

ABSTRAK

PERANCANGAN DAN FABRIKASI ANTENA YAGI-UDA UNTUK *BASE TRANSCEIVER STATION* 4G PADA SISTEM *PRIVATE* LTE (2026: xii + 70 Halaman + 28 Gambar + 16 Tabel + 36 Daftar Pustaka + Lampiran)

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Kebutuhan akan jaringan komunikasi lokal yang mandiri mendorong pengembangan sistem *Private* LTE berbasis *Software Defined Radio* (SDR) sebagai alternatif untuk mendukung layanan komunikasi pada wilayah dengan keterbatasan kualitas jaringan seluler komersial. Antena *directional* berperan penting dalam mendukung pemancaran dan penerimaan sinyal pada sisi *Base Transceiver Station* (BTS). Oleh karena itu, dua antena Yagi-Uda dirancang dan difabrikasi untuk sistem *Private* LTE berbasis LTE Band 3 *Frequency Division Duplex* (FDD), masing-masing pada frekuensi *downlink* (DL) 1,840 GHz dan *uplink* (UL) 1,750 GHz. Antena menggunakan konfigurasi empat elemen berbahan aluminium dan dioptimasi menggunakan CST *Studio Suite* 2024 dengan metode *Trust Region Framework*. Hasil simulasi menunjukkan *return loss* dan VSWR masing-masing sebesar $-35,33$ dB dan 1,035 pada antena DL, serta $-30,76$ dB dan 1,059 pada antena UL. Hasil pengukuran menggunakan NanoVNA menunjukkan frekuensi resonansi 1,841 GHz dengan *return loss* $-18,98$ dB dan VSWR 1,253 untuk antena DL, serta frekuensi resonansi 1,750 GHz dengan *return loss* $-26,92$ dB dan VSWR 1,094 untuk antena UL. Hasil tersebut menunjukkan bahwa kedua antena memenuhi spesifikasi *return loss* dan VSWR yang ditetapkan. Selanjutnya, antena diintegrasikan dengan sistem *Private* LTE berbasis USRP B210, srsRAN, dan srsEPC untuk pengujian *end-to-end*. Hasil penelitian menunjukkan bahwa antena Yagi-Uda yang dirancang dapat mendukung implementasi jaringan *Private* LTE Band 3 berbasis SDR.

Kata Kunci: Antena Yagi-Uda, *Private* LTE, LTE Band 3 FDD, CST *Studio Suite*, NanoVNA, USRP B210.

ABSTRACT

DESIGN AND FABRICATION OF A YAGI-UDA ANTENNA FOR A 4G BASE TRANSCEIVER STATION IN A PRIVATE LTE SYSTEM (2026: xii + 70 Pages + 28 Figures + 16 Tables + 36 References + Appendices)

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The need for an independent local communication network has driven the development of a Private LTE system based on Software Defined Radio (SDR) as an alternative to support communication services in areas with limited commercial cellular network quality. A directional antenna plays an important role in supporting signal transmission and reception at the Base Transceiver Station (BTS) side. Therefore, two Yagi-Uda antennas were designed and fabricated for a Private LTE system based on LTE Band 3 Frequency Division Duplex (FDD), operating at downlink (DL) frequency of 1.840 GHz and uplink (UL) frequency of 1.750 GHz, respectively. The antennas use a four-element aluminum configuration and were optimized using CST Studio Suite 2024 with the Trust Region Framework method. Simulation results show return loss and VSWR values of -35.33 dB and 1.035 for the DL antenna, and -30.76 dB and 1.059 for the UL antenna, respectively. Measurement results using NanoVNA show a resonant frequency of 1.841 GHz with a return loss of -18.98 dB and VSWR of 1.253 for the DL antenna, and a resonant frequency of 1.750 GHz with a return loss of -26.92 dB and VSWR of 1.094 for the UL antenna. These results indicate that both antennas meet the specified return loss and VSWR requirements. Furthermore, the antennas were integrated into a Private LTE system based on USRP B210, srsRAN, and srsEPC for end-to-end testing. The research results show that the designed Yagi-Uda antennas can support the implementation of a Private LTE Band 3 network.

Keywords: *Yagi-Uda antenna, Private LTE, LTE Band 3 FDD, CST Studio Suite, NanoVNA, USRP B210.*