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VISION focus

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plus...

- Sony confirms image sensor split
- 3D display without need for 3D glasses
- Lensless technique catches the small details
- Compact Imaging sees OCT in smartphones, tablets and wearables
- Row breaks out over cadmium quantum dot TVs

...and the latest product launches

Cover photo credit: Denel Spaceteq

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Teledyne Dalsa and Denel Spaceteq to develop Earth observation satellite

Custom multispectral sensors scheduled for manufacture by 2017; benefits for agriculture.

Image: Denel Spaceteq

Image sensor technology developer Teledyne Dalsa is to partner with Denel Spaceteq, Stellenbosch, South Africa, a high-performance satellite systems and solutions provider to African and international aerospace market, with the aim of developing a new multi-spectral image sensor for advanced earth observations.

With Teledyne Dalsa's experience in multispectral imaging, and Spaceteq's background in earth observation satellites, this multimillion dollar development project is expected to return high resolution images by 2019 when the next satellite launch is scheduled.

The earth observation application will contribute to the ARMC (African Resource Management are expected to enable acquisition of data for applications such as agriculture, crop and forestry management, urban planning, environment and disaster monitoring.

Sensor priority

Patrick Ndhlovu, General Manager of Spaceteq, commented, "We're excited to see this project move forward with Teledyne Dalsa. Earth observation satellites are developed by firstly choosing the ideal sensor, then the optics, and then building the rest around that. With their deep understanding of multispectral and hyperspectral imaging, and the challenges associated with these harsh environments, Teledyne Dalsa is an obvious choice for this critical aspect of our product."

Jean Pierre Luevano, International Sales Manager at Teledyne Dalsa, said, "Our experience with system designs optimized for radiation hardness and extreme environments will give Spaceteq and its customer a competitive advantage in today's earth observation market by providing unprecedented high resolution images at very small ground resolutions."

Image: Sundambila / Denel Spaceteq.

Colorful scenes: South Africa's new satellite will have improved sensing powers.

African landscapes: From the earlier Sumbandila satellite, South Africa's first.

Teledyne Dalsa's multispectral imaging solutions leverage its long experience in design, fabrication and packaging technologies to achieve multispectral sensitivity in a single fully miniaturized package. A single device can contain multiple imaging areas tailored to different multispectral bandwidths. Positioning advanced dichroic filters directly in the imaging area achieves highly efficient multispectral sensors at various resolutions.

About Denel Spaceteq

Denel Spaceteq is a provider of high-performance small- and medium-sized satellites and related systems and solutions to the local and international aerospace market. Spaceteq through the absorption of SunSpace has its origins in the SUNSAT satellite programme of Stellenbosch University.

SUNSAT, South Africa's first satellite, was developed completely by a local team of engineers, and launched in 1999 by the American space agency NASA. Most of the team who designed and developed SUNSAT forms the core of Spacteq today.

http://optics.org/news/6/9/58

Sony confirms image sensor split

New operational structure at Japanese electronics and consumer devices giant slated for April next year.

Sony is set to spin off its world-leading image sensor operation – reckoned by analysts to have around a 40 per cent share of the global market for such devices – into a separate division.

Photo: Sony.

Sony's Yamagata technology center. The company is investing heavily in image sensor development and production both here and at its Nagasaki site.

The giant Japanese company says that it has been implementing a series of measures to reinforce its devices segment and the imaging sensor sub-division, which it identifies as a key growth driver for the wider Sony Group.

"As part of these measures, Sony will adopt a new operational structure," announced the firm.

"The aim of this new structure is to enable each of the three main businesses within this segment, namely the semiconductor, battery and storage media businesses, to more rapidly adapt to their respective changing market environments and generate sustained growth." Image sensors sits within the semiconductor division.

Tomoyuki Suzuki, executive deputy president and "corporate executive officer" at Sony, will continue to oversee the "devices" segment after the change, which will see the image sensor unit become part of the newly established "Sony Semiconductor Solutions Corporation".

Terushi Shimizu, currently deputy president of the device solutions business group within Sony, is set to become the president of Sony Semiconductor Solutions following the switch. It will have two subsidiaries – one confusingly named the Sony Semiconductor Corporation, and Sony LSI Design Inc. They will respectively cover semiconductor manufacturing and design operations.

Related functions including research and development, business control, and sales - currently overseen by central business groups within Sony Corporation - are set to be transferred to the Semiconductor Solutions affiliate once the new company starts operations next April.

Corporate strategy: image sensors key

The switch is part of the corporate strategy first announced by Sony in February 2015, in which the company outlined plans to sequentially split out various business units from central Sony control.

continued on next page

Image: Sony Olympus Medical Solutions.

The medical sector represents one area of expected strong growth for providers of imaging sensors, and Sony has teamed up with market leader Olympus to exploit the opportunity. The companies reckon that their new "4K" endoscopy system will be something of a game-changer.

continued from previous page

Sony confirms image sensor split

"The aim of these measures is to ensure clearly attributable accountability and responsibility from the perspective of shareholders, management policies with an emphasis on sustainable profit generation, and the acceleration of decision-making processes and reinforcement of business competitiveness," the firm said. "The decision to establish Sony Semiconductor Solutions forms part of this strategy."

Imaging sensors is seen as a key area of expertise that Sony can exploit. According to market analysts at Japan-based Techno Systems Research (TSR), the Japanese firm accounted for more than 40 per cent of the image sensor market last year. In total, the market is thought to be worth some $8.7 billion annually.

OmniVision Technologies, the US-listed company which is set to be taken over by a Chinese private equity group, ranks second with a 16 per cent share, just ahead of Samsung, reckons TSR.

Sony is believed to have benefited hugely from Apple's adoption of its sensors in various products, including two in the iPhone 6, and earlier this year the Wall Street Journal reported that the Japanese firm was investing more than $1 billion in its image sensor fabrication facilities.

Back in February, Sony had identified its long-standing expertise in CMOS image sensors as a key growth driver for the company, saying that it would engage in "aggressive capital investment" to boost both production capacity and research efforts. That included a ¥45 billion (around $370 million) investment to increase production of stacked CMOS sensors at key sites in Nagasaki and Yamagata.

Next-gen endoscope

Sony has also been looking to exploit its sensor expertise in the potentially lucrative medical sector, partly by setting up the Sony Olympus Medical Solutions joint venture in 2013. That came shortly after Olympus – the world's largest provider of endoscopes - was hit by scandal.

Just last month, Sony Olympus Medical Solutions announced that it was about to begin selling a new "ultra-high-definition" surgical endoscopy system it had developed alongside its parent companies.

They reckon that the "VISERA" endoscope, which incorporates Sony's 4K "Exmor R" CMOS image sensor, new telescopic optics from Olympus, and a xenon lamp, will set a new standard in endoscopy.

According to the industrial imaging company Framos, the Exmor R sensor represented something of a "game-changer", in that it showed how CMOS technology could truly compete with CCDs in nearly all machine vision applications. Unlike its predecessors, the fifth-generation design features back-side illumination, with microlenses and a color filter array on its top surface.

Meanwhile, following a series of rumors, Sony confirmed earlier this year that it was to stop making CCD sensors in March 2017, as CMOS technology further improves and the imaging industry increasingly adopts it. However, the company added that it would continue to support CCD products for another decade.

http://optics.org/news/6/9/54

Thermal electronics inspection reaching defect-free designs

"Quick identification of a failing IC saves precious debugging time"

Xenics thermal cameras can detect heat defects in electronics before qualification, saving a considerable amount of time and money. The cameras can also be used for critical control of heat dissipation in a working instrument to optimize its lifecycle.

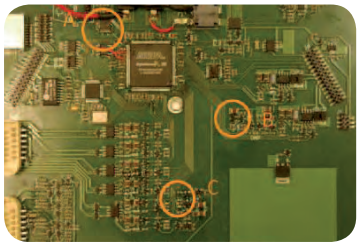


Figure 1: Prototype PCB

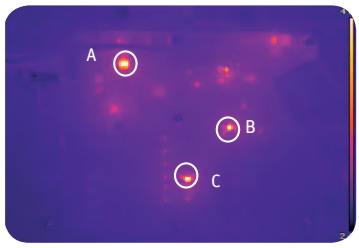


Figure 2: Failed PCB showing hot spots

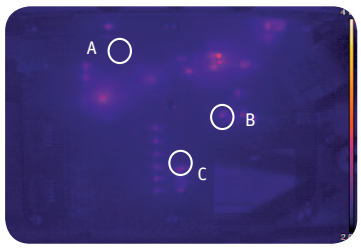


Figure 3: Repaired PCB

Thermal imaging in PCB prototyping and repair

The potential of thermal imaging for the development or repair of Printed Circuit Boards (PCBs) is still often underestimated. Early detection of Surface-Mount Technology (SMT) resistors running hot allows system engineers to re-size them before board qualification, saving a considerable amount of qualification time. A potentially very costly field repair can also be avoided in case long-term reliability problems would arise only many months later.

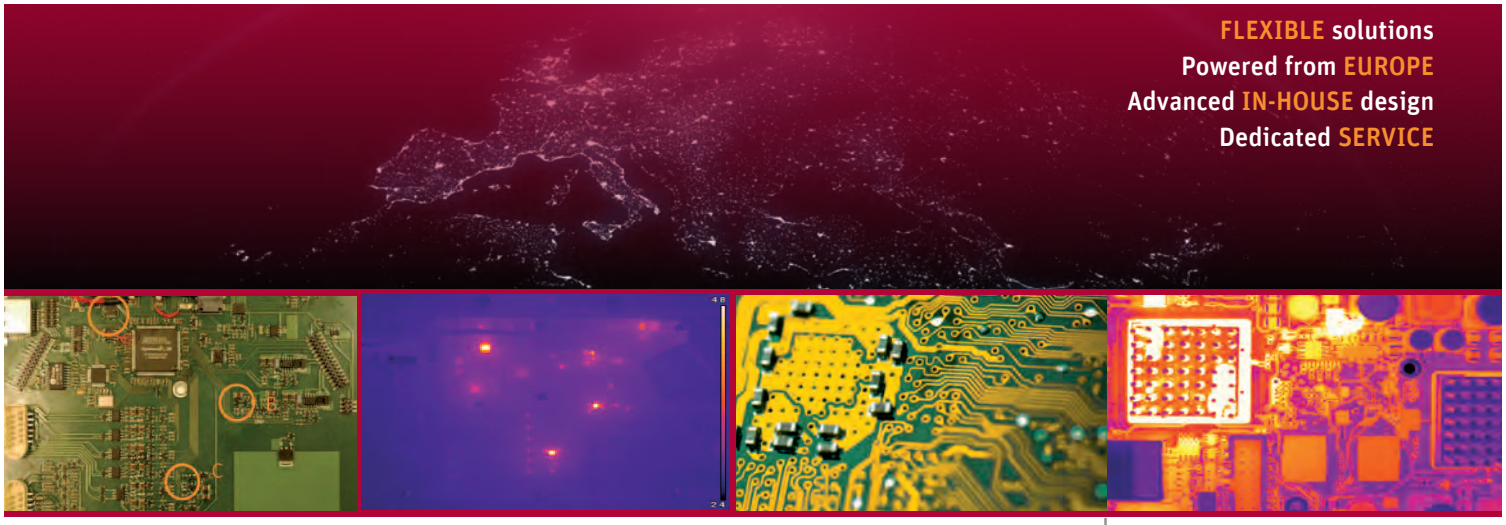
We will illustrate a successful customer case using the prototype PCB as shown in Figure 1.

The thermal image of the Gobi camera reveals three major hot spots after initial power-up of the PCB (Figure 2). At the top, leftmost (A) you can see a faulty logic Integrated Circuit (IC), probably damaged during production of the prototype. The two remaining hot spots (B and C) indicate small resistors getting too hot. After further investigation the customer learned that the resistors could operate too close to their maximum dissipation rating and chose other values.

The IC is responsible for auxiliary signal generation, and its failure is not obvious from a system perspective. Quick identification of a failing IC with our Gobi thermal imaging camera saved the customer precious debugging time.

Thermal imaging in power electronics motor drives

Electronic motor controls use Insulated Gate Bipolar Transistors (IGBTs) to control current in the electric motor windings. Sophisticated motor control algorithms ensure the drive's excellent speed and position accuracy as well as efficiency. A single IGBT chip capable of carrying more than 100 A must be capable of dissipating more than 200 W, but weighs not more than 1 gram. Verification of the thermal design using a Gobi thermal imaging camera is therefore essential.



Advanced IR camera portfolio	Gobi-384 Series	Gobi-640 Series
Array type	Uncooled a-Si	
Spectral band	8 µm to 14 µm	
# pixels	384 x 288	640 x 480
Pixel pitch	17 µm or 25 µm	
Frame rate	Up to 50 Hz in full resolution	
Interface	Ethernet, Analog, CameraLink, GigE or CoaXPress	
Trigger	Trigger input	
On-board image processing	Image processing algorithms for non-uniformity correction, auto-exposure and contrast enhancement	
Thermography	Up to 2000 °C	
Lenses	Broad range of lenses available	

Key features Gobi

- **High sensitivity**
  Detection of temperature differences as small as 0.05°C
- **Automatic alerts**
  Adjustable threshold set at 1°C above average temperature, with visual and audible alarms
- **Suited for machine vision applications**
  Industry-standard interfaces for easy communication and reliable data transfer
- **High image quality**
  Custom image processing algorithms on the camera hardware
- **High speed in smaller window**
  Reduced window of interest for higher frame rates
- **Flexible programming in an open architecture**
  Software Development Kit (SDK) supporting C++, Visual Basic, Labview or Linux.

Xenics nv

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3D display without need for 3D glasses

Laser and moving mirror creates large-scale, stereoscopic images outdoors. Developers seeking commercial partners.

A partnership between the Technical University of Vienna (TU Wien), Austria, and TriLite Technologies has developed a new prototype for a 3D display that can be used without 3D glasses. The large scale display will be showcased next week at the "Back to the Future Day" – October 21st, 2015 – which is the future date to which Marty McFly, the star of the 1989 movie, travelled.

Image TriLite.

Billboard of the future? A simulation of large-scale glasses-free 3D display.

Having refined an initial monochrome prototype into a color version, the development partnership is now seeking commercial partners to take the display technology to market. Their work has recently been published in Optics Express.

One of the futuristic technological innovations presented in the film was a huge 3D display. The TU Wien's development statement says, "As far as the invention of the display is concerned, Hollywood was almost right. Such displays will soon be possible. TU Wien and TriLite Technologies have developed a display element which uses special micro optics and moving micro mirrors to project different pictures into different directions. This technology can be used to create 3D displays without the need for 3D glasses."

The first prototype was developed by TriLite Technologies and TU Wien earlier in 2015. Each 3D pixel, which they call "Trixels", consists of a laser and a moveable mirror. The mirror directs the laser beams across the viewers' field of vision, from left to right. During that movement the image information is changed. The design enables different pictures to be sent to the viewer´s left and right eyes, so that a 3D effect is created without the need for 3D glasses.

Photo: TriLite.

The basic element of future large-scale displays: A Trixel with a movable mirror.

3D - and now in color

Now, a more advanced second prototype has been produced. It is now a full color display, a significant advancement over the first monochromatic version. Each Trixel has been equipped with three different lasers (red, green and blue). The module consists of 12x9 Trixels, so any number of modules can be assembled to create a large outdoor display.

"The software for controlling the modules and displaying movies has already been developed," commented Jörg Reitterer, from TriLite Technologies, and a PhD student in Professor Ulrich Schmid's team at TU Wien. "We can use any off-the-shelf 3D movie and play it on our display."

"The basic technology was invented by TriLite Technologies in 2011. At TU Wien, three research institutes worked on different tasks such as steering the Trixels and optimizing the connection between them. The technology is now ready for the market, and we are looking for partners for mass production all over the world", says Franz Fidler, CTO of TriLite Technologies.

Paper conclusions

The Optics Express article concludes: "We have designed an auto stereoscopic, large-scale, multi-view laser display for outdoor use. The individual Trixels of our display incorporate laser light sources, leading to sunlight readable luminance. MEMS mirrors deflect the emitted light and form different images for the left and right eye of the viewer to achieve the autostereoscopic effect in a time-multiplexed manner without any loss of resolution. The proposed concept allows for a modular display, imposing no limits on the total size.

"We calculate the maximum distance, at which a 3D effect can be perceived, the maximum number of 3D viewing zones, as well as the luminance of the display. Assuming perfectly flat reflective surfaces of the MEMS mirrors, maximum viewing distances of up to approximately 70 meters can be achieved. The volume of a single Trixel including the package is only 0.96 cm3 resulting in a Trixel pitch of 12 mm. Our prototype display is capable of sending different image information to the left and right eyes of multiple viewers, effectively proofing our proposed approach."

http://optics.org/news/6/10/15

Lensless technique catches the small details

Customized version of coherent diffraction imaging leads to improved resolution.

A team at Friedrich Schiller University Jena, Germany, has devised a means to push the resolution of an established lensless optical imaging method to new levels, potentially opening up fresh application areas for the technique.

Coherent diffraction imaging (CDI) involves reconstructing the image of an object by analyzing the diffraction pattern created when a highly coherent beam of photons hits the subject.

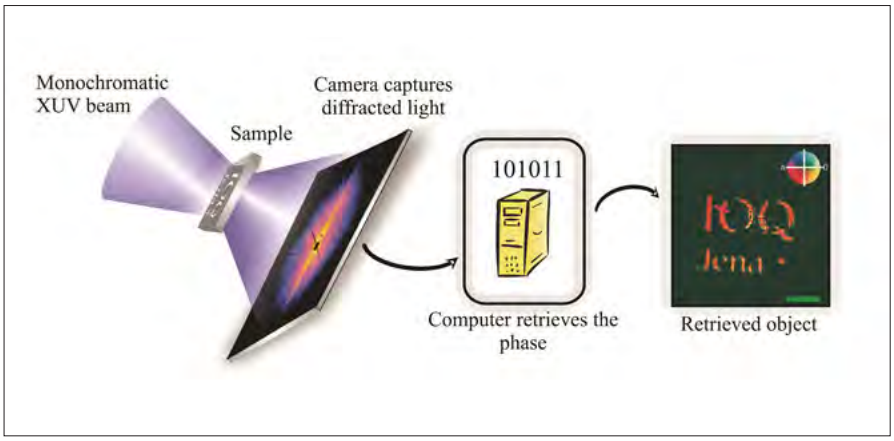
Modeling the paths that those photons have taken on the way to the detector can indicate the shape or form of the original object, and do so without a lens being involved in the operation.

"The computer does the imaging part; forget about the lens," explained Michael Zürch of Friedrich Schiller University Jena.

As with other similar methodologies, the absence of a lens means that the quality of the final image is heavily dependent upon the quality of the incident beam - which has usually been either extreme ultraviolet (EUV) photons or X-rays.

Since generation of EUV or powerful X-ray beams can be logistically challenging, researchers have for some time pursued more convenient bench-top machines able to do the same job. Although cheaper, these platforms have to date delivered less than satisfactory results, largely through an inability to produce as many photons as the more sophisticated versions.

The team at Jena tackled the problem by using a special customized ultrafast laser, able to generate extreme UV photons at a wavelength of 33 nanometers much faster than the existing tabletop systems - around one hundred times faster, according to the researchers.



Credit: Friedrich Schiller University Jena

The new platform has delivered unprecedented resolution for this EUV wavelength, according to the researchers.

More photons means a better resolution. Results due to be reported at next month's Frontiers In Optics conference in San Jose show that the researchers were able to generate an image with a resolution of 26 nanometers; almost the theoretical limit.

"Nobody has achieved such a high resolution with respect to the wavelength in the extreme ultraviolet before," commented Zürch.

Real-time imaging

Another potential issue with existing light sources has been the long exposure times that they require, making it difficult for CDI to deliver real-time feedback on rapidly changing subjects or active biological systems.

The new source has accelerated matters considerably; the Jena team says that it has reduced the exposure time to around one second, fast enough for real-time imaging in several systems of potential interest. While collecting images at this rate, the system delivered a resolution below 80 nanometers.

A combination of high-resolution and real-time imaging using a relatively small and convenient platform could allow CDI to broaden its applicability into a number of valuable scenarios.

Zürch commented that it could mean engineers are able to spot tiny defects in semiconductor chips, or help biologists zoom in on the organelles that make up a cell. Eventually the team hopes it might be able to cut down on the exposure times further, and reach even higher resolution levels.

http://optics.org/news/6/9/36

Sponsored Editorial

Linear Variable Bandpass Filters for Hyperspectral Imaging

Hørsholm, Denmark, October 22, 2015 – Delta Optical Thin Film A/S announces the launch of several Linear Variable Bandpass Filters that are specifically designed for Hyperspectral Imaging.

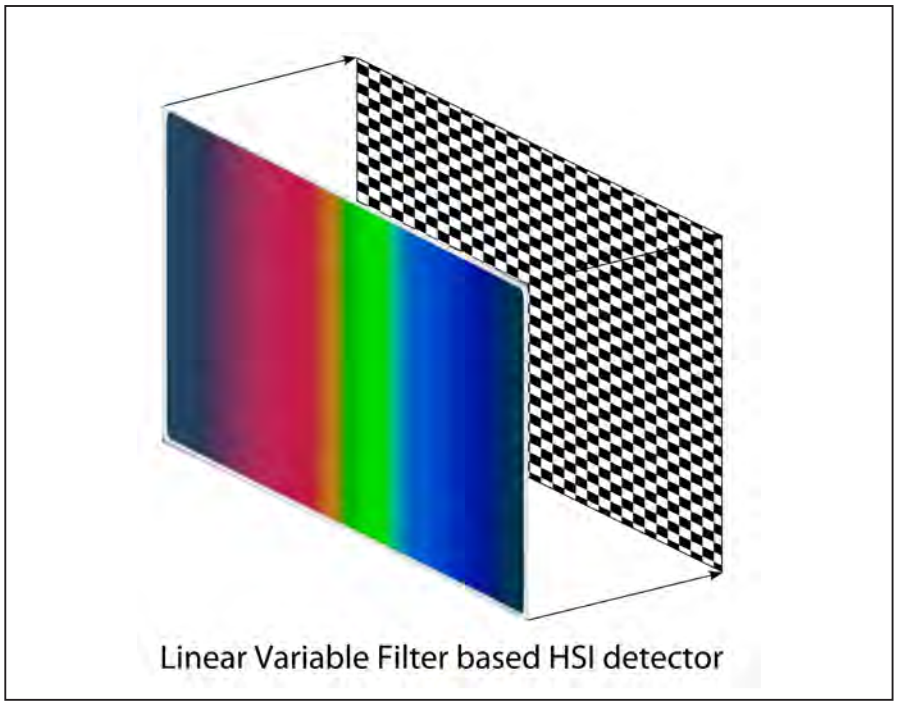
Hyperspectral imaging (HSI) has been used for a couple of decades in applications such as satellite imaging, air reconnaissance and other not overly price sensitive markets. Classical Hyperspectral imaging cameras use prisms or grating as dispersive elements. These cameras are bulky, sensitive to misalignment and very expensive. The advent of alternative approaches makes HSI attractive for volume markets or even consumer products, for example cancer detection, precision farming, food testing in supermarkets and many more.

Delta Optical Thin Film A/S develops and manufactures custom Linear Variable Bandpass Filters (LVBPF) for mid-size and full-frame CCD/CMOS sensors (e.g. 25mm x 25mm or 24mm x 36mm). These filters offer very high transmission and are fully blocked in the light sensitive wavelength range of silicon-based detectors (200nm to 1150nm). The combination of LVBPFs with silicon detectors allows the design of very compact, robust and affordable HSI detectors that offer several advantages and benefits over conventional approaches:

- Huge aperture compared to grating and prism
- Higher transmission than grating and prism
- Short measurement time
- High suppression of stray light
- Excellent signal to noise ratio

Delta Optical Thin Film A/S welcomes requests for custom designed Linear Variable Bandpass Filters. Available for immediate testing are filters with the following specifications:

- Centre wavelength range 450nm to 880nm, bandwidth approximately 2% of centre wavelength, transmission 60% to 90%, blocking range 200 nm to 1150nm, blocking level OD4, size 24mm x 36mm
- Centre wavelength range 450nm to 850nm, bandwidth approximately 4% of centre wavelength, transmission 70% to 90%, blocking range 200nm to 1100nm, blocking level OD4, size 25mm x 25mm
- Centre wavelength range 800nm to 1000nm, bandwidth approximately 0.6% of centre wavelength, transmission >70%, blocking range 200nm to 1200nm, blocking level OD4, size 19mm x 8mm
- Centre wavelength range 800nm to 1000nm, bandwidth approximately 1% of centre wavelength, transmission >70%, blocking range 200nm to 1200nm, blocking level OD4, size 19mm x 8mm



Linear Variable Filter based HSI detector

The sizes are given as height x length, where height is perpendicular to the wavelength gradient and length is along the wavelength gradient. The filters can be diced to smaller sizes.

About Delta Optical Thin Film A/S

Delta Optical Thin Film A/S *(www.deltaopticalthinfilm.com)* is the leading supplier of advanced, high performance linear variable filters commonly used in a variety of biomedical imaging applications including fluorescence microscopy, flow cytometry, monochromators and micro-plate readers among others.

Delta Optical Thin Film A/S also provides single, multiband, laserline and broadband band pass filters; long pass filters; short pass filters; notch filters; dichroic and polarizing beam splitters along with other custom coated optical components.

Delta Optical Thin Film A/S offers a wide range of high efficiency durable ultra-hard coated filters that have set the standard for high performance and precise operation. With its unique design tools and decades of experience, Delta is able to provide highly competitive standard filters and customized filters and optical components tailored to customers' specific applications.

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www.deltaopticalthinfilm.com

shop.deltaopticalthinfilm.com

JAI A/S

New JAI GO-2400 with 2.35 megapixel *(Sony IMX174)*

JAI expands its affordable Go Series with GO-2400 – a 2.35 megapixel industrial area scan camera featuring Sony's CMOS IMX174 image sensor with global shutter.

GO-2400 is ideal for a wide range of machine vision applications and delivers remarkable sensitivity, high dynamic range and the lowest noise in its class.

- Based on Sony IMX174 sensor
- 2.35 megapixel and Multi ROI
- < 7e- read noise
- Robust design *(10G vibration, 80G shock)*
- GigE PoE
- 29 x 29 x 41.5 mm
- 46 grams

Read more on: http://www.jai.com/go

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BitFlow

Cyton CXP Family

BitFlow has been building frame grabbers for 21 years now. That's quite a few frame grabbers.

With the Cyton CXP Family, BitFlow continues our support of high speed and flexibility that has made us a leader in high speed data acquisition.

We have consistently provided the best and most versatile products for data acquisition.

No other company can offer as many options for frame grabbers as we do.

From Analog to LVDS to CL to CXP, we have it all.

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FRAMOS GmbH

The alternative to laser

LED pattern projector from EFFILUX

Without any laser safety class, the new EFFI-Lase 2.0 can be used for applications like 3D triangulation, positioning and stereo vision, through the projection of lines, grids, point clouds, circles or crosses.

Further benefits are: No speckle, High resolution, long lifetime, all wavelengths.

In addition to the new EFFI-Lase, FRAMOS presents its extensive portfolio of imaging components including the GigE camera series from SMARTEK Vision, high-speed camera HS-2000 from Emergent Vision and CoaxLink frame grabbers from Euresys.

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Fax: +49.89.710667-66

Varioptic - a Business Unit of Parrot

NEW ! Autofocus module for Microscopy

This compact Autofocus objective is dedicated to microscopy applications and includes the popular Arctic 316 Liquid Lens.

With a magnification from X2 to X5, a typical focus range up to 1.7mm for a working distance of 5 to 7mm, it can refocus fast, with no mechanical movement! It allows to build very easily AutoFocus microscopes, for applications such a life science or industrial inspection.

A Caspian Microscopy Development kit is now available, including X2, X3, X5 extension rings, power supply and an Auto Focus Microscope module.

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Fax: +33 (0)4 37 65 35 30

Xenics Infrared Solutions

New: Long range MWIR surveillance core

For stable medium to long range imaging, Xenics presents the Stirling cooled XCO-640: a midwave infrared camera OEM module with zoom range going from 15 mm to 825 mm.

The advanced on-board image processing for increased contrast performance, makes the XCO-640 module the perfect fit for flexible and mobile observation platforms for law enforcement, homeland security and perimeter surveillance.

Advanced on-board image processing features include:

- Local Contrast Enhancement (LACE)
- Automatic Gain Control (AGC)
- Non-Uniformity Correction (NUC)

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Metaphase Technologies, Inc.

HiSLED

The Award Winning High Speed LED System for Quality Imaging

Utilizing the latest in LED, optics, and strobe controller technology, the HiSLED (High Speed LED Illuminator) provides ultra-high intensity illumination at the short pulses required to capture non-blurred images of high speed events. Traditionally, this required costly high-speed cameras with high amount of illumination. But now this can be accomplished more economically utilizing the HiSLED Illumination System.

Applications:

- Image speed projective analysis
- Mechanical machine diagnostics
- Military munitions/armament analysis
- Web/film inspection
- Container inspection *(Cans, bottles, etc.)*
- Extrusion inspection

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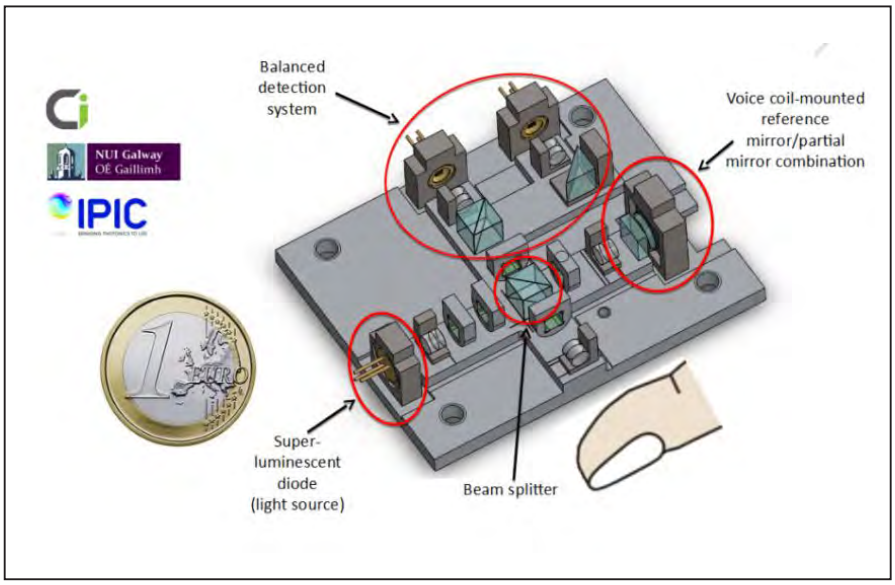
Compact Imaging sees OCT in smartphones, tablets and wearables

Novel time-domain platform offers smaller form factors and lower costs.

The capabilities of optical coherence tomography (OCT) as a non-contact imaging technique have become readily apparent since it first made inroads into ophthalmology clinics in the 1990s, but the inherent size and complexity of the instrumental platforms have conspired to keep it out of lower-cost or consumer-based applications.



Credit: Compact Imaging.

MR-OCT is designed to bring OCT technology within reach of new applications.

That may now be about to change, with the development of a new OCT platform christened multiple reference OCT (MR-OCT) by Compact Imaging, a California start-up with strong Irish connections.

The company believes MR-OCT offers a way to bring the technique's biometric and imaging capabilities to applications where cost and form-factor are critical, making it attractive to developers of smartphones, wearable technologies, or security systems.

Compact Imaging's breakthrough hinges on a modified version of the usual architecture employed for time-domain OCT. A partial mirror is placed close to the reference mirror, causing some of the reference beam's light to be reflected multiple times between the two mirrors. In addition, the reference mirror itself is attached to a low-cost oscillating miniature actuator, moving it back and forth.

In use, the partial mirror allows a portion of light to proceed onwards and form the reference beam for the OCT operation, while the rest makes a return journey to the reference mirror and duly takes part in subsequent reflections - effectively creating multiple scan segments, each increasingly delayed by its trip between the mirrors.

The combination of the partial mirror and the oscillating reference mirror means that the OCT reference beam becomes a composite signal. When compared with the signal from the probe beam hitting a sample, the resulting interference signals correspond to light backscattered from regions successively deeper within the target.

"Moving the reference mirror by just a small amount, some 35 microns, and having the light from it interact with a partial mirror creates multiple reference signals, which then of course interact with the signals from the probe beam directed at the target," said Compact Imaging CEO Don Bogue.

"The span that successive reference signals cover increases with each reflection, so the small motion of the reference mirror can effectively scan a much larger distance. And, because each of the separate reference signals spans an increasing distance in the same amount of time, the interference signals associated with each of the separate reference signals has different frequency content, and can be separated out in the processing domain in order to generate an image or process biometric information very effectively."

An enhanced scanning depth is valuable on its own, but it's the potential simplicity and cost-effectiveness of MR-OCT's optomechanical architecture that is crucial to the revolution which Compact Imaging now foresees.

The company's own working MR-OCT research system employs a voice coil extracted from the optical pickup head of a DVD player, and the company envisages the heart of working MR-OCT units being of similarly convenient size. Not coincidentally, system inventors Josh Hogan and Carol Wilson were previously involved in the development of the DVD+RW recording format while at HP Labs.

"Our lenses and beam splitters are all either consumer level items or have a direct analogue in the consumer domain,"

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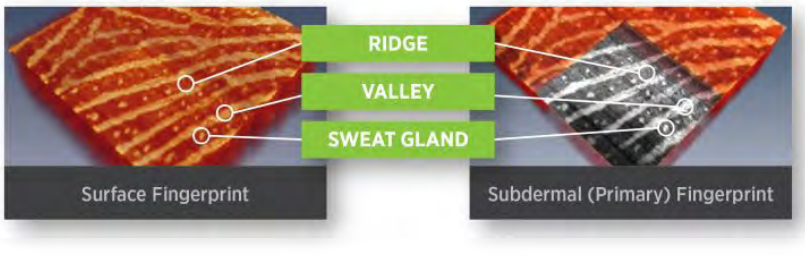
Compact Imaging sees OCT in smartphones, tablets and wearables

commented Bogue. "That means we can make a low-cost system, while the design itself allows that system to fit into an inherently small footprint with low operating power."

Under the skin

Potential applications for a genuinely low-cost compact OCT platform could include a number of uses in health monitoring and non-destructive testing.



Credit: Compact Imaging.

Biometric security based on the deeper "primary" fingerprint could be harder to fool.

Bogue singled out an application in biometric security that may prove to be particularly successful, in which MR-OCT captures not the surface fingerprint pattern of an individual, but instead the harder-to-fake "primary" fingerprint pattern lying just under the surface.

A method to see through any surface-level attempts at forgery and confirm authentic sub-dermal markers could add a valuable layer of security to existing databases of biometric information, without rendering them obsolete.

Imaging of blood flow and pulsation effects with MR-OCT may ultimately prove valuable new additions to biometric assessment techniques too.

The time-domain version of OCT has had inherent difficulty matching the headline-grabbing performance figures boasted by the alternative Fourier-domain and swept-source versions of the technique - but systems like that are far out of reach for these kinds of biometric applications.

"Those OCT platforms are pitched at the most advanced scientific and clinical diagnostic uses," Bogue said. "But if the issue is how to get OCT and its capabilities into volume applications, then you simply can't be talking about that kind of cost or complexity. You need systems that are the size and cost of the optical units in a DVD drive, and we are not aware of anyone else approaching the market in ways that will produce a solution of the same low cost and robustness as MR-OCT."

The Ireland connection

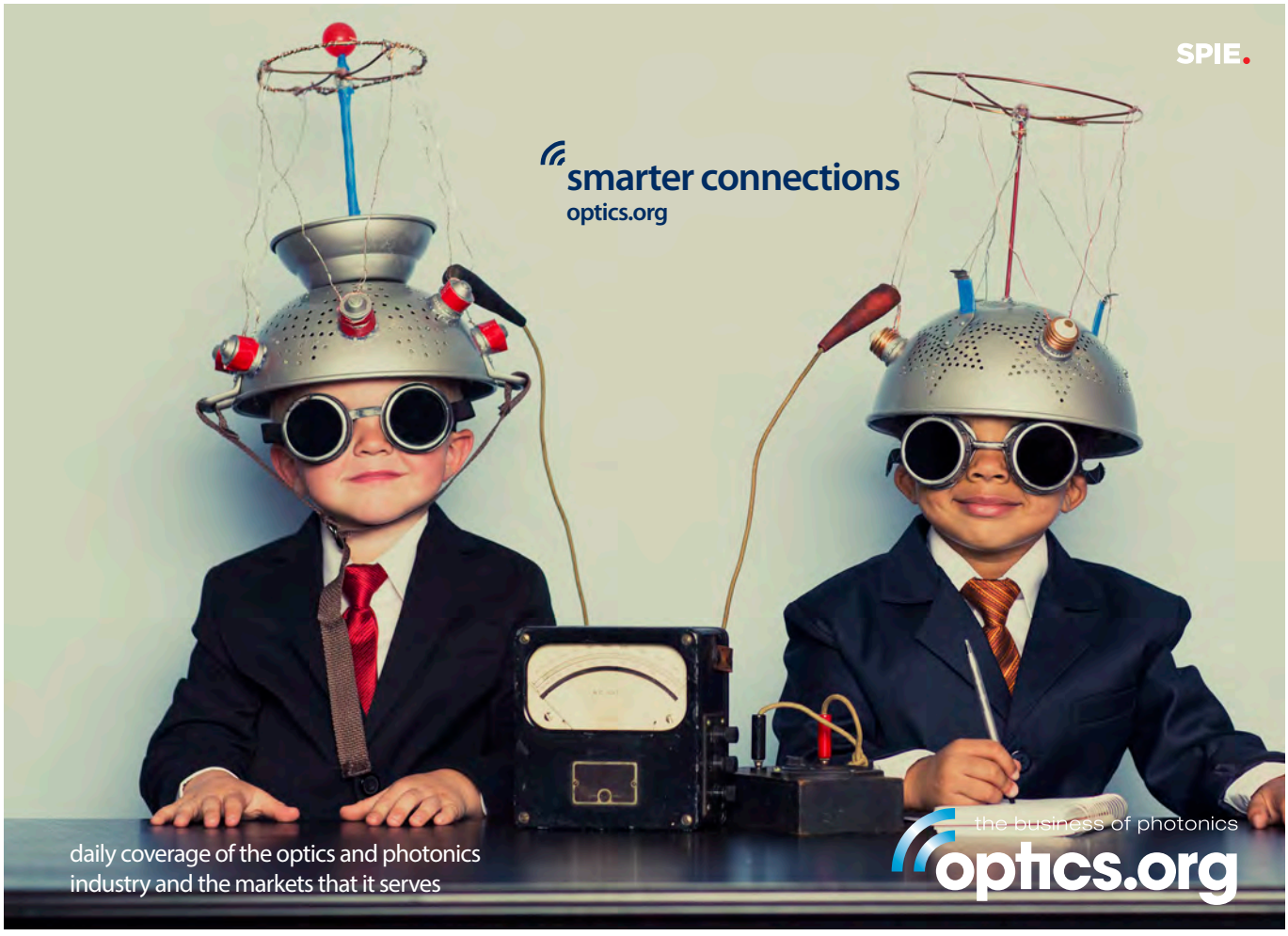
In March 2015 Compact Imaging announced a collaboration with the Irish Photonic Integration Center (IPIC) in Cork, aimed at commercialization of the MR-OCT platform. The Tissue Optics and Microcirculation Imaging lab at NUI Galway is another collaborative partner, and Compact Imaging was also mentioned at the opening of the Photonics Ireland 2015 conference in September 2015.

But in fact the Irish connections go deeper. Co-inventor Josh Hogan attended University College Dublin and Ulster University prior to working in California, and a high percentage of Compact Imaging's investment capital has come from Irish institutions or individuals connected with the country, according to Bogue.

IPIC's involvement has been key to the company's success in miniaturizing the technology from its initial bench-top implementation. The first-generation prototypes now measure about 50 x 50 mm, and Bogue indicated that his road map towards even smaller versions was on course to conclude early in 2016.

"Our next phase will see the technology becoming incorporated in products and brought to market," he commented. "OCT is a powerful technology, and if you can get it down to something that fits into your wrist watch, then huge opportunities open up. That needs small, low-cost, robust and simple systems; and that's exactly where we are driving OCT."

http://optics.org/news/6/9/56



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Competition to Win a High Definition Zoom Lens

Resolve Optics invites you to enter a free competition to win one of their market-leading Z10 high definition zoom lenses.

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On top of the ultra-compact size, superb performance and unique image format flexibility the Z10 also has built in topside and back focus adjustment to make setting up as simple as it could possibly be. Proven in a wide range of applications the Z10 is a true asset that enables sensors deliver the full benefits of high definition imaging in a compact envelope.

To enter the competition please visit **http://www.resolveoptics.com/winZ10/** and tell us about the application(s) that you would intend to use the Z10 for. The winner of this competition will be selected by a prize draw and announced on **www.resolveoptics.com** on or after 15th January 2016.

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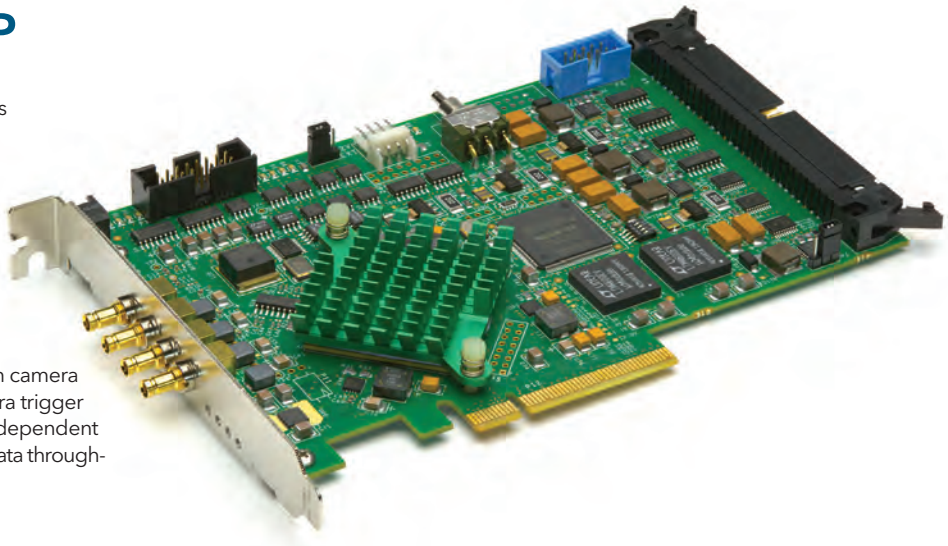

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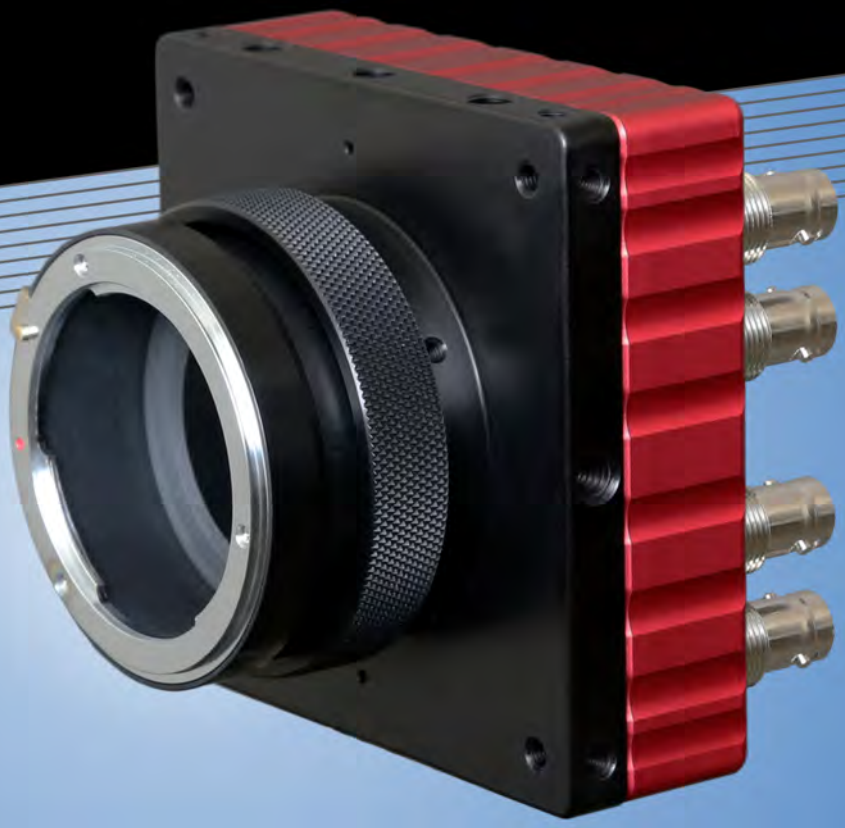

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Row breaks out over cadmium quantum dot TVs

QD Vision, whose cadmium selenide dots now feature in Philips monitors, accuses rival Nanoco of making misleading statements.

A row has broken out between two developers of quantum dot (QD) technology, as European authorities debate whether or not to ban the use of cadmium-based QDs in display screens.

As an extremely toxic heavy metal, the use of cadmium is highly regulated under Europe's "Restriction of Hazardous Substances" (RoHS) directive. However, cadmium is also extremely useful for certain optical applications – for example in cadmium telluride solar panels made by First Solar, and in high-quality lenses for microscopes. As a result, the RoHS legislation includes a number of exemptions where cadmium is allowed.

Whether or not those exemptions should include TVs and other display screens - where the fluorescence of QDs is harnessed to improve color reproduction - is now becoming a bone of contention. Earlier this week Nanoco, a small UK company developing technology to produce cadmium-free quantum dots in volume, said that it was challenging the legality of cadmium-based QD displays by requesting an official investigation via a petition with the European Parliament.

In May, the European Parliament voted heavily against plans put forward by the European Commission to extend an RoHS exemption for cadmium in displays until July 2018.

However, since then QD-based LCD monitors and TVs from Philips and its affiliate TPV have started to appear on the European market, featuring QDs supplied by US-based QD Vision. Those screens are promoted as having the kind of excellent color reproduction and energy typically associated with organic LED displays, but at a much lower cost.

Image: TCL.

Released earlier this year, this QD-enhanced 55-inch TV from TCL features fluorescent nanocrystal technology developed by QD Vision. The company's QDs are based on cadmium selenide, while rivals Nanosys and Nanoco are both working to advance cadmium-free alternatives. Nanoco and QD Vision are now engaged in a war of words over the perceived legality of displays using cadmium-based QDs in Europe.

Legal basis questioned

Nanoco CEO Michael Edelman said in a company statement highlighting what Nanoco claims to be the "legal uncertainty" surrounding QD-enhanced displays in Europe: "There is no legal basis for keeping or allowing new cadmium displays in the market. Alternatives are readily available and the previous QD exemption expired with the [European] Parliament's vote [in May]."

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Row breaks out over cadmium quantum dot TVs

Massachusetts Institute of Technology (MIT) spin-out QD Vision, which has received heavy backing from venture capitalists, hit back immediately. In two statements, it questioned the motives and accuracy of Nanoco's releases, describing them as part of an "ongoing public relations campaign" to exclude cadmium-based QDs from the European Union:

"In May of this year, the European Parliament asked the European Commission to review a recent decision to extend QD Vision's exemption for using cadmium selenide based on its solution's energy efficiency and a lack of competitive alternatives," is its interpretation of the situation in Europe.

"According to the Commission, that review is under way according to the process prescribed by the Parliament, which also stated that, in the meantime, their recommendation should introduce 'no market disruptions'. Claims by Nanoco that the exemption was stopped by the Commission and Parliament are incorrect and misleading."

Rival technologies

Its CEO Mustafa Ozgen says that the cadmium selenide dots have "significant" advantages over rival technologies in terms of color gamut and energy efficiency that alternatives cannot yet match.

QD Vision claimed: "Nanoco continues its efforts to have products using its indium-based quantum dot technology introduced into the [European Union] display market, but there are none to date."

According to the Massachusetts firm, the recently released Philips monitor is the first QD-based monitor on the market. "There is currently no monitor in the market using indium quantum dots," it added. "Televisions based on QD Vision's quantum dot technology have been on the market since 2013."

A second statement from QD Vision went further, accusing Nanoco of making

SID Display Week video interview with Russell Kempt, Vice President of Worldwide Sales and Marketing, Nanosys - another developer of cadmium-free QDs. Watch the full interview ***here****.*

"manifestly incorrect and misleading" statements about the situation.

The company points to a press release from the European Parliament, in which the Parliament acknowledges that the May vote did not amount to a ban on cadmium QDs, but would trigger a new assessment of the technology and any potential alternatives.

"There are therefore no market distortions, as the current exemption remains valid until revoked," stated the European Parliament announcement.

New developments

However, that release also pointed to some "important new developments" with regard to the availability of cadmium-free QDs, and described the European Commission's key justification for granting the latest QD exemption – that cadmium-free QDs were not yet technically available – as "manifestly incorrect".

"A whole line of TVs based on this technology has become widely available on the [European] Union market, by well-known major retailers," it announced, in what appears to be a reference to indium-based QDs in new TVs from Samsung. Similar offerings from LG Display are expected, while Nanoco also points to new lighting products from Marl International that feature its cadmium-free technology.

QD Vision has dismissed such alternatives as inferior, with CEO Ozgen saying: "We look forward to a swift technical assessment of the alternatives in this exciting segment - one that will plainly demonstrate that safe and energy-efficient cadmium selenide QDs are the only competitive solution for Europe."

Nanoco evidently disagrees with that opinion, adding that its partner Dow has completed a production facility to make cadmium-free QDs in Cheonan, South Korea, with commercial volumes expected soon. CEO Edelman reported earlier this year that the company was working with no fewer than 11 different display OEMs based in Asia and the US.

The UK firm, which is listed on the London Stock Exchange, could reveal more when it announces preliminary financial results next week.

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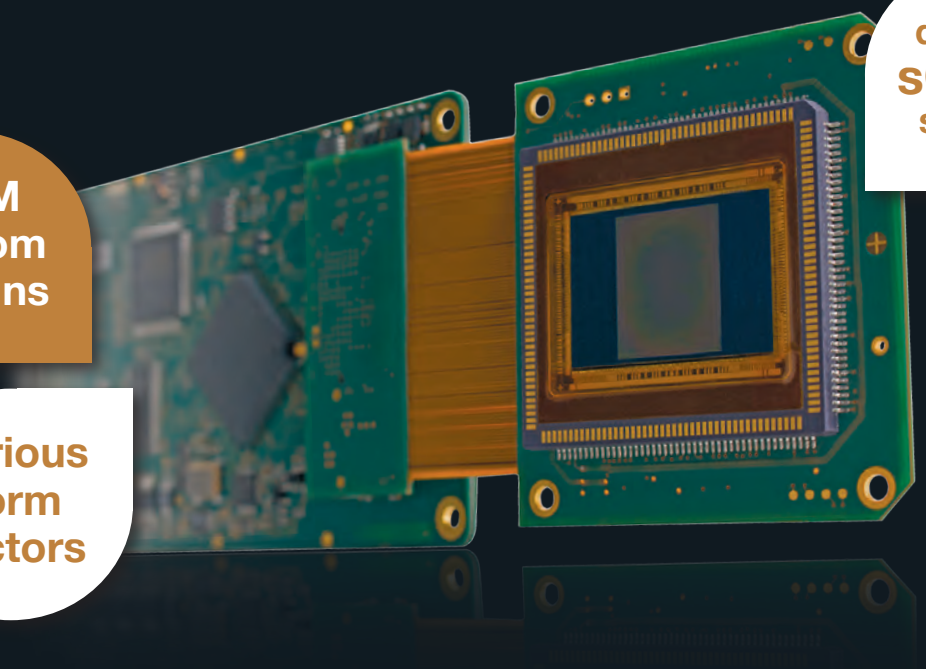

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