Analysis of Very High Throughput (VHT) at MAC and PHY Layers under MIMO Channel in IEEE 802.11ac WLAN

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***Abstract*—This paper analyses the very high system throughput of IEEE 802.11ac by taking into consideration of the key features MAC and PHY layers under a Multiple In Multiple Out (MIMO) channel. Throughput at the MAC layer is calculated from the transmission probability, contention window and transmission stage. Likewise, the new critical attributes of 802.11ac PHY (i.e. modulation and coding schemes, spatial streams, and channel bandwidth) are used to determine the throughput at the PHY layer. To this end, a theoretical model is formulated at the MAC and PHY layers followed by a system model of MIMO multipath fading channel for 802.11ac. The system model is verified by simulation analysis. The results compare theoretical and simulation findings for different sets of parameters. Furthermore, important trends and trade-offs are identified between system throughput and (MAC + PHY) features as a function of number of contending stations and payload size. The system throughput of 802.11ac networks is significantly improved due to the addition of new PHY features. However, the system may degrade upto 50% in terms of symbol reception in case of a high error-prone MIMO channel. The performance of 802.11ac systems is also analyzed under different MIMO TGn channel models in terms of Packet Error Rate (PER). Thus based on our simulation results, an appropriate channel model can be chosen for 802.11ac network under a given configuration to achieve a better performance.**

Keyword — Performance, analysis, throughput, MAC, physical, MIMO, multipath, fading, transmission probability, contention window, modulation, coding, spatial streams, channel bandwidth, channel model

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