

## ABSTRACT

This research explores the increasing need for fiber optic connectivity in various environments, such as office buildings, hotels or high-rise residential complexes. Along with population growth and demands for internet-based services that require high bandwidth, fiber optic access network technology is increasingly becoming a relevant solution. Fiber to the Room (FTTR), a network architecture that uses optical fiber to reach each unit or room, is emerging as an effective solution with high speed, large transmission capacity, and optimal signal quality. FTTR is implemented using Gigabit Passive Optical Network (GPON) technology, where optical fiber is pulled directly to each unit or room using a passive optical splitter. This enables direct fiber optic connectivity to the device or user within it without requiring additional infrastructure within the unit. GPON works by transmitting data via light waves, and one optical fiber can serve multiple customers by splitting optical signals using a passive optical splitter at the Optical Line Terminal (OLT). This research designs an FTTR network by analyzing the required devices, including specifications, layout and optimal number of devices. Next, simulations are carried out using OptiSystem software to ensure performance meets standards. The results of this research were compared with related journals to gain a deeper understanding of FTTR network design using GPON technology.

**Keyword** : FTTR, PON, FM, BPSK, BER