



## FOR IMMEDIATE RELEASE:

### 4G and 5G are changing the RF front-end industry landscape: what are the next steps?

RF Front End Modules and Components for Cellphones 2017 report – Smartphone RF Front-End Module Review - March 2017

**LYON, France – March 14, 2017:** “The RF<sup>1</sup> front end modules and components market for cellphones is highly dynamic”, asserts **Claire Troadec, Activity Leader, RF Devices & Technologies at Yole Développement (Yole)**. And she adds:” From being worth US\$10.1 billion last year, it is expected to reach US\$22.7 billion in 2022.” Such high growth is definitely something that players in other semiconductor markets would envy: a market that will more than double in six years! However, the growth is not evenly distributed...

Yole Group of companies including Yole and [System Plus Consulting](#) investigated the RF industry and proposes today two reports focused on the FE<sup>2</sup> part of the market, at the modules and components level:

[RF Front End Modules and Components for Cellphones 2017](#) : this industry is undoubtedly complex today. This status is due to the diversity of products and technologies but not only... Facing to the smartphones market needs (more high resolution video and so more bandwidth...), RF FE players have to find a way to develop competitive products and so answer the market needs. Yole’s report proposes an impressive picture of the status of this market and analyzes the evolution of this industry in term of architecture, design and materials. With a mix of lot of M&A<sup>3</sup> and disruptive technologies, RF requires today high attention.

[Smartphone RF Front-End Module Review](#) points out the current technical challenges. This report is a detailed comparison of the current solutions proposed by the leaders of this industry. It highlights the technical choices to be done to answer to the smartphone market evolution.

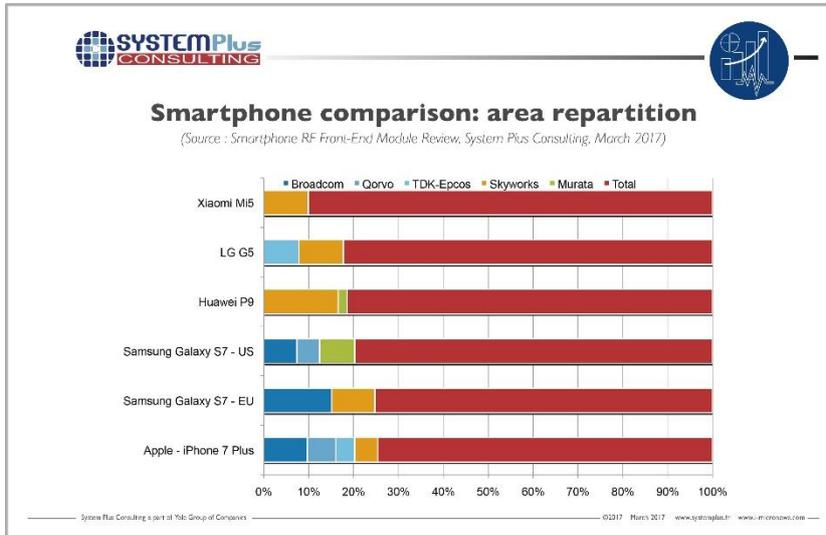


The upcoming 5G communication technology is creating a new order in the communication market. Major RF FE players are battling to provide powerful devices that could be integrated in smartphones. “Not all technologies suit the 5G requirement, but every player could win something”, explains **Stéphane Elisabeth, RF and Advanced Packaging Cost Engineer at System Plus Consulting**. “There will be opportunities for low cost competitors in the SAW filter market for low

<sup>1</sup> RF : Radio-Frequency

<sup>2</sup> FE : Front End

<sup>3</sup> M&A : Mergers & Acquisitions



band communications like GSM, 2G or 3G, as high quality competitors shift focus to the 4G and 5G market with BAW filters.” This comes along with better integration of all the FE communication devices, now in just one module.

“Filters represent the biggest business in the RF front end industry, and the value of this business will more than triple from 2016 to 2022”, announces Claire Troade

from Yole. Most of this growth will derive from additional filtering needs from new antennas as well as the need for more filtering functionality due to multiple CA<sup>4</sup>.

PAs<sup>5</sup> and LNAs<sup>6</sup>, the second biggest RF FE business, will be almost flat over the same period. High-end LTE<sup>7</sup> PA market growth will be balanced by a shrinking 2G/3G market. In parallel, LNA market will grow steadily, especially thanks to the addition of new antennas.

Switches, the third biggest business, will double. This market will mainly be driven by antenna switches.

Lastly, antenna tuners, a small business today with an estimated US\$36 million market value, will expand 7.5-fold to reach US\$272 million in 2022. This growth is mainly due to tuning being added to both the main and the diversity antennas.

In the longer term, possible developments could even render RF front-ends obsolete. Seamless Waves (FR), for example, is developing a CMOS<sup>8</sup>-based tunable analog-to-digital converter and tunable digital-to-analog converter that can actively center on a specific frequency and adjusts its bandwidth, thus converting only the needed part of the incoming signal. If this technology manages to get the low power consumption and small size required for smartphones, it could disrupt the industry and allow more innovative developments such as on-phone cognitive radio. This would create a totally different industry.

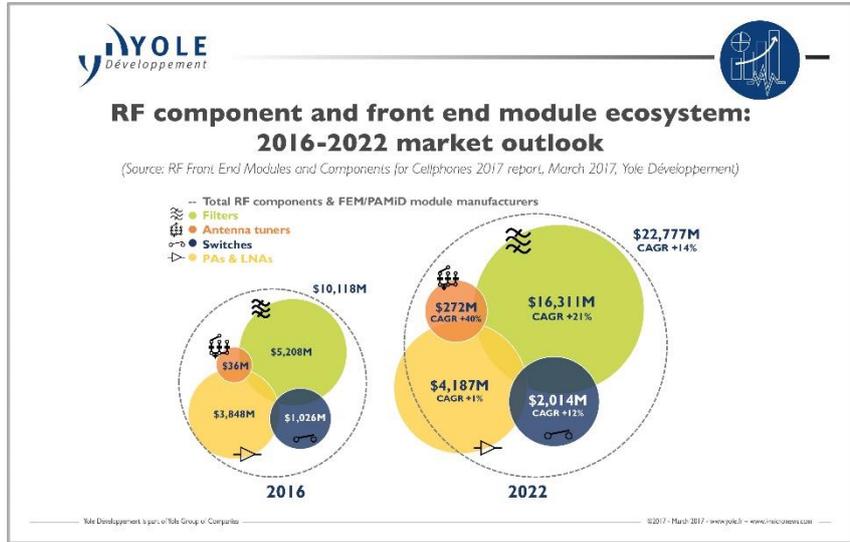
<sup>4</sup> CA : Carrier Aggregation

<sup>5</sup> PA : Power amplifiers

<sup>6</sup> LNA : Low Noise Amplifiers

<sup>7</sup> LTE : Long Term Evolution

<sup>8</sup> CMOS : Complementary Metal Oxide Semiconductor



Yole Group of Company is definitely involved in the RF FE industry. Based on its market, technology, reverse engineering and manufacturing costing expertise and its knowledge of the “More than Moore” industry, analysts are answering the industry questionings with a comprehensive analysis of this RF sector for smartphones applications. A detailed description of both reports, [RF Front End Modules and Components for Cellphones 2017](#) and [Smartphone RF Front-End Module Review](#) is now available on I-Micronews.com, with its new RF Electronics Sections, [News](#) and [Reports](#).

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### About [RF Front End Modules and Components for Cellphones 2017 report](#)

*A dynamic market with high responsiveness to technical innovation, the RF front end industry is set to grow at 14% CAGR to reach \$22.7B in 2022.*

▪ Author:

**Claire Troadec** is leading the RF activity at Yole Développement. She has been a member of the MEMS manufacturing team from 2013. She graduated from INSA Rennes in France with an engineering degree in microelectronics and material sciences. She then joined NXP Semiconductors, and worked for 7 years as a CMOS process integration engineer at the IMEC R&D facility. During this time, she oversaw the isolation and performance boost of CMOS technology node devices from 90 nm down to 45 nm. She has authored or co-authored seven US patents and nine international publications in the semiconductor field and before joining Yole Développement managed her own distribution company.

▪ Companies cited in the report:

ACCO Semiconductor Inc., Alcatel-Lucent, Altis Semiconductor (X-FAB), Analog Devices Inc. (Hittite), Amkor, Apple, ASE Group, Broadcom Ltd. (Avago Technologies, Javelin Semiconductor), Cavendish Kinetics, China Mobile, Coolpad, DelfMEMS, Ericsson, Fujitsu, GLOBALFOUNDRIES, Google, Hon Hai Precision Industry Co. (Foxconn), HTC, Huawei (Hisilicon), Infineon, Intel, Integrated Device Technology (IDT), JCET/STATS ChipPAC, Kyocera, Lenovo, LG, Marvell, Mediatek, NXP Semiconductors (Freescale) and many more...



### About [Smartphone RF Front-End Module Review](#)

*Review of RF front-end modules and components found in five flagship smartphones: Apple iPhone 7 Plus, Samsung Galaxy S7, Huawei P9, LG G5, and Xiaomi Mi5*

▪ Authors:

**Stéphane Elisabeth** 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 micro-electronics.

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

▪ Companies analyzed in the report:

Apple vs. Samsung vs. Huawei vs. LG vs. Xiaomi

### About [System Plus Consulting](#) – [www.systemplus.fr](http://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. System Plus Consulting is a sister company of Yole Développement. More info on [www.systemplus.fr](http://www.systemplus.fr).

### About [Yole Développement](#) – [www.yole.fr](http://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, 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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