc. (m) : (F8.4)
Marker->ARP North Ecc(m) : (F8.4)
Marker->ARP East Ecc(m) : (F8.4)
Alignment from True N : (deg; + is clockwise/east)

```

Antenna Radome Type : (A4 from rcvr_ant.tab; see instructions)
Radome Serial Number :
Antenna Cable Type : (vendor & type number)
Antenna Cable Length : (m)
Date Installed : (CCYY-MM-DDThh:mmZ)
Date Removed : (CCYY-MM-DDThh:mmZ)
Additional Information : (multiple lines)

5. Surveyed Local Ties

- 5.1 Tied Marker Name : DORIS antenna ref. pt.(FUTB)
Tied Marker Usage : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
Tied Marker CDP Number :
Tied Marker DOMES Number : 92902S001
Differential Components from GNSS Marker to the tied monument (ITRS)
dx (m) : -0.9035
dy (m) : 5.7862
dz (m) : 1.7732
Accuracy (mm) : 1
Survey method : TRIANGULATION
Date Measured : 2012-05-16
Additional Information : high geodetic surveying proceed by IGN-F
- 5.2 Tied Marker Name : DORIS antenna ref. pt.(FUUB)
Tied Marker Usage : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
Tied Marker CDP Number :
Tied Marker DOMES Number : 92902S003
Differential Components from GNSS Marker to the tied monument (ITRS)
dx (m) : -1.4999
dy (m) : 5.7752
dz (m) : 1.6296
Accuracy (mm) : 1
Survey method : TRIANGULATION
Date Measured : 2012-05-18
Additional Information : high geodetic surveying proceed by IGN-F
- 5.3 Tied Marker Name : Marker DORIS
Tied Marker Usage : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
Tied Marker CDP Number :
Tied Marker DOMES Number : 92902M002
Differential Components from GNSS Marker to the tied monument (ITRS)
dx (m) : 0.8090
dy (m) : 5.8504
dz (m) : 2.2190
Accuracy (mm) : 1
Survey method : TRIANGULATION
Date Measured : 2012-05-18
Additional Information : high geodetic surveying proceed by IGN-F
- 5.4 Tied Marker Name : FTTG
Tied Marker Usage : GNSS
Tied Marker CDP Number :
Tied Marker DOMES Number : 92903M001
Differential Components from GNSS Marker to the tied monument (ITRS)
dx (m) : -427.116
dy (m) : 4228.005
dz (m) : 1268.213
Accuracy (mm) : 10
Survey method : GNSS CAMPAIGN
Date Measured : 2012-05-20
Additional Information : GNSS campaign proceed by IGN-F
- 5.x Tied Marker Name :
Tied Marker Usage : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
Tied Marker CDP Number : (A4)
Tied Marker DOMES Number : (A9)
Differential Components from GNSS Marker to the tied monument (ITRS)
dx (m) : (m)
dy (m) : (m)
dz (m) : (m)
Accuracy (mm) : (mm)
Survey method : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
Date Measured : (CCYY-MM-DDThh:mmZ)
Additional Information : (multiple lines)

6. Frequency Standard

6.1 Standard Type : INTERNAL
Input Frequency :
Effective Dates : 1998-09-25/2012-05-20
Notes :

6.2 Standard Type : INTERNAL
Input Frequency :
Effective Dates : 2012-05-20/CCYY-MM-DD
Notes :

6.x Standard Type : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
Input Frequency : (if external)
Effective Dates : (CCYY-MM-DD/CCYY-MM-DD)
Notes : (multiple lines)

7. Collocation Information

7.1 Instrumentation Type : DORIS
Status : PERMANENT
Effective Dates : 2000-12-13/2012-05-18
Notes : Four character ID : FUTB
: IERS DOMES number : 92902S001

7.2 Instrumentation Type : DORIS
Status : PERMANENT
Effective Dates : 2012-05-18/CCYY-MM-DD
Notes : Four character ID : FUUB
: IERS DOMES number : 92902S003

7.3 Instrumentation Type : GNSS
Status : PERMANENT

Effective Dates : 2011-10-15/CCYY-MM-DD
Notes : Four character ID : FTTG
: IERS DOMES number : 92903M001
: distant from 4.5km

7.4 Instrumentation Type : Tide gauge
Status : PERMANENT
Effective Dates : 2011-10-15/CCYY-MM-DD
Notes : in Leava bay, distant from 4.5km

7.x Instrumentation Type : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)
Status : (PERMANENT/MOBILE)
Effective Dates : (CCYY-MM-DD/CCYY-MM-DD)
Notes : (multiple lines)

8. Meteorological Instrumentation

8.1.x Humidity Sensor Model :
Manufacturer :
Serial Number :
Data Sampling Interval : (sec)
Accuracy (% rel h) : (% rel h)
Aspiration : (UNASPIRATED/NATURAL/FAN/etc)
Height Diff to Ant : (m)
Calibration date : (CCYY-MM-DD)
Effective Dates : (CCYY-MM-DD/CCYY-MM-DD)
Notes : (multiple lines)

8.2.x Pressure Sensor Model :
Manufacturer :
Serial Number :
Data Sampling Interval : (sec)
Accuracy : (hPa)
Height Diff to Ant : (m)
Calibration date : (CCYY-MM-DD)
Effective Dates : (CCYY-MM-DD/CCYY-MM-DD)
Notes : (multiple lines)

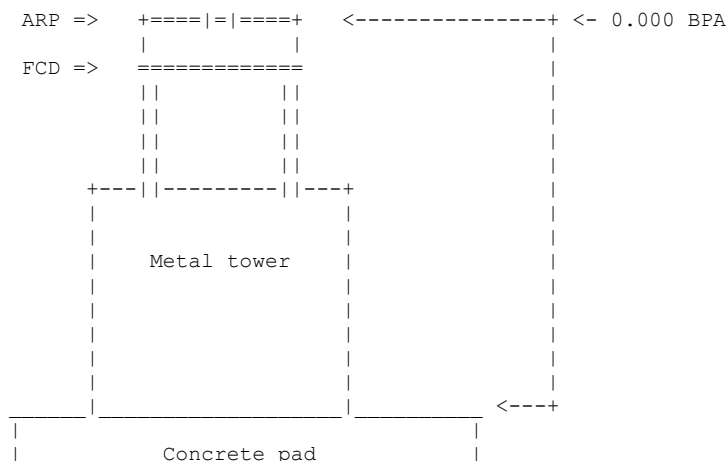
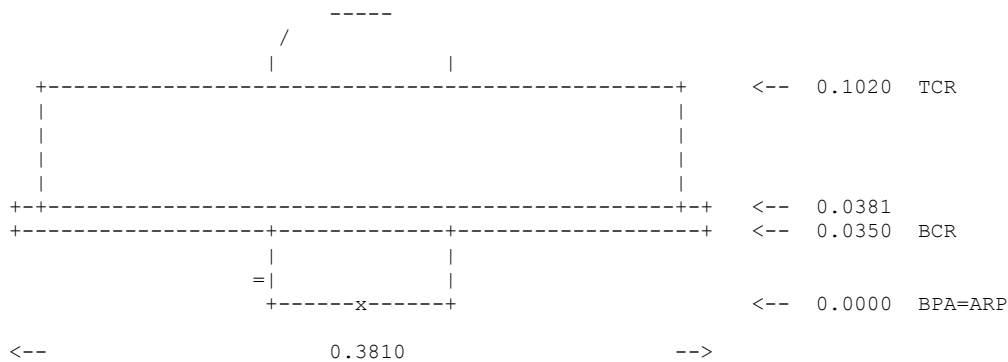
- 8.3.x Temp. Sensor Model :
Manufacturer :
Serial Number :
Data Sampling Interval : (sec)
Accuracy : (deg C)
Aspiration : (UNASPIRATED/NATURAL/FAN/etc)
Height Diff to Ant : (m)
Calibration date : (CCYY-MM-DD)
Effective Dates : (CCYY-MM-DD/CCYY-MM-DD)
Notes : (multiple lines)
- 8.4.x Water Vapor Radiometer :
Manufacturer :
Serial Number :
Distance to Antenna : (m)
Height Diff to Ant : (m)
Calibration date : (CCYY-MM-DD)
Effective Dates : (CCYY-MM-DD/CCYY-MM-DD)
Notes : (multiple lines)
- 8.5.x Other Instrumentation : (multiple lines)
9. Local Ongoing Conditions Possibly Affecting Computed Position
- 9.1.x Radio Interferences : (TV/CELL PHONE ANTENNA/RADAR/etc)
Observed Degradations : (SN_RATIO/DATA GAPS/etc)
Effective Dates : (CCYY-MM-DD/CCYY-MM-DD)
Additional Information : (multiple lines)
- 9.2.x Multipath Sources : (METAL ROOF/DOME/VLBI ANTENNA/etc)
Effective Dates : (CCYY-MM-DD/CCYY-MM-DD)
Additional Information : (multiple lines)
- 9.3.x Signal Obstructions : (TREES/BUILDINGS/etc)
Effective Dates : (CCYY-MM-DD/CCYY-MM-DD)
Additional Information : (multiple lines)
10. Local Episodic Effects Possibly Affecting Data Quality
- 10.x Date : (CCYY-MM-DD/CCYY-MM-DD)
Event : (TREE CLEARING/CONSTRUCTION/etc)
11. On-Site, Point of Contact Agency Information
- Agency : Météo-France
Preferred Abbreviation : MF
Mailing Address : directeur-nc@meteo.fr
Primary Contact
Contact Name : Philippe FRAYSSINET
Telephone (primary) : 687.27.93.00
Telephone (secondary) :
Fax :
E-mail :
Secondary Contact
Contact Name :
Telephone (primary) :
Telephone (secondary) :
Fax :
E-mail :
Additional Information :
12. Responsible Agency (if different from 11.)
- Agency : Centre National d'Etudes Spatiales
Preferred Abbreviation : CNES
Mailing Address : CNES DCT/ME/NC 18, avenue Edouard Belin
31401 Toulouse cedex 09 - France
Primary Contact
Contact Name : Alain Brissaud
Telephone (primary) :
Telephone (secondary) :

Fax :
E-mail :
Secondary Contact
Contact Name : Jean Paul Cardaliaguet
Telephone (primary) : (33) 5.61.27.31.98
Telephone (secondary) : (33) 5.61.28.35.22
Fax :
E-mail : jean-paul.cardaliaguet@cnes.fr
Additional Information : generic email : regina.operation@cnes.fr

13. More Information

Primary Data Center : IGN
Secondary Data Center : CDDIS
URL for More Information :
Hardcopy on File
Site Map :
Site Diagram :
Horizon Mask :
Monument Description :
Site Pictures :
Additional Information :
Antenna Graphics with Dimensions

TRM59800.00



ARP: Antenna Reference Point

L1 : L1 Phase Center

TCR: Top of Choking

TGP: Top of Ground Plane

TPA: Top of Preamplifier

TOP: Top of Pole

L2 : L2 Phase Center

BCR: Bottom of Choking

BGP: Bottom of Ground Plane

BPA: Bottom of Preamplifier

All dimensions are in meters.

6.3. «FTTG» GNSS station site log

FTTG Site Information Form (site log)
International GNSS Service
See Instructions at:
ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0. Form

Prepared by (full name) : Médéric Gravelle
Date Prepared : 2013-07-05
Report Type : NEW
If Update:
Previous Site Log : (ssss_ccyymmdd.log)
Modified/Added Sections : (n.n,n.n,...)

1. Site Identification of the GNSS Monument

Site Name : Leava
Four Character ID : FTTG
Monument Inscription :
IERS DOMES Number : 92903M001
CDP Number : (A4)
Monument Description :
Height of the Monument : (m)
Monument Foundation : (STEEL RODS, CONCRETE BLOCK, ROOF, etc)
Foundation Depth : (m)
Marker Description : (CHISELLED CROSS/DIVOT/BRASS NAIL/etc)
Date Installed : 2011-10-15T00:00Z
Geologic Characteristic : (BEDROCK/CLAY/CONGLOMERATE/GRAVEL/SAND/etc)
Bedrock Type : (IGNEOUS/METAMORPHIC/SEDIMENTARY)
Bedrock Condition : (FRESH/JOINTED/WEATHERED)
Fracture Spacing : (1-10 cm/11-50 cm/51-200 cm/over 200 cm)
Fault zones nearby : (YES/NO/Name of the zone)
Distance/activity : (multiple lines)
Additional Information :

2. Site Location Information

City or Town : Leava
State or Province : Wallis and Futuna
Country : Wallis and Futuna
Tectonic Plate : PACIFIC
Approximate Position (ITRF)
X coordinate (m) : -6178755.610
Y coordinate (m) : -198468.869
Z coordinate (m) : -1564754.802
Latitude (N is +) : -141745.6828
Longitude (E is +) : -1780936.81
Elevation (m,ellips.) : (F7.1)
Additional Information : (multiple lines)

3. GNSS Receiver Information

- 3.1 Receiver Type : LEICA GRX1200+GNSS
Satellite System : (GPS+GLO+GAL+BDS+QZSS+SBAS)
Serial Number : 496225
Firmware Version : 8.00
Elevation Cutoff Setting : (deg)
Date Installed : 2011-10-15
Date Removed : (CCYY-MM-DDThh:mmZ)
Temperature Stabiliz. : (none or tolerance in degrees C)
Additional Information : (multiple lines)
- 3.x Receiver Type : (A20, from rcvr_ant.tab; see instructions)
Satellite System : (GPS+GLO+GAL+BDS+QZSS+SBAS)
Serial Number : (A20, but note the first A5 is used in SINEX)
Firmware Version : (A11)
Elevation Cutoff Setting : (deg)

```

Date Installed      : (CCYY-MM-DDThh:mmZ)
Date Removed       : (CCYY-MM-DDThh:mmZ)
Temperature Stabiliz. : (none or tolerance in degrees C)
Additional Information : (multiple lines)

4. GNSS Antenna Information

4.1 Antenna Type      : LEIAR25
    Serial Number     : (A*, but note the first A5 is used in SINEX)
    Antenna Reference Point : BPA
    Marker->ARP Up Ecc. (m) : 0.000
    Marker->ARP North Ecc(m) : 0.000
    Marker->ARP East Ecc(m) : 0.000
    Alignment from True N : 0.000 deg
    Antenna Radome Type  : LEIT
    Radome Serial Number :
    Antenna Cable Type   : (vendor & type number)
    Antenna Cable Length : (m)
    Date Installed       : 2011-10-15
    Date Removed         : (CCYY-MM-DDThh:mmZ)
    Additional Information : (multiple lines)

4.x Antenna Type      : (A20, from rcvr_ant.tab; see instructions)
    Serial Number     : (A*, but note the first A5 is used in SINEX)
    Antenna Reference Point : (BPA/BCR/XXX from "antenna.gra"; see instr.)
    Marker->ARP Up Ecc. (m) : (F8.4)
    Marker->ARP North Ecc(m) : (F8.4)
    Marker->ARP East Ecc(m) : (F8.4)
    Alignment from True N : (deg; + is clockwise/east)
    Antenna Radome Type  : (A4 from rcvr_ant.tab; see instructions)
    Radome Serial Number :
    Antenna Cable Type   : (vendor & type number)
    Antenna Cable Length : (m)
    Date Installed       : (CCYY-MM-DDThh:mmZ)
    Date Removed         : (CCYY-MM-DDThh:mmZ)
    Additional Information : (multiple lines)

5. Surveyed Local Ties

5.x Tied Marker Name      :
    Tied Marker Usage     : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
    Tied Marker CDP Number : (A4)
    Tied Marker DOMES Number : (A9)
    Differential Components from GNSS Marker to the tied monument (ITRS)
        dx (m)           : (m)
        dy (m)           : (m)
        dz (m)           : (m)
    Accuracy (mm)         : (mm)
    Survey method         : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
    Date Measured         : (CCYY-MM-DDThh:mmZ)
    Additional Information : (multiple lines)

6. Frequency Standard

6.1 Standard Type        : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
    Input Frequency       : (if external)
    Effective Dates       : (CCYY-MM-DD/CCYY-MM-DD)
    Notes                 : (multiple lines)

6.x Standard Type        : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
    Input Frequency       : (if external)
    Effective Dates       : (CCYY-MM-DD/CCYY-MM-DD)
    Notes                 : (multiple lines)

7. Collocation Information

7.1 Instrumentation Type : TIDE GAUGE
    Status                : PERMANENT
    Effective Dates       : 2011-10-18/CCYY-MM-DD
    Notes                 : (multiple lines)

7.x Instrumentation Type : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)

```

Status : (PERMANENT/MOBILE)
Effective Dates : (CCYY-MM-DD/CCYY-MM-DD)
Notes : (multiple lines)

8. Meteorological Instrumentation

8.1.1 Humidity Sensor Model :
Manufacturer :
Serial Number :
Data Sampling Interval : (sec)
Accuracy (% rel h) : (% rel h)
Aspiration : (UNASPIRATED/NATURAL/FAN/etc)
Height Diff to Ant : (m)
Calibration date : (CCYY-MM-DD)
Effective Dates : (CCYY-MM-DD/CCYY-MM-DD)
Notes : (multiple lines)

8.1.x Humidity Sensor Model :
Manufacturer :
Serial Number :
Data Sampling Interval : (sec)
Accuracy (% rel h) : (% rel h)
Aspiration : (UNASPIRATED/NATURAL/FAN/etc)
Height Diff to Ant : (m)
Calibration date : (CCYY-MM-DD)
Effective Dates : (CCYY-MM-DD/CCYY-MM-DD)
Notes : (multiple lines)

8.2.1 Pressure Sensor Model :
Manufacturer :
Serial Number :
Data Sampling Interval : (sec)
Accuracy : (hPa)
Height Diff to Ant : (m)
Calibration date : (CCYY-MM-DD)
Effective Dates : (CCYY-MM-DD/CCYY-MM-DD)
Notes : (multiple lines)

8.2.x Pressure Sensor Model :
Manufacturer :
Serial Number :
Data Sampling Interval : (sec)
Accuracy : (hPa)
Height Diff to Ant : (m)
Calibration date : (CCYY-MM-DD)
Effective Dates : (CCYY-MM-DD/CCYY-MM-DD)
Notes : (multiple lines)

8.3.1 Temp. Sensor Model :
Manufacturer :
Serial Number :
Data Sampling Interval : (sec)
Accuracy : (deg C)
Aspiration : (UNASPIRATED/NATURAL/FAN/etc)
Height Diff to Ant : (m)
Calibration date : (CCYY-MM-DD)
Effective Dates : (CCYY-MM-DD/CCYY-MM-DD)
Notes : (multiple lines)

8.3.x Temp. Sensor Model :
Manufacturer :
Serial Number :
Data Sampling Interval : (sec)
Accuracy : (deg C)
Aspiration : (UNASPIRATED/NATURAL/FAN/etc)
Height Diff to Ant : (m)
Calibration date : (CCYY-MM-DD)
Effective Dates : (CCYY-MM-DD/CCYY-MM-DD)
Notes : (multiple lines)

8.4.1 Water Vapor Radiometer :
Manufacturer :
Serial Number :
Distance to Antenna : (m)

```

Height Diff to Ant      : (m)
Calibration date       : (CCYY-MM-DD)
Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
Notes                  : (multiple lines)

8.4.x Water Vapor Radiometer :
Manufacturer           :
Serial Number          :
Distance to Antenna    : (m)
Height Diff to Ant     : (m)
Calibration date       : (CCYY-MM-DD)
Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
Notes                  : (multiple lines)

8.5.1 Other Instrumentation : (multiple lines)

8.5.x Other Instrumentation : (multiple lines)

9. Local Ongoing Conditions Possibly Affecting Computed Position

9.1.1 Radio Interferences : (TV/CELL PHONE ANTENNA/RADAR/etc)
Observed Degradations    : (SN RATIO/DATA GAPS/etc)
Effective Dates          : (CCYY-MM-DD/CCYY-MM-DD)
Additional Information    : (multiple lines)

9.1.x Radio Interferences : (TV/CELL PHONE ANTENNA/RADAR/etc)
Observed Degradations    : (SN RATIO/DATA GAPS/etc)
Effective Dates          : (CCYY-MM-DD/CCYY-MM-DD)
Additional Information    : (multiple lines)

9.2.1 Multipath Sources   : (METAL ROOF/DOME/VLBI ANTENNA/etc)
Effective Dates          : (CCYY-MM-DD/CCYY-MM-DD)
Additional Information    : (multiple lines)

9.2.x Multipath Sources   : (METAL ROOF/DOME/VLBI ANTENNA/etc)
Effective Dates          : (CCYY-MM-DD/CCYY-MM-DD)
Additional Information    : (multiple lines)

9.3.1 Signal Obstructions : (TREES/BUILDINGS/etc)
Effective Dates          : (CCYY-MM-DD/CCYY-MM-DD)
Additional Information    : (multiple lines)

9.3.x Signal Obstructions : (TREES/BUILDINGS/etc)
Effective Dates          : (CCYY-MM-DD/CCYY-MM-DD)
Additional Information    : (multiple lines)

10. Local Episodic Effects Possibly Affecting Data Quality

10.1 Date                : (CCYY-MM-DD/CCYY-MM-DD)
Event                    : (TREE CLEARING/CONSTRUCTION/etc)

10.x Date                : (CCYY-MM-DD/CCYY-MM-DD)
Event                    : (TREE CLEARING/CONSTRUCTION/etc)

11. On-Site, Point of Contact Agency Information

Agency                  : SHOM
Preferred Abbreviation  : SHOM
Mailing Address          : (multiple lines)
Primary Contact
Contact Name            : Guillaume Voineson
Telephone (primary)     :
Telephone (secondary)   :
Fax                     :
E-mail                  : guillaume.voineson@shom.fr
Secondary Contact
Contact Name            :
Telephone (primary)     :
Telephone (secondary)   :
Fax                     :
E-mail                  :
Additional Information   : (multiple lines)

```

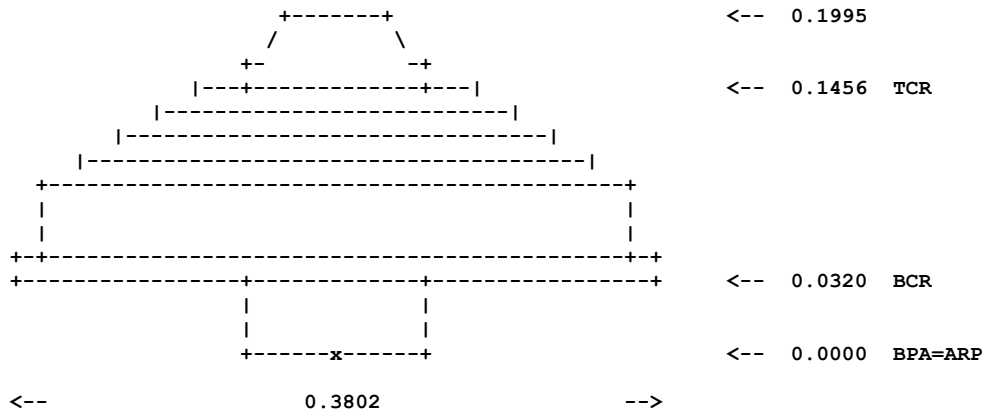
12. Responsible Agency (if different from 11.)

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

13. More Information

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

LEIAR25



6.4. Geodetic points

Source DITTT/ST/BGN, contact bgn.dittt@gouv.nc

Réseau Géodésique de Wallis et Futuna (1996)



Station Météo MAOPO'OPO

Commune	: Alo	Identifiant ST :	4902-01
Province	:		
Feuille au 1/50000°	: 4902F FUTUNA ALOFI	Identifiant INSEE :	9861101
Feuille au 1/10000°	:		

Repère	Désignation
(a)	Bloc en béton : Repère bronze GM hémisph.
(b)	Socle en béton : Repère bronze PM
(c)	Bloc rocheux : bétonné : Douille : SHOM (MOP 86)

Repère	Informations complémentaires			
	Etat	Visite	Exploit.GPS	Remarque
(a)	Bon état	04/11/2010	Oui	Matricule IRD : HORN
(b)	Bon état	04/11/2010	Oui	Matricule IRD : PLOT
(c)	Bon état	04/11/2010	Oui	Matricule IRD : SHOM

Situation	Site
Extrait 1/25 000° IGN	<u>Situation topo</u> : Mala'e <u>Accès</u> : Depuis la RT1, en direction de SIGAVE, prendre un chemin direction Nord juste après la chapelle Saint Michel. Faire environ 500m jusqu'à la Station Météo France. <u>Accessible</u> : A tout véhicule par temps sec <u>Autorisations diverses</u> : Voir Afalaato. <u>Orientement au sol à partir du repère principal</u> <u>Photo(s) disponible(s)</u> : 6

Réseau Géodésique de Wallis et Futuna (1996)



Station Météo MAOPO'OPO

Commune : Alo
Province :
Feuille au 1/50000° : 4902F FUTUNA ALOFI
Feuille au 1/10000° :
Identifiant ST : **4902-01**
Identifiant INSEE : **9861101**

Coordonnées planes et altitude

Réseau géodésique : RGWF96
Réseau altimétrique : NGWF Futuna
Ellipsoïde : IAG GRS 1980
Projection : UTM - 01S

Repère	E (m)	N (m)	CP	Altitude (m)	CH
(a)	379 104.088	8 417 941.660	101	35.7	209
(b)	379 118.012	8 417 946.786	101	35.5	209
(c)	379 114.357	8 417 925.622	101	35.5	209

CP101 : Détermination GPS géodésique : précision < 5 ppm

CH209 : Détermination par conversion de la He en appliquant la moyenne générale des différences entre les He et les Altitudes

Coordonnées tridimensionnelles géographiques

Réseau géodésique : RGWF96
Ellipsoïde : IAG GRS 1980

Repère	Longitude	Latitude	CP	He (m)	CHe
(a)	-178°07'15.40927"	-14°18'28.02009"	101	82.565	301
(b)	-178°07'14.94373"	-14°18'27.85545"	101	82.309	301
(c)	-178°07'15.06915"	-14°18'28.54363"	101	82.313	301

CP101 : Détermination GPS géodésique : précision < 5 ppm

CH301 : Détermination GPS géodésique : précision < 5 ppm

The Réseau Géodésique de Wallis et Futuna, RGWF96, has been established by DITTT. Geodetic network RGWF96 is a ITRF94 solution, epoch 1993.0. For more details, contact DITTT.

Point 4902-01b was not observed. Its existence was known after the campaign.

Réseau Géodésique de Wallis et Futuna (1996)



Station Météo MAOPO'OPO

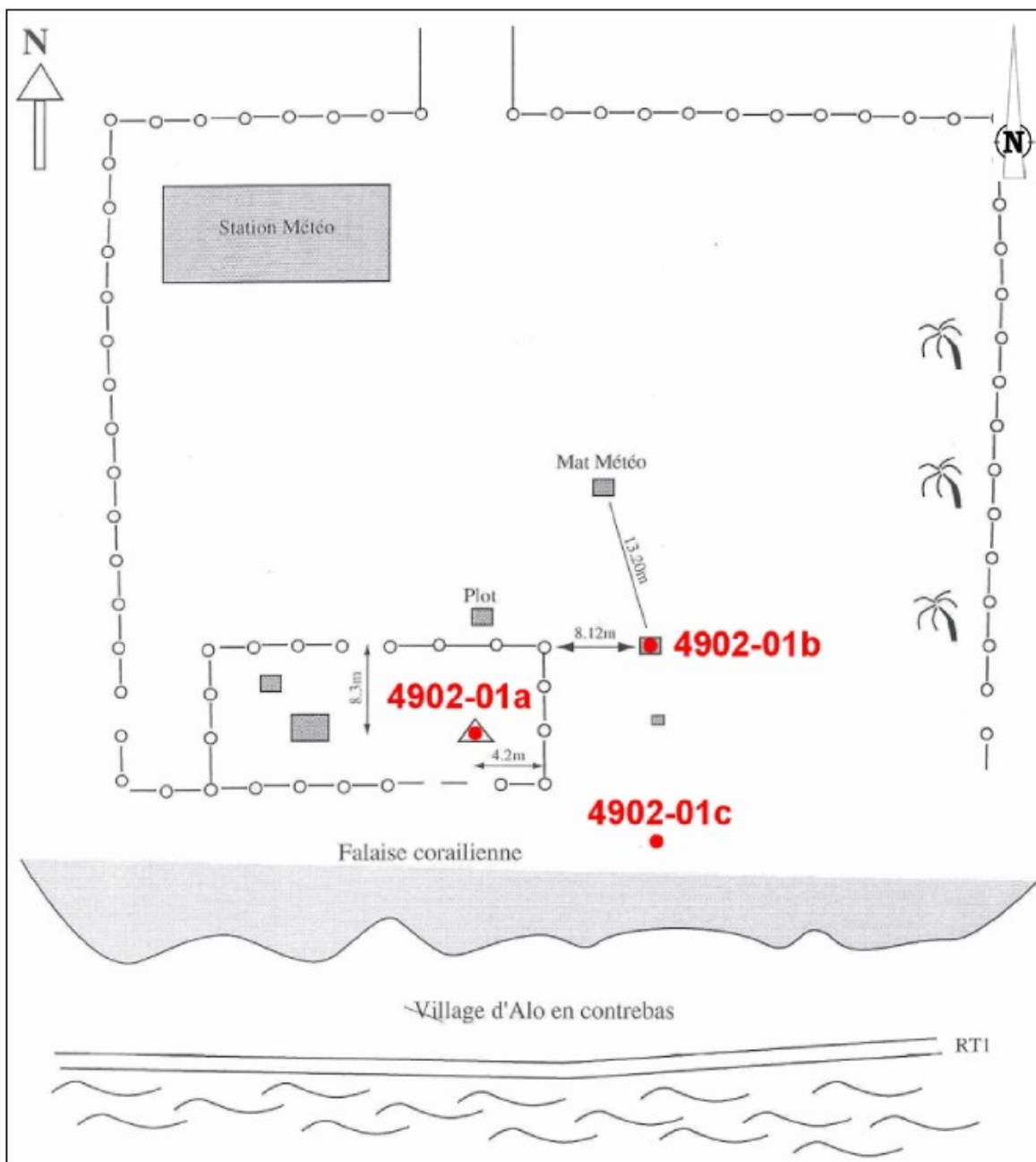
Commune : Alo
Province :
Feuille au 1/50000° : 4902F FUTUNA ALOFI
Feuille au 1/10000° :

Identifiant ST :

4902-01

Identifiant INSEE :

9861101



Réseau Géodésique de Wallis et Futuna (1996)



Station Météo MAOPO'OPO

Commune : Alo
Province :
Feuille au 1/50000° : 4902F FUTUNA ALOFI
Feuille au 1/10000° :

Identifiant ST : **4902-01**

Identifiant INSEE : **9861101**



4902-01a#1.jpg \ 08/11/2010



4902-01a#2.jpg



4902-01b#1.jpg \ 04/11/2010



4902-01b#2.jpg



4902-01c#1.jpg \ 04/11/2010



4902-01c#2.jpg

6.5. Leica Geo Office report file

Local GNSS observations were processed with Leica Geo Office V8.3



Récapitulatif du Traitement Futuna

Informations sur le Projet

Nom du Projet:	Futuna
Date de création:	02/10/2015 11:57:37
Fuseau Horaire:	1h 00'
Nom Syst. Coordonnées:	WGS 1984
Logiciel d'application:	LEICA Geo Office 8.3
Date et heure de début:	05/15/2012 00:59:45
Date et heure de fin:	05/20/2012 06:18:15
Points occupés manuellement:	10
Noyau de Post-Traitement:	PSI-Pro 3.0
Traité:	02/10/2015 13:15:43

Paramètres de Traitement

Paramètres	Sélectionnés
Angle de Coupure:	3°
Type d'Ephémérides:	Précises
Type de solution:	Automatique
Type GNSS:	Automatique
Fréquence:	Automatique
Fixer les ambiguïtés jusqu'à:	80 km
Durée mini pour solution flottante (statique):	5' 00"
Taux d'échantillonnage:	Tout Utiliser
Modèle Troposphérique:	Hopfield
Modèle Ionosphérique:	Automatique
Utiliser modélisation statistique:	Oui
Distance mini.:	8 km
Activité ionosphérique:	Automatique

Ligne de Base - Aperçu

FTNA - FTTG	Référence: FTNA	Mobile: FTTG
Type de capteur / N° S:	GX1230GG / 472271	GRX1200+ GNSS / 496225
Type d'antenne / N° S:	ASH700936D_M SNOW / -	LEIAR25 LEIT / -
Hauteur d'antenne:	0.0000 m	0.0000 m
Coordonnées:		
Latitude:	14° 18' 28.09064" S	14° 17' 45.77709" S
Longitude:	178° 07' 15.40537" O	178° 09' 36.86732" O
Hteur Ellip.:	84.8589 m	52.2974 m
Type de solution:	Phase: toutes fixes	
Type GNSS:	GPS / GLONASS	
Fréquence:	L1/E1 et L2	
Ambiguïté:	Oui	
Plage horaire:	05/16/2012 05:51:45 - 05/17/2012 00:04:15	
Durée:	18h 12' 30"	
Vecteur Ligne Base:	dLat: 0° 00' 42.31354" Pente: 4434.7302 m	dLon: -0° 02' 21.46196" dAlt: -32.5616 m
DOP (min-max):	GDOP: 1.1 - 3.2 PDOP: 1.0 - 2.6	HDOP: 0.5 - 1.2 VDOP: 0.8 - 2.3
Nombre de satellites utilisés:	GPS: 31 GLONASS: 23	
FTNA - FTTG	Référence: FTNA	Mobile: FTTG
Type de capteur / N° S:	GX1230GG / 472271	GRX1200+ GNSS / 496225
Type d'antenne / N° S:	ASH700936D_M SNOW / -	LEIAR25 LEIT / -
Hauteur d'antenne:	0.0000 m	0.0000 m
Coordonnées:		
Latitude:	14° 18' 28.09064" S	14° 17' 45.77715" S
Longitude:	178° 07' 15.40537" O	178° 09' 36.86728" O
Hteur Ellip.:	84.8589 m	52.2999 m
Type de solution:	Phase: toutes fixes	
Type GNSS:	GPS / GLONASS	
Fréquence:	L1/E1 et L2	
Ambiguïté:	Oui	
Plage horaire:	05/15/2012 00:59:45 - 05/15/2012 21:43:45	
Durée:	20h 44' 00"	
Vecteur Ligne Base:	dLat: 0° 00' 42.31349" Pente: 4434.7286 m	dLon: -0° 02' 21.46192" dAlt: -32.5590 m
DOP (min-max):	GDOP: 1.2 - 3.2 PDOP: 1.1 - 2.6	HDOP: 0.5 - 1.1 VDOP: 0.9 - 2.3
Nombre de satellites utilisés:	GPS: 31 GLONASS: 23	

FTNA - 20000	Référence: FTNA	Mobile: 20000
Type de capteur / N° S:	TRIMBLE / 5134	GX1230GG / 472277
Type d'antenne / N° S:	TRM59800.00 NONE / -	LEIAX1202GG NONE / -
Hauteur d'antenne:	0.0000 m	0.0000 m
Coordonnées:		
Latitude:	14° 18' 28.09064" S	14° 18' 25.79568" S
Longitude:	178° 07' 15.40537" O	178° 07' 14.79482" O
Hteur Ellip.:	84.8589 m	83.9025 m
Type de solution:	Phase: toutes fixes	
Type GNSS:	GPS / GLONASS	
Fréquence:	L1/E1 et L2	
Ambiguïté:	Oui	
Plage horaire:	05/19/2012 04:40:15 - 05/19/2012 22:01:15	
Durée:	17h 21' 00"	
Vecteur Ligne Base:	dLat: 0° 00' 02.29495" Pente: 72.8749 m	dLon: 0° 00' 00.61054" dAlt: -0.9565 m
DOP (min-max):	GDOP: 1.2 - 5.0 PDOP: 1.1 - 4.0	HDOP: 0.5 - 1.7 VDOP: 0.9 - 3.5
Nombre de satellites utilisés:	GPS: 30 GLONASS: 23	
FTNA - SHOM	Référence: FTNA	Mobile: SHOM
Type de capteur / N° S:	GX1230GG / 472271	GX1230GG / 472277
Type d'antenne / N° S:	TRM59800.00 NONE / -	LEIAX1202GG NONE / -
Hauteur d'antenne:	0.0000 m	1.4340 m
Coordonnées:		
Latitude:	14° 18' 28.09064" S	14° 18' 28.47711" S
Longitude:	178° 07' 15.40537" O	178° 07' 14.89842" O
Hteur Ellip.:	84.8589 m	82.7196 m
Type de solution:	Phase: toutes fixes	
Type GNSS:	GPS / GLONASS	
Fréquence:	L1/E1 et L2	
Ambiguïté:	Oui	
Plage horaire:	05/17/2012 22:35:15 - 05/18/2012 06:52:45	
Durée:	8h 17' 30"	
Vecteur Ligne Base:	dLat: -0° 00' 00.38648" Pente: 19.4033 m	dLon: 0° 00' 00.50694" dAlt: -2.1393 m
DOP (min-max):	GDOP: 1.2 - 2.3 PDOP: 1.1 - 1.9	HDOP: 0.5 - 0.8 VDOP: 0.9 - 1.8
Nombre de satellites utilisés:	GPS: 19 GLONASS: 16	

FTNA - HORN	Référence: FTNA	Mobile: HORN
Type de capteur / N° S:	GX1230GG / 472271	GX1230GG / 472277
Type d'antenne / N° S:	ASH700936D_M SNOW / -	LEIAX1202GG NONE / -
Hauteur d'antenne:	0.0000 m	1.5350 m
Coordonnées:		
Latitude:	14° 18' 28.09064" S	14° 18' 27.99967" S
Longitude:	178° 07' 15.40537" O	178° 07' 15.44782" O
Hteur Ellip.:	84.8589 m	82.4683 m
Type de solution:	Phase: toutes fixes	
Type GNSS:	GPS / GLONASS	
Fréquence:	L1/E1 et L2	
Ambiguïté:	Oui	
Plage horaire:	05/16/2012 21:49:45 - 05/17/2012 00:04:15	
Durée:	2h 14' 30"	
Vecteur Ligne Base:	dLat: 0° 00' 00.09096" Pente: 3.8923 m	dLon: -0° 00' 00.04245" dAlt: -2.3906 m
DOP (min-max):	GDOP: 1.3 - 1.8 PDOP: 1.2 - 1.6	HDOP: 0.6 - 0.6 VDOP: 1.0 - 1.4
Nombre de satellites utilisés:	GPS: 12 GLONASS: 10	

FTNA - HORN	Référence: FTNA	Mobile: HORN
Type de capteur / N° S:	GX1230GG / 472271	GX1230GG / 472277
Type d'antenne / N° S:	TRM59800.00 NONE / -	LEIAX1202GG NONE / -
Hauteur d'antenne:	0.0000 m	1.5350 m
Coordonnées:		
Latitude:	14° 18' 28.09064" S	14° 18' 27.99969" S
Longitude:	178° 07' 15.40537" O	178° 07' 15.44781" O
Hteur Ellip.:	84.8589 m	82.4662 m
Type de solution:	Phase: toutes fixes	
Type GNSS:	GPS / GLONASS	
Fréquence:	L1/E1 et L2	
Ambiguïté:	Oui	
Plage horaire:	05/17/2012 05:12:15 - 05/17/2012 22:30:45	
Durée:	17h 18' 30"	
Vecteur Ligne Base:	dLat: 0° 00' 00.09094" Pente: 3.8931 m	dLon: -0° 00' 00.04244" dAlt: -2.3927 m
DOP (min-max):	GDOP: 1.1 - 3.8 PDOP: 1.0 - 3.1	HDOP: 0.5 - 1.5 VDOP: 0.8 - 2.7
Nombre de satellites utilisés:	GPS: 31 GLONASS: 23	

FTNA - 10000	Référence: FTNA	Mobile: 10000
Type de capteur / N° S:	TRIMBLE / 5134	GX1230GG / 472277
Type d'antenne / N° S:	TRM59800.00 NONE / -	LEIAX1202GG NONE / -
Hauteur d'antenne:	0.0000 m	0.0000 m
Coordonnées:		
Latitude:	14° 18' 28.09064" S	14° 18' 34.28968" S
Longitude:	178° 07' 15.40537" O	178° 07' 18.49706" O
Hteur Ellip.:	84.8589 m	52.7288 m
Type de solution:	Phase: toutes fixes	
Type GNSS:	GPS / GLONASS	
Fréquence:	L1/E1 et L2	
Ambiguïté:	Oui	
Plage horaire:	05/20/2012 01:20:15 - 05/20/2012 06:18:15	
Durée:	4h 58' 00"	
Vecteur Ligne Base:	dLat: -0° 00' 06.19904" Pente: 214.2812 m	dLon: -0° 00' 03.09169" dAlt: -32.1302 m
DOP (min-max):	GDOP: 1.2 - 2.3 PDOP: 1.1 - 1.9	HDOP: 0.5 - 1.0 VDOP: 0.9 - 1.8
Nombre de satellites utilisés:	GPS: 16 GLONASS: 12	
FTNA - FTTG	Référence: FTNA	Mobile: FTTG
Type de capteur / N° S:	TRIMBLE / 5134	GRX1200+ GNSS / 496225
Type d'antenne / N° S:	TRM59800.00 NONE / -	LEIAR25 LEIT / -
Hauteur d'antenne:	0.0000 m	0.0000 m
Coordonnées:		
Latitude:	14° 18' 28.09064" S	14° 17' 45.77713" S
Longitude:	178° 07' 15.40537" O	178° 09' 36.86703" O
Hteur Ellip.:	84.8589 m	52.2892 m
Type de solution:	Phase: toutes fixes	
Type GNSS:	GPS / GLONASS	
Fréquence:	L1/E1 et L2	
Ambiguïté:	Oui	
Plage horaire:	05/19/2012 04:32:15 - 05/19/2012 21:05:15	
Durée:	16h 33' 00"	
Vecteur Ligne Base:	dLat: 0° 00' 42.31351" Pente: 4434.7216 m	dLon: -0° 02' 21.46167" dAlt: -32.5698 m
DOP (min-max):	GDOP: 1.2 - 5.0 PDOP: 1.1 - 4.0	HDOP: 0.5 - 1.9 VDOP: 0.9 - 3.6
Nombre de satellites utilisés:	GPS: 30 GLONASS: 23	

FTNA - FTTG	Référence: FTNA	Mobile: FTTG
Type de capteur / N° S:	GX1230GG / 472271	GRX1200+ GNSS / 496225
Type d'antenne / N° S:	TRM59800.00 NONE / -	LEIAR25 LEIT / -
Hauteur d'antenne:	0.0000 m	0.0000 m
Coordonnées:		
Latitude:	14° 18' 28.09064" S	14° 17' 45.77705" S
Longitude:	178° 07' 15.40537" O	178° 09' 36.86733" O
Hteur Ellip.:	84.8589 m	52.2923 m
Type de solution:	Phase: toutes fixes	
Type GNSS:	GPS / GLONASS	
Fréquence:	L1/E1 et L2	
Ambiguïté:	Oui	
Plage horaire:	05/17/2012 05:12:15 - 05/18/2012 00:59:15	
Durée:	19h 47' 00"	
Vecteur Ligne Base:	dLat: 0° 00' 42.31359" Pente: 4434.7309 m	dLon: -0° 02' 21.46196" dAlt: -32.5667 m
DOP (min-max):	GDOP: 1.2 - 4.9 PDOP: 1.1 - 3.9	HDOP: 0.5 - 1.7 VDOP: 0.9 - 3.6
Nombre de satellites utilisés:	GPS: 31 GLONASS: 23	

FTNA - FTTG	Référence: FTNA	Mobile: FTTG
Type de capteur / N° S:	GX1230GG / 472271	GRX1200+ GNSS / 496225
Type d'antenne / N° S:	TRM59800.00 NONE / -	LEIAR25 LEIT / -
Hauteur d'antenne:	0.0000 m	0.0000 m
Coordonnées:		
Latitude:	14° 18' 28.09064" S	14° 17' 45.77700" S
Longitude:	178° 07' 15.40537" O	178° 09' 36.86729" O
Hteur Ellip.:	84.8589 m	52.2986 m
Type de solution:	Phase: toutes fixes	
Type GNSS:	GPS / GLONASS	
Fréquence:	L1/E1 et L2	
Ambiguïté:	Oui	
Plage horaire:	05/18/2012 00:59:45 - 05/18/2012 21:10:45	
Durée:	20h 11' 00"	
Vecteur Ligne Base:	dLat: 0° 00' 42.31364" Pente: 4434.7302 m	dLon: -0° 02' 21.46193" dAlt: -32.5604 m
DOP (min-max):	GDOP: 1.2 - 6.2 PDOP: 1.1 - 5.0	HDOP: 0.5 - 3.1 VDOP: 0.9 - 4.2
Nombre de satellites utilisés:	GPS: 31 GLONASS: 23	

6.6. Adjustment input file

```
TITL  FUTUNA (FRANCE) REGINA-DORIS TIES - MAY 2012 SURVEY
COMP  ADJ
ELIP  GRS 80          6378137.000  6356752.3142  0.0000  0.0000  0.0000 m
MAXI          15
CONF  YES YES YES YES NO
PSOL  NO  YES
PMIS  NO  NO
PRES  YES NO
PADJ  NO  NO YES NO  YES NO
VARF  YES YES NO
RTST  TAU MAX
LUNT  m   1.000000000000
CONV  0.00010
CLEV  95.000
ANGT  GRD
LDEC  4

*****
*          ITRF ACRONYMS, n° DOMES and POINTS DESCRIPTION          *
*****

*DORIS:
*FUUB : new DORIS Ant. Ref. Pt. (Starec type)          DOMES 92902S003
*FUUB_marker : DORIS concrete pillar / domed brass mark  DOMES 92902M002
*FUTB : ex-DORIS Ant. Ref. Pt. (Starec type)          DOMES 92902S001

*GNSS permanent stations
*FTNA : Ref. Pt.          DOMES 92902S002
*FTTG : Ref. Pt.          DOMES 92903M001

*****
*          LIST OF POINTS for the SURVEY ADJUSTMENT          *
*****

*10000: station to orient the survey polygon network
*20000: station to orient the survey polygon network
*DORIS_2GHz: DORIS antenna, upper part
*1000: survey station on FTNA
*100: survey domed brass mark
*101: mini reflector pole on control point 100
*200: survey domed brass mark
*201: mini reflector pole on control point 200
*202: survey station on control point 200
*300: survey domed brass mark
*301: mini reflector pole on control point 300
*302: survey station on control point 300
*400: survey domed brass mark
*401: mini reflector pole on control point 400
*402: survey station on control point 400
*500: survey domed brass mark
*501: mini reflector pole on control point 500
*502: survey station on control point 500
*HORN: survey domed brass mark          RGWF96-identifiant ST: 4902-01a
*5001: mini reflector pole on geodetic point HORN
*5002: survey station on geodetic point HORN
*SHOM: survey domed brass mark          RGWF96-identifiant ST: 4902-01c
*6001: mini reflector pole on geodetic point SHOM
*6002: survey station on geodetic point SHOM

*Temporary points
*1: survey station
*2: survey station
*3: survey station
*4: survey station

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

*FORCED IGS08/ITRF2008 EPOCH 2012:186 COORDINATES
3DC
XYZ  000 FTNA          -6178322.4511          -202694.9628          -1566024.4520
COV  CT DIAG          1
ELEM          0.000001          0.000001          0.000001
```

Futuna ITRF site co-location survey – May 2012

*****AZIMUT DEDUCTED FROM THE GNSS DETERMINATION*****

```

3DD
PLH 000 FTNA      s 14 18 28.090640 w178 7 15.405370      84.8589 m 0
PLH 000 20000     s 14 18 25.795680 w178 7 14.794820      83.9024 m 0

COV LG DIAG
ELEM              0.000001              0.000001              0.1

3DD
PLH 000 FTNA      s 14 18 28.090640 w178 7 15.405370      84.8589 m 0
PLH 000 10000     s 14 18 34.289680 w178 7 18.497060      52.7288 m 0
COV LG DIAG
ELEM              0.000001              0.000001              0.1

```

*****APPROXIMATE COORDINATES*****

```

PLH 000 200      s 14 18 27.834420 w178 7 15.778440      82.5836 m 0
PLH 000 10000    s 14 18 34.289680 w178 7 18.497060      52.7289 m 0
PLH 000 20000    s 14 18 25.795690 w178 7 14.794820      83.9025 m 0
PLH 000 SHOM     s 14 18 28.477110 w178 7 14.898420      82.7196 m 0
PLH 000 HORN     s 14 18 27.999690 w178 7 15.447810      82.4666 m 0
PLH 000 1        s 14 18 28.260260 w178 7 15.447300      83.9002 m 0
PLH 000 500      s 14 18 28.099620 w178 7 15.999520      82.5298 m 0
PLH 000 501      s 14 18 28.099630 w178 7 15.999520      82.7293 m 0
PLH 000 502      s 14 18 28.099660 w178 7 15.999540      83.9441 m 0
PLH 000 100      s 14 18 28.091740 w178 7 15.409810      83.1559 m 0
PLH 000 101      s 14 18 28.091750 w178 7 15.409810      83.3555 m 0
PLH 000 2        s 14 18 28.207170 w178 7 15.691110      83.8925 m 0
PLH 000 201      s 14 18 27.834380 w178 7 15.778420      82.7780 m 0
PLH 000 202      s 14 18 27.834390 w178 7 15.778430      83.9183 m 0
PLH 000 3        s 14 18 27.985590 w178 7 15.990200      83.8632 m 0
PLH 000 300      s 14 18 27.819590 w178 7 15.513060      82.3628 m 0
PLH 000 301      s 14 18 27.819580 w178 7 15.513060      82.5626 m 0
PLH 000 302      s 14 18 27.819600 w178 7 15.513050      83.8231 m 0
PLH 000 4        s 14 18 27.674190 w178 7 15.649510      83.7999 m 0
PLH 000 400      s 14 18 27.937910 w178 7 15.331060      82.3609 m 0
PLH 000 401      s 14 18 27.937910 w178 7 15.331040      82.5599 m 0
PLH 000 402      s 14 18 27.937940 w178 7 15.331050      83.7961 m 0
PLH 000 5001     s 14 18 27.999640 w178 7 15.447810      82.6623 m 0
PLH 000 5002     s 14 18 27.999680 w178 7 15.447780      84.0684 m 0
PLH 000 6001     s 14 18 28.477110 w178 7 14.898510      82.9159 m 0
PLH 000 6002     s 14 18 28.477080 w178 7 14.898460      84.0538 m 0
PLH 001 DORIS_2GHz s 14 18 28.028730 w178 7 15.599570      84.7288 m 0
PLH 000 FUUB     s 14 18 28.028740 w178 7 15.599560      85.7252 m 0
PLH 000 FUUB_marker s 14 18 28.028730 w178 7 15.599540      83.5411 m 0

```

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

*Total station height and prism height over reference point: 0.235m

```

3DD
PLH 000 1000     s 14 18 28.090640 w178 7 15.405370      85.0940 m 0
PLH 000 FTNA     s 14 18 28.090640 w178 7 15.405370      84.8590 m 0
COV LG DIAG
ELEM              0.00000004              0.00000004              0.00000009

```

*Total station height over survey mark: 1.419m

*mini reflector pole, prism height over survey mark of 0.20m

```

3DD
PLH 000 502      s 14 18 28.097650 w178 7 15.777370      84.1341 m 0
PLH 000 501      s 14 18 28.097650 w178 7 15.777370      82.9151 m 0
PLH 000 500      s 14 18 28.097650 w178 7 15.777370      82.7151 m 0
COV LG DIAG
ELEM              0.000001              0.000001              0.000002
ELEM              0.000001              0.000001              0.000002

```

*Total station height over survey mark: 1.344m

*mini reflector pole, prism height over survey mark of 0.20m

```

3DD
PLH 000 202      s 14 18 27.834420 w178 7 15.778440      83.9276 m 0
PLH 000 201      s 14 18 27.834420 w178 7 15.778440      82.7836 m 0
PLH 000 200      s 14 18 27.834420 w178 7 15.778440      82.5836 m 0
COV LG DIAG
ELEM              0.000001              0.000001              0.000002
ELEM              0.000001              0.000001              0.000002

```

*Total station height over survey mark: 1.464m

*mini reflector pole, prism height over survey mark of 0.20m

```

3DD
PLH 000 302      s 14 18 27.819600 w178 7 15.513050      83.8231 m 0
PLH 000 301      s 14 18 27.819600 w178 7 15.513050      82.5591 m 0
PLH 000 300      s 14 18 27.819600 w178 7 15.513050      82.3591 m 0
COV LG DIAG
ELEM              0.000001              0.000001              0.000002

```

Futuna ITRF site co-location survey – May 2012

ELEM	0.000001	0.000001	0.000002
*Total station height over survey mark: 1.440m			
*mini reflector pole, prism height over survey mark of 0.20m			
3DD			
PLH 000 402	S 14 18 27.93794 W178 7 15.33105	83.7961 m	0
PLH 000 401	S 14 18 27.93794 W178 7 15.33105	82.5561 m	0
PLH 000 400	S 14 18 27.93794 W178 7 15.33105	82.3561 m	0
COV LG DIAG			
ELEM	0.000001	0.000001	0.000006
ELEM	0.000001	0.000001	0.000002
*Total station height over survey mark: 1.607m			
*mini reflector pole, prism height over survey mark of 0.20m			
3DD			
PLH 000 5002	s 14 18 27.999690 w178 7 15.447810	84.0736 m	0
PLH 000 5001	s 14 18 27.999690 w178 7 15.447810	82.6666 m	0
PLH 000 HORN	s 14 18 27.999690 w178 7 15.447810	82.4666 m	0
COV LG DIAG			
ELEM	0.000001	0.000001	0.000002
ELEM	0.000001	0.000001	0.000002
*Total station height over survey mark: 1.343m			
*mini reflector pole, prism height over survey mark of 0.20m			
3DD			
PLH 000 6002	s 14 18 28.477110 w178 7 14.898420	84.0626 m	0
PLH 000 6001	s 14 18 28.477110 w178 7 14.898420	82.9196 m	0
PLH 000 SHOM	s 14 18 28.477110 w178 7 14.898420	82.7196 m	0
COV LG DIAG			
ELEM	0.000001	0.000001	0.000002
ELEM	0.000001	0.000001	0.000002
*Informations provided by J-C POYARD, result from DORIS station renovation			
3DD			
PLH 000 FUUB	s 14 18 28.035730 w178 7 15.585284	85.6134 m	0
PLH 000 FUTB	s 14 18 28.036000 w178 7 15.585000	85.0000 m	0
COV LG DIAG			
ELEM	0.000004	0.000004	0.000004
*Informations result from local GNSS observation process by Leica Geo Office			
3DD			
PLH 000 FTNA	s 14 18 28.090640 w178 7 15.405370	84.8589 m	0
PLH 000 FTTG	s 14 17 45.777100 w178 9 36.867270	52.2963 m	0
COV LG DIAG			
ELEM	0.000004	0.000004	0.000004

* Total Station Observations 2012 T.DONAL *

Tours d'horizon
SIGM AH 8.0
HIST NEW
DSET AH

DIR	6002	20000	0 0	0.0
DIR	6002	1	322 10	79.4
DIR	6002	1000	339 84	80.2
DIR	6002	2	318 99	17.6
DIR	6002	4	350 52	34.1
DIR	6002	202	338 52	56.3
*DIR	6002	201	334 48	41.0
*DIR	6002	202	334 62	34.7
DIR	6002	FUUB	334 55	37.8
*DIR	6002	203	334 52	40.8
*DIR	6002	204	334 58	31.6
DIR	6002	DORIS_2GHz	334 55	36.2
DIR	6002	100	339 48	77.3
DSET AH				
DIR	6002	20000	0 0	0.0
DIR	6002	301	350 54	70.6
DIR	6002	401	355 33	74.6
DIR	6002	5001	343 94	58.0
DIR	6002	FUUB_marker	334 55	32.8
DSET AH				
DIR	1	10000	0 0	0.0
DIR	1	6002	295 33	67.9
*DIR	1	2	84 82	32.8
DIR	1	3	101 29	66.5
DIR	1	4	150 16	47.6
DIR	1	1000	185 91	5.5
DIR	1	20000	186 91	25.1
DIR	1	500	89 28	12.4
DIR	1	300	161 62	86.2
DIR	1	400	192 35	32.4
DIR	1	HORN	170 70	61.9

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DIR	1	100	184 42	95.0
*DIR	1	201	134 31	98.7
*DIR	1	202	134 73	10.3
DIR	1	FUUB	134 52	54.5
*DIR	1	203	134 44	6.9
*DIR	1	204	134 60	86.4
DIR	1	DORIS_2GHz	134 52	77.7
DSET AH				
DIR	1	10000	0 0	0.0
DIR	1	501	89 28	18.8
DIR	1	301	161 62	91.8
DIR	1	401	192 35	54.4
DIR	1	5001	170 70	68.3
DIR	1	FUUB_marker	134 53	33.9
*DIR	1	101	184 43	49.5
DSET AH				
DIR	3	20000	0 0	0.0
DIR	3	202	28 62	87.0
DIR	3	1000	80 45	65.6
DIR	3	1	99 32	98.5
DIR	3	2	110 21	72.0
*DIR	3	201	75 89	30.8
*DIR	3	202	76 19	2.8
DIR	3	FUUB	76 4	16.8
*DIR	3	203	75 97	93.5
*DIR	3	204	76 10	6.8
DIR	3	DORIS_2GHz	76 4	00.1
DIR	3	4	20 91	87.4
DIR	3	500	173 92	31.0
DIR	3	200	28 62	78.0
DIR	3	300	47 4	24.9
DIR	3	HORN	70 55	36.2
DIR	3	100	80 66	40.5
DSET AH				
DIR	3	20000	0 0	0.0
DIR	3	501	173 92	38.3
DIR	3	201	28 62	71.1
DIR	3	301	47 4	15.3
DIR	3	5001	70 55	24.0
DIR	3	FUUB_marker	76 4	30.3
DIR	3	101	80 66	35.1
DSET AH				
DIR	4	20000	0 0	0.0
DIR	4	6002	126 33	98.6
DIR	4	1	152 75	44.3
DIR	4	202	215 77	49.3
DIR	4	3	225 47	40.0
DIR	4	1000	140 34	80.5
DIR	4	500	216 45	92.3
DIR	4	200	215 77	20.8
DIR	4	300	126 23	44.6
DIR	4	HORN	138 80	94.2
DIR	4	100	140 92	75.8
DSET AH				
DIR	4	20000	0 0	0.0
DIR	4	501	216 45	73.7
DIR	4	201	215 77	34.4
DIR	4	301	126 23	48.8
DIR	4	401	118 23	75.4
DIR	4	5001	138 80	80.1
DIR	4	101	140 92	78.6
DIR	4	FUUB_marker	164 72	11.8
*DIR	4	201	164 56	55.4
*DIR	4	202	164 88	8.4
DIR	4	FUUB	164 72	31.9
*DIR	4	203	164 65	95.8
*DIR	4	204	164 79	2.7
DIR	4	DORIS_2GHz	164 72	49.2
DSET AH				
DIR	202	20000	0 0	0.0
DIR	202	1000	111 6	76.6
DIR	202	6002	112 92	94.4
DIR	202	2	157 70	45.1
DIR	202	3	231 77	4.6
*DIR	202	201	125 22	40.8
*DIR	202	202	125 65	74.9
DIR	202	FUUB	125 44	07.8
*DIR	202	203	125 35	26.3
*DIR	202	204	125 52	95.2
DIR	202	DORIS_2GHz	125 44	10.7
DIR	202	4	14 36	26.9
DIR	202	500	215 45	28.5
DIR	202	300	68 36	48.4
DIR	202	400	86 83	77.2
DIR	202	HORN	102 15	99.5
DIR	202	100	111 56	3.5

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DSET	AH				
DIR	202	20000	0 0	0.0	
DIR	202	501	215 45	8.1	
DIR	202	301	68 36	47.2	
DIR	202	5001	102 16	0.3	
DIR	202	101	111 56	3.3	
DSET	AH				
DIR	5002	20000	0 0	0.0	
DIR	5002	1	181 98	11.4	
DIR	5002	2	236 35	38.2	
DIR	5002	1000	154 90	49.7	
DIR	5002	3	283 79	17.2	
DIR	5002	4	347 48	78.5	
*DIR	5002	201	269 38	0.7	
*DIR	5002	202	270 13	8.6	
DIR	5002	FUUB	269 75	54.6	
DIR	5002	500	270 40	30.8	
*DIR	5002	203	269 60	69.6	
*DIR	5002	204	269 91	27.8	
DIR	5002	DORIS_2GHz	269 75	98.7	
DIR	5002	200	312 25	48.8	
DIR	5002	400	50 44	14.4	
DIR	5002	100	157 75	2.1	
DSET	AH				
DIR	5002	20000	0 0	0.0	
DIR	5002	201	312 25	56.2	
DIR	5002	401	50 44	52.4	
DIR	5002	101	157 75	84.8	
DIR	5002	FUUB_marker	269 75	90.3	
DSET	AH				
DIR	502	20000	0 0	0.0	
DIR	502	4	13 2	29.1	
DIR	502	402	54 50	4.8	
DIR	502	2	91 83	54.6	
DIR	502	1000	68 99	39.9	
DIR	502	3	375 5	45.7	
DIR	502	1	88 43	60.0	
DIR	502	300	36 2	77.0	
DIR	502	100	69 10	42.8	
DSET	AH				
DIR	502	20000	0 0	0.0	
*DIR	502	201	58 38	99.2	
*DIR	502	202	58 67	33.7	
DIR	502	FUUB	58 53	16.4	
*DIR	502	203	58 47	39.7	
*DIR	502	204	58 58	80.7	
DIR	502	DORIS_2GHz	58 53	10.2	
DIR	502	201	13 42	97.5	
DIR	502	301	36 2	73.4	
DIR	502	401	54 49	94.8	
DIR	502	101	69 10	48.9	
DIR	502	FUUB_marker	58 53	42.1	
DSET	AH				
DIR	402	502	0 0	0.0	
DIR	402	2	373 83	44.1	
DIR	402	1	337 0	81.2	
DIR	402	1000	343 67	15.7	
DIR	402	4	60 30	69.7	
*DIR	402	201	394 2	55.7	
*DIR	402	202	394 43	28.0	
DIR	402	FUUB	394 22	91.8	
*DIR	402	203	394 14	91.1	
*DIR	402	204	394 31	47.6	
DIR	402	DORIS_2GHz	394 23	19.3	
DIR	402	300	52 92	33.7	
DIR	402	HORN	383 86	27.0	
DIR	402	100	344 96	52.1	
DSET	AH				
DIR	402	502	0 0	0.0	
DIR	402	301	52 92	62.1	
DIR	402	5001	383 86	44.1	
DIR	402	101	344 96	50.9	
DIR	402	FUUB_marker	394 22	83.0	
DSET	AH				
DIR	302	20000	0 0	0.0	
DIR	302	402	116 22	88.6	
DIR	302	1000	155 25	6.4	
DIR	302	1	169 59	8.2	
DIR	302	2	205 60	5.7	
*DIR	302	201	202 94	64.4	
*DIR	302	202	203 44	74.6	
DIR	302	FUUB	203 19	69.5	
*DIR	302	203	203 9	78.1	
*DIR	302	204	203 30	38.9	
DIR	302	DORIS_2GHz	203 20	8.5	
DIR	302	3	256 97	48.8	

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DIR	302	4	331 61	18.2	
DIR	302	500	244 84	9.3	
DIR	302	200	275 15	85.7	
DIR	302	400	116 22	45.3	
DIR	302	100	156 23	37.3	
DSET AH					
DIR	302	20000	0 0	0.0	
DIR	302	501	244 84	18.9	
DIR	302	201	275 15	79.3	
DIR	302	401	116 22	37.4	
DIR	302	101	156 23	99.3	
DIR	302	FUUB_marker	203 19	63.5	
*stations	1000	and 2 less precise			
SIGM AH		18.0			
HIST NEW					
DSET AH					
DIR	1000	20000	0 0	0.0	
DIR	1000	3	295 43	16.4	12
DIR	1000	502	282 84	66.5	
DIR	1000	2	258 62	65.0	
DIR	1000	1	198 91	54.7	
DIR	1000	4	350 77	13.0	
DIR	1000	500	282 85	70.6	
DIR	1000	200	322 90	72.3	
DIR	1000	HORN	356 63	51.3	
*DIR	1000	201	303 67	2.9	
*DIR	1000	202	304 23	87.1	
DIR	1000	FUUB	303 95	45.0	
*DIR	1000	203	303 84	2.1	
*DIR	1000	204	304 7	25.4	
DIR	1000	DORIS_2GHz	303 95	63.7	
DIR	1000	400	12 2	29.1	
DIR	1000	10000	212 66	8.6	
DSET AH					
DIR	1000	20000	0 0	0.0	
DIR	1000	501	282 85	51.3	
DIR	1000	201	322 90	59.4	
DIR	1000	401	12 3	29.9	
DIR	1000	FUUB_marker	303 96	16.1	
DIR	1000	5001	356 64	67.0	
DSET AH					
DIR	1000	10000	0 0	0.0	
DIR	1000	5002	143 98	28.8	
DIR	1000	6001	313 42	92.6	
DSET AH					
DIR	2	20000	0 0	0.0	
DIR	2	6002	99 24	81.8	12
DIR	2	3	319 22	66.2	
DIR	2	1000	52 65	29.0	
DIR	2	202	363 57	24.5	12
DIR	2	500	299 72	94.9	
DIR	2	200	363 56	70.8	
DIR	2	300	4 67	72.6	
DIR	2	400	36 20	94.5	
DIR	2	HORN	32 10	70.9	
DIR	2	100	52 50	53.3	
DSET AH					
DIR	2	20000	0 0	0.0	
DIR	2	501	299 72	71.7	
DIR	2	201	363 57	4.0	12
DIR	2	301	4 67	5.3	
DIR	2	401	36 20	37.0	12
DIR	2	5001	32 10	70.9	
DIR	2	101	52 49	85.4	
DIR	2	FUUB_marker	7 39	10.2	
DIR	2	1	91 84	42.1	
*DIR	2	201	7 10	62.0	
*DIR	2	202	7 67	23.3	
DIR	2	FUUB	7 38	92.6	
*DIR	2	203	7 26	70.0	
*DIR	2	204	7 50	4.0	
DIR	2	DORIS_2GHz	7 38	37.0	
DSET AH					
DIR	2	20000	0 0	0.0	
DIR	2	1	91 85	69.3	
HIST GEN	Tours d'horizon				
Zenithales					
SIGM ZA	8.0				
HIST NEW					
HT	FUUB_marker	0.20			
*ZANG ZA	6002	20000	101 4	41.7	

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ZANG ZA 6002	1	100 55	24.7
ZANG ZA 6002	1000	96 57	1.6
ZANG ZA 6002	2	100 40	79.7
ZANG ZA 6002	4	100 48	31.2
ZANG ZA 6002	202	100 26	22.5
*ZANG ZA 6002	201	95 77	25.7
*ZANG ZA 6002	202	95 77	28.0
ZANG ZA 6002	FUUB	95 77	26.8
*ZANG ZA 6002	203	94 58	13.8
*ZANG ZA 6002	204	94 58	72.8
*ZANG ZA 6002	DORIS_2GHz	94 58	43.3
ZANG ZA 6002	100	102 94	90.2
*ZANG ZA 6002	20000	101 9	45.6
ZANG ZA 6002	301	103 46	76.7
ZANG ZA 6002	401	104 51	19.9
ZANG ZA 6002	5001	104 0	80.9
ZANG ZA 6002	FUUB_marker	101 29	95.8
*ZANG ZA 1	10000	109 93	57.5
ZANG ZA 1	6002	99 44	67.5
ZANG ZA 1	2	100 6	13.9
ZANG ZA 1	3	100 12	71.7
ZANG ZA 1	4	100 33	52.1
ZANG ZA 1	1000	86 5	50.2
*ZANG ZA 1	20000	100 99	26.8
ZANG ZA 1	500	105 4	7.6
ZANG ZA 1	300	107 12	11.5
ZANG ZA 1	400	109 26	61.7
ZANG ZA 1	HORN	111 29	60.1
ZANG ZA 1	100	108 88	12.0
*ZANG ZA 1	201	86 46	21.9
*ZANG ZA 1	202	86 46	33.5
ZANG ZA 1	FUUB	86 46	27.7
*ZANG ZA 1	203	83 7	51.3
*ZANG ZA 1	204	83 7	48.4
*ZANG ZA 1	DORIS_2GHz	83 7	49.8
*ZANG ZA 1	10000	109 85	36.5
ZANG ZA 1	501	104 31	19.2
ZANG ZA 1	301	106 20	27.0
ZANG ZA 1	401	108 7	94.7
ZANG ZA 1	5001	109 75	58.9
ZANG ZA 1	FUUB_marker	102 70	42.2
ZANG ZA 1	101	106 51	85.2
*ZANG ZA 3	20000	100 97	22.1
ZANG ZA 3	202	99 55	28.3
ZANG ZA 3	1000	95 61	23.7
ZANG ZA 3	1	99 87	13.7
ZANG ZA 3	2	99 83	24.6
*ZANG ZA 3	201	90 2	32.9
*ZANG ZA 3	202	90 2	28.7
ZANG ZA 3	FUUB	90 2	30.8
*ZANG ZA 3	203	87 51	72.9
*ZANG ZA 3	204	87 51	75.8
*ZANG ZA 3	DORIS_2GHz	87 51	74.3
ZANG ZA 3	4	100 28	67.1
ZANG ZA 3	500	123 7	63.2
ZANG ZA 3	200	110 30	76.1
ZANG ZA 3	300	106 26	94.4
ZANG ZA 3	HORN	105 46	64.8
ZANG ZA 3	100	102 54	25.7
*ZANG ZA 3	20000	101 11	68.3
ZANG ZA 3	501	119 86	0.0
ZANG ZA 3	201	108 72	81.8
ZANG ZA 3	301	105 43	91.0
ZANG ZA 3	5001	104 68	95.5
ZANG ZA 3	FUUB_marker	101 73	99.0
ZANG ZA 3	101	101 82	67.5
*ZANG ZA 4	20000	101 15	16.1
ZANG ZA 4	6002	99 51	49.1
ZANG ZA 4	1	99 66	33.6
ZANG ZA 4	202	98 79	30.3
ZANG ZA 4	3	99 71	19.3
ZANG ZA 4	1000	94 42	75.2
ZANG ZA 4	500	104 81	40.8
ZANG ZA 4	200	112 27	29.3
ZANG ZA 4	300	114 82	78.3
ZANG ZA 4	HORN	107 24	63.9
ZANG ZA 4	100	102 78	67.1
*ZANG ZA 4	20000	101 27	17.1
ZANG ZA 4	501	104 6	1.6
ZANG ZA 4	201	110 30	52.3
ZANG ZA 4	301	112 82	82.3
ZANG ZA 4	401	106 28	15.1
ZANG ZA 4	5001	106 17	14.1
ZANG ZA 4	101	101 92	24.7
ZANG ZA 4	FUUB_marker	101 49	77.7
*ZANG ZA 4	201	88 96	81.6

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*ZANG ZA 4	202	88 96	78.6
ZANG ZA 4	FUUB	88 96	80.1
*ZANG ZA 4	203	86 25	93.2
*ZANG ZA 4	204	86 25	92.7
*ZANG ZA 4	DORIS_2GHz	86 25	92.9
*ZANG ZA 202	20000	101 11	8.5
ZANG ZA 202	1000	94 54	25.8
ZANG ZA 202	6002	99 73	85.3
ZANG ZA 202	2	100 13	84.3
ZANG ZA 202	3	100 44	45.5
*ZANG ZA 202	201	85 90	28.9
*ZANG ZA 202	202	85 90	29.4
ZANG ZA 202	FUUB	85 90	29.1
*ZANG ZA 202	203	82 35	71.9
*ZANG ZA 202	204	82 35	79.1
*ZANG ZA 202	DORIS_2GHz	82 35	75.5
ZANG ZA 202	4	101 20	23.5
ZANG ZA 202	500	108 36	85.9
ZANG ZA 202	300	112 27	55.6
ZANG ZA 202	400	107 16	49.0
ZANG ZA 202	HORN	108 26	97.4
ZANG ZA 202	100	103 56	94.0
*ZANG ZA 202	20000	101 20	4.5
ZANG ZA 202	501	107 17	52.8
ZANG ZA 202	301	110 72	89.6
ZANG ZA 202	5001	107 14	70.2
ZANG ZA 202	101	102 63	60.1
*ZANG ZA 5002	20000	101 21	70.7
ZANG ZA 5002	1	101 33	37.6
ZANG ZA 5002	2	101 15	29.4
ZANG ZA 5002	1000	79 48	62.5
ZANG ZA 5002	3	100 80	6.5
ZANG ZA 5002	4	101 45	95.0
*ZANG ZA 5002	201	78 14	95.2
*ZANG ZA 5002	202	78 14	96.7
ZANG ZA 5002	FUUB	78 14	95.9
ZANG ZA 5002	500	105 80	90.6
*ZANG ZA 5002	203	72 79	65.9
*ZANG ZA 5002	204	72 79	64.4
*ZANG ZA 5002	DORIS_2GHz	72 79	65.1
ZANG ZA 5002	200	108 46	66.4
ZANG ZA 5002	400	125 79	76.8
ZANG ZA 5002	100	118 50	68.5
*ZANG ZA 5002	20000	101 30	91.2
ZANG ZA 5002	201	107 34	31.2
ZANG ZA 5002	401	123 6	60.0
ZANG ZA 5002	101	114 62	3.3
ZANG ZA 5002	FUUB_marker	107 20	98.7
*ZANG ZA 502	20000	100 99	98.0
ZANG ZA 502	4	100 54	73.0
ZANG ZA 502	402	100 45	63.9
ZANG ZA 502	2	100 33	25.4
ZANG ZA 502	1000	95 89	75.8
ZANG ZA 502	3	101 46	13.5
ZANG ZA 502	1	100 16	20.1
ZANG ZA 502	300	105 93	2.1
ZANG ZA 502	100	102 83	79.2
*ZANG ZA 502	20000	100 89	60.3
*ZANG ZA 502	201	90 76	35.5
*ZANG ZA 502	202	90 75	96.1
ZANG ZA 502	FUUB	90 76	15.8
*ZANG ZA 502	203	88 32	2.8
*ZANG ZA 502	204	88 32	6.8
*ZANG ZA 502	DORIS_2GHz	88 32	4.8
ZANG ZA 502	201	107 3	79.9
ZANG ZA 502	301	105 18	43.0
ZANG ZA 502	401	104 26	24.8
ZANG ZA 502	101	102 11	92.9
ZANG ZA 502	FUUB_marker	102 10	62.9
ZANG ZA 402	502	99 54	25.3
ZANG ZA 402	2	99 54	80.5
ZANG ZA 402	1	99 36	73.4
ZANG ZA 402	1000	84 41	56.9
ZANG ZA 402	4	99 97	93.4
*ZANG ZA 402	201	85 81	88.1
*ZANG ZA 402	202	85 81	82.1
ZANG ZA 402	FUUB	85 81	85.1
*ZANG ZA 402	203	82 47	98.4
*ZANG ZA 402	204	82 47	97.5
*ZANG ZA 402	DORIS_2GHz	82 47	97.9
ZANG ZA 402	300	113 70	29.6
ZANG ZA 402	HORN	120 56	52.0
ZANG ZA 402	100	107 67	97.6
ZANG ZA 402	502	99 54	11.7
ZANG ZA 402	301	111 84	7.2
ZANG ZA 402	5001	117 65	86.8

ZANG ZA 402	101	105 29	59.0
ZANG ZA 402	FUUB_marker	101 90	62.3
*ZANG ZA 302	20000	101 10	14.2
ZANG ZA 302	402	100 25	97.0
ZANG ZA 302	1000	91 0	70.0
ZANG ZA 302	1	99 64	5.3
ZANG ZA 302	2	99 66	0.8
*ZANG ZA 302	201	82 95	4.8
*ZANG ZA 302	202	82 95	2.0
ZANG ZA 302	FUUB	82 95	3.4
*ZANG ZA 302	203	78 94	80.9
*ZANG ZA 302	204	78 94	81.8
*ZANG ZA 302	DORIS_2GHz	78 94	81.3
ZANG ZA 302	3	99 83	11.3
ZANG ZA 302	4	100 24	13.0
ZANG ZA 302	500	104 85	64.3
ZANG ZA 302	200	109 87	1.4
ZANG ZA 302	400	113 97	31.4
ZANG ZA 302	100	104 75	55.1
*ZANG ZA 302	20000	101 19	64.3
ZANG ZA 302	501	104 10	94.0
ZANG ZA 302	201	108 30	40.8
ZANG ZA 302	401	112 11	57.9
ZANG ZA 302	101	103 33	44.9
ZANG ZA 302	FUUB_marker	102 58	95.6

Zenithales
*stations 1000 and 2 less precise (hard weather conditions)

SIGM ZA 16.0
SIGM ZB 20.0

HIST NEW

*ZANG ZA 2	20000	100 94	53.9
ZANG ZA 2	6002	99 59	23.2
ZANG ZA 2	3	100 16	19.6
ZANG ZA 2	1000	91 80	60.0
ZANG ZA 2	202	99 85	48.0
ZANG ZA 2	500	108 78	25.3
ZANG ZA 2	200	107 8	95.7
ZANG ZA 2	300	107 42	82.1
ZANG ZA 2	400	107 14	20.9
ZANG ZA 2	HORN	109 32	61.0
ZANG ZA 2	100	105 11	79.0
*ZANG ZA 2	20000	101 9	56.7
ZANG ZA 2	501	107 50	95.0
ZANG ZA 2	201	106 1	89.2
ZANG ZA 2	301	106 46	40.3
ZANG ZB 2	401	106 21	22.6
ZANG ZA 2	5001	108 3	76.6
ZANG ZA 2	101	103 73	47.1
ZANG ZA 2	FUUB_marker	103 64	55.2
ZANG ZA 2	1	99 93	21.9
*ZANG ZA 2	201	81 50	34.4
*ZANG ZA 2	202	81 50	66.2
*ZANG ZB 2	FUUB	81 50	50.3
*ZANG ZA 2	203	76 94	23.4
*ZANG ZA 2	204	76 94	30.0
*ZANG ZA 2	DORIS_2GHz	76 94	26.7
*ZANG ZA 2	20000	100 79	51.2
ZANG ZA 2	1	99 93	45.1
*ZANG ZA 1000	20000	102 7	91.8
ZANG ZA 1000	3	104 38	78.1
ZANG ZA 1000	502	104 10	24.6
ZANG ZA 1000	2	108 19	13.8
ZANG ZA 1000	1	113 93	79.3
ZANG ZA 1000	4	105 57	14.1
ZANG ZA 1000	500	109 10	26.3
ZANG ZA 1000	200	111 57	87.0
ZANG ZA 1000	HORN	145 6	22.6
*ZANG ZA 1000	201	93 46	25.9
*ZANG ZA 1000	202	93 46	23.5
ZANG ZA 1000	FUUB	93 46	24.7
*ZANG ZA 1000	203	88 70	35.7
*ZANG ZA 1000	204	88 70	37.4
*ZANG ZA 1000	DORIS_2GHz	88 70	36.5
ZANG ZA 1000	400	130 82	88.3
*ZANG ZA 1000	10000	109 93	45.2
*ZANG ZA 1000	20000	102 18	58.8
ZANG ZA 1000	501	108 40	21.5
ZANG ZA 1000	201	110 67	56.3
ZANG ZA 1000	401	128 89	14.8
ZANG ZA 1000	FUUB_marker	115 80	89.6
*ZANG ZA 1000	5001	142 63	26.8
*ZANG ZA 1000	10000	110 14	38.4
ZANG ZA 1000	5002	120 51	7.3
ZANG ZA 1000	6001	107 16	12.0

HIST GEN Zénithales

Distances

SIGM DP 0.0010

HIST NEW

DIST DP 6002	1	17.74815
DIST DP 6002	1000	19.31047
DIST DP 6002	2	25.16197
DIST DP 6002	4	33.40146
DIST DP 6002	202	32.95000
DIST DP 6002	301	27.38336
DIST DP 6002	401	21.09315
DIST DP 6002	5001	22.09777
DIST DP 6002	FUUB_marker	25.13172
DIST DP 1	6002	17.74860
DIST DP 1	2	7.48623
DIST DP 1	3	18.33011
DIST DP 1	4	19.00527
DIST DP 1	1000	5.49389
DIST DP 1	501	17.30699
DIST DP 1	301	13.75093
DIST DP 1	401	10.58768
DIST DP 1	5001	8.10464
DIST DP 1	FUUB_marker	8.46034
DIST DP 1	101	5.32779
DIST DP 2	6002	25.16298
DIST DP 2	3	11.25784
DIST DP 2	1000	9.36046
DIST DP 2	202	11.75190
DIST DP 2	501	9.88727
DIST DP 2	201	11.80440
DIST DP 2	301	13.11892
DIST DP 2	401	13.66313
DIST DP 2	5001	9.76377
DIST DP 2	101	9.16145
DIST DP 2	FUUB_marker	6.14130
DIST DP 2	1	7.48653
DIST DP 2	1	7.48673
DIST DP 3	202	7.86613
DIST DP 3	1000	17.86650
DIST DP 3	1	18.33016
DIST DP 3	2	11.25774
DIST DP 3	4	13.99459
DIST DP 3	501	3.69496
DIST DP 3	201	7.94084
DIST DP 3	301	15.23836
DIST DP 3	5001	16.30558
DIST DP 3	FUUB_marker	11.78750
DIST DP 3	101	17.70500
DIST DP 4	6002	33.40212
DIST DP 4	1	19.00542
DIST DP 4	202	6.25971
DIST DP 4	3	13.99469
DIST DP 4	1000	14.80135
DIST DP 4	501	16.79809
DIST DP 4	201	6.34081
DIST DP 4	301	6.18281
DIST DP 4	401	12.58211
DIST DP 4	5001	11.74240
DIST DP 4	101	14.71415
DIST DP 4	FUUB_marker	11.00249
DIST DP 202	1000	13.72833
DIST DP 202	6002	32.95011
DIST DP 202	2	11.75205
DIST DP 202	3	7.86648
DIST DP 202	4	6.25981
DIST DP 202	501	10.57248
DIST DP 202	301	8.08064
DIST DP 202	5001	11.20469
DIST DP 202	101	13.59873
DIST DP 1000	3	17.86642
DIST DP 1000	502	17.84797
DIST DP 1000	2	9.36032
DIST DP 1000	1	5.49380
DIST DP 1000	4	14.80142
DIST DP 1000	501	17.96632
DIST DP 1000	201	13.87225
DIST DP 1000	401	5.78010
DIST DP 1000	FUUB_marker	6.31801
DIST DP 1000	5001	3.91807
DIST DP 1000	5002	3.23876
DIST DP 1000	6001	19.40415
DIST DP 5002	1	8.01054

DIST DP 5002	2	9.68822
DIST DP 5002	1000	3.23906
DIST DP 5002	3	16.26313
DIST DP 5002	4	11.69225
DIST DP 5002	201	11.21059
DIST DP 5002	401	4.25667
DIST DP 5002	101	3.13175
DIST DP 5002	FUUB_marker	4.66508
DIST DP 502	4	16.76467
DIST DP 502	402	20.64214
DIST DP 502	2	9.81704
DIST DP 502	1000	17.84789
DIST DP 502	3	3.51797
DIST DP 502	1	17.27098
DIST DP 502	201	10.57070
DIST DP 502	301	16.98623
DIST DP 502	401	20.68780
DIST DP 502	101	17.68514
DIST DP 502	FUUB_marker	12.19093
DIST DP 402	502	20.64212
DIST DP 402	2	13.59801
DIST DP 402	1	10.50225
DIST DP 402	1000	5.35455
DIST DP 402	4	12.52184
DIST DP 402	502	20.64215
DIST DP 402	301	6.67103
DIST DP 402	5001	4.13878
DIST DP 402	101	5.30150
DIST DP 402	FUUB_marker	8.52096
DIST DP 302	402	6.55628
DIST DP 302	1000	9.02502
DIST DP 302	1	13.68726
DIST DP 302	2	13.05205
DIST DP 302	3	15.18234
DIST DP 302	4	6.05837
DIST DP 302	501	16.96573
DIST DP 302	201	8.03386
DIST DP 302	401	6.67583
DIST DP 302	101	8.93127
DIST DP 302	FUUB_marker	6.93643

HIST GEN Distances
HIST ALL Toutes les observations
END

6.7. Adjustment output file

```
=====
FUTUNA (FRANCE) REGINA-DORIS TIES - MAY 2012 SURVEY
Microsearch GeoLab, V2001.9.20.0          GRS 80          UNITS: m,GRAD
=====
Wed Feb 11 14:11:10 2015

Input file:  ..\FTNA.iob
Output file: ..\FTNA.lst
Options file: ..\default.gpj
```

PARAMETERS		OBSERVATIONS	
Description	Number	Description	Number
No. of Stations	33	Directions	206
Coord Parameters	98	Distances	118
Free Latitudes	33	Azimuths	0
Free Longitudes	33	Vertical Angles	0
Free Heights	32	Zenithal Angles	171
Fixed Coordinates	1	Angles	0
Astro. Latitudes	0	Heights	0
Astro. Longitudes	0	Height Differences	0
Geoid Records	0	Auxiliary Params.	0
All Aux. Pars.	24	2-D Coords.	0
Direction Pars.	24	2-D Coord. Diffs.	0
Scale Parameters	0	3-D Coords.	3
Constant Pars.	0	3-D Coord. Diffs.	51
Rotation Pars.	0		
Translation Pars.	0		
	-----		-----
Total Parameters	122	Total Observations	549

Degrees of Freedom =		427	

SUMMARY OF SELECTED OPTIONS

OPTION	SELECTION
Computation Mode	Adjustment
Maximum Iterations	15
Convergence Criterion	0.00010
Residual Rejection Criterion	Tau Max
Confidence Region Types	1D 2D 3D Station
Variance Factor (VF) Known	Yes
Scale Covariance Matrix With VF	Yes
Scale Residual Variances With VF	No
Force Convergence in Max Iters	No
Distances Contribute To Heights	No
Compute Full Inverse	Yes
Optimize Band Width	Yes
Generate Initial Coordinates	Yes
Re-Transform Obs After 1st Pass	Yes
Geoid Interpolation Method	Bi-Quadratic

```
=====
FUTUNA (FRANCE) REGINA-DORIS TIES - MAY 2012 SURVEY
Microsearch GeoLab, V2001.9.20.0          GRS 80          UNITS: m,GRAD
=====
Adjusted PLH Coordinates:
```

CODE	FFF	STATION		LATITUDE STD DEV		LONGITUDE STD DEV		ELIP-HEIGHT STD DEV	
PLH	000	1	S 14 18	28.26025	W178 7	15.44734		83.9004 m	0
				0.0011		0.0011		0.0011	
PLH	000	100	S 14 18	28.09173	W178 7	15.40986		83.1561 m	0
				0.0011		0.0011		0.0011	
PLH	000	1000	S 14 18	28.09064	W178 7	15.40536		85.0940 m	0
				0.0011		0.0011		0.0011	
PLH	000	10000	S 14 18	34.28967	W178 7	18.49707		52.7289 m	0
				0.0015		0.0015		0.3316	
PLH	000	101	S 14 18	28.09173	W178 7	15.40987		83.3557 m	0
				0.0011		0.0011		0.0011	

Futuna ITRF site co-location survey – May 2012

Adjusted PLH Coordinates:										
CODE	FFF	STATION		LATITUDE STD DEV		LONGITUDE STD DEV		ELIP-HEIGHT STD DEV		
PLH	000	2	S 14 18	28.20717 0.0011	W178 7	15.69114 0.0011		83.8928 0.0011	m	0
PLH	000	200	S 14 18	27.83438 0.0011	W178 7	15.77847 0.0011		82.5785 0.0011	m	0
PLH	000	20000	S 14 18	25.79566 0.0015	W178 7	14.79487 0.0014		83.9022 0.3316	m	0
PLH	000	201	S 14 18	27.83438 0.0011	W178 7	15.77848 0.0011		82.7782 0.0011	m	0
PLH	000	202	S 14 18	27.83438 0.0011	W178 7	15.77848 0.0011		83.9186 0.0011	m	0
PLH	000	3	S 14 18	27.98559 0.0011	W178 7	15.99025 0.0011		83.8635 0.0011	m	0
PLH	000	300	S 14 18	27.81958 0.0011	W178 7	15.51311 0.0011		82.3631 0.0011	m	0
PLH	000	301	S 14 18	27.81957 0.0011	W178 7	15.51311 0.0011		82.5628 0.0011	m	0
PLH	000	302	S 14 18	27.81959 0.0011	W178 7	15.51310 0.0011		83.8233 0.0011	m	0
PLH	000	4	S 14 18	27.67419 0.0011	W178 7	15.64957 0.0011		83.8001 0.0011	m	0
PLH	000	400	S 14 18	27.93790 0.0011	W178 7	15.33111 0.0011		82.3611 0.0011	m	0
PLH	000	401	S 14 18	27.93790 0.0011	W178 7	15.33109 0.0011		82.5600 0.0011	m	0
PLH	000	402	S 14 18	27.93793 0.0011	W178 7	15.33110 0.0011		83.7964 0.0011	m	0
PLH	000	500	S 14 18	28.09962 0.0011	W178 7	15.99957 0.0011		82.5299 0.0011	m	0
PLH	000	5001	S 14 18	27.99963 0.0011	W178 7	15.44785 0.0011		82.6632 0.0011	m	0
PLH	000	5002	S 14 18	27.99967 0.0011	W178 7	15.44783 0.0011		84.0685 0.0011	m	0
PLH	000	501	S 14 18	28.09963 0.0011	W178 7	15.99957 0.0011		82.7294 0.0011	m	0
PLH	000	502	S 14 18	28.09966 0.0011	W178 7	15.99959 0.0011		83.9443 0.0011	m	0
PLH	000	6001	S 14 18	28.47709 0.0013	W178 7	14.89853 0.0013		82.9153 0.0012	m	0
PLH	000	6002	S 14 18	28.47707 0.0011	W178 7	14.89850 0.0011		84.0541 0.0011	m	0
PLH	001	DORIS_2GHz	S 14 18	28.02872 0.0011	W178 7	15.59962 0.0011		84.7288 0.0000	m	0
PLH	000	FTNA	S 14 18	28.09064 0.0010	W178 7	15.40537 0.0010		84.8590 0.0010	m	0
PLH	000	FTTG	S 14 17	45.77710 0.0023	W178 9	36.86727 0.0023		52.2964 0.0023	m	0
PLH	000	FUTB	S 14 18	28.02900 0.0024	W178 7	15.59932 0.0024		85.1118 0.0024	m	0
PLH	000	FUUB	S 14 18	28.02873 0.0011	W178 7	15.59960 0.0011		85.7252 0.0011	m	0
PLH	000	FUUB_marker	S 14 18	28.02872 0.0011	W178 7	15.59959 0.0011		83.3412 0.0011	m	0
PLH	000	HORN	S 14 18	27.99964 0.0011	W178 7	15.44787 0.0011		82.4639 0.0011	m	0
PLH	000	SHOM	S 14 18	28.47707 0.0015	W178 7	14.89850 0.0015		82.7111 0.0019	m	0
=====										
FUTUNA (FRANCE) REGINA-DORIS TIES - MAY 2012 SURVEY										
Microsearch GeoLab, V2001.9.20.0				GRS 80		UNITS: m,GRAD				
=====										
Adjusted XYZ Coordinates:										
CODE	FFF	STATION		X-COORDINATE STD DEV		Y-COORDINATE STD DEV		Z-COORDINATE STD DEV		
XYZ		1		-6178320.2765 0.0011		-202693.6327 0.0011		-1566029.2662 0.0011	m	0
XYZ		100		-6178320.7981 0.0011		-202694.7740 0.0011		-1566024.0636 0.0011	m	0
XYZ		1000		-6178322.6787 0.0011		-202694.9704 0.0011		-1566024.5101 0.0011	m	0
XYZ		10000		-6178247.3104 0.3211		-202599.7921 0.0106		-1566201.1235 0.0820	m	0
XYZ		101		-6178320.9914 0.0011		-202694.7800 0.0011		-1566024.1129 0.0011	m	0
XYZ		2		-6178320.9116 0.0011		-202686.3433 0.0011		-1566027.6836 0.0011	m	0
XYZ		200		-6178322.5545 0.0011		-202683.7784 0.0011		-1566016.2568 0.0011	m	0
XYZ		20000		-6178338.3461 0.3211		-202713.7903 0.0106		-1565955.8686 0.0819	m	0

Futuna ITRF site co-location survey – May 2012

Adjusted XYZ Coordinates:						
CODE	FFF	STATION	X-COORDINATE STD DEV	Y-COORDINATE STD DEV	Z-COORDINATE STD DEV	
XYZ	201		-6178322.7479 0.0011	-202683.7846 0.0011	-1566016.3062 0.0011	m 0
XYZ	202		-6178323.8523 0.0011	-202683.8207 0.0011	-1566016.5881 0.0011	m 0
XYZ	3		-6178322.8592 0.0011	-202677.4381 0.0011	-1566021.0774 0.0011	m 0
XYZ	300		-6178322.1975 0.0011	-202691.7238 0.0011	-1566015.7627 0.0011	m 0
XYZ	301		-6178322.3910 0.0011	-202691.7300 0.0011	-1566015.8119 0.0011	m 0
XYZ	302		-6178323.6115 0.0011	-202691.7703 0.0011	-1566016.1240 0.0011	m 0
XYZ	4		-6178324.8270 0.0011	-202687.7183 0.0011	-1566011.7879 0.0011	m 0
XYZ	400		-6178321.1185 0.0011	-202697.1457 0.0011	-1566019.2860 0.0011	m 0
XYZ	401		-6178321.3112 0.0011	-202697.1525 0.0011	-1566019.3351 0.0011	m 0
XYZ	402		-6178322.5083 0.0011	-202697.1915 0.0011	-1566019.6415 0.0011	m 0
XYZ	500		-6178320.7112 0.0011	-202677.0882 0.0011	-1566024.1440 0.0011	m 0
XYZ	5001		-6178321.0573 0.0011	-202693.6430 0.0011	-1566021.1990 0.0011	m 0
XYZ	5002		-6178322.4178 0.0011	-202693.6884 0.0011	-1566021.5476 0.0011	m 0
XYZ	501		-6178320.9044 0.0011	-202677.0946 0.0011	-1566024.1936 0.0011	m 0
XYZ	502		-6178322.0808 0.0011	-202677.1326 0.0011	-1566024.4946 0.0011	m 0
XYZ	6001		-6178317.1370 0.0012	-202709.9863 0.0013	-1566035.4804 0.0013	m 0
XYZ	6002		-6178318.2400 0.0011	-202710.0234 0.0011	-1566035.7615 0.0011	m 0
XYZ	DORIS_2GHz		-6178322.9860 0.0003	-202689.1557 0.0011	-1566022.5758 0.0010	m 0
XYZ	FTNA		-6178322.4511 0.0010	-202694.9628 0.0010	-1566024.4520 0.0010	m 0
XYZ	FTTG		-6178749.5672 0.0023	-198466.9581 0.0023	-1564756.2386 0.0023	m 0
XYZ	FUTB		-6178323.3545 0.0024	-202689.1766 0.0024	-1566022.6788 0.0024	m 0
XYZ	FUUB		-6178323.9509 0.0011	-202689.1876 0.0011	-1566022.8224 0.0011	m 0
XYZ	FUUB_marker		-6178321.6421 0.0011	-202689.1124 0.0011	-1566022.2330 0.0011	m 0
XYZ	HORN		-6178320.8642 0.0011	-202693.6364 0.0011	-1566021.1500 0.0011	m 0
XYZ	SHOM		-6178316.9393 0.0018	-202709.9807 0.0015	-1566035.4296 0.0016	m 0

FUTUNA (FRANCE) REGINA-DORIS TIES - MAY 2012 SURVEY						
Microsearch GeoLab, V2001.9.20.0			GRS 80		UNITS: m,GRAD	
Residuals (critical value = 4.045):						
NOTE: Observation values shown are reduced to mark-to-mark.						
TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
XCT	FTNA			-6178322.45110 0.0010	-0.0000 0.0000	-0.0000 *
YCT	FTNA			-202694.96280 0.0010	0.0000 0.0000	0.0000 *
ZCT	FTNA			-1566024.45200 0.0010	-0.0000 0.0000	-0.0000 *
ELAT		FTNA	20000	0 00 2.29496 0.0010	0.0007 0.0003	2.1864 9.04
ELON		FTNA	20000	0 00 0.61055 0.0010	-0.0017 0.0006	-3.0051 23.21
EHGT		FTNA	20000	-0.95650 0.3162	-0.0002 0.0002	-1.2984 3.40
ELAT		FTNA	10000	0 00 6.19904 0.0010	0.0003 -0.0000	0.0003 1.27
ELON		FTNA	10000	0 00 3.09169 0.0010	-0.0006 0.0002	-3.0828 2.60
EHGT		FTNA	10000	-32.13010 0.3162	0.0000 0.0000	0.3963 0.03
ELAT		1000	FTNA	0 00 0.00000 0.0002	0.0000 0.0000	0.0000 158.38*
ELON		1000	FTNA	0 00 0.00000	-0.0001	-0.0001

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				0.0002	0.0000	382.82*
=====						
Residuals (critical value = 4.045):						
NOTE: Observation values shown are reduced to mark-to-mark.						
TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
----	-----	-----	-----	-----	-----	-----
EHGT		1000	FTNA	-0.23500	-0.0000	-0.0000
				0.0003	0.0000	0.00*
ELAT		502	501	0 00 0.00000	0.0008	0.7923
				0.0010	0.0010	624.89
ELON		502	501	0 00 0.00000	0.0006	0.6066
				0.0010	0.0010	494.07
EHGT		502	501	-1.21900	0.0041	2.9138
				0.0014	0.0014	3382.76
ELAT		502	500	0 00 0.00000	0.0010	1.0512
				0.0010	0.0010	714.08
ELON		502	500	0 00 0.00000	0.0006	0.5738
				0.0010	0.0010	401.46
EHGT		502	500	-1.41900	0.0046	3.2591
				0.0014	0.0014	3249.91
ELAT		202	201	0 00 0.00000	0.0000	0.0100
				0.0010	0.0010	8.59
ELON		202	201	0 00 0.00000	0.0001	0.1253
				0.0010	0.0010	107.53
EHGT		202	201	-1.14400	0.0036	2.5873
				0.0014	0.0014	3199.81
ELAT		202	200	0 00 0.00000	0.0001	0.0701
				0.0010	0.0010	51.44
ELON		202	200	0 00 0.00000	0.0002	0.2365
				0.0010	0.0010	172.69
EHGT		202	200	-1.34400	0.0039	2.7784
				0.0014	0.0014	2923.27
ELAT		302	301	0 00 0.00000	0.0007	0.6774
				0.0010	0.0010	528.30
ELON		302	301	0 00 0.00000	-0.0002	-0.2544
				0.0010	0.0010	197.59
EHGT		302	301	-1.26400	0.0036	2.5278
				0.0014	0.0014	2828.36
ELAT		302	300	0 00 0.00000	0.0005	0.4883
				0.0010	0.0010	328.61
ELON		302	300	0 00 0.00000	-0.0001	-0.1375
				0.0010	0.0010	91.91
EHGT		302	300	-1.46400	0.0038	2.6984
				0.0014	0.0014	2606.00
ELAT		402	401	0 00 0.00000	0.0008	0.8071
				0.0010	0.0010	640.52
ELON		402	401	0 00 0.00000	0.0003	0.2629
				0.0010	0.0010	209.65
EHGT		402	401	-1.24000	0.0037	1.4930
				0.0024	0.0024	2955.99
ELAT		402	400	0 00 0.00000	0.0008	0.7744
				0.0010	0.0010	529.71
ELON		402	400	0 00 0.00000	-0.0003	-0.2570
				0.0010	0.0010	176.31
EHGT		402	400	-1.44000	0.0047	3.3512
				0.0014	0.0014	3294.98
ELAT		5002	5001	0 00 0.00000	0.0013	1.3271
				0.0010	0.0010	934.87
ELON		5002	5001	0 00 0.00000	-0.0008	-0.7864
				0.0010	0.0010	556.23
EHGT		5002	5001	-1.40700	0.0018	1.2507
				0.0014	0.0014	1255.98
ELAT		5002	HORN	0 00 0.00000	0.0011	1.1115
				0.0010	0.0010	685.97
ELON		5002	HORN	0 00 0.00000	-0.0011	-1.0846
				0.0010	0.0010	671.96
EHGT		5002	HORN	-1.60700	0.0024	1.7106
				0.0014	0.0014	1505.21
ELAT		6002	6001	0 00 0.00000	-0.0003	-0.4451
				0.0010	0.0008	294.22
ELON		6002	6001	0 00 0.00000	-0.0009	-1.1982
				0.0010	0.0007	764.07
EHGT		6002	6001	-1.14300	0.0042	3.1548
				0.0014	0.0013	3681.05
ELAT		6002	SHOM	0 00 0.00000	0.0000	0.0000
				0.0010	0.0000	0.00*
ELON		6002	SHOM	0 00 0.00000	0.0000	0.0000
				0.0010	0.0000	0.00*
EHGT		6002	SHOM	-1.34300	-0.0000	-0.0000
				0.0014	0.0000	0.00*
ELAT		FUUB	FUTB	0 00 0.00027	0.0000	0.0000
				0.0020	0.0000	0.00*
ELON		FUUB	FUTB	0 00 0.00028	-0.0000	-0.0000
				0.0020	0.0000	0.00*
EHGT		FUUB	FUTB	-0.61340	-0.0000	-0.0000

Futuna ITRF site co-location survey – May 2012

				0.0020	0.0000	0.00*
=====						
Residuals (critical value = 4.045):						
NOTE: Observation values shown are reduced to mark-to-mark.						
TYPE AT	FROM	TO		OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
-----	-----	-----		-----	-----	-----
ELAT	FTNA	FTTG	0 00	42.31354 0.0020	-0.0000 0.0000	-0.0000 0.00*
ELON	FTNA	FTTG	0 02	21.46190 0.0020	-0.0000 0.0000	-0.0000 0.00*
EHGT	FTNA	FTTG		-32.56260 0.0020	-0.0000 0.0000	-0.0000 0.00*
DIR	6002	20000	0 0	0.0 18.0	-0.6 15.6	-0.0
DIR	6002	1	322 10	79.4 18.0	-3.9 16.3	-0.2
DIR	6002	1000	339 84	80.2 18.0	-11.8 16.6	-0.7
DIR	6002	2	318 99	17.6 18.0	-14.4 16.7	-0.9
DIR	6002	4	350 52	34.1 18.0	4.2 16.7	0.2
DIR	6002	202	338 52	56.3 18.0	15.0 16.7	0.9
DIR	6002	FUUB	334 55	37.8 18.0	3.4 16.8	0.2
DIR	6002	DORIS_2GHz	334 55	36.2 18.0	7.6 16.8	0.5
DIR	6002	100	339 48	77.3 18.0	0.5 16.4	0.0
DIR	6002	20000	0 0	0.0 18.0	-5.1 14.9	-0.3
DIR	6002	301	350 54	70.6 18.0	-3.7 15.9	-0.2
DIR	6002	401	355 33	74.6 18.0	-7.3 15.4	-0.5
DIR	6002	5001	343 94	58.0 18.0	0.7 15.8	0.0
DIR	6002	FUUB_marker	334 55	32.8 18.0	15.4 15.8	1.0
DIR	1	10000	0 0	0.0 18.0	-3.1 15.6	-0.2
DIR	1	6002	295 33	67.9 18.0	-18.4 13.6	-1.3
DIR	1	3	101 29	66.5 18.0	7.1 16.2	0.4
DIR	1	4	150 16	47.6 18.0	20.9 16.8	1.2
DIR	1	1000	185 91	5.5 18.0	-41.4 15.5	-2.7
DIR	1	20000	186 91	25.1 18.0	1.4 16.6	0.1
DIR	1	500	89 28	12.4 18.0	27.7 15.6	1.8
DIR	1	300	161 62	86.2 18.0	11.0 15.4	0.7
DIR	1	400	192 35	32.4 18.0	8.9 15.5	0.6
DIR	1	HORN	170 70	61.9 18.0	-8.5 15.7	-0.5
DIR	1	100	184 42	95.0 18.0	-10.8 13.6	-0.8
DIR	1	FUUB	134 52	54.5 18.0	17.0 14.9	1.1
DIR	1	DORIS_2GHz	134 52	77.7 18.0	-11.8 14.9	-0.8
DIR	1	10000	0 0	0.0 18.0	-5.1 14.7	-0.4
DIR	1	501	89 28	18.8 18.0	10.8 14.7	0.7
DIR	1	301	161 62	91.8 18.0	-0.6 14.9	-0.0
DIR	1	401	192 35	54.4 18.0	13.5 14.8	0.9
DIR	1	5001	170 70	68.3 18.0	6.7 14.9	0.4
DIR	1	FUUB_marker	134 53	33.9 18.0	-25.1 14.1	-1.8
DIR	3	20000	0 0	0.0 18.0	3.4 16.1	0.2
DIR	3	202	28 62	87.0 18.0	-27.8 15.8	-1.8
DIR	3	1000	80 45	65.6 18.0	13.1 16.9	0.8
=====						

Futuna ITRF site co-location survey – May 2012

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Residuals (critical value = 4.045):						
NOTE: Observation values shown are reduced to mark-to-mark.						
TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
-----	-----	-----	-----	-----	-----	-----
DIR		3	1	99 32	98.5	-4.5
					18.0	16.7
DIR		3	2	110 21	72.0	42.9
					18.0	16.1
DIR		3	FUUB	76 4	16.8	-3.9
					18.0	16.4
DIR		3	DORIS_2GHz	76 4	0.1	-2.3
					18.0	16.4
DIR		3	4	20 91	87.4	0.5
					18.0	16.4
DIR		3	500	173 92	31.0	-0.2
					18.0	5.5
DIR		3	200	28 62	78.0	-12.3
					18.0	13.8
DIR		3	300	47 4	24.9	6.2
					18.0	15.8
DIR		3	HORN	70 55	36.2	-12.5
					18.0	16.6
DIR		3	100	80 66	40.5	-2.7
					18.0	16.5
DIR		3	20000	0 0	0.0	10.3
					18.0	15.3
DIR		3	501	173 92	38.3	-10.0
					18.0	6.0
DIR		3	201	28 62	71.1	0.3
					18.0	13.6
DIR		3	301	47 4	15.3	13.8
					18.0	15.2
DIR		3	5001	70 55	24.0	-2.0
					18.0	15.9
DIR		3	FUUB_marker	76 4	30.3	-25.7
					18.0	15.4
DIR		3	101	80 66	35.1	13.3
					18.0	15.7
DIR		4	20000	0 0	0.0	2.6
					18.0	15.9
DIR		4	6002	126 33	98.6	-9.7
					18.0	16.0
DIR		4	1	152 75	44.3	0.9
					18.0	16.8
DIR		4	202	215 77	49.3	-12.4
					18.0	14.7
DIR		4	3	225 47	40.0	4.2
					18.0	16.3
DIR		4	1000	140 34	80.5	17.1
					18.0	16.7
DIR		4	500	216 45	92.3	-9.8
					18.0	16.2
DIR		4	200	215 77	20.8	1.9
					18.0	11.1
DIR		4	300	126 23	44.6	-3.3
					18.0	11.4
DIR		4	HORN	138 80	94.2	9.8
					18.0	16.2
DIR		4	100	140 92	75.8	-1.3
					18.0	16.5
DIR		4	20000	0 0	0.0	2.8
					18.0	15.6
DIR		4	501	216 45	73.7	2.0
					18.0	15.7
DIR		4	201	215 77	34.4	-6.5
					18.0	11.6
DIR		4	301	126 23	48.8	-11.6
					18.0	11.6
DIR		4	401	118 23	75.4	-7.2
					18.0	15.1
DIR		4	5001	138 80	80.1	4.3
					18.0	16.2
DIR		4	101	140 92	78.6	9.7
					18.0	16.3
DIR		4	FUUB_marker	164 72	11.8	-2.7
					18.0	15.6
DIR		4	FUUB	164 72	31.9	6.2
					18.0	15.7
DIR		4	DORIS_2GHz	164 72	49.2	3.0
					18.0	15.7
DIR		202	20000	0 0	0.0	-8.8
					18.0	16.0
DIR		202	1000	111 6	76.6	15.7
					18.0	16.8

Futuna ITRF site co-location survey – May 2012

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Residuals (critical value = 4.045):						
NOTE: Observation values shown are reduced to mark-to-mark.						
TYPE AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM	
-----	-----	-----	-----	-----	-----	-----
DIR	202	6002	112 92	94.4	4.5	0.3
				18.0	16.2	
DIR	202	2	157 70	45.1	8.5	0.5
				18.0	15.9	
DIR	202	3	231 77	4.6	-12.3	-0.9
				18.0	14.0	
DIR	202	FUUB	125 44	7.8	-1.4	-0.1
				18.0	14.6	
DIR	202	DORIS_2GHz	125 44	10.7	-3.9	-0.3
				18.0	14.6	
DIR	202	4	14 36	26.9	-13.1	-1.0
				18.0	13.0	
DIR	202	500	215 45	28.5	9.1	0.6
				18.0	14.8	
DIR	202	300	68 36	48.4	11.0	0.9
				18.0	12.7	
DIR	202	400	86 83	77.2	-5.6	-0.4
				18.0	15.7	
DIR	202	HORN	102 15	99.5	-4.5	-0.3
				18.0	16.0	
DIR	202	100	111 56	3.5	0.9	0.1
				18.0	16.3	
DIR	202	20000	0 0	0.0	-7.7	-0.5
				18.0	14.6	
DIR	202	501	215 45	8.1	19.5	1.4
				18.0	13.6	
DIR	202	301	68 36	47.2	-2.0	-0.2
				18.0	12.4	
DIR	202	5001	102 16	0.3	-22.7	-1.5
				18.0	14.7	
DIR	202	101	111 56	3.3	13.0	0.9
				18.0	15.0	
DIR	5002	20000	0 0	0.0	10.5	0.6
				18.0	16.2	
DIR	5002	1	181 98	11.4	8.0	0.5
				18.0	15.8	
DIR	5002	2	236 35	38.2	-33.2	-2.1
				18.0	15.9	
DIR	5002	1000	154 90	49.7	-23.4	-1.9
				18.0	12.5	
DIR	5002	3	283 79	17.2	8.4	0.5
				18.0	16.1	
DIR	5002	4	347 48	78.5	10.0	0.6
				18.0	15.4	
DIR	5002	FUUB	269 75	54.6	0.2	0.0
				18.0	12.4	
DIR	5002	500	270 40	30.8	5.0	0.3
				18.0	15.8	
DIR	5002	DORIS_2GHz	269 75	98.7	5.8	0.5
				18.0	12.4	
DIR	5002	200	312 25	48.8	10.4	0.7
				18.0	14.2	
DIR	5002	400	50 44	14.4	-3.6	-0.4
				18.0	8.8	
DIR	5002	100	157 75	2.1	2.0	0.2
				18.0	8.7	
DIR	5002	20000	0 0	0.0	16.2	1.2
				18.0	13.8	
DIR	5002	201	312 25	56.2	2.9	0.2
				18.0	12.9	
DIR	5002	401	50 44	52.4	-1.3	-0.1
				18.0	8.7	
DIR	5002	101	157 75	84.8	-6.2	-0.9
				18.0	7.3	
DIR	5002	FUUB_marker	269 75	90.3	-11.5	-1.1
				18.0	10.8	
DIR	502	20000	0 0	0.0	3.4	0.2
				18.0	15.5	
DIR	502	4	13 2	29.1	5.6	0.3
				18.0	16.4	
DIR	502	402	54 50	4.8	-1.2	-0.1
				18.0	16.3	
DIR	502	2	91 83	54.6	23.4	1.6
				18.0	14.9	
DIR	502	1000	68 99	39.9	-16.4	-1.0
				18.0	16.5	
DIR	502	3	375 5	45.7	-11.5	-1.7
				18.0	6.9	
DIR	502	1	88 43	60.0	-25.4	-1.6
				18.0	16.2	

Futuna ITRF site co-location survey – May 2012

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Residuals (critical value = 4.045):							
NOTE: Observation values shown are reduced to mark-to-mark.							
TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES	PPM

DIR		502	300	36 2	77.0	13.8	0.9
					18.0	15.7	
DIR		502	100	69 10	42.8	8.2	0.5
					18.0	16.1	
DIR		502	20000	0 0	0.0	8.8	0.6
					18.0	15.0	
DIR		502	FUUB	58 53	16.4	-0.2	-0.0
					18.0	16.0	
DIR		502	DORIS_2GHz	58 53	10.2	-12.7	-0.8
					18.0	16.0	
DIR		502	201	13 42	97.5	21.5	1.4
					18.0	15.0	
DIR		502	301	36 2	73.4	14.6	0.9
					18.0	15.7	
DIR		502	401	54 49	94.8	-7.6	-0.5
					18.0	16.3	
DIR		502	101	69 10	48.9	8.8	0.6
					18.0	16.0	
DIR		502	FUUB_marker	58 53	42.1	-33.2	-2.1
					18.0	15.8	
DIR		402	502	0 0	0.0	0.8	0.1
					18.0	15.5	
DIR		402	2	373 83	44.1	-17.2	-1.1
					18.0	16.2	
DIR		402	1	337 0	81.2	23.3	1.5
					18.0	15.6	
DIR		402	1000	343 67	15.7	-11.1	-0.8
					18.0	13.8	
DIR		402	4	60 30	69.7	-5.7	-0.4
					18.0	15.0	
DIR		402	FUUB	394 22	91.8	8.2	0.5
					18.0	15.5	
DIR		402	DORIS_2GHz	394 23	19.3	9.8	0.6
					18.0	15.5	
DIR		402	300	52 92	33.7	5.7	0.5
					18.0	12.2	
DIR		402	HORN	383 86	27.0	-0.0	-0.0
					18.0	7.6	
DIR		402	100	344 96	52.1	-13.8	-1.1
					18.0	12.2	
DIR		402	502	0 0	0.0	-3.3	-0.2
					18.0	13.4	
DIR		402	301	52 92	62.1	-18.0	-1.5
					18.0	11.6	
DIR		402	5001	383 86	44.1	-13.9	-1.8
					18.0	7.8	
DIR		402	101	344 96	50.9	17.7	1.7
					18.0	10.4	
DIR		402	FUUB_marker	394 22	83.0	17.5	1.3
					18.0	14.0	
DIR		302	20000	0 0	0.0	-1.5	-0.1
					18.0	15.7	
DIR		302	402	116 22	88.6	6.2	0.5
					18.0	12.2	
DIR		302	1000	155 25	6.4	1.9	0.1
					18.0	16.2	
DIR		302	1	169 59	8.2	12.4	0.7
					18.0	16.7	
DIR		302	2	205 60	5.7	2.8	0.2
					18.0	16.5	
DIR		302	FUUB	203 19	69.5	1.4	0.1
					18.0	13.7	
DIR		302	DORIS_2GHz	203 20	8.5	-2.3	-0.2
					18.0	13.7	
DIR		302	3	256 97	48.8	3.1	0.2
					18.0	16.2	
DIR		302	4	331 61	18.2	-9.6	-0.8
					18.0	11.4	
DIR		302	500	244 84	9.3	5.7	0.4
					18.0	16.1	
DIR		302	200	275 15	85.7	-16.2	-1.3
					18.0	12.8	
DIR		302	400	116 22	45.3	1.8	0.2
					18.0	9.8	
DIR		302	100	156 23	37.3	-5.8	-0.4
					18.0	15.8	
DIR		302	20000	0 0	0.0	18.1	1.3
					18.0	14.4	
DIR		302	501	244 84	18.9	7.0	0.5
					18.0	14.8	

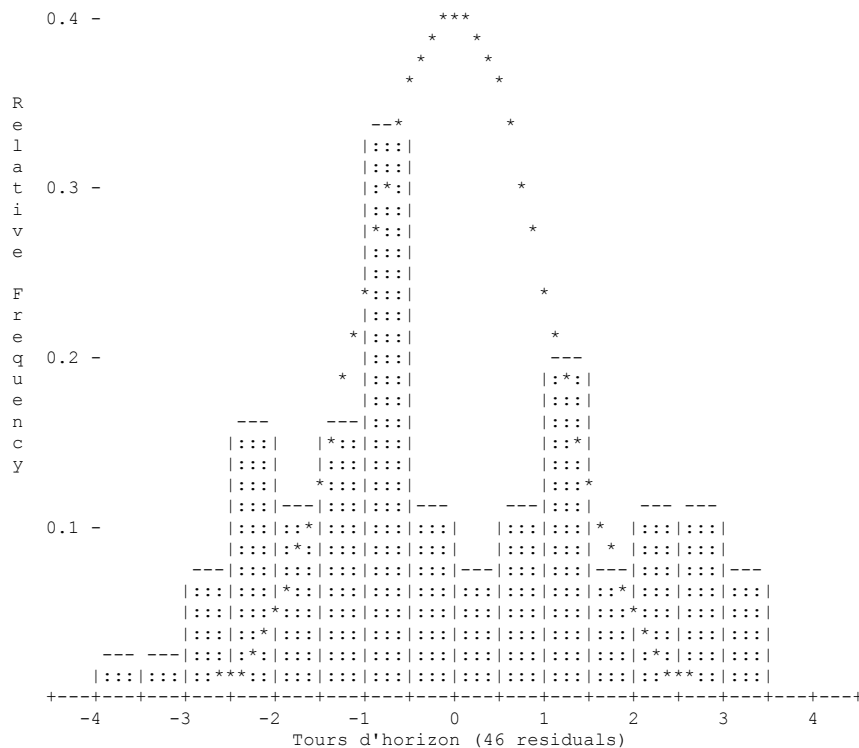
Futuna ITRF site co-location survey – May 2012

DIR	302	201	275 15	79.3	5.6	0.5
				18.0	12.3	
DIR	302	401	116 22	37.4	-0.9	-0.1
				18.0	10.7	
DIR	302	101	156 23	99.3	-24.5	-1.7
				18.0	14.6	
DIR	302	FUUB_marker	203 19	63.5	-5.4	-0.4
				18.0	12.8	
DIR	1000	20000	0 0	0.0	-16.3	-1.0
				18.0	16.4	
DIR	1000	3	295 43	16.4	58.6	2.9
				21.6	20.3	
DIR	1000	502	282 84	66.5	37.5	2.4
				18.0	15.6	
DIR	1000	2	258 62	65.0	-3.2	-0.2
				18.0	15.9	
DIR	1000	1	198 91	54.7	26.1	1.8
				18.0	14.4	
DIR	1000	4	350 77	13.0	24.6	1.5
				18.0	16.5	
DIR	1000	500	282 85	70.6	-30.8	-1.9
				18.0	16.0	
DIR	1000	200	322 90	72.3	-8.0	-0.5
				18.0	15.2	
DIR	1000	HORN	356 63	51.3	2.5	0.3
				18.0	7.5	
DIR	1000	FUUB	303 95	45.0	-16.8	-1.2
				18.0	14.2	
DIR	1000	DORIS_2GHz	303 95	63.7	-13.9	-1.0
				18.0	14.2	
DIR	1000	400	12 2	29.1	-9.1	-0.8
				18.0	10.9	
DIR	1000	10000	212 66	8.6	-33.1	-2.1
				18.0	15.6	
DIR	1000	20000	0 0	0.0	13.9	0.9
				18.0	14.9	
DIR	1000	501	282 85	51.3	9.6	0.7
				18.0	14.5	
DIR	1000	201	322 90	59.4	29.9	2.1
				18.0	14.3	
DIR	1000	401	12 3	29.9	-24.7	-2.3
				18.0	11.0	
DIR	1000	FUUB_marker	303 96	16.1	-19.8	-1.6
				18.0	12.7	
DIR	1000	5001	356 64	67.0	-8.9	-1.2
				18.0	7.6	
DIR	1000	10000	0 0	0.0	-25.3	-2.2
				18.0	11.6	
DIR	1000	5002	143 98	28.8	33.1	3.0
				18.0	11.0	
DIR	1000	6001	313 42	92.6	-7.8	-1.0
				18.0	7.7	
DIR	2	20000	0 0	0.0	7.7	0.5
				18.0	16.4	
DIR	2	6002	99 24	81.8	63.2	3.3
				21.6	19.2	
DIR	2	3	319 22	66.2	-3.9	-0.3
				18.0	15.0	
DIR	2	1000	52 65	29.0	-16.1	-1.0
				18.0	15.7	
DIR	2	202	363 57	24.5	-56.7	-2.9
				21.6	19.4	
DIR	2	500	299 72	94.9	-11.2	-0.9
				18.0	12.7	
DIR	2	200	363 56	70.8	10.1	0.7
				18.0	14.0	
DIR	2	300	4 67	72.6	-32.2	-2.2
				18.0	14.5	
DIR	2	400	36 20	94.5	31.3	1.9
				18.0	16.2	
DIR	2	HORN	32 10	70.9	20.3	1.3
				18.0	15.2	
DIR	2	100	52 50	53.3	-10.5	-0.7
				18.0	14.2	
DIR	2	20000	0 0	0.0	-26.4	-1.7
				18.0	15.9	
DIR	2	501	299 72	71.7	-36.7	-3.1
				18.0	12.0	
DIR	2	201	363 57	4.0	-63.7	-3.5
				21.6	18.2	
DIR	2	301	4 67	5.3	-7.8	-0.5
				18.0	14.8	
DIR	2	401	36 20	37.0	68.2	3.4
				21.6	20.0	
DIR	2	5001	32 10	70.9	-11.5	-0.7
				18.0	15.3	

Residuals (critical value = 4.045):

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

TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
DIR		2	101	52 49 85.4 18.0	16.7 13.7	1.2
DIR		2	FUUB_marker	7 39 10.2 18.0	15.7 12.9	1.2
DIR		2	1	91 84 42.1 18.0	32.6 13.6	2.4
DIR		2	FUUB	7 38 92.6 18.0	-0.0 13.4	-0.0
DIR		2	DORIS_2GHz	7 38 37.0 18.0	14.3 13.4	1.1
DIR		2	20000	0 0 0.0 18.0	34.1 11.5	3.0
DIR		2	1	91 85 69.3 18.0	-34.1 11.5	-3.0



FUTUNA (FRANCE) REGINA-DORIS TIES - MAY 2012 SURVEY

Microsearch GeoLab, V2001.9.20.0

GRS 80

UNITS: m, GRAD

Residuals (critical value = 4.045):

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

OBSERVATION				OBSERVATION		RESIDUAL	STD RES
TYPE	AT	FROM	TO	STD	DEV	STD DEV	PPM
ZANG		6002	1	100	55	24.7	0.6
						9.5	
						16.0	
ZANG		6002	1000	96	57	1.6	-0.1
						16.0	
ZANG		6002	2	100	40	79.7	-0.2
						16.0	
ZANG		6002	4	100	48	31.2	-0.7
						16.0	
ZANG		6002	202	100	26	22.5	0.1
						16.0	
ZANG		6002	FUUB	95	77	26.8	0.2
						16.0	
ZANG		6002	100	102	94	90.2	-0.5
						16.0	
ZANG		6002	301	103	46	76.7	-0.7
						16.0	
						15.5	

Futuna ITRF site co-location survey – May 2012

Residuals (critical value = 4.045):						
NOTE: Observation values shown are reduced to mark-to-mark.						
TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
ZANG		6002	401	104 51	19.9 16.0	-13.2 15.2
ZANG		6002	5001	104 0	80.9 16.0	-16.2 15.2
ZANG		6002	FUUB_marker	101 80	60.0 16.0	1.8 15.5
ZANG	1		6002	99 44	67.5 16.0	-19.0 15.0
ZANG	1		2	100 6	13.9 16.0	-33.8 15.1
ZANG	1		3	100 12	71.7 16.0	-12.0 15.8
ZANG	1		4	100 33	52.1 16.0	-7.5 15.8
ZANG	1		1000	86 5	50.2 16.0	-24.1 14.8
ZANG	1		500	105 4	7.6 16.0	-5.2 15.6
ZANG	1		300	107 12	11.5 16.0	0.9 15.3
ZANG	1		400	109 26	61.7 16.0	7.0 15.1
ZANG	1		HORN	111 29	60.1 16.0	-13.2 14.7
ZANG	1		100	108 88	12.0 16.0	-16.5 13.8
ZANG	1		FUUB	86 46	27.7 16.0	-15.9 15.0
ZANG	1		501	104 31	19.2 16.0	20.9 15.6
ZANG	1		301	106 20	27.0 16.0	7.5 15.3
ZANG	1		401	108 7	94.7 16.0	-22.3 15.2
ZANG	1		5001	109 75	58.9 16.0	2.6 14.3
ZANG	1		FUUB_marker	104 20	59.9 16.0	8.9 15.0
ZANG	1		101	106 51	85.2 16.0	-17.5 13.8
ZANG	3		202	99 55	28.3 16.0	-12.7 14.9
ZANG	3		1000	95 61	23.7 16.0	4.0 15.8
ZANG	3		1	99 87	13.7 16.0	-4.4 15.8
ZANG	3		2	99 83	24.6 16.0	-17.8 15.5
ZANG	3		FUUB	90 2	30.8 16.0	0.5 15.4
ZANG	3		4	100 28	67.1 16.0	-14.5 15.7
ZANG	3		500	123 7	63.2 16.0	-18.5 9.2
ZANG	3		200	110 30	76.1 16.0	-7.1 13.8
ZANG	3		300	106 26	94.4 16.0	-14.9 15.4
ZANG	3		HORN	105 46	64.8 16.0	5.2 15.6
ZANG	3		100	102 54	25.7 16.0	-8.2 15.7
ZANG	3		501	119 86	0.0 16.0	-9.0 8.7
ZANG	3		201	108 72	81.8 16.0	2.0 14.0
ZANG	3		301	105 43	91.0 16.0	-13.2 15.4
ZANG	3		5001	104 68	95.5 16.0	-8.2 15.5
ZANG	3		FUUB_marker	102 81	90.8 16.0	-6.7 15.4
ZANG	3		101	101 82	67.5 16.0	5.7 15.7
ZANG	4		6002	99 51	49.1 16.0	-11.5 15.7
ZANG	4		1	99 66	33.6 16.0	-8.7 15.8
ZANG	4		202	98 79	30.3 16.0	-24.6 14.4

Futuna ITRF site co-location survey – May 2012

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Residuals (critical value = 4.045):						
NOTE: Observation values shown are reduced to mark-to-mark.						
TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
-----	-----	-----	-----	-----	-----	-----
ZANG		4	3	99 71	19.3	-0.5
					16.0	15.7
ZANG		4	1000	94 42	75.2	-3.1
					16.0	15.8
ZANG		4	500	104 81	40.8	-7.1
					16.0	15.6
ZANG		4	200	112 27	29.3	0.1
					16.0	12.7
ZANG		4	300	114 82	78.3	-12.1
					16.0	12.8
ZANG		4	HORN	107 24	63.9	-8.1
					16.0	15.3
ZANG		4	100	102 78	67.1	4.6
					16.0	15.6
ZANG		4	501	104 6	1.6	-5.7
					16.0	15.6
ZANG		4	201	110 30	52.3	8.7
					16.0	12.9
ZANG		4	301	112 82	82.3	4.9
					16.0	12.8
ZANG		4	401	106 28	15.1	-30.5
					16.0	15.3
ZANG		4	5001	106 17	14.1	-19.7
					16.0	15.1
ZANG		4	101	101 92	24.7	-8.7
					16.0	15.6
ZANG		4	FUUB_marker	102 65	41.1	-4.7
					16.0	15.3
ZANG		4	FUUB	88 96	80.1	-13.8
					16.0	15.3
ZANG		202	1000	94 54	25.8	1.0
					16.0	15.6
ZANG		202	6002	99 73	85.3	2.9
					16.0	15.7
ZANG		202	2	100 13	84.3	-12.7
					16.0	15.5
ZANG		202	3	100 44	45.5	-14.3
					16.0	14.9
ZANG		202	FUUB	85 90	29.1	-15.1
					16.0	14.6
ZANG		202	4	101 20	23.5	-22.2
					16.0	14.4
ZANG		202	500	108 36	85.9	18.5
					16.0	14.9
ZANG		202	300	112 27	55.6	-9.1
					16.0	14.0
ZANG		202	400	107 16	49.0	-2.3
					16.0	15.3
ZANG		202	HORN	108 26	97.4	-7.2
					16.0	15.1
ZANG		202	100	103 56	94.0	3.9
					16.0	15.5
ZANG		202	501	107 17	52.8	-2.4
					16.0	14.9
ZANG		202	301	110 72	89.6	-28.8
					16.0	14.0
ZANG		202	5001	107 14	70.2	-1.8
					16.0	15.0
ZANG		202	101	102 63	60.1	0.7
					16.0	15.5
ZANG		5002	1	101 33	37.6	-23.2
					16.0	15.4
ZANG		5002	2	101 15	29.4	-17.1
					16.0	15.5
ZANG		5002	1000	79 48	62.5	-20.7
					16.0	13.7
ZANG		5002	3	100 80	6.5	-20.5
					16.0	15.8
ZANG		5002	4	101 45	95.0	-19.1
					16.0	15.6
ZANG		5002	FUUB	78 14	95.9	19.4
					16.0	13.3
ZANG		5002	500	105 80	90.6	12.7
					16.0	15.6
ZANG		5002	200	108 46	66.4	-15.4
					16.0	15.0
ZANG		5002	400	125 79	76.8	-15.0
					16.0	11.8
ZANG		5002	100	118 50	68.5	-11.6
					16.0	11.0

Futuna ITRF site co-location survey – May 2012

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Residuals (critical value = 4.045):							
NOTE: Observation values shown are reduced to mark-to-mark.							
TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES	PPM
-----	-----	-----	-----	-----	-----	-----	-----
ZANG		5002	201	107 34	31.2	-7.0	-0.5
					16.0	15.0	
ZANG		5002	401	123 6	60.0	45.2	3.8
					16.0	11.8	
ZANG		5002	101	114 62	3.3	20.2	1.9
					16.0	10.8	
ZANG		5002	FUUB_marker	109 90	71.1	-10.0	-0.8
					16.0	13.1	
ZANG		502	4	100 54	73.0	-4.0	-0.3
					16.0	15.7	
ZANG		502	402	100 45	63.9	-0.8	-0.1
					16.0	15.8	
ZANG		502	2	100 33	25.4	-18.4	-1.2
					16.0	15.1	
ZANG		502	1000	95 89	75.8	9.8	0.6
					16.0	15.7	
ZANG		502	3	101 46	13.5	-23.7	-2.4
					16.0	9.9	
ZANG		502	1	100 16	20.1	-0.6	-0.0
					16.0	15.7	
ZANG		502	300	105 93	2.1	16.7	1.1
					16.0	15.4	
ZANG		502	100	102 83	79.2	6.3	0.4
					16.0	15.7	
ZANG		502	FUUB	90 76	15.8	14.6	1.0
					16.0	15.2	
ZANG		502	201	107 3	79.9	7.3	0.5
					16.0	14.7	
ZANG		502	301	105 18	43.0	11.5	0.7
					16.0	15.4	
ZANG		502	401	104 26	24.8	-6.2	-0.4
					16.0	15.7	
ZANG		502	101	102 11	92.9	-1.6	-0.1
					16.0	15.7	
ZANG		502	FUUB_marker	103 14	94.6	8.6	0.6
					16.0	15.2	
ZANG		402	502	99 54	25.3	-12.0	-0.8
					16.0	15.8	
ZANG		402	2	99 54	80.5	-6.1	-0.4
					16.0	15.7	
ZANG		402	1	99 36	73.4	-20.5	-1.3
					16.0	15.5	
ZANG		402	1000	84 41	56.9	-2.5	-0.2
					16.0	14.5	
ZANG		402	4	99 97	93.4	-15.7	-1.0
					16.0	15.6	
ZANG		402	FUUB	85 81	85.1	-31.1	-2.1
					16.0	14.9	
ZANG		402	300	113 70	29.6	8.9	0.7
					16.0	13.1	
ZANG		402	HORN	120 56	52.0	-2.1	-0.2
					16.0	11.6	
ZANG		402	100	107 67	97.6	20.6	1.5
					16.0	13.6	
ZANG		402	502	99 54	11.7	-25.6	-1.6
					16.0	15.8	
ZANG		402	301	111 84	7.2	15.5	1.2
					16.0	13.2	
ZANG		402	5001	117 65	86.8	7.8	0.8
					16.0	10.2	
ZANG		402	101	105 29	59.0	-14.4	-1.1
					16.0	13.6	
ZANG		402	FUUB_marker	103 39	85.8	-3.0	-0.2
					16.0	14.9	
ZANG		302	402	100 25	97.0	-16.1	-1.1
					16.0	14.5	
ZANG		302	1000	91 0	70.0	10.4	0.7
					16.0	15.3	
ZANG		302	1	99 64	5.3	-7.8	-0.5
					16.0	15.7	
ZANG		302	2	99 66	0.8	-9.4	-0.6
					16.0	15.6	
ZANG		302	FUUB	82 95	3.4	8.9	0.6
					16.0	14.3	
ZANG		302	3	99 83	11.3	-4.2	-0.3
					16.0	15.7	
ZANG		302	4	100 24	13.0	-18.8	-1.3
					16.0	14.1	
ZANG		302	500	104 85	64.3	24.3	1.6
					16.0	15.5	

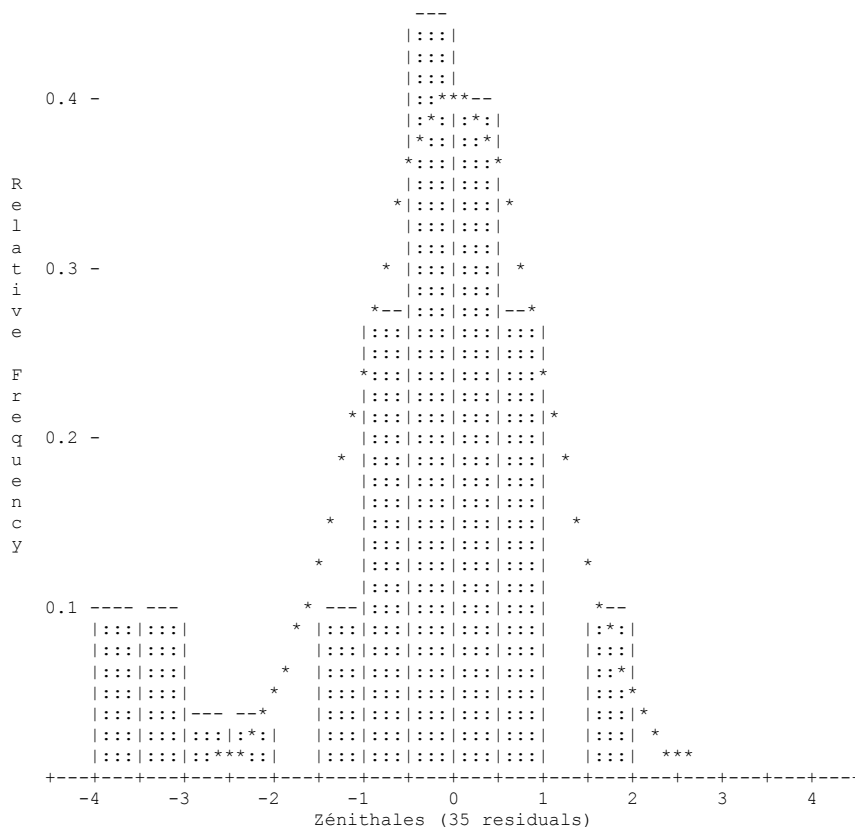
Futuna ITRF site co-location survey – May 2012

=====						
Residuals (critical value = 4.045):						
NOTE: Observation values shown are reduced to mark-to-mark.						
TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
----	----	-----	-----	-----	-----	-----
ZANG		302	200	109 87	1.4	18.3
					16.0	13.8
ZANG		302	400	113 97	31.4	15.2
					16.0	13.7
ZANG		302	100	104 75	55.1	14.1
					16.0	15.0
ZANG		302	501	104 10	94.0	19.4
					16.0	15.5
ZANG		302	201	108 30	40.8	-2.9
					16.0	14.0
ZANG		302	401	112 11	57.9	-33.2
					16.0	13.7
ZANG		302	101	103 33	44.9	-3.9
					16.0	15.0
ZANG		302	FUUB_marker	104 42	10.5	2.7
					16.0	14.3
ZANG	2	6002		99 59	23.2	4.0
					16.0	15.5
ZANG	2	3		100 16	19.6	-39.1
					16.0	15.5
ZANG	2	1000		91 80	60.0	-20.9
					16.0	15.5
ZANG	2	202		99 85	48.0	-56.2
					16.0	15.5
ZANG	2	500		108 78	25.3	4.8
					16.0	14.8
ZANG	2	200		107 8	95.7	-4.5
					16.0	15.0
ZANG	2	300		107 42	82.1	11.3
					16.0	15.2
ZANG	2	400		107 14	20.9	12.2
					16.0	15.4
ZANG	2	HORN		109 32	61.0	28.5
					16.0	15.0
ZANG	2	100		105 11	79.0	9.7
					16.0	15.1
ZANG	2	501		107 50	95.0	1.1
					16.0	14.8
ZANG	2	201		106 1	89.2	-6.5
					16.0	15.1
ZANG	2	301		106 46	40.3	-2.6
					16.0	15.2
ZANG	2	401		106 21	22.6	-73.5
					20.0	19.6
ZANG	2	5001		108 3	76.6	5.6
					16.0	14.8
ZANG	2	101		103 73	47.1	3.9
					16.0	15.1
ZANG	2	FUUB_marker		105 71	3.9	0.4
					16.0	14.0
ZANG	2	1		99 93	21.9	-31.2
					16.0	15.1
ZANG	2	1		99 93	45.1	-8.0
					16.0	15.1
ZANG	1000	3		104 38	78.1	-4.0
					16.0	15.8
ZANG	1000	502		104 10	24.6	-11.1
					16.0	15.7
ZANG	1000	2		108 19	13.8	-6.2
					16.0	15.5
ZANG	1000	1		113 93	79.3	-46.9
					16.0	14.8
ZANG	1000	4		105 57	14.1	-9.1
					16.0	15.8
ZANG	1000	500		109 10	26.3	0.2
					16.0	15.6
ZANG	1000	200		111 57	87.0	-6.0
					16.0	15.3
ZANG	1000	HORN		145 6	22.6	-1.6
					16.0	13.1
ZANG	1000	FUUB		93 46	24.7	12.8
					16.0	14.1
ZANG	1000	400		130 82	88.3	-8.9
					16.0	13.9
ZANG	1000	501		108 40	21.5	-7.2
					16.0	15.6
ZANG	1000	201		110 67	56.3	-20.9
					16.0	15.4
ZANG	1000	401		128 89	14.8	22.9
					16.0	13.9

Residuals (critical value = 4.045):

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

TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
ZANG		1000	FUUB_marker	117 74	67.9	7.8
					16.0	14.5
ZANG		1000	5002	120 51	7.3	-9.9
					16.0	13.7
ZANG		1000	6001	107 16	12.0	-16.5
					16.0	5.2



FUTUNA (FRANCE) REGINA-DORIS TIES - MAY 2012 SURVEY

Microsearch GeoLab, V2001.9.20.0 GRS 80 UNITS: m, GRAD

Residuals (critical value = 4.045):

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

TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
DIST		6002	1	17.74810 0.0010	-0.0001 0.0010	-0.1197 6.4
DIST		6002	1000	19.31040 0.0010	-0.0000 0.0010	-0.0118 0.59
DIST		6002	2	25.16190 0.0010	0.0003 0.0010	0.3463 13.13
DIST		6002	4	33.40140 0.0010	-0.0002 0.0010	-0.1734 4.98
DIST		6002	202	32.95000 0.0010	-0.0000 0.0010	-0.0249 0.72
DIST		6002	301	27.38330 0.0010	0.0004 0.0009	0.4472 15.48
DIST		6002	401	21.09310 0.0010	0.0000 0.0010	0.0001 0.01
DIST		6002	5001	22.09770 0.0010	0.0003 0.0010	0.2885 12.50
DIST		6002	FUUB_marker	25.13658 0.0010	0.0004 0.0010	0.4207 16.01
DIST	1		6002	17.74860 0.0010	-0.0006 0.0010	-0.6427 34.62
DIST	1		2	7.48620 0.0010	0.0000 0.0010	0.0365 4.82
DIST	1		3	18.33010 0.0010	0.0000 0.0010	0.0436 2.3

Futuna ITRF site co-location survey – May 2012

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Residuals (critical value = 4.045):						
NOTE: Observation values shown are reduced to mark-to-mark.						
TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
----	----	-----	-----	-----	-----	-----
DIST		1	4	19.00520 0.0010	-0.0005 0.0010	-0.5045 26.07
DIST		1	1000	5.49380 0.0010	-0.0001 0.0010	-0.1373 24.76
DIST		1	501	17.30690 0.0010	0.0031 0.0010	3.1720 179.81
DIST		1	301	13.75090 0.0010	0.0008 0.0010	0.8665 61.59
DIST		1	401	10.58760 0.0010	-0.0006 0.0010	-0.5722 52.98
DIST		1	5001	8.10460 0.0010	0.0003 0.0010	0.2768 33.63
DIST		1	FUUB_marker	8.47115 0.0010	0.0003 0.0010	0.2673 31.15
DIST		1	101	5.32770 0.0010	-0.0001 0.0010	-0.0884 16.29
DIST		2	6002	25.16290 0.0010	-0.0007 0.0010	-0.7015 26.61
DIST		2	3	11.25780 0.0010	0.0000 0.0010	0.0181 1.59
DIST		2	1000	9.36040 0.0010	0.0001 0.0010	0.1453 15.37
DIST		2	202	11.75190 0.0010	0.0006 0.0010	0.6527 54.87
DIST		2	501	9.88720 0.0010	-0.0019 0.0010	-1.9185 190.72
DIST		2	201	11.80440 0.0010	0.0008 0.0010	0.8447 70.39
DIST		2	301	13.11890 0.0010	0.0014 0.0010	1.4627 109.70
DIST		2	401	13.66310 0.0010	0.0005 0.0010	0.5617 40.22
DIST		2	5001	9.76370 0.0010	0.0014 0.0010	1.3980 141.46
DIST		2	101	9.16140 0.0010	0.0001 0.0010	0.1152 12.41
DIST		2	FUUB_marker	6.15598 0.0010	0.0012 0.0010	1.1952 191.92
DIST		2	1	7.48650 0.0010	-0.0003 0.0010	-0.2668 35.25
DIST		2	1	7.48670 0.0010	-0.0005 0.0010	-0.4689 61.97
DIST		3	202	7.86610 0.0010	0.0002 0.0010	0.1938 24.18
DIST		3	1000	17.86650 0.0010	-0.0004 0.0010	-0.4172 23.05
DIST		3	1	18.33010 0.0010	0.0000 0.0010	0.0436 2.34
DIST		3	2	11.25770 0.0010	0.0001 0.0010	0.1195 10.47
DIST		3	4	13.99450 0.0010	0.0001 0.0010	0.1134 7.97
DIST		3	501	3.69490 0.0010	-0.0003 0.0010	-0.3071 80.84
DIST		3	201	7.94080 0.0010	-0.0001 0.0010	-0.0916 11.21
DIST		3	301	15.23830 0.0010	-0.0000 0.0010	-0.0489 3.14
DIST		3	5001	16.30550 0.0010	-0.0002 0.0010	-0.2217 13.40
DIST		3	FUUB_marker	11.79466 0.0010	-0.0003 0.0010	-0.3482 29.07
DIST		3	101	17.70500 0.0010	-0.0006 0.0010	-0.6487 36.01
DIST		4	6002	33.40210 0.0010	-0.0009 0.0010	-0.9037 25.93
DIST		4	1	19.00540 0.0010	-0.0007 0.0010	-0.7082 36.60
DIST		4	202	6.25970 0.0010	-0.0001 0.0010	-0.1187 18.67
DIST		4	3	13.99460 0.0010	0.0000 0.0010	0.0117 0.82
DIST		4	1000	14.80130 0.0010	-0.0006 0.0010	-0.5617 37.44
DIST		4	501	16.79800 0.0010	-0.0007 0.0010	-0.6717 38.87
DIST		4	201	6.34080 0.0010	0.0005 0.0010	0.4758 73.15
DIST		4	301	6.18280 0.0010	-0.0005 0.0010	-0.5449 86.11

Futuna ITRF site co-location survey – May 2012

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Residuals (critical value = 4.045):						
NOTE: Observation values shown are reduced to mark-to-mark.						
TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
----	----	-----	-----	-----	-----	-----
DIST		4	401	12.58210 0.0010	0.0007 0.0010	0.6970 54.50
DIST		4	5001	11.74240 0.0010	-0.0000 0.0010	-0.0484 4.05
DIST		4	101	14.71410 0.0010	-0.0007 0.0010	-0.6687 44.44
DIST		4	FUUB_marker	11.00892 0.0010	-0.0004 0.0010	-0.4522 40.52
DIST		202	1000	13.72830 0.0010	-0.0006 0.0010	-0.5804 41.78
DIST		202	6002	32.95010 0.0010	-0.0001 0.0010	-0.1293 3.76
DIST		202	2	11.75200 0.0010	0.0005 0.0010	0.5515 46.36
DIST		202	3	7.86640 0.0010	-0.0001 0.0010	-0.1119 13.96
DIST		202	4	6.25980 0.0010	-0.0002 0.0010	-0.2202 34.64
DIST		202	501	10.57240 0.0010	-0.0000 0.0010	-0.0125 1.15
DIST		202	301	8.08060 0.0010	-0.0001 0.0010	-0.0921 11.13
DIST		202	5001	11.20460 0.0010	0.0003 0.0010	0.3523 30.99
DIST		202	101	13.59870 0.0010	-0.0004 0.0010	-0.4207 30.36
DIST		1000	3	17.86640 0.0010	-0.0003 0.0010	-0.3159 17.45
DIST		1000	502	17.84790 0.0010	-0.0001 0.0010	-0.0804 4.44
DIST		1000	2	9.36030 0.0010	0.0002 0.0010	0.2462 26.05
DIST		1000	1	5.49380 0.0010	-0.0001 0.0010	-0.1373 24.76
DIST		1000	4	14.80140 0.0010	-0.0007 0.0010	-0.6630 44.19
DIST		1000	501	17.96630 0.0010	0.0001 0.0010	0.1208 6.61
DIST		1000	201	13.87220 0.0010	-0.0003 0.0010	-0.3270 23.20
DIST		1000	401	5.78010 0.0010	0.0002 0.0010	0.2263 38.65
DIST		1000	FUUB_marker	6.37010 0.0010	-0.0002 0.0010	-0.2009 31.24
DIST		1000	5001	3.91800 0.0010	0.0004 0.0010	0.4177 105.81
DIST		1000	5002	3.23870 0.0010	-0.0002 0.0010	-0.2011 61.80
DIST		1000	6001	19.40410 0.0010	0.0005 0.0007	0.6932 24.85
DIST		5002	1	8.01050 0.0010	-0.0002 0.0010	-0.1552 19.17
DIST		5002	2	9.68820 0.0010	0.0005 0.0010	0.4895 50.04
DIST		5002	1000	3.23900 0.0010	-0.0005 0.0010	-0.5026 154.43
DIST		5002	3	16.26310 0.0010	0.0001 0.0010	0.0604 3.67
DIST		5002	4	11.69220 0.0010	-0.0004 0.0010	-0.4071 34.40
DIST		5002	201	11.21050 0.0010	-0.0004 0.0010	-0.4045 35.50
DIST		5002	401	4.25660 0.0010	0.0001 0.0010	0.0844 19.59
DIST		5002	101	3.13170 0.0010	-0.0001 0.0010	-0.0610 19.17
DIST		5002	FUUB_marker	4.69182 0.0010	-0.0001 0.0010	-0.1318 27.79
DIST		502	4	16.76460 0.0010	0.0002 0.0010	0.1820 10.60
DIST		502	402	20.64210 0.0010	0.0000 0.0010	0.0209 0.99
DIST		502	2	9.81700 0.0010	0.0001 0.0010	0.0695 6.94
DIST		502	1000	17.84780 0.0010	0.0000 0.0010	0.0212 1.17
DIST		502	3	3.51790 0.0010	0.0001 0.0010	0.0989 27.19
DIST		502	1	17.27090 0.0010	-0.0001 0.0010	-0.1257 7.13

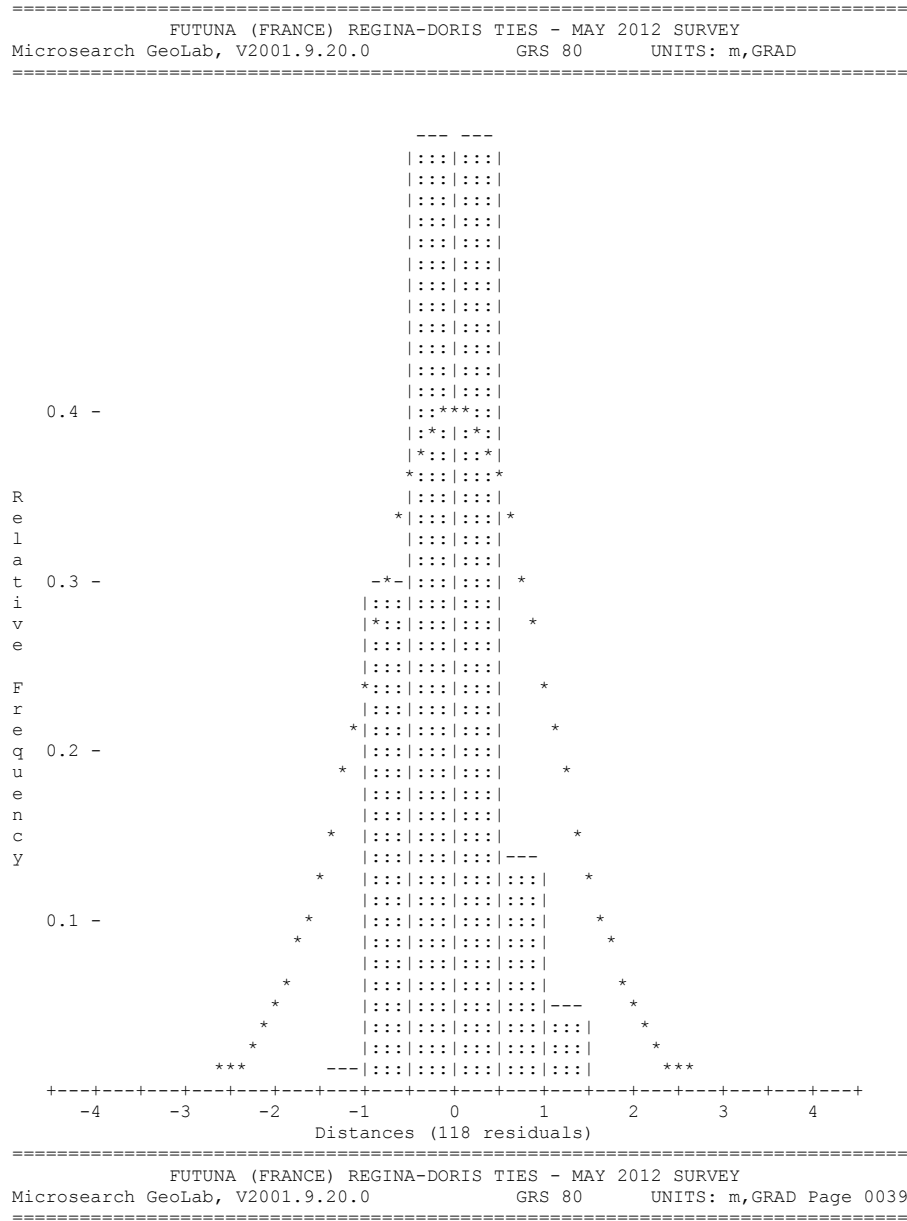
Futuna ITRF site co-location survey – May 2012

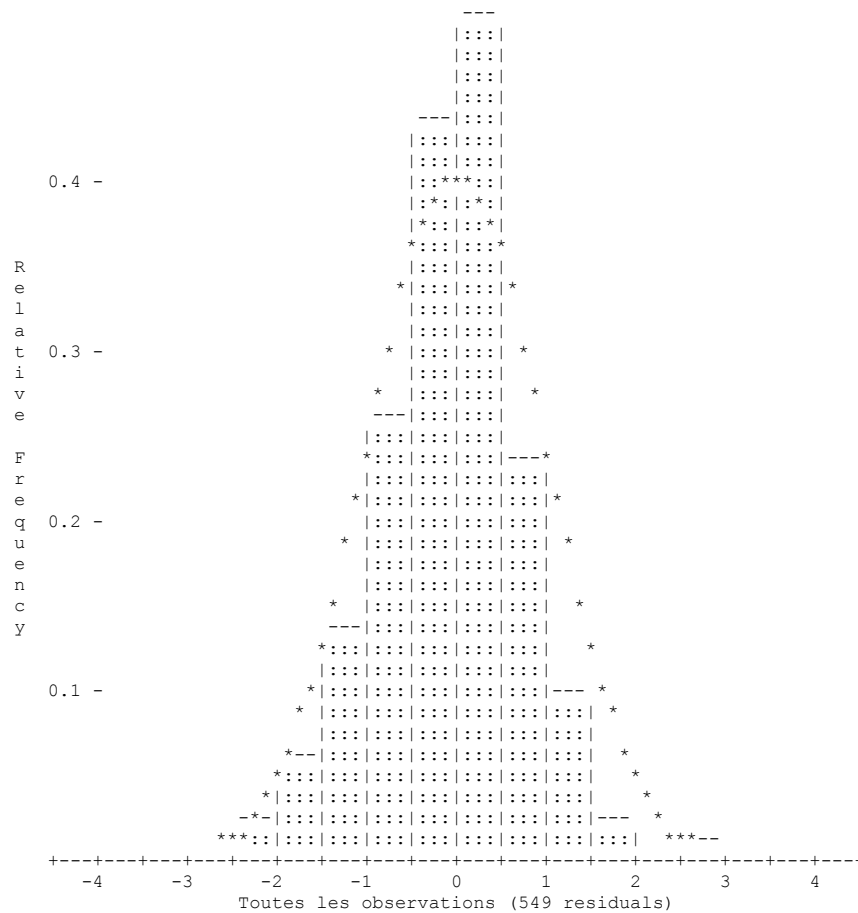
```
=====
```

Residuals (critical value = 4.045):
NOTE: Observation values shown are reduced to mark-to-mark.

TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
DIST		502	201	10.57070 0.0010	0.0002 0.0010	0.1788 16.34
DIST		502	301	16.98620 0.0010	0.0012 0.0010	1.1923 68.60
DIST		502	401	20.68780 0.0010	0.0006 0.0010	0.6123 28.85
DIST		502	101	17.68510 0.0010	0.0000 0.0010	0.0121 0.67
DIST		502	FUUB_marker	12.19915 0.0010	0.0001 0.0010	0.1526 12.29
DIST		402	502	20.64210 0.0010	0.0000 0.0010	0.0209 0.99
DIST		402	2	13.59800 0.0010	0.0002 0.0010	0.1525 11.04
DIST		402	1	10.50220 0.0010	-0.0007 0.0010	-0.6825 63.80
DIST		402	1000	5.35450 0.0010	-0.0004 0.0010	-0.4009 73.97
DIST		402	4	12.52180 0.0010	0.0000 0.0010	0.0437 3.43
DIST		402	502	20.64210 0.0010	0.0000 0.0010	0.0209 0.99
DIST		402	301	6.67100 0.0010	0.0004 0.0010	0.3962 57.86
DIST		402	5001	4.13870 0.0010	-0.0007 0.0010	-0.6562 157.12
DIST		402	101	5.30150 0.0010	0.0005 0.0010	0.4773 88.31
DIST		402	FUUB_marker	8.52923 0.0010	-0.0005 0.0010	-0.5251 60.64
DIST		302	402	6.55620 0.0010	-0.0004 0.0010	-0.3717 55.74
DIST		302	1000	9.02500 0.0010	-0.0007 0.0010	-0.7598 82.99
DIST		302	1	13.68720 0.0010	-0.0011 0.0010	-1.1535 82.76
DIST		302	2	13.05200 0.0010	0.0004 0.0010	0.4457 33.73
DIST		302	3	15.18230 0.0010	0.0004 0.0010	0.4171 27.01
DIST		302	4	6.05830 0.0010	-0.0004 0.0010	-0.4142 67.31
DIST		302	501	16.96570 0.0010	-0.0003 0.0010	-0.3391 19.52
DIST		302	201	8.03380 0.0010	0.0005 0.0010	0.5260 63.89
DIST		302	401	6.67580 0.0010	0.0004 0.0010	0.3660 53.88
DIST		302	101	8.93120 0.0010	-0.0011 0.0010	-1.1641 127.42
DIST		302	FUUB_marker	6.94741 0.0010	-0.0003 0.0010	-0.2752 39.13

Futuna ITRF site co-location survey – May 2012





S T A T I S T I C S S U M M A R Y

Residual Critical Value Type	Tau Max
Residual Critical Value	4.0450
Number of Flagged Residuals	0
Convergence Criterion	0.0001
Final Iteration Counter Value	4
Confidence Level Used	95.0000
Estimated Variance Factor	1.0993
Number of Degrees of Freedom	427

Chi-Square Test on the Variance Factor:

9.6554e-01 < 1.0000 < 1.2630e+00 ?

THE TEST PASSES

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

Variance factor used	=	1.0993
1-D expansion factor	=	1.9600
2-D expansion factor	=	2.4477
3-D expansion factor	=	2.7955

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

Futuna ITRF site co-location survey – May 2012

FUTUNA (FRANCE) REGINA-DORIS TIES - MAY 2012 SURVEY					
Microsearch GeoLab, V2001.9.20.0			GRS 80	UNITS: m,GRAD	
2-D and 1-D Station Confidence Regions (95.000 and 95.000 percent):					
STATION	MAJOR SEMI-AXIS	AZ	MINOR SEMI-AXIS	VERTICAL	
1	0.0026	5	0.0026	0.0021	
100	0.0026	172	0.0026	0.0021	
1000	0.0026	21	0.0026	0.0021	
10000	0.0036	26	0.0036	0.6498	
101	0.0027	166	0.0026	0.0021	
2	0.0027	138	0.0026	0.0021	
200	0.0027	40	0.0027	0.0022	
20000	0.0036	19	0.0033	0.6498	
201	0.0027	37	0.0027	0.0022	
202	0.0027	27	0.0026	0.0022	
3	0.0027	2	0.0026	0.0021	
300	0.0027	123	0.0027	0.0022	
301	0.0027	131	0.0027	0.0022	
302	0.0027	146	0.0026	0.0021	
4	0.0027	40	0.0026	0.0021	
400	0.0027	39	0.0026	0.0022	
401	0.0027	35	0.0026	0.0022	
402	0.0027	174	0.0026	0.0021	
500	0.0027	179	0.0027	0.0022	
5001	0.0026	164	0.0026	0.0022	
5002	0.0026	162	0.0026	0.0021	
501	0.0027	177	0.0027	0.0022	
502	0.0027	169	0.0027	0.0022	
6001	0.0032	127	0.0030	0.0023	
6002	0.0028	48	0.0027	0.0022	
DORIS_2GHz	0.0026	131	0.0026	0.0000	
FTNA	0.0026	90	0.0026	0.0021	
FTTG	0.0057	90	0.0057	0.0046	
FUTB	0.0058	131	0.0058	0.0046	
FUUB	0.0026	131	0.0026	0.0022	
FUUB_marker	0.0026	103	0.0026	0.0022	
HORN	0.0026	165	0.0026	0.0022	
SHOM	0.0038	48	0.0037	0.0036	

FUTUNA (FRANCE) REGINA-DORIS TIES - MAY 2012 SURVEY					
Microsearch GeoLab, V2001.9.20.0		GRS 80		UNITS: m,GRAD	
3D Station Confidence Regions (95.000 percent):					
STATION	MAJ-SEMI (AZ,VANG)	MED-SEMI (AZ,VANG)	MIN-SEMI (AZ,VANG)		
1	0.0031 (237, 90)	0.0030 (5, 0)	0.0030 (95, 0)		
100	0.0031 (172, 90)	0.0030 (352, 0)	0.0030 (82, 0)		
1000	0.0031 (163, 90)	0.0030 (21, 0)	0.0030 (291, 0)		
10000	0.9269 (26, 90)	0.0041 (206, 0)	0.0041 (116, 0)		
101	0.0031 (166, 90)	0.0030 (346, 0)	0.0030 (76, 0)		
2	0.0031 (347, 90)	0.0030 (138, 0)	0.0030 (228, 0)		
200	0.0031 (41, 90)	0.0031 (220, 0)	0.0030 (310, 0)		
20000	0.9269 (196, 90)	0.0041 (19, 0)	0.0038 (289, 0)		
201	0.0031 (37, 0)	0.0031 (215, 90)	0.0030 (307, 0)		
202	0.0031 (40, 90)	0.0031 (207, 0)	0.0030 (297, 0)		
3	0.0031 (2, 0)	0.0031 (175, 90)	0.0030 (272, 0)		
300	0.0031 (117, 90)	0.0031 (303, 0)	0.0030 (213, 0)		
301	0.0031 (125, 90)	0.0031 (311, 0)	0.0030 (221, 0)		
302	0.0031 (117, 90)	0.0030 (326, 0)	0.0030 (236, 0)		
4	0.0031 (74, 90)	0.0030 (220, 0)	0.0030 (310, 0)		
400	0.0031 (184, 90)	0.0030 (39, 0)	0.0030 (309, 0)		
401	0.0031 (184, 90)	0.0030 (35, 0)	0.0030 (305, 0)		
402	0.0031 (160, 90)	0.0030 (354, 0)	0.0030 (264, 0)		
500	0.0031 (359, 0)	0.0031 (177, 90)	0.0030 (269, 0)		
5001	0.0031 (156, 90)	0.0030 (344, 0)	0.0030 (254, 0)		
5002	0.0031 (142, 90)	0.0030 (342, 0)	0.0030 (252, 0)		
501	0.0031 (357, 0)	0.0031 (177, 90)	0.0030 (87, 0)		
502	0.0031 (349, 0)	0.0031 (154, 90)	0.0030 (259, 0)		
6001	0.0037 (127, 0)	0.0035 (217, 0)	0.0033 (26, 90)		
6002	0.0032 (48, 0)	0.0031 (140, 90)	0.0031 (318, 0)		
DORIS_2GHz	0.0030 (131, 0)	0.0030 (41, 0)	0.0000 (0, 90)		
FTNA	0.0029 (63, 2)	0.0029 (333, 2)	0.0029 (193, 87)		
FTTG	0.0066 (63, 2)	0.0066 (333, 2)	0.0066 (193, 87)		
FUTB	0.0066 (82, 90)	0.0066 (311, 0)	0.0066 (221, 0)		
FUUB	0.0031 (82, 90)	0.0030 (311, 0)	0.0030 (221, 0)		
FUUB_marker	0.0031 (109, 90)	0.0030 (283, 0)	0.0030 (13, 0)		
HORN	0.0031 (148, 90)	0.0030 (345, 0)	0.0030 (255, 0)		
SHOM	0.0052 (49, 90)	0.0043 (228, 0)	0.0043 (318, 0)		

6.8. Futuna SINEX file

```
%=SNX 1.00 IGN 14:147:00000 IGN 12:139:00000 12:139:00000 C 00009
*-----
+FILE/COMMENT
* File created by geotosnx software (Z.Altamimi)
* Original input file: FTNA_SINEX.cov
* Matrix Scalling Factor used: 1.00000000000
-FILE/COMMENT
*-----
+SITE/ID
*CODE PT DOMES T STATION DESCRIPTION APPROX_LON APPROX_LAT APP_H
FTNA A 92902S002 92902S002 181 52 44.5 -14 18 28.0 84.9
FUUB A 92902S003 92902S003 181 52 44.4 -14 18 28.0 85.7
FUTB A 92902S001 92902S001 181 52 44.4 -14 18 28.0 85.1
-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 FTNA A 1 12:139:00000 m 2 -.617832245110000E+07 0.10655E-02
2 STAY FTNA A 1 12:139:00000 m 2 -.202694962800000E+06 0.10655E-02
3 STAZ FTNA A 1 12:139:00000 m 2 -.156602445200000E+07 0.10655E-02
4 STAX FUUB A 1 12:139:00000 m 2 -.617832395100000E+07 0.11144E-02
5 STAY FUUB A 1 12:139:00000 m 2 -.202689187700000E+06 0.10954E-02
6 STAZ FUUB A 1 12:139:00000 m 2 -.156602282230000E+07 0.10963E-02
7 STAX FUTB A 1 12:139:00000 m 2 -.617832335460000E+07 0.24048E-02
8 STAY FUTB A 1 12:139:00000 m 2 -.202689176600000E+06 0.23961E-02
9 STAZ FUTB A 1 12:139:00000 m 2 -.156602267880000E+07 0.23965E-02
-SOLUTION/ESTIMATE
*-----
+SOLUTION/MATRIX_ESTIMATE L COVA
*PARA1 PARA2 PARA2+0 PARA2+1 PARA2+2
1 1 0.113535798411683E-05
2 1 -.153585486745186E-15 0.113535798761302E-05
3 1 0.325992881510611E-15 -.602198067287343E-15 0.113535798531187E-05
4 1 0.113535808840153E-05 0.691972372605866E-13 -.299135886412341E-13
4 4 0.124181236170318E-05
5 1 -.654414337059319E-13 0.113535798038690E-05 -.256515765866052E-12
5 4 -.792711284906361E-09 0.119990022167708E-05
6 1 -.299015115911108E-13 0.271240731856742E-12 0.113535797876730E-05
6 4 -.109128591768550E-07 -.310816426933637E-08 0.120180705468143E-05
7 1 0.113535808840153E-05 0.706159564782740E-13 -.313492988852956E-13
7 4 0.124181236169037E-05 -.792709725854179E-09 -.109128607477123E-07
7 7 0.578324429781065E-05
8 1 -.668601530862671E-13 0.113535798038690E-05 -.255755243701958E-12
8 4 -.792712788206437E-09 0.119990022167817E-05 -.310816346457813E-08
8 7 -.792711229154200E-09 0.574133215781235E-05
9 1 -.284658019494177E-13 0.270480209704075E-12 0.113535797876730E-05
9 4 -.109128576532333E-07 -.310816508800604E-08 0.120180705469315E-05
9 7 -.109128592240922E-07 -.310816428324753E-08 0.574323899083795E-05
-SOLUTION/MATRIX_ESTIMATE L COVA
%ENDSNX
```