

9 月 15 日

3.4KW 液冷式發射機 TH1 廠驗及教育訓練

1. 上午 09:10 時左右抵達工廠，換證進入後，先進行工廠簡介及安全教育。
2. 接下來由 R&S 工程師針對 TH1 設備構造進行說明。
3. 原備有一份廠驗報告，逐項以 ETL 進行各項參數及特性量測檢查，檢查結果，特性良好，並符合採購規範。
4. 由廠商以廠驗軟體再跑一次，並列印新的廠驗報告(內文圖片日期符合當日驗收日期)，以作為該廠驗之正式文件，如附件一（液冷式 3400W 發射機 TH1 廠驗報告）。

下午進行 TH1 發射機詳細介紹及操作說明。

1. 發射功率範圍：1.2kW～14.3kW。
2. 發射頻率範圍：470MHz～700MHz。
3. 每個機架最多可裝 12 組 PA。
4. 每個機架最多可裝 4 套 Dual Drive 的發射機。

R&S®TH1

NEW LIQUID-COOLED UHF TRANSMITTER

- ▶ 1.2 kW to 14.3 kW
- ▶ UHF range 470 MHz – 700 MHz
- ▶ Up to 12PA per rack
- ▶ MultiTX with up to 4 Tx in Dual Drive per rack
- ▶ Transmission standards: DVB-T2/T, to follow: ATSC3.0/ATSC, ISDB-T
- ▶ **The solution of choice for 5G Broadcast commercial deployment**



以下是 Rohde & Schwarz 的 R&S TH1 液冷發射機系列 的 5 個特色：

特性名稱	說明
一、節能與減碳	相較於目前最有效率的發射機，能耗降低約 15%。 碳足跡比現有很多已安裝機組小約 50%。 液冷設計使廢熱能量 90% 以上排向機房外部，減少室內冷卻負荷。
二、靈活與未來導向應用支援	支援 5G Broadcast、多媒體資料傳送給車載、物聯網裝置等新型應用。 軟體定義激勵器 (software-defined exciter) 平台，高度可擴充與可配置。
三、高效率運營與維護簡化	完全密封、無風扇 (fan-less) 的功率放大單元，減少風扇故障與噪音問題。 內部自我監控關鍵參數（如液體溫度、流量、壓力、反射功率等），提升可靠性。 具備遠端操作與監控界面（web, SNMP, 智慧裝置支援等）。
四、高功率輸出與模組化擴展性	多種輸出功率等級可選，例如 UHF 頻段從 1.2 kW 到 9.6 kW 平均功率輸出。 有多個放大器模組組合 (amplifiers per transmitter)，可以根據需求組合。 支援 MultiTX（多臺機器在同一機架中安裝，以節省空間與整體基礎設施成本）。
五、環境操作條件與耐用性	工作頻率範圍為 UHF 頻段 V/IV，即約 470-700 MHz（若需求可延伸至 700-862 MHz）。 可在海拔最高 2000 m 操作（更高可特別要求）。 室內操作溫度範圍 +1 °C 至 +45 °C，濕度可達約 95%（無凝結）條件。

HOME

2025.10.27 08:25:26

SFN

2025.10.27 08:25:36

Logbook

2025.10.27 08:25:53

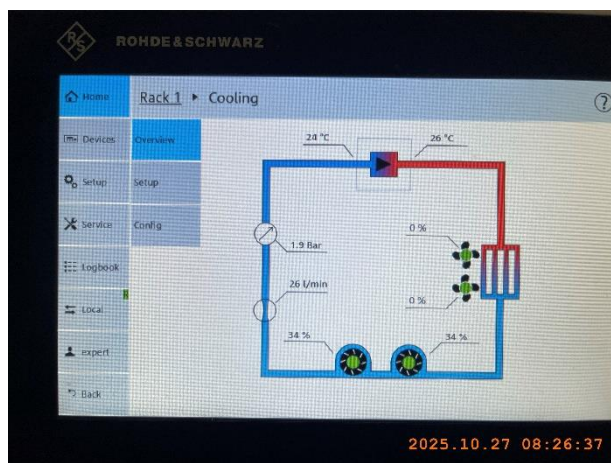
Cooling

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SFN



Cooling



9 月 16 日

400W 氣冷式發射機 TMU9Evo 廠驗及教育訓練

1. 上午 09:00 時左右抵達工廠，換證進入後，由 R&S 工程師針對 400W 氣冷式發射機 TMU9Evo 設備構造進行說明。
2. 原備有一份廠驗報告，逐項以 ETL 進行各項參數及特性量測檢查，檢查結果，特性良好，並符合採購規範。
3. 由廠商以廠驗軟體再跑一次，並列印新的廠驗報告(內文圖片日期符合當日驗收日期)，以作為該廠驗之正式文件，如附件二（氣冷式 400W 發射機 TMU9Evo 廠驗報告）。

下午進行 400W 氣冷式發射機 TMU9Evo 詳細介紹及操作說明：

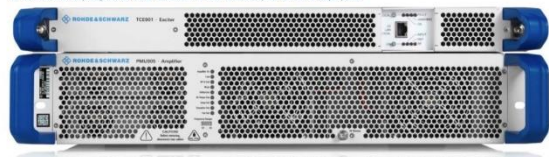
TMU9Evo 外觀及應用模式：

1. 發射功率範圍：400W～3kW。
2. 發射頻率範圍：470–790 MHz（可選 790–862 MHz）。

備註：為符合更嚴格的標準與抑制離帶輻射，需在射頻輸出端搭配適當濾波器。



The RAS™TMU9evo comprising the RAS™TCE901 exciter and the RAS™PAU905 amplifier with 400 W output power.



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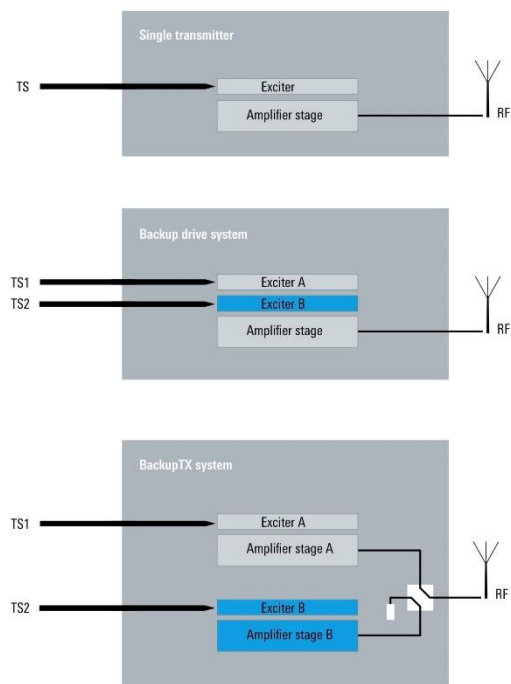
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可應用之模式（概述）：

1. 單機單 Exciter。
2. 單機雙 Exciter。
3. 雙機單 Exciter。

R&S™TMU9evo redundancy configurations for maximum availability

The standby components (blue) additionally perform the functions of system monitoring and control.



以下是 Rohde & Schwarz 的 400W 氣冷式發射機 TMU9Evo 的 5 個特色：

特色	簡述	對用戶的好處
高效率 Doherty 架構	整機效率最高可達約 40%（COFDM；ATSC 可更高），並提供「自適應效率最佳化」功能	降低耗電與營運成本；在功率/頻道調整時仍維持高效率
400 W 省空間機型（3U，19"）	400 W 型號採 3U、19" 機箱，深度約 550 mm	體積小、易上架，便於既有機櫃整合與空間節省
低基礎設施需求（氣冷式）	對場站冷卻與供電要求低；高效率減少外部冷卻系統需求	適合基礎設施較受限或空調成本高的場域
MultiTX 多機同櫃	400 W 機型可在同一機櫃整合最多 6 台（MultiTX）	提升機櫃密度與可用性；易於做備援/多頻道部署
內建效能與訊號分析	內建效率量測與訊號分析、自我監測	即時掌握運轉狀態，縮短故障時間、提升服務品質

補充：TMU9evo 為 UHF 數位電視中功率氣冷系列，整體平台主打「易操作」、「高效率」、「長壽命設計」與「面向未來」；其軟體式激發器亦有利 ATSC 3.0 等標準的彈性升級與功能擴展。

9月17日
TH1 液冷式發射機之 PA(型號：PHU100)教育訓練

R&S TH1 功率放大模組(PHU100)之 5 項重點特色：

特色	說明
液冷、全密封、無風扇設計	TH1 的功放單元採「完全密封、無風扇」結構，搭配液冷，提升可靠度與耐用度。
高能源效率	相較同級最佳設計可再降低約 15% 能耗；整機電源因數 PF > 0.95，有助於整站能效表現。
可擴展模組化功率	以功率放大模組疊加提供 1.2 kW～9.6 kW（COFDM 平均功率）的多型號選擇，支援同櫃 MultiTX 併架。
低噪音、熱量外排	室內噪音 < 60 dBA；液冷設計使得約 90% 廢熱導出至室外，降低機房空調負荷。
智慧監控與保護	支援網頁/行動裝置維護；功率放大級監測包含前/反射功率、溫度、晶體管/電源狀態、電壓電流、反射與 VSWR 等，並具保護機制。

PHU100 結構說明：

外觀	正面
	 Figure 4-9: Pulling amplifier out of rack 6. NOTICE! To prevent damage to the connectors, do not place the amplifier on its rear panel. Set down the amplifier horizontally with the its base facing downward.
背面	上視圖

Opening and closing R&S PHU100 amplifier



Figure 4-15: Loosening contact plate

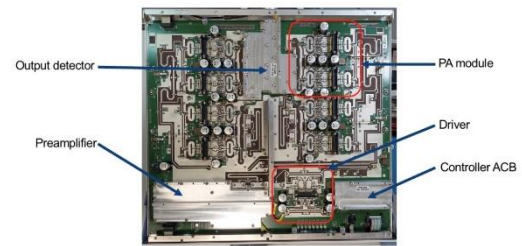
4. Undo all screws on the rear panel (Torx screwdriver T10).



Figure 4-16: Undoing screws on rear panel

5. Undo all screws securing the top cover (Torx screwdriver T10).
6. Lift off the top cover.

PHU100 OVERVIEW



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下視圖

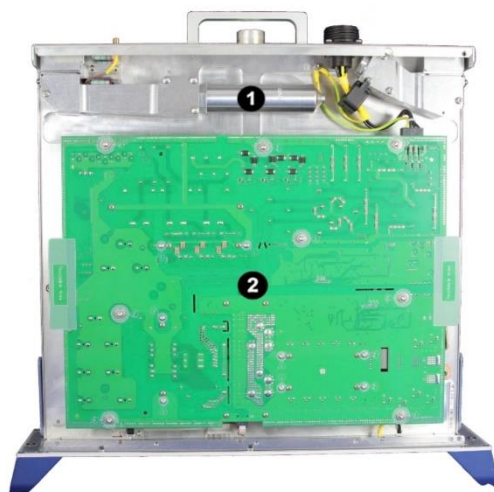


Figure 2-3: Amplifier - underside

- 1 = Pressure equalization
- 2 = Power supply unit (A2)

BLOCK DIAGRAM

Block diagram

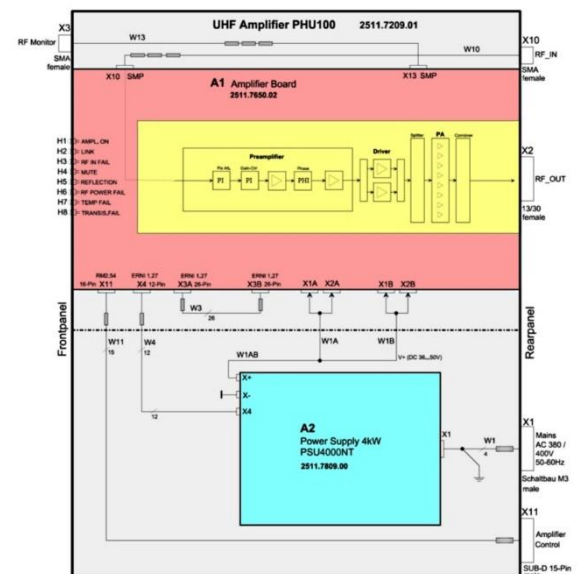
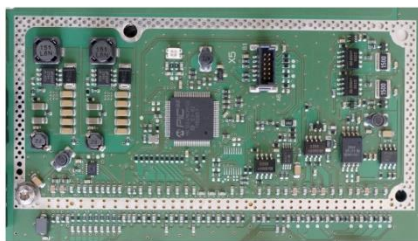


Figure 2-4: Block diagram of R&S PHU100

ACB CONTROLLER

PHU100 ACB CONTROLLER



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POWER SUPPLY



Overview :

1. 前置放大器 (Preamplifier)
2. 放大板 A1 (Amplifier board A1)
3. 功率 A、功率 B、功率輸出、反射輸出偵測器 (Detector for PWR_A, PWR_B, PWR_OUT, REFL_OUT)
4. 功率分配器 (Splitter)
5. 功率放大模組 (PA module)
6. 控制器 (Controller)
7. 驅動器 (Driver)

電源供應單元位於底部。

The entire amplifier unit is on the top side of the amplifier.

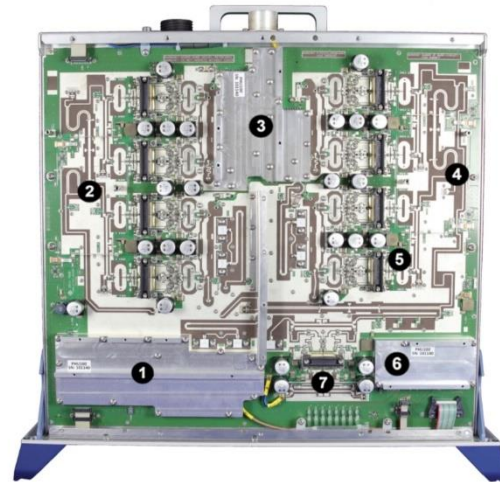


Figure 2-2: Amplifier - top side

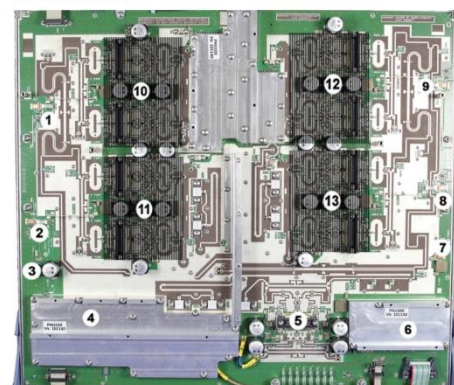
- 1 = Preamplifier
- 2 = Amplifier board A1
- 3 = Detector for PWR_A, PWR_B, PWR_OUT, REFL_OUT
- 4 = Splitter
- 5 = PA module
- 6 = Controller
- 7 = Driver

The power supply unit is on the underside.

功率放大器模組概覽 (Overview of modules) :

1. Fuse, module 2B, 40 A (F2303), 保險絲, 模組 2B, 40 安培 (F2303)
2. Fuse, module 1B, 40 A (F2302), 保險絲, 模組 1B, 40 安培 (F2302)
3. Fuse, preamplifier, 5 A T (F2301), 保險絲, 前置放大器, 5 安培 (慢熔型) (F2301)
4. Preamplifier shielding cover (14x T10 screws), 前置放大器遮罩蓋 (14 個 T10 螺絲固定)
5. Driver transistor (V12), 驅動晶體管 (V12)
6. Controller shielding cover (4x T10 screws), 控制器遮罩蓋 (4 個 T10 螺絲固定)
7. Fuse, driver 20 A (F2201), 保險絲, 驅動部分, 20 安培 (F2201)
8. Fuse, module 1A, 40 A (F2202), 保險絲, 模組 1A, 40 安培 (F2202)
9. Fuse, module 2A, 40 A (F2203), 保險絲,

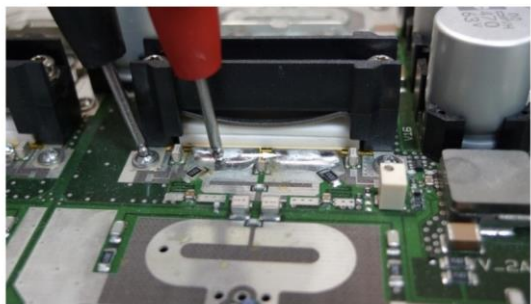
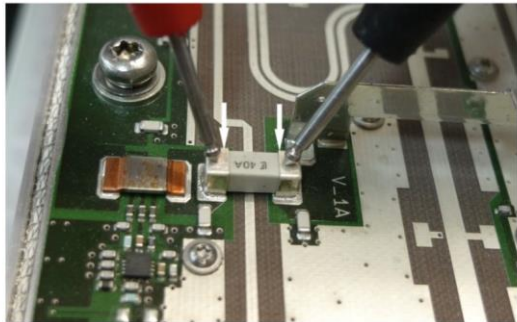
Overview of modules

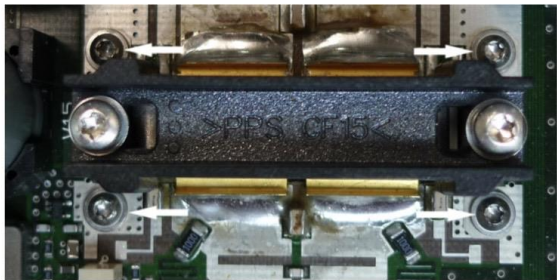


- 1 = Fuse, module 2B, 40 A (F2303)
- 2 = Fuse, module 1B, 40 A (F2302)
- 3 = Fuse, preamplifier, 5 A T (F2301)
- 4 = Preamplifier shielding cover (14x T10 screws)
- 5 = Driver transistor (V12)
- 6 = Controller shielding cover (4x T10 screws)
- 7 = Fuse, driver 20 A (F2201)
- 8 = Fuse, module 1A, 40 A (F2202)
- 9 = Fuse, module 2A, 40 A (F2203)
- 10 = Module 2B (V28, V29)
- 11 = Module 1B (V26, V27)
- 12 = Module 2A (V18, V19)
- 13 = Module 1A (V16, V17)

模組 2A，40 安培（F2203） 10. Module 2B (V28, V29)，模組 2B（V28、V29） 11. Module 1B (V26, V27)，模組 1B（V26、V27） 12. Module 2A (V18, V19)，模組 2A（V18、V19） 13. Module 1A (V16, V17)，模組 1A（V16、V17）	
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功率晶體故障檢查及更換之操作步驟：

故障檢查： 使用萬用表測量驅動晶體或輸出級晶體兩個閘極對地的電阻。 ► 正極表筆接於閘極端子（朝外側的金屬接點）。 若測得電阻與 $11k\Omega$ 有明顯差異，則晶體為故障，必須更換。 測量時，直流電源殘餘電壓必須 $\leq 0.5V$，否則測量不準。 若殘餘電流偏高，應檢查殘餘電流與地的關係及對應保險絲。	 Figure 4-42: Checking resistance of transistor  Figure 4-45: Checking fuse (F2201)
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注意：1. 先拆小螺絲(M2)，再拆中間螺絲(M2.5) 旋鬆晶體管兩側接地銅片上的 4 顆 M2 螺絲（使用 Torx T6 起子）	 Figure 4-44: Undoing screws of ground strips
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使用 Torx T 8 起子，旋鬆晶體管固定架上的
2 顆 M2.5 螺絲

3. Undo the 2 screws of the transistor retainer (Torx screwdriver T8).

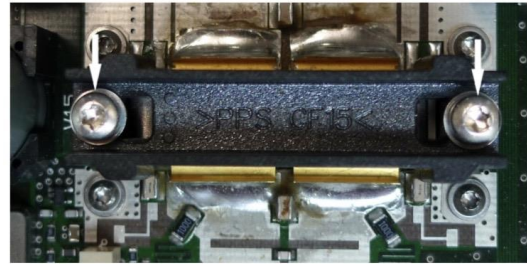


Figure 4-43: Unscrewing screws on transistor

取下功率晶體：以雙焊槍加熱撬開：
對故障的晶體管進行去焊處理。在操作時，
需同時加熱汲極端與閘極端，使用兩支烙鐵
同時加熱後將晶體管取出。

除餘下的焊錫：清潔(座+晶片)。

功率晶體塗上新的石墨膠。
使用鋸齒刮片來刮平石墨膠。
注意兩側要有些許留白，不要塗滿。



Figure 4-47: Spreading heat-conducting paste

功率晶體斜邊朝向輸出端。
功率晶體壓下時搖一下，確保對正及密合。

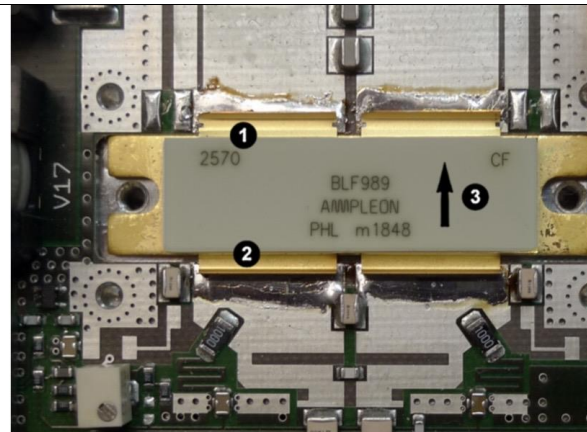


Figure 4-48: Positioning transistor

1 = Drain
2 = Gate
3 = Pushing direction

M2.5 螺絲先含住。

先鎖小螺絲 M2，使用 4 顆螺絲固定兩條接地帶（Torx T6 螺絲起子，扭力：29 Ncm）。

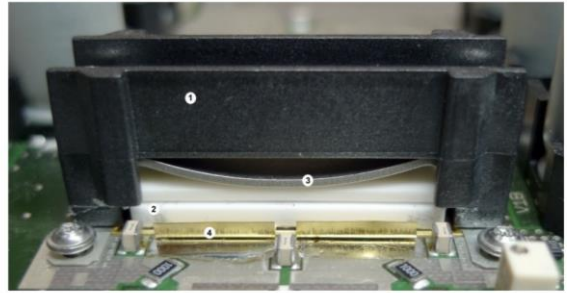


Figure 4-49: Mounting transistor unit

- 1 = Clamping block
- 2 = Pressure plate (ceramic)
- 3 = Transistor spring
- 4 = Terminal lug (gate side)

上固定鐵片，

鎖緊 M2.5 螺絲，使用扭力螺絲起子交替鎖緊晶體管固定器的螺絲，直到每一顆達到 70 Ncm 的鎖緊扭力。

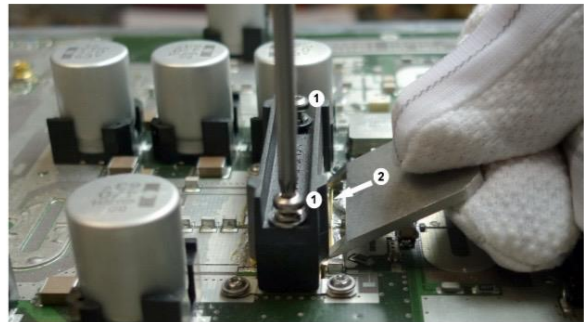


Figure 4-50: Tightening screws on transistor

- 1 = Transistor retainer
- 2 = Pressure applied using transistor installation tool

將烙鐵的尖端以低阻抗方式接觸至散熱器。

將晶體管的端子片焊接到印刷電路板上。

注意：

在焊接端子片時，焊料必須完全且均勻地流到端子片下方。

為避免損壞，晶體管端子片不可向印刷板方向彎曲（出於公差原因，端子片與印刷板之間需留有微小間隙）。



Figure 4-51: Tightening screws of ground strips

焊點應形成輕微的圓角。

以電錶檢查接點阻值為 11.0K 歐姆。

接下來的重點說明：

使用 BIAS_ADJUST CAN 指令啟動自動靜態電流調整（請參閱第 5.4.6 章「靜態電流校準」，第 98 頁）。

靜態電流調整必須對前置放大晶體管、驅動晶體管及所有輸出級晶體管同時進行，即使只更換了一顆晶體管，也必須全部一起校準。

進行功能測試與連續運行測試（請參閱第 5 章「功能測試」，第 79 頁）

螺絲扭力對照表：

名詞說明：

M = 螺紋規格（公制）

MAS = A2/A4-70 不鏽鋼螺絲建議鎖緊扭力（Nm）

MAG = 螺柱（牙銷）建議鎖緊扭力（Nm）

MAC = 黃銅 CuZn37 螺絲建議鎖緊扭力（Nm）

M	1.4	2	2.5	3	4	5	6	8	10
MAS	-	0.29	0.66	1.03	2.35	4.6	8	18	36
MAG	0.07	0.17	0.45	0.75	2.3	4.1	-	-	-
MAC	-	0.14	0.33	0.6	1.3	2.7	4.5	11	-

M = Thread size
MAS = Recommended tightening torque for A2/A4-70 screws in Nm
MAG = Recommended tightening torque for threaded pins in Nm
MAC = Recommended tightening torque for CuZn37 screws in Nm

原廠工程師教學示範相關照片



學員實際操作相關照片



9月18日

TMU9Evo 氣冷式發射機之 PA(型號：PMU905)教育訓練

下面整理 R&S TMU9evo 發射機所用 Power Amplifier「PMU905」的 5 項重點特色：

重點	說明
400 W（COFDM）額定輸出	PMU905 為 UHF Band IV/V 空冷功放模組，單模組額定輸出功率 400 W（DTV/COFDM，RMS）
同級最佳效率與功率密度	官方型錄指出 PMU905 具備「最高效率與最高功率密度」等級的表現，可有效降低整機能耗與機櫃空間需求。
全 UHF 頻段寬帶運作	PMU905 可在整個 UHF 頻段運作，無需硬體改裝或更換（Multiband/Wideband 設計），便於頻道調整與庫存統一。
Multiband Doherty 高效率架構	搭載 R&S 多頻段 Doherty 技術，為 TMU9evo 系列達成高系統效率的關鍵功放架構。
空冷、模組化、易維護	空冷設計、插拔式模組，利於快速維護與擴充；用於 TMU9evo 空冷中功率平台（整機效率可達約 40%）。

PMU905 結構說明：

外觀	背面
	 Figure 3-4: Power supply unit and fans (front cover removed)

上視圖：功率放大板（頂蓋已移除）

1. 前置放大器 + 驅動放大器。
2. 輸出級（含 4 顆電晶體）。
3. 放大器控制板。
4. 射頻檢測器。
5. 諧波濾波器。
6. 風扇 E1。
7. 風扇 E2。
8. 電源模組。

說明：

一個或兩個電源模組位於放大器的左側，在前蓋後方。



Figure 3-3: Amplifier board - A2 (top cover removed)

- 1 = Preamplifier + driver amplifier
2 = Output stage with 4 transistors
3 = Amplifier control board
4 = RF detectors
5 = Harmonics filter
6 = Fan E1
7 = Fan E2
8 = Power supply unit (e)

One or two power supply units are to the left of the amplifier behind the front cover.

背面（無備用電源）



Figure 3-4: Power supply unit and fans (front cover removed)

背面（有備用電源）



Figure 3-5: Power supply units and fans (front cover removed)

- 1 = Fan E1
2 = Fan E2
3 = Power supply 1 - A3
4 = Installation compartment for power supply 2 - A4 (option)

BLOCK DIAGRAM（無備用電源）

3.5.1 Block Diagram of Variants 02 and 04; without Power Supply Standby

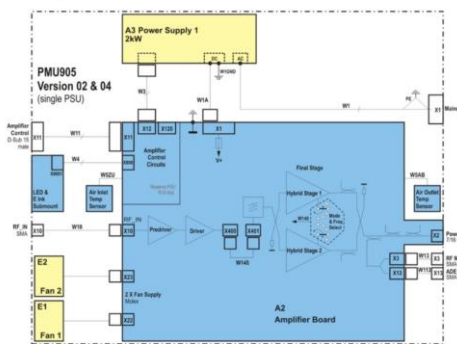


Figure 3-9: Block diagram of R&S PMU905 variants 02 and 04; without power supply standby



The power supply unit of variants 02 and 04 can be accessed only after the amplifier has been removed and opened.

BLOCK DIAGRAM（有備用電源）

3.5.2 Block Diagram of Variants 12 and 14; with Power Supply Standby

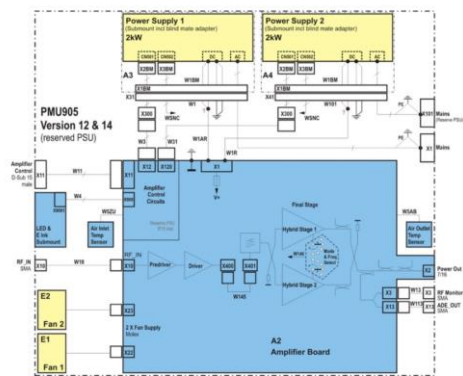


Figure 3-10: Block diagram of R&S PMU905 variants 12 and 14; with power supply standby



The two power supply units of variants 12 and 14 can be replaced while the amplifier is still in operation by removing the front panel.

更換功率晶體之方式，同 PHU100 之更換步驟，此處略。

9 月 19 日

ROHDE & SCHWARZ 公司參觀，因該公司涉部份國防工業，且吾等有簽保密協定，故略。

附件一：液冷式 3400W 發射機 TH1 廠驗報告，共 22 頁

P1 FACTORY ACCEPTANCE TEST TRANSMITTER 1 Order Data Customer: Public Television Service Foundation Taiwan Order number: 008174 ID No.: 2512.0100002 Ser. No.: 101853 2 Transmitter Quality Data Transmitter Quality Measurement is documented in the following Documents Cert. Number: 1030-1295290 	P2 3 Acceptance Test ☒ The transmitter is accepted without remarks. ☐ The transmitter is accepted with the following remarks: ☐ The transmitter is not accepted because of the following remarks: Remarks: Signatures from R&S: 16.09.2025 Date Signature (T. Rosenroth) 16.09.2025 Date Signature (M. Ruck) Signatures from customer: Public Television Service Foundation: 16.09.2025 Date Signature (Chang Wen) Name 莊偉文 16.09.2025 Date Signature (Lin Ming-Feng) Name 林信宏 16.09.2025 Date Signature (Wu Ming-Fu) Name 魏民福 16.09.2025 Date Signature (Zhou Yang) Name 楊詠恩 Seite 2 von 2																					
P3  INFORMATION Calibration Certificate Certificate Number 1030-1295290 General Data Site: PTS Sanyl Standard: DVB-T Transmission Frequency: 569 MHz Transmitter Index: Ts-1 Unit Data Item: THX1 TRANSMITTER KMAT Type: TH1 Output Power: 3400 W Bandwidth: 6.0 MHz Result: This information sheet is not part of the test report or calibration certificate. 	P4  Calibration Certificate Certificate Number 1030-1295290 Zertifikatsnummer Unit Data Item: THX1 TRANSMITTER KMAT Manufacturer: ROHDE & SCHWARZ Type: TH1 Serial Number: 2512.0006002 Serial Number: 102214 Order Data Customer: Public Television Service Foundation Address: Lane 75, Sec. 5, Kangning Rd., Muzhi Dist., Hsinchu City 314 City: Tainpei City TW Unit Number: 0000080114 Date of Issue: 2025-09-12 Date of Validity: Standard Calibration Status of Calibration: New device Number of Pages: 2 Pages Calibration Certificate 17 Pages Outgoing Results Result: All measured values are within the manufacturer's specifications. ROHDE & SCHWARZ Mark Transmitter Date of Issue: 2025-09-12 Date of Validity: 2027-09-12 Signature: [Signature] Signature: [Signature] Signature: [Signature]	P5 Serial Number: 2512.0006002 Serial Number: 102214 Certificate Number 1030-1295290 Calibration Station: 2012.0160.01-04-00-PB-1 Calibration Station: 2012.0160.01-04-00-PB-1 Station number: 2012-0160-01-04-00-PB-1 Order Temperature: (23 ± 0.7) °C <table border="1"> <thead> <tr> <th>Measuring condition</th> <th>Measuring point</th> <th>Measuring point</th> <th>Calibration certificate number</th> <th>Cal. Date</th> </tr> </thead> <tbody> <tr> <td>Power</td> <td>TH1</td> <td>TH1</td> <td>1030-1295290</td> <td>2025-09-12</td> </tr> <tr> <td>Frequency</td> <td>TH1</td> <td>TH1</td> <td>1030-1295290</td> <td>2025-09-12</td> </tr> <tr> <td>Power</td> <td>TH1</td> <td>TH1</td> <td>1030-1295290</td> <td>2025-09-12</td> </tr> </tbody> </table> Result: This information sheet is not part of the test report or calibration certificate.	Measuring condition	Measuring point	Measuring point	Calibration certificate number	Cal. Date	Power	TH1	TH1	1030-1295290	2025-09-12	Frequency	TH1	TH1	1030-1295290	2025-09-12	Power	TH1	TH1	1030-1295290	2025-09-12
Measuring condition	Measuring point	Measuring point	Calibration certificate number	Cal. Date																		
Power	TH1	TH1	1030-1295290	2025-09-12																		
Frequency	TH1	TH1	1030-1295290	2025-09-12																		
Power	TH1	TH1	1030-1295290	2025-09-12																		
P1/17	P2/17	P3/17																				

Model Number: 2012-000000 Serial Number: 102214

Certificate Number 1030-1295290

Outgoing Results

Test Result	Test Count
PASS	13
LOGB	0
LOGD	0
FAIL	1

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Model Number: 2012-000000 Serial Number: 102214

Certificate Number 1030-1295290

The following abbreviations may be used in this document:

(a) No measurement uncertainty stated because the errors always add together. So it is sure that a measurement result is within the 100% limit.

(b) The measurement uncertainty depends on the measurement result. The stated measurement uncertainty is valid for the data shown in the specification. Measurement results outside the data area have a higher measurement uncertainty but are within the specification.

(c) Functional test. Therefore no measurement uncertainty is stated.

(d) Typical value after performance test.

(e) The measurement uncertainty is taken into account when setting the measuring system.

(f) Verification of specified requirements, non accelerated measurement. Technical operations that consist of the determination of one or more characteristics to a specified procedure (normally ISO).

DL or DT Data sheet limit for symmetrical tolerance limits
DUL Data sheet upper limit
DOL Data sheet lower limit
MU Measurement uncertainty
MU or MU Measurement uncertainty lower value
MU or MU Measurement uncertainty upper value
Nom Nominal value
Den Denominator
MEK Measurement error
Act Actual value
UGB Uncertainty guard band. Measuring uncertainty extends the data (test) limit.
DU Data sheet uncertainty

Explanation of charts:

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Model Number: 2012-000000 Serial Number: 102214

Certificate Number 1030-1295290

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Model Number: 2012-000000 Serial Number: 102214 Certificate Number 1030-1295290

Software used for measurement			
Item	Type	Version	Remark
R&D Detect	Component	1.36.10.13	
R&D Detect Drivers	Component	1.44.3.1754	
1st Transmitter Campaign	Component	2.6.1.0	

Model Number: 2012-000000 Serial Number: 102214

Certificate Number 1030-1295290

Transmitter Config Info		PASS
Carrier Frequency	900000000 Hz	
Modulation	DVB-T	
Channel Bandwidth	6.0 MHz	
Attenuation	59.39 dB	
Normal Output Power	3000.30 W	

Transmitter Setup Info		PASS
The following values are read from the transmitter:		
Efficiency DC Voltage	88.0 %	
Power Reference	91.8 %	
PA Efficiency	47.6 %	
PA Power Consumption	7980 W	

Show Transmitter DFP PASS

Hardware Info					PASS
Device	Material Number	Serial Number	HW-Revision	Product Date	
Transceiver	2012-000000	102214	01.00	2022-12-01	
SFP-100	2012-000000	102214	01.00	2022-12-01	
SFP-100	2012-000000	102214	01.00	2022-12-01	
UHF-Antenna	2011-7299-02	101256	06.00	2024-10-04	
UHF-Antenna	2011-7299-02	101257	06.00	2024-10-04	
UHF-Antenna	2011-7299-02	101258	06.00	2024-10-04	
SCE-100	2012-000000	101439	12.00	2025-03-27	
SFP-100	2012-000000	101700	06.00	2025-03-27	
SFP-100	2012-000000	101701	06.00	2025-03-27	
ICP-100	2012-000000	101702	06.00	2025-03-27	
SFP-100	2012-000000	101703	06.00	2025-03-27	
SFP-100	2012-000000	101704	06.00	2025-03-27	
SFP-100	2012-000000	101705	06.00	2025-03-27	
SFP-100	2012-000000	101706	06.00	2025-03-27	
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SFP-100	2012-000000	101807	06.00	2025-03-27	
SFP-100	2012-000000	101808	06.00	2025-03-27	
SFP-100	2012-000000	101809	06.00	2025-03-27	
SFP-100	2012-000000	101810	06.00	2025-03-27	
SFP-100	2012-000000	101811	06.00	2025-03-27	
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SFP-100	2012-000000	101815	06.00	2025-03-27	
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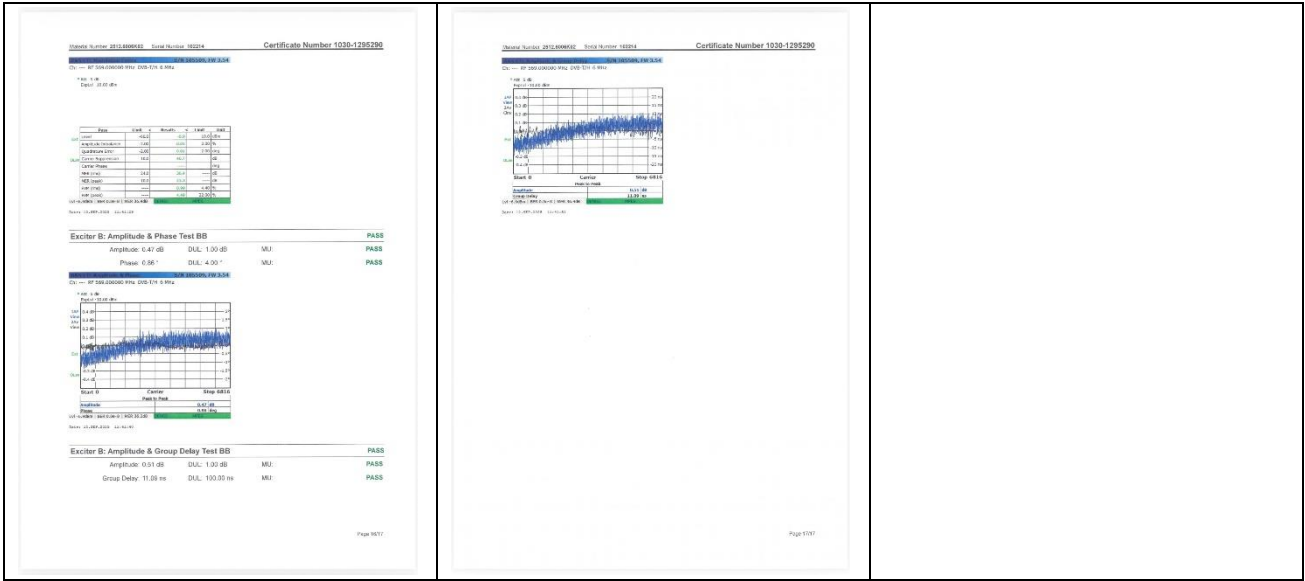
Show ExciterB DFP PASS

Model Number: 2012-000000 Serial Number: 102214

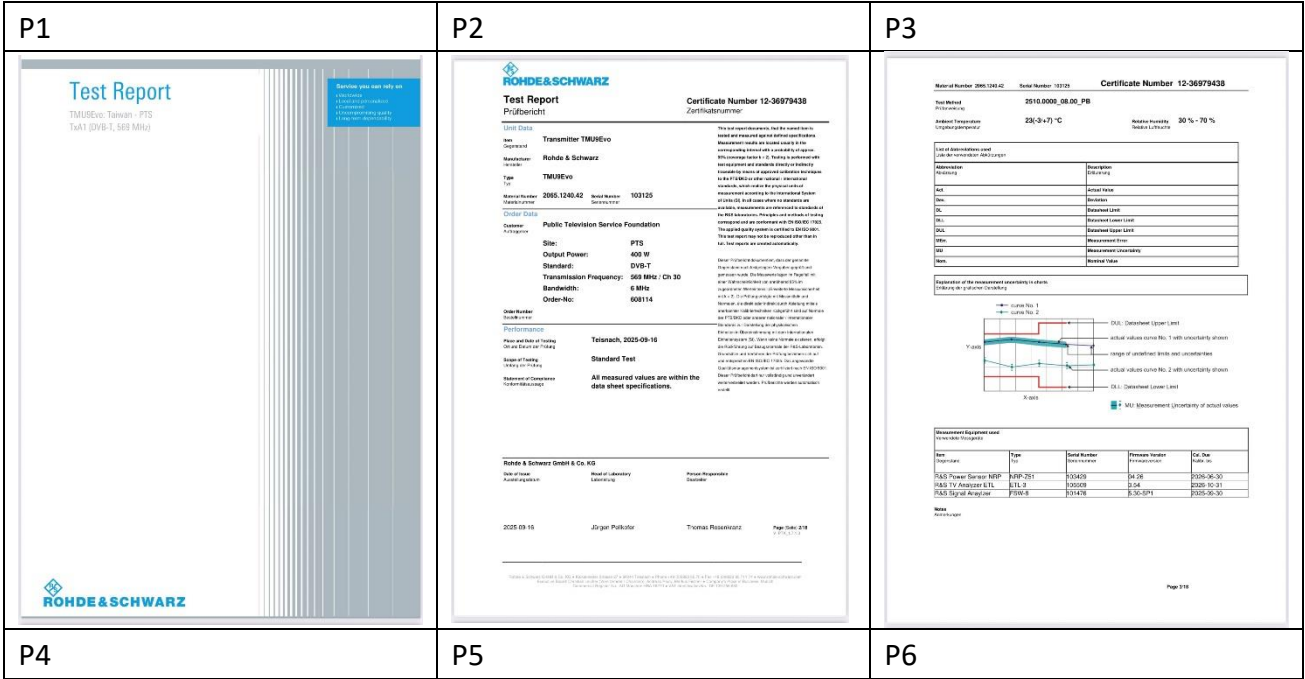
Certificate Number 1030-1295290

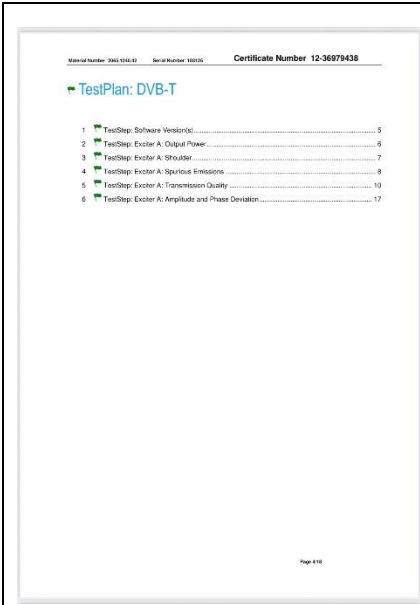
Hardware Info					PASS
Device	Material Number	Serial Number	HW-Revision	Product Date	
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SFP-100	2012-000000	101700	06.00	2025-03-27	
SFP-100	2012-000000	101701	06.00	2025-03-27	
SFP-100	2012-000000	101702	06.00	2025-03-27	
SFP-100	2012-000000	101703	06.00	2025-03-27	
SFP-100	2012-000000	101704	06.00	2025-03-27	
SFP-100	2012-000000	101705	06.00	2025-03-27	
SFP-100	2012-000000	101706	06.00	2025-03-27	
SFP-100	2012-000000	101707	06.00	2025-03-27	
SFP-100	2012-000000	101708	06.00	2025-03-27	
SFP-100	2012-000000	101709	06.00	2025-03-27	
SFP-100	2012-000000	101710	06.00	2025-03-27	
SFP-100	2012-000000	101711	06.00	2025-03-27	
SFP-100	2012-000000	101712	06.00	2025-03-27	
SFP-100	2012-000000	101713	06.00	2025-03-27	
SFP-100	2012-000000	101714	06.00	2025-03-27	
SFP-100	2012-000000	101715	06.00	2025-03-27	
SFP-100	2012-000000	101716	06.00	2025-03-27	
SFP-100	2012-000000	101717	06.00	2025-03-27	
SFP-100	2012-000000	101			

P10/17 Source Number 1030-1295290 Serial Number 10224 Certificate Number 1030-1295290 Exciter A: IQ Amplitude Imbalance Test BB PASS IQ Amplitude Imbalance: 4.02 % DUL: 0.50 % DLL: -0.50 % MU: 0.10 % PASS Exciter A: IQ Quadrature Error Test BB PASS IQ Quadrature Error: -0.02 ° DUL: 0.50 ° DLL: -0.50 ° MU: 0.10 ° PASS Page 10/17	P11/17 Source Number 1030-1295290 Serial Number 10224 Certificate Number 1030-1295290 Exciter A: Amplitude & Phase Test BB PASS Amplitude: 0.51 dB DUL: 1.00 dB MU: PASS Phase: 0.50 ° DUL: 4.00 ° MU: PASS Exciter A: Amplitude & Group Delay Test BB PASS Amplitude: 0.51 dB DUL: 1.00 dB MU: PASS Group Delay: 11.74 ns DUL: 100.00 ns MU: PASS Page 11/17	P12/17 Source Number 1030-1295290 Serial Number 10224 Certificate Number 1030-1295290 Exciter B: Shoulder Test BB PASS Left Shoulder: 35.11 dB DUL: 37.00 dB MU: 0.20 dB PASS Right Shoulder: 34.81 dB DUL: 37.00 dB MU: 0.20 dB PASS Exciter B: Spurious Emissions Test BB PASS Spurious: 62.22 dBc DUL: 50.30 dBc MU: 1.00 dB PASS Exciter B: Harmonics Emissions Test BB PASS Page 12/17
P13/17 Source Number 1030-1295290 Serial Number 10224 Certificate Number 1030-1295290 Exciter B: Crest Factor Test BB PASS Crest Factor: 7.95 dB DUL: 10.00 dB DLL: MU: 0.20 dB PASS Exciter B: BER Test BB PASS BER before Flood: 0.00E-7 DUL: 1.00E-05 DLL: MU: PASS BER before Flood: 0.00E-7 DUL: 1.00E-05 DLL: MU: PASS BER after Flood: 0.00E-6 DUL: 1.00E-05 DLL: MU: PASS Exciter B: Constellation Test BB PASS Page 13/17	P14/17 Source Number 1030-1295290 Serial Number 10224 Certificate Number 1030-1295290 Exciter B: Carrier Noise Ratio Test BB PASS Carrier Noise Ratio: 30.00 dB DUL: 34.00 dB MU: 1.20 dB PASS Exciter B: MER Test BB PASS Modulation Error Ratio: 35.47 dB DUL: 33.00 dB MU: 0.20 dB PASS Exciter B: Constellation Test BB PASS Page 14/17	P15/17 Source Number 1030-1295290 Serial Number 10224 Certificate Number 1030-1295290 Exciter B: IQ Amplitude Imbalance Test BB PASS IQ Amplitude Imbalance: 0.03 % DUL: 0.50 % DLL: -0.50 % MU: 0.10 % PASS Exciter B: IQ Quadrature Error Test BB PASS IQ Quadrature Error: 0.01 ° DUL: 0.50 ° DLL: -0.50 ° MU: 0.10 ° PASS Page 15/17
P16/17	P17/17	

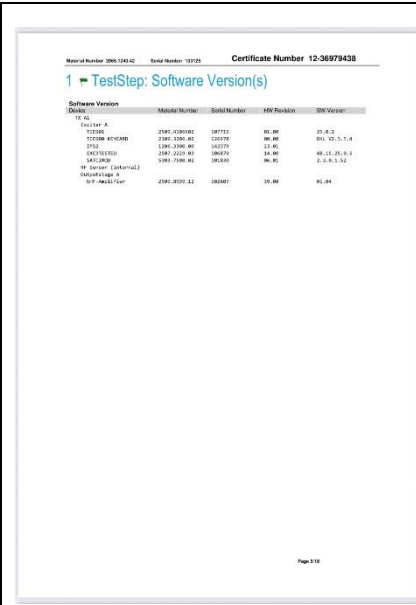


附件二：氣冷式 400W 發射機 TMU9Evo 廠驗報告，共 18 頁

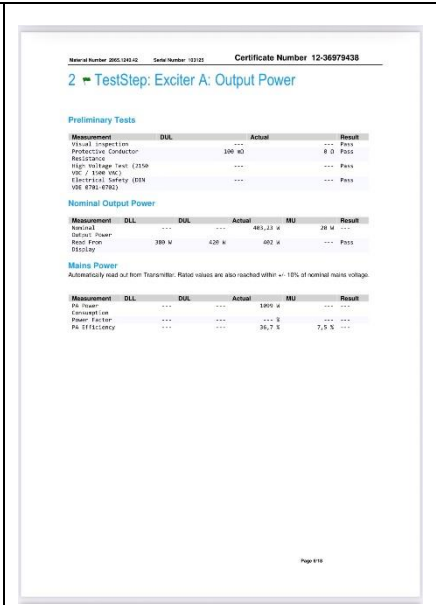




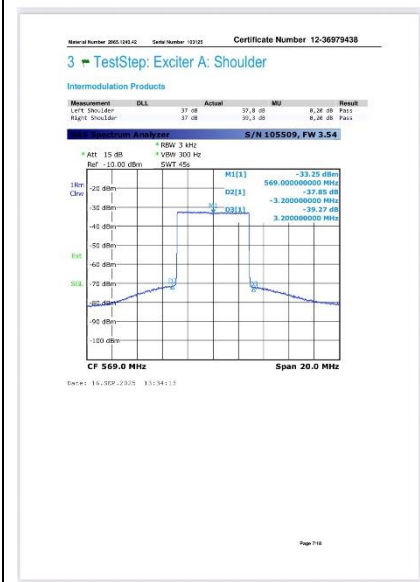
P7



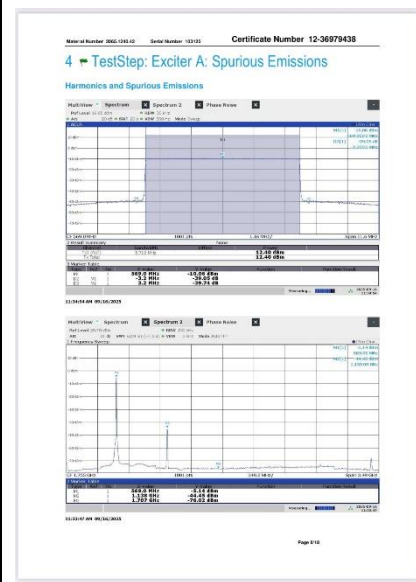
P8



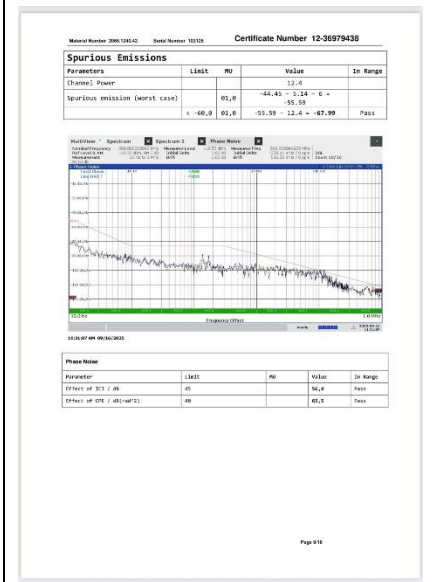
P9



P10



P11



P12

TestStep: Amplitude and Phase S/N 105509, FW 3.54

Ch: --- RF 569.000000 MHz DVB-T/H 6 MHz

* Att: 15 dB
ExpLev: -10.00 dBm

	Pass	Limit	Results	Limit	Unit
Level		-60.0	0.0	10.0	dBm
Amplitude Imbalance		-2.00	0.00	2.00	%
Quadrature Error		-2.00	0.00	2.00	deg
Carrier Suppression		10.0	40.0		dB
Carrier Phase			75.0		deg
MER (rms)		20.0	35.0		dB
MER (peak)		10.0	22.0		dB
LVN (rms)			1.00	5.40	%
LVN (peak)			0.00	22.00	%
LVN 0.0dBm BER 0.0e-8 MER 35.0dB DETMOD: JPS00					

Date: 16. SEP. 2025 13:30:19

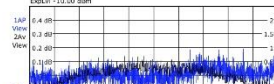
6 TestStep: Exciter A: Amplitude and Phase Deviation

Amplitude Deviation/Group Delay

Measurement	DOL	Actual	Result
Amplitude	2 dB	0.30 dB	Pass
Group Delay	200 ns	10.78 ns	Pass
Phase	0 °	1.00 °	Pass

S/N 105509, FW 3.54

Ch: --- RF 569.000000 MHz DVB-T/H 6 MHz

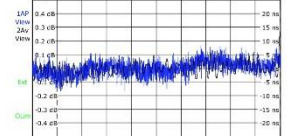
* Att: 15 dB
ExpLev: -10.00 dBm

Start 0	Carrier	Stop 6816
Peak to Peak		
Amplitude		0.30 dB
Phase		1.00 deg
LVN 0.0dBm MER 0.0e-7 MER 35.0dB DETMOD: JPS00		

Date: 16. SEP. 2025 13:27:09

TestStep: Amplitude & Group Delay S/N 105509, FW 3.54

Ch: --- RF 569.000000 MHz DVB-T/H 6 MHz

* Att: 15 dB
ExpLev: -10.00 dBm

Start 0	Carrier	Stop 6816
Peak to Peak		
Amplitude		0.30 dB
Group Delay		10.78 ns
LVN 0.0dBm BER 0.0e-8 MER 35.0dB DETMOD: JPS00		

Date: 16. SEP. 2025 13:37:17