

PRC: ADVANCING TERAHERTZ TECHNOLOGY

Introduction:

As the era of 5G communication dawns, the People’s Republic of China (PRC) has established itself as a world leader in communication technology. The PRC is not content to rest on the laurels of its success with today’s critical technologies; Beijing and state-supported businesses throughout the country have begun research and development (R&D) on terahertz (THz)-based technology for the next generation of communication devices. THz technology promises capabilities that are orders of magnitude beyond those of current 5G systems, and its applications could potentially touch every aspect of life, including the defense and national security sectors. Indeed, THz-based systems could provide extremely secure communication networks and help identify potential threats. The PRC now leads the world in THz R&D efforts, and the United States should be mindful of this growing advantage.

BLUF:

- PRC has prioritized THz technology R&D to lead the next wave of communication and security innovation
- Terahertz technology may allow large amounts of data to be securely and quickly transferred, far outstripping the capabilities of current 5G technology
- Numerous commercial and security applications could be derived from PRC R&D efforts, such as improved screening capabilities & enhanced secure communication
- Several state-supported Chinese companies are leading key THz-based initiatives

Terahertz Technology: Beyond 5G



Figure 1 - Word Cloud of Chinese-language Terms from PAI Collection

Using Babel Street’s robust linguistic ontology, Babel Street analysts—without the assistance of linguists—discovered a trove of publicly available information (PAI) and analyzed Chinese THz R&D. The data examined show that dominance in advancing THz technology is at the top of PRC R&D priorities. The unique characteristics of THz electromagnetic waves (those falling within the frequency range of 100 GHz -10 THz) give them [great scientific research value](#) and broad application prospects

in object imaging, radio astronomy, broadband mobile communications, medical diagnosis, environmental monitoring, and various military applications. To put things into perspective, modern-day home routers operate between 2.4GHz – 5GHz. A present-day THz connection would make the theoretical maximum data transfer speed approximately three times the frequency of 5GHz. Experts believe that 6G, driven by THz technology, will eventually be [100 times faster than 5G](#)—or fast enough to download 142 hours of Netflix content in just one second.

There are claims in PAI that PRC’s Tianyan 05 Satellite, deployed by the Long March 6 rocket November 6, 2020, is the world’s first satellite to carry 6G technology into space. However, there is a countervailing perspective that claims it is inappropriate to call this is a 6G satellite when it is more of an [“adaptability test”](#) of THz communications equipment. Nonetheless, PRC’s space deployment of THz technology for research purposes could catapult PRC as a leader in accessibility and speed of global communications. Before the launch of this experimental satellite, experts claimed the United States was the world leader in THz technology research.

Key National Security Technology

The special spectral location, spectral characteristics, and ultra-large bandwidth of THz waves make the technology extremely important in the [national defense realm](#), specifically in ultra-wideband high-speed communication and radar detection. Chen Miao of Hunan Huanuo Star Electronic Technology Co., Ltd explained that with advances in THz technology, counterterrorism officers could use wall radar to accurately detect, locate, track and analyze terrorists and hostages hidden in buildings—greatly increasing the success rate of hostage rescues while ensuring the safety of the rescue forces.

“Terahertz radar is more conducive to target imaging and target feature structure details acquisition in complex environments and can achieve more accurate shape recognition of the target” according to Lin Jun, a researcher at the 23rd Institute of Aerospace

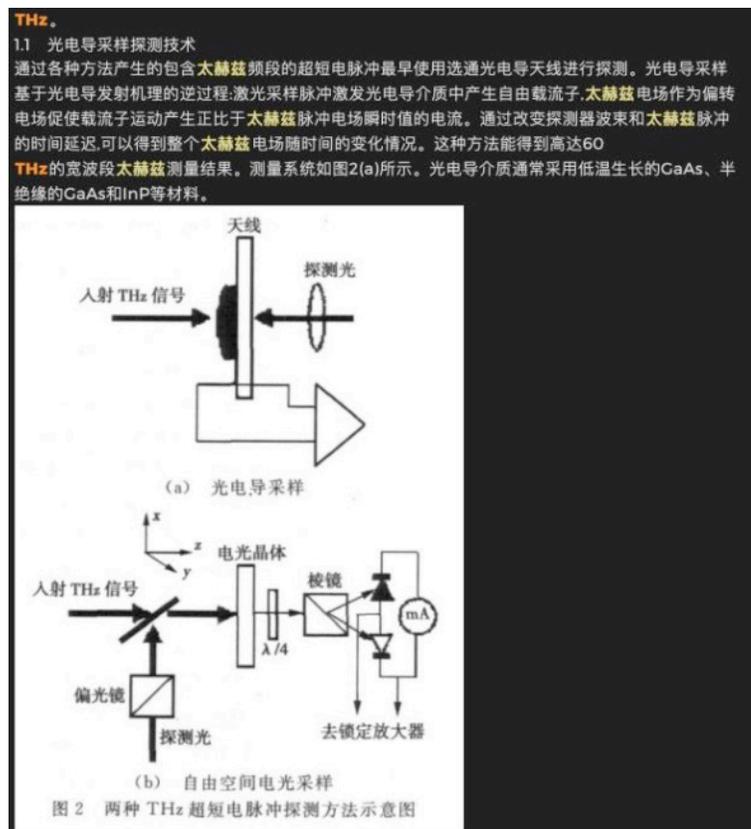


Figure 2 - Example of PRC THz R&D

Science & Industry. “At the same time, due to the short wavelength, terahertz radar can obtain a larger Doppler for low-speed targets. This terahertz radar technology can capture frequency shifts, which provide the ability to detect and recognize slow-moving targets. The radar also has video imaging capabilities.”

Specific to communications, the high frequency, narrow beam, and strong penetrating power of THz waves can effectively solve the problem of limited bandwidth and reliable transmission. Compared to microwaves or lightwaves, the THz spectrum is more suitable for secure communications both on the ground and in space. Terahertz waves feature a strong anti-interference ability and can be used for [classified communications](#), which is why it is highly desirable in wartime military applications.

Major Companies Connected to THz R&D

Tongfang Weishi Technology Co

Ltd – Developing THz infrared composite [human security detector](#) to use THz waves to penetrate clothing and achieve terahertz imaging.

ECCOM (Huaxun Technology) – Developing [graphene THz chips](#) and THz imaging, and can provide biological detection services.

Daheng New Epoch Technology, Inc – Subsidiary, Daheng Optics provides an integrated solution with a range of THz [time domain spectrometers](#).

TCL Communication Technology Holdings Ltd. – Initiated research in [6G technology](#), specifically in THz communications. TCL Communications CEO Guo Aiping stated, “the industry has now fully entered the field of [terahertz development](#) and application. In the field of communications, TCL Communications looks forward to working with experts and scholars to develop and research terahertz science and technology to drive the technological development of the communications industry.”

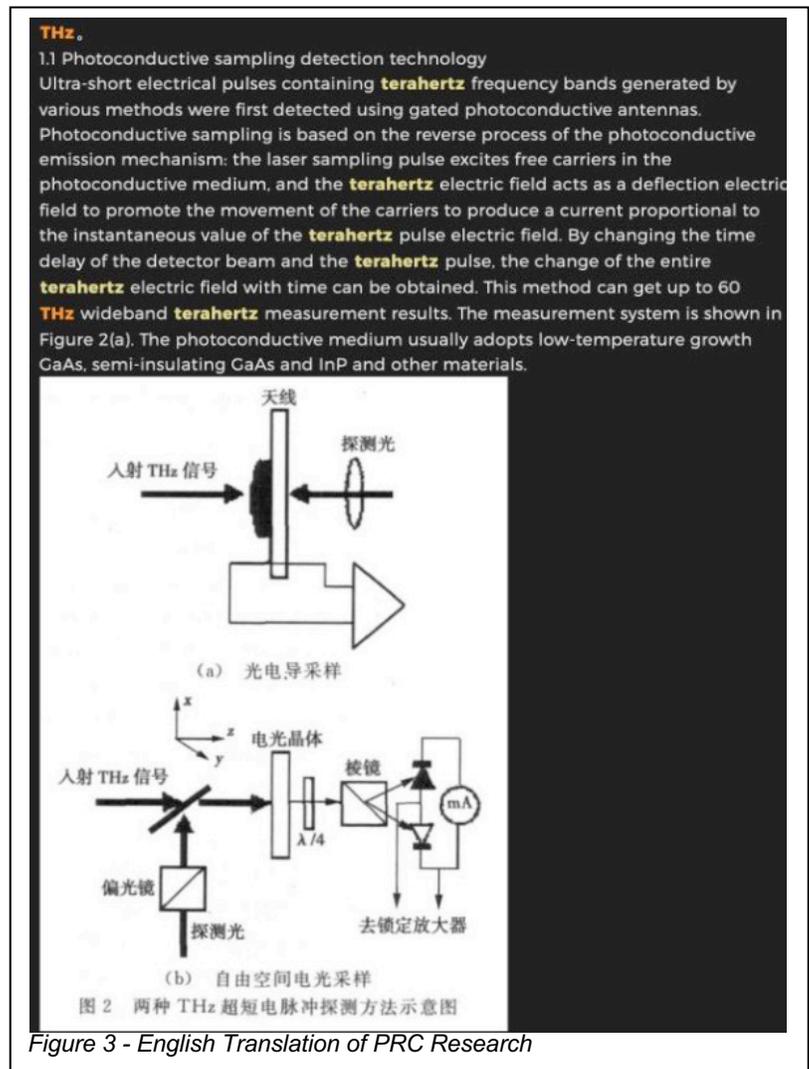


Figure 3 - English Translation of PRC Research

Jiangsu Hengtong Terahertz Technology Co., Ltd. – Dedicated to the research and development, [product development](#), and application of THz technology.

Conclusion

PRC's research and development efforts toward exploring the potential application of the terahertz band have opened the aperture for the THz technology in both material sciences and information technology. Although all technologies have their limitations in the initial stages of R&D, PRC leadership believes THz technology is a viable technology worthy of investment—especially for potential applications in space communications. Despite inaccuracies of the claims regarding PRC's alleged successful launch of the first 6G satellite, it is indeed one of the first satellites carrying THz space communications equipment. PRC is known for its desire to outpace global competitors, especially in the field of technology, hence the concerted effort to apply terahertz technology across a broad range of applications both on the ground and in space. The pace of PRC R&D will likely accelerate as the viability of 6G technology becomes more apparent. If the United States and other Western powers hope to maintain technological parity or regain the lead in innovation, policymakers and researchers will need to closely monitor PRC efforts. Effective open-source intelligence (OSINT) tools will be critical to this effort, allowing analysts and observers to gain native-language insights and timely updates.

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