

MicroLED: Samsung, Apple, BOE... the race is on ¹

OUTLINES:

- About 5,500 patents filed by more than 350 organizations and representing almost 2,500 families have been identified and selected by Yole Développement.
- The level of activity is growing exponentially with 40% of the patents filed in 2019 alone!
- China and display makers drive this exponential growth.
- Mass transfer still dominates activity.
- Rise in other technology nodes shows industry moving from prototypes to consumer displays.
- Samsung pursues multiple development tracks, Apple slows down on IP² and startups remain a major innovation force...

*“The growth is fueled by the meteoric rise of Chinese companies”, asserts **Eric Virey, PhD. Principal Display Market and Technologies Analyst within the Photonics, Sensing & Display division at Yole Développement (Yole)**. “This mirrors a more general trend in the country as it transitions from a manufacturing to an innovation driven-economy. This also reflects the situation in the display industry where Chinese companies now hold more than 50% of the worldwide display capacity in 2020.”*

The microLED industry stays definitively attractive with numerous innovations and business opportunities. In Yole’s MicroLED Display report, analysts estimate that the cumulated effort in microLED to date reaches close to US\$4.8 billion, with Apple alone close to \$1.8 billion, factoring in both the Luxvue acquisition and internal developments. Excluding this acquisition and the recent deal between Facebook and Plessey, Startup have raised a cumulated US\$800 million to date and could add another \$100 million in 2020 pending disruption due to the Covid-19 pandemic. In addition, panel makers such as Samsung, LG, AUO or Innolux also significantly increased their efforts...

In this dynamic context, the market research & strategy consulting company Yole releases today the MicroLED IP report, MicroLED Displays - Intellectual Property Status & Landscape

¹ Extracted from :

- MicroLED Displays - Intellectual Property Status & Landscape 2020 report, Yole Développement

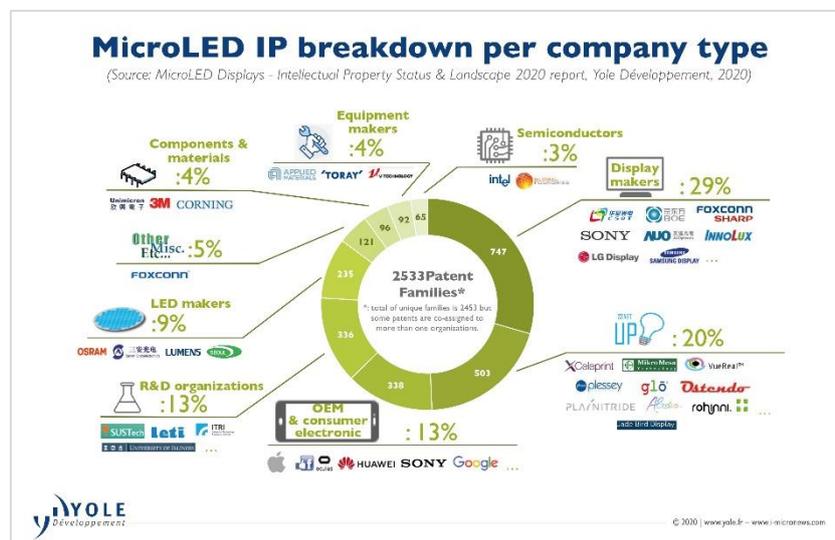
² IP : Intellectual Property

2020, performed in collaboration with Knowmade, a technology intelligence and IP strategy consulting company.

Under this new MicroLED report, Yole’s Display team describes and analyzes the microLED IP landscape with more than 4x more patent families and 3x more players compared to the 2018 edition, respectively +1900 and +200. Analysts identified news players and new technology trends. They also added new technology segments in this new report. This 2020 edition also includes an overview of China IP trends as well as detailed geographic trends by country of filing and company headquarters.

Yole has been investigating the microLED industry, innovative technologies for many years. The company has built a dedicated team of analysts, with a significant expertise focused on display technologies and related applications. Thanks to a deep expertise and valuable industrial knowledge, analysts propose a comprehensive collection of technology, market & patent reports: MicroLED Display 2019 - MiniLED for Display Applications: LCD and Digital Signage - Next Generation 3D Display 2019... Discover this whole collection on i-Micronews, Display reports section.

How are patent filings and countries of patent filings evolving? What are the key microLED-related patents? What are the emerging technologies? Which technology nodes are generating the most activities among chip design, transfer, defect management...? Who is part of the microLED IP landscape? What are the key IP collaborations?... Yole’s display team sheds light on the attractive microLED sector and the related IP activities.



“The increase in patents coming from China is remarkable”, comments Eric Virey from Yole. “Many of those microLED patents are questionable. Nevertheless, established players shouldn’t underestimate their Chinese competitors and dismiss the threat: some patents show world class innovation and demonstrate a strong resolve to close the gap with established rivals.” In addition, in

high volumes, even low quality patents can be used as bargaining tools to fend off infringement lawsuits, negotiate cross licensing agreements etc.

The proliferation of subpar patents may however hinder innovation as it increases barriers to entry: increasing resources are required to conduct freedom-to-operate analysis, monitor patent activities, try to invalidate wrongly granted patents and respond to infringement lawsuits.

Over the last 2 years, the industry has entered what can be seen either as a virtuous cycle or a bubble: companies are jumping on the microLED bandwagon for fear of being left out.

Eric Virey explains: *“Display makers dominated IP activity in 2019. Most were initially dismissive of microLEDs but all are now accelerating their effort. BOE now leads in volume with close to 150 new patent families in 2019 alone.”*

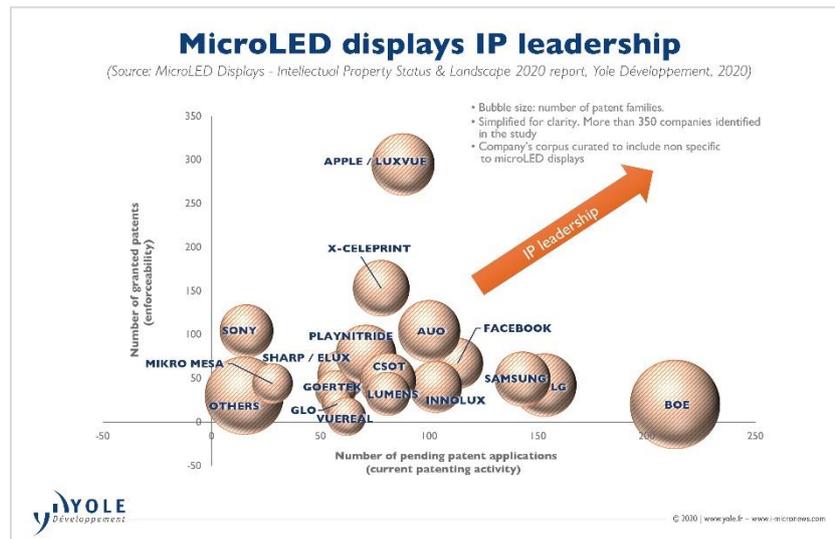
LG, AUO, Samsung, CSOT, Tianma, Innolux, CEC Panda, Visionox and companies in the Foxconn group all dramatically increased activity as well. Korean companies are investing massively in OLED but μ LED could be a credible alternative for high end TVs. Chinese makers are at least 3 years behind Korea in OLED, so μ LED could be a more differentiating play. For companies such as AUO or Innolux that haven't invested in OLED, μ LED could be critical for long term survival and allow them to remain relevant in various high end market segments without requiring OLED-like multi-billion dollar capex.

Many companies now have portfolio addressing multiple technology nodes. Licensing and legal battles will likely arise if μ LED displays enter volume manufacturing. Except in the field of microdisplays where the most capex-intensive manufacturing steps can easily be outsourced, startups and small companies are not planning to become display makers. Rather, most will focus on their core expertise and attempt to license their technology to established display makers and OEMs.

In the microLED IP world, Samsung pursues multiple development tracks, Apple slows down and startups remain a major innovation force...

In order to compete with LG's white OLED and maintain its leadership in the high TV market segment, Samsung Display Co. (SDC), announced a US\$13 billion investment to develop and manufacture QD-OLED by 2021-2022. But Samsung is hedging its bets: its Visual Display group is developing μ LED using in house mass transfer and chips developed by Playnitride. The company showed impressive 75" to 150" μ LED TV prototypes at CES 2020...Meanwhile, Samsung Display's is following its own development track and its QNED nanorod μ LED "ink", while still at an early stage, could be disruptive and bring the full benefits of μ LED to its emerging QD-OLED technology and manufacturing infrastructure. Between the two extreme scenario of broad μ LED success or limitation to smaller niche markets and segments, QNED could open a third path by blending μ LED into more established display technologies.

LG effort is more centralized with strong collaboration between the different divisions and a patent portfolio showing increasing maturity in μ LED technologies.



In parallel “Historical” players such as X-Celeprint, or, more recently, Playnitride also remain very active. They have developed broad portfolios covering a wide range of microLED technology nodes. Startups eLux, Glo, Vuereal, Mikro Mesa, Aledia Jade Bird Display, Rohinni and others have also significantly increased the size of their portfolio. Activity has accelerated at Facebook after it acquired mLED and InfiniLED. Its recent exclusive licensing and manufacturing deal with μ LED microdisplay Plessey confirms its ambitions for augmented reality applications. Discover the related article written by Yole’s analysts on [i-Micronews](#). IP filing at Sony has stalled despite the fact that the company is commercializing a μ LED based Public Information Display. More surprisingly, activity at Apple has also slowed down significantly since 2017. The few patents it has since published however show the high level of maturity and advancement reached by the company in μ LED display technologies. Recent patents also show that the company has expanded the scope of its effort into developing microdisplays for augmented reality. Overall, the reduced activity could also be a sign of confidence in an already robust μ LED portfolio as the company now focuses on setting up its supply chain. If successful, Apple would be the first to disrupt the industry by having developed its own display technology and establishing a mostly fables supply chain model, something that Huawei could be willing to emulate.

The collection of display technology, market & patent reports is available on [i-Micronews](#) with a detailed description, list of companies, key features, sample of the report and more... Stay tuned on [i-Micronews](#) to follow our display activities!

Press contacts

Sandrine Leroy, Director, Public Relations, leroy@yole.fr

Marion Barrier, Assistant, Public Relations, marion.barrier@yole.fr

Le Quartz, 75 Cours Emile Zola – 69100 Villeurbanne – Lyon –France – +33472830189
www.yole.fr - www.i-micronews.com – [LinkedIn](#) – [Twitter](#)

About our analyst

Eric Virey, PhD. serves as a Principal Display Market and Technologies Analyst within the Photonics, Sensing & Display division at Yole Développement (Yole).

Eric is a daily contributor to the development of the Display activity at Yole, with a large collection of market and technology reports on display technologies, Quantum Dots, MicroLEDs, TFT backplanes as well as multiple custom consulting projects: business strategy, identification of investments or acquisition targets, due diligences (buy/sell side), market and technology analysis, cost modelling, technology scouting, etc.

Eric has spoken in more than 50 industry conferences worldwide over the last 10 years. He has been interviewed and quoted by leading media over the world including: The Wall Street Journal, CNN, Fox News, CNBC, Bloomberg, Financial Review, Forbes, Technology Review, etc. He is also a regular contributor to various display industry media and organizations.

Previously Eric has held various R&D, engineering, manufacturing and business development positions with Fortune 500 Company Saint-Gobain in France and the United States.

Eric Virey holds a PhD in Optoelectronics from the National Polytechnic Institute of Grenoble. He is currently based in Portland, OR.

About the report

MicroLED Displays - Intellectual Property Status & Landscape 2020

MicroLED intellectual property activity growing exponentially both in terms of patents and topics. BOE takes over Apple, China and traditional display makers now in the lead. – Performed by Yole Développement

Companies cited:

Acer; Aledia; Apple / Luxvue; Applied Materials; AU Optronics ; BOE ; CEA ; CEC Panda ; Century Display; Changelight; HKC; CIOMP; Cooledge ; Corning; Cree; CSOT; Dai Nippon Printing; Epistar; Facebook / Oculus; Foxconn; Fuzhou University; Global Interface Solution; Glo; Globalfoundries; Goertek; Google / X Development; Guangdong U. Of Technology; Gwangju Inst. Of Science & Tech.; HC Semitek; Himax; Hisense; Huawei; Huazhong U. Of Science & Tech.; IBM; Innolux; Intel; ITRI; Jade Bird Display; Japan Display; Junwan Microelectronic; KAIST; KIMM; Konka; Kookmin University; KOPTI; Korea Advanced Nano Fab Center; Kyocera; LG; Lightizer; Lumens; Lumileds...

Related reports

- [MicroLED 2019](#)
- [MiniLED for Display Applications: LCD and Digital Signage](#)
- [Next Generation 3D Display 2019](#)

About Yole Développement

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... [More](#)

For more information and images, please visit [i-Micronews](#)

###