

# MARTA : LAUNCHER LOCALISATION BY A NETWORK OF STATIONS

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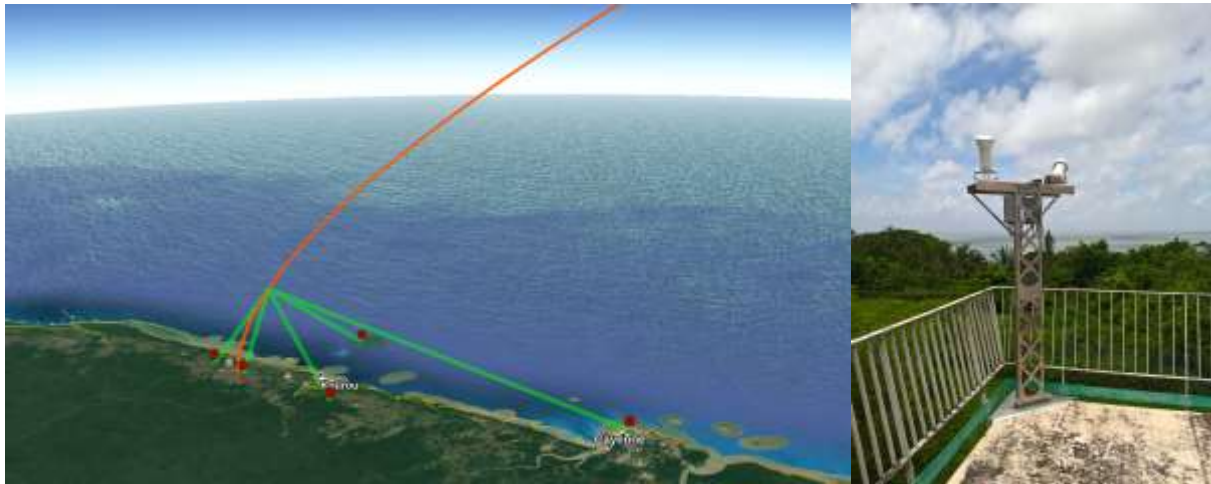
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In 2019, the CSG IP network has been upgraded, the concept of Software Defined Radio (SDR) is more and more common, the hardware is cheap and reliable, on the shelf GNSS receiver offers excellent time synchronization at low cost and the need for precise trajectory at low cost is as crucial as ever.

MARTA is an experimentation for a new localization system for CSG launchers. It is based on a network of low cost telemetry stations installed all across CSG, it aims at finding the launcher position and velocity by Time and Frequency Difference Of Arrival (TFDOA).

Low cost and robust SDR telemetry receivers, synchronized by GNSS (better than 5nsRMS) and connected to a high performance IP network allows a Central Server to compute the location of the launcher. The signal-processing algorithm (Early-Late gates) and the localization process (Least mean square, Kalman filter) are mostly inspired from GNSS technologies. Those systems are implemented with extensive use of opensource libraries with high performance GPU acceleration for the most demanding calculations.

The stations are conceived by INGENSPACE, with the legacy of SVOM ground stations. This robust and performant hardware has already been deployed all around the world for several years. The software has been developed internally by CNES.



The benefits of this system would be:

- No additional hardware needed on the launcher, useful for micro launcher with no mass budget to spare.
- Capability to track several stages simultaneously, which is particularly useful for first stage boost back trajectories.
- Virtually no mechanical maintenance: there is no moving part and all the complexity is in the software.
- Redundancy by design,
- Can be used on any S band modulation,

The system has been installed in Kourou in April 2021. The results of the experimentation should be following soon.