

UPGRADING KHZ SLR AT THE SGF, HERSTMONCEUX. G. Appleby¹, C. Potter¹, J. Rodriguez¹, R. Sherwood¹, T. Shoobridge¹, V. Smith¹, M. Wilkinson¹. ¹NERC Space Geodesy Facility, Herstmonceux, UK, matwi@nerc.ac.uk

Introduction: The SGF, Herstmonceux began kHz operation in 2007 using a 2kHz High Q laser to fire pulses with energy of 0.42mJ and 10ps width. Over the following years, the new set-up has shown to be capable of observing the full ILRS target list but with mixed results, largely below our expectations.

Unfortunately the laser frequently required new optics within the laser bed on a frequent basis due to a very small beam diameter & high energy density in the beam path after the post amplifier. The laser performance improved following several iterations made to the beam path and upgrades to the transmit and receive optics also resulted in improved return signal strength.

A complete redesign of the laser to give increased reliability and pulse energy was agreed and took place at the beginning of 2014. The laser now incorporates all of the pulse energy generation within the regenerative stage and the post amplifier has been completely removed, and instead of Nd:VAN the laser media is now Nd:YAG.

This reworked laser has a reported functionality of being able to switch from one to two kHz without optical realignment and the pulse energy is now 0.7mJ at 2kHz, or 1.1mJ at 1kHz.

Firing the laser in a controlled manner is very important to avoid damage from thermal blooming and to ensure a long lifetime for the laser. A warm up time is required along with continuous triggering at the selected repetition rate to maintain stability. An independent triggering source was built to provide triggers when required: for example between satellite passes, when inhibiting the laser for in-sky safety or when operating with another laser or telescope activity.

SLR at kHz rates is significantly more responsive than low firing rate systems and an automated satellite search and lock system has been developed and is in operation at Herstmonceux with encouraging results for low and high Earth orbiting targets.