A Next-Generation Hybrid Analog Beamsteering and MIMO Digital Radar for Highly Automated Driving

Kevin Gu
Metawave Corporation, USA
kevin.gu@metawave.com

***Abstract*— Radar plays a critical role in the sensor integration and perception implementation of advanced driver assistance systems (ADAS) systems and self-driving operations. Advances in radio-frequency (RF) technologies and digital signal processing (DSP) have made it possible to design efficient radars at lower cost and in smaller form factors. Most modern automotive radars have been improving their performance such as range and angular resolution by utilizing advanced digital beamforming (DBF) and virtual array methodologies known as Multiple-Input-Multiple-Output (MIMO). However, such an approach has a significant computational burden and lacks sufficient equivalent isotropic radiated power (EIRP) and signal-to-noise ratio due to its direct wide field-of-view illumination. In this talk, we will present the world's first advanced analog, digitally enhanced beamsteering MIMO radar, which supports both virtual-array-based digital scanning in azimuth and analog beam steering in elevation for long range detection (e.g., pedestrian sensing at 300m) with high angular resolution and lower computational requirements. The talk will discuss and highlight challenges in the design, implementation, and characterization of such a complex high-performance radar system, including different levels of RF components such as a 76-81GHz 16-channel phased-array beamforming IC, scalable antenna-in-package (AiP), and frontend system board with radar transceivers and processing unit integration. The actual radar system demonstration will also be presented in the talk.**