Advanced millimeter-wave concurrent 44/60GHz phased array for communications and sensing

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Wireless communications and sensing have become an indispensable part of our daily lives from communications, public service and safety, consumer, industry, sports, gaming and entertainment, asset and inventory management, banking to government and military operations. As communications and sensing are poised to address challenging problems to make our lives even better under environments that can potentially disrupt them, like highly populated urban areas, crowded surroundings, or moving platforms, considerable difficulties emerge that greatly complicate communications and sensing. Significantly improved communication and sensing technologies become absolutely essential to address these challenges. Phased arrays allow RF beams carrying the communication or sensing information to be rapidly steered or intercepted from different angles across areas with particular amplitude profiles electronically, enabling swift single- or multi-point communications or sensing over large areas or across many targets while avoiding potentially disrupting obstacles. They are particularly attractive for creating robust communication links for both line-of-sight (LOS) and non-line-of-sight (NLOS) due to their high directivity and scanning ability. In this talk, we will present a novel millimeter-wave dual-band 44/60 GHz phased-array frontend capable of two-dimensional scanning with orthogonal polarizations. This phased array particularly resolves the “RF signal leakage and isolation dilemma” encountered in the existing phased-array systems. It integrates “electrically” the phased-array functions in two separate millimeter-wave bands into a single phased array operating concurrently in dual-band. These unique features, not achievable with existing millimeter-wave phased arrays, will push the phased-array system performance to a next level, while reducing size and cost, and enhance the capability and applications for wireless communications and sensing, particularly when multifunction, multi-operation, multi-mission over complex environments with miniature systems become essential. This phased array enables vast communication and sensing applications, either communication or sensing or both simultaneously - for instance, concurrent Earth-satellite/inter-satellite communications, high-data-rate WPANs and HDMI, and accurate, high-resolution, enhanced-coverage multi-target sensing.