



How to Analyze Partial Discharge

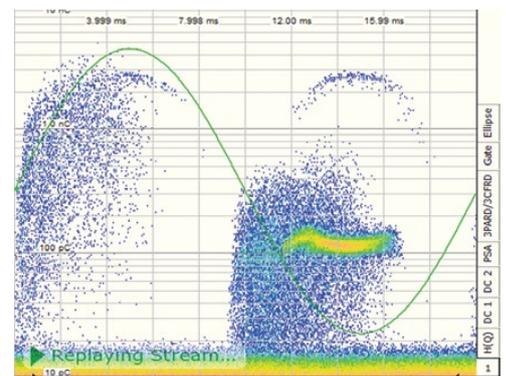
There are several well-known approaches of partial discharge (PD) analysis. The most common ones are:

- The use of Phase-Resolved Partial Discharge (PRPD), with the PD charge over the phase angle
- The PD trend over time
- The PD charge dependency of the high voltage (Q(U))
- Statistical TDR (sTDR) for localization, where the travelling times in a cable are used to determine the PD position

New approaches introduced by OMICRON are the use of multi-band measurements with one MPD acquisition unit for single-phase source discrimination (3CFRD/3FREQ) and the use of time synchronous measurements with three MPD acquisition units connected to all three phases of a test object (3PARD).

Phase-Resolved Partial Discharge (PRPD) is a well-known tool that provides the possibility to analyze the faults with respect to the phase of the applied voltage. Additional information can be obtained by taking into account the position of the PD pulses in reference to the phase of the voltage.

Figure 1



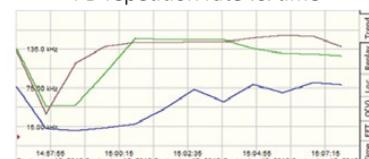
Phase Resolved Partial Discharge

Changes in the PD behavior over time may indicate changes to the PD fault. Some international standards limit the allowed rise of charge during a test to a certain limit.

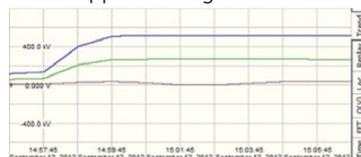
Charge vs. time



PD repetition rate vs. time



Applied voltage vs. time

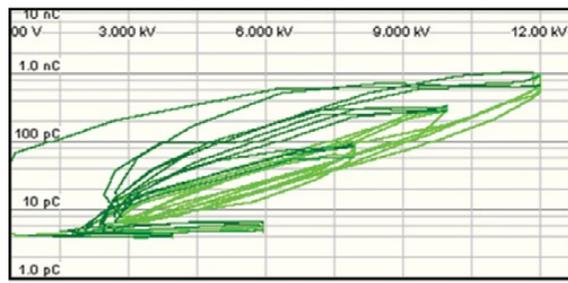


PD repetition rate vs. applied voltage



Figure 2

Q(U) will generate a graph that shows the relationship between test voltage level and PD charge magnitude. Figure 3 shows examples of real PD measurements.



CIGRE WG 21.03, TC21:
Recognition of Discharges,
Elektra No. 11 (1969)

Multiple test voltage runs (4kV, 6kV, 8kV, 10kV, 12kV) by automated test set

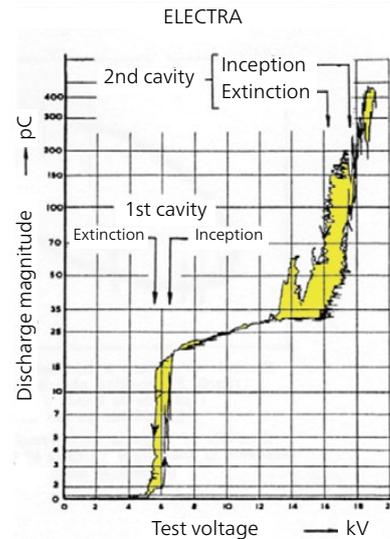


Figure 3

Source: CIGRE publication "Recognition of discharges", www.cigre.org

For fault localization on power cables, OMICRON supports two methods. These include the Time Domain Reflectometry (TDR) and the Statistical TDR (sTDR). Signal propagation along a medium-voltage/high-voltage cable system can be very complex. Therefore, analyzing the test results is one of the main challenges. TDR is a very well-known tool for fault localization. However there are limitations in noisy situations with multiple reflections. The sTDR is more robust in noisy environments and can visualize the multiple reflection points.

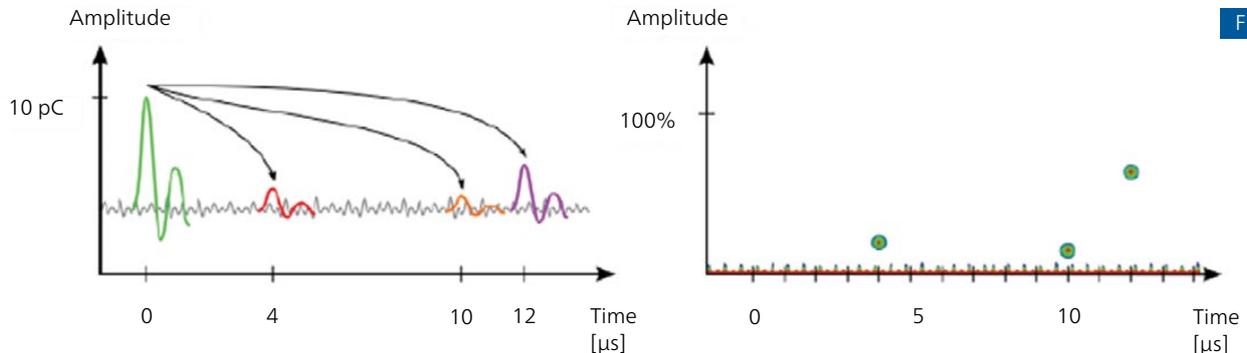


Figure 4

Scope view and schematic of signal correlation for sTDR



Please click [HERE](#) or scan the QR code to watch our PD video on Youtube.

More information about the MPD 600 PD measurement and analysis system is available at:

www.omicronenergy.com/mpd600

Hands-on training is also available from OMICRON Academy, where you can learn how to perform PD measurement and analysis on a variety of electrical assets. Please click [HERE](#) for more information.