# EGNOS performance during ionospheric disturbances at high latitudes. Results from the Arctic Testbed project Yngvild L. Andalsvik<sup>\*1</sup>, Anders M. Solberg<sup>1</sup>, Rune I. Hanssen<sup>1</sup>, Marco Porretta<sup>2</sup> and Per Erik Kvam<sup>3</sup>

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## ABSTRACT

This presentation will show preliminary results from the experiments conducted in the Arctic Test Bed (ATB) project. This is an ESA project which is developed in the framework of the European GNSS Evolution Program (EGEP). A significant reduction in EGNOS Safety-of-Life service availability is often seen at high latitudes during geomagnetic activity. The experiments investigate the effects that different changes in the EGNOS configuration during a period in 2014 with high ionospheric activity could have on performance at high latitudes.

Key words: EGNOS, SBAS, Ionosphere, High latitudes.

## Introduction

The Arctic Testbed project is an ESA project aiming at improvements to EGNOS service at high latitudes. This is one of the main R&D activities investigated in the framework of the European GNSS Evolution Program (EGEP). The project utilizes a SPEED platform (Support Platform for EGNOS Evolution and Demonstration) for simulating EGNOS. The SPEED platform used is second generation, supporting EGNOS evolutions e.g. supporting dual constellation, correction data adapted to dual frequency users and additional processing for maritime users. It uses EGNOS operational algorithms, but has the flexibility to adjust a number of parameters for experimentation purposes. This flexibility is a key element for the proposed investigation.

The experimentation in the Arctic Testbed project focuses on several aspects of the arctic, for instance different types of dissemination means due to the low elevation of the GEOs. However, for this presentation we will focus on the experiments regarding ionospheric disturbances during the geomagnetic storm on 27th of February 2014 and whether the effects on EGNOS could have been reduced.

## Method

February 2014 had several periods of EGNOS underperformance [1] and one of the most significant ones is the one studied in this work. The experiments are performed with real GNSS observation data (not simulated data) from both EGNOS RIMS stations and additional reference stations.

The period chosen is a 7-day period from 24th of February until 2nd of March.

Two main aspects are investigated to evaluate the effects on EGNOS performance:

- ATB has several extra reference stations enabling both an extension of the network, but also a densification (see figure 1). The effects of adding additional reference stations will be shown both for days with quiet conditions and active ionospheric conditions.
- Secondly, we are evaluating the effects of changing the elevation mask on the reference stations to see if the there are any dependencies between the elevation mask and performance when there is high ionospheric activity.



Figure 1: RIMS (black) and additional ATB reference stations (yellow) inside the ATB service area

## Summary

This presentation will show results from experiments performed in spring 2016 in connection with the ESA Arctic Testbed project. The results will focus on the changes of EGNOS service at high latitudes during a geomagnetic storm in 2014.

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## References

[1] Pintor P., Roldan R, Gómez J., de la Casa C., Fidalgo R. M. (2015). The impact of the high ionospheric activity in the EGNOS performance. Volume XI, Issue 3.