

Paris Session 2022



Improved sensitivity to detect critical
PD defects required

SC D1

PS 1: Testing, Monitoring and Diagnostics

Q1.06 What is preventing on line PD monitoring becoming widely accepted ?

Claus Neumann (Germany)

CN Power Engineering Consult



Improved sensitivity to detect critical PD defects required

Current User expectations from PDM system application:

- Improved availability & reduction in maintenance costs
- Higher degree of efficiency to support risk assessment process.
- Better determination of “dielectric failure probability”
- Sufficient sensitivity to detect critical defects

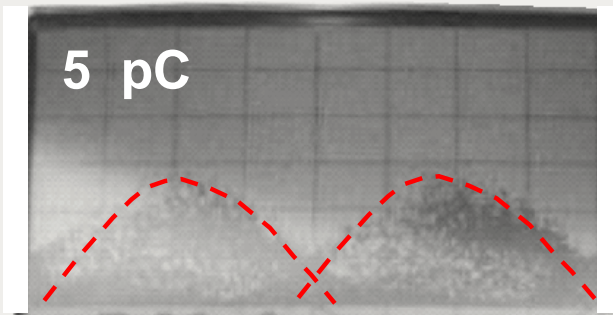
In the past:

- Sensitivity of the PDM system more oriented on detection of mobile particles.
- Detection of other types of defects, e.g. protrusions on HV conductor or particles on insulators, would have required a higher sensitivity, i.e. a more appropriate sensor arrangement.
- Dielectric failures in GIS due to FFO, e.g. in connection with disconnecter switching difficult to predict with PDM systems using sensors located far away.

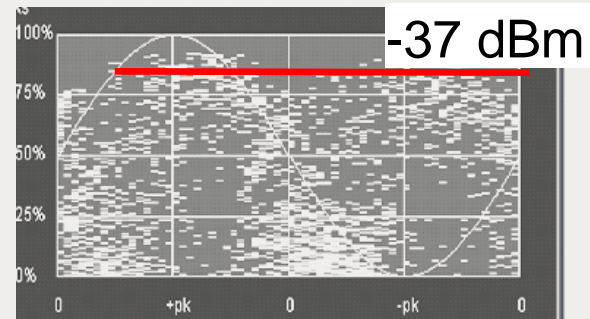
Illustration is given with the reference to a UHF PDM system applied on **GIS/GIL**.

Sensitivity verification Step1 carried out in the lab

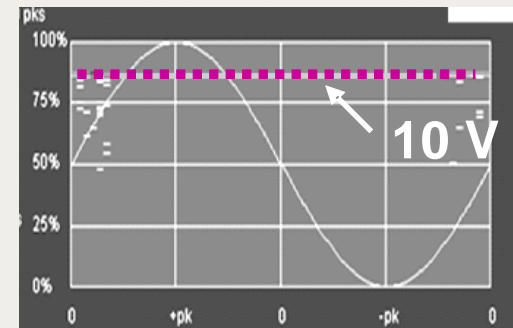
a) Moving particle **MP**



convent. method

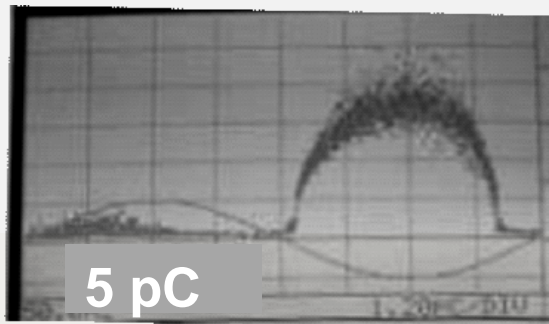


UHF method

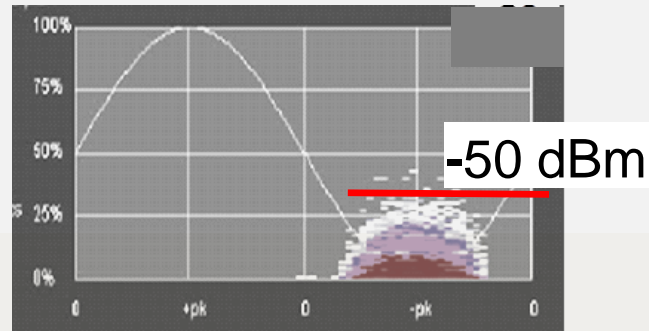


artifical pulse

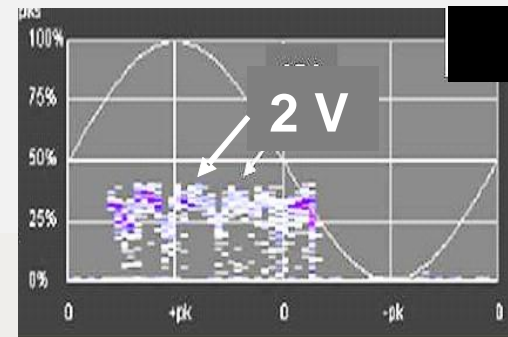
b) Fixed particle on HV conductor **PT**



convent. method
Group Discussion Meeting



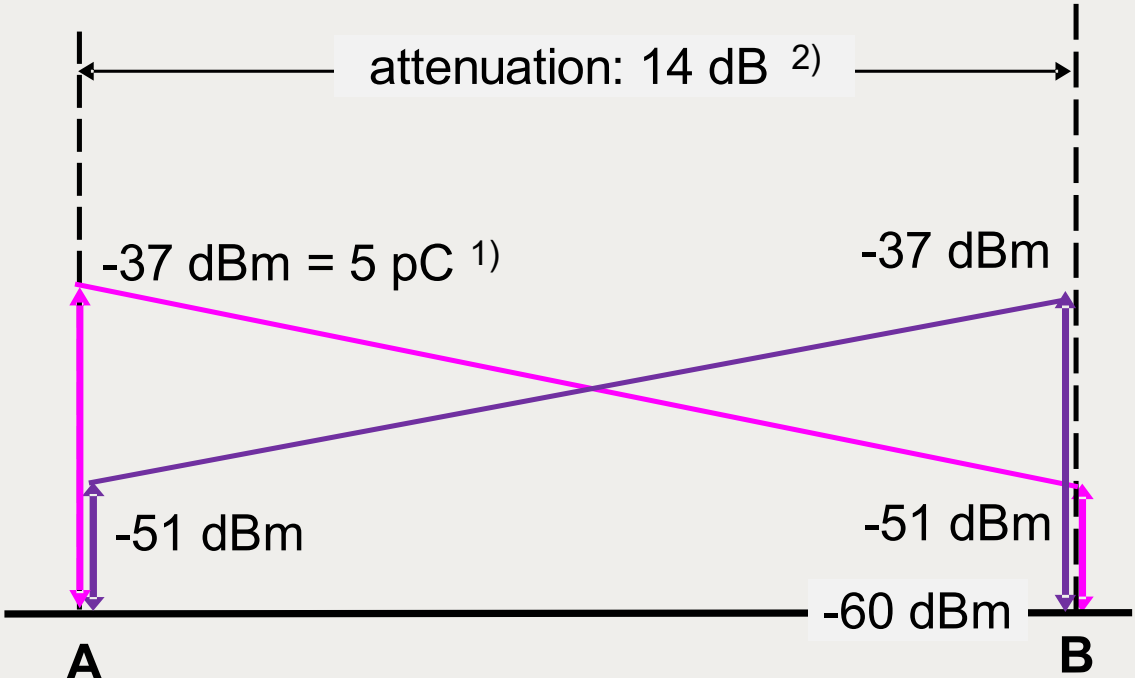
UHF method



artifical impulse

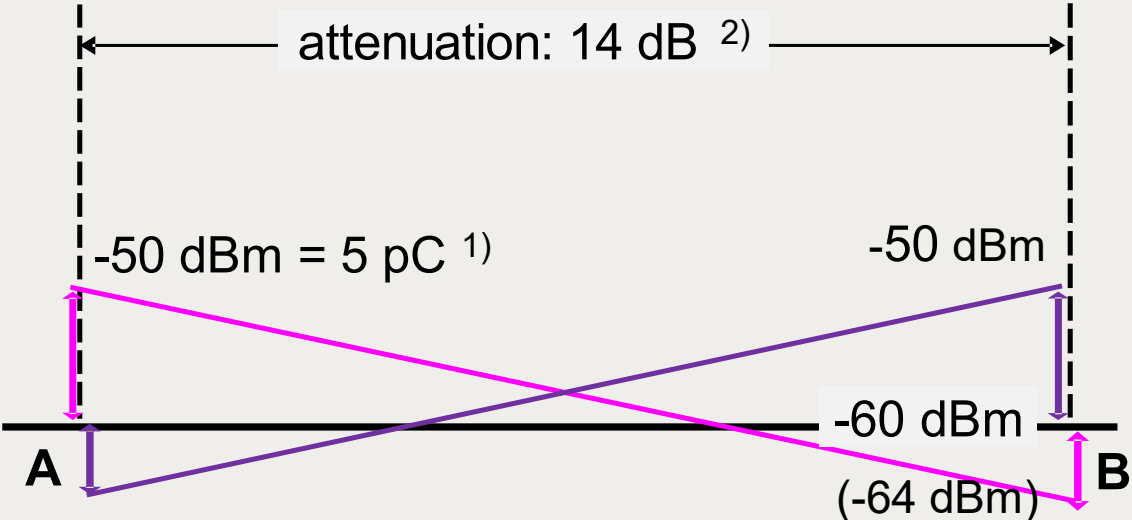
Sensitivity verification Step 2 carried out onsite (TB 654)

a) mobile particle (MP)



➤ Information from Sensitivity Verification:
 1) step 1: mobile particle MP; 2) step 2

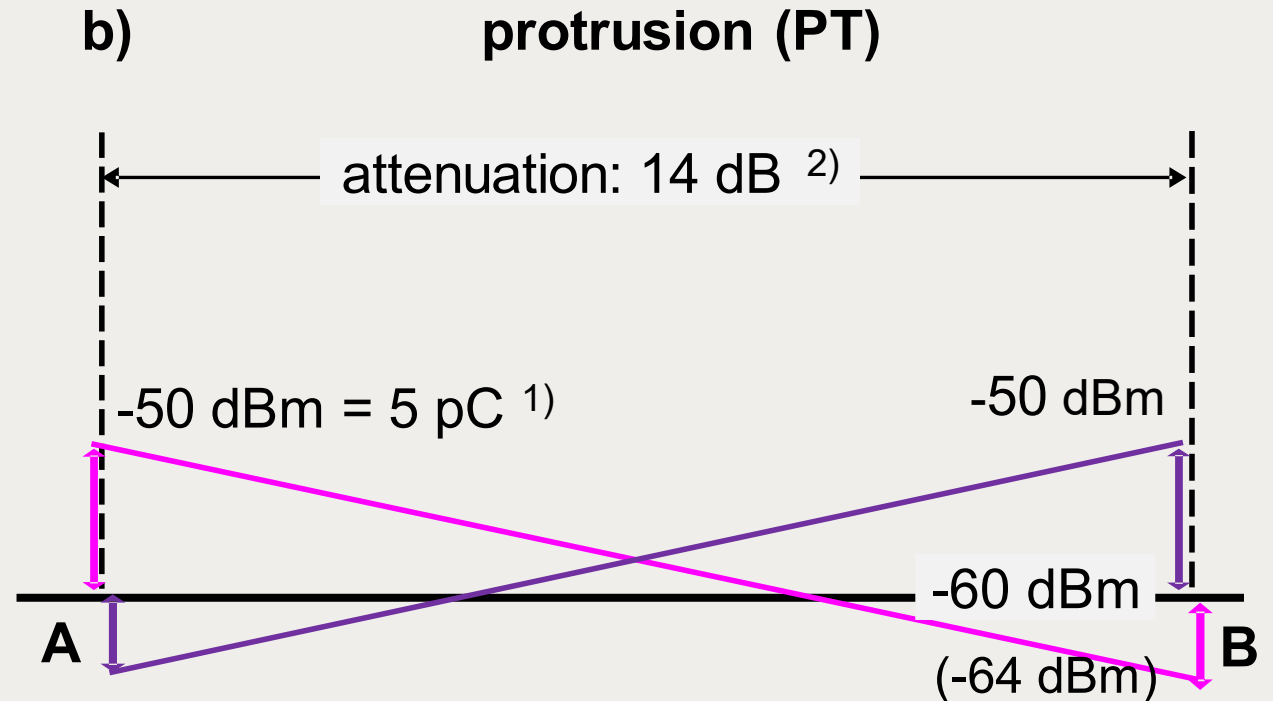
b) protrusion (PT)



➤ Information from Sensitivity Verification:
 1) step 1: protrusion PT; 2) step 2

Is sensitivity sufficient for detection of critical PD defects?

- Critical PD defect => reduction of insulation withstand level below coordination withstand level (U_{cw}) => might lead to dielectric failures.
- Critical defect of PT type => PD magnitude about 1...2 pC at service voltage
- Critical defect of the MP type => PD magnitude of about 5...10 pC.
- Sensitivity **insufficient** for detection of critical PD defects of PT type (in the middle third between sensor A and B)



- Information from Sensitivity Verification:
1) step 1: protrusion PT; 2) step 2

Improvements of PDM system sensitivity required

- Future PDM systems in GIS/GIL => both types of PD defects – MP and PT– to be taken into account in sensitivity verification
- Existing PDM systems => improvement to be achieved by the installation of additional UHF sensors.