

ABSTRAK

RANCANG BANGUN ANTENA YAGI 2.4 GHz SEBAGAI PENGUAT SINYAL WIFI DI KORAMIL 418 -01 MAKRAYU

(2026 : XIV + 69 Halaman + 30 Gambar + 10 Tabel + 8 Lampiran)

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Penelitian ini bertujuan merancang, memfabrikasi, dan menguji Antena Yagi 8 elemen sebagai *transmitter* direktif untuk memfokuskan pancaran sinyal Wi-Fi di lokasi tersebut. Tahapan metode meliputi pemodelan pada CST Studio Suite, fabrikasi berbahan aluminium, hingga uji laboratorium menggunakan *Vector Network Analyzer* (VNA) serta uji lapangan menggunakan MikroTik. Hasil simulasi menunjukkan performa sangat optimal dengan *Return Loss* -24,516 dB, VSWR 1,124, impedansi 50 Ω , *Bandwidth* 218,6 MHz, dan *Gain* 12,54 dBi. Setelah difabrikasi, pengukuran riil menggunakan VNA menunjukkan hasil presisi dengan impedansi 49,84 Ω , VSWR 1,2 dan *Return Loss* -19,96 dB, yang sukses memenuhi standar kelayakan industri telekomunikasi ($VSWR \leq 1.5$). Melalui perhitungan metode perbandingan dua antena dengan *Spectrum Analyzer*, diperoleh nilai *Gain* aktual sebesar 13,609 dBi, sukses melampaui target awal (≥ 9 dBi). Pada uji lapangan hingga jarak 20 meter, Antena Yagi secara konsisten memberikan penguatan sinyal (*signal strength*) yang jauh lebih kuat dibanding antena omni bawaan MikroTik, dengan peningkatan paling signifikan pada jarak 5 meter sebesar 20 dB (-52 dBm pada Antena Yagi dibandingkan -72 dBm pada antena bawaan). Selain itu, pada jarak terjauh (20 meter), Antena Yagi berhasil mendongkrak nilai *Signal-to-Noise Ratio* (SNR) dari batas kritis 15 dB menjadi 25 dB. Penelitian ini menyimpulkan bahwa Antena Yagi 8 elemen efektif menyediakan cakupan sinyal Wi-Fi yang lebih kuat, stabil, dan minim interferensi derau untuk mendukung aktivitas di Koramil 418-01 Makrayu.

Kata Kunci: Antena Yagi, Wi-Fi 2.4 GHz, CST Studio Suite, *Gain*, *Signal-to-Noise Ratio* (SNR).

ABSTRACT

DESIGN AND BUILD 2.4 UGHZ YAGI ANTENNA AS A WIFI SIGNAL BOOSTER IN KORAMIL 418-01 MAKRAYU

(2026 : XIV + 69 Pages + 30 Pictures + 10 Tables + 8 Appendices)

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This research aims to design, fabricate, and test the 8-element Yagi Antenna as a directive transmitter to focus the Wi-Fi signal emission in the location. The method stages include modeling on the CST Studio Suite, aluminum fabrication, to laboratory tests using Vector Network Analyzer (VNA) and field tests using MikroTik. The simulation results show very optimal performance with a Return Loss of -24.516 dB, VSWR of 1.124, impedance of 50 Ω , Bandwidth of 218.6 MHz, and Gain of 12.54 dBi. After fabrication, real measurements using VNA showed precision results with an impedance of 49.84 Ω , VSWR 1.2, and a Return Loss of -19.96 dB, which successfully met the telecommunications industry feasibility standard ($VSWR \leq 1.5$). Through the calculation of the comparison method of two antennas with the Spectrum Analyzer, the actual gain value of 13,609 dBi was obtained, successfully exceeding the initial target (≥ 9 dBi). In field tests up to 20 meters, the Yagi Antenna consistently provides much stronger signal strength than MikroTik's built-in omni antenna, with the most significant increase at a distance of 5 meters of 20 dB (-52 dBm on the Yagi Antenna compared to -72 dBm on the built-in antenna). In addition, at the farthest distance (20 meters), the Yagi Antenna managed to boost the Signal-to-Noise Ratio (SNR) value from the critical limit of 15 dB to 25 dB. This study concludes that the 8-element Yagi Antenna effectively provides stronger, stable, and minimal noise interference Wi-Fi signal coverage to support activities at Koramil 418-01 Makrayu.

Keywords: Yagi antenna, Wi-Fi 2.4 GHz, CST Studio Suite, gain, signal-to-noise ratio (SNR).