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Throughput Analysis of LTE PDSCH Channel for ETU Model

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Abstract— LTE (long term evolution) is a future generation standard by 3GPP Company project. In this paper the physical layer of LTE transceiver is analysed for downlink channel in FDD (frequency division duplexing) mode. Simulation results analyses the throughput performance of LTE PDSCH channel for ETU (extended typical urban) model in terms of SNR and for no. of frames transmitted. Results are obtained with the help of LTE system toolbox by Math works specified in TS36 101.

Keywords— LTE, Throughput, SNR, FDD, PDSCH, Modulation.

I. INTRODUCTION

This Long term evolution (LTE) is a new future based telecom technology specified by 3GPP for 4G wireless communication. LTE provides high spectral efficiency, high data rates, extreme throughput, low latency and less propagation delays, also high frequency stability and flexibility. LTE works on various technologies like OFDM and MIMO. LTE is highly equipped with high speed GPRS, WCDMA, HSPA and this will provide mobile operators deploying LTE to give a seamless services and multimode devices for customers. LTE 4G devices may use SDR (software defined radio) receivers which allows for better use of availability bandwidth as well as making use of multiple channels simultaneously. 4G LTE is based upon packet switching only which will allow users low latency data transmission.

LTE supports two duplexing systems FDD and TDD in same frequency bands as those allocated to UMTS. LTE technology has evolved over multiple releases which have led to improved data throughput for various multi-path fading propagation models. Main aim of LTE network is to increase channel throughput in downlink transmission i.e. from base station to mobile station for the different propagation fading channels. This paper is organised as follows: Section 2nd & 3rd describes about ETU model and LTE PDSCH downlink transmission channel. Simulation results are shown in section 4th. Finally conclusion and future scope are detailed in section 5th.

II. ETU MODEL

Propagation channel modelling function is to impair transmitted signal with environmental disturbances.

Multi-path fading channel is defined by a combination of multi--path delay profiles and a maximum of Doppler frequency which can be 5 hz, 70hz and 300 hz. When a wireless signal travels from a transmitter to receiver it follows multiple paths. The signal may travel directly following line of sight between Tx and Rx. It may bounces off the ground and reaches the receiver or it may be reflected by multiple buildings on the way to receiver. When these copies of same signal arrives at the receiver they are delayed and attenuated based upon the path length, they have followed and on various other factors.

Wireless channels thus perform the convolution operation on transmission signal. ETU model has 9 multi--path components with maximum of -70 db relative powers for 5000 excess tap delays. If channel is time varying as most of wireless channel are each filter tap can be modelled to have a Rayleigh or Rician distribution with a mean value. Variation in values of a channel tap from one sample to next sample depends upon Doppler frequency which depends on speed of mobile unit. Higher the velocity of mobile unit, higher would be the Doppler frequency and greater would be the variation in the channel.

III. LTE PDSCH CHANNEL

LTE PDSCH is a physical downlink shared channel. It is used to transmit downlink channel (DL-SCH). The DL-SCH is the transport channel for transmitting downlink data. One of the two coded transport blocks (codeword's) can be transmitted simultaneously on PDSCH depending on pre-coding scheme. The coded DL-SCH codeword's undergoes scrambling, modulation, layer mapping, resource elements. Scrambled codeword's undergoes QPSK, 16 QAM or 64 QAM modulations. Choices created flexibility to allow the scheme to maximize the data throughput depending on channel condition

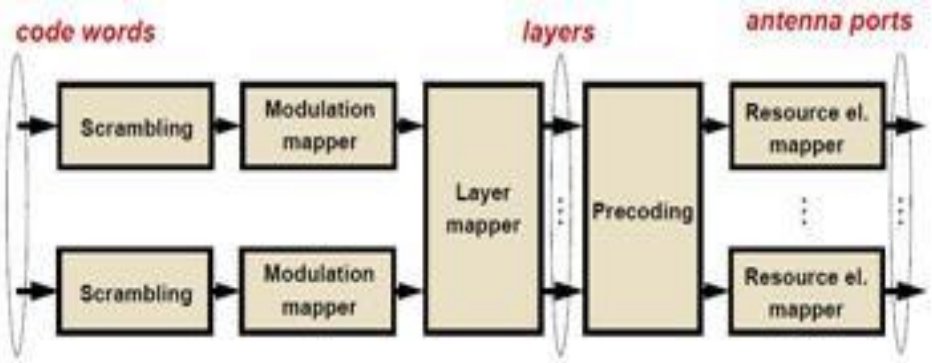

Figure 1: LTE PDSCH downlink channel

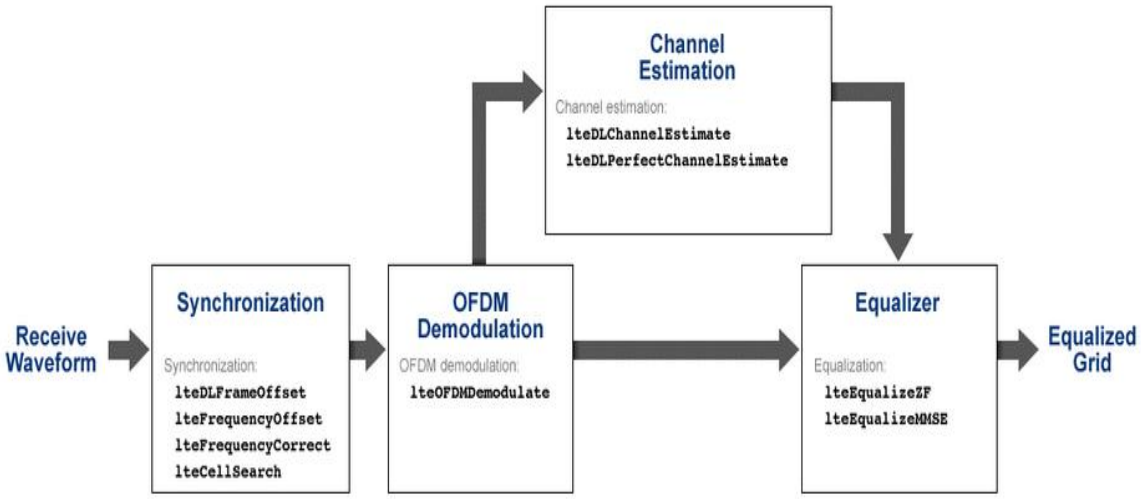

Figure 2: PDSCH downlink receiver function

IV. SIMULATION RESULTS

Case 1: Doppler(5hz)

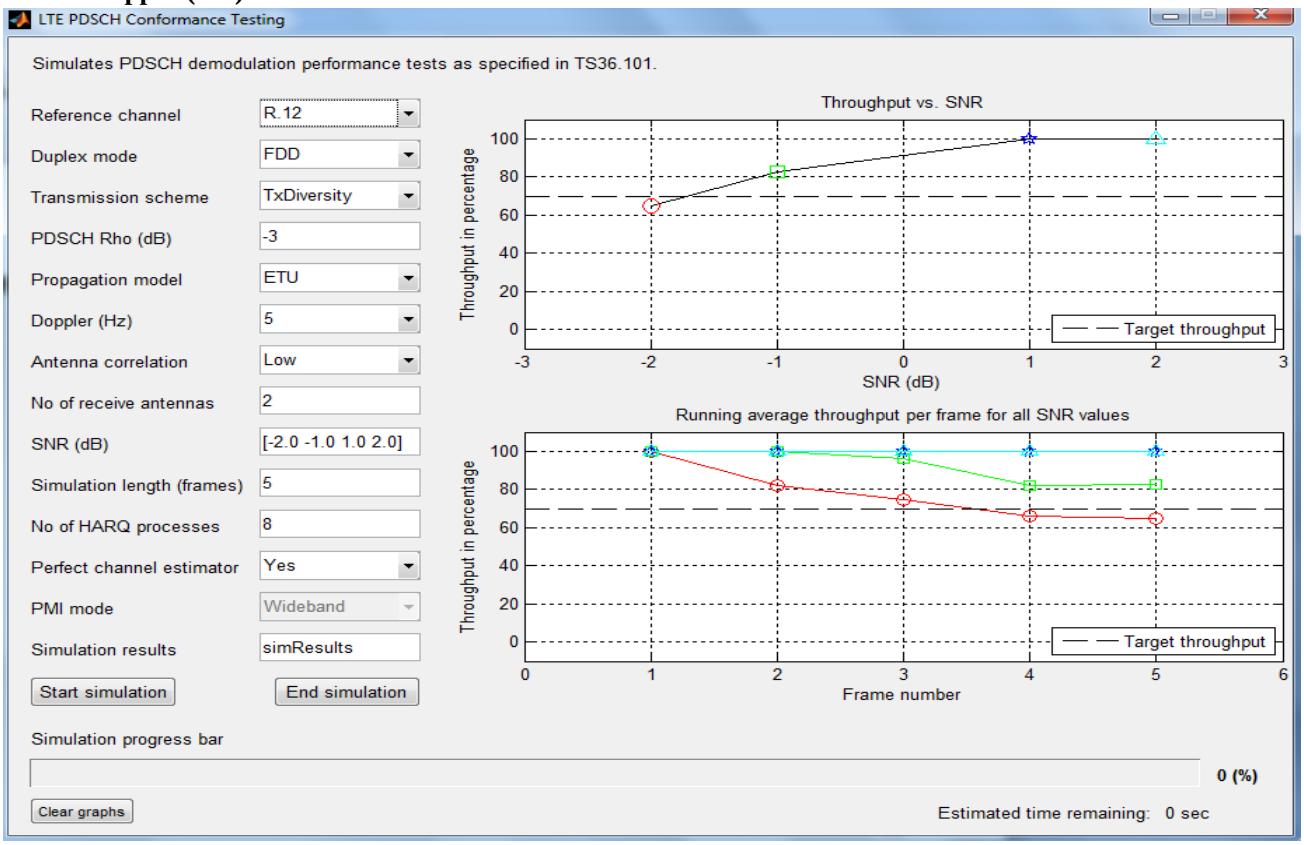

Figure 3: : % throughput for SNR & no. of frames (5 hz doppler)

Case 2: Doppler (70 hz)

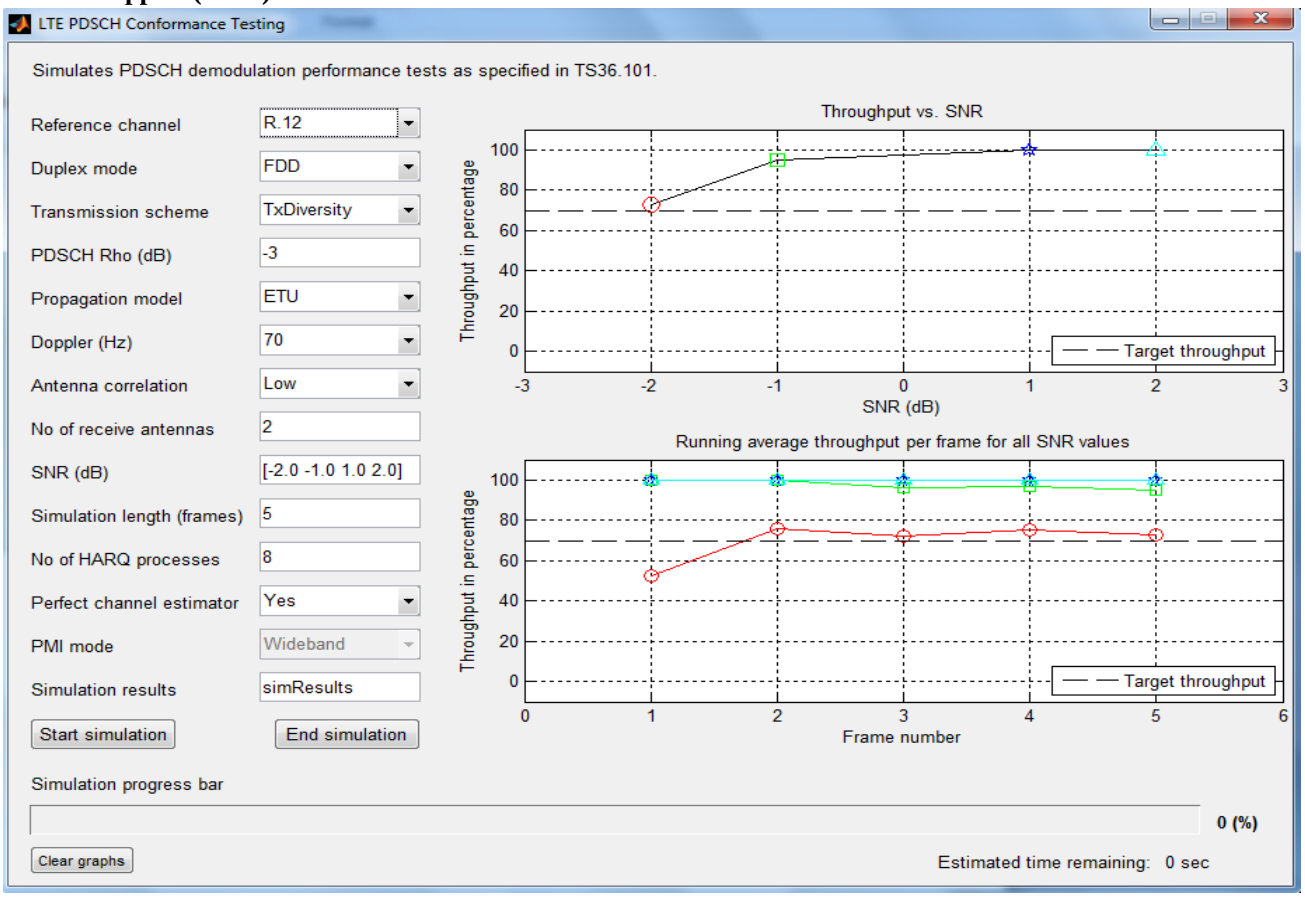

Figure 4: % throughput for SNR & no. of frames (70 hz doppler)

Case 3: Doppler(300 hz)

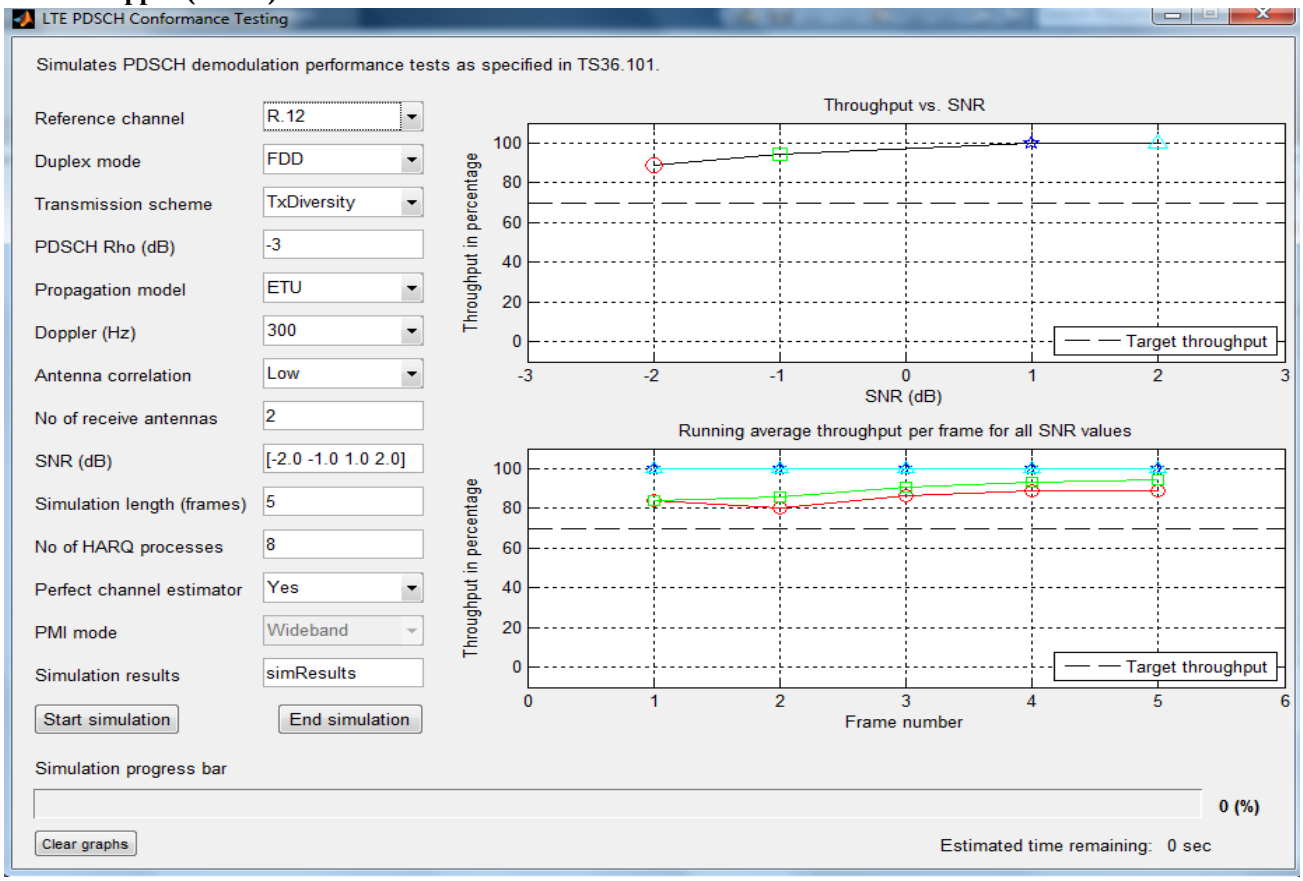

Figure 5: % throughput for SNR & no. of frame (300 hz doppler)

V. CONCLUSION

Simulation results shows the impact of % throughput depending on SNR & no. of frames transmission for ETU model in LTE PDSCH channel. For the different doppler values, % of throughput for various SNR values are changing as per the no.of frames transmitted. Best throughput performance is estimated above the targeted throughput for both cases i.e. SNR & Frame number.

Table 1: Simulation Result Parameter

Duplexing method	**FDD**			
Antenna correlation	**LOW**			
No. of antenna	**2 (180 deg. Sectoring)**			
HARQ	**8**			
Doppler(Hz)	**% Throughput per frame per SNR**			
	-2	**-1**	**1**	**2**
5 HZ	**64.78**	**82.39**	**100**	**100**
70 HZ	**72.83**	**95.22**	**100**	**100**
300 HZ	**88.67**	**94.31**	**100**	**100**

VI. FUTURE SCOPE

Throughput performance of LTE network in downloading channel for propagation fading model is a very big criterion. Throughput testing tells the performance of signal over noise or fading. So in this future scope we can take much more no. of frames and SNR values and also work on changing with antenna and Tx scheme.

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