

## ABSTRACT

The development of telecommunications technology become strict every year, including in the 5th generation technology (5G), research and implementation are also being carried out. The Ministry of Communication and Information Technology (KEMKOMINFO) is currently developing the frequency spectrum in Indonesia, by 3.5 GHz frequency which is declared ideal for the needs in Indonesia. With this high frequency, a microstrip type antenna is needed and also a Multiple Input Multiple Output (MIMO) system arrangement is needed in order to provide a wide transmission bandwidth.

In this final project, (4x4) MIMO transmitter antenna system on frequency 3.5 GHz designed, which is 16 elements with 4 rows and 4 columns of elements, and using a circular shape *patch*. Circular patches are chosen because it can provide to a increase gain. Than, it is helped by the use of multi substrate and air gap methods for increasing bandwidth even gain in reaching to 5G specifications. The substrate material used FR-4 because it can give a good impedance matching, with has a thickness ( $h$ ) 1.6mm and a dielectric permittivity ( $\epsilon_r$ ) 4.3.

Based on the simulation, a single antenna on a MIMO transmitter antenna system using the multi substrate and air gap method resulted in a maximum gain is 7.314 dBi and a minimum gain is 6.778 dBi. Then obtained bandwidth 104 MHz (3.447-3.551 GHz) to 107 MHz (3.443-3.550 GHz). Meanwhile, mutual coupling on the MIMO system obtained at -21.427 dB and the smallest at -48.304 dB.

**Keywords:** *Microstrip Antenna, MIMO, 5G.*