FOR IMMEDIATE RELEASE:

Solid-state lighting source: a business opportunity of US$32 billion in 2024

Extracted from:
- Status of the Solid-State Lighting Source Industry report - VCSELs – Market and Technology Trends report from Yole Développement, 2019
- VCSEL – Vertical Cavity Surface Emitting Laser 2018 – Patent Landscape Analysis from KnowMade
- VCSEL in Smartphone – Comparison from System Plus Consulting, 2019

LYON, France – September 30, 2019: SSL sources aren’t new technologies. In fact, they’ve existed since the 1960s. However, only in the last 25 years have they started appearing in high-volume applications. Yole Développement (Yole) estimates therefore that the overall SSL source market will grow from US$20.4 billion in 2018 to US$32.3 billion in 2024, at a 8% CAGR between 2018 and 2024.

“Such growth will be driven mostly by LED technologies”, comments Pars Mukish, Business Unit Manager at Yole. “However, related market share will decline from about 84% in 2018 to 73% in 2024, reflecting different market/application dynamics and a transition towards LD technologies.”

Under its new technology & market report, Status of the Solid-State Lighting Source Industry, the market research and strategy consulting company is offering a global examination of SSL source trends. This new analysis reveals the overall SSL source types (visible LED, UV LED, IR LED, EEL, and VCSEL) and proposes a deep understanding of SSL source markets, applications, industries, and technologies. In addition, Yole’s analysts point out SSL source players, dynamics, and rankings.

Yole Group of companies, including Yole, System Plus Consulting and Knowmade investigates the lighting industry for a while and is building step by step a deep industrial and technical knowledge. In 2019 the team announced an impressive collection of technology, market and IP analyses focused on the different light sources: VCSEL, EEL and more.

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1 SSL: Solid-State Lighting
2 CAGR: Compound Annual Growth Rate
3 LD: Laser Diodes
4 LED: Light Emitting Diodes
5 EEL: Edge-Emitting Laser
6 VCSEL: Vertical Cavity Surface-Emitting Laser
As a example, VCSEL in Smartphone — Comparison performed by System Plus Consulting proposes a relevant comparison of current VCSEL technologies for smartphones. Today, up to three VCSEL dies can be integrated in a smartphone: 3D recognition with the flood illuminator; the dot projector; and ToF\(^7\) for the proximity sensor. “Already integrated in flagship smartphones, these functions will quickly find a home in all smartphones, causing a sharp increase in VCSEL demand”, comments Sylvain Hallereau, Senior Analyst, at System Plus Consulting.

To propose a complete analysis of the VCSEL ecosystem, KnowMade developed a deep added-value patent analysis to describe the VCSEL IP landscape. “The release of the Apple iPhone X in 2017 and its range of optical sensors triggered new opportunities for VCSEL players to address a high-volume market,” comments Paul Leclaire, Patent Analyst at KnowMade. “At the beginning of this new era, where new applications such as LiDAR or 3D sensors are arising, understanding the IP position and strategy of historical VCSEL IP players as well as identifying the IP newcomers and the threat they represent is essential.”

Under this dynamic context, Yole Group is announcing today a new growth era for the solid-state lighting industry and details its analysis: “LED revenue will continue to thrive on visible applications over the next five years, with general lighting holding the majority, about 45% of the total “LED opportunity.”, asserts Pierrick Boulay, Technology & Market Analyst, Solid State Lighting and Lighting Systems at Yole. “However, such an application has already reached a certain degree of maturity, and thus related LED devices can be considered as commodities – leading to a high-volume/low-margin market.”

Automotive lighting and direct-view displays are other booming LED applications. These will become critical for the industry’s survival, since most other applications can be considered as declining or “flat” (i.e. LCD backlights). The one exception is horticultural lighting, which is still emerging.

A large part of the LED industry also has a foothold in the non-visible LED market, with UV and IR LEDs highlighting several high-potential applications (i.e. gas sensing and water disinfection). But these are still emerging, and will take time to materialize.

In parallel, the LD industry is booming. Several applications are rising and plenty of others are emerging or in development.

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\(^7\) ToF : Time of Flight
And VCSEL, driven by the integration of front 3D cameras in smartphones, will likely see a 5x market revenue increase from 2018 – 2024. And this is just the beginning, with smartphone rear 3D cameras and LiDAR likely next in line.

From its side, EEL will experience strong but much steadier growth during the same period (i.e. only a 2x revenue increase), driven mostly by optical transceivers and the increased development of telecom infrastructure (around 55% – 65% of EEL market opportunity). Here also there are a large number of applications that could further boom in the future – for example, LiDAR and sensors.

In this context, it is likely that the visible LED industry will further consolidate in the future as markets reach maturity. Such a trend will directly impact other SSL source industries, since several visible LED players might “forage new lands” in order to survive…

The SSL collection of reports is available on i-Micronews.com, SSL section.

Yole also announces its participations to two key conferences next months:

**EPIC Meeting on VCSELs Technology and Applications at Sony**  
(October 17 & 18 – Stuttgart, Germany)  
- “VCSEL – A market fueled by smartphone applications. But not only…”

**SEMICON Europa** (November 12-15, 2019 – Munich, Germany)  
- “How next generation cars will impact the automotive industry?”
  
Date: On November 13, 2019 at 9:55AM during the SMART Transportation Forum

For both presentations, Yole’s speaker will be Pierrick Boulay, Technology & Market Analyst, Solid-state Lighting. Make sure to collect all presentations on i-Micronews.com.

Stay tuned!
ABOUT THE REPORTS:

**Status of the Solid-State Lighting Source Industry**
*From lighting to sensing: a new growth era for the solid-state lighting industry.* – Powered by Yole Développement (Yole).

**Companies cited:**

And:

- **VCSELs – Market and Technology Trends**
  *New functionalities in smartphone and automotive are boosting the VCSEL market.* – A Yole Développement’s report

- **VCSEL in Smartphone – Comparison**
  *Physical analysis and cost comparison of ten leading flagship smartphone VCSEL dies (dot projector, flood illuminator, and proximity sensor) from Apple, Huawei, Xiaomi, Oppo, Lenovo, and Intel.* – A System Plus Consulting comparative analysis

- **VCSEL – Vertical Cavity Surface Emitting Laser 2018 – Patent Landscape Analysis**
  *3D sensing in the Apple iPhone X paves the way for new VCSEL opportunities. How is the VCSEL-related patent landscape impacted by the rise of new applications?* – A KnowMade patent analysis

- **Edge Emitting Lasers: Market and Technology Trends**
  *Fast growing new applications will drive the EEL market to reach US$5.1B in 2024.* – A Yole Développement’s report

Authors of these reports:

- **Pierrick Boulay** works as Market and Technology Analyst in the fields of Solid State Lighting and Lighting Systems to carry out technical, economic and marketing analysis. Pierrick has authored several reports and custom analysis dedicated to topics such as general lighting, automotive lighting, LiDAR, IR LEDs, UV LEDs and VCSELs. Prior to Yole, Pierrick has worked in several companies where he developed his knowledge on general lighting and on automotive lighting. In the past, he has mostly worked in R&D department for LED lighting applications. Pierrick holds a master degree in Electronics (ESEO – Angers, France).

- **Guillaume Chevalier** has joined System Plus Consulting in early 2018 to perform physical analyses. He holds a two-year university degree in technology of physical measurements and instrumentation technics.

- **Sylvain Hallereau** serves as a Senior Technology and Costing analyst in charge of IC, LED, MEMS and Photonic. He has more than 15 years of experience in semiconductor device manufacturing cost analysis and has studied a wide range of technologies. He holds a Master degree in Microelectronics from the University of Nantes.

- **Dr. Paul Leclaire** works for Knowmade in the fields of RF technologies, Wireless communications and MEMS sensors. He holds a PhD in Micro and Nanotechnology from the University of Lille, France, in partnership with IEMN in Villeneuve-d’Ascq and CRHEA-CNRS in SophiaAntipolis, France. Paul previously worked in innovation strategy consulting firm as Consultant.

- **Pars Mukish** holds a master degree in Materials Science & Polymers (ITECH - France) and a master degree in Innovation & Technology Management (EM Lyon - France). Since 2015, Pars has taken on responsibility for developing SSL and Display activities activities as Business Unit Manager at Yole Développement (Yole). Pars is part of the Photonics, Sensing & Display division at Yole. Previously, he has worked as Marketing Analyst and Techno-Economic Analyst for several years at the CEA (French Research Center).
• Martin Vallo, PhD is serves as a Technology & Market Analyst specialized in solid-state lighting technologies, within the Photonics, Sensing & Display division at Yole Développement (Yole). With 9 years’ experience within semiconductor technology, Martin is involved today in the development of technology & market reports as well as the production of custom consulting projects at Yole. Prior his mission at Yole, he worked at CEA (Grenoble, France), with a mission focused on the epitaxial growth of InGaN/GaN core-shell nanowire LEDs by MOCVD and their characterization for highly flexible photonic devices. Martin graduated from Academy of Sciences, Institute of Electrical Engineering (Slovakia) with an engineering degree in III-nitride semiconductors.

ABOUT YOLE DEVELOPPEMENT

Founded in 1998, Yole Développement (Yole) 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 & Sensors - Imaging - Medical Technologies - Compound Semiconductors - RF Electronics - Solid State Lighting - Displays - Photonics - Power Electronics - Batteries & Energy Management - Advanced Packaging - Semiconductor Manufacturing - Software & Computing - Memory and more...

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.

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