

ABSTRAK

EVALUASI EFEKTIVITAS INSULATED GROUND SHIELD WIRE (IGSW) DALAM MENGURANGI GANGGUAN SAMBARAN PETIR PADA SUTT 70 KV LABUAN BAJO – RANGKO

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Gangguan akibat sambaran petir pada sistem transmisi SUTT 70 kV Sec. Labuan Bajo – Rangko yang menimbulkan back flashover, ditandai dengan trip PMT dan berhasil *Auto Reclosing* terjadi pada tanggal 2 Februari 2026. Buruknya sistem pentanahan tower mengakibatkan gangguan itu terjadi. Penelitian ini bertujuan menganalisis kondisi pentanahan tower serta melakukan evaluasi efektivitas dari penambahan proteksi petir *Insulated Ground Shield Wire (IGSW)* dalam mengurangi gangguan sambaran petir. Analisis yang dilakukan menggunakan simulasi *Electromagnetic Transients Program* (EMTP) pada Tower T.005 dengan memvariasikan arus sambaran petir dari 30 kA hingga 182 kA dan nilai tahanan pentanahan IGSW dari 62,1 Ω hingga 3 Ω . Pengukuran data di lapangan, tahanan pentanahan di T.005 mencapai 62,1 Ω atau 20,7 kali lipatnya dari standarnya 3 Ω . Simulasi sambaran petir 182 kA dengan kondisi tower eksisting menghasilkan tegangan pada isolator sebesar 948 kV, jauh diatas batas ketahanan tegangan tembus sebesar 343 kV. Penambahan IGSW dengan pentanahan 3 Ω pada sambaran 30 kA terbukti menurunkan tegangan tembus sebesar 69,6 % dan menaikkan arus kritis *back flashover* menjadi 45-46 kA dari sebelumnya kurang dari 30 kA. Namun pada sambaran ekstrem 182 kA efektivitas IGSW menurun menjadi 7,6% karena isolator IGSW mengalami *flashover*. Dapat disimpulkan bahwa IGSW efektif mengurangi gangguan pada sebagian besar sambaran petir, namun tidak mampu mencegah *back flashover* pada sambaran berarus ekstrem.

Kata kunci : *Back flashover*, IGSW, pentanahan tower, sambaran petir.

ABSTRACT

EVALUATION OF THE EFFECTIVENESS OF INSULATED GROUND SHIELD WIRE (IGSW) IN REDUCING LIGHTNING STRIKE DISTURBANCES ON THE 70 KV LABUAN BAJO – RANGKO TRANSMISSION LINE

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A lightning-induced disturbance on the 70 kV overhead transmission line of the Labuan Bajo – Rangko Section, which caused back flashover and was marked by circuit breaker (PMT) tripping and a successful Auto Reclosing, occurred on 2 February 2026. The poor condition of the tower grounding system caused this disturbance to occur. This study aims to analyze the tower grounding condition and to evaluate the effectiveness of adding Insulated Ground Shield Wire (IGSW) lightning protection in reducing lightning-induced disturbances. The analysis was carried out using an Electromagnetic Transients Program (EMTP) simulation on Tower T.005 by varying the lightning current from 30 kA to 182 kA and the IGSW grounding resistance from 62.1 Ω to 3 Ω . From field measurements, the grounding resistance at T.005 reached 62.1 Ω , or 20.7 times higher than its standard of 3 Ω . The simulation of a 182 kA lightning strike under the existing tower condition produced an insulator voltage of 948 kV, far above the insulator withstand voltage limit of 343 kV. The addition of IGSW with 3 Ω grounding at a 30 kA strike was proven to reduce the insulator voltage by 69.6% and to raise the critical back flashover current to 45–46 kA from previously below 30 kA. However, at the extreme 182 kA strike, the IGSW effectiveness decreased to 7.6% because the IGSW insulator experienced flashover. It can be concluded that IGSW effectively reduces disturbances for most lightning strikes but is unable to prevent back flashover at extreme lightning currents.

Keywords: *Back flashover, IGSW, tower grounding, lightning strike*