

Continued,  
enhanced ocean altimetry  
and climate monitoring  
from space

31 October > 4 November 2022

IDS workshop  
OSTST meeting



Venice - Italy



<https://ostst-altimetry-2022.com/>

## DORIS System status : network and onboard receiver Future missions

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# Agenda

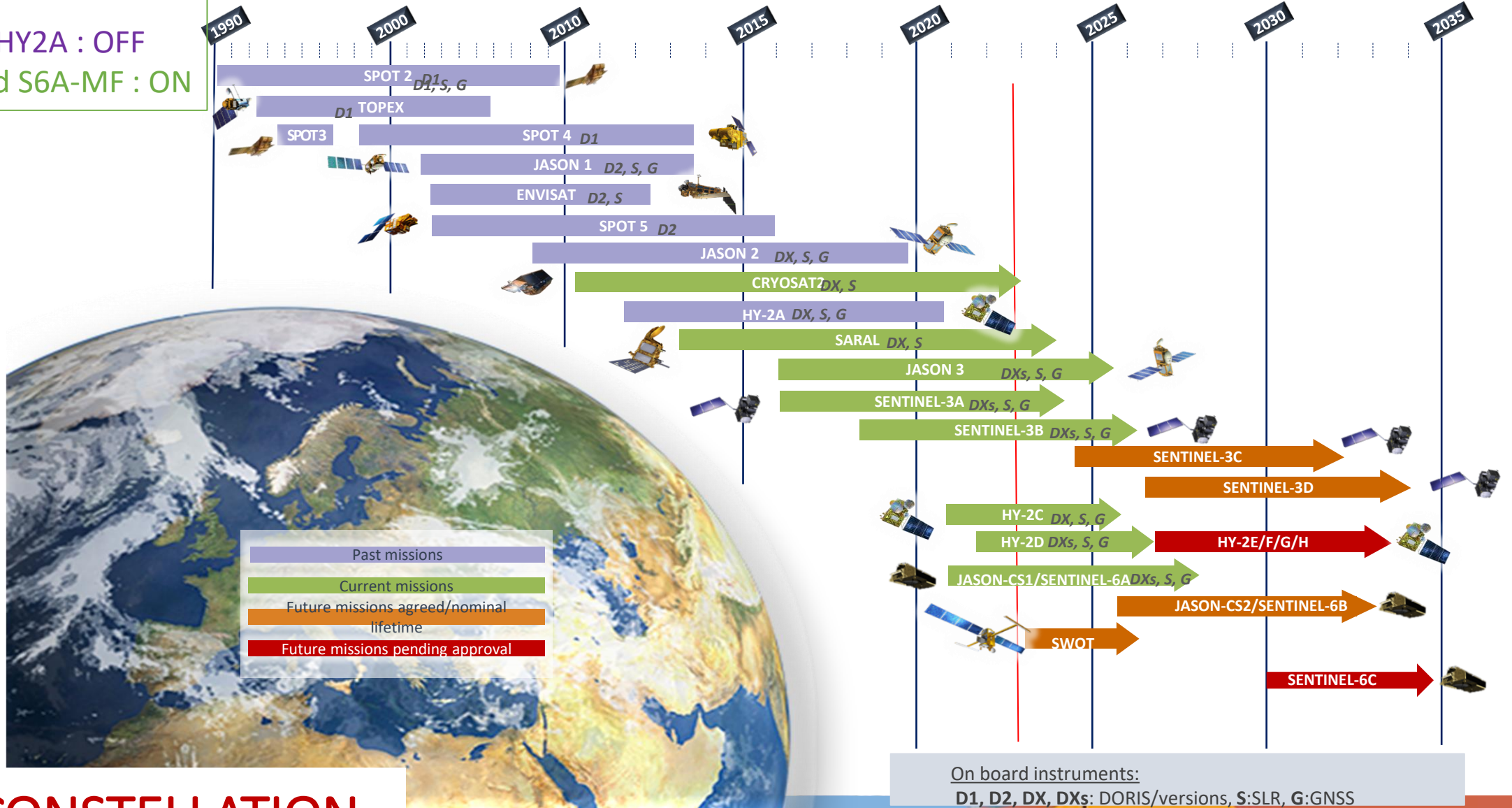
- Status on current missions
- Status on potential next missions and opportunities
- Some news about the onboard receiver
- Status on beacons network

# Current missions

8 instruments in exploitation

Since 2018 :

- Jason2 and HY2A : OFF
- HY2C&D and S6A-MF : ON



# DORIS CONSTELLATION

# Next missions



## Sentinel6C

- Satellite identical to S6A&B
- Same organization as S6A&B : Airbus DS GmbH prime contractor.
- Schedule : Kick-off 2024/2025, launch around 2030.

## HY2E and F

- Technical documents signed between T-DMS and NSOAS.
- Imminent order

## What about the next ESA missions ?

- CRISTAL, Sentinel3NG...
- waiting for decision & confirmation about DORIS onboard...
- Considering the DORIS advantages : orbit accuracy, geodesy performances, and robustness against jamming

# Opportunities

## ESA Phase A GENESIS

Four geodesy technics onboard : DORIS, GNSS, SLR and VLBI (E-GRASP)

Satellite altitude : 6000km

ESA RFI publication July 15th → final document Septembre 15th

TAS Italy interested in answering : in touch with T-DMS for the DORIS part.



## CNES Phase 0 study : DORIS / Galileo

Innovative platform at MEO altitude → improve future determination of the ITRF / robustness of the navigation system.

Kick-off : end of 2022

CNES R&T study on DORIS receiver :

- adjustments to work at 20 000km
- more beacons in visibility, more Doppler collision
- link budget...

## Opportunities : R&T studies

- **R&T radiations on USO (Ultra-Stable Oscillator) :**

Objective : define the pre-irradiation level to obtain USO more robust against the space radiations

First pre-irradiation planned in November

Results and conclusion : end of 2023

- **R&T Modernization of DORIS signals**

Objective : improve the robustness against interferences and multi-tracks, the datation accuracy, study the optimization of the demodulation and the pursuit of numerous beacons...

Kick-off : last week

Results and conclusion : end of 2023

# Onboard receiver : R&T Twin DORIS-GNSS receiver (1/2)

## CNES R&T : The twin (or mixed) DORIS-GNSS receiver

Reminder :

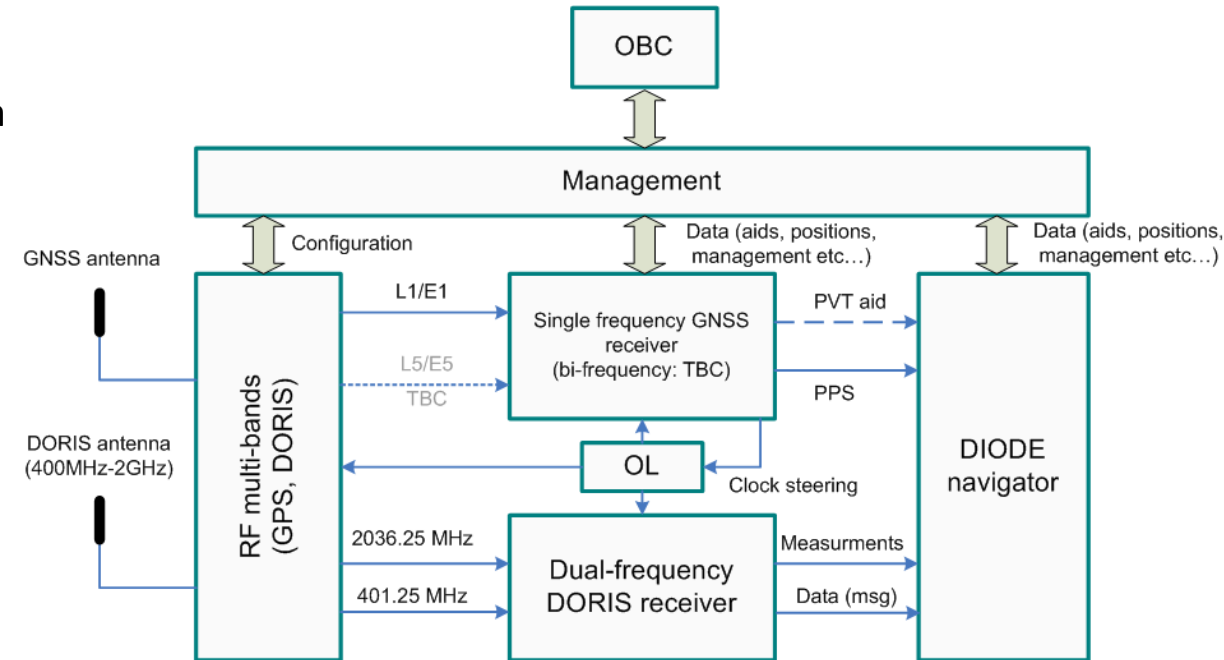
- Take benefit with T/F given by GNSS and orbit determination given by DORIS
- Have 2 instruments in one, for the Precise Orbit Determination (POD) requirements : reduction of Mass-Consumption-Volume

Two phases were carried out :

- Feasibility phase
- Mock-up on electronic card : in progress, not fully realized

The main aims of this second phase were :

- Demodulation of DORIS signals
- Integration of DIODE and DORIS software on Zynq card
- Validation of the DORIS function with the Doris Beacon Simulator (DBS)
- DORIS and GNSS work together



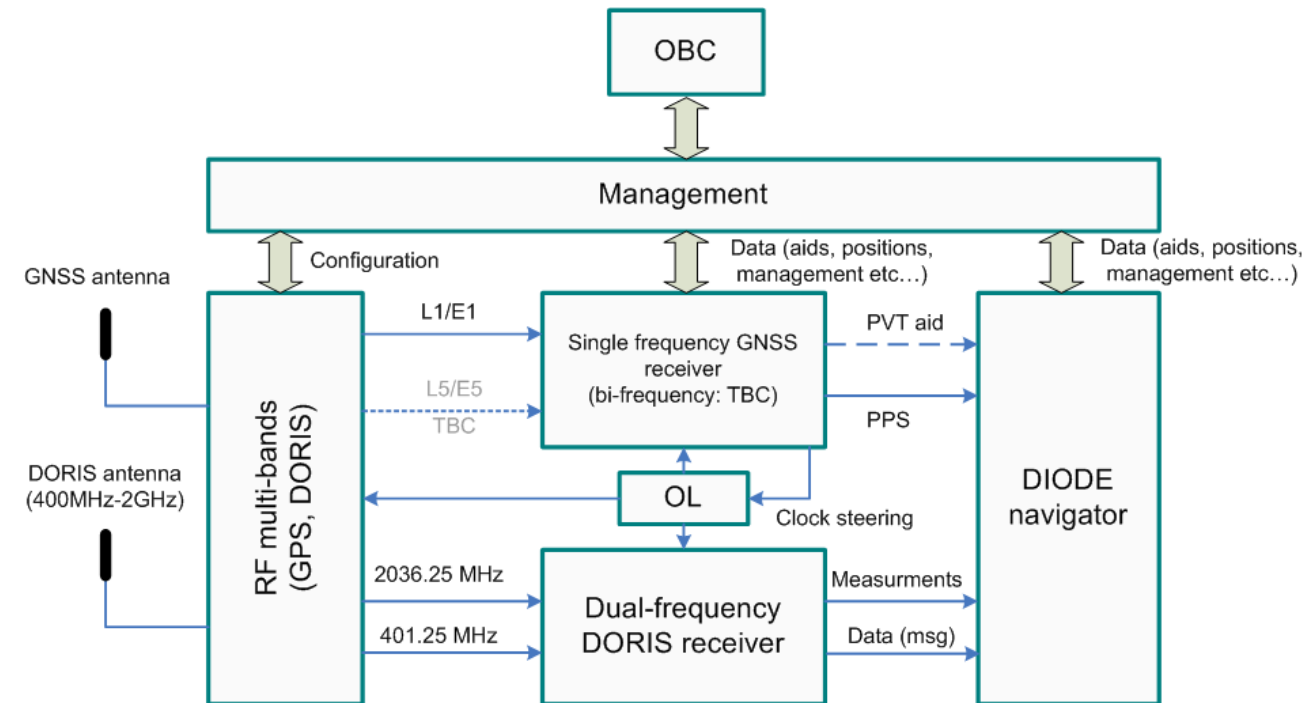
# Onboard receiver : R&T Twin DORIS-GNSS receiver (2/2)

The results :

- Positive points : development of the « gestion » software, DIODE integration on Zynq card, and demodulation loop at 400MHz
- Opened points : phase measurements validation, messages treatment, demodulation at 2GHz, number of beacons, integration of DORIS software...

Conclusion :

- Numerous opened points after 5 years
- Reserved conclusion
- CNES decision to be taken to continue, or not, this activity

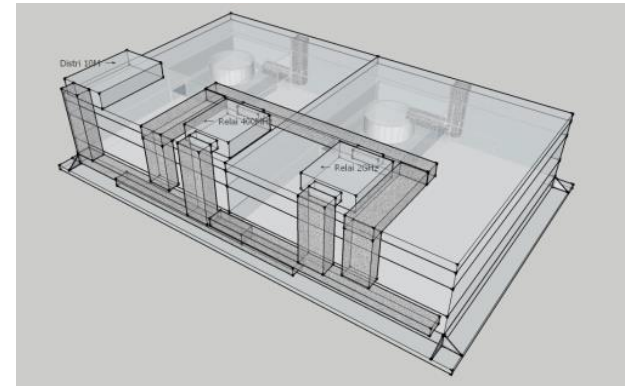




# Onboard receiver : DORIS NEO receiver (1/2)

## T-DMS fifth generation of DORIS receiver : DORIS NEO

- Technological breakthrough with components
  - reduction of hardware complexity
  - easier scalability by software reprogramming
- Strong re-design of electronic cards
  - receiver simplification
  - physical independence of each chain
  - offer of a modular instrument : one or two chain(s) instrument



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### Main goals :

- ✓ Same performances, same functionalities as previous generation DGXX-S
- ✓ Reduction of lead time, cost, and also mass and volume

# Onboard receiver : DORIS NEO receiver (2/2)

- Activities carried out on own funds for T-DMS, with CNES DORIS service, during 6 months, with engineering meetings
- Architecture validation
  - With receiver modules bread-boards
  - With new tests benches

Functionnal verification : ok

Risk mitigation : partially ok

TRL4 level

Next steps :

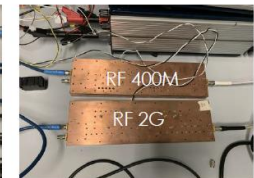
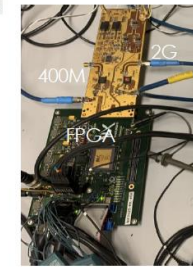
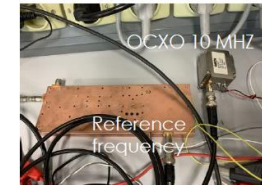
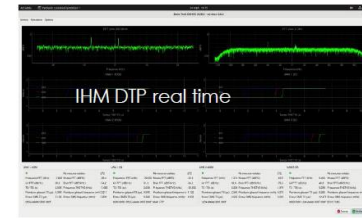
Full chain verification

DORIS EM manufactory

DORIS PFM and FM



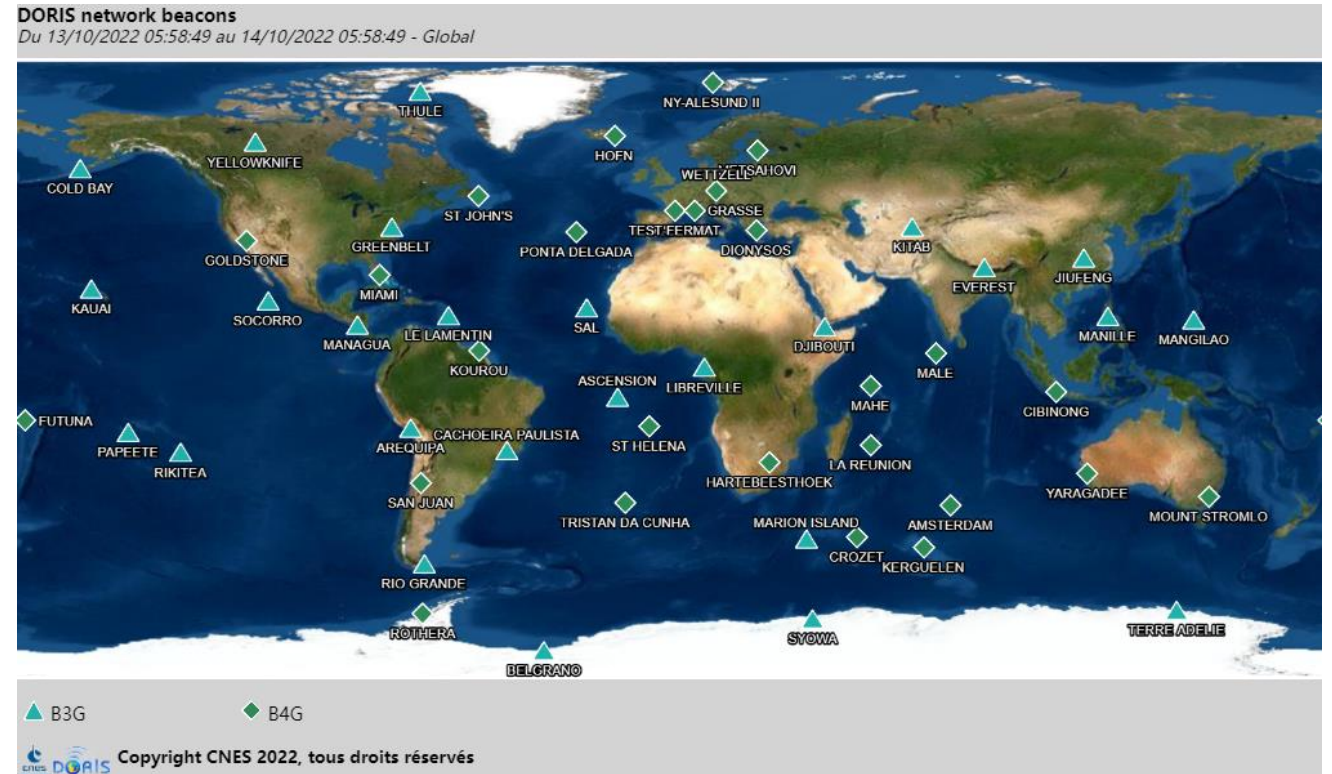
TRL5 level



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# Beacons network

- A positive status on DORIS network  
26 B4G in the network



- Action concerning the connection of beacons to maser : ongoing
  - ✓ On Grasse, Wetzell and Ny Alesund sites : done
  - ✓ On Yellowknife site : the beacon and the maser are ready → « just » the connection to do
  - On Greenbelt, HBK, Yarragadee, Kauai and Syowa : discussion and organization ongoing

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THANK YOU FOR YOUR ATTENTION