

Speaker name: Akanksha Bhutani
Organization: Karlsruhe Institute of Technology
Country: Germany
Speaker picture:



Presentation title: Sub-THz Antenna and Package Integration for Miniaturized Surface-Mount Device Modules

SHORT ABSTRACT OF PRESENTATION

The availability of a wide usable bandwidth above 100 GHz makes the use of these frequencies highly appealing for 6G wireless communication and high-resolution millimeter-wave (mmWave) radars. However, despite significant advancements in semiconductor technologies enabling monolithic microwave integrated circuits (MMICs) operating above 100 GHz, their utilization has largely remained limited to laboratory experiments and low-volume applications. This limitation is primarily due to challenges related to limited transmission power and higher path loss, which have been widely acknowledged. To fully unlock the potential of these frequencies, there is an urgent need to develop broadband, high-efficiency antennas, and low-loss interconnects between antennas and MMICs. Moreover, factors such as heat dissipation, cost, and size further complicate

the implementation of high-performance mmWave and terahertz (THz) systems. One critical aspect that demands attention is the dilemma between off-chip and on-chip solutions for systems operating above 100 GHz, each having its own advantages and challenges. Therefore, this talk focuses on two key research areas: (1) the development of off-chip antenna and package concepts in the WR6 band (110–170 GHz) using mature and novel packaging technologies, and (2) the advancement of high-gain and high-efficiency on-chip antennas in the WR3 (220–325 GHz) and WR2.2 (325–500 GHz) bands, utilizing innovative techniques in combination with different semiconductor technologies. In summary, this talk sheds light on the advancements made in mmWave and THz antenna and package technologies while highlighting the remaining challenges that must be overcome to accelerate the adoption of higher frequency bands in future radar

and wireless communication systems. By addressing these obstacles, we can pave the way for realizing the full potential offered by frequencies beyond 100 GHz.

KEYWORDS

Antenna, 6G, IC packaging, millimeter-wave, sub-THz, radar, wireless communication.

ACKNOWLEDGMENT

This work is financially supported by the Federal Ministry of Education and Research (BMBF), Germany under the project “ESSENCE-6GM” (grant number: 16KISK173) and “Open6GHub” (grant number: 16KISK010).

BIOGRAPHY

Akanksha Bhutani received the M.Sc. and Ph.D. degrees in electrical engineering and information technology from the Karlsruhe Institute of Technology (KIT), Germany, in 2012 and 2019,

respectively. From 2012 to 2019, she served as a research assistant with the Institute of Radio Frequency Engineering and Electronics (IHE), KIT. Since 2021, she has been leading the Antennas and Packaging research group at IHE, KIT. Her primary research revolves around THz antennas and packaging for radar and wireless communication systems. She received the “Carl Freudenberg Prize” and the “Suedwestmetall Advancement Award” for her dissertation in 2019 and 2020, respectively. Additionally, she received the IEEE Microwave Magazine Best Paper Award in 2017 and the European Microwave Week (EuMW) Best Paper Awards in 2019 and 2022. In 2023, she served as the Operations Officer at EuMW 2023, held in Berlin. Later that year, she was honored with the prestigious International IHP “Wolfgang Mehr” Fellowship Award by the Leibniz-Institut für innovative Mikroelektronik (IHP). She has authored and co-authored around 60 research papers published in peer-reviewed conference proceedings and journals.