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NOIRE Study Report: Towards a Low Frequency Radio Interferometer in Space

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Ground based low frequency radio interferometers have been developed in the last decade and are providing the scientific community with high quality observations. Conversely, current radioastronomy instruments in space have a poor angular resolution with single point observation systems. Improving the observation capabilities of the low frequency range (a few kHz to 100 MHz) requires to go to space and to set up a space based network of antenna that can be used as an interferometer.

We present the outcome of the NOIRE (Nanosatellites pour un Observatoire Interférométrique Radio dans l'Espace / Nanosatellites for a Radio Interferometer Observatory in Space) study which assessed, with help of CNES' PASO, the feasibility of a swarm of nanosatellites dedicated to a low frequency radio observatory. With such a platform, space system engineering and instrument development must be studied as a whole: each node is a sensor and all sensors must be used together to obtain a measurement. The study was conducted on the following topics: system principle and concept (swarm, node homogeneity); Space and time management (ranging, clock synchronization); Orbitography (Moon orbit, Lagrange point options); Telecommunication (between nodes and with ground) and networking; Measurements and processing; Propulsion; Power; Electromagnetic compatibility.

No strong show-stopper was identified during the preliminary study, although the concept is not yet ready. Several further studies and milestones are identified. The NOIRE team will collaborate with international teams to try and build this next generation of space systems.