ABSTRAK

SIMULASI PENGARUH REDAMAN HUJAN TERHADAP KINERJA KOMUNIKASI 5G PADA FREKUENSI 28 GHz

(2025:xv + 60 halaman + 32 gambar + 6 tabel + 11 lampiran

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Penelitian ini menganalisis secara komprehensif dampak signifikan variasi redaman hujan terhadap kinerja sistem komunikasi 5G pada frekuensi tinggi di Palembang, Indonesia menggunakan data curah hujan periode Maret 2025 dengan menggunakan tiga model redaman hujan: Model ITU-R P.618.5, *Simple Attenuation Model* (SAM), dan Model ITU-R Tropis. Simulasi menunjukkan Model ITU-R P.618-5 menghasilkan redaman dan *Path Loss* tertinggi, menyebabkan *Received Power* turun di bawah ambang batas putus pada jarak pendek, sementara Model SAM paling konservatif dan Model ITU-R Tropis berada di antaranya. Secara konsisten, ketiga model ini menunjukkan bahwa curah hujan tinggi dan kondisi *Non Line of Sight* mempercepat penurunan *Received Power* dan secara signifikan meningkatkan *Bit Error Rate* (BER) serta menurunkan Eb/No, dengan *Non Line of Sight* selalu memperburuk performa. Kinerja sistem nirkabel sangat dipengaruhi oleh jarak dan intensitas curah hujan. Kondisi *Non Line of Sight* secara drastis meningkatkan BER hingga hampir 10^0, menandakan hilangnya sinyal. Peningkatan hujan serta jarak dapat menyebabkan BER mencapai ambang batas putus, terutama pada kondisi *Non Line of Sight* yang dapat menghambat komunikasi. Simulasi ini menegaskan bahwa redaman hujan adalah faktor dominan yang memerlukan strategi mitigasi efektif untuk memastikan keandalan layanan 5G di lingkungan tropis.

Kata kunci: 5G, 28 GHz, Redaman Hujan, *Urban Macro*, Palembang.

ABSTRACT

SIMULATION OF THE EFFECT OF RAIN ATTENUATION ON 5G COMMUNICATION PERFORMANCE AT 28 GHz FREQUENCY

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This study comprehensively analyzes the significant impact of rain attenuation variations on the performance of 5G communication systems at high frequencies in Palembang, Indonesia using rainfall data for the period of March 2025 using three rain attenuation models: the ITU-R P.618.5 Model, the Simple Attenuation Model (SAM), and the ITU-R Tropical Model. Simulations show that the ITU-R P.618-5 Model produces the highest attenuation and Path Loss, causing Received Power to drop below the dropout threshold at short distances, while the SAM Model is the most conservative and the ITU-R Tropical Model is in between. Consistently, these three models show that heavy rainfall and Non-Line of Sight conditions accelerate the decline in Received Power and significantly increase the Bit Error Rate (BER) and decrease Eb/No, with Non-Line of Sight always deteriorating performance. Wireless system performance is strongly influenced by distance and rainfall intensity. Non-Line of Sight conditions drastically increase BER to almost 10^0, indicating signal loss. Increasing rainfall and distance can cause BER to reach the dropout threshold, especially in Non Line of Sight conditions which can hinder communication. This simulation confirms that rain attenuation is a dominant factor that requires effective mitigation strategies to ensure the reliability of 5G services in tropical environments.

Keywords: 5G, 28 GHz, Rain Attenuation, Urban Macro, Palembang.