INTEGRATED DISRUPTIVE COMPONENTS FOR
2 μM FIBRE LASERS

ISLA

ISLA project newsletter 1

April 2012

ISLA is a project supported by the European Commission under Framework Seven.

Welcome to the first ISLA project newsletter!

Fibre lasers have already had a major impact in the marketplace for laser products. Their small size, flexibility and high power has proved highly desirable and the range of applications is growing all the time, ranging from sensing and measurement to cutting and marking. Most fibre lasers operate at around 1 μm because there are high power pump diodes and an array of technology building blocks developed for erbium-doped fibre amplifiers (EDFAs) which make this a convenient and low cost route to fibre laser sources.

The ISLA consortium believes that fibre lasers emitting radiation at around 2 μm will have an increasingly important role to play in this rapidly expanding market. Two micron fibre lasers offer a clear route to higher power fibre lasers and can be built using established silica fibre technology. The ISLA project will develop an integrated modular common platform of fibre and components to support high power CW SM, Q-switched pulsed and sub-ps pulsed lasers. The prototypes will be tested in two key industrial applications: transparent plastic cutting and PV cell scribing.

In this initial newsletter the key elements of the project are briefly reviewed and the objectives defined. In future newsletters the progress in technology development will be reported. Readers wishing to know more about the project are invited to join the ISLA Advisory Group, which offers an opportunity to help direct the development work and to identify and develop new applications with the consortium.

Consortium

Gooch & Housego (coordinator)

Trinity College Dublin

ORC Southampton

Oclaro Switzerland

ROFIN Sinar Laser

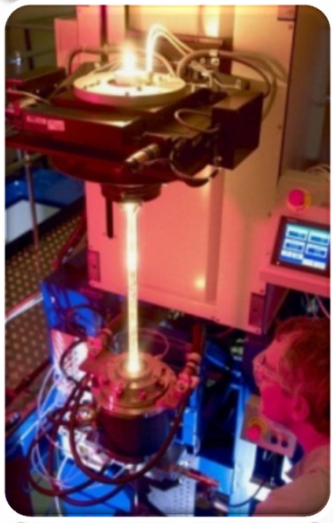
Time-Bandwidth Products

Vivid Components

Coordinator Andrew Robertson arobertson@goochandhousego.com
Admin Bruce Napier bruce@vividcomponents.co.uk

SEVENTH FRAMEWORK PROGRAMME

Rare-earth-doped fibres



ISLA will optimise the core composition to enhance the cross-relaxation process in Tm-doped silica fibres to realise efficiencies close to the theoretical limit. This will require a carefully tailored host core composition to allow the incorporation of a high concentration of rare earth ions and to avoid unwanted parasitic spectroscopic processes.

ISLA will also optimise Ho-doped silica fibres for in-band pumped Ho fibre lasers. A family of compatible fibres will be developed in SM, PM and photo-sensitive variants to provide a broad platform for integrated ISLA devices operating in CW and pulsed modes.

For more info contact Andy Clarkson wac@orc.soton.ac.uk

Fibre-coupled bulk optic components

Isolators: **The weak Verdet constant and high loss of traditional optical isolator materials (*e.g.* TGG; terbium gallium garnet, BIG; bismuth iron garnet) at 2μm make isolators a critical component for 2μm lasers. ISLA will explore newly available materials and new disruptive designs to provide fibre-coupled prototype isolators in the 2 μm region.**

Modulators: **ISLA will develop modulator devices as part of the integrated platform, so that these devices may be combined with other components to simplify design and improve performance. These will include a specialised acousto-optic tunable filter (AOTF) for laser tuning with greatly reduced sidelobes, and several AO modulators for operation at various power levels.**

For more info contact Tim Durrant: tdurrant@goochandhousego.com

Carbon nanotube modelockers

Polymer-carbon nanotube composites offer an exciting disruptive technology for saturable absorber modelockers which may be made using low cost laboratory techniques. These devices offer considerable advantages over SESAMs (semiconductor saturable absorber mirrors), the preferred modelocker technology at 1μm, *e.g.* a much broader tuning range, large absorption cross-section, and fast time constants to support sub-picosecond pulse formation.

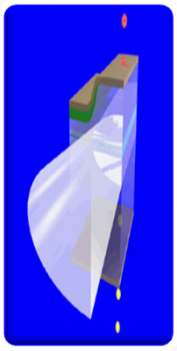
For more info contact Werner Blau wblau@tcd.ie

Fibre-coupled bulk optic components

Using both commercially available fibres and the fibres developed in the project, a set of fused fibre components optimised for the ISLA fibre lasers will be developed for singlemode (SM), multimode (MM) and polarisation maintaining (PM) fibres. These fused components will be developed to provide system elements (*e.g.* taps, WDMs) as well as high power pump combiners (*e.g.* 19×1 combiners, 6+1×1 combiners *etc.)* as an integral part of an integrated common platform.

For more info contact Tom Legg: tlegg@goochandhousego.com

Laser pump diodes



Diodes in the 79x nm range generally suffer from reduced performance and lifetime compared with longer wavelength diodes such as 808 nm or those in the 9xx nm range. The main reason is the higher photon energy leading to increased carrier leakage resulting in high threshold currents and lower efficiency. To overcome these issues, wide bandgap materials containing high amounts of aluminum are required but these result in relatively low brightness pump sources and integration of gratings is difficult compared with the well-established processes for InP devices.

In the ISLA project several novel techniques will be investigated at Oclaro to improve the threshold currents and efficiency of laser diodes at 79x nm. Power levels of 4W and higher from 100µm stripe width are expected during the project; twice that of reported devices to date.

For more info contact Susanne Pawlik: Susanne.Pawlik@oclaro.com

Demonstration fibre lasers

The component and fibre developments made in the ISLA project will be integrated in three demonstration lasers:

1) 500W CW Ho-doped fibre laser for the cutting of selected transparent plastics (without addition of any dyes or additives). The performance will be compared directly with a similar power 1µm reference laser.
2) 20W 10mJ Ho-doped Q-switched fibre laser; its performance will be demonstrated in the scribing of thin film PV panels. Higher scribing speed will be demonstrated for the ISLA 2µm fibre laser compared with a 1µm reference.
3) 100W ps Ho-doped MOPA will explore the potential for scaling short pulse fibre sources in the 2 µm wavelength regime to much higher power levels.

Join the ISLA Advisory Group!

The consortium seeks to build relations with end users of 2 µm fibre lasers, component manufacturers and laser system integrators. If you would like to find out more and be involved with the project please contact Bruce Napier bruce@vividcomponents.co.uk