



Galileo Technology Centre

**GalTeC  
Products Catalogue**

PC

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## 1 Introduction

GalTeC is a data processing and analysis facility developed by Thales ATM and NavPos Systems in a DLR-funded program. Its primary goal is an independent assessment and verification of Galileo/GNSS system performance. GalTeC provides the following major functions:

- Provision of highly precise satellite ephemeris (orbit and clock parameters) – for a posteriori assessment of GNSS system performance
- Independent SIS performance evaluation service covering the past and current system status of Galileo, SBAS, GPS, GLONASS
- GNSS Service Volume analysis and prediction
- Performance analysis and verification in user receiver domain
- Services provision via internet

### 1.1 Scope

This Document orders, lists and describes the products provided by GalTeC - primarily via its WEB site:

[www.galtecproject.de/galtec\\_web/](http://www.galtecproject.de/galtec_web/)

but also products which can be provided on contractual basis (order) are listed in this document.

### 1.2 Reference Documents

Acronym	Document Title	Reference
[ICD]	GalTeC - Interface Control Document	THA-GTEC-ICD-SW-005
[RD-1]	"Continuous GNSS Performance Monitoring, Prediction and Information Services via GalTeC"	Article published by GalTeC participants during ION GNSS 2008 in Savannah, USA.  See also Home > Documents on GalTeC Web Site

## 1.3 Document Outline

Section 1	describes the purpose, scope and application field of this document.
Section 2	contains the overview of the GalTeC products
Section 3	lists the single real data based products
Section 4	lists the single simulated data products

## 1.4 Acronyms

APV	Approach with Vertical guidance (aviation flight phase expression)
DDMMYY	Datum e.g. 27.10.2008
doy	day of year (1.1.YYYY = doy 1)
EGNOS	European Geostationary Navigation Overlay System
GalTeC	Galileo Technology Centre
GLONASS	Global Orbiting Navigation Service System
GNSS	Global Navigation Satellite System (GPS, Galileo, GLONASS)
HPL	Horizontal Protection Level
Hor	Horizontal
ICD	Interface Control Document
ID	Identification
IGS	International GNSS Service (used as source by GalTeC for GPS archived data)
NANU	Notice Advisory to NAVSTAR Users
NAGU	Notice Advisory to GLONASS Users
OPS	GNSS-X Operations or associated organisation
Pos	Position
PR	Pseudorange
PRN	Pseudorandom Noise code (= GPS satellite designator)
PVT/I	Position Velocity Time (computed by the GNSS receiver) and Integrity
RAIM	Receiver Autonomous Integrity Monitoring
RINEX	Receiver Independent Exchange Format
RX	Receiver (GalTeC GPS/EGNOS receiver)
SISA	Signal In Space Accuracy
SISE	Signal In Space Error (truth, to be estimated)
SISRA	Signal In Space Reference Accuracy (Sigma of SISRE, zero centred)

SISRE	Signal In Space Reference Error (GalTeC derived)
SV	Satellite Vehicle (GPS Satellite)
TLE	Two Line Elements (Keplerian Data, Orbits)
URA	User Range Accuracy (parameter broadcast by GPS)
USCG	U.S. Coast Guard
UTC	Universal Time Coordinated
Ver. Vert.	Vertical
VPL	Vertical Protection Level
YY, YYYY	Year either 08 or 2008

## 2 GalTeC Products Overview

GalTeC is an Information and Assessment Facility for GNSS users. It collects on a daily basis GNSS observations either from own receivers or from IGS sites and derives from that performance figures.

The GNSS systems GPS, GLONASS, EGNOS and Galileo(Giove) are monitored.

Additionally to observations GalTeC collects and presents each day the status, notices and almanacs of each system provider, not as own product but as a site archiving centrally the information for all systems on one place.

Finally GalTeC provides different GNSS service volume simulations for the running day and past days.

The concept of and way to navigate in the GalTeC web site to access the daily products and understand the representation is described in the [RD-1] which can be retrieved also from the GalTeC Web site and maybe should be consulted in parallel with this document. Also the topic related Online Help describes more in detail the single products (graphics, annotations).



Figure 2-1: GalTeC Home page

□ - Analysis based on real world data

□ - Analysis based on predicted data

The GalTeC products can be labelled with multi dimensional attributes:

1. GNSS Type

- GPS
- EGNOS/GPS
- GLONASS and GLONASS/GPS
- Giove or Galileo

2. Products Access Level

- Free Access via Internet
- Registered Users Access via Internet
- Customized Order via other transfer methods

3. Data

- Analysis based on recently Locally Observed Data
- Analysis based on recently Globally Observed Data
- Analysis based on Simulated\* Data (Predictions)

*\* based on real broadcast Almanacs (Giove using TLE and Full-Galileo with artificial almanac)*

### 3 Real Data Products

Real Data is updated daily and is retrievable at least 6 months into the past. Earliest available products are available for 1.1.2009. Most of the following products have a slight latency of 1 day at maximum (update shortly after midnight UTC). SIS products are available only for the date 2 weeks before or earlier. As all processing is done in Linux environment the users can expect accordingly formatted Text files.

#### 3.1 GPS and GPS Receiver Products

The GPS receiver is a **Septentrio AsteRx1** receiver connected with an antenna at the Thales site (Stuttgart, Germany) with the following configuration:

- L1 receiver
- GPS and Giove

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
GPS+Giove Raw Records	order	Septentrio Binary Format	ATRXdoy0.YY_.gz	not Online
AsteRx1 raw receiver records (all Logs enabled), 24 hours, 1second resolution, zipped size 120 MB				
GPS RINEX Observation Data	registered	RINEX O V2.10	GTRX02_doyYYYY_O.gz	GPS > Data > GPS Receiver
GPS observations (code, phase, ranges), 24 hour period, 1 second resolution, zipped size 10 MB				
GPS RINEX Navigation Data	registered	RINEX N V2.10	GTRX02_doyYYYY_N.gz	GPS > Data > GPS Receiver
GPS navigation (ephemeris), over 24 hours, small size				

**Table 3-1: GalTeC GPS Receiver Data (Raw and Rinex)**

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
Position Velocity Table	registered	Text (Linux)	GTRX02_doyYYYY_pos_vel.dat.gz	GPS > Data > GPS Receiver
To ASCII decoded receiver generated position results, GalTeC specific table format see [ICD], 24 hours, 1 second interval, zipped size 2MB				
xDOP and xPL Table	registered	Text (Linux)	GTRX02_doyYYYY_dop_xpl.dat.gz	GPS > Data > GPS Receiver
To ASCII decoded receiver generated DOP and Protection Level (RAIM) results, GalTeC specific table format see [ICD], 24 hours, 1 second interval, 0.5 MB				
Range Residuals	registered	Text (Linux)	GTRX02_doyYYYY_rng_res.dat.gz	GPS > Data > GPS Receiver
To ASCII decoded receiver generated Range Residuals results, GalTeC specific table format see [ICD], 24 hours, 1 second interval, zipped size 2 MB				

**Table 3-2: GalTeC GPS Receiver Data (Clear Text Tables)**

The following is not directly a GPS receiver output data. It is rather the output of the GalTeC Precise Reference determination module. It delivers for each GPS satellite, based on IGS round the world monitor stations a 24h analysis of Orbit Errors and Clock Errors and there-from derived SIS Range Errors.

Only for occasional days precise orbit data computed by GalTeC itself (SP3 files) are provided, since such files ("End Products") are daily available by IGS itself.

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
Precise Orbit and Clock	registered	SP3 (Text)	ref_YYYYMMDD_WEEKD.sp3 (WEEK = GPS Week, D = Day of Week 1..7)	GPS > Data > GPS Processed Data
Precise Orbit and Clock sp3-file according to IGS rules, see also [ICD], 24h file, 1 minute(s) resolution, only on occasional days available				
SIS Range Errors	registered	Text (Linux)	sisre_gpsNN.dat    NN=01..32	GPS > Data > GPS Processed Data
GalTeC formatted table of Orbit errors (along,cross,radial) and Clock errors based on a delta between SP3 and Ephemeris derived orbits/clock corrections. 1 Minute resolution. One File per satellite or one single zipped file containing all satellites - 1.2MB. Available for each day.				

**Table 3-3: GalTeC-Processed GPS Data**

The **Analysis Function** is performing statistical analysis and presentation of the results in graphical form and also in parallel in textual form.

The results in textual form contain summaries of all displayed information on the web site's Analysis section and plots (numerical figures). These result summaries are contained in three Clear-Text (Linux!) files:

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
Position/Integrity Analysis Report	registered	Text (Linux)	ana_pos_result.txt	GPS > Analysis
Contains information seen in GPS > Analysis > Position Positioning quality (Septentrio AsteRx1 output) with relation to APV-II position requirement (95% accuracy). This is a one-day-statistic result over 86400 samples. Attention - any Integrity numbers are based on a RAIM Protection level (xPL).				
SISRE Analysis Report	registered	Text (Linux)	ana_sis_result.txt	GPS > Analysis
Contains information seen in GPS > Analysis > Signal in Space SISRE - SIS Reference Errors (also called URE or SISE) analysis result, in parallel to the Analysis>SIS menu. Listed is an evaluation result and the values for each satellite. This is a one-day analysis over 1440 samples (dt=1min). Each satellite is analysed for a whole day (covered by world wide monitoring). Satellites are evaluated as GREEN only if SISRE is smaller then the related URA in more than 68.23% over the day.				
PR Residuals Analysis Report	registered	Text (Linux)	ana_rex_result.txt	GPS > Analysis
Contains information seen in GPS > Analysis > Receiver Tracking GPS Range Residuals statistical analysis results, per satellite: max, mean and sigma of residual range errors, based on receiver position solution. This is a one day analysis, however satellites are visible only part of a day.				

**Table 3-4: GalTeC GPS Analysis Summary text files**

The GalTeC products in form of Analysis pictures/plots which are available with free access are listed on the following pages.

Menu: GPS > Analysis > Position

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
2-D Position plot	free	Bitmap, PNG	d2d.png	GPS > Analysis > Position
Position Fixes of the GalTeC receiver relative to a Reference Coordinate (in Stuttgart, Germany) and Statistics. This is a 24h plot.				
Horizontal Errors time plot	free	Bitmap, PNG	dhor.png	GPS > Analysis > Position
Horizontal Error over Time (24h) and Statistics (another representation of the above plot).				
Vertical Errors time plot	free	Bitmap, PNG	dvert.png	GPS > Analysis > Position
Vertical Error over Time (24h) and Statistics.				
Histogram North Errors	free		gauss_dn.png	GPS > Analysis > Position
Distribution of North errors of the day with biased Gaussian overlay. (Horizontal component)				
Histogram East Errors	free		gauss_de.png	GPS > Analysis > Position
Distribution of East errors of the day with biased Gaussian overlay. (Horizontal component)				
Histogram Vertical Errors	free		gauss_du.png	GPS > Analysis > Position
Distribution of Up errors of the day with biased Gaussian overlay. (Vertical component)				

**Table 3-5: GalTeC GPS PVT Analysis**

Menu: GPS > Analysis > Receiver Tracking

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
Number of SV and DOP plot	free	Bitmap, PNG	dop.png	GPS > Analysis > Receiver Tracking
Number of used satellite measurements and VDOP and HDOP - time plot (24h)				

**Table 3-6: GalTeC GPS SV Tracking/Use Analysis**

Menu: GPS > Analysis > Signal in Space

Here the results of the GalTeC Reference module are displayed and statistically analysed (green plots). They represent the difference in Orbit and Clock derived from Ephemeris as compared to Precise Orbit and Clock data (SP3 usually downloaded from IGS). Presented are the SISRE (SIS Reference Errors components), i.e. orbital and clock errors per satellite. It is an equivalent to the URE (User Range Error). The results are globally computed values (i.e. using data from world wide IGS stations and received Navigation messages, so each satellite is represented for full 24h.

As contrast locally derived Range Errors are added, based on the GalTeC receiver output - Range Residuals which contain all errors. These represent commonly a UERE. As a satellite is seen by the GalTeC station only part time of a day, these plots are not continuous, but the resolution in time is 1 s, so much more samples are available for statistics. These plots are coloured in orange.

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
SV 3-D Orbit Error plot	free	Bitmap, PNG	Gnn_dOrbit.png, (nn = PRN)	GPS > Analysis > Signal in Space
Time Plot of the three orbital errors - along, cross and radial directions. Added are markers when IODE did change according to Ephemeris data.				
SV Clock Error plot	free	Bitmap, PNG	Gnn_dClock.png, (nn = PRN)	GPS > Analysis > Signal in Space
Time Plot of the Clock error, converted to Range error (dt x c).				
SISRE Range error plot	free	Bitmap, PNG	Gnn_SISRE.png, (nn = PRN)	GPS > Analysis > Signal in Space

SISRE over 24h time plot. SISRE is the resulting range error taken from Orbit and Clock error for a worst user location. It is also called URE. Additionally the broadcast URA is plot. An analysis is performed on how often SISRE is smaller than SISRE (or URE).

Histogram SISRE and SISRA	free	Bitmap, PNG	Gnn_Stat.png, (nn = PRN)	GPS > Analysis > Signal in Space
Distribution of SISRE in classes -15m to +15m, 1 meter class width. Additionally two Gaussian distributions are plot, one biased (around mean deviation of SISRE) and one forced to be Zero mean, but containing 68.23 of SISRE within +/- 1sigma, which is declared as SISRA. For comparison the broadcast URA (of 24h) are marked - also as 1-sigma parameters around Zero-Mean. Some statistics are shown in an info box.				
SV Pseudorange Residuals	free	Bitmap, PNG	gNN_uere.png, (NN = PRN)	GPS > Analysis > Signal in Space
This is a time plot of the Pseudorange residual error as given by the GalTeC receiver, in principle the commonly known parameter UERE (User Equivalen Range Error). It is intended to cross compare with the SISRE. However the Residuals contain all errors including SISRE errors.				
Histogram Residuals	free	Bitmap, PNG	gNN_uere_hist.png, (nn = PRN)	GPS > Analysis > Signal in Space
Distribution of the residual errors (UERE) with the gaussian parameters and fitting curve.				

**Table 3-7: GalTeC GPS satellite SIS Analysis**

To receive the "official" information on the GPS status some files are mirrored from the USCG Navigation Center (<http://www.navcen.uscg.gov>).

The following products are collected and archived at GalTeC and available for free (as at USCG site):

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
GPS System Status	free	Text	doy.aa1 (doy=day of year)	GPS > System information > GPS Status
Unclassified (Daily) GPS Operational Advisory, unchanged original format.				
GPS NANU	free	Text	YYYYNUM.nnu (NANU-Number.nnu)	GPS > System information > GPS NANU
Actual valid GPS Operators Notice for NavStar Users. Can be repeated at different days within GalTeC web navigation, as long as they are valid or replaced by more actual ones. Note NANUs are not like Status files updated each day. They are announcements for the near future.				
GPS Almanac	free	Text (YUMA)	doy.alm	GPS > System information > GPS Almanac
Actual valid GPS almanac in YUMA format.				

**Table 3-8: GPS OPS mirrored information**

### 3.2 EGNOS and EGNOS Receiver Products

The EGNOS GPS receiver is a **Septentrio PolaRx2** receiver connected with an antenna at the Thales site with the following configuration:

- L1/L2 receiver
- EGNOS augmentation enabled (i.e. L2 Iono correction etc. disabled), Use augmentation data from PRN 120 only.

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
GPS L1+L2 and EGNOS Raw Records	order	Septentrio Binary Format	PLRXdoy0.YY_.gz	not Online
PolaRx2 raw receiver records (all Logs enabled), 24 hours, 1second resolution, zipped size 140 MB				
GPS RINEX Observation Data	registered	RINEX O V2.10	GTRX01_doyYYYY_O.gz	EGNOS > Data > EGNOS Receiver
GPS L1/L2 observations (code, phase, ranges), 24 hour period, 1 second resolution, zipped size 13 MB				
GPS RINEX Navigation Data	registered	RINEX N V2.10	GTRX01_doyYYYY_N.gz	EGNOS > Data > EGNOS Receiver
GPS navigation (ephemeris), over 24 hours, small size				

**Table 3-9: GalTeC EGNOS Receiver Data (Raw and Rinex)**

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
Position Velocity Table	registered	Text (Linux)	GTRX01_doyYYYY_pos_vel.dat.gz	EGNOS > Data > EGNOS Receiver
To ASCII decoded receiver generated position results, GalTeC specific table format see [ICD], 24 hours, 1 second interval, zipped size 2MB				
xDOP and xPL Table	registered	Text (Linux)	GTRX01_doyYYYY_dop_xpl.dat.gz	EGNOS > Data > EGNOS Receiver
To ASCII decoded receiver generated DOP and Protection Level (SBAS) results, GalTeC specific table format see [ICD], 24 hours, 1 second interval, 0.6 MB				
Range Residuals*	registered	Text (Linux)	GTRX01_doyYYYY_rng_res.dat.gz	EGNOS > Data > EGNOS Receiver
To ASCII decoded receiver generated Range Residuals results, GalTeC specific table format see [ICD], 24 hours, 1 second interval, zipped size 2 MB.				
*Please do note: These data are for information only as this are residuals after applied Augmentation. No related Graphics are therefore found in the EGNOS section of the Web site (No <i>Signal in Space</i> section here)				
SBAS Message Types	registered	Text (Linux)	GTRX01_doyYYYY_sbas_mt.dat.gz	EGNOS > Data > EGNOS Receiver
To ASCII decoded receiver reported SBAS MT sequence (of all EGNOS GEOs), GalTeC specific table format see [ICD], 24 hours, 1 second interval, 1.0 MB				

**Table 3-10: GalTeC EGNOS Receiver Data (Clear Text Tables)**

The Analysis Function is performing statistical analysis and presentation of the results in graphical form and also in parallel in textual form.

The results in text form containing summaries of all displayed information on the web site's Analysis section and plots (numerical figures) are contained in two Clear-Text (Linux!) files:

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
Position/Integrity Analysis Report	registered	Text (Linux)	ana_pos_result.txt	EGNOS > Analysis
Contains information seen in EGNOS > Analysis > Position and EGNOS > Analysis > Integrity Positioning and Integrity performance (Septentrio PolaRx2 output) with relation to (minimum) APV-II position requirements. This is a one-day-statistic result over 86400 samples.				
Transmit EGNOS Messages Report	registered	Text (Linux)	ana_mtype_result.txt	EGNOS > Analysis
Statistic on received SBAS Message Types in 24h, per MT and per EGNOS GEO.				

**Table 3-11: GalTeC EGNOS Analysis Summary text files**

The GalTeC products in form of Analysis pictures/plots which are available with free access are listed below.

Menu: EGNOS > Analysis > Position

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
2-D Position plot	free	Bitmap, PNG	d2d.png	EGNOS > Analysis > Position
Position Fixes of the GalTeC receiver relative to a Reference Coordinate (in Stuttgart, Germany) and Statistics. This is a 24h plot.				
Horizontal Errors time plot	free	Bitmap, PNG	dhor.png	EGNOS > Analysis > Position
Horizontal Error over Time (24h) and Statistics (another representation of the above plot).				
Vertical Errors time plot	free	Bitmap, PNG	dvert.png	EGNOS > Analysis > Position
Vertical Error over Time (24h) and Statistics.				
Histogram North Errors	free		gauss_dn.png	EGNOS > Analysis > Position
Distribution of North errors of the day with biased Gaussian overlay. (Horizontal component)				
Histogram East Errors	free		gauss_de.png	EGNOS > Analysis > Position
Distribution of East errors of the day with biased Gaussian overlay. (Horizontal component)				
Histogram Vertical Errors	free		gauss_du.png	EGNOS > Analysis > Position
Distribution of Up errors of the day with biased Gaussian overlay. (Vertical component)				

**Table 3-12: GalTeC EGNOS PVT Analysis**

Menu: EGNOS > Analysis > Integrity

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
Horizontal PL time plot	free	Bitmap, PNG	hpl.png	EGNOS > Analysis > Integrity
Horizontal Protection Level and Position Error over time (24h) and Statistics (e.g. Availability).				
Horizontal Stanford plot	free	Bitmap, PNG	hstan.png	EGNOS > Analysis > Integrity
Stanford Plot Horizontal Protection Level vs. Hor. Position Errors and Statistics. APV-II bounds.				
Horizontal PL time plot	free	Bitmap, PNG	vpl.png	EGNOS > Analysis > Integrity
Vertical Protection Level and Position Error over time (24h) and Statistics (e.g. Availability).				
Vertical Stanford plot	free		vstan.png	EGNOS > Analysis > Integrity
Stanford Plot Vertical Protection Level vs. Vert. Position Errors and Statistics. APV-II bounds.				

**Table 3-13: GalTeC EGNOS Integrity Analysis**

Menu: EGNOS > Analysis > Receiver Tracking

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
Number of SV and DOP plot	free	Bitmap, PNG	dop.png	EGNOS > Analysis > Receiver Tracking
Number of used satellite measurements and VDOP and HDOP - time plot (24h).				
Note: Only GPS satellites are used which are given free by EGNOS Augmentation data!				

**Table 3-14: GalTeC GPS SV Tracking/Use Analysis**

Menu: EGNOS > Analysis > EGNOS messages

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
EGNOS Message Types	free	Bitmap, PNG	sbasMT120.png and sbasMT126.png	EGNOS > Analysis > Receiver Tracking
Two graphics, EGNOS broadcast message types over 24 hours. One plot per EGNOS legacy GEO (in 2008: PRN120 and 126).				

**Table 3-15: GalTeC EGNOS Broadcasts Analysis**

The "official" information on the EGNOS status is retrieved from an EGNOS service provider Notices e-mailing system. The Notices or Status messages are archived on the GalTeC web site. The Notices are received only on-event, i.e. not each day. Please note that on some days besides the short message a lengthier Advisory is sent out. The service is provided by ESSP (EGNOS OPS User Support; <http://asqf-gnss.com/WebPortal/Egnos/Pages/Home.page>)

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
GPS System Status	free	Text	YYYYMMDD_hhmm.enu	GPS > System information > EGNOS Status
Mirroring of occasionally sent Status messages (EGNOS Outage Reports) and/or EGNOS User Advisories.				

**Table 3-16: EGNOS OPS mirrored information**

### 3.3 GLONASS and GLONASS Receiver Products

The GLONASS/GPS receiver is a **Septentrio PolaRx3** receiver connected with an antenna at the Thales site and has the following configuration:

- L1/L2 receiver
- GPS and GLONASS

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
GLONASS+GPS Raw Records (L1+L2)	order	Septentrio Binary Format	PLR3doy0.YY_.gz	not Online
PolaRx3 raw receiver records (all Logs enabled), 24 hours, 1second resolution, zipped size 160 MB.				
GLONASS RINEX Observation Data	registered	RINEX O V2.10	GTRX03_doyYYYY_O.gz	GPS > Data > GLONASS Receiver
GLONASS observations (code, phase, ranges), 24 hour period, 1 second resolution, zipped size 10 MB				
GLONASS RINEX Navigation Data	registered	RINEX G V2.10	GTRX03_doyYYYY_N.gz	GPS > Data > GLONASS Receiver
GLONASS navigation (ephemeris), over 24 hours, small size				

**Table 3-17: GalTeC GLONASS Receiver Data (Raw and Rinex)**

The Position solution of the GLONASS-GPS receiver is a combined one (not GLONASS-only!) as the PolRx3 like many other GLONASS capable receivers can not deliver isolated GLONASS solutions.

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
Position Velocity Table	registered	Text (Linux)	GTRX03_doyYYYY_pos_vel.dat.gz	GLONASS > Data > GLONASS Receiver
To ASCII decoded receiver generated GPS+GLONASS position results, GalTeC specific table format see [ICD], 24 hours, 1 second interval, zipped size 2MB				
xDOP and xPL Table	registered	Text (Linux)	GTRX03_doyYYYY_dop_xpl.dat.gz	GLONASS > Data > GLONASS Receiver
To ASCII decoded receiver generated DOP and Protection Level (RAIM) results, GalTeC specific table format see [ICD], 24 hours, 1 second interval, 0.5 MB				
Range Residuals	registered	Text (Linux)	GTRX03_doyYYYY_rng_res.dat.gz	GLONASS > Data > GLONASS Receiver
To ASCII decoded receiver generated Range Residuals results (GLONASS-only), GalTeC specific table format see [ICD], 24 hours, 1 second interval, zipped size 1 MB.				

**Table 3-18: GalTeC GLONASS Receiver Data (Clear Text Tables)**

The following is not directly a GLONASS receiver output data. It is rather the output of the GalTeC Precise Reference determination module. It delivers for each GLONASS satellite, based on IGS or round the world monitor stations a 24h analysis of Orbit errors and Clock Errors and there-from derived SIS Range errors.

Only for occasional days precise orbit data computed by GalTeC (SP3 files) are provided, as such files (End Products) are daily available by IGS itself.

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
Precise Orbit and Clock	registered	SP3 (Text)	ref_YYYYMMDD_14481.sp3	GLONASS > Data > GLONASS Processed Data
Precise Orbit and Clock sp3-file according to IGS rules, see also [ICD], 24h file, 1 minute(s) resolution. Computed only occasionally by GalTeC				
SIS Range Errors	registered	Text (Linux)	sisre_gloNN.dat    NN=01..24	GLONASS > Data > GLONASS Processed Data
GalTeC formatted table of Orbit errors (along,cross,radial) and Clock errors based on a delta between SP3 and Ephemeris derived orbits/clock corrections. 1 Minute resolution. One File per satellite <b>or</b> one single zipped file containing all satellites - 0.6 MB. Available for each day.				

**Table 3-19: GalTeC-Processed GLONASS Data**

The **Analysis Function** is performing statistical analysis and presentation of the results in graphical form and also in parallel in textual form.

The results in text form containing summaries of all displayed information on the web site's Analysis section and plots (numerical figures) are contained in three Clear-Text (Linux!) files:

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
Position/Integrity Analysis Report	registered	Text (Linux)	ana_pos_result.txt	GLONASS > Analysis
Contains information seen in GLONASS > Analysis > Position Positioning quality (Septentrio PolaRx3 output) with relation to APV-II position requirement (95% accuracy). This is a one-day-statistic result over 86400 samples. <i>Attention - the Integrity Results are based on RAIM PL.</i>				
SISRE Analysis Report	registered	Text (Linux)	ana_sis_result.txt	GLONASS > Analysis
Contains information seen in GLONASS > Analysis > Signal in Space  SISRE - SIS Reference Errors (also called URE or SISE) analysis result, in parallel to the Analysis>SIS menu. Listed is an evaluation result and the values for each satellite. This is a one-day analysis over 1440 samples (dt=1min). Each satellite is analysed for a whole day (covered by world wide monitoring). Contrary to the GPS satellites the GLONASS satellites are not evaluated (due to missing URA or SISA like parameter). The flag is always set to "YELLOW".				
PR Residuals Analysis Report	registered	Text (Linux)	ana_rex_result.txt	GLONASS > Analysis
Contains information seen in GLONASS > Analysis > Receiver Tracking GLONASS Range Residuals statistical analysis results, per satellite: max, mean and sigma of residual range errors, based on the receiver position solution. This is a one day analysis, however satellites are visible only part of a day.				

**Table 3-20: GalTeC GPS Analysis Summary text files**

The GalTeC products in form of Analysis pictures/plots which are available with free access are listed below.

Menu: GLONASS > Analysis > Position

As mentioned above the position output of the receiver is a combined GPS+GLONASS (dual frequency) PVT !

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
2-D Position plot	free	Bitmap, PNG	d2d.png	GLONASS > Analysis > Position
Position Fixes of the GalTeC receiver relative to a Reference Coordinate (in Stuttgart, Germany) and Statistics. This is a 24h plot.				
Horizontal Errors time plot	free	Bitmap, PNG	dhor.png	GLONASS > Analysis > Position
Horizontal Error over Time (24h) and Statistics (another representation of the above plot).				
Vertical Errors time plot	free	Bitmap, PNG	dvert.png	GLONASS > Analysis > Position
Vertical Error over Time (24h) and Statistics.				
Histogram North Errors	free		gauss_dn.png	GLONASS > Analysis > Position
Distribution of North errors of the day with biased Gaussian overlay. (Horizontal component)				
Histogram East Errors	free		gauss_de.png	GLONASS > Analysis > Position
Distribution of East errors of the day with biased Gaussian overlay. (Horizontal component)				
Histogram Vertical Errors	free		gauss_du.png	GLONASS > Analysis > Position
Distribution of Up errors of the day with biased Gaussian overlay. (Vertical component)				

**Table 3-21: GalTeC GLONASS+GPS PVT Analysis**

Menu: GLONASS &gt; Analysis &gt; Receiver Tracking

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
Number of SV and DOP plot	free	Bitmap, PNG	dop.png	GPS > Analysis > Receiver Tracking
Number of used satellite measurements and VDOP and HDOP - time plot (24h), GPS+GLONASS !				

**Table 3-22: GalTeC GLONASS+GPS SV Tracking/Use Analysis**

Menu: GLONASS &gt; Analysis &gt; Signal in Space

Here the results of the GalTeC Reference module are displayed and statistically analysed (green plots). They represent the difference in Orbit and Clock derived from Ephemeris as compared to Precise Orbit and Clock data (SP3 usually downloaded from IGS). Presented are the SISRE (SIS Reference Errors components), i.e. orbital and clock errors per satellite. It is an equivalent to the URE (User Range Error). The results are globally computed values (i.e. using data from world wide IGS stations and received Navigation messages, so each satellite is represented for full 24h.

As contrast locally derived Range Errors are added, based on the GalTeC receiver output - Range Residuals which contain all errors. These represent commonly a UERE. As a satellite is seen by the GalTeC station only part time of a day, these plots are not continuous, but the resolution in time is 1 s, so much more samples are available for statistics. These plots are coloured in orange.

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
SV 3-D Orbit Error plot	free	Bitmap, PNG	Rnn_dOrbit.png, (nn = Slot Nr)	GLONASS > Analysis > Signal in Space
Time Plot of the three orbital errors - along, cross and radial directions.				
SV Clock Error plot	free	Bitmap, PNG	Rnn_dClock.png, (nn = Slot Nr)	GLONASS > Analysis > Signal in Space
Time Plot of the Clock error, converted to Range error (dt x c).				
SISRE Range error plot	free	Bitmap, PNG	Rnn_SISRE.png, (nn = Slot Nr)	GLONASS > Analysis > Signal in Space
SISRE over 24h time plot. SISRE is the resulting range error taken from Orbit and Clock error for a worst user location. It is also called URE.				
Histogram SISRE and SISRA	free	Bitmap, PNG	Rnn_Stat.png, (nn = Slot Nr)	GLONASS > Analysis > Signal in Space

Distribution of SISRE in classes -15m to +15m, 1 meter class width. Additionally two Gaussian distributions are plot, one biased (around mean deviation of SISRE) and one forced to be Zero mean, but containing 68.23 of SISRE within +/- 1sigma, which is declared as SISRA. Some statistics are shown in an info box.

SV Pseudorange Residuals	free	Bitmap, PNG	rNN_uere.png, (NN = Slot Nr)	GLONASS > Analysis > Signal in Space
--------------------------	------	-------------	------------------------------	--------------------------------------

This is a time plot of the Pseudorange residual error as given by the GalTeC receiver, in principle the commonly known parameter UERE (User Equivalen Range Error). It is intended to cross compare with the SISRE. However the Residuals contain all errors including SISRE errors.

Histogram Residuals	free	Bitmap, PNG	rNN_uere_hist.png, (NN = Slot Nr)	GLONASS > Analysis > Signal in Space
---------------------	------	-------------	-----------------------------------	--------------------------------------

Distribution of the residual errors (UERE) with the gaussian parameters and fitting curve.

**Table 3-23: GalTeC GLONASS satellite SIS Analysis**

To receive the "official" information on the GLONASS status some files are mirrored from the Russian RSA's IANC (Information - Analytical Centre) (<http://www.glonass-ianc.rsa.ru>).

The following products are collected and archived at GalTeC and available for free (as at IANC site):

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
GLONASS System Status	free	Text	const_YYMMDD.glo	GLONASS > System information > GLONASS Status
GLONASS Operational Status (table over all satellites in orbit), unchanged original format - i.e. with Cyrillic coded Font. These files are found in the IANC FTP Archive section /Status/ folder.				
GLONASS NAGU	free	Text	YYYYMMDD_hhmm.ngu (self defined)	GLONASS > System information > GLONASS NAGU
This is a copy from the IANC daily updated (but not archived) Status information - with additional Advisory information in the second part of the file. (Link via "Information from GLONASS Control Center" on IANC web site)				
GLONASS Almanac	free	Text	receiver_DDMMYY.agl	GLONASS > System information > GLONASS Almanac
Actual valid GLONASS almanac from IANC's FTP Archive (.../Almanac/ folder). it is an specific two line format - presumably from An Ashtech GG-24 receiver. The description (in Cyrillic) is found in the same path on the FTP archive server under /Formats/.				

**Table 3-24: GLONASS OPS mirrored information**

### 3.4 Galileo and Galileo Receiver Products

The GalTeC's "Galileo" receiver is the same as the GPS receiver: the **Septentrio AsteRx1** receiver connected with an antenna at the Thales site with the following configuration:

- L1 receiver
- GPS and Giove

Due to the status of Galileo in 2008 the related products which can be offered are very limited. However for the sake of harmonic site-navigation for all GNSS, the menu structure of Galileo in GalTeC is designed in the same way as for GPS, GLONASS and partly EGNOS. Please do not be confused that most sections will be empty until 2011 when the Galileo Mission itself starts.

What is available is at lower level the receiver tracking records:

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
GPS+Giove Raw Records	order	Septentrio Binary Format	ATRXdoy0.YY_.gz	not Online
AsteRx1 raw receiver records (all Logs enabled), 24 hours, 1second resolution, zipped size 120 MB (same file as with GPS and AsteRx1, see §3.1!)				
GPS RINEX Observation Data	registered	RINEX O V3.00	GTRX02_doyYYYY_O.gz	Galileo > Data > Galileo Receiver
Galileo and GPS observations (code, phase, ranges), 24 hour period, 1 second resolution, zipped size 11 MB				
GPS RINEX Navigation Data	registered	RINEX L V3.00	GTRX02_doyYYYY_L.gz	Galileo > Data > Galileo Receiver
Galileo Navigation (ephemeris), over 24 hours, small size				

**Table 3-25: GalTeC Giove/GPS Receiver Data (Raw and Rinex)**

GALILEO > Data > Processed data : - - - - - empty, reserved for future use

GALILEO > Analysis > : - - - - - The whole menu tree is empty, reserved for future use

GALILEO > System Information >

Product Designation	Access	File Type	File Name	Menu-Class
<b>Description</b>				
GIOVE System Status	free	Text	YYYYMMDD_gal_info.txt	GALILEO > System information > GALILEO Status
A daily short text copy from ESTEC Giove Web site ( <a href="http://www.giove.esa.int">www.giove.esa.int</a> : "Signal transmission")				
Giove TLE	free	TLE (Text)	YYYYMMDD_hhmm.tle	GLONASS > System information > GALILEO TLE
This is a daily file copy from the <a href="http://www.celestrak.com">CelesTrak</a> web site for both Giove's Two Line Elements.				

**Table 3-26: Giove OPS mirrored information**

### 3.5 Per-Order Real Data based Products

The kind of Analysis over Position and Protection Level performance can be varied in many terms, particular thresholds, percentages, axes limit on graphs. Please contact us to discuss the options.	order
The kind of Analysis over SIS performance can also be varied in several terms, particular URA statistic, SISRA computation, threshold, graphical properties. Please contact us to discuss the options.	order
Glove Reception and Tracking Analysis (Tracking, Signal Strength, Code/Phase)	order
3 Receivers Raw Data (see Table 3-1, Table 3-9, Table 3-17)	order

To receive more detailed information on the properties of the Analysis and Result representation options please contact the GalTeC team. Contact Information is given via the GalTeC web site or contact:

**THALES ATM GmbH**  
 BU Space  
 Lilienthalstrasse 2; 70825 Korntal-Münchingen; GERMANY  
 Tel: ++49-711-86032.460 (or .0); Fax: ++49-711-86032.805

## 4 Simulation Products

### 4.1 Online Simulation Products

For each day a prediction with the GalTeC prediction tool will be performed (for the coming day). All Plots are generated for 24h of actual day. Simulations for each day passed (up to 6 month) can be retrieved if wanted. You can find two types of simulations. A World Wide simulation and Local point simulations - for Stuttgart location. The latter is meant as a demonstration. Users who need such plots for their locations can apply for such a service.

Predictions are performed for the GNSS:

- GPS
- GLONASS
- Galileo (or Giove)
- GPS+GLONASS
- GPS+Galileo (or +Giove)
- GPS+GLONASS+Galileo

Additionally to the static plots for the World, a dynamic simulation (Video) can be downloaded by Registered users.

**Simulation > GPS > ...**

Product Designation	Access	File	File Name	Menu-Class
GPS minimum Visibility over World plot	free	PNG	W_GPS_min_vis_YYYYMMDD.png	... > GPS prediction plots
GPS Maximum HDOP over World	free	PNG	W_GPS_max_hdop_YYYYMMDD.png	... > GPS prediction plots
GPS Maximum VDOP over World	registered	PNG	W_GPS_max_vdop_YYYYMMDD.png	... > GPS prediction plots
GPS Visibility, NSV Time Plot for Stuttgart	free	PNG	STU_GPS_nsv_t_YYYYMMDD.png	... > GPS prediction plots
GPS Visibility Elevation Time Plot for Stuttgart	free	PNG	STU_GPS_elv_t_YYYYMMDD.png	... > GPS prediction plots
GPS Visibility Horizontal Bar Time Plot for Stuttgart	free	PNG	STU_GPS_bar_t_YYYYMMDD.png	... > GPS prediction plots
GPS VDOP/HDOP/PDOP/TDOP/GDOP Time Plot for Stuttgart	free	PNG	STU_GPS_dop_t_YYYYMMDD.png	... > GPS prediction plots
GPS Visibility over World as Time Video	registered	AVI	W_GPS_vis_t_YYYYMMDD.avi	... > GPS prediction movie

**Table 4-1: GPS Simulations**

**Simulation > GLONASS > ...**

Product Designation	Access	File	File Name	Menu-Class
GLONASS minimum Visibility over World plot	free	PNG	W_GLO_min_vis_YYYYMMDD.png	> GLONASS prediction plots
GLONASS Maximum HDOP over World	free	PNG	W_GLO_max_hdop_YYYYMMDD.png	> GLONASS prediction plots
GLONASS Maximum VDOP over World	registered	PNG	W_GLO_max_vdop_YYYYMMDD.png	> GLONASS prediction plots
GLONASS Visibility, NSV Time Plot for Stuttgart	free	PNG	STU_GLO_nsv_t_YYYYMMDD.png	> GLONASS prediction plots
GLONASS Visibility Elevation Time Plot for Stuttgart	free	PNG	STU_GLO_elv_t_YYYYMMDD.png	> GLONASS prediction plots
GLONASS Visibility Horizontal Bar Time Plot for Stuttgart	free	PNG	STU_GLO_bar_t_YYYYMMDD.png	> GLONASS prediction plots
GLONASS VDOP/HDOP/PDOP/TDOP/GDOP Time Plot for Stuttgart	free	PNG	STU_GLO_dop_t_YYYYMMDD.png	> GLONASS prediction plots
GLONASS Visibility over World as Time Video	registered	AVI	W_GLO_vis_t_YYYYMMDD.avi	> GLONASS prediction movie

**Table 4-2: GLONASS Simulations**

**Simulation > GALILEO > ...**

Product Designation	Access	File	File Name	Menu-Class
Galileo <sup>(1)</sup> minimum Visibility over World plot	free	PNG	W_GAL_min_vis_YYYYMMDD.png	> GALILEO prediction plots
Galileo <sup>(1)</sup> Maximum HDOP over World	free	PNG	W_GAL_max_hdop_YYYYMMDD.png	> GALILEO prediction plots
Galileo <sup>(1)</sup> Maximum VDOP over World	registered	PNG	W_GAL_max_vdop_YYYYMMDD.png	> GALILEO prediction plots
Giove <sup>(2)</sup> Visibility, NSV Time Plot for Stuttgart	free	PNG	STU_GAL_nsv_t_YYYYMMDD.png	> GALILEO prediction plots
Giove <sup>(2)</sup> Visibility, Elevation Time Plot for Stuttgart	free	PNG	STU_GAL_elv_t_YYYYMMDD.png	> GALILEO prediction plots
Giove <sup>(2)</sup> Visibility Horizontal Bar Time Plot for Stuttgart	free	PNG	STU_GLO_bar_t_YYYYMMDD.png	> GALILEO prediction plots
Galileo <sup>(1)</sup> VDOP/HDOP/PDOP/TDOP/GDOP Time Plot for Stuttgart	free	PNG	STU_GAL_dop_t_YYYYMMDD.png	> GALILEO prediction plots
GALILEO Visibility over World as Time Video	registered	AVI	W_GAL_vis_t_YYYYMMDD.avi	> GALILEO prediction movie

**Table 4-3: Galileo/Giove simulations**

- (1) 2009 and 2010 Galileo Theoretical 27 SV constellation, from 2011 on Galileo real constellation
- (2) 2009 and 2010 Giove (A+B) constellation, from 2011 on Galileo real constellation

**Simulation > GPS/GLONASS > ...**

Product Designation	Access	File	File Name	Menu-Class
GPS+GLONASS minimum Visibility over World plot	registered	PNG	W_GPS_GLO_min_vis_YYYYMMDD.png	> GPS/GLONASS prediction
GPS+GLONASS Maximum HDOP over World	registered	PNG	W_GPS_GLO_max_hdop_YYYYMMDD.png	> GPS/GLONASS prediction
GPS+GLONASS Maximum VDOP over World	registered	PNG	W_GPS_GLO_max_vdop_YYYYMMDD.png	> GPS/GLONASS prediction
GPS+GLONASS Visibility, NSV Time Plot for Stuttgart	free	PNG	STU_GPS_GLO_nsv_t_YYYYMMDD.png	> GPS/GLONASS prediction
GPS+GLONASS Visibility, Elevation Time Plot for Stuttgart	free	PNG	STU_GPS_GLO_elv_t_YYYYMMDD.png	> GPS/GLONASS prediction
VDOP/HDOP/PDOP/TDOP/GDOP Time Plot for Stuttgart	free	PNG	STU_GPS_GLO_dop_t_YYYYMMDD.png	> GPS/GLONASS prediction

**Table 4-4: Combined GPS+GLONASS Simulations**
**Simulation > GPS/GALILEO > ...**

Product Designation	Access	File	File Name	Menu-Class
GPS+Giove <sup>(2)</sup> minimum Visibility over World plot	registered	PNG	W_GPS_GAL_min_vis_YYYYMMDD.png	> GPS/GALILEO prediction
GPS+Giove <sup>(2)</sup> Maximum HDOP over World	registered	PNG	W_GPS_GAL_max_hdop_YYYYMMDD.png	> GPS/GALILEO prediction
GPS+Giove <sup>(2)</sup> Maximum VDOP over World	registered	PNG	W_GPS_GAL_max_vdop_YYYYMMDD.png	> GPS/GALILEO prediction
GPS+Giove <sup>(2)</sup> Visibility, NSV Time Plot for Stuttgart	free	PNG	STU_GPS_GAL_nsv_t_YYYYMMDD.png	> GPS/GALILEO prediction
GPS+Giove <sup>(2)</sup> Visibility, Elevation Time Plot for Stuttgart	free	PNG	STU_GPS_GAL_elv_t_YYYYMMDD.png	> GPS/GALILEO prediction
GPS+Galileo <sup>(1)</sup> VDOP/HDOP/PDOP/TDOP/GDOP Time Plot for Stuttgart	free	PNG	STU_GPS_GAL_dop_t_YYYYMMDD.png	> GPS/GALILEO prediction

**Table 4-5: Combined GPS + Galileo Simulations**

**Simulation > GPS/GALILEO/GLONASS > ...**

Product Designation	Access	File	File Name	Menu-Class
GPS+Galileo <sup>(1)</sup> +GLONASS minimum Visibility over World plot	registered	PNG	W_GPS_GAL_min_vis_YYYYMMDD.png	> GPS/GALILEO prediction

**Table 4-6: Combined GPS+GLONASS+Galileo simulations**

## 4.2 Special Registration users

A limited number of registered users may apply for an individual GNSS Prediction service, where they can submit a coordinates set and receive by **e-mail** a package of following simulation plots daily for that location and the coming day. In principle these are the above listed plots for Stuttgart (STU).

Plot/Video	File Type	Generic Name
Visibility at Point NSV Time Plot, GPS	PNG	GPS_nsv_t_YYYYMMDD.png
Visibility at Point NSV Time Plot, GLONASS	PNG	GLO_nsv_t_YYYYMMDD.png
Visibility at Point NSV Time Plot, Giove <sup>(2)</sup>	PNG	GAL_nsv_t_YYYYMMDD.png
NSV Time Plot, GPS+GLONASS	PNG	GPS_GLO_nsv_t_YYYYMMDD.png
NSV Time Plot, GPS+Giove <sup>(2)</sup>	PNG	GPS_GAL_nsv_t_YYYYMMDD.png
Visibility at Point Elevation Time Plot, GPS	PNG	GPS_elv_t_YYYYMMDD.png
Visibility at Point Elevation Time Plot, GLONASS	PNG	GLO_elv_t_YYYYMMDD.png
Visibility at Point Elevation Time Plot, Giove <sup>(2)</sup>	PNG	GAL_elv_t_YYYYMMDD.png
ElevationsTime Plot, GPS+GLONASS	PNG	GPS_GLO_elv_t_DDMMYYYY.png
ElevationsTime Plot, GPS+Giove <sup>(2)</sup>	PNG	GPS_GAL_elv_t_DDMMYYYY.png

Visibility At Point Horizontal Bar Time Plot, GPS	PNG	GPS_bar_t_YYYYMMDD.png
Visibility At Point Horizontal Bar Time Plot, GLONASS	PNG	GLO_bar_t_YYYYMMDD.png
Visibility At Point Horizontal Bar Time Plot, Giove <sup>(2)</sup>	PNG	GAL_bar_t_YYYYMMDD.png
VDOP/HDOP/PDOP/TDOP/GDOP Time Plot, GPS	PNG	GPS_dop_t_YYYYMMDD.png
VDOP/HDOP/PDOP/TDOP/GDOP Time Plot, GLONASS	PNG	GLO_dop_t_YYYYMMDD.png
VDOP/HDOP/PDOP/TDOP/GDOP Time Plot, Galileo <sup>(1)</sup>	PNG	GAL_dop_t_YYYYMMDD.png
VDOP/HDOP/PDOP/TDOP/GDOP Time Plot, GPS+GLONASS	PNG	GPS_GLO_dop_t_DDMMYYYY.png
VDOP/HDOP/PDOP/TDOP/GDOP Time Plot, GPS+Giove <sup>(2)</sup>	PNG	GPS_GAL_dop_t_DDMMYYYY.png

**Table 4-7: User specific location simulations**

### 4.3 Per Order Simulated Data based Products

The NavPos Systems Service Volume Simulator AVIGA® is used and has been further developed to a GalTeC Prediction tool in the frame of the GalTeC project. The prediction tool offers the means to predict, analyse and evaluate GPS, GLONASS and Galileo Services.

AVIGA offers to run simulations at point, over area and along routes in terms to analyse

- Accuracy,
- Continuity of Service,
- Integrity and
- Availability.

In addition, AVIGA supports the analysis of GNSS constellation performances in terms of

- Visibility and
- Geometry

The AVIGA tool is composed of modules, which fulfil the following tasks:

- **Space Segment Module:** predicts satellites trajectories from standard almanacs, e.g. Almanac YUMA files, computes satellite trajectories from user – defined Keplerian elements; Broadcast Ephemeris or SP3 Precise Ephemeris.
- **Visibility Module:** evaluates visibility characteristics of satellite coverage accounting for mask skyline angles;
- **DOP (or Geometry) Module:** evaluates DOP and Position Error characteristics of satellite coverage. Position accuracy is estimated from the position errors covariance matrix.
- **Availability Module:** evaluates availability of DOP and position accuracy. Models of satellite outages and navigation solution errors are used in this model.
- **Integrity/Continuity Modules:**
  - **RAIM:** evaluates availability of the snapshot RAIM FD/FDE methods.
  - **SBAS:** evaluates availability of the SBAS Protection Levels.
  - **Galileo:** evaluates availability of protection level according to concept proposed for Galileo system, calculates the pertaining Integrity Risk.
- **Service Availability module:** analyses availability of Accuracy, Continuity and Integrity Risk according to the proposed Galileo concept. It also allows the analysis of critical satellites.
- **GBAS / Galileo LE:** analyses performance of GPS, Galileo based local area augmentation systems.
- **Route Module:** analyses the performance along a specified route

- SISE Analysis Module: assesses satellite orbital and clock errors from SP3 precision orbits and RINEX Navigation files.
- Data Dissemination Module: simulates disseminating of Galileo Messages from Ground Mission Segment via ULS network to world-wide or regional users (under development).

Some of the AVIGA Service Volume Simulation modules include error components simulation to analyse the Galileo Service performance and the impact of various errors sources.

The tool also allows the simulation of seldom failures of the system such as erroneous behaviour and outages.

On Customer request different services base on the capability of this tool can be offered. Contact Information is given via the GalTeC web site or contact:

**THALES ATM GmbH**

BU Space

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