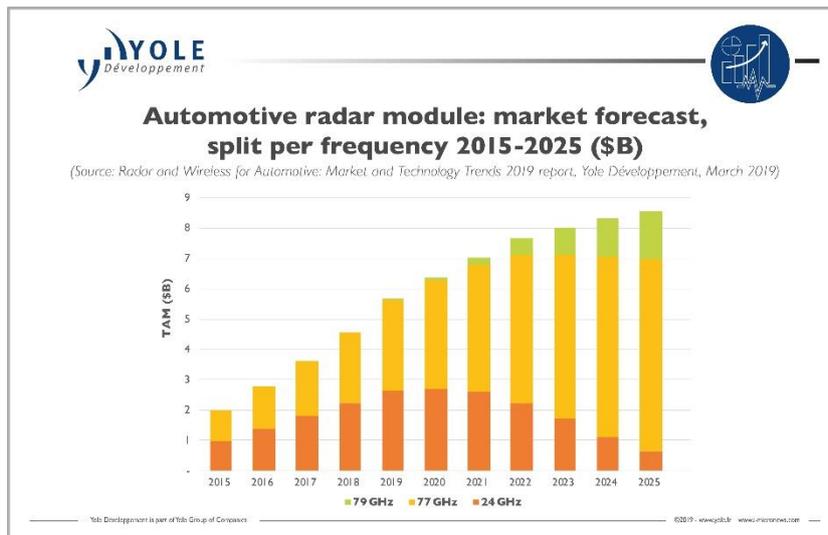




integrated transceivers, and Texas Instruments even adding signal processing in its transceivers. The radar MMIC ecosystem is expected to move from an IDM<sup>6</sup> to a fabless/foundry model, with volumes increasing and the technology transitioning to advanced technology nodes. The IDMs of yesterday could become the fabless of tomorrow.



At [Yole Développement \(Yole\)](#), analysts expect the radar market to reach US\$8.6 billion by 2025, at a 2015 CAGR of 15.6%. Market growth depends on the specific radar frequency, explains the market research & strategy consulting company, Yole in its latest radar report: [Radar and Wireless for Automotive: Market and Technology Trends 2019](#).

“24GHz radar held a large part of the 2018 market with US\$2.2 billion and will grow slightly until 2020 for features like BSM<sup>7</sup> before being replaced by 79GHz high-resolution short-range radar that enables mapping of the entire car’s surroundings”, comments **Cédric Malaquin Technology & Market Analyst, RF Devices & Technology at Yole**. Many players including Veoneer, Aptiv, Hella are also transitioning to 77GHz radar for short and middle-range sensing.

Yole’s report reveals the status of radar technologies and their applications. What are the major drivers? What will the market look like in 2025? What are the current technologies and the emerging ones?... Yole’s analysts propose you today a comprehensive overview of the radar market and technology landscape. In addition, the automotive radar report from Yole Développement (Yole) is offering a deep understanding of automotive grade radar, V2X, connectivity and GNSS solutions.

Yole Group of companies including Yole Développement (Yole) and System Plus Consulting are together following the radar technologies for automotive applications for a while. Based on a strong synergy between their activities, both partners propose a wide collection of RF electronics technology & market analyses and comparison reports. Yole and System Plus Consulting take into account technology

<sup>6</sup> IDM: Integrated Device Manufacturer

<sup>7</sup> BSM: Blind-Spot Monitoring

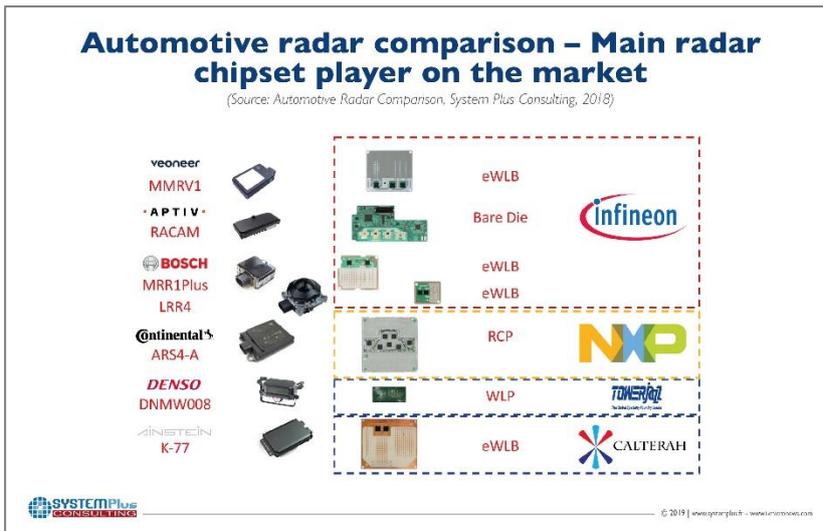
evolution, market trends, the whole supply chain and more to point out the ecosystem and business opportunities.



Recently System Plus Consulting released two dedicated reports: [Automotive Radar Comparison 2018](#) and [Ainstein K-77 Long Range Radar featuring Calterah CAL77A2T4R FOWLP Transceiver](#).

The comparative technology study provides insights on technology data for RF chipsets and antenna boards in radar systems. It includes the study of fifteen radar systems from several OEMs, including Continental, Veoneer, ZF, Valeo, Bosch, Aptiv, Denso and Ainstein.

From its side, the Ainstein K-77 Long Range radar report is the latest one from the RF report collection. Released beginning of 2019, this reverse engineering and costing analysis presents the next-generation mid- & long-range, wideband and high-resolution radar sensor for ADAS based on RF CMOS technology using eWLB packaging.



“The K-77 is built on RF CMOS Technology from Calterah featuring two transmitters and four receivers designed for low power consumption and unit cost,” explains **Stéphane Elisabeth, PhD. Expert Cost Analyst at System Plus Consulting**. And he adds: “The chipset allows cascading in order to increase the number of receiving and transmitting paths. Using eWLB<sup>8</sup> packaging reduces parasitic signals, making this new chipset compact and powerful. Both MMICs are soldered on an asymmetric PCB<sup>9</sup> with a hybrid PTFE/FR4 substrate.”

A detailed description of each radar report is available on [i-micronews.com, RF Electronics section](#).

A detailed description of each radar report is available on [i-micronews.com, RF Electronics section](#).



In addition, Yole Développement and System Plus Consulting will be exhibiting at [European MicroWave Week](#) (Paris, France, from Sept. 29 to Oct. 4 - Booth B577). Our experts propose a relevant presentation “Autonomous drive sensors and fusion market overview”. Save the date right now to meet our experts!

<sup>8</sup> eWLB : embedded Wafer Level Ball Grid Array

<sup>9</sup> PCB: Printed Circuit Board

**ABOUT THE REPORTS:**

- [Radar and V2X for automotive](#)

*The radar and 5G/V2X markets will both grow - one through market pull, the other through prospective enablement. - Produced by Yole Développement*

**Companies cited in the report:**

Acura, Ainstein, Alfa Romeo, Alps Electric, Analog Devices, Anzhi Auto, Aptiv, Arbe Robotics, Asahi Kasei Microdevice, Astyx, AT&T, Autoroad, AutoTalks, Audi, Azcom, Bentley, BAIC, BAW, BMW, Bosch, Bugatti, Buick, BYD, Calterah, CEI, Changan, ChengTech, Chevrolet, Chery, Chrysler, Cohda Wireless, Continental, Cradar, Cruise, Daihatsu, Denso-Ten, DongFeng, FAW, Fiat, Ford, Furukawa Electric, Geely and more ...

- [Ainstein K-77 Long Range Radar featuring Calterah CAL77A2T4R FOWLP Transceiver](#)

*A next-generation mid- and long-range, wideband and high-resolution radar sensor for ADAS based on RF CMOS technology using eWLB packaging – Produced by System Plus Consulting*

Based on a complete teardown analysis of the Ainstein radar, we are releasing two reports. One report provides the bill-of-material (BOM) and the manufacturing cost of the radar sensor. The other report reviews the CAL77A2T4R transceiver, including a complete die analysis, cost analysis, and price estimate for the chips. It also includes a physical and technical comparison with TI's AWR1243, which targets long-range radar detection and radar imaging...

- [Automotive Radar Comparison 2018](#)

*Continental, Veoneer, ZF, Valeo, Bosch, Aptiv, Denso, Ainstein: Discover the technologies used in the main Radar Systems and Chipsets - Produced by System Plus Consulting*

The report includes a description of each component and statistical analyses for most radar systems focusing on the RF board. Moreover, we compare the costs of the main systems to explain OEM choices and supplier preferences. The main board analyses along with the full Bills-of-Materials (BOMs) and system costings are not covered in this report...

**About the authors:**

- **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 DelfMEMS (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).
- **Stéphane Elisabeth**, PhD has joined System Plus Consulting's team in 2016. Stéphane is Expert Cost Analyst in RF, Sensors and Advanced Packaging. 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.
- **David Le Gac** has joined System Plus Consulting as a cost analyst in 2013. He is in charge of reverse costing with a focus on boards and systems. He previously worked for Lacroix Electronics where he was in charge of components database. He holds a master degree in microelectronics from the University of Rennes.
- 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 RFSOI 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.

- **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 YOLE GROUP OF COMPANIES



**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) and on [LinkedIn](#) and [Twitter](#).



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](http://www.yole.fr) and follow Yole on [LinkedIn](#) and [Twitter](#).

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