EPSC Abstracts
Vol. 9, EPSC2014-164, 2014
European Planetary Science Congress 2014

Solar System Radioastronomy in Space with Cubesat

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Abstract

Low frequency radioastronomy observatories for the heliosphere have been using similar instrumentation for decades. The Cassini, STEREO, and the future Solar Orbiter or JUICE missions are embarking goniopolarmetric radio receiver connected to 3 electric antennas. Such instrument provides the spectral matrix (or part of it) from which the wave parameters can be derived. With a point source assumption (plane wave), we derive the direction of arrival of the wave, the polarization and the flux density. In case of a spatially extended source (disk shaped, with a given radial profile), the source centroid direction and the apparent source size is provided. This type of instrumentation cannot provide much more parameters, as there is a maximum of to 9 independent measurements for each time-frequency step.

We propose a concept of radioastronomy instrumentation using a swarm of small satellites (possibly cubesats) with sensitive radio receivers measuring the wave front and phase of the radio waves on each spacecraft. This instrument will also provide 3-dimensional interferometric measurement. Such resolved imaging capabilities of the inner heliosphere would be a real step forward to better understand the radio emissions mechanisms and the propagation processes. We will present the various existing projects and the roadmap to reach the goal.