ABSTRACT

In designing Telkom University Landmark Tower (TULT), the concept of green and smart building is the main focus. Smart building integrates IoT technology to maximize operational efficiency and optimize energy use. The TULT building has 19 floors and 178 rooms dedicated to 3 faculties with a total of ±12,460 students. The problem that occurs is the decline in the quality of the WLAN network during joint exams due to the low throughput per access point in each room. Green buildings pay attention to environmentally friendly energy efficiency, as well as occupant health and comfort such as the high concentration of CO_2 in the room. Problems related to air quality in the room due to the large number of occupants in it, especially the increase in CO_2 concentration need to be considered. Evaluation and analysis are needed to overcome connectivity problems and increased CO_2 concentration in the room.

Two solutions are proposed: (1) evaluate the performance of Fiber To The Building (FTTB) system using X-GPON technology by calculating the feasibility and performance of the system. Link Power Budget and Rise Time Budget are calculated manually and compared with the feasibility simulation software results. Bit Error Rate (BER) is analyzed through network design simulation, (2) designing CO_2 detection system using PWM Infrared Carbon Dioxide Sensor and Arduino Uno microcontroller. The system can detect and display CO_2 level information in the building through a Liquid Crystal Display (LCD), as well as a buzzer as a sound indicator that sends a warning when the level exceeds the set threshold.

Based on testing the eligibility of Link Power Budget requirements, with manual transmission power of -5.072 dBm for downstream and -5.367 dBm for upstream, and simulation of -8.015 dBm for downstream and -8.544 dBm for upstream, both of which are still above the minimum limit of PT Telkom (-28 dBm). The bit error rate (BER) must be less than 10-9, with manual calculations showing downstream values of 0.0012628 x 10-9 and upstream values of 0.0189647 x 10-9, while simulations show values of 0. Manual Q-Factor calculations are met with downstream 19.398 and upstream 18.660, exceeding the ideal Q-Factor of at least 6. On the other hand, calibration results show a strong linear relationship between sensor values and calibration values, with sensor slope values close to ideal (1), namely 0.987 for sensor 1 and 0.9472 for sensor 2. Calibration of the CO2 sensor significantly improved the accuracy of CO2 concentration measurement, from 88% to 97% for sensor 1 and from 84% to 90% for sensor 2. The data transmission bitrate of 832.00 bps and the average transmission delay of 0,034 seconds can be said to be very good according to THIPON standards.

Keywords: Green and Smart Building, evaluation, fiber optic network, PWM Infrared Carbon Dioxide Sensor.