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SPIE Optics+Photonics 2012 Edition

Welcome to our latest **Product Focus** which we have published specifically for **Optics+Photonics 2012**.

Here you can see a range of products from both exhibitors and non-exhibitors alike. We have included booth numbers (where available) making it easy for you to check out the products for yourself.

We also look at a €20 million investment at ULIS as they build a brand new facility and move production to 200mm wafers. And, how Phase Focus landed £3.2m funding to speed development of disruptive lens-free microscopy.

The next edition of the **optics.org Product Focus** for **Photonics West 2013,** will be incorporated into the new official **Photonics West Show Daily**.

Every day of the show, from Tuesday 5th - Thursday 7th February, 6,000+ copies will be distributed inside the Moscone Center in both North and South halls and primary hotels, giving you more exposure to attendees than ever before.

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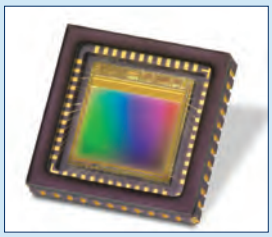

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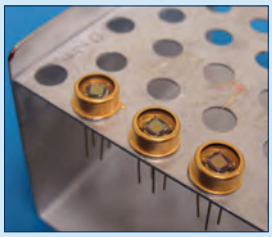

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Cambridge Technology Inc announces the 8350K High Stability Galvanometer

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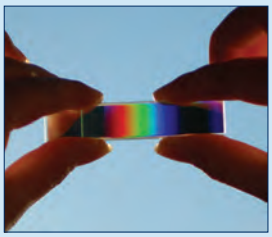

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Venture funding brings 'virtual microscopy' into sharper focus

UK-based Phase Focus lands £3.2M funding from Ombu Group and Fusion IP to speed development of disruptive lens-free microscopy.

Phase Focus, a spin-out from the UK's University of Sheffield, has attracted £3.2 million in equity funding aimed at commercializing a potentially revolutionary "lensless" form of microscopy.

Ombu Group, a new player on the UK's venture scene, has provided the bulk of that capital with a £3 million investment, while existing investor Fusion IP added a further £220,000.

Phase Focus's seemingly counter-intuitive idea is to remove the need for lenses in microscopy – a highly disruptive concept with a very wide range of applications in both science and industry. Instead of using a lens to capture light in the normal manner, light scattered by a specimen is instead collected by a conventional CCD, CMOS or other sensor via an aperture, analyzed, and the image reconstructed using a sophisticated phase retrieval algorithm.

The approach – known as "ptychography" in the scientific literature - is similar in principle to holography, in that it relies on direct collection of diffracted coherent light provided by a laser or other high-coherence source. But as the start-up's CEO Ian Pykett explains, the big difference is that no reference beam is needed.

"That makes it hugely more simple than holography – at any wavelength," he told optics.org. And while he thinks that in the longer term the approach may cause most disruption in electron and X-ray microscopy, where existing optics are very limited (and very costly), the Ombu investment will lead to a growing number of commercial applications in the UV, visible and infrared realm, where the absence of a lens means that aberration- and noise-free microscopy is feasible.

Off-the-shelf

Chief scientific officer John Rodenburg is the major academic force behind the technology, which was developed through the £4.3 million"ultimate microscopy" project funded by the UK's Engineering and Physical Sciences Research Council.

Set up in 2006, Phase Focus uses standard off-the-shelf detectors to generate the ptychographic images, but what has made the approach practical is a deep mathematical understanding of the behavior of the scattered and diffracted light, combined with recent advances in computing power.

Generating a lens-free image does require collection of at least two diffraction patterns, with the specimen moved in relation to the illumination source – something typically done with standard galvanometer motors or similar scanner components.

The phase retrieval algorithm processes the diffraction patterns to create a pair of images generated by the specimen - an amplitude image and a phase image.

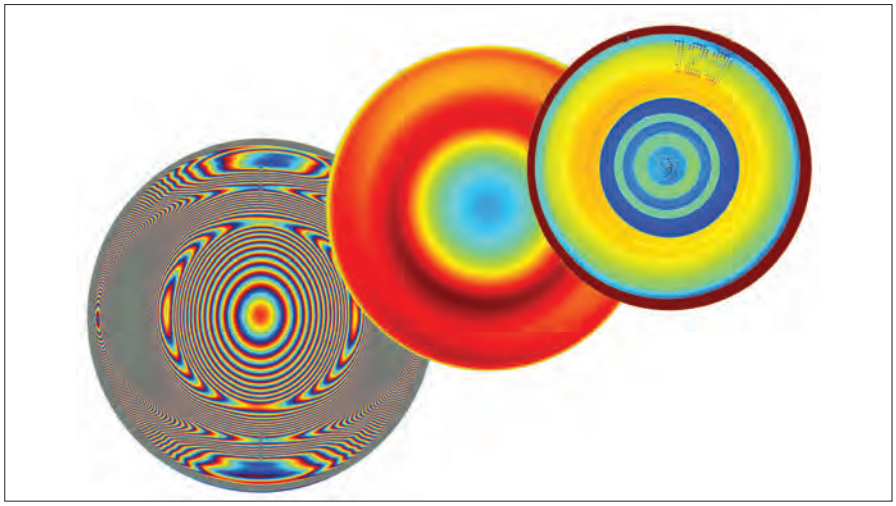

Photo courtesy of Phase Focus

High-resolution images of a soft contact lens (center and right), calculated from the phase map (left) generated by the "lensless" Phase Focus microscopy approach. The contact lens industry has provided the first commercial applications of the potentially disruptive technology.

Despite those complexities, nothing special is required in the computing department either, with standard graphics cards able to yield images with a typical processing time of 30-60 seconds – fast enough to be used in a variety of live cell imaging applications, says Pykett.

OEM plans

Aside from making a conventional optic redundant, a "virtual lens" also frees the image from any optical defects or aberrations, yielding a high-fidelity, noise-free image whose lateral resolution is determined largely by the wavelength of the illuminating source. Pykett says that resolution for visible wavelengths is typically better than one micron, while recent development work has demonstrated that thick specimens such as biological tissues can also be investigated.

According to the CEO, the long-term plan for Phase Focus is to work with microscopy OEMs to incorporate the "virtual lens" technology within their hardware – delivering computed images through a standard equipment format.

Both an electron microscope and an optical Olympus BX41 microscope have already been fitted with a Phase Focus accessory. Talks with manufacturers have been initiated, but right now the priority is to continue demonstrating the power of the technology with early adopters and high-profile research teams.

Revenue stream

In the visible wavelength range, the key advantage of the lens-free approach is to image transparent samples that cannot be stained - for example to measure the thickness and refractive power of contact lenses *(see image, left)*.

In fact, says Pykett, contact lens companies have provided much of the early commercial traction for Phase Focus, where customers have either purchased systems or used its metrology service.

As with any start-up seeking the next level of investment up from seed funding, the revenues generated have proved to be highly beneficial in attracting funding, by reducing the risk of venture partner investment.

Live imaging of unstained biological samples is the next likely application area, but where the lens-free approach may well come into its own is for the much shorter wavelengths associated with electron and X-ray microscopy – where lenses are both inadequate and hugely expensive.

"For electron microscopy, I think that this will be revolutionary," Pykett said.

For the full version of this article, visit optics.org/indepth/3/7/1

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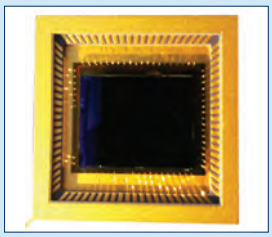

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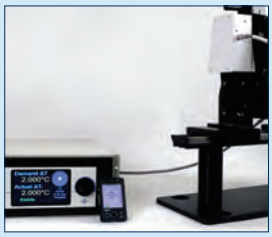

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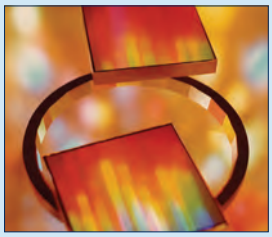

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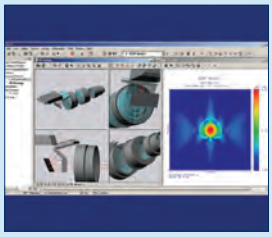

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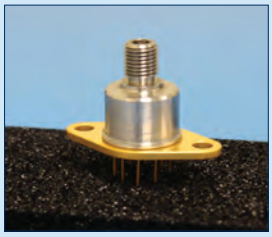

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ULIS targets volume markets as it triples IR sensor capacity

Investment of €20 million and move to 200 mm wafers as the firm marks its tenth anniversary.

ULIS, the France-based manufacturer of uncooled infrared sensors for military, security and industrial applications, is to expand its production capacity dramatically, following a €20 million investment.

Coming as the company marks ten years in existence, ULIS is to build a brand new facility adjacent to its existing operations in Veurey-Voroize, near Grenoble. The new site should be up and running by the middle of next year, and will triple ULIS' current manufacturing capacity, the company told optics.org.

As well as moving production from the existing 150 mm silicon CMOS process line to a 200 mm format, ULIS says that it will introduce a new series of low-cost infrared sensors that are designed to target the emerging commercial market for such devices – where it has identified a gap in the currently available supply.

The new process will also feature pixel-level and wafer-level packaging, helping to keep costs down through faster production.

Jean-François Delepau, ULIS' managing director, says that the investment in a new state-of-the-art manufacturing facility will be instrumental in enabling the company to penetrate high-volume but price-sensitive markets such as the automotive sector and applications in monitoring energy efficiency.

"We have always aimed to be at the forefront of new infrared market developments," Delepau said. "This €20 million investment is another major step in our growth. In particular, [it] will go a long way in boosting our penetration into emerging high-volume market areas, such as automotive and low-resolution sensors."

As well as opening up new applications outside of the military and security markets that ULIS has prioritized until now, the new facility is expected to create around 30 jobs over the next three years. Back in 2002, the company had begun operations with 35 employees, and now has 140 staff.

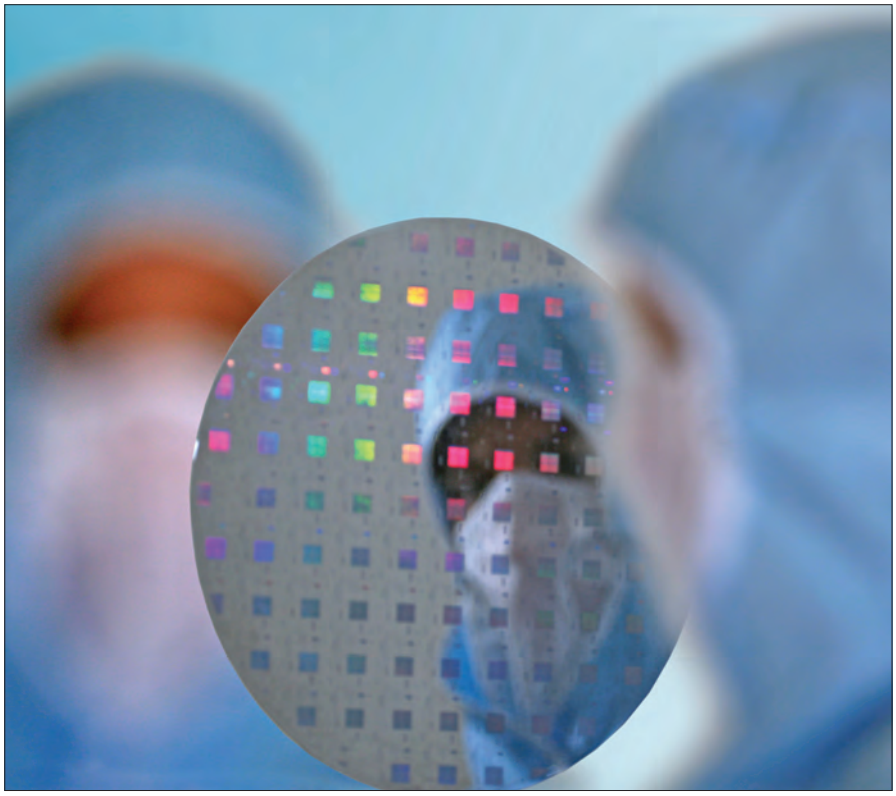

Photo courtesy of ULIS

Central to the new production site at ULIS is a shift to the larger 200 mm CMOS wafer process, which will mean both higher-volume production and the potential for greater functionality on each uncooled infrared chip made.

Larger format: more functionality

As well as increasing production throughput and helping to reduce costs, the larger wafer format will enable ULIS to integrate greater functionality onto each infrared chip, which it says will in turn reduce device complexity. For example, by adding more memory for voltage reading, less tuning will be needed.

The company thinks that this will speed the adoption of infrared sensors in emerging commercial applications by making the technology simpler and more accessible for imaging system designers and camera makers, for example.

ULIS told optics.org that automotive applications – specifically the detection of pedestrians – and monitoring of energy loss in buildings would likely represent the two most important commercial uses for its uncooled sensors as the technology proliferates.

That should help add significantly to the firm's sales revenues, which in 2011 grew to €45 million. ULIS says that it currently ranks as the number-two vendor of uncooled infrared sensors worldwide.

Evidence for the greater shift in emphasis towards commercial applications is provided by a recent market report from the analyst company Yole Developpement. It predicts that annual sales of uncooled infrared cameras should grow from 320,000 units in 2011 to 1.1 million units by 2017.

At the moment, military applications represent about 30% of the market – but that proportion will shrink to less than 15% as commercial demand accounts for the vast majority of market growth.

Initially set up as a subsidiary of infrared technology company Sofradir, ULIS' shareholders also include GE Equity. The company works closely with the CEA-Leti research center, and is currently developing 12 µm pixel pitch uncooled infrared sensors.

Articles by Mike Hatcher,
Editor in Chief of optics.org

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