ABSTRACT

5G has been deployed in several countries. Indonesia is currently implementing the equalization of 5G networks throughout the country to meet the needs of applications requiring wide frequency spectrum and minimal delay. 5G technology in Indonesia operates in the 3.5 GHz frequency band. To establish 5G in small area regions, a Base Transceiver Station (BTS) with a small radius, known as a femtocell BTS, is required. Indonesia is significantly lagging behind other countries in terms of 5G equalization, standing at 0.9% in May 2023. Therefore, the author has designed and implemented a front-end 5G transceiver system for femtocell areas to meet the aforementioned needs.

In this capstone project, the author focuses on the design of a femtocell 5G amplifier system using RF AMPs, namely Low Noise Amplifier (LNA) and High Power Amplifier (HPA), as the antenna part has been previously worked on by the author in the last semester. Low Noise Amplifier (LNA) and High Power Amplifier (HPA) serve as amplifiers for the 3.5 GHz antenna. The system design will be carried out by measuring gain, return loss, and VSWR.

The Low Noise Amplifier (LNA) is a device designed to amplify signals received from the receiving antenna while suppressing noise occurring in the signal. Meanwhile, the High Power Amplifier (HPA) is an amplifier that operates on the transmitter, functioning to amplify the radio frequency (RF) signal output power. In the measurement results of HPA, a return loss of -5.5381dB, gain of -13.475dB, and VSWR of 3.2910 were obtained. Whereas for LNA, a return loss of -3.0708dB, gain of -15.717dB, and VSWR of 5.4163 were obtained. The results obtained do not meet the target achievement due to miscalculations in the RF bandwidth during PCB design.

Keywords: 5G, Femtocell, HPA, LNA, Amplifier