# Abstract

This thesis is one of the very first of its kind comprehensive study of 5G in indoor environment at 5.7GHZ with multiple antenna combinations for generating large scale path loss models for the development of standards for 5G at 5.7 GHZ. This work can be considered as a brick in the wall for the development of 5G. Our results show that some of our results provided here are a bit simpler to the previous 3GPP and ITU standard models and are much physically comparable to these. However, it offers very small added accuracy and somehow lack physical basis.

Measurements were conducted in the Research lab of Electrical Engineering department on the 1st floor of GCU Lahore. This test was attempted at 5.7 GHz. Since future mm-Wave wireless systems will be used by people and appliances with different physical orientations, approximately half of the TX and RX co-polarized antennas used and half of the cross - polarized antennas used.

In order to represent common indoor hotspot locations, TX antennas were placed 1 m above the floor and was very close to the 2 m ceiling and RX antennas were placed 1.4 m above the floor (typical mobile height level).

Single and multi-frequency models were introduced in this thesis, the expressions for the closed form optimization are given in Appendix.

The models for path loss are given for both LOS and NLOS scenarios. Through the course of this thesis we get to know the value of including FSPL in our analytical investigation of various path loss models depicts that it contributes toward enhanced approximation, forecasting and cohesion in contrast to other available models that do not encompass distance as reference. A list of tender data acquired from various path loss models in this thesis using omnidirectional approach is included in Appendix. These models and

channel attributes are advantageous for the designs and system-wide simulations of wideband radio-systems, that one may utilize to approximate overall throughput and capacity of the network for indoor environments at 5.7 GHz millimeter wave frequency band.