

Comparison Study of UHF Sensor Modelling Based on 4th Order Hilbert Fractal Category for Partial Discharge Detection in Power Transformer

Abstract

PD detection is an effective method of inspecting insulation defects and identifying potential faults in a power transformer. Electromagnetic waves generated due to PD can be detected by ultrahigh-frequency (UHF) sensor in the frequency band greater than 300 MHz. However, the size and the frequency bandwidth of a UHF sensor for PD detection are the concern for practical installation inside a transformer. High sensitivity and wide bandwidth of sensors are needed in order to detect the PD signal at an early stage. This paper presents an array with partial ground 4th order Hilbert fractal UHF sensor for PD detection inside a power transformer. This UHF sensor was modeled to capture PD signal in a range of frequencies between 300 MHz to 3 GHz. The sensor is designed by using CST software where the transmission lines combined 2 sensors become 1 output by setting the dimension of 100 x 200 mm for length and width with an FR4 epoxy substrate of thickness 1.6 mm. Based on the simulation result, the proposed sensor is obtained a PD signal measurement with a reflection coefficient below -10 dB with VSWR ≤ 5 . The advantages of this sensor have a wide bandwidth, high sensitivity and suitable size for easy installation. Thus, this sensor has been qualified as UHF PD detection in the power transformer.

Keywords

CST Software; Hilbert Fractal; Partial Ground; Transformer; UHF Sensor