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# Path Loss Models for 5G Millimeter Wave in Urban Microcells at 60GHZ

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**Abstract**

*In this paper we focus on measurement for a future outdoor cellular system at 60 GHZ which directed in an urban microcellular environment with line of sight(LOS) as well as non line of sight (NLOS)situation utilizing different combinations of omnidirectional and directional transmit and receive antennas. .In support of the collected data ,in our research we describe a path loss model generated using the monte carlo simulation suitable for the improvement of fifth generation standard (5G)that shows the distance reliance of received power. This loss is communicated in simple formula as the entirely of an inaccessible of path loss factor and floating intercept that minimize the mean square error fit to the empirical data , here we illustrate the two path loss model demonstrating in two unlike scenario to analysis its different parameter ,such as received power ,path loss and path loss exponent.*

***Keywords**—60GHz; 5G; millimeter wave; path loss model; NLOS,LOS*

## 1. Introduction

Millimeter wave communication systems often defined within a frequency range of 30-300 GHZ where a total of 250 GHZ bandwidth are available .These frequency ranges are very significant to expedite the capacity requirement of future 5G networks . The millimeter wave frequency bandwidth coincides with a wavelength of 10 mm at 30 ghz which decreases to 1mm at 300 GHZ.By virtue of recent technology developed in smart phones or other remote devices, mobile data rates for internet access have increased dramatically during the last few decades .As per the industrial forecast,a 1000-crease increment in data traffic of mobile internet can occur in the year between 2010 and 2020[1][2][4].WLAN is base for all the smart devices, for high broadband wireless internet accessibility everywhere at hotspots ,home, shopping mall ,railway station, airport terminal as well as in office.Millimeter wave communication technology attracted a great interest through the academia and also from industry.Wireless Multi input multi output (MIMO) technology which tens to enable growing spectral efficiency and power efficiency is investigated in immense extent which moderately adopted[6] 5G millimeter wave frequency band is viewed likely to meet in new generation WLAN system mostly due to unused wide bandwidth .In 2001 , united state federal communication (FCC)[4] occupy bandwidth in 54-66GHZ band for a unlicensed usage [3] Since all countries like Japan,Australia ,korea and European union[4] also stated to allocate same 60 GHZ band frequency band [4]. Numerous antenna technologies are considered like a viable answer in a matter of contention during the 5G next generation, millimeter wave technology [7]-[11][4].The conventional system of antenna not able to provide high range ,better reliability and high throughput like Multiple antenna systems There are two categories of multiple antennas one is smart antenna system and another is spatial multiplexing based MIMO system[4]. Smart antenna systems produce diversity gain along with fading environment ,antenna gain and interference.The massive exploration and request for high speed data rates and large bandwidth got motivated research in a next generation cellular communication system[2] for 5G cellular systems. The millimeter wave band promises a large spectrum at 60 GHZ and is a massive energy frequency spectrum .

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