LYON, France – November 9, 2017: The CCM\textsuperscript{1} industry used to be a very fragmented market place. According to Yole Développement (Yole), this market is moving slowly towards the consolidation phase with significant technology changes and supply chain evolution. In 2016, this ecosystem showed 10 companies beyond US$ 1 billion in revenue. Within the CIS\textsuperscript{2} market segment for CCM applications, the 3 main players are sharing 75% of the total market… The CCM industry revenue was US$23.4 billion in 2016 and is expecting to reach US$ 46.8 billion in 2022.

Nevertheless the CCM supply chain still appears as a complex industry: Yole’ analysts identified some overlaps between the activities of CCM sub components companies. As an example, lens manufacturing and module assembly remains the last overlapping market segments. By the way, mastering the full CCM technology set has become almost impossible. Adding to the complexity of the ecosystem and due to the evolution of these technologies, illumination parts will enter in the ecosystem.

Yole Group of Companies releases its CCM analyses this month: both partners, Yole and System Plus Consulting pursue their collaboration to investigate the imaging industry, dive deep inside the technology innovations and understand the market drivers and issues. Two reports are now available: Camera Module Industry Market and Technology Trends and Camera Module Physical Analyses Overview.

“CCM industry will continue to be driven by technology”, asserts Pierre Cambou, Activity Leader at Yole. “New technologies are serving demanding applications, in a market hungry for technology performance.”

\textsuperscript{1} CCM: Compact Camera Module
\textsuperscript{2} CIS: CMOS Image Sensor
Smartphone manufacturers and car makers are integrating more and more functionalities. Rear facing and front facing, CIS, OIS\(^3\) and lens… All are art of the Yole Group of companies analyses.

“At 12.2% CAGR\(^4\) for the next five years, the CMM industry is a growth powerhouse with numerous large companies thriving in a dynamic market”, comments Pierre Cambou from Yole. Today giant camera module players have emerged such as LG Innotek, Semco, Foxconn Sharp, O-Film and Sunny Optical.

Historically one could differentiate the faith of camera module market from the sub parts such as the image sensor, the lens and the autofocus or optical image stabilization system (VCM\(^5\)). It seems that differentiated growth has now ended and every sub segment is enjoying almost equal benefit from the rising market tide. This convergence is in part due to the end of quasi-monopoly from Sony in the image sensor sub-segment now joined by Samsung and Omisivion. The story is very similar for Largan Precision in the lens set sub-segment which is now facing renewed competition from Sunny Optical, Kantatsu and Genious Optical.

The last sub-domain detailed by Yole’s analysts in the CCM report is VCMs. The growth of VCM companies has been undercut by dire structuration efforts. Yole had mentioned the inability of the VCM to serve the demand in the mobile market. Price pressures have changed the face of competition with competitors such as Mitsumi and Shichoh which were forced out and new players such as New Shichoh and Jawha to take center stage.

New technologies are serving demanding applications in a market hungry for technology performance. Therefore, mobile rear photography camera is still the main driver of the camera module industry. In 2015 OIS was the VCM technology differentiator introduced by Apple. While competition and the whole ecosystem was struggling to incorporate this innovation, the dual camera approach has been an elegant solution from LG and Huawei to recycle old module designs into state of the art systems. Those two innovations have collided and resulted into the impetus to provide dual rear cameras with dual OIS which is only happening end of 2017.

On the mobile front camera side, the impact of selfies has been increasing the performance and cost of camera devices. Now Apple and Samsung are coming out with dual front camera setup incorporating biometric capability and also adding a 3D sensing user interface for Apple. Those innovations are game changing as they explain the enormous increase in camera module content per

\(^3\) OIS : Optical Image Stabilization  
\(^4\) CAGR : Compound Annual Growth Rate  
\(^5\) VCM : Voice Coil Motors
smartphone. While 2 cameras were needed few years ago, now the new normal in the high end of mobile is to have 3 to 4 cameras, having 2 cameras on one or both sides. With a gross average cost of US$6 per camera it is quite easy to understand we left a world of US$12 per smartphone in 2015 and have entered a world in the range of US$24 worth of camera module per smartphone in 2017. This vision is currently being implemented by most OEMs and while the smartphone industry is entering into a more modest growth pattern due to maturity, the camera module industry is not slowing down its pace thanks to volume demand, sustained prices and a technology driven environment.

Since the last reports performed by System Plus Consulting and Yole, the CCM industry has completely changed: more and more innovative functionalities have been integrated in smartphones and the growing automotive market segment is also looking for new approaches. In 2017 the CCM reports are providing renewed analysis and a track of the specification metrics. They are offering valuable insights about the market evolution and the technology choices made by the main players.

Under this context, CCM companies have updated their design. “In the automotive sector for example, manufacturers have rationalized their components in terms of size and number of boards and connectors”, asserts Audrey Lahrach, in charge of costing analyses at System Plus Consulting. “Their newer designs clearly express their ability to get closer to the mobile camera module’s structure in order to reduce manufacturing cost.”

A detailed description of both reports is available on i-micronews.com, imaging reports section.

---

6 OEM: Original Equipment Manufacturer
ABOUT THE REPORTS:

**Camera Module Industry**

New technologies and applications have restructured the Compact Camera Module industry - Produced by Yole Développement (Yole) part of Yole Group of Companies.

Companies cited in the report:

Authors:

- **Pierre Cambou** joined the imaging industry in 1999. Following an engineering degree from Université de Technologie de Compiègne in parallel to a master of science from Virginia Tech in 1998, as well as graduating from Grenoble Ecole de Management’s MBA, Cambou took several positions at Thomson TCS, which became Atmel Grenoble in 2001 and e2v Semiconductors in 2006. In 2012 he founded Vence Innovation, now called Irlynx, in order to bring to market a disruptive man-to-machine interaction technology. He joined market research and strategy consulting company Yole Développement as imaging activity leader in 2014.

- From 1996 to 1999 **Jean-Luc Jaffard** paved the way of imaging activity at STMicroelectronics being at the forefront of the emergence and growth of this business. At STMicroelectronics Imaging division he has been appointed Research Development and Innovation Director managing a large multidisciplinary and multicultural team and was later on promoted Deputy General Manager and Advanced Technology Director in charge of identifying, sourcing or developing the breakthrough Imaging Technologies and Applications to transform them into innovative and profitable products. In 2010 he was appointed STMicroelectronics Intellectual Property Business Unit Director. In 2014 he created the Technology and Innovation branch of Red Belt Conseil, to support High Tech actors like SME, Research Institutes, Start-ups, Analysts, Investors and public authorities. Jean-Luc Jaffard owns multiple patents in semiconductor and Imaging domains and has been invited speaker in many conferences worldwide. He studied Electronic and Microelectronic and has been graduated from Ecole Supérieure d’Electricité of Paris in 1979.

**Camera Module 2017 Physical Analyses Overview**

24 camera modules for consumer and automotive applications, all from the main OEMs, analyzed and compared. - Produced by System Plus Consulting, part of Yole Group of Companies. This report is composed of two sections: rear-facing and front-facing for smartphones as well as one specific section for automotive camera.

List of companies covered in this report:
Samsung, Robert Bosch, Huawei, Continental, Sony, Land Rover, Lenovo, TRW, Nissan… And more.

Authors:

- **Audrey Lahrach** is in charge of costing analyses for IC, LCD & OLED Displays and Sensor Devices. She holds a Master degree in Microelectronics from the University of Nantes.

- **Nicolas Radufe** is in charge of physical analysis at System Plus Consulting. He has a deep knowledge in chemical and physical analyses. He previously worked in microelectronics R&D for CEA/LETI in Grenoble and for STMicroelectronics in Crolles.

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

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. System Plus Consulting is a sister company of Yole Développement. More info on www.systemplus.fr.

ABOUT YOLE DEVELOPPEMENT – 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, reverse engineering and reverse costing services and well as IP and patent analysis. With a strong focus on emerging applications using silicon and/or micro manufacturing, the Yole group of companies has expanded to include more than 80 collaborators worldwide covering MEMS and image sensors, Compound Semiconductors, RF Electronics, Solid-state lighting, Displays, software, Optoelectronics, Microfluidics & Medical, Advanced Packaging, Manufacturing, Nanomaterials, Power Electronics and Batteries & Energy Management.

The “More than Moore” market research, technology and strategy consulting company Yole Développement, along with its partners System Plus Consulting, PISEO and KnowMade, support industrial companies, investors and R&D organizations worldwide to help them understand markets and follow technology trends to grow their business. For more information, visit www.yole.fr and follow Yole on LinkedIn and Twitter.

• Consulting & Financial Services: Jean-Christophe Eloy (eloy@yole.fr)
• Reports: David Jourdan (jourdan@yole.fr)

Yole Group of Companies - Press Relations & Corporate Communication: Sandrine Leroy (leroy@yole.fr)

###