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INVESTIGATING THE CONCEPT OF FRAUNHOFER LINES AS A POTENTIAL METHOD TO DETECT CORONA IN THE WAVELENGTH REGION 338.67NM – 405NM DURING THE DAY

N.Maistry, John Van Coller[1] and RA Scutz[2]

[1] Faculty of Engineering and the Built Environment, Private Bag 3, Wits 2050, South Africa
[2] Meiring Naude, Pretoria South Arica
Email: nmaistry@csir.co.za

Abstract

It is essential to detect corona discharge as a symptom of insulation breakdown in high voltage (HV) applications. However accuracy of such measurement is often degraded due to the existence of solar background noise in the signal. Fraunhofer lines in the solar spectrum are areas of the solar spectrum where the solar radiation is lower in intensity due to certain wavelengths of light that have been absorbed by gases. This paper will investigate the concept of Fraunhofer lines as a potential method to detect corona in the wavelength region 338,77nm-405nm during the day and through signal processing optimise the signal to noise ratio (SNR). One of the signal processing techniques used was the implementation of an optical narrow band-pass filter. From the results obtained it was determined that the purchased optical filter was not filtering out the solar radiation and hence no corona was detected. The signal to noise ratio was 0.0314. Hence a new approach of simulating a narrow band-pass filter in MATLAB was applied. The MATLAB model allowed the filter to adjust its bandwidth along the wavelength range until the highest SNR was obtained. The SNR was 2.121. The simulated filter specifications that generated the highest SNR had a full width half maximum (FWHM) of 0.05nm and central wavelength (CWL) of 357.558nm which coincided with the wavelength of a different Fraunhofer line and a different corona peak. The results verified a 67% increase in the SNR ratio. Additionally correlation proved to be an efficient technique to detect corona in the presence of solar radiation.