

ABSTRACT

Telecommunication technology is growing rapidly in Indonesia both in urban and rural areas. However, the development of terrestrial infrastructure is uneven due to the geographical challenges of the region, which is in the form of mountains and the sea. Included in Raja Ampat Regency which has tourism potential should be supported by adequate telecommunications networks. To overcome this problem, a proposed backhaul network technology solution is a combination of microwave transport and FSO on terrestrial links and HAPS to support LTE network communication.

This plan uses a design method based on the capacity to determine the number of customers over a period of five years. So that we get the cell average throughput value from the calculation of single user throughput. Then simulate the terrestrial microwave link backhaul and determine the FSO HAPS link backhaul model.

So that the total capacity needed is 1,292.44 Mbps, with a total site of 31 sites in all districts of Raja Ampat, the average distance is 15.76 Km, the frequency microwave link used is 8, 15 and 23 GHz with vertical polarization, free space loss averaged 134.94 dB, and the average fade margin was 41.08 dB. While the HAPS platform used in the form of a Sky Station blimp is placed at a height of 20 km in the stratosphere. FSO links are used to link the HAPS between 4 pieces and between HAPS and terrestrial. HAPS capacity depends on the number of terrestrial link capacities connected as in HAPS_WAIGEO connected with 3 terrestrial links with a minimum capacity of 490.80 Mbps. Inter-HAPS uses a 1064 nm FSO wavelength resulting in 190 dB of free space loss, while the HAPS link with terrestrial using a 1550 nm wavelength results in a 10^{-9} BER value.

Keywords: LTE, HAPS, *microwave link, free space optical communication, capacity planning, backhaul*