



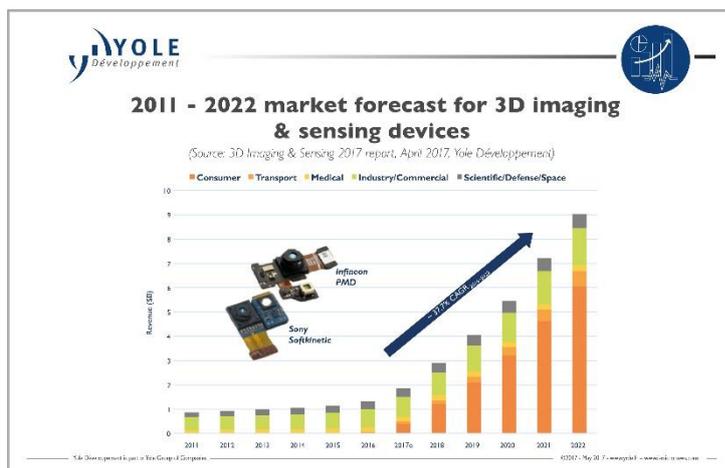
FOR IMMEDIATE RELEASE:

3D imaging & sensing technologies: An expected explosion within the consumer market segment

3D Imaging and Sensing 2017 report & STMicroelectronics Time of Flight Proximity Sensor in the Apple iPhone 7 Plus report – Yole Group of Companies

LYON, France – May 11, 2017: “Beyond its traditional medical and industrial markets, 3D imaging & sensing is ready to conquer consumer and automotive sectors”, explains **Pierre Cambou, Activity Leader, Imaging at Yole Développement** (Yole), part of Yole Group of Companies¹. The “More than Moore” market research and strategy consulting company announces an exponential growth pattern starting from US\$1.3 billion in 2016 and reaching US\$9 billion in 2022.

These results are part of the new imaging technology and market report published by Yole, titled [3D Imaging and Sensing 2017](#). This analysis report provides a clear-cut vision of the challenges ahead for 3D imaging & sensing. Some technologies will see developments in the billions of dollars, and some in the tens or hundreds of millions. The tide will not enrich all players... As an independent observer of markets and technologies, the consulting company Yole proposes today a unique understanding of the revolution before it happens.



A 3D imaging & sensing market revolution is ahead, thanks to an expected explosion of consumer applications. For several decades, 3D imaging & sensing technologies have matured under the umbrella of high-end markets and been applied with great success, mainly in medical and industrial applications.

In 2016 3D imaging & sensing devices became quite significant business wise, generating more than US\$1.3 billion in revenue. While Yole’s analysts

anticipated the advent of 3D imaging & sensing in consumer products by 2020, it seems the schedule has accelerated in recent months. Indeed, thanks to advances in semiconductor miniaturization, new 3D technologies are now able to answer the consumer market needs. In addition, Yole confirms, the number of 3D imaging and sensing devices manufactured is set to take off in 2017 propelled by the initial entry into the smartphone market. This increase in volume will be also

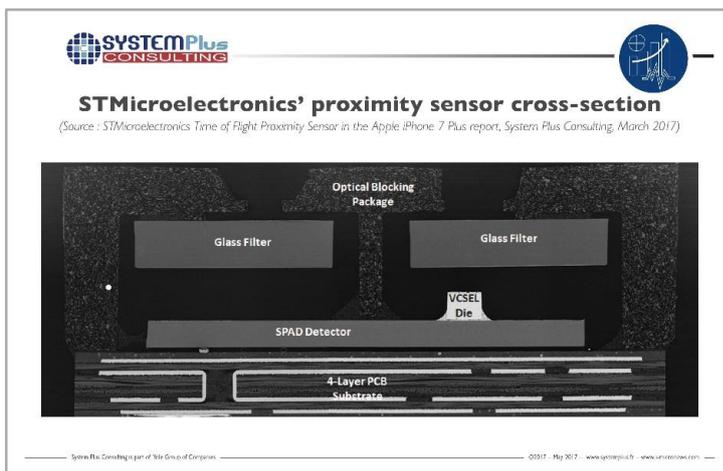
¹ Yole Group of Companies includes Yole Développement, System Plus Consulting, KnowMade, Blumorpho and PISEO.

supported by computing and wearable applications: over one billion 3D imaging devices will be shipped in 2022.

“2018 will likely see a massive influx of products, with the first applications in mobile and computing”, asserts Pierre Cambou from Yole. “And with the iPhone8 expected to incorporate a front-facing 3D camera, 3D’s application as a user interface will finally be better understood.”

3D imaging & sensing has made several consumer attempts in the past, i.e. the Kinect game accessory and the Leap motion gesture controller. This time around, Yole is expecting Apple to make it right and definitive. Augmented reality is an application, not hardware, and mobile will be the main benefactor of this innovation. Drones & Robots will also benefit from the situation. With a CAGR of 37.7% over the next five years, the consulting company Yole forecasts 3D imaging & sensing devices to reach US\$9 billion by 2022.

According to [Yole’s 3D Imaging & Sensing report](#), technologies have been developed to disrupt all markets. Indeed 3D imaging & sensing technologies are difficult to segment, since plethora of approaches coexist. “This is a typical sign of market immaturity, with each application developing its own “technology flavor” and multiple companies fighting for different market niches”, says Pierre Cambou.



However, this situation is about to change significantly in the next five years, as a forthcoming “killer application” will bring to market a specific set of devices and players. Big things are on the horizon, especially for technologies like ToF², which is bringing device miniaturization and structured light which proposes high-resolution mapping at reasonable cost. Today, systems based on 3D sensing technologies are part of the most profitable and innovative imaging

solutions. Leaders of the consumer market clearly understood benefits of these new type of sensors. For several years, STMicroelectronics has been investigating ToF technology and now provides several smartphone manufacturers with ranging sensors. Under its latest dedicated reverse engineering & costing report on [STMicroelectronics' latest proximity sensor embedded in the Apple iPhone 7 Plus](#), System Plus Consulting, part of Yole Group of Companies proposes a relevant analysis of STMicroelectronics

² ToF : Time of Flight

approach³. In a very small form factor (2.80 mm x 2.40 mm), the FlightSense™ proximity sensor is a custom Apple device measuring half the size of the rest of STMicroelectronics's portfolio... Major improvements are in the VCSEL integration, on the sensing/processing die along with a new design of SPAD⁴ based detector. *“This could be the first step for STMicroelectronics proving the feasibility of small form factor ToF devices which could then be part of the more ambitious 3D sensing camera of the Apple iPhone 8”*, says **Stéphane Elisabeth, RF, sensor & Advanced Packaging Cost Engineer at [System Plus Consulting](#)**.

Semiconductor players in this field have clearly a great part to play, as none of them is exempt from imaging product involvement. Specific technologies such as SPAD and 3D hybrid stack BSI⁵ will probably play a significant role. Laser illuminators and LIDARs (another aspect of ToF technology) will also play determinant roles.

The 3D Imaging & Sensing report from Yole describes the applications, technologies, and players associated with this market's impending explosion. Furthermore, this new report delivers key insights into the battle for 3D markets and technologies before it really happens. A detailed description of the 3D Imaging & Sensing report is available in i-micronews.com, [Imaging reports section](#).

³ Source: [STMicroelectronics Time of Flight Proximity Sensor in the Apple iPhone 7 Plus report](#), System Plus Consulting, March 2017

⁴ SPAD : Single-Photon Avalanche Diode

⁵ BSI : Back-Side Illumination



About [3D Imaging and Sensing 2017 report](#)

Beyond its traditional medical and industrial markets, 3D imaging & sensing is ready to conquer consumer and automotive, with an exponential growth pattern starting from \$1.3B in 2016 and reaching \$9B in 2022 – This report has been performed by Yole Développement (Yole) part of Yole Group of Companies.

Author:

From 1999, **Pierre Cambou** has been part of the imaging industry. Pierre took several positions at Thomson TCS, which became Atmel Grenoble in 2001 and e2v Semiconductors in 2006. In 2012, he founded a start-up called Vence Innovation (now Irlinx) in order to bring to market a disruptive infrared interaction technology. He has an Engineering degree from Université de Technologie de Compiègne and a Master of Science from Virginia Tech. More recently, he graduated from Grenoble Ecole de Management's MBA. He joined Yole Développement as Imaging Activity Leader in 2014.

Companies cited in the report:

Abbott, AMS, Anritsu, Apple, ASC, BAE Systems, Bioptigen, Bosello, Canon, Continental, Core Photonics, Crystalvue, Epcos, Fakeshift, Fairchild, Faro, First Sensor, Fujifilm, GE, Gestigon, IDS, Huvitz, IFM, iRobot, iRay, Hamamatsu, Heptagon, Hexagon Metrology, Himax, Hokuyo, Hologic, Honeywell, Lee, Infineon, Keyence, Konica Minolta, Kreon, Leddartech, Leica, Linx, Lips, LMI, Mantis Vision, Medtech, Melexis, Namuga, Nidek, Nikon, Nordson Dage, Nsi, Oculus, On Semi and more...



About [STMicroelectronics Time of Flight Proximity Sensor in the Apple iPhone 7 Plus report](#):

This report analyzes the complete microsystem, from the illumination device, which is a Vertical-Cavity Surface-Emitting Laser (VCSEL), to the collector, which is based on STMicroelectronics' Single Photon Avalanche Diode (SPAD)...

This report has been performed by System Plus Consulting, part of Yole Group of Companies.

Authors:

Stéphane Elisabeth has a deep knowledge of materials characterization and electronic systems. He holds an Engineering Degree in Electronics & Numerical Technology as well as a PhD in Materials for Micro-electronics. **Yvon Le Goff** has joined System Plus Consulting in 2011, in order to setup the laboratory of System Plus Consulting. He previously worked during 25 years in Atmel Nantes Technological Analysis Laboratory as fab support in physical analysis, and 3 years at Hirex Engineering in Toulouse, in a DPA lab.

About System Plus Consulting – www.systemplus.fr

System Plus Consulting specializes in the cost analysis of electronics, from semiconductor devices to electronic systems. Created more than 20 years ago, System Plus Consulting has developed a complete range of services, costing tools and reports to deliver in-depth production cost studies and estimate the objective selling price of a product. System Plus Consulting engineers are experts in Integrated Circuits - Power Devices & Modules - MEMS & Sensors - Photonics – LED - Imaging – Display - Packaging - Electronic Boards & Systems. Through hundreds of analyses performed each year, System Plus Consulting offers deep added-value reports to help its customers understand their production processes and determine production costs. Based on System Plus Consulting's results, manufacturers are able to compare their production costs to those of competitors. More info on www.systemplus.fr - Press contact: Sandrine Leroy (leroy@yole.fr)

About Yole Développement – www.yole.fr

Founded in 1998, Yole Développement has grown to become a group of companies providing marketing, technology and strategy consulting, media and corporate finance services. With a strong focus on emerging applications using silicon and/or micro manufacturing, the Yole Développement group has expanded to include more than 50 collaborators worldwide covering MEMS, Compound Semiconductors, RF Electronics, LED, Displays, Image Sensors, Optoelectronics, Microfluidics & Medical, Advanced Packaging, Manufacturing, Nanomaterials, Power Electronics and Batteries & Energy Management.

The “More than Moore” company Yole, along with its partners System Plus Consulting, PISEO, Blumorpho and KnowMade, support industrial companies, investors and R&D organizations worldwide to help them understand markets and follow technology trends to grow their business.

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