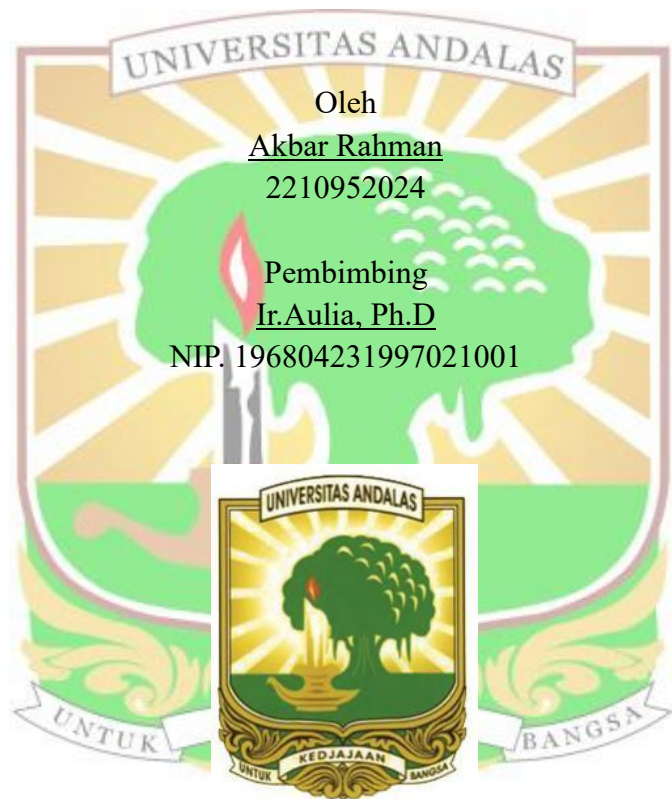


# **ANALISIS KARAKTERISTIK SINYAL EMISI AKUSTIK PADA LUCUTAN KORONA MENGGUNAKAN METODE PENGODEAN PREDIKTIF LINEAR**

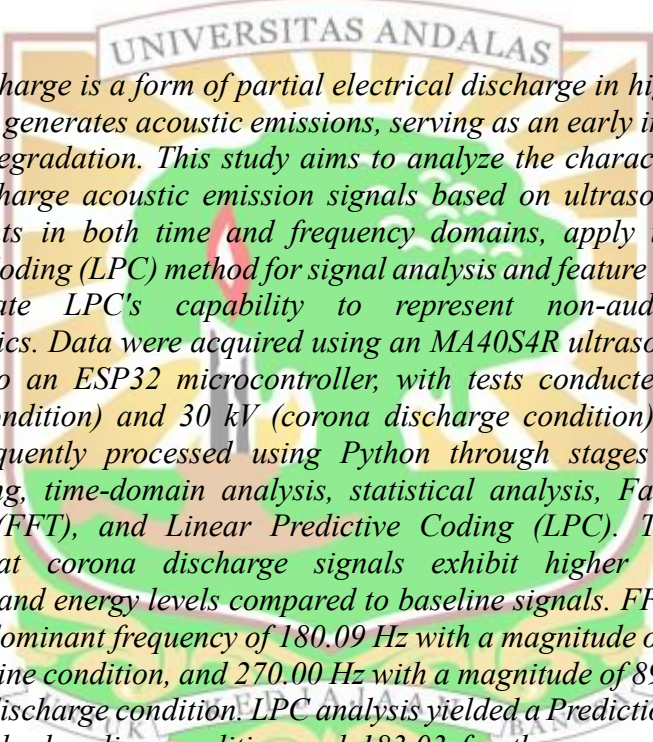
## **TUGAS AKHIR**

Karya Ilmiah sebagai salah satu syarat untuk menyelesaikan jenjang strata satu (S-1) di Departemen Teknik Elektro, Fakultas Teknik, Universitas Andalas



**Program Studi Sarjana  
Departemen Teknik Elektro  
Fakultas Teknik Universitas Andalas  
2026**

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| Judul                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ANALISIS KARAKTERISTIK SINYAL EMISI AKUSTIK PADA LUCUTAN KORONA MENGGUNAKAN METODE PENGODEAN PREDIKTIF LINEAR | Akbar Rahman |
| Program Studi                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Teknik Elektro                                                                                                | 2210952024   |
| Fakultas Teknik Universitas Andalas                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                               |              |
| <p style="text-align: center;"><b>Abstrak</b></p> <p><i>Corona discharge</i> merupakan salah satu bentuk pelepasan muatan listrik parsial pada sistem tegangan tinggi yang menghasilkan emisi akustik dan dapat digunakan sebagai indikator awal kerusakan isolasi. Penelitian ini bertujuan untuk menganalisis karakteristik sinyal emisi akustik <i>corona discharge</i> berdasarkan data hasil pengukuran sensor ultrasonik pada domain waktu dan domain frekuensi, menerapkan metode <i>Linear Predictive Coding</i> (LPC) dalam analisis dan ekstraksi ciri sinyal, serta mengevaluasi kemampuan LPC dalam merepresentasikan karakteristik sinyal non-audio. Data diperoleh menggunakan sensor ultrasonik MA40S4R yang terhubung dengan ESP32 pada pengujian tegangan 5 kV sebagai kondisi <i>baseline</i> dan 30 kV sebagai kondisi <i>corona discharge</i>. Selanjutnya data diolah menggunakan Python melalui tahapan <i>preprocessing</i>, analisis domain waktu, analisis statistik, <i>Fast Fourier Transform</i> (FFT), dan <i>Linear Predictive Coding</i> (LPC). Hasil penelitian menunjukkan bahwa sinyal <i>corona discharge</i> memiliki amplitudo, fluktuasi, dan energi yang lebih tinggi dibandingkan sinyal <i>baseline</i>. Analisis FFT menghasilkan frekuensi dominan sebesar 180,09 Hz dengan magnitudo 61,19 dB pada kondisi <i>baseline</i> dan 270,00 Hz dengan magnitudo 89,49 dB pada kondisi <i>corona discharge</i>. Analisis LPC menghasilkan <i>Prediction Error</i> sebesar 0,0616 pada kondisi <i>baseline</i> dan 183,03 pada kondisi <i>corona discharge</i>, sehingga menunjukkan adanya perbedaan karakteristik sinyal yang signifikan. Hasil penelitian membuktikan bahwa metode LPC mampu merepresentasikan karakteristik sinyal non-audio serta efektif digunakan untuk mengekstraksi ciri sinyal emisi akustik <i>corona discharge</i> sebagai pendukung sistem pemantauan kondisi peralatan tegangan tinggi.</p> <p><b>Kata Kunci:</b> <i>Corona discharge</i>, Emisi Akustik, <i>Linear Predictive Coding</i> (LPC), <i>Fast Fourier Transform</i> (FFT), Sensor Ultrasonik</p> |                                                                                                               |              |

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| <i>Title</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <i>ANALYSIS OF ACOUSTIC EMISSION SIGNALS CHARACTERISTICS IN CORONA DISCHARGE USING LINEAR PREDICTIVE CODING METHOD</i> | Akbar Rahman |
| <i>Mayor</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <i>Bachelor of Electrical Engineering</i>                                                                              | 2210952024   |
| <i>Faculty of Engineering Andalas University</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                        |              |
| <p style="text-align: center;"><b><i>Absract</i></b></p> <p style="text-align: center;"></p> <p><i>Corona discharge is a form of partial electrical discharge in high-voltage systems that generates acoustic emissions, serving as an early indicator of insulation degradation. This study aims to analyze the characteristics of corona discharge acoustic emission signals based on ultrasonic sensor measurements in both time and frequency domains, apply the Linear Predictive Coding (LPC) method for signal analysis and feature extraction, and evaluate LPC's capability to represent non-audio signal characteristics. Data were acquired using an MA40S4R ultrasonic sensor connected to an ESP32 microcontroller, with tests conducted at 5 kV (baseline condition) and 30 kV (corona discharge condition). The data were subsequently processed using Python through stages including preprocessing, time-domain analysis, statistical analysis, Fast Fourier Transform (FFT), and Linear Predictive Coding (LPC). The results indicate that corona discharge signals exhibit higher amplitude, fluctuation, and energy levels compared to baseline signals. FFT analysis revealed a dominant frequency of 180.09 Hz with a magnitude of 61.19 dB for the baseline condition, and 270.00 Hz with a magnitude of 89.49 dB for the corona discharge condition. LPC analysis yielded a Prediction Error of 0.0616 for the baseline condition and 183.03 for the corona discharge condition, demonstrating a significant difference in signal characteristics. The findings confirm that the LPC method is capable of representing non-audio signal characteristics and is effective for extracting features from corona discharge acoustic emission signals, thereby supporting condition monitoring systems for high-voltage equipment.</i></p> <p><b><i>Keywords:</i></b> <i>Corona discharge, Acoustic Emissions, Linear Predictive Coding (LPC), Fast Fourier Transform (FFT), Ultrasonic Sensors.</i></p> |                                                                                                                        |              |