

# The influence of phase angle harmonic voltage variations on partial discharge measurement = Pengaruh perubahan variasi sudut fasa tegangan harmonik pada pengukuran partial discharge

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## Abstrak

### **ABSTRACT**

HDPE High density Polyethylene is one of the common insulation material that is used for high voltage equipment where partial discharge could happen. The duration of electrical insulation is dependent on the voltage that applied. Supply voltage being distorted caused by loads. This load is influenced by switching which cause harmonic modulation. Partial discharge activity is being monitored by combining the fundamental frequency with variant of harmonics 3rd, 5th, 7th and also the variant of phase angle of harmonics 0, 90, 180, 270. The measurement is focused on partial discharge inception voltage by stepping up voltage for 1s in every 10s until it reaches the specific value where THD was kept constant at 10. The measurement The fundamental frequency in PDIV results in a higher voltage than the varied phase angle harmonics combination in VMAX, where it can also be concluded that the trend of varied combination has the same trend of the simulation of VMAX. Thus, the average charge and repetition rate of varied measurements have also the same trend. It can be concluded when phase angle shifted, VMAX is also shifted causing the peak value of combined waveform to increase. This affected the changing of average charge and repetition rate. The influence of phase angle harmonics should be considered, since the result of the average charge and repetition rate has higher value than the fundamental frequency.

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### **ABSTRAK**

HDPE High-density Polyethylene merupakan salah satu peralatan tegangan tinggi berbahan isolasi dimana bisa terjadi partial discharge. Kemampuan ketahanan isolasi listrik bergantung terhadap besarnya tegangan yang diterapkan. Tegangan pasokan terdistorsi karena adanya beban. Beban ini dipengaruhi oleh switching yang menyebabkan terjadinya modulasi harmonik. Aktivitas partial discharge diukur dengan menggabungkan variasi harmonik ke-3, -5, -7 dan variasi sudut harmonik 0, 90, 180, 270. Pengukuran menggunakan partial discharge inception voltage dengan menaikkan tegangan selama 1 detik di setiap 10 detik hingga mencapai nilai tertentu dimana total distorsi harmonik bernilai konstan di 10. Hasil pengukuran frekuensi dasar di PDIV menghasilkan nilai tegangan lebih tinggi ketika terjadi variasi sudut harmonik di tegangan maksimum dan menghasilkan tren yang sama dengan simulasi tegangan maksimum. Hal ini mengakibatkan rata-rata charge dan repetition rate pada pengukuran memiliki tren yang sama. Hal ini dapat disimpulkan ketika sudut fasa berubah, maka tegangan maksimum juga berubah yang menyebabkan naiknya nilai kombinasi sudut gelombang. Perubahan ini akan mengakibatkan perubahan nilai rata-rata dan repetition rate. Pengaruh harmonik sudut fasa harmonik harus dipertimbangkan karena hasil dari nilai rata-rata charge dan repetition rate memiliki nilai yang lebih tinggi dibandingkan nilai frekuensi dasar.