Beyond COVID-19 outbreak and US-China trade war, 5G and Wi-Fi 6 pursue their growth¹

OUTLINE:

- 5G and Wi-Fi 6 benefit from the COVID-19 pandemic.
- RF² front-end and connectivity markets poised for double-digit growth: Yole Développement (Yole) forecasts a 11% CAGR³ between 2020 and 2025, with a US$25.4 billion market by 2025.
- 5G poses challenges to the RF front-end industry with the development of wideband PAs⁴ and filters translating into investments in design and material engineering.
- Without doubts, the US/China trade war accelerates the ecosystem transition: The five major companies, Murata, Skyworks, Broadcom, Qorvo and Qualcomm share almost 80% of the overall business. A variety of other companies from China, South Korea, Japan and Europe complete the RF front-end competitive landscape.
- OEM’s outlook: Yole expects Chinese mobile device manufacturers to rethink their supply strategy… Apple lost market share, while all 4 major OEMs⁵ from China have significantly progressed. With its investments in the filter company Shoulder, Huawei works to get a complete RF front-end as supplied by US-based companies.

“Consumer appetite for data has not been reduced by the COVID-19 pandemic” asserts Cédric Malaquin, Technology & Market Analyst, specialized in RF devices & technologies within the Power & Wireless division at Yole Développement (Yole). “In fact, it’s the opposite. People realized the importance of being connected during lockdown. Most of the data traffic increase has been handled by fixed networks, but mobile networks also have been affected. Many service providers had to adapt to the situation…”.

¹ Extracted from:
- 5G’s Impact on RF Front-End and Connectivity for Cellphones report, Yole Développement, 2020

² RF: Radio Frequency
³ CAGR: Compound Annual Growth Rate
⁴ PA: Power Amplifier
⁵ OEM: Original Equipment Manufacturer
The early 5G implementation started end 2019. The technology has a strong potential for RF front-end market growth and is very attractive to many companies across the world. In parallel, sizing market opportunities and highlighting technology trends appeared to be useful for the semiconductor industry. The RF front-end and the connectivity markets involve a substantial amount of technology platforms competing with each other, many of which having a strong market disruption potential.

In this context, Yole and System Plus Consulting investigates disruptive RF technologies and related markets in depth. Both companies point out the latest innovations and underline the business opportunities. Released today, the 5G’s Impact on RF Front-End and Connectivity for Cellphones report, performed by Yole’s analysts gives detailed analysis of each technology’s strengths and weaknesses and delivers an ecosystem snapshot. Including market trends and forecasts, market shares, ecosystem and US/China trade war analysis, this study also points out COVID-19’s impact on the RF front-end and connectivity business.

**Latest evolution of Huawei Mate Series RF board**  

This technology & market report is linked to System Plus Consulting comparative analysis, RF Front-End Module Comparison 2020 – Volume 2, published in Q2 2020. In this report, the reverse engineering & consulting company proposes a technical and cost overview of Huawei’s Mate and P series Radio Frequency Front-End Module technologies from 2015 to 2019. This new report highlights the technical choices made by the leading Chinese OEM over the years.

“A drop in the number, area and cost of American components is revealed in latest Mate series,” explains Stéphane Elisabeth, Technology & Cost Analyst at System Plus Consulting. “In addition, we underline Huawei’s ability to still produce a highly competitive smartphone with 5G Sub-6GHz technology despite the political situation…”.
What are the economic and technological challenges of the RF front-end industry? What are the key drivers? Who are the suppliers to watch, and what innovative technologies are they working on? What is Huawei’s strategy in this highly competitive context, in front of the US-based companies? Yole and System Plus Consulting reveal the latest technical and market trends.

**Worldwide 5G network launch in June 2020**

Whether fixed or mobile, service providers have a great window for migrating consumers to broadband internet access and to the new 5G and Wi-Fi 6 plus fibre standards, announces Yole in its latest RF electronics report. The benefit at the network operator level is the efficiency of the new technologies, which would reduce cost of operation. And as early adopter consumers are ready to pay extra fees for the improved network and compelling data plans, the return on investment for the carrier will come sooner. China, South Korea and USA are early adopter countries of 5G where all major carriers have launched their network and where consumers are technology enthusiasts. In Japan, in Europe and for the rest of the world, 5G network rollout is moving forward at a slower pace. The Chinese market will pull most of the demand for 5G smartphones in 2020. The US government is putting a strong emphasis on 5G and Wi-Fi 6 with unprecedented spectrum auction plans to accelerate the technology adoption at a broader scale. Indeed, these technology transitions contribute greatly to GDP in a context where nations are looking for growth more than ever.

“RF front-end and connectivity markets poised for double digit growth,” asserts Cédric Malaquin from Yole. “Indeed, when we purchase a smartphone, we often look at the battery lifetime and the photographic performance. Then come system performance and connectivity, which
is attributed to SoC\(^7\) performance. One must also notice the fundamental role of the RF front-end in the system performance. It directly impacts the device power consumption and is essential for routing, filtering and amplifying signals to and from the antennas”.

LTE and LTE-Advanced and Wi-Fi 5 standards have contributed to the rising complexity of RF front-end solutions in handsets. 5G and Wi-Fi 6 are no exception as both standards introduce new features that will increase the RF content and complexity. Indeed, to cope with more stringent requirements in data transmission speed and better spectral efficiency, a 5G handset will feature a 4x4 MIMO\(^8\) downlink for frequencies above 2.5 GHz.

According to Antoine Bonnabel, Technology & Market Analyst for the Power & Wireless team of Yole: “It will also have NR\(^9\) frequency bands along with EN-DC\(^10\) of 5G with LTE. There will be a 2x2 MIMO uplink in some cases and likely a diversity transmit link. Sounding reference signals will also be mandatory in 5G handset to optimize the radio link with an active antenna system within range”.

On top of that, 5G devices will have to meet the definition of high-power user equipment for TDD\(^11\) NR bands and to be capable of operating with at least 100 MHz of bandwidth. CA\(^12\) will be applied to 5G as it was for LTE.

Other features will be evaluated, such as supplementary uplink, which could affect the RF content. Wi-Fi 6 will essentially democratize the use of 2x2 MIMO for up and downlink. Wi-Fi 6E will extend the frequency coverage of Wi-Fi signals to 6 GHz. New use cases such as file sharing or augmented reality and smart remote control are driving the need for a precise

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**2020-2025 RF front-end and connectivity market forecast - Per type of component**

(Source: SoC’s Impact on RF Front-End and Connectivity for Mobiles 2020 report, Yole Development, 2020.)

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\(^7\) SoC: System-on-Chip
\(^8\) MIMO: Multiple Input Multiple Output
\(^9\) NR: New Radio
\(^10\) EN-DC: Dual Connectivity
\(^11\) TDD: Time Division Duplex
\(^12\) CA: Carrier Aggregation
positioning technology. Thus, a new UWB radio will be added in handsets, further increasing the RF content.

Overall, the RF front-end and connectivity market was valued at US$15.2 billion in 2019. It will grow 11% CAGR between 2020 and 2025 to reach US$25.4 billion by 2025 according to the 5G’s Impact on RF Front-End and Connectivity for Cellphones report.

All year long, Yole Développement and System Plus Consulting publish numerous reports. In addition, experts realize various key presentations and interviews and organize key conferences. In this regard, Yole and CITC invite you to take part in two collaborative online forums covering power packaging and RF packaging: The Power and RF Packaging Virtual Forums on November 24 & December 1, 2020. Register on i-Micronews.

In addition, do not miss Cédric Malaquin’s presentation about “5G a game changing technology for the society” during the upcoming SSDM2020 – Virtual conference on September 27, 2020 at 1:00PM. Register on i-Micronews.

Stay tuned on i-Micronews!

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About our analysts
As a Technology & Market Analyst, specialized in RF devices & technologies within the Power & Wireless division at Yole Développement (Yole), Cédric Malaquin is involved in the development of technology & market reports as well as the production of custom consulting projects. Prior his mission at Yole, Cédric first served Soitec as a process integration engineer during 9 years, then as an electrical characterization engineer during 6 years. He deeply contributed to FDSOI and RF SOI products characterization. He has also authored or co-authored three patents and five international publications in the semiconductor field. Cédric graduated from Polytech Lille in France with an engineering degree in microelectronics and material sciences.

Antoine Bonnabel works as a Technology & Market Analyst for the Power & Wireless team of Yole Développement (Yole). He carries out technical, marketing and strategic analyses focused on RF devices, related technologies and markets. Prior to Yole, Antoine was R&D Program Manager for DeliMEMS (FR), a company specializing in RF switches and supervised Intellectual Property and Business Intelligence activities of this company. In addition, he also has co-authored several market reports and is co-inventor of three patents in RF MEMS design. Antoine holds a M.Sc. in Microelectronics from Grenoble Institute of Technologies (France) and a M.Sc. in Management from Grenoble Graduate School of Business (France).

Dr. Stéphane Elisabeth has joined System Plus Consulting’s team in 2016. He has a deep knowledge of Materials characterizations and Electronics systems. He holds an Engineering Degree in Electronics and Numerical Technology, and a PhD in Materials for Microelectronics.

About the reports
**5G’s Impact on RF Front-End and Connectivity for Cellphones 2020**
An intensifying US-China competition for RF technology supremacy. – Performed by Yole Développement

**Companies cited:**

**RF Front-End Module Comparison 2020 – Volume 2**
Technical and cost overview of Huawei’s Mate and P series Radio Frequency Front-End Module technologies from 2015 to 2019. – Performed by System Plus Consulting

**Related reports:**
- 5G’s Impact on Telecom Infrastructure 2019
- Active and Passive Antenna Systems for Telecom Infrastructure 2019
- Advanced RF System-in-Package for Cellphones 2019
- RF Front-End Module Comparison 2020 – Volume 1
- Qualcomm’s Second Generation 5G mmWave Chipset, from Modem to Antenna

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

**About System Plus Consulting**
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… More

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