出國報告（出國類別：其他）

汰換桃園國際機場 05/23 跑道儀降系統二套工廠測試出國報告書

服務機關：民用航空局飛航服務總臺
姓名職稱：鄭國璽 課長
王金誠 工務員
派赴國家：義大利 米蘭
出國期間：100/03/01 ~ 100/03/14
報告日期：100/04/26

列印

提 要 表

系統識別號：	C10000885
計畫名稱：	汰換桃園國際機場05/23跑道儀降系統二套工廠測試
報告名稱：	汰換桃園國際機場05/23跑道儀降系統二套工廠測試報告
計畫主辦機關：	交通部民用航空局
出國人員：	姓名 / 服務機關 / 服務單位 / 職稱 / 官職等 / E-MAIL 信箱 鄭國璽 交通部民用航空局飛航服務總臺 航電技術室 課長 薦任(派) 聯絡人jeng@ms1.anws.gov.tw 王金誠 交通部民用航空局飛航服務總臺 桃園裝修區臺 工務員 薦任(派)
前往地區：	義大利
參訪機關：	Thales公司
出國類別：	其他
出國期間：	民國100年03月01日 至 民國100年03月14日
報告日期：	民國100年04月26日
關鍵詞：	工廠測試,ILS,維修中心
報告書頁數：	170頁
報告內容摘要：	本次工廠測試中，本總臺廠測人員共對左右定位臺（Localizer）及左右定位臺模擬機（mockup system）實施843項測試，對滑降臺（Glide Path）裝備及滑降臺模擬機部份實施702項測試，針對測距儀（DME）裝備部分實施246項測試，塔臺控制單元部份28項測試，合計共進行1819項大小測試，經測試其中除塔臺控制單元之跑道切換時間未符合ICAO Annex 10中3.1.2.7.2之規範外，其餘各項測試結果均符合合約規範。依據「臺灣桃園國際機場道面整建及助導航設施提升工程計畫」之規劃目標，桃園國際機場05/23跑道未來將由現行的2類（Cat Ⅱ）精確儀器進場跑道提昇爲3A類（Cat ⅢA）精確儀器進場跑道，本總臺爰編列相關預算進行汰換，預期相關設備架設完成後，桃園機場05/23跑道進場能見度標準將可由現行的300公尺（Cat Ⅱ），再降低至200公尺（Cat ⅢA），藉以減輕霧鎖機場狀況，提昇桃園國際機場之整體效率與競爭力，
電子全文檔：	C10000885_01.pdf
出國報告審核表：	
限閱與否：	否
專責人員姓名：	陳碧雲
專責人員電話：	02-23496197

列印

目錄

壹、目的

桃園國際機場 05/23 跑道儀器降落系統(ILS)自 88 年啓用迄今已逾 12 年以上，相關設備元件逐漸老化，故障率漸增，爰有必要進行汰新。

另依據交通部重要施政計畫「臺灣桃園國際機場道面整建及助導航設施提升工程計畫」之規劃目標，桃園國際機場 05/23 跑道未來將由現行的 2 類（Cat Ⅱ）精確儀器進場跑道提昇爲 3A 類（Cat ⅢA）精確儀器進場跑道。有鑑於此，本總臺爰編列相關預算進行 05/23 跑道 ILS/DME 設備之汰新與昇級採購，預期相關設備架設完成後，桃園機場 05/23 跑道進場能見度標準將可由現行的 300 公尺（Cat Ⅱ），再降低至 200 公尺（Cat ⅢA），藉以減輕霧鎖機場狀況，提昇桃園國際機場之整體效率與競爭力，及落實本總臺「飛航安全，世界一流；飛航服務，顧客滿意。」之目標。

鑒於本次所購設備將來係爲運作於低能見度進場之重要精確儀降設備，爰其精確度及可靠度必須完全符合 ICAO 相關規定及本總臺之設計要求，據此，本總臺依據本案採購契約規定，選派相關人員前往原設備製造廠（簡稱原廠）執行工廠測試，藉以確保所購 3A 類 ILS/DME 設備與模擬機（Mock up system）之各項功能均能符合規定。

另本總臺派員前往原廠執行工廠測試之主要目的，乃希望藉助原廠各項精密測量儀表及測試環境，對所採購各儀器降落系統及模擬機（含天線模擬系統）之性能逐一檢視、測量與驗證。倘若發現與規範不符之處，便可在設備尚未出廠之際，立即通知原廠相關工程部門或設計部門進行性能改善或修改，不僅可避免爾後設備來臺架設後，因性能不佳無法通過相關陣地測試所引起履約困擾，派員逕赴原廠執行工廠測試，更可直接監督所購設備在原廠製程後端之組裝及測試品質，減少日後設備驗收時不易查出之隱性瑕疵，確保所購設備之品質。

貳、 過程

一、參與人員：

鄭國璽　民用航空局飛航服務總臺 航電技術室助航設備課課長

王金誠　民用航空局飛航服務總臺 桃園區臺助航設備臺工務員

二、日期： 100 年 03 月 01 日至 100 年 03 月 14 日。

三、行程：

1.100 年 03 月 01 日於桃園國際機場搭乘中華航空班機至德國法蘭克福機場，轉機搭乘德國漢莎航空班機，於 03 月 02 日下午抵達義大利米蘭林內機場。

2.100 年 03 月 03 日及 04 日:於義大利米蘭 THALES 公司與該公司專案經理 MR. Daniele BONECCHI 及工程師 MR. CARLO 討論協議工廠測試流程；並進行為期 2 日之左右定位臺（Localizer）裝備工廠測試。

3.100 年 03 月 05 日及 06 日：星期例假日，進行工廠測試資料整理。

4. 100 年 03 月 07 日及 08 日：於義大利米蘭 THALES 工廠進行為期 2 日之滑降臺（G/P）裝備工廠測試。

5.100 年 03 月 09 日及 10 日:於義大利米蘭 THALES 工廠進行為期 2 日之測距儀（DME）裝備工廠測試；當中 03 月 09 日下午與原廠負責維修中心 MR. FAUSTO RUSCONI 討論成立維修中心可行性及相關事宜。

6.100 年 03 月 11 日：於義大利米蘭 THALES 工廠進行為期 1 日之監控系統（RCSI）裝備工廠測試，並完成所有裝備之工廠測試，由雙方代表簽署本次工廠測試紀錄。

7.100 年 03 月 12 日：星期例假日，進行工廠測試資料整理。

8.100 年 03 月 13 日於義大利米蘭瑪爾盆薩機場搭乘荷蘭航空班機至荷蘭阿姆斯特丹機場，轉機搭乘中華航空班機，於 03 月 14 日返抵桃園國際機場。

參、 工廠測試內容

一、測試結果

本次實施工廠測試之設備共計有 05 跑道左右定臺、05 跑道滑降臺、05 測距儀臺、23 跑道左右定臺、23 跑道滑降臺、23 測距儀臺及左右定位臺模擬機、滑降臺模擬機等 8 項主系統及 1 項附屬塔臺控制單元（Towe Control Unit，TCU）。

爲確保本案所購設備品質，在本次工廠測試中，原廠工程師配合本總臺廠測人員共對左右定位臺（Localizer）及左右定位臺模擬機（mockup system）部分實施 843 項測試，滑降臺（Glide Path）裝備及滑降臺模擬機部份 702 項測試，測距儀（DME）裝備 246 項測試，塔臺控制單元部份 28 項測試，合計共進行 1819 項大小測試，經測試其中除塔臺控制單元之跑道切換時間未符合 ICAO Annex 10 中 3.1.2.7.2 之規範外，其餘各項測試結果均符合合約規範。

該項未符合規範之情形爲：受測之 05/23ILS 裝備在進行跑道切換測試時，05 及 23ILS/DME 設備將僅被同時抑制 5 秒後，就會進行跑道互鎖切換，不符合 Annex 10 Volume 1 第 3 章 3.1.2.7.2 節之安全規範。

Annex 10 Volume 1 第 3 章 3.1.2.7.2 節規範如下：

3.1.2.7.2 在跑道2端均裝置有ILS設施或同一機場不同跑道中設置有同頻ILS設施之情況下，互鎖裝置應確保同一時間僅有一部ILS設施發射訊號。當ILS設施進行切換時，二部ILS被同時抑制發射之時間不得少於20秒。

3.1.2.7.2 At locations where ILS facilities serving opposite ends of the same runway or different runways at the same airport use the same paired frequencies, an interlock shall ensure that only one facility shall radiate at a time. When switching from one ILS facility to another, radiation from both shall be suppressed for not less than 20 seconds.

有關前述測試結果未符合 ICAO 規範部份，原廠專案經理 MR. Daniele BONECCHI 及工程師 MR. CARLO 商討後，向總臺廠測人員說明，該 ILS 發射抑制之時間長短涉及軟體程式之修改，須由德國軟體工程師授權後方可進行修改，爰該公司一時無法立即進行修改，惟該公司再三保證必定會在裝備運送來臺之前，完成相關軟體設定以確保其設備符合 ICAO 相關規範。

二、測試項目

（一）左右定位臺 **Localizer（THALES ILS 420 Localizer）：**

- SERIAL NUMBER：

- Power Supply Data：

1、AC Input Voltage

2、AC-DC Conv. Output

3、DC/DC-5V Output#1

4、DC/DC+15V Output#1

5、DC/DC-15V Output#1

6、DC/DC+24V Output#1

7、DC/DC-5V Output#2

8、DC/DC+15V Output#2

9、DC/DC-15V Output#2

10、DC/DC+24V Output#2

- Transmitter Data：

1、Course CSB

Power at connector CRS CSB 15±0.5W

2、Clearance CSB

Power at connector CLR CSB 15±0.5W

4、RF Frequency

（1）Course TX Freq. 110.1MHz+0.004 MHz

（2）Clearance TX Freq. 110.1MHz-0.004 MHz

（3）CRS Freq. – CLR Freq. =8KHz

5、SDM Setting Range for Course and Clearance CSB TRANMITTER 1

（1）Select SDM for the CRS Transmitter 1.

（2）PIR measured 36%、38%、40%、42%、44%

（3）Select SDM for the CLR Transmitter 1.

（4）PIR measured 36%、38%、40%、42%、44%

6、SDM Setting Range for Course and Clearance CSB TRANMITTER 2

（1）Select SDM for the CRS Transmitter 2.

（2）PIR measured 36%、38%、40%、42%、44%
（3）Select SDM for the CLR Transmitter 2.
（4）PIR measured 36%、38%、40%、42%、44%

7、DDM Setting Accuracy for Course and Clearance CSB TRANMITTER 1
（1）Select DDM for the CRS Transmitter 1.
（2）PIR measured 0.0%、0.5%、+1.0%、-0.5%、-1.0%
（3）Select DDM for the CLR Transmitter 1.　CLR SBO off
（4）PIR measured 0.0%、0.5%、+1.0%、-0.5%、-1.0%

8、DDM Setting Accuracy for Course and Clearance CSB TRANMITTER 2
（1）Select DDM for the CRS Transmitter 2.
（2）PIR measured 0.0%、0.5%、+1.0%、-0.5%、-1.0%
（3）Select DDM for the CLR Transmitter 2.　CLR SBO off
（4）PIR measured 0.0%、0.5%、+1.0%、-0.5%、-1.0%

9、Identification Modulation Setting TRANMITTER 1
（1）Adjust Ident AM modulation for Transmitter 1.　CRS CSB Adjusted 6.0%、8.0%、10.0%
（2）Adjust Ident AM modulation for Transmitter 1.　CLR CSB Adjusted 6.0%、8.0%、10.0%
（3）Adjust Ident AM modulation for Transmitter 1.　CRS CSB Frequency Measurement 1024
（4）Adjust Ident AM modulation for Transmitter 1.　CLR SBO Frequency Measurement 1024

10、Identification Modulation Setting TRANMITTER 2
（1）Adjust Ident AM modulation for Transmitter 2.　CRS CSB Adjusted 6.0%、8.0%、10.0%
（2）Adjust Ident AM modulation for Transmitter 2.　CLR CSB Adjusted 6.0%、8.0%、10.0%
（3）Adjust Ident AM modulation for Transmitter 2.　CRS CSB Frequency Measurement 1024
（4）Adjust Ident AM modulation for Transmitter 2.　CLR SBO Frequency Measurement 1024

11、Identification Keying
（1）Ident keyed IQJY
（2）Ident off
（3）Ident continuous

12、SBO RF Phase Control TRANMITTER 1
（1）Course width DDM Nominal Setting
（2）DDM （phase set to +90°）
（3）DDM （phase set to +180°）

（4）DDM （phase set to +270°）
（5）Transmitter 1 Clearance width DDM Nominal Setting
（6）DDM （phase set to +90°）
（7）DDM （phase set to +180°）
（8）DDM （phase set to +270°）

13、SBO RF Phase Control TRANMITTER 2
（1）Course width DDM Nominal Setting
（2）DDM （phase set to +90°）
（3）DDM （phase set to +180°）
（4）DDM （phase set to +270°）
（5）Transmitter 2 Clearance width DDM Nominal Setting
（6）DDM （phase set to +90°）
（7）DDM （phase set to +180°）
（8）DDM （phase set to +270°）

14、Course CSB Distortion Factor A1 Signal
（1）90Hz Sidebands +/-90 Modulation Distortion
（2）90Hz Sidebands +/-180 Modulation Distortion
（3）150Hz Sidebands +/-150 Modulation Distortion
（4）150Hz Sidebands +/-300 Modulation Distortion

15、CLR Distortion Factor
（1）90Hz Sidebands +/-90 Modulation Distortion
（2）90Hz Sidebands +/-180 Modulation Distortion
（3）150Hz Sidebands +/-150 Modulation Distortion
（4）150Hz Sidebands +/-300 Modulation Distortion

■ Monitor Measurement Data：
1、Antenna RF-Level Alarm Indications
（1）Course Position Mon 1
（2）Course Position Mon 2
（3）Course Width Mon 1
（4）Course Width Mon 2
（5）Clearance Mon 1
（6）Clearance Mon 2

2、Antenna SDM Alarm Indications
（1）Course Position Mon 1
（2）Course Position Mon 2
（3）Course Width Mon 1
（4）Course Width Mon 2
（5）Clearance Mon 1
（6）Clearance Mon 2

3、Antenna DDM Alarm Indications

（1）Course Position Mon 1
（2）Course Position Mon 2
（3）Course Width Mon 1
（4）Course Width Mon 2
（5）Clearance Mon 1
（6）Clearance Mon 2

4、Antenna Identity Alarm Indications

（1）ID Alarm Indication Mon 1：”ALARM”
（2）ID Alarm Indication Mon 2：”ALARM”
（3）COTINUOUS 1024 Hz Mon 1：”ALARM”
（4）COTINUOUS 1024 Hz Mon 2：”ALARM”

5、Standby RF-Level Alarm Indications

（1）Course Position Standby-Mon 1
（2）Course Position Standby-Mon 2
（3）Course Width Standby-Mon 1
（4）Course Width Standby-Mon 2
（5）Clearance Standby-Mon 1
（6）Clearance Standby-Mon 2

6、Standby SDM Alarm Indications

（1）Course Position Standby-Mon 1
（2）Course Position Standby-Mon 2
（3）Course Width Standby-Mon 1
（4）Course Width Standby-Mon 2
（5）Clearance Standby-Mon 1
（6）Clearance Standby-Mon 2

7、Standby DDM Alarm Indications

（1）Course Position Standby-Mon 1
（2）Course Position Standby-Mon 2
（3）Course Width Standby-Mon 1
（4）Course Width Standby-Mon 2
（5）Clearance Standby-Mon 1
（6）Clearance Standby-Mon 2

8、Monitor Integrity Test Alarm Indications

（1）RF-Level Integrity Signal A Waveform Sett.
（2）RF-Level Integrity Signal B Waveform Sett.
（3）SDM Signal A Waveform Sett.
（4）SDM Signal B Waveform Sett.
（5）DDM Signal A Waveform Sett.
（6）DDM Signal B Waveform Sett.

9、Equipment Changeover & Shutdown

（1）Equipment transfer

（2）Time for full shutdown

10、Battery Operation

（1）System NORMAL

（2）Mains OFF

（3）MAINS OFF　BATTERY LOW

（4）MAINS OFF　BATTERY DRIVEN OFF　BATTERY LOW

（5）Transmitters OFF　Front panel ON

（6）Transmitters ON　System NORMAL

（7）System OFF

11、RCSE Communication

（1）Status same

（2）MAIN OFF

（二）滑降臺 G/P（THALES ILS 420 GP）：

■ SERIAL NUMBER：

■ Power Supply Data：

1、AC Input Voltage

2、AC-DC Conv. Output

3、DC/DC-5V Output#1

4、DC/DC+15V Output#1

5、DC/DC-15V Output#1

6、DC/DC+24V Output#1

7、DC/DC-5V Output#2

8、DC/DC+15V Output#2

9、DC/DC-15V Output#2

10、DC/DC+24V Output#2

■ Transmitter Data：

1、Transmitter Carrier Power Course and Clearance at Antennas

（1）Power at connector A1 1.0±0.050W

（2）Power at connector A3 0.0625±0.025W

（3）Power at connector A2 0.250±0.025W

2、Carrier Frequency Course and Clearance

（1）CLR TX Freq. 331.996MHz（A1）

（2）CRS TX Freq. 332.004MHz（A1）

（3）CRS Freq. – CLR Freq. =8KHz

3、SDM Setting for Course and Clearance TRANMITTER 1

（1）Select normal modulation for CRS CSB1 Transmitter 1.
PIR measured 72%、76%、80%、84%、88%

（2）Select normal Mod. for CLR Transmitter 1.
PIR measured 72%、76%、80%、84%、88%

（3）Select normal Modu. for CRS CSB2 Transmitter 1.
PIR measured 72%、76%、80%、84%、88%

4、SDM Setting for Course and Clearance TRANMITTER 2

（1）Select normal modulation for CRS CSB1 Transmitter 2.

PIR measured 72%、76%、80%、84%、88%

（2）Select normal Mod. for CLR Transmitter 2.

PIR measured 72%、76%、80%、84%、88%

（3）Select normal Modu. for CRS CSB2 Transmitter 2.

PIR measured 72%、76%、80%、84%、88%

5、DDM Setting Accuracy for Course and Clearance TRANMITTER 1

（1）Select normal modulation for CRS CSB1 Transmitter 1.

PIR measured -11.7%、-12.7%、10.7%

（2）Select normal Mod. for CLR Transmitter 1.

PIR measured 31.0%、30.0%、29.0%

（3）Select normal Modu. for CRS CSB2 Transmitter 1.

PIR measured -47.7%、-46.7%、-48.7%

6、DDM Setting Accuracy for Course and Clearance TRANMITTER 2

（1）Select normal modulation for CRS CSB1 Transmitter 2.

PIR measured -11.7%、-12.7%、10.7%

（2）Select normal Mod. for CLR Transmitter 2.

PIR measured 31.0%、30.0%、29.0%

（3）Select normal Modu. for CRS CSB2 Transmitter 2.

PIR measured -47.7%、-46.7%、-48.7%

7、SBO RF Phase Control

（1）TX1 Set Course CSB1 DDM – Setting = 0%

（2）SBO （phase set to +90°）

（3）SBO （phase set to +180°）

（4）SBO （phase set to +270°）

（5）TX2 Set Course CSB1 DDM – Setting = 0%

（6）SBO （phase set to +90°）

（7）SBO （phase set to +180°）

（8）SBO （phase set to +270°）

8、CRS CSB1 Distortion Factor A1 Signal

（1）90Hz Sidebands +/-90 Modulation Distortion

（2）90Hz Sidebands +/-180 Modulation Distortion

（3）150Hz Sidebands +/-150 Modulation Distortion

（4）150Hz Sidebands +/-300 Modulation Distortion

9、CLR Distortion Factor A3 Signal

（1）90Hz Sidebands +/-90 Modulation Distortion

（2）90Hz Sidebands +/-180 Modulation Distortion

（3）150Hz Sidebands +/-150 Modulation Distortion

（4）150Hz Sidebands +/-300 Modulation Distortion

10、CRS CSB2 Distortion Factor A1 Signal

（1）90Hz Sidebands +/-90 Modulation Distortion
（2）90Hz Sidebands +/-180 Modulation Distortion
（3）150Hz Sidebands +/-150 Modulation Distortion
（4）150Hz Sidebands +/-300 Modulation Distortion

■ Monitor Measurement Data：

1、AERIAL RF-Level Alarm Indications
（1）Course Position Nearfield-Mon 1
（2）Course Position Nearfield-Mon 2
（3）Course Position Integral-Mon 1
（4）Course Position Integral-Mon 2
（5）Course Width Integral-Mon 1
（6）Course Width Integral-Mon 2
（7）Clearance Integral-Mon 1
（8）Clearance Integral-Mon 2

2、AERIAL SDM Alarm Indications
（1）Course Position Nearfield-Mon 1
（2）Course Position Nearfield-Mon 2
（3）Course Position Integral-Mon 1
（4）Course Position Integral-Mon 2
（5）Course Width Integral-Mon 1
（6）Course Width Integral-Mon 2
（7）Clearance Integral-Mon 1
（8）Clearance Integral-Mon 2

3、AERIAL DDM Alarm Indications
（1）Course Position Nearfield-Mon 1
（2）Course Position Nearfield-Mon 2
（3）Course Position Integral-Mon 1
（4）Course Position Integral-Mon 2
（5）Course Width Integral-Mon 1
（6）Course Width Integral-Mon 2
（7）Clearance Integral-Mon 1
（8）Clearance Integral-Mon 2

4、Standby RF-Level Alarm Indications
（1）Course Position Standby-Mon 1
（2）Course Position Standby-Mon 2
（3）Course Width Standby-Mon 1
（4）Course Width Standby-Mon 2
（5）Clearance Standby-Mon 1
（6）Clearance Standby-Mon 2

5、Standby SDM Alarm Indications

（1）Course Position Standby-Mon 1
（2）Course Position Standby-Mon 2
（3）Course Width Standby-Mon 1
（4）Course Width Standby-Mon 2
（5）Clearance Standby-Mon 1
（6）Clearance Standby-Mon 2

6、Standby DDM Alarm Indications

（1）Course Position Standby-Mon 1
（2）Course Position Standby-Mon 2
（3）Course Width Standby-Mon 1
（4）Course Width Standby-Mon 2
（5）Clearance Standby-Mon 1
（6）Clearance Standby-Mon 2

7、 Monitor Integrity Test Alarm Indications

（1）RF-Level Integrity Signal A Waveform Sett.
（2）RF-Level Integrity Signal B Waveform Sett.
（3）SDM Signal A Waveform Sett.
（4）SDM Signal B Waveform Sett.
（5）DDM Signal A Waveform Sett.
（6）DDM Signal B Waveform Sett.

8、Equipment Changeover & Shutdown

（1）Equipment transfer
（2）Time for full shutdown

9、Battery Operation

（1）System NORMAL
（2）Mains OFF
（3）MAINS OFF BATTERY LOW
（4）MAINS OFF BATTERY DRIVEN OFF BATTERY LOW
（5）Transmitters OFF Front panel ON
（6）Transmitters ON System NORMAL
（7）System OFF

10、RCSE Communication

（1）Status same
（2）MAIN OFF

（三）測距儀 DME（THALES DME 415）：

■ SERIAL NUMBER：

■ TRANSPONDER：

1、TRANSMITTER：

（1）Radio frequency and Channelling

（a）Nominal Channel

（b）Nom.Freq[MHz]

TX1、TX2 Frequency[MHz]

（2）Spectrum

（a）Full power operation

TX1、TX2 Spectrum @±800KHz Spectrum @±2MHz

（b）Reduced power operation

TX1、TX2 Spectrum @±800KHz Spectrum @±2MHz

（3）Power output

TX1、TX2 Full power[W] Reduced power[W]

（4）Pulse shape

（a）TX1-1° TX1-2° Rise time Duration Decay time {us}

（b）TX2-1° TX2-2° Rise time Duration Decay time {us}

（c）TX1 TX2 Mode[X/Y] Pulse spacing{us}

（5）Transmission rate

TX1 TX2 MONITOR[ppps] Measured{ ppps }

2、KEYER：

（1）Identity signal

Morse equivalent

（2）Associated Identity

（a） MASTER operation

Code Trigger Transponder1 Transponder2

（b）SLAVE operation

Code Trigger Transponder1 Transponder2

Code recovery（ON SENSE） Transponder1 Transponder2

Code recovery（ON SIGNAL） Transponder1 Transponder2

3、MONITOR AND BITE：

（1）GENERATOR OF INTERROGATIONS AND CW

（a）Level RF -70 CW

（b）Level RF -40 CW

（c）Nominal RF

（d）Level RF -40 Pulsed

（e）Pulse spacing
（f）Rate of interrogation
（g）Radiofrequency shift

（2）ACQUISITION SECTION OF MONITOR/BITE
（a）1 GHz detector
RF power Reading（External instr Mon1 Mon2）
Counting Reading（External instr Mon1 Mon2）

（b）63MHz IF detector
RF power Reading（External instr Mon1 Mon2）
Time interal Reading（External instr Mon1 Mon2）
Counting Reading（External instr Mon1 Mon2）

4、LCSU UNIT：
（1）CONTROL & STATUS PANEL
（a） DME commands
Request/release control
Main transponder On/Off
Transponder changeover
Selection Synth./detailed status for indications
（b）LCSU commands
Lamp test
Silence buzzer
（c）Equipment indications
DME Synth. status
DME detailed status
Site
（d）LCSU Indications
Operation Warning Data Com.

（2）LOCAL PC
（a）Login and password
（b）Command and control of the LCSU and of all equipment / devices connected to LCSU
（c）DME in Automatic Mode，commands and controls
Commands
Status indications
Buzzer
Detailed status display
Parameter presetting
Test execution
Archive management: storage, display and printing of the results and presets , …… ;
（d）DME in Manual（Maintenance）Mode，commands and controls
Commands
Status indications

Buzzer
Detailed status display
Parameter presetting
Test execution
Archive management: storage, display and printing of the results and presets , …… ;

（e）LCSU archive management of the equipment / devices connected to LCSU
Storage , display and printing
Archive erasing and back-up

5、SERIAL / PARALLEL / MODEM INTERFACINGS：

（1）Serial communication ports RS-232

（a）Serial communication port 1（front）with PC
（b）Serial communication port 1（top）with PC
（c）Serial communication port 2 with
（d）Serial communication port 3 with
（e）Recover of the operation after a connection failure

（2）Parallel I/O port

（a）Configuration and test of the input lines
（b）Configuration and test of the output lines
（c）Restart of the operation after a connection failure

6、POWER SUPPLY SYSTEM：

（1）DC SUPPLY

（a）DC supply
（b）Operation with DC power supply
（c）Indication on the LCSU and PC
（d）Restart of the after a supply blackout

（2）AC SUPPLY

（a）AC supply
（b）Operation with AC power supply
（c）Indication on the LCSU and PC
（d）Restart of the after a Mains supply blackout
（e）Faulty simulation of one AC/DC power supply module at time to verify indications on LCSU and PC

7、AC/DC POWER SUPPLY AND BATTERY CHARGER：

（a）Operation with AC supply
（b）Operation with DC supply
（c）Continuity of service following Mains supply blackout and restore
（d）Faulty simulation of one AC/DC power supply module at time to verify indications on LCSU and PC

（e）Battery breaker
battery predepletion
activation（low DC supply）
automatic re-arming（restoring Mains）

（四）遠端監控系統（RCSI）（THALES RCSI-447）：

- SERIAL NUMBER：

- Connection with the equipment

- Controls and Indications：
  1、”SELECT”
  2、”CONTROL REQUEST/RELEASE”
  3、”EQUIP ON/OFF”and”TX ON”
  4、”CHANGEOVER”
  5、”WARNING”
  6、”ALARM”
  7、”NORMAL”
  8、” CONTROL REQUEST/RELEASE”
  9、”LAMP TEST”

- Connection and operations with a PC：
  1、Equipment status
  2、Equipment control and measurements display

- Interlock changeover RWY：

肆、 心得與建議

一、心得

職等二人有幸參與本次汰換桃園國際機場 05/23 跑道 ILS/DME 設備案之工廠測試，心中抱著戒慎恐懼的心情遠渡重洋來到 Thales 公司米蘭廠執行廠測任務，在 14 天的廠測期間，無時不秉持著兢兢業業、如履薄冰的心情謹慎執行工廠測試的每項步驟，終於順利完成總臺所購 8 項助導航設備共計 1819 項之工廠測試項目，爲總臺汰換桃園國際機場 05/23 跑道 ILS/DME 案之設備品質看好第一道關卡。

在工廠測試期間，原廠配合本案執行廠測之工程師 Mr. Carlo 工作態度認真，實事求是，執行各測試程序時，更是有條不紊，絲毫沒有一般印象中義大利人那種鬆散的做事氣息，相反地，Mr. Carlo 對於我們一再提出的質疑絲毫沒有不悅的表情，每當職等提出質疑時，總能耐心並詳細地解說各項測試之方法與步驟，再搭配精密測量儀表進行測試及驗證，讓職等清楚瞭解該裝備之測試方式與步驟，對於職等日後在裝備調校及故障排除上，實有莫大的助益。

另本次工廠測試時，職等亦對總臺首次採購之 Localizer 模擬機（Mock up system）及 G/P 模擬機等裝備一併進行各項測試，原廠訓練暨客服部經理 Mr. FAUSTO RUSCONI 與職等談起本總臺首次採購之 ILS 模擬機時，亦覺得本總臺在 ILS 採購案內，增加採購模擬機（含天線模擬系統）的作法，非常聰明也值得推廣。

職等歸納原廠意見後，亦認爲 ILS 模擬機至少有以下幾項優點：

一、利用模擬機進行實務訓練，可彌補往常 ILS 設備一旦驗收啓用後，即無法再任意調校之缺憾，未來將可有效加強同仁實務操作之經驗與故障排除之能力。

二、模擬機除平時負有教育訓練之目的外，當線上 ILS 裝備發生卡片故障時，模擬機之卡片亦可緊急抽調前去支援線上設備，此外，模擬機亦可充做卡片維修之測試平臺使用，具有一機多用之功能。

三、採購模擬機與單獨購買備份卡片價錢差不多，可說是經濟又實用。

四、總臺若要推動航電證照制度，除了學科筆試外，也可利用模擬機進行實務操作與故障排除等術科檢定用，真正達成証照考試之目的。

二、建議

本次工廠測試期間，職等藉與原廠洽談成立維修中心之便，在訓練暨客服部經理 Mr. FAUSTO RUSCONI 的安排下有幸參觀原廠平時不對外開放之測試維修中心，親眼見識先進國家在電子模組測試及檢修上的尖端技術，以及原廠工程師專業、敬業的工作態度，總算不虛此行。

在原廠的測試維修中心中，各測試人員工作桌上均搭配有專用卡片測試平臺（Test Bench）、測試用電腦、測試軟體及各項精密測量儀表。原廠工程師進行卡片測試時，只需將待測卡片插入測試平臺中，測試電腦即會送出各種模擬訊號，自動進行卡片測試，測試結果並將顯示於電腦螢幕上，告知工程師該卡片可能的故障點爲何，接者工程師可依此初步查修結果，再進一部以手動方式調整各測試點位置及測試號，或佐以相關測試儀表之量測比較，即可找出該卡片的真正故障點。

古人云「工欲善其事，必先利其器」，又云「巧婦難爲無米之炊」，在參觀原廠的測試維修中心後，職等直覺本總臺航電人員在無前述檢修利器及豐富資源之支持下，實難達到原廠 Level 3 的查修規模與能量。

另外，在與 Thales 洽談總臺成立維修中心之可行性時，Mr. FAUSTO RUSCONI 明白告知，Thales 站在 ILS 供應商的立場上，不可能協助總臺成立維護中心，其理由包括：

1. 卡片維修涉及該設備之設計原理，此部份屬原廠之智慧財產權，原廠不可能輸出給總臺知道，總臺若想得到該設計細節，恐須付出天價來購買。
2. 維護中心需購置大量專用測試平臺、精密量測儀錶及專屬測試軟體，總投資金額龐大，初估約需 100 萬歐元以上（折合 4000 萬臺幣以上），實際上已足夠總臺購買 10 年內所需之備份組件，所以不符經濟效益。
3. 一旦總臺投資數千萬臺幣成立維修中心後，因該測試設備多係針對 Thales 產品所量身開發，以致該維護中心未來將以查修 Thales 卡片爲主，總臺後續 ILS 採購若不是 Thales 得標，則該維修中心將有投資浪費之疑慮；相反地，總臺若繼續獨家採購 Thales 設備則又綁標之嫌。

考量總臺未來航電組織再造後之航電人力發展方向，併歸納原廠提供之建議後，職等冒昧建議：

1. 總臺仍有必要成立維護中心，總臺成立之維護中心可以小而美，不必具備原廠一般的維護規模，一來可減少投資成本，二來自行維護卡片，可節省公帑及增進同仁之查修技能，大幅提昇總臺航電人員之設備維護能力。
2. 爲發展小而美的維護中心考量，總臺可繼續於助導航設施採購案中，規劃採購模擬訓練機，因該訓練機不僅可提供同仁實務操作之機會，或緊急時備份件之來源，更可用作維護中心查修卡片時之測試平臺使用。

伍、 附錄（工廠測試文件）

Int.Order nr.: 10679Z-RCSI1 Country : TAIWAN Location :

Equip. Type: RCSI447 Equip.PN: 527311008 Equip.SN : 11-002-02 data 04/03/2011

pc board Description	pc board PN	SN	SW ver.	PCS
AC/DC	488700011L	1116137		01
CSB	488700001	10-A39-019		02
INC	474930065	10B480060		01

Tagliabue

THALES

5273110XX-090 Rev. A

REMOTE CONTROL RCSI-447

Factory Acceptance Test

THALES
A6719

CHANGES

REVISION	CHANGE DESCRIPTION
A	First edition (ECN 04209)
B	
C	
D	

IDENTIFICATION

- Document Number : 5273110XX
- Document Title : Factory Acceptance Test
- Revision : A
- Doc. Type Indicator : 090
- Product : REMOTE CONTROL RCSI-447

AUTHORIZATIONS

Rev/Date	A 16/11/2009	B	C	D	E
Written by	**G. Barbara** *(Development)*				
Checked by	**P. Lunardi** *(Line Manager)*				
Approved by	**E. Farina** *(Product Manager)*				
Quality stamp	**M. Perduca** *(Quality assurance)*				

CERTIFICATE OF FACTORY ACCEPTANCE TEST

This is to certify that the Remote Control & Status Indicator RCSI 447

Part Number

- ☑ 527311008 AC version
- ☐ 527311010 DC version

Serial Number 11-002-02

Contract Number 106792

Has been checked in mechanical and electrical compliance with the values contained in the attached Test Record.

The Factory Acceptance Test took place:

- ☑ Without any objection
- ☐ With objection
- ☐ All deficiencies cleared

Date of Factory Acceptance Test: 11-03-2011

Location of Factory Acceptance Test: GORGONZOLA

For the customer	For Thales
Signature	Signature
NAME	MILEA CARLO
NAME	NAME

TABLE OF CONTENTS

1 SCOPE

The present document describes the test procedures for Factory Acceptance Test of the unit Remote Control & Status Indicator RCSI 447.

Tests here described and the obtained results are intended for Customer Acceptance of the system as a whole.

2 COMPOSITION AND IDENTIFICATION

2.1 *RCSI 447*

- ❑ **AC version p/n 527311008** **s/n** 11-002-02
- ❑ **DC version p/n 527311010** **s/n** .....

q.ty	Name	Ref.	Part nr.	Serial nr.
1	CSB module	CSB	488700001	10-A33 019 RCSI
1	Indications and Controls	INC	474930065	WB480060 RCSI

2.2 *Firmware*

Component	Part nr.	Release
FW		Rev 3.2.6

2.3 *Other options and spare parts*

Description	Ref.	Part nr.	Serial nr.
Power supply	AC/DC	488700011	146137 RCSI
Power supply (24 V)	DC/DC	488700009	-
Power supply (48 V)	DC/DC	488700010	-
Modem	LGM 28.8	8404583248	-
Modem party line	LGM 1200	8404583233	-
Extender	LGM EXT 2	8404583904	-

3 TEST AND CHECK PROCEDURES

3.1 *General*

This chapter contains the description of the test procedures, whereas the results are reported in chapter 4.

3.2 *Connection with the equipment*

Connect RCSI to the equipment through modems, or through another type of interface according the system layout, previously configured according to the connection type.

Check the equipment status on the control panel.

3.3 *Controls and Indications*

These tests have the scope to verify the working conditions of the control panel.

a) Press the key "SELECT" and check that the display is enabled in the DETAILED STATUS.

b) Push the button "CONTROL REQUEST/RELEASE" and check that the LED "ENABLE" is on.

c) Switch on the equipment by pressing the key "EQUIP ON/OFF" and check the LED "TX ON" of the transmitter on antenna is lit.

d) Press the key "CHANGEOVER" and check the TX on antenna changes with all the relevant indications.

e) Generate at least one warning condition of the equipment and check, after the established delay, that the indication "WARNING" is on.

f) Generate an alarm condition of both transmitters/transponders and check that, after the established delay, the equipment is shut down and the led "ALARM" is on.

g) Remove all alarms and warnings and check that the led NORMAL is on.

h) Push the button "CONTROL REQUEST/RELEASE" and check that the LED "ENABLE" is off.

i) Push the button "LAMP TEST" and check that all led, display and buzzer go on.

3.4 *Connection and operations with a PC*

a) Run on the PC a suitable program, MCS, ADRACS or WINSV, and check the equipment status on the screen.

b) Request the equipment control and check the capability to control the equipment and to display the some measurements.

4 TEST RESULTS AND LIMIT VALUES

4.1 *Measuring Instruments*

- N. 1 Set of cables
- N. 1 Equipment
- N. 1 Personal Computer

4.2 *Connection with the equipment*

OK
---------- (ok)

4.3 *Controls and Indications*

a) "SELECT" OK ---------- (ok)

b) "CONTROL REQUEST/RELEASE" OK ---------- (ok)

c) "EQUIP ON/OFF" and "TX ON" OK ---------- (ok)

d) "CHANGEOVER" OK ---------- (ok)

e) "WARNING" OK ---------- (ok)

f) "ALARM" OK ---------- (ok)

g) "NORMAL" OK ---------- (ok)

h) "CONTROL REQUEST/RELEASE" OK ---------- (ok)

i) "LAMP TEST". OK ---------- (ok)

4.4 *Connection and operations with a PC*

a) Equipment status OK ---------- (ok)

b) Equipment control and measurements display OK ---------- (ok)

5 ANNOTATIONS

5.1 *Notes*

THIS PART IS RESERVED FOR CUSTOMER USE

5.2 *Tests on request*

THIS PART IS RESERVED FOR CUSTOMER USE;
FOR RECORDING OF SPECIFIC TESTS NOT CONTAINED IN THIS BOOK

END of DOCUMENT

Configuration

Int.Order nr.: 10679Z-LOC1 Country : TAIWAN Location :

Equip. Type: ILS420-LOC Equip.PN: 098747-0002 Equip.SN : 193 data 29/12/2010

pc board Description	pc board PN	SN	SW ver.	PCS
5 Volt DC Converter	8313830511	04884		07
AC-DC Converter	5834120102	9918		05
AC-DC Converter	5834120102	9919		05
BACKPLANE MOD/PA	120602-0001	4474624169		B
BACKPLANEDIGITAL	120598-0002	4360		02
DC-DC CONVERTER	8313812400	04689		06
DC-DC CONVERTER	8313812400	04690		06
ECU	120571-0003	4302		02
INTERFACE CCA NEW	120628-0001	4107		02
LCP	8313521003	02670		01
LGX	120570-0004	4855		03
LGX	120570-0004	4815		03
LGX	120570-0004	4802		03
LGX	120570-0004	4803		03
PA-MODULATOR	120588-0002	4278		03
PA-MODULATOR	120588-0002	4284		03
PA-MODULATOR	120588-0002	4297		03
PA-MODULATOR	120588-0002	4164		03
Power Rack Assembly	8313831001	00684		06
SOAC	120621-0001	4100		09
SYNTHESIZER	120496-0002	4793		09
SYNTHESIZER	120496-0002	4791		09
TRANSFER SWITCH	120622-0001	4506		08

ATTACHMENT A. CERTIFICATE OF FACTORY ACCEPTANCE TEST

This is to certify that the Transmitter Unit Localizer DEDF

Part Number: 098747-0002

Serial Number: 193

Contract Number: 106732 - TAIWAN

has been checked in mechanical and electrical compliance with the values contained in the attached Test Record.

The Factory Acceptance Test took place:

- [x] - Without any objection
- [ ] - With objection
- [ ] - All deficiencies cleared

Date of Factory Acceptance Test : 09/03/2011

Location of Factory Acceptance Test : GORGONZOLA

For the Customer	For Thales
王晉斌	
Signature	Signature
Wang Chin-Cheng	MILEA CARLO
NAME	NAME
2011.03.09	

ATTACHMENT B. LOCALIZER DESIGN QUALIFICATION TEST DATA FOR THE THALES ILS 420 INSTRUMENT LANDING SYSTEM

Attachments B.1 through B.3 contain the following data sheets:

B.1) Equipment Configuration
B.2) Factory Acceptance Test Data
B.3) Supporting Data Printouts

B.1 EQUIPMENT CONFIGURATION

B.1.1 Configuration Tables

The configuration tables for the hardware and software verify equipment under test.

Software versions shall be recorded on the following table.

B.1.1.1 Software Configuration

LOCALIZER SOFTWARE CONFIGURATION DATA		
	Version	Remarks
WINADRACS (PMDT)	4.6	
Monitor (LG-M)	7.00	
Transmitter (LG-A)	5.00	
LCP	4.24	

B.1.1.2 Test Equipment Calibration Verification

STANDARD TEST EQUIPMENT			
Equipment	Manufacturer / Model	Calibration Number	CAL Due
Multimeter	e.g. TEK DMM 249 or equivalent		
Power Meter	e.g. HP 437 A or equivalent		
Power Sensor	e.g. 8482A or equivalent		
RF - Counter	e.g. HP 5342 A or equivalent		
Portable ILS Receiver	R&S EVS 200 or equivalent		
Spectrum Analyzer	e.g. HP 8568 B or equivalent		
Oscilloscope	e.g. Tektronix 2462 B or equivalent		
Localizer Antenna Simulator	Thales		

B.1.1.3 Localizer Equipment Configuration Data

Assembly	Thales Part Number	Reference Designator	Revision Level	Serial Number
LOCALIZER ELECTRONIC SUBSYSTEM	098747-0002	UNIT 1		193
SYNTHESIZER CCA	120496-0002	Side 1	09	4793
		Side 2	09	4791
AUDIO GENERATOR CCA	120570-0004	Side 1	03	4855
		Side 2	03	4815
MONITOR CCA	120570-0004	Side 1	03	4802
		Side 2	03	4803
INTERFACE CCA	120628-0001		02	4107
EXECUTIVE CONTROL UNIT CCA	120571-0003		02	4302
LOCAL CONTROL PANEL	831352100 3		01	02607
BACKPLANE CCA DIGITAL	120598-0002		02	4360
BACKPLANE CCA MOD/PA	120602-0001		B	54474624169
Power Rack Assembly *serial number located on side of rack use a mirror to read	831383100 1		06	00684
MODULATOR/POWER AMPLIFIER ASSEMBLY	120588-0002	COURSE 1	03	4278
		COURSE 2	03	4284
		CLEAR 1	03	4257
		CLEAR 2	03	4164
TRANSFER SWITCH	120622-0001		08	4506
STANDBY, ON-AIR COMBINER (SOAC)	120621-0001		09	4100
AC-DC CONVERTER	583412010 2	PS1	05	9919
		PS2	05	9918
DC-DC CONVERTER +5, +/- 15, +26V	8313812400	NO. 1	06	04690
		NO.2	06	04689
5 Volt DC Converter Assembly	8313830511		07	04884

B.1.1.4 System Waveform Settings

B.1.1.4.1 Transmitter 1

Parameter	Course Transmitter	Clearance Transmitter
CRS/CLR CSB DDM	0.00	0.00
CSB SDM	41.0	41.1
RF Level	12.6	7.5
SBO Amplitude	34.0	25.6
SBO Phase	59	243

B.1.1.4.2 Transmitter 2

Parameter	Course Transmitter	Clearance Transmitter
CRS/CLR CSB DDM	0.00	0.00
CSB SDM	41.0	41.1
RF Level	14.4	7.7
SBO Amplitude	32.0	25.0
SBO Phase	62	243

B.2 FAT TEST DATA

This section contains data sheets for recording measurements and observations during the tests according to instructions in the test procedures. The test paragraph number uniquely identifies each data item, in the left-most column.

The next column contains the test title above a description of the identifying conditions under which the data was taken.

Locations are specified for recording measured data. Limits are provided to evaluate whether the test step has passed or failed with any formulae required for data reduction

A check mark shall be made in the "Pass" or "Fail" column on the right side of the data sheet to clearly indicate whether the objective of each test step has been met.

B.2.1 Power Supply Data

3.3.2 PERFORMANCE TEST POWER SUPPLY							
Step No.	Test Conditions	MIN. ACCEPT. Level	Data	MAX. ACCEPT. Level	UNIT	PASS	FAIL
Step 1	AC Input Voltage		227.5		V	✓	
Step 2	AC-DC Conv. Output	54 - 1.6	54,01	54 + 1.6	V	✓	
Step 3	DC/DC-5 V Output #1	+ 5 - 0.4	5.20	+ 5 + 0.4	V	✓	
	DC/DC +15 V Output #1	+15 - 0.45	14,37	+15 + 0.45	V	✓	
	DC/DC –15 V Output #1	-15 - 0.45	-15,01	-15 + 0.45	V	✓	
	DC/DC + 24 V Output #1	+24 - 0.7	23,85	+24 + 1.0	V	✓	
	DC/DC-5 V Output #2	+ 5 - 0.4	5,21	+ 5 + 0.4	V	✓	
	DC/DC +15 V Output #2	+15 - 0.45	14,85	+15 + 0.45	V	✓	
	DC/DC -15 V Output #2	-15 - 0.45	-15,01	-15 + 0.45	V	✓	
	DC/DC + 24 V Output #2	+24 - 0.7	23,91	+24 + 1.0	V	✓	

B.2.2 Transmitter Data

B.2.2.1 Transmitter Power Data

B.2.2.1.1 Course CSB

5.1.1 Transmitter Carrier Power Course and Clearance at Antennas							
Step No.	Tested Signals	Test Conditions	Test TX1 Measured	Test TX2 Measured	UNIT	PASS	FAIL
Step 1,4	CRS CSB	Power at connector CRS CSB 15 ±0.5 W	15,0	15,0	W	✓	

B.2.2.1.2 Clearance CSB

5.1.2 Transmitter Carrier Power Course and Clearance at Antennas							
Step No.	Tested Signals	Test Conditions	Test TX1 Measured	Test TX2 Measured	UNIT	PASS	FAIL
Step 1,4	CLR CSB	Power at connector CLR CSB 7.5 ±0.5 W	7,42	7.44	W	✓	

B.2.3 RF Frequency Data

5.2. RF Frequency							
Step No.	Test Conditions Channel Frequencies	Accept. Tolerance F: ±0.0005% Diff.: ±0.5%	Data TX1	Data TX2	UNIT	PASS	FAIL
Step 3	Course TX Freq. 110.1 MHz + 0.004 MHz	110.103 450 110.104 550	110.103905	110.103.900	MHz	✓	
Step 3	Clearance TX Freq. 110.1 MHz – 0.004 MHz	110.095 450 100.096 550	110.095.903	110.095.970	MHz	✓	
Step 3.	CRS Freq. - CLR Freq. = 8 kHz	7.960 8.040	7997	7996	kHz	✓	
Step 4.	Course TX Freq. (customer freq.)				MHz		
Step 4.	Clearance TX Freq. (customer freq.)				MHz		
Step 4.	CRS Freq. - CLR Freq. = 8 kHz	7.960 8.040			kHz		

B.2.4 SDM Setting Data

5.3 SDM Setting Range for Course and Clearance CSB TRANSMITTER 1								
Para-graph No.	Test Conditions		Data	Data	MIN./MAX. ACCEPT. Level	UNIT	PASS	FAIL
Step 1	Select SDM for the CRS Transmitter 1. (No Ident)		Monitor 1 Data Screen Course SDM	Monitor 2 Data Screen Course SDM	Difference PIR to Monitor ±1.0			
	TX Settings	PIR measured						
Step 1	37.0	36%	36.0	36.0	35 to 37	%	✓	
	39.0	38%	38.0	38.0	37 to 39	%	✓	
Step 1	41.0	40%	40.0	40.0	39 to 41	%	✓	
	43.0	42%	42.0	42.0	41 to 43	%	✓	
Step 1	45.2	44%	44.0	44.0	43 to 45	%	✓	
Step 2	Select SDM for the CLR Transmitter 1. (No Ident)		Monitor 1 Data Screen Clear SDM	Monitor 2 Data Screen Clear SDM	Difference PIR to Monitor ±1.0			
	TX Settings	PIR measured						
Step 2	36.9	36%	36.0	36.0	35 to 37	%	✓	
	38.3	38%	38.0	38.1	37 to 39	%	✓	
Step 2	41.1	40%	40.0	40.0	39 to 41	%	✓	
	43.1	42%	42.1	42.0	41 to 43	%	✓	
Step 2	45.3	44%	44.0	44.0	43 to 45	%	✓	

5.3 SDM Setting Range for Course and Clearance CSB TRANSMITTER 2								
Para-graph No.	Test Conditions		Data	Data	MIN./MAX. ACCEPT. Level	U N I T	P A S S	F A I L
Step 1	Select SDM for the CRS Transmitter 2. (No Ident)		Monitor 1 Data Screen Course SDM	Monitor 2 Data Screen Course SDM	Difference PIR to Monitor ±1.0			
	TX Settings	PIR measured						
Step 1	37.0	36%	36.0	36.0	35 to 37	%	✓	
	39.0	38%	38.0	38.0	37 to 39	%	✓	
Step 1	41.0	40%	40.0	40.0	39 to 41	%	✓	
	43.0	42%	42.0	42.0	41 to 43	%	✓	
Step 1	45.1	44%	44.0	44.0	43 to 45	%	✓	
Step 2	Select SDM for the CLR Transmitter 2. (No Ident)		Monitor 1 Data Screen Clear SDM	Monitor 2 Data Screen Clear SDM	Difference PIR to Monitor ±1.0			
	TX Settings	PIR measured						
Step 2	36.4	36%	36.0	36.0	35 to 37	%	✓	
	38.3	38%	38.0	38.0	37 to 39	%	✓	
Step 2	41.1	40%	40.0	40.0	39 to 41	%	✓	
	43.1	42%	42.1	42.0	41 to 43	%	✓	
Step 2	45.3	44%	44.1	44.0	43 to 45	%	✓	

B.2.5 DDM Setting Data

5.4 DDM Settings Accuracy for Course and Clearance CSB TRANSMITTER 1								
Para-graph No.	Test Conditions		Data	Data	MIN./MAX. ACCEPT. Level	UNIT	PASS	FAIL
Step 1	Select DDM for the CRS Transmitter 1. (No Ident)		Monitor 1 Data Screen Course DDM	Monitor 2 Data Screen Course DDM	Difference PIR to Monitor ±1.0			
	Transmitter Settings	PIR measured						
Step 1	0.0	0.0 %	0.0	0.0	-1.0 to 1.0	%	✓	
	0.5	0.5 %	0.5	0.5	-0.5 to 1.5	%	✓	
Step 1	+1.0	+1.0 %	1.0	1.0	0.0 to 2.0	%	✓	
	-0.5	-0.5%	-0.5	-0.5	0.5 to -1.5	%	✓	
Step 1	-1.0	-1.0 %	-1.0	-1.0	0.0 to -2.0	%	✓	
Step 2	Select DDM for the CLR transmitter 1. (No Ident) CLR SBO off		Monitor 1 Data Screen Clear DDM	Monitor 2 Data Screen Clear DDM	Difference PIR to Monitor ±1.0			
	Transmitter Settings	PIR measured						
Step 2	0.0	0.0 %	0.0	0.0	-1.0 to 1.0	%	✓	
	0.5	0.5 %	0.5	0.5	-0.5 to 1.5	%	✓	
Step 2	+1.0	+1.0 %	1.0	1.0	0.0 to 2.0	%	✓	
	-0.5	-0.5%	-0.5	-0.5	0.5 to -1.5	%	✓	
Step 2	-1.0	-1.0 %	-1.0	-1.0	0.0 to -2.0	%	✓	

5.4 DDM Settings Accuracy for Course and Clearance CSB TRANSMITTER 2								
Para-graph No	Test Conditions		Data	Data	MIN./MAX. ACCEPT. Level	U N I T	P A S S	F A I L
Step 1	Select DDM for the CRS Transmitter 2. (No Ident)		Monitor 1 Data Screen Course DDM	Monitor 2 Data Screen Course DDM	Difference PIR to Monitor ±1.0			
	Transmitter Settings	PIR measured						
Step 1	0.0	0.0 %	0.0	0.0	-1.0 to 1.0	%	✓	
	0.5	0.5 %	0.5	0.5	-0.5 to 1.5	%	✓	
Step 1	+1.0	+1.0 %	1.0	1.0	0.0 to 2.0	%	✓	
	-0.5	-0.5%	-0.5	-0.5	0.5 to -1.5	%	✓	
Step 1	-1.0	-1.0 %	-1.0	-1.0	0.0 to -2.0	%	✓	
Step 2	Select DDM for the CLR transmitter 2. (No Ident) CLR SBO off		Monitor 1 Data Screen Clear DDM	Monitor 2 Data Screen Clear DDM	Difference PIR to Monitor ±1.0			
	Transmitter Settings	PIR measured						
Step 2	0.0	0.0 %	0.0	0.0	-1.0 to 1.0	%	✓	
	0.5	0.5 %	0.5	0.5	-0.5 to 1.5	%	✓	
Step 2	+1.0	+1.0 %	1.0	1.0	0.0 to 2.0	%	✓	
	-0.5	-0.5%	-0.5	-0.5	0.5 to -1.5	%	✓	
Step 2	-1.0	-1.0 %	-1.0	-1.0	0.0 to -2.0	%	✓	

B.2.6 Ident AM Data

5.5 Identification Modulation Setting TRANSMITTER 1						
Step No.	Test Conditions	MIN/MAX. ACCEPT. Level	Data PIR	UNIT	PASS	FAIL
Step 1.	Adjust Ident AM modulation for Transmitter 1	Difference ±0.5% Modulation				
	Adjusted		CRS CSB			
Step 1.	6.0 %	±0.5	5,9	%	✓	
Step 1.	8.0 %	±0.5	7,9	%	✓	
Step 1.	10.0 %	±0.5	9,8	%	✓	
Step 2.	Adjust Ident AM modulation for Transmitter 1	Difference ±0.5% Modulation				
	Adjusted		CLR CSB			
Step 2.	6.0 %	±0.5	5,8	%	✓	
Step 2.	8.0 %	±0.5	7,7	%	✓	
Step 2.	10.0 %	±0.5	9,6	%	✓	
Step 3.	Frequency Measurement		CRS CSB			
Step 3.	1024	±0.5	1024.0	Hz	✓	
Step 3.	Frequency Measurement		CLR SBO			
Step 3.	1024	±0.5	1024,0	Hz	✓	

5.5 Identification Modulation Setting TRANSMITTER 2						
Step No.	Test Conditions	MIN/MAX. ACCEPT. Level	Data PIR	UNIT	PASS	FAIL
Step 1.	Adjust Ident AM modulation for Transmitter 2	Difference ±0.5% Modulation				
	Adjusted		CRS CSB			
Step 1.	6.0 %	±0.5	5,6	%	✓	
Step 1.	8.0 %	±0.5	7,6	%	✓	
Step 1.	10.0 %	±0.5	9,6	%	✓	
Step 2.	Adjust Ident AM modulation for Transmitter 2	Difference ±0.5% Modulation				
	Adjusted		CLR CSB			
Step 2.	6.0 %	±0.5	5,8	%	✓	
Step 2.	8.0 %	±0.5	7,7	%	✓	
Step 2.	10.0 %	±0.5	9,6	%	✓	
Step 3.	Frequency Measurement		CRS CSB			
Step 3.	1024	±0.5	1024,0	Hz	✓	
Step 3.	Frequency Measurement		CLR SBO			
Step 3.	1024	±0.5	1024,0	Hz	✓	

B.2.7 Identification Keying

5.6 Identification Keying					
Step No.	Test Conditions	MIN. ACCEPT. Level	UNIT	PASS	FAIL
Step 1	Ident keyed IQJY	Morse code "TEST"	Status	✓	
Step 2	Ident off	No ident.	Status	✓	
Step 3	Ident continuous	Cont. ident	Status	✓	

B.2.8 SBO RF Phase Control Data

5.7. SBO RF Phase Control TRANSMITTER 1							
Step No.	Test Conditions	TX1 Phase setting (°)	DDM Data Monitor 1 Width (%)	DDM Data Monitor 2 Width (%)	DDM MIN./MAX. ACCEPT. Level	PASS	FAIL
Step 1	Course width DDM Nominal Setting	59	15.5	15.5	15.5% ±1%	✓	
Step 2	DDM (phase set to +90°)	149	0.2	0.2	0% ±1%	✓	
Step 3	DDM (phase set to +180°)	239	-15.5	-15.5	-15.5% ±1%	✓	
Step 4	DDM (phase set to +270°)	329	-0.1	-0.1	0% ±1%	✓	
Step 6/1	Clearance width DDM Nominal Setting	249	26.0	26.0	26.0 % ± 1%	✓	
Step 6/2	DDM (phase set to +90°)	339	-0.1	-0.1	0% ±1%	✓	
Step 6/3	DDM (phase set to +180°)	69	-26.0	-26.0	-26.0 % ±1%	✓	
Step 6/4	DDM (phase set to +270°)	159	0.0	0.0	0% ±1%	✓	

- CRS SBO Amplitude.....33.0 %.....
- CLR SBO Amplitude.....25.6 %.....

5.7. SBO RF Phase Control TRANSMITTER 2							
Step No.	Test Conditions	TX2 Phase setting (°)	DDM Data Monitor 1 Width (%)	DDM Data Monitor 2 Width (%)	DDM MIN./MAX. ACCEPT. Level	P A S S	F A I L
Step 1	Course width DDM Nominal Setting	32	15.5	15,5	15.5% ±1%	V	
Step 2	DDM (phase set to +90°)	152	0,0	0,0	0% ±1%	V	
Step 3	DDM (phase set to +180°)	212	-15.5	-15,5	-15.5% ±1%	V	
Step 4	DDM (phase set to +270°)	332	-0,1	-0,1	0% ±1%	V	
Step 6/1	Clearance width DDM Nominal Setting	243	26,0	26,0	26.0 % ± 1%	V	
Step 6/2	DDM (phase set to +90°)	333	-0,1	-0,1	0% ±1%	V	
Step 6/3	DDM (phase set to +180°)	63	-26,1	26,1	-26.0 % ±1%	V	
Step 6/4	DDM (phase set to +270°)	153	0,0	0,1	0% ±1%	V	

- CRS SBO Amplitude.....32,0.....
- CLR SBO Amplitude.....25,0.....

B.2.9 Distortion Factor

5.8.1 Course CSB Distortion Factor A1 Signal							
Step No.	Test Conditions	MAX. ACCEPT. Level	Data TX1	Data TX2	UNIT	PASS	FAIL
Step 4.	90 Hz Sidebands +/- 90 Hz Modulation Distortion	≤ -26.0	-54 / -51	-49 / -50	dB	✓	
Step 4.	90 Hz Sidebands +/- 180 Hz Modulation Distortion	≤ -26.0	-61 / -55	-56 / -55	dB	✓	
Step 4.	150 Hz Sidebands +/- 150 Hz Modulation Distortion	≤ -26.0	-57 / -54	-53 / -53	dB	✓	
Step 4.	150 Hz Sidebands +/- 300 Hz Modulation Distortion	≤ -26.0	-59 / -57	-63 / -57	dB	✓	

5.8.2 CLR Distortion Factor							
Step No.	Test Conditions	MAX. ACCEPT. Level	Data TX1	Data TX2	UNIT	PASS	FAIL
Step 4.	90 Hz Sidebands +/- 90 Hz Modulation Distortion	≤ -26.0	-50 / -46	-60 / -54	dB	✓	
Step 4.	90 Hz Sidebands +/- 180 Hz Modulation Distortion	≤ -26.0	-67 / -65	-62 / -69	dB	✓	
Step 4.	150 Hz Sidebands +/- 150 Hz Modulation Distortion	≤ -26.0	-50 / -46	-67 / -52	dB	✓	
Step 4.	150 Hz Sidebands +/- 300 Hz Modulation Distortion	≤ -26.0	-65 / -61	-65 / -67	dB	✓	

B.2.10 Monitor Measurement Data

B.2.10.1 RF Level Data

5.9.1 Antenna RF-Level Alarm Indications								
Step No.	Test Conditions	Alarm Limits		Pre-Alarm Limits		UNIT	PASS	FAIL
		Lower	Alarm No Alarm	Lower	Pre-Alarm No Pre-Alarm			
Step 2	Course Position Nearfield - Mon 1 **Only if Nearfield installed	90 %	A	92.5 %	?	Status	✓	
Step 2.	Course Position Nearfield - Mon 2 **Only if Nearfield installed	90 %	A	92.5 %	?	Status	✓	
Step 2.	Course Position Mon 1	90 %	A	92.5 %	?	Status	✓	
Step 2.	Course Position Mon 2	90 %	A	92.5 %	?	Status	✓	
Step 2.	Course Width Mon 1	90 %	A	92.5 %	?	Status	✓	
Step 2.	Course Width Mon 2	90 %	A	92.5 %	?	Status	✓	
Step 2.	Clearance Mon 1	90 %	A	92.5 %	?	Status	✓	
Step 2.	Clearance Mon 2	90 %	A	92.5 %	?	Status	✓	

B.2.10.2 SDM Data

5.9.1 Antenna SDM Alarm Indications								
Step No.	Test Conditions	Alarm Limits		Pre-Alarm Limits		UNIT	PASS	FAIL
		Upper Lower	Alarm No Alarm	Upper Lower	Pre-Alarm No Pre-Alarm			
Step 3	Course Position Nearfield - Mon 1 **Only if Nearfield installed	44 %	A	42 %	P	Status	✓	
		36 %	A	38 %	P	Status		
Step 3	Course Position Nearfield - Mon 2 **Only if Nearfield installed	44 %	A	42 %	P	Status	✓	
		36 %	A	38 %	P	Status		
Step 3	Course Position Mon 1	44 %	A	42 %	P	Status	✓	
		36 %	A	38 %	P	Status		
Step 3	Course Position Mon 2	44 %	A	42 %	P	Status	✓	
		36 %	A	38 %	P	Status		
Step 3	Course Width Mon 1	44 %	A	42 %	P	Status	✓	
		36 %	A	38 %	P	Status		
Step 3	Course Width Mon 2	44 %	A	42 %	P	Status	✓	
		36 %	A	38 %	P	Status		
Step 3	Clearance Width Mon 1	44 %	A	42 %	P	Status	✓	
		36 %	A	38 %	P	Status		
Step 3	Clearance Width Mon 2	44 %	A	42 %	P	Status	✓	
		36 %	A	38 %	P	Status		

B.2.10.3 DDM Data

5.9.1 Antenna DDM Alarm Indications								
Step No.	Test Conditions	Alarm Limits		Pre-Alarm Limits		UNIT	PASS	FAIL
		Upper Lower	Alarm No Alarm	Upper Lower	Pre-Alarm No Pre-Alarm			
Step 4	Course Position Nearfield - Mon 1 **Only if Nearfield installed	0 + 0.7 %	A	0 + 0.4 %	P	Status	✓	
		0 - 0.7 %	A	0 - 0.4 %	P	Status		
Step 4	Course Position Nearfield - Mon 2 **Only if Nearfield installed	0 + 0.7 %	A	0 + 0.4 %	P	Status	✓	
		0 - 0.7 %	A	0 - 0.4 %	P	Status		
Step 4	Course Position Mon 1	0 + 0.7 %	A	0 + 0.4 %	P	Status	✓	
		0 - 0.7 %	A	0 - 0.4 %	P	Status		
Step 4	Course Position Mon 2	0 + 0.7 %	A	0 + 0.4 %	P	Status	✓	
		0 - 0.7 %	A	0 - 0.4 %	P	Status		
Step 4	Course Width Mon 1	17.7 %	A	17.0 %	P	Status	✓	
		13.3 %	A	14.0 %	P	Status		
Step 4	Course Width Mon 2	17.7 %	A	17.0 %	P	Status	✓	
		13.3 %	A	14.0 %	P	Status		
Step 4	Clearance Width Mon 1	31.0 %	A	29.0 %	P	Status	✓	
		21.0 %	A	23.0 %	P	Status		
Step 4	Clearance Width Mon 2	31.0 %	A	29.0 %	P	Status	✓	
		21.0 %	A	23.0 %	P	Status		

B.2.11 Identity Alarm Data

5.9.1 Antenna Identity Alarm Indications							
Step No.	Test Conditions	Limits Upper Lower	Monitor Action	Result Alarm No Alarm	UNIT	PASS	FAIL
Step 5	ID Alarm Indication Mon 1: "ALARM"	12.0 %	YES	A	Status	✓	
		4.0 %	YES	A	Status		
Step 5	ID Alarm Indication Mon 2: "ALARM"	12.0 %	YES	A	Status	✓	
		4.0 %	YES	A	Status		
Step 5	Continuous 1024 Hz Mon 1: "ALARM"		YES	A	Status	✓	
Step 5	Continuous 1024 Hz Mon 2: "ALARM"		YES	A	Status	✓	

B.2.11.1 Standby RF-Level Data

5.9.1 Standby RF-Level Alarm Indications								
Step No.	Test Conditions	Alarm Limits		Pre-Alarm Limits		UNIT	PASS	FAIL
		Lower	Alarm No Alarm	Lower	Pre- Alarm No Pre-Alarm			
Step 6	Course Position Standby - Mon 1	90 %	A	92.5 %	P	Status	✓	
Step 6.	Course Position Standby - Mon 2	90 %	A	92.5 %	P	Status	✓	
Step 6.	Course Width Standby - Mon 1	90 %	A	92.5 %	P	Status	✓	
Step 6.	Course Width Standby - Mon 2	90 %	A	92.5 %	P	Status	✓	
Step 6.	Clearance Standby - Mon 1	90 %	A	92.5 %	P	Status	✓	
Step 6.	Clearance Standby - Mon 2	90 %	A	92.5 %	P	Status	✓	

B.2.11.2 Standby SDM Data

5.9.1 Standby SDM Alarm Indications								
Step No.	Test Conditions	Alarm Limits		Pre-Alarm Limits		UNIT	PASS	FAIL
		Upper Lower	Alarm No Alarm	Upper Lower	Pre-Alarm No Pre-Alarm			
Step 7	Course Position Standby - Mon 1	44 %	A	42 %	P	Status	V	
		36 %	A	38 %	P	Status		
Step 7	Course Position Standby - Mon 2	44 %	A	42 %	P	Status	V	
		36 %	A	38 %	P	Status		
Step 7	Course Width Standby - Mon 1	44 %	A	42 %	P	Status	V	
		36 %	A	38 %	P	Status		
Step 7	Course Width Standby - Mon 2	44 %	A	42 %	P	Status	V	
		36 %	A	38 %	P	Status		
Step 7	Clearance Width Standby - Mon 1	44 %	A	42 %	P	Status	V	
		36 %	A	38 %	P	Status		
Step 7	Clearance Width Standby - Mon 2	44 %	A	42 %	P	Status	V	
		36 %	A	38 %	P	Status		

B.2.11.3 Standby DDM Data

5.9.1 Standby DDM Alarm Indications								
Step No.	Test Conditions	Alarm Limits		Pre-Alarm Limits		UNIT	PASS	FAIL
		Upper Lower	Alarm No Alarm	Upper Lower	Pre-Alarm No Pre-Alarm			
Step 8	Course Position Standby - Mon 1	0 + 0.7 %	A	0 + 0.4 %	P	Status	✓	
		0 - 0.7 %	A	0 - 0.4 %	P	Status		
Step 8	Course Position Standby - Mon 2	0 + 0.7 %	A	0 + 0.4 %	P	Status	✓	
		0 - 0.7 %	A	0 - 0.4 %	P	Status		
Step 8	Course Width Standby - Mon 1	17.7 %	A	17.0 %	P	Status	✓	
		13.3 %	A	14.0 %	P	Status		
Step 8	Course Width Standby - Mon 2	17.7 %	A	17.0 %	P	Status	✓	
		13.3 %	A	14.0 %	P	Status		
Step 8	Clearance Width Standby - Mon 1	31.0 %	A	29.0 %	P	Status	✓	
		21.0 %	A	23.0 %	P	Status		
Step 8	Clearance Width Standby - Mon 2	31.0 %	A	29.0 %	P	Status	✓	
		21.0 %	A	23.0 %	P	Status		

B.2.12 Monitor Integrity Test Data

5.9.1 Monitor Integrity Test Alarm Indications							
Step No.	Test Conditions	Limits Upper Lower	Monitor 1 Alarm No Alarm	Monitor 2 Alarm No Alarm	UNIT	PASS	FAIL
Step 9	RF-Level Integrity Signal A Waveform Sett.	92.0 %	A	A	Status	✓	
		88.0 %	A	A	Status		
Step 9	RF-Level Integrity Signal B Waveform Sett.	72.0 %	A	A	Status	✓	
		68.0 %	A	A	Status		
Step 9	SDM Signal A Waveform Sett.	41.0 %	A	A	Status	✓	
		39.0 %	A	A	Status		
Step 9	SDM Signal B Waveform Sett.	39.0 %	A	A	Status	✓	
		37.0 %	A	A	Status		
Step 9	DDM Signal A Waveform Sett.	+ 0.5 %	A	A	Status	✓	
		- 0.5 %	A	A	Status		
Step 9	DDM Signal B Waveform Sett.	2.0 %	A	A	Status	✓	
		1.0 %	A	A	Status		

B.2.13 Executive Monitoring

5.10 Equipment Changeover & Shutdown							
Para-graph No.	Test Conditions	MIN. ACCEPT. Level	Data	MAX. ACCEPT. Level	UNIT	PASS	FAIL
Step 1.	Equipment transfer	Eqpt 2 main Eqpt 1 off			Status	✓	
Step 2.	Time for full shutdown		2	2	sec	✓	

B.2.14 Battery Operation

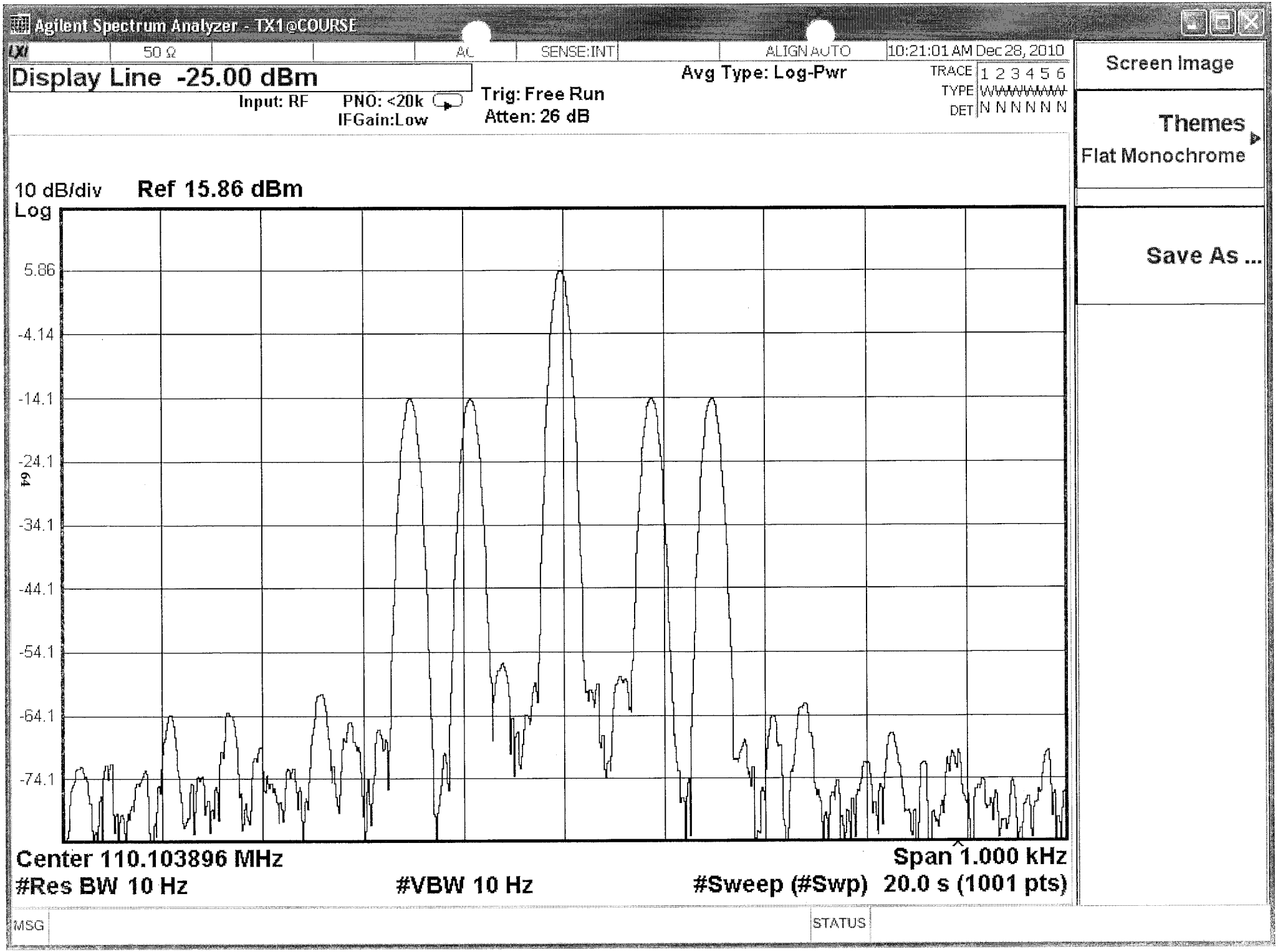
5.11 Battery Operation				
Para-graph No.	Test Conditions	UNIT	PASS	FAIL
Step 5.	System NORMAL	Status	✓	
Step 8.	Mains OFF	Status	✓	
Step 11.	MAINS OFF BATTERY LOW	Status	✓	
Step 15.	MAINSOFF BATTERY DRIVEN OFF BATTERY LOW	Status	✓	
Step 16.	Transmitters OFF Front Panel ON	Status	✓	
Step 18.	Transmitters ON System NORMAL	Status	✓	
Step 23.	System OFF	Status	✓	

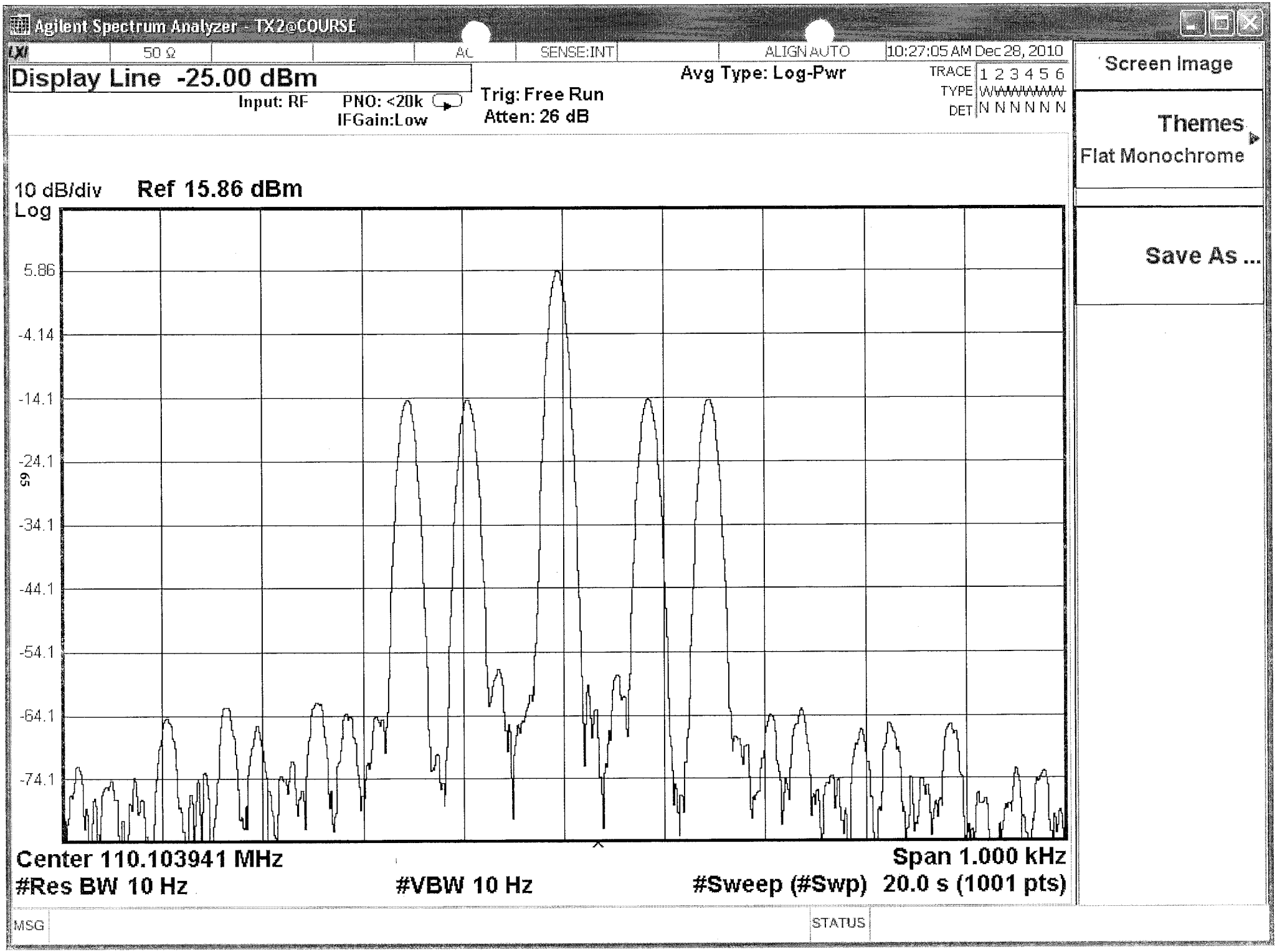
B.2.15 RCSE Communication

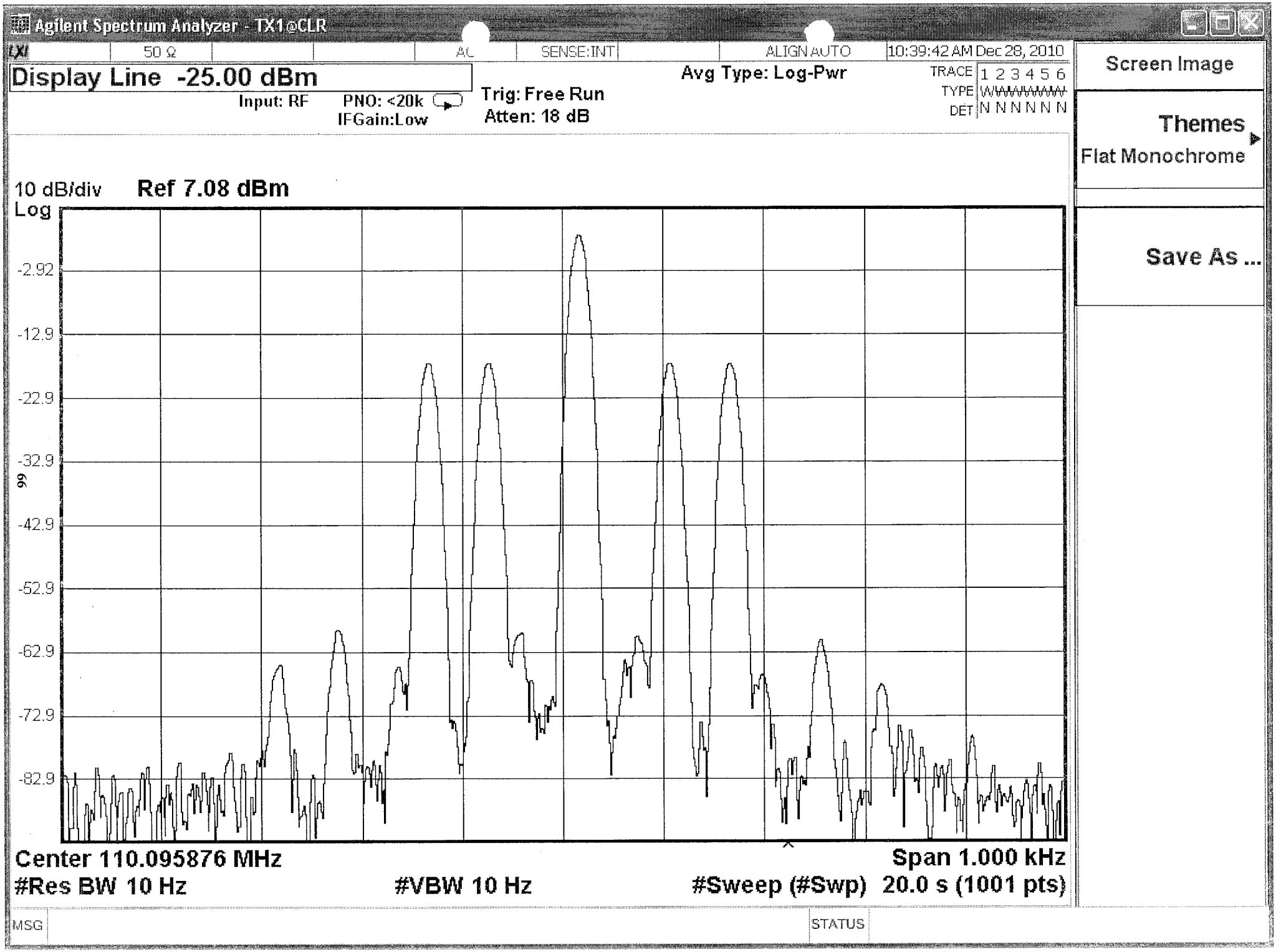
5.12 RCSE Communication				
Para-graph No.	Test Conditions	UNIT	PASS	FAIL
Step 4.	Status same	Status		
Step 6.	MAIN OFF	Status		

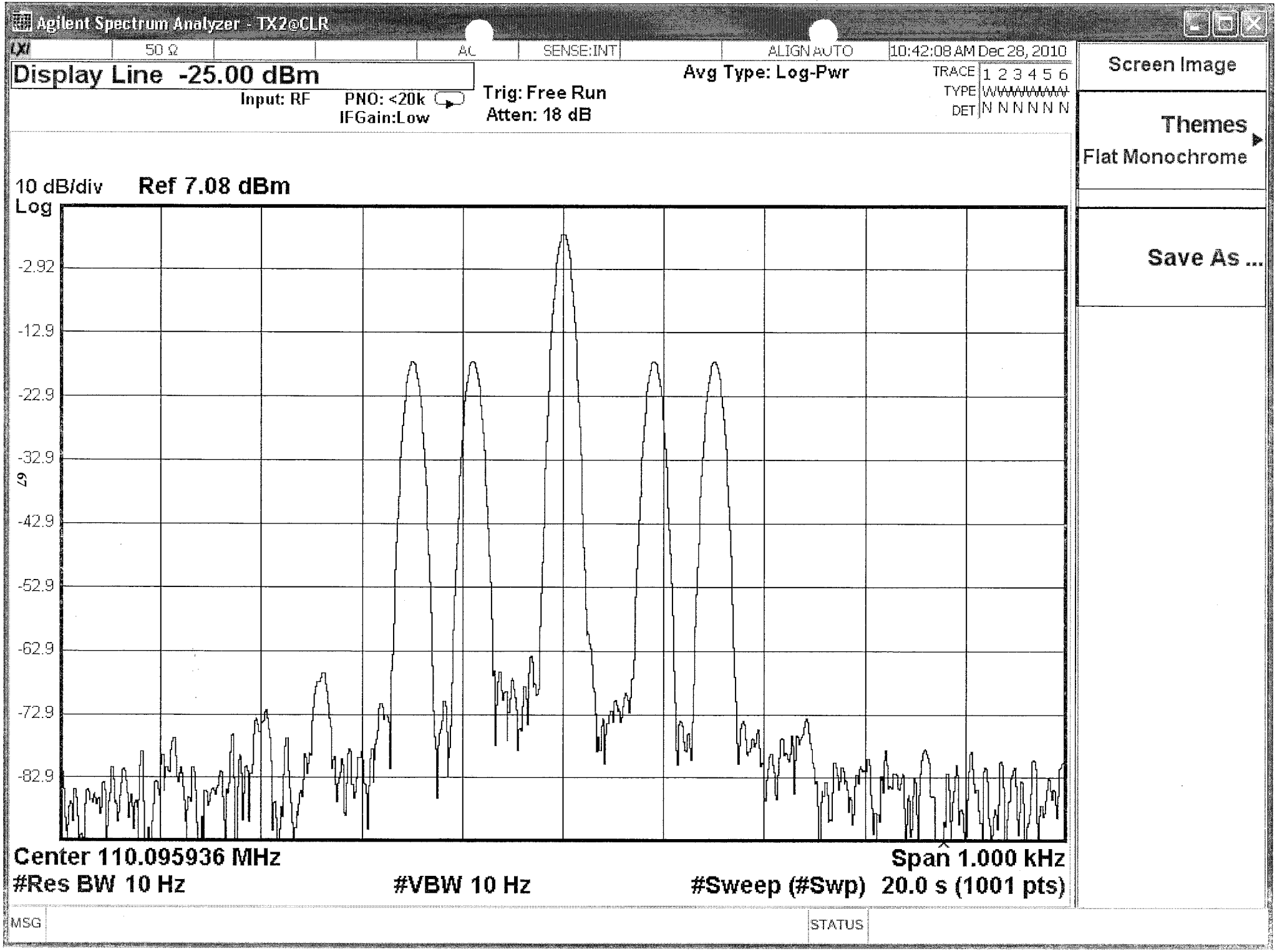
B.3 SUPPORTING DATA PRINTOUTS

Attach supporting PMDT screen printouts or test equipment plotter outputs in this section in the sequential order specified by the test procedure. Each printed sheet shall be marked with the procedure paragraph number, step number, date and time.


Agilent Spectrum Analyzer - TX1@COURSE
50 Ω
AC
SENSE:INT
ALIGN AUTO
10:21:01 AM Dec 28, 2010
Display Line -25.00 dBm
Input: RF
PNO: <20k
IFGain:Low
Trig: Free Run
Atten: 26 dB
Avg Type: Log-Pwr
TRACE 1 2 3 4 5 6
TYPE
DET N N N N N N
Screen Image
Themes
Flat Monochrome
Save As ...
10 dB/div
Log
Ref 15.86 dBm
5.86
-4.14
-14.1
-24.1
-34.1
-44.1
-54.1
-64.1
-74.1
Center 110.103896 MHz
#Res BW 10 Hz
#VBW 10 Hz
Span 1.000 kHz
#Sweep (#Swp) 20.0 s (1001 pts)
MSG
STATUS


Agilent Spectrum Analyzer - TX2@COURSE
50 Ω
AC
SENSE:INT
ALIGN AUTO
10:27:05 AM Dec 28, 2010
Display Line -25.00 dBm
Input: RF
PNO: <20k
IFGain:Low
Trig: Free Run
Atten: 26 dB
Avg Type: Log-Pwr
TRACE 1 2 3 4 5 6
TYPE
DET N N N N N N
Screen Image
Themes
Flat Monochrome
Save As ...
10 dB/div
Log
Ref 15.86 dBm
5.86
-4.14
-14.1
-24.1
-34.1
-44.1
-54.1
-64.1
-74.1
dB
Center 110.103941 MHz
#Res BW 10 Hz
#VBW 10 Hz
Span 1.000 kHz
#Sweep (#Swp) 20.0 s (1001 pts)
MSG
STATUS


Agilent Spectrum Analyzer - TX1@CLR
50 Ω
AC
SENSE:INT
ALIGN AUTO
10:39:42 AM Dec 28, 2010
Display Line -25.00 dBm
Input: RF
PNO: <20k
IFGain:Low
Trig: Free Run
Atten: 18 dB
Avg Type: Log-Pwr
TRACE 1 2 3 4 5 6
TYPE W W W W W W
DET N N N N N N
Screen Image
Themes
Flat Monochrome
Save As ...
10 dB/div
Ref 7.08 dBm
Log
-2.92
-12.9
-22.9
-32.9
-42.9
-52.9
-62.9
-72.9
-82.9
99
Center 110.095876 MHz
#Res BW 10 Hz
#VBW 10 Hz
Span 1.000 kHz
#Sweep (#Swp) 20.0 s (1001 pts)
MSG
STATUS


Agilent Spectrum Analyzer - TX2@CLR
50 Ω
AC
SENSE:INT
ALIGN AUTO
10:42:08 AM Dec 28, 2010
Display Line -25.00 dBm
Input: RF
PNO: <20k
IFGain:Low
Trig: Free Run
Atten: 18 dB
Avg Type: Log-Pwr
TRACE 1 2 3 4 5 6
TYPE
DET N N N N N N
Screen Image
Themes
Flat Monochrome
Save As ...
10 dB/div
Ref 7.08 dBm
Log
-2.92
-12.9
-22.9
-32.9
-42.9
-52.9
-62.9
-72.9
-82.9
dB
Center 110.095936 MHz
Span 1.000 kHz
#Res BW 10 Hz
#VBW 10 Hz
#Sweep (#Swp) 20.0 s (1001 pts)
MSG
STATUS

Configuration

Int.Order nr.: 10679Z-65 Country : TAIWAN Location :

Equip. Type: GS ACTIVE DEDF Equip.PN: 098775-0001 Equip.SN : 136 data 23/12/2010

pc board Description	pc board PN	SN	SW ver.	PCS
5 Volt DC Converter	8313830511	04885		
AC-DC Converter	5834120102	09921		05
AC-DC Converter	5834120102	09920		05
BACKPLANE MOD/PA	120602-0001	24177		B
BACKPLANEDIGITAL	120598-0002	04326		02
DC-DC CONVERTER	8313812400	04691		06
DC-DC CONVERTER	8313812400	04692		06
ECU	120571-0003	04300		02
GS CLR Power Adder	120634-0001	04052		02
INTERFACE CCA NEW	120628-0001	04175		02
LCP	8313521003	02638	4.24	01
LGX	120570-0004	04822	7.0	03
LGX	120570-0004	04825	7.0	03
LGX	120570-0004	04842	5.0	03
LGX	120570-0004	04832	5.0	03
Mod P/A	120589-0002	24318		04
Mod P/A	120589-0002	24315		04
Mod P/A	120589-0002	24304		04
Mod P/A	120589-0002	24280		04
Power Rack Assembly	8313831001	00685		
SOAC	120621-0001	04167		09
SYNTHESIZER	120496-0002	04633		09
SYNTHESIZER	120496-0002	04623		09
TRANSFER SWITCH	120622-0001	04538		08

Rocco

CERTIFICATE
OF FACTORY ACCEPTANCE TEST

This is to certify that the Transmitter Unit Glide Path DEDF Standard Active

Part Number: 098775-0001

Serial Number: 136

Contract Number: 106797

has been checked in mechanical and electrical compliance with the values contained in the attached Test Record.

The Factory Acceptance Test took place:

- [X] - without any objection
- [ ] - with objection
- [ ] - All deficiencies cleared

Date of Factory Acceptance Test : 09-03-2011

Location of Factory Acceptance Test : GORGONZOLA

For the Customer	For Thales
Signature	Signature
NAME	NAME

ATTACHMENT B

GLIDE PATH DESIGN QUALIFICATION TEST DATA

For the

THALES ILS 420

INSTRUMENT LANDING SYSTEM

Attachments B.1 through B.3 contain the following data sheets:

B.1) Equipment Configuration

B.2) Design Qualification Test Data

B.3) Supporting Data Printouts

8 B.1 - EQUIPMENT CONFIGURATION

8.1 Configuration tables

Configuration tables for hardware and software verify equipment under test.

Software versions shall be recorded on the following table.

8.1.1 Software Configuration

GLIDE PATH SOFTWARE CONFIGURATION DATA		
	Version	Remarks
WINADRACS (PMDT)	4.6	
Monitor (LG-M)	7.0	
Transmitter (LG-A)	5.0	
LCP	4.24	

8.1.2 Test Equipment Calibration Verification

EQUIPMENT CALIBRATION			
EQUIPMENT	MANUFACTURER / MODEL	CALIBRATION NUMBER	CAL DUE
Multimeter	e.g. DMM 249		
Power Meter	e.g. HP 432 A or equivalent		
Power Meter Sensor	e.g. 8482A or equivalent		
RF - Counter	e.g. HP 5342 A or equivalent		
Spectrum Analyzer	e.g. HP 8568 B or equivalent		
Oscilloscope	e.g. Tektronix 2462 B or equivalent		
GP Antenna Simulator	Thales		
Portable ILS Receiver	R&S EVS 200 or equivalent		

8.1.3 GLIDESLOPE EQUIPMENT CONFIGURATION DATA

ASSEMBLY	THALES PART NUMBER	REFERENCE DESIGNATOR	REVISION LEVEL	SERIAL NUMBER
GLIDESLOPE ELECTRONIC SUBSYSTEM	098775-0001	UNIT 1		136
SYNTHESIZER CCA	120496-0002	Side 1	09	4635
		Side 2	09	4623
AUDIO GENERATOR CCA	120570-0004	Side 1	03	4832
		Side 2	03	4842
MONITOR CCA	120570-0006	Side 1	03	4825
		Side 2	03	4822
INTERFACE CCA	~~120498-000~~ 120623-0001		02	4175
EXECUTIVE CONTROL UNIT CCA	120571-0003		02	4300
STANDBY, ON-AIR COMBINER (SOAC)	120621-0001		09	4167
BACKPLANE CCA DIGITAL	120598-0002		02	4326
BACKPLANE CCA MOD/PA	120602-0001		B	24177
LOCAL CONTROL PANEL	831352100-3		01	02238
MODULATOR/POWER AMPLIFIER ASSEMBLY	120589-0002	COURSE 1	04	24280
		COURSE 2	04	24318
		CLEAR 1	04	24315
		CLEAR 2	04	24304

ASSEMBLY	THALES PART NUMBER	REFERENCE DESIGNATOR	REVISION LEVEL	SERIAL NUMBER
GS CLR Power Adder	120634-000 A		02	4052
TRANSFER SWITCH ASSEMBLY	120622-000 A		05	4538
AC-DC CONVERTER	583412010 2	PS1	05	9920
		PS2	05	9921
DC-DC CONVERTER +5, +/- 15, +26V	8313812400	NO. 1	06	4692
		NO.2	06	4691
Power Rack Assembly *serial number located on side of rack use a mirror to read	831383100 A			00685
5 Volt DC Converter Assembly	8313830511			04885

8.1.4 System Waveform Settings

	TX1	TX2	
Course CSB1 DDM	-11.63	-11.72	%
Course CSB1 SDM	80.4	80.5	%
Course CSB1 RF Level	2.56	2.56	% w
Course SBO Amplitude	54.7	54.0	%
Course SBO Phase	11	8	DEG
CLR CSB DDM	30.50	29.52	%
CLR CSB SDM	81.2	81.4	%
CLR CSB RF level	1.27	1.32	% w
Course CSB2 DDM	-45.68	-44.68	%
Course CSB2 SDM	78.2	76.8	%
Course CSB2 RF Level	0.30	0.29	% w
Course CSB2 Phase	116	124	DEG

9 B.2 - FAT TEST DATA

This section contains data sheets for recording measurements and observations during the tests according to instructions in the test procedures. The test paragraph number uniquely identifies each data item, in the left-most column.

The next column contains the test title above a description of the identifying conditions under which the data was taken.

Locations are specified for recording measured data. Limits are provided to evaluate whether the test step has passed or failed with any formulae required for data reduction

A check mark shall be made in the "Pass" or "Fail" column on the right side of the data sheet to clearly indicate whether the objective of each test step has been met.

9.1 Power Supply Data

Test 3.3.2 TESTS POWER SUPPLY							
Step No.	Test Conditions	MIN. ACCEPT. LEVEL	DATA	MAX. ACCEPT. LEVEL	UNIT	PASS	FAIL
Step 1	AC Input Voltage		227		V	√	
Step 2	AC-DC Conv. Output	54 - 1.6	53.7	54 + 1.6	V	√	
Step 3	DC/DC-5 V Output #1	+ 5 - 0.4	5.27	+ 5 + 0.4	V	√	
	DC/DC +15 V Output #1	+15 - 0.45	14.91	+15 + 0.45	V	√	
	DC/DC –15 V Output #1	-15 - 0.45	-14.99	-15 + 0.45	V	√	
	DC/DC + 24 V Output #1	24 - 1	24.83	24 + 1	V	√	
	DC/DC-5 V Output #2	+ 5 - 0.4	5.28	+ 5 + 0.4	V	√	
	DC/DC +15 V Output #2	+15 - 0.45	14.89	+15 + 0.45	V	√	
	DC/DC -15 V Output #2	-15 - 0.45	-14.97	-15 + 0.45	V	√	
	DC/DC + 24 V Output #2	24 - 1	24.83	24 + 1	V	√	

9.2 Transmitter Data

9.2.1 Transmitter Power Data

5.1.1 to 5.1.3 Transmitter Carrier Power Course and Clearance at Antennas							
Step No.	Tested Signals	Test Conditions	Test TX-1	Test TX-2	UNIT	PASS	FAIL
Steps 1-7	CRS CSB1 (A1)	Power at connector A1 1.0 ±0.050 W	Measured 1.013	Measured 1.009	W	✓	
Step 8	CLR CSB (A3)	Power at connector A3 0.0625 ±0.025 W	Measured 0.0645	Measured 0.0648	W	✓	
Steps 13-16	CRS CSB2 (A2)	Power at connector A2 0.250 ±0.025 W	Measured 0.229	Measured 0.229	W	✓	

9.2.2 RF Carrier Frequency Data

5.2 RF Carrier Frequency Course and Clearance							
Para-graph No.	Test Conditions	MIN./MAX. ACCEPT. LEVEL	DATA TX1	DATA TX2	U N I T	P A S S	F A I L
Step 3	CLR TX Freq. 331.996 MHz (A1)	±0.001%	331995009	331995210	MHz	✓	
Step 3	CRS TX Freq. 332.004 MHz (A1)	±0.001%	332003007	332003212	MHz	✓	
Step 3.	CRS Freq. - CLR Freq. = 8 kHz	±0.5%	7998	8002	kHz	✓	
Step 4.	CRS TX Freq. (customer freq.)	±0.001%	N.A.	N.A.	MHz		
Step 4.	CLR TX Freq. (customer freq.)	±0.001%	N.A.	N.A.	MHz		
Step 4.	CRS Freq. - CLR Freq. = 8 kHz	±0.5%	N.A.	N.A.	kHz		

9.2.3 SDM Setting Data

5.3 SDM Setting for Course and Clearance TRANSMITTER 1								
Para-graph No.	Test Conditions		MIN/MAX. ACCEPT. LEVEL	DATA Monitor 1	DATA Monitor 2	UNIT	PASS	FAIL
Step 1.	Select normal modulation for CRS CSB1 Transmitter 1		Difference PIR to Monitor ±2.0	CRS CSB1 SDM	CRS CSB1 SDM			
	Adjusted	PIR measured						
Step 2.	72.3	72%	70 to 74	71.9	71.9	%	√	
Step 2.	76.4	76%	74 to 78	76.0	76.0	%	√	
Step 2.	80.4	80%	78 to 82	79.9	79.9	%	√	
Step 2.	84.4	84%	82 to 86	83.9	84.0	%	√	
Step 2.	88.4	88%	86 to 90	87.9	87.8	%	√	
Step 3.	Select normal Mod. for CLR Transmitter 1		Difference PIR to Monitor ±2.0	Clearance SDM	Clearance SDM			
	Adjusted	PIR measured						
Step 4.	73.0	72%	70 to 74	72.0	72.0	%	√	
Step 4.	77.1	76%	74 to 78	76.0	76.0	%	√	
Step 4.	81.2	80%	78 to 82	80.1	80.1	%	√	
Step 4.	85.2	84%	82 to 86	84.1	84.1	%	√	
Step 4.	89.3	88%	86 to 90	88.0	88.1	%	√	

5.3 SDM Setting for Course and Clearance TRANSMITTER 1								
Para-graph No.	Test Conditions		MIN/MAX. ACCEPT. LEVEL	DATA Monitor 1	DATA Monitor 2	U N I T	P A S S	F A I L
Step 3.	Select normal Mod. for CRS CSB2 Transmitter 1		Difference NA	CRS CSB2 SDM	CRS CSB2 SDM			
	Adjusted	PIR measured						
Step 4.	70.4	72%	NA	NA	NA	%	✓	
Step 4.	74.3	76%	NA	NA	NA	%	✓	
Step 4.	78.2	80%	NA	NA	NA	%	✓	
Step 4.	82.1	84%	NA	NA	NA	%	✓	
Step 4.	86.0	88%	NA	NA	NA	%	✓	

* CRS CSB2 SDM can't be read accurately with the monitors because of the way the CRS width signal is generated in the SOAC. For this parameter the signal will only be checked against the PIR and verified it can make the specified signals.

5.3 SDM Setting for Course and Clearance TRANSMITTER 2								
Para-graph No.	Test Conditions		MIN/MAX. ACCEPT. LEVEL	DATA Monitor 1	DATA Monitor 2	UNIT	PASS	FAIL
Step 1.	Select normal modulation for CRS CSB1 Transmitter 2		Difference PIR to Monitor ±2.0	CRS CSB1 SDM	CRS CSB1 SDM			
	Adjusted	PIR measured						
Step 2.	72.5	72%	70 to 74	72.0	72.0	%	✓	
Step 2.	76.5	76%	74 to 78	76.0	76.0	%	✓	
Step 2.	80.5	80%	78 to 82	80.0	80.0	%	✓	
Step 2.	84.5	84%	82 to 86	83.3	83.9	%	✓	
Step 2.	88.6	88%	86 to 90	88.0	88.0	%	✓	
Step 3.	Select normal Mod. for CLR Transmitter 2		Difference PIR to Monitor ±2.0	Clearance SDM	Clearance SDM			
	Adjusted	PIR measured						
Step 4.	73.3	72%	70 to 74	72.1	72.2	%	✓	
Step 4.	77.3	76%	74 to 78	76.0	76.0	%	✓	
Step 4.	81.4	80%	78 to 82	80.1	80.1	%	✓	
Step 4.	85.5	84%	82 to 86	84.0	84.0	%	✓	
Step 4.	89.5	88%	86 to 90	88.0	88.0	%	✓	

5.3 SDM Setting for Course and Clearance TRANSMITTER 2								
Para-graph No.	Test Conditions		MIN/MAX. ACCEPT. LEVEL	DATA Monitor 1	DATA Monitor 2	U N I T	P A S S	F A I L
Step 3.	Select normal Mod. for CRS CSB2 Transmitter 2		NA	CRS CSB2 SDM	CRS CSB2 SDM			
	Adjusted	PIR measured						
Step 4.	69.2	72%	NA	NA	NA	%	✓	
Step 4.	73.0	76%	NA	NA	NA	%	✓	
Step 4.	76.8	80%	NA	NA	NA	%	✓	
Step 4.	80.7	84%	NA	NA	NA	%	✓	
Step 4.	84.5	88%	NA	NA	NA	%	✓	

* CRS CSB2 SDM can't be read accurately with the monitors because of the way the CRS width signal is generated in the SOAC. For this parameter the signal will only be checked against the PIR and verified it can make the specified signals.

9.2.4 DDM Setting Data

5.4 DDM Setting Accuracy for Course and Clearance TRANSMITTER 1								
Para-graph No.	Test Conditions		MIN/MAX. ACCEPT. LEVEL	DATA Monitor 1	DATA Monitor 2	U N I T	P A S S	F A I L
Step 1.	Select normal modulation for CRS CSB1 Transmitter 1		Difference PIR to Monitor ±1.0	Course Position DDM	Course Position DDM			
	Adjusted	PIR measured						
Step 2.	-11.63	-11.7	-10.7 to -12.7	-11.7	-11.7	%	✓	
Step 2.	-12.63	-12.7	-11.7 to -13.7	-12.7	-12.7	%	✓	
Step 2.	-10.63	-10.7	-9.7 to -11.7	-10.63	-10.63	%	✓	
Step 3.	Select normal Mod. for CLR Transmitter 1		Difference PIR to Monitor ±1.0	Clearance DDM	Clearance DDM			
	Adjusted	PIR measured						
Step 4.	31.5	31.0	30 to 32	31.0	31.2	%	✓	
Step 4.	30.5	30.0	29 to 31	30.0	30.2	%	✓	
Step 4.	29.4	29.0	28 to 30	29.0	29.0	%	✓	
Step 3.	Select normal Mod. for CRS CSB2 Transmitter 1		Difference PIR to Monitor ±1.0	CRS CSB2 DDM	CRS CSB2 DDM			
	Adjusted	PIR measured						
Step 4.	-46.45	-47.7	NA	NA	NA	%	✓	

5.4 DDM Setting Accuracy for Course and Clearance TRANSMITTER 1								
Para-graph No.	Test Conditions		MIN/MAX. ACCEPT. LEVEL	DATA Monitor 1	DATA Monitor 2	UNIT	PASS	FAIL
Step 4.	-45.48	-46.7	NA	NA	NA	%		
Step 4.	-47.43	-48.7	NA	NA	NA	%		

Please note SBO setting of TX1: 56.7 %

* CRS CSB2 DDM can't be read accurately with the monitors because of the way the CRS width signal is generated in the SOAC. For this parameter the signal will only be checked against the PIR and verified it can make the specified signals.

5.4 DDM Setting Accuracy for Course and Clearance TRANSMITTER 2								
Para-graph No.	Test Conditions		MIN/MAX. ACCEPT. LEVEL	DATA Monitor 1	DATA Monitor 2	U N I T	P A S S	F A I L
Step 1.	Select normal modulation for CRS CSB1 Transmitter 2		Difference PIR to Monitor ±1.0	Course Position DDM	Course Position DDM			
	Adjusted	PIR measured						
Step 2.	-11.72	-11.7	-10.7 to -12.7	-11.8	-11.8	%	✓	
Step 2.	-12.72	-12.7	-11.7 to -13.7	-12.9	-12.7	%	✓	
Step 2.	-10.70	-10.7	-9.7 to -11.7	-10.8	-10.7	%	✓	
Step 3.	Select normal Mod. for CLR Transmitter 2		Difference PIR to Monitor ±1.0	Clearance DDM	Clearance DDM			
	Adjusted	PIR measured						
Step 4.	31.54	31.0	30 to 32	30.7	31.0	%	✓	
Step 4.	30.52	30.0	29 to 31	29.8	29.8	%	✓	
Step 4.	29.52	29.0	28 to 30	28.9	29.0	%	✓	
Step 3.	Select normal Mod. for CRS CSB2 Transmitter 2		Difference PIR to Monitor ±1.0	CRS CSB2 DDM	CRS CSB2 DDM			
	Adjusted	PIR measured						
Step 4.	-45.63	-47.7	NA	NA	NA	%	✓	

5.4 DDM Setting Accuracy for Course and Clearance TRANSMITTER 2								
Para-graph No.	Test Conditions		MIN/MAX. ACCEPT. LEVEL	DATA Monitor 1	DATA Monitor 2	U N I T	P A S S	F A I L
Step 4.	-46.68	-46.7	NA	NA	NA	%	✓	
Step 4.	-46.60	-48.7	NA	NA	NA	%	✓	

Please note SBO setting of TX2: ..50.0.. %

* CRS CSB2 DDM can't be read accurately with the monitors because of the way the CRS width signal is generated in the SOAC. For this parameter the signal will only be checked against the PIR and verified it can make the specified signals.

9.3 SBO RF Phase Control Data

5.5 SBO RF Phase Control							
Step No.	Test Conditions TX 1	SBO Phase setting in °	DDM MIN./MAX. ACCEPT. LEVEL	DDM DATA Monitor 1/2 Course Pos.	U n i t	P a s s	F a i l
Step 1.	Set Course CSB1 DDM-Setting = 0 %	11	11.7 % ±1 %	11.7	%	✓	
Step 2.	SBO phase set to +90°	101	0.0 % ± 1 %	0.6	%	✓	
Step 3.	SBO (phase set to +180°)	191	-11.7 %± 1%	-11.6	%	✓	
Step 4.	SBO (phase set to +270°)	281	0.0 % ± 1 %	-0.5	%	✓	
Step No.	Test Conditions TX 2	SBO Phase setting in °	DDM MIN./MAX. ACCEPT. LEVEL	DDM DATA Monitor 1/2 Course Pos.	U N I T	P A S S	F A I L
Step 1.	Set Course CSB1 DDM-Setting = 0 %	8	11.7 % ±1 %	11.7	%	✓	
Step 2.	SBO phase set to +90°	98	0.0 % ± 1 %	0.6	%	✓	
Step 3.	SBO (phase set to +180°)	188	-11.7 %± 1%	-11.7	%	✓	
Step 4.	SBO (phase set to +270°)	278	0.0 % ± 1 %	-0.5	%	✓	

9.4 CSB1 Distortion Factor

5.6 CRS CSB1 Distortion Factor A1 Signal							
Step No.	Test Conditions	MAX. ACCEPT. LEVEL	DATA TX1	DATA TX2	UNIT	PASS	FAIL
Step 1.	90 Hz Sidebands +/- 90 Hz Modulation Distortion	≤ -26.0	≤-26 / ≤-26	≤-26 / ≤-26	dB	✓	
Step 2.	90 Hz Sidebands +/- 180 Hz Modulation Distortion	≤ -26.0	≤-26 / ≤-26	≤-26 / ≤-26	dB	✓	
Step 3.	150 Hz Sidebands +/- 150 Hz Modulation Distortion	≤ -26.0	≤-26 / ≤-26	≤-26 / ≤-26	dB	✓	
Step 4.	150 Hz Sidebands +/- 300 Hz Modulation Distortion	≤ -26.0	≤-26 / ≤-26	≤-26 / ≤-26	dB	✓	

9.5 CLR Distortion Factor

5.7 CLR Distortion Factor A3 Signal							
Step No.	Test Conditions	MAX. ACCEPT. LEVEL	DATA TX1	DATA TX2	UNIT	PASS	FAIL
Step 1.	90 Hz Sidebands +/- 90 Hz Modulation Distortion	≤ -26.0	≤-26 / ≤-26	≤-26 / ≤-26	dB	✓	
Step 2.	90 Hz Sidebands +/- 180 Hz Modulation Distortion	≤ -26.0	≤-26 / ≤-26	≤-26 / ≤-26	dB	✓	
Step 3.	150 Hz Sidebands +/- 150 Hz Modulation Distortion	≤ -26.0	≤-26 / ≤-26	≤-26 / ≤-26	dB	✓	
Step 4.	150 Hz Sidebands +/- 300 Hz Modulation Distortion	≤ -26.0	≤-26 / ≤-26	≤-26 / ≤-26	dB	✓	

9.6 CRS CSB2 Distortion Factor

5.8 CRS CSB2 Distortion Factor A2 Signal							
Step No.	Test Conditions	MAX. ACCEPT. LEVEL	DATA TX1	DATA TX2	UNIT	PASS	FAIL
Step 1.	90 Hz Sidebands +/- 90 Hz Modulation Distortion	≤ -26.0	≤-26 / ≤-26	≤-26 / ≤-26	dB	✓	
Step 2.	90 Hz Sidebands +/- 180 Hz Modulation Distortion	≤ -26.0	≤-26 / ≤-26	≤-26 / ≤-26	dB	✓	
Step 3.	150 Hz Sidebands +/- 150 Hz Modulation Distortion	≤ -26.0	≤-26 / ≤-26	≤-26 / ≤-26	dB	✓	
Step 4.	150 Hz Sidebands +/- 300 Hz Modulation Distortion	≤ -26.0	≤-26 / ≤-26	≤-26 / ≤-26	dB	✓	

9.7 Monitor Measurement Data

9.7.1 RF-Level Data

6.1 Aerial RF-Level Alarm Indications								
Para-graph No.	Test Conditions	ALARM Limits		PRE-ALARM Limits		UNIT	PASS	FAIL
		Lower	Alarm No Alarm	Lower	Pre-Alarm No Alarm			
Step 2	Course Position Nearfield - Mon 1	90 %	A	92.5 %	PA	Status	✓	
Step 2.	Course Position Nearfield - Mon 2	90 %	A	92.5 %	PA	Status	✓	
Step 2.	Course Position Integral - Mon 1	90 %	A	92.5 %	PA	Status	✓	
Step 2.	Course Position Integral - Mon 2	90 %	A	92.5 %	PA	Status	✓	
Step 2.	Course Width Integral - Mon 1	90 %	A	92.5 %	PA	Status	✓	
Step 2.	Course Width Integral - Mon 2	90 %	A	92.5 %	PA	Status	✓	
Step 2.	Clearance Integral - Mon 1	90 %	A	92.5 %	PA	Status	✓	
Step 2.	Clearance Integral - Mon 2	90 %	A	92.5 %	PA	Status	✓	

9.7.2 SDM Data

6.1 Aerial SDM Alarm Indications								
Step No.	Test Conditions	ALARM Limits		PRE-ALARM Limits		UNIT	PASS	FAIL
		Upper Lower	Alarm No Alarm	Upper Lower	Pre-Alarm No Alarm			
Step 3	Course Position	84 %	A	83 %	PA	Status	✓	
	Nearfield - Mon 1 *Only if installed	76 %	A	77 %	PA	Status		
Step 3.	Course Position	84 %	A	83 %	PA	Status	✓	
	Nearfield - Mon 2 *Only if installed	76 %	A	77 %	PA	Status		
Step 3.	Course Position	84 %	A	83 %	PA	Status	✓	
	Integral - Mon 1	76 %	A	77 %	PA	Status		
Step 3.	Course Position	84 %	A	83 %	PA	Status	✓	
	Integral - Mon 2	76 %	A	77 %	PA	Status		
Step 3.	Course Width	84 %	A	83 %	PA	Status	✓	
	Integral - Mon 1	76 %	A	77 %	PA	Status		
Step 3.	Course Width	84 %	A	83 %	PA	Status	✓	
	Integral - Mon 2	76 %	A	77 %	PA	Status		
Step 3.	Clearance Width	84 %	A	83 %	PA	Status	✓	
	Integral - Mon 1	76 %	A	77 %	PA	Status		
Step 3.	Clearance Width	84 %	A	83 %	PA	Status	✓	
	Integral - Mon 2	76 %	A	77 %	PA	Status		

9.7.3 DDM Data

6.1 Aerial DDM Alarm Indications								
Step No.	Test Conditions	ALARM Limits		PRE-ALARM Limits		UNIT	PASS	FAIL
		Upper Lower	Alarm No Alarm	Upper Lower	Pre-Alarm No Alarm			
Step 4	Course Position	0 + 5.0 %	A	0 + 2.5 %	PA	Status	✓	
	Nearfield - Mon 1 *Only if installed	0 - 5.0 %	A	0 - 2.5 %	PA	Status		
Step 4.	Course Position	0 + 5.0 %	A	0 + 2.5 %	PA	Status	✓	
	Nearfield - Mon 2 *Only if installed	0 - 5.0 %	A	0 - 2.5 %	PA	Status		
Step 4.	Course Position	0 + 5.0 %	A	0 + 2.5 %	PA	Status	✓	
	Integral - Mon 1	0 - 5.0 %	A	0 - 2.5 %	PA	Status		
Step 4.	Course Position	0 + 5.0 %	A	0 + 2.5 %	PA	Status	✓	
	Integral - Mon 2	0 - 5.0 %	A	0 - 2.5 %	PA	Status		
Step 4.	Course Width	21.8 %	A	20.8 %	PA	Status	✓	
	Integral - Mon 1	13.2 %	A	14.1 %	PA	Status		
Step 4	Course Width	21.8 %	A	20.8 %	PA	Status	✓	
	Integral - Mon 2	13.2 %	A	14.1 %	PA	Status		
Step 4.	Clearance	34.5 %	A	33.5 %	PA	Status	✓	
	Integral - Mon 1	25.5 %	A	26.5 %	PA	Status		
Step 4.	Clearance	34.5 %	A	33.5 %	PA	Status	✓	
	Integral - Mon 2	25.5 %	A	26.5 %	PA	Status		

9.7.4 Standby RF-Level Data

6.1 Standby RF-Level Alarm Indications								
Step No.	Test Conditions	ALARM Limits		PRE-ALARM Limits		UNIT	PASS	FAIL
		Lower	Alarm No Alarm	Lower	Pre-Alarm No Alarm			
Step 5	Course Position Standby - Mon 1	90 %	A	92.5 %	PA	Status	✓	
Step 5.	Course Position Standby - Mon 2	90 %	A	92.5 %	PA	Status	✓	
Step 5.	Course Width Standby - Mon 1	90 %	A	92.5 %	PA	Status	✓	
Step 5.	Course Width Standby - Mon 2	90 %	A	92.5 %	PA	Status	✓	
Step 5.	Clearance Standby - Mon 1	90 %	A	92.5 %	PA	Status	✓	
Step 5.	Clearance Standby - Mon 2	90 %	A	92.5 %	PA	Status	✓	

9.7.5 Standby SDM Data

6.1 Standby SDM Alarm Indications								
Step No.	Test Conditions	ALARM Limits		PRE-ALARM Limits		UNIT	PASS	FAIL
		Upper Lower	Alarm No Alarm	Upper Lower	Pre-Alarm No Alarm			
Step 6	Course Position	84 %	A	83 %	PA	Status	√	
	Standby - Mon 1	76 %	A	77 %	PA	Status		
Step 6.	Course Position	84 %	A	83 %	PA	Status	√	
	Standby - Mon 2	76 %	A	77 %	PA	Status		
Step 6.	Course Width	84 %	A	83 %	PA	Status	√	
	Standby - Mon 1	76 %	A	77 %	PA	Status		
Step 6.	Course Width	84 %	A	83 %	PA	Status	√	
	Standby - Mon 2	76 %	A	77 %	PA	Status		
Step 6.	Clearance	84 %	A	83 %	PA	Status	√	
	Standby - Mon 1	76 %	A	77 %	PA	Status		
Step 6.	Clearance	84 %	A	83 %	PA	Status	√	
	Standby - Mon 2	76 %	A	77 %	PA	Status		

9.7.6 Standby DDM Data

6.1 Standby DDM Alarm Indications								
Step No.	Test Conditions	ALARM Limits		PRE-ALARM Limits		UNIT	PASS	FAIL
		Upper Lower	Alarm No Alarm	Upper Lower	Pre-Alarm No Alarm			
Step 7.	Course Position	-6.7%	A	-9.2%	PA	Status	✓	
	Standby - Mon 1	-16.7%	A	-14.2%	PA	Status		
Step 7.	Course Position	-6.7%	A	-9.2%	PA	Status	✓	
	Standby - Mon 2	-16.7%	A	-14.2%	PA	Status		
Step 7.	Course Width	21.8 %	A	20.8 %	PA	Status	✓	
	Standby - Mon 1	13.2 %	A	14.1 %	PA	Status		
Step 7.	Course Width	21.8 %	A	20.8 %	PA	Status	✓	
	Standby - Mon 2	13.2 %	A	14.1 %	PA	Status		
Step 7.	Clearance	34.5 %	A	33.5 %	PA	Status	✓	
	Standby - Mon 1	25.5 %	A	26.5 %	PA	Status		
Step 7.	Clearance	34.5 %	A	33.5 %	PA	Status	✓	
	Standby - Mon 2	25.5 %	A	26.5 %	PA	Status		

9.7.7 Monitor Integrity Test Data

6.1 Monitor Integrity Test Alarm Indications							
Step No.	Test Conditions	Limits	Monitor 1	Monitor 2	UNIT	PASS	FAIL
		Upper / Lower	Alarm / No Alarm	Alarm / No Alarm			
Step 8	RF-Level Integrity	92.0 %	A	A	Status	✓	
	Signal A Waveform Sett.	88.0 %	A	A	Status		
Step 8	RF-Level Integrity	72.0 %	A	A	Status	✓	
	Signal B Waveform Sett.	68.0 %	A	A	Status		
Step 8	SDM	82.0 %	A	A	Status	✓	
	Signal A Waveform Sett.	78.0 %	A	A	Status		
Step 8	SDM	78.0 %	A	A	Status	✓	
	Signal B Waveform Sett.	74.0 %	A	A	Status		
Step 8	DDM	+ 1.0 %	A	A	Status	✓	
	Signal A Waveform Sett.	- 1.0 %	A	A	Status		
Step 8	DDM	4.0 %	A	A	Status	✓	
	Signal B Waveform Sett.	2.0 %	A	A	Status		

9.8 Executive Monitoring

EQUIPMENT CHANGEOVER & SHUTDOWN							
Para-graph No.	Test Conditions	MIN. ACCEPT. LEVEL	DATA	MAX. ACCEPT. LEVEL	UNIT	PASS	FAIL
Step 1.	Equipment transfer	Eqpt 2 main Eqpt 1 off			Status	✓	
Step 2.	Time for full shutdown		2	2	sec	✓	

9.9 Battery Operation

Para-graph No.	Test Conditions	UNIT	PASS	FAIL
Step 6.	System NORMAL	Status	✓	
Step 9.	Mains OFF	Status	✓	
Step 12.	MAINS OFF BATTERY LOW	Status	✓	
Step 15.	MAINSOFF BATTERY DRIVEN OFF BATTERY LOW	Status	✓	
Step 16.	Transmitters OFF Front Panel ON	Status	✓	
Step 19.	Transmitters ON System NORMAL	Status	✓	
Step 23.	System OFF	Status	✓	

9.10 RCSE Communication

6.4 RCSE Communication				
Para-graph No.	Test Conditions	UNIT	PASS	FAIL
Step 4.	Status same	Status	✓	
Step 6.	MAIN OFF	Status	✓	

Configuration

Int.Order nr.: 10679Z-DME1 Country : TAIWAN Location :

Equip. Type: DME415 Equip.PN: 527400012X Equip.SN : 10-050-02 data 29/12/2010

pc board Description	pc board PN	SN	SW ver.	PCS
100W TRANSMITTER	474910016U	10B450006		11
100W TRANSMITTER	474910016U	10B450009		11
AC/DC 600W	488700022P	10-A37-08		01
AC/DC 600W	488700022P	10-A37-14		01
AFI	474930032Y	08B120212		01
CSB	411700126E	10B470054		01
DC-DC power supply	488700021N	10-L52-17		02
DC-DC power supply	488700021N	10-L52-17		02
DIGITAL MODULATOR	483700015B	10B420057		09
DIGITAL MODULATOR	483700015B	10B420059		09
DIGITAL PROCESSOR	483700014A	10B450028		06
DIGITAL PROCESSOR	483700014A	10B450044		06
DUPLEXER	474910014S	10B320026		04
DUPLEXER	474910014S	10B320027		04
INC	474729907M	10B210070		02
LCSU --	474910052G	10B510005	2.05	01
MONITOR	474910013Z	10B070008		23
MONITOR	474910013Z	10B440011		23
RECEIVER	474910012Y	10B460016		1417
RECEIVER	474910012Y	10B460013		17
SUB-RACK BCPS	598700009H	10-A45-02		01
TAI DUMMY	474930112V	10B100022		01

THALES

8BR 02012 0001 ULGFA Ed. 8.0

DME AN 415/435

DME Ground Beacon
FACTORY ACCEPTANCE TEST

THALES ITALIA S.p.A.
ATM Division

CHANGES / APPROVALS

Edition	Description
05	UPDATED WITH NEW "THALES" LOGO AND VERIFIED
06	ADDED THE SERIAL NUMBER FOR MODULE TAI-DUMMY
07	-CHANGED EPROM CODE 451700201A WITH 451700211T V_2.01 -UPDATED LOGO & NAME OF THE COMPANY
08	CHANGED "ID CODE DUR." WITH "CODE PERIOD" AND "ms" IN "sec"
09	

Revision Date	5.0 April 2002	6.0 September 2003	7.0 March 2004	8.0 August 2004	9.0
Written by				F. RUSCONI	
Checked by				F. RUSCONI	
Approved by				A. CASPANI	
Quality Stamp				THALES ATM S.p.A. QUALITY ASSURANCE Maria Perduca	

INDEX

SCOPE

This volume contains the Final and Customer Acceptance Tests of the DME GROUND BEACON model AN415 and model AN435.
Tests here described and the obtained results are intended for Customer acceptance of the system as a whole.

Test engineer: ANTONIO BELUSSI

Customer: TAIWAN

Contract: 10679 Z

Address / Installation Site:

Date: 29-12-2010

Remarks:

Customer	THALES ITALIA SpA
(Signature)	(Signature)
WANG CHIN-CHENG	MILESI CARLO
(Name)	(Name)
Gorgonzola, 2011.03.09	Gorgonzola, 09-03-2011
(Location and Date)	(Location and Date)

1 COMPOSITION AND IDENTIFICATION

1.1 *EQUIPMENT*

MODEL : ☒ AN-415
☐ AN-435

CONFIGURATION: ☐ Single
☐ Single Transponder, dual Monitor
☒ Fully Dual

PART NUMBER: 5274000012X

SERIAL NUMBER: 10-050-02

1.2 *SOFTWARE VERSIONS INSTALLED*

LCSU		rel. 2.05
TRANSPONDER		rel. 1.17
MONITOR		rel. 1.15
RMM		rel.
PC :	ODBC-32	rel.
	WINSV	rel.
	WIN-DME	rel.
	UTILITY	rel.

.....

1.3 *COMPOSITION OF THE EQUIPMENT*

UNIT	*DESCRIPTION*	*P/N*		*Nr*	*S/N*
PWS	DC-DC power supply	488700021N	☒	1	10-L52-17 PCS02
			☒	2	10-L52-16 PCS02
RX	Receiver	474910012Y	☒	1	10B460013-PCS17
			☒	2	10B460016-PCS17
DPR	Digital processor	483700014A	☒	1	10B450028-PCS06
			☒	2	10B450044-PCS06
DMD	Digital modulator	483700015B	☒	1	10B420059-PCS09
			☒	2	10B420057-PCS09
TX	100W transmitter	474910016U	☒	1	10B450009-PCS11
			☒	2	10B450006-PCS11
TKW	1KW transmitter (AN-435)	474910019F	☐	1	/
			☐	2	/
MON	Monitor	474910013Z	☒	1	10B440011-PCS23
			☒	2	10B700008-PCS23
DPX	Duplexer	474910014S	☒	1	10B320027-PCS04
			☒	2	10B320026-PCS04
LCSU	Local control & status unit	407000008X	☐	1	
		474910052G	☒	1	10B510005-PCS01
	Composed of:				
	1. CSB 188	411700126 E			10B470054-PCS01
	2. INC	474729907 M			10B210070-PCS02
AFI	Associated facility interface	474930032Y	☒	1	08B120212-PCS01
TAI-D	TAI Dummy	474930112V	☒	1	10B100022-PCS01
MDM	Modem LGM 28.8 D1	488700018T	☐	1	Opt.
			☐	2	Opt.
MDM	Modem Party Line LGM1200	488700013N	☐	1	Opt.
			☐	2	Opt.

UNIT	DESCRIPTION	P/N		Nr	S/N
BCPS	Sub-rack "PCS"	598700009H	☒	1	Opt. 10-A45-02 Pcs1
AC/DC	AC/DC 600W "PCS"	488700022P	☒	1	Opt. 10-A37-08 Pcs1
			☒	2	Opt. 10-A37-14 Pcs1
			☐	3	Opt.
			☐	4	Opt.
BCPS	Kit Sub-rack "FRAKO",	570710012K	☐	1	Opt.
	Including:				
	BATTERY SUPERVISOR	474910008M	☐		Opt.
AC-DC	AC/DC 600W "FRAKO"	488700017J	☐	1	Opt.
			☐	2	Opt.
			☐	3	Opt.
-	DC terminal bar "PCS"	598700010V	☐	1	Opt.
-	Batt. Prot. Breaker "PCS"	9831731	☐	1	Opt.

1.4 *SPARE PARTS*

UNIT	DESCRIPTION	P/N	Q.ty	S/N

1.5 *LOCAL OPERATOR UNIT*

UNIT	*P/N*	*S/N*	*SOFTWARE*	*RELEASE*
PC	_____	_____	odbc-32	_____
			winsv	_____
			win-dme	_____
			utility	_____
Monitor	_____	_____		
Keyboard	_____	_____		
Printer	_____	_____		
Modem	_____	_____		
UPS	_____	_____		

1.6 *REMOTE OPERATOR UNIT*

UNIT	*P/N*	*S/N*	*SOFTWARE*	*RELEASE*
PC	_____	_____	odbc-32	_____
			winsv	_____
			win-dme	_____
			utility	_____
Monitor	_____	_____		
Keyboard	_____	_____		
Printer	_____	_____		
Modem	_____	_____		
UPS	_____	_____		

1.7 *REMOTE CONTROL & STATUS INDICATOR*

UNIT	*P/N*	*S/N*	*SW RELEASE*
STD AC versions			
❑ RCSI 446-0	52731 1017		
❑ RCSI 446-2	52731 1001		
❑ RCSI 446-8	52731 1002		
❑ Other :			
.....	_____	_____	_____

1.8 *STATUS INDICATOR*

UNIT	*P/N*	*S/N*	*SW RELEASE*
❑ SI 446-2	52731 1023		
❑ SI 446-8	52741 1020		
❑ Other :			
.....	_____	_____	_____

2 SET-UP OF THE EQUIPMENT

2.1 *OPERATING PARAMETERS*

CHANNEL & MODE ..... 30 X .....

TRANSMITTER FREQUENCY ..... 991 ..... MHz

RECEIVER FREQUENCY ..... 1054 ..... MHz

IDENTITY CODE ..... TEST .....

2.2 *PRESETTINGS AND DEFAULT VALUES*

PARAMETER	*Default value*	*Modif. by the customer*
MAIN DELAY	50µsec Mode X	
	56µsec Mode Y	
TRANSMISSION RATE	800 ... 4800 ppps	
RECEIVER DEAD TIME	60 µsec	
SHORT ECHO SUPPR.	ON	
LONG ECHO SUPPR.:	(off)	
Threshold Level	0 dBm	
Duration	100 µsec	
MONITOR LOGIC	1 MON	

2.3 *EQUIPMENT CONFIGURATION*

LOCAL PC	(YES/NO)	
REMOTE PC	(YES/NO)	
BATTERY CHARGER & POWER SUPPLY (BCPS)	(YES/NO)	
ASSOC. FACILITY INTERF. (VOR / D-VOR / ILS)	(YES/NO)	
REMOTE CONTROL & STATUS INDICATOR	(YES/NO)	
STATUS INDICATOR	(YES/NO)	

3 TEST AND CHECK PROCEDURES

3.1 *GENERAL*

3.1.1 SCOPE

Scope of this document is to guide in an overall check of the equipment.
The test will be to proof the compliance to the ICAO Annex 10 and the functionality of the equipment.

3.1.2 MEASUREMENT SET-UP

The measurement set-up simulates the operational condition of the equipment as in a real installation. Checks are made to verify all units and interfaces that may be used in the system:

- P.C.;
- Remote control;
- Associated facility;
- Parallel interfaces (signalling and commands on-off type);
- Serial interfaces (serial connections with other equipments).

Reference data of the instrumentation used for the test should be recorded in this book.
The typical measurement set-up is shown in Fig. 3.1.

3.2 *TEST PROCEDURE*

All tests are to verify the operation of the equipment (transponder, monitor and BITE, LCSU, power supply system) on the operative channel specified by the Customer.

3.2.1 TYPES OF TEST

The following tests are here performed:

- Real measure/verification of the parameter or functionality by means of external instrumentation (oscilloscope, multi-meter, spectrum Analyzer, universal counter, ...);
- Real measure/verification of the parameter or functionality by means of internal instrumentation (monitor/BITE);
- Indirect test of the parameter by means of verification/measure of other characteristic closely correlate to the one under test.

Furthermore, on customer request, the present document can be integrated with additional tests and verifications.

Most of the measurements are carried out using the internal instrumentation of the equipment (monitor/BITE); some other tests are performed by means of external standard instrumentation (oscilloscope, spectrum Analyzer,....), in order to check, also, the correct functionality of the instrumentation of the monitor/BITE (hw, sw, counters, DAC and ADC converters, ...).

3.2.2 PARAMETER SET-UP

All functional and configuration parameters of the equipment under test (default parameters, parameters modified by the Customer) must be recorded in this book, like:

- Transponder parameters (channel, ID code, co-location, main delay, echo on/off, ...);
- Monitor / BITE parameters (primary/secondary alarms, thresholds alarm delays, ... etc.);
- Configuration parameters (single/dual, monitor logic, ac/dc power supply, ... etc).

3.2.3 INSTRUMENTATION

The final test of the DME 415 / 435 Ground Beacon requires the use of the following instrumentation.

Standard instrumentation:

UNIT	MODEL	P/N	S/N
❑ Oscilloscope			
❑ Peak Power meter			
❑ Spectrum Analyzer			
❑ Universal Counter			
❑			
❑			
❑			
❑			
❑			
❑			
❑			

Other:

UNIT	MODEL	P/N	S/N
❑ Personal Computer			
❑ Printer			
❑ RCSI			
❑ I/O AUX Test set			
❑ AFI Test set			
❑			
❑			
❑			
❑			
❑			

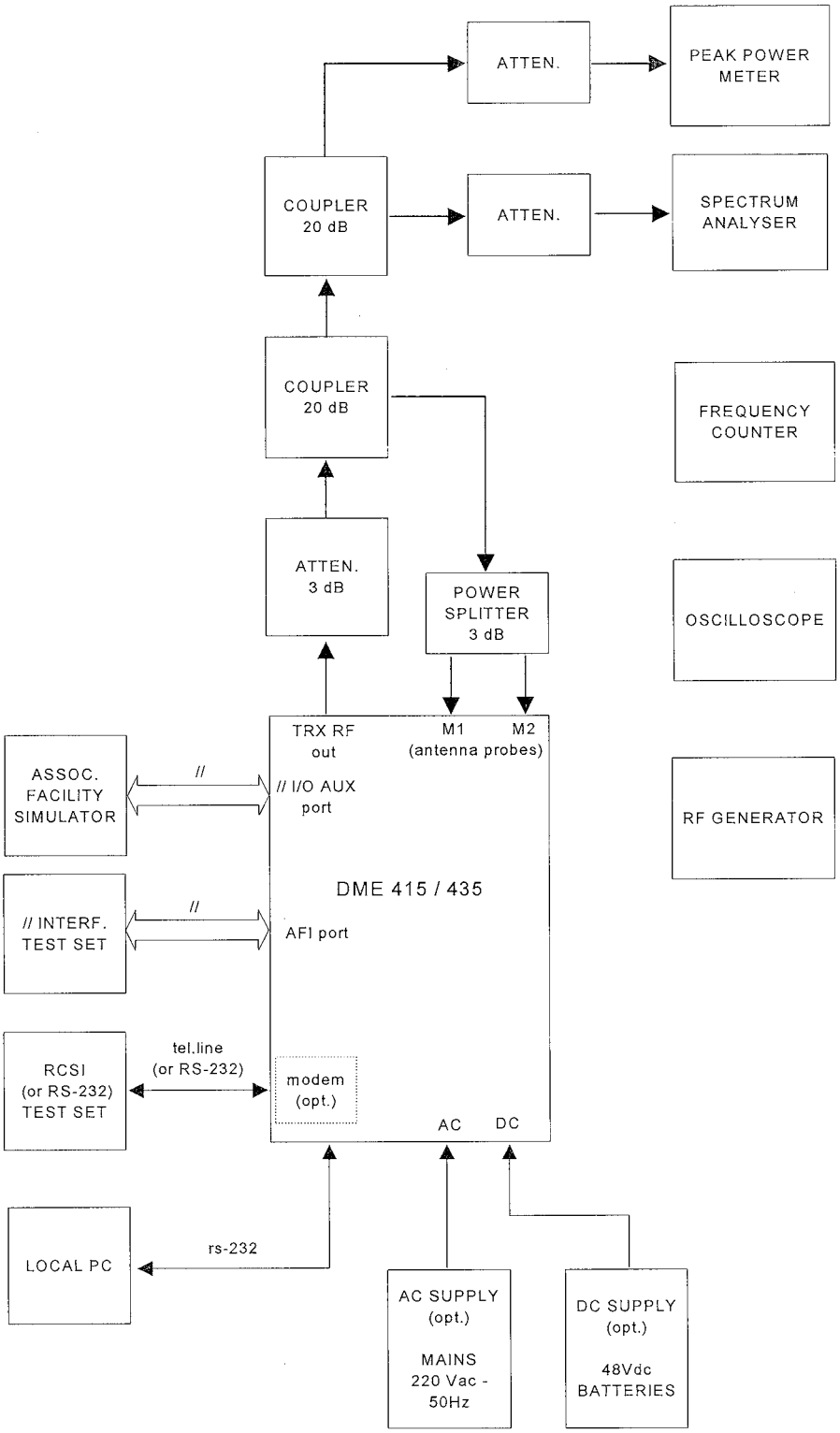


Fig. 3.1 Typical DME 415/435 measurement set-up

3.3 *TRANSPONDER*

All measurements, if not otherwise specified, are referred to the RF connector output of the transponder. The transponder tests marked with (^) have the purpose to verify, further than the parameter under test, also to proof the correct operation of the internal instruments of the monitor/BITE.

3.3.1 TRANSMITTER

3.3.1.1 Radiofrequency and Channelling

Purpose of this test is to verify that the operative frequency RF of the transmitter is the one corresponding to the channel and mode selected.

Technical data:
- The operative channel, selected among the 252 DME channels, 126 in X mode and 126 in Y mode, is in the RF band 962 MHz ... 1213 MHz;
- Channels are spaced 1MHz.

Measurement instruments:
- Spectrum Analyzer,
- Equipment Monitor/BITE.

Procedure:
- Detect the operational frequency of the transmitter on antenna by means of the spectrum Analyzer and take record the result of the test.
- Perform the TRANSMITTER FREQUENCY test on the operational transmitter on antenna by means of the monitor/BITE end enclose the results of the test.
- In case of dual transmitter, change over the equipment main and repeat the test procedure for the other transmitter.

3.3.1.2 Spectrum

The purpose of this test is to verify the spectrum of the transmitted signal.

Technical data:
- During the transmission of the pulse the power within a 500 KHz band shifted ± 800 KHz from the main frequency is <20 mW and at ± 2 MHz is <0.2 mW.

  The ICAO requirements are more understandable in the following form (cfr. Eurocae Ed. 57):
  The spectrum lines at ± 800 KHz and at ± 2 MHz are at least :
  - 40dB and 58dB below the peak level of the spectrum, for the DME AN-415,
  - 47dB and 65dB below the peak level of the spectrum, for the DME AN-435.

  Note; The attenuation levels here above apply to ERPs of +57dBm and + 67dBm respectively;
  For different ERP levels these attenuation levels must be changed accordingly.
- Each lobe of the spectrum must be lower then the adjacent one closer to the nominal frequency.

Measurement instruments:
- Spectrum Analyzer

Procedure:
- Detect the spectrum of the transmitter operational on antenna by means of a spectrum Analyzer. The transmitter must be set to " full power ".
- Repeat the measurement with the transmitter set to "reduced power ".
- Take note of the results or attach a print-out of the spectrum Analyzer.
- In case of dual transmitter, change over the main transponder and repeat the test for the other transmitter.

3.3.1.3 Output power (^)

Purpose of this test is to verify the RF peak power output of the transmitted pulses.

Technical data:
- DME 415 peak power output 100 W +(0% ÷ 10%);
- DME 435 peak power output 1000 W + (0% ÷ 10%);
- Reduced power - 3dB respect to the peak power output

Measurement instruments:
- Peak Power meter (or spectrum Analyzer);
- Equipment monitor/BITE

Procedure:
- Detect the RF power level of the transmitted signal when the equipment is operating "Full Power" and on antenna by means of the external instrument.
- Take note of the results.
- Perform the PEAK POWER OUTPUT test on the same transponder using the monitor/BITE and take note of the results.
- Repeat the same test in "Reduced Power" condition and take note of the results.
- In case of a dual system repeat the above test for the other transponder.

3.3.1.4 Droop

The purpose of this test is to verify the RF peak variation among the transmitted pulses.
Technical data:
- Droop between a pair is < 1 dB (≅ 20% power level; ≅ 10% voltage level).

Measurement instruments:
- Equipment monitor/BITE

Procedure:
- Perform the DROOP measurement on the transmitted signal when the equipment is operating "Full Power" and on antenna monitor/BITE and take note of the results.
- Repeat the same test in "Reduced Power" condition and take note of the results.
- In case of a dual system repeat the above test for the other transponder.

3.3.1.5 Pulse Shape (^)

The purpose of this test is to verify the Pulse Shape during the transmission (replies, squitters, identity).

Technical data:
- Rise time 1.5 ÷ 3 μs;
- Decay time < 3.5 μs;
- Duration 3.5 ± 0.5μs;
- Spacing 12 ± 0.1μs (mode X), 30 ± 0.1μs (mode Y).

Measurement instruments:
- Spectrum Analyzer (used as reference linear detector for the transmitted signal)
- Oscilloscope
- Equipment monitor/BITE

Procedure:
- The transponder must be operating "Full power" and on antenna.
- Detect and display, on the oscilloscope, the pulses transmitted and measure Rise time (from 10 to 90%), Decay time (from 90 to 10%) and Duration (50%) of the first and second pulses.
- Measure the time interval between the first and the second pulse of the pair, at 50% on the leading edge of the pulses (Pulse Spacing).
- Take note of the results.
- Perform the PULSE SHAPE and SPACING on the same transmitter using monitor/BITE and take note of the results.
- Repeat the same test in "Reduced Power" condition and take note of the results.
- In case of a dual system repeat the above test for the other transponder.

3.3.1.6 Transmission Rate (^)

The purpose of this test is to verify the Transmission Rate of the transponder w/o any external interrogating load.

Technical data:
- Transmission Rate according to the value preset (800ppps or 2700ppps)

Measurement instruments:
- Universal counter
- Equipment monitor/BITE

Procedure:
- Detect, by means of the Universal counter, the number of pulses, or pairs, transmitted by the transponder operating on antenna.
- Take note of the results.
- Perform the TRANSMISSION RATE test on the same transmitter using the monitor/BITE and take note of the results.
- In case of a dual system repeat the above test for the other transponder.

3.3.2 KEYER

3.3.2.1 Identity signal

The purpose of this test is to verify the correct transmission of the Morse Code;
equipment must be preset as "DME Master" mode.

Technical data:
- Identity code according to ICAO Annex 10.

Measurement instruments:
- Equipment monitor/BITE

Procedure:
- Perform, using Monitor/BITE, tests IDENTITY CODE and IDENTITY TIMING on the transponder operating on antenna.
- Take note of the results.
- In case of a dual system repeat the above test for the other transponder.

3.3.2.2 Associated identity

The purpose of this test is to verify the interfacing circuitry for the association of the Identification Code with an Associated Facility (VOR/ILS equipment).

Technical data:
- Master/Slave code association (according to the ICAO Annex 10).
- Master/Slave trigger association.
- Identity code recovery (Slave association) in case of failure of the associated VOR/ILS.

Measurement instruments:
- Simulator of VOR/ILS association

Procedure:
- DME MASTER condition
- Master Code: the DME transmits is own IDENTITY CODE (1 time) and send the same Morse Code to the VOR/ILS (3 times).
- Master Trigger: DME transmits is own IDENTITY CODE (1 time) and send to the VOR/ILS a trigger signal (3 times) that must be used by the VOR/ILS to synchronize and generate by itself the same Identity Code.

- DME SLAVE condition
- Slave Code: the DME transmits, only, the IDENTITY CODE it receives from the VOR/ILS.
- Slave Trigger: DME transmits is own IDENTITY CODE when it receives a trigger signal from the VOR/ILS.

- Identity Recovery (only for SLAVE condition):
- On Signal: The DME recovers, automatically, the transmission of its own Identity Code when a faulty status is released by the VOR/ILS.
- On Sensing: The DME recovers, automatically, the transmission of its own Identity Code when Code/trigger are not receives from the VOR/ILS for two cycles of emissions.
- Take note of the results.
- In case of a dual system repeat the above test for the other transponder.

3.3.3 RECEIVER

3.3.3.1 Threshold Sensitivity

The purpose of this test is to verify the sensitivity of the receiver (reply efficiency better than 70%)

Technical data:
- Sensitivity better than - 91 dBm for AN-435;
- Sensitivity better than - 81 dBm for AN-415;
- Adjustable up to -76 dBm at 1 dB step.

Measurement instruments:
- Equipment monitor/BITE

Procedure:
- Perform the SENSITIVITY test on the transmitter operating on antenna using the monitor/BITE.

- Take note of the results.
- In case of a dual system repeat the above test for the other transponder.

3.3.3.2 Dynamic

The purpose of this test is to verify the accuracy of the transponder at different interrogation levels.

Technical data:
- from -10 dBm to -70 dBm the max error of the main delay is:
  - mean value ≤ 150 ns;
  - standard deviation ≤ 200 ns;
- from -71 dBm to -91 dBm the max error of the main delay is:
  - mean value ≤ 200 ns;
  - standard deviation ≤ 500 ns.

Measurement instruments:
- Equipment monitor/BITE

Procedure:
- Perform the test REPLY DELAY VARIATION WITH LEVEL on the transmitter operating on antenna using the monitor/BITE
- Take note of the results.
- In case of a dual system repeat the above test for the other transponder.

3.3.3.3 Bandwidth

The purpose of this test is to verify the bandwidth of the receiver (% of reply efficiency) with interrogations correctly coded but shifted in frequency.

Technical data:
- Frequency deviation: ± 200 kHz;
- Sensitivity reduction: < 1dB.

Measurement instruments:
- Equipment monitor/BITE

Procedure:
- Perform the test BANDWIDTH on the transmitter operating on antenna using the monitor/BITE
- Take note of the results.
- In case of a dual system repeat the above test for the other transponder.

3.3.3.4 Adjacent channel rejection

The purpose of this test is to verify the capability of the receiver to reject (% of reply efficiency) interrogations correctly coded but on the adjacent channel.

Technical data:
- Frequency deviation: ± 900 kHz;
- Interrogation level: -10dBm

Measurement instruments:
- Equipment monitor/BITE

Procedure:
- Perform the test ADJACENT CHANNEL REJECTION on the transmitter operating on antenna using the monitor/BITE.
- Take note of the results.
- In case of a dual system repeat the above test for the other transponder.

3.3.3.5 Sensitivity variation/reduction

3.3.3.5.1 Overload

The purpose of this test is to verify the variation of the sensitivity threshold of the receiver in presence of high number of interrogations correctly coded.

Technical data:
- Interrogation load to generate at least 4800 ppps of replies;
- Sensitivity reduction: at least 50 dBm

Measurement instruments:
- Equipment monitor/BITE

Procedure:
- Perform the test AUTOMATIC GAIN REDUCTION on the transmitter operating on antenna using the monitor/BITE
- Take note of the results.
- In case of a dual system repeat the above test for the other transponder.

Note / Condition of test:
- Antiecho circuits must be disabled.
- Dead time must be set for 60 μs.

3.3.3.5.2 Overload on the adjacent channel

The purpose of this test is to verify the variation of the sensitivity threshold of the receiver in presence of a high number of interrogations correctly coded on an adjacent channel to the one in use.

Technical data:
- Interrogating load on the adjacent channel:
  level up to –10 dBm shifted in frequency ± 900 kHz
  and to generate at least 3600 ppps of replies;
- Sensitivity reduction: < 1dB.

Measurement instruments:
- Equipment monitor/BITE

Procedure:
- Perform the test ADJACENT CHANNEL DESENSITISATION on the transmitter operating on antenna using the monitor/BITE.
- Take note of the results.
- In case of a dual system repeat the above test for the other transponder.

3.3.3.6 Decoder

The purpose of this test is to verify the variation of the sensitivity threshold of the receiver in presence of different coded interrogations.

Technical data:
- Nominal code ± 1 μs: < 1dB;
- Nominal code ± 2 μs: total rejection (up to -10 dBm of interrogating level).

Measurement instruments:
- Equipment monitor/BITE

Procedure:
- Perform the test DECODER on the transmitter operating on antenna using the monitor/BITE.
- Take note of the results.
- In case of a dual system repeat the above test for the other transponder.

3.3.3.7 Echoes Suppression

The purpose of this test is to verify efficiency of the short and long echo suppression circuits.

Technical data (see doc. 8BR 02010 9901 DTGFF):
- "Short echo" suppression specification;
- "Long echo" suppression specification;
- "Short echo" On/Off preset;
- "Long echo" On/Off level-duration preset.

Measurement instruments:
- Equipment monitor/BITE

Procedure:
- Perform the test ECHO SUPPRESSION on the transmitter operating on antenna using the monitor/BITE.
- Take note of the results.
- In case of a dual system repeat the above test for the other transponder.

3.3.3.8 Recovery time

The purpose of this test is to verify the sensitivity of the receiver (% of reply efficiency) when a disturbance, one strong single pulse, occurs just before a weak interrogation pair.

Technical data
- Disturb level: from 0 a 60 dB above the sensitivity threshold;
- Delay: 8 us before the interrogation pair;
- Sensitivity reduction: < 1 dB.

Measurement instruments:
- Equipment monitor/BITE

Procedure:
- Perform the test RECOVERY TIME on the transmitter operating on antenna using the monitor/BITE.
- Take note of the results.
- In case of a dual system repeat the above test for the other transponder.

Note / Condition of test:
- The short echo suppression circuit has influence on this test; for this reason it must be performed twice: one time with short echo suppression on and then with short echo suppression off.

3.3.3.9 Dead time

The purpose of this test is to verify the correct operation (% of reply efficiency) of the dead time circuit.

Technical data
- Dead time duration: nominal 60μs (preset range: from 0 to 150μs)

Measurement instruments:
- Equipment monitor/BITE

Procedure:
- Perform the test DEAD TIME on the transmitter operating on antenna using the monitor/BITE.
- Take note of the results.
- In case of a dual system repeat the above test for the other transponder.

Note / Condition of measure:
- Echo suppression circuits have influence on this test; for this reason it must be performed setting off both short and long echo suppression.

3.4 *MONITOR AND BITE*

3.4.1 GENERATOR OF INTERROGATIONS AND CW (^)

The purpose of this test is to verify the correct operation of the generator of interrogations of the monitor/BITE by setting the following parameters:

- RF level (of the CW signal and the pulse modulated signal);
- Frequency;
- RF modulated signal shape (single pulse, pulse pair and CW);
- Spacing of the pair;
- Interrogation rate.

Technical data

- RF level (CW/pulsed) accuracy: ±1 dB;
- Pulse spacing accuracy: ±100 ns;
- RF accuracy: ±0.0001%;

Measurement instruments:

- Equipment monitor/BITE
- Oscilloscope
- Spectrum Analyzer
- Universal counter

Procedure:

- Preset the monitor /BITE as SIGNAL GENERATOR (configurable tests) and perform the following tests:

n.	*Test*	*Instrument*	*Preset value*
1	• RF level CW -70	Spectrum Analyzer	• Level –70 dBm • Nominal channel frequency • CW
2	• RF level CW -40 • Nominal RF	Spectrum Analyzer	• Level –40 dBm • Nominal channel frequency • CW
3	• RF level pulsed -40 • Pulse spacing	Spectrum Analyzer and Oscilloscope	• Level –40 dBm • Nominal channel frequency • Pulse pair • Spacing (TBD by customer) • Repetition 0pps
4	• Number of interrogation	Spectrum Analyzer and Oscilloscope (or Counter)	• Level –40 dBm • Nominal channel frequency • Pulse pair • Spacing (TBD by customer) • Repetition (TBD by customer)
5	• RF shift	Spectrum Analyzer	• Level –40 dBm • Deviation from nominal RF of the channel (TBD by customer) • CW

- Take note of the results.
- In case of a dual monitor system repeat the above test for the other unit.

Note / Condition of measure:
- The RF signal is picked-up from the patch panel between the monitor/BITE and the duplexer module.
- The RF signal level generated by the monitor/BITE is referred to the input/output connector of the transponder.

3.4.2 ACQUISITION SECTION OF MONITOR/BITE (^)

3.4.2.1 1 GHz Detector

The purpose of this test is to verify the correct operation of the RF 1 GHz detector (antenna probe input circuit) and the monitor/BITE necessary for the following measurements: 1) power to the antenna (ERP); 2) transmission rate.

Technical data
- Power measurement:
  the accuracy of the monitor, with respect to power measurements performed using reference external instrumentation (Peak Power meter), is better than ±10% for an RF input signal in the range +28 dBm .... + 18 dBm.
- Transmission rate measurement:
  the accuracy of the monitor, with respect to measurement performed using reference external instrumentation (Universal Counter), is better than ±2% for an RF input signal in the range +30 dBm ... + 18 dBm and transmission rate from 100 to 10000 ppps.

Measurement instruments:
- Equipment monitor/BITE
- DME RF signal generator (or the transmitter of the same equipment)
- Oscilloscope
- Peak power meter / Spectrum Analyzer
- Universal counter

Procedure:
- Generate by means of Trx1 or Trx2 the DME reference signal to be applied on the monitor/BITE input, to the corresponding antenna probe, and perform the following tests:
-

n.	*Test*	*Instrument*	*RF Input Signal*
1	• RF power measurement	Spectrum Analyzer (or Peak Power Meter) and monitor/BITE	• Level +28 ... +18 dBm • Nominal channel frequency • Pulse pair (either X or Y mode) • Nominal spacing • Repetition rate 800 or 2700pps (nominal TRx rate)
2	• Transmission rate measurement	Spectrum Analyzer (or Peak Power Meter) Counter and monitor/BITE	• As above

- Take note of the results.
- In case of a dual system repeat the above test for the other monitor.

Note / Condition of measure:

- The RF signal to be acquired and measured must be synchronized with the interrogation of the monitor/BITE. For this reason, it is more convenient to use the DME transmitter output signal instead of an external generator.
- The maximum power level expected (+ 28 dBm) is valid for both models (DME 415 and 435) and is calculated with the max. Pout (50+1 dBm), with the coupler of the antenna probe (20 dB) and the cable loss for a total of 3 dB in the two cables (RF and monitor);
  N.B.: In the DME AN-435 there is, in the wired cabinet, at the input of each monitor, an attenuator of 10 dB.

3.4.2.2 63 MHz IF detector (Alternative of paragraphs 3.3.1.3, 3.3.1.5 and 3.3.1.6)

NOTE: The present test is fully comprensive and alternative of the previous tests:
3.3.1.3 Output power; 3.3.1.5 Pulse shape; 3.3.1.6 Transmission Rate.

The purpose of this test is to verify the correct operation of the IF 63 MHz detector (I/O circuit for interrogations and replies to the monitor/BITE) and of the internal instrument performing the following measurements: 1) output power of transmitter (Pout); 2) Main Delay; 3) Reply Efficiency; 4) all the other measurement of the executive monitor and maintenance testings (except those performed with the RF detector).

It performs, mainly, three different types of measurements:
1) Level measurement (e.g.: Power); 2) Time interval measurement (e.g.: Main delay, Spacing, Pulse shape, ...); 3) Events counting measurement (e.g.: Reply efficiency).

Technical data

- Level measurement:
  the accuracy of the monitor, with respect to power measurements performed using reference external instrumentation (Peak Power meter), is better than ±10% over a dynamic range of 10dB, for an RF input signal of:
  - +50 (-0; +2) dBm for the DME AN-415
  - +60 (-0; +2) dBm for the DME AN-435.
- Time interval measurement :
  the accuracy of the monitor, with respect to time measurements performed with external instrumentation is better than ±50 ns over the range: 0.5 μs to 350 μs.
- Event counting measurements: the accuracy of the monitor respect to measurement performed using a reference universal counter is better than ±2%.
  The counting range is from 0 to 10000 ppps.

Measurement instruments:

- Equipment monitor/BITE
- Oscilloscope
- Peak power meter / Spectrum Analyzer

Procedure:

- Use the transmitter of the equipment under test as generator of the DME reference test signal to be applied at the monitor/BITE input (using the equipment internal connection: transmitter-> duplexer -> monitor);

- Perform the test as per the following table:

n.	*Test*	*Instrument*	*RF Input signal*
1	• RF power measurement	Spectrum Analyzer (or Peak power meter) and monitor/BITE	• RF Level RF from –18 e –28 dBm • Nominal Channel frequency • DME pulse pair • Nominal spacing • Repetition either 800 or 2700ppps (nominal Trx rate)
2	• Duration measurement	Spectrum Analyzer (or Peak power meter), oscilloscope and monitor/BITE;	• As above
3	• Counter measurement	Spectrum Analyzer (or Peak power meter), counter and monitor/BITE	• As above

- Take note of the results. - In case of a dual system repeat the above test for the other monitor/BITE.

Note / Condition of test:
- For power measurement and duration measurement the RF signal to be acquired and measured must be synchronized with the interrogation of the monitor/BITE. For this reason, it is more convenient to use the DME transmitter output signal instead of an external generator.
- The parameter under test for Duration measurements must be the same for both the internal and external measurement (rise time, or duration , or spacing, ...)
- The parameter under test for Counter measurements must be the same for both the internal and external measurement (transmission rate, ...)

3.5 *LCSU UNIT*

3.5.1 CONTROL & STATUS PANEL

The purpose of this test is to verify the correct operation of controls and status information provided on the front door of the equipment.

Technical data:
- DME: Commands
  - 1 - Request/release control;
  - 2 - Transponder On/Off;
  - 3 - Transponder Changeover;
  - 4 - Selection Synthetic/Detailed status indications;
- LCSU Commands:
  - 5 - Lamp test;
  - 6 - Buzzer silencing;
- Equipment status indications:
  - 7 - DME Synthetic status: Alarm; Warning; Normal; Data Com;
  - 8 - DME Detailed status
    - Monitor 1: Alarm, Stby-Alarm; Faulty; Bypass;
    - Monitor 2: Alarm, Stby-Alarm; Faulty; Bypass;
    - Transponder 1: On; Warning; Faulty; On Antenna;
    - Transponder 2: On; Warning; Faulty; On Antenna;
  - 9 - Site: Mains Off; Env.Alarm; Other Warning;

- LCSU status Indication : Operation; Faulty, Data Com;

Measurement instruments:
- Visual control
- Local P.C.
- Remote control and status unit

Procedure:
- Check, while performing FAT, the correct operation of all commands and indications, provided by the LCSU.

3.5.2 LOCAL PC

The purpose of this test is to verify the correct operation of the controls using the Local P.C.

Technical data:
- Login and passwords;
- Commands and controls of the LCSU and of all the equipment/devices connected (via serial, parallel or modem connections)
- DME in Automatic Mode, commands and controls
    1. Commands
    2. Status indications
    3. Buzzer
    4. Detailed display of the status (checks, warnings, ...)
    5. Parameters presetting (operational, configuration, ...)
    6. Tests execution (routine check, test measurement, ...)
    7. Archive management;
- DME in Manual (Maintenance) Mode, Commands and controls:
    1. Commands
    2. Status indications
    3. Buzzer
    4. Detailed display of the status (checks, warnings, ...)
    5. Parameters presetting (operational, configuration, ...)
    6. Tests execution (routine check, manual test measurement, ...)
    7. Archive management;
- Management of the historical data of: DME, LCSU and equipment/devices connected to LCSU:
    1 - Storage, display and printing
    2 - Archives erasing and back-up

Measurement instruments:
- Visual control
- Command/control panel of LCSU
- Remote control unit
- Test set for Serial interfacings
- Test set for Parallel interfacings

Procedure:
- Check, while performing FAT, the correct operation of all commands and indications and features provided by the PC program.
- Simulate also the physical interruption of the link PC – DME.

3.5.3 SERIAL / PARALLEL / MODEM INTERFACINGS

3.5.3.1 Serial communication ports RS232

The purpose of this test is to verify the correct operation of the RS232 interfaces of the LCSU.

Technical data
- Three serial configurable ports, by means of the local P.C., available on the LCSU.
- All three ports are general purpose and can be used indifferently for the same applications; with the following specificities:
  1. Port 1 is provided with two connectors (hardwired): one is in front door (LCSU) and the other one is on the top of the equipment. Port 1 is reserved for local P.C.
  2. Ports 2 and 3 are for general purposes: interfacings with other equipment or modems (internal and/or external).

Measurement instruments:
- Visual control,
- Local PC,
- Internal modem and remote control

Procedure:
- Check, during FAT, the correct operation of the configuration of the whole system.
- Simulate a failure (interruption) on the hardware link.

3.5.3.2 Parallel I/O ports

The purpose of this test is to verify the correct operation of the parallel I/O ports of the LCSU.

Technical data
- Configuration, by means of P.C., of the single I/O line.
- I/O lines are general purpose and can be used indifferently to interface Auxiliary signals on/off (Site status indications: intrusion, smoke alarm, ...).

Measurement instruments:
- Visual control,
- Local PC,
- Test set to verify the Parallel I/O.

Procedure:
- Check, during FAT, the correct operation of these I/O lines, if correctly configured.
- Simulate a failure (interruption) on the hardware links.

3.5.3.3 Modem

The purpose of this test is to verify the correct operation of the modems, either internal or external, by using the serial ports of the LCSU

Technical data
- The modems are configurable by means of the local P.C.

Measurement instruments:
- Visual control,
- Local PC,
- Test set to verify the connections

Procedure:
- Check, during FAT, the correct operation of the modems
- Simulate a failure (interruption) on the hardware links.

3.6 *POWER SUPPLY SYSTEM*

Applicability of the following test procedures is dependent on the physical configuration of the power supply system in use.
- DC supply: Always applicable
- AC supply: Applicable to DME equipped with (optional) AC/DC modules
- AC/DC supply and Battery Charger:
  Applicable to DME equipped with (optional) AC/DC modules and with (optional) Battery Breaker.

3.6.1 DC SUPPLY (only)

Verify:
- The correct operation of the equipment when powered by DC supply;
- Indications, about the supply type available, on both LCSU and P.C.

Technical data:
- 48Vdc power supply input range: 40... 60 Vdc.

Measurement instruments:
- Visual control,
- Local PC,
- Multimeter.

Procedure:
- Check, during FAT, the correct operation of the equipment when powered by 48 Vdc supply (generator or battery)
- Simulate a power blackout and then restore the DC supply.

3.6.2 AC SUPPLY (only)

Verify:
- The correct operation of the equipment when powered by AC Mains supply;
- Indications, about the supply type available, on both LCSU and P.C.

Technical data:
- Mains input range:
  1 – Voltage range: 187...276 Vac,
  2 – Frequency: 48 ... 64 Hz.

Measurement instruments:
- Visual control,
- Local PC,
- Multimeter.

Procedure:
- Check, during FAT, the correct operation of the equipment when powered with AC Mains supply.
- Simulate a failure of one AC/DC power supply module at time.
- Simulate a power blackout and then restore the AC supply.

3.6.3 AC/DC POWER SUPPLY AND BATTERY CHARGER (AC and DC supply)

Verify :

- The correct operation of the equipment, when powered by AC Mains and by DC supply.
- The operation with battery back-up in case of mains failure.
- The correct indications on the LCSU and PC.
- The (optional) Battery breaker.

Technical data:

- Mains input range:
  1 – Voltage range: 187...276 Vac,
  2 – Frequency: 48 ... 64 Hz.
- 48Vdc power supply input range : 40... 60 Vdc.

Measurement instruments:

- Visual control,
- Local PC,
- Multimeter.

Procedure:

- While performing FAT, check the correct operation of the equipment alternating the supply power applied to the beacon (mains or battery)
- Switching from mains to battery and then back to mains check that the equipment keeps operating correctly (without any interruptions).
- Simulate a failure of one AC/DC power supply module at time (remove the module) and verify the correctness of the messages displayed.
- Simulate a mains blackout, then reduce the level of the DC supply (simulating the battery discharging) and check: at first the signalling indicating Battery Pre-depletion and finally the activation (open) of the Battery breaker.
- Restore Mains supply and check that the Battery breaker is automatically re-armed (close).

4 TEST RESULTS AND LIMIT VALUES

4.1 *GENERAL*

The tests marked with (^) have the purpose to verify, further than the parameter under test, even the correct operation of the internal instruments of the monitor/BITE.

4.2 *TEST CONDITIONS*

See attachment:

- ❑ Print-out of all the operational parameters and configuration of the equipment under test.

4.3 *TRANSPONDER*

4.3.1 TRANSMITTER

4.3.1.1 Radio frequency and Channelling

Purpose of this test is to verify that the operative frequency RF of the transmitter is the one corresponding to the channel and mode selected.

SPECIFICATION:

Nominal Channel	30 X
Nom. Freq. [MHZ]	991

RESULT:

Transmitter	Frequency [MHZ]
TX1	990, 99852
TX2	990, 99887

See attachment:

X Print-out of the test TRANSMITTER FREQUENCY with TX1 operational on antenna.

X Print-out of the test TRANSMITTER FREQUENCY with TX2 operational on antenna.

4.3.1.2 Spectrum

The purpose of this test is to verify the spectrum of the transmitted signal.

SPECIFICATION:

Spectrum lines	AN-415 [- dBc] (*)	AN-435 [- dBc] (**)
@ ± 800 kHz	-40	-47
@ ± 2 MHz	-58	-65

(*) with ERP = +57dBm
(**) with ERP = +67dBm

RESULT:

Full power operation

Transmitter	Spectrum @ ± 800 kHz	Spectrum @ ± 2 MHz	Attached Plot
TX1	< -40	< -58	
TX2	< -40	< -58	

Reduced power operation

Transmitter	Spectrum @ ± 800 kHz	Spectrum @ ± 2 MHz	Attached Plot
TX1	< -40	< -58	
TX2	< -40	< -58	

4.3.1.3 Power output (^)

Purpose of this test is to verify the RF peak power output of the transmitted pulses.

SPECIFICATION:

Peak Power Output	AN-415 [W]	AN-435 [W]
Full power	100 W + (0% ÷ 10%)	1000 W + (0% ÷ 10%)
Reduced power	50 W + (0% ÷ 10%)	500 W + (0% ÷ 10%)

RESULT:

Transmitter	Full power [W]	Reduced power [W]
TX1	104	53
TX2	106	53

See attachment:
@ Full power operation
X Print-out of the test PEAK POWER OUTPUT with TX1 operational on antenna.

X Print-out of the test PEAK POWER OUTPUT with TX2 operational on antenna.

@ Reduced power operation
X Print-out of the test PEAK POWER OUTPUT with TX1 operational on antenna.
X Print-out of the test PEAK POWER OUTPUT with TX2 operational on antenna.

4.3.1.4 Droop

The purpose of this test is to verify the RF peak variation of the transmitted pulses.

SPECIFICATION:

Max. Droop	**1 dB (≅ 20% as power; 10% as voltage level)**

RESULT:

See attachment:
@ Full power operation
X Print-out of the test POWER DROOP with TX1 operational on antenna.
X Print-out of the test POWER DROOP with TX2 operational on antenna.

@ Reduced power operation
X Print-out of the test POWER DROOP with TX1 operational on antenna.
X Print-out of the test POWER DROOP with TX2 operational on antenna.

4.3.1.5 Pulse shape (^)

The purpose of this test is to verify the Pulse Shape during the transmission (replies, squitters, identity).

SPECIFICATION:

Rise time [μs] (10%÷90%)	**Duration [μs]** at 50%	**Decay time [μs]** (90%÷10%)
1.5 ÷ 3 μs	3.5 ± 0.5μs	< 3.5 μs

Mode	**Pulse spacing**
X	12 ± 0.1μs
Y	30 ± 0.1μs

RESULT:

Transmitter	Rise time [µs]	Duration [µs]	Decay time [µs]
TX1 - 1° pulse	1,99	3,34	1,85
TX1 - 2° pulse	2,00	3,39	1,88
TX2 - 1° pulse	2,00	3,37	1,89
TX2 - 2° pulse	2,00	3,36	1,88

Transmitter	Mode [X/Y]	Pulse spacing [µs]
TX1	X	11,98
TX2	X	12,02

See attachment:
@ Full power operation
X Print-out of the test PULSE SHAPE with TX1 operational on antenna.
X Print-out of the test PULSE SHAPE with TX2 operational on antenna.
X Print-out of the test SPACING with TX1 operational on antenna.
X Print-out of the test SPACING with TX2 operational on antenna.

@ Reduced power operation
X Print-out of the test PULSE SHAPE with TX1 operational on antenna.
X Print-out of the test PULSE SHAPE with TX2 operational on antenna.
X Print-out of the test SPACING with TX1 operational on antenna.
X Print-out of the test SPACING with TX2 operational on antenna.

4.3.1.6 Transmission rate (^)

The purpose of this test is to verify the Transmission Rate of the transponder w/o any external interrogating load.

SPECIFICATION:

Preset	Minimum rate	Maximum rate
800 ... 4800 ppps	800 ± 80 ppps	4800 ± 150 ppps
2700 ... 4800 ppps	2700 ± 90 ppps	4800 ± 150 ppps

RESULT:

Preset	MONITOR Minimum rate [ppps] M1	M2	Measured	
TX1	825	825	824	ppps
TX2	823	823	824	ppps

See attachment:
- Print-out of the test TRANSMISSION RATE with TX1 operational on antenna.
- Print-out of the test TRANSMISSION RATE with TX2 operational on antenna.

4.3.2 KEYER

The purpose of this test is to verify the correct transmission of the identity Signal;
(equipment preset as "DME Master").

4.3.2.1 Identity signal

SPECIFICATION:

ID code preset	Morse equivalent
" TEST "	- . ... -
New ID code: T T	- -

Dot [sec]	Dash [sec]	Space [sec]	Interval [sec]	Code Period [µs]	ID Code Repetition [sec]
0.1 ÷ 0.16 ±5%	3 x Dot	1 x Dot	3 x Dot	64 x Dot	< 40 sec
0,12	0,36	0,12	0,36	741	31

RESULT:

See attachment:
- Print-out of the test IDENTITY CODE with TX1 operational on antenna.
- Print-out of the test IDENTITY CODE with TX2 operational on antenna.
- Print-out of the test IDENTITY TIMING with TX1 operational on antenna.
- Print-out of the test IDENTITY TIMING with TX2 operational on antenna.

Associated Identity

The purpose of this test is to verify the interfacing circuitry for the association of the Identification Code with an Associated Facility (VOR/ILS equipment).

SPECIFICATION: *RESULT:*

	Transponder 1	Transponder 2
@ MASTER operation		
Code	Ok	Ok
Trigger	Ok	Ok
@ SLAVE operation		
Code	Ok	Ok
Trigger	Ok	Ok
Code recovery (ON SENSE)	Ok	Ok
Code recovery (ON SIGNAL)	Ok	Ok

4.3.3 RECEIVER

4.3.3.1 Sensitivity threshold

The purpose of this test is to verify the sensitivity of the receiver (reply efficiency better than 70%)

SPECIFICATION:

Receiver Sensitivity (70% efficiency)	**AN-415 [dBm]**	**AN-435 [dBm]**
Minimum thresh.	At least –81 dBm	At least -91 dBm

RESULT:

See attachment:
- Print-out of the test SENSITIVITY with TX1 operational on antenna.
- Print-out of the test SENSITIVITY with TX2 operational on antenna.

4.3.3.2 Dynamic

The purpose of this test is to verify the accuracy of the transponder at different interrogation levels.

SPECIFICATION:

Interrogation Level [dBm]	**Main Delay Average Error**	**Standard Deviation**
from -10 ... to -70	≤ 150 ns	≤ 200 ns
from -71 ... to -88	≤ 200 ns	≤ 500 ns

RESULT:

See attachment:
- Print-out of the test REPLY DELAY VARIATION WITH LEVEL with TX1 operational on antenna.
- Print-out of the test REPLY DELAY VARIATION WITH LEVEL with TX2 operational on antenna.

4.3.3.3 Bandwidth

The purpose of this test is to verify the bandwidth of the receiver (% of reply efficiency) with interrogations correctly coded but shifted in frequency.

SPECIFICATION:

Interr. Frequency deviation from nom. [kHz]	**Sensitivity variation**	**Reply eff. @ 1 dB above threshold**
± 200 kHz	≤ 1 dB	≥ 90%

RESULT:

See attachment:
- Print-out of the test BANDWIDTH with TX1 operational on antenna.
- Print-out of the test BANDWIDTH with TX2 operational on antenna.

4.3.3.4 Adjacent channel rejection

The purpose of this test is to verify the capability of the receiver to reject (% of reply efficiency) interrogations correctly coded but on the adjacent channel.

SPECIFICATION:

Interr. Frequency deviation from nom. [kHz]	**Level**	**Reply eff. @ -10 dBm**
± 900 kHz	@ -10dBm	≤ 10 %

RESULT:

See attachment:
- Print-out of the test ADJACENT CHANNEL REJECTION with TX1 operational on antenna.
- Print-out of the test ADJACENT CHANNEL REJECTION with TX2 operational on antenna.

4.3.3.5 Sensitivity Variation/Reduction

4.3.3.5.1 Overload

The purpose of this test is to verify the variation of the sensitivity threshold of the receiver in presence of high numbers of interrogations correctly coded.

SPECIFICATION:

Interrogating load	**Transmission rate (Antiecho Off; Dead time 60 μs)**
10.000 pps	4800 ± 150 ppps

RESULT:

See attachment:
- Print-out of the test AUTOMATIC GAIN REDUCTION with TX1 operational on antenna.
- Print-out of the test AUTOMATIC GAIN REDUCTION with TX2 operational on antenna.

4.3.3.5.2 Overload on the adjacent channel

Purpose of this test is to verify the variation of the sensitivity threshold of the receiver in presence of a high number of interrogations correctly coded on an adjacent channel to the one in use.

SPECIFICATION:

Interrogation load			**Sensitivity reduction**	**Reply efficiency @ 1 dB above threshold (Antiecho Off; Dead time 60 μs)**
Rate	**Level**	**Interr. RF Deviation from nominal**		
3600 ppps	Up to - 10 dBm	± 900 kHz	≤ 1 dB	≥ 70%

RESULT:

See attachment:
- Print-out of the test ADJACENT CHANNEL DESENSITIZATION with TX1 operational on antenna.
- Print-out of the test ADJACENT CHANNEL DESENSITIZATION with TX2 operational on antenna.

4.3.3.6 Decoder

The purpose of this test is to verify the variation of the sensitivity threshold of the receiver in presence of interrogations at different spacings.

SPECIFICATION:

Interrogations		Reply efficiency
Level	**Spacing**	
1 dB above threshold	Nom. ± 1 µs	≥ 90%
Up to - 10 dBm	Nom. ± 2 µs	≤ 10%
Up to - 10 dBm	Single pulse	≤ 10%

RESULT:

See attachment:
☒ Print-out of the test DECODER with TX1 operational on antenna.
☒ Print-out of the test DECODER with TX2 operational on antenna.

4.3.3.7 Echoes suppression

The purpose of this test is to verify efficiency of the short and long echo suppression circuits.

SPECIFICATION:

Interrogation	Short echo	Reply efficiency
Level: -10 dBm ÷ Rx sensitivity	Level: at least 6dB below the interrogation level	≥ 90%

Interrogation level	Long echo		Reply efficiency
	Level	**Delay**	
–10 dBm ÷ Rx threshold	At least 6 dB above the interrogation	Within the Long antiecho duration	≥ 90%
–10 dBm ÷ Rx threshold	At least 1 dB below the interrogation	Within the Long antiecho duration	≤ 15%
–10 dBm ÷ Rx threshold	At least 1 dB above the interrogation	Beyond the Long antiecho duration	≥ 90%

RESULT:

See attachment:
☒ Print-out of the test ECHO SUPPRESSION with TX1 operational on antenna.
☒ Print-out of the test ECHO SUPPRESSION with TX2 operational on antenna.

4.3.3.8 Recovery time

The purpose of this test is to verify the sensitivity of the receiver (% of reply efficiency) when a disturbance, one strong single pulse, occurs just before a weak interrogation pair.

SPECIFICATION:

Test pulse		Interrogation level	Reply efficiency
Level	**Before interrogation**		
from 0 to 60 dB above sensitivity threshold	8 μs (Test performed @ 9μ)	1dB above the receiver sensitivity threshold	≥ 85% (*)
			≤ 10% (**)

(*) in case of Short Echo OFF
(**) in case of Short Echo ON

RESULT:

See attachment:
☒ Print-out of the RECOVERY TIME test results with TX1 operational on antenna.
☒ Print-out of the RECOVERY TIME test results with TX2 operational on antenna.

4.3.3.9 Dead time

The purpose of this test is to verify the correct operation (% of reply efficiency) of the dead time circuit.

SPECIFICATION:

Interrogation		Reply eff. @ Short & Long Echoes Off
Level	**Delay (1^{st} int. ⇔ 2^{nd} int.)**	
Up to –10 dBm	Within the Dead Time	≤ 10%
	Beyond the Dead Time	≥ 90%

RESULT:

See attachment:
☒ Print-out of the DEAD TIME test results with TX1 operational on antenna.
☒ Print-out of the DEAD TIME test results with TX2 operational on antenna.

4.4 *MONITOR AND BITE*

4.4.1 GENERATOR OF INTERROGATIONS AND CW (^)

The purpose of this test is to verify the correct operation of the monitor/BITE interrogations generator.

SPECIFICATION:

Parameter	Accuracy	Units
• RF level : CW /pulsed	± 2	dB
• Δ between Mon1 and Mon 2	± 1	dB
• Pulse spacing	± 100	ns
• Radiofrequency	± 0.001	%
• Interrogation Rate	± 2%	ppps

RESULT:

Test	Parameter	Preset value	Mon 1	Mon 2	Units
1	• level RF -70 CW	-70	-71	-71,2	dBm
2	• level RF -40 CW	-40	-40,4	-40,8	dBm
	• Nominal RF	1054	1054,00232	1053,99995	MHz
3	• level RF -40 Pulsed	-40	-40,8	-41,2	dBm
	• Pulse spacing	12,00	12,00	12,00	µs
4	• Rate of interrogation	2000	1996	1996	ppps
5	• Radiofrequency shift	MHz ±900	±900	±900	kHz

4.4.2 ACQUISITION SECTION OF THE MONITOR/BITE (^)

4.4.2.1 1 GHz detector

The purpose of this test is to verify the correct operation of the RF 1 GHz detector (antenna probe input circuit) and of the monitor/BITE necessary for the following measurements: 1) power to the antenna (ERP); 2) transmission rate.

SPECIFICATION:

Test type	Accuracy (*)
• **RF power**	± 10%
• **Counting**	± 2%

(*) compared to the external instrumentation.

RESULT:

Test type	Reading			Units
	External instr.	Mon 1	Mon 2	
• **RF power**	104	108	105	W
• **Counting**	826	829	829	ppps

4.4.2.2 63 MHz IF detector (Alternative of paragraphs 4.3.1.3, 4.3.1.5 and 4.3.1.6)

NOTE: The present test is fully comprensive and alternative of the previous tests:
4.3.1.3 Output power; 4.3.1.5 Pulse shape; 4.3.1.6 Transmission Rate

The purpose of this test is to verify the correct operation of the IF 63 MHz detector (I/O circuit for interrogations and replies to the monitor/BITE) and of the internal instrument performing the following measurements: 1) output power of transmitter (Pout); 2) Main Delay; 3) Reply Efficiency; 4) all the other measurement of the executive monitor and maintenance testings (except those performed with the RF detector).

SPECIFICATION:

Test type	Input range	Accuracy (*)
• **RF power** **AN-415** **AN-435**	10 dB dynamic range Max. (+50 + 2)dBm Max. (+60 + 2)dBm	± 10%
• **Time interval**	0.5 ÷ 350 µs	± 50 ns
• **Counting**	Up to 10000 events	± 2%

(*) compared to the external instrumentation.

RESULT:

Test type	Reading			Unit
	External instrument.	Mon 1	Mon 2	
• **RF Power**	104	108	105	W
• **Time interval**	12,00	11,98	11,98	µs
• **Counting**	829	829	829	ppps

4.5 *LCSU UNIT*

4.5.1 CONTROL & STATUS PANEL

The purpose of this test is to verify the correct operation of controls and status information provided on the front door of the equipment by the LCSU.

SPECIFICATION: Commands and Indications correct operation

RESULT:

Test		Result
❑ **DME commands:**		
1	Request/release control	Ok
2	Main transponder On/Off	Ok
3	Transponder changeover	Ok
4	Selection Synth./detailed status for indications	Ok
❑ **LCSU commands:**		
5	Lamp test	Ok
6	Silence buzzer	Ok
❑ **Equipment indications**		
7	DME Synth. status: Alarm; Warning; Normal; Data Com;	Ok
8	DME detailed status: MON 1: Alarm, Stby Alarm;; Bypass MON 2: Alarm, Stby Alarm;; Bypass TRANSP. 1: On; Warning; Faulty; On Antenna TRANSP. 2: On; Warning; Faulty; On Antenna	Ok
9	Site: Mains Off; Env.Alarm; Other Warning	Ok
❑ **LCSU Indications:** Operation; Warning, Data Com;		Ok

4.5.2 LOCAL PC

The purpose of this test is to verify the correct operation of the controls using the Local P.C.

RESULT:

	Test	Result
❑	**Login and passwords;**	Ok
❑	**Command and control of the LCSU and of all equipment/devices connected to LCSU (via serial, parallel or modem);**	Ok
❑	**DME in Automatic Mode, commands and controls :**	
1	Commands	Ok
2	Status Indications	Ok
3	Buzzer	Ok
4	Detailed status display (checks, warnings, ...)	Ok
5	Parameter presetting (operational, configuration, ...)	Ok
6	Test execution (routine check, test measurement, ...)	Ok
7	Archive management: storage, display and printing of the results and presets, ...;	Ok
❑	**DME in Manual (Maintenance) Mode, commands and controls:**	
8	Commands	Ok
9	Status indications	Ok
10	Buzzer	Ok
11	Detailed status display (checks, warnings, ...)	Ok
12	Parameter presetting (operational, configuration, ...)	Ok
13	Test execution (routine check, manual measure, ...)	Ok
14	Archive management: storage, display and printing of the results and presets, ...);	Ok

❑	**LCSU archive management of the equipment/devices connected to LCSU**	
15	Storage, display and printing	Ok
16	Archive erasing and back-up	Ok

4.5.3 SERIAL / PARALLEL / MODEM INTERFACINGS

4.5.3.1 Serial communication ports RS-232

The purpose of this test is to verify the correct operation of the RS232 interfaces of the LCSU.

RESULT:

Test	Result
❑ Serial communication port 1 (front) with PC	Ok
❑ Serial communication port 1 (top) with PC	Ok
❑ Serial communication port 2 with ..... (specify)	Ok
❑ Serial communication port 3 with ..... (specify)	Ok
❑ Recover of the operation after a connection failure	Ok

4.5.3.2 Parallel I/O port

The purpose of this test is to verify the correct operation of the parallel I/O ports of the LCSU.

RESULT:

Test	Result
❑ Configuration and test of the input lines	Ok
❑ Configuration and test of the output lines	Ok
❑ Restart of the operation after a connection failure	Ok

4.5.3.3 Modem (optional)

The purpose of this test is to verify the correct operation of the modems, either internal or external, by using the serial ports of the LCSU

Test	Result
❑ Serial communication port 2 with ..... (specify)	Ok
❑ Serial communication port 3 with ..... (specify)	Ok
❑ Recover of the operation after a connection failure	Ok

4.6 *POWER SUPPLY SYSTEM*

4.6.1 DC SUPPLY (only)

Purpose of the test is to verify:

- The correct operation of the equipment when powered by DC supply;
- Indications, about the supply type available, on both LCSU and P.C.

SPECIFICATION:

DC supply	**40... 60 Vdc (Nom. 48 Vdc)**

RESULT:

Test	Result
❑ A) Operation with DC power supply	Ok
❑ B) Indication on the LCSU and PC (mains not available)	Ok
❑ C) Restart of the operation after a supply blackout	❑ Ok

4.6.2 AC SUPPLY (only)

Purpose of the test is to verify:

- The correct operation of the equipment when powered by AC Mains supply;
- Indications, about the supply type available, on both LCSU and P.C.

SPECIFICATION:

AC supply	**187... 276 Vac (Nom. 220 Vac)**

RESULT:

Test	Result
❑ A) Operation with AC power supply	Ok
❑ B) Indication on the LCSU and PC (no indications)	Ok
❑ C) Restart of the operation after a Mains supply blackout (without back-up battery)	Ok
❑ D) Faulty simulation of one AC/DC power supply module at time to verify indications on LCSU and PC	Ok

4.6.3 AC/DC POWER SUPPLY AND BATTERY CHARGER (AC and DC supply)

Purpose of the test is to verify:

- The correct operation of the equipment, when powered by AC Mains and by DC supply.
- The battery back-up in case of mains failure
- The correct indications, about the supply type in use, on the LCSU and PC.
- The operation of the battery breaker.

SPECIFICATION:

DC supply	**40... 60 Vdc (Nom. 48 Vdc)**
AC supply	**187... 276 Vac (Nom. 220 Vac)**
Battery Breaker **Activation** **Rearming**	 **42 ± 1 Vdc** **51± 1 Vdc (Mains restore)**

RESULT:

Test	Result
❑ Operation with AC supply (as per previous p. 4.6.2, A) and B))	Ok
❑ Operation with DC supply (as per previous p. 4.6.1, A) and B))	Ok
❑ Continuity of service following Mains supply blackout and restore	Ok
❑ Faulty simulation of one AC/DC power supply module at time to verify indications on LCSU and PC	Ok
❑ Battery breaker (optional):	
o battery predepletion	Ok
o activation (low DC supply)	Ok
o automatic re-arming (restoring Mains)	Ok

5 ANNOTATIONS

5.1 *NOTES*

THIS PART IS RESERVED FOR CUSTOMER USE

5.2 *TESTS ON REQUEST*

THIS PART IS RESERVED FOR CUSTOMER USE;
FOR RECORDING OF SPECIFIC TESTS NOT CONTAINED IN THIS BOOK

Subject: DME - Routine Check on Antenna - Trx 1

TRANSPONDER PARAMETERS

Setting	Value
Channel and Mode	: 30 X
Reduced Power	: OFF (0 dB)
Identity Code	: TEST
Transmission Rate	: 800 ÷ 4800 ppps
Reply Delay	: 50,00 us
Dead Time	: 60 us
Short Echo Supp.	: ON
Thr.Lg. Dist.Echo	: -30 dBm
Sensitivity N	: -81 dBm
Antiecho Duration	: 100 us
Morse Mode	: MASTER TRIGGER

PULSE SPACING - nsfa = 100

MONITOR 1	MONITOR 2
11,99 dev =0,02 us	11,98 dev =0,01 us

PEAK POWER OUTPUT - nsfa = 100

	MONITOR 1	MONITOR 2
1st Pulse	107 dev = 1 W	104 dev = 1 W
2nd Pulse	108 dev = 0 W	105 dev = 0 W

TRANSMISSION RATE - nsfa = 10

MONITOR 1	MONITOR 2
825 dev = 2 ppps	825 dev = 3 ppps

PEAK POWER DROOP - nsfa = 1000

MONITOR 1	MONITOR 2
0,0 dB	0,0 dB

REPLY EFFICIENCY - nsfa = 100

MONITOR 1	MONITOR 2
97 %	99 %

TRANSMITTER FREQUENCY - nsfa = 10

MONITOR 1	MONITOR 2
991,0 MHz	991,0 MHz

PULSE SHAPE - nsfa = 100

	MONITOR 1	MONITOR 2
1st Pulse Rise Time	2,02 dev = 0,03 us	2,03 dev = 0,03 us
1st Pulse Decay Time	1,99 dev = 0,02 us	1,98 dev = 0,02 us
1st Pulse Duration	3,31 dev = 0,03 us	3,31 dev = 0,02 us
2nd Pulse Rise Time	2,07 dev = 0,03 us	2,06 dev = 0,03 us
2nd Pulse Decay Time	2,02 dev = 0,03 us	2,01 dev = 0,02 us
2nd Pulse Duration	3,35 dev = 0,02 us	3,35 dev = 0,02 us

REPLY DELAY VARIATION WITH LEVEL - nsfa = 100

Level	MONITOR 1	MONITOR 2
-10 dBm	49,95 dev = 0,02 us	49,99 dev = 0,02 us
-30 dBm	49,98 dev = 0,01 us	50,03 dev = 0,04 us
-50 dBm	50,02 dev = 0,02 us	50,06 dev = 0,03 us
-70 dBm	50,02 dev = 0,02 us	50,06 dev = 0,04 us
-78 dBm	50,01 dev = 0,03 us	50,05 dev = 0,04 us

Subject: DME - Routine Check on Antenna - Trx 1

SENSITIVITY - nsfa = 100

Level	MONITOR 1	MONITOR 2
-78 dBm	98 %	99 %
-79 dBm	99 %	98 %
-80 dBm	98 %	98 %
-81 dBm	99 %	97 %
-82 dBm	97 %	99 %
-83 dBm	99 %	100 %
-84 dBm	94 %	92 %

BANDWIDTH - nsfa = 100

Frequency	Level	MONITOR 1	MONITOR 2
- 200 KHz	-78 dBm	98 %	98 %
+ 200 KHz	-78 dBm	97 %	97 %

ADJACENT CHANNEL REJECTION - nsfa = 100

Frequency	Level	MONITOR 1	MONITOR 2
- 900 KHz	-10 dBm	0 %	0 %
+ 900 KHz	-10 dBm	0 %	1 %

DECODER - nsfa = 100

Spacing	Level	MONITOR 1	MONITOR 2
10,0 us	-10 dBm	0 %	0 %
11,0 us	-80 dBm	99 %	99 %
13,0 us	-80 dBm	96 %	97 %
14,0 us	-10 dBm	0 %	0 %
Single Pulse	-10 dBm	1 %	0 %

DEAD TIME - nsfa = 100

Level[I]	Level [E]	Delay [I ->E]	MONITOR 1	MONITOR 2
- 70 dBm	- 70 dBm	58,0 us	7 %	0 %
- 70 dBm	- 70 dBm	77,0 us	99 %	99 %

ECHO SUPPRESSION - nsfa = 100

	Level[I]	Level [E]	Delay [I ->E]	MONITOR 1	MONITOR 2
Long	-27 dBm	7 dB	106,0 us	99 %	100 %
Long	-27 dBm	-1 dB	106,0 us	4 %	3 %
Long	-27 dBm	-1 dB	118,0 us	99 %	100 %
Short	-15 dBm	-8 dB	7,0 us	95 %	99 %
Short	-50 dBm	-8 dB	7,0 us	98 %	98 %
Short	-64 dBm	-8 dB	7,0 us	94 %	98 %

IDENTITY CODE READING - nsfa = -

MONITOR 1	MONITOR 2
- . . . -	- . . . -

IDENTITY CODE TIMING - nsfa = 1

	MONITOR 1	MONITOR 2
Dot	120 ms	120 ms
Space	120 ms	120 ms
Dash	360 ms	360 ms
Interval	360 ms	360 ms
Repetition Period	31 s	31 s
Code Period	741,0 us	741,0 us

Subject: DME - Routine Check on Antenna - Trx 1

TRANSMITTED POWER - nsfa = 100

	MONITOR 1	MONITOR 2
1st Pulse	105 dev = 0 W	105 dev = 0 W
2nd Pulse	105 dev = 0 W	105 dev = 0 W

Subject: DME - Routine Check on Antenna - Trx 1 - Maintenance

TRANSPONDER PARAMETERS

Setting	Value
Channel and Mode	: 30 X
Reduced Power	: ON (-3 dB)
Identity Code	: TEST
Transmission Rate	: 800 ÷ 4800 ppps
Reply Delay	: 50,00 us
Dead Time	: 60 us
Short Echo Supp.	: ON
Thr.Lg. Dist.Echo	: -30 dBm
Sensitivity N	: -81 dBm
Antiecho Duration	: 100 us
Morse Mode	: MASTER TRIGGER

PULSE SPACING - nsfa = 100

MONITOR 1	MONITOR 2
12,03 dev =0,04 us	12,03 dev =0,04 us

PEAK POWER OUTPUT - nsfa = 100

	MONITOR 1	MONITOR 2
1st Pulse	44 dev = 0 W	43 dev = 0 W
2nd Pulse	44 dev = 0 W	43 dev = 0 W

TRANSMISSION RATE - nsfa = 10

MONITOR 1	MONITOR 2
823 dev = 1 ppps	824 dev = 2 ppps

PEAK POWER DROOP - nsfa = 1000

MONITOR 1	MONITOR 2
0,0 dB	0,0 dB

REPLY EFFICIENCY - nsfa = 100

MONITOR 1	MONITOR 2
95 %	94 %

TRANSMITTER FREQUENCY - nsfa = 10

MONITOR 1	MONITOR 2
991,0 MHz	991,0 MHz

PULSE SHAPE - nsfa = 100

	MONITOR 1	MONITOR 2
1st Pulse Rise Time	1,95 dev = 0,03 us	1,96 dev = 0,03 us
1st Pulse Decay Time	2,03 dev = 0,03 us	2,03 dev = 0,03 us
1st Pulse Duration	3,21 dev = 0,03 us	3,22 dev = 0,02 us
2nd Pulse Rise Time	1,99 dev = 0,03 us	2,00 dev = 0,02 us
2nd Pulse Decay Time	2,06 dev = 0,03 us	2,05 dev = 0,02 us
2nd Pulse Duration	3,25 dev = 0,03 us	3,27 dev = 0,03 us

REPLY DELAY VARIATION WITH LEVEL - nsfa = 100

Level	MONITOR 1	MONITOR 2
-10 dBm	49,98 dev = 0,03 us	50,02 dev = 0,01 us
-30 dBm	50,01 dev = 0,02 us	50,05 dev = 0,03 us
-50 dBm	50,02 dev = 0,02 us	50,07 dev = 0,03 us
-70 dBm	50,04 dev = 0,06 us	50,08 dev = 0,04 us
-78 dBm	50,03 dev = 0,04 us	50,07 dev = 0,04 us

SENSITIVITY - nsfa = 100

Level	MONITOR 1	MONITOR 2
-78 dBm	94 %	92 %
-79 dBm	94 %	94 %
-80 dBm	95 %	93 %
-81 dBm	96 %	87 %
-82 dBm	97 %	95 %
-83 dBm	93 %	93 %
-84 dBm	90 %	92 %

BANDWIDTH - nsfa = 100

Frequency	Level	MONITOR 1	MONITOR 2
- 200 KHz	-78 dBm	94 %	95 %
+ 200 KHz	-78 dBm	98 %	96 %

ADJACENT CHANNEL REJECTION - nsfa = 100

Frequency	Level	MONITOR 1	MONITOR 2
- 900 KHz	-10 dBm	0 %	1 %
+ 900 KHz	-10 dBm	1 %	0 %

DECODER - nsfa = 100

Spacing	Level	MONITOR 1	MONITOR 2
10,0 us	-10 dBm	0 %	0 %
11,0 us	-80 dBm	95 %	93 %
13,0 us	-80 dBm	98 %	97 %
14,0 us	-10 dBm	2 %	0 %
Single Pulse	-10 dBm	0 %	0 %

DEAD TIME - nsfa = 100

Level[I]	Level [E]	Delay [I ->E]	MONITOR 1	MONITOR 2
- 70 dBm	- 70 dBm	58,0 us	1 %	6 %
- 70 dBm	- 70 dBm	77,0 us	99 %	100 %

ECHO SUPPRESSION - nsfa = 100

	Level[I]	Level [E]	Delay [I ->E]	MONITOR 1	MONITOR 2
Long	-27 dBm	7 dB	106,0 us	99 %	99 %
Long	-27 dBm	-1 dB	106,0 us	1 %	4 %
Long	-27 dBm	-1 dB	118,0 us	97 %	96 %
Short	-15 dBm	-8 dB	7,0 us	96 %	95 %
Short	-50 dBm	-8 dB	7,0 us	99 %	94 %
Short	-64 dBm	-8 dB	7,0 us	96 %	95 %

IDENTITY CODE READING - nsfa = -

MONITOR 1	MONITOR 2
- . . . -	- . . . -

IDENTITY CODE TIMING - nsfa = 1

	MONITOR 1	MONITOR 2
Dot	120 ms	120 ms
Space	120 ms	120 ms
Dash	360 ms	360 ms
Interval	360 ms	360 ms
Repetition Period	31 s	31 s
Code Period	741,0 us	741,0 us

TRANSMITTED POWER - nsfa = 100

	MONITOR 1	MONITOR 2
1st Pulse	46 dev = 0 W	46 dev = 0 W
2nd Pulse	46 dev = 0 W	46 dev = 0 W

Subject: DME - Result of Measurement on Antenna - Trx 1 - Maintenance

TRANSPONDER PARAMETERS

Setting	Value
Channel and Mode	: 30 X
Reduced Power	: OFF (0 dB)
Identity Code	: TEST
Transmission Rate	: 800 ÷ 4800 ppps
Reply Delay	: 50,00 us
Dead Time	: 60 us
Short Echo Supp.	: OFF
Thr.Lg. Dist.Echo	: 0 dBm
Sensitivity N	: -81 dBm
Antiecho Duration	: 100 us
Morse Mode	: MASTER TRIGGER

ADJACENT CHANNEL DESENSITIZATION - nsfa = 100

Frequency	Prf [B]	Level [B]	Level [A]	MONITOR 1	MONITOR 2
- 900 KHz	3600 ppps	-10 dBm	-78 dBm	86 %	97 %
+ 900 KHz	3600 ppps	-10 dBm	-78 dBm	83 %	82 %

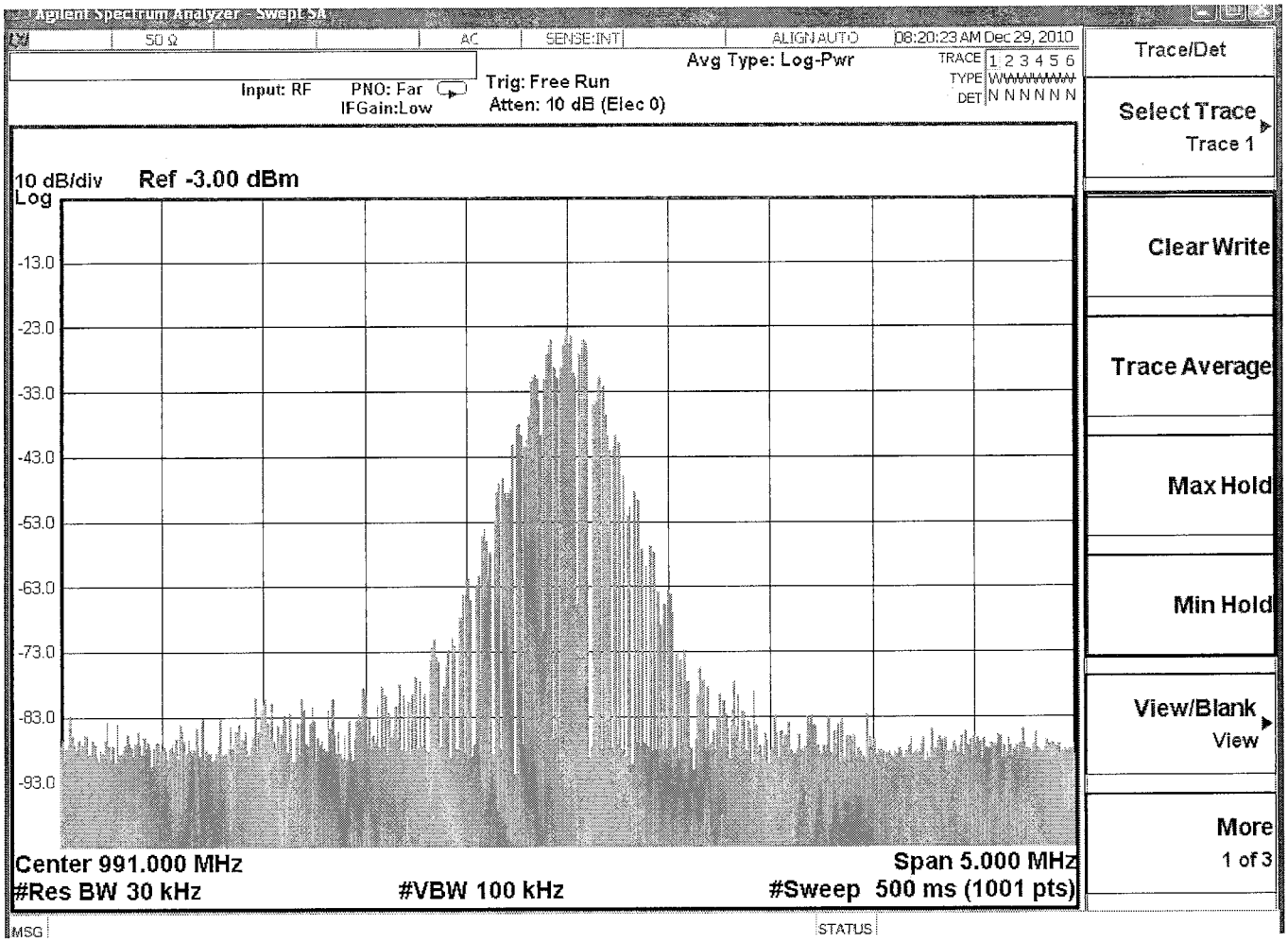
RECOVERY TIME - nsfa = 100

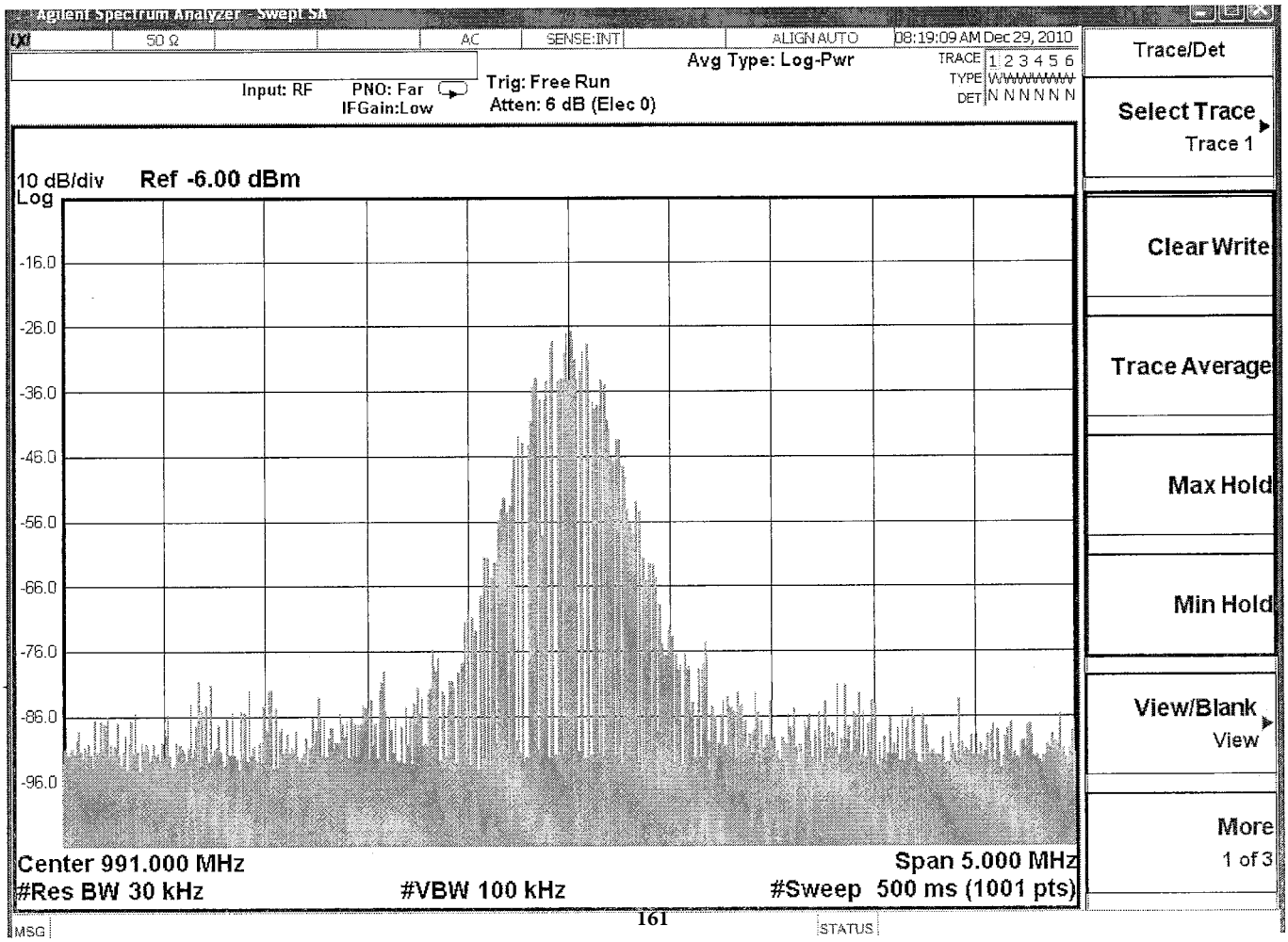
Level [U]	Level[I]	Delay[U->I]	MONITOR 1	MONITOR 2
-21 dBm	-80 dBm	9,0 us	100 %	99 %

AUTOMATIC GAIN REDUCTION - nsfa = 100

Level [H]	Prf [H]	Level [L]	Prf [L]	MONITOR 1	MONITOR 2
- 45 dBm	5000 ppps	-50 dBm	5000 ppps	4808 ppps	4808 ppps

TX1


Agilent Spectrum Analyzer - Swept SA
50 Ω
AC
SENSE:INT
ALIGN AUTO
08:20:23 AM Dec 29, 2010
Avg Type: Log-Pwr
TRACE 1 2 3 4 5 6
TYPE W
DET N N N N N
Input: RF
PNO: Far
IFGain:Low
Trig: Free Run
Atten: 10 dB (Elec 0)
10 dB/div
Log
Ref -3.00 dBm
-13.0
-23.0
-33.0
-43.0
-53.0
-63.0
-73.0
-83.0
-93.0
Center 991.000 MHz
#Res BW 30 kHz
#VBW 100 kHz
Span 5.000 MHz
#Sweep 500 ms (1001 pts)
MSG
STATUS
Trace/Det
Select Trace
Trace 1
Clear Write
Trace Average
Max Hold
Min Hold
View/Blank
View
More
1 of 3


Agilent Spectrum Analyzer - Swept SA
50 Ω
AC
SENSE:INT
ALIGN AUTO
08:19:09 AM Dec 29, 2010
Avg Type: Log-Pwr
TRACE 1 2 3 4 5 6
TYPE W
DET N N N N N
Input: RF
PNO: Far
IFGain:Low
Trig: Free Run
Atten: 6 dB (Elec 0)
10 dB/div
Log
Ref -6.00 dBm
-16.0
-26.0
-36.0
-46.0
-56.0
-66.0
-76.0
-86.0
-96.0
Center 991.000 MHz
#Res BW 30 kHz
#VBW 100 kHz
Span 5.000 MHz
#Sweep 500 ms (1001 pts)
MSG
STATUS
Trace/Det
Select Trace
Trace 1
Clear Write
Trace Average
Max Hold
Min Hold
View/Blank
View
More
1 of 3

Subject: DME - Routine Check on Antenna - Trx 2

TRANSPONDER PARAMETERS

Setting	Value
Channel and Mode	: 30 X
Reduced Power	: OFF (0 dB)
Identity Code	: TEST
Transmission Rate	: 800 ÷ 4800 ppps
Reply Delay	: 50,00 us
Dead Time	: 60 us
Short Echo Supp.	: ON
Thr.Lg. Dist.Echo	: -30 dBm
Sensitivity N	: -81 dBm
Antiecho Duration	: 100 us
Morse Mode	: MASTER TRIGGER

PULSE SPACING - nsfa = 100

MONITOR 1	MONITOR 2
12,01 dev =0,01 us	12,01 dev =0,01 us

PEAK POWER OUTPUT - nsfa = 100

	MONITOR 1	MONITOR 2
1st Pulse	101 dev = 1 W	105 dev = 1 W
2nd Pulse	101 dev = 0 W	105 dev = 1 W

TRANSMISSION RATE - nsfa = 10

MONITOR 1	MONITOR 2
823 dev = 1 ppps	823 dev = 2 ppps

PEAK POWER DROOP - nsfa = 1000

MONITOR 1	MONITOR 2
0,0 dB	0,0 dB

REPLY EFFICIENCY - nsfa = 100

MONITOR 1	MONITOR 2
98 %	99 %

TRANSMITTER FREQUENCY - nsfa = 10

MONITOR 1	MONITOR 2
991,0 MHz	991,0 MHz

PULSE SHAPE - nsfa = 100

	MONITOR 1	MONITOR 2
1st Pulse Rise Time	2,10 dev = 0,03 us	2,10 dev = 0,03 us
1st Pulse Decay Time	2,03 dev = 0,03 us	2,03 dev = 0,02 us
1st Pulse Duration	3,36 dev = 0,02 us	3,37 dev = 0,02 us
2nd Pulse Rise Time	2,08 dev = 0,03 us	2,08 dev = 0,03 us
2nd Pulse Decay Time	2,00 dev = 0,02 us	2,00 dev = 0,02 us
2nd Pulse Duration	3,34 dev = 0,02 us	3,35 dev = 0,02 us

REPLY DELAY VARIATION WITH LEVEL - nsfa = 100

Level	MONITOR 1	MONITOR 2
-10 dBm	49,95 dev = 0,02 us	49,97 dev = 0,02 us
-30 dBm	50,00 dev = 0,02 us	50,02 dev = 0,01 us
-50 dBm	50,02 dev = 0,07 us	50,03 dev = 0,02 us
-70 dBm	50,03 dev = 0,03 us	50,04 dev = 0,03 us
-78 dBm	50,02 dev = 0,03 us	50,04 dev = 0,04 us

SENSITIVITY - nsfa = 100

Level	MONITOR 1	MONITOR 2
-78 dBm	100 %	93 %
-79 dBm	97 %	99 %
-80 dBm	100 %	98 %
-81 dBm	97 %	96 %
-82 dBm	99 %	98 %
-83 dBm	97 %	99 %
-84 dBm	96 %	95 %

BANDWIDTH - nsfa = 100

Frequency	Level	MONITOR 1	MONITOR 2
- 200 KHz	-78 dBm	95 %	100 %
+ 200 KHz	-78 dBm	98 %	97 %

ADJACENT CHANNEL REJECTION - nsfa = 100

Frequency	Level	MONITOR 1	MONITOR 2
- 900 KHz	-10 dBm	0 %	0 %
+ 900 KHz	-10 dBm	0 %	0 %

DECODER - nsfa = 100

Spacing	Level	MONITOR 1	MONITOR 2
10,0 us	-10 dBm	1 %	0 %
11,0 us	-80 dBm	94 %	97 %
13,0 us	-80 dBm	98 %	99 %
14,0 us	-10 dBm	0 %	0 %
Single Pulse	-10 dBm	0 %	0 %

DEAD TIME - nsfa = 100

Level[I]	Level [E]	Delay [I ->E]	MONITOR 1	MONITOR 2
- 70 dBm	- 70 dBm	58,0 us	1 %	2 %
- 70 dBm	- 70 dBm	77,0 us	100 %	99 %

ECHO SUPPRESSION - nsfa = 100

	Level[I]	Level [E]	Delay [I ->E]	MONITOR 1	MONITOR 2
Long	-27 dBm	7 dB	106,0 us	100 %	99 %
Long	-27 dBm	-1 dB	106,0 us	4 %	3 %
Long	-27 dBm	-1 dB	118,0 us	100 %	99 %
Short	-15 dBm	-8 dB	7,0 us	97 %	95 %
Short	-50 dBm	-8 dB	7,0 us	95 %	97 %
Short	-64 dBm	-8 dB	7,0 us	98 %	98 %

IDENTITY CODE READING - nsfa = -

MONITOR 1	MONITOR 2
- . . . -	- . . . -

IDENTITY CODE TIMING - nsfa = 1

	MONITOR 1	MONITOR 2
Dot	120 ms	120 ms
Space	120 ms	120 ms
Dash	360 ms	360 ms
Interval	360 ms	360 ms
Repetition Period	31 s	31 s
Code Period	741,0 us	741,0 us

Subject: DME - Routine Check on Antenna - Trx 2

TRANSMITTED POWER - nsfa = 100

	MONITOR 1	MONITOR 2
1st Pulse	105 dev = 1 W	105 dev = 0 W
2nd Pulse	105 dev = 0 W	105 dev = 0 W

Subject: DME - Routine Check on Antenna - Trx 2 - Maintenance

TRANSPONDER PARAMETERS

Setting	Value
Channel and Mode	: 30 X
Reduced Power	: ON (-3 dB)
Identity Code	: TEST
Transmission Rate	: 800 ÷ 4800 ppps
Reply Delay	: 50,00 us
Dead Time	: 60 us
Short Echo Supp.	: ON
Thr.Lg. Dist.Echo	: -30 dBm
Sensitivity N	: -81 dBm
Antiecho Duration	: 100 us
Morse Mode	: MASTER TRIGGER

PULSE SPACING - nsfa = 100

MONITOR 1	MONITOR 2
12,02 dev =0,04 us	12,02 dev =0,04 us

PEAK POWER OUTPUT - nsfa = 100

	MONITOR 1	MONITOR 2
1st Pulse	42 dev = 0 W	44 dev = 0 W
2nd Pulse	42 dev = 0 W	44 dev = 0 W

TRANSMISSION RATE - nsfa = 10

MONITOR 1	MONITOR 2
824 dev = 1 ppps	826 dev = 1 ppps

PEAK POWER DROOP - nsfa = 1000

MONITOR 1	MONITOR 2
0,0 dB	0,0 dB

REPLY EFFICIENCY - nsfa = 100

MONITOR 1	MONITOR 2
97 %	99 %

TRANSMITTER FREQUENCY - nsfa = 10

MONITOR 1	MONITOR 2
991,0 MHz	991,0 MHz

PULSE SHAPE - nsfa = 100

	MONITOR 1	MONITOR 2
1st Pulse Rise Time	2,01 dev = 0,04 us	2,02 dev = 0,03 us
1st Pulse Decay Time	2,04 dev = 0,03 us	2,03 dev = 0,03 us
1st Pulse Duration	3,26 dev = 0,03 us	3,27 dev = 0,02 us
2nd Pulse Rise Time	1,98 dev = 0,03 us	1,99 dev = 0,03 us
2nd Pulse Decay Time	2,01 dev = 0,02 us	2,00 dev = 0,02 us
2nd Pulse Duration	3,22 dev = 0,04 us	3,24 dev = 0,04 us

REPLY DELAY VARIATION WITH LEVEL - nsfa = 100

Level	MONITOR 1	MONITOR 2
-10 dBm	50,00 dev = 0,02 us	50,02 dev = 0,02 us
-30 dBm	50,02 dev = 0,02 us	50,03 dev = 0,02 us
-50 dBm	50,03 dev = 0,01 us	50,04 dev = 0,04 us
-70 dBm	50,05 dev = 0,03 us	50,05 dev = 0,04 us
-78 dBm	50,04 dev = 0,03 us	50,05 dev = 0,04 us

SENSITIVITY - nsfa = 100

Level	MONITOR 1	MONITOR 2
-78 dBm	97 %	99 %
-79 dBm	98 %	98 %
-80 dBm	98 %	95 %
-81 dBm	99 %	95 %
-82 dBm	97 %	98 %
-83 dBm	100 %	100 %
-84 dBm	95 %	95 %

BANDWIDTH - nsfa = 100

Frequency	Level	MONITOR 1	MONITOR 2
- 200 KHz	-78 dBm	99 %	98 %
+ 200 KHz	-78 dBm	96 %	97 %

ADJACENT CHANNEL REJECTION - nsfa = 100

Frequency	Level	MONITOR 1	MONITOR 2
- 900 KHz	-10 dBm	0 %	0 %
+ 900 KHz	-10 dBm	0 %	1 %

DECODER - nsfa = 100

Spacing	Level	MONITOR 1	MONITOR 2
10,0 us	-10 dBm	0 %	1 %
11,0 us	-80 dBm	98 %	99 %
13,0 us	-80 dBm	99 %	98 %
14,0 us	-10 dBm	0 %	0 %
Single Pulse	-10 dBm	1 %	0 %

DEAD TIME - nsfa = 100

Level[I]	Level [E]	Delay [I ->E]	MONITOR 1	MONITOR 2
- 70 dBm	- 70 dBm	58,0 us	4 %	3 %
- 70 dBm	- 70 dBm	77,0 us	99 %	100 %

ECHO SUPPRESSION - nsfa = 100

	Level[I]	Level [E]	Delay [I ->E]	MONITOR 1	MONITOR 2
Long	-27 dBm	7 dB	106,0 us	100 %	100 %
Long	-27 dBm	-1 dB	106,0 us	2 %	2 %
Long	-27 dBm	-1 dB	118,0 us	98 %	100 %
Short	-15 dBm	-8 dB	7,0 us	98 %	96 %
Short	-50 dBm	-8 dB	7,0 us	94 %	98 %
Short	-64 dBm	-8 dB	7,0 us	98 %	99 %

IDENTITY CODE READING - nsfa = -

MONITOR 1	MONITOR 2
- . ... -	- . ... -

IDENTITY CODE TIMING - nsfa = 1

	MONITOR 1	MONITOR 2
Dot	110 ms	120 ms
Space	120 ms	120 ms
Dash	355 ms	360 ms
Interval	365 ms	360 ms
Repetition Period	31 s	31 s
Code Period	741,0 us	741,0 us

TRANSMITTED POWER - nsfa = 100

	MONITOR 1	MONITOR 2
1st Pulse	46 dev = 0 W	46 dev = 0 W
2nd Pulse	46 dev = 0 W	46 dev = 0 W

Subject: DME - Result of Measurement on Antenna - Trx 2 - Maintenance

TRANSPONDER PARAMETERS

Setting	Value
Channel and Mode	: 30 X
Reduced Power	: OFF (0 dB)
Identity Code	: TEST
Transmission Rate	: 800 ÷ 4800 ppps
Reply Delay	: 50,00 us
Dead Time	: 60 us
Short Echo Supp.	: OFF
Thr.Lg. Dist.Echo	: 0 dBm
Sensitivity N	: -81 dBm
Antiecho Duration	: 100 us
Morse Mode	: MASTER TRIGGER

ADJACENT CHANNEL DESENSITIZATION - nsfa = 100

Frequency	Prf [B]	Level [B]	Level [A]	MONITOR 1	MONITOR 2
- 900 KHz	3600 ppps	-10 dBm	-78 dBm	83 %	90 %
+ 900 KHz	3600 ppps	-10 dBm	-78 dBm	86 %	86 %

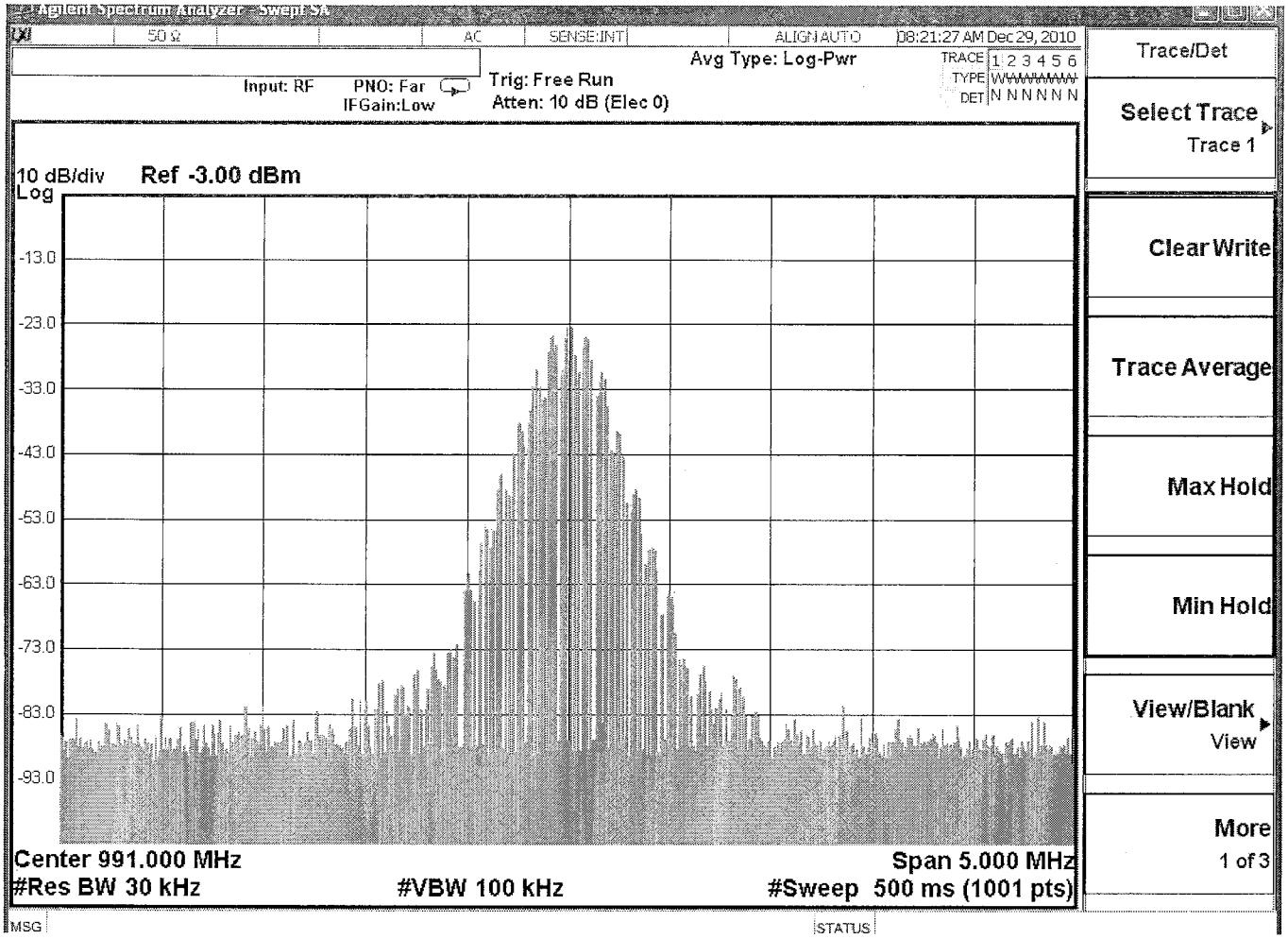
RECOVERY TIME - nsfa = 100

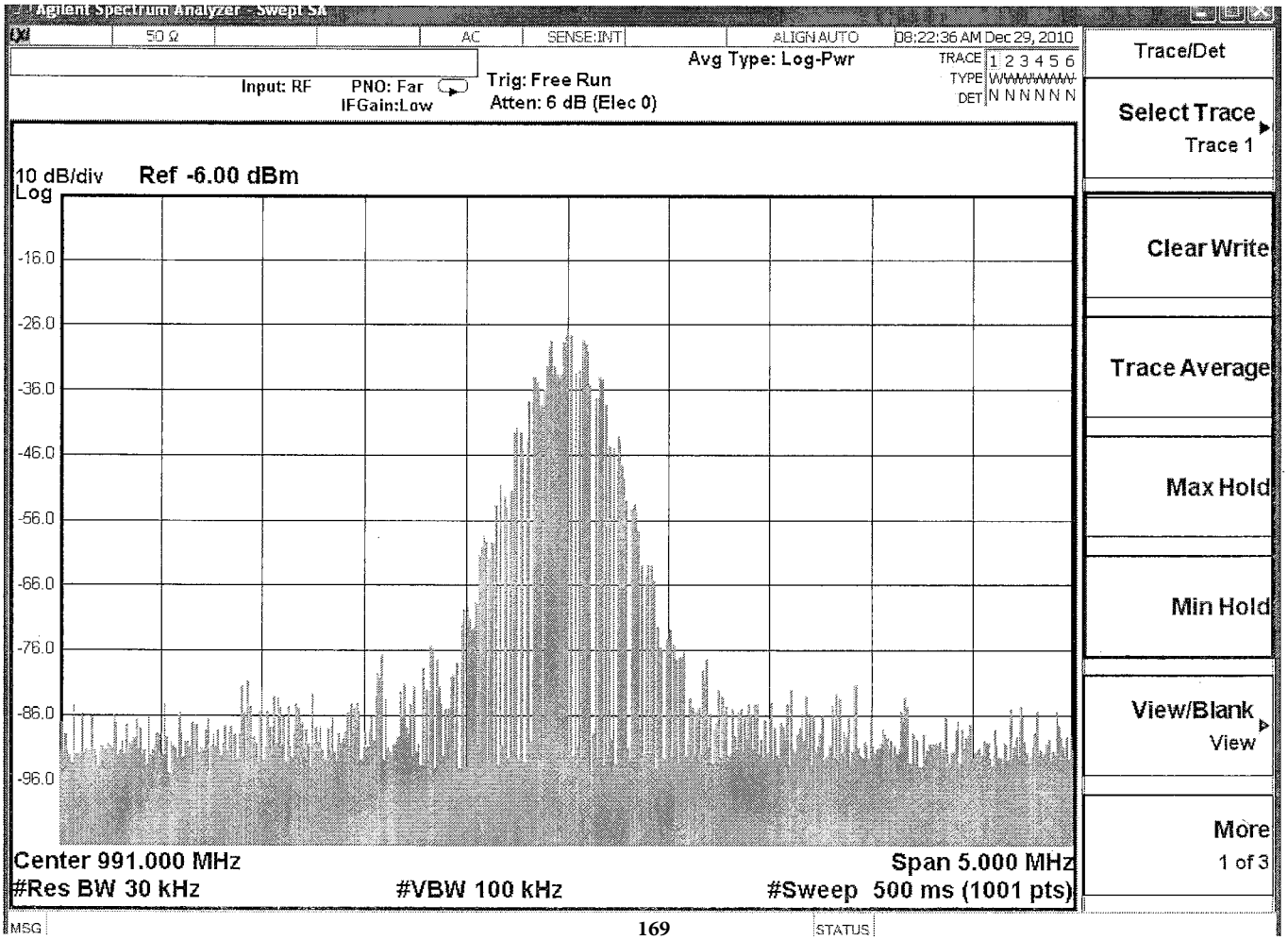
Level [U]	Level[I]	Delay[U->I]	MONITOR 1	MONITOR 2
-21 dBm	-80 dBm	9,0 us	98 %	97 %

AUTOMATIC GAIN REDUCTION - nsfa = 100

Level [H]	Prf [H]	Level [L]	Prf [L]	MONITOR 1	MONITOR 2
- 45 dBm	5000 ppps	-50 dBm	5000 ppps	4808 ppps	4806 ppps

TX2


Agilent Spectrum Analyzer - Swept SA
50 Ω
AC
SENSE:INT
ALIGN AUTO
08:21:27 AM Dec 29, 2010
Avg Type: Log-Pwr
TRACE 1 2 3 4 5 6
TYPE WWWWWW
DET N N N N N N
Input: RF
PNO: Far
IFGain:Low
Trig: Free Run
Atten: 10 dB (Elec 0)
10 dB/div
Log
Ref -3.00 dBm
-13.0
-23.0
-33.0
-43.0
-53.0
-63.0
-73.0
-83.0
-93.0
Center 991.000 MHz
#Res BW 30 kHz
#VBW 100 kHz
Span 5.000 MHz
#Sweep 500 ms (1001 pts)
MSG
STATUS
Trace/Det
Select Trace
Trace 1
Clear Write
Trace Average
Max Hold
Min Hold
View/Blank
View
More
1 of 3


Agilent Spectrum Analyzer - Swept SA
50 Ω
AC
SENSE:INT
ALIGN AUTO
08:22:36 AM Dec 29, 2010
Avg Type: Log-Pwr
TRACE 1 2 3 4 5 6
TYPE WWWWWW
DET N N N N N N
Input: RF
PNO: Far
IFGain:Low
Trig: Free Run
Atten: 6 dB (Elec 0)
10 dB/div
Log
Ref -6.00 dBm
-16.0
-26.0
-36.0
-46.0
-56.0
-66.0
-76.0
-86.0
-96.0
Center 991.000 MHz
#Res BW 30 kHz
#VBW 100 kHz
Span 5.000 MHz
#Sweep 500 ms (1001 pts)
MSG
STATUS
Trace/Det
Select Trace
Trace 1
Clear Write
Trace Average
Max Hold
Min Hold
View/Blank
View
More
1 of 3