# EISCAT_3D

## Development of a large near-Earth space monitoring system in Europe

## Do you want to be part of the future? Get in touch now!

The EISCAT Scientific Association undertakes fundamental research into solar-terrestrial physics and atmospheric science. Members of EISCAT are funding agencies of China, Finland, Germany, Japan, Norway, Sweden and the United Kingdom, who make long-term commitments to EISCAT based on an annual subscription. Agencies from France, Russia and Ukraine buy radar time on a "pay-per-use" basis.

EISCAT operates three incoherent scatter radars: the UHF system with transmitter and receiver in Tromsø (Norway) and receivers in Kiruna (Sweden) and Sodankylä (Finland); the VHF radar in Tromsø, and the EISCAT Svalbard Radar near Longyearbyen. The UHF is the only tri-static incoherent scatter radar in the world, but this capability will soon be lost due to interference from GSM services.

### EISCAT_3D

EISCAT and its international partners are preparing for construction of the next-generation radar, to provide comprehensive 3D monitoring of the upper atmosphere and ionosphere. EISCAT_3D will consist of multiple phased arrays, using state-of-the-art signal processing and beam-forming techniques to achieve ten times higher temporal and spatial resolution than the present radars.

EISCAT_3D, which is an ESFRI Roadmap project, will be designed for continuous operation, capable of imaging an extended spatial area over northern Scandinavia with multiple beams, interferometric capabilities for small-scale imaging, and real-time access to its extensive data system. The highly modular and expandable design includes a central active array of around 500 m diameter, comprising some 32,000 antennas with additional small outlying arrays for imaging applications. Smaller receiver sites will be located between 50 and 150 km from the central site.

### Preparatory Phase Study

From October 2010, the European Commission is funding the four-year EISCAT_3D Preparatory Phase Study, within which we will resolve the remaining technical issues and logistical questions, so that construction can begin. However, the most important task of this study is to assemble the consortium which will construct and operate the new radar.

Current plans include a 32,000 element phased array for the transmitter and 16,000 elements for the receiver sites.

LOFAR-UK Chilbolton, High-Band Array1 20-250 MHz
comprising 96 tiles x 16 cells x 2 directions = 3072 elements.

### EISCAT & LOFAR

The LOFAR project has recently developed two large-scale antenna arrays as broad-band receivers for radio astronomy purposes. The High-Band Array can be used as a receiver for EISCAT_3D and the existing VHF radar with little modification. Therefore the University of Oulu, Finland, has bought one LOFAR "remote station" (48 HBA tiles) to be deployed at Kilpisjärvi in Finland in summer 2011. The site will be use to develop EISCAT_3D receiver technology, and it will provide bi-static measurements with the EISCAT VHF. The development work is funded by the FP7 Preparatory Phase Study and by the European Regional Development Fund of Lapland.

European Union
European Regional Development Fund
European Social Fund

Leverage from the EU 2007–2013

### Science Objectives

EISCAT_3D will be a key facility for many research and operational areas including environmental monitoring, space plasma physics, solar system science and space situational awareness. Its location, within the auroral oval and at the edge of the atmospheric polar vortex, is unique for studying many important atmospheric and geospace processes. In addition, EISCAT_3D will provide a platform for developing new applications in radar technology, experiment design and data analysis. Major science topics include:

- Influence of natural solar-terrestrial variability on climate.
- Long-term change due to human activity.
- Coupling between atmospheric layers.
- Space plasma physics.
- Measurements of solar wind and corona.
- Effects of meteors and energetic particles.
- Monitoring of space weather.
- Support for future space missions.
- Orbit determination of space debris and meteors.
- Radar mapping of near-Earth objects.

### Time Line

2010-2014: FP7 Preparatory Phase Study
2014-2015: Construction Phase
2016-2045: Operational Phase

### Get Involved in EISCAT_3D and log on to:

**www.eiscat3d.se**

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