Medical imaging: semiconductor technology is a key enabler for truly dedicated solutions

OUTLINES:

- The detector market for medical imaging equipment is forecasted to grow to US$6.6 billion in 2025 with a 7.3% CAGR between 2019 and 2025.
- Molecular imaging, MRI\(^2\) and CT-scans are racing for performance, high image quality and multimodality.
- On the other hand, ultrasound, endoscopy and OCT\(^3\) are targeting accessibility and affordability with point of care solutions.
- The medical imaging landscape is showing a wide variety of players, from multinationals to disruptive start-ups.
- COVID-19 outbreak: medical imaging modalities are at the forefront of the pandemic, yet overall, the medical imaging procedures have been cut back in hospitals and this will have a direct impact on sales for 2020.

“The medical imaging industry has always been a place for high-end technology and innovative solutions,” asserts Marjorie Villien, PhD. Technology & Market Analyst at Yole Développement (Yole). “There are many players, and many dynamics, from big companies trying to innovate in mature markets, to disruptive start-ups innovating in specific fields. At Yole, we investigate this sector for a while and propose today a comprehensive overview and deep understanding of the technical innovations and their issues and market evolution.”

The market research & strategy consulting company Yole releases today the technology & market report, Status of Medical Imaging Equipment and Detectors. This new study proposes a comprehensive overview of the medical imaging market covering six major modalities: endoscopy, US\(^4\), OCT, X-ray, MI\(^5\) and MRI. “Each of them having their own dynamics and

\(^1\) Extracted from:
- Status of Medical Imaging Equipment and Detectors report, Yole Développement, 2020
- OmniVision’s OVM6948 CameraCubeChip report, System Plus Consulting, 2020
- Butterfly Network iQ CMUT Sensor report, System Plus Consulting, 2020
- Artificial Intelligence for Medical Imaging report, Yole Développement, 2020

\(^2\) MRI: Magnetic Resonance Imaging
\(^3\) OCT: Optical Coherence Tomography
\(^4\) US: Ultrasound
\(^5\) MI: Molecular Imaging
drivers and they are well analyzed in this new imaging report,” announces Marjorie Villien from Yole.

In the Status of Medical Imaging Equipment and Detectors report, the global picture presented is key to understanding the market to make pertinent business decisions. It is easy to overlook key events from this complex picture. Understanding the dynamics at the equipment level and the detector level is crucial, hence Yole’s report provides many answers, shedding light on this ever-changing scenario.

What are the most dynamic medical imaging modalities? What are the market drivers for each of them? What is the impact of the evolution of the semiconductor technologies on the medical imaging sector? What are the benefits offered by disruptive semiconductor innovations? Who is leading this medical imaging industry? How will the industrial landscape evolve? What is the status of AI for medical imaging applications? ... Imaging analysts from Yole offer you today a snapshot of the medical imaging industry, at the equipment and detector levels.

Globally speaking, the medical imaging equipment market is estimated to be worth US$38 billion in 2019. It is forecasted to increase toward US$52 billion in 2025, with a 5.3% CAGR6. “This is a relatively high value considering the slow-moving nature of the medical industry”, comments Jérôme Mouly, Senior Technology & Market Analyst and Business Developer at Yole. “This figure is backed up by different trends observed at the equipment and detector levels, and evolution of the players in the industry.”

Generally speaking, the medical imaging industry is profiting from global trends in the development of semiconductor technology. According to Yole’s medical imaging report, the detector market for medical imaging equipment is estimated at US$4.3 billion for all modalities in 2019. It is forecasted to grow to US$6.6 billion in 2025 with a CAGR of 7.3%.

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6 CAGR: Compound Annual Growth Rate
At first most modalities, such as X-ray and molecular imaging, relied on tube technologies. Others, such as US, used piezoelectric crystals. Today, thanks to microtechnology development, all modalities have moved towards semiconductor solutions for detection. Yole and its partner System Plus Consulting recently identified two relevant examples:

- Remarkably, in the US market development of CMUT\(^7\) allowed Butterfly Network to offer a new kind of ultrasound probe with a disruptive approach rarely seen in the medical market. The Buttefly IQ probe is using MUT Technology to enable an all-in-one examination probe at a lower price. According to System Plus Consulting analysis, Butterfly Network iQ CMUT Sensor, it is the first CMUT on silicon bonded with an ASIC die for medical ultrasound.

- The smallest camera in the world for endoscopes developed by OmniVision is based on a fully wafer bonded technology, with CIS, packaging and optic at wafer level. “OmniVision’s camera is a VGA\(^8\) camera module,” explains Sylvain Hallereau, Senior Technology & Cost Analyst at System Plus Consulting. And he details: “It integrates a WLP\(^9\) OmniVision CIS\(^10\) and a small WLO\(^11\) manufactured by VisEra. The entire camera module is provided in a 0.65mm × 0.65mm × 1.2mm 4-pin package including a 0.58mm × 0.58mm CIS die.” (Source: OmniVision’s OVM6948 CameraCubeChip report, System Plus Consulting, 2020)

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\(^7\) CMUT: Capacitive Micromachined Ultrasonic Transducers  
\(^8\) VGA: Video Graphics Array  
\(^9\) WLP: Wafer-Level Packaged  
\(^10\) CIS: CMOS Image Sensor  
\(^11\) WLO: Wafer-Level Optic
Although detector manufacturers cater for multiple modalities, the unique requirements each modality has detector-wise means that there is little technological crossover, leading to a very diverse ecosystem.

All six modalities have varying degrees of difference regarding their market dynamics. The general trend is twofold. On one hand, for modalities such as MRI, X-ray or molecular imaging, where large equipment is involved, there is a race towards higher performance machines. On the other hand, in modalities with smaller equipment, such as ultrasound, endoscopy, or OCT, Yole’s analysts see a trend in the development of accessibility and affordable point of care solutions. Not to say that performance is a negligible factor, but in these markets, there is a push for low-cost solutions, and a trend towards single use, and/or point of care.

“These trends are due to different factors,” explains William Watkins, Technology & Market Analyst at Yole. “First, development of semiconductor technology has led to widespread adoption in the medical industry. It has allowed for the miniaturisation of camera modules at such a low cost that for certain applications, such as endoscopy, it is now possible to consider single use, disposable equipment where the camera module is also single use. This miniaturisation has also allowed equipment manufacturers to design portable solutions allowing for point of care medicine. This is where the equipment comes to the patient instead of the conventional other way round. This trend may even go directly to the patient’s home.”

Moreover, according to the medical imaging report from Yole, there is a trend towards tele-diagnosis and dematerialized medicine. The 2020 coronavirus pandemic has catalyzed this change in paradigm, making these trends more acceptable, as it reduces stress on medical infrastructure. It is thus important to understand the technologies hidden behind these modalities as they are the main reason these changes are possible.

AI1 is playing a key role within the medical imaging industry. The dedicated ecosystem, with detailed forecasts and analysis have been also well analyzed by the market research and strategy consulting company. Yole announced last January a significant report, titled Artificial Intelligence for Medical Imaging. Yole’s analysts identified several AI applications including preprocessing steps, screening and segmentation, diagnosis and prediction of treatment outcome/treatment planning…

“The artificial intelligence for medical imaging market is an ever-moving ecosystem with diverse market positions and structures,” comments Yohann Tschudi, PhD. Technology & Market Analyst from Yole. And he adds: “The artificial intelligence for medical imaging market is made up of a myriad of start-ups, many of which being spin-offs from universities. It highlights the fact that this market is driven by medical research, as well as the value it can generate for hospitals with regards to all the hardware, and cloud companies as well as OEMs that revolve around it.”

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1 AI: Artificial Intelligence
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About our analysts

As a Technology & Market Analyst, Medical & Industrial Imaging, Marjorie Villien, PhD., is member of the Photonics & Sensing activities group at Yole Développement (Yole). Marjorie contributes regularly to the development of imaging projects with a dedicated collection of market & technology reports as well as custom consulting services in the medical and industrial fields. She regularly meets with leading imaging companies to identify and understand technology issues, analyze market evolution and ensure the smart combination of technical innovation and industrial application.

After spending two years at Harvard and prior to her position at Yole, Marjorie served as a research scientist at INSERM and developed dedicated medical imaging expertise for the diagnosis and follow-up treatment of Alzheimer’s disease, stroke and brain cancers.

She presents to numerous international conferences throughout the year and has authored or co-authored 12 papers and 4 patents. Marjorie Villien graduated from Grenoble INP (France) and holds a PhD. in physics & medical imaging.

Jérôme Mouly serves as a Senior Technology & Market Analyst & Business Developer specialized in microtechnologies within the Photonics & Sensing team at Yole Développement (Yole). Jérôme actively assists and supports the development of strategic projects, working with leading customers of the company.

Since 2000, he has also been engaged in more than 100 marketing and technological analyses for industrial groups, start-ups and institutes in the field of MEMS, BioMEMS, wearable & connected medical devices. Through the group’s numerous activities at Yole, Jérôme covers the whole microelectronic supply chain including manufacturing processes and device development.

Jérôme is also regularly involved in international conferences, giving presentations and delivering keynotes. Jérôme Mouly holds a Master of Physics from the University of Lyon (France).

As a Technology & Market Analyst specialized in Imaging/Materials within the Photonic & Sensing Division at Yole Développement (Yole), William L. Watkins, PhD., is involved in the development of technology & market reports as well as the production of custom consulting projects.

Prior to Yole, William worked as a research engineer at Sorbonne University (Paris, France) on the use of nanoparticles in the development of novel inks and pigments.

William was awarded a PhD in the field of physics from the Paris Institute of Nanosciences (INSP - Sorbonne University, Paris, France). His research thesis focused on the analysis and development of optical gas sensors using nanoparticles.

As well as

- Yohann Tschudi, PhD Technology & Market Analyst and Loic Michoud, Technology & Market Analyst, both at Yole Développement
- Sylvain Hallereau, Senior Technology & Cost Analyst and Nicolas Radufe, Lab Analyst at System Plus Consulting

About the report

Status of Medical Imaging Equipment and Detectors

Semiconductor technologies continue to revolutionize the medical imaging market by enabling point of care and disposable systems. - – Performed by Yole Développement

Companies cited:

Related reports
- OmniVision’s OVM6948 CameraCubeChip
• Butterfly Network iQ CMUT Sensor
• Artificial Intelligence for Medical Imaging

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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

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