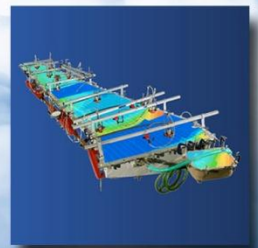
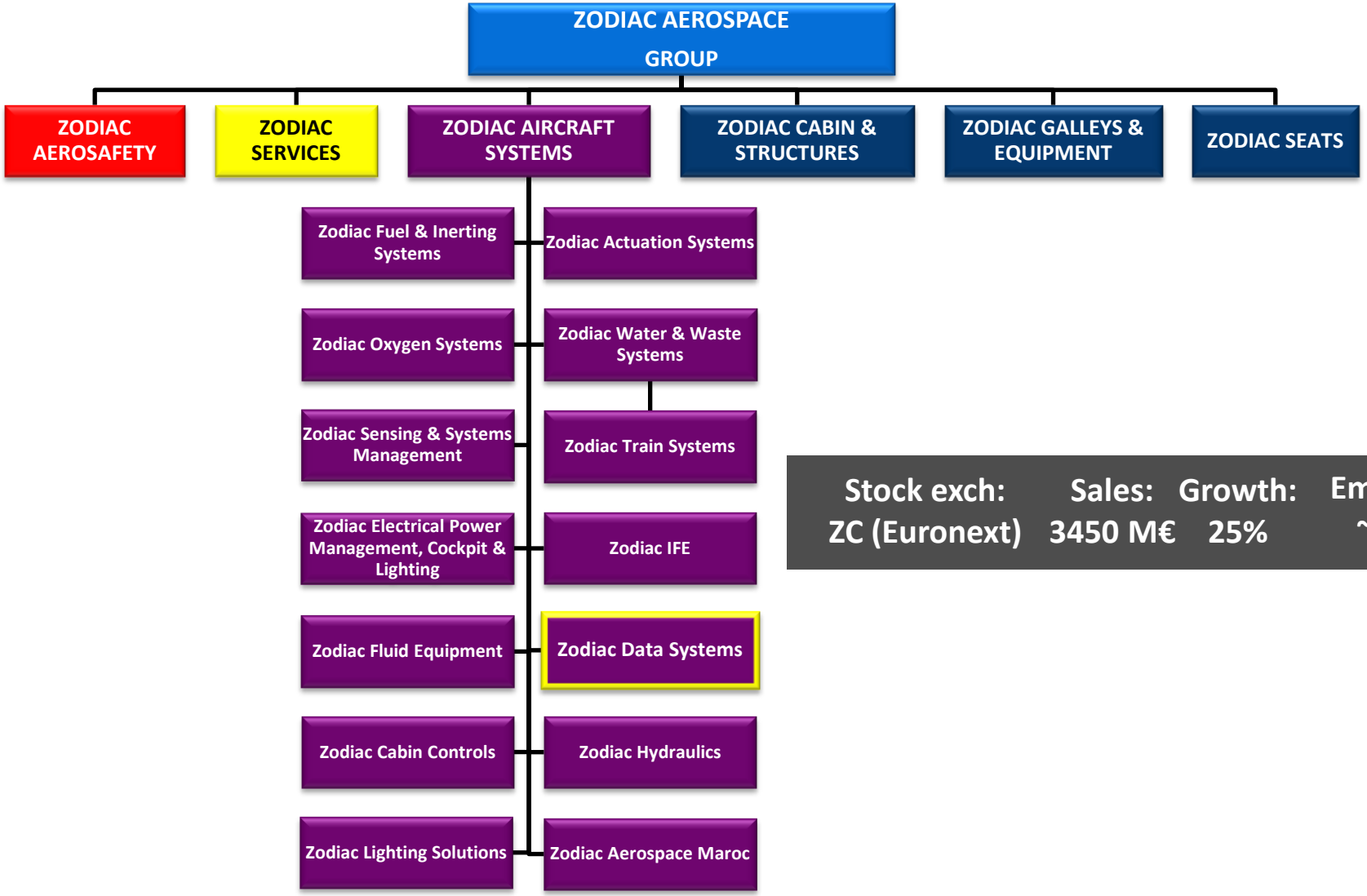
ZODIAC DATA SYSTEMS

ZODIAC AEROSPACE





Stock exch:	Sales:	Growth:	Employees:
ZC (Euronext)	3450 M€	25%	~ 26000

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ZODIAC AEROSPACE

The CORTEX Family

One philosophy, Multiple applications

PC-based telemetry equipment
- FPGA embedded-boards
- Real time IF processing
- High level of integration

TT&C, SCIENCE & DEEP SPACE

REMOTE SENSING

SATELLITE TRACKING

FLIGHT TEST

CRT	DS	HDR	DTR	RTR	RSR
Command Ranging & Telemetry ▪ *3000 units worldwide*	Deep Space ▪ *Optimized hardware for Deep Space comunications*	High Datarate Receiver ▪ *Up to 2 Gbps* ▪ *16 QAM & 32/64APSK*	Digital Tracking Receiver ▪ *Carrier&SQPN tracking up to 3 channels*	Radio Telemetry Receiver ▪ *Quad-band telemetry receiver*	Radio Signal Recorder ▪ *Fully digital IF recorder / reproducer*

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ZODIAC AEROSPACE

The IFoIP Family

One hardware, Multiple applications

IFoIP equipment:
- FPGA embedded-boards
- Real time IF processing
- High level of integration

Customized

SDR

Software Defined Radio
- *Customized applications*

Inspection

CSI

Carrier Signal Inspector
- *Detects the carrier*
- *Display the noise floor*

Monitoring

CSM

Carrier Signal Monitoring
- *Database & Alarm management*
- *Reporting*

Analysis

CSA

Carrier Signal Analyzer
- *Characterize carriers in blind mode*
- *Carrier under carrier*

Geolocation

CGL

Compact Geo Location
- *Locate transmitters*

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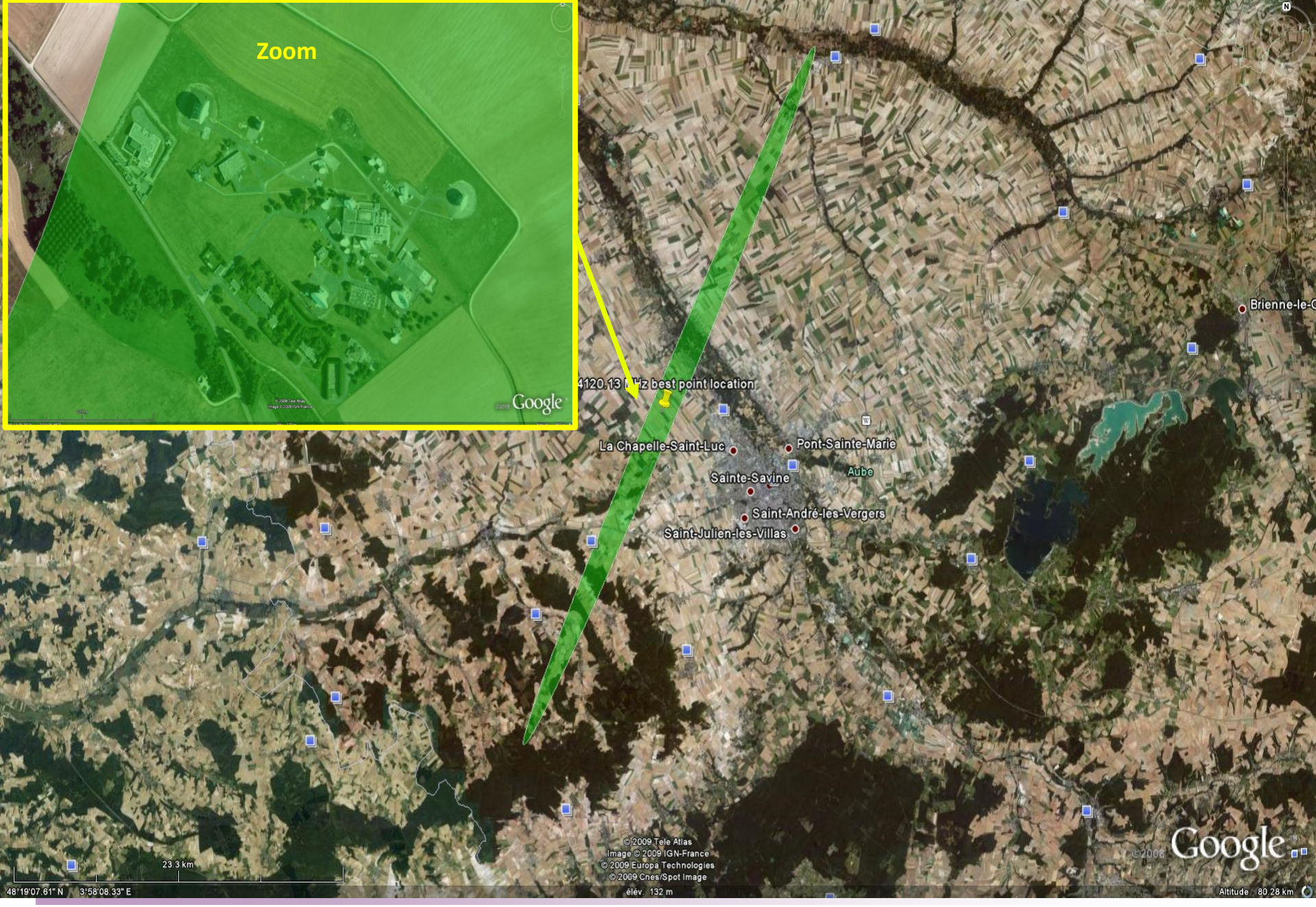

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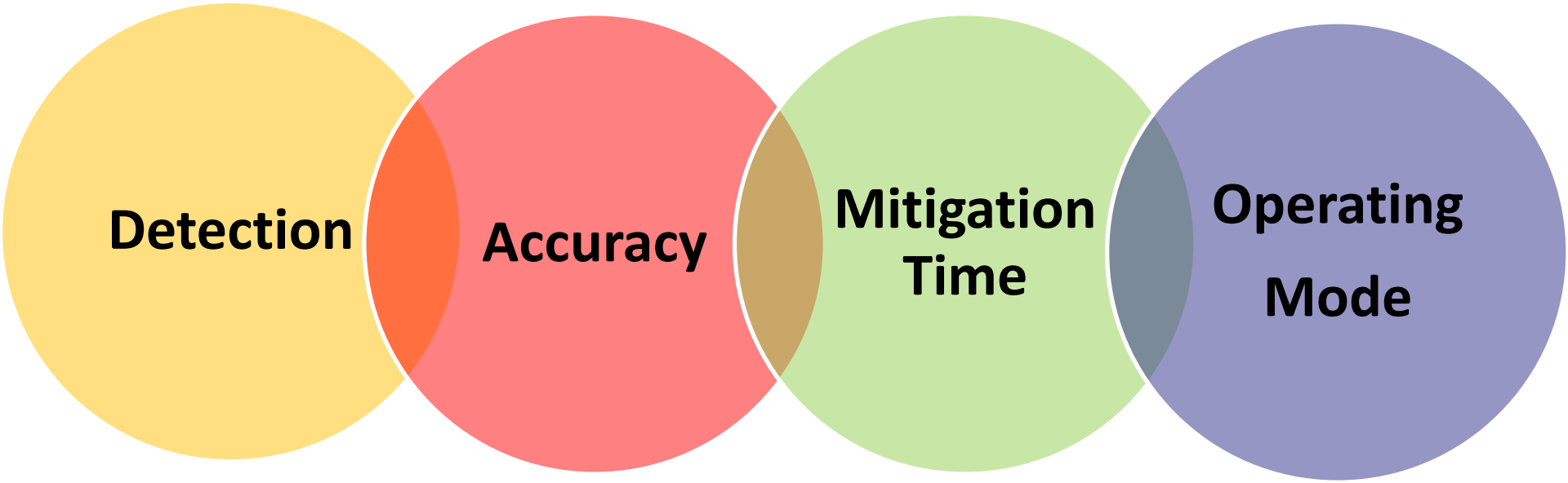
Geolocation Performance Pilars



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Performance

Detection – Computation of accurate TDOA / FDOA

Factors affecting detection

- Size of the antennas
  - Transmitters ……
- Satellites angular separation …..
- Mirror Satellite occupancy ……
- Satellite Characteristics……
  - Phase noise
  - Local Oscillator drift
  - Acceleration
- Signal RF parameters……

ZDS supplies

➔ **High processing gain**

Up to 81dB (depending on carrier param.)

➔ **Broad Carrier Cancellation capabilities**

➔ **Improved Compensation Algorithms**

➔ **Highly flexible, high throughput digitizer architecture**

Ability to perform wide band recording during tens of seconds

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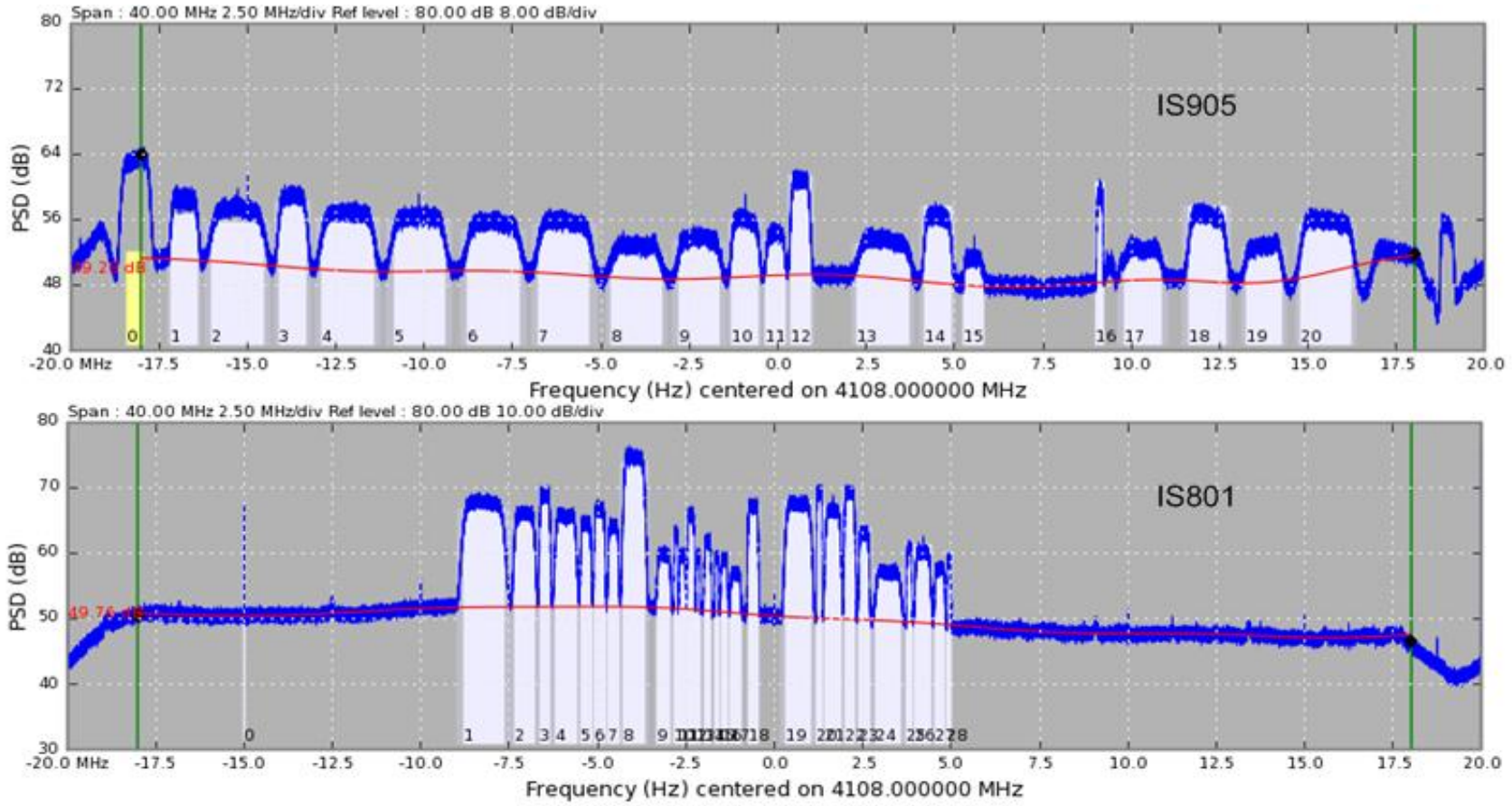
Performance

Detection – Computation of accurate TDOA / FDOA

Geoloc Examples



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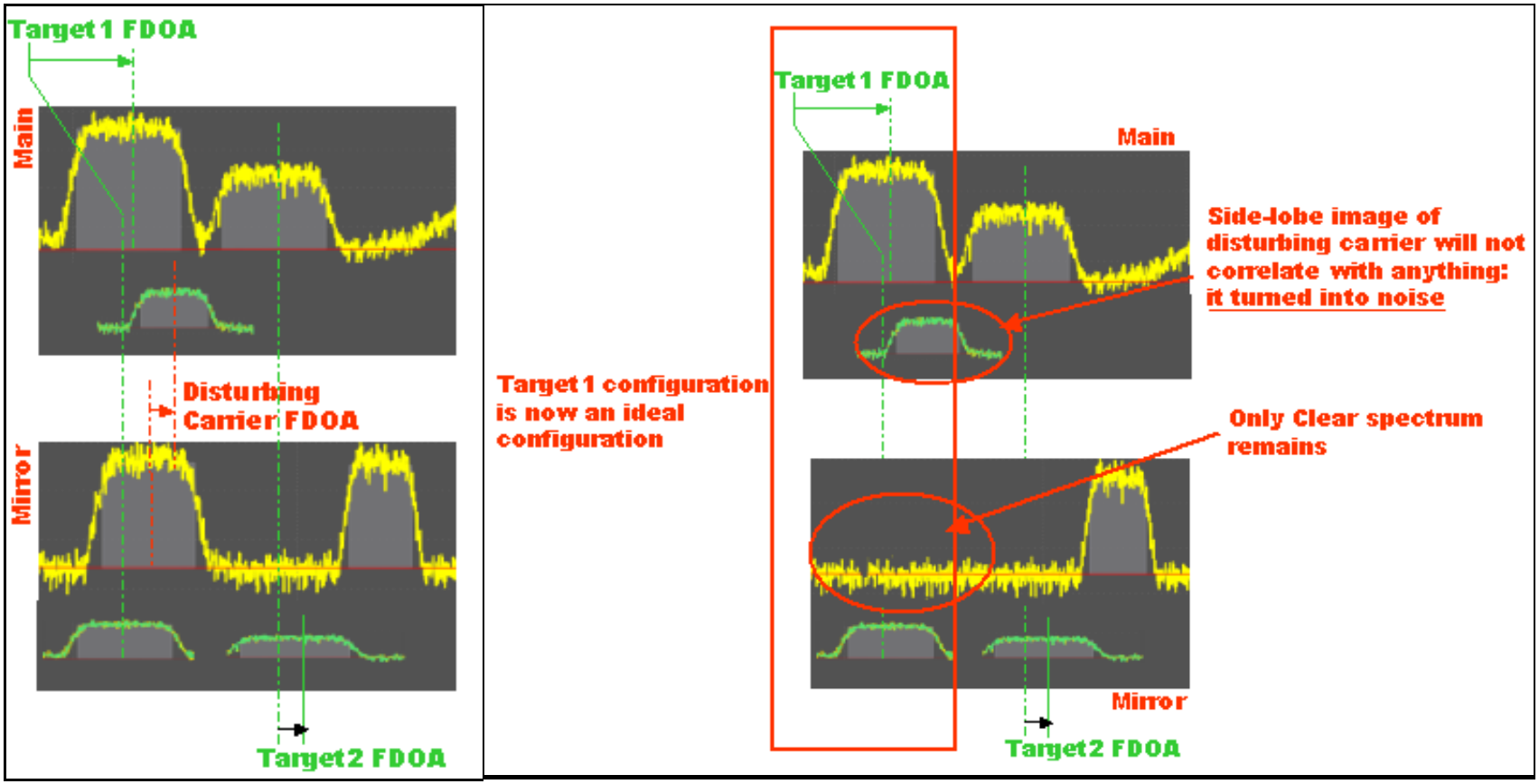
Performance

Detection – Computation of accurate TDOA / FDOA

Carrier Cancellation

- Up to 60 MHz wide Carrier cancellation before correlation



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Performances

Location Accuracy – Resolution of the final position

Factors affecting location accuracy

FDOA/TDOA accuracy……

Position of the references ……

Ephemeris ……

Relative positions of the satellites ..

ZDS supplies

➔ Hardware / Algorithm design to guarantee the best achievable processing gain

➔ Ephemeris generation tools

Mono-site (Co-Orbits) / Multi-Site (passive)

➔ Expert system to analysis the most suitable measurement time

Speed

Hardware performances ……

Number of samples to process ……

High processing ……

ZDS supplies

➔ Dedicated Hardware filtering architecture

➔ 64-bit Multi-Core Optimized software

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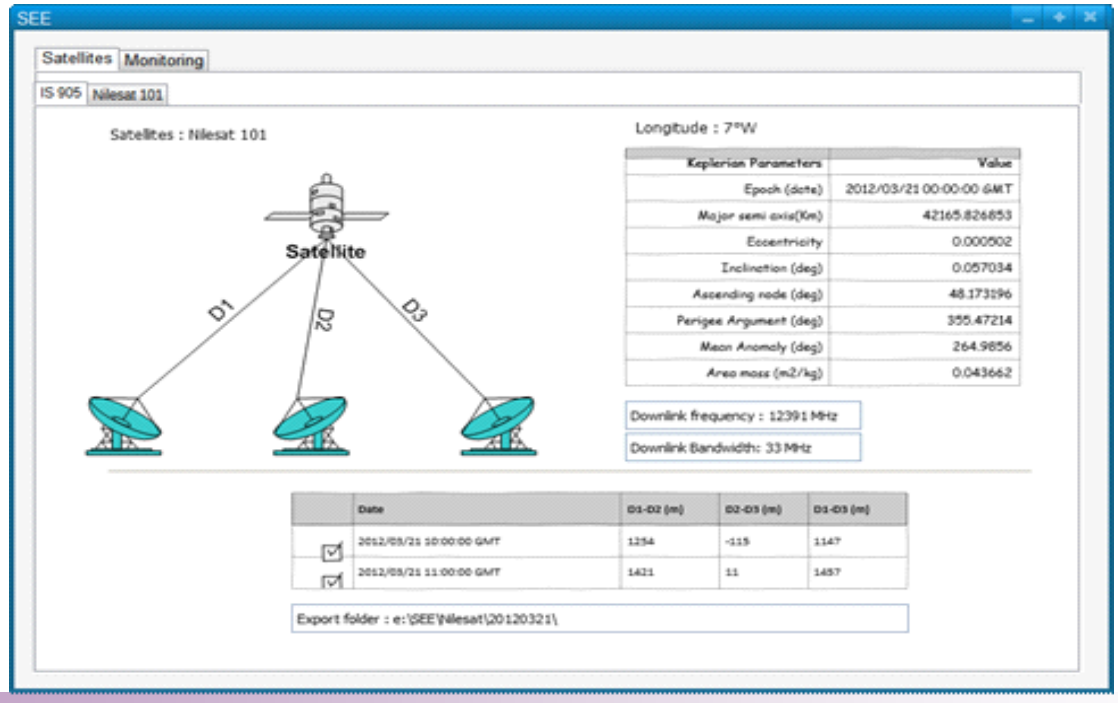
ZODIAC AEROSPACE

Satellite Ephemeris Estimator

Passive ephemeris estimation add-on to geolocation system

Principles

The passive method for geostationary satellite ephemeris estimation is based on differences distances measurement between the satellite and three ground stations installed in three different locations with an average 300 km distance gap.



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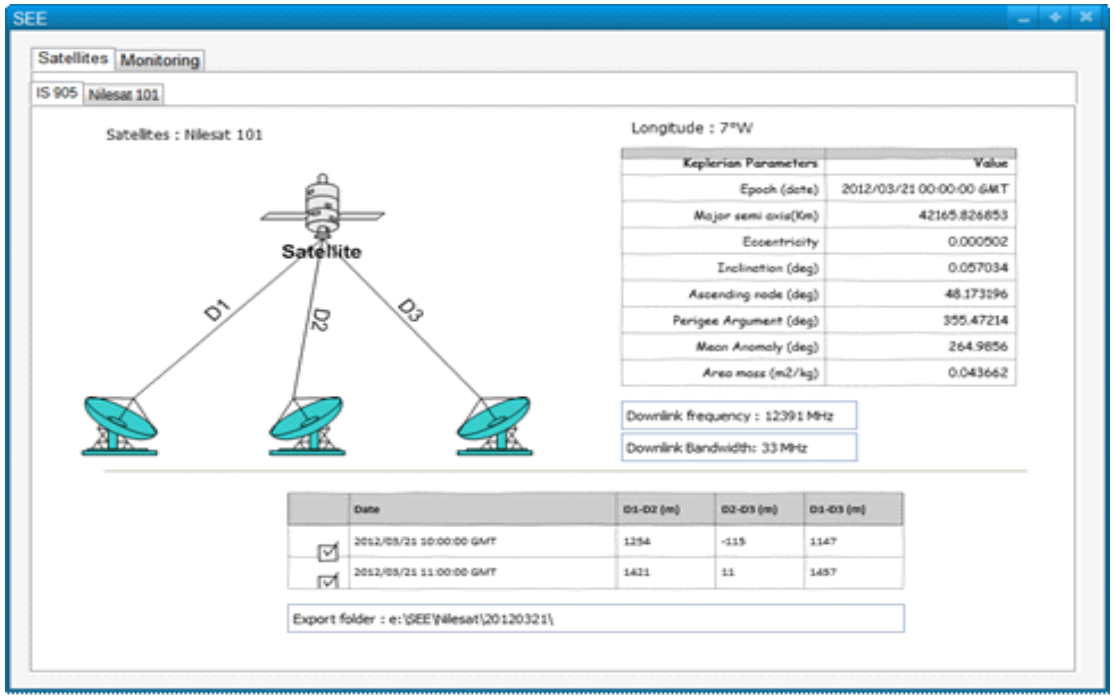
Satellite Ephemeris Estimator

Passive ephemeris estimation add-on to geolocation system

Accuracy

The main purpose is to reach the accuracy at which one can use geolocation results without the use of additional reference transmitters: the operating mode then solely relies on a single reference carrier.

The system continuously streams main/mirror orbital data to the geolocation system: after stabilization phase, up to date, accurate data are available upon triggering of a geolocation task



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Performances

Operating Mode: easing-up the process

Operating mode

Automated

- Detection & Geolocation …….
- Full transponder……..

Full Manual (Metrology Approach) ..

Distant Antennas ……..

Interface with other applications …..

Multi sites ……..

Autonomous system ……..

➔ **One-Click Modes**

➔ **Macro Task Manager**

Geolocation-aware transponder monitoring

Continuous Co-Orbit Estimation

Multi-Carrier oriented Hardware Design

➔ **Expert mode**

➔ **Multi-site GPS synchronisation**

➔ **XML interfaces**

➔ **Scalable system architecture**

➔ **Stand alone system**

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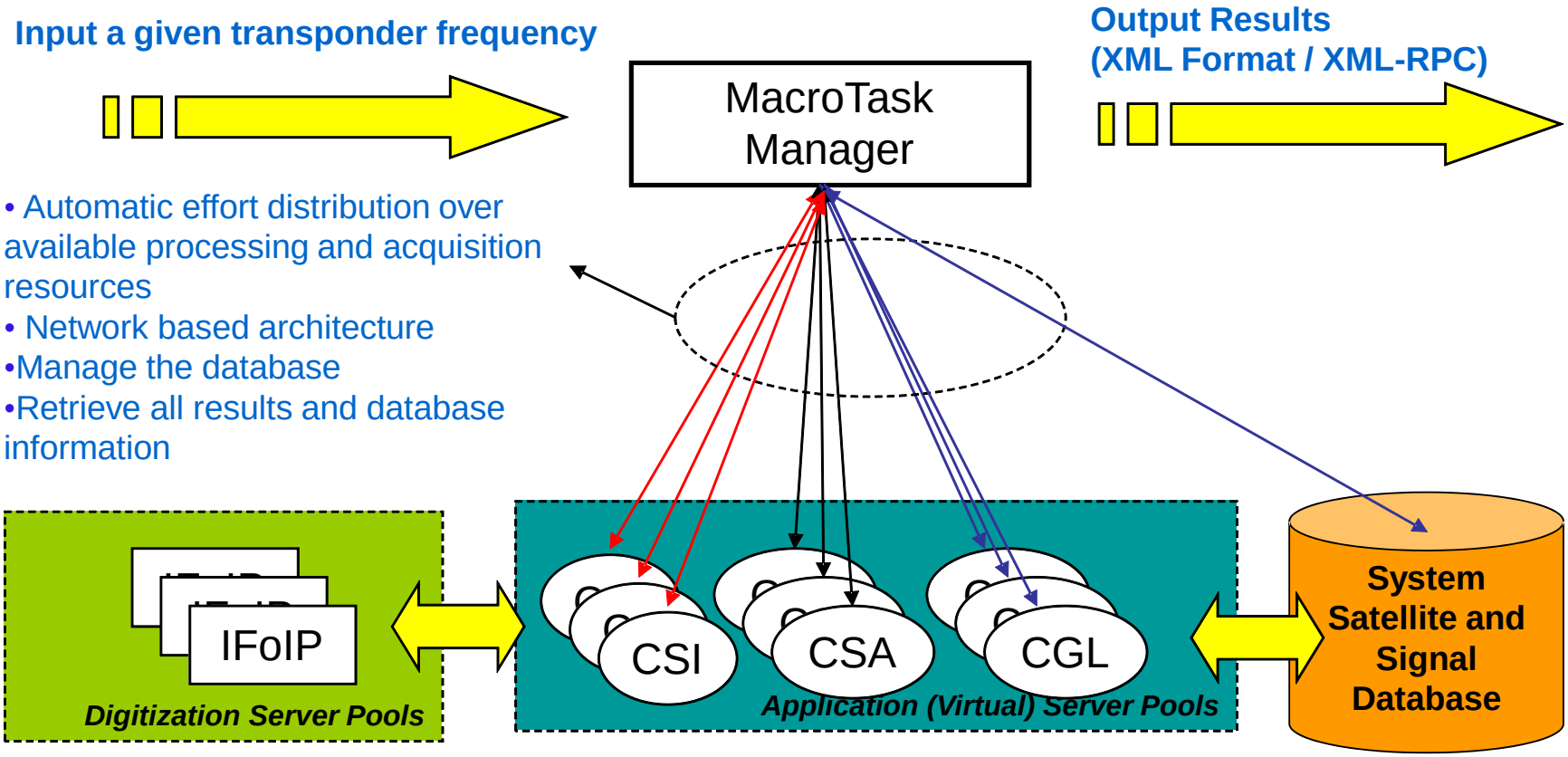
Performances

Operating Mode: Automated MacroTasks Architecture

Main principles



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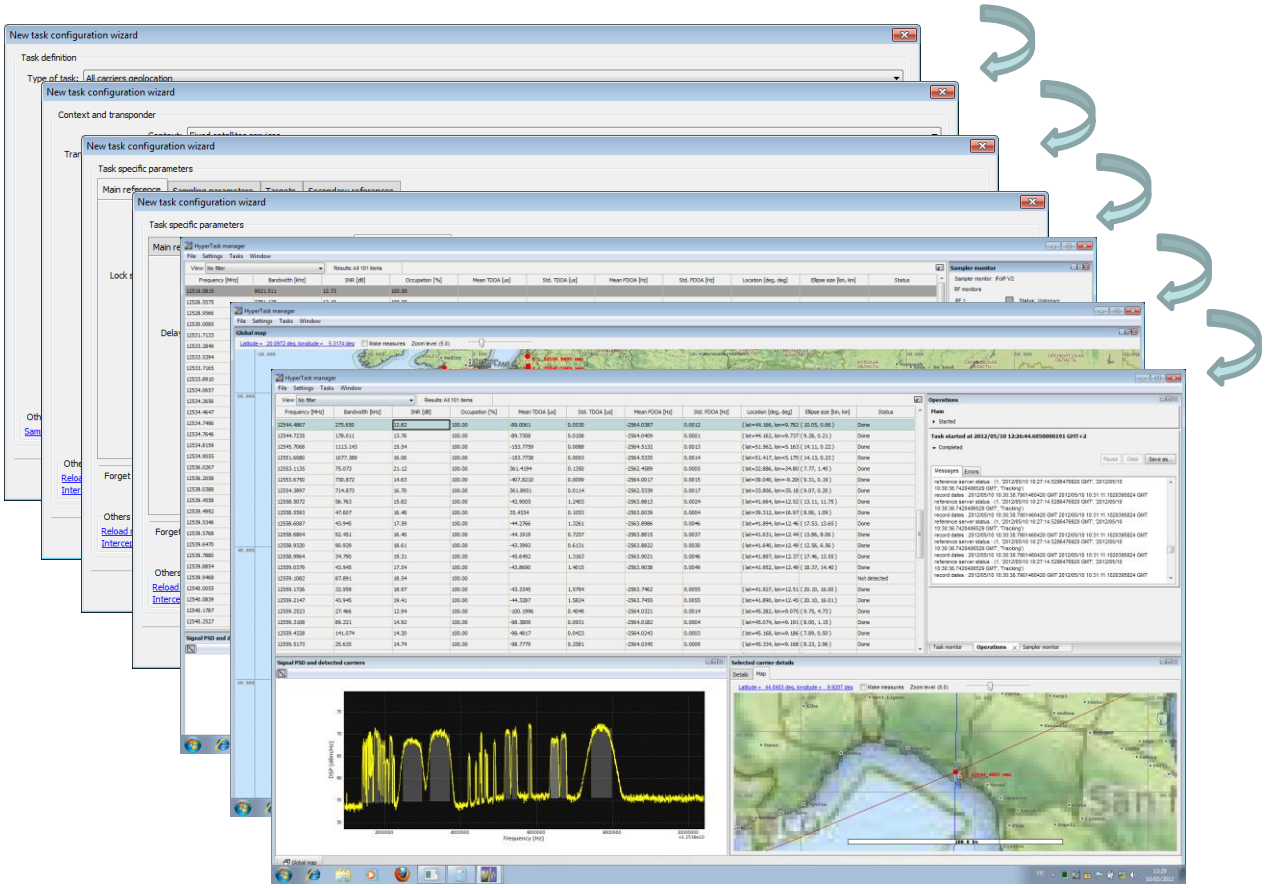
Performances

Operating Mode: Automated MacroTasks Architecture

A simple configuration process



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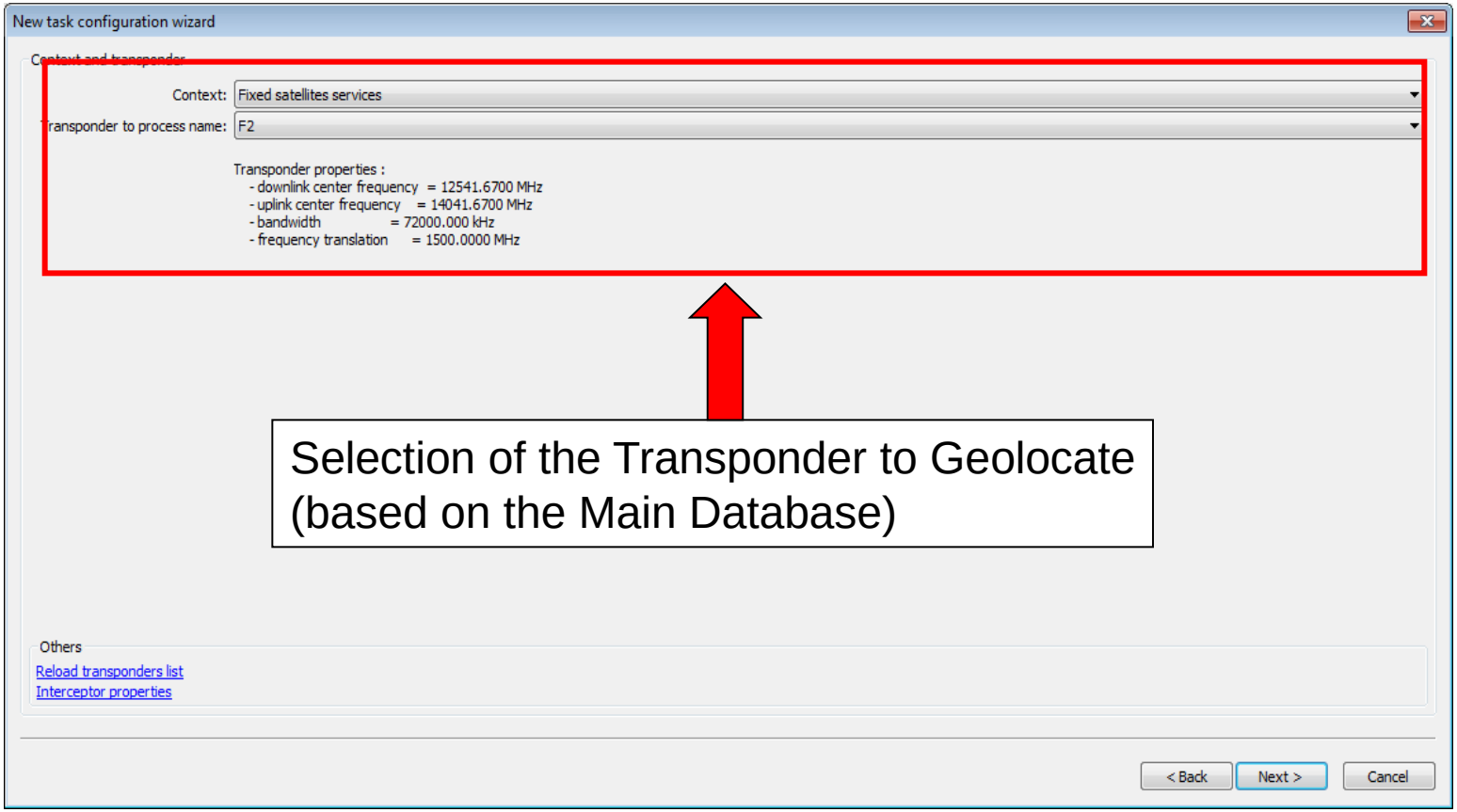
Performances

Operating Mode: Automated MacroTasks Architecture

Select your satellite and transponder



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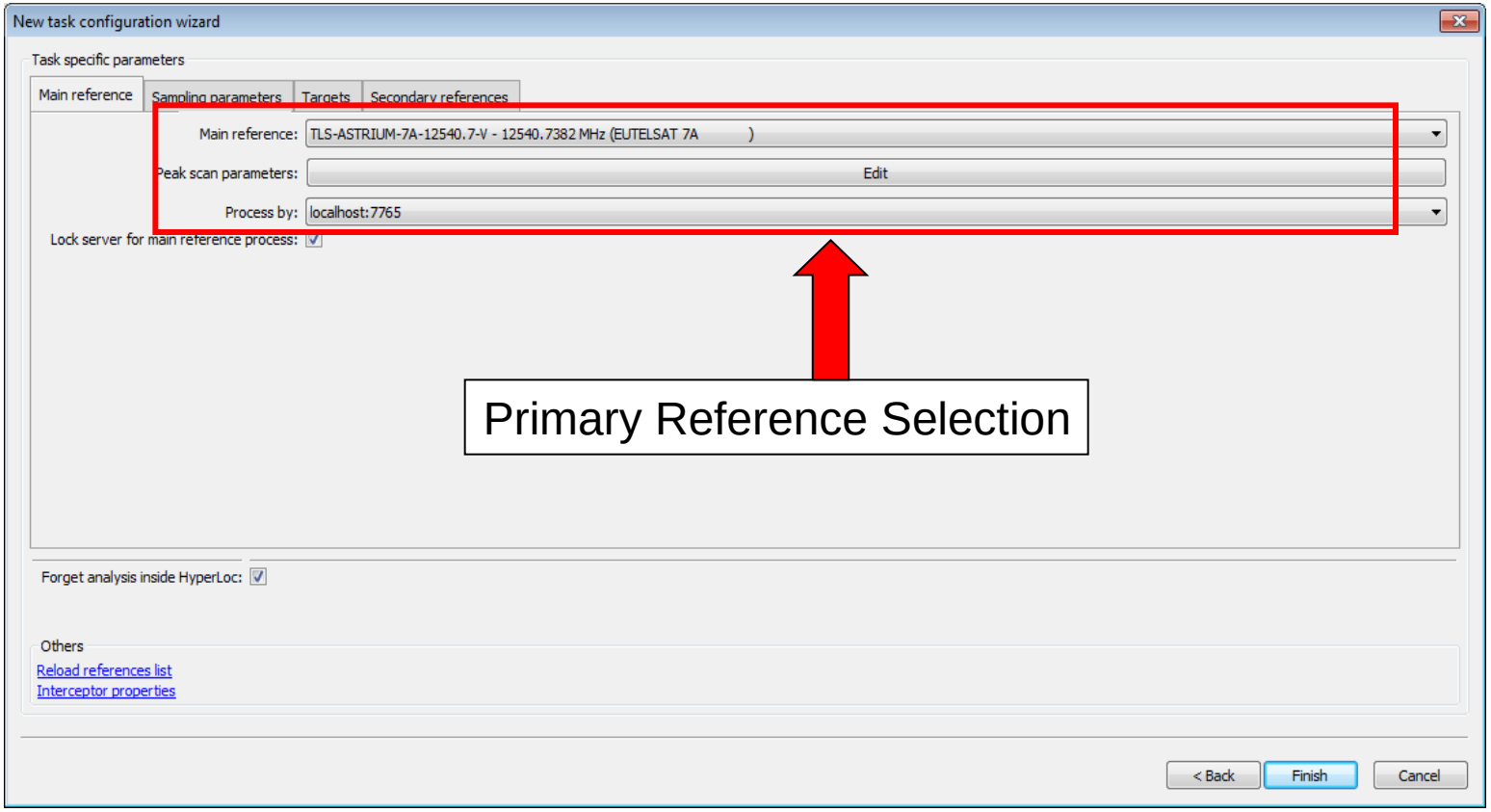
Performances

Operating Mode: Automated MacroTasks Architecture

Select your primary reference



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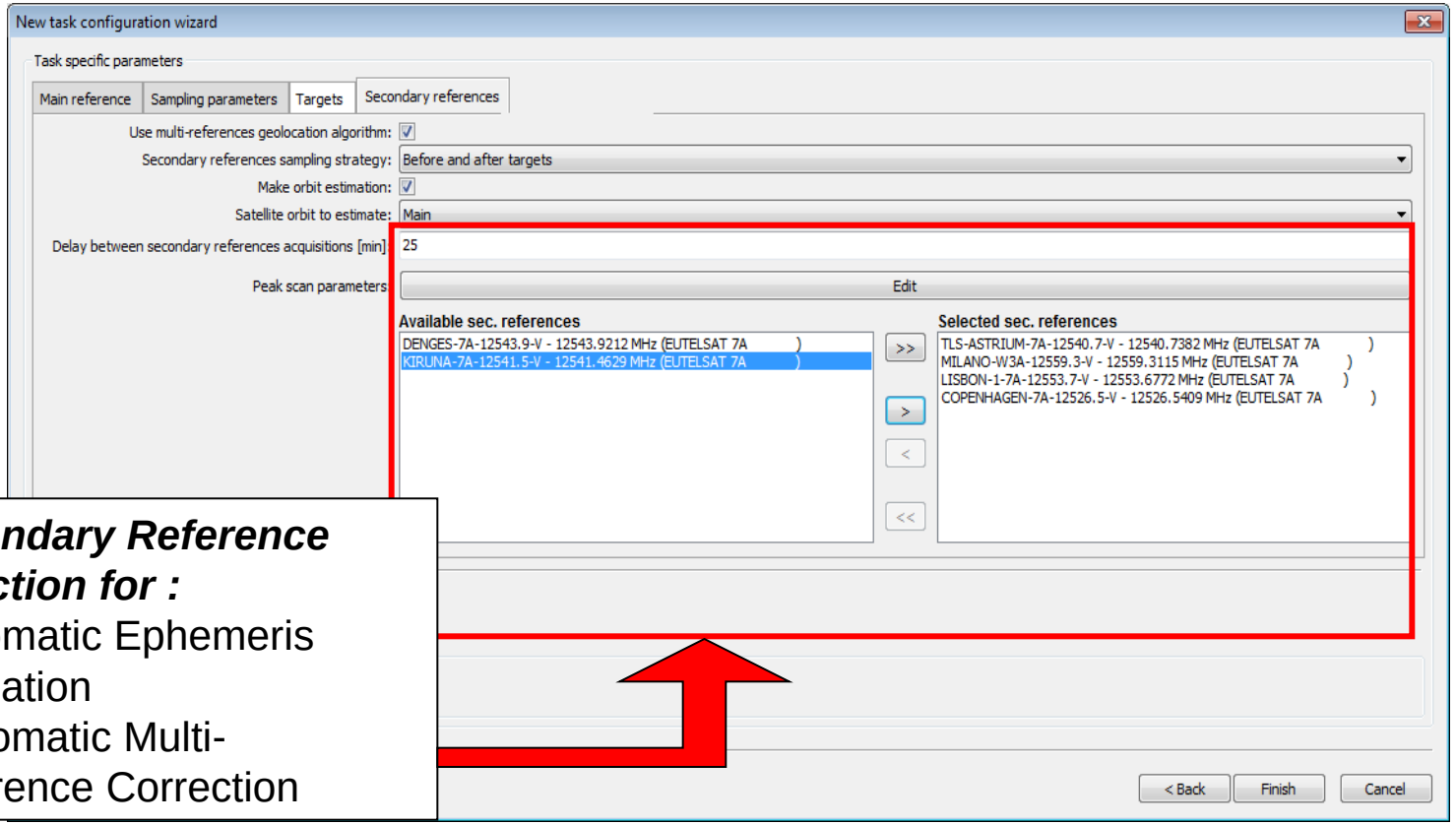
Performances

Operating Mode: Automated MacroTasks Architecture

Select your secondary references



Secondary Reference Selection for :

- Automatic Ephemeris estimation
- Automatic Multi-Reference Correction

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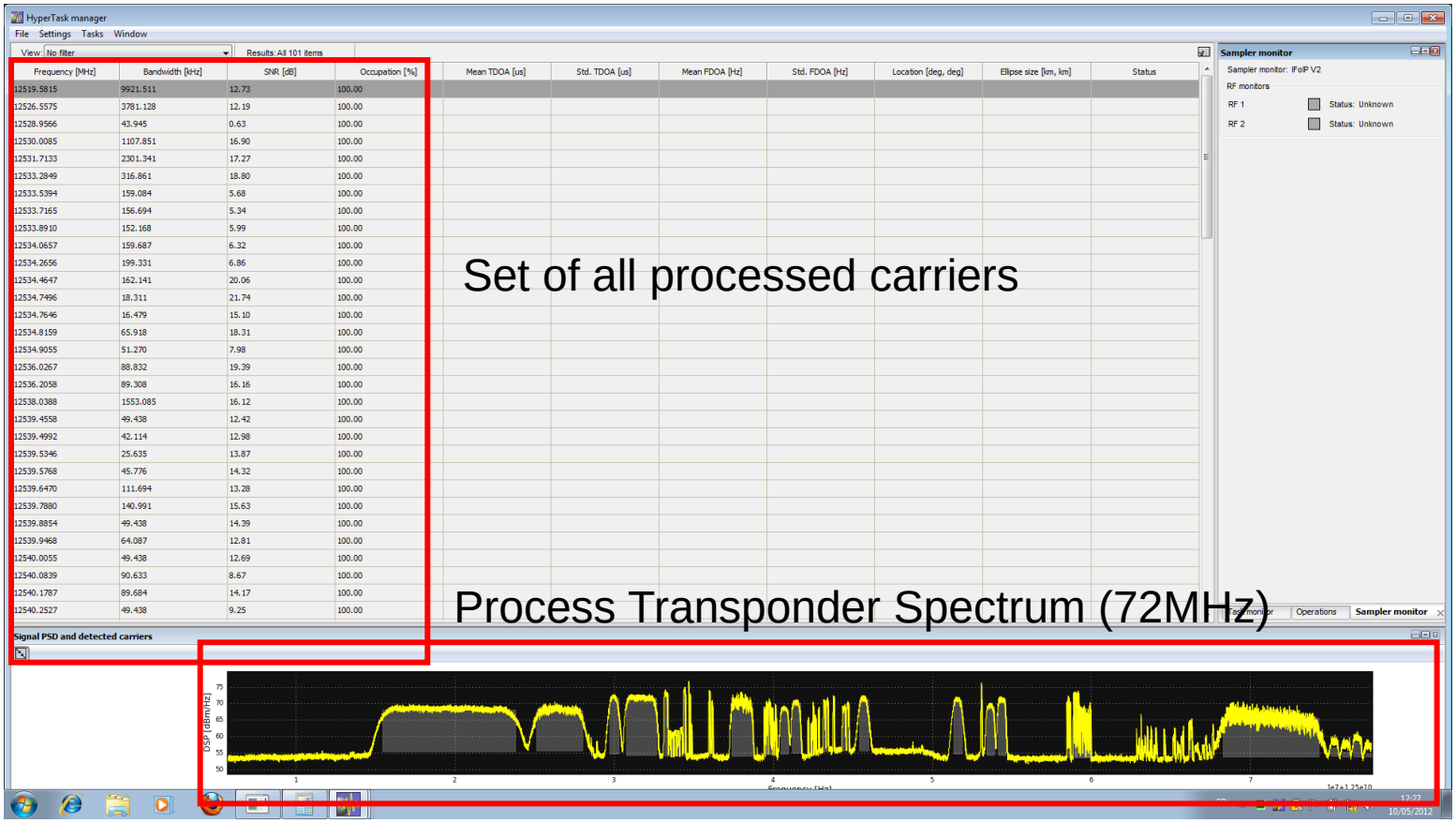
Performances

Operating Mode: Automated MacroTasks Architecture

Select the carriers to locate



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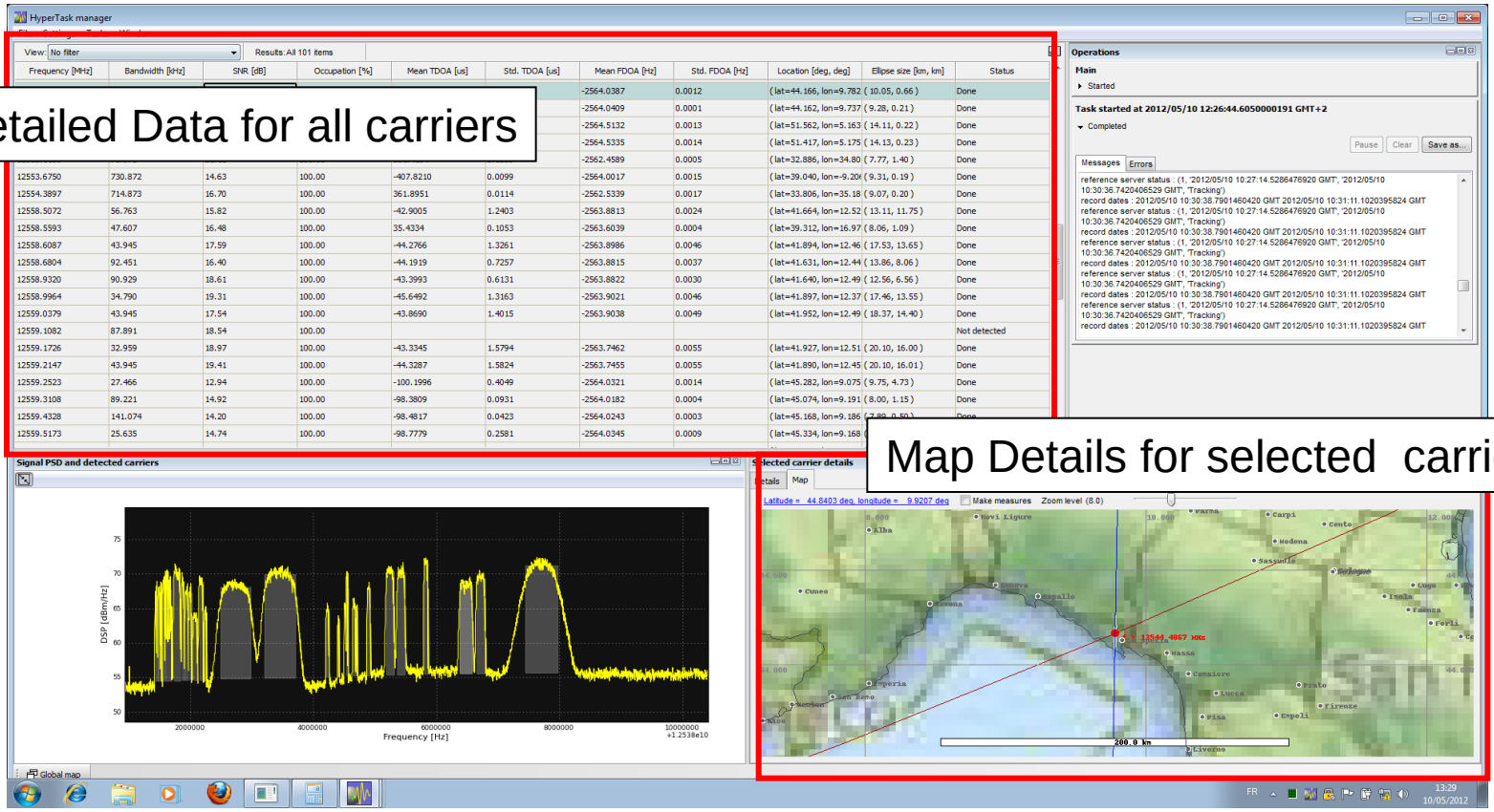
Performances

Operating Mode: Automated MacroTasks Architecture

Results: positions & information on the carriers



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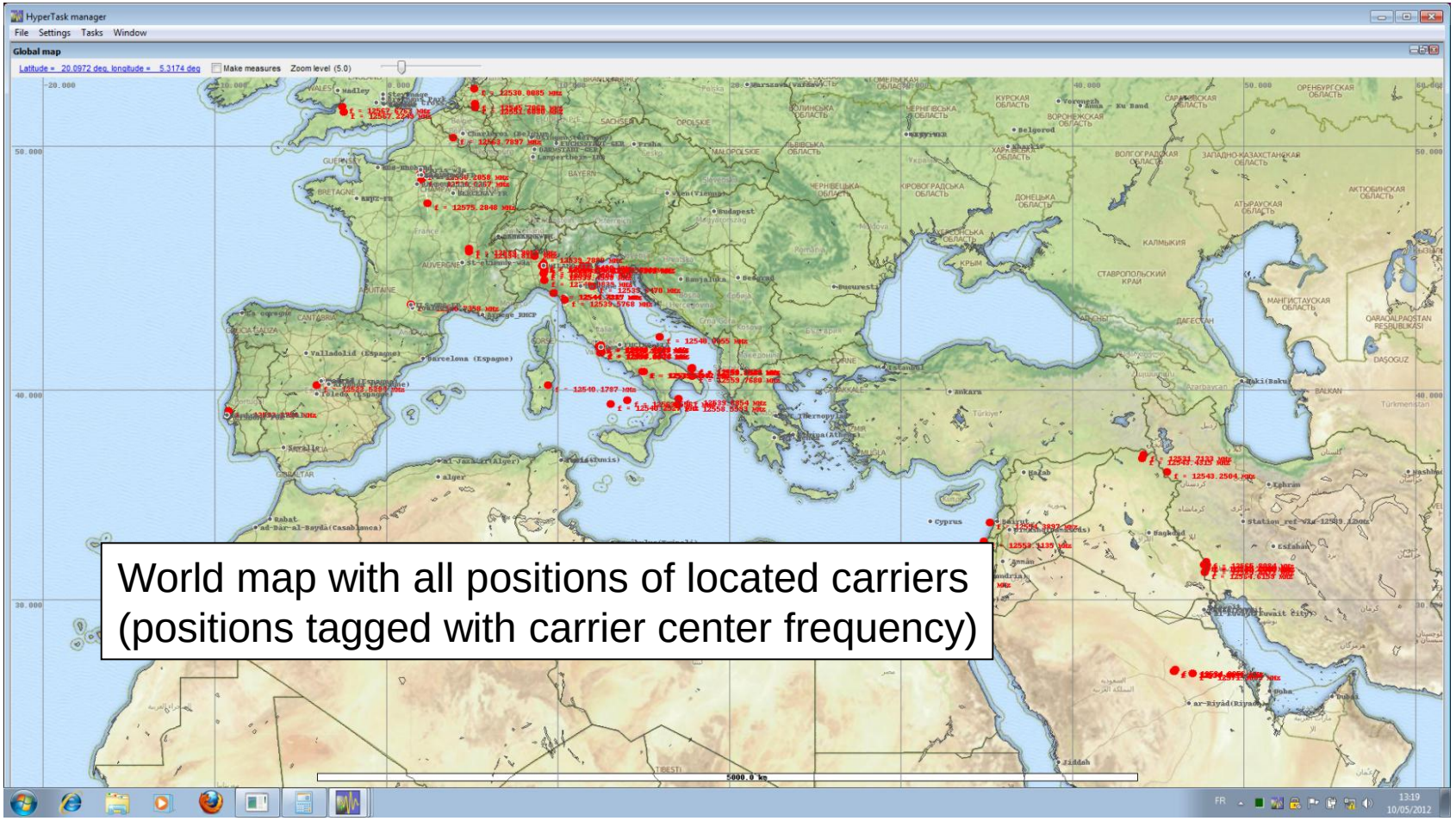
Performances

Operating Mode: Automated MacroTasks Architecture

Results: positions on the map



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ZODIAC AEROSPACE

Latest technologies

New request

TDMA signal ……

Ka Band……

Spotted satellites ……

ZDS Upcoming Features

- ➔ Geolocation of the users
- ➔ Better accuracy with One Sat
- ➔ Downsizing system configuration

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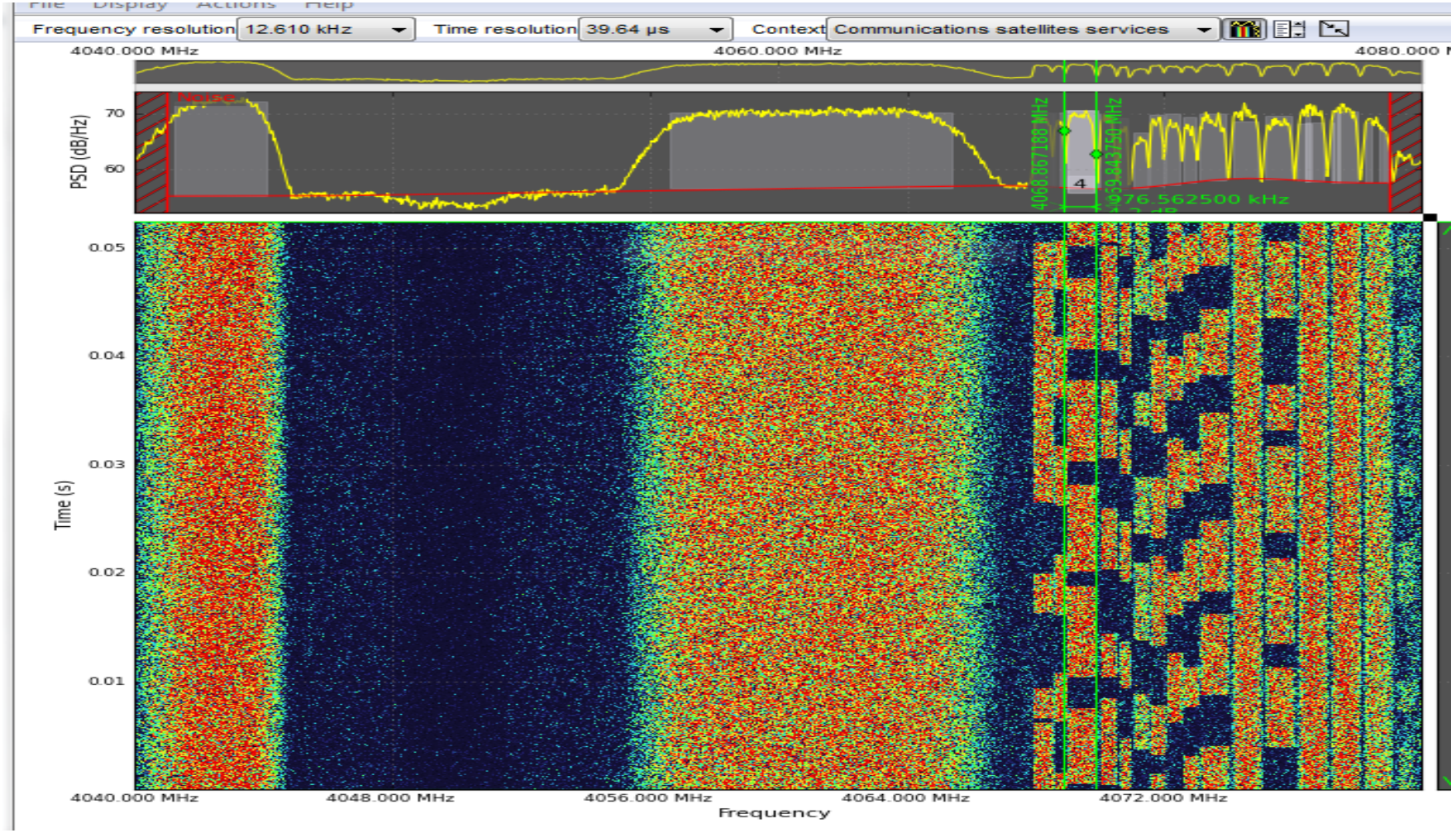
Performances

Burst signal

In TDMA context



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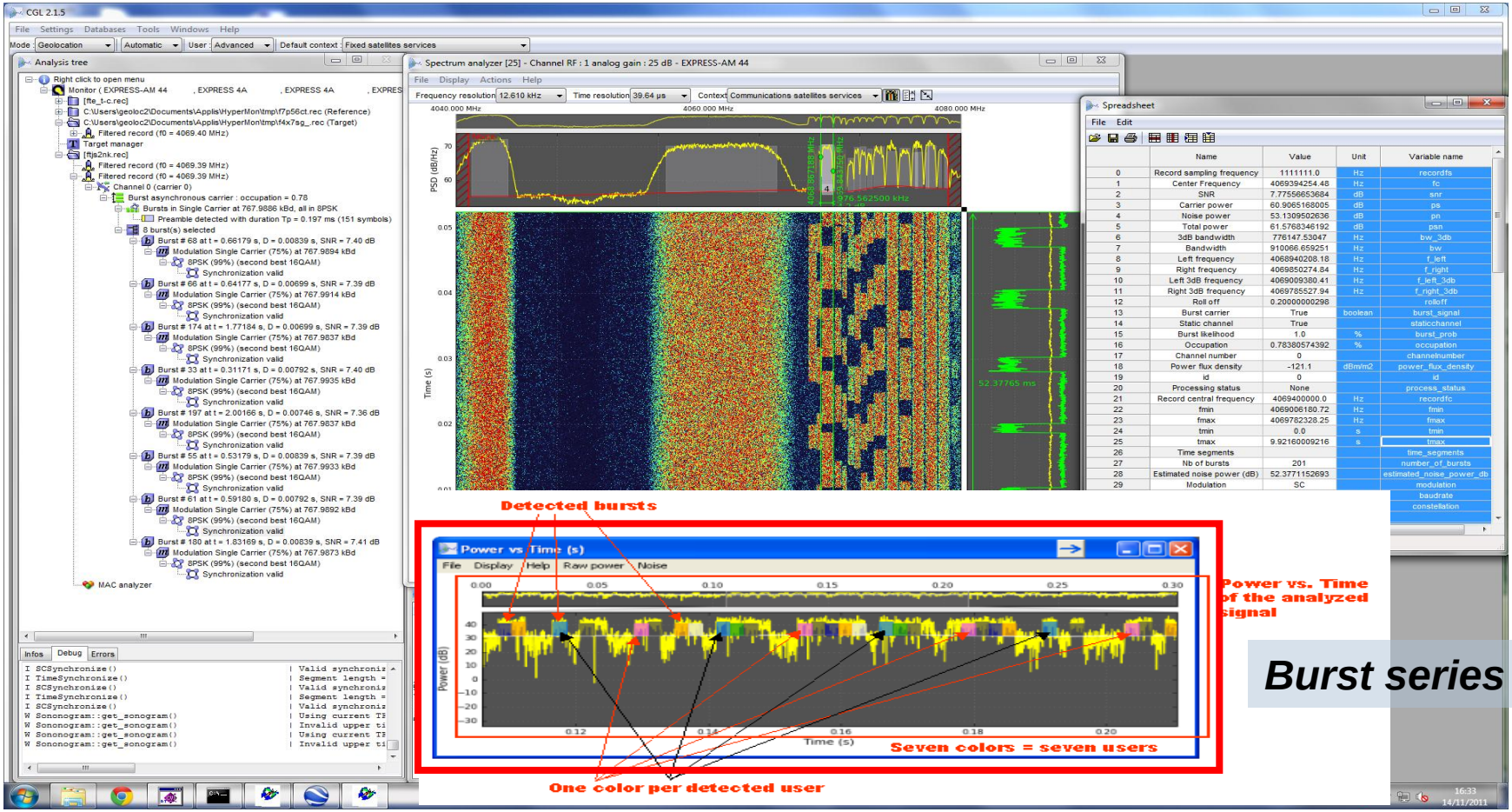
Performances

Burst Signal

In TDMA context



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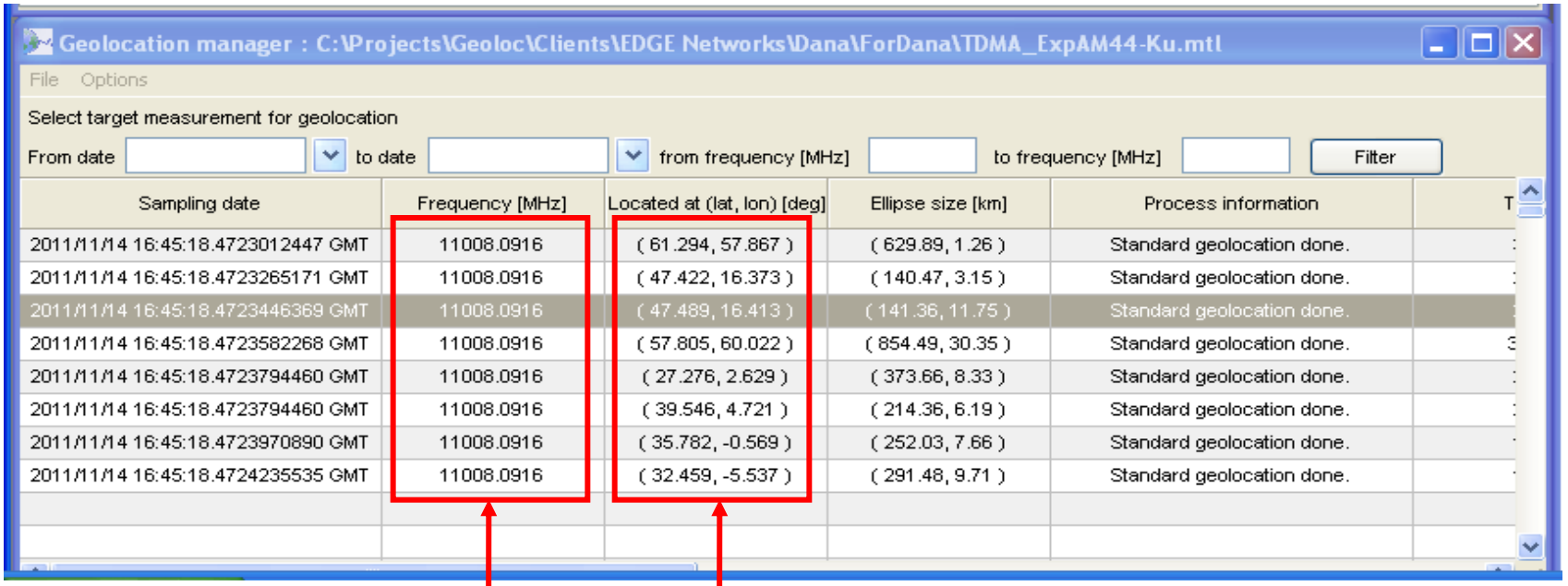
Performances

Burst Signal

In TDMA context



Sampling date	Frequency [MHz]	Located at (lat, lon) [deg]	Ellipse size [km]	Process information
2011/11/14 16:45:18.4723012447 GMT	11008.0916	(61.294, 57.867)	(629.89, 1.26)	Standard geolocation done.
2011/11/14 16:45:18.4723265171 GMT	11008.0916	(47.422, 16.373)	(140.47, 3.15)	Standard geolocation done.
2011/11/14 16:45:18.4723446369 GMT	11008.0916	(47.489, 16.413)	(141.36, 11.75)	Standard geolocation done.
2011/11/14 16:45:18.4723582268 GMT	11008.0916	(57.805, 60.022)	(854.49, 30.35)	Standard geolocation done.
2011/11/14 16:45:18.4723794460 GMT	11008.0916	(27.276, 2.629)	(373.66, 8.33)	Standard geolocation done.
2011/11/14 16:45:18.4723794460 GMT	11008.0916	(39.546, 4.721)	(214.36, 6.19)	Standard geolocation done.
2011/11/14 16:45:18.4723970890 GMT	11008.0916	(35.782, -0.569)	(252.03, 7.66)	Standard geolocation done.
2011/11/14 16:45:18.4724235535 GMT	11008.0916	(32.459, -5.537)	(291.48, 9.71)	Standard geolocation done.

One single central frequency

Several distinct locations

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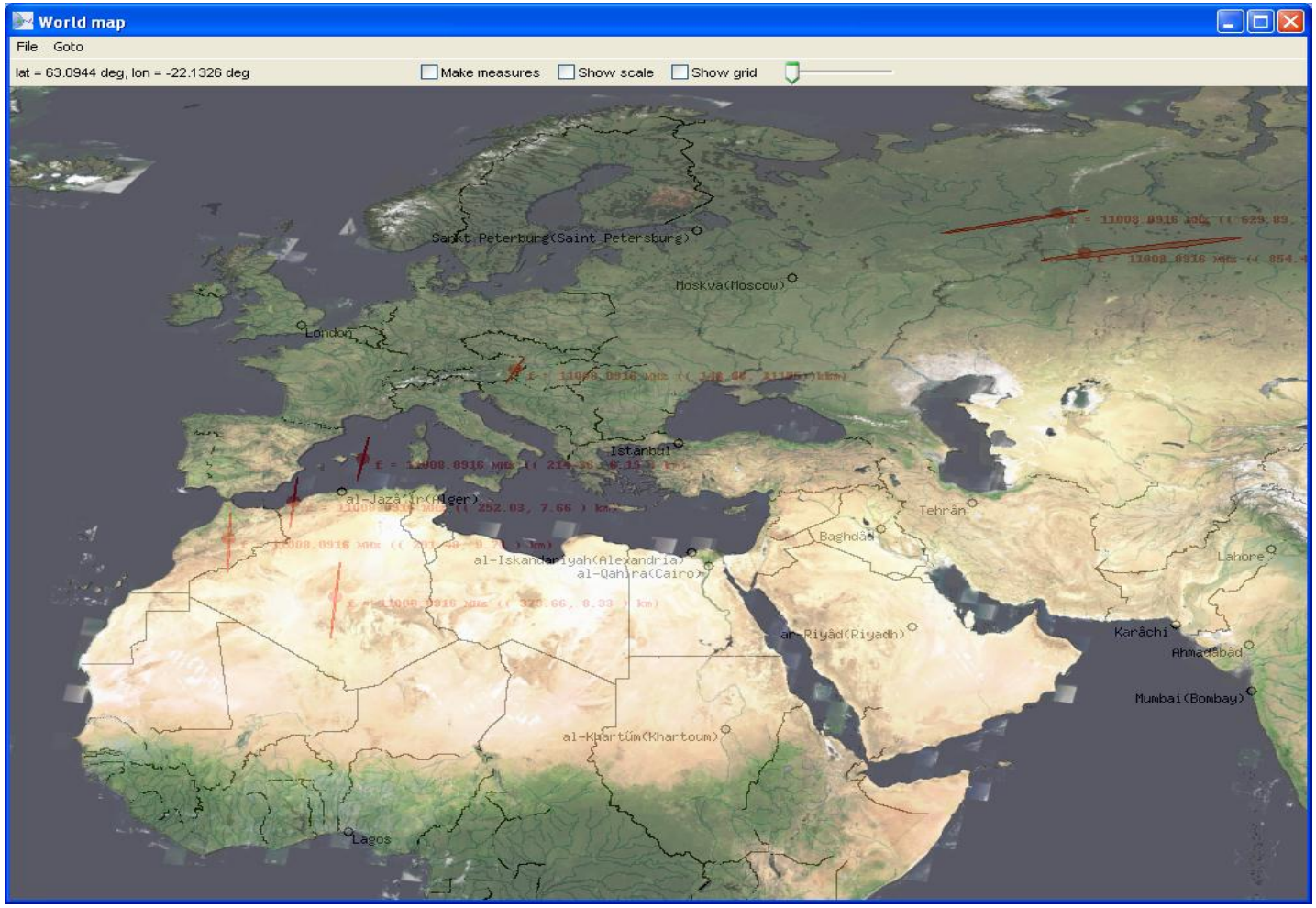
Performances

Burst Signal

In TDMA context



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Thank you !