

Millimeter-Wave and Terahertz MIMO Radar Systems for High-Resolution Sensing Applications

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Abstract—Millimeter-wave and terahertz bands, with their broadband capabilities, are anticipated to make higher resolution sensing under harsh environments, such as in darkness or heavy dust, a reality. Already, the 79 GHz-band has been allocated for high-resolution radar for automotive applications. This paper introduces MIMO techniques to enable three-dimensional scanning. Additionally, to improve range resolution, use of the 140 GHz-band is newly considered. Both 79 GHz and 140GHz radar can be integrated into CMOS circuits with multiple antennas, enabling cost-efficient, miniaturized sensor modules which are applicable for various industrial usages.

Kazuaki Takahashi received the B.E. and M.E. degrees in electrical and computer engineering, and the Ph.D. degree in electrical engineering from Yokohama National University, Yokohama, Japan, in 1986, 1988 and 2006, respectively. In 1988, he joined the Tokyo Research Laboratory, Matsushita Electric Industrial Co. Ltd., Kawasaki Japan, where he was engaged in research and development of monolithic microwave ICs, millimeter wave ICs based on Si and GaAs for mobile communication equipment. His current research interests include the development of short range multi-gigabit wireless system and high resolution radar system in millimeter wave and terahertz bands, and low-power radio systems for IoT/M2M. He is also working on developing wireless standards in IEEE and Wi-Fi Alliance. He is currently engaged in Automotive and Industrial Systems Company, Panasonic Corporation, Yokohama Japan. Dr. Takahashi is a member of the IEICE and IEEE.

