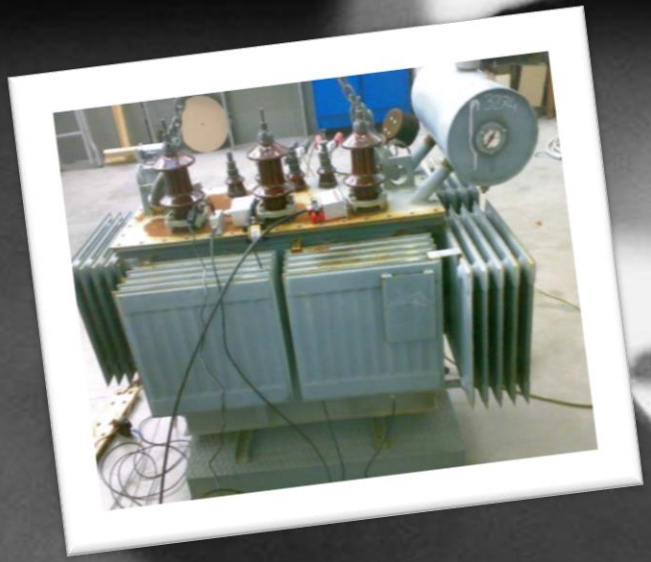
TECHIMP
Italy

TECHIMP **MV TRANSFORMER** CASE STUDIES

LIST OF CASE STUDIES

- 0,4/15 kV MV Transformer – Off-line PD Test
- 0,4/15 kV MV Transformer – On-line PD Test

TECHIMP SpA



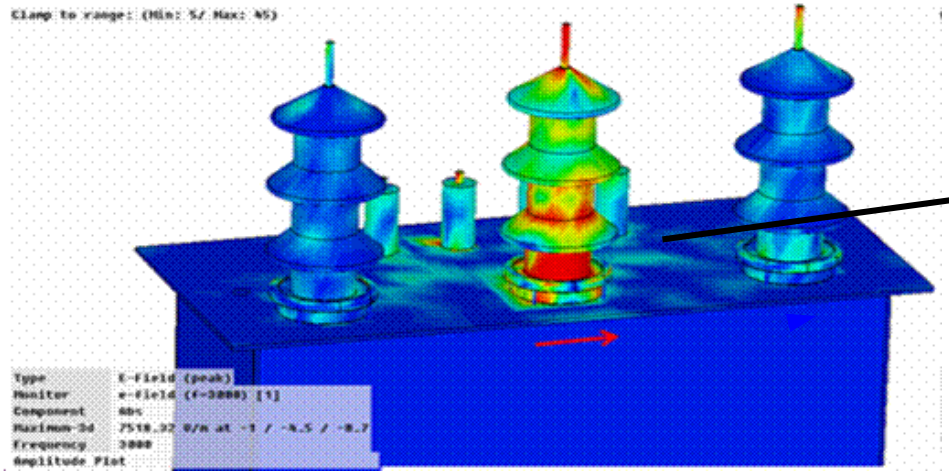
LOCATION	**EUROPE**
EUT	**MV TRANSFORMER**
RATED VOLTAGE	**0,4 / 15 kV**
INSULATION	
LENGTH	
VINTAGE	
TYPE OF TEST	**OFF-LINE**
PD SENSOR	**VARIOUS**

CASE STUDY

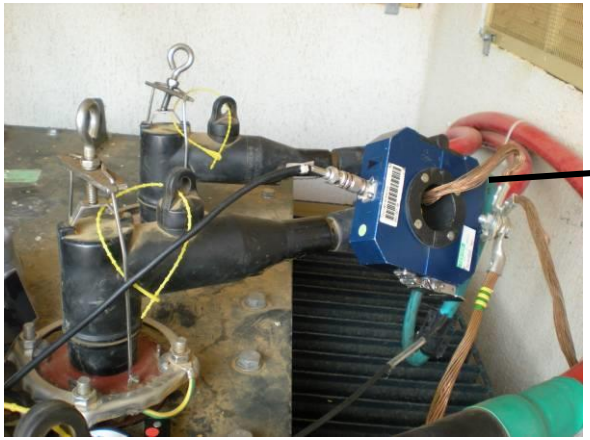
Quality control significantly highlights defects

TRANSFORMERS:

PD pulses originated inside transformers can propagate outside through **conduction** (along the MV cables connected to the transformer) or **irradiation**.



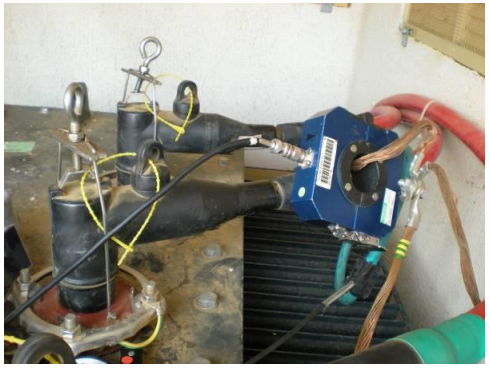
IRRADIATION → Antenna Sensors



CONDUCTION → HFCT or FMC on MV cables

PD measurement setup

- **HFCT:** installed around cable ground lead or directly around cables. Monitoring of PD activities within both transformers and cables.



- **FMC:** tied to the cable. Monitoring of PD activities within both transformers and cables

- **UHF Antenna sensor:** close to cables entrance on the transformer top. Monitoring of PD activities within cable termination and inside transformer

PD measurement setup

Capacitive Coupler

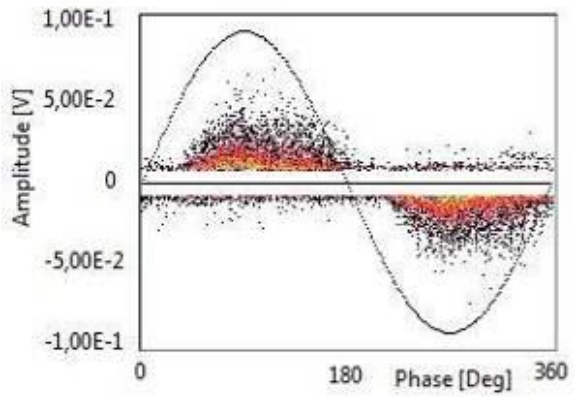
Horn Antenna

TEV Jumper

PD measurement results

Acquisition through capacitive coupler:

- No Amplifier

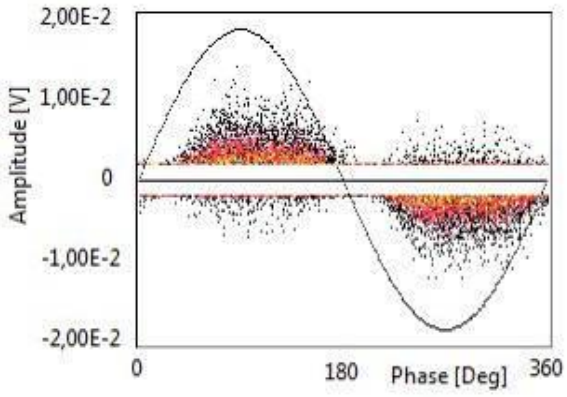


PD Magnitude

- 50 mV

Acquisition through TEV Jumper:

- No amplifier

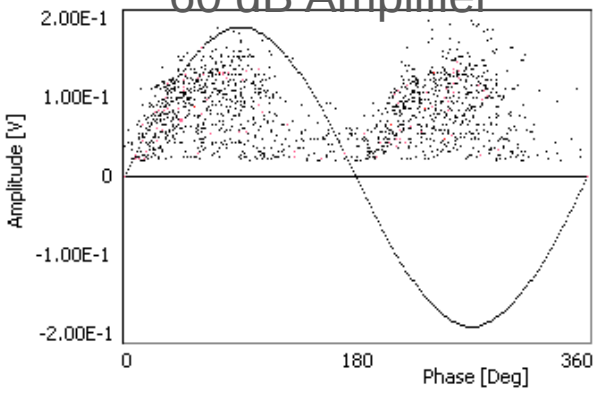


PD Magnitude

- 10 mV

Acquisition through HORN antenna:

- HP 300 MHz and 60 dB Amplifier

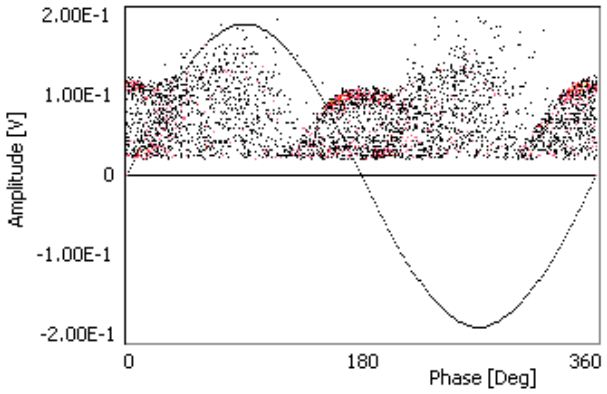


PD Magnitude

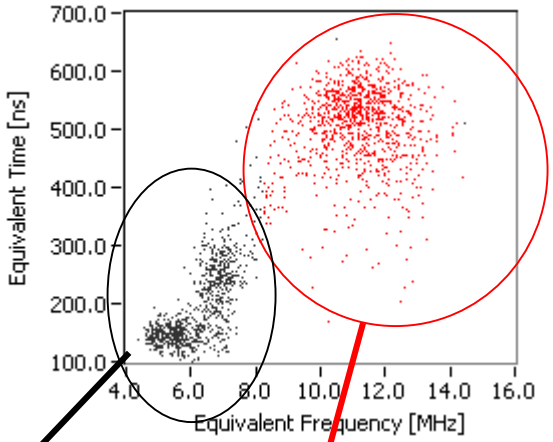
- 150 mV

PD measurement results

Entire Acquisition

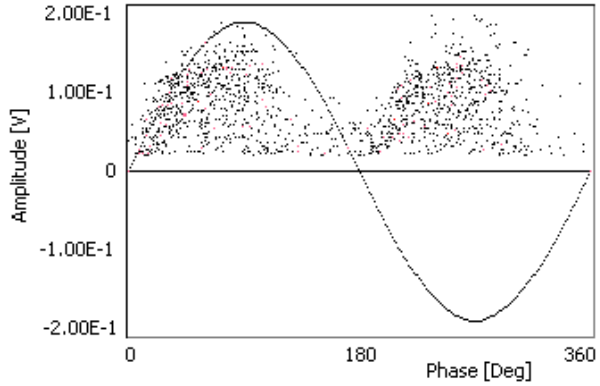


TF Separation Map

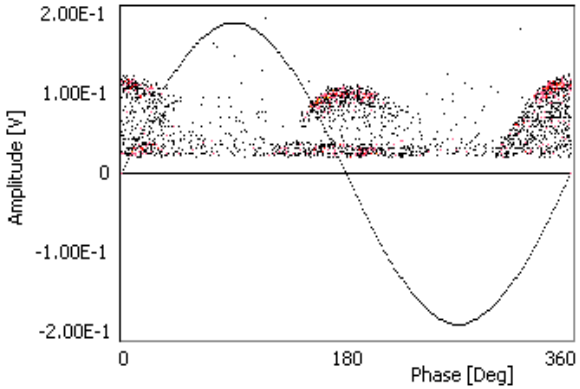


Detection carried out through Horn Antenna sensor

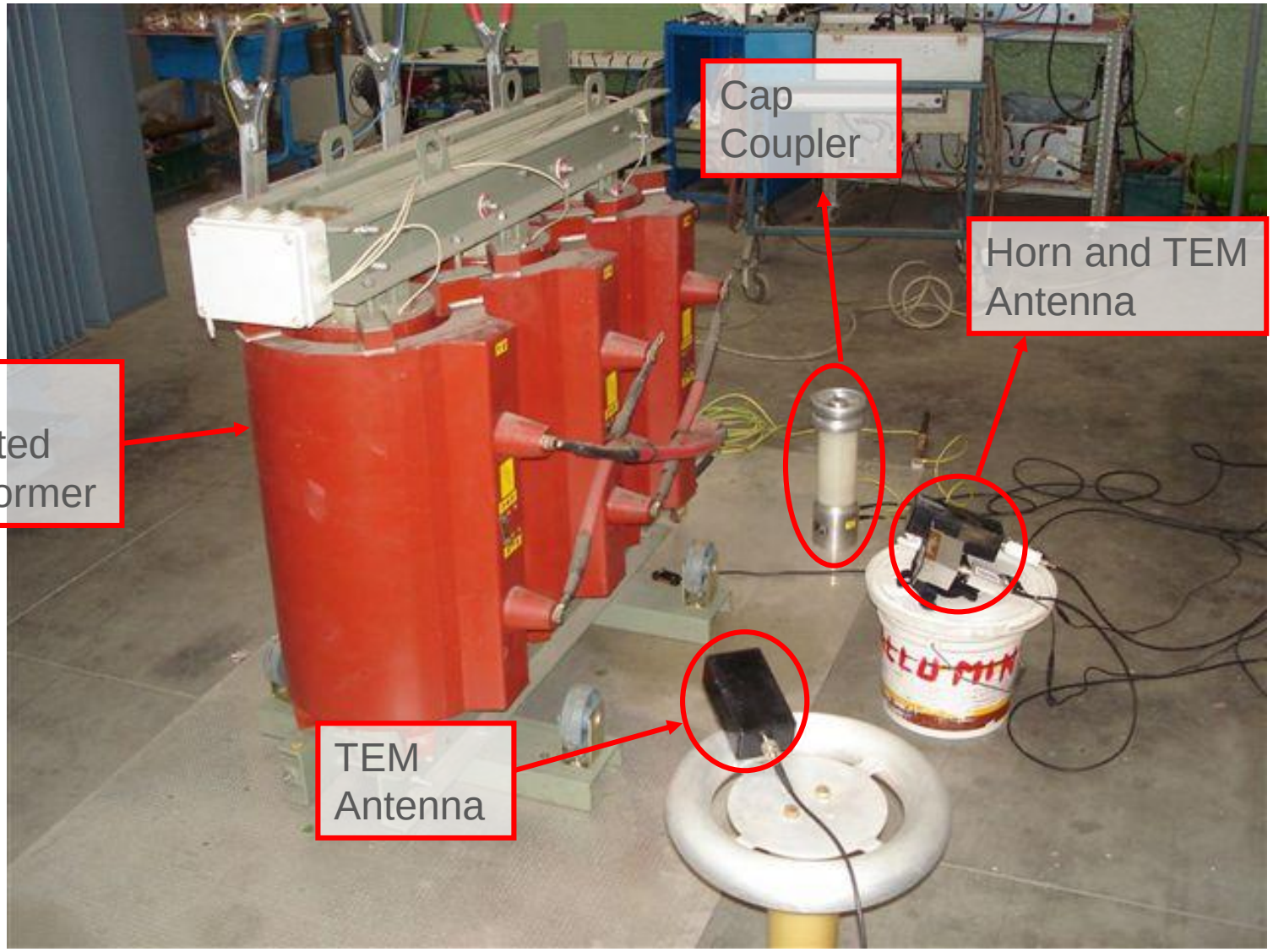
SubPattern A: Internal Defect relevant to Phase A



SubPattern B: Internal Defect relevant to Phase B



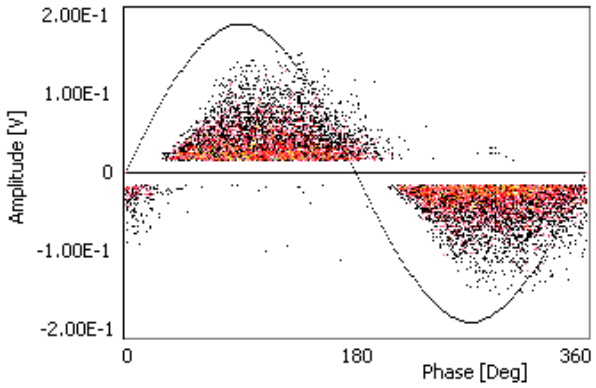
PD measurement results



PD measurement results

Acquisition through capacitive coupler:

- No Amplifier

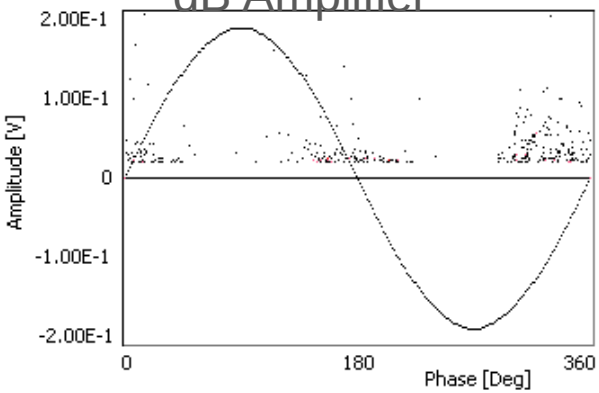


PD Magnitude

- 150 mV

Acquisition through TEM Antenna:

- HP 100 MHz 20 dB Amplifier

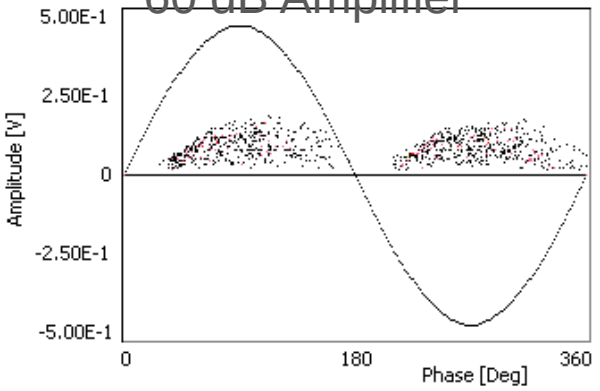


PD Magnitude

- 100 mV

Acquisition through HORN antenna:

- HP 300 MHz and 60 dB Amplifier



PD Magnitude

- 200 mV

TECHIMP SpA

LOCATION	**EUROPE**
EUT	**MV TRANSFORMER**
RATED VOLTAGE	**0,4 / 15 kV**
INSULATION	
LENGTH	
VINTAGE	
TYPE OF TEST	**ON-LINE**
PD SENSOR	**VARIOUS**

CASE STUDY

On-line PD detection allows large number of information to be extracted and correlated in order to get a complete and accurate diagnosis.

PD measurement setup

- No PD test during quality control procedure is required for small oil insulating transformer
- Utilities prefer replace any single failed transformer

BUT

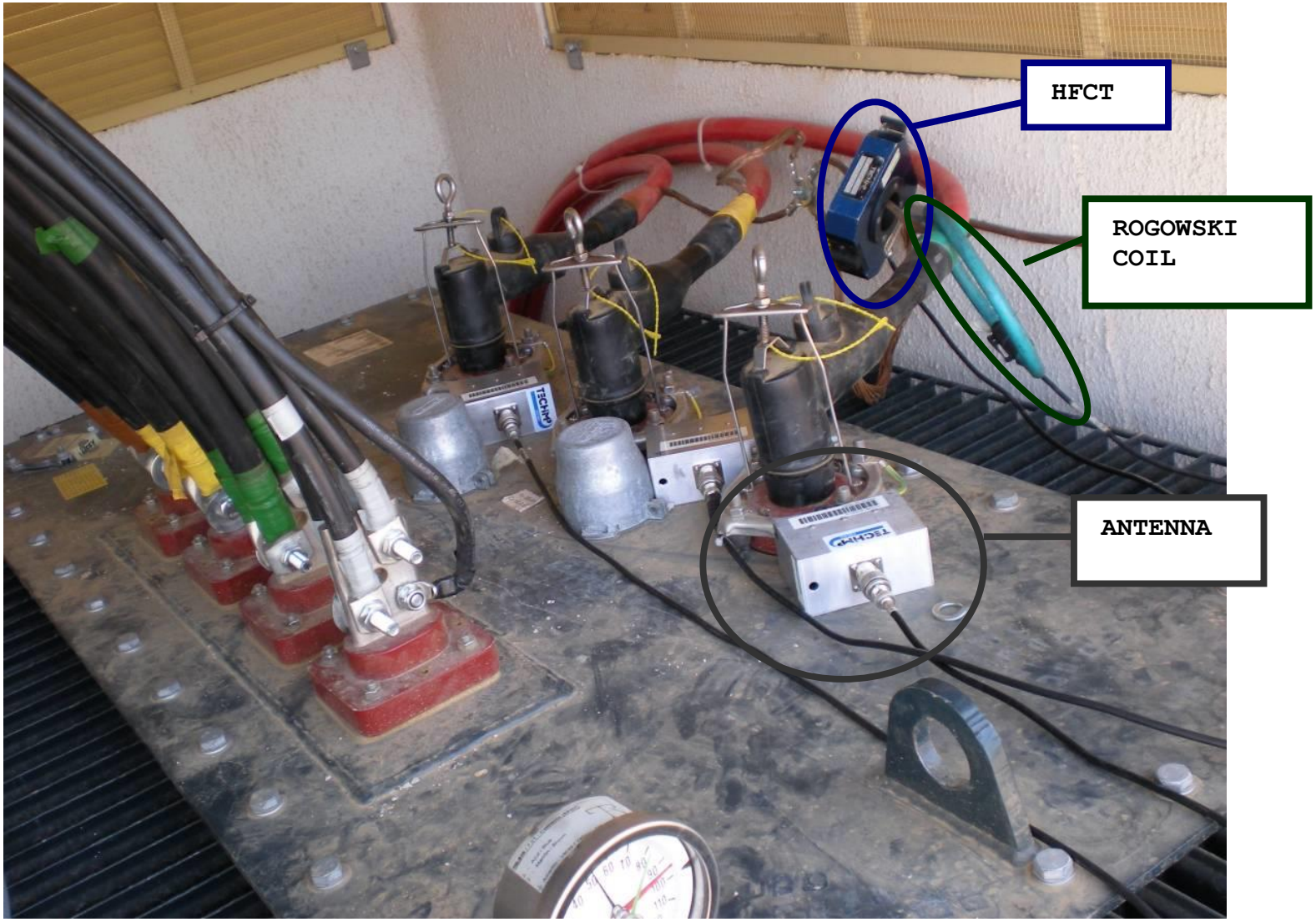
- In this solar plant 5 transformers EXPLODED in 5 months causing significant lost of money and time
- PD tests were carried out after these EXPLOSION both on-field and in factory: PD having very high magnitude were found in several units, preventing further unavoidable failures
- After-laying tests are, in general, avoided for costs reasons
- Using the SAME detector for ALL the assets of a solar park can be reasonable, economically viable and effective.
- It is enough to provide the transformers/cables and switchgears with appropriate sensors and to perform a periodical on-line screening.

PD measurement setup

Transformer just after installation

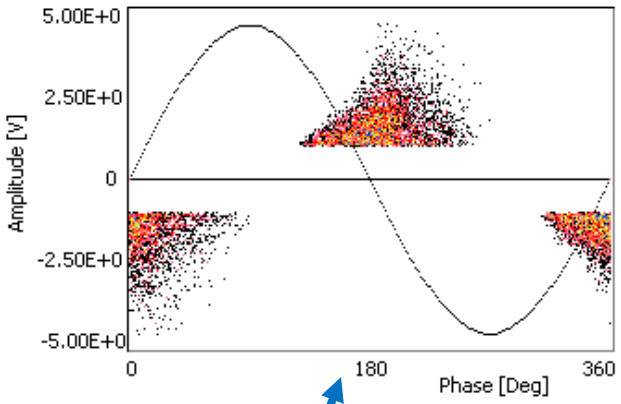
Transformer after the failure

PD measurement setup

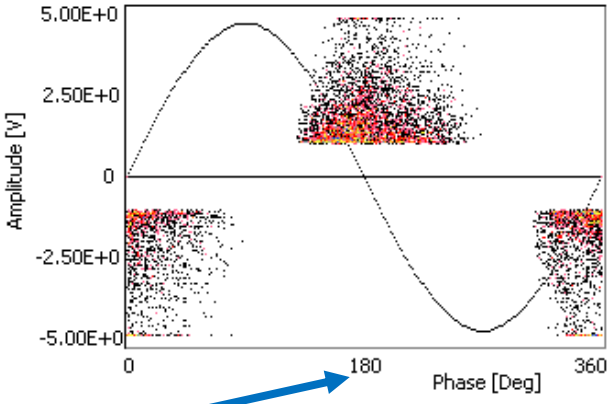


PD measurement results

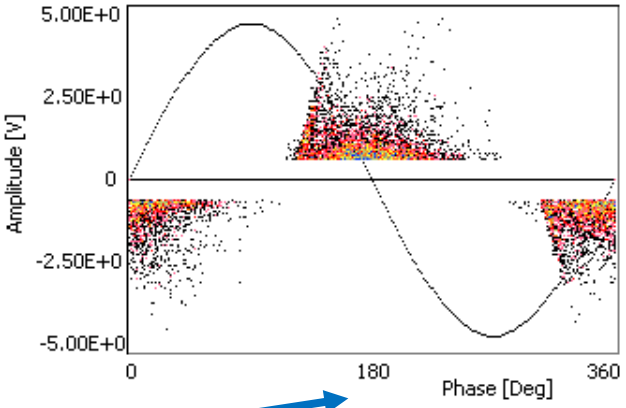
Interfaces PD in Phase Red



Interfaces PD in Phase Yellow

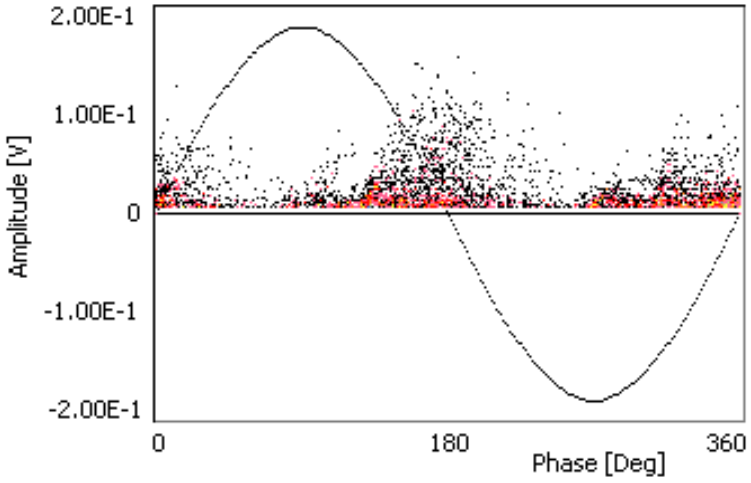


Interfaces PD in Phase Green



HFCT clamped around cable ground lead

UHF Antenna close to the transformer bushing

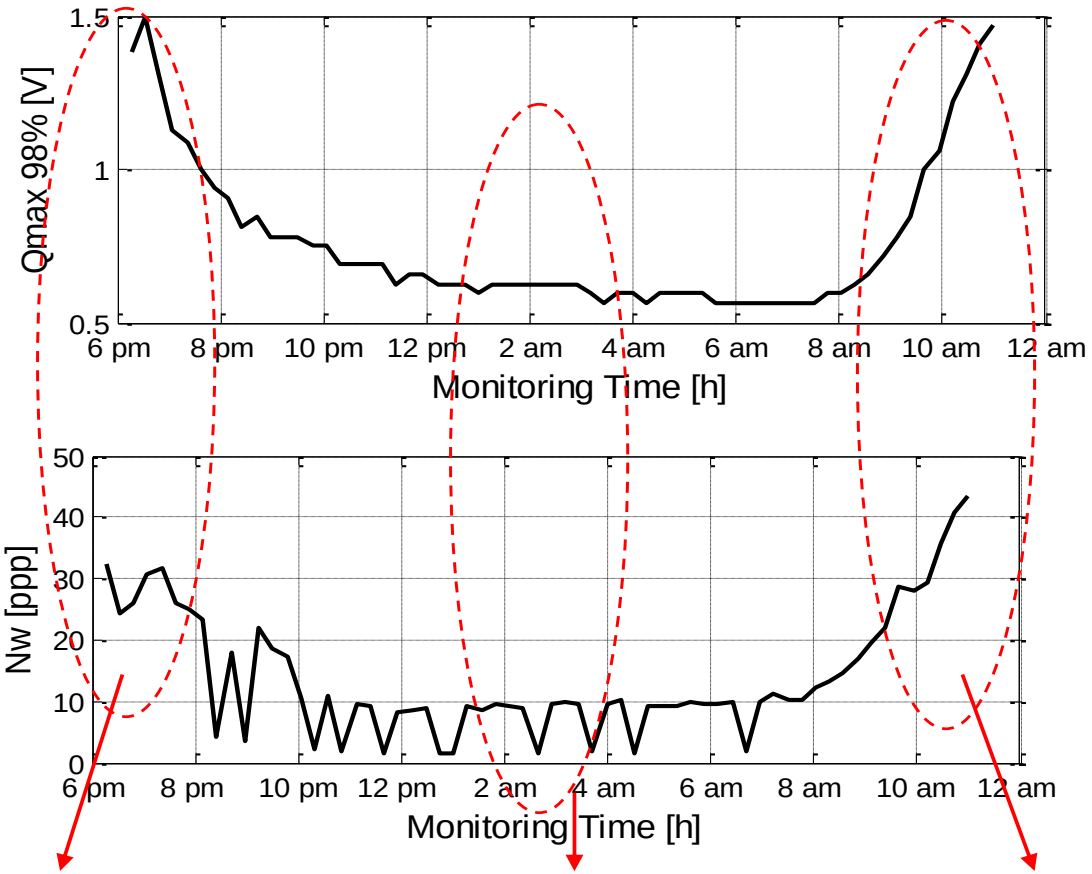


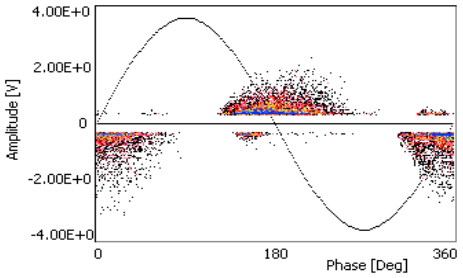
PD measurement results

Same transformer was continuously monitored for 18 hours.

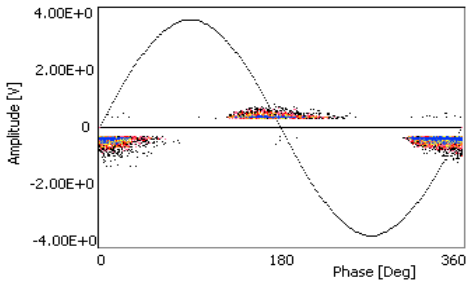
By analyzing the magnitude and repetition rate TREND it is possible to assess the risk associated to the PD activities and, thus,

PREVENT THE FAILURE!!

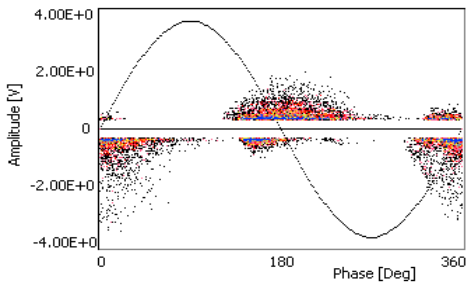




02 Sept: 6:00 pm



03 Sept: 1am



03 Sept: 11 am