

ABSTRACT

5G technology has begun to be implemented in Indonesia. however, its deployment remains uneven, including in Central Java Province. This study focuses on 5G network planning in the urban area of Surakarta City, which has experienced significant economic growth—from -1.76% in 2020 to 6.25% in 2022 and 5.57% in 2023—supported by an increase in the tourism sector. The study was conducted over an area of 44.1 km², with 4 downlink sites and 6 uplink sites. The network planning utilized two macrocell propagation models: 3GPP TR38.900 Urban Macro (UMa) and Stanford University Interim (SUI). The SUI model was analyzed based on three terrain categories: Terrain A with 32 sites, Terrain B with 26 sites, and Terrain C with 29 sites. Simulations were carried out using the Atoll Radio Planning software for both Uplink (UL) and Downlink (DL) scenarios under Outdoor-to-Outdoor (O2O) Non-Line of Sight (NLOS) conditions. The simulation results indicate that the SUI Terrain B model provides the best signal performance, with an average SS-RSRP of -70.53 dB (classified as good) and an SS-SINR of 4.29 dB (classified as normal) at a frequency of 26 GHz. The lowest recorded values for the uplink O2O-NLOS scenario were an RSRP of -117.56 dB and an SINR of 2.17 dB. Based on these findings, the SUI Terrain B model is recommended for 5G network implementation in Surakarta City.

Keywords: 3GPP TR38.900, 5G NR, Atoll, Coverage Planning, SUI