

# 成浩科電股份有限公司簡介 | The Best Power of Life | 因專注而專業 因關心而安心



成浩科電成立於2006年，是萬世盛(註)工程顧問(股)關係企業，累計超過20年以上，承攬台電、核能、機場、捷運、鐵路、科技園區...等電力電機工程設計、施工、竣工檢測、維護等業務，我們具有豐富之實務經驗，專注且熟悉電力工程上的安全細節；自2014年網羅國際頂尖技術人才成立研發團隊，自主成功發明具國際水平的局部放電(partial discharge)檢測技術，生產高可靠度的局部放電監測感測器，並依據多重物理量之概念，設計出可以判斷局部放電頻率和波形的辨識軟件，不僅符合國際標準法規IEC 62478規範，亦可應用於各高壓電力設備在線局部放電診斷之預防工程。

我們關心客戶供電系統的穩定與安全，不僅立足臺灣，也積極向全球各地的公民營工程顧問設計單位、電力公司、公民營輸配電設備製造廠進行整合與策略合作，為客戶提供電力系統24小時局部放電智能監測、在線檢測、分析診斷，提供高可靠度的解決方案，重新定義「預防電學」。

註：萬世盛工程顧問股份有限公司於2006年轉投資成浩科電(股)，領有行政院公共工程委員會工程技術顧問公司執照、用電設備檢驗維護業登記執照及甲級電氣承裝業執照，為一含括設計監造，施工，檢驗與維護保養全方位之機電工程顧問公司。

# 局部放電概述

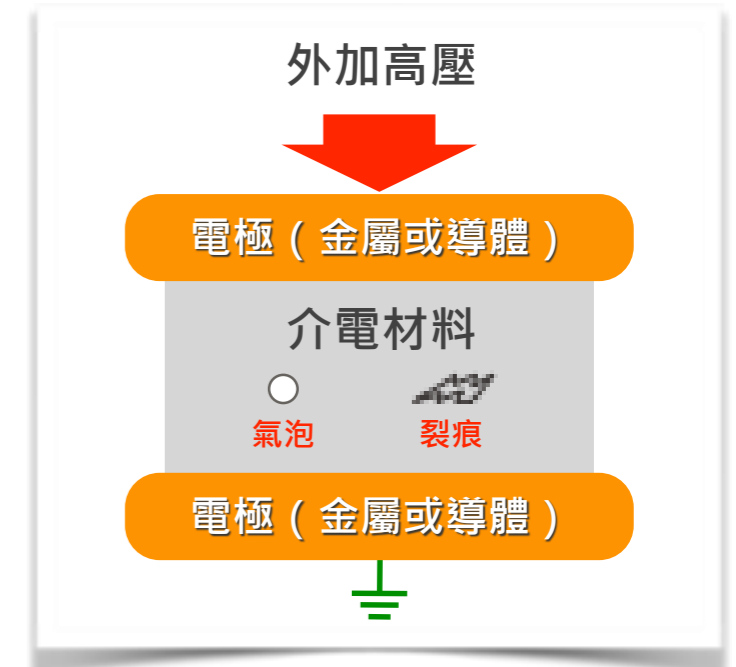
## ❖ 什麼是局部放電

電力設備之絕緣劣化源自於設備之絕緣介質部份放電，因電力設備在使用中承受高電壓，而設備本身存有一些潛在的缺失在強電場下會產生放電現象。放電有很多種情況，如：突出物之尖端放電，接地間距不足之放電，連結處未緊密造成之放電，沿面距離不足或表面不潔造成之爬電及介電材料之內部局部放電。不論何種放電均會促使電力設備之絕緣破壞，進而輕者供電中斷；重者造成事故甚至引起火災。不論何種狀況發生均可能造成嚴重之財務損失，甚至影響生命安全。

任何一種放電都是由能量轉換與釋放的結果，是故放電發生時一定會伴隨著發生光、聲、電場及電磁波等自然現象，這些現象在發生的初期所產生的訊號極其微弱，相較於電力設備所處環境之各種雜訊，將更顯渺小。為偵測出這些現象，可藉由高感度之感測器及高速訊號擷取設備，將這些現象顯現於示波器上。然而波形通常雜亂無章，即使有任何的放電亦可能埋沒在各種干擾訊號中，為分辨出是否有放電現象，當有放電存在時它又屬何種放電，可藉由統計軟體根據它與電力相位間的關係而逐一分離出來。

## ❖ 為什麼局部放電的訊息可以減少電力故障的風險？

由於局部放電是絕緣破壞的起始原因，若能早期偵測，則可避免後續的絕緣劣化。有鑒於此，WinTech 設立了局部放電的實驗室，聚焦局部放電的監測和測試技術研究，建立檢測及分析系統，來發展絕緣系統的「預測智能」，從而提升電力系統的安全及可靠。



# 局部放電種類

外加高壓



電極 ( 金屬或導體 )

介電材料



電極 ( 金屬或導體 )



定義：絕緣材料表面或內部，由於電場分布不平均且集中氣隙 (void)間所產生之橋接放電行爲(一般而言小於一個微秒 $\mu s$ 或數個納秒 $ns$ )，通常伴隨著聲音、光、熱、脈衝電流、電磁波等.....不可逆之物理現象。

## 內部放電 | Internal Discharge

絕緣材料內的氣泡或裂痕所發生的放電現象。

電極 ( 金屬或導體 )

介電材料



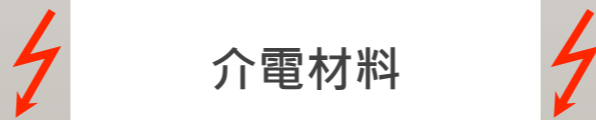
電極 ( 金屬或導體 )



## 沿面放電 | Surface Discharge

在絕緣材料表面所發生的放電現象。

電極 ( 金屬或導體 )



電極 ( 金屬或導體 )



## 電暈放電 | Corona Discharge

導體邊緣尖端的部分或粗糙的表面，由於電極間周圍因不均勻電場所產生放電。

電極 ( 金屬或導體 )

尖端



金屬導體



電力設備無預警事故造成災難損失難以估計...這是可預防的！



# 電力設備無預警事故造成災難損失難以估計...這是可預防的！

## ❖ 局部放電初期：

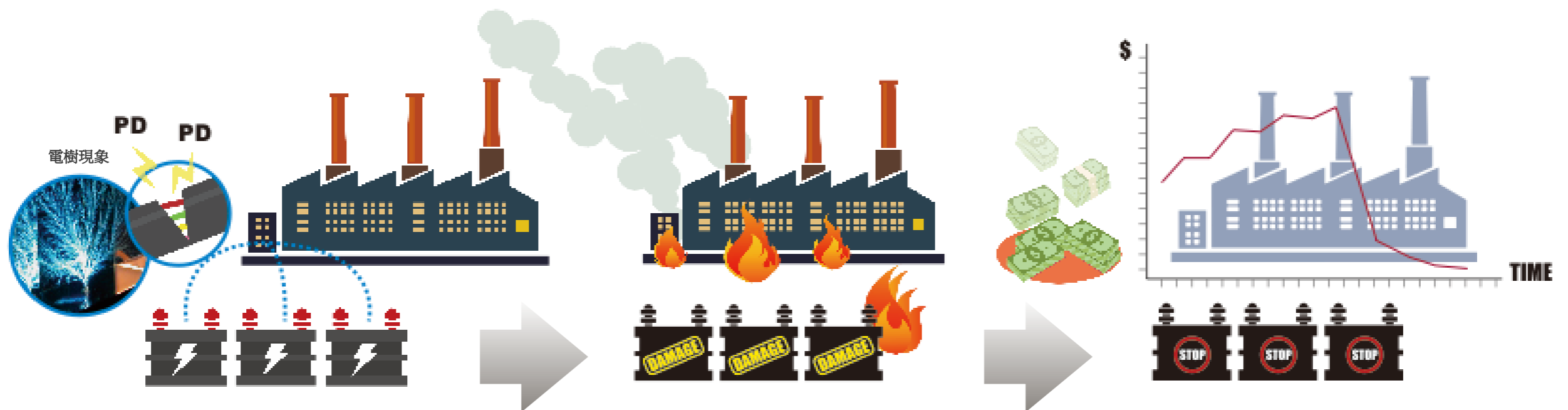
- 雖內部介質材質劣化，有微弱電訊號，仍然可正常供電運作，並未有立即危險。

## ❖ 局部放電絕緣劣化：

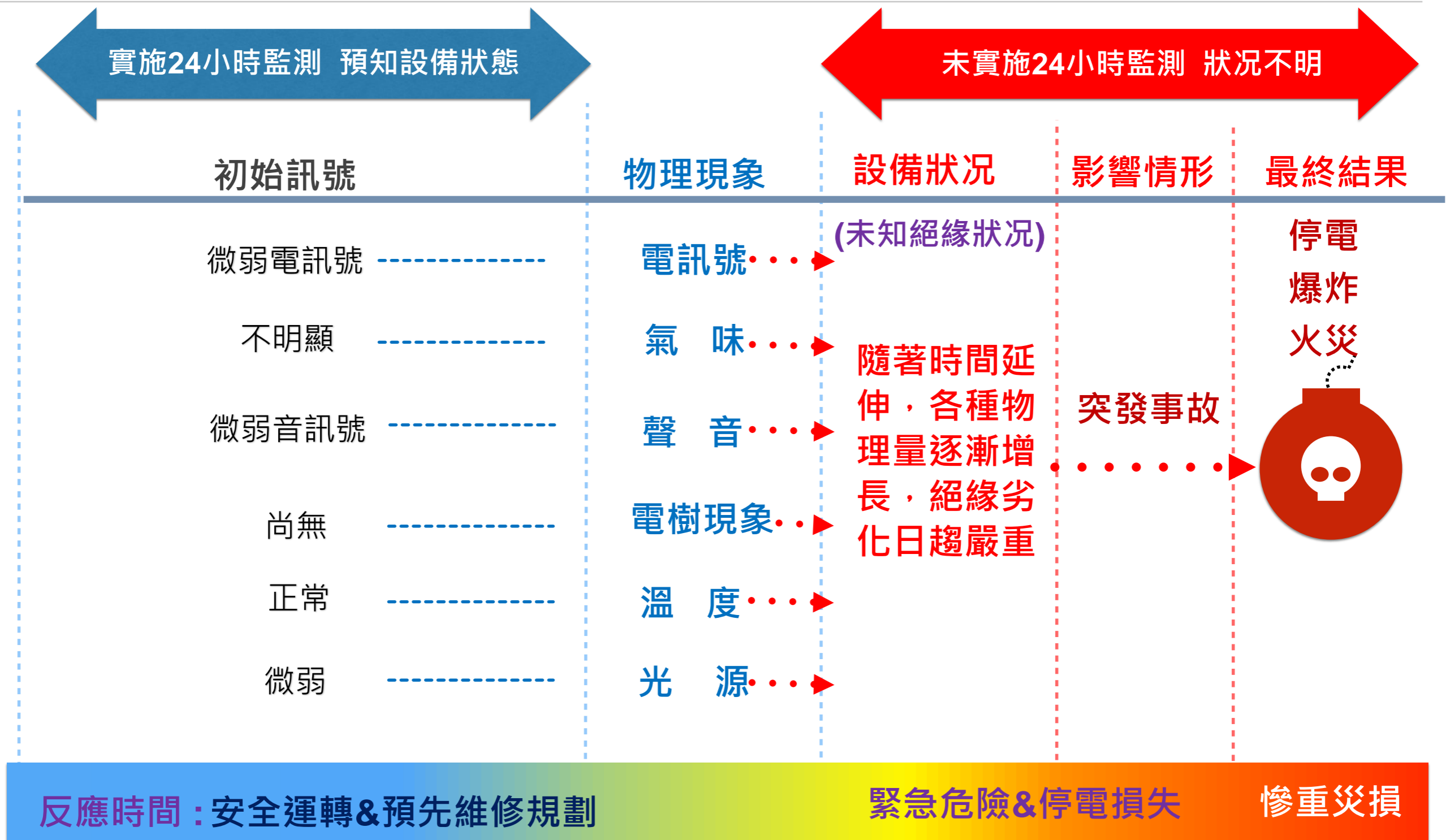
- 局部放電現象是不可逆的物理現象，長期未進行監測及關注放電趨勢，無預警資訊以進行改善維修，恐造成絕緣劣化、擊穿(Break Down).....，而導致事故發生。

## ❖ 電氣事故發生：

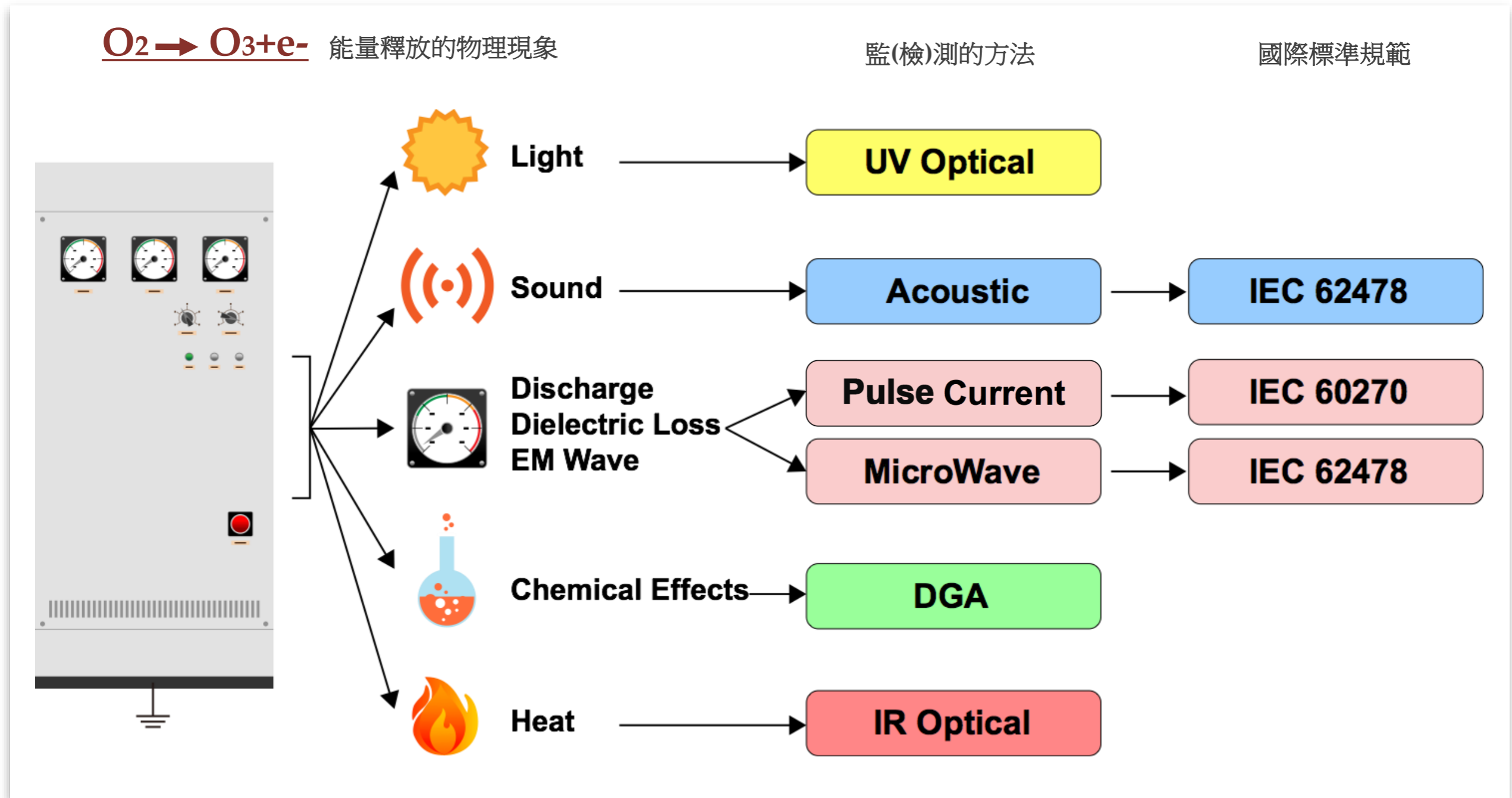
- 廠家造成的停電損失將難以估計，恐造成每天至少百萬以上，甚至上億之財務損失，不容忽視。



# 局部放電多重物理量監（檢）測專利技術



# 局部放電之物理現象與偵測方法



# IEC 60270 & IEC 62478 局部放電偵測之國際規範

| IEC 60270                |      | IEC 62478                      |
|--------------------------|------|--------------------------------|
| 首次公告1968年；2000年修訂迄今      | 公告年份 | 首次公告2016年迄今                    |
| 定量測試                     | 標準   | 定性測試                           |
| pC                       | 量測單位 | mV or dBm                      |
| 需要                       | 校正   | 不需要                            |
| 停電檢查、開孔測試                | 量測方法 | 帶電監(檢)測擷取紀錄放電訊號                |
| 耦合電容器 ( 脈衝電流 )           | 感測器  | 聲音(AE)、脈衝電流(HFCT)、微波(UHF)訊號感測器 |
| 廠驗、定期檢查                  | 用途   | 在線24小時監測&檢測                    |
| 判斷各設備局部放電合格與否；<br>檢測工序複雜 | 說明   | 觀察局部放電訊號趨勢；<br>監(檢)測工序簡易       |

- IEC 60270標準為一「定量」的標準，局部放電的量測單位為皮庫(pico-coulomb, pC)，此標準多用於高壓設備的出廠試驗與竣工試驗，由於需要局部放電校準源來校正測試系統儀器的量測值，必須在高壓設備離線(off-line)狀態下才能進行對放電源的定量校準，通常採電容耦合局部放電之脈衝電流，本檢測方法有IEEE、IEC等國際標準來針對不同高壓設備定義放電量的合格標準。
- IEC 62478標準為一「定性」的標準，局部放電的量測單位為毫伏(mini-volt, mV)，由於在高壓設備帶電情形下檢測，故無法對量測儀器進行校準，本檢測方法需觀察放電的趨勢，以判斷局部放電對高壓設備的危害程度。
- 依據：以IEC 60270為基礎，按高壓設備之屬性，選擇適當測試準則如IEEE 400.3、IEEE C57-124 等。



# 成浩科電局部放電偵測市場優勢-多重物理發明與專利

## ❖ 局部放電偵測技術優勢~融合世界頂尖技術，創造精確可靠的檢測方法

1. 感測器：本團隊採用在IEC 62478\*規範下自行開發的高帶寬、高感度之感測器。
2. 辨識軟體：利用所接收到的聲音、電磁場及電磁波訊號交叉比對，來確認放電之存在，再藉由其與電源相位之關係分辨出尖端放電、沿面放電、內部放電及噪聲，提高局部放電辨識的正確率。
3. 訊號之擷取：採用內建有自行開發局部放電軟件的高階示波器(LeCroy)，取代局部放電專用機，頻帶較寬(500MHz)、取樣速度較快(2.5GS/s)的高階示波器，更可完整地呈現局部放電波形，且對複雜之局部放電訊號不會有任何遺漏。
4. 放電訊號定位：
  - A. 變換AE感測器裝置，從量測到的訊號強度來判斷局部放電之位置。
  - B. 利用AE與HFCT感測器兩者接收到訊號的時間差，亦即，藉由聲音訊號與電子訊號在介質中之傳輸速度推算放電的正確位置。
  - C. 對於一個無金屬遮蔽之設備，如電纜、模鑄變壓器...等，可用裝有雷射光點之超高頻數組天線（UHF Antenna Array）來搜尋放電之位置。

### \*IEC 62478：

- ✓ 量測PD產生的電磁波(3MHz-3GHz)頻段與音波(100Hz-250kHz頻段)訊號
- ✓ 感測器：聲音、電、微波訊號感測器
- ✓ 在線(on-line)局部放電測試，多用於現場檢測
- ✓ 優點：無需停電，檢測容易

# 成浩科電局部放電偵測市場優勢-多重物理發明與專利

第 103125239 號 修正日期:104.10.13 修正本

## 發明摘要

※ 申請案號：

※ 申請日：

※IPC 分類：

【發明名稱】使用多重物理量的局部放電檢測系統以及方法/

PARTIAL DISCHARGE DETECTION SYSTEM AND  
METHOD USING MULTIPLE PHYSICAL QUANTITIES

【中文】

本發明提供一種用於電力設備之使用多重物理量的局部放電檢測系統以及方法。本發明之局部放電檢測系統包括第一檢測元件、第二檢測元件以及局部放電判斷元件。第一及第二檢測元件分別用以偵測電力設備之多重物理量中的第一物理量與第二物理量。局部放電判斷元件根據第一物理事件與第二物理事件以及其二者發生的相關性（例如事件時間差）判斷上述電力設備是否已發生局部放電。因此，本發明係藉由判斷多個物理量的事件間的相關性、來決定是否進一步擷取或分析該些物理量的資訊。

【英文】

The invention provides a partial discharge detection system and method using multiple physical quantities for an electric power apparatus. The partial discharge detection system includes a first detection element, a second detection element and a partial discharge determination element. The first and second detection elements are configured to detect first and second physical

9201-A53229TWF1

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## 中華民國專利證書

發明第 I530694 號

發明名稱：使用多重物理量的局部放電檢測系統以及方法

專利權人：楊萬木、梁文烈

發明人：梁文烈、蘇經洲

專利權期間：自2016年4月21日至2034年7月23日止

上開發明業經專利權人依專利法之規定取得專利權

經濟部智慧財產局局長

王美花

中華民國 105 年 4 月 21 日



注意：專利權人未依法繳納年費者，其專利權自原繳費期限屆滿後消滅。

# 「漸變槽線天線」獲頒發明鉑金獎成浩科電技藝超群冠蓋全台



成浩科電(股)參與2017年臺北國際發明暨技術交易展之發明「漸變槽線天線」報名參加評選，與臺灣和來自全球超過一千三百名精英競爭角逐，通過由經濟部智慧財產局組成海內外評審團審查報名發明專利文件，評審員們到攤位現場進行勘察發明產品的實際運用，成浩經過嚴謹的評審流程，榮獲最高榮譽「鉑金獎」第二名（23名鉑金獎得主排名第二），獲經濟部智慧財產局洪局長頒獎肯定，並由帶領成浩科電(股)研發團隊的大家長—董事長楊萬木接下鉑金獎獎杯。

各式高壓電力設備經檢測或監測診斷出有局部放電時，最難的就是如何定位。本次獲獎發明鉑金獎之「漸變槽線天線」為中、高壓局部放電"定位"技術，運用在電力檢測設備上，具備高指向性、高增益及高頻響應之局部放電感測器，利用局部放電所產生的電磁輻射訊號定位高壓設備之絕緣缺陷，特別應用於變電站高壓礙子、高壓配電盤、模鑄型變壓器...之局部放電定位，並曾在2016年度IEEE國際期刊獲刊發表與肯定。

# 成浩科電多重物理量發明專利-「陣列天線」國際期刊發表

IEEE ANTENNAS AND WIRELESS PROPAGATION LETTERS, VOL. 15, 2016

1881

## A Novel Miniaturized Vivaldi Antenna Using Tapered Slot Edge With Resonant Cavity Structure for Ultrawideband Applications

Yushun Liu, Wenjun Zhou, Senior Member, IEEE, Shijie Yang, Weihao Li, Pengfei Li, and Shuai Yang

**Abstract**—In this letter, a novel tapered slot edge with resonant cavity (TSERC) structure is adopted to improve the design of a planar printed conventional Vivaldi antenna. The proposed modified structure has the capacity to extend the low-end bandwidth limitation. In addition, the directivity and antenna gain of the TSERC structure Vivaldi antenna has been significantly improved when compared to a conventional Vivaldi antenna of the same size at lower frequencies. Compared to the conventional Vivaldi antenna, the TSERC structure lowers the gain at the higher frequencies. A prototype of the modified Vivaldi antenna was fabricated and tested. The measured results were found to be in good agreement with the simulated, which validates the feasibility of this novel design.

**Index Terms**—Miniaturized, tapered slot edge with resonant cavity, Vivaldi antenna.

### I. INTRODUCTION

ULTRAWIDEBAND (UWB) antennas have been increasingly applied in wireless communication, biomedical detection, and radar system in recent years [1]–[4]. The Vivaldi antenna is one of the best candidates for the UWB technology due to its broad bandwidth, low cross polarization, and highly directive radiation patterns [5].

The Vivaldi antenna belongs to the class of endfire traveling wave antennas, which has theoretically infinite bandwidth [6]. However, the Vivaldi antenna requires a large antenna size to achieve excellent performance in the low-end working band [7]–[8]. According to the research work in [9] the width of a Vivaldi antenna should reach at least one half-wavelength for effective radiation to occur. A Vivaldi antenna presented in [10] utilized a tapered slot edge (TSE) structure to extend the low-end frequency limitation for miniaturizing the antenna size. Though the low-end cutoff frequency can be decreased by employing this technique, the antenna gain and radiation characteristics at lower frequencies are not improved obviously.

In this letter, a modified Vivaldi antenna is designed and measured. The structure of tapered slot edge with resonant cavity (TSERC) is applied to improve the antenna performance. Compared to the TSE structure, the low-end cutoff frequency of the

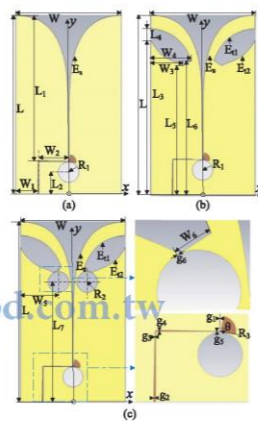


Fig. 1. Configurations of the three Vivaldi antennas: (a) CVA, (b) TSE structure Vivaldi antenna, (c) TSERC structure Vivaldi antenna.

TSERC structure is further reduced with the same antenna size. Simulation and measured results show that relative bandwidth has been increased by nearly 17%. The directivity of proposed modified Vivaldi antenna has also been improved. This letter is organized as follows: In Section II, the structure of the antenna is presented. Simulation and measured results are provided in Section III, which is followed by conclusion in Section IV.

### II. ANTENNA DESIGN

Configurations of three Vivaldi antennas, namely, the conventional Vivaldi antenna (CVA), the TSE structure Vivaldi antenna, and the TSERC structure Vivaldi antenna, are shown in Fig. 1, where the dimensions of all antennas are  $258 \times 150$  mm<sup>2</sup> with structural parameters in Table I. All the three have already been optimized. The dielectric substrate used in this letter is chosen as FR4 with a thickness of 0.8 mm, a dielectric constant of 4.6, and a tangent loss of 0.01. The structure of the CVA is shown in Fig. 1(a). The exponential profile curves  $E_S$  employed in this

TABLE I  
DIMENSIONS OF PROPOSED ANTENNAS

| Value (mm) |
|------------|
| 185.2      |
| 193.0      |
| 172.2      |
| 1.0        |
| 1.5        |
| 0.5        |
| 0.9        |
| 0.2        |
| 0.5        |
| 15.0       |
| 15.0       |
| 10.0       |

$$W_1 = \frac{W_0}{2} \left( 1 - \frac{z}{L} \right)^{2n} \quad (1)$$

$$W_2 = \frac{W_0}{2} \left( 1 - \frac{z}{L} \right)^{2m} \quad (2)$$

$$W_3 = \frac{W_0}{2} \left( 1 - \frac{z}{L} \right)^{2k} \quad (3)$$

$$W_4 = \frac{W_0}{2} \left( 1 - \frac{z}{L} \right)^{2j} \quad (4)$$

$$W_5 = \frac{W_0}{2} \left( 1 - \frac{z}{L} \right)^{2i} \quad (5)$$

$$W_6 = \frac{W_0}{2} \left( 1 - \frac{z}{L} \right)^{2h} \quad (6)$$

$$W_7 = \frac{W_0}{2} \left( 1 - \frac{z}{L} \right)^{2g} \quad (7)$$

$$W_8 = \frac{W_0}{2} \left( 1 - \frac{z}{L} \right)^{2f} \quad (8)$$

$$W_9 = \frac{W_0}{2} \left( 1 - \frac{z}{L} \right)^{2e} \quad (9)$$

$$W_{10} = \frac{W_0}{2} \left( 1 - \frac{z}{L} \right)^{2d} \quad (10)$$

$$W_{11} = \frac{W_0}{2} \left( 1 - \frac{z}{L} \right)^{2c} \quad (11)$$

$$W_{12} = \frac{W_0}{2} \left( 1 - \frac{z}{L} \right)^{2b} \quad (12)$$

$$W_{13} = \frac{W_0}{2} \left( 1 - \frac{z}{L} \right)^{2a} \quad (13)$$

IEEE ANTENNAS AND WIRELESS PROPAGATION LETTERS, VOL. 15, 2016

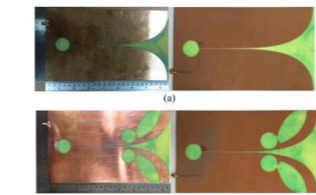


Fig. 2. Photographs of the fabricated prototypes: (a) CVA, (b) TSERC structure Vivaldi antenna.

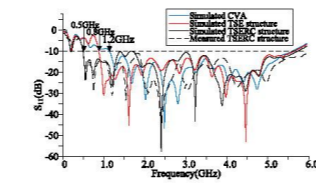


Fig. 3. Return loss of proposed antennas.

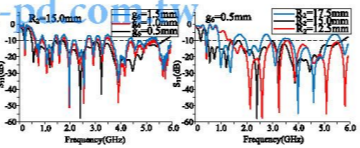


Fig. 4. Simulated return loss of different resonant cavity parameters.

of the CVA is 1.2 GHz, while the TSE structure Vivaldi antenna lowers it to 0.8 GHz. The TSERC structure Vivaldi antenna further reduces the limitation to 0.5 GHz. It means that the TSERC structure is able to miniaturize the size of the CVA by means of lowering the minimum working frequency [11]. The measured  $S_{11}$  variation with frequency is also plotted in Fig. 3. It is observed that the measured result is in excellent agreement with the simulation proving the effectiveness of the proposed design. The difference between the simulated and measured results is possibly due to the effect of the SMA connector and the inaccuracy during manufacturing.

Simulated  $S_{11}$  variation is obtained by changing the joint width ( $g_c$ ) and radius ( $R_c$ ) of the symmetrical resonant cavity as given in Fig. 4. It is observed that the operation bandwidth of the TSERC structure Vivaldi antenna depends on the designed parameters of the resonant cavity. Lowering the joint width ( $g_c$ ) resulted in the reduction of low-end cutoff frequency. Meanwhile, the radius ( $R_c$ ) of resonant cavity plays a vital role in return loss characteristic of the proposed antenna. In the proposed antenna, the joint width ( $g_c$ ) and radius ( $R_c$ ) of resonant

LIU et al.: NOVEL MINIATURIZED VIVALDI ANTENNA USING TSERC STRUCTURE FOR UWB APPLICATIONS

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TABLE II  
MEASURED HPBW OF PROPOSED ANTENNAS

| 1 GHz | 1.5 GHz | 2 GHz |
|-------|---------|-------|
| 89.7° | 121.1°  | 60.5° |
| 77.0° | 55.6°   | 48.7° |
| 4 GHz | 5 GHz   | 6 GHz |
| 53.8° | 72.2°   | 58.1° |
| 54.3° | 71.1°   | 58.6° |

, respectively, to maintain the on at 0.5 GHz.

radiation patterns in E-plane (in  $\phi = 0^\circ$ ) at 0.5, 1.5, 2, 3, and 5 GHz (opposed antennas have endfire in the axial direction of the CVA at 0.5 GHz. Simulated and measured results are compared and measured results are compared with the measured antennas.

Detailed comparisons of the HPBW in E-plane of the Vivaldi antenna are shown in Fig. 5, i.e., 0.5, 1.5, 2, and 5 GHz. Measured results of the TSERC structure show an improvement in directivity compared to the measured antennas. From Table II, the HPBW of the Vivaldi antenna is smaller in dimension [11]–[15]. In addition, the improvement in directivity of the

operating characteristic of the antenna at the low frequencies, the conventional and the TSERC structure are given in Fig. 6(a) and (b), respectively. The proposed structure shows a more current along the radiating edge frequency electromagnetic field. The current path on the antenna is observed in regions B and C. It means that the current path on the antenna is observed in regions B and C. It means that the current path on the antenna is observed in regions B and C.

### D. Gains

According to the analysis of surface current distribution, the TSERC structure contributes to the radiation of electromagnetic wave at the lower frequencies. However, as shown in Fig. 6(c), part of the surface current along the radiating edges in region C, which can excite the higher-frequency electromagnetic wave, is coupled to the resonant cavity. This characteristic lowers

the gain of the antenna at the lower frequencies (<3.5 GHz) and lowered at the higher frequencies (>3.5 GHz) due to the characteristics of surface current distribution. In ad-

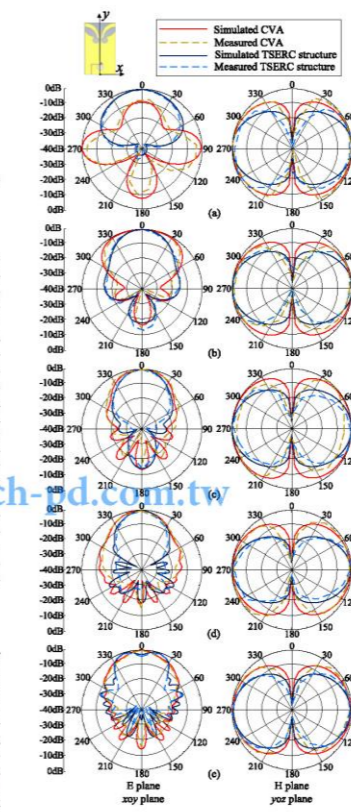


Fig. 5. Simulated and measured radiation patterns of two printed Vivaldi antennas in E-plane ( $xoz$ ) and H-plane ( $yoz$ ) at (a) 0.5, (b) 1.5, (c) 2, (d) 3, and (e) 5 GHz.

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reduction of the gain at the higher frequencies of two tributes to the high cross-polarization level [16].

### IV. CONCLUSION

After a TSERC structure Vivaldi antenna is proposed, end  $S_{11} \leq -10$  dB limitation of the proposed antenna to 0.5 GHz was increased by 14.6% and achieved 19.5% size reduction compared to CVAs. Simulated results show that the TSERC structure Vivaldi antenna with higher endfire directivity compared to the original design. In addition, the antenna gain is improved compared to the original design. According to the characteristics, the proposed antenna can be used for the endfire directional UWB radio frequency applications.

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### A. Return Loss

Fig. 3 illustrates the  $S_{11}$  variation of the CVA, the TSE structure Vivaldi antenna, and the TSERC structure Vivaldi antenna. As shown in the figure, the lower end  $S_{11} \leq -10$  dB limitation



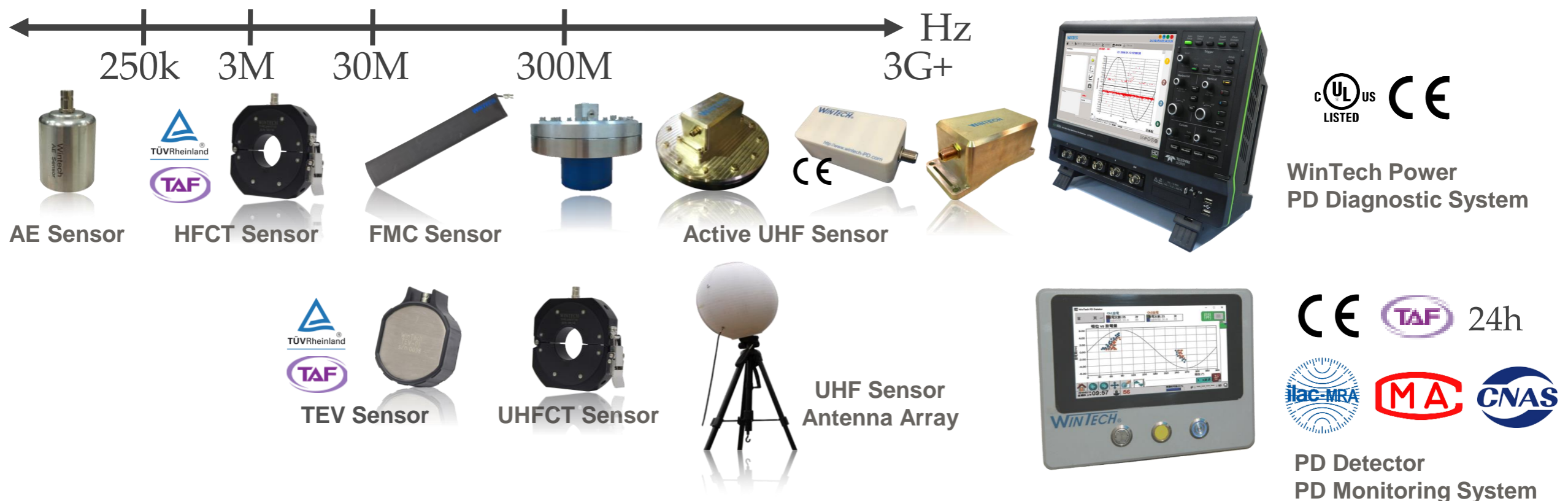
# 成浩科電局部放電偵測市場優勢-局部放電檢測技術研發說明

## ❖ Wintech 檢測局部放電的關鍵線索

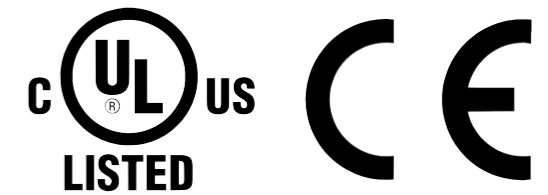
- 局部放電會產生多種物理現象，可以從兩種以上的感測器檢測證實局部放電的發生。
- 絕緣物內部局部放電(Internal Partial Discharge)源自其缺陷在外加電源時，因此該局部放電發生的時間點與外加電源的相位有關聯性。

## ❖ Wintech 檢測局部放電的核心技術

- 多重物理量感測器量測範圍
- 局部放電監測及檢測系統



# WinTech Power 局部放電診斷系統



| 產品規格 |              |      |               |
|------|--------------|------|---------------|
| 型號   | WP-1         | 尺寸   | H : 291.7 mm  |
| 解析度  | 12 bits      |      | W : 399.4 mm  |
| 取樣率  | 2.5 GS/s     |      | D : 131.31 mm |
| 頻寬   | 500 MHz      | 電源   | 90 — 264 VAC  |
| 儲存容量 | 12.5 Mpts/Ch |      | 45 — 66 Hz    |
| 通道個數 | 4            | 工作溫度 | 5°C — 40°C    |
| 屏幕大小 | 12.1"        | 工作濕度 | 95% RH        |
| 操作系統 | Windows 7    | 重量   | 5.9 ± 0.5 kg  |

❖ 適用於IEC 60270 & IEC 62478 離線與在線局部放電試驗、診斷、分析

❖ WinTech PD 局部放電預防診斷系統適用於3.3kV以上中高壓電力設備上，如高壓電纜、變壓器、GIS...等，搭配自行研發之多重物理量感測器，施行現場局部放電檢測或24小時在線監測。

## WinTech Power 局部放電診斷系統-特色介紹

- ❖ **高頻寬、高取樣率、高解析度**：精確呈現訊號之時域波形。
- ❖ **大儲存容量**：可儲存完整的原始訊號波形，進行壓縮數據節省容量，並提供歷史紀錄回調，及後續之放電分析與辨識。
- ❖ **觸控操作介面程式**：更簡易、更親和的人性化介面操作，提供放電相位辨識圖形及波型原貌顯示以及短期統計資訊。
- ❖ **訊號處理程式**：分析波形訊號的結果，提供長期統計資訊，診斷設備之局部放電狀況、歸納放電種類及建立趨勢圖，並自動產生報告。
- ❖ **雲端監控程式**：遠端操作與設定局部放電診斷系統之參數，提供數據异地備份以及電子郵件預警之功能。
- ❖ **24小時在線監測**：提供多種監測模式，滿足顧客檢測時間需求。

# PD Detector 24H智能監測系統



|       |   |
|-------|---|
| 型號    | PDD-SA  |
| 通道數   | 2-4-6   |
| 頻寬    | 1MHz-80MHz  |
| 量測範圍  | 1mV-4V (VP-P) < 50Ω >   |
| 通訊端口  | 內建RJ-45& USB X 4  |
| 電源    | 90-264VAC / 45Hz-66Hz   |
| 尺寸/重量 | 220mm x 170mm x 140mm / <2kg  |
| 功能    | <ul style="list-style-type: none"> <li>△ 24小時在線監測</li> <li>△ 7吋彩色觸控屏幕</li> <li>△ 顯示放電等級(安全、警告、危險)</li> <li>△ 具顯示即時波形、FFT、TF MAP、PRPD、放電次數、放電趨勢圖等</li> <li>△ 數據異地備分、警示電子郵件(需連結網際網路)</li> </ul> |

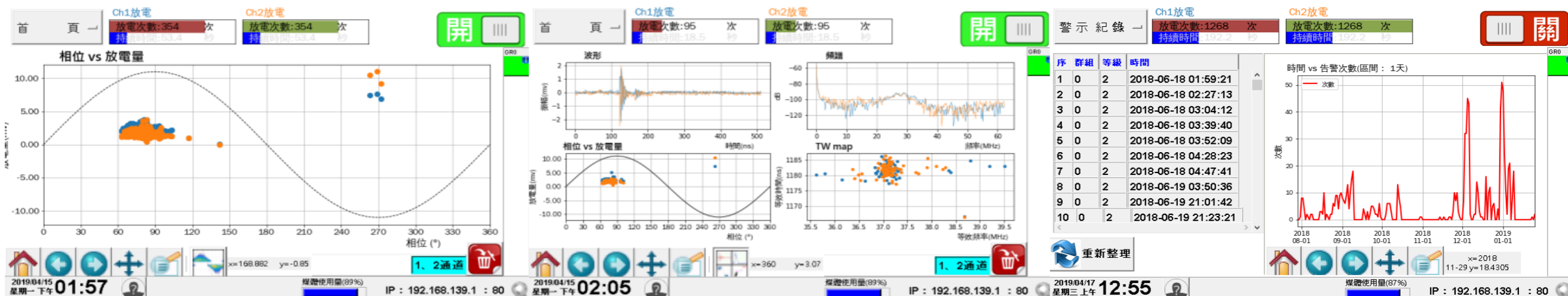
- ❖ 適用各種電力設備監測
- ❖ 在線即時預警郵件通知
- ❖ 雙訊號辨識重複確認
- ❖ 高經濟高效能





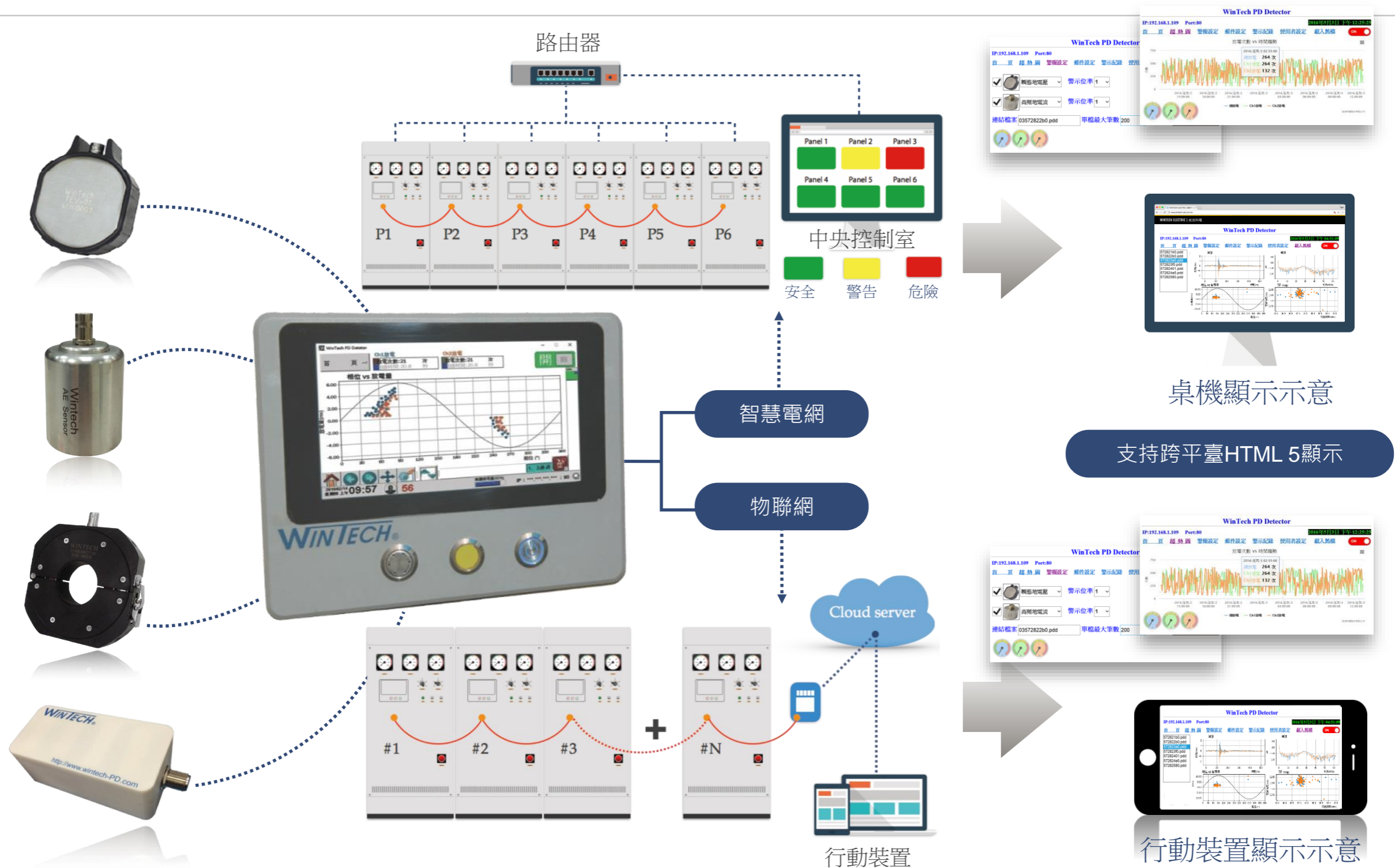
# PD Detector 24H智能監測系統-特色介紹

- ❖ 可診斷電力設備絕緣劣化現象，避免因設備故障所造成的經濟損失，適用於變壓器、配電盤、GIS等各種設備。
- ❖ 雙訊號比對辨識，排除外部訊號干擾，避免誤發警報。
- ❖ 放電訊號相位(PRPD)分析與局部放電發生次數相對應，精確辨識局部放電訊號特徵。
- ❖ 記錄局部放電歷程數據，建立趨勢圖，預先掌握設備絕緣狀態。
- ❖ 具備現場警示與電子郵件警示功能，提醒顧客即時因應。
- ❖ PD Detector是電力設備早期故障預警的最佳偵測儀器。



# PD Detector 24H智能監測系統

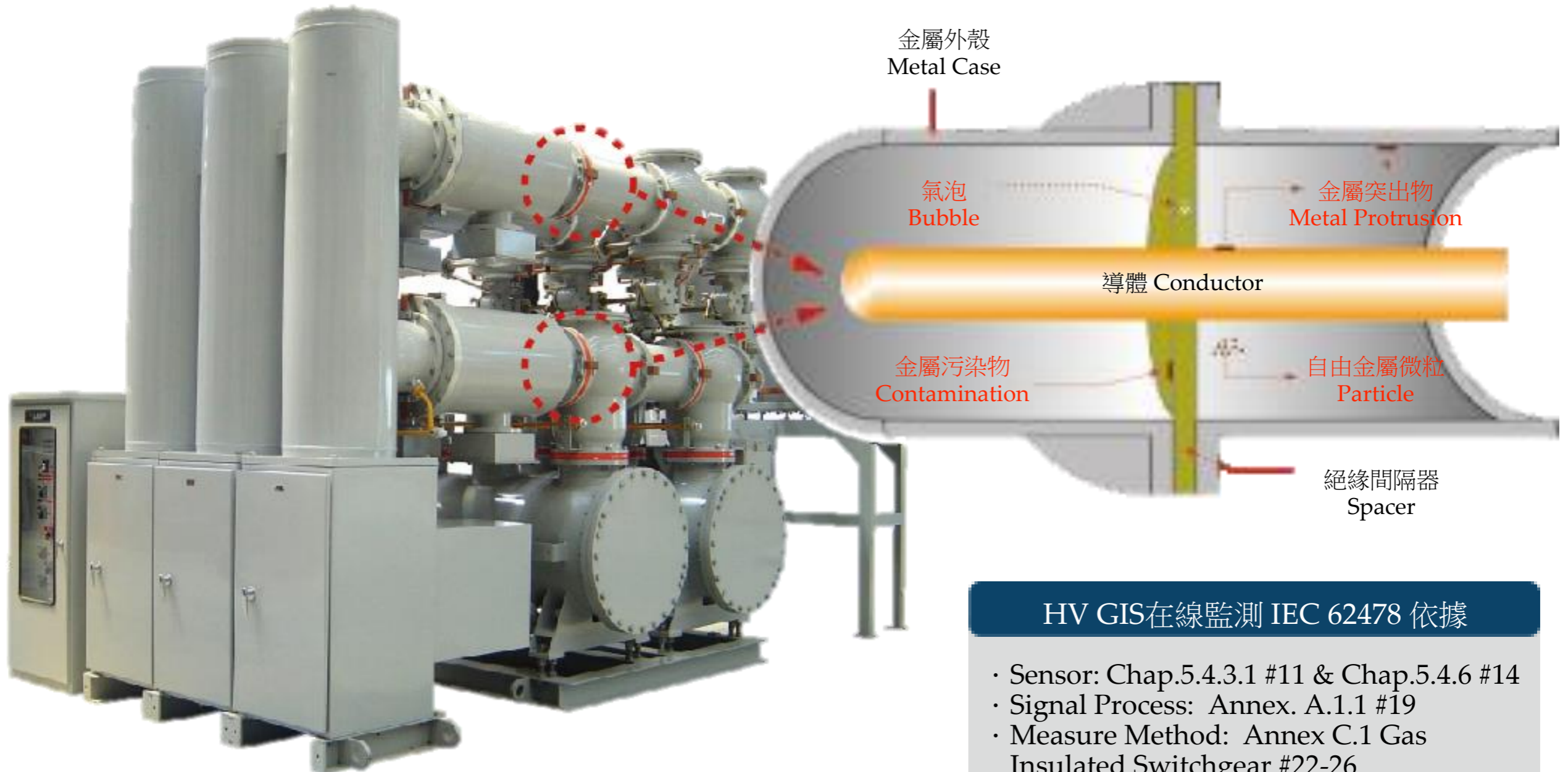
## 局部放電物聯網&智慧電網&工業4.0遠端監測系統架構



# PD 監(檢)測感測器監測應用

## GIS (六氟化硫氣體絕緣開關設備) - 局部放電發生原因

局部放電發生原因：金屬微粒 | 尖刺突出物 | 絕緣間隔器表面微粒、裂痕 | 濕氣影響SF6特性



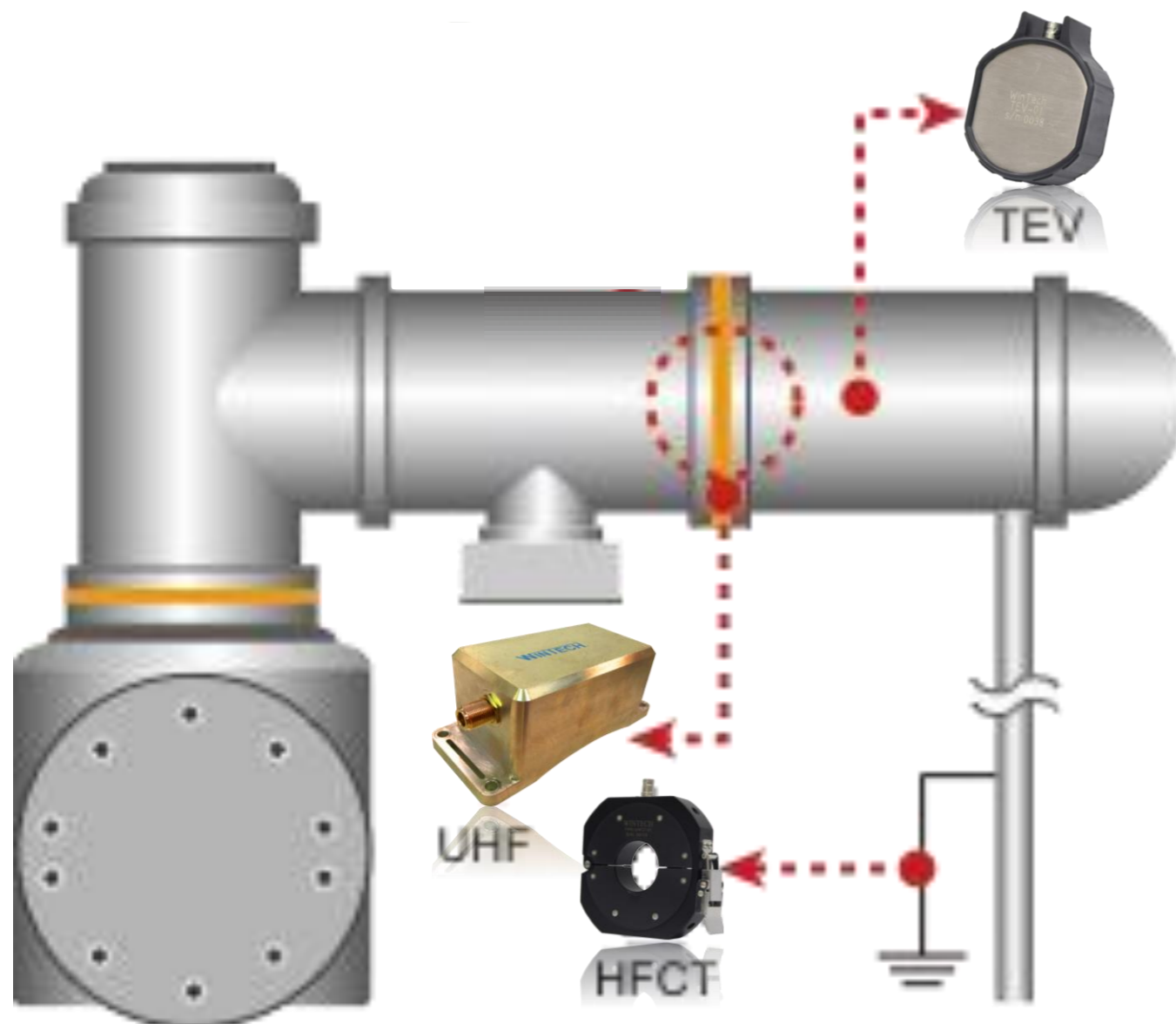
### HV GIS在線監測 IEC 62478 依據

- Sensor: Chap.5.4.3.1 #11 & Chap.5.4.6 #14
- Signal Process: Annex. A.1.1 #19
- Measure Method: Annex C.1 Gas Insulated Switchgear #22-26

# PD 監(檢)測感測器監測應用

## GIS (六氟化硫氣體絕緣開關設備) - 電力設備局部放電感測器應用

高壓設備GIS進行在線檢測或24小時監測時，使用多重物理量感測器放置位置示意圖



在線檢測 & 24H監測

OR

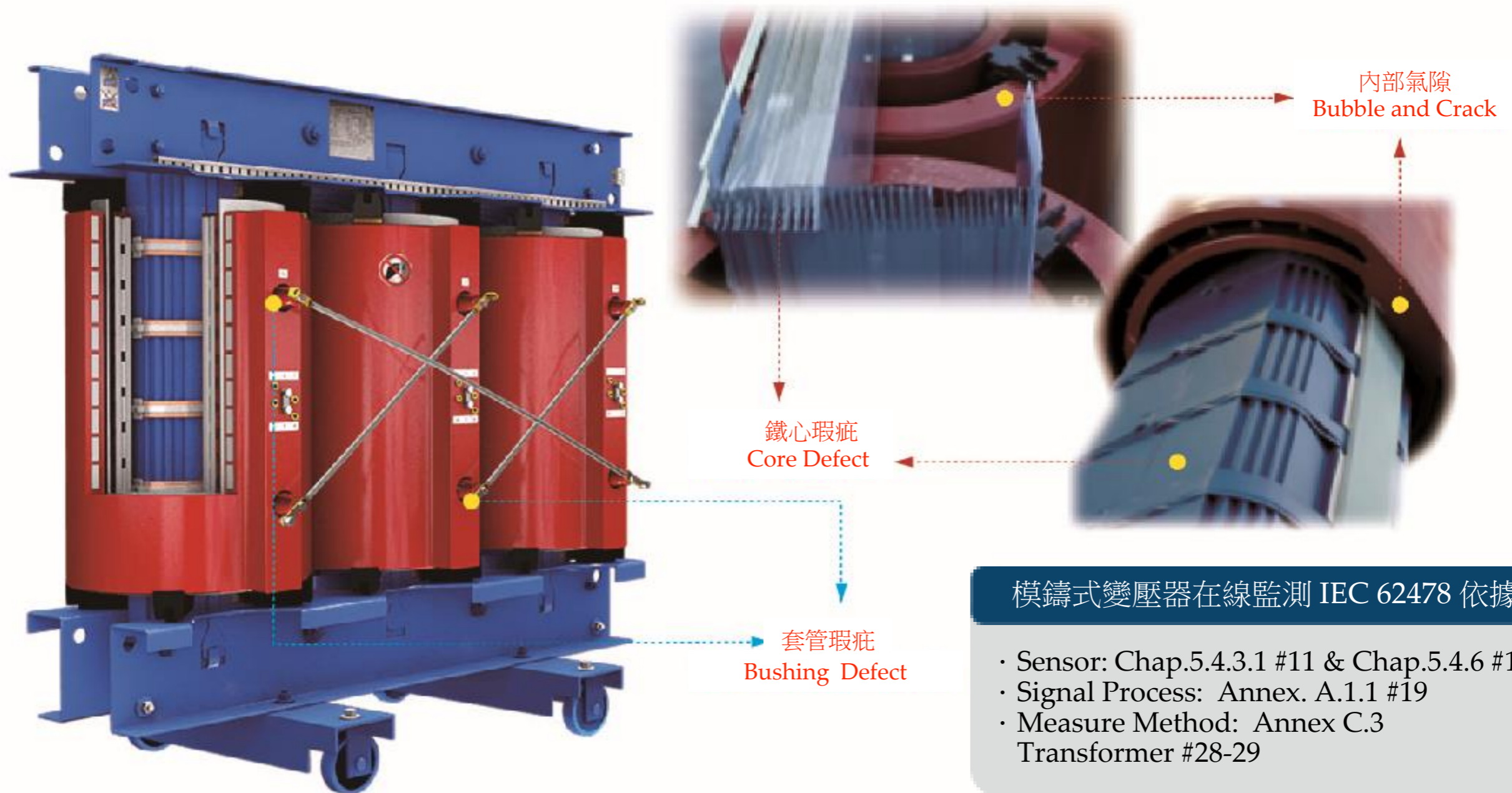
24H在線監測

OR

# PD監(檢)測感測器監測應用

## 模鑄式變壓器-局部放電發生原因

局部放電發生原因：套管瑕疵 | 鐵心瑕疵 | 內部氣隙



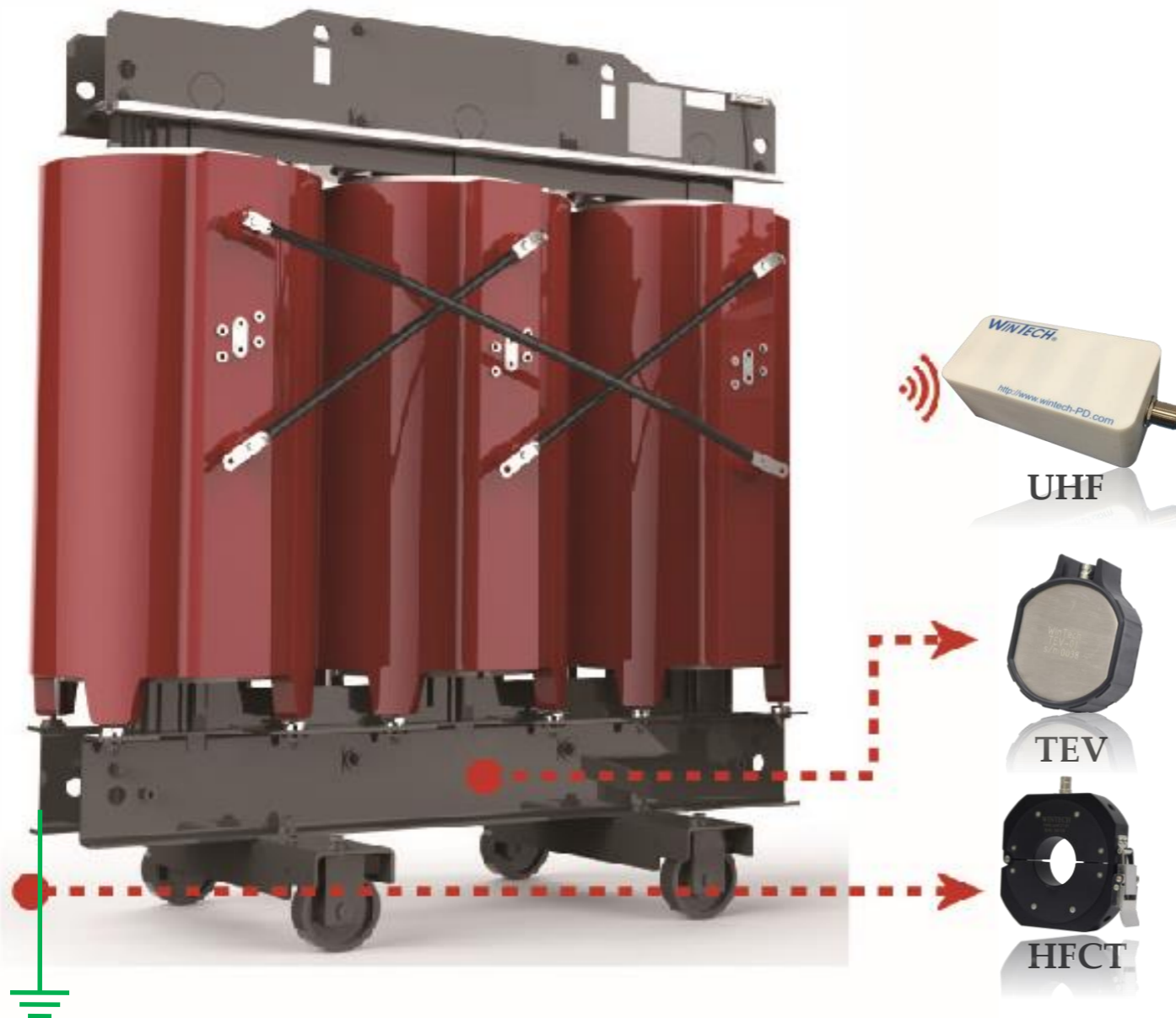
模鑄式變壓器在線監測 IEC 62478 依據

- Sensor: Chap.5.4.3.1 #11 & Chap.5.4.6 #14
- Signal Process: Annex. A.1.1 #19
- Measure Method: Annex C.3 Transformer #28-29

# PD監(檢)測感測器監測應用

## 模鑄式變壓器-電力設備局部放電感測器應用

高壓設備CRT進行在線檢測或24小時監測時，使用多重物理量感測器放置位置示意圖



# PD監(檢)測感測器監測應用

## 油浸式變壓器-局部放電發生原因

局部放電發生原因：絕緣油及材料等劣化 | 線圈及鐵心瑕疵 | 油中氣泡

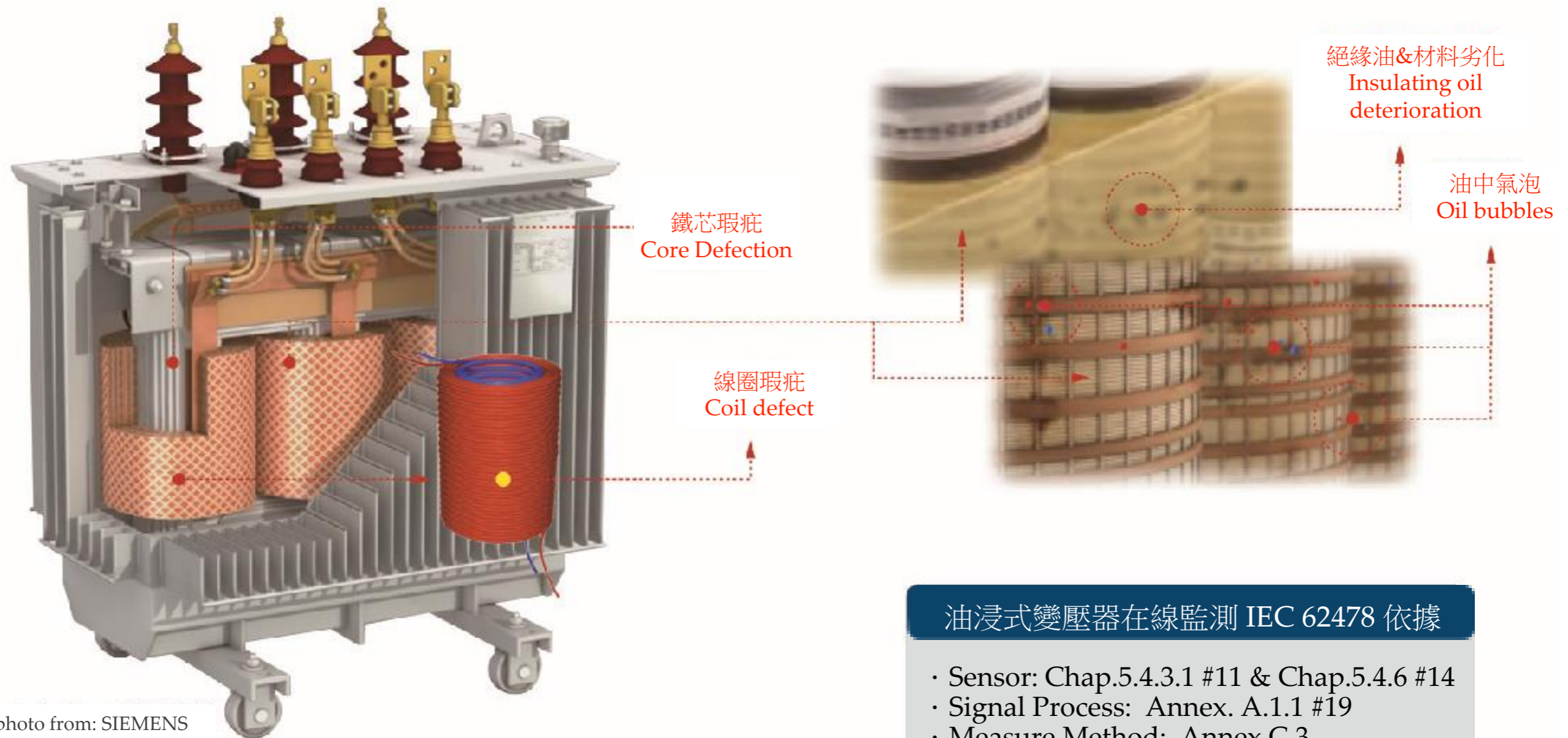


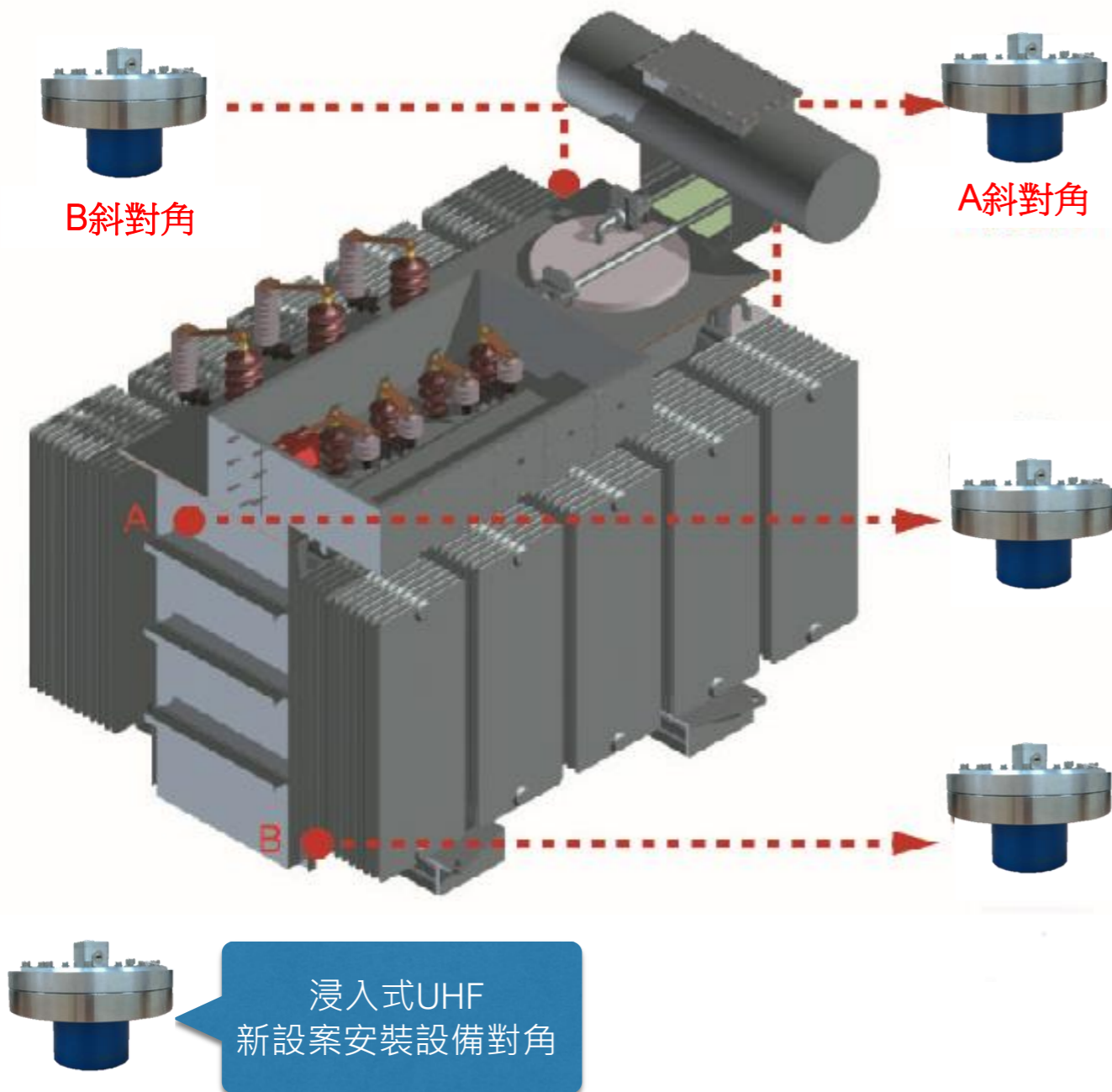
photo from: SIEMENS

- 油浸式變壓器在線監測 IEC 62478 依據**
- Sensor: Chap.5.4.3.1 #11 & Chap.5.4.6 #14
  - Signal Process: Annex. A.1.1 #19
  - Measure Method: Annex C.3 Transformer #28-29

# PD監(檢)測感測器監測應用

## 油浸式變壓器-電力設備局部放電感測器應用

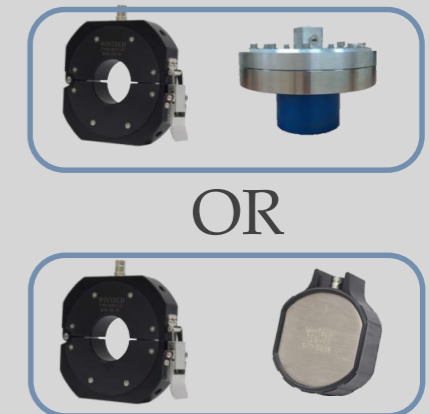
高壓設備OIL TR進行在線檢測或24小時監測時感測器放置位置示意圖



在線檢測 & 24H監測



24H在線監測

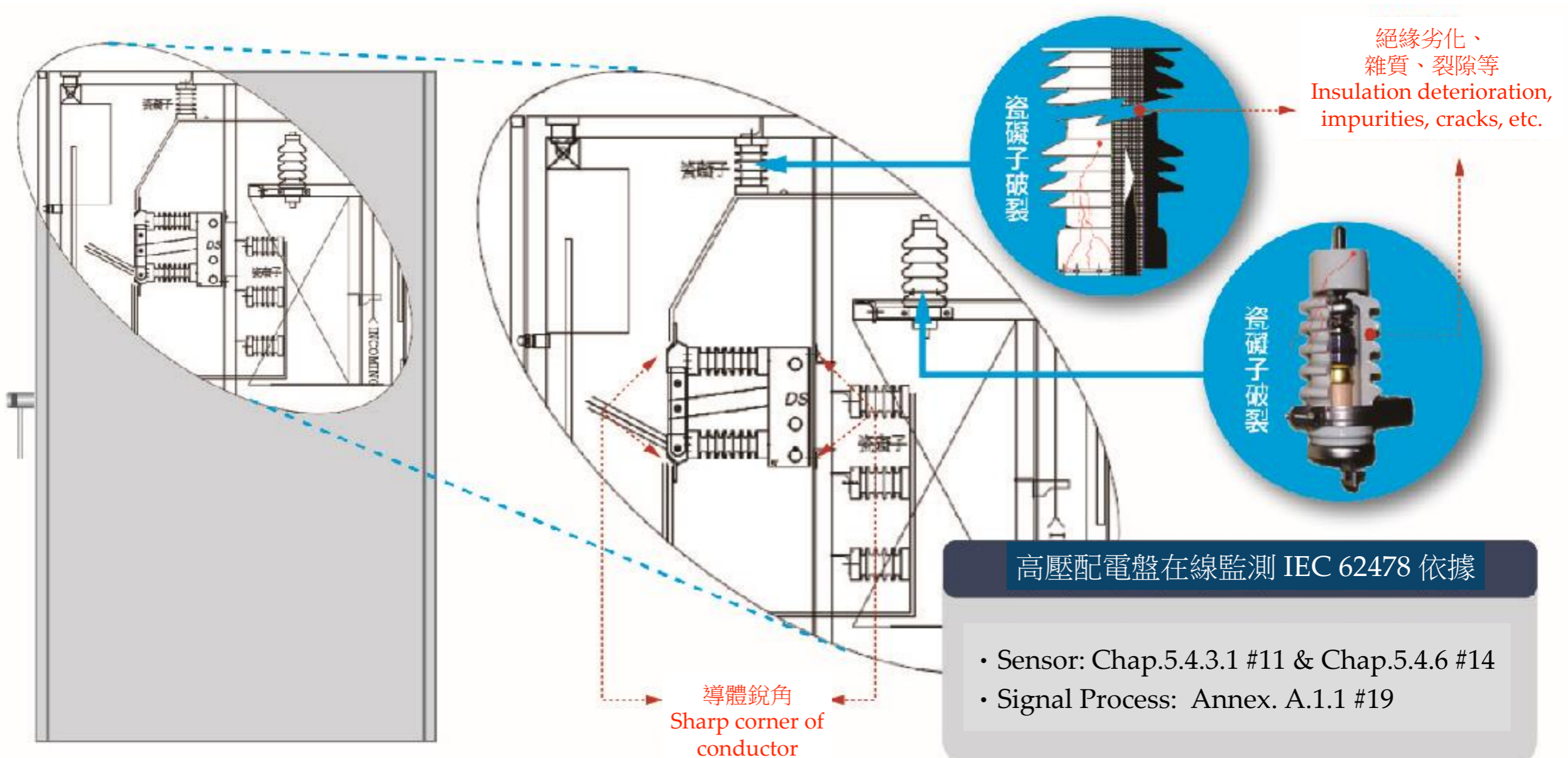




# PD監(檢)測感測器監測應用

## 高壓配電盤-局部放電發生原因

局部放電發生原因：絕緣劣化 | 金屬突出物 | 裂痕 | 接觸不良



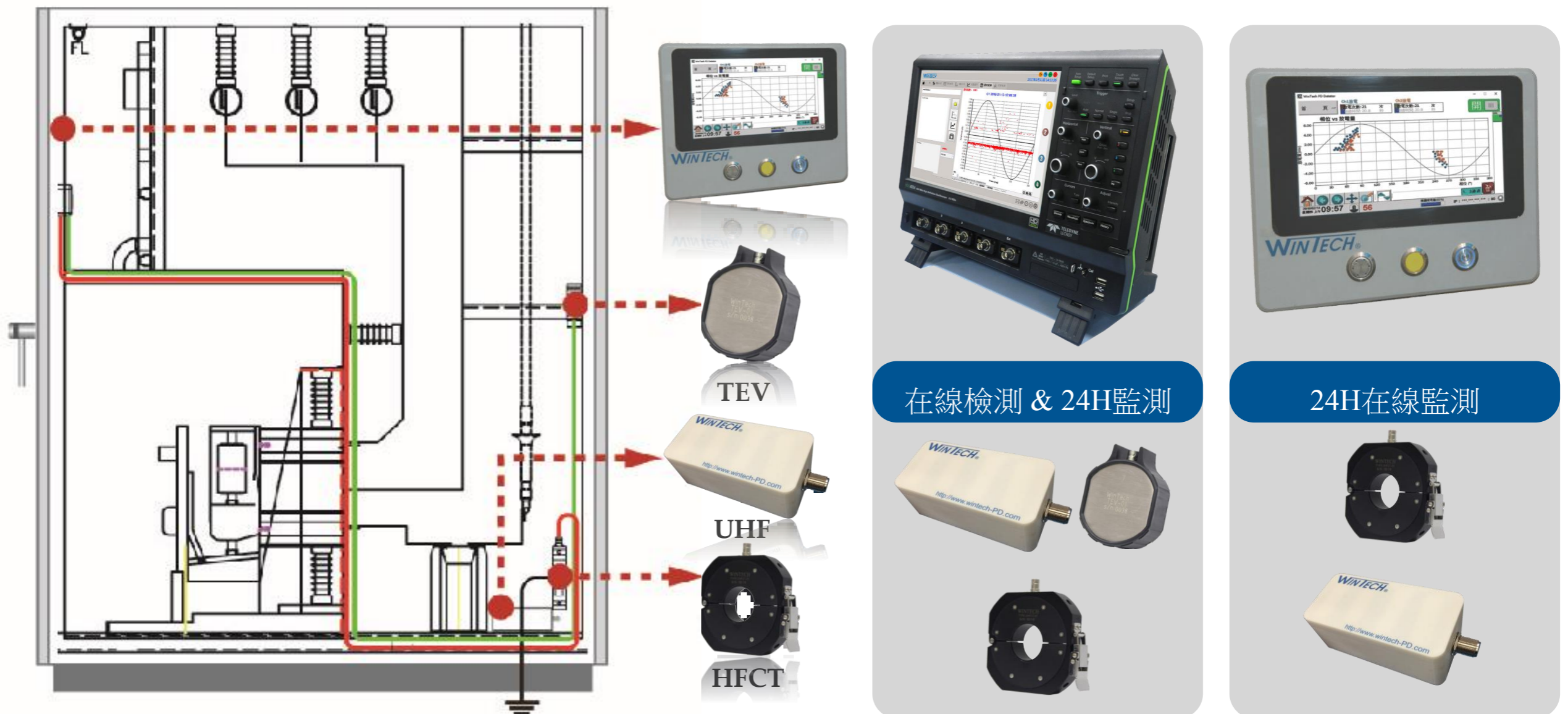
高壓配電盤在線監測 IEC 62478 依據

- Sensor: Chap.5.4.3.1 #11 & Chap.5.4.6 #14
- Signal Process: Annex. A.1.1 #19

# PD監(檢)測感測器監測應用

## 高壓配電盤-電力設備局部放電感測器應用

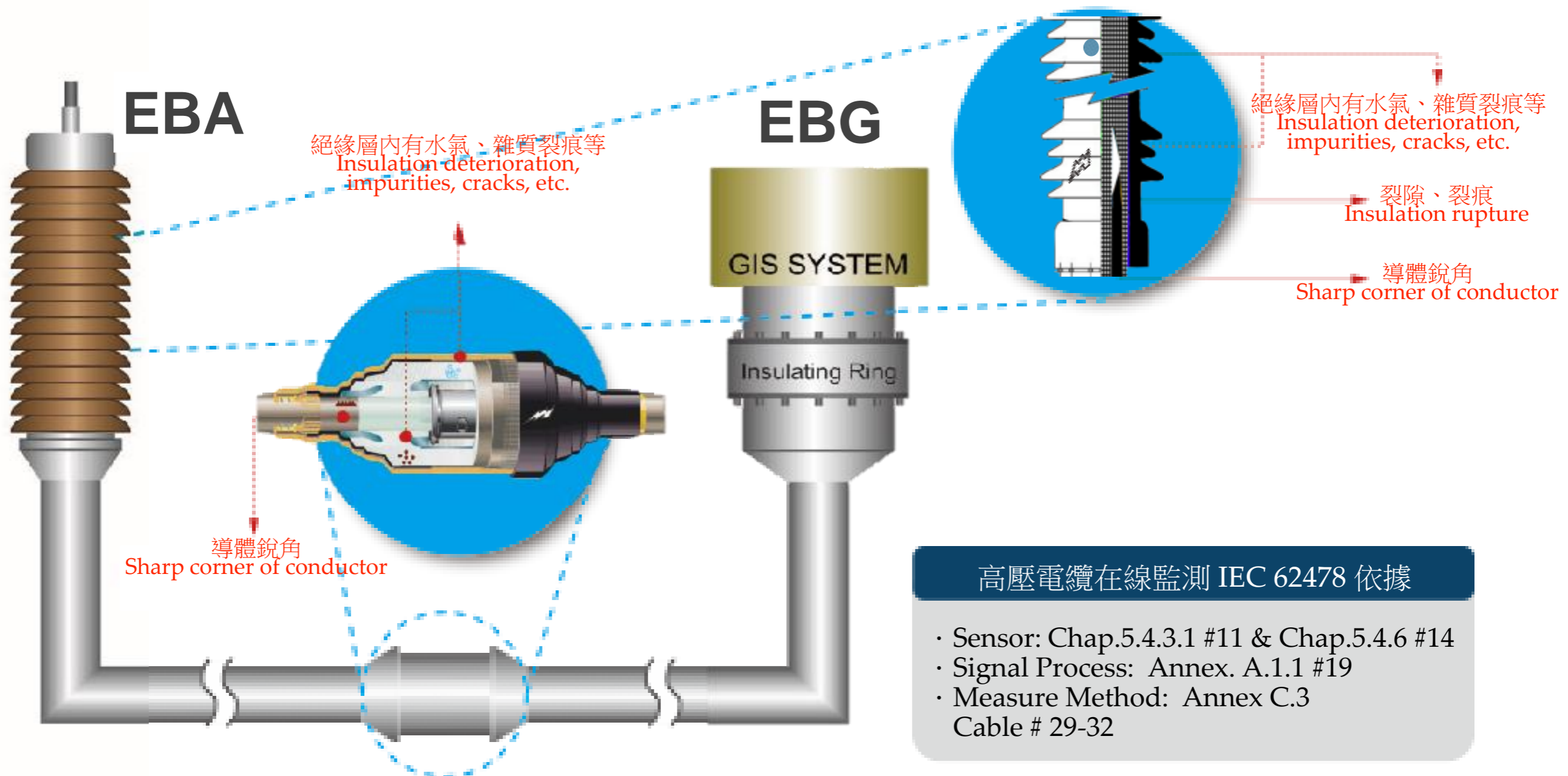
高壓配電盤進行在線檢測或24小時監測時，使用多重物理量感測器放置位置示意圖



# PD監(檢)測感測器監測應用

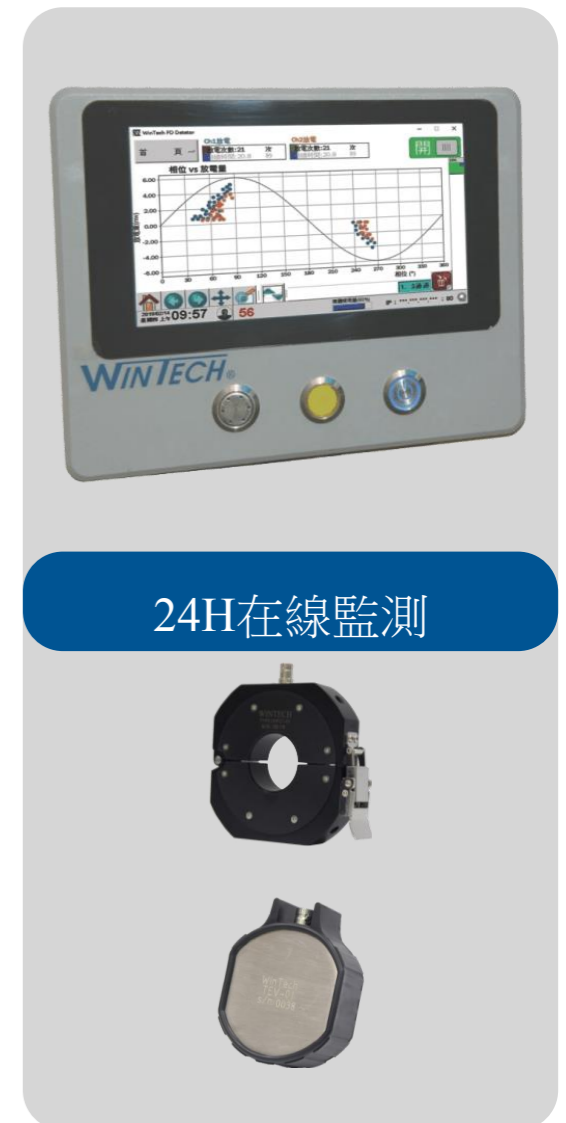
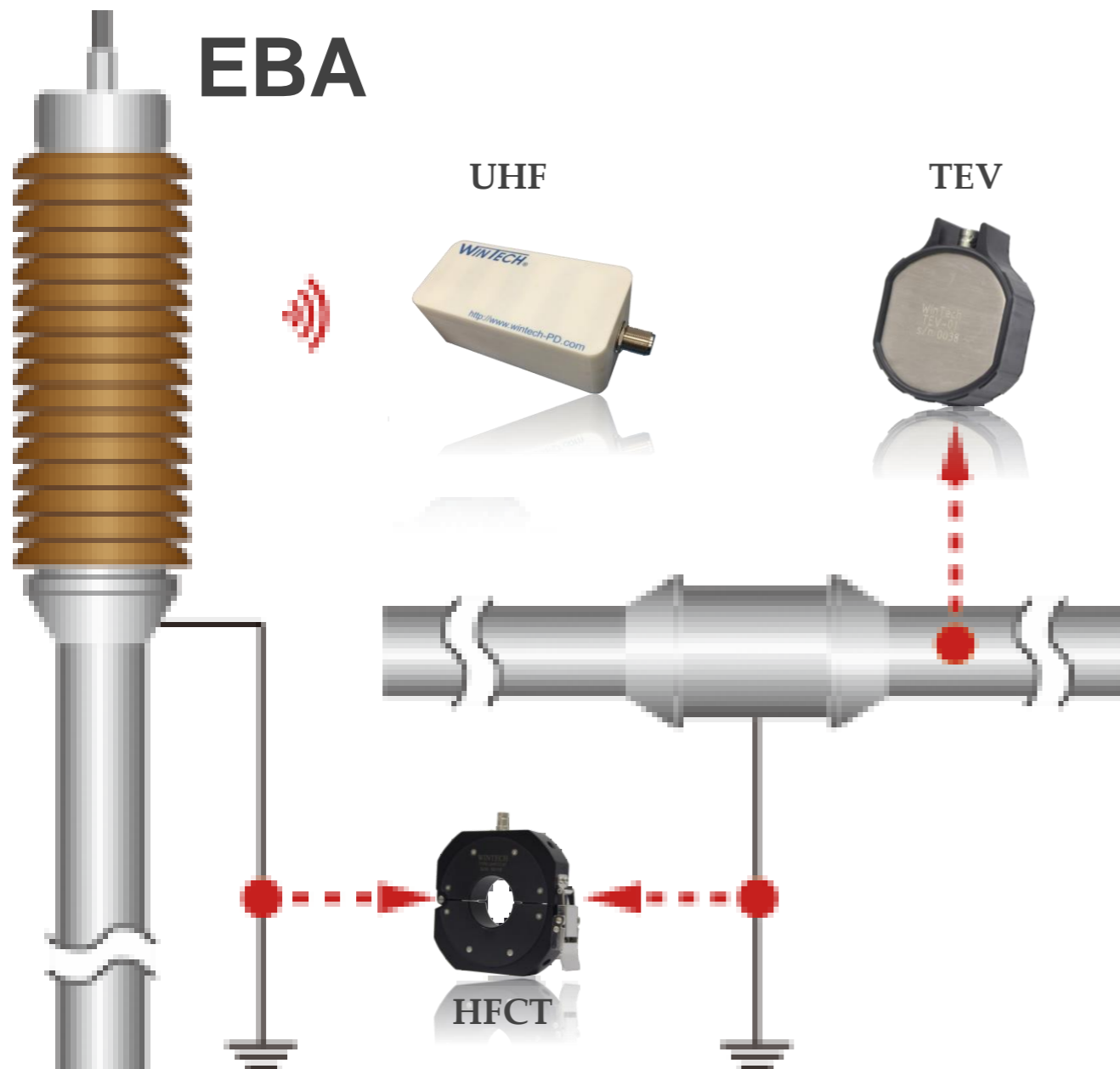
## 高壓電纜-局部放電發生原因

局部放電發生原因：裂隙、裂痕 | 尖端突出物 | 水氣 | 施工不良



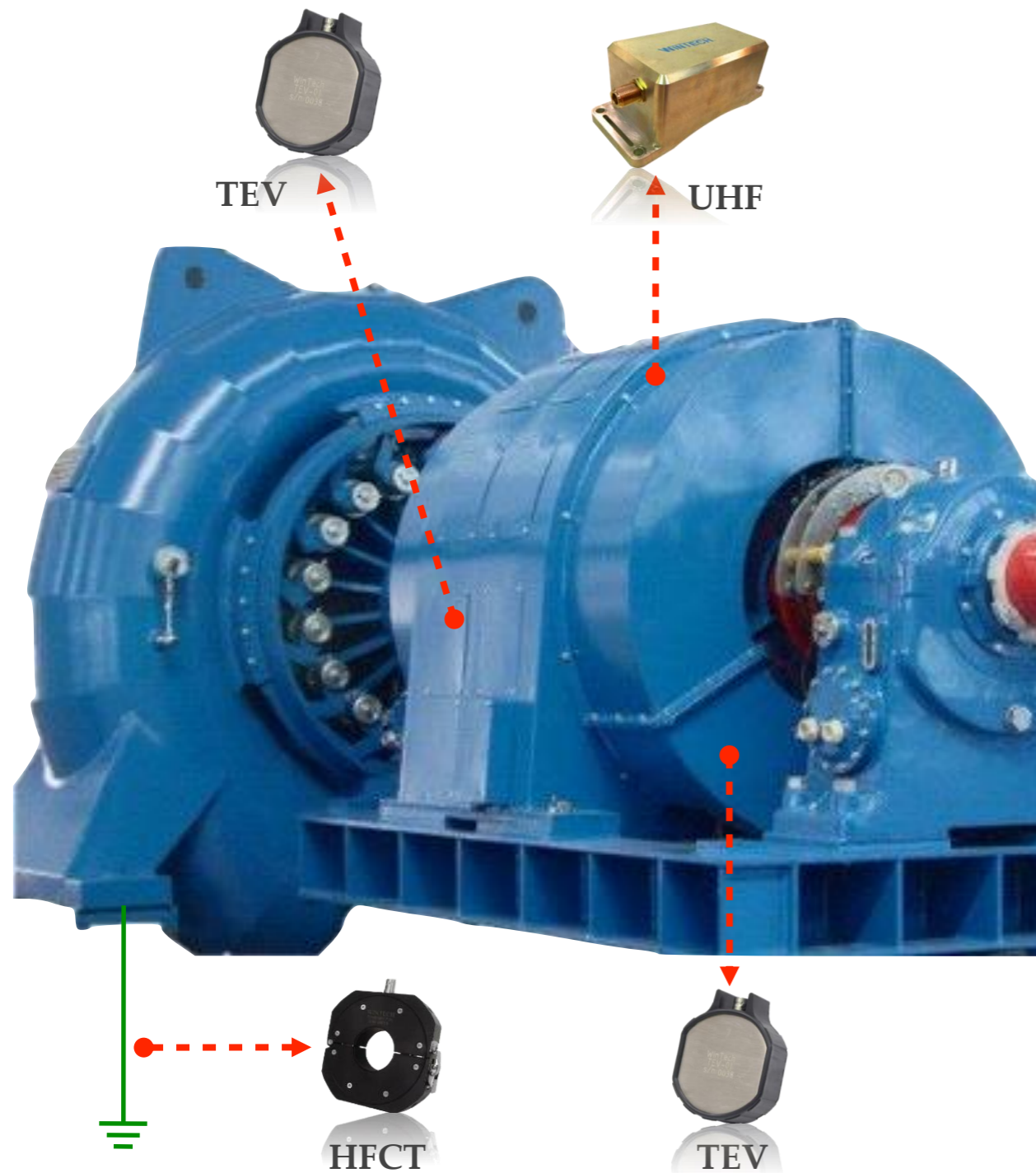
# PD監(檢)測感測器監測應用

高壓電纜-電力設備局部放電感測器應用



# PD監(檢)測感測器監測應用

## 轉動機械-電力設備局部放電感測器應用



**在線檢測 & 24H監測**

**24H在線監測**

OR

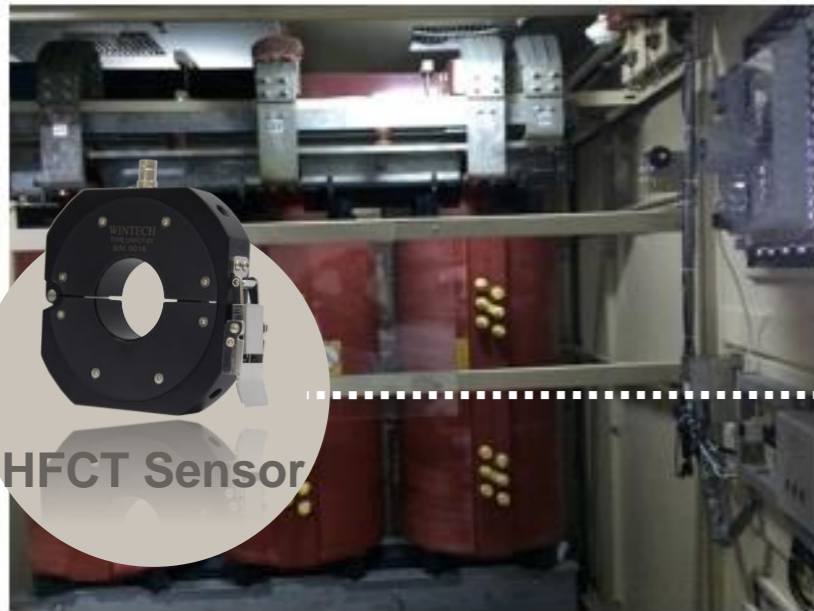
❖ 注：若被監測物為新設，可開孔(亦可不開孔)安裝UHF感測器；若被監測物為既設，建議安裝TEV感測器。

## 24小時監測案例1—澎湖馬公機場

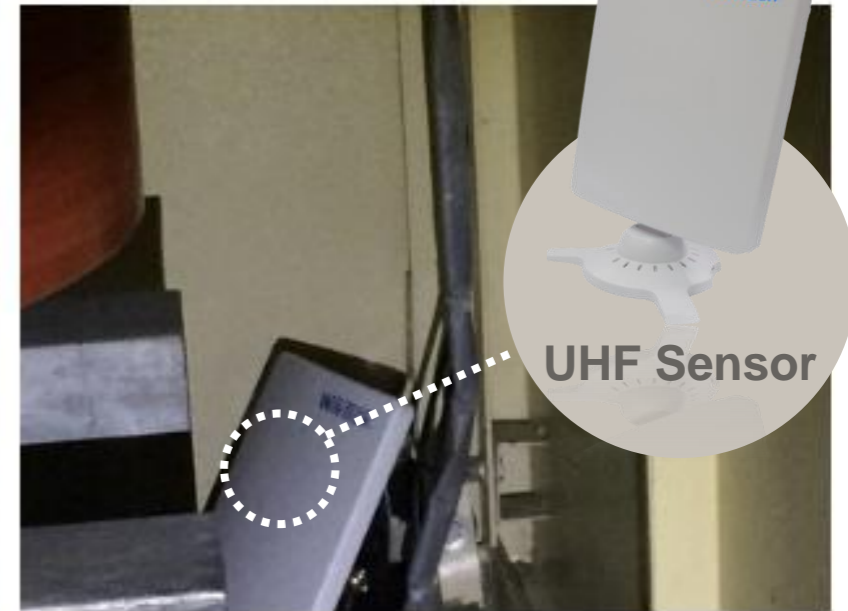
- 監測物件：高壓配電盤 整修改造案
- WinTech Detector 24h在線監測



WINTECH  
PD Detector



WINTECH  
HFCT Sensor



WINTECH  
UHF Sensor

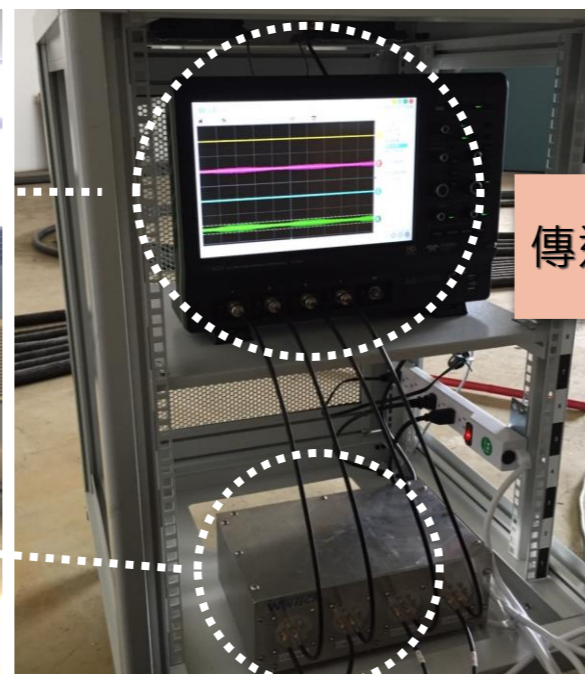
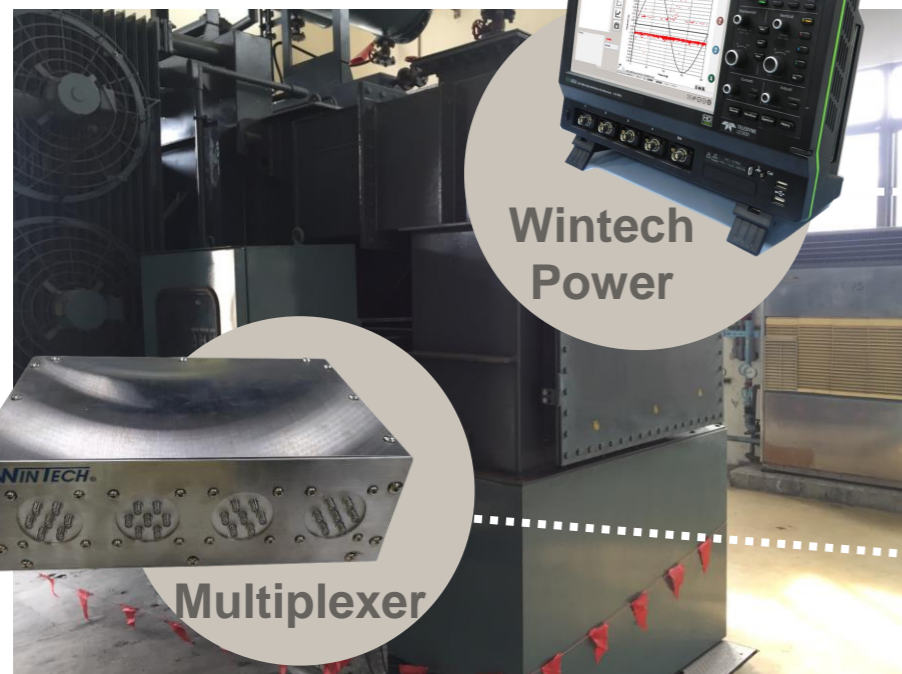
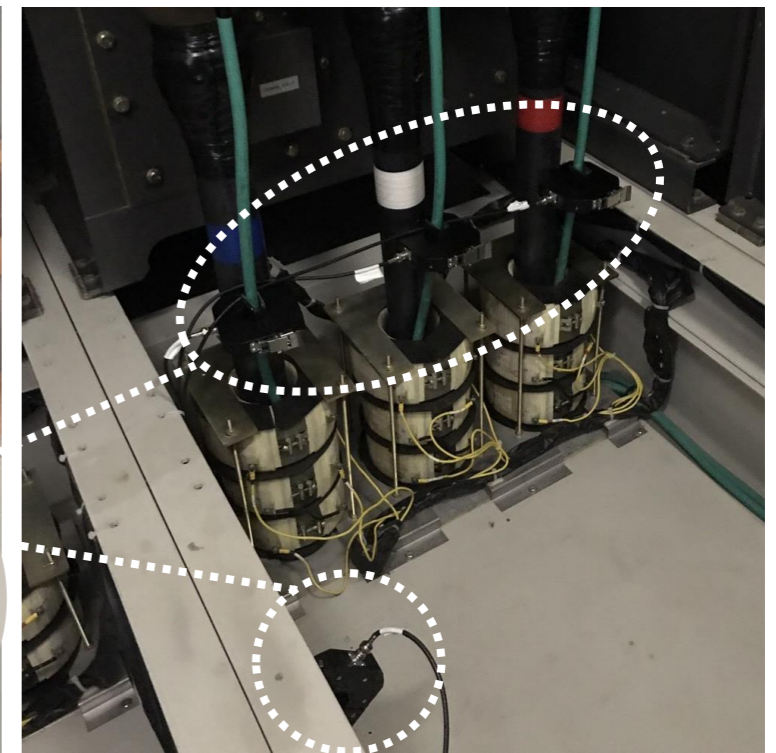
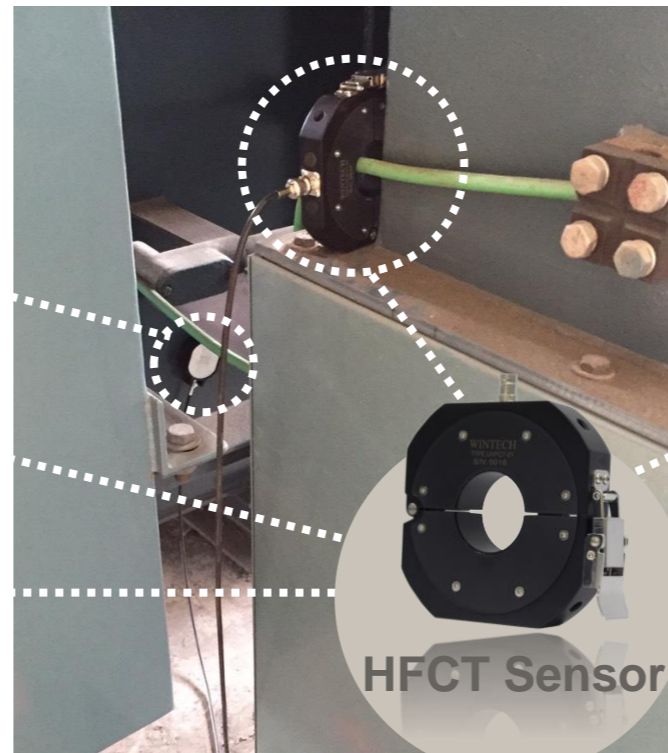
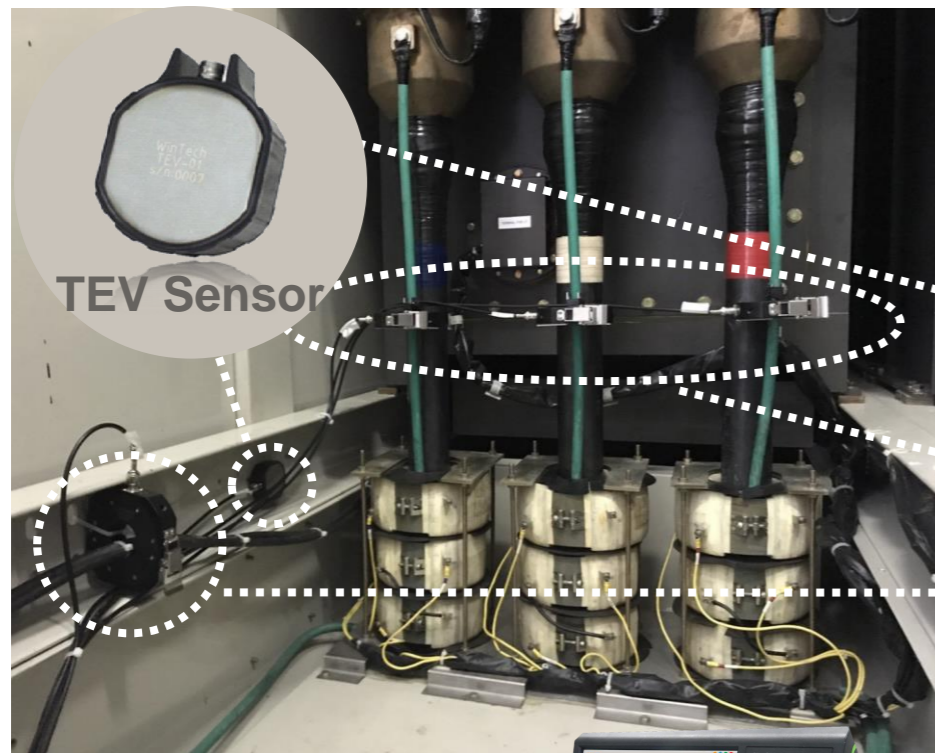
## 24小時監測案例2—花蓮統昶

- 監測物件：高壓配電盤
- WinTech Detector 24h在線監測



## 24小時監測案例3—高雄中污

- 監測物件：69kV油浸變壓器+配電盤
- WinTech Power 24h多功器在線監測



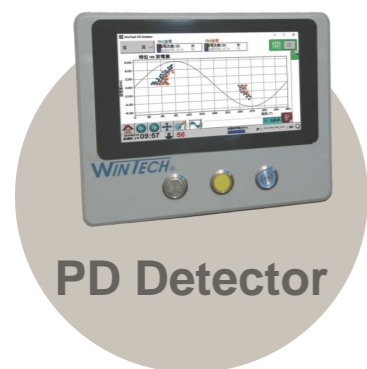
傳送中控室





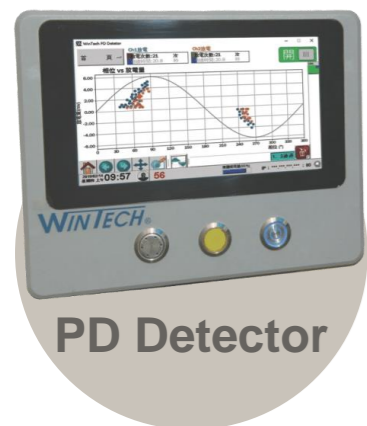
## 24小時監測案例4—台大醫院

- 監測物件：22.8kV VCB配電盤
- WinTech Detector 24h在線監測



## 24小時監測案例5—康橋林口分校

- 監測物件：22.8kV VCB配電盤
- WinTech Detector 24h在線監測



PD Detector

x 7



UHF Sensor

x 7



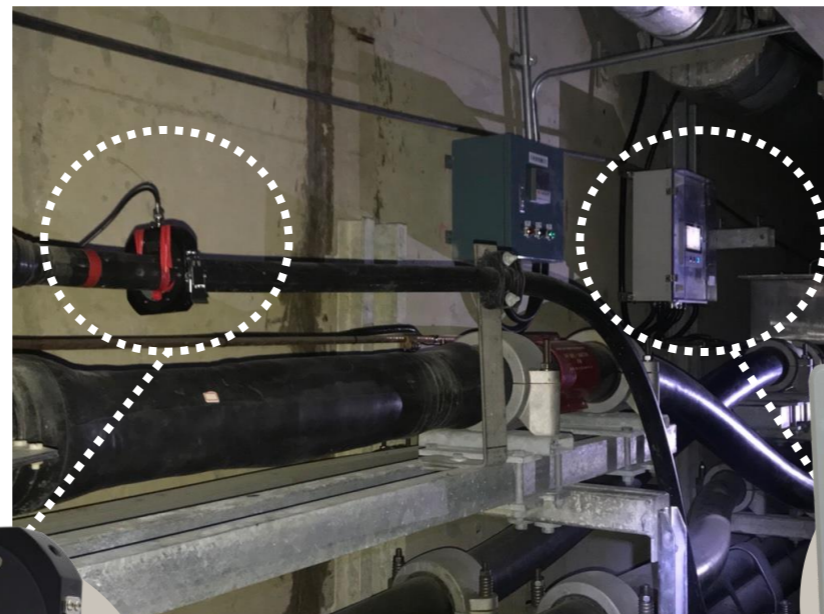
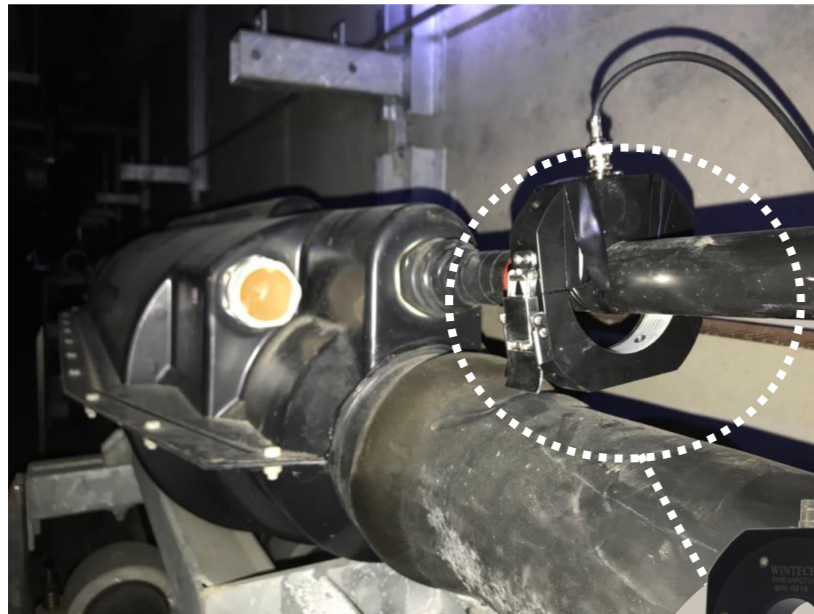
HFCT Sensor

x 7

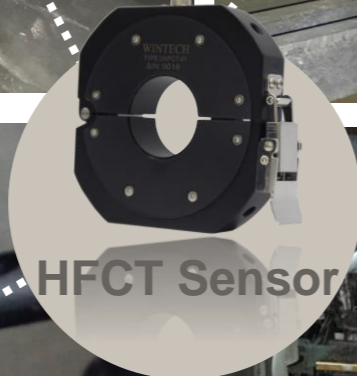


## 24小時監測案例6—台電綜研所 南科60通道地下電纜

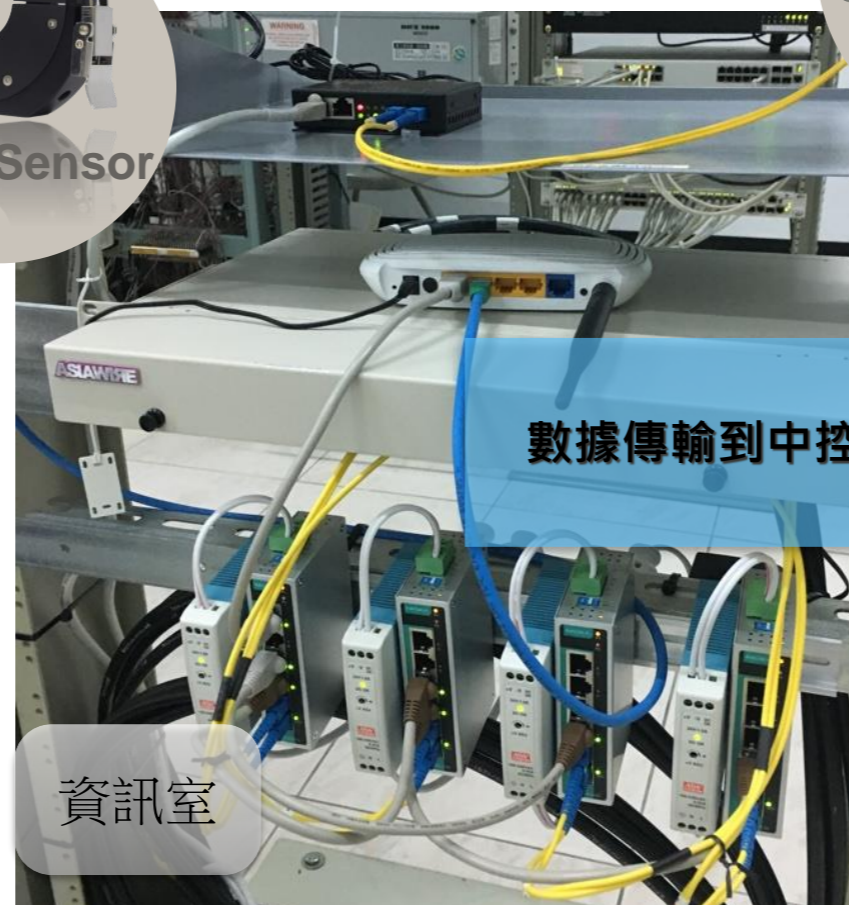
- 監測物件：345 kV 電纜
- WinTech Detector 24h 在線監測



PD Detector

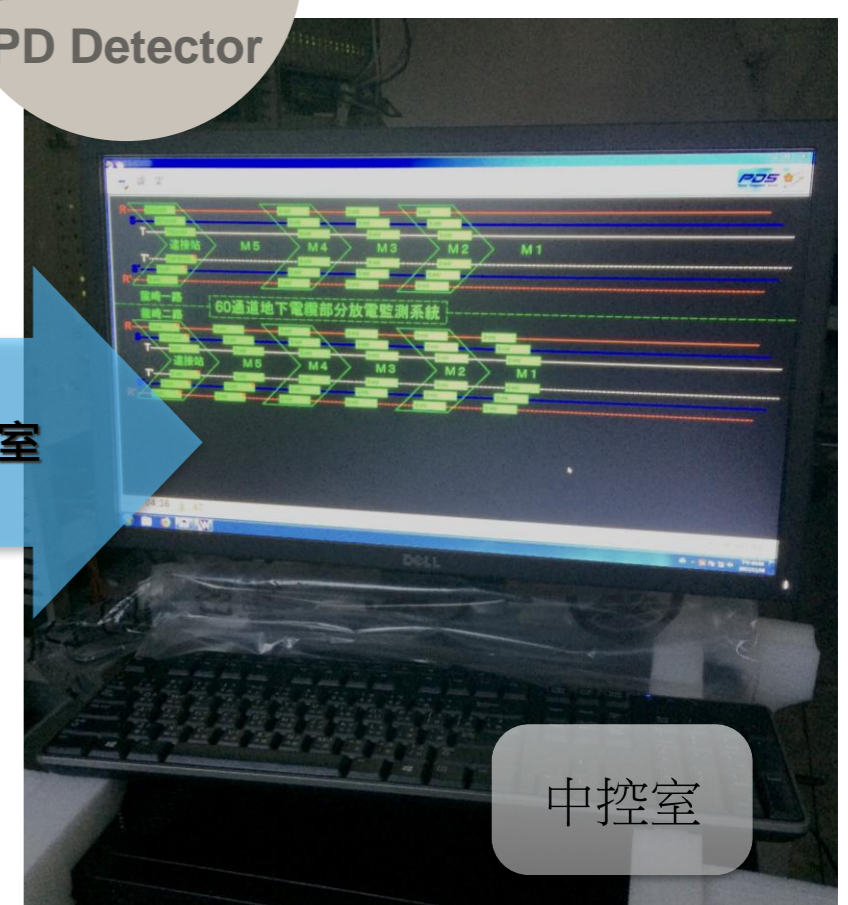


HFCT Sensor



數據傳輸到中控室

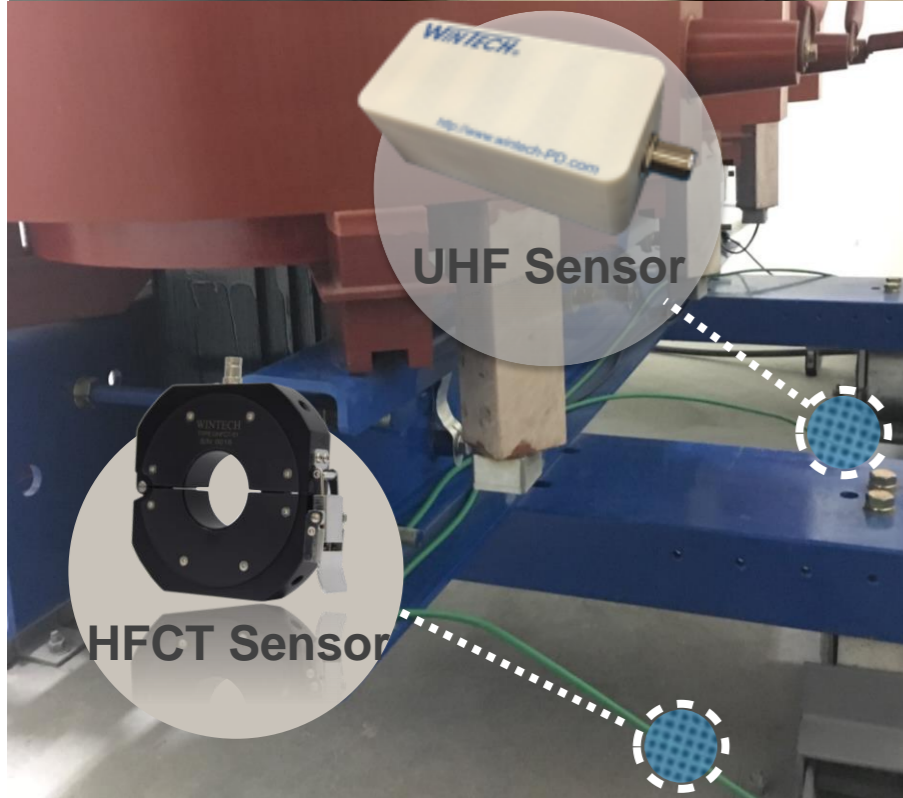
資訊室



中控室

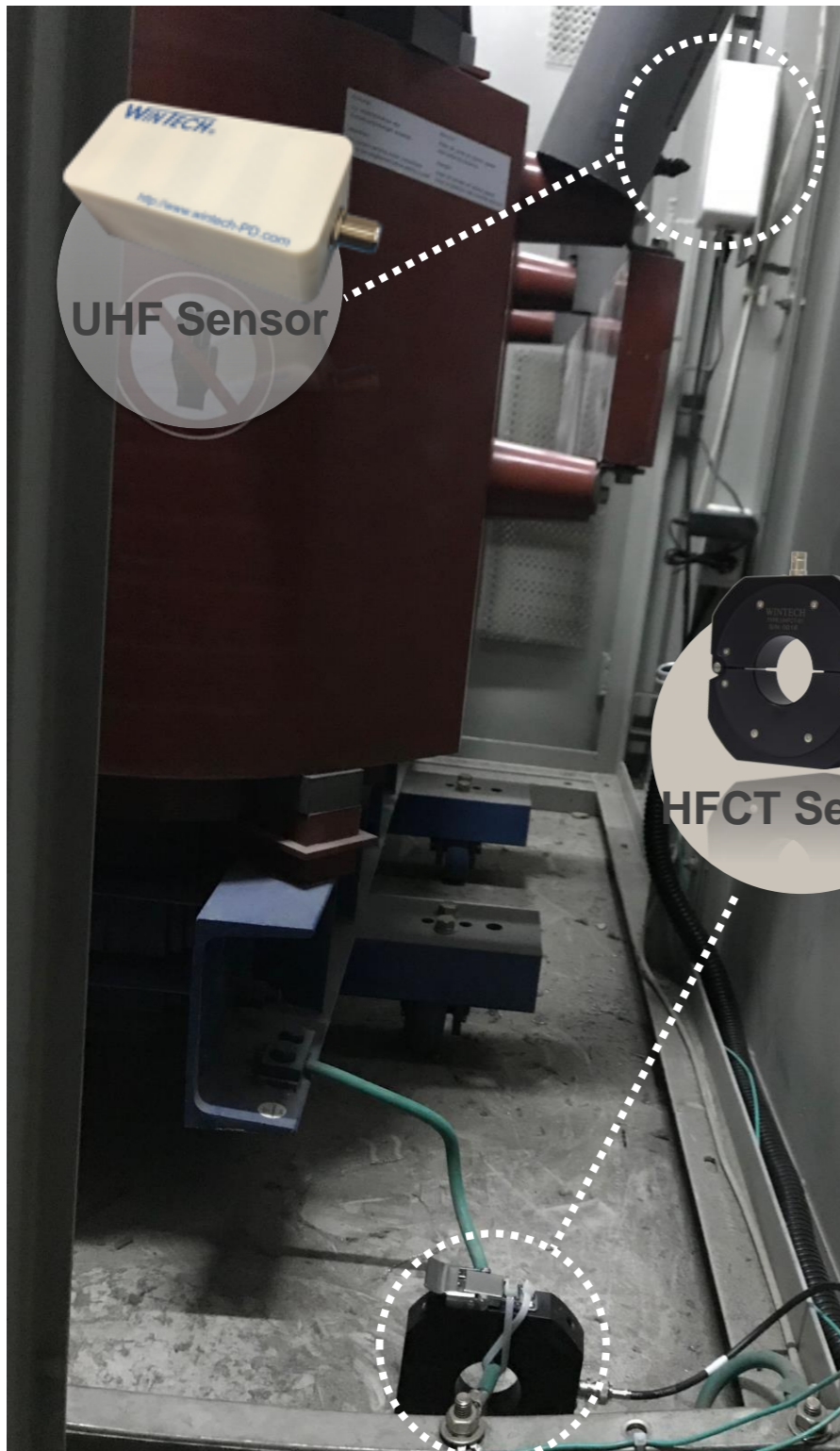
## 24小時監測案例7—高雄輕軌

- 監測物件：22.8 kV 模鑄式變壓器
- WinTech Detector 24h 在線監測



## 24小時監測案例8—中央氣象局

- 監測物件：22.8 kV 模鑄&油浸變壓器
- WinTech Detector 24h 在線監測



## 24小時監測案例9—NCC濟南路

- 監測物件：22.8 kV 模鑄式變壓器
- WinTech Detector 24h 在線監測



# 成浩科電運轉中局部放電24小時在線監測實績(節錄)

| 客戶             | 工程名稱  |
|----------------|---|
| 臺灣澎湖馬公機場       | 運轉中22.8kV配電盤之24小時局部放電在線監測(既有設備改繕)               |
| 臺灣電力股份有限公司-綜研所 | 運轉中之高壓345kV以上60通道地下電纜多功監測系統24小時局部放電在線監測         |
| 台大醫院西址院區       | 運轉中22.8kV高壓配電盤24小時局部放電在線監測                      |
| 高雄中區污水廠        | 運轉中69kV油浸變壓器+配電盤多功器24小時局部放電在線監測                 |
| 統昶營銷股份有限公司     | 運轉中22.8kV高壓配電盤24小時局部放電在線監測                      |
| 康橋林口分校 & 新竹分校  | 運轉中22.8kV高壓變電站全系統24小時局部放電在線監測                   |
| 中央氣象局          | 運轉中22.8kV-11.4kV 模鑄&油浸變壓器24小時局部放電監測(既有設備改繕)     |
| 高雄捷運輕軌         | 運轉中22.8kV模鑄式變壓器24小時局部放電在線監測                     |
| NCC國家通訊傳播委員會   | 運轉中22.8kV模鑄式變壓器24小時局部放電在線監測(既有設備改繕)             |
| 台南市安平水資源中心變電站  | 運轉中22.8kV VCB&GCV高壓盤24小時局部放電在線監測                |
| 台塑南亞配電盤場總變電室   | 運轉中33.5kV&22.8kV VCB & GCV 24小時局部放電在線監測(既有設備改繕) |
| 合肥長鑫12吋晶圓廠-中國  | 運轉中22.8kV模鑄式變壓器& VCB 24小時局部放電在線監測               |
| 行政院原子能委員會-核能三廠 | 運轉中13.8kV & 4.16kV NPBD非隔相總線局部放電遠端監測系統(既有設備改繕)  |

## 成浩科電局部放電設備優勢

- ❖ 延攬國內外知名學者專家成立研發團隊，並與國內外知名大學產學合作，結合學理與現場實務，經10餘年之驗證，先後研發出各種頻段與訊號之感測器及辨識軟體。硬軟體全數為國內生產製造，大幅降低使用者之成本支出。
- ❖ 硬體方面，我司依據局部放電發生時所釋出之物理現象，開發出偵測聲音、高頻電流、瞬時電壓及超高頻訊號，頻寬自100KHz至3000MHz皆有。完整的頻寬及多樣化感測器，符合IEC62478規範，優於國際知名品牌。另外，我司專利之「指向性陣列天線」不僅在國際期刊IEEE發表，並於2017年國際發明展獲「鉑金獎」之肯定，為局部放電定位技術之重大突破。
- ❖ 軟體方面，我司開發之「多重物理量」技術及大數據分析，正確地分辨出干擾與放電訊號，完整地展現局部放電之波型原貌。
- ❖ Wintech Power使用最大量測範圍，達3G之高階示波器做為局部放電檢測與診斷軟體設計基礎，四通道多重物理量同步擷取，同步診斷，一鍵式友善人機介面操作，大大提升檢測效率。操作軟體支持繁簡中文及多國語言版本。
- ❖ PD Detector採用兩種物理量以上的感測器進行在線監測，符合TCP/IP網絡傳輸通信協定、物聯網與智慧電網整合能力，現場監測數據透過內建RJ45連結到中控室，可遠端自主觀察PRPD圖、PD趨勢圖、PD歷史紀錄.....等，可客製支持 I/O & RS-485 等與SCADA系統完美整合。