ABSTRACT

Indonesia, one of the largest archipelagic countries, faces challenges in distributing broadband access due to its numerous islands and remote locations. While traditionally relying on geostationary orbit (GSO) satellites, new non-GSO satellite constellations like Starlink offer improved connectivity in underserved areas. However, these new systems risk interfering with existing GSO satellites. To address this, the International Telecommunication Union (ITU) requires non-GSO systems to protect GSO satellites from harmful interference, ensuring both can operate without compromising communication services.

This thesis research analyzes the technical, economic, and regulatory aspects of Telkom-3S (a GSO satellite) and Starlink (a non-GSO satellite) in Indonesia, focusing on the downlink Ku-Band frequency. It assesses interference between Telkom-3S and Starlink by analyzing C/N, C/I, C/N+I, and capacity reduction due to interference. The study reviews ITU-R's latest regulations, evaluating non-GSO compliance. It presents epfd calculations for downlink evaluations using Starlink and Telkom 3S and adapts the avoidance angle to reduce harmful interference, focusing on the interference level of epfd towards Telkom 3S's earth station.

The technical analysis indicates that the downlink C/N for Telkom-3S is sufficient at 11.80 dB without interference. Still, the C/I is at -8.33 dB when Starlink is at 0° avoidance angle, improving significantly with a 1° angle. The C/(N+I) value is inferior at -8.37 dB at 0°, improving to 0.98 dB at 1° and stabilizing between 11.65 dB and 11.79 dB from 10° to 80°. The probability of C/(N+I) is above 11.8 dB 94.4% of the time. Economically, Telkom 3S's capacity drops from 198.62 Mbps to 53.17 Mbps when Starlink is at a 1° angle, stabilizing between 198.45 Mbps and 198.56 Mbps at angles between 20° and 80°. The regulatory analysis shows that the epfd calculation results exceed the interference limit ITU-R Radio Regulation article 22. The recommendation based on this research is if Starlink wants to transmit signals at an avoidance angle of 10° to reduce the impact of interference caused by Starlink to Telkom 3S.

Keywords: GSO, non-GSO, Interference, Capacity, epfd, Ku-Band, Regulatory, Telkom-3S, Starlink.