Non-Contact Ultrasound via Terahertz Photoacoustic Transduction

Yasuaki Monnai
University of Tokyo

Abstract

We discuss non-contact ultrasound based on terahertz photoacoustic transduction. Owing to the strong attenuation of terahertz waves in water, modulated irradiation of a water-containing surface enables localized ultrasound generation without physical contact. By delivering terahertz waves to the skin, acoustic waves can be generated within the body. While further improvement in acoustic pressure is required for fully practical operation, this approach establishes a new modality of ultrasound that eliminates the need for direct transducer contact. In contrast to conventional in-vivo ultrasound systems constrained by physical coupling, the proposed method enables flexible and remote operation, extending ultrasound beyond clinical and laboratory settings.

Biography

YASUAKI MONNAI received the B.E. degree in mathematical engineering and information physics and the M.S. and Ph.D. degrees in information physics and computing from the University of Tokyo in 2008, 2010, and 2013, respectively. From 2010 to 2012, he was a Visiting Scholar with University of Kassel and Philipps University of Marburg. From 2015 to 2021, he was an Assistant Professor and Associate Professor with Keio University. Since 2021, he has been an Associate Professor with the University of Tokyo. His research interests include terahertz plasmonic lenses, leaky-wave antennas, integrated radar systems, and terahertz-induced ultrasound. He received the Best Paper Award at ICMMTS 2025 and serves as an Associate Editor for IEEE Transactions on Terahertz Science and Technology.