World Academy of Science, Engineering and Technology
International Journal of Electronics and Communication Engineering
Vol:19, No:09, 2025

Hybrid Beam-Forming Techniques for 6G Terahertz Communication: Challenges

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Abstract : The terahertz band is the main pillar of 6G wireless communication system. It is difficult to meet the high data rate of 1Tbps by millimeter frequency support systems. The terahertz band suffers huge propagation loss limiting wireless distance. Terahertz band imposes ultra massive multiple input multiple output antenna (UM-MIMO) systems which produce high array gain with narrow beamforming. The conventional methods for MIMO beamforming are Analog and Digital beamforming. The fully digital beamforming methods utilize dedicated structure of DAC/ADC and RF chains. These structures increase hardware complexity and are power hungry. The analog beamforming structures utilize ADC/DAC with phase shifters with less hardware complexity but support less data rates. As a result, a hybrid beamforming method can be adapted for UM-MIMO systems. This paper will investigate challenges in hybrid beamforming architecture which will address the low spatial degrees of freedom (SDoF) limitation in Terahertz (THz) Communication. The flexible hardware connections are proposed, in order to switch the system in an adaptive manner so as to minimize the power requirements.

Keywords : 6G, terahertz communication, beamforming, challenges
Conference Title : ICTSP 2025 : International Conference on Telecommunications and Signal Processing
Conference Location : San Francisco, United States
Conference Dates : September 27-28, 2025