# INTISARI

Latar belakang penelitian ini didasari oleh tingginya persentase kegagalan isolator polimer saat pengujian *steep front impulse* yang mencapai 41% menurut studi, sehingga diperlukan metode deteksi dini yang andal untuk mendeteksi cacat internal atau *puncture*. Tujuan dilakukannya penelitian adalah untuk menganalisis karakteristik parameter pengujian seperti tegangan puncak *(peak voltage)*, waktu muka *(front time)*, dan kecuraman *(steepness)* pada isolator polimer 20 kV jenis tumpu, serta mengidentifikasi pengaruh adanya cacat buatan terhadap parameter tersebut dan fenomena *flashover* yang menyertainya.

Eksperimen dilakukan dengan prosedur pengujian *steep front impulse voltage* menurut standar IEC 62217 di Laboratorium Tegangan Tinggi DTETI FT UGM menggunakan pembangkit impuls Passoni Villa 1200 kV-60 kJ dan serangkaian skema uji yang meliputi isolator normal serta isolator dengan lubang buatan. Data gelombang tegangan impuls dianalisis menggunakan osiloskop dan pemrosesan data berbasis *software* Python, sementara fenomena visual *arc* saat terjadi *flashover* terekam menggunakan kamera digital.

Hasil penelitian menunjukkan bahwa rentang tegangan pengujian *steep front impulse* yang efektif pada studi ini berada pada 20%-80% puncak *full lightning impulse* dengan nilai *steepness* maksimum tercatat pada sekitar 60% puncaknya. Isolator dengan lubang/cacat memperlihatkan penurunan rata-rata nilai *peak voltage, front time* yang relatif lebih singkat, dan peningkatan *steepness* dibandingkan isolator normal. Selain itu, pola *arc* saat *flashover* cenderung mengarah dan berkonsentrasi pada titik lokasi lubang. Simpulan penelitian menyatakan bahwa pengujian *steep front impulse voltage* efektif sebagai teknik deteksi dini untuk mengidentifikasi *puncture* pada isolator polimer, dengan perubahan nilai parameter gelombang impuls serta perubahan pola visual *arc* menjadi indikator kuat adanya kerusakan di area kritis yaitu area *base end fitting*.

Kata kunci : isolator polimer, *steep front impulse voltage*, *steepness*, *front time*, *peak voltage*

# ABSTRACT

*The background of this research is based on the high failure rate of polymer insulators during steep front impulse testing, which reaches 41% according to previous studies, indicating the need for an early and reliable detection method to identify internal defects or puncture. The objectives of this study is to analyze the characteristics of test parameters, such as peak voltage, front time, and steepness on 20 kV polymer insulators, as well as to identify the effect of artificial defects on these parameters and the accompanying flashover phenomenon.*

*The experiment was conducted using the steep front impulse voltage test procedure based on IEC 62217 at the High Voltage Laboratory of the Department of Electrical Engineering and Information Technology, Faculty of Engineering, Universitas Gadjah Mada, using a Passoni Villa 1200 kV-60 kJ impulse generator and a series of test schemes involving both normal insulators and insulators with artificial holes. Impulse voltage waveforms were recorded using an oscilloscope and processed using Python-based software, while visual arc phenomena during flashover were recorded using a digital camera.*

*The results show that the effective range of steep front impulse testing in this study is between 20% and 80% of the full lightning impulse peak voltage, with the maximum steepness occurring at approximately 60% of its peak. Insulators with holes/defects exhibited a decrease in the average values of peak voltage and front time, as well as an increase in steepness compared to normal insulators. Furthermore, the arc pattern during flashover tended to lead toward and concentrate on the hole location. The study concludes that steep front impulse voltage testing is an effective technique for the early detection of internal defects leading to puncture in polymer insulators, and that variations in impulse waveform parameters combined with visual arc patterns provide strong indicators of critical defect locations (base end fitting).*

***Keywords*** *: polymer insulators, steep front impulse voltage, steepness, front time, peak voltage*