

## ABSTRACT

Measuring radiation pattern, polarization and gain of antenna under test (AUT) accurately is important to be done therefore is able to test the performance of antenna. Principally in measuring radiation pattern, polarization and gain at least need two antennas. One as reference antenna and the others as AUT. Reference antenna act as transmitter, generating electric field and antenna as the receiver which is mounted on antenna positioner system, converting electric field which is seen onto antenna surface to create electric field pattern that can be measured. Antenna measurement system which already have at antenna laboratory, Telkom university is not maximal yet because it is still done by manually. Therefore, it is designed and built a system for antenna measurement which rely on automatic, integrated, precision and valid so that can be obtained the optimum measurement.

In this research it is propose to design and realized antenna measurement system which is automatically, integrated, precision and valid which consist by software and hardware. Software is used as the controller antenna position therefore can move automatically in the precise axis and also as the further processing power data (dBm) sampling which is received by the antenna. Hardware function as the motioner of the antenna. Result from software will be processed in C# and Microsoft excel. This software is running on personal computer and connected to control hardware such as mechanic design with minimum system microcontroller ATmega 328P based on arduino uno through USB port and also to control power data acquisition from antenna through serial port from spectrum analyzer

Result from system antenna measurement system which is designed and built has accuracy polarization  $7.2^\circ \pm 0.0864^\circ/\text{step}$ , elevation  $7.2^\circ \pm 0.2536^\circ/\text{step}$  and azimuth  $7.2^\circ \pm 0.2352^\circ/\text{step}$ , sampling received power (dBm) from spectrum analyzer is 3 sample/step and average measurement time is 1 minute 59 seconds, meanwhile manually spend 8 minute 10 seconds.

Average received power on GUI -35.85801043215110 dBm (13 digit precise number) and average received power using signal hound manually get -37.40 dBm (2 digit precise number). Difference between received power on GUI and signalhound which is -1.5419895678489 with frequency 2.35 Ghz[25].

Measurement radiation pattern azimuth and elevation using system which is built has given the maximum difference from normalized received power is 13.0972 dBm and 11.89113 dbm respectively. It also given the HPBW difference that compare to the simulation, which is give  $40.24^\circ$  and  $39^\circ$  for azimuth and elevation respectively. Gain measurement give difference result average 0.405 dB from simulation (gain result is more approach to the simulation other than using the manual).

Measurement antenna parameter which is designed and built has proof automatically in data acquisition and movement, integrated software and hardware, precisely in acquisition data and also valid so that it can state the system is capable and appropriate to use to measure antenna with frequency 1Ghz-4.4Ghz[16] with maximum load is 600 gram and maximum dimension 10 x 10 cm x 2 cm.

**Keywords :** Antenna Under Test (AUT), Spectrum Analyzer, Reference antenna, Mikrocontroller, Radiation Pattern, Polarization.