The forthcoming EISCAT 3D as an extraterrestrial matter monitor

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High Power Large Aperture (HPLA) radars such as the tristatic EISCAT UHF combined with the EISCAT VHF have been versatile instruments for studying many properties of the meteoroid population even though not designed for the purpose. The future EISCAT 3D facility can become in many aspects orders of magnitude better for observing the extra-terrestrial matter. Whereas the overall science theme with atmospheric radars is to study how the Earth's atmosphere is coupled to space, meeting the requirements for meteor studies is one of the design goals phrased from the user community.

The radar will comprise a phased-array transmitter and several phased-array receivers around Northern Scandinavia. It will work at 233 MHz centre frequency with a power of up to 10 MW and run an advanced signal-processing system. Its measurement techniques have never been combined in one radar system: volumetric-, aperture synthesis- and multistatic imaging and adaptive experiments. The volumetric imaging will increase the observing volumes, the interferometry improve the spatial resolution and orbit determinations. These are important issues for studying filaments in the meteor showers, to compute the dust flux in the Earth's vicinity and to estimate the ejection time of meteoroids accurately for theoretical evolution modelling. Investigations using the 233 MHz VHF frequency will provide higher rates than for example the earlier EISCAT UHF. In addition, the new system will observe a larger volume in space and offers the opportunity for longer observation runs up to continuous monitoring. We give a review of how all these new functions will improve the HPLA radar meteor observations.