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The Swarm Absolute Scalar Magnetometers now operating in orbit

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Swarm is one of the Earth Explorer Missions run by the European Space Agency. Its principal goal is to make the best ever survey of the Earth's magnetic field and ionosphere and to study how they vary over space and time. This will be achieved by a constellation of three identical satellites, launched on the 22nd of November 2013.

In order to observe the magnetic field thoroughly, each satellite carries two magnetometers: a Vector Field Magnetometer coupled with a star tracker camera, to measure the direction of the magnetic field in space, and an Absolute Scalar Magnetometer (ASM), to measure its intensity.

The ASM is the French contribution to the Swarm mission. This new generation instrument, based on the atomic spectroscopy of the helium 4 metastable state, was developed by CEA-Leti (1) in Grenoble with technical assistance and financing from CNES (2) and scientific support from IPGP (3).

As the Swarm magnetic reference, the ASM scalar performances are crucial for the mission's success. Thanks to a new dedicated design, the ASM offers the best precision and absolute accuracy ever attained in space, with similar performances all along the orbit. The ASM will thus deliver high resolution scalar measurements at 1 Hz for the in-flight calibration of the vector field data over the 4 year mission. It can also be operated at a much higher sampling rate ("burst" mode at 250 Hz). In addition, on an experimental basis, this instrument also takes vector field measurements, which are being validated jointly by CEA-Leti and IPGP, with support from CNES.

This poster presents the capabilities and working principle of this instrument as well as the results of the in-flight verifications carried out during the 3 first months in orbit, including the performances, the last status and future prospects.

1 CEA-Leti : French Atomic Energy and Alternative Energies Commission - Electronics and Information Technology Laboratory
2 CNES : Centre National d'Etudes Spatiales - French Space Agency
3 IPGP : Institut de Physique du Globe de Paris - Paris Institute of Earth Physics