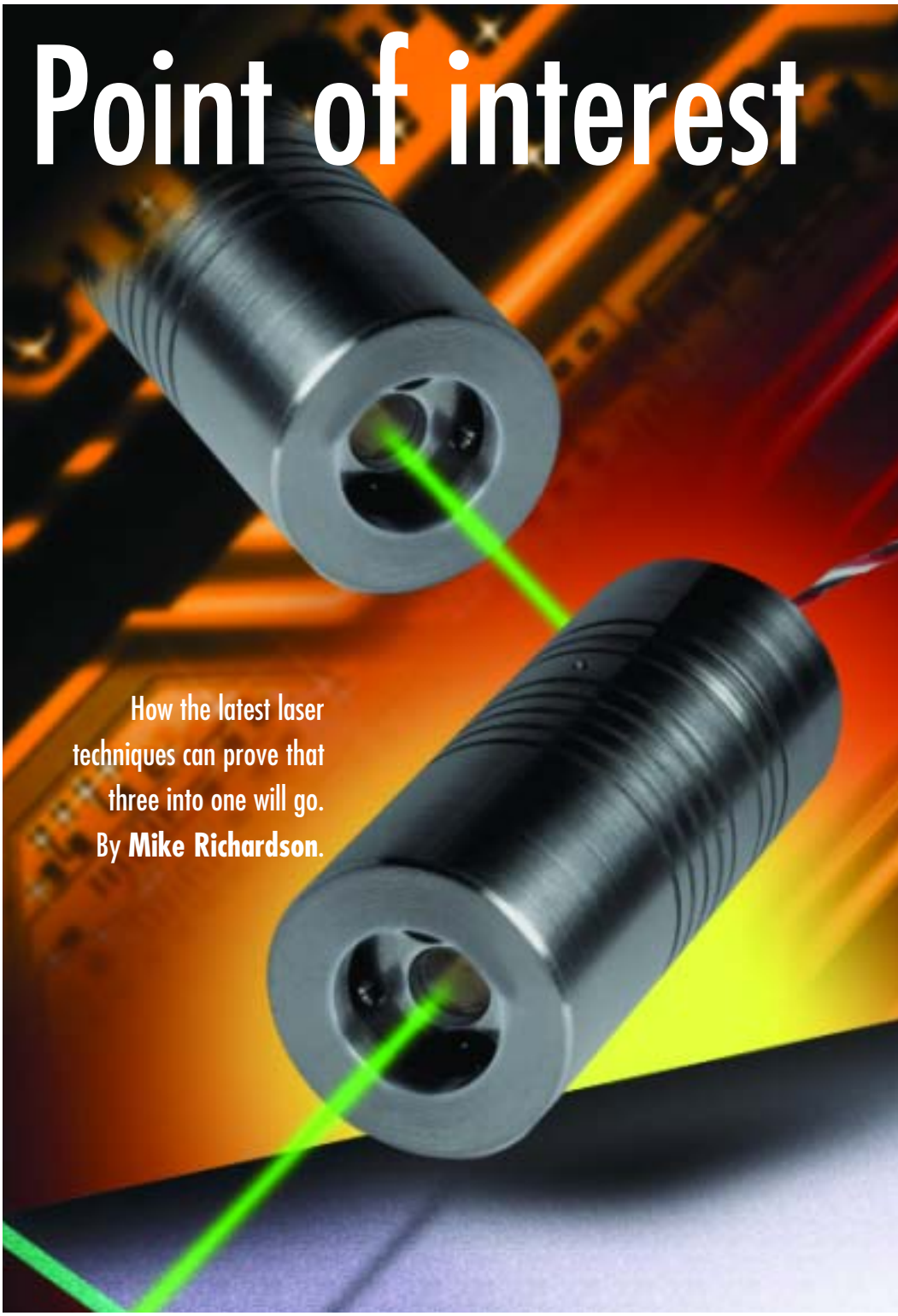
Point of interest



How the latest laser techniques can prove that three into one will go.

By **Mike Richardson**.

Mention the word 'laser' and you could be forgiven for thinking of epic sci-fi space movies with the kind of handheld accessories that no self respecting Jedi should be without. Less destruction and fight, more construction of light, the advances in laser technology – through a burgeoning use of innovative electronics and minus the wobbly 'zapping' noises – have brought a host of industry applications under the steady beam of the laser's focus.

Laser specialist Pacer sees an innovative use for fibre lasers and market growth stemming from their versatility and flexibility. Pulse on demand fibre lasers can replace a number of other lasers in a multi-station process. Users can vary the pulse width, peak energy, repetition rate and program complex pulse shapes. Frequency doubling and trebling enables a single laser to ablate at the fundamental, doubled and tripled frequencies.

"The demand for fibre lasers is driven by the customers' requirements for increased speed and improved quality," Pacer's new business development director Stuart Sendall began. "Because fibre lasers have different optical beam characteristics – which are significantly better than traditional lasers – you can achieve brighter intensity all in one focal point. Even though older laser systems had the high power and could be focused, they didn't have the beam quality or accuracy of focal point currently demonstrated by fibre lasers. As a result, the energy density wasn't as high as hoped. Fibre lasers deliver a much higher brightness, which has set the benchmark in terms of W/cm≈ and in a more clearly defined area to because the beam quality is higher and therefore more precise and faster."

Sendall notes that some materials don't interact well with certain lasers because they simply absorb the energy and overheat. This is particularly noticeable on semiconductor repair, scribing and marking, solar panels and even with writing encoder discs. Nowadays, material interaction is more predictable and consistent because of the advances in laser technology.

To underline his point, he relates the process of stripping wire and marking it. "This normally requires the work of two lasers: one to strip the insulation off and the other to mark it. The difference is that while one is a heat based process the other clearly needs to avoid heat, so it's rare to find one laser that does both tasks. The semiconductor process requires numerous lasers to perform a number of different processes on a hybrid combina-

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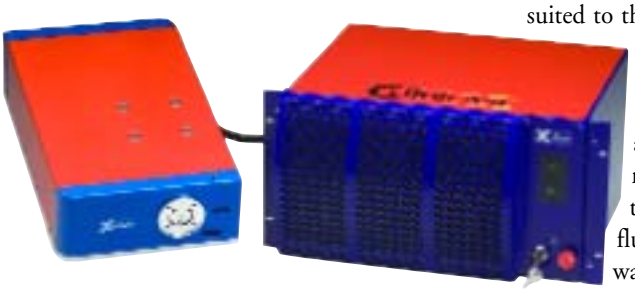

tion of materials. Sometimes it's down to wavelength but much of the time it is due to the energy pulse profile, the shape of it, how long it will last and its peak energy. Pulse on demand lasers optically 'pulse' to create a hammering effect. By shaping the pulses you can obtain more flexibility and versatility than having just one traditional laser."

Three of a kind

While material processing is normally performed at around 1064nm, a revolutionary process of adding a 'crystal' can double the frequency to 532nm (green) and treble the frequency to 355nm (UV). Normally, you would require an infrared laser, a green laser or a UV laser, whereas in theory, you can use the latest optical filtering techniques to enable one laser to generate all three of these wavelengths on demand.

"Customers are looking for more versatility and flexibility; they want fully adjustable lasers to replace a number of different types of laser," Sendall affirmed. "This places technology demands such as higher brightness, long life diode sources and lower cost per Watt technology platforms to meet these requirements."

Photonic Products states that general medical uses now employ laser diodes in patient positioning, DNA analysis, X-ray scanners and blood sensors. Complementary activity can also be seen in the field of molecular diagnostics and where the deflection of laser light caused by particles in suspension, i.e. in blood can prove a useful diagnostic tool such as a nephelometer. In addition, low level laser therapy for muscle recovery and skin treatment continues to grow in interest.

Photonic's sales director Tony Wright reaffirms this view by pointing to the proliferation of new applications that are suited to the compact size and versatility of the laser diode.

"There's an expanding use of laser diodes in bio-scientific applications, such as in instruments that function around the stimulation and sensing of fluorescence at a number of wavelengths," he explained. "The recently introduced blue violet (405nm) devices enable new areas of activity in bioscientific and medical fields. Fibre delivery to 'point of interest' is becoming progressively more attractive and is adding to the versatility of the laser diode as a laser solution. Customers primarily require reliability which we are able to offer in our range of modules and collimators - many with focusable optics and onboard drive circuitry - due to the fact that the 'heartbeat' of the device is either a well proven Sanyo, Sony or Opnext laser diode."

Many laser techniques touch on the electronics industry such as the ablation of indium tin oxide (ITO) in OLED manufacture, as well as numerous material processing applications including semiconductor scribing, solar panel processing, thick film deposition and laser deposition.

Pulsed laser deposition is new area of innovation where a powder form of the base metal, such as titanium for example, is used to create a desired shape by illuminating the area and fusing the powder together to form the shape. Repeating the build up process over successive layers gradually constructs an intricate 3d shape.

Upward integration

With low cost, versatility, power reduction, longer lifetimes and consistent quality on different surfaces high on the laser user's wish list, Sendall says that Pacer is seeing an upward integration to add functionality and intelligence whilst making user application simpler.

Wright points to a distinct market requirement: a demand for higher stability green modules at economic price levels. "Current technology is generally centred on a diode pumped crystal arrangement where a higher wavelength diode (808nm) is used to ultimately produce 532nm emission. But if you're looking for any kind of stability then thermo electric cooling (TEC) is usually a prerequisite here. Generally this carries a prohibitive cost for many applications. However, in collaboration with Sanyo, we've just launched a TEC green module at pricing that approaches that of many uncooled lased diode modules."

Satisfying a range of diverse laser applications, both Pacer and Photonic Products have dedicated design centres to help customers who cannot source off the shelf components or assemblies. Pacer uses its extensive product portfolio and capability in designing pcbs, assemblies, enclosures and connections, whilst Photonic Products offers a complete custom design service centred on the packaging and supply of laser diode solutions for a host of applications.