



Preparatory mission at SSC in Kiruna, Sweden SSC supports GAREF !

Since the start of the **PariSat** youth project, one of the major technical challenges has been to successfully transmit all the data from space, via a telemetry system. Given the terrestrial trajectory flown by **PariSat**, the **SSC** (Swedish Space Corporation) station at **Esrangle** in the north of Sweden (40km from Kiruna) appeared to be an ideal solution.

A reduced team from **GAREF** therefore went to the Esrangle base (**SSC**) from Sunday April 7 to Wednesday April 10, 2024. The team was accompanied throughout this stay by Erik and Elena from **SSC**. Elena is currently doing her master's thesis (for the University of Luleå) on the reception of **PariSat**.

The main challenge of this preliminary mission was to best prepare for the reception of flight data from **PariSat** by precisely configuring **SSC's** ground equipment.

To do this, the station's engineers were able to rely on a simulator, designed and manufactured by young people from **GAREF**, which recreates a radio signal in every way similar to that which will be transmitted by **PariSat**.

Indeed, as **PariSat** only makes a single pass over Sweden, it is necessary that the antennas be perfectly oriented before the flight and the receivers already programmed.



The young people actively participate in telemetry configuration and testing operations with Erik and Elena from SSC. The GAREF simulator is the gray box in the center of the table in the top photo.



The GAREF team was able to be accommodated in the Esrangle base itself, under 1m of snow...

As a reminder, **PariSat**, on board **ESA** flight Ariane 6 VA262, will retransmit its measurements and images according to the IRIG106 standard in PCM-FM, Biphase-L, 1Mbit/s on a 2235 MHz carrier frequency, with a power of + 33dBm. This telemetry system, which has already proven itself in previous **GAREF** experiments, is the result of close cooperation between young people from **GAREF** and **ENSEA**.



Antenna calibration

SSC has implemented a very sophisticated tracking strategy to guarantee optimal reception of **PariSat** during its flight over the Earth. Three antennas of different sizes and apertures (with increasingly narrow beams, and therefore increasingly strong gains) are controlled in common by automatic systems. They will be used simultaneously on launch day to ensure a flawless reception. If there is difficulty picking up the signal while following the intended trajectory, **SSC** has search algorithms to slightly adjust the orientation, by scanning upstream or downstream of the intended trajectory, or by oscillations around the intended point.

A technical mission but not only...

For Jeanne, Elias, Nolan and Axel, from **GAREF**, this mission to **Esrange**, north of the Arctic Circle, is an accomplishment in itself. The **SSC** team was very welcoming, ready to devote a lot of time to them, to explain the different facets of their job and to take an interest in the **PariSat** project. On site, they witnessed the impressive device deployed in the Polar Circle to recover data from **PariSat**, and had the opportunity to visit the multiple technical installations at **Esrange** to their great pleasure.

This trip was also an opportunity for them to meet in person the **SSC** engineers, with whom they have worked closely for more than a year. They are very proud of this European cooperation which they wish to develop for their future projects.



The **GAREF** team also had the incredible chance to observe an aurora borealis, at a time of year when they become rare and despite very inclement weather! For space enthusiasts, they couldn't have dreamed of a better conclusion.



The GAREF team at the foot of the ESX antenna at SSC (authorized to be photographed)

Impromptu Northern Lights, but so beautiful!

SSC: Swedish Space Corporation ESA: European Space Agency ENSEA: Ecole Nationale Supérieure de l'Electronique et de ses Applications

GAREF PARIS, club scientifique de jeunes de Paris - Site Internet : www.garef.com

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Agrément "jeunesse et éducation populaire" n° 75JEP05-337 - Immatriculation Préfecture : W751011661 NAF : 94.99Z - SIREN : 311 550 644



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