

# Latest Activities and Developments at the SGF, Herstmonceux

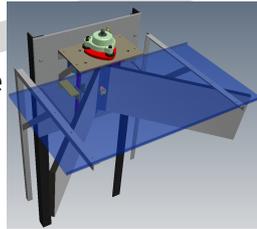
Matthew Wilkinson (matwi@nerc.ac.uk),  
Graham Appleby, Robert Sherwood, Toby Shoobridge,  
José Rodríguez, Victoria Smith, Christopher Potter  
NERC Space Geodesy Facility, Herstmonceux, UK

## Introduction

The NERC Space Geodesy Facility, Herstmonceux operates a high-performance kHz SLR system, with improved acquisition speed, return signal strength and target switching efficiency. In addition, local GNSS and absolute gravimetry measurements, co-located with the SLR station, are collected and site stability is routinely monitored.

## Site-tie and Calibration Survey

A site survey was carried out in 2017 to update the inter-technique site tie vectors between the telescope axis intersection invariant point and the reference markers on the SGF GNSS sites (HERS, HERT and HERO) and the gravimeter floor studs.

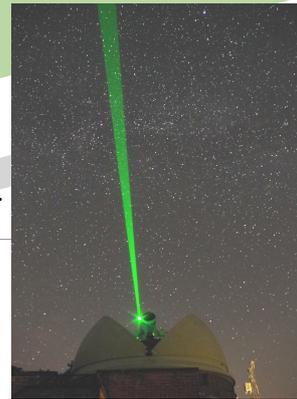


Included in the survey was the distance from the SLR telescope reference to the centre of retro-reflecting targets for terrestrial calibration of the SLR system delay. The SGF team were able to identify errors in the reported results using intimate knowledge of the calibration target design. Upon receiving the revised report, the calibration target distances were updated and agreement was found at the millimetre level with those from the previous survey carried out in 2008 by IGN.

The newly constructed target with a well defined reference point was adopted as the primary SLR calibration target.

## Renewal of Funding

Following a Strategic Review, NERC concluded that it shall continue to support the SGF and that it should be reclassified under the National Capability National Public Good funding stream from April 2018 and no longer be part of NERC's Services & Facilities portfolio. The SGF will continue to be part of and managed by the British Geological Survey (BGS).



## In-sky Safety

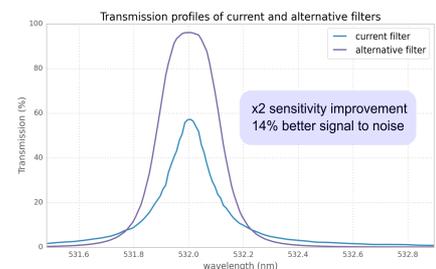
An active radar that tracks with the SLR telescope, an ADS-B receiver and the observer all switch off the laser beam should an aircraft approach the direction of fire. In addition to this, the advantages of an active camera system are being explored.



Predictions for the International Space Station (ISS) were added to the ADS-B listen2planes TCP/IP server so that it will be treated like an aircraft and the laser will be inhibited if it approaches the beam.

## Daytime Filter

A high transmission narrowband spectral filter was installed for daytime operations. It is oven controlled and has a peak transmission of >90%. It was necessary to tilt the optic to both avoid reflections in the range measurements and also to optimise the transmission window to the laser wavelength. After repeated attempts at tuning, only an estimated 50% transmission could be achieved with the optic installed in the receive telescope. This poor performance could be due to the spectral width of the 10ps, kHz laser being larger than the filter band width.



## Space Surveillance and Tracking

The SGF is contracted through the UK Space Agency (UKSA) to take part in European Space Surveillance and Tracking (EUSST) projects and submits passive optical and laser data.

The current funding period runs until the end of 2018 and the planning process for the next phase is underway. The UK is in a difficult position as it is far from clear that it will be able to remain part of the EUSST consortium after the UK leaves the European Union, though this remains an ambition.

## GNSS, Absolute Gravimetry

The SGF operates two International GNSS Service (IGS) reference sites, HERS and HERT. It also hosts a third site, which is an Ordnance Survey (OS) GeoNet 'zero-order' GNSS reference station, named HERO. The HERS site was recently upgraded with a Septentrio PolarRx5TR multi-constellation timing receiver, accepting a 10MHz signal from the SGF active hydrogen maser.

Absolute Gravimetry data has been collected at Herstmonceux since 2006. A Micro-g FG5-X gravimeter is permanently installed in the SGF basement, alongside two legacy FG5 models. A gravity measurement consists of hourly drop sets over a 24 hour period. The SGF has recently started campaign deployments and has visited Eskdalemuir in Scotland, Newlyn in Cornwall, Hartland in Devon and Port of Spain, Trinidad.

