Terahertz Technologies - Market Share Analysis, Industry Trends & Statistics, Growth Forecasts 2019 - 2029

Market Report | 2024-02-17 | 173 pages | Mordor Intelligence

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Report description:

The Terahertz Technologies Market size is estimated at USD 0.76 billion in 2024, and is expected to reach USD 2.17 billion by 2029, growing at a CAGR of 23.14% during the forecast period (2024-2029).

Key Highlights
-Terahertz technology is a growing as well as an emerging field with the potential for developing applications ranging from passenger scanning at an airport to large digital data transfers. It has been reflecting significant advancements on the scientific front.
-Due to the various crucial properties of terahertz technology, terahertz radiation is expected to be adopted as an important technology in the coming years. This technology is commonly used to detect concealed explosives or narcotics or to detect substances leaking from plastic pipes. Terahertz technology can monitor layer thickness by visualizing non-destructive material defects in ceramics and plastics.
-The field of non-destructive, non-contact testing holds great potential for terahertz (THz) spectroscopy, especially THz imaging. Due to its accuracy and precision, terahertz technology plays an important role in the removal of all cancerous tissue in real-time, minimizing the number of surgeries and enabling earlier and more accurate diagnosis. Terahertz radiations range from the microwave band's high-end to the far-IR's lower end in the electromagnetic spectrum. THz technology has shown promising potential for applications in various fields, including communication, security inspection, and biomedicine. More particularly, THz technology has been used in neuroscience to distinguish between benign and malignant brain tumors.
-In addition, terahertz radiation can be used to produce high-quality spectroscopic images, greatly facilitating the diagnosis of many chronic and related diseases. The initial stage towards the advancement of technology establishment in the healthcare field is the replacement of conventional X-rays and infrared rays with terahertz rays, which drives the market expansion during the forecast period. THz imaging also enables 3D analysis to be performed on tablets and more. It thus helps in the measurement of

coating integrity and thickness, detection and identification of local chemical or physical structures within the core, etc. It also helps in the inspection of cracks or chemical cohesion, as well as delamination and integrity of embedded layers.
-A significant challenge to adopting terahertz technology in the market has been a sheer lack of knowledge of the technology. Also, the need for more awareness of the topic, especially in developing regions, has been a significant restraining factor for the market's growth.
-With the COVID-19 outbreak, the terahertz technology market witnessed significant growth, with its major healthcare, biomedical, and security applications. The outbreak resulted in many research and development activities in the healthcare space to find appropriate technology to detect the virus, augmenting market growth.

Terahertz Technology Market Trends

Defense and Security Segment Holds Major Market Share

- In security environments, identifying threats such as hidden weapons and body-worn explosives is a robust operational need. In recent years, terahertz technology has seen an increase in interest due to the growing emphasis on imaging concealed explosives. THz technology helps to detect and identify hidden objects. At airports or other security-critical places, dangerous non-metallic substances like ceramic knives or plastic explosives can now be detected with terahertz beams.
- Additionally, metal detection and X-ray bag scanning are time-consuming processes. It becomes more difficult in the case of public transportation hubs, wherein there is a lot of movement. Hence, there is a need for technological solutions that can perform security checks even at a distance from the potential source. Terahertz technology allows the scanning of many people without needing them to stop for a security check, thereby offering a solution to these challenges.
- THz sensors' conceivable military applications are broad. They thus can be widely used for intelligence, surveillance, and reconnaissance (ISR), including detecting isolated personnel behind enemy lines, fixing targets, and terminal guidance of precision weapons. Also, in a non-combat environment, THz could help detect plastic or minimal metal land mines on current or former battlefields. Most anti-personnel mines combine metal and plastic (and are manufactured to avoid detection by metal detectors).
- The current technology for land-mine detection requires analysis of soil temperature. It is measured in three dimensions and then injected into cumbersome software algorithms that make rough estimates with limited confidence. This detection technique primarily uses field programmable gate array (FPGA) technology. THz spectroscopic imaging is one of the logical alternatives to FPGA, as it can detect almost any material under the right conditions with relatively high confidence.
- According to NATO, in 2023, the United States spent a sum of around USD 860 billion on defense. This makes their defense budget the largest out of all the NATO members. Germany had the second-greatest defense expenditure at around USD 68 billion, with the UK in third place. This involvement of a high amount of expenditure on defense is expected to create ample growth opportunities throughout the forecast period.

North America Holds Major Market Share

- The United States is a crucial market for terahertz technologies, primarily owing to the growing homeland security issues, investments in defense, and the R&D processes. In addition, the stringent government regulations regarding the production and safety of aerospace technologies in the U.S. and the growing automotive and aerospace industries are driving the market for THz technologies in the regional market.
- According to Airlines for America (A4A), the total commercial aviation drives around 5 percent of the total U.S. GDP, which is the equivalent of around USD 1.25 trillion in 2022. On a daily basis, U.S. airlines operate around 25,000 flights carrying 2.3 million

passengers to and from about 80 countries and over 65,000 tons of cargo to and from over 220 countries. As the aviation industry mounts and stabilizes a robust recovery, U.S. airlines are innovating, investing, and growing. Such heightened demand from the aircraft industry is a significant driver for the inspection systems' growth based on the terahertz technology. Furthermore, the increase in helicopters and commercial aircraft production in the United States is expected to drive the market significantly.
- Moreover, Canadian innovators are focusing on producing a comprehensive range of technologically complex, increased-value products for domestic and competitive global markets, further shaping the future of the terahertz technologies market. In Canada, security screening equipment is expected to be in high demand due to the increased number of public places requiring security screening. For instance, Canadian airlines screen passengers before they board flights bound for the country. Air Canada's union, the Canadian Union of Public Employees (CUPE), announced additional pre-flight screening by making flight attendants responsible.
- Moreover, to increase their consumer base and better meet their demands across various applications, significant companies are also investing, merging with other businesses, and investing in new projects. For instance, in November 2022, MIT engineers built a low-cost terahertz camera. The device mainly delivers greater sensitivity and speed than the previous versions and could be utilized for industrial inspection, airport communications, and security purposes.
- Also, in June 2023, Silicon Catalyst, the only global incubator focused exclusively on accelerating semiconductor solutions, declared the admission of four companies into the semiconductor industry's highly acclaimed program. The newly admitted companies include Cambridge Terahertz, which is focused on democratizing the Terahertz spectrum through CMOS phased array technology.

Terahertz Technology Industry Overview

The terahertz technologies market is fragmented, with the presence of major players like Luna Innovations, Teravil Ltd, TeraView Limited, Toptica Photonics AG, and HUBNER GmbH & Co. KG. Market players are utilizing a variety of strategies to increase their product portfolio and gain sustainable competitive advantages, such as partnerships, innovation, expansion, and acquisitions.

- In June 2023, Keysight introduced PathWave ADS 2024 to speed up the growth of 5G mmWave Design and Lead 6G. The PathWave Advanced Design System (ADS) 2024 is primarily an electronic design automation (EDA) software suite that provides chip designers new millimeter wave and subterahertz (sub-THz) frequency capabilities that can enhance 5G mmWave product design and anticipate the core requirements, especially for 6G wireless communications development.
- In September 2022, Toptica announced an increase in its capacity by building new facilities for a growing workforce. The new facility more than doubles the footprint and allows the company to increase its lab and production spaces, which are critical for anticipated growth over the next decade.

Additional Benefits:

- The market estimate (ME) sheet in Excel format
- 3 months of analyst support

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