TECHIMP SpA
Italy

Ti
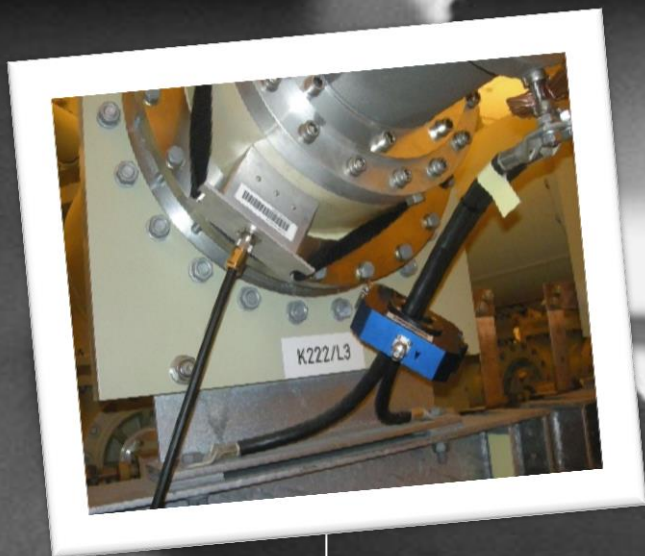
TECHIMP **HV GIS** CASE STUDIES

LIST OF CASE STUDIES

- 220kV GIS System – PD in the dielectric spacers
- 130kV GIS System – PD in the GIS System
- 400kV GIS System – PD in the GIS System

TECHIMP SpA

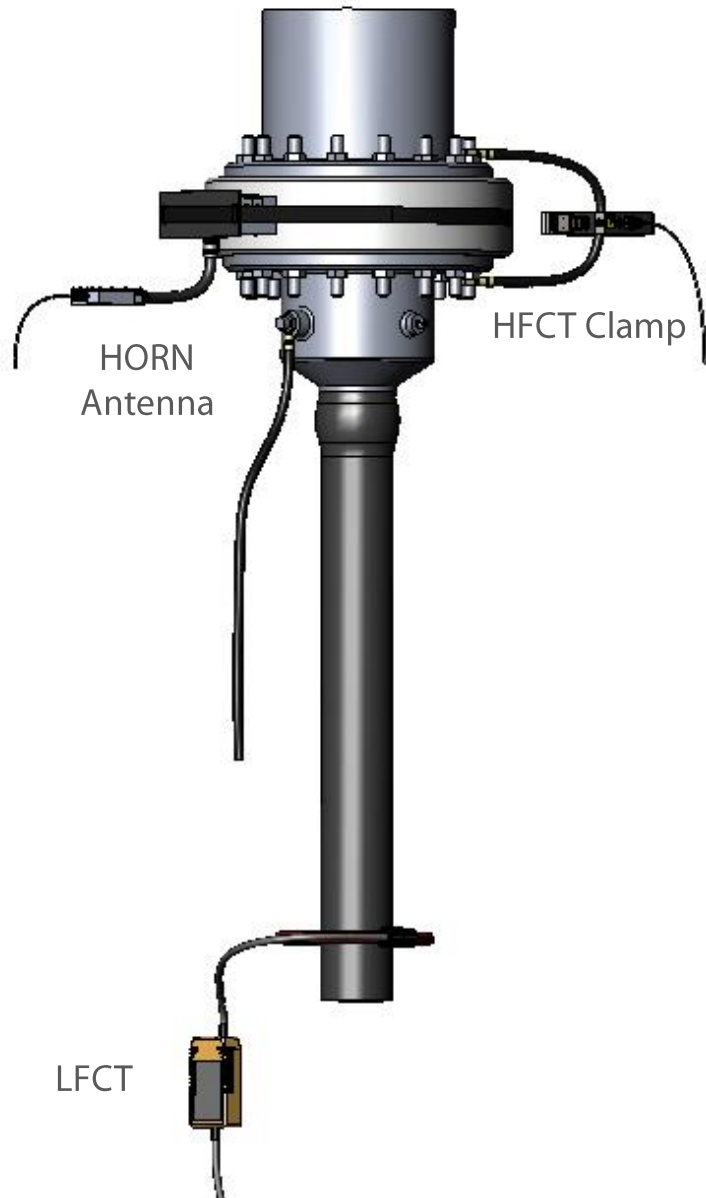|	
LOCATION	**EUROPE**
EUT	**GIS SYSTEM**
RATED VOLTAGE	**220 kV**
INSULATION	**XLPE**
LENGTH	
VINTAGE	
TYPE OF TEST	**ON-LINE**
PD SENSOR	**HFCT, HORN**

CASE STUDY

On-line PD detected inside the dielectric spacers of GIS terminations.

[GIS Termination]

HORN Antenna

HFCT Clamp

LFCT
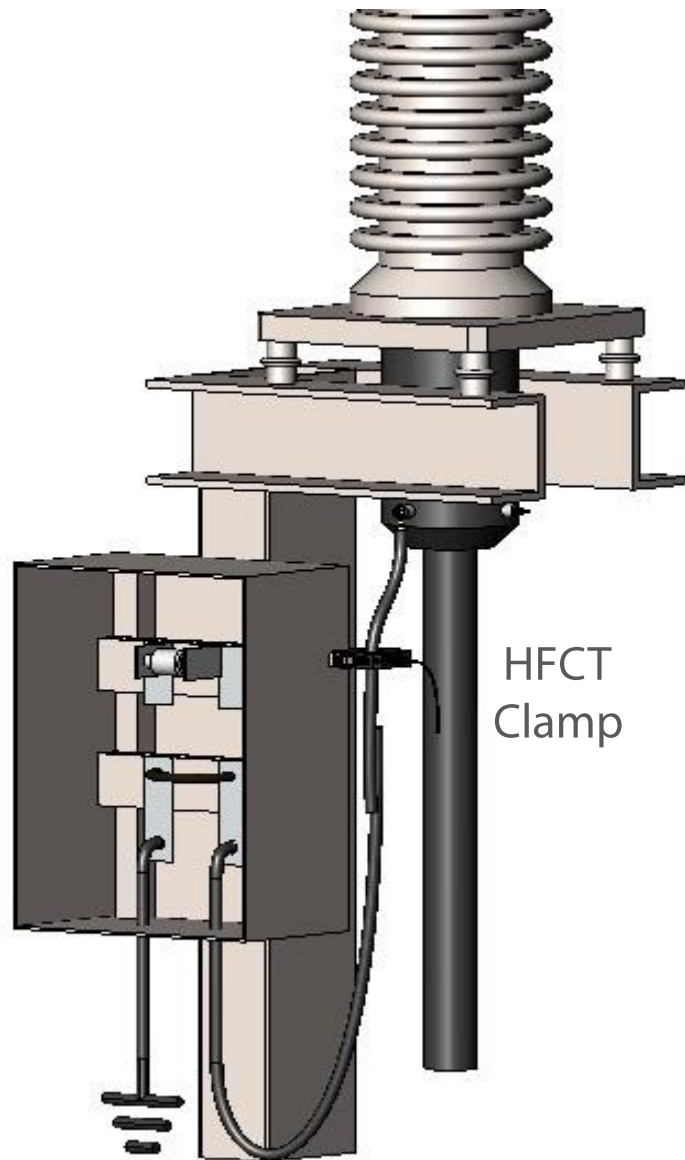
High Frequency PD pulses were achieved by means of Clamp HFCT 39mm placed around the ground connection, and by means of HORN Antenna placed on dielectric spacer of the GIS Termination.

Thanks to the Clamp version of the HFCT it is possible to perform on-line PD measurements without ground lead disconnection or out of service of the EUT.
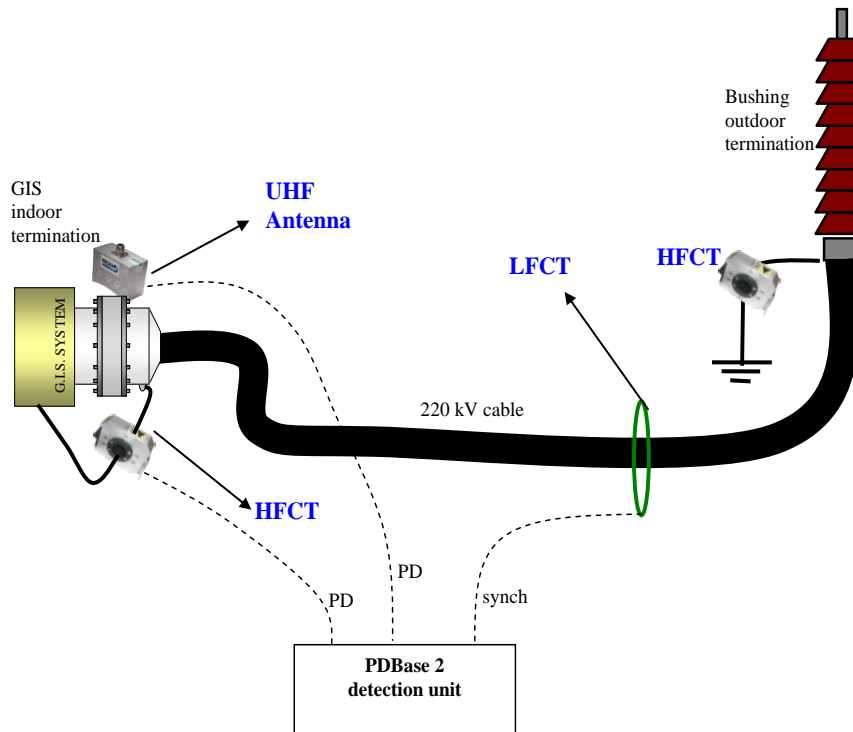
[ODSE Termination]

High Frequency PD pulses were achieved by means of Clamp HFCT 39mm placed around the ground connection of the ODSE Termination.

Thanks to the Clamp version of the HFCT it is possible to perform on-line PD measurements without ground lead disconnection or out of service of the EUT.
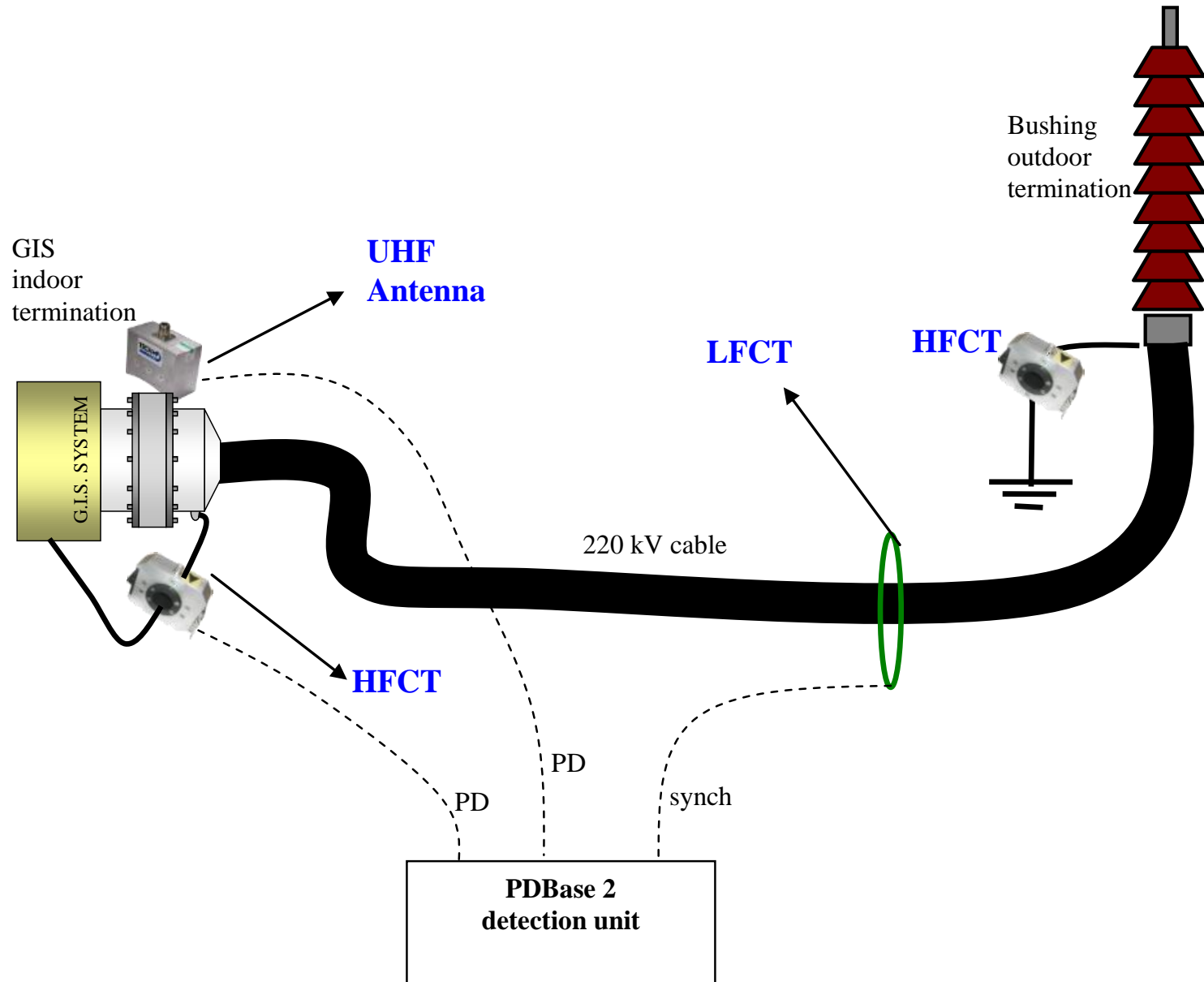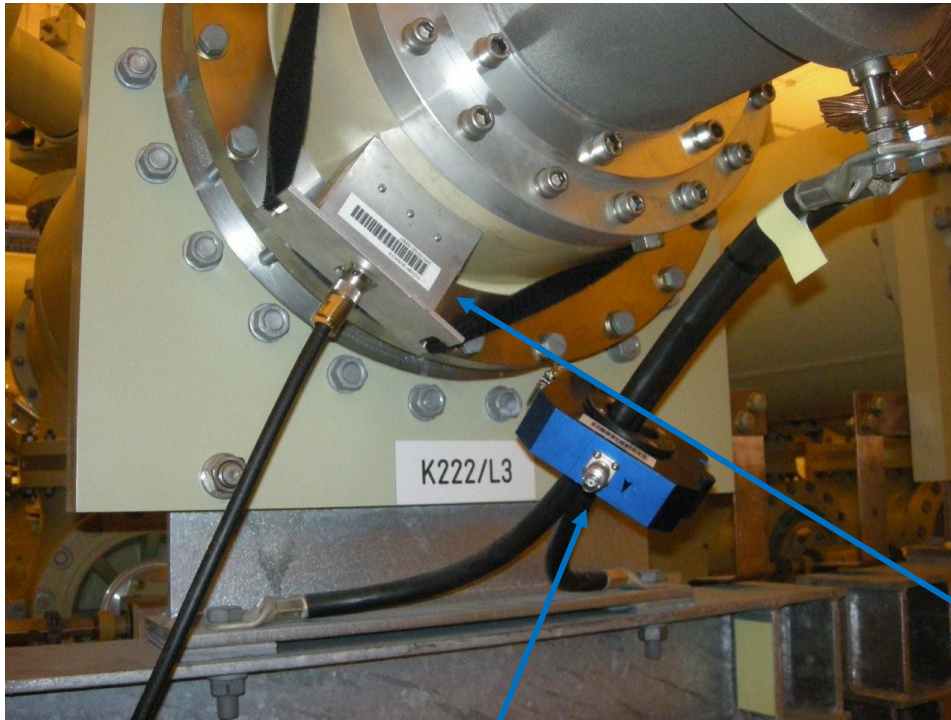
HFCT Clamp
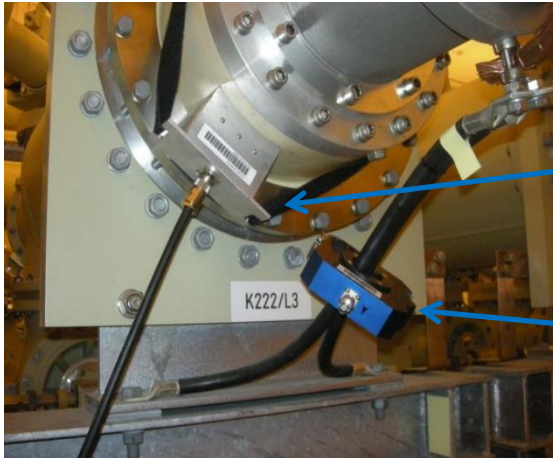
Techimp UHF Antenna

Techimp HFCT Sensor

Measurement Set Up:

- Techimp PD Base II
- Techimp UHF Antenna
- Techimp HFCT Sensor

GIS
indoor
termination

**UHF
Antenna**

LFCT

Bushing
outdoor
termination

HFCT

G.I.S. SYSTEM

220 kV cable

HFCT

PD

PD

synch
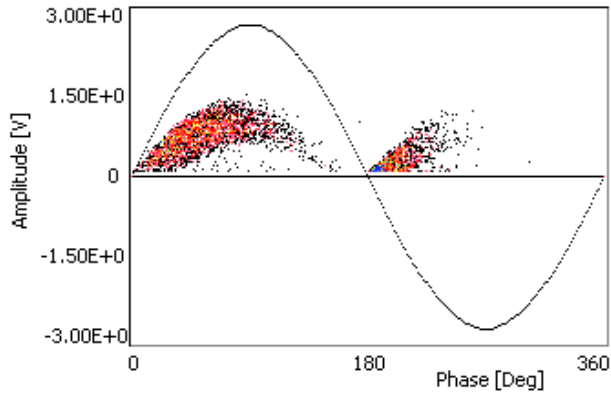
**PDBase 2
detection unit**
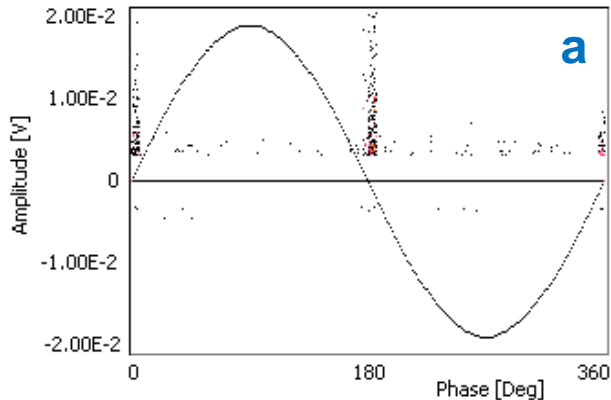
HFCT sensor around
cable ground lead

UHF antenna on GIS
spacer

HFCT inductive sensor and its installation
around the ground lead at cable termination

Internal PD detected with UHF Antenna.
The internal PD was located in the dielectric spacers at GIS termination
(**CORRECT ALARM !**)

a) PD activity detected inside the GIS

PD measurement only on the GIS does not allow an exhaustive analysis of the detected phenomena
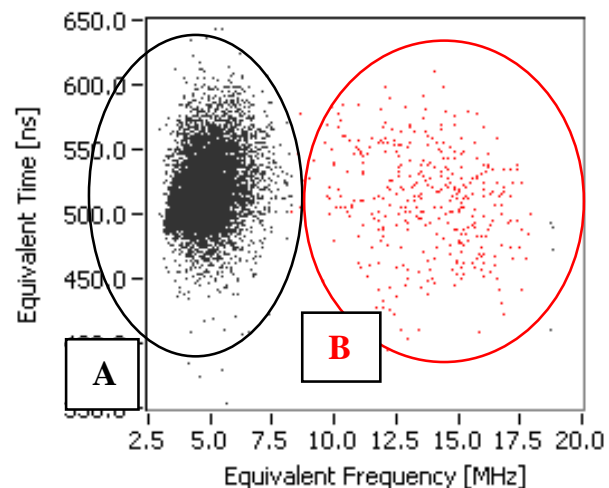(**FALSE ALARM !**)
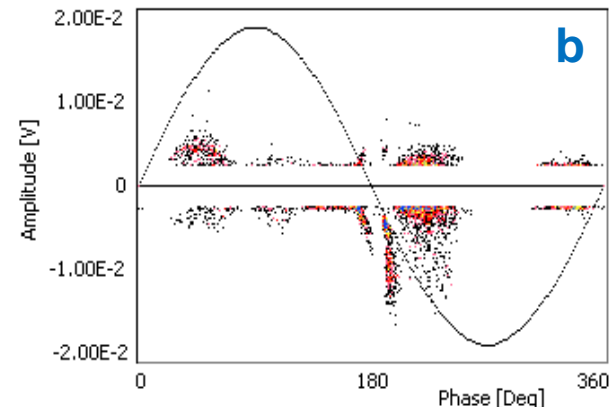
b) PD activity detected at Outdoor Termination

Carrying out PD detection also at the outdoor termination the PD activity can be correctly addressed to an external Phenomena

AVOIDING FALSE ALARM !
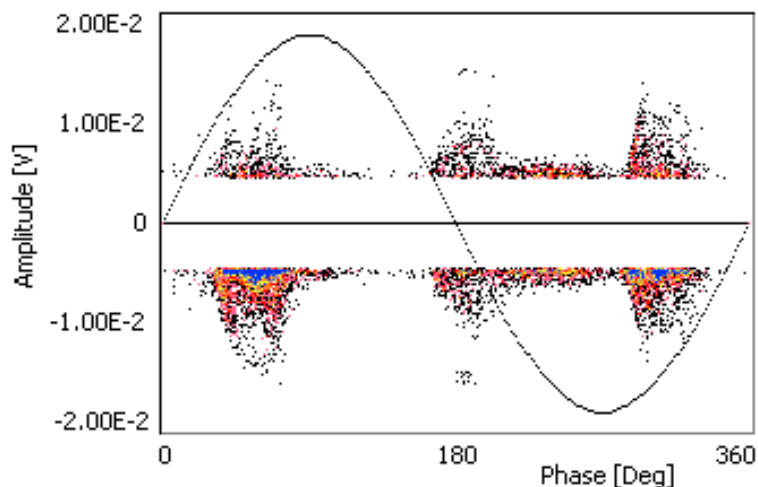**EFFECTIVE MAINTENANCE !**

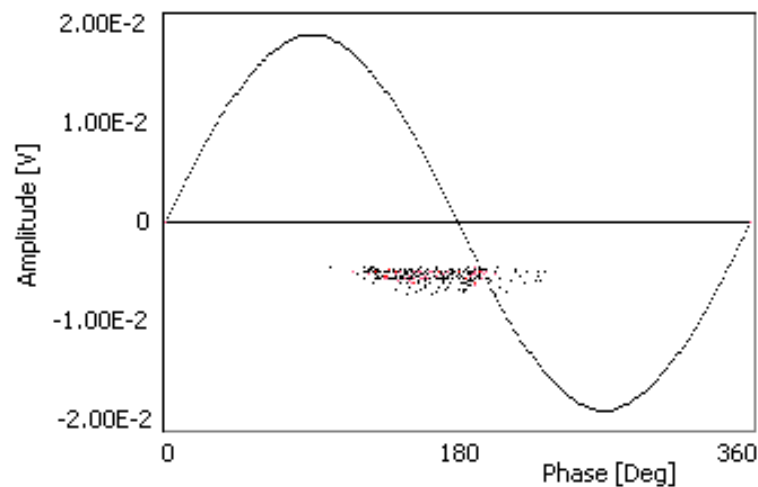**PRPD Pattern – Complete Acquisition**
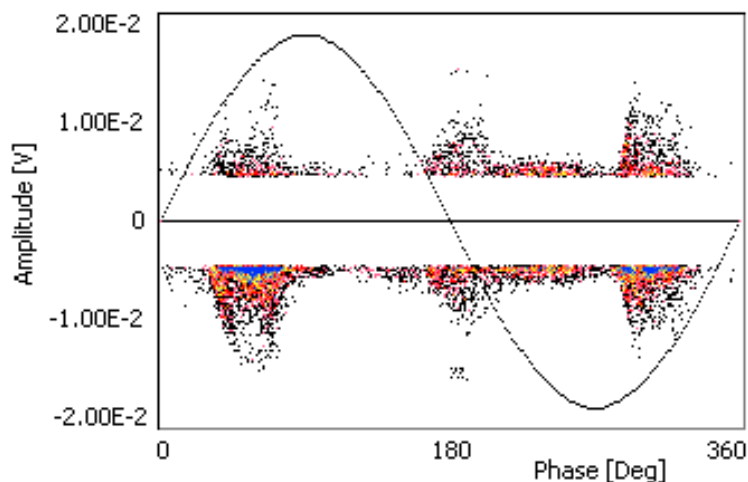
T-F Separation Map
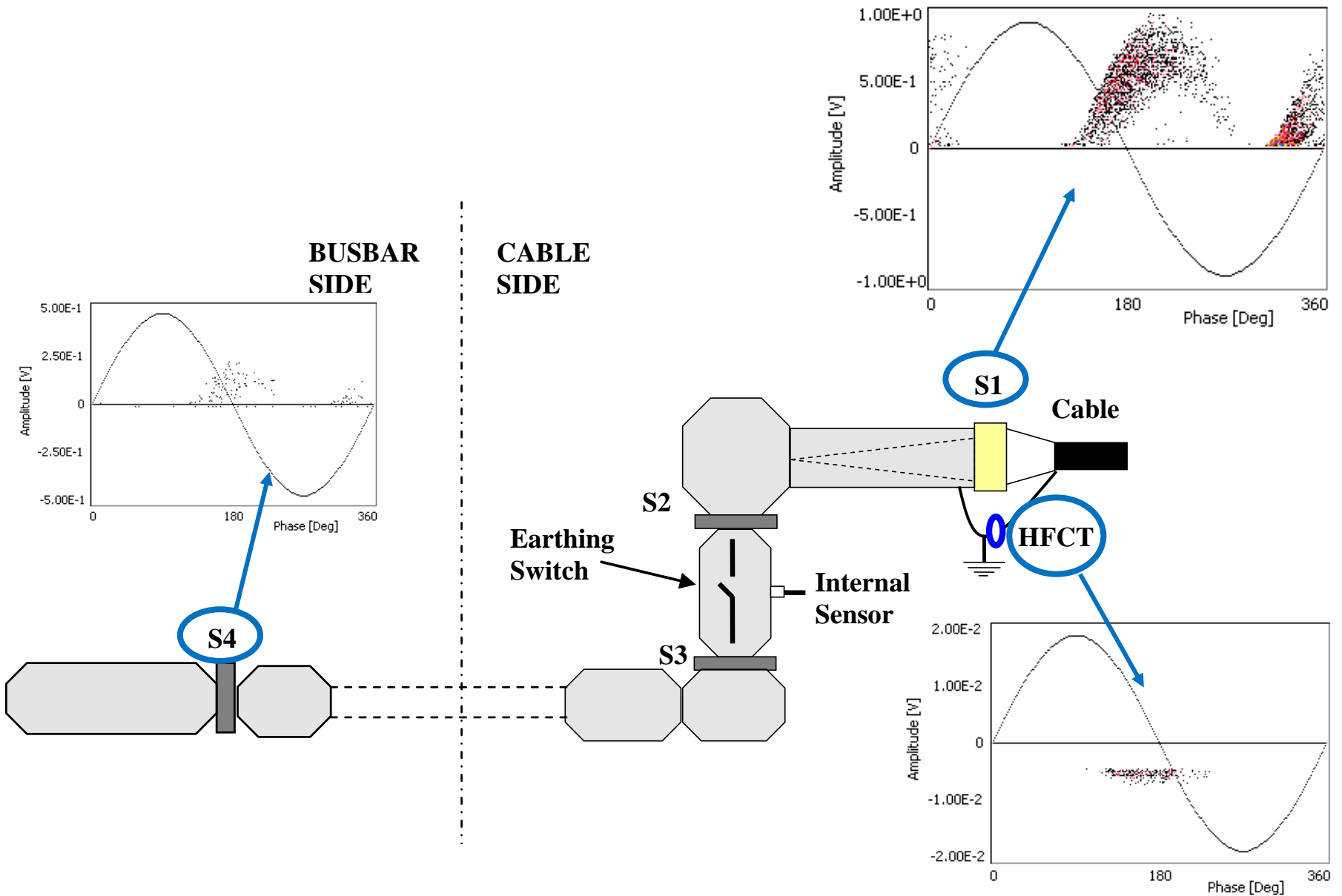
PRPD Pattern – Sub class A
Surface and corona disturbances
at outdoor bushings

PRPD Pattern – Sub class B
PD due to internal cavity

BUSBAR
SIDE

CABLE
SIDE

S1

Cable

S2

Earthing
Switch

Internal
Sensor

HFCT

S4

S3

Considering amplitude and repetition rate of detected PD it has been suggested to:

1 – Monitoring the PD amplitude Trend

in order to verify that PD activity in the GIS does not increase too quickly. In this way the customer may schedule maintenance only when really needed.

Ti SOLUTION

TiMS
Techimp Monitoring Systems

2 - Regular basis PD Measurements

in order to avoid unexpected failures and consequent failures during service of the entire HV system.

Ti SOLUTION
PD Measurement on/off-line with
Techimp PPDC +
PD sensors

HFCT GROUND

TECHIMP SpA

|	
LOCATION	**EUROPE**
EUT	**GIS SYSTEM**
RATED VOLTAGE	**130 kV**
INSULATION	**XLPE**
LENGTH	
VINTAGE	
TYPE OF TEST	**ON-LINE**
PD SENSOR	**VARIOUS**

CASE STUDY

Example of measurements performed on a GIS system.

[GIS Switch]

High Frequency PD pulses were achieved by means of Clamp HFCT 39mm placed around the ground connection, the HORN Antenna placed on dielectric spacer of the GIS Termination and by means the window coupler covering the dielectric inspection window.

Example of PD pattern: Internal defect in epoxy spacer

High Voltage

HFCT   **PD Signal**
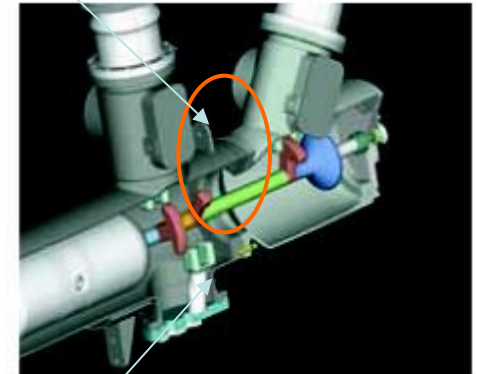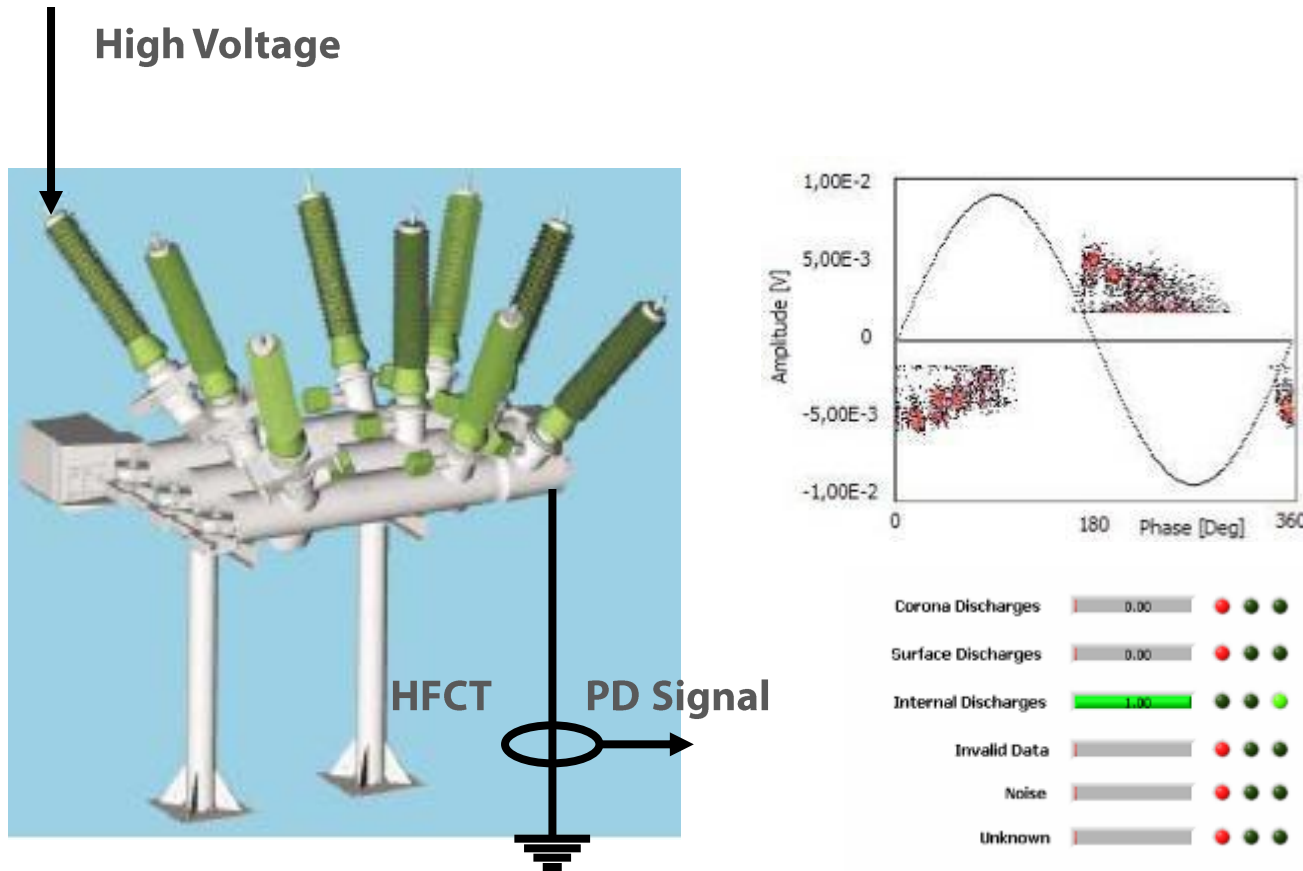
**HFCT: High Frequency Current Transformer**

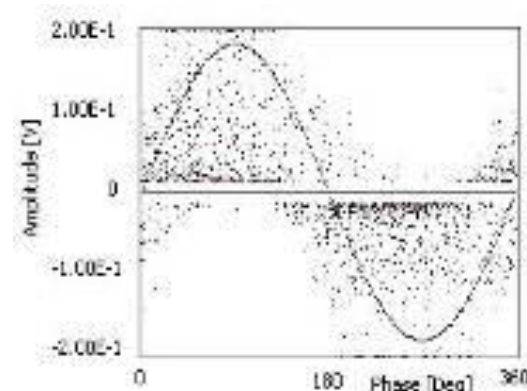# Example of PD pattern: free moving particles

Window coupler covering the dielectric inspection window

When GIS are provided with dielectric inspection windows, PD detection in UHF bandwidth can be obtained using circular window external couplers, which represent robust and effective alternative to the use of internal sensors.

20kV
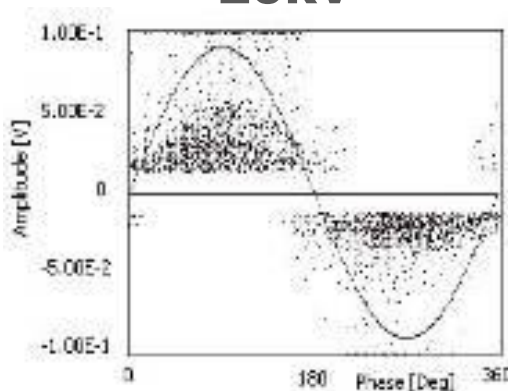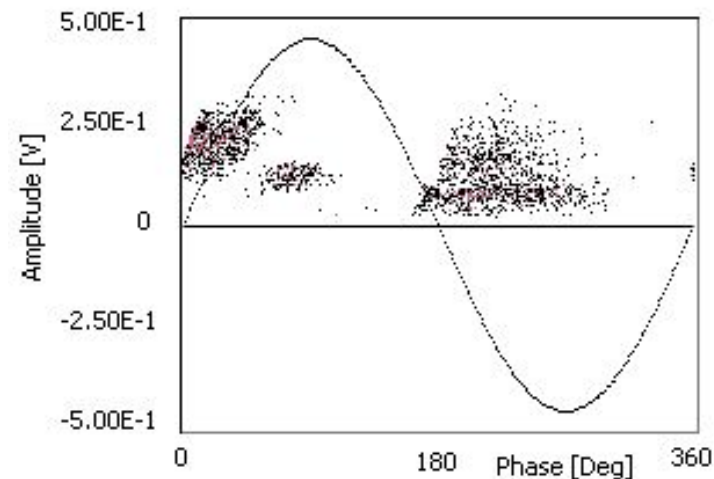

50kV

Example of PD pattern: internal defect in epoxy spacer

Spacer coupler applied to the dielectric spacer

Discharges due to the presence of protrusions, floating particles and internal defects in the dielectric spacer can be successfully detected placing UHF sensors attached to the spacer.

170 kV

The detected PD was a manufacturing defect due to bad assembly.

In order to avoid this kind of problem it is suggested to use

Techimp solutions for FAT:

Ti SOLUTION

- Techimp PD Base II

- QCII Software

TECHIMP SpA

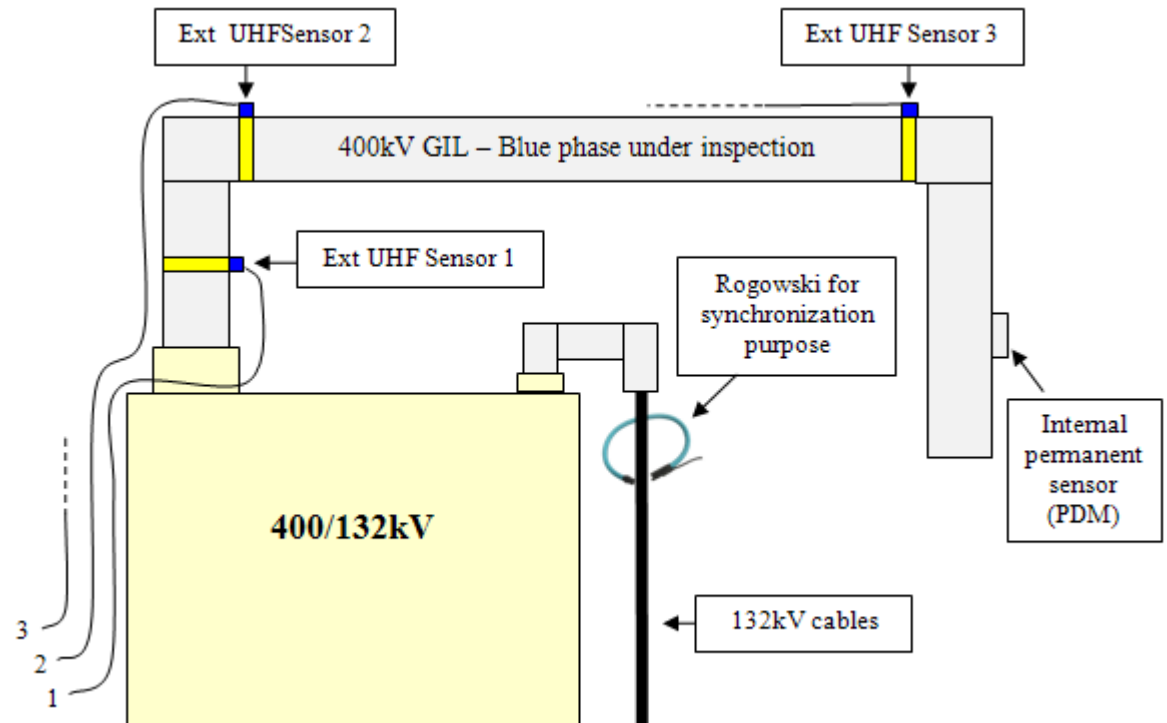|	
LOCATION	**UAE**
EUT	**GIS SYSTEM**
RATED VOLTAGE	**400 kV**
INSULATION	**XLPE**
LENGTH	
VINTAGE	
TYPE OF TEST	**ON-LINE**
PD SENSOR	**HORN**

CASE STUDY

On-line PD detected on the GIS System.

During the measurement 3 external PD sensors were used, located on the spacers of the bus duct.

Spacer coupler applied to the dielectric spacer
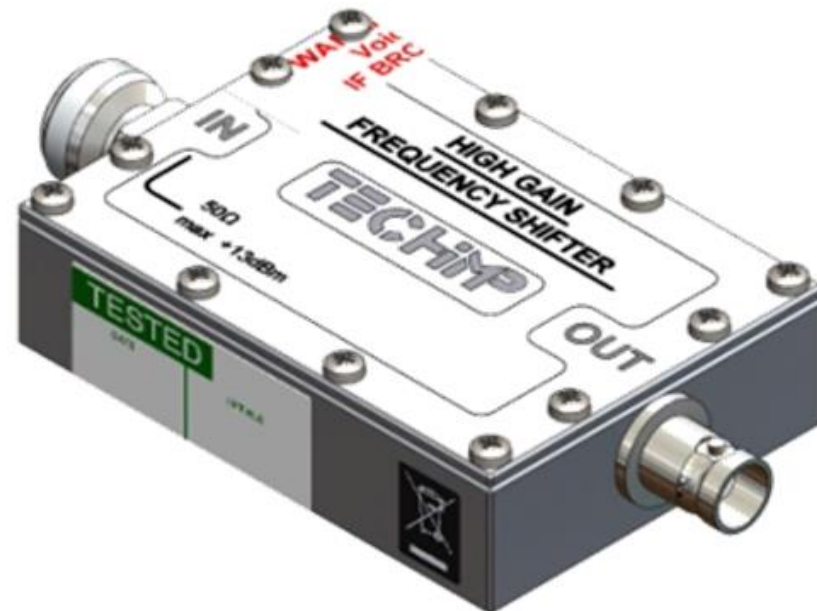
PDCheck + Frequency shifter

⬇

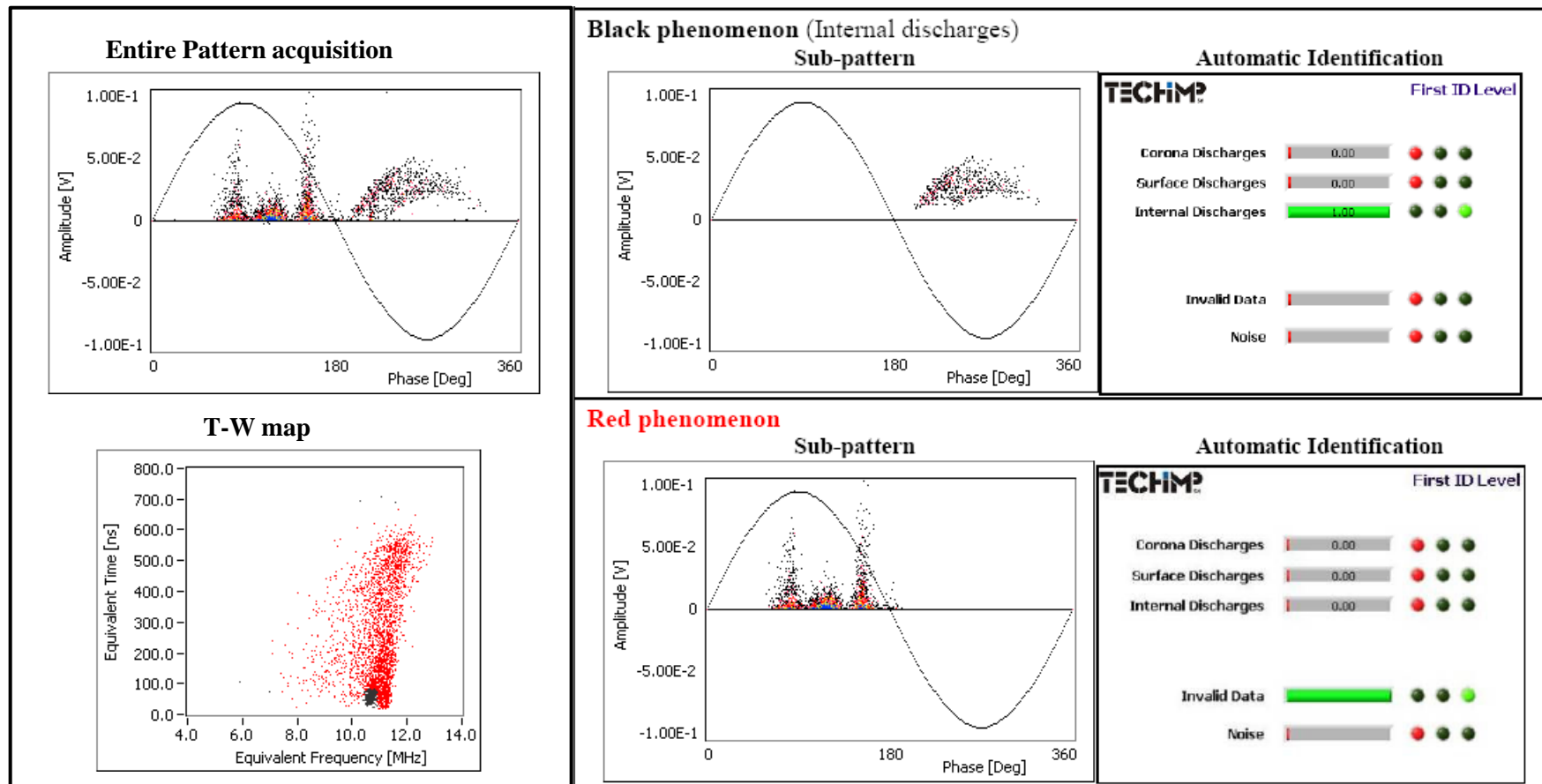**up to 1 GHz keeping the TechImp T-W map feature**

⬇

Fine for GIS/GIL applications

Frequency shifter
- Band pass filter BP: 150 MHz – 1 GHz
- Gain: +40dB
- External power supply or internal battery: 9 V
- Input connector: UHF N male
- Output connector: BNC female

Internal PD were detected from only one sensor. Strong selectivity and attenuation along the GIS systems.

Regular basis PD Measurements

in order to do a frequent check of the entire GIS system.

Ti SOLUTION
PD Measurement on/off-line with
Techimp PPDC +
PD sensors

HFCT
GROUND