Press Release

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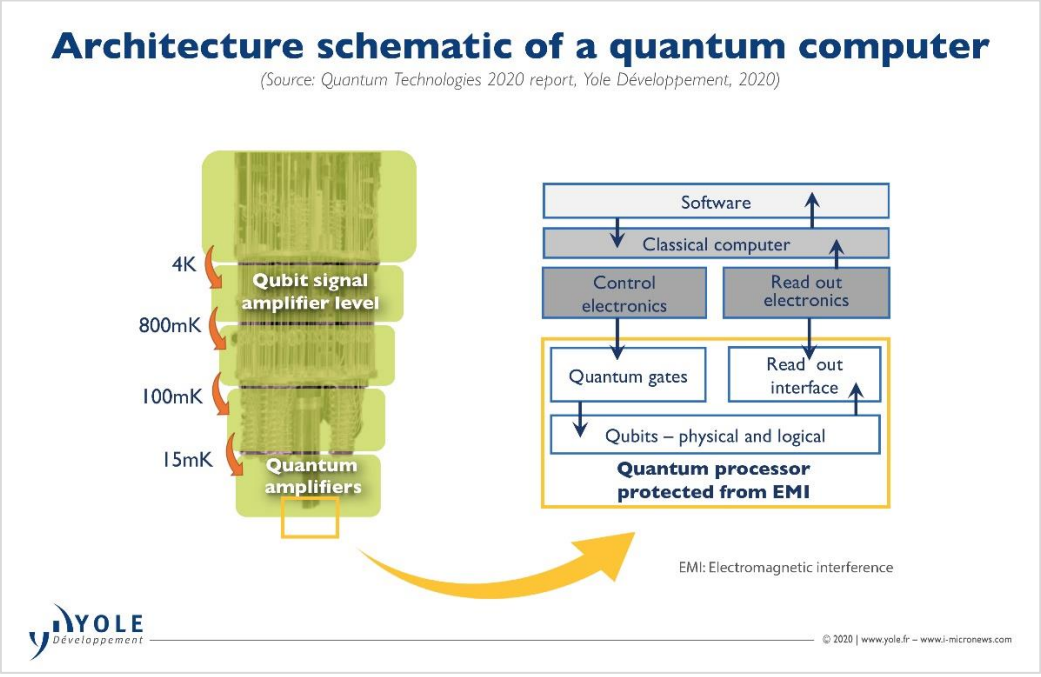
LYON, France

Quantum technologies: a jump to a commercial state[1]

OUTLINES:

- Quantum technologies are shifting from fundamental R&D to engineering.
- The total market for quantum technologies should reach US$3.2 billion in 2030.
- The battle royale has started for quantum supremacy.

"*Quantum technologies are at the crossroads of numerous applications and fields,*" says **Eric Mounier, PhD. Fellow Analyst at Yole Développement (Yole).** They span system engineering, materials research, cryogenic technology, software, semiconductors and photonics. They are still early stage technologies, but with huge potential, explains the market research & strategy consulting company in its new Quantum Technologies report. And Eric adds: *"In the past, we saw the first quantum revolution when the priorities were to understand and predict. Today we are entering the second quantum revolution, when engineering is needed to develop future quantum systems based on photons, electrons, atoms or molecules."*



[1] Extracted from : Quantum Technologies report, Yole Développement, 2020

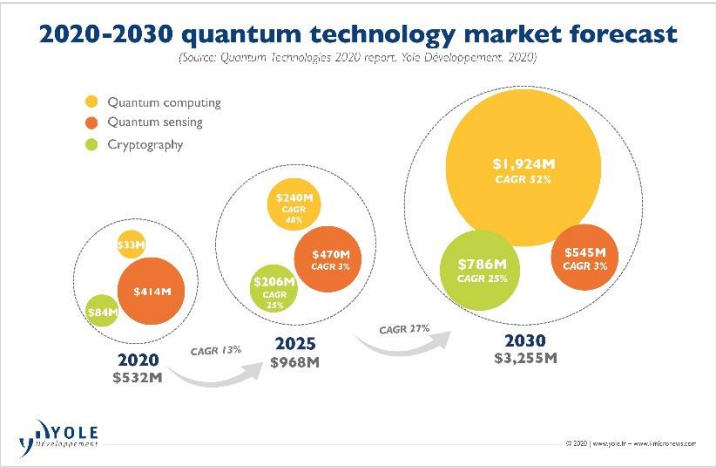
Quantum technologies and specifically quantum computing are rising, bringing many questions: which qubit technologies will be favored? Developments are ongoing, but could new qubit technologies be found for quantum computer applications? Is business module yet defined? What will be the strategy of the GAFAM[2]?...

For more than 20 years, Yole has developed its semiconductor activities by enlarging step by step its expertise towards technical innovations and disruptions. Under its development, the company has grown with a dedicated activity focused on a wide range of emerging technologies including quantum computing, quantum sensing, metamaterials, wet-ware, neuromorphic and more. As part of its products and services, Yole's team proposes today a collection of reports covering such technologies. A detailed description of these reports is available on i-Micronews.com, reports section.

"Innovation is at the heart of our activities," asserts **Guillaume Girardin, Director, Photonic & Sensing**. *"Under a dynamic ecosystem, anticipate disruption is clearly a challenge for industrials. Our aim through our activities including technology & market reports, monitors, consulting services, online & onsite events… is to support our customers to help them follow emerging technologies, identify and analyze time-to-market and upcoming technological inflexion points."*

The total market value for quantum technologies, including computing, cryptography and sensing, will grow from about US$480 million in 2018 to US$3.2 billion in 2030, with a 17% CAGR[3].

Yole's analysts estimate the quantum computing hardware market value to be about US$30 million today, mostly for quantum annealers, growing to US$650 million in 2030. QaaS will be worth US$1.37 billion in 2030. The QKD[4] market was worth US$68 million in 2019 and will grow to US$785 million in 2030. The quantum sensor market will grow from US$400 million in 2019 to US$545 million in 2030.



"Growth for quantum technologies will take off after 2026-2027 due to future announcements of available quantum computers and new use cases for quantum telecommunication, as shown," details Eric Mounier from Yole. *"Quantum computing is today attracting the most interest. And it also drives developments in telecommunications and sensing. Quantum communication is a more*

[2] GAFAM : Google, Apple, Facebook, Amazon and Microsoft
[3] CAGR : Compound Annual Growth Rate
[4] QKD : Quantum Key Distribution

mature technology for short distances around 100km. Quantum sensors and clocks are still small markets."

Although quantum computing is jumping to a commercialization state, many challenges are still ahead. For example, qubit control must achieve sufficient fidelity, coherence and scalability. Cryogenic control technology is also critical for access to this technology. At each stage, qubits are protected from thermal noise during the process of sending control and readout signals to the processor. And of course, quantum computing requires specific algorithms. Are we today at the early stages of the quantum computing as we were 70 years ago for semiconductors? Maybe, but there are large differences between these technologies. First, there is no defined architecture for quantum computing as von Neumann had laid out for classical computers. Second, scalability is still an issue for qubit manufacturing in volume.

Moreover, we cannot say today that an equivalent to Moore's law will exist for quantum computing in the future, explain Yole's analysts in the Quantum Technologies report. However, quantum technologies are today in the engineering phase. Future developments in cryogenic, software and qubit manufacturing could speed up quantum computer advancements.

At Yole, analysts believe that quantum technologies are a real disruption in the sense they are based on totally new technologies, use cases, supply chain and business model evolutions… A detailed description of the Quantum Technologies report is available today on i-Micronews.com.

Yole is organizing a dedicated online event on March 19. This quantum technologies webcast will give an overview of the current status for quantum technologies, including computers but also communication and sensing. We will discuss our market forecast as well as the upcoming challenges that must be faced for quantum technologies to turn into a viable business. Register today!

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About the report

Quantum Technologies 2020

Quantum technologies are jumping to a commercial state. - Performed by Yole Développement

Companies cited

1QBit, A*Quantum, A.P.E., Alibaba, Alice&Bob, Alpine Quantum, Amazon, Ankh.1, Anyon Systems, ApexQubit, AppliedQubit, Artiste-qb.net, AtomComputing, AtomSensors, Atos, Aurea Technology, Aurora Quantum Technologies, Automatski, Axion Technologies, Beit.tech, Black Brane System, Bleximo, BlueFors Cryogenics, Bosch, Boxcat, Bra-Ketscience, BraneCell, Cambridge Quantum Computing, Coax Co., ColdQuanta, ColdQuanta, Cryoconcept, Cryomech, Cryptalabs, Cryptomathic, CryptoNext Security, D slit technologies, Delft Circuits bv, Deutsche Telekom, D-wave, EeroQ, Elyah, Entanglement Partners and many more...

Author

With more than 25+ years' experience within the semiconductor industry, **Eric Mounier** PhD. is Fellow Analyst at Yole Développement (Yole). Eric provides daily in-depth insights into current and future semiconductor trends, markets and innovative technologies (such as Quantum computing, Si photonics, new sensing technologies, new type of sensors ...). Based on relevant methodological expertise and a strong technological background, he works closely with all the teams at Yole to point out disruptive technologies and analyze and present business opportunities through technology & market reports and custom consulting projects. With numerous internal workshops on technologies, methodologies, best practices and more, Yole's Fellow Analyst ensures the training of Yole's Technology & Market Analysts.

In this position, Eric Mounier has spoken in numerous international conferences, presenting his vision of the semiconductor industry and latest technical innovations. He has also authored or co-authored more than 100 papers as well as more than 120 Yole's technology & market reports.

Previously, Eric held R&D and Marketing positions at CEA Leti (France).

Eric Mounier has a PhD. in Semiconductor Engineering and a degree in Optoelectronics from the National Polytechnic Institute of Grenoble (France).

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 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 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… More

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