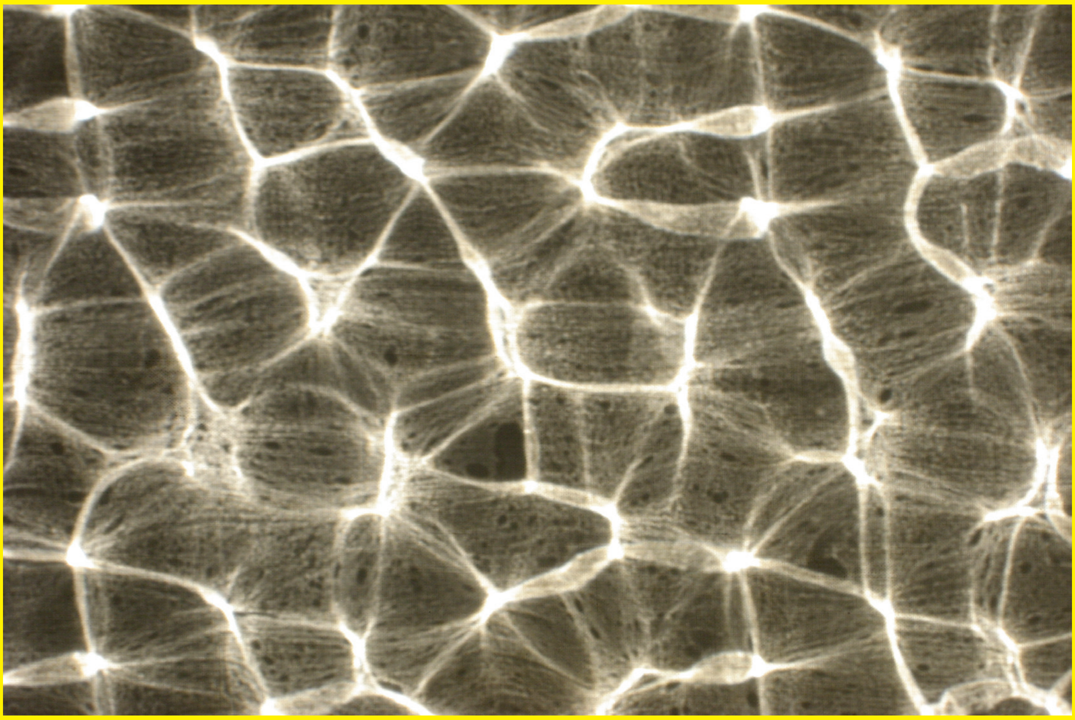
Australian Optical Society

NEWS



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ABN 63 009 548 387

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A scientific paper in any area of optics.

* ***Review Article***

Simply give a run down of the work conducted at your laboratory, or some aspect of this work.

* ***Conference Report***
* ***News Item***
* ***Book Review***
* ***Cartoon or drawing***

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On submission of a scientific or review article you may request that the paper be refereed, and if subsequently accepted it will be identified as a refereed paper in the contents page. The refereeing process will be the same as for any of the regular peer reviewed scientific journals. Please bear in mind that refereeing takes time and the article should therefore be submitted well in advance of the publication date.

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When using Greek letters and mathematical symbols, use font sets such as Symbol or MT Extra. Please avoid using symbols that are in Roman fonts, where the Option or Alt key is used; e.g. Opt-m in Times font on the Mac for the Greek letter mu.

If using TeX, use a style file similar to that for Phys Rev. Letters (one column for the title, author and by-line, and two for the main body). The top and bottom margins must be at least 20mm and the side margins 25mm. Submit a pdf file with the diagrams included (no page numbers), as well as copies of the diagrams in their original format in separate files.

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AOS NEWS

ARTICLES

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President's Report

Dear colleagues

the last AOS meeting and the AIP congress in Brisbane is already two months ago, and we had a holiday break since then, but I still have good recollections of the many science talks, discussions at poster boards, of many new tricks and some inspiring new ideas that I learned about during the conference. We had a very big program in Brisbane. These meetings are an essential part of our lives as scientists, research students or engineers in the photonics industry. Organizing these meetings is an key activity of the AOS.

How many workshops and conferences should we have ? This is a question that causes many discussions. They can be too frequent and sometimes there is not enough time to produce new results. We could also waste our resources, money as well as oil, with too much travel. Many people complain that we have too many conferences. On the other had we like to meet regularly and also maintain the contact with colleagues overseas. Conferences a great way for our younger colleagues to show their work and make valuable contacts.

In response to this question, we now a long term plan for the AOS. We want to hold a major meeting for most of the topics in optics about once a year. The time slot in December is preferred since June and July period is best reserved for international meetings, largely overseas. This reduces the number of meetings from what we did a few years ago. Generally speaking we would like to alternate between ACOLS and the AIP congress for the general research topics and hold an annual ACOFT style meeting for the photonics topics. Most of these will be in about December.

However, there are exceptions and a transition period. This year we will have a very interesting and high quality ACOFT meeting http://www.coinacoft2007.com.au/ - in June 2007 at the traditional time. Please come to Melbourne to attend this if you are interested in photonics.

We are proud that we have attracted the very large meeting of the International Commission for Optics (ICO) http://www.iceaustralia.com/ICO2008/ to come to Australia in July 2008. This international meeting , where we hope that several hundreds of visitors will come to Sydney, will give us an opportunity to showcase our work in Australia and get direct feedback from our colleagues from overseas. This will be a rare opportunity for our students to meet so many experts from around the world. We will also have photonics meetings at the same time.

Then we will finally come to the regular schedule, with the AIP congress in Adelaide in Dec 2008 and an ACOLS/ACOFT meeting for 2009. We hope that this series of conferences allows you to show your work and meet your colleagues. Your input into holding such meetings is highly valued. Please participate in this events in optics.

with best regards

Hans Bachor

Conference Watch

FOCUS ON MICROSCOPY	**Valencia, Spain**	**10 - 13 April 2007**
CLEO/QELS	**Baltimore MD, USA**	**6 - 11 May 2007**
Coherence and Quantum Optics 9.	**Rochester NY, USA**	**10 - 13 June 2007**
International Conference on Quantum Information	**Rochester NY, USA**	**10 - 13 June 2007**
Nanophotonics (NANO)	**Hangzhou, China**	**18 - 21 June 2007**
COIN / ACOFT	**Melbourne**	**24 -27 June 2007**
International Conference on General Relativity and Gravitation	**Sydney**	**8 - 13 July 2007**
Eduardo Amaldi Conference on Gravitational Waves	**Sydney**	**8 - 14 July 2007**
CLEO Pacific Rim	**Seoul, S. Korea**	**26 - 31 August 2007**
Advanced Infrared technology and Applications Workshop,	**Leon, Mexico,**	**8 - 12 October 2007**

18TH INTERNATIONAL CONFERENCE ON GENERAL RELATIVITY AND GRAVITATION (GRG18)

8 – 13 July 2007

7TH EDOARDO AMALDI CONFERENCE ON GRAVITATIONAL WAVES (AMALDI7)

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The program for GRG18 will incorporate all areas of General Relativity and Gravitation including Classical General Relativity; Numerical Relativity; Relativistic Astrophysics and Cosmology; Experimental Work on Gravity and Quantum Issues in Gravitation.
The program for Amaldi7 will cover all aspects of Gravitational Wave Physics and Detection.

PLENARY LECTURES

Bernd Bruegman (Friedrich-Schiller-University Jena)
Numerical relativity

Daniel Eisenstein (University of Arizona)
Dark energy

Francis Everitt (Stanford University)
Gravity Probe B and precision tests of General Relativity

Jonathan Feng (University of California Irvine)
Collider physics and cosmology

Laurent Freidel (Perimeter Institute)
Non-string quantum gravity

Badri Krishnan (Albert Einstein Institute Golm)
Black hole horizons

Renata Loll (Utrecht University)
Other approaches to quantum gravity

Steve McMillan (Drexel University)
Gravitational dynamics of large stellar systems

Robert Myers (Perimeter Institute)
Gravitational aspects of string theory

Marialessandra Papa (Albert Einstein Institute Golm)
Gravitational wave astronomy from ground and space

Hans Ringstroem (KTH, Stockholm)
Cosmic censorship

Peter Schneider (Bonn)
Gravitational lensing

Daniel Shaddock (JPL California Institute of Technology)
Gravitational wave detection from space: technology challenges

Stan Whitcomb (California Institute of Technology)
Ground-based gravitational wave detection: now and future

PUBLIC LECTURES

Sir Roger Penrose
The Emeritus Rouse Ball Professor of Mathematics
The University of Oxford

Kip S Thorne
The Feynman Professor of Theoretical Physics
California Institute of Technology

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IMPORTANT DEADLINES • Abstract Submission Deadline – 27 April 2007 • Early-Bird Deadline – 6 April 2007

Register Online Now! To register online please visit the Conferences website **www.grg18.com** or **www.amaldi7.com**

FURTHER INFORMATION

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Papers reporting on new research and development results as well as practical implementations and applications in the technical areas as described in the topics are solicited. Each author is requested to submit a 35-word abstract and a 2-page summary. Papers should be submitted only via the conference web site with the corresponding author's contact information including the full mailing address, fax number and e-mail address.

<u>Deadline for Paper Submission: March 23, 2007</u>

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Yasuhiko Arakawa, Univ. of Tokyo, Japan
James Fujimoto, MIT, USA
Ferenc Krausz, Max-Planck-Institute of Quantum Optics, Germany

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First Call for Papers

Advanced Infrared Technology and Applications International Workshop 2007

AITA 9 International Workshop http://www.cio.mx/AITA07/AITA07.htm

AITA 2007 constitutes a forum for bringing together researchers working in universities, industry, and government to exchange knowledge, ideas, and experiences in the infrared science and technology. The workshop will take place on the campus of the *Centro de Investigaciones en Optica (CIO)*, in León, Guanajuato, México, October 8 - 12, 2007. E-mail for further information: AITA9@cio.mx.

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Important Dates:

Conference dates:	October 8-12, 2007
Abstract:	March 30, 2007
4-page summary:	July 1, 2007
Early registration:	July 10, 2007
Housing reservations:	July 20, 2007
10-page manuscript	October 8, 2007

Areas of interest include Advanced IR:

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Early Registration Fees: Regular US$300, Student (ID and less than 34 years of age) US$150. Increase by $50 after July 1, 2007.

Conference language: English

Conference Location: León is the fourth largest city in México, situated in the State of Guanajuato, between México City and Guadalajara. León is world-famous for its leather industry. (A pair of fine man/woman´s shoes costs from US$20 to $30.). Only 30 min away, the capital of Guanajuato is considered one of the most beautiful colonial cities in México and has been named *Treasure of the Humanity* by UNESCO. For the last 30 years, this city has been hosting the famous *Festival Internacional Cervantino* (http://www.festivalcervantino.gob.mx) from October 3 through October 22. International artistic and cultural events are presented in its theaters, museums, and open space. Two hours away, quaint city San Miguel de Allende gives home to unique handicrafts in wood, pottery, metal, rocks, and is populated by Americans (30%). In the autumn, the weather cools just enough to walk outside, but sweaters are worn at night.

COIN-ACOFT 2007 International Conference
Melbourne, Australia
24 - 27 June 2007

In 2007 the International Conference on the Optical Internet (COIN) will be held jointly with the Australian Conference on Optical Fibre Technology (ACOFT) at the University of Melbourne. COIN-ACOFT 2007 will showcase internationally competitive research in optical networks, transmission, access and devices, and will combine the latest fundamental research results with a strong focus on industry applications.

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- Optical Transmission Systems and Technologies
- Optical Networks, Architectures and Control
- Access Technologies (Wireless and Optical)
- Optics Components, Devices, Fabrication and Applications
- Defence Applications
- Photonic Components and Integrated Circuits
- Electronics in Photonics,
- Biophotonics and Sensors

COIN-ACOFT/AOS will be held on the beautiful campus at the University of Melbourne, Australia, from June 24 –27, 2007. The conference venue is close to downtown Melbourne and is served by many hotels, ranging from luxury accommodations to budget student-style housing. The University of Melbourne is located adjacent to Melbourne's famed Lygon St. restaurant and café district. A short tram ride takes you to the Yarra River, Federation Square, art galleries, concert halls, and the Southgate restaurant and e ntertainment complex.

COIN-ACOFT 2007 will include exciting networking events including the ever-popular conference dinner. A prestigious group of invited speakers will bring up-to-date information about the latest R&D activities in optical networking and optical communications. The conference will be a great opportunity to meet researchers, industry professionals and students.

As the Conference Chairs of COIN-ACOFT 2007, we encourage you to share in this prestigious technical and social event.

Rod Tucker, University of Melbourne, Australia
Tomonori Aoyama, University of Tokyo, Japan
Minho Kang, Information and Communications University, Korea

Key Dates

Deadline for receipt of papers	**3 March 2007**
Notification of acceptance of papers	**30 March 2007**
Presenter and early bird registration deadline	**27 April 2007**
Conference starts	**24 June 2007**

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Slow light in Bragg gratings

Joe T. Mok,* C. Martijn de Sterke, Ian C. M. Littler, and Benjamin J. Eggleton
Centre for Ultrahigh-bandwidth Devices for Optical Systems (CUDOS), School of Physics, University of Sydney, NSW 2006.

Slow light is a fundamental research field that could pave the way to faster routers, lightweight phased-array antennas, ultra-low-threshold nonlinear optical devices, and enhanced sensitivity in sensing applications. We present our results of slow light using gap solitons in a fibre Bragg grating, which is capable of significantly delaying short pulses without dispersive broadening.

INTRODUCTION

The study of slow light, while a fundamental subject, is also expected to have a range of applications. For instances, future optical switches and routers may rely on slow-light buffers [1], which are capable of many times more bandwidth and easier to scale to higher bit rates than electronic buffers. Broadband phased-array antennas, which require a large and tunable true-time delay [2], could be made more lightweight by employing slow-light delay lines. At low group velocities, nonlinear effects are enhanced, which may lead to ultra low-threshold nonlinear devices [3]. The increased light-matter interaction at low group velocities may also enhance the sensitivity in sensing applications [4].

In this article, we will first review the principle behind common slow light systems, and then highlight how the use of gap solitons overcome the universal problem of pulse broadening [5]. This is followed by our recent experimental results that show sub-nanosecond pulses delayed by almost two and half pulse widths by this technique [6]. We then show numerical results that give a realistic estimate of the delay achievable by currently available silica fibre Bragg gratings (FBG), and by Bragg gratings in chalcogenide waveguides [7].

PRINCIPLE

The basic principle governing common slow light systems is the Kramers-Kronig relations, which relate the refractive index n at frequency ω to the absorption or gain $\alpha\omega$ as

$$n(\omega) = 1 + \frac{c}{\pi}\int_0^\infty \frac{\alpha(\omega')}{\omega'^2-\omega^2}\mathrm{d}\omega', \qquad (1)$$

where c is the speed of light in vacuum. The group velocity v_g, the velocity at which a pulse envelop travels at, is given by $v_g = c/n_g$, where n_g is the group index given by

$$n_g = n + \omega\frac{\mathrm{d}n}{\mathrm{d}\omega}. \qquad (2)$$

In Eq. (1), the factor $(\omega'^2-\omega^2)^{-1}$ becomes significant only when $\omega' \approx \omega$, which suggests that $n(\omega)$ changes

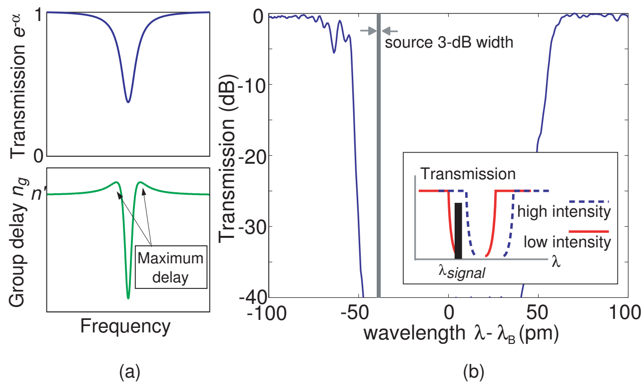

FIG. 1: (a) The variation of group index near a Lorenztian-shaped resonance, where the transmission per unit length is given by exp(-α), with maximum α equal 1. (b) Sharp and deep Bragg resonance at a Bragg wavelength λ_B of 1064 nm.

rapidly only when $\alpha(\omega)$ changes sharply in the vicinity of ω. Consequently, a large and sharp-edged resonance then gives rise to a large change in the refractive index with respect to frequency dn/dω, which from Eq. (2) leads to a large group index and a low group velocity. The resonance can be created by atomic transitions [8], the photonic bandgap effect [9, 10], stimulated scattering [11, 12], or any other resonant effects. Figure 1(a) illustrates the transmission (per unit length) of a Lorentzian resonance, typical of the spectral line shape of atomic transitions, and its associated group index calculated using Eqs. (1) and (2). There are spectral regions near the resonance, as shown in Fig. 1(a), where the group index is higher than its background value n'. Optical pulses launched at these frequencies propagate through the medium at a lower group velocity than those away from from the resonance, and hence emerge with a delay.

For slow light using Bragg gratings, we rely on the sharp and deep resonance created by the Bragg reflections, forming a bandgap centred at the Bragg wavelength

$$\lambda_B = 2n\Lambda, \qquad (3)$$

where Λ is the grating period. Light propagates slowly when launched near the band-edge just outside the bandgap. Bragg gratings are a attractive slow light platform for a number of reasons: 1. It is more compact than fibre-based slow light that uses up to a few kilometers of fibres. 2. Compared to photonic crystals, Bragg gratings can easily be fabricated with a few hundred thousands periods. 3. It operates at room temperature, unlike those employing electromagnetically induced transparency (EIT). 4. It has a large available bandwidth, since it is used as an edge-pass, not a band-pass device. We elaborate this point further below.

NONLINEARITY TO THE RESCUE

Close examination of Fig. 1(a) reveals that the group index varies with frequency, and therefore does not stay constant over the finite bandwidth of a pulse. This leads to dispersion, which spreads the pulse out in time, causing interference with neighbouring pulses, and scrambling of the information. Dispersive pulse broadening is a property of *all* linear resonant systems, including Bragg gratings. There are schemes that attempt to engineer the linear properties of different slow light systems to minimise the dispersion (see for example [13]), but most remain theoretical and do not eliminate dispersion completely. Furthermore, although a constant group index would alleviate the problem of pulse broadening, one would also lose tunability of the delay due to the lack of variation in n_g.

In order to compensate for dispersion *completely* while still maintaining tunable delay, we exploit the Kerr nonlinearity of the medium that causes the refractive index to depend on intensity I as

$$n = n_0 + n_2 I, \tag{4}$$

with n_0 being the refractive index at low intensities, and n_2 the nonlinear coefficient. The presence of the Kerr nonlinearity has two consequences. First, self-phase modulation, a manifestation of the intensity-dependent index, compensates for the dispersive effect that causes broadening. The slowed pulse propagates as a soliton, which maintains its shape indefinitely. Second, the Bragg wavelength and the bandgap shifts to a longer wavelength at higher intensities according to Eqs. (3) and (4), schematically shown in the inset of Fig. 1(b). As we shall see below, this intensity-dependent bandgap shift provides a tuning mechanism of the group velocity.

Slow light in nonlinear Bragg gratings was demonstrated by two of us in the past, with a group velocity of $0.5c/n$ [14]. In that experiment, light was launched outside the bandgap near the band-edge, exciting *Bragg solitons*. At sufficiently high launch powers, the delayed pulse maintained its width through the formation of a soliton. In the present experiment, slow light is achieved by launching light inside the bandgap. Light is reflected at low intensities, but transmitted at high intensities due to the bandgap being shifted by nonlinear effects (see Fig. 1(b) inset), allowing pulses to propagate as *gap solitons*. Although both types of solitons are governed by the same set of nonlinear coupled mode equations, and can both propagate slowly in Bragg gratings, a number of differences in the physics exists between the two. First of all, Bragg solitons have a constant transmission close to unity, whereas the transmission of gap solitons increases with the input power. Secondly, the transmission of gap solitons saturates and generally does not approach unity. This is because usually only part of the input pulse is excited and propagates as a gap soliton, with the remaining light being reflected. Thirdly, at low velocities, more solutions to the governing equations exists inside the gap than do outside, prompting us to study slow light in the gap soliton regime.

EXPERIMENT

Figure 2 illustrates the experimental setup we use to demonstrate this slow light scheme. The pulsed source is a Q-switched laser emitting 0.68 ns pulses at a fixed wavelength of 1064 nm. Pulses of the appropriate power are launched into a 10-cm silica FBG, which is put under a small but controllable tension by a translation stage, detuning the bandgap with respect to the fixed laser wavelength. First, this allows us to probe any part of the bandgap to measure the transmission spectrum as shown in Fig. 1(b), with a spectral resolution limited only by the source bandwidth, which is 1.9 pm and indicated in the figure. Secondly, and more importantly, with this technique we can accurately launch the pulses anywhere along the transmission spectrum by detuning the bandgap. The bandgap is 118 pm wide, which corresponds to a grating index contrast Δn of 1.6×10^{-4}. To minimise the power required to shift the bandgap by nonlinear effects, we chose to launch the pulses near the short wavelength band-edge, at a detuning where the transmission is -40 dB. At sufficiently high input powers, transmission increases due to the bandgap shift, with the transmitted pulses measured with a photodiode followed by a sampling oscilloscope.

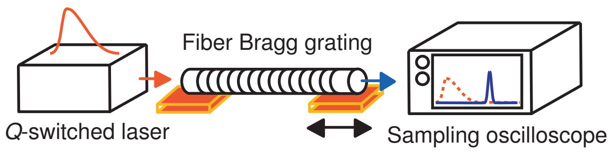

FIG. 2: Schematic of the experimental setup

RESULTS

As the launch peak power increases beyond 1.75 kW, the transmission increases to and saturates roughly at

−10 dB. The output pulses emerges with a delay, as shown by the solid lines in Fig. 3(a). We calculate the delay of the output pulses by comparing their arrival times to a reference pulse that is launched far away from the bandgap. This reference pulse, which resembles the input pulse shape, travels at a group velocity of c/n and is shown by the dotted lines in Fig. 3(a).

The largest delay we observed was 1.6 ns, corresponding to a group velocity of $0.23c/n$, at the launch peak power of 1.75 kW, shown in the bottommost trace in Fig. 3(a). The output pulse has a slightly narrower pulse width than does the input, as predicted by the simulations (Fig. 3(b)), indicating that dispersion has been compensated. The delay is tunable by varying the input power, as shown by other traces in Fig. 3 by roughly 1 ns. At higher powers, the bandgap shifts further away from the pulse spectrum, increasing the group velocity. The output pulse width does however vary with delay. As will be discussed below, this variation in pulse width can be avoided by simultaneously changing the detuning by controlling the strain applied to the FBG.

The velocity of $0.23c/n$ may not sound terribly impressive compared to results which tout velocities measured in metres per second (see, for example, [8]), but it compares favourably when one measures the result in fractional delay. Fractional delay is defined as the delay per pulse width, which is 2.4 in this case. This metric takes into account both the delay performance and pulse bandwidth, which is important since there is usually a trade-off between delay and bandwidth in slow light systems. A higher fractional delay implies less restriction to this trade-off. Fractional delays reported in the literature ranges from roughly 0.1 [15] to 4.5 [16].

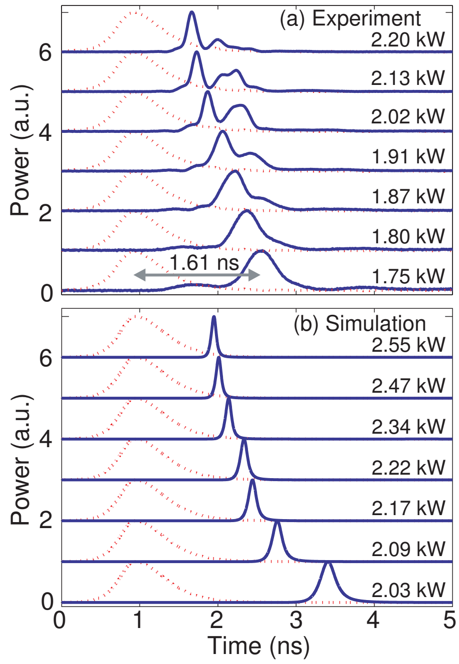

FIG. 3: Measured and simulated transmitted pulse (solid) at launch peak power above 1.75 kW. Dotted lines show the reference pulse, which resembles the input pulse, travelling at c/n.

TOWARDS LARGE BANDWIDTH, LARGE DELAY SLOW LIGHT

What is the available bandwidth?

For devices such as routers, modulators and phased-array antennas, usually a large device bandwidth of tens of gigahertz or more is required. Most slow light effects are based on resonances that are bandwidth-limited. For examples, in an EIT system, a spectral hole is burned through an otherwise absorptive spectral region by an intense light. A signal pulse launched at that spectral hole will then propagate slowly [8], but the pulse spectrum is limited to the bandwidth of that hole. For slow light using stimulated Brillouin scattering (SBS), the SBS linewidth dictates the available bandwidth for slow light. Even with the pump dithering method [17], the scheme runs out of bandwidth when the Stokes and anti-Stokes spectra overlap.

With the gap soliton based slow light scheme, although the bandgap has a finite bandwidth, the pulse spectrum needs not be confined to the bandgap. In fact, the spectrum of the pulse, once in the nonlinear regime, lies outside the bandgap (see Fig. 4). Thus, we are using the Bragg grating as an edge-pass device that has a large available bandwidth, rather than a bandpass device, such as the cases using EIT and SBS, where the bandwidth is limited. Although we have demonstrated slow light with a bandwidth of only around 1 GHz, there is no fundamental limitation to the available bandwidth in gap soliton based slow light. To observe considerable slow light effect or delay, however, the index contrast needs to be large enough such that the bandgap width is at least comparable to the pulse spectrum.

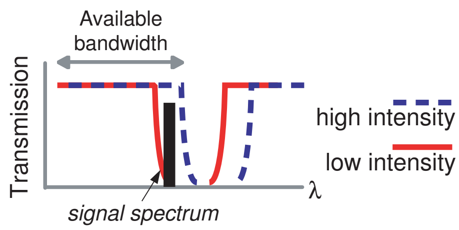

FIG. 4: Schematic illustrating the transmission spectrum of a Bragg grating and the useable bandwidth in gap soliton based slow light.

Tunable delay with constant output pulse width

We have shown pulse delay up to 1.6 ns, with a tunable range of roughly 1 ns by varying the incident power, although the output pulse width changes. Tunable delay is also possible by varying the detuning by applying different levels of strain. When the two tuning mechanisms are used simultaneously, it is possible to tune the delay without changing the output pulse width. To investigate the tunable delay range by this method [7], we simulate launching and propagating 0.68 ns pulses into a 10 cm Bragg grating under different conditions and calculate the pulse delay. For a range of index contrasts Δn and detunings, we adjust the launch power until we obtain an output pulse that has the same pulse width as that of the input. The simulated delay of the output pulse is plotted in Fig. 5, with the error bars representing simulation granularity.

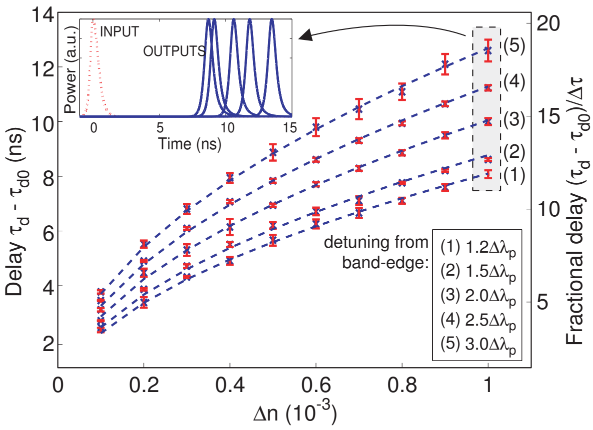

FIG. 5: Simulated delay (error bars show simulation granularity) as a function of grating index contrast Δn, for 5 detunings rangeing from 1.2 to 3.0 times the pulse spectral width ($\Delta\lambda_p$) from the band-edge. Dashed lines are fitted to simulated data based on a model after Ref. [7]. Inset shows the output pulses, normalised to unity peak, with a tunable delay range of 7 pulse widths at $\Delta n = 10^{-3}$.

Figure 5 shows that the delay increases with Δn and does not appear to saturate, which implies that the delay is only limited to the maximum attainable Δn. The dotted lines are calculations based on a linear Bragg grating model [7], fitted to the data points for each detuning. At a fixed Δn of 10^{-3}, roughly the maximum value attainable in silica, the delay is tunable between 8 ns and 12.5 ns, or 7 pulse widths, when the detuning is varied between 1.2 and 3.0 times the pulse spectral width ($\Delta\lambda_p$) from the band-edge. We choose this range of detuning to ensure that the internal intensities, enhanced due to the slow light effect, is well below the damage threshold of silica fibres. The inset in Fig. 5 shows the delayed output pulses, all have the same pulse width as the input, at five different detunings within the above range. Transmission of the output pulses varies from 20% to 28%, and are normalised to unity peak in the figure. Based on our model [7], we expect that Bragg gratings written in chalcogenide, in which index change as large as $\Delta n \approx 0.01$ has been observed [18], would produce delay over 60 pulse widths, with a tunable range of 20 pulse widths.

CONCLUSIONS

According to the Kramers-Kronig relations, slow light systems exploiting resonant effects can slow pulses down but inevitably broaden them. While engineering their dispersive properties provides a means to reduce pulse broadening, the range of tunability is also reduced. Nonlinearity can compensate dispersion while retaining the large tunability. Using gap soliton in Bragg gratings, it is possible to produce tunable delays of tens of pulse width, while there is no fundamental limitation to the available bandwidth.

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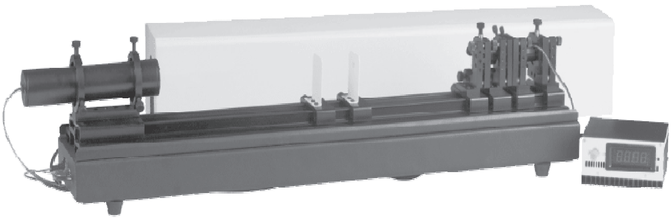

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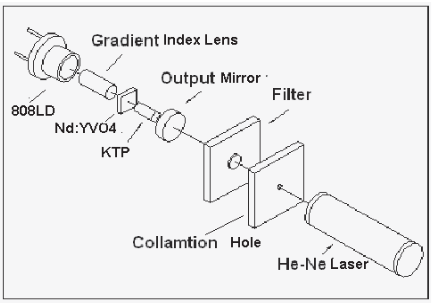
- Variable pumping current
- Understand the theory through practice
- Cost effective

Experimental Setup



Specifications

Semiconductor Laser	808nm, ≤500mW
Laser Power Supply	Output: 0 ~ 500mA
$Nd:YVO_4$ Crystal	3 × 3 × 1mm
KTP Crystal	2 × 2 × 5mm
Output Mirror	ϕ6, R = 50mm
Optical Power Indicator	2μW ~ 200mW, 6 ranges

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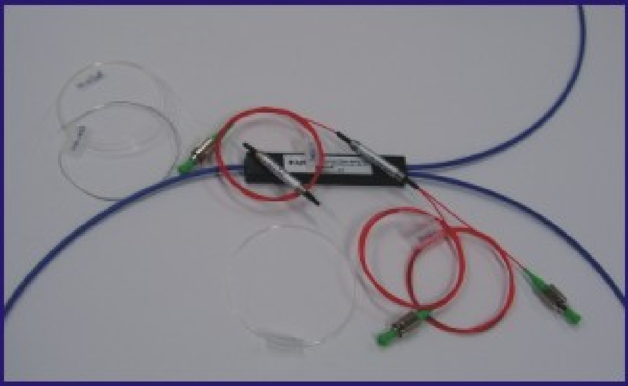

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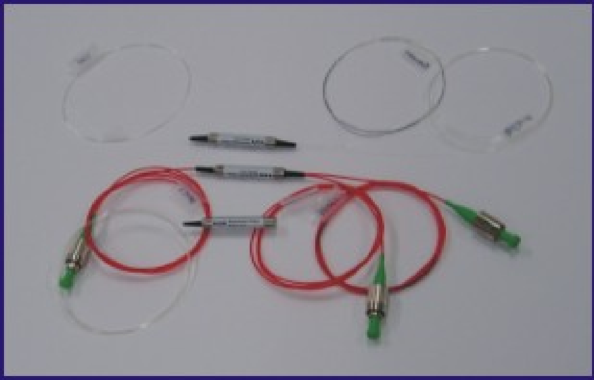

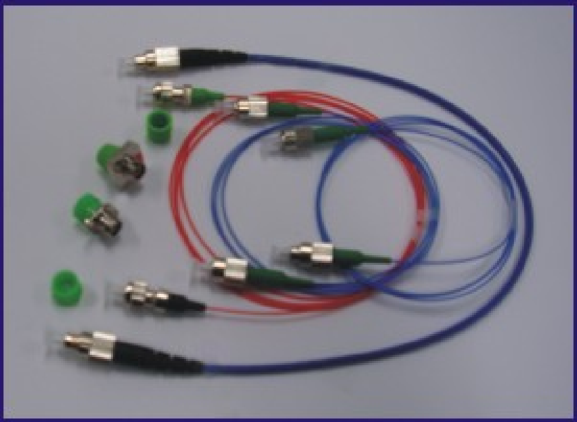

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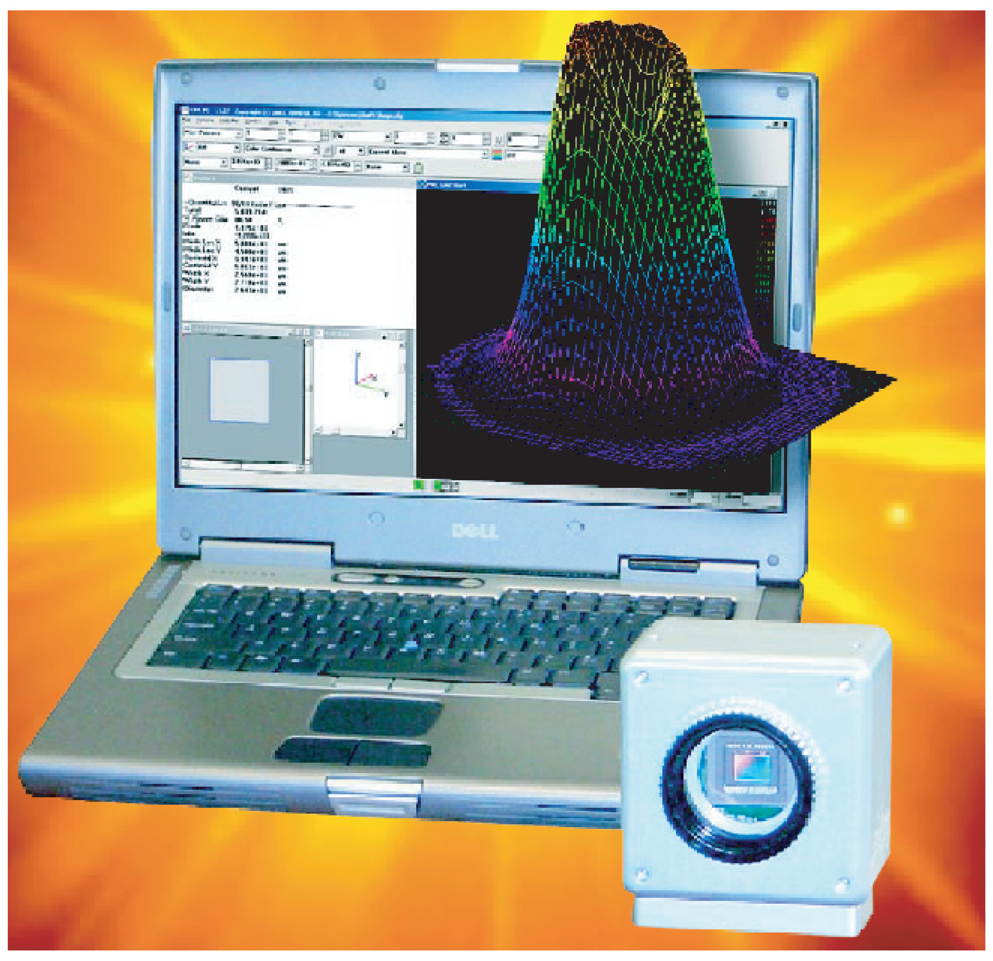

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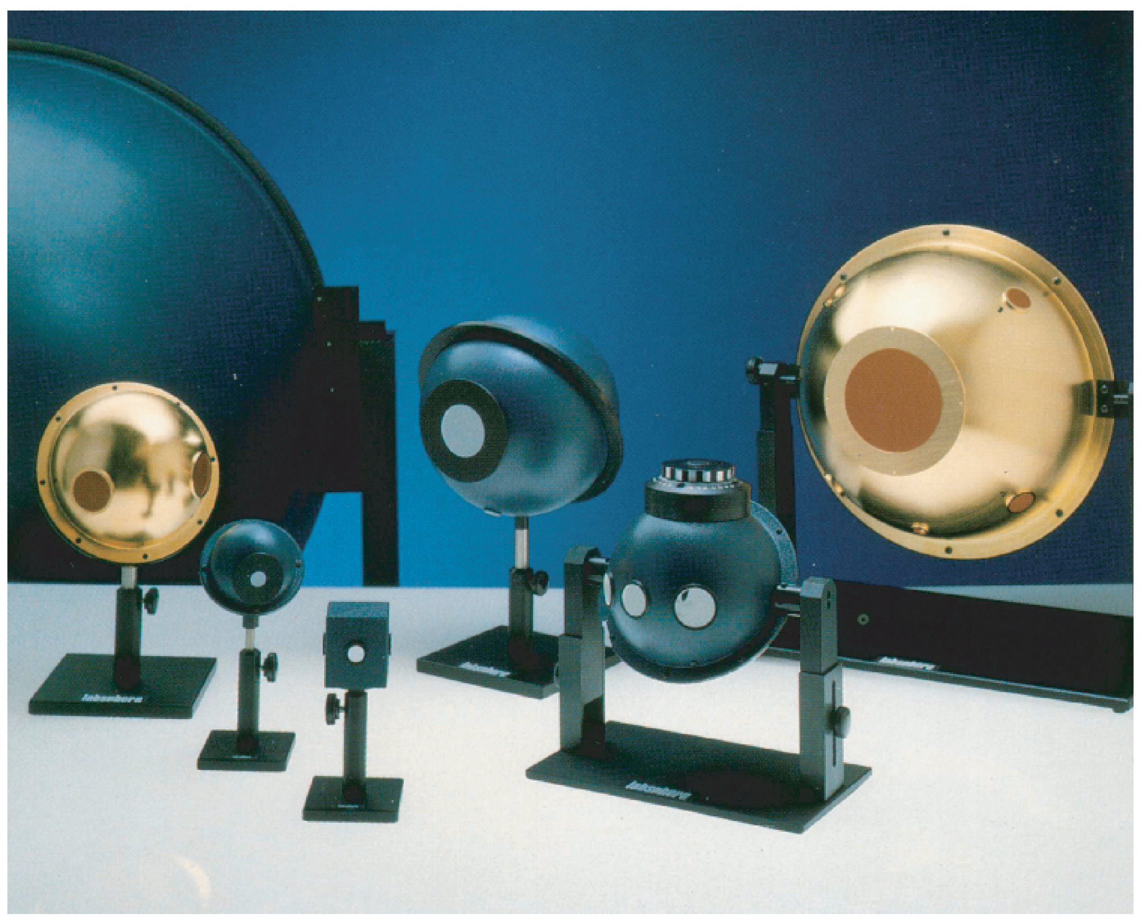

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Newport
Experience | Solutions

Spectra-Physics
A Division of Newport Corporation

Newport's new 1918-C Benchtop Performance in the Palm of Your Hand

Measure a lot, with just a little! Newport's new 1918-C Series handheld Power Meters bring the leading edge performance and advanced features you'd expect to find in a benchtop instrument, right into the palm of your hand.

In designing the 1918-C Optical Power Meter, we combined the feedback received from you the customer, and our own 20+years of experience designing, manufacturing and using laser measurement instruments every day. The result is an instrument that sets a new standard in Optical Power Meters.

Whether you are using the power meter to tweak up your laser, or in an application such as laser spectroscopy, multiphoton microscopy, biophotonics, or nanophotonics, we think you'll be impressed with the 1918-C.
Visit www.newport.com/1918-C

> Compact and ergonomic design ideal for use in the lab and in the field
> Power measurements from 1 nW – 6 kW
> Energy measurements from 250 µJ – 75 J
> Measurement rep rates up to 2 kHz
> Built-in stand for fexible viewing
> Compatible with all Newport "Smart" power and energy detectors

Contact us for a free copy of the Newport Resource catalogue

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ABN 82 882 831 899

CUDOS

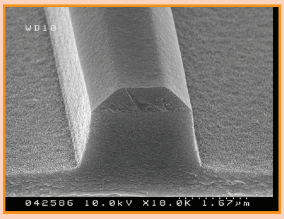
Centre for Ultrahigh bandwidth Devices for Optical Systems

An Australian Research Council Centre of Excellence

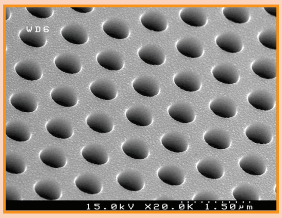
Chalcogenide materials platform

Switching, regeneration, wavelength conversion etc require nonlinear optical response. Our approach: use waveguides of chalcogenide glass (fibre or etched in planar thin films), combining high material nonlinearity (n2) and tight confinement to produce nonlinear response at low threshold.

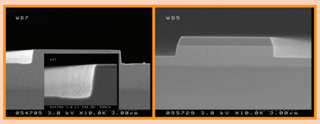
Gratings and photonic crystals can also be written into the planar films using focused ion beam or phase mask interferometry.



Chalcogenide Waveguide

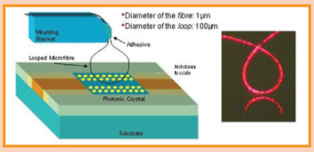


An image of a 2-D photonic crystal lattice milled into a 300nm thick AMTIR-1 chalcogenide glass membrane supported on a silicon nitride window.



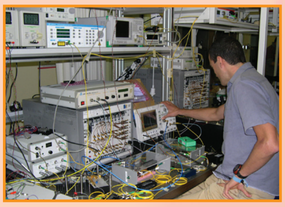
(Left) Profile of reactive ion-etched As_2S_3 waveguide; (Right) Similar rib waveguide structure in AMTIR-1 glass.

Light can be coupled from fibres into planar resonant cavities in photonic crystals using looped tapered fibre for experiments in switching and filtering.



Schematic of a looped taper used for high efficiency coupling to photonic crystal waveguides, with an illuminated looped taper (at right).

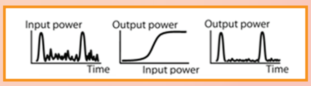
Devices can be evaluated using short pulse lasers with FROG analysis for detailed physical studies of pulse propagation through to 160 Gb/s BERT systems for evaluating network performance.



Mark Pelusi tests a component in the 40 Gb/s BERT system at Sydney University.

Applications

Here is an example of a simple integrated photonic regenerator. High intensity pulses are broadened enough in the waveguide to pass through the offset Bragg filter. No broadening occurs at low intensities. The power transfer curve can be tailored to have the correct nonlinear response.



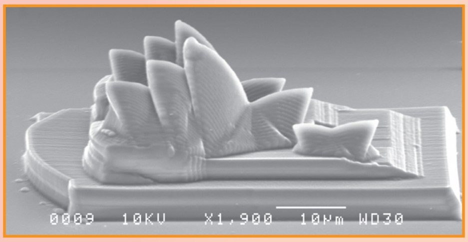
This nonlinear power transfer curve results in both signal to noise and bit error rate improvement.

The optical regenerator consists of a 5cm long nonlinear As_2S_3 rib waveguide where spectral broadening occurs due to intensity-dependent phase modulation, followed by an integrated Bragg grating band pass filter, offset from the signal frequency, near the exit facet.

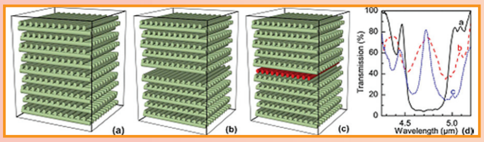
Similar phase modulation techniques produce wavelength converters and pulse compressors.

Three dimensional photonic crystals

We use photo-polymerisation and micro-explosion techniques to create three dimensional photonic crystals. Photo-polymerisation allows all kinds of microscopic objects to be sculpted



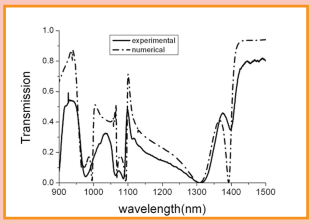
while the micro-explosion approach allows regular structures like "woodpiles" to be micro-machined.



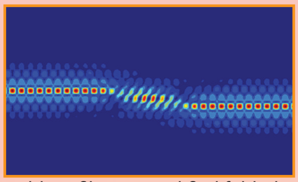
(a) Schematic of a woodpile lattice in which the void channels are represented within a bulk polymer material;
(b) a planar defect embedded within a woodpile lattice;
(c) a one-dimensional lattice is embedded within a planar defect;
(d) infrared transmission measurements of a simple woodpile lattice (solid black), with planar defect (dashed red) and embedded one-dimensional lattice (dotted blue).

Device modelling

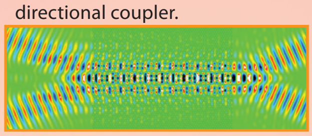
Semi-analytic and fully numerical codes are used to develop, explore and optimise photonic device concepts.



Experimental and theoretical transmission spectra (3D FDTD) compared on a linear scale. Radius r=250 nm; the lattice period was 1000nm.



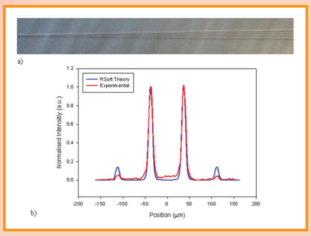
Field profile in a modified folded directional coupler.



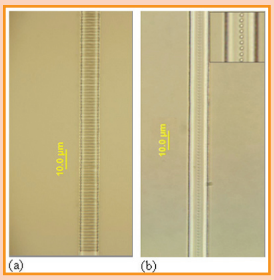
Field plot in an autocollimating beam combiner relyin on highly efficient coupling.

Femtosecond laser machining

Allows waveguides, gratings, couplers to be written directly into active glasses and other bulk materials.



a) Phase contrast micrograph of a femtosecond laser-written conventional 1.4 splitter;
b) the experimental and modelled output in the 4 arms.



Gratings formed in rib waveguides using (a) the scribe methods and (b) the single-pulse method (close-up of features shown in the inset).

For more information please visit http://www.cudos.org.au or email cudos@physics.usyd.edu.au

SPI Lasers

SPI Fiber Laser Technologies

SPI Lasers manufacture and sell laser modules or systems offering both pulsed and CW options with 5W~200W output power range. Their pulsed lasers run with nanosecond pulses and Kilowatts of peak power whilst the CW lasers can be operated from CW through to modulated microsecond pulses.

High powered 1090nm water cooled fiber lasers, 100W to 200W, TEM_{00} (M^2 <1.1) CW or Modulated to 10kHz closed loop, 50kHz open loop - Modulated pulses 10µs to CW

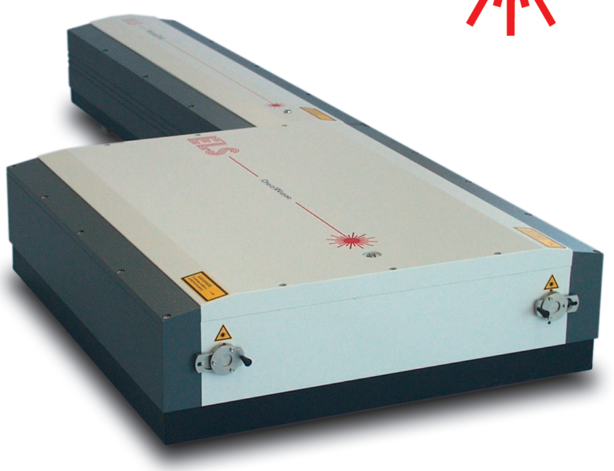
Applications
- Micro-machining
- Marking & Engraving
- Micro-welding (biomedical)
- Laser Tweezers
- Selective Laser Melting
- Plastics welding
- Soldering
- Sintering

Features
- Small footprint
- High energy efficiency
- No lamps to replace!
- Excellent beam quality
- No calibration or alignment
- Dynamic and broad parameter control
- Near maintenance free operation

Please contact us at Lastek for more information or to inquire about SPI's Free 30 Day Trial Offer

ELS

ELS Advanced Laser Systems using Thin Disk Technology



DuoWave/QuadroWave
- Tunable green and UV sources based on external frequency doubling of VersaDisk-1030
- Green Range: 505 to 527.5 nm / UV Range: 253 to 263.8 nm
- TEM_{00} profile; Single Frequency

VersaDisk-1030
- Yb:YAG thin disk laser,
  up to 100 W cw at 1030 nm,
  perfect TEM_{00} profile;
  optional single frequency (50 W)
  and/or wavelength tuning
  from 1010 nm to 1055 nm
  Q-switch option: 12 mJ@1030 nm
  Green version 7.5W at 515 nm

SpectroStar
- Single frequency CW OPO,
  several Watt Idler, 2.2-5.2 (6) µm,
  linewidth < 1 MHz,
  with tunable pump laser VersaDisk

MonoDisk
- Economic laser for pumping and
  material processing at 515 nm
  Output Power 5 W to 50 W CW
  TEM_{00} profile

PowerDisk
- Regenerative thin-disk amplifier,
  1030 nm, TEM_{00} profile
  10 ns pulse width
  25 mJ pulse energy (1 kHz)
  Optional frequency conversion

LASTEK

Lastek Pty Ltd
Thebarton Campus, University of Adelaide
10 Reid Street, Thebarton SA 5031 Australia
Ph (08) 8443 8668 Fax (08) 8443 8427
Email: sales@lastek.com.au Lastek website: www.lastek.com.au

VAN063C

lambda scientific

Light Sources

Low-pressure Mercury Lamp

Sodium Lamp

He-Ne Laser (1.5mW@633nm)

Hydrogen Lamp

Hydrogen Lamp

High Pressure Mercury Lamp

Multi-group Discharge Lamp

High Pressure Spherical Xenon Lamp

Green Laser

Tungsten-Bromine Lamp

Brightness Adjustable White Light Source

IR Light Source (porcelain clay rod)

Lambda Scientific Pty Ltd
2/147, Buxton Street, North Adelaide SA 5006 Australia
Phone: +61 8 8267 2686
Fax: +61 8 8267 2689
E-mail: sales@lambdasci.com

Product News

High Accuracy Pulsed Laser Wavelength Meter

The new model 821 Pulsed Laser Wavelength Meter from Bristol Instruments provides the most reliable accuracy available. This unique instrument has a built-in wavelength standard so that the system is continuously calibrated. The result is a highly precise instrument that measures the absolute wavelength of pulsed and CW lasers to an accuracy of +/-0.02cm^{-1}.

- Pulsed and CW Laser Measurement
- Measures wavelength to an accuracy of +/- 0.02cm^{-1}
- Built in wavelength standard for continuous calibration
- Operation from 350nm to 1100nm
- Asynchronous operation with automatic pulse detection
- USB interface for effortless integration into an experiment

Bristol Instruments was founded by three former employees of Burleigh Instruments, with a combined experience of more than 35 years with advanced optical interferometer-based products. Through Bristol Instruments we continue to support Burleigh wavelength meters and Fabry-Perot interferometers, to help researchers preserve their investment in these instruments.

Other products available from Bristol include a high accuracy wavelength meter, low cost wavelength meter, Fabry-Perot interferometer mirrors and optical fibre laser couplers.

Coherent Scientific
Ph: (08) 8150 5200, Fax: (08) 8352 2020
sales@coherent.com.au
www.coherent.com.au

At the Technical Manufacturing Corporation (TMC), precision, reliability and performance are paramount to their entire product range. All products, ranging from the humble breadboard to highly advanced pneumatic and piezoelectric isolated solutions are constructed with due diligence and to the exacting standards required by today's advanced photonics industries.

TMC's wide range of catalogue items are suitable for most demanding photonics applications, however if your application requires something better then the best, TMC has the capability to custom manufacture products for extreme applications. Once recent example is the delivery of two high precision table assemblies to NASA Goddard's AIM (Advanced Interferometer and Metrology) laboratory. NASA took delivery of two TMC actively controlled optical tops to fulfil their metrology/interferometry requirements.

These Class 100 clean-room compliant table-top solutions were designed and constructed based around TMC's 794 Series ClassOne Clean Top II Optical tops and provide a vibration free work surface of nearly 7.5m. sq. each (4.7m in length by 1.5m in width and over 600mm thick). As thermally induced table top fluctuations can have a large negative impact on high precision interferometers, reducing their overall performance and accuracy, TMC customised the 794 Series with low expansion INVAR top and bottom face sheets, providing a thermally stable work surface. The lowest possible vibration environment was realised as each tabletop is supported by six Stacis 2100 active vibration control modules. The Stacis 2100 employ inertial vibration sensors and piezoelectric actuators to sense floor vibration and cancel these in real time for both amplitude and frequency. With a bandwidth of 0.6-250Hz the Stacis active vibration control system effectively eliminate unwanted floor vibration at frequencies typically amplified by pneumatic isolation systems. The coupling of TMC's experience in high precision vibration control and capability for custom manufacturing has allowed TMC to provide the best solution possible for NASA Goddard's AIM's Laboratory. To see how a TMC solution can best suit you contact Coherent Scientific.

Coherent Scientific
Ph: (08) 8150 5200, Fax: (08) 8352 2020
sales@coherent.com.au
www.coherent.com.au

PM panda fibre optical attenuator

Polarization maintaining fixed attenuator is based on micro-optics technology; it can achieve very high attenuation precision. The device is pigtailed and it can supply with 250um panda fiber or with connectors, 20dB Min extinction ratio and 55dB min return loss. The PM fiber attenuator is widely used in optical communication systems, lab research, sensors and receivers. The device can supply with customer specified attenuation values.

Email: sales@afwtechnology.com.au
Tel: 03 9702 4402

Gentec's New Power & Energy Monitors: SOLO 2 & UNO

Gentec-EO is proud to announce the latest additions to its monitor family: the SOLO 2 and the UNO. The new SOLO 2 Energy and Power Meter is more ergonomically shaped; with a wide screen 2 times bigger than the SOLO-PE, a transfer rate 20 times faster and the ability to read high repetition rate energy detectors up to 3 kHz.

SOLO 2 Features:
- 20X faster data transfer rate
- Display 100% larger than previous SOLO
- Reads energy detectors (with metallic absorbers) up to 3 kHz

The new UNO Power Meter will present the same inventive ergonomics as the new SOLO 2 ; a wide screen with large digit and easy one-finger navigation, but in a very affordable package that includes the most useful functions. Once again, with its SOLO 2 and UNO monitors, Gentec-EO is raising the bar for the highest quality/price ratio meters on the market.
UNO Features:
 - Simple to use, ergonomically designed
 - Reads all power detectors (including photodiodes)
 - Unbeatable price!

New Phazir Handheld NIR Material Analyzer from Ocean Optics

This handheld, point-and-shoot NIR measurement tool is the first of its kind to offer real-time, instantaneous, qualitative and quantitative materials analysis. Both material ID and concentration levels are displayed on this nondestructive instrument's onboard color LCD screen. All data is stored in memory, which then can be exported to a PC for logging or additional processing using formats such as a Microsoft Excel spreadsheet.
Two Phazir models are available, depending on wavelength range; the DTS-PHAZIR-1018 for 1000-1600 nm and the DTS-PHAZIR-1624 for 1600-2400 nm.

Features:
 - Provides qualitative and quantitative material analysis, including material ID and concentration level measurements
 - Safe, nondestructive measurement -- uses a standard light source
 - All data stored in memory and downloadable to PC
 - Easy to use -- point and shoot operation with instantaneous (1-2 seconds) analysis time
 - New software features and upgrades can be performed by the user
 - Color LED display
 - Advanced, intuitive user interface
 - Rechargable lithium ion battery for 5 to 8 hours of continued use

For more information please contact:
Lastek Pty Ltd
Adelaide University - Thebarton Campus
10 Reid St, Mile End, South Australia 5031
Phone: (08) 8443 8668
Toll Free: 1800 882 215 (NZ: 0800 441 005)
email: sales@lastek.com.au
web: www.lastek.com.au

New Diffraction Grating Mount

Newport's new model DGM-1 mount is designed specifically for precision positioning of diffraction gratings. This mount is capable of holding square or rectangular gratings having dimensions of 12.5 mm, 25 mm, or 50 mm, all 6-mm-thick. Its unique clamp design allows the grating, regardless of size, to always sit at the centre of rotation of the mount. Four degrees of freedom are provided to achieve ideal alignment. Angular adjustments pitch and roll are driven by two precision 100-TPI threaded screws, and a linear x-axis adjustment allows the grating to be located right at the centre of yaw rotation. All adjustments are lockable. The DGM-1 is supplied with two BR-U clamps to allow mounting to an optical table top.

- Hold various sized gratings, square or rectangular 12.5 mm, 25 mm, or 50 mm
- 4 axes of precision adjustment
- Yaw and roll adjustments made about centre point on grating surface
- 10 arc sec of angular sensitivity
- All adjustments lockable

For more information please contact:
Neil or Graeme
sales@newspec.com.au
Tel: 08 8273 3040   Fax: 08 8273 3050

New Hand-held Optical Power & Energy Meter

For applications requiring the measurement of low-power, high-power or energy of continuous or pulsed light sources, Newport's model 1918-C Hand-Held Optical Power and Energy Meter is the new instrument of choice. This new optical meter squeezes the advanced features and display capabilities of Newport's latest 1935-C Series optical meters, into a compact, wall-plug and battery powered device, making it ideal for use in the lab or in the field.

The 4 inch, full colour, graphical LCD display enables both numerical and graphical measurement representation, with a selection of various colour palettes to allow viewing through laser safety goggles. The 1918-C is compatible with Newport's large range of high and low power and energy detector heads. Pulseed, peak-to-peak and DC source measurements can be displayed in units of W, dBm, dB, J, A, and V. Advanced features include a 250,000 data point storage buffer, analogue and digital filtering, programmable sample rates, moving statistics, plotting and multiple user-configuration storage.

- Measurement rep-rates up to 4 kHz
- *True rms* measurements
- Power measurements, 1 nW to 6 kW
- Energy measurements, 100 mJ to 75 J
- USB computer interface
- Data storage via internal memory (250k data samples) or *USB Flash Drive*
- Plotting, graphing, math, statistics, and on-board data post-processing

For more information please contact:
Neil or Graeme
sales@newspec.com.au
Tel: 08 8273 3040
Fax: 08 8273 3050

New Solar Panel I-V test Station

Newport's new Oriel I-V Test Station runs I-V measurements and calculates critical parameters such as short circuit current (Isc), current density (Jsc), open circuit voltage (Voc), fill factor (ff), maximum output power (Pmax), and cell efficiency (h), and other standard photovoltaic cell parameters. The station is modular and can include a source/meter, reference cell, cell holder, probing assembly, vibration isolated lab table, and measurement software, depending on the required configuration.

The new Test Station is designed to work with existing Newport Oriel 2x2" or 4x4" solar simulators, and Oriel Research Housing (model 96000) based simulators. The only other thing required is a PC to run the software, and some solar cells to measure.

- New! Complete I-V measurement solution for photovoltaic cells
- Works with any 2x2" and 4x4" beam size Newport Oriel solar simulator as well as Research Housing based simulator
- Easy to retrofit to existing Newport Oriel simulators with modular subassemblies
- Easy-to-use LabVIEW based I-V characterization software
- CE mark pending

For more information please contact:
Neil or Graeme
sales@newspec.com.au
Tel: 08 8273 3040
Fax: 08 8273 3050

New Higher Power Lasers

Cobalt of Sweden has announced the release of its higher power models of the Cobalt Calypso™ lasers. The single-line Cobolt Calypso™ is now available with up to 100 mW at 491 nm and the Cobolt Dual Calypso™ with up to 50+50 mW at 491+532 nm.

The Cobolt Calypso™ family consists of continuous-wave solid-state lasers operating at fixed wavelengths in the blue and green. The single-line Calypso laser emits at 491 nm and the unique Dual Calypso laser emits simultaneously at 491 and 532 nm in one beam. The output power of these lasers has now been scaled to 100 mW and 50+50 mW respectively, while maintaining the same compact package and optical performance as the lower power models.

All Cobolt lasers are single-frequency lasers with very narrow spectral bandwidth (typically <30 MHz). Built on a robust platform they feature low noise (rms noise <0.3%; peak-to-peak noise <3%), excellent beam quality (M2<1.1) and low power consumption (the full system consumes <40W). The wavelengths and beam characteristics match very well those of the Ar-ion lasers and the laser housing has a mechanical outline compatible with the current industry standard for blue solid-state Ar-ion laser alternatives.

The higher power levels make the Cobolt Calypso™ lasers particularly attractive for demanding applications including cell sorting, spinning-disc or line-scanning confocal microscopy, high throughput bioanalysis and laser Doppler velocimetry.

The Cobolt Calypso™ lasers are available with an ultra-compact controller unit especially designed for OEM integration. The controller comes in a robust metal housing with mounting holes for convenient handling and installation, and for optimum heat dissipation. It is equipped with standard connectors for power supply (5V, 8A) and for remote operation and monitoring of the laser system via digital (RS-232) or analogue interfaces. The Cobolt Calypso lasers are also available with a CDRH-compatible controller for stand-alone use.

Further information on these and other laser systems is available from WARSASH Scientific Pty Ltd at (02) 9319 0122 or sales@warsash.com.au

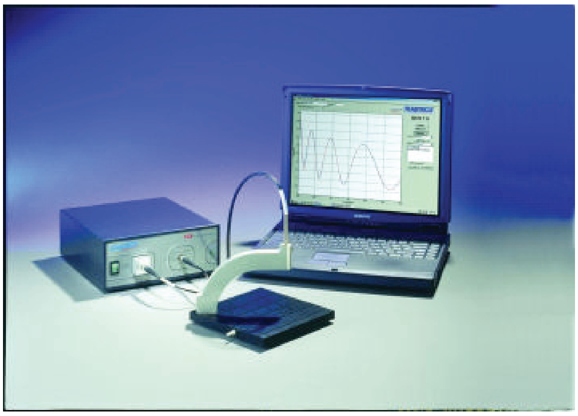
Filmetrics Inc. Appoints Warsash Scientific as their Representative in Australia & NZ

Warsash Scientific Pty Ltd are pleased to announce their appointment as the exclusive Australian and New Zealand Representatives of Filmetrics, Inc. of California.

Filmetrics is the leader in affordable and easy-to-use instruments for measuring film thickness (30Å to 450µm), index of refraction, and deposition rates.

Founded in 1995, Filmetrics' mission was to make thin-film measurements simple, easy-to-use, and reasonably priced. Filmetrics succeeded in this, designing affordable purpose-built miniature spectrometer systems and combining them with sophisticated software that integrated advanced thin-film expertise into a simple, intuitive Windows interface.

Further information on these systems is available from WARSASH Scientific Pty Ltd at (02) 9319 0122 or sales@warsash.com.au



CLEO/QELS 2007
May 6 - 11 2007 Baltimore MD, USA.

CLEO Pacific Rim 2007
August 26 - 31 2007, COEX, Seoul, Korea

Important dates!
Deadline for Paper Submission : March 23, 2007
Notification of Acceptance : May 25, 2007
Pre-registration Due Date: July 6, 2007

NOMINATIONS OPEN FOR 2007 VICTORIA PRIZE AND FELLOWSHIPS

Nominations for the Victoria Prize and Victoria Fellowships have opened.

The awards are worth more than $250,000 and are part of the Victorian Government's commitment "to support and foster excellence in science, technology and engineering and complement the Science, Technology and Innovation Initiative."

The $50,000 Victoria Prize recognises a scientist or engineer whose groundbreaking discovery or technological innovation has significantly advanced knowledge or has the clear potential to produce a commercial outcome or other benefit to the community.

The research institute supporting the work of the Victoria Prize recipient will again be recognised with the $100,000 Anne & Eric Smorgon Memorial Award, presented by the Jack and Robert Smorgon Families Foundation.

Past Victoria Prize winners include:

- David Solomon, for his research into polymer technology including the development of the world's first plastic bank note, which was introduced in Australia in 1988 and is now used in 22 countries;
- David Vaux, for his pioneering efforts in understanding apoptosis, or programmed cell death;
- Keith Nugent, whose seminal work has changed the way we see and measure images through light; and
- Eric Reynolds, for his groundbreaking research into oral health and the prevention of tooth decay.

As well as the Victoria Prize, up to six $18,000 Victoria Fellowships are awarded to early career researchers to help them travel overseas and further their research, expand international networks, develop a commercial idea or undertake specialist training.

Applications are open to any young researcher working in private enterprise or a research institution.

Victoria Fellows planning a study mission in France will be eligible to apply for the $5,000 AFAS FEAST-France Fellowships, offered by the Australian French Association for Science and Technology (Victoria) and the Embassy of France.

Nominations and applications close on 10 April 2007 with winners publicly announced in August. Application and nomination forms are available from www.business.vic.gov.au/vicprize

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Nanophotonics (NANO)
Topical Meeting and Tabletop Exhibit

June 18-21, 2007
Zhejiang University (ZJU)
Hangzhou, China

Submission deadline March 2, 2007 (*yes, I know, but they might take a post-deadline paper!! Ed*.)

Nanophotonics is an emerging multidisciplinary field that deals with optics on the nanoscale. The objective of this topical meeting is to bring together international scientists and researchers interested in the recent developments in nanophotonics. It provides an international forum to present and discuss the state-of-the-art methods, materials, instrumentation and applications related to light-matter interactions on the nanometer scale. More specifically, the conference discusses the recent developments and challenges in materials processing and synthesis, fabrication, design and modeling, characterization and applications of nanophotonics.

Chairs
Joseph W. Haus, Univ. of Dayton, USA
Sailing He, ZJU, China and KTH, Sweden
Xi Liu, ZJU, China

Sponsored by: OSA, ZJU, and NSFC

Pico Second Diode Pumped Lasers

Introducing the new PICO (PS) & PICO REGEN (RG) series diode pumped solid state lasers from Photonics Industries, featuring ~15ps nominal pulse widths and average powers ranging from 200mW to 50W. The PS series are mode locked with a high rep rate ~80Mhz providing a "quasi cw" type of laser radiation while the RG series are Q-switched to offer higher pulse energy and peak powers.

PICO Series

Features:

- Air cooled up to 5W
- Closed loop chilled up to 50W
- Small form factor, compact laser head
- Industrial grade
- Diode pumped technology
- Excellent beam quality (M2 typically <1.2)
- Wide range of powers and harmonic options available:
    - o IR 1064nm: up to 50 Watts
    - o Green 532nm: up to 25 Watts
    - o UV 355nm: up to 16 Watts
    - o DEEP UV 266nm: up to 4 Watts

PICO REGEN Series

Features:

- Closed loop chilled up to 30W
- Small form factor, compact laser head
- Industrial grade
- Diode pumped technology
- Variable rep rate: Single Shot to 100kHz
- Excellent beam quality (M2 typically <1.2)
- Wide range of powers and harmonic options available:
    - o IR 1064nm: up to 30 Watts
    - o Green 532nm: up to 13 Watts
    - o UV 355nm: up to 8 Watts
    - o DEEP UV 266nm: up to 4 Watts

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Advanced Instruments for Research & Industry

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NSW 2012
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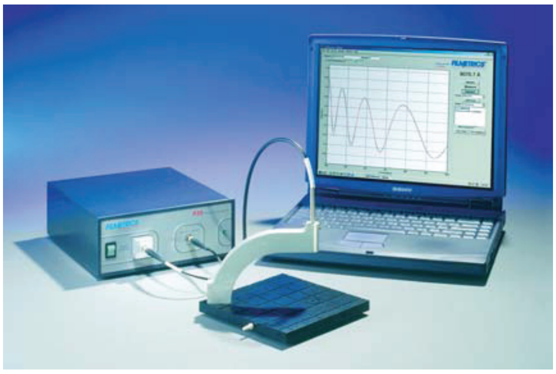
Advanced Thin-Film Measurement Systems

FILMETRICS

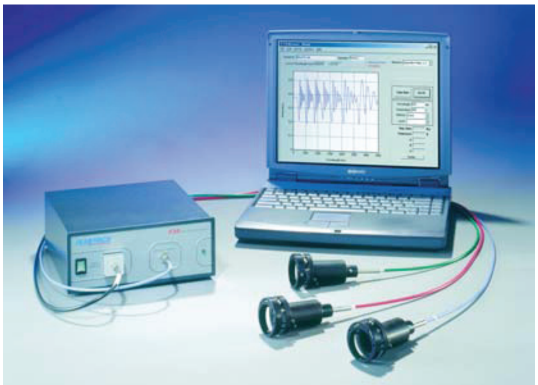


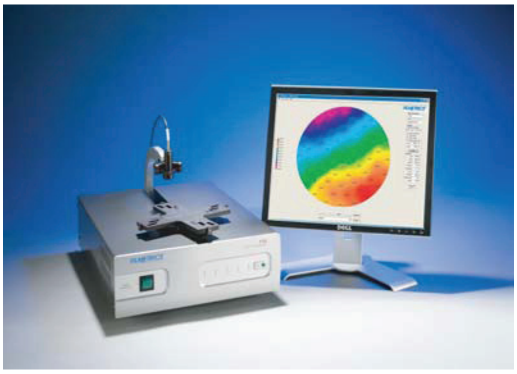
F20 - Thin-Film & Optical Constants

Thickness and optical constants (n and k) are measured quickly and easily withthe F20 advanced spectrometry system. Spectral analysis of reflectance from the top and bottom of the thin film provides thickness, refractive index, and extinction coefficient in seconds. The entire desktop system sets up in minutes and can be used by anyone with basic computer skills.

F30 - Thin-Film Deposition

Measure deposition rates, layer thickness, optical constants (n and k), and uniformity of semiconductors and dielectric layers in real-time with the F30 spectral reflectometry system. For growing layers, the F30 continuously monitors sample reflectance at one or more wavelengths. The deposited layer's optical properties produce unique time-dependent interference oscillations in the reflectivity signal. "Virtual interface" analysis of these oscillations allows for easy determination of the layer's deposition rate and optical constants within 1% accuracy.





F20 - Automated Thin-Film Mapping System

Thin-film thickness and n and k are mapped quickly and easily with the F50 advanced spectral reflectance system. The motorized stage moves automatically to selected measurement points and provides thickness measurements in seconds. Choose one of the dozens of predefined polar, rectangular, or linear map patterns, or create your own with no limit on the number of measurement points.

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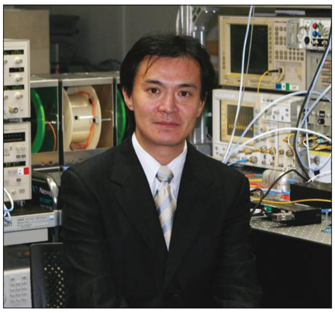
NEWSLETTER

COMMISSION INTERNATIONALE D'OPTIQUE • INTERNATIONAL COMMISSION FOR OPTICS

Hideyuki Sotobayashi wins the ICO Prize

The ICO Prize for 2006 is won by Dr Hideyuki Sotobayashi of Japan.



Dr Hideyuki Sotobayashi, a senior scientist at the National Institute of Information and Communications Technology, Japan.

Dr Hideyuki Sotobayashi, a senior researcher at the Advanced Communications Technology Group, National Institute of Information and Communications Technology (NICT) in Japan, has been awarded the ICO Prize for 2006. A talented researcher, Dr Sotobayashi was chosen for "his outstanding contributions in the areas of optics communications, optical fibre technologies and new photonic devices. These achievements were done as a researcher younger than 40 years old (as per 31 December 2006)".

Dr Sotobayashi received his PhD in electrical engineering in 1997 from the University of Tokyo. He then served as an attached researcher at the NICT and is currently a senior scientist at the same institution in the Advanced Communications Technology Group. He is an affiliated researcher at the Research Laboratory of Electronics at the Massachusetts Institute of Technology (US).

His research interests include fibre lasers, highly nonlinear optical fibres for supercontinuum generation, nanoscale photonic-crystal microcavities, broadband optical amplifiers based on optical fibres, optical code division multiplexing (OCDM), transmission systems and ultrafast hierarchical hybrid OCDM/wavelength demultiplexing (WDM) photonic devices.

Among his many achievements in research, in 2002 Dr Sotobayashi and two collaborators proposed a photonic gateway performing the bilateral conversion and reconversion of multiplexing format and operating at 40 Gbit/s (4 × 10 Gbit/s). The optical OCDM-to-WDM conversion and WDMO-to-CDM reconversion was demonstrated in an experiment for the first time. The experiment was based on ultrafast photonic processing in both the time and frequency domains, namely optical encoding/decoding along with optical time-gating in the time domain, and supercontinuum generation followed by spectrum slicing in the frequency domain. Thus they proved the feasibility of ultra-highspeed operation in photonic networks.

Moreover, Dr Sotobayashi has reviewed the latest photonics devices with the intention of redesigning them in order to simplify their configurations.

Through these accomplishments and others, Dr Sotobayashi has significantly contributed to improving the performance of key technologies for hierarchical optical time domain (OTDM)/WDM multiplexing format conversions, and OTDM wavelength-band conversion networks.

Dr Sotobayashi has authored or co-authored more than 60 peer-reviewed articles in international journals and has been invited to various international conferences. He has received many distinctions and awards including the 1999 Young Engineer Award from the Institute of Electronic and Communication Engineers of Japan and the 2005 Young Scientist Award from the Ministry of Education, Culture, Sports, Science and Technology of Japan. In addition, he holds one awarded patent.

Dr Sotobayashi is very active in a number of professional societies in optics, photonics and electrical engineering. In recent years he has participated in many scientific committees and tutorials in photonics and optical communications technologies.

Optical transmission technologies are dramatically progressing in part because of Dr Sotobayashi's numerous contributions to optical technology and devices. The future of photonic networks is very promising and will enable routing and switching in the optical layer by use of ultrafast photonic processing.

Dr Sotobayashi is expected to deliver a plenary lecture at one of the forthcoming major ICO topical meetings, where the award ceremony for the ICO Prize 2006 will take place. This event will be announced in due course.

The ICO Prize committee is chaired by Dr B Y Kim and its members are Prof. S Bagayev (Russia), A Friesem (Israel), G Jin (People's Republic of China), J Love (Australia) and A M Weiner (US).

The committee is now seeking nominations for the ICO Prize 2007. Nominators are asked to visit the ICO website and follow the instructions given on the awards page (www.ico-optics.org/awards.html).

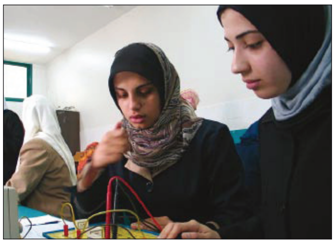
Nominations should be submitted no later than 15 April 2007. They can be sent by post to Dr B Y Kim, chair of the prize committee, at Novera Optics, KT Second Research Centre, 463-1 Jeonmin-dong, Yuseong-gu, Daejeon 305-811 Korea; sent by fax: +82 42 602 3799; or sent by e-mail: yoon.kim@noveraoptics.co.kr.

Palestinian wins Galileo Galilei Award

Prof. Mohammed M Shabat wins the ICO Galileo Galilei Award 2006 for his many contributions to optics and photonics.

Prof. Mohammed M Shabat, a professor of physics at the Islamic University of Gaza, Palestine.

Prof. Shabat presenting at the 9th International Symposium on Microwave and Optical Technology.



Undergraduate students at work in the IUG laboratory for electronics.

ICO established the Galileo Galilei Award in 1993 to recognize outstanding contributions in the field of optics that are achieved under unfavourable circumstances. According to the rules of the award, outstanding contributions include advances in fundamental scientific questions or problems; research or development of optical methods or devices; or scientific or technical leadership in the establishment of regional optical centres. Winners will have experienced difficult economic or social conditions, or a lack of access to scientific or technical facilities or sources of information.

For the year 2006 the recipient of the award is Prof. Mohammed M Shabat at the Islamic University of Gaza (IUG), Palestine. Prof. Shabat was selected "for his outstanding scientific contributions in the area of theoretical and electromagnetic optics, which were accomplished under comparative unfavourable circumstances as defined on the award call and for his relevant work for the organization of optics and photonics activities in Palestine".

Prof. Shabat was born in Beit Hanoun, Gaza Strip, Palestine, in 1960. He received his BSc in physics from Al-Aazhar University, Egypt, in 1984 and his PhD from the University of Salford, UK, in 1990. He was a research fellow at the University of Manchester's Institute of Science and Technology, UK, from 1989 to 1992. In 1992 he joined the IUG as an assistant professor of physics. The IUG is the first higher-education institution to be established in the Gaza Strip. The Faculty of Science at IUG is one of the pioneering faculties in Palestine. It was established to meet the needs of specialists and scientific researchers and to educate students in the latest developments in science and technology.

Prof. Shabat served as dean of the Faculty of Science from 1993 to 1997, and served as vice-president of administrative affairs at IUG from 2001 to 2005. In 1996 he became associate professor of physics and was made professor of physics in 2000. He was awarded the Shoman Prize for a Young Arab Scientist (Jordan) in 1995, and received the Humboldt Research Fellowship from 1998 to 1999 at the Centre for Semiconductor Technology and Optoelectronics, Duisburg-Essen University, Germany.

Since 1994 Prof. Shabat has been a visiting scientist in various institutes, universities and research laboratories: Bochum University, Germany; the Institut National Polytechnique de Grenoble (INPG), France; Salford University, UK; the International Centre for Theoretical Physics (ICTP), Italy; and Duisburg-Essen University, Germany. He is currently visiting scientist at the Max Planck Institute for the Physics of Complex Systems, Germany. In addition to his strong research background Prof. Shabat has published more than 140 papers in international journals and has contributed to many local and international conferences. His research interests include non-linear optical sensors, optoelectronics, magneto-static surface waves, numerical techniques, mesoscopic systems, energy physics, applied mathematics, nanotechnology and physics education.

Prof. Shabat is very devoted to his students. He has supervised more than 20 postgraduate students in physics and mathematics. Recently he established a Palestinian Optical Society. At IUG he has been an active member of scientific committees for establishing new postgraduate programmes in mathematics, physics and electrical engineering, as well as undergraduate programmes in computer science, environmental sciences and optometry. He was a member of the editorial board for the journal *Transactions on Magnetics* from the Institute of Electrical and Electronics Engineers (IEEE) from 1996 to 1997.

Prof. Shabat has been active in raising the international profile of Palestinian science. He has served as associate member of the ICTP (1997); a member of the Palestinian delegation to the 44th meeting of the International Atomic Energy Agency in Austria (2000); a senior member of IEEE (2003); a member of the steering committee of the World Renewable Energy Congress/Network, UK (2003); a fellow of the Academy of Sciences for the Developing World (2004); and a member of the committee for the Shoman Prize for Young Arab Researchers (2006). Prof. Shabat is also a member of the Palestinian Physical Society; the Palestinian Society for Mathematics and Computer Sciences; the Palestinian national committee of the Ministry for Higher Education in Science, Technology and Research; and a fellow of the Palestinian Academy of Sciences. Prof. Shabat is the first Arabian scientist to win the Galileo Galilei Award.

The ceremony for the 2006 Galileo Galilei Award will be held sometime in 2007 or 2008 and it will be followed by the plenary lecture delivered by Prof. Shabat at one of the major ICO conferences during that period. Details will be published in a future issue of the *ICO Newsletter* and on the ICO website.

The ICO Galileo Galilei Award committee consists of: Ichirou Yamaguchi (Japan), chair, and members S Bagayev (Russia), Z Ben Lakhdar (Tunisia), A Consortini (Italy), N Gaggioli (Argentina) and V Vlad (Romania).

The 2007 award is now open for nominations. Nominators are asked to view www.ico-optics.org/Awards for more information.

ICO Bureau decides development strategy

The Bureau approves actions to develop ICO at a two-day meeting in St Petersburg.

The ICO Bureau meets once every year to discuss updates and developments for the current ICO programmes and to determine whether new activities should be considered. In the years when the General Conference and General Assembly take place, the Bureau meets where those events are held. In addition to those special dates, the Bureau usually meets during major ICO meetings. This year the ICO Bureau held its annual meeting in Saint Petersburg, colocated with the ICO Topical Meeting on Optoinformatics/Information Photonics 2006.

The two-day meeting was held at the Research Institute of Optoinformatics at Saint Petersburg State University of Information Technologies, Mechanics and Optics (ITMO). The hospitality and technical support provided by ITMO's academic authorities helped to make the meeting a success.

Prof. Nikolay Nikonorov, director of the Research Institute of Optoinformatics, presented a summary of activities and research areas developed at the institute with details of research on optical materials, GRIN media and 3D holography. In addition to other approved actions, ICO will try to increase its presence in ICSU activities, enhance the links with industry and coordinate activities in the areas of optics and photonics with international societies for education and training. ICO will also coordinate the internal organization and territorial committees. Detailed information will be offered in the corresponding Green Book edited by the ICO Secretariat at the end of term 2005–2008.

The ICO Bureau. First row from left to right: M L Calvo, A T Friberg, G von Bally, R Dándliker and A Sawchuk. Second row (from left to right): P Stahl, G Sincerbox, I Yamaguchi, A Consortini, H Lefèvre, B Y Kim, G Jin, A Guzmán, A Wagué, M Kujawinska, Y Pettrof and M Gu.

The next ICO Bureau meeting will be held in Cape Coast, Ghana, during the ICO Topical Meeting 2007 on Optics and Laser Applications in Medicine and Environmental Monitoring for Sustainable Development in November 2007.

A detailed report on the ICO Topical meeting on Optoinformatics/Information Photonics 2006 will appear in the April 2007 issue of the *ICO Newsletter*.

Visit to Mexican institutions bears fruit

A Cuban researcher visits Mexico under ICO's Travelling Lecturer Programme.

Dr Fájer delivering a lecture at CINVESTAV, the National Polytechnic Institute, in Mérida in Mexico.

From 19 August to 9 September 2006 Dr Víctor Fájer, a researcher at the Centre of Technological Applications and Nuclear Development (Cuba), visited different Mexican institutions under the ICO Travelling Lecturer Programme. These institutions have shown an interest in the development of laser systems constructed in Cuba as well as their use in analysis. The visit included the Federal District and the Sinaloa and Yucatán states.

Dr Fájer delivered talks on design aspects, promoting collaboration in the region, and the development of optical instruments and their applications. The first lecture, entitled "New developments in laser polarimeters and their applications", was given in the Centre of Applied Sciences and Technological Development (CCADET), where Dr Fájer received invaluable support from Dr Roberto Ortega.

CCADET, a centre at the National Autonomous Metropolitan University of Mexico (UNAM), develops methods and techniques for employing optics, electronics and mechanics. It has an infrastructure of optical laboratories that enables researchers to perform experimental studies of nonlinear optics, optical fibres and other topics connected with lasers. During his visit to the centre Dr Fájer held discussions with

Dr Víctor Fájer with researcher I Martínez-Rodríguez at the Laboratory of Chromatography, Mazatlán Research Station on Aquaculture and Environmental Management.

researchers and visited the laboratories.

Dr Fájer next visited the Mazatlán Research Station on Aquaculture and Environmental Management (CIAD). This visit was facilitated by Dr María Cristina Chávez, director of the research station. At the research station Dr Fájer gave a seminar on "Polarimetric and chromatographic techniques employing lasers for vegetable extracts" mainly to promote different applications of the laser systems to potential users. Dr Fájer also visited the analytical laboratory, which has powerful chromatographic equipment.

As a result of his visit the Research Station on Aquaculture and Environmental Management decided to promote these techniques in similar units, such as the one in Culiacán which analyzes agricultural products.

The third exchange, organized by Dr Rodrigo Patiño, took place at the Research Centre for Investigation and Advanced Studies (CINVESTAV) at the National Polytechnic Institute. Dr Fájer visited various laboratories, including those belonging to the Department of Applied Physics. The applied-physics department was opened in 1987 and at present has 28 lecturers, all of whom belong to the National Research System. The research interests of the members of the department include corrosion, electrochemistry, physics and chemistry of materials, condensed matter, complex systems, statistics, nonlinear physics, elementary particle physics and life matter.

Dr Fájer delivered a seminar entitled "Design criteria of automatic polarimeters: influence of the spectral bandwidth on polarimetric measurements". Researchers, technicians and students from CINVESTAV actively participated in the seminar.

During his visit to CINVESTAV, Dr Fájer and others identified a mutual interest in collaborating on the application of laser systems. This tentative interest could be met with a collaboration agreement between CINVESTAV and the Centre of Technological Applications and Nuclear Development of Cuba.

All the institutions mentioned above showed strong interest in promoting the applications and development of laser systems in the Latin-American region.

Forthcoming events with ICO participation

Below is a list of events with ICO participation that are coming up in 2007–2008. For further information, see www.ico-optics.org/events.html.

17–19 April 2007
International Workshop Technolaser 2007
Havana, Cuba.
Contact: Dr J R Triana, tecnolaser@ceaden.edu.cu, www.ceaden.cu/tecnolaser/index.asp

3–5 June 2007
Education and Training in Optics and Photonics (ETOP) 2007
Ottawa, Canada.
Contact: Dr Marc Nantel, marc.nantel@oce-ontario.org

9–11 July 2007
3rd Asian and Pacific Rim Symposium on Biophotonics (APBP 2007)
Cairns, Australia.
Contact: Prof. Min Gu, mgu@swin.edu.au, www.apbp2007.com

5–7 September 2007
International Conference on Optics and Laser Applications – ICOLA 2007
Yogyakarta, Indonesia.
Contact: Dr Sar Sardy, sardy@eng.ui.ac.id

11–14 September 2007
8th International Conference on Correlation Optics
Chernivtsi, Ukraine.
Contact: Prof. Oleg V Angelsky, oleg@optical.chernovtsy.ua

8–12 October 2007
Advanced Infrared Technology and Applications International Workshop 2007 (AITA 9)
León, Guanajuato, Mexico.
Contact: Prof. Marija Strojnik, mstrojnik@aol.com, http://ronchi.isti.cnr.it/AITA2007

19–22 November 2007
ICO Topical Meeting 2007 on Optics and Laser Applications in Medicine and Environmental Monitoring for Sustainable Development
Cape Coast, Ghana.
Contact: Prof. Paul Buah-Bassuah, buahbass@hotmail.com

7–11 July 2008
ICO-21, Triennial Congress of the International Commission for Optics
Darling Harbour, Sydney, Australia.
Contact: Prof. John Love, jdl124@rsphysse.anu.edu.au

Contacts

International Commission for Optics (www.ico-optics.org).

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Responsibility for the accuracy of this information rests with ICO. President: Ari T Friberg, Royal Institute of Technology, Optics, Electrum 229, SE-164 40 Kista, Sweden; e-mail: ari.friberg@imit.kth.se. Associate secretary: Gert von Bally, Laboratory of Biophysics, Medical Centre, University of Münster, Robert-Koch-Str. 45, D-48129 Münster, Germany; e-mail: lbiophys@uni-muenster.de.

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