Paris Session 2022

UHF Band scanning solution for PD Monitoring

SC D1 PS1 Q6

Question 1.06: Would industry and academia working together more closely lead to new or improved algorithms? What is preventing online PD monitoring becoming widely accepted? Where do the challenges remain to push this technique forward?

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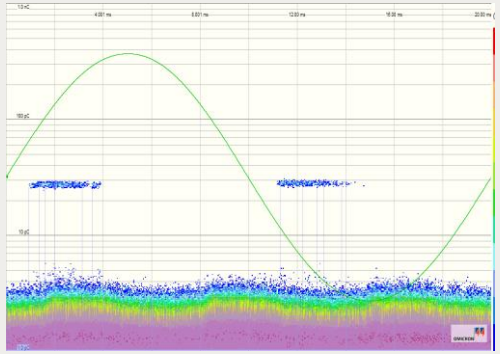
UHF Band scanning potential for PD monitoring

•Mock-up under test

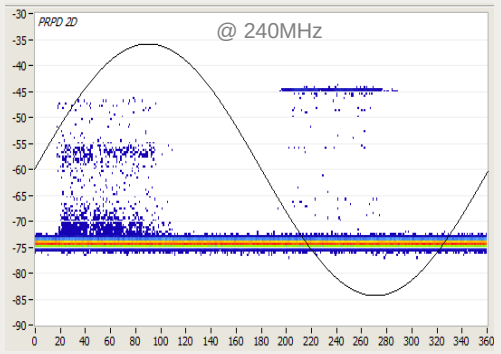
• A recent comparison of conventional UHF “wide band” and “band scanning” PD measurements on a defect-free mock-up was performed in High Voltage lab.

•Two UHF sensors were used: one external and one inside the GIS.

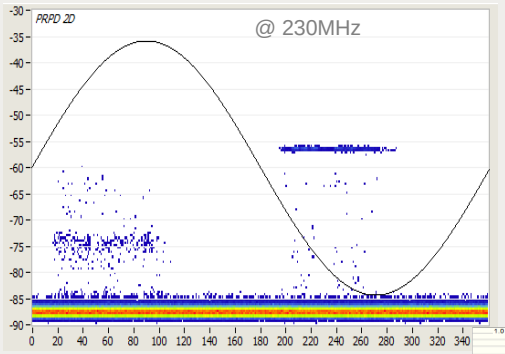
•External PD were measured from 200kV by both systems



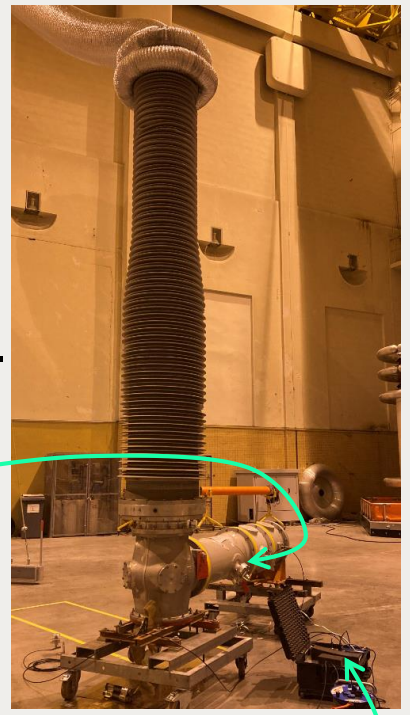
Conventional method



UHF band scanning external sensor



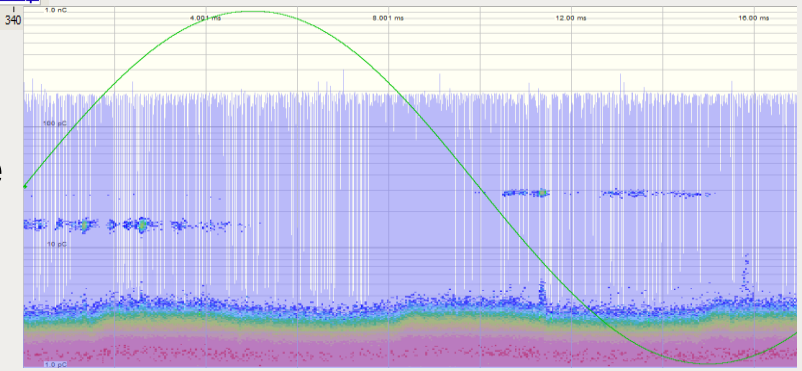
UHF band scanning internal sensor



UHF sensors

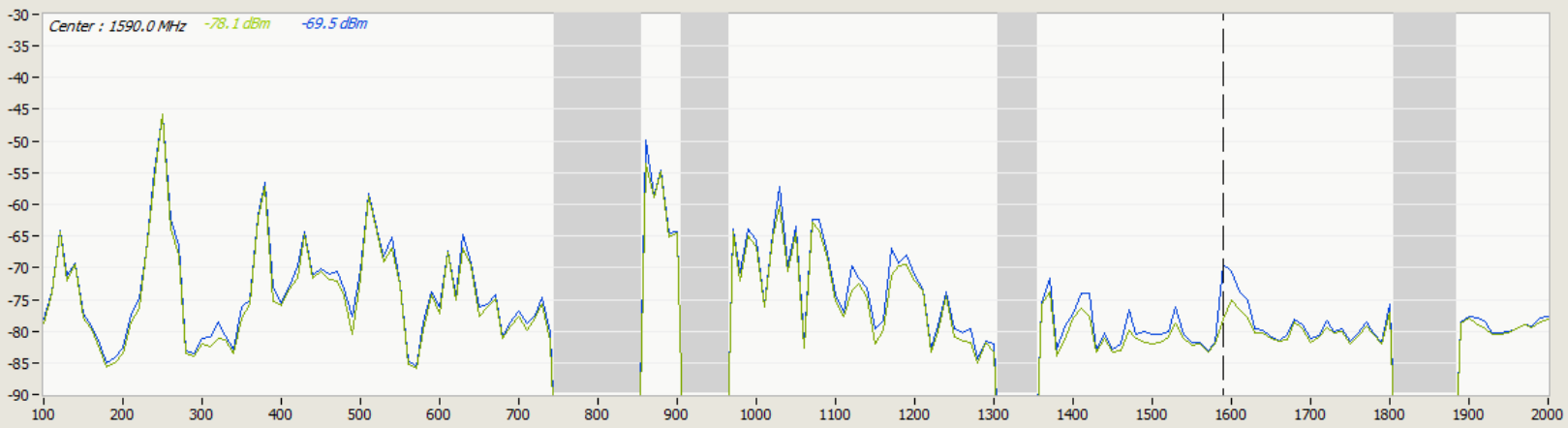
Portable **band scanning** system

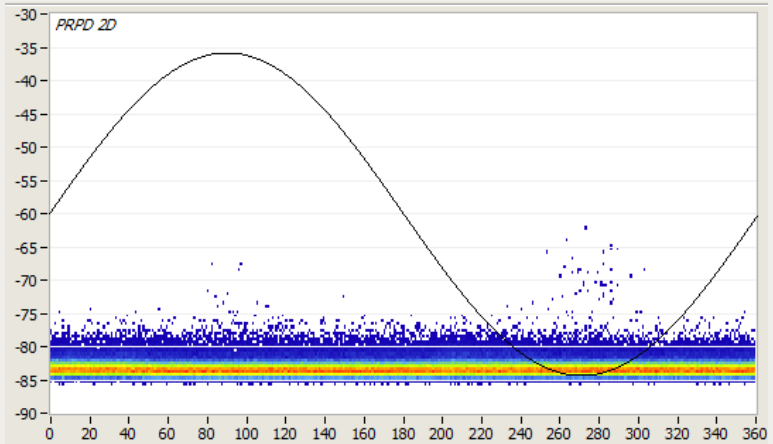
•While the conventional method had be perturbated by external noise like a pump as below, band scanning displayed the frequency band of interest only.



UHF Band scanning potential for PD monitoring

- *In a defect free GIS*
- The breakdown voltage is commonly assumed to be reached without significant PD records. A UHF band scanning monitoring system can detect the small PD activity that takes place just before breakdown in a clean GIS environment.



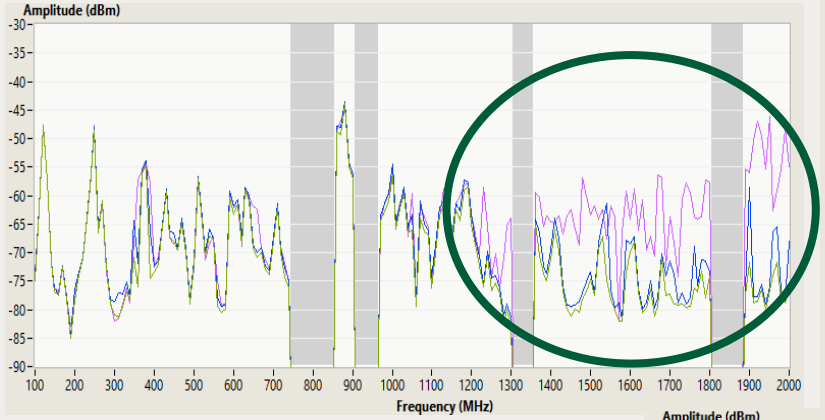


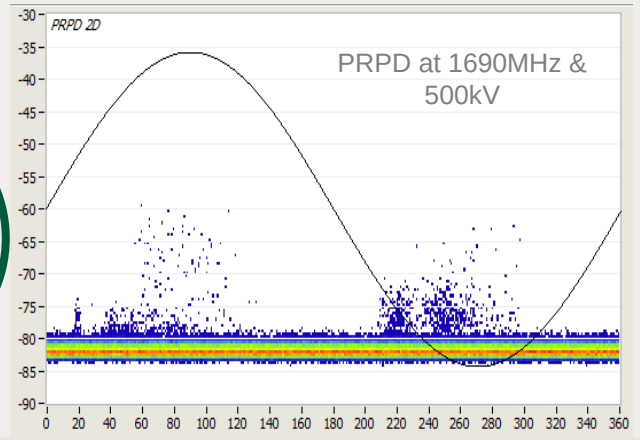
- External PDs are mostly active below 1200MHz, above this level we measured an activity change between spectrums average (green curve) and maximums (blue curve) recorded at 1590MHz. The PRPD at this frequency showed the PDs announcing a breakdown.

UHF Band scanning potential for PD monitoring

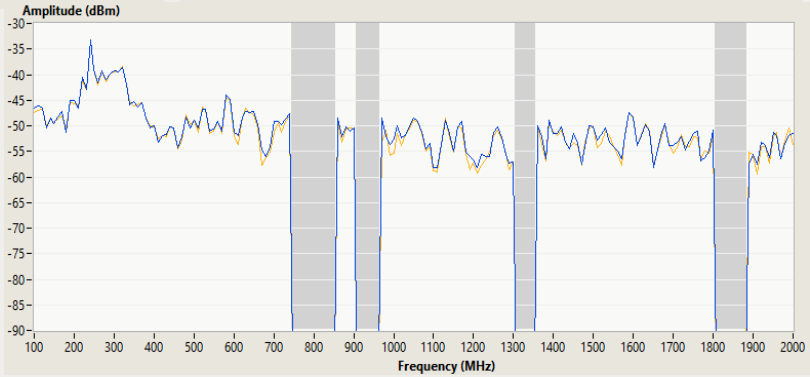
•More measurements of this PD activity were performed showing the spectrum evolution right before breakdown. The spectrums comparison between internal and external activity showed no activity change on the external sensor while a clear activity changed on the internal sensor was observed.

Internal UHF activity at 500kV: average (Green) and maximums (Blue), and 520kV maximums (Purple). At 500kV the pattern announcing the breakdown is recorded, indeed at 520kV a breakdown occurred.





External UHF activity at 500kV maximums (Orange) and 520kV maximums (Blue)



UHF Band scanning potential for PD monitoring

•*Conclusion:*

•UHF band scanning PD monitoring system displays a specific frequency band of interest and then avoid the external perturbations of the testing/site environment.

•This technique is precise enough to measure the PD's announcing a breakdown in a defect free GIS mock-up despite being perturbated by external PDs: external floating potential 30pC permanent, and external noises: nearby pump 200pC not permanent.

•While wide bands systems used on site will trigger spurious alarms because they cannot focus on one specific band of the spectrum. The affect user's trust in UHF monitoring.

•Band scanning systems will be able to monitor specific frequency bands and then different PD activities, differentiating internal and external activities with the help of external sensor.