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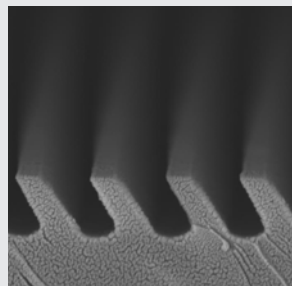
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OXFORD INSTRUMENTS

Soaraway success of ARVRMR justifies its own event

Welcome to the first issue of AR|VR|MR Focus, the magazine (and free download from optics. org) that covers all aspects of augmented, virtual and mixed reality technologies, produced by the team that brings you optics.org. The editorial focus of this issue is the expanded exhibition and conference – in fact, the third annual edition of the event that started life embedded in Photonics West in 2018. It has proved so successful that organizer SPIE has created this standalone expo that is collocated with Photonics West.

ARVRMR, which is often shortened to the handy "XR" fortunately, features must-see presentations and demonstrations from the biggest names in consumer electronics and up-and-coming XR companies.

This three-day event includes a new technical program, invited industry talks, panel discussion, a student Optical Design Challenge, courses, headset demonstrations, and the opportunity to network with leading companies and thought leaders. All around you are many brand new and futuristic technologies vying to become part of the new decade's must-have infrastructure.

Highlights in this issue

Europe will account for a quarter of the global augmented, virtual and mixed reality marketplace by 2023, 40% more than North America. So says a new market analysis by Digi-Capital, a Silicon Valley-based XR adviser. Its 2019 Augmented/Virtual Reality Report, was presented at October's AWE EU conference, in Munich, Germany. The largest single markets for XR outside Europe could be China, USA, Japan, South Korea and India by 2023, with Russia, Germany, UK, France and Italy leading the charge for Europe *(page 6)*.

The European Space Agency has been testing a tool developed by Finnish research agency VTT as part of its training and operations system. The tool, using augmented reality, has been developed to support astronauts in training and operations during a space flight *(page 7)*.

South Korean Company Moiin Group, a developer of virtual reality technologies, has been awarded US patents for its Fiber-Bragg Grating (FBG) motion capture suits. CEO Jae-yun Ok says the company is taking another step "towards having a fully integrated VR ecosystem" *(page 8)*.

Plessey, an embedded semiconductor technologies developer, has developed the first GaN on silicon-based red LED. The company says this creates a path towards low-cost manufacturing of ultra-fine pitch and red InGaN pixels, which in turn will accelerate adoption of microLEDs in AR microdisplays and mobile, large display applications" *(page 9)*.

Compound Photonics US, a developer of compact microdisplay solutions, has launched its CP2K234 series of Liquid Crystal on Silicon microdisplays targeting AR-MR smart glasses and head-mounted displays *(page 12)*.

Smart glasses developer Vuzix has announced that its OEM partner Ride-On Vision has received regulatory approval for its Ride-On Smart Ski Goggles, based on the Vuzix Blade *(page 13)*.

Plus we showcase a range of the latest product launches from CES 2020 *(page 4)* and across the industry.

If you are attending ARMRVR, BIOS and/or Photonics West 2020, please come and meet the optics.org/ARMRVR editorial and sales teams on Booth 3126.

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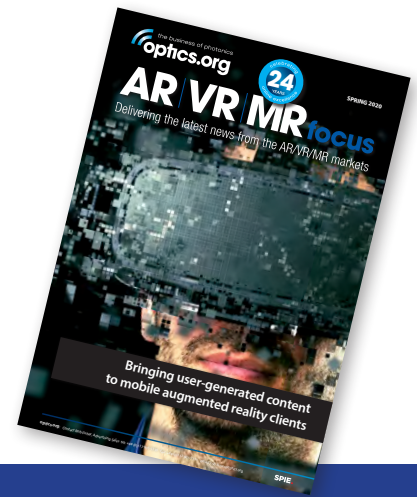
This Issue

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imec develops infrared thin-film sensor with 'record' pixel density

Compound Photonics launches 'smallest' 2Kx2K microdisplay for AR/MR

Vuzix begins volume production for Ride-On's smart ski goggles program

plus the latest product launches from within the industry

CES 2020 REVIEW
More colorful, wider, brighter and put down that lidar!

Ooh, Las Vegas! Laser TV is the future, says laser TV maker; and lidar can be bettered, says developer of alternative tech.

Hisense launches its laser TV technologies

Hisense has launched three new Laser TV products: the 75-in Trichrome Laser TV; the Sonic Screen Laser TV; and the Self-Rising Screen Laser TV. Dr. Lin Lan, VP of Hisense Group, commented that his company is now aiming for an annual target of 40 million TV unit sales.

Image: Hisense.

Hisense has launched three new Laser TV products.

The China headquartered consumer electronics giant believes that laser TV is the only display technology that meets the BT2020 standard, described as "the top standard for future TV color." Also at CES, Dolby will perform the first technology demonstration of Dolby Vision on the TriChroma Laser TV.

The launching of 75in and 100in TriChroma Laser TV is described as "a breakthrough in color technology" – the TriChroma technology enables the color display to show 90% of the colors recognizable by the human eye.

Dr. Liu Xianrong, chief scientist at Hisense, commented, "We have introduced a prototype of the Self-Rising Screen Laser

TV. Hisense believes that the ideal form of television for the family is integrated into the entire home, and only appearing when needed. The Self-Rising Laser TV provides a rolling screen that also maintains peak optical performance."

Hisense adds that screen-sound achieves the integration of sound and picture and is pioneering the technology of sound generation for cellular bionic screens.

This technology makes the positioning of the sound clearer and enables the sound to spread farther and perform better in detail. "Hisense believes that laser display will dominate in the future," added Dr. Lan. "Since the first laser TV was released in 2015, Hisense has progressed by growing the screen size from 75in to 150in. Picture quality also increased from monochromatic light source technology to full-color.

According to data from CMM, in 2019, the overall unit sales of laser TVs in China's color TV market increased by 107%, which is the fastest growing product category in recent years. In the North American market, Hisense Laser TVs are also popular with consumers.

Terranet presents 'first serious lidar alternative'

Swedish company Terranet is demonstrating VoxelFlow, a 3D motion perception technology that detects and classifies objects "far more accurately and exponentially faster than Lidar," the company claims.

Image: Terranet.

Terranet is introducing VoxelFlow, a 3D motion perception technology.

Terranet's demo is timely considering Tesla CEO Elon Musk and serial provocateur caused a rumpus in April, 2019, with his remark that, "Lidar is a fool's errand. Anyone relying on Lidar is doomed. Doomed!" But Terranet plans on backing up Musk's claims that Lidar is merely a dangerous shortcut to image recognition – a perilous reliance if that is what the promised fully autonomous cars of the future will continue to use.

Invented by Dirk Smits, VoxelFlow was built upon the understanding that today's camera-based computer vision and AI navigation systems are too slow. Lidar has limited resolution and slow scanning rates, making it nearly impossible to distinguish between, for example, a fixed lamppost and a running child, Terranet argues.

VoxelFlow classifies dynamic moving objects at low latency using very low computational power, producing 10 million 3-D points per second, resulting in rapid edge detection without motion blur.

"Terranet succeeding in proving VoxelFlow as a serious and necessary contender to Lidar is just the kind of shake-up the oft self-congratulatory autonomous driving community needs to kick start the new decade and save lives," said Terranet CEO, Pär-Olof Johannesson.

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CES 2020 REVIEW: More colorful, wider, brighter and put down that lidar!

LetinAR busts technical Barriers of AR optics

LetinAR, a developer of optical solutions for AR smart glasses, has announced that, at CES 2020, it is releasing its PinMR 2020 lens, to "take AR optics to the next level."

LetinAR is showing new AR smart glasses.

Image: LetinAR.

As a developer of optical systems for AR smart glasses, LetinAR first introduced its PinMR (Pin Mirror) technology in 2018. The lens was recognized for having overcome performance limitations of the existing AR optical system. Now LetinAR is presenting the PinMR 2020 lens, which is said to "resolve technological barriers and elevates the optical system to the next level."

The strongest feature of the latest lens is that it overcomes the issue of the vertical viewing angle, which has been the greatest challenge to AR optical system technology. The vertical viewing angle which was previously limited to 23° has been widened to close to 40°, thereby enhancing performance by approximately 73%. On top of that, the eye-box, an existing strength, has been further improved, so that it can be easily worn like regular glasses.

By combining the AI facial recognition function to the PinMR lens technology, the company plans to present a vision for future applications of AR. Also receiving the spotlight is the AI translation solution which utilizes True Wireless Headsets and PinMR smart glasses.

Kim Jae-hyeok, CEO at LetinAR comments, "It was LetinAR's strong technological base that enabled us to not only overcome the limitations of the existing AR optical system,

but to also overcome the vertical viewing angle issue, which has been regarded as a major technological challenge. We plan to demonstrate diverse forms of AR at CES 2020 to show the changes that can be brought to the lives of humankind."

Yang Sang-hwan, the director of the Naver D2 Startup Factory, added that "LetinAR's technology excels to the point that it may earn the Prism Award by SPIE, the leading authority in the field of optics."

Bosch offers spectrum of life-focused technologies

German engineering and tech giant Bosch is presenting connected products for mobility and the home. Among the highlights at the trade fair are solutions that either make use of artificial intelligence (AI) or that were developed or manufactured with its help.

Bosch is paving the way for 3D displays in vehicles.

Image: Bosch.

The international supplier of technology and services says it wants to make AI safe, robust, and explainable, whether in manufacturing, smart homes, or automated driving. Followig are some of its innovatuons on show:

- 3D display – bringing the third dimension to the cockpit: The new Bosch 3D display uses passive 3D technology to generate a realistic 3-D effect for images and warning signals. This allows visual information to be grasped faster than when displayed on conventional screens, reducing driver distraction.

- SoundSee – intelligent ears for the ISS (with AI inside): Barely bigger than a lunch box, Bosch's SoundSee is packed with state-of-the-art artificial intelligence

(AI). SoundSee is already in orbit and will soon be deployed onboard on the International Space Station. Riding on NASA's flying autonomous Astrobee robot, SoundSee uses integrated microphones to capture ambient noise in space and then analyze the audio using AI-driven analytics.

- Light Drive smart glasses – keeping information always in view: Bosch Sensortec is presenting Light Drive smart glasses – claimed to be the world's first solution for making a normal pair of glasses smart. The integrated projection system consists of MEMS mirrors, optical elements, sensors, and an intelligent software connection. These glasses are more than one-third thinner than previous solutions on the market and weigh less than 10g, says Bosch.

- Interior monitoring – safety, comfort, and convenience for all occupants (AI inside): Based on eyelid movements, direction of gaze, and sitting position, this Bosch vehicle interior monitoring system detects when the driver is drowsy or looks at a smartphone – and alerts the driver to critical situations.

- Intelligent front camera: understanding what it sees with computer vision and AI (AI inside): This camera detects objects, categorizes them into classes such as vehicles, pedestrians, or bicycles, and measures their movement. The camera is also capable of interpreting what it sees to distinguish between the lane and the grass shoulder or roadside structures – even in the absence of road markings.

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https://optics.org/news/11/1/8

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European VR and AR market growth to 'outpace' North America by 2023

Market analyst Digi-Capital made several trend predictions at the European AWE "XR" conference in Germany, in October 2019.

Europe will account for a quarter of the global augmented, virtual and mixed reality marketplace (collectively "XR") by 2023, 40% more than North America. So says a new market analysis by Digi-Capital, a Silicon Valley-based XR adviser.

Its 2019 Augmented/Virtual Reality Report, was presented at October 2019's AWE EU conference, in Munich, Germany, also reveals that Germany, UK, France, Italy and Russia will lead the way for XR in Europe.

Image: Microsoft.

Heads up: Microsoft's Hololens is an important AR tech in the emerging "XR" marketplace.

Tim Merel, Managing Director of Digi-Capital, commented, "While Asia could dominate XR over the next five years, Europe might drive significantly more of the rest of the global augmented reality market and virtual reality market than North America in the same timeframe.

He added, "Despite the early stage XR market having a way to go before it truly scales, in the long run companies from Silicon Valley to Shanghai could find significant users and revenue in the spatial computing markets of Europe.'

The report claimed that the largest single country markets for XR outside Europe "could be China, USA, Japan, South Korea and India by 2023, with Russia, Germany, UK, France and Italy leading the

charge for Europe." Digi-Capital added that while those five countries could drive around three quarters of European spatial computing revenue, the long tail of other European countries could each contribute a significant amount to growth in the region.

Continental shifts

Grouping all countries by region, the analyst argues that Asia could have 51% of the global XR market by 2023. In spite of Silicon Valley being the source of many innovations across spatial computing, long term European revenue could account for 25% of the global XR market with 17% coming from North America. So, while the USA is the second largest

single country market after China, North America as a whole might become the third largest region in the world for AR/VR after Europe.

Merel added, "In terms of installed base, AR's geographic distribution is broadly similar to smartphone distribution, and VR's distribution is roughly similar to the games market. So, it is not surprising that the key XR economic drivers of hardware sales, eCommerce sales, ad spend, enterprise software/services, in-app purchases, premium app sales, location based entertainment and video could end up along similar regional lines to those markets in the long run. Number of users and unit economics tend to dominate how money flows globally.
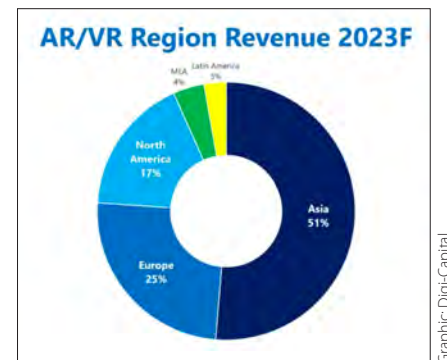
Graphic: Digi-Capital.

The largest single markets for XR outside Europe could be China, USA, Japan, South Korea and India by 2023, with Russia, Germany, UK, France and Italy leading the charge for Europe.

"In that context the long term potential of XR in Europe is helped by both its large consumer population and a long history of industrial innovation, particularly in the German-speaking region of Europe."

Merel discussed this and more in his presentation at AWE EU in Munich, alongside speakers from Snap, Facebook, Google, Microsoft, Magic Leap, Coca-Cola, HTC Vive, and others.

Matthew Peach Editor in Chief, optics.org

https://optics.org/news/10/10/18

VTT develops tool based on AR and AI to support space repairs

European Space Agency has been testing the astronaut assistance tool as part of its training and operations system.

AR-AI tool could support astronauts in complex repair tasks.

Image: VTT Research.

The European Space Agency has been testing a tool developed by Finnish research agency VTT as part of its training and operations system. The tool, using augmented reality, has been developed to support astronauts in training and operations during a space flight.

In space, says VTT, astronauts need to perform maintenance and repair tasks. To support them, they have completed thorough training, and have access to detailed instructions on computer screen and, if necessary, to experts on ground.

A permanent contact with ground could improve the crew performance, but communications is limited on exploration missions to Moon and Mars. However, the agency warns, delving any deeper into operations in training could make the training period unreasonably long.

VTT has now developed a tool that contributes to ESA's goal to give unambiguous guidance to astronauts in complex maintenance and repair tasks both during the space mission and when training for it before the flight.

The use of augmented reality makes the tool unique. The work instructions are provided as text, graphics or speech to the astronaut's Microsoft HoloLens-AR head mounted display. For example, an arrow [simulation] may directly indicate a lever in the device being serviced and show in which direction it is to be turned. The astronaut may also access the device's service history on his or her AR display as well as its status report that is being observed both in space and on the ground.

"The tool we have developed reduces the risk of human error and significantly speeds up the work performance. It is also extremely well suited for both supervised and individual training of astronauts. The tool uses augmented reality in a new way that is of great help in demanding maintenance and installation tasks of critical importance with a view to security or financial costs in other sectors as well, such as mines, paper mills and nuclear power plants," commented Principal Scientist Kaj Helin from VTT.

AR on Mars?

The cooperation between ESA and VTT has been close for well over a decade. In the latest project, which began in September, the AR tool will be integrated into the training and operations system currently under development.

"There is a strong interest in the AR field from ESA and the way VTT works with challenges of interest to ESA. So VTT is on a path that we ESA see as very fruitful - both for spacecraft testing and human space flight applications," said technical officer Mikael Wolff from ESA's European Space Research and Technology Centre ESTEC.

The importance of the AR tool will increase as the distances become longer on space missions. At the moment, a space mission lasting slightly over one year is preceded by training that takes about two years. When flying to Mars, the outward journey alone will take more than six months, and when the mission arrives on the planet, the crew has to manage novel environments and new technologies.

It is clear that, using traditional training methods, the duration of training would need to be multiplied. With the AR tool, the astronauts could practice the maintenance and repair of equipment to be used on Mars during the long outward journey. VTT has already created a future scenario where astronauts can practice the maintenance of, for example, the Mars rover in a setting resembling the real environment.

The initial work was carried out in a joint VTT and ESA project with the contract number 4000125238/18/NL/AF/as, and the work will continue for the next 18 months in the project 4000127710/19/NL/GLC that was launched in September. Another partner in the project is the Irish SKYTEK, which is developing mobiPV, the training and operations system for ESA astronauts.

Video
The following VTT Research video shows the use of the new AR package in a simulated repair scenario:

https://www.youtube.com/watch?v=c-DVoLT4n9c&t=9s

Matthew Peach Editor in Chief, optics.org

https://optics.org/news/11/1/3

Moiin Group gains US patent recognition for motion capture tech

Korean company says its FBG-based motion capture suits are taking another step towards fully integrated VR ecosystem.

Korean company says its FBG-based motion capture suits are taking another step towards fully integrated VR ecosystem.

South Korean Company Moiin Group, a developer of virtual reality technologies, has been awarded US patents for its Fiber-Bragg Grating (FBG) motion capture suits. CEO Jae-yun Ok says the company is taking another step "towards having a fully integrated VR ecosystem."

The company believes that the idea of VR has long captured the minds of consumers, with the proliferation of home- and mobile-based VR equipment, location-based VR theme parks, and other VR-based devices. VR has diverse applications in many industries, including education, defense, and entertainment.

The FBG suits created by the Moiin Group were developed in cooperation with Professor Kim Jin-seok of the Korean Institute of Science and Technology. FBGs and the suite of technologies they represent are considered fourth-generation VR technologies and are intended to make VR more immersive and accessible.

Previous motion capture devices, based on IMUs or cameras, were prohibitively expensive and required significant expertise to operate, a challenge that is being removed with the products from the Moiin Group.

The Moiin Group, led by Ok, has monitored VR technology growth for some time and have identified the choke-points preventing adoption as the burden of installation costs and the limitations inherent to the technologies presented thus far. By focusing on fiber-optic sensors, these installation and maintenance costs can be significantly reduced, which will lead to greater adoption.

The Moiin difference

Many VR systems based on inertial sensor technology incorporate dozens of cameras within a wearer's workspace to read the wearer's movements. The more cameras, the more accurate the position values, but the larger the data volume, so that many users are less able to participate simultaneously. Inertial sensor technology can also cause an error rate due to the influence of electromagnetic fields caused by the environment.

In its alternative design, the FBG sensor developed by Moin is a method of recognizing the wearer's position through the refraction of light in the FBG fiber optic cable. The fiber optic sensor accurately measures joint movement and overcomes the margin of error due to prolonged use. This is a step further from existing products, says the company.

Ok commented, "The suit based on FBG sensors can be shared with many content producers. The company is planning to quickly deliver suites for VR applications in various fields. We expect to achieve a win-win system with diverse VR content companies through this suit."

Moiin is planning to conduct demonstrations of the VR suits and other FBG technologies in a roadshow in the United States and other large markets in 2020, in concert with the rollout of key portions of a VR ecosystem, The Oasis City.

Matthew Peach Editor in Chief, optics.org

https://optics.org/news/11/1/2

Image: Moiin.

Optical sensing and control: Moiin's X-1 suit.

Plessey develops native Red InGaN LEDs on silicon

New approach to microLED is attractive because it offers lower manufacturing costs and scalability to larger wafers.

Plessey, an embedded technologies developer of microLED technologies intended for augmented reality and display markets, has developed what it calls The "world's first GaN (gallium nitride) on silicon-based Red LED.

InGaN-based blue and green LEDs have been commercially available for some time, but red LEDs are typically based on AlInGaP material or color-converted Red. For AR applications, Plessey comments that achieving high efficiency ultra-fine pitch Red pixels (< 5 μm across) remains elusive due to severe edge effects from AlInGaP material and cavity losses from colour conversion processes.

InGaN-based Red is attractive because it offers lower manufacturing costs, scalability to larger 200 mm or 300 mm wafers and better hot/cold factor over incumbent AlInGaP-based Red.

However, achieving red spectral emission with InGaN material is challenging due to the high indium content, inducing significant strain in the active region, subsequently reducing crystal quality and creating numerous defects.

Strain-engineered active region

Plessey says it has successfully overcome these challenges by using a proprietary strain engineered active region to create an efficient InGaN Red LED. The new InGaN Red microLEDs offer an output wavelength of 630 nm at 10 A/cm2, full width at half maximum of 50 nm, hot cold factor over 90% and higher efficiencies over conventional AlInGaP and colour converted Red at ultra-fine pixel pitches.

With these specifications, Plessey says it now has the capability to manufacture native Blue, Green and Red InGaN material or tune wavelengths from 400nm – 650nm using its GaN-on-silicon platform.

Dr Wei Sin Tan, Director of Epitaxy and Advanced Product Development, at Plessey, commented, "This is an exciting result as it creates a path towards low cost manufacturing of ultra-fine pitch and efficient Red InGaN pixels, which will accelerate the adoption of microLEDs in both AR microdisplays and mobile/large display applications."

Other recent achievements from Plessey includes the world's first wafer-level bonded monolithic 3,000 ppi GaN-on-silicon microLED emissive display hybridised to an active-matrix CMOS backplane; as well as native Blue and Green emission layers on the same wafer. The company is continuing to develop microLED display solutions, including the planned production of full RGB microLED displays in 2020.

Plessey will be exhibiting at CES 2020. Joining forces with Compound Photonics, a developer of compact, high resolution microdisplay technologies, to develop the World's smallest 1080p microLED based near-eye display solution for AR/MR applications.

Matthew Peach Editor in Chief, optics.org

https://optics.org/news/10/12/11

Image: Plessey.

Well red: Plessey's GaN on Silicon-based Red LED.

# imec develops infrared thin-film sensor with 'record' pixel density

Enables high-resoultion applications in shortwave and near infrared surveillance, biometric ID, VR automation and more.

Nanoelectronics and digital technology hub imec, has dveloped a new thin-film monolithic image sensor that captures light in both the near-infrared (NIR) and short-wavelength infrared (SWIR) regions.

The imec team says the development process – based on a monolithic approach – promises "an order of magnitude" gain in fabrication throughput and cost compared to processing today's conventional IR imagers, while at the same time enabling multi-megapixel resolution. IR imagers are used in a wide variety of applications, and imec's new technology greatly extends their possibilities, including surveillance, biometric identification, virtual reality, machine vision, and industrial automation.

To date, infrared image sensors are produced through a hybrid technology, with the crystalline semiconductor detector and the electronic readout being fabricated separately and then interconnected at pixel or chip periphery level.
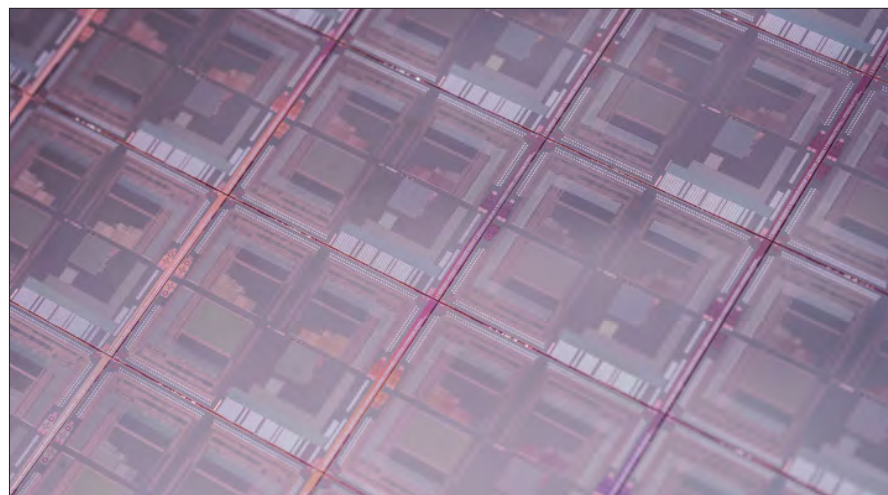
Wafer with image sensors for the SWIR range. Processed at wafer-scale, these thin-film imagers can be produced with increased throughput and cost compared to today's conventional IR imagers, while at the same time enabling multi-megapixel resolution.

Imec notes that this approach is both expensive and time-consuming, with a low throughput, "resulting in sensors with a restricted resolution that often require cooling to reduce the signal noise under dark conditions." So researchers have been investigating various monolithic approaches. imec believes its new approach "paves the way to high-resolution, low-cost, wafer-based SWIR imagers."

Quantum dots

imec's latest infrared imagers consist of a novel thin-film photodetector pixel stack based on quantum dots deposited directly on top of an electronic readout. They are manufactured in a monolithic process compatible with wafer-based mass production.

The pixels embed new high-performance, low bandgap quantum dot materials that match or even surpass the performance of inorganic light absorbers. The stacks can be tuned to target a wavelength spectrum from visible light (400nm) through to 2µm.

Test photodiodes on silicon substrate achieve an external quantum efficiency above 60% at 940nm wavelength, exceeding the state-of-the-art, and above 20% at 1450nm, allowing for uncooled operation with dark current comparable to commercial InGaAs photodetectors. The prototype imager has resolution of 758 x 512 pixels and 5µm pixel pitch.

'New applications'

"We are excited to present this outstanding thin-film imager, a collaborative result of several teams with expertise ranging from chemistry, device engineering, readout design through integration and fab manufacturing. This result opens up many new applications for thin-film imagers," commented Pawel Malinowski, imec's thin-film imagers program manager.

New sensors can be integrated in camera modules with standard or SWIR lenses.

"Our imagers could be integrated in next generation world-facing smartphone cameras coupled with eye-safe light sources, enabling compact sensing modules for augmented reality. In inspection, they could be used for food or plastics sorting, and in surveillance for low-light cameras with better contrast. Additionally, by enabling feature distinction in bad weather or smoke, one can envision firefighting applications and advanced driver assistance systems."

Looking ahead, imec says it is aiming to develop a wafer-level NIR and SWIR image sensor technology and technologies for companies with a roadmap in innovative image sensors, cameras and smart imaging applications. The current SWIR photodetector is the result of several collaborations, including the Flemish VLAIO-SBO project MIRIS (IWT/150029) with academic partners Ghent University and University of Hasselt, and Flanders based companies active in imaging technology.

Matthew Peach Editor in Chief, optics.org
https://optics.org/news/10/10/38

Compound Photonics launches 'smallest' 2Kx2K microdisplay for AR/MR

Company says there is a market need for larger, symmetrical field of view for more naturalistic viewing.

Compound Photonics US, a developer of compact, high-specification microdisplay solutions, has launched its CP2K234 series of Liquid Crystal on Silicon microdisplays targeting next generation augmented and mixed reality smart glasses and head-mounted / head-up display applications.

With its claimed "industry leading" 3.015µm pixel, native 2048x2048 pixel resolution and 1:1 aspect ratio, this 8.6mm (0.34in) diagonal display enables retina resolution (equivalent to 60 pixels/degree) when combined with next generation 50°+ wide field-of-view waveguides. The CP2K234 is available as either a polarization (amplitude) or phase (holographic) modulator.

"Based on a survey of our customers' needs, we identified the requirement to fill a larger, symmetrical field of view with enough pixels to enable a more naturalistic viewing experience," commented Ed Passon, SVP Marketing & Customer Engineering at Compound Photonics.

"The all-in-one Integrated Display Module package (measuring 11 x 11.5 x 3 mm) includes the complete display subsystem with MIPI input. The 2K2 IDM enables customers to build extremely compact systems to meet the form factors required for AR devices," he added. "In addition, the inclusion of 64 steering pixels horizontally and vertically provides flexibility in design and compensation of human vision factors."

Frame-by-frame control

Compound Photonics' NOVA display driver architecture has customizable, frame-by-frame control of frame rate (up to 240 Hz), color sub frame rate and other parameters to optimize for low latency, short persistence and power according to type of image content

CP2K234 microdisplay based on Liquid Crystal on Silicon.

Image: Compound Photonics.

and use case. The company added, "This flexibility to dynamically adjust the display mode allows system designers to achieve the best performance-to-power consumption trade-off for demanding AR/MR applications."

For phase/holographic mode applications, the 3.015µm pixel and more than 4 million available pixels on the CP2K234 screen offer the ability to generate higher quality holographic content.

Yiwan Wong, CEO of Compound Photonics, further commented, "CP continues to lead the industry in rapid innovation for microdisplays. With our 1080p microdisplay product introduction in Spring of 2019 and our recent announcement with Plessey Semiconductors on microLED

collaboration, we are leading the industry in addressing the requirements for AR/MR smart glasses and HMD/HUDs.

"The company's 1080p and 2K2 LCoS reflective displays are available today; emerging microLED emissive display technology is being jointly developed with Plessey; and ultimately we aim to achieve true holographic 3D display via CP's LCoS phase display solutions in the future. For the first time, we can provide customers in the AR/MR space with an extensible software configurable platform based on our efficient drive architecture that can operate with a wide range of display types to support various application requirements."

The CP2K234 amplitude samples and development kits in IDM packaging are now available and slated for full production in Q4 2020. Samples for phase modulation will also be available in Q4 2020. The current CP1080p26 series continues to be available in production.

Matthew Peach Editor in Chief, optics.org

https://optics.org/news/10/12/30

Vuzix begins volume production for Ride-On's smart ski goggles program

Blade integrated into goggles to bring AR to the slopes for hands-free navigation etc.

Smart glasses developer Vuzix has announced that its OEM partner Ride-On Vision has received regulatory approval for its Ride-On Smart Ski Goggles based on the Vuzix Blade. Ride-On is now moving to volume production for this program.

The Blade is effectively integrated into Ride-On's ski goggles and brings AR to the slopes with the world's first AR offering hands-free interaction, navigation of the mountain's slopes, recording of one's time on the slopes, and audio player, fully controlled by the Ride-On goggles.

Vuzix had previously delivered initial Vuzix Blade Smart Glasses to Ride-On beginning in the first quarter of 2019 to support its proof-of-concept effort. In the second quarter of 2019, Vuzix received a follow-on order for 100 Blade units from Ride-On to advance the program from pre-production through regulatory approval and into volume production.

As part of this continued OEM effort, Vuzix has also provided software updates

Ride-On's ski goggles and brings AR to the slopes.

and recently shipped an additional 20 Vuzix Blade Smart Glasses to Ride-On. The company expects to deliver the first volume batch of Vuzix Blade Smart Glasses to Ride-On before the end of 2019 and anticipates Blade shipments to them to expand significantly in Q1 2020 to fulfill its Smart Ski Goggle reseller orders across several countries, during the 2019-

2020 winter ski season in Europe and the United States.

Motorcycle opportunity

Additionally, Vuzix and Ride-On are working together on the initiation of a proof of concept for a wearable Vuzix Blade-based system for a major motorcycle company

"The team at Vuzix has been great to work with to support the overall development effort of this program to deliver the best possible experience for our Smart Ski Goggle customers," commented Alon Getz, CEO and Founder of Ride-On.

"The 2019-2020 ski season is a coming out party for AR experiences for skiers and we are looking forward to bringing additional products to market with Vuzix."

"The overall design and the see-through waveguide optics are critical must-have features for our prosumer partner Ride-On. We're excited to see this customer move rapidly from proof of concept and now into volume production of a product that will deliver innovative location-based information to ski and snowboarding enthusiasts on the slopes," commented Paul Travers, President and CEO at Vuzix.

Matthew Peach Editor in Chief, optics.org

https://optics.org/news/10/11/33

Apps include hands-free navigation of the slopes, recording of times, and even an audio player.