

## Enhanced support for sounding rockets at Andøya Rocket Range - present status and future for the ALOMAR instrumentation.

Kolbjørn Bekkelund<sup>(1)</sup>, Michael Gausa<sup>(1)</sup>, Ralph Latteck<sup>(2)</sup>, Steve Marple<sup>(3)</sup>

<sup>(1)</sup>Andøya Rocket Range ,P.O. Box 54, N-8481 Andenes, Norway, Email: [kobe@rocketrange.no](mailto:kobe@rocketrange.no)

<sup>(2)</sup> Leibniz- Institut für Atmosphärenphysic, 18225 Kühlungsborn, Germany, Email: [latteck@iap-kborn.de](mailto:latteck@iap-kborn.de)

<sup>(3)</sup> Department of Communications Systems, Lancaster University, Lancaster, LA1 1YR, UK, Email: [s.marple@lancaster.ac.uk](mailto:s.marple@lancaster.ac.uk)

During the last couple of years the basic aurora research equipment at Andøya Rocket Range like the magnetometers, All-Sky television system and the Meridian Scanning Photometer (MSP) has been complemented with a new digital Ionosonde and the New MF-radar.

### DIGITAL IONOSONDE

The Ionosonde, a Canadian Digital Ionosonde (CADI) is operating between 1.5 and 12 Mhz, using 13 bit Barker coded transmissions to produce a 11 dB S/N improvement compared to uncoded single pulse operations. This new system includes an 87 meter high two-wire rhombus transmit antenna and is automated with respect to online data presentation. To further enhance its operation the CADI is remote controlled via a 5 Mb/s radiolink and by the use of the Linux operating system.

### NEW MF-RADAR

The Leibniz-Institut für Atmosphärenphysik e.V. an der Universität Rostock (IAP) and Andøya Rocket Range has with this project realised the biggest radar (1square km) on the northern hemisphere operating on the 3 Mhz band. By phaseshifting the 58 transmitter outputs a steerable beam of 7 deg. may be pointed in any given direction producing wind information up to heights of 100 km with a 2 km accuracy, providing the scientists with near realtime profiles and the possibility for concurrent lidar, radar and rocket measurements in the same volume.

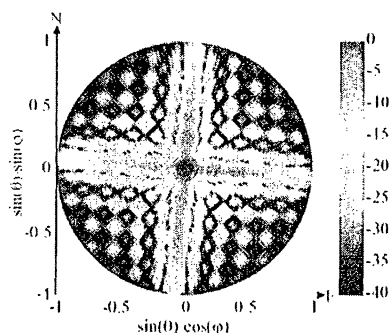


Fig.1. New MF-radar contour plot – antenna radiation pattern: Normalized total gain (dB) [2]

### ALL-SKY IMAGER

To further enhance the Andøya Rocket Range support during aurora campaigns a new All-Sky Imager (ASI) has recently been installed in cooperation with the University of Oslo. With its 630.0 nm and 557.7 nm narrow band interference filters and Photometrics Series 300 CCD camera the resulting images will be combined with data from the similar Ny-Ålesund, Svalbard system producing a unique view of the aurora from Andøya in the south to Svalbard in the north. The ASI software can also map data onto coastline maps, include rocket trajectory and/or satellite footprints. The new All-Sky Imager will, together with the existing All-Sky Television system be placed outside in a hut made especially for this purpose. With its top-mounted acrylic dome and moderate heating this hut provides the cameras with a stable environment as well as the possibility for an easy relocation if needed.

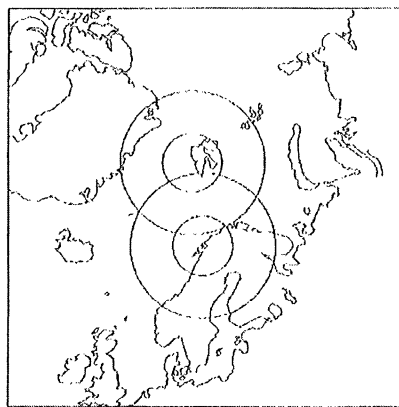


Fig.2. Andøya (AND, 69.3N, 16.0E) – Ny Ålesund (NYA, 78.9N, 11.9E) ASI coverage

### IMAGING RIOMETER

As a replacement for the old widebeam riometer, Andøya Rocket Range is now collaborating with the Department of Communication Systems (DCS) at the Lancaster University in England to build a new Imaging

Riometer for Ionospheric Studies (IRIS). With its 64 crossed dipoles, digital receivers and Butler Matrix beamshaping 49, 12 deg. wide imaginary beams are projected onto the sky above the Andøya Rocket Range, enabling scientists to monitor auroral absorption and its effect upon HF wave propagation, dynamics and structure of energetic particle precipitation as well as artificially induced absorption and scintillation. The Andøya Rocket Range Imaging Riometer will, as part of the Global Riometer Array network – GLORIA, a project lead by the head of DCS, Professor Farideh Honary have the opportunity to acquire riometer data from other sites connected to the network and thereby further enhance the scientific value of this investment.

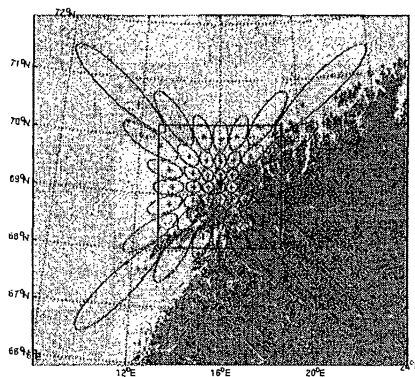


Fig.3. Andøya Imaging Riometer beam projection [3]

Due to an expected future increase in rocketbased science regarding the aurora and the ionosphere, Andøya Rocket Range and the University of Oslo is also looking into the possibility of complementing the new Allsky Imager and the Imaging Riometer with a new advanced Meridian Scanning Photometer.

To ensure a continued technical development of all existing aurora and ionospheric equipment and infrastructure, and that related projects are running as planned Andøya Rocket Range has employed new personnel targeted for this task.

The combination of highly motivated technicians, existing and new instruments will provide the scientists using Andøya Rocket Range with a powerful and flexible toolbox and optimum value for their spendings.