ABSTRACT

The increasing demand for cellular networks with high capacity and low latency has driven the need for efficient and rapidly deployable backhaul solutions. Free Space Optics (FSO) presents a wireless alternative that can overcome the limitations of fiber optic deployment, particularly in areas with geographic or cost-related challenges. This study aims to evaluate the performance of the CENTAURI 10 FSO device as a backhaul solution for Telkomsel's 4G network in the Bukit Sentul area, Bogor. The evaluation was conducted through a Proof of Concept (PoC) approach, focusing on key performance indicators such as received optical power (Rx Power), data throughput, latency, and link availability under various weather conditions. The results show that FSO devices can provide connections of up to 10 Gbps with low latency in clear weather, but are prone to performance degradation in bad weather. As a solution, FSO and sensitive receivers are used. A cloud-based monitoring system is used to maintain service stability. These findings indicate that FSO has strong potential as a backhaul technology, especially in areas that do not yet have fiber optic networks. The CENTAURI 10 Free Space Optics (FSO) device was evaluated as a backhaul solution for the 4G network in the Bukit Sentul area, Bogor, operated by Telkomsel. The assessment was conducted through field trials and OptiSystem simulations using key parameters such as received optical power (Rx Power), throughput, latency, and packet loss. Field test results demonstrated stable throughput of 10.2 Gbps, consistent latency of 12.60 µs, and 0% packet loss across all frame sizes. Under clear weather conditions, Rx Power was recorded in the range of -17 dBm to -18 dBm, while during heavy fog it dropped drastically to -35 dBm, leading to reduced link stability. OptiSystem simulations confirmed that adverse weather causes significant attenuation and an increase in the Bit Error Rate (BER), which can degrade communication quality. These findings indicate that FSO has strong potential as a backhaul technology with performance comparable to fiber optics, though it requires weather mitigation strategies such as adaptive power control and backup links.

Keywords: Free Space Optics, Centauri 10, backhaul network, 4G, Telkomsel, Proof of Concept, latency, throughput.