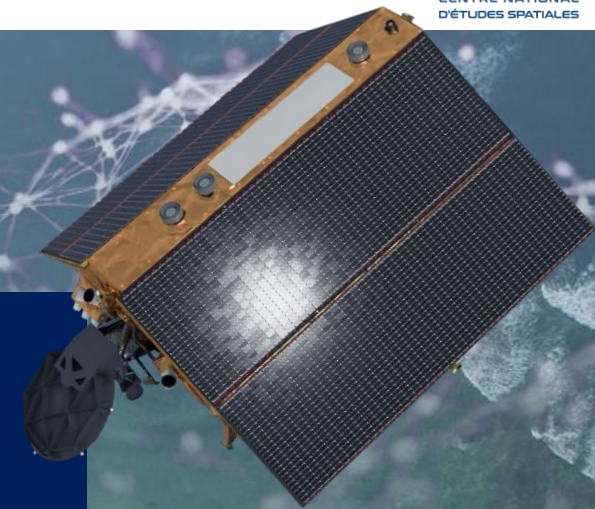


DORIS for GENESIS* status

*An ESA mission - Contract was carried out under a programme of and funded by the European Space Agency

Olivier Dumond
DORIS Project manager
CNES



IN PARTNERSHIP WITH



JPL



Project status (DORIS)

DORIS Hardware contracts

Next milestones

Challenges

Development status

Tests set-up

Results / analyses

Conclusion

Project status (DORIS) – DORIS Hardware Contracts

IDS Workshop

ESA Contract No. 4000147947/25/NL/LW signed in April 2025

DORIS Receiver

Procured through contract with Thales-DMS (as all from the beginning)
Generation DGXX-S (2016, 1st mission)

Flight model number **13**

Contract signed in December 2025



DORIS UHF/S antenna

Procured through contract with Thales-AEC (as all from the beginning)

Flight model number **31**

Contract signed in December 2025



Strong heritage for the 2 hardware

14 106 cumulated **days** of operation (10 models)

10 years of mission w/o anomaly for Sentinel-3A and Jason-3 (1st DGXX-S FM)

Project status (DORIS) – Milestones

IDS Workshop

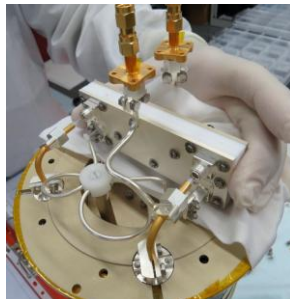


June & July 2026
Manufacturing
Readiness Review

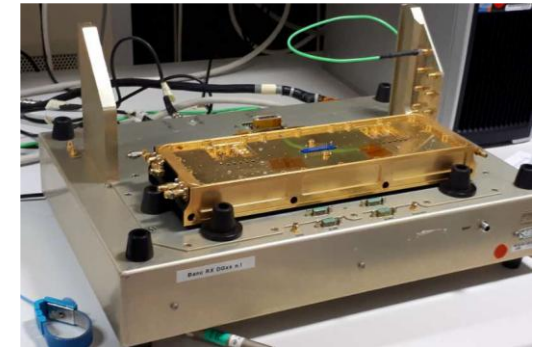


2027
DORIS System
Delivery Review Board

30/09/2025
DORIS System - Preliminary
Design Review



September 2026
DORIS System - Critical Design
Review



Project status (DORIS) – Challenges

A never experienced altitude of 6000 km

Budget link around 10 to 13 dB worst than LEO 1350 km

- But bearable by the receiver due to high margin of design
- Action to improve the 1st stage gain is however in progress on CNES side

RF signal collisions

- Beacons in visibility are around 12 compared to 5 (at LEO 1350 km)
- 7 beacons can be tracked in parallel
- Separation of 2 beacon signals is achieved for $\Delta f > 200\text{Hz}$ and $\Delta P > 3\text{dB}$

Radiation

- For electronic component inside the mechanical frame of the receiver, total dose globally lower or equal compared to LEO 1350 km
- Acceptable for Single Event Effect
- Analysis in progress concerning the radome in PTFE, no concern due to the heritage in flight for >10 years @1350km but corresponds to lower dose than 4 years @6000km
- Question raised for the USO, experience of frequency shift during pass in SAA for LEO (what will be the behaviour @6000km)

Thermal

- USO is sensitive to thermal variation
- Mid-term stability is impacted
- Test to be performed by DORIS Receiver to verify the impact on Doppler measurement accuracy

Development status (DORIS) – Test set-up (1/2)

IDS Workshop

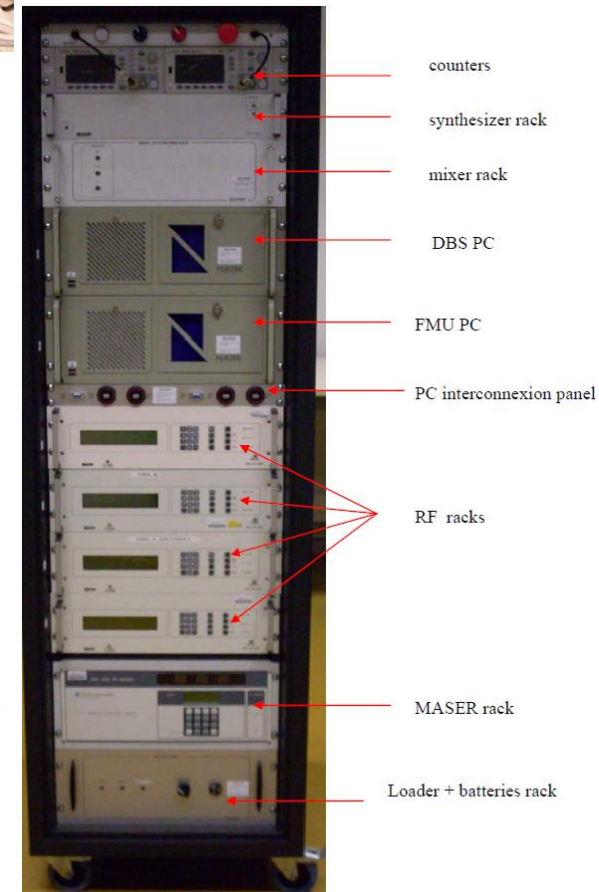
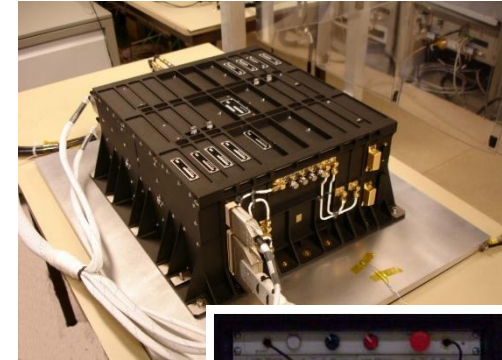
Objective to provide simulated data in RINEX format to the Working Group for all the 4 geodesy technics

For DORIS we rely on:

- An Engineering Model representative to FM in terms of performances
- A signal generator: DBS for Doris Beacon Simulator

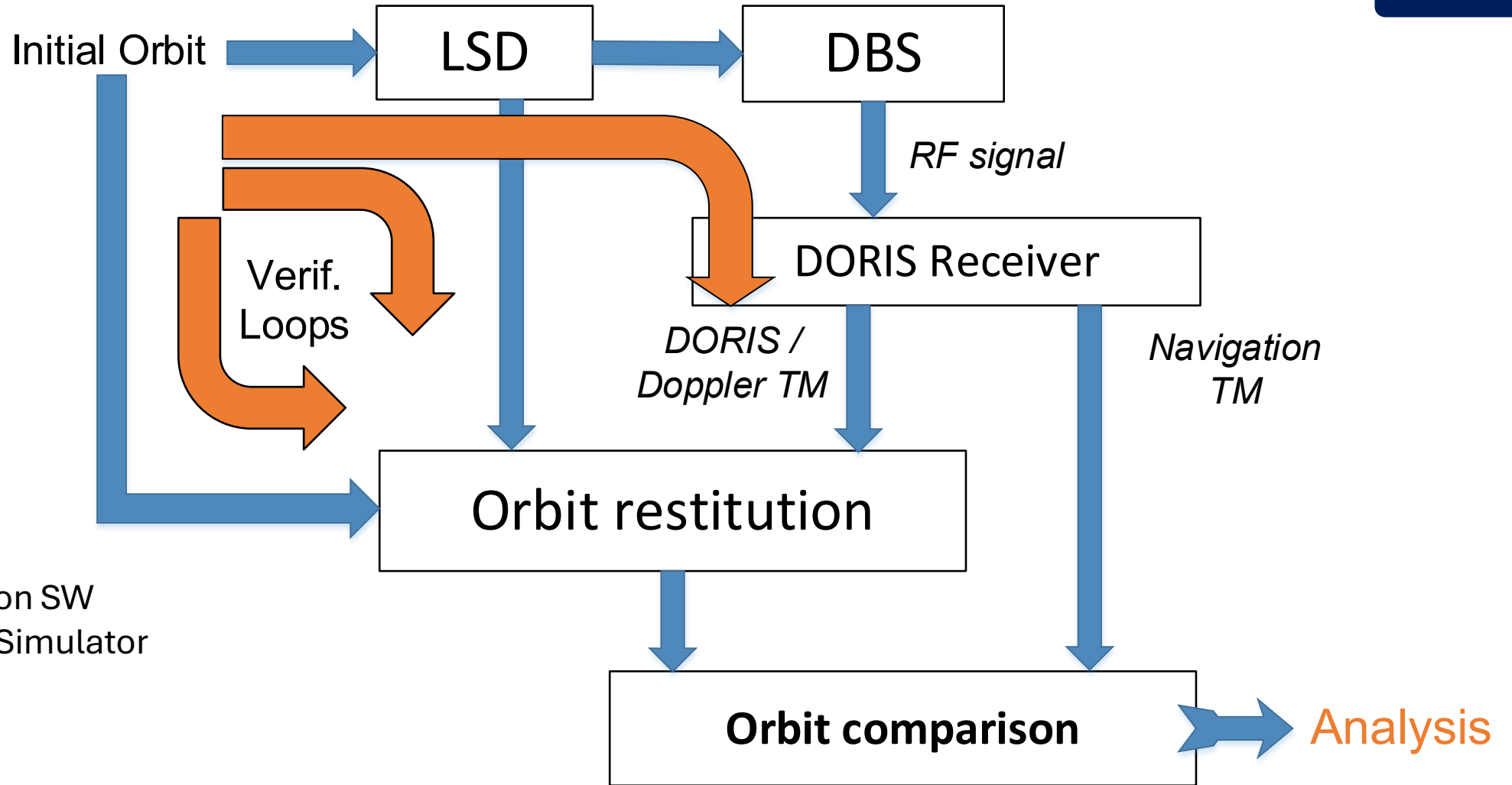
In order to fit to the Genesis orbit we have adapted our standard benches:

- Coupling of several DBS to achieve 12 beacons signals simultaneously



Development status (DORIS) – Test set-up (2/2)

Test principle



LSD : DORIS Simulation SW
DBS : DORIS Beacon Simulator

Results from last CNES internal test conducted end of 2025 :

Doppler Measurements are acquired for simulated GENESIS orbit but minimal satellite elevation to be increased from LEO standard 5 degrees to at least 10 degrees due to degraded link budget.

Beacon acquisition configuration/algorithm to be optimized vs 7 channels limitation, and to rather choose passes with acceptable inter-beacon interferences.

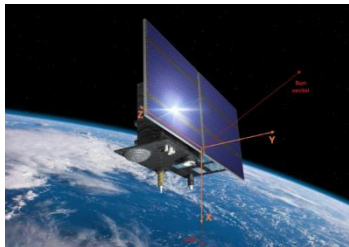
Performances of Doppler Measurements and DIODE navigator to be further evaluated with a better configuration for future tests.

Development status (DORIS) – Analyses & Results (2/3)

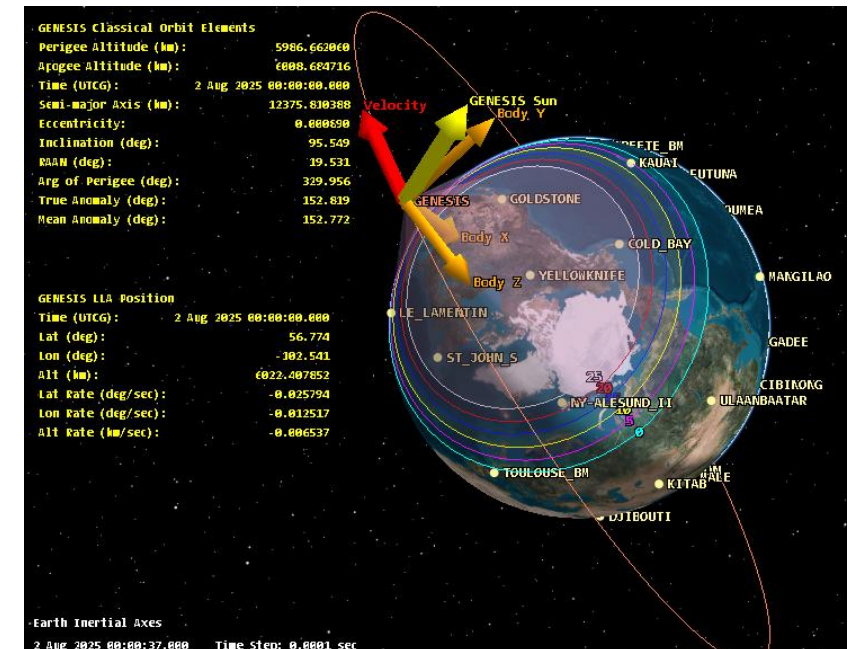
Preparation on-going for tests with last ESA orbit, attitude, and auxiliary information.

In coordination with scientific teams (CNES/GRGS/CLS) , on-going tests are for 3-10 August 2025 simulated week, with an initialization of DORIS receiver simulated on 2 August 2025.

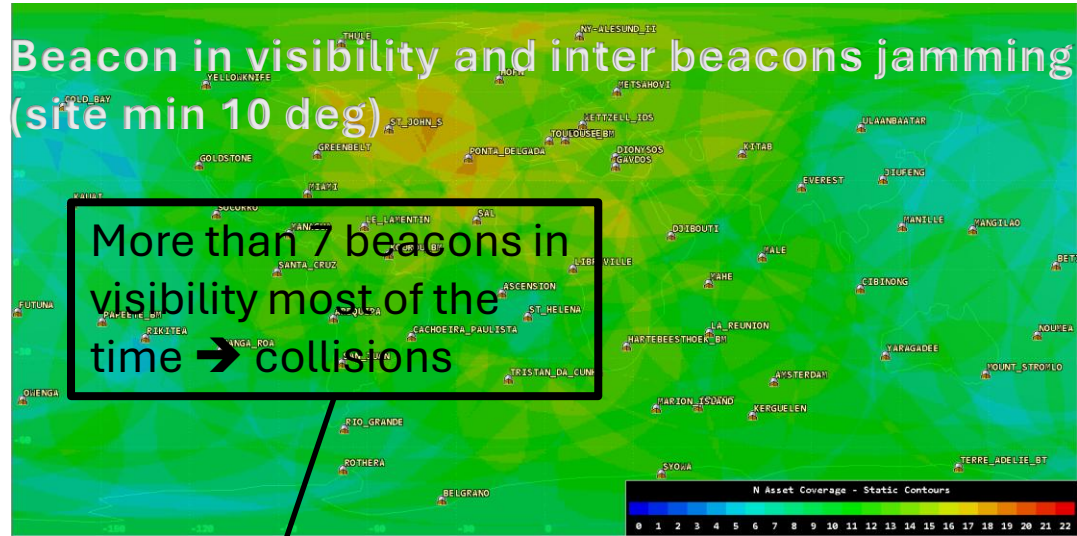
An objective is also to generate DORIS RINEX measurement files for orbit and localization determination evaluation.



*3D Satellite Tool Kit
GENESIS orbit and
attitude on 2 August
2025 figuring ESA
orbit and attitudes
inputs:*

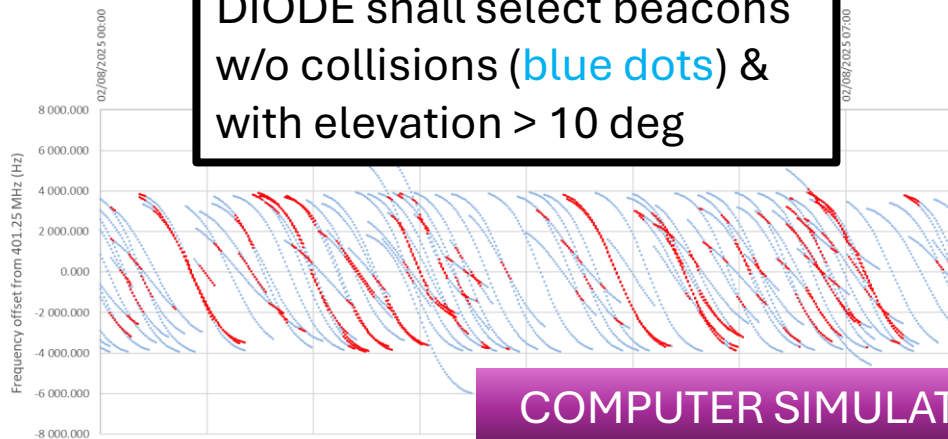


Development status (DORIS) – Analyses & Results (3/3)



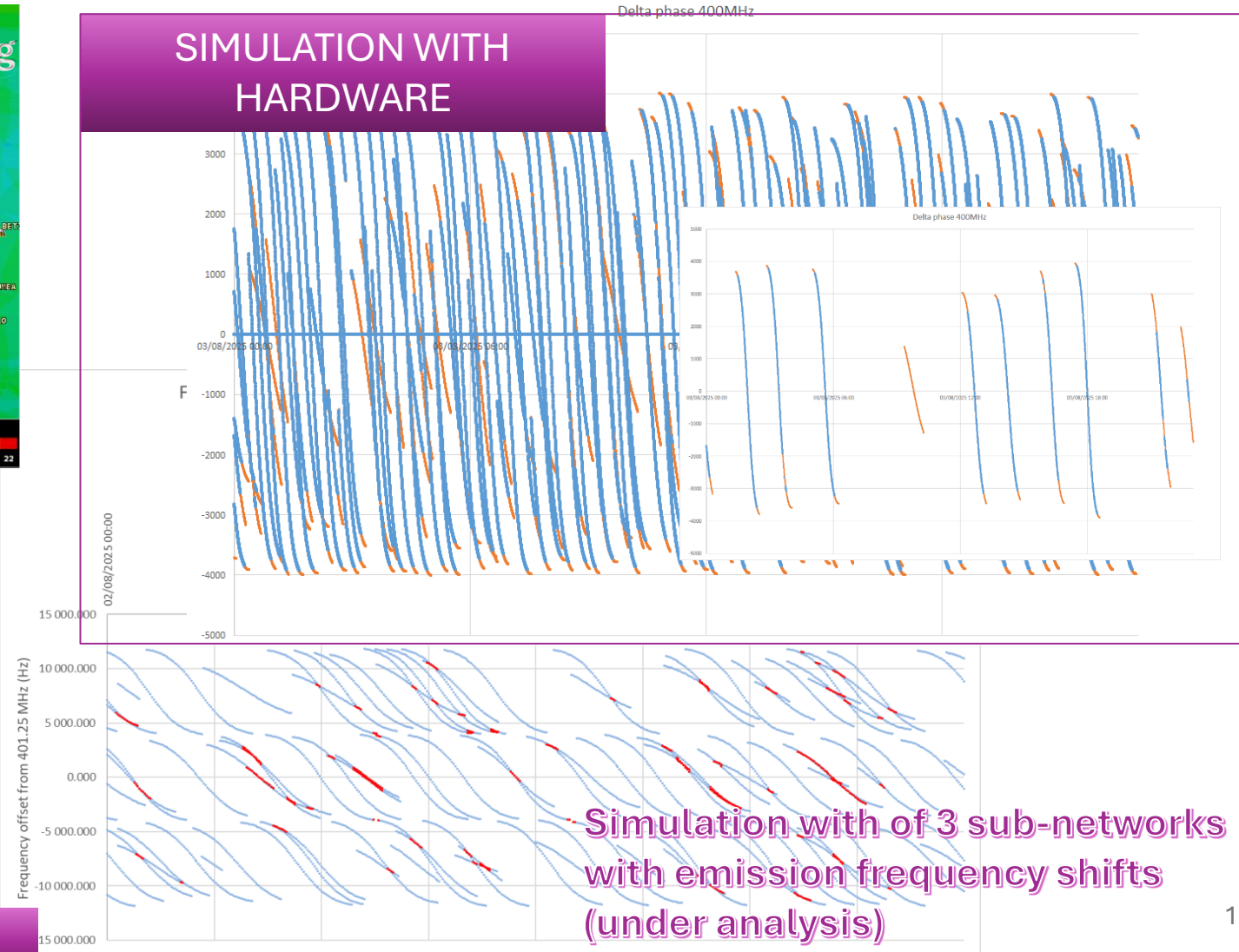
Frequency Offset from 401.25 MHz for Jammed and Unjammed Orbit Points
Jamming Criteria +200Hz -3dBc for 401.25 MHz Band, Time Step 60s
Min elevation for Jammed Beacon 10 deg, Min Elevation for Jamming Beacon 5 deg

DIODE shall select beacons w/o collisions (blue dots) & with elevation > 10 deg



COMPUTER SIMULATION

SIMULATION WITH HARDWARE



Conclusions

Manufacturing of the recurring hardware are progressing nominally.

We benefit of a strong hardware heritage and a design with significant margins.

Activities for providing simulated DORIS data in RINEX are on-going, inputs from ESA and OHB taken into account to build a test scenario.

Results expected in the coming weeks ! Then we'll pass the ball to the WG.

Activities for adapting the DIODE software are done in parallel.