

ABSTRACT

Channel interference is a notable issue in dense network where massive number of wireless devices would be kept in close proximity. Efficient spectrum usage is highly appreciated in this connection to incorporate large number of cellular and IoT devices. The prime objective of this research is to analyze the issues associated with optimum spectrum usage and co channel interference and design antenna systems that will mitigate the co channel interference with high spectrum efficiency. In 5G ecosystem, applications are diversified and static/dynamic in nature. In this context antennas need to be more flexible that can operate in multiple frequency bands with different polarizations in order to cater different services, increase SINR and spectrum efficiency.

Thus prior to conduct further investigations on the requirement of specific antennas for diverse application, the wireless channels in indoor/outdoor/static and dynamic scenarios are studied. Large scale models are necessary for network planning and link budgeting while small scale models are necessary for efficient receiver design and performance analysis. Conversely, Ultra-wideband (UWB) is a radio technology that can use very low energy level for short-range, high-bandwidth communications over a large portion of the radio spectrum. The RF front of 5G network would become progressively denser with the gradual integration of advanced and updated services. Consequently, the radio spectrum would be congested with overlapping frequency bands which led to inter-symbol-interference (ISI) in communication systems. Hence the application of UWB radios is essential to cater all non-cellular based services under same roof in conjunction with advanced modulation techniques and coding schemes. mm-UWB is a key enabling technology in this direction in future heterogeneous wireless domain.

Hence our research work is broadly categorized in three sections. In section I, we have investigated wireless channel modeling for static and dynamic environments. We have also investigated terminal independent frequency domain channel characterizations.

In this section, TM₀₃ mode 2×2 MSA array is designed for outdoor P2P high gain application in 5G UDN environment. Also a TM₀₃ mode penta-polarization antenna is proposed. MSA for tri-band and dual-band penta-polarization agile application is also prescribed to co-channel and ISI mitigation. The work of a TM₀₃ mode miniaturized frequency and polarization reconfigurable 2×2 array is presently going on.

In the final section, a feedback based beam steerable antenna for indoor environment for effective network coverage, optimum data transfer and efficient energy usage is planned.