Grant agreement no: 287732

ISLA

Integrated disruptive componentS
for 2µm fibre LAsers

D6.17 Report on IP, PUDF and
standardisation developments 3

Technical Coordinator: Andrew Robertson
Company: Gooch and Housego (Torquay) Ltd.
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ISLA Ref: ISLA_VIV_200_B_WP6

Leader in charge of deliverable: Bruce Napier
Vivid Components

| Project co-funded by the European Commission within the Seventh Framework Programme |
| Dissemination level |
| PU | Public |
| PP | Restricted to other programme participants (including the Commission Services) |
| RE | Restricted to a group specified by the consortium (including the Commission Services) |
| CO | Confidential, only for members of the consortium (including the Commission Services) |

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<td>Vivid</td>
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Statement of independence

The work described in this document is genuinely a result of efforts pertaining to the ISLA project: any external source is properly referenced.

Confirmation by Author:  Bruce Napier  Vivid Components
Section A: Dissemination measures

PUBLIC

Dissemination has been a key part of ISLA in order to accomplish the long-term project aims, and took place chiefly through the activities of WP6. There have been three areas of dissemination activity, which varied in relative importance during the course of the project:

- **Standards activity** to establish the ISLA technology in an industrial context.
- **ISLA Advisory Group (IAG)** to develop exploitation routes and improve information flow between the consortium and other organisations working on or using 2 µm fibre laser technology.
- **Dissemination activity** to spread information on the objectives and progress of the project to a wide audience. Where appropriate, this was through the normal engineering channels, *e.g.* peer-reviewed journals and conference presentations, but also through a dedicated workshop and the project website.

Standardisation activity

Although excellent progress has been made in ISLA, especially regarding components, the results of the project have not been appropriate for standardisation. It was expected that ISLA would provide input to a number of the key standards committees, for example:

- IEC SC86B WG6 (Interconnect) and WG7 (Passive Components)
- IEC SC86C WG1 (Fibre Optic Sub-systems) and WG4 (Active Components)
- Relevant CENELEC committees
- BSI ACE 6/10 (Fibre Optic Systems & Equipment).

The level of development of 2 µm fibre laser technology, and the uptake by the market, is not at a level which requires standards developments. However, it is emphasised that in broad terms ISLA technology is compatible with existing standards for silica-based fibre devices. It is expected that in the coming years, standards specifically relating to 2 µm lasers will be developed, based on ISLA technology.

Nevertheless, ISLA members Rofin, II-VI and G&H have considerable representation on several of the above committees, and have kept up-to-date with relevant developments. There has been participation in several BSI, IEC and CENELEC committees by G&H in an observational capacity (with respect to ISLA). Bob Musk is a UK National Expert for Fibre Optic interconnect and Active Devices with the BSI. Additionally, there has been participation in the DIN standards committee “NA 027 Normenausschuss Feinmechanik und Optik (NAFuO)” by Rofin in an observational capacity with respect to ISLA.

ISLA Advisory Group (IAG)

Details of the activity of the IAG in the reporting period are given in D6.16. An overview based on the DoW and summary of D6.16 follows.

The ISLA consortium consists of a small group of leading technical companies, but if the project results are to be taken up and exploited by industry, a much wider cross-section of industry must be made aware of the project aims and results. Consequently, a number of these companies have been invited to form an external group; this is the ISLA Advisory Group (IAG).

The IAG has played a key role in the exploitation of the project results. It has built relationships between potential end users in high end markets with the ISLA consortium.
Originally, ISLA targeted two key applications (PV and plastic processing). However, during the course of the project, it became clear that the breakthrough nature of 2 µm fibre laser technology permits many other applications across a broad range of sectors: aerospace, medical, communications, etc. The IAG has helped to identify the application space for the ISLA technology, and built relationships with users of components and lasers. This contact with end-users during the development phase has helped to ensure that the project outputs are well aligned with industrial need and increase the chances of successful exploitation.

The IAG had three phases:

1. Project start
   - Bring technical inputs from a wider industrial group
   - Fully define the initial project requirements
   - Identify potential 2 µm fibre laser applications

2. During the project
   - Receive periodic updates on the project technical progress
   - Interact with the ISLA consortium to provide comments from a wider industrial perspective

3. Project conclusion
   - Enable the recommendations to be supported by a “critical mass”
   - Promote further uptake of the project results.

As discussed in the previous report, the IAG modus operandum was changed during the course of the project based on actual experience and feedback. Work focused on a few partners, the IAG Core Group, to try to build exploitation routes for the ISLA technology.

In this final period of the project effort has been concentrated on growing the IAG by enlisting more interested organisations, but also in developing exploitation routes for ISLA-based products or further research. This is described in ISLA_VIV_204_A_WP6 (D6.16 Final ISLA Advisory Group activity report). There are currently (13-Aug-2015) two hundred and six members of the IAG with nine active members of the core group. As expected, the organisations fall into several groups:

<table>
<thead>
<tr>
<th>Category</th>
<th>9M</th>
<th>18M</th>
<th>45M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component manufacturer</td>
<td>3</td>
<td>14</td>
<td>21</td>
</tr>
<tr>
<td>Laser/ system integrator</td>
<td>11</td>
<td>21</td>
<td>44</td>
</tr>
<tr>
<td>End user</td>
<td>5</td>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td>Academia</td>
<td>14</td>
<td>31</td>
<td>63</td>
</tr>
<tr>
<td>Research organisation</td>
<td>6</td>
<td>22</td>
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<tr>
<td>Other</td>
<td>2</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>41</td>
<td>101</td>
<td>206</td>
</tr>
</tbody>
</table>

The IAG is open to any organisation (IND, GOV or SME, public or private) willing to contribute to the project. In particular end users have been encouraged to join.
Dissemination activity

Website

A website was established in the first few weeks of the project start. The appearance of the site was updated in Apr-2012 in line with the other presentation material (leaflets, banners etc.: see below). A complete overhaul of both the public and private sites was implemented in Feb-2013. This format has been maintained throughout the remainder of the project.

This website (www.isla-project.eu) summarises non-confidential aspects of the work, the philosophy of the project, and details of the consortium. The website is publicised with links from all the members’ individual websites, as well as through all the project literature. It has been kept updated throughout the project.

There are many ISLAs and ISLA projects, including the film star Isla Fisher and the International Surf Lifesaving Association. In late 2013 the International Society for Medical Laser Applications was established (www.isla-laser.org) which has not helped the project on Google. However, due to the cross-links from other sites, the frequent updates and careful choice of keywords, the project has scored well on Google searches throughout the project.

Table 1: ISLA website Google search results @9M → @18M → @45M (Not including advertised links.)

<table>
<thead>
<tr>
<th>Search term</th>
<th>google.com</th>
<th>google.de</th>
<th>google.co.uk</th>
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<tr>
<td>ISLA FP7</td>
<td>1→1</td>
<td>1→1</td>
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<tr>
<td>ISLA project</td>
<td>1→1</td>
<td>1→1</td>
<td>1→1</td>
</tr>
<tr>
<td>ISLA fibre laser</td>
<td>1→1</td>
<td>1→1</td>
<td>1→1</td>
</tr>
</tbody>
</table>

Figure 1 Screenshot of the new ISLA website homepage in Jul-2015
The website has a simple structure: a homepage with links to the following pages:

- Consortium: with links to the members’ webpages
- Links: to other relevant FP7 projects
- Events: relating to the project (including info on ISLA attendees & presenters)
- Background: Overview of the project objectives and rationale.
- Public docs: Outputs from the project for download (newsletter, presentation etc.)
  - New pages on the project outputs were added in the final year
    - Publications: details of journal and conference papers
    - Workshop: information on the D6.15 Munich workshop event

The site includes an RSS feed to send information to the subscribers.

**Figure 2** Graphs showing number of site visits per day (not including search engine robots) 01-Mar-2014 to the end of the project (c. >100 visits/day).

**Conference presentations**
Throughout the project ISLA presented key technical progress at major laser and photonics conferences e.g. Photonics Europe, FiSC (International Workshop on Fiber Lasers) etc. In this reporting period there have been several such presentations. For completeness all such events are listed below:

**M1-M9**

- **IWNBP (22-28 Oct-2011; St Germain au Mont d’Or, France):** Prof. Werner Blau (TCD) gave an invited talk and presentation of preliminary project results at the International Workshop on Nano and Bio-Photonics
- **Monabiphot (21-23 Jun-2012; Giens, France):** Prof. Blau and his co-workers presented ISLA material at the Molecular Nano- and Biophotonics Conference

**M9-M18**

- **NPO 2012 (29-Jul to 04-Aug-2012; Polvijärvi, North Karelia, Finland):** TCD presented ISLA material at the International Workshop Nanocarbon Photonics and Optoelectronics

• **Nanoweek (14-18 Sep-2012; TCD, Dublin, Ireland):** Aidan Murray poster on “Graphene Based Materials for Non-Linear Applications and Ultrafast Laser Applications” at CRANN

• **"Thesis-in-3" (25-Oct-2012; TCD, Dublin, Ireland):** Aidan Murray presentation on ISLA

• **LASE 2013, Photonics West 2013 (02-07 Feb-2013; San Francisco, USA):** ORC attended and presented a paper on ISLA topics at this conference (part of Photonics West 2013) entitled, “Electronically controllable mode selection in a multimode fiber” (J. M. O. Daniel and W. A. Clarkson, paper 8601-22)

• **CLEO/Europe-IQEC 2013 (12-16 May-2013; Munich, Germany):** ORC presented two ISLA-related papers at this major international Conference on Lasers and Electro-Optics (CLEO).
  o “Ultra-broadband Wavelength Swept Tm-doped Fibre Laser” (M. Tokurakawa, J.M.O. Daniel, C.S. Chenug, H. Liang and W. A. Clarkson, paper CJ-7.5) [http://dx.doi.org/10.1109/CLEOE-IQEC.2013.6801346](http://dx.doi.org/10.1109/CLEOE-IQEC.2013.6801346)
  o “Bandwidth-Controllable Tunable Q-Switched Thulium Fibre Laser” (J.M.O. Daniel and W.A. Clarkson; paper CJ-10.2) [http://dx.doi.org/10.1109/CLEOE-IQEC.2013.6801300](http://dx.doi.org/10.1109/CLEOE-IQEC.2013.6801300)

• **Graphene Week 2013 (02-07 Jun-2013; Chemnitz, Germany)**
  o “Graphene Based Materials for Non-Linear Applications and Ultrafast Laser Applications”
    - Poster
    - Aidan Murray (TCD)

• **WONTON 2013 (16-20 Jun-2013; Santa Fe, NM, USA)**
  o 5th International Workshop on Nanotube Optics and Nanospectroscopy
  o “Graphene Based Materials for Non-Linear Applications and Ultrafast Laser Applications”
    - Poster
    - Aidan Murray (TCD)

• **WSOF 2013 (28-30 Aug-2013; Sigtuna, Sweden)**
  o 3rd Workshop on Specialty Optical Fibers and their Applications.
  o ISLA tabletop exhibition space
    - Bruce Napier (Vivid) and Gary Stevens (G&H)
  o "Specialty Doped Fibres in High Power Lasers”
    - Invited paper T2.2: [http://dx.doi.org/10.1364/WSOF.2013.T2.2](http://dx.doi.org/10.1364/WSOF.2013.T2.2)
    - Jayanta Sahu (ORC)

• **NANOSMAT (22-25 Sep-2013; Granada, Spain)**
  o 8th International Conference on Surfaces, Coatings and Nano-Structured Materials
  o “Nanocarbon Materials and Composites for Photonics and Optoelectronics.”
    - Keynote paper
    - Werner Blau (TCD)
ICAPP 2013 (14-15 Nov-2013; Keio University, Japan)
  o 2nd International Conference on Advanced Photonic Polymers
  o "Ultrafast NLO in nanocarbon polymer composites"
    • Invited paper
    • Werner Blau (TCD)

Photonics West 2014 (01-06 Feb-2014; San Francisco, USA)
  o "High power pump laser diodes for 2 µm fibre laser"
    • Proc. SPIE 8965, 89650R (2014): http://dx.doi.org/10.1117/12.2040141
    • Susanne Pawlik (II-VI)

FISC 2014 (27-28 Feb-2014; Dresden, Germany)
  o International Laser Symposium Fiber & Disc 2014
  o "High power fibre laser components for 2 µm applications"
    • Paper
    • Gary Stevens (G&H)
  o ISLA also had a booth exhibition space at this event
    • Bruce Napier (Vivid)

Photonics Europe 2014 (14-17 Apr-2014; Brussels, Belgium)
  o "Fibre laser component technology for 2-micron laser systems"
    • Proc. SPIE 9135, 91350N: http://dx.doi.org/10.1117/12.2054511
    • Gary Stevens (G&H)
  o ISLA also had a booth in the "Innovation Village"
    • Bruce Napier (Vivid)

MRS Spring Meeting (21-25 Apr-2014; San Francisco, USA)
  o "Nanocarbon Based Materials for Non-Linear Optical Applications and Ultrafast Laser Applications"
    • Paper JJ2.05
    • Werner Blau (TCD)

CLEO 2014 (08-13 Jun-2014; San José, USA)
  o "Effect of seed linewidth on few-moded fiber amplifiers"
    • Paper: http://dx.doi.org/10.1364/CLEO_SI.2014.STu2N.7
    • Jae Daniel, Nikita Simakov, Peter Shardlow and W. A. Clarkson (ORC)

The World Innovation Conference (15-18 Jun-2014; Washington DC, USA)
  o "Graphene Based Materials for Non-Linear Optical Applications and Ultrafast Laser Applications at 2 Microns"
    • Paper
    • Aidan Murray (TCD)

IEEE Photonics Society Summer Topical Meeting (14-16 Jul-2014; Montréal, Canada)
  o "Few-Mode TDFA for Mode Division Multiplexing at 2µm"
    • Paper: http://dx.doi.org/10.1109/SUM.2014.85
    • Y.Jung, P.C.Shardlow et al. (ORC)

NPO 2014 (28-Jul to 01-Aug-2014; North Karelia, Finland)
  o Fourth International Workshop on Nanocarbon Photonics and Optoelectronics
  o "Rational bottom-up assembly of tailored molecular aggregates on nanocarbon for high sensitivity nonlinear optical and light harvesting applications"
    • Invited paper
    • Werner Blau (TCD)
• Europhoton 2014 (24-29 Aug-2014; Neuchatel, Switzerland)
  o 6th EPS-QEOD Europhoton Conference
  o “Spectrally-tailored thulium-doped fibre amplified spontaneous emission source at two-microns”
    ▪ Poster TuP-T1-P-24
    ▪ A.Billaud, P.C.Shardlow, J.M.O.Daniel, W.A.Clarkson (ORC)

• ISLC 2014 (07-10 Sep-2014; Palma de Mallorca, Spain)
  o 24th International Semiconductor Laser Conference
  o “Recent Progress in Semiconductor Laser for Fiber Laser Applications”
    ▪ Proc. ISLC p. 106-7: http://dx.doi.org/10.1109/ISLC.2014.186
    ▪ Susanne Pawlik (II-VI)

• NANOSMAT 2014 (08-12 Sep-2014; Dublin, Ireland):
  o 9th International Conference on Surfaces, Coatings and Nano-Structured Materials
  o “Carbon-based Nanomaterials and Self-Assembled Nanohybrids as Versatile Materials Platform for Optoelectronics and Nanophotonics”
    ▪ Invited paper
    ▪ Werner Blau (TCD)

• 9-TCS (14-18 Sep-2014; Toruń, Poland)
  o 9th Torunian Carbon Symposium
  o “Carbon Materials in Science and Technology”
    ▪ Invited paper
    ▪ Werner Blau (TCD)

• ECOC 2014 (21-25 Sep-2014; Cannes, France)
  o European Conference on Optical Communication 2014
  o 90 nm gain extension towards 1.7 µm for diode-pumped silica-based thulium-doped fiber amplifiers
    ▪ Paper: http://dx.doi.org/10.1109/ECOC.2014.6964109
    ▪ Z. Li; S. Alam; J. Daniel; P. Shardlow et al. (ORC)

• Photonics West 2015 (07-12 Feb-2015; San Francisco, USA)
  o G&H, JDSU, II-VI and Rofin had booths at this exhibition/conference
  o “Optical Isolators for 2-micron fibre lasers”
    ▪ Proc. SPIE 9346, 93460O: http://dx.doi.org/10.1117/12.2077505
    ▪ Gary Stevens (G&H)

• ICU 2015 (10-15 May-2015; Metz, France)
  o 2015 International Congress on Ultrasonics
  o Matched Pair of AOTFs with Net Zero Frequency-Shift
    ▪ Paper
    ▪ Jon Ward (G&H)

• CLEO Europe 2015 (21-25 Jun-2015; Munich, Germany)
  o Conference on Lasers and Electro-Optics
  o “Null-frequency-shift acousto-optic tunable filter for wavelength tuning of a Tm fibre laser”
    ▪ Paper CJ-14.6
    ▪ Peter Shardlow (ORC), Jon Ward (G&H) et al.
  o “Optimising Tm-Doped Silica Fibres for High Lasing Efficiency”
    ▪ Paper CJ-14.3
    ▪ P. Shardlow, D. Jain, R. Parker, J. Sahu, W. A. Clarkson (ORC)
Planned

- **Photonics West 2016 (16-18 Feb-2016; San Francisco, USA)**
  - Dedicated ISLA session invited within conference LA105 “Components and Packaging for Laser Systems”
  - At the time of writing, four papers have been submitted on the following topics for 2 µm fibre lasers, as discussed with the conference chair (Alexei Glebov)
    - ISLA overview and passive components [Invited]; Gary Stevens (G&H)
    - Active components; Jon Ward (G&H)
    - Modelockers; Werner Blau (TCD)
    - Fibre; Andy Clarkson (ORC)
  - Session to be chaired by Bruce Napier (Vivid)

Trade shows and exhibitions

Members exhibiting at trade shows publicised the project throughout: *e.g.* Laser World of Photonics; Photonics West *etc.* In this reporting period there have been several such presentations. For completeness all such events are listed below:

**M1-M9**
- **Photonics Europe (16-18 Apr-2012; Brussels):** ISLA had a tabletop display at attended by Bruce Napier (Vivid), Mia Swain (G&H) and Toby Woodbridge (G&H). This was a very useful dissemination event: a three day event consisting of a trade show and poster session alongside a major scientific conference. ISLA had a tabletop in the “Innovation Village” alongside a number of other FP7 projects.

**M9-M18**
- **LASYS (12-14 Jun-2012; Stuttgart, Germany):** TBP had a booth and distributed ISLA leaflets at the International Trade Fair for Laser Material Processing
- **SPIE Security & Defence (24-27 Sep-2012; Edinburgh, UK):** G&H had a booth and distributed ISLA leaflets at this trade show/ conference.
- **Photonics West 2013 (02-07 Feb-2013; San Francisco, USA):** G&H, TBP and ROFIN all had booths at this major event and distributed ISLA flyers.
- **Laser World of Photonics (13-16 May-2013; Munich, Germany):** G&H, TBP and ROFIN all had booths at this major event and distributed ISLA flyers.

**M19-45**
- **CLEO 2013 (09-14 Jun-2013; San Jose, USA)**
  - 2013 Conference on Lasers and Electro-Optics
  - JDSU had a booth at this event
  - Bojan Resan (JDSU) held discussions with key CREOL researchers Profs. Martin Richardson & Konstantin Vodopyanov on 2 µm applications.
- **ICT 2013 (06-08 Nov-2013; Vilnius, Lithuania)**
  - ISLA had a booth exhibition space at this event
    - Bruce Napier (Vivid)
- **Photonics West 2014 (01-06 Feb-2014; San Francisco, USA)**
  - G&H, JDSU and ROFIN all had booths at this major event, and distributed project flyers.
• **FISC 2014 (27-28 Feb-2014; Dresden, Germany)**
  o International Laser Symposium Fiber & Disc 2014
  o ISLA also had a booth exhibition space at this event
    - Bruce Napier (Vivid)

• **Photonics Europe 2014 (14-17 Apr-2014; Brussels, Belgium)**
  o ISLA had a booth in the “Innovation Village”
    - Bruce Napier (Vivid)

• **Photonics West 2015 (07-12 Feb-2015; San Francisco, USA)**
  o G&H, JDSU and ROFIN all had booths at this major event, and distributed project flyers.

• **Laser World of Photonics (22-25 Jun-2015; Munich, Germany)**
  o G&H, JDSU and ROFIN all had booths at this major event, and distributed project flyers.
  o “ISLA-Two micrometer Sources and Toolset for Enhanced Material Processing”
    - Presentation at “Advanced Manufacturing and Photonics for Production” joint EC-funded project session
    - Andrew Robertson (G&H)

**Publications**
Throughout ISLA, as appropriate, papers were submitted to academic journals, e.g. Journal of Lightwave Technology, Applied Optics, Electronics Letters, etc. For completeness all refereed papers are listed below:

M1-M9
- Prof. Werner Blau (TCD) co-edited a special issue and wrote the editorial of the OSA Optical Materials Express on Nanocarbon Photonics
- “Feature issue introduction: nanocarbon for photonics and optoelectronics,”
  - Werner Blau (TCD)
  - [http://dx.doi.org/10.1364/OME.2.000891](http://dx.doi.org/10.1364/OME.2.000891)

M9-M18
- “Nonlinear Properties of Graphene Dispersions and Thin Films at a Wavelength of 1.2 µm”
  - Journal of Nanoelectronics and Optoelectronics 8, 1, pg. 23-27 (Jan-2013)
  - Aidan Murray and Werner Blau (TCD)
  - [http://dx.doi.org/10.1166/jno.2013.1425](http://dx.doi.org/10.1166/jno.2013.1425)

M19-M45
- “Controllable broadband nonlinear optical response of graphene dispersions by tuning vacuum pressure”
  - Xin Cheng…Werner J. Blau et al. (TCD)
  - Optics Express 21, p16486-16493 (2013)
  - [http://dx.doi.org/10.1364/OE.21.016486](http://dx.doi.org/10.1364/OE.21.016486)
- “Ag-stabilized few-layer graphene dispersions in low boiling point solvents for versatile nonlinear optical applications”
  - Zhenyu Sun, Ningning Dong, Kangpeng Wang et al. (TCD)
  - [http://dx.doi.org/10.1016/j.carbon.2013.06.010](http://dx.doi.org/10.1016/j.carbon.2013.06.010)
• “Hybrid Plasmonic Nanostructures with Unconventional Nonlinear Optical Properties”
  o Yong Zhang, Jing Jing Wang, Kyle E. Ballantine, Paul R. Eastham and Werner J. Blau (TCD)
  o Advanced Optical Materials 2, p. 331-337 (2014)
  o http://dx.doi.org/10.1002/adom.201300503

• “First demonstration of a 2µm few-mode TDFA for mode division multiplexing”
  o Y. Jung, P. C. Shardlow…J. K. Sahu, W. A. Clarkson et al. (ORC)
  o Optics Express 22, p. 10544-10549 (2014)
  o http://dx.doi.org/10.1364/OE.22.010544

• “Tunable effective nonlinear refractive index of graphene dispersions during the distortion of spatial self-phase modulation”
  o G. Wang, S. Zhang…W. J. Blau et al. (TCD)
  o http://dx.doi.org/10.1063/1.4871092

• “Saturable absorption behavior of free-standing graphene polymer composite films over broad wavelength and time ranges”
  o Yanyan Feng, Ningning Dong…Werner J. Blau et al. (TCD)
  o Optics Express 23, p. 559 (2015)
  o http://dx.doi.org/10.1364/OE.23.000559

• “Ultra-short wavelength operation of a thulium fibre laser in the 1660–1750 nm wavelength band”
  o J. Daniel, N. Simakov, M. Tokurakawa, M. Ibsen & W. A. Clarkson (ORC)
  o Optics Express 23, p. 18269 (2015)
  o http://dx.doi.org/10.1364/OE.23.018269

Other

Workshop (see D6.15)
A workshop was held on FRI 26-Jun-2015 at the Räter Park Hotel (Munich, Germany) to present the results of the ISLA project. This full-day event consisted of a set of seven technical presentations from the ISLA consortium summarising the outcomes from the project, and a set of seven presentations from guest speakers on applications for 2 µm lasers.

The event was held on the day following the Laser World of Photonics exhibition in Munich to maximise the number and quality of attendees.

The target attendance was 50 people, and the event was fully booked.

The workshop was a big success: the quality of presentations from both ISLA partners and guests was outstanding. Many visitors commented that it was a particularly useful and interesting day.

As a direct result of the workshop, ISLA was invited to have a dedicated session on the project at Photonics West 2016 (San Francisco, USA; Feb-2016); see above.

Slides from the workshop are available from the project public website:
http://isla-project.eu/outputs/isla-workshop/

[For confidentiality reasons, some of the guest presenters’ slides are not available.]
Newsletters
Public newsletters were published and distributed throughout the project (through WP6) containing public domain material on the progress of the project. They were sent to the distribution list (>200 experts) and put on the website.

The style and appearance is the same as that used for the leaflets (D6.5) and the website, and was used throughout the project to give ISLA a consistent and recognisable image. These newsletters were issued approximately every six months. For consistency a summary of each newsletter is listed below:

- #6 (Jul-2015) D6.22: This newsletter is a summary of all ISLA components and laser development
- #5 (Oct-2014) D6.14: Topics: high power isolator and combiner testing, graphene modelockers and rare earth fibres
- #3 (Apr-2013) D6.11: Topics: new packaging for the G&H high power combiner, ORC Tm- and Ho-doped fibres, G&H isolator development
- #2 (Oct-2012) D6.9: Topics: update on G&H fused components (combiners and PM devices) and some background on fibre development at ORC
- #1 (Apr-2012) D6.6: The first ISLA newsletter gave an overview of the project, covering all the technical WPs.

Banners and leaflets
Several forms of promotional material were produced through the WP6 activities to promote the project to appropriate areas of industry: promotional leaflets at the start (D6.5) and end of the project (D6.18) and a technology transfer document targeting engineers (D6.19).

The leaflets (glossy copies and pdf) are available for use throughout the project at trade shows and exhibitions and have been distributed at many major events (see above).

Two 2 m banners were also purchased based on this design (each was based on one side of the leaflet). These banners were used at a number of ISLA events: (New banners were ordered in M31 to update the content in line with project progress)

- Photonics Europe 2012 (Brussels 16-18 Apr-2012)
- WSOF2013 (28-30 Aug-2013; Sigtuna, Sweden)
- ICT 2013 "Create, Connect, Grow" (06-08 Nov-2013; Vilnius, Lithuania)
- FISC 2014 (27-28 Feb-2014; Dresden, Germany)
- Photonics Europe 2014 (14-17 Apr-2014; Brussels, Belgium)

The banners were on display in the conference room at G&H (Torquay) when not in use.

Press releases
Two press releases, at the start (D6.1) and end of the project (D6.20) were issued as planned.
Project presentation & fact sheet
A 20-slide overview of the project is available for download from the public website, which was available for use by the consortium at appropriate events. This document could be used at short notice by the consortium whenever there an opportunity arose to give a presentation on the project, e.g. Peter Shardlow (ORC) at the Apr-2013 COST IC1101 Action Group meeting (Free Space Communications) and Aidan Murray at NPO 2012.

Video
A short video describing the aims and objectives of the project was produced and put online (both on YouTube and directly available from the public website). This video is described in ISLA_VIV_106_A_WP6 D6.4 Project video.

Day-to-day dissemination
All partners have been encouraged to disseminate information on their participation in the project through their usual industrial activities: from conversations at trade shows and links from the organisation website down to discussions during customer visits. In this way, given the active and high profile of the consortium members within the laser and photonics industries, news of the project was spread across a wide relevant audience.

This interaction has included forging links with several related FP7 projects.

- **COST IC1101 Action Group (Free Space Communications):** Following an initial contact through exchange of newsletters, ISLA was invited to present at the COST IC1101 annual meeting (Prague, Czech Republic; 25-26 Apr-2013), at which Dr. Peter Shardlow (ORC) gave the ISLA presentation, and further information on fibres for the 2 µm regime. This has led to further interactions with COST members.
  - An article on ISLA was included in the Autumn 2013 COST IC1101 magazine.
  - Discussions with Prof. Roger Green, Dr. Murat Uysal and Prof. Fary Ghassemlooy continued throughout the project, although due to the slow progress on the lasers, the planned trials to test a 2 µm free space link could not be undertaken.
  - Following these discussions, another COST IC1101 member, Florian Moll (DLR: Deutsches Zentrum für Luft- und Raumfahrt e.V.) was one of the guest speakers at the ISLA workshop D6.17. He presented on the potential for free space communications using 2 µm.

- **LIFT (Leadership in Fibre Lasers Technology)** Several members of the large LIFT consortium are also in ISLA (G&H, ROFIN, II-VI, JDSU), which ensured close interaction of the projects. There are mutual links on the websites.
  - There was a proposal for joint testing work in WP5 by Fraunhofer IWS (Dresden, Germany), which is interested in both scribing PV cells and cutting/drilling/structuring carbon fibre reinforced material with ISLA demo lasers (WP5). Due to the delays to the final ISLA lasers this could not be carried out. However, discussions continue beyond the end of the project.
  - Dr. Lasse Leick (NKT Photonics) spoke at the ISLA workshop on 2 µm fibre lasers as pumps for mid-IR supercontinuum sources.
• IMPROV (Innovative Mid-infrared high power source for Resonant ablation of Organic based photoVoltaic devices). Mutual links to websites are established and the projects share some results and dissemination activity.
  o Dr. Eric Lallier (Thales TRT) spoke at the ISLA workshop on 2 µm lasers for MIR frequency conversion.

• MODE-GAP (Multi-mode capacity enhancement with photonic band-gap fibre); ORC is a member of both MODE-GAP and ISLA. Following a meeting at ORC in the first reporting period, it was agreed to have mutual links on the websites and continue to exchange information.
  o ORC also has pages on its website for both ISLA and MODE-GAP.
  o Prof. David Richardson (ORC) spoke at the ISLA workshop on communication techniques using 2 µm fibre.
# A1: List of all scientific (peer reviewed) publications

<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
<th>Main author</th>
<th>Title of the periodical or the series</th>
<th>Date</th>
<th>Publisher</th>
<th>Place of publication</th>
<th>Year of publication</th>
<th>Relevant pages</th>
<th>Permanent identifiers</th>
<th>Open access?</th>
<th>Comments</th>
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<tr>
<td>1</td>
<td>Feature issue introduction: nanocarbon for photonics and optoelectronics</td>
<td>Werner Blau</td>
<td>Optical Materials Express</td>
<td>01-Jun-12</td>
<td>OSA</td>
<td>Online</td>
<td>2012</td>
<td>891-2</td>
<td>dx.doi.org/10.1364/OE.2008891</td>
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<td>7</td>
<td>First demonstration of a 2μm few-mode T DFA for mode division multiplexing</td>
<td>Y. Yung</td>
<td>Optics Express</td>
<td>05-May-14</td>
<td>OSA</td>
<td>US</td>
<td>2014</td>
<td>Vol. 22, pp. 10544-10549</td>
<td><a href="http://dx.doi.org/10.1364/OE.22.010544">http://dx.doi.org/10.1364/OE.22.010544</a></td>
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<td>8</td>
<td>Saturable absorption behavior of free-standing graphene polymer composite films over broad wavelength and time ranges</td>
<td>Y. Feng</td>
<td>Optics Express</td>
<td>12-Jan-15</td>
<td>OSA</td>
<td>US</td>
<td>2015</td>
<td>Vol. 23, pp 559</td>
<td><a href="http://dx.doi.org/10.1364/OE.23.000599">http://dx.doi.org/10.1364/OE.23.000599</a></td>
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<td>G&amp;H</td>
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<td>Vivid</td>
<td>Public ISLA website</td>
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<td>Online</td>
<td>Scientific community; industry</td>
<td>&gt;3000 visits/ month mid-2013</td>
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<td>Vivid</td>
<td>Project mentioned in optics.org article</td>
<td>27-Nov-11</td>
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<td>Short article on project start in Laser Focus World</td>
<td>06-Dec-11</td>
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<td>Short article on project start in Industrial Laser Solutions</td>
<td>06-Dec-11</td>
<td>Magazine/ online</td>
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<td>10000?</td>
<td>Worldwide</td>
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<td>Articles in popular press</td>
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<td>Short article on project start in Electro Optics</td>
<td>19-Dec-11</td>
<td>Magazine/ online</td>
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<td>Vivid</td>
<td>Short article on project start in Photonics.com</td>
<td>19-Dec-11</td>
<td>Magazine/ online</td>
<td>Scientific community; industry</td>
<td>10000?</td>
<td>Europe</td>
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<td>Articles in popular press</td>
<td>Vivid</td>
<td>Short article on project start in Photonik</td>
<td>17-Jan-12</td>
<td>Online</td>
<td>Scientific community; industry</td>
<td>10000?</td>
<td>Worldwide</td>
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<td>Presentation</td>
<td>TCD</td>
<td>ISLA_VIV_029_A_WP6 Proj background- Nanocarbon NLO Presentation on CNFs for non-linear optics put on website</td>
<td>14-Feb-12</td>
<td>Online</td>
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<td>Articles in popular press</td>
<td>Vivid</td>
<td>Short article on project start in Biophotonics</td>
<td>20-Feb-12</td>
<td>Magazine/ online</td>
<td>Scientific community; industry</td>
<td>10000?</td>
<td>Worldwide</td>
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<td>ISLA_VIV_027_D_WP6 D6.2 Project presentation</td>
<td>27-Feb-12</td>
<td>Online</td>
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<td>Vivid</td>
<td>Short article on project start in EuroPhotonics</td>
<td>01-Mar-12</td>
<td>Magazine/ online</td>
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<td>Articles in popular press</td>
<td>Vivid</td>
<td>Short article on project start in Laser &amp; Photonics</td>
<td>01-Mar-12</td>
<td>Magazine/ online</td>
<td>Scientific community; industry</td>
<td>10000?</td>
<td>Worldwide</td>
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<td>17</td>
<td>Flyers</td>
<td>Vivid</td>
<td>ISLA_VIV_041_A_WP6 D6.5 Proj promotional leaflet Short article on project start in Photonics Spectra</td>
<td>05-Apr-12</td>
<td>N/A</td>
<td>Scientific community; industry</td>
<td>2500 copies</td>
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<td>Posters</td>
<td>Vivid</td>
<td>Two banners based on D6.5 leaflet</td>
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<td>?</td>
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<td>19</td>
<td>Articles in popular press</td>
<td>Vivid</td>
<td>Short article on project start in Photonics Spectra</td>
<td>13-Apr-12</td>
<td>Magazine/ online</td>
<td>Scientific community; industry</td>
<td>90000 copies</td>
<td>Worldwide</td>
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<td>20</td>
<td>Other</td>
<td>Vivid</td>
<td>Short article on project start in EPIC newsletter</td>
<td>13-Apr-12</td>
<td>Magazine/ online</td>
<td>Scientific community; industry</td>
<td>200</td>
<td>Europe</td>
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<td>21</td>
<td>Exhibition</td>
<td>Vivid</td>
<td>Photonics Europe 2012: tabletop exhibition space</td>
<td>14-Apr-12</td>
<td>Brussels, Belgium</td>
<td>Scientific community; industry</td>
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<td>Worldwide</td>
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<td>22</td>
<td>Other</td>
<td>Vivid</td>
<td>First newsletter released D6.6 (ISLA_VIV_042_A_WP6)</td>
<td>24-Apr-12</td>
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<td>Scientific community; industry</td>
<td>100</td>
<td>Worldwide</td>
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<td>23</td>
<td>Other</td>
<td>ORC</td>
<td>Meeting at ORC (with G&amp;H &amp; Vivid) with MODE-GAP ORC researchers (Jonathon Price and Alex Heidt)</td>
<td>17-May-12</td>
<td>Southampton, UK</td>
<td>Scientific community; industry</td>
<td>15</td>
<td>UK</td>
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<td>24</td>
<td>Other</td>
<td>Vivid</td>
<td>Discussion with IMPROV re collaboration and joint research</td>
<td>18-May-12</td>
<td>Online</td>
<td>Scientific community; industry</td>
<td>15</td>
<td>Europe</td>
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<td>25</td>
<td>Exhibition</td>
<td>TBP</td>
<td>TBP booth and distributed ISLA leaflets at the International Trade Fair for Laser Material Processing LASYS</td>
<td>12-Jun-12</td>
<td>Stuttgart, Germany</td>
<td>Scientific community; industry</td>
<td>1000?</td>
<td>Worldwide</td>
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<td>26</td>
<td>Conference</td>
<td>TCD</td>
<td>Molecular Nano- and Biophotonics Conference (Monabiphoto): ISLA presentation</td>
<td>21-Jun-12</td>
<td>Hyeres, France</td>
<td>Scientific community</td>
<td>100?</td>
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<td>27</td>
<td>Website</td>
<td>Vivid</td>
<td>Website updated in line with comments from 9M review</td>
<td>10-Jul-12</td>
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<td>28</td>
<td>Conference</td>
<td>TCD</td>
<td>International Workshop Nanocarbon Photonics and Optoelectronics (NP0 2012): ISLA presentation &amp; associated paper</td>
<td>29-Jul-12</td>
<td>Polvijärvi, Finland</td>
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<td>Conference</td>
<td>TCD</td>
<td>Nanowork at CRANN: ISLA poster</td>
<td>14-Sep-12</td>
<td>TCD, Dublin, Ireland</td>
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<td>24-Oct-12</td>
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<td>G&amp;H</td>
<td>San Francisco, USA</td>
<td>Photonics West 2013: booth; ISLA flyers distributed</td>
<td>02-Feb-13</td>
<td>San Francisco, USA</td>
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<td>Photonics West 2013: booth; ISLA flyers distributed</td>
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<td>02-Feb-13</td>
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<td>37</td>
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<td>San Francisco, USA</td>
<td>Photonics West 2013: ISLA flyers distributed; presentation on ISLA material</td>
<td>02-Feb-13</td>
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<td>25-Apr-13</td>
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<td>ISLA video online &amp; on YouTube</td>
<td>06-May-13</td>
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<td>Munich, Germany</td>
<td>Laser World of Photonics: booth; ISLA flyers distributed</td>
<td>13-May-13</td>
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<td>44</td>
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<td>CLEO Europe 2013: ISLA flyers distributed; and ISLA-related papers presented (1 of 2)</td>
<td>13-May-13</td>
<td>Munich, Germany</td>
<td>Scientific community; industry</td>
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<td>ORC</td>
<td>Munich, Germany</td>
<td>ISLA flyer distributed; two ISLA-related papers presented (2 of 2)</td>
<td>13-May-13</td>
<td>Munich, Germany</td>
<td>Scientific community; industry</td>
<td>2000?</td>
<td>Worldwide</td>
<td></td>
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<tr>
<td>46</td>
<td>Website</td>
<td>Online</td>
<td>Agreement with Lift project to put mutual links on websites</td>
<td>15-May-13</td>
<td>Online</td>
<td>Scientific community; industry</td>
<td>30</td>
<td>Online</td>
<td></td>
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<tr>
<td>47</td>
<td>Vivid</td>
<td>Online</td>
<td>Newsletter #3 distributed and online</td>
<td>21-May-13</td>
<td>Online</td>
<td>Scientific community; industry</td>
<td>100</td>
<td>Worldwide</td>
<td></td>
<td></td>
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<tr>
<td>48</td>
<td>TCD</td>
<td>Chemnitz, Germany</td>
<td>Poster presented at Graphene Week 2013</td>
<td>02-Jun-13</td>
<td>Chemnitz, Germany</td>
<td>Scientific community; industry</td>
<td>500</td>
<td>Worldwide</td>
<td></td>
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<tr>
<td>49</td>
<td>TBP</td>
<td>San Jose, USA</td>
<td>Booth at 3rd Workshop with project literature</td>
<td>09-Jun-13</td>
<td>San Jose, USA</td>
<td>Scientific community; industry</td>
<td>500</td>
<td>Worldwide</td>
<td></td>
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<tr>
<td>50</td>
<td>Worksho</td>
<td>Santa Fe, NM, USA</td>
<td>ISLA tabletop at 3rd Workshop on Nanotube Optics and Nanospectroscopy (WONTON 2013)</td>
<td>16-Jun-13</td>
<td>Santa Fe, NM, USA</td>
<td>Scientific community; industry</td>
<td>200</td>
<td>Worldwide</td>
<td></td>
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<tr>
<td>53</td>
<td>ORC</td>
<td>N/A</td>
<td>ISLA article in COST ICT1011 Newsletter Fall 2013 (following Peter Shardlow presentation)</td>
<td>02-Sep-13</td>
<td>N/A</td>
<td>Scientific community; industry</td>
<td>500</td>
<td>Worldwide</td>
<td></td>
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<tr>
<td>54</td>
<td>TCD</td>
<td>Granada, Spain</td>
<td>Werner Blau keynote paper on ISLA at NANOSMAT &quot;Nanocarbon Materials and Composites for Photonics and Optoelectronics&quot;</td>
<td>22-Sep-13</td>
<td>Granada, Spain</td>
<td>Scientific community; industry</td>
<td>500</td>
<td>Worldwide</td>
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<tr>
<td>55</td>
<td>Vivid</td>
<td>Vilnius, Lithuania</td>
<td>ISLA booth at ICT 2013 exhibition &quot;Create, Connect, Grow&quot;</td>
<td>06-Nov-13</td>
<td>Vilnius, Lithuania</td>
<td>Scientific community; industry</td>
<td>500</td>
<td>Europe</td>
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<tr>
<td>#</td>
<td>Type</td>
<td>Organiser</td>
<td>Title</td>
<td>Date</td>
<td>Location</td>
<td>Attendance</td>
<td>Region</td>
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<td>57</td>
<td>Other</td>
<td>Vivid</td>
<td>ISLA Newsletter #4 (D6.13) sent to distribution list &amp; put on website</td>
<td>03-Dec-13</td>
<td>Online</td>
<td>?</td>
<td>Online</td>
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<tr>
<td>58</td>
<td>Exhibition</td>
<td>G&amp;H</td>
<td>Booth at Photonics West 2014 with ISLA material</td>
<td>01-Feb-14</td>
<td>San Francisco, US</td>
<td>500</td>
<td>Worldwide</td>
<td></td>
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<tr>
<td>59</td>
<td>Exhibition</td>
<td>Rofin</td>
<td>Booth at Photonics West 2014 with ISLA material</td>
<td>01-Feb-14</td>
<td>San Francisco, US</td>
<td>500</td>
<td>Worldwide</td>
<td></td>
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<tr>
<td>60</td>
<td>Conference</td>
<td>Ódaro</td>
<td>Paper presented &quot;High power pump laser diodes for 2 um fibre laser&quot;</td>
<td>01-Feb-14</td>
<td>San Francisco, US</td>
<td>100</td>
<td>Worldwide</td>
<td></td>
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<tr>
<td>61</td>
<td>Conference</td>
<td>Vivid</td>
<td>ISLA joint booth with HALO project at FISC 2014 (International Laser Symposium 2014)</td>
<td>27-Feb-14</td>
<td>Dresden, Germany</td>
<td>200</td>
<td>Europe</td>
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<tr>
<td>62</td>
<td>Conference</td>
<td>G&amp;H</td>
<td>Gary Stevens paper &quot;High power fibre laser components for 2um applications&quot; at FISC 2014 (International Laser Symposium 2014)</td>
<td>27-Feb-14</td>
<td>Dresden, Germany</td>
<td>200</td>
<td>Europe</td>
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<tr>
<td>63</td>
<td>Other</td>
<td>Vivid</td>
<td>New updated banners ordered</td>
<td>01-Apr-14</td>
<td>N/A</td>
<td>?</td>
<td>N/A</td>
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<tr>
<td>64</td>
<td>Conference</td>
<td>G&amp;H</td>
<td>Photons Europe paper; “Fibre laser component technology for 2-micron laser systems,” Gary Stevens</td>
<td>14-Apr-14</td>
<td>Brussels, Belgium</td>
<td>100</td>
<td>Europe</td>
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<tr>
<td>65</td>
<td>Exhibition</td>
<td>Vivid</td>
<td>Photons Europe; ISLA booth</td>
<td>14-Apr-14</td>
<td>Brussels, Belgium</td>
<td>500</td>
<td>Europe</td>
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<tr>
<td>66</td>
<td>Conference</td>
<td>TCD</td>
<td>MRS Spring Meeting: paper on Nanocarbon Based Materials for Non-Linear Optical Applications and Ultrafast Laser Applications</td>
<td>21-Apr-14</td>
<td>San Francisco</td>
<td>200</td>
<td>Worldwide</td>
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<tr>
<td>67</td>
<td>Conference</td>
<td>ORC</td>
<td>CLEO 2014 “Effect of seed linewidth on few-moded fiber amplifiers”</td>
<td>08-Jun-14</td>
<td>San Jose, USA</td>
<td>200</td>
<td>Worldwide</td>
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<tr>
<td>69</td>
<td>Conference</td>
<td>ORC</td>
<td>Few-Mode TDFA for Mode Division Multiplexing at 2µm</td>
<td>14-Jul-14</td>
<td>Montreal, Canada</td>
<td>200</td>
<td>Worldwide</td>
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<tr>
<td>70</td>
<td>Conference</td>
<td>TCD</td>
<td>Werner Blau invited paper at 4th NPO, &quot;Rational bottom-up assembly of tailored molecular aggregates on nanocarbon for high sensitivity nonlinear optical and light harvesting applications&quot;</td>
<td>28-Jul-14</td>
<td>North Karelia, Finland</td>
<td>200</td>
<td>Worldwide</td>
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<td>71</td>
<td>Conference</td>
<td>ORC</td>
<td>Europhoton conference; ORC paper “Spectrally-tailored thulium-doped fibre amplified spontaneous emission source at two-microns”</td>
<td>24-Aug-14</td>
<td>Neuchatel, Switzerland</td>
<td>200</td>
<td>Europe</td>
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<td>72</td>
<td>Conference</td>
<td>II-VI</td>
<td>ISLC 2014; 24th International Semiconductor Laser Conference; II-VI poster “Recent Progress in Semiconductor Laser for Fiber Laser Applications”</td>
<td>07-Sep-14</td>
<td>Mallorca, Spain</td>
<td>200</td>
<td>Worldwide</td>
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<td>73</td>
<td>Conference</td>
<td>TCD</td>
<td>Werner Blau chair and invited paper at 9th NANOSMAT conference: INV-17 &quot;Carbon-based Nanomaterials and Self-Assembled Nanohybrids as Versatile Materials Platform for Optoelectronics and Nanophotonics&quot;</td>
<td>08-Sep-14</td>
<td>Dublin, Ireland</td>
<td>200</td>
<td>Worldwide</td>
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<tr>
<td>74</td>
<td>Conference</td>
<td>TCD</td>
<td>Werner Blau invited paper at 9th Torunian Carbon Symposium Poland</td>
<td>14-Sep-14</td>
<td>Torun, Poland</td>
<td>200</td>
<td>Europe</td>
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<td>75</td>
<td>Other</td>
<td>Vivid</td>
<td>Newsletter #5 (D6.14)</td>
<td>15-Sep-14</td>
<td>N/A</td>
<td>200</td>
<td>Online</td>
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<td>Date</td>
<td>Location</td>
<td>Audience</td>
<td>Participants</td>
<td>Event Type</td>
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<td>76</td>
<td>Conference</td>
<td>ORC</td>
<td>90 nm gain extension towards 1.7 μm for diode-pumped silica-based thulium-doped fiber amplifiers</td>
<td>21-Sep-14</td>
<td>Cannes, France</td>
<td>Scientific community; industry</td>
<td>200</td>
<td>Worldwide</td>
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<tr>
<td>77</td>
<td>Magazine</td>
<td>Vivid</td>
<td>Sent contacts to Ind Laser Systems magazine for 2 um fibre laser article</td>
<td>17-Oct-14</td>
<td>N/A</td>
<td>Scientific community; industry</td>
<td>?</td>
<td>Online</td>
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<tr>
<td>79</td>
<td>Conference</td>
<td>G&amp;H</td>
<td>Int. Congress on Ultrasonics Matched Pair of AOTFs with Net Zero Frequency-Shift</td>
<td>10-May-15</td>
<td>Metz, France</td>
<td>Scientific community; industry</td>
<td>200</td>
<td>Worldwide</td>
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<tr>
<td>82</td>
<td>Workshop</td>
<td>G&amp;H</td>
<td>Presentation at &quot;Advanced Manufacturing and Photonics for Production&quot; at Laser World of Photonics ISLA - Two micrometer Sources and Toolset for Enhanced Material Processing</td>
<td>24-Jun-15</td>
<td>Munich, Germany</td>
<td>Scientific community; industry</td>
<td>200</td>
<td>Worldwide</td>
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<td>83</td>
<td>Workshop</td>
<td>Vivid</td>
<td>Workshop at Raeter Park Hotel D6.15</td>
<td>25-Jun-15</td>
<td>Munich, Germany</td>
<td>Scientific community; industry</td>
<td>50</td>
<td>Worldwide</td>
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<td>84</td>
<td>Press release</td>
<td>Vivid</td>
<td>Newsletter #6 (D6.22)</td>
<td>11-Aug-15</td>
<td>N/A</td>
<td>Scientific community; industry</td>
<td>200</td>
<td>Online</td>
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<td>85</td>
<td>Other</td>
<td>G&amp;H</td>
<td>Final press release (D6.20)</td>
<td>12-Aug-15</td>
<td>N/A</td>
<td>Scientific community; industry</td>
<td>7</td>
<td>Online</td>
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