



FOR IMMEDIATE RELEASE:

After MEMS microphones, AI changes the audio world

Extracted from :

- Microphones, Microspeakers, and Audio Solutions – Market and Technology Trends, Yole Développement, 2019
- USound Achelous UT-P 2016 MEMS Speaker report, System Plus Consulting, 2019

LYON, France – December 5, 2019: “VPA¹ is the main driver for the audio industry today” says **Alexis Debray, PhD. Technology & Market Analyst, Optoelectronics at Yole Développement (Yole).**

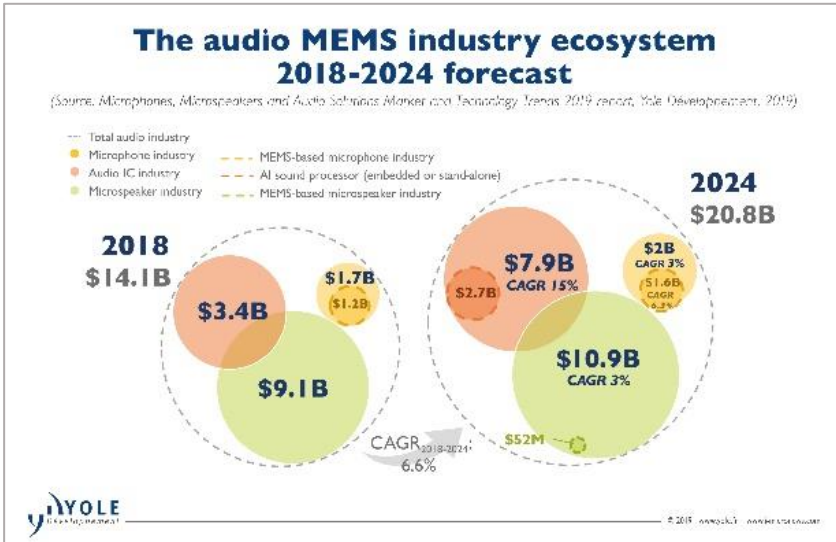
Dimitrios Damianos, PhD. Technology & Market Analyst Photonics, Sensing & Display at Yole also comments: “An interesting feature of this new application is that it spreads through various systems : smartphones, smart speakers, smart watches, wireless earbuds, cars, smart TVs and their remote controllers”.

This application is based on traditional components of audio systems: microphones, speakers, audio codecs, and audio amplifiers. But it also relies on new components related to computing and analyzing voice data, fueled by the emergence of consumer-level AI². Cumulatively, the consumer market for microphones, audio IC³, and microspeakers is expected to increase from US\$14.1 billion in 2018 to US\$20.8 billion in 2024 with a 6.6% CAGR⁴. Looking at the volume growth of MEMS⁵ microphones gives an idea of the products involved. MEMS microphones in smart speakers will experience a 13% CAGR with volumes reaching 1.2 billion units in 2024, announces the market research & strategy consulting company. In wireless earbuds, MEMS microphones will have a 29% CAGR, reaching 1.3 billion units in 2024.

As part of this enthusiastic and dynamic ecosystem, Yole and its sister company [System Plus Consulting](#) closely collaborate to share their technical

expertise and industrial knowledge. Both partners deeply analyze this flourishing industry and related technologies and deliver today a comprehensive description of the audio world.

Yole announces its report, titled [Microphones, microspeakers, and audio solutions market and technology trends](#). This new technology & market analysis focuses on market forecasts and trends and supply chain. This report also proposes a detailed technology roadmap for consumer microphones, microspeakers and audio ICs through 2024. It aims to study major technological trends, understand the value



¹ VPA : Virtual Personal Assistant
² AI : Artificial Intelligence
³ IC : Integrated Circuit
⁴ CAGR : Compound Annual Growth Rate
⁵ MEMS : Microelectromechanical systems

chain, infrastructure and players' strategy and analyze the related issues.

In parallel, System Plus Consulting conducted a full reverse costing study dedicated to the first mass-produced MEMS speaker proposed by the

European company USound : [USound Achelous UT-P 2016 MEMS Speaker](#). Smaller than the classical speaker, with a volume of only 49mm³, this innovative solution has been built up for in-ear audio systems. USound has developed a dedicated technology to bring together several MEMS speakers (up to 80), increase the output sound power and give better spatial sound distribution.

"The secret of the first MEMS speaker is not only in the silicon," comments **Sylvain Hallereau, Senior Cost Analyst for IC, power and MEMS at System Plus Consulting**. And he adds: *"The packaging solution developed by USound is very important. Indeed the acoustic membrane is fixed onto the package, with a*

consequent impact on the sound quality. All package structures are designed to enhance sound quality and protect the silicon MEMS, the package is the speaker, as shown on the cross-section and disassembly pictures".

USound and many companies are today strongly involved in the microphones, audio IC, and microspeakers industry. System Plus Consulting and Yole investigate this sector to get a clear view of the strategy of each player and understanding their market positioning. So who is eating the audio pie?

"For MEMS microphones, Knowles and Goertek are the main players", details Alexis Debray from Yole. *"They show 39% and 28% market shares respectively, of this US\$1.2 billion market in 2018"*. Knowles' revenues might have saturated in recent years. However it is still holding its ground in an expanding market against Chinese players who offer lower cost solutions.

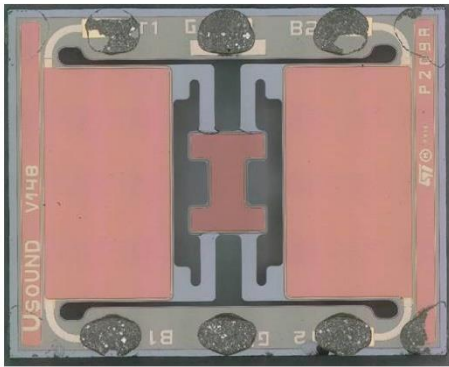
In parallel, Infineon Technologies traditionally supplied the microphone die to players such as Goertek and AAC. Today, its strategy seems to evolve. Indeed the company starts offering a complete MEMS microphones offer. In this regard, Yole's analysts had the opportunity to debate with **Dr. Roland Helm, Head of sensors at Infineon Technologies**. They exchanged about technologies, technical challenges, market opportunities and evolution of the industry. This interview is available on [i-Micronews.com](#).

For audio codecs and amplifiers, Cirrus Logic, Qualcomm, and Texas Instruments are the main players in a US\$3.4 billion market in 2018. Their market shares were 35%, 18%, and 12% respectively. A full analysis of the audio supply chain with the leading companies involved is available in Yole's technology & market report.

In the future, AI processing will probably spread among players, as AP⁶ makers like Apple, Qualcomm, and HiSilicon will integrate it. Knowles and Goertek

MEMS speaker developed by USound: top optical view

(Source: USound Achelous UT-P 2016 MEMS Speaker report, System Plus Consulting, 2019)



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⁶ AP: Application Processor

are proposing dedicated audio chips integrating AI capabilities along with codecs and digital signal processing functions.

On the other side, IP⁷ providers like CEVA and Xperi are working towards chip designs for AI processing. No matter the approach, AI is attracting all the attention. Finally, ever expanding use-cases are generating a wealth of new data that are fueling AI, giving much more functionality. And what's better than one's own voice to control these devices seamlessly? That's the next battleground for the audio players across the whole supply chain: the voice arena... To get a detailed description of both audio reports powered by Yole and System Plus Consulting, visit [i-Micronews.com](https://www.i-micronews.com) website.

All year long, Yole Group of Companies publishes numerous Photonics & Sensing reports including the audio reports collection. Yole's experts realize various key presentations all year long. Discover them on [i-Micronews](https://www.i-micronews.com) and well as the 2020 program. Stay tuned!

⁷ IP: Intellectual Property

ABOUT THE REPORTS

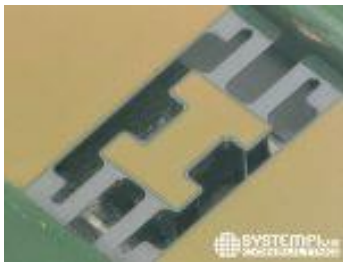


[Microphones, microspeakers, and audio solutions market and technology trends](#)

The voice-based world is shaking up the audio industry, making it worth \$20.8B in 2024 - Performed by Yole Développement

Companies cited

AAC Technologies, Alibaba, Amazon, ams AG, Analog Devices, Apple, ASE, Audience, Audiopixels, Bosch Sensortec, BSE, CEVA, Cirrus Logic, DSP Group, Gettop, Goertek, Google, Harman, Hosiden, HTC, Huawei, Infineon, Intel, InvenSense, Knowles, MEMSensing, Merus Audio, Motorola, NeoMEMS, Nokia, NXP, Omron, Oppo, Qualcomm, Samsung, SensiBel, Sony, STMicroelectronics, TDK-Invensense, Texas Instruments, TSMC, USound, Vesper, XFab, Xiaomi, xMOS and many more...



[USound Achelous UT-P 2016 MEMS Speaker](#)

First mass-produced MEMS speaker based on SOI and PZT thin film technology - Performed by System Plus Consulting

This report includes technology and cost analysis of the UT-P 2016 MEMS Speaker. These analyses provide the technical intelligence necessary to understand this technology.

Authors

- **Dimitrios Damianos**, PhD joined Yole Développement as a Technology and Market Analyst and is working within the Photonics, Sensing & Display division. Dimitrios works with his team to deliver valuable technology and market reports regarding the imaging industry including photonics and sensors. After his research on theoretical and experimental quantum optics and laser light generation, Dimitrios pursued a PhD in optical and electrical characterization of dielectric materials on silicon with applications in photovoltaics and image sensors, as well as silicon-on-insulator for microelectronics at Grenoble University, France. In addition, Dimitrios holds an MSc degree in Photonics from the University of Patras, Greece. He has also authored and co-authored several scientific papers in international peer-reviewed journals.
- **Alexis Debray**, PhD is a Technology & Market Analyst, Optoelectronics at Yole Développement. As a member of the Photonics, Sensing & Display division, Alexis is today engaged in the development of technology & market reports as well as the production of custom consulting projects dedicated to the imaging industry. After spending 2 years at the University of Tokyo developing expertise focused on MEMS technologies, Alexis served as a research engineer at Canon Inc. Over 15 years he contributed to numerous development projects, focused on MEMS devices, language comprehension, and terahertz imaging devices. Alexis is the author of various scientific publications and patents. He graduated from ENSICAEN and holds a PhD in applied acoustics.
- **Sylvain Hallereau** is Senior Cost Analyst for IC, power and MEMS at System Plus Consulting. He has more than 10 years of experience in power device manufacturing cost analysis and has studied a wide range of technologies.
- **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.

ABOUT YOLE GROUP



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 <https://www.systemplus.fr/> and on [LinkedIn](#) and [Twitter](#).



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](#). Consulting & Financial Services: Jean-Christophe Eloy (eloy@yole.fr) Reports: David Jourdan (jourdan@yole.fr). Yole Développement, System Plus Consulting, Knowmade, PISEO and Blumorpho are part of Yole Group of Companies. Yole Group of Companies - Press Relations & Corporate Communication: Sandrine Leroy (leroy@yole.fr).

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