



TEST REPORT FROM RFI GLOBAL SERVICES LTD

Test of: Blighter B422-HPNB Aux Unit

FCC ID: UFQB400HPNBAUX

To: FCC Part 90: 2010 Subpart F in accordance with RFI Test Plan
RFI/REGE1/TP75565JD03

Test Report Serial No:
RFI-RPT-RP76945JD15B

This Test Report Is Issued Under The Authority Of Chris Guy, Head of Global Approvals:		
Checked By:	Ian Watch	
Signature:		
Date of Issue:	27 May 2011	

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1. Customer Information

Company Name:	Plextek Ltd
Address:	London Road Great Chesterford Essex CB10 1NY








2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR90
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2010: Part 90: Public Safety Radio Pool
Specification Reference:	47CFR2
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2010: Part 2: Frequency Allocations and Radio Treaty matters; General Rules and Regulations
Site Registration:	FCC: 209735
Location of Testing:	RFI Global Services Ltd, Wade Road, Basingstoke, Hampshire, RG24 8AH
Test Dates:	18 April 2011 to 14 May 2011

Test Plan Reference:	RFI/REG1/TP75565JD03 Date: 11 January 2010
Description:	Test plan from RFI Global Services Ltd for Blighter B400 Series Radar

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 2.1046	Transmitter RF Conducted Output Power	
Part 2.1049	Transmitter Occupied Bandwidth (Bandwidth Limitations)	
Part 2.1051/ 2.1057	Spurious Emissions At Antenna Terminals	
Part 2.1053 / 2.1057	Field Strength Of Spurious Radiation	
Part 2.1053	Field Strength Of Spurious Radiation at Band Edges	
Key to Results		
 = Complied  = Did not comply		

2.3. Methods and Procedures

Reference:	ANSI/TIA-603-C-2004
Title:	Land Mobile Communications Equipment, Measurements and performance Standards

2.4. Deviations from the Test Specification

For the measurements contained within this test report, there were no deviations from, additions to, or exclusions from the test specification identified above.

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	Blighter
Description:	FMCW Radar – Aux Unit
Model Name or Number:	B422-HPNB
Serial Number:	6B609
Hardware Version Number:	BoM / Rev – Aux 6BA49B/01
Software Version Number:	Build 102
FCC ID:	UFQB400HPNBAUX

3.2. Description of EUT

The equipment under test was a FMCW Radar (Auxiliary Unit)

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Category Of Equipment:	Radar		
Type Of Radio Device:	Transceiver		
Power Supply Requirement(s):	Nominal	16.0 V	
	Minimum	12.0 V	
	Maximum	24.0 V	
Modulation Type:	FM-CW		
Antenna Type:	Sectoral Horn		
Antenna Gain:	26dBi on boresight		
Transmit Frequency Range:	16.2 GHz to 17.2 GHz		
Transmit Channels Tested:	Channel ID	Channel Frequency (MHz)	Azimuth Angle (°)
	Bottom	16293.04	2.9
	Middle	16718.04	48.6
	Top	17139.91	92.9
Receive Frequency Range:	16.2 GHz to 17.2 GHz		
Receive Channels Tested:	Channel ID	Channel Frequency (MHz)	Azimuth Angle (°)
	Bottom	16293.04	2.9
	Middle	16718.04	48.6
	Top	17139.91	92.9

3.5. Support Equipment

The following support equipment was used to exercise the EUT during testing:

Description:	Laptop
Brand Name:	HP
Model Name or Number:	Compaq 6730
Serial Number:	CNU911BPRK

Description:	Wave guide to co-axial adapter plate
Brand Name:	Plextek
Model Name or Number:	6BM17D01
Serial Number:	Not stated

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

The EUT was tested in the following operating mode(s):

- Transmitting on bottom, middle and top channels at the highest power level.

4.2. Configuration and Peripherals

The EUT was tested in the following configuration(s):

- The EUT Aux Unit is dependent on the Main Unit to supply the RF and operational signals necessary for its operation, so the Aux Unit was tested connected to the Main unit.
- Radiated tests were performed with the horn antennas removed, two blanking plates fitted over the receiver ports and waveguide to coaxial adaptor plates fitted to the transmitter ports. Waveguides were fitted to each adaptor plate and the antenna ports were terminated into suitable loads. The EUT was mounted onto a tripod located in the centre of the anechoic chamber turntable. All earthing points on the EUT were bonded to the structure of the anechoic chamber. The centre of the radar units were positioned at 1.5 metres above the anechoic chamber floor in line with height of the test antennas.
- Conducted tests were performed with the horn antennas removed, a blanking plate containing radar absorbent material was fitted over the receiver port and waveguide to coaxial adaptor plate fitted to the transmitter port. Waveguides were fitted to each adaptor plate and the test system was connected to the waveguides by coaxial cables.
- Power was provided by a bench power supply. The power supply was located outside the anechoic chamber during radiated tests. Power cables were routed through an access point in the anechoic chamber wall.
- LAN connection was through Ethernet cable to a laptop PC. A bespoke application on the laptop PC was used to configure the EUT during tests. The laptop PC was located outside the anechoic chamber during radiated tests. Ethernet cables were routed through an access point in the anechoic chamber wall.
- EUT range was set to Normal 8 km for all tests.
- GPS receiver was enabled during all tests.
- Radar scan mode was disabled.
- The WLAN was enabled during all tests. The supplied antenna was fitted to the WLAN RF port on the EUT during tests.

5. Measurements, Examinations and Derived Results

5.1. General Comments

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to *Section 6. Measurement Uncertainty* for details.

5.2. Test Results**5.2.1. Transmitter RF Power Output (Conducted):****Test Summary:**

Test Engineer:	Nick Steele	Test Date:	18 April 2011
Test Sample Serial Number:	6B609		

FCC Part:	47CFR2.1046
Test Method Used:	As detailed in ANSI TIA-603-C-2004 2.2.1

Environmental Conditions:

Temperature (°C):	27
Relative Humidity (%):	29

Results:

Channel	Frequency (MHz)	Conducted RF Output Power (dBm)	Waveguide to coaxial adaptor plate loss (dB)	Total Conducted RF Power Output (dBm)
Bottom	16293.04	20.8	16.0	36.8
Centre	16718.04	20.7	16.0	36.7
Top	17139.91	19.5	16.0	35.5

Note(s):

1. Conducted output power was measured using a calibrated RF power meter with thermal power sensor. The stated loss of 16 dB for the waveguide to coaxial adaptor plate and waveguide was added to the conducted power measurement and the result recorded in the above tables.
2. The transmitter was enabled until the power measurement stabilised. The power was recorded at this point.

5.2.2. Transmitter Occupied Bandwidth (Bandwidth Limitations):**Test Summary:**

Test Engineer:	Nick Steele	Test Date:	14 May 2011
Test Sample Serial Number:	6B609		

FCC Part:	47CFR2.1049
Test Method Used:	Occupied bandwidth was measured using the occupied bandwidth function of a Rohde & Schwarz FSEM30 Test Receiver.

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	26

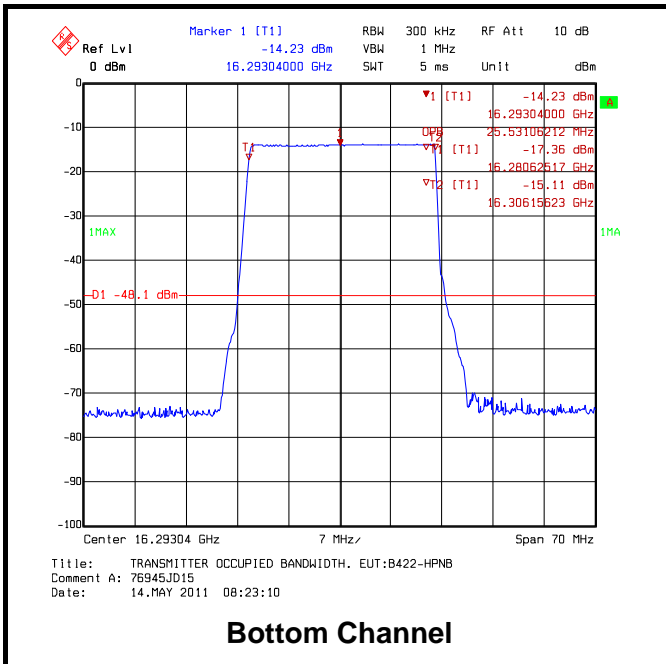
Results:

Channel	Frequency (MHz)	RBW (kHz)	VBW (kHz)	Occupied Bandwidth (MHz)
Bottom	16293.04	300	1000	25.531
Middle	16718.04	300	1000	25.531
Top	17139.91	300	1000	25.531

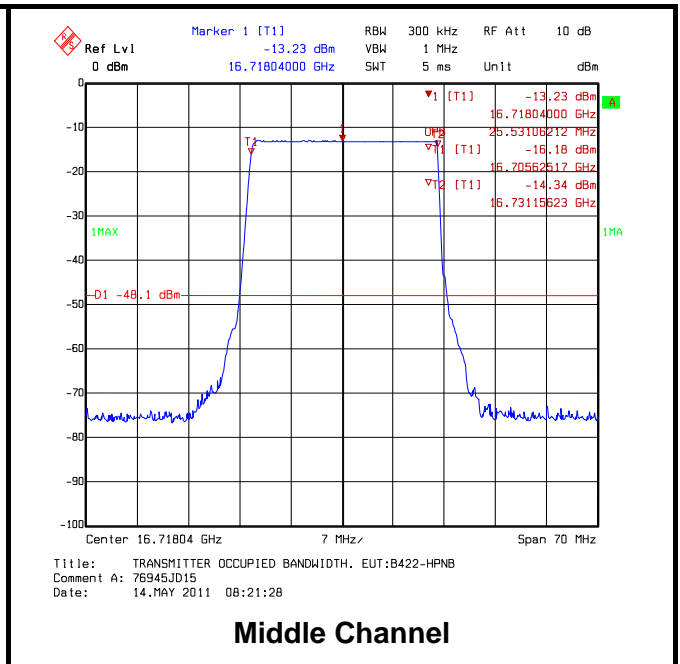
Note(s):

1. The test was performed as a conducted measurement at the antenna port.
2. The measurement equipment was configured to measure 99% of the power bandwidth.
3. Measurement bandwidths were set automatically by the test receiver.

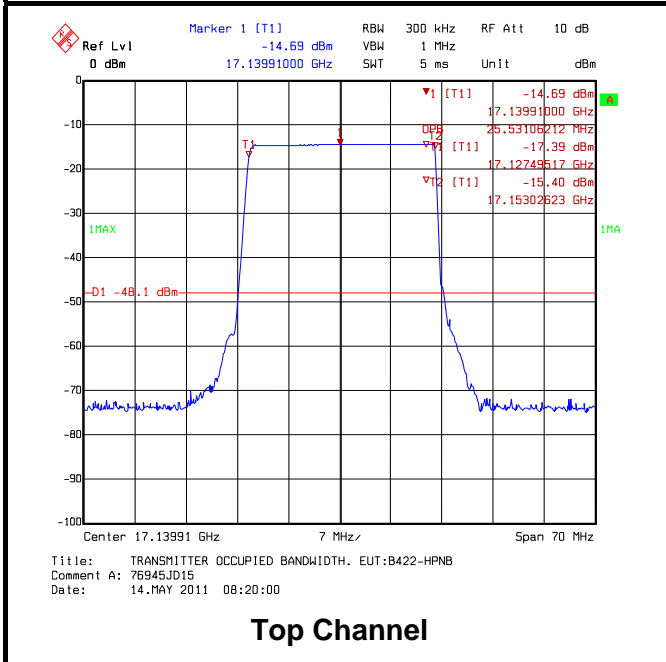
Transmitter Occupied Bandwidth (Bandwidth Limitations) (continued)



Bottom Channel



Middle Channel



Top Channel

5.2.3. Spurious Emissions At Antenna Terminals**Test Summary:**

Test Engineer:	Nick Steele	Test Date:	20 April 2011
Test Sample Serial Number:	6B609		

FCC Part:	47CFR2.1051 and 47CFR2.1057
Test Method Used:	As detailed in ANSI TIA-603-C-2004 Section 2.2.13

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	31

Results:

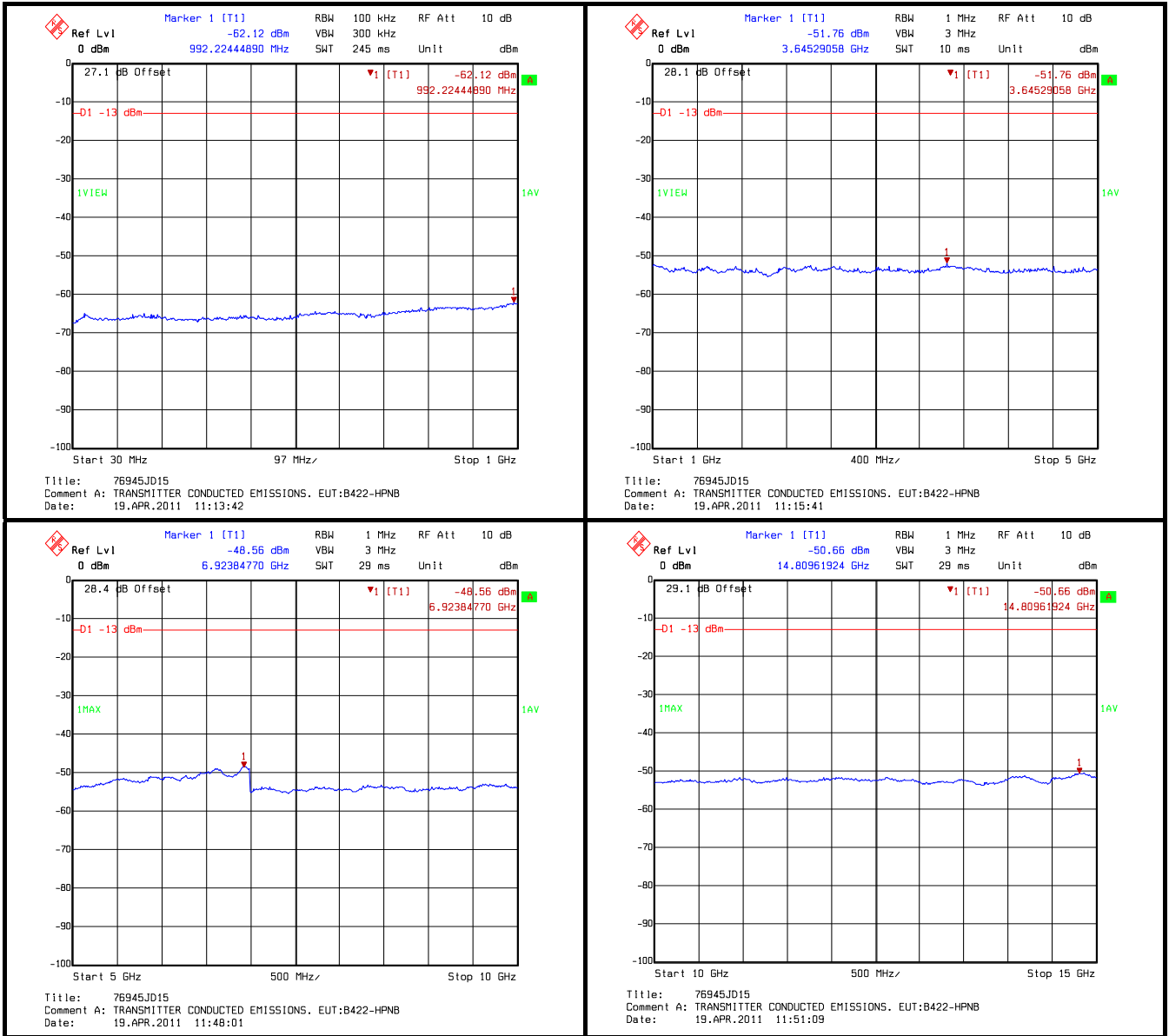
Frequency (GHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
18.717435	-39.6	-13.0	26.6	Complied

Note(s):

1. A waveguide to coaxial adaptor plate was fitted on transmitter antenna port. The antenna port under test was connected to the measurement equipment using suitable cables, attenuators and waveguides where required.
2. Pre-scans were performed with the EUT transmitting at maximum power on the highest frequency.
3. Measurements were performed from 30 MHz to 86 GHz.
4. The emissions shown on the 15 GHz to 20 GHz pre-scan plots at approximately 17 GHz is the carrier frequency of the EUT radar transmitter.
5. No spurious emissions were detected above the noise floor of the measuring receiver therefore the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above.

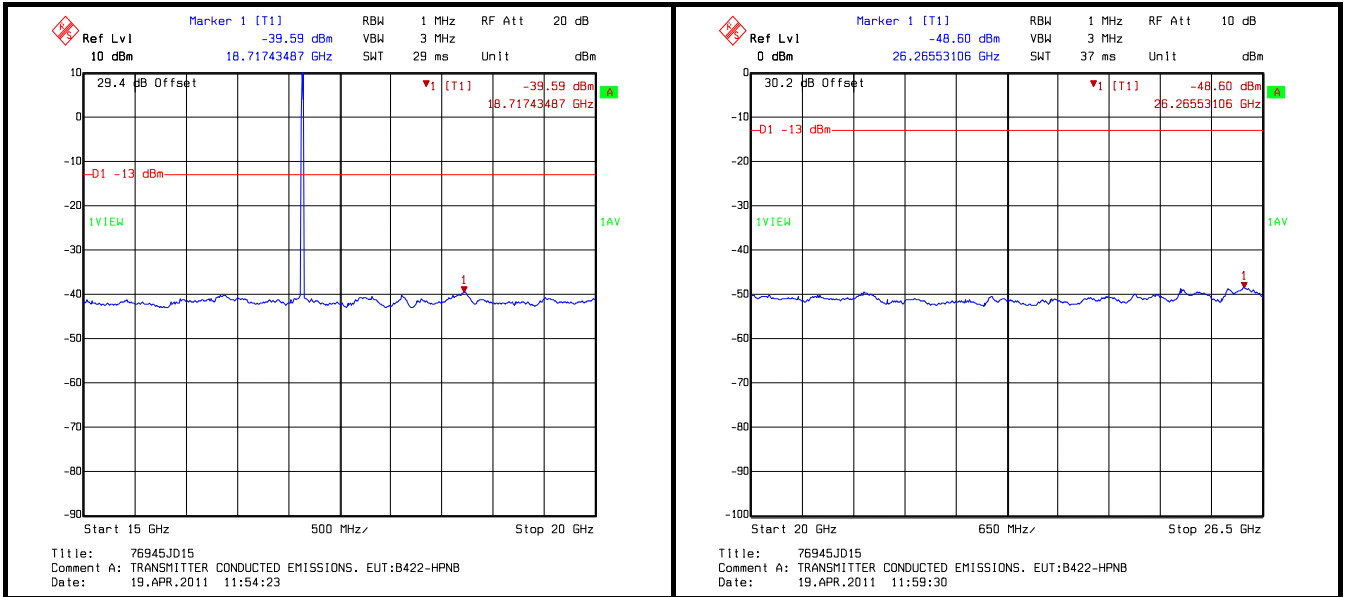
Spurious Emissions At Antenna Terminals (continued)

Top Channel



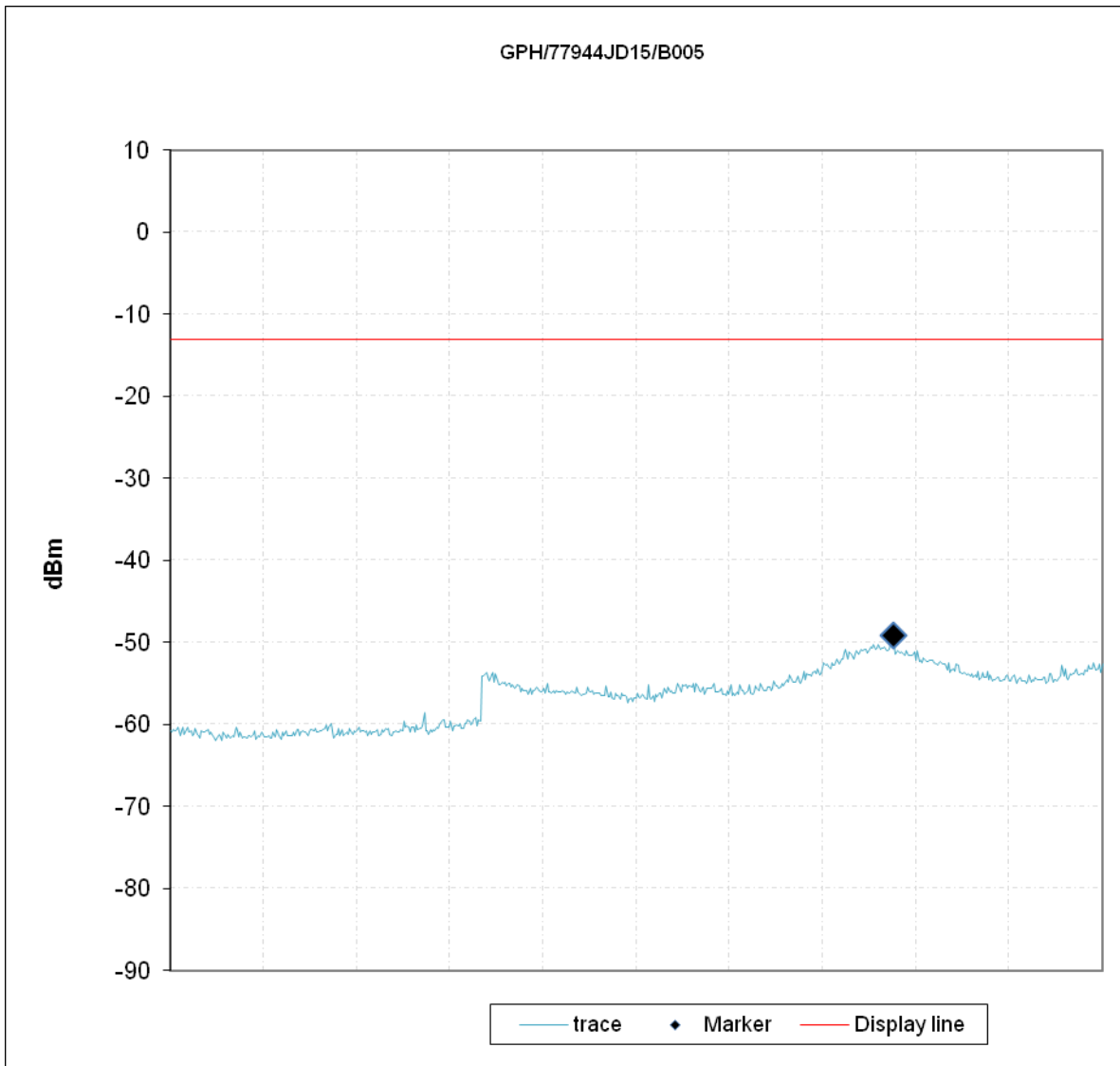
Spurious Emissions At Antenna Terminals (continued)

Top Channel



Spurious Emissions At Antenna Terminals (continued)

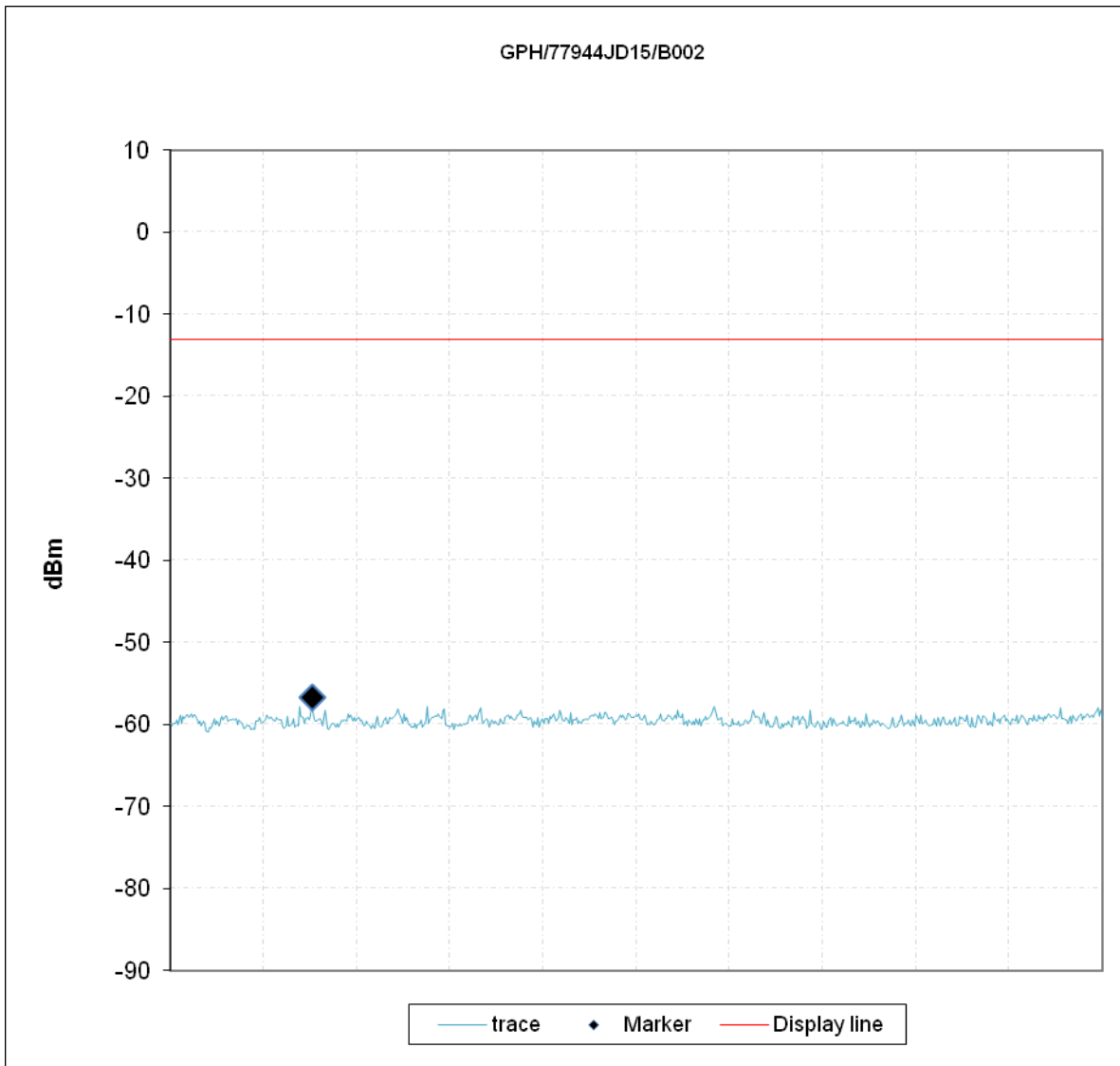
Top Channel



Start Frequency: 26.5 GHz
Stop Frequency: 40.0 GHz
RBW 1000 kHz; VBW 3000 kHz
Peak 36962.5 MHz; -49.17 dBm
Display Line: -13.0 dBm
Date: 20/04/2011; Time: 12:05:08

Spurious Emissions At Antenna Terminals (continued)

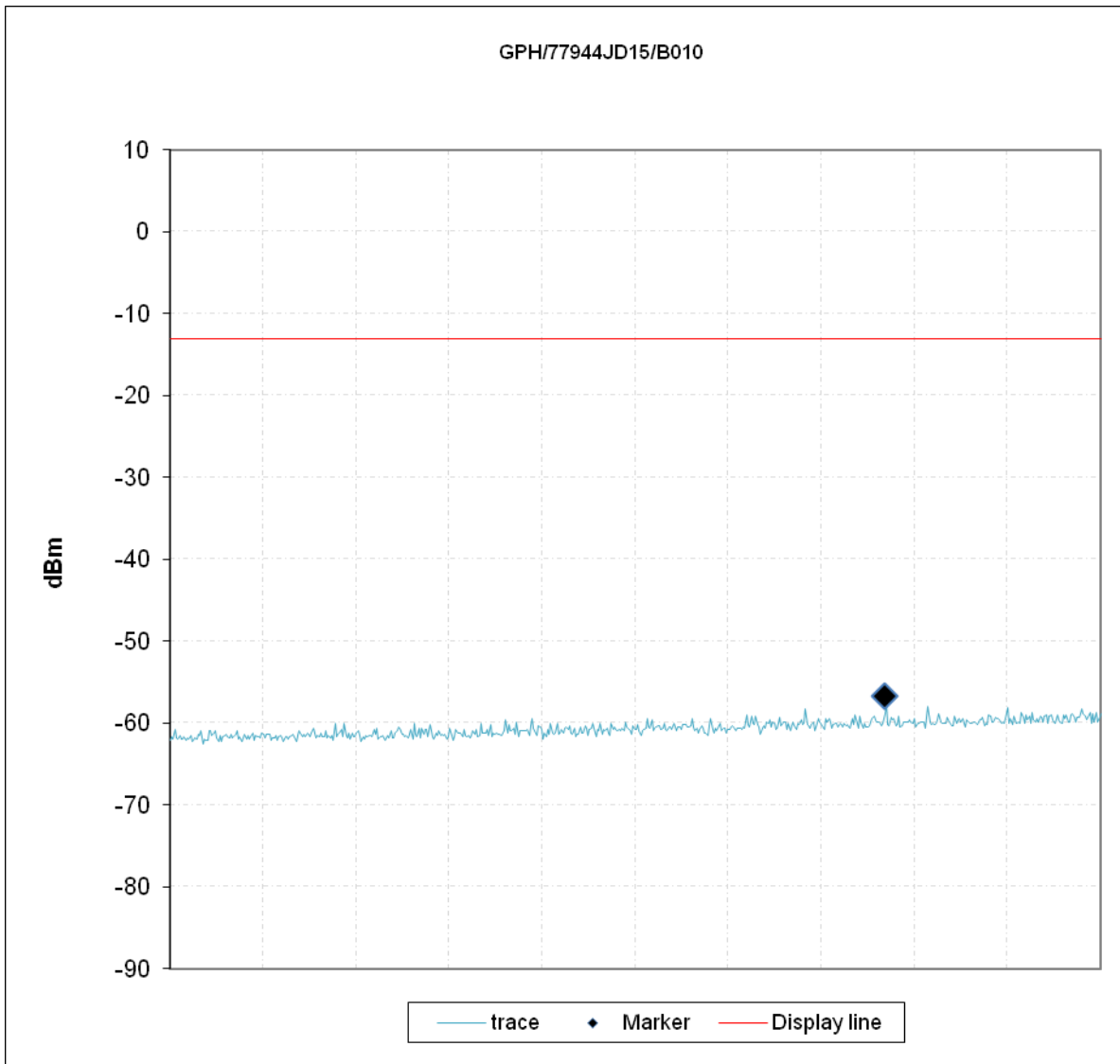
Top Channel



Start Frequency: 40.0 GHz
Stop Frequency: 60.0 GHz
RBW 1000 kHz; VBW 3000 kHz
Peak 4303.333 MHz; -56.67 dBm
Display Line: -13.0 dBm
Date: 20/04/2011; Time: 3:30:20

Spurious Emissions At Antenna Terminals (continued)

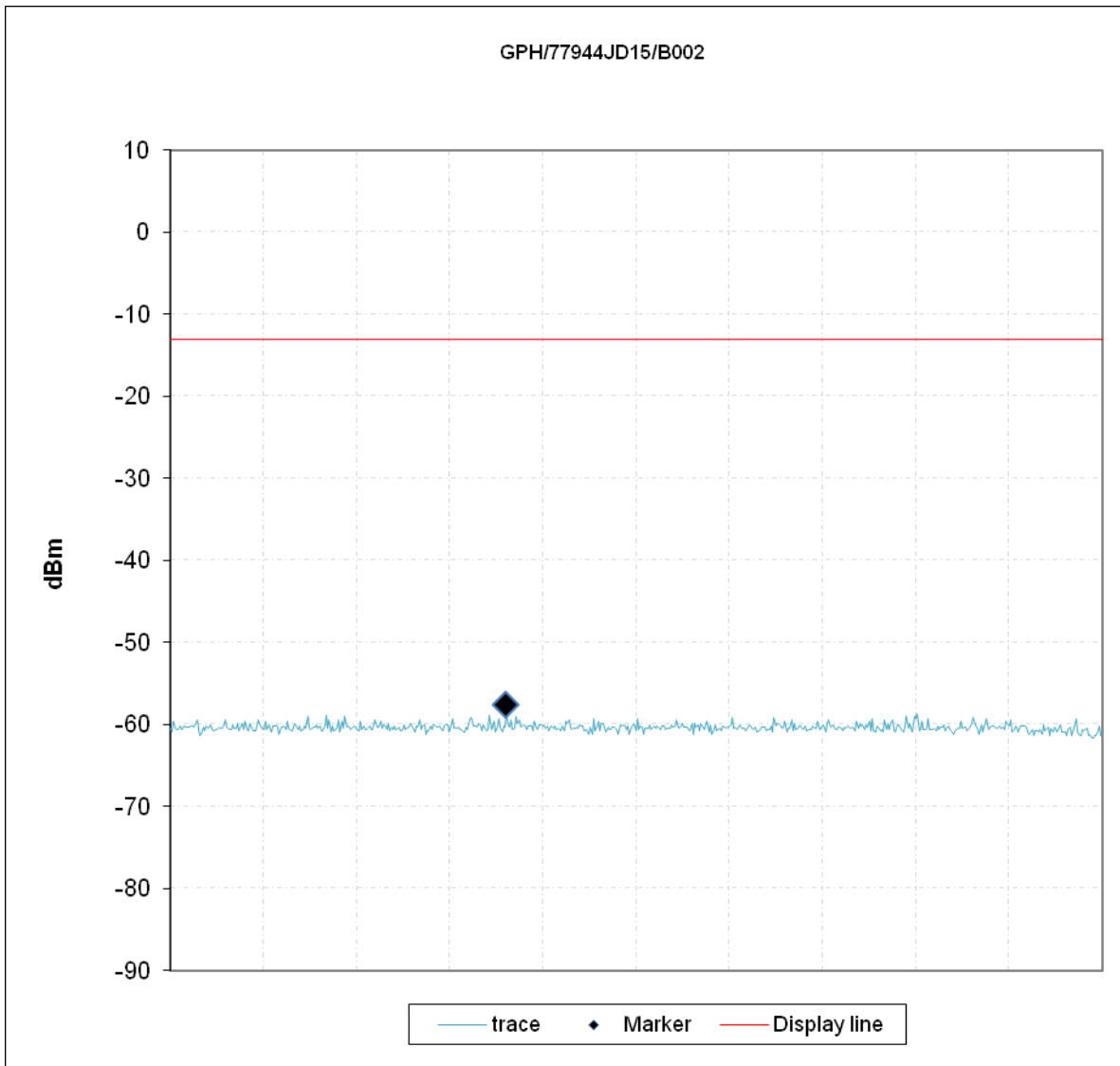
Top Channel



Start Frequency: 60.0 GHz
Stop Frequency: 75.0 GHz
RBW 1000 kHz; VBW 3000 kHz
Peak 71525. MHz; -56.67 dBm
Display Line: -13.0 dBm
Date: 20/04/2011; Time: 4:29:16

Spurious Emissions At Antenna Terminals (continued)

Top Channel



Start Frequency: 75.0 GHz
Stop Frequency: 86.0 GHz
RBW 1000 kHz; VBW 3000 kHz
Peak 83800. MHz; -57.67 dBm
Display Line: -13.0 dBm
Date: 20/04/2011; Time: 3:50:11

5.2.4. Field Strength of Spurious Radiation Out Of Band**Test Summary:**

Test Engineer:	Nick Steele	Test Date:	03, 04 & 05 May 2011
Test Sample Serial Number:	6B609		

FCC Part:	47CFR2.1053 and 47CFR2.1057
Test Method Used:	As detailed in ANSI TIA-603-C-2004 Section 2.2.12

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	17

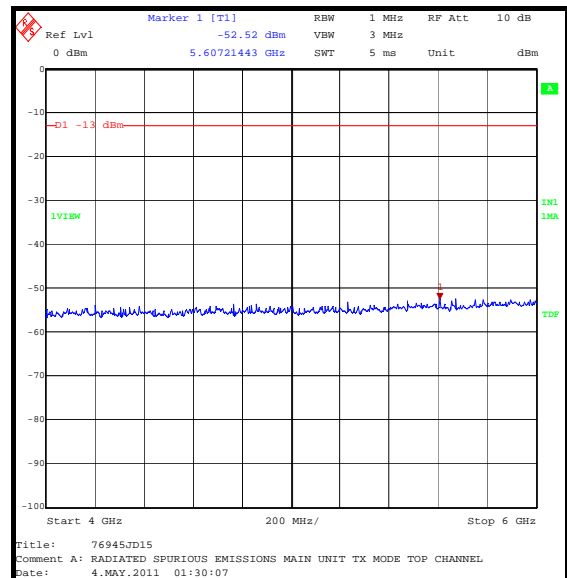
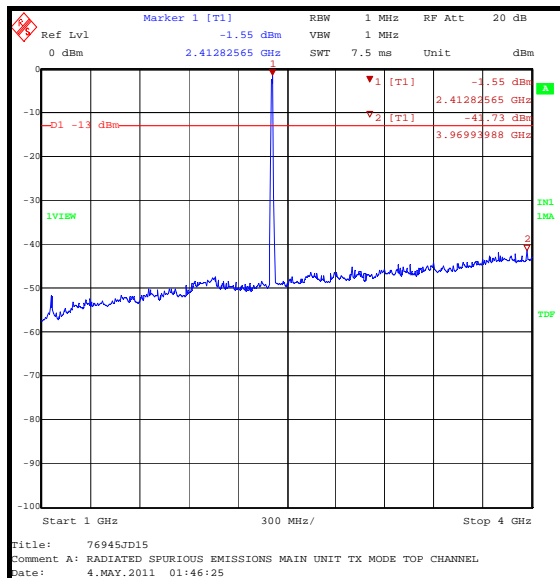
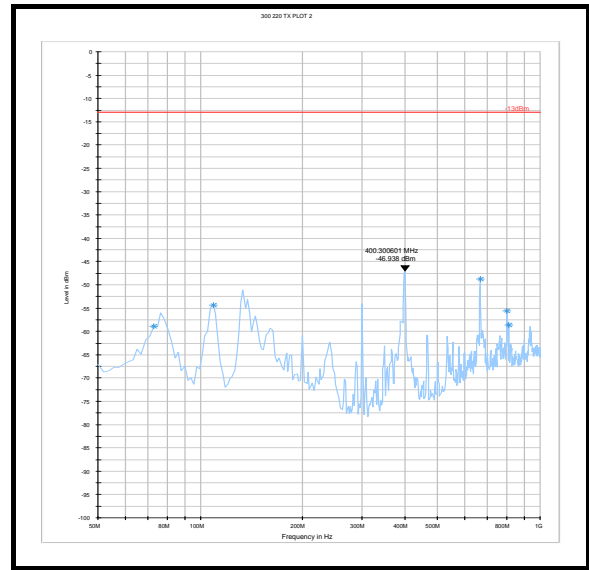
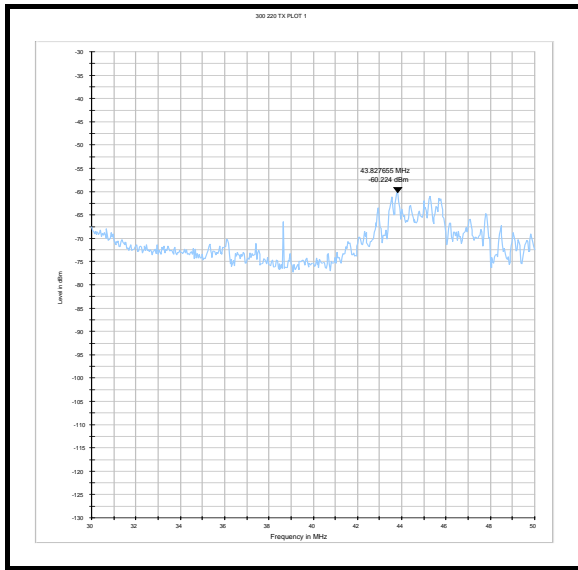
Results:

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
17604.392	-37.4	-13.0	24.4	Complied

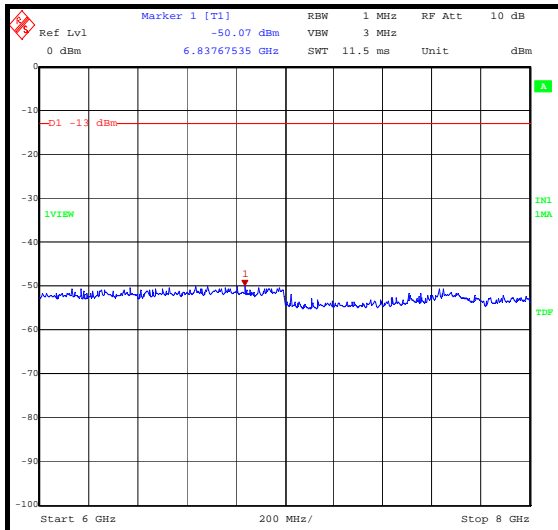
Note(s):

1. Pre-scans were performed with the EUT transmitting at maximum power on the highest frequency.
2. The emissions shown on the 15 GHz to 20 GHz pre-scan plots at approximately 17 GHz is the carrier frequency of the EUT radar transmitter.
3. No spurious emissions were detected above the noise floor of the measuring receiver. Where possible, the noise floor was at least 20 dB below the specified limit.

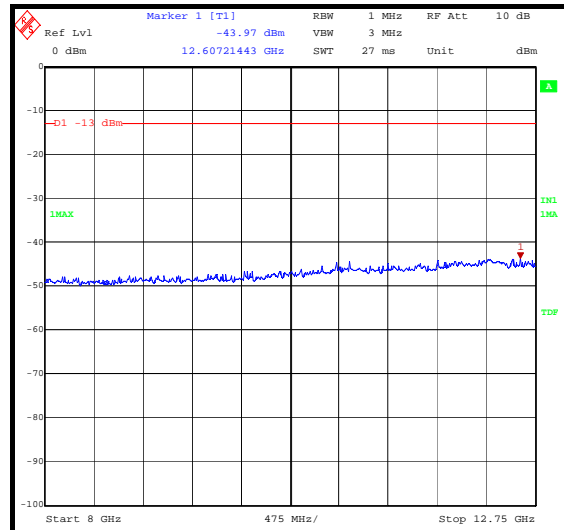
Field Strength of Spurious Radiation Out Of Band (continued):



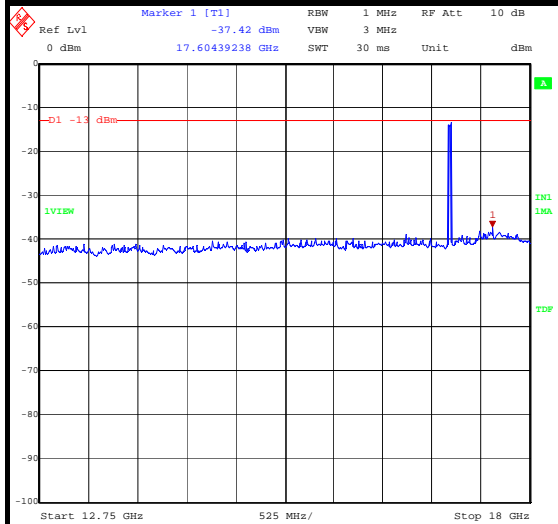
Field Strength of Spurious Radiation Out Of Band (continued):



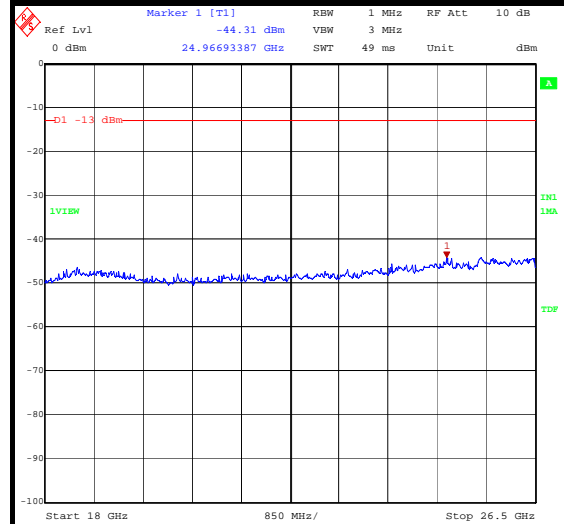
Title: 76945JD15
Comment A: RADIATED SPURIOUS EMISSIONS MAIN UNIT TX MODE TOP CHANNEL
Date: 4.MAY.2011 01:21:55



Title: 76945JD15
Comment A: RADIATED SPURIOUS EMISSIONS MAIN UNIT TX MODE TOP CHANNEL
Date: 4.MAY.2011 01:11:20

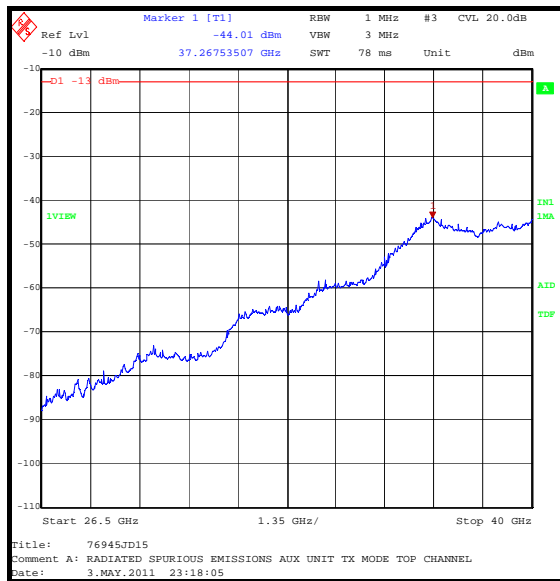


Title: 76945JD15
Comment A: RADIATED SPURIOUS EMISSIONS AUX UNIT TX MODE TOP CHANNEL
Date: 4.MAY.2011 00:23:07

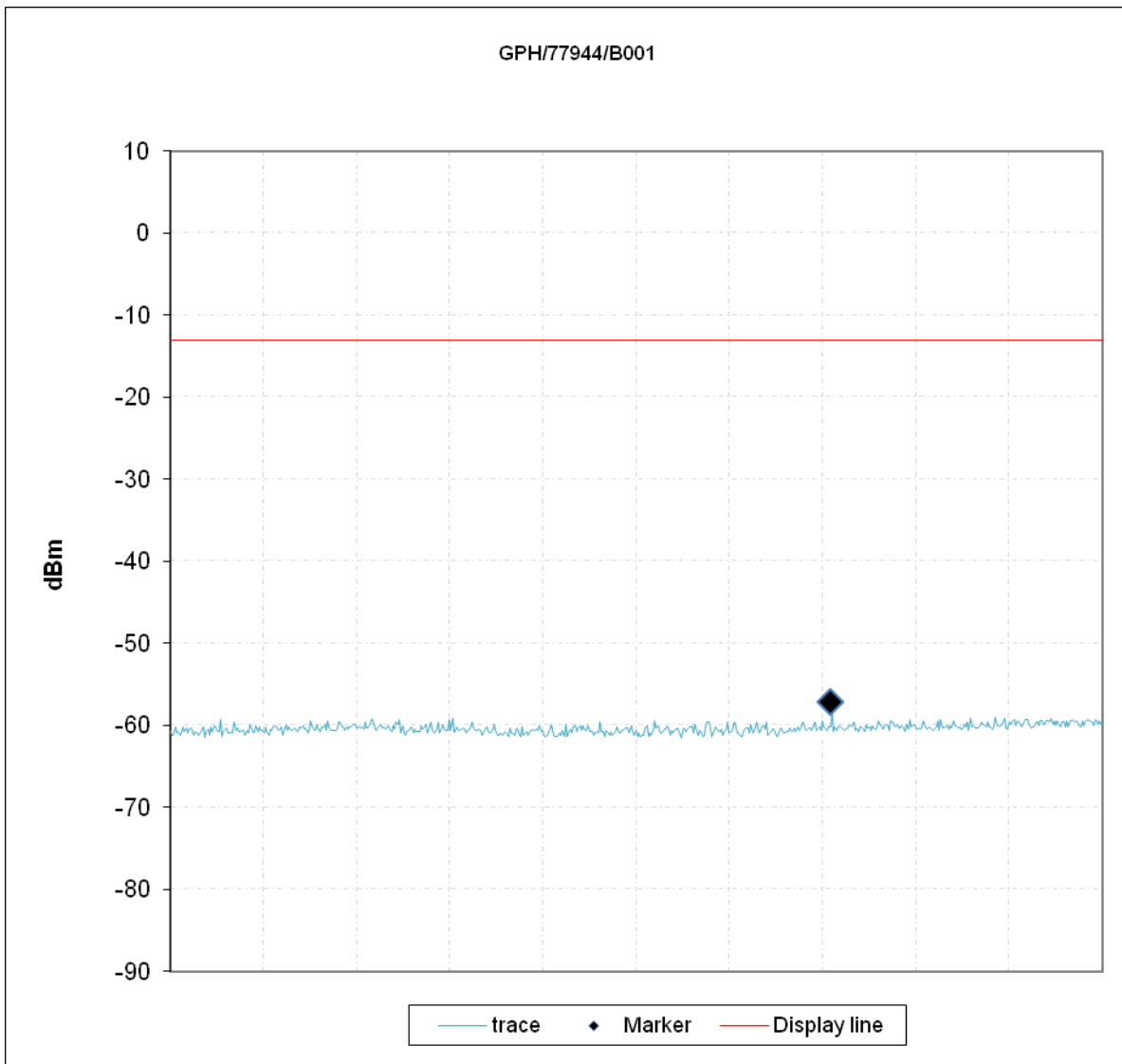


Title: 76945JD15
Comment A: RADIATED SPURIOUS EMISSIONS AUX UNIT TX MODE TOP CHANNEL
Date: 4.MAY.2011 00:00:53

Field Strength of Spurious Radiation Out Of Band (continued):

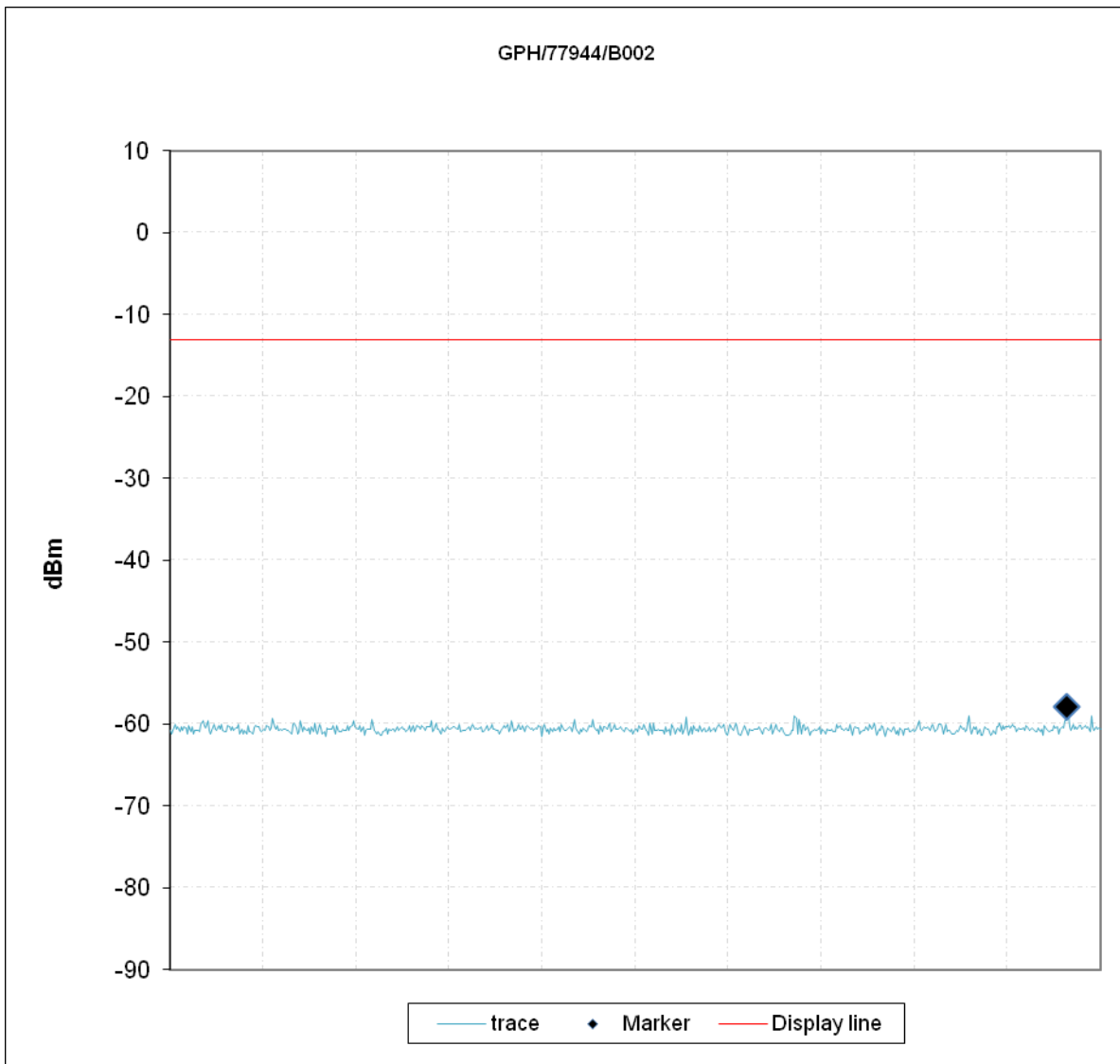


Field Strength of Spurious Radiation Out Of Band (continued):



Start Freq 40 GHz; Stop Freq 60GHz
Ref 10.0 dB
RBW 1000 KHz; VBW 3000 KHz
Peak 54166.667 GHz; -57.17 dBm
Date: 12/05/2011; Time: 8:53:10 PM
Display line: -13dBm

Field Strength of Spurious Radiation Out Of Band (continued):



Start Freq 60.0GHz; Stop Freq 75.0GHz

Ref 10.0 dB

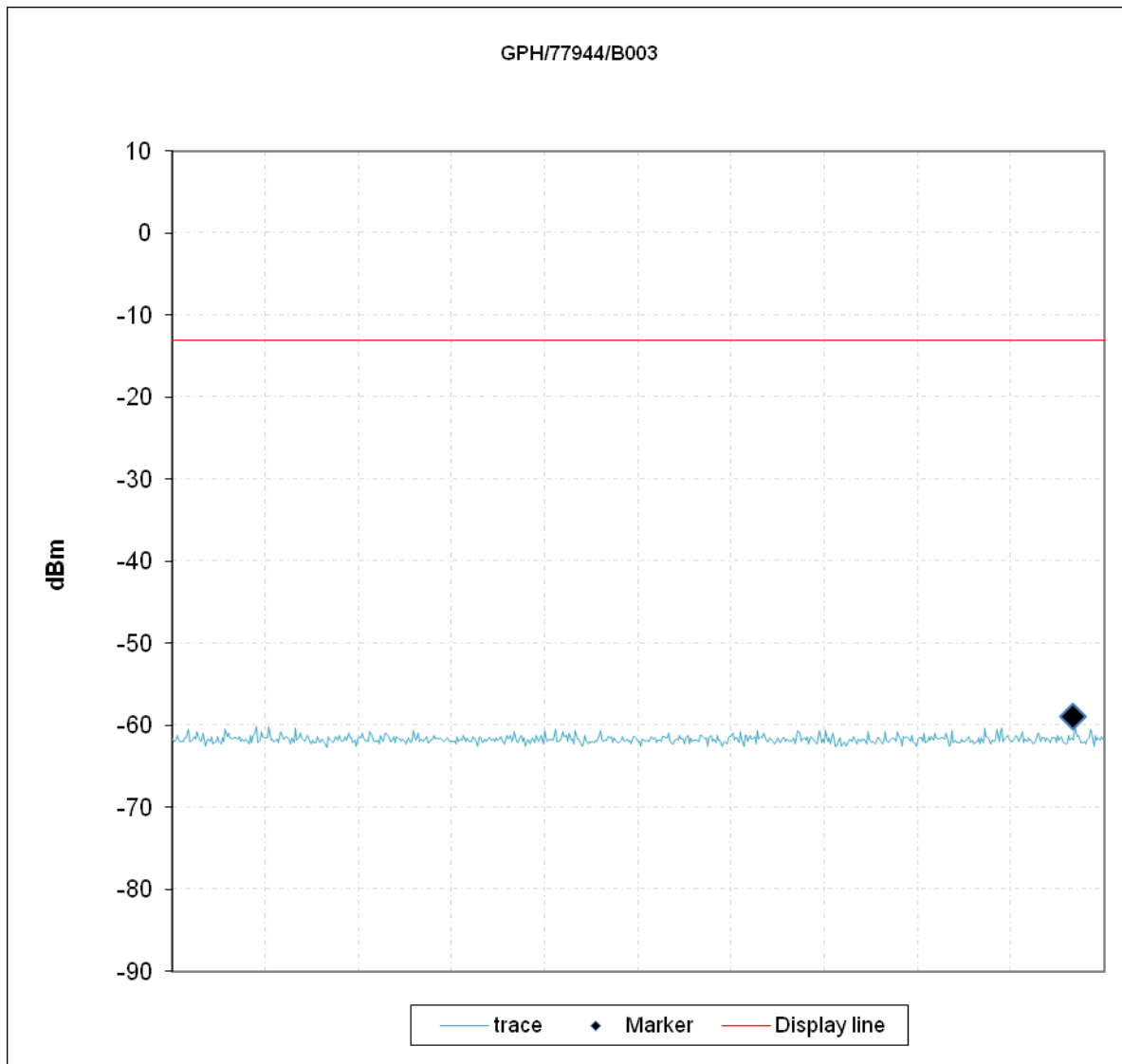
RBW 1000 KHz; VBW 3000 KHz

Peak 74450. GHz; -57.83 dBm

Date: 12/05/2011; Time: 8:35:55 PM

Display line: -13dBm

Field Strength of Spurious Radiation Out Of Band (continued):



Start Freq 75.0GHz; Stop Freq 86.0GHz

Ref 10.0 dB

RBW 1000 KHz; VBW 3000 KHz

Peak 85633.333 GHz; -59 dBm

Date: 12/05/2011; Time: 8:17:32 PM

Display line: -13dBm

5.2.5. Field Strength of Spurious Radiation at Band Edges

Test Summary:

Test Engineer:	Nick Steele	Test Date:	04 May 2011
Test Sample Serial Number:	6B609		

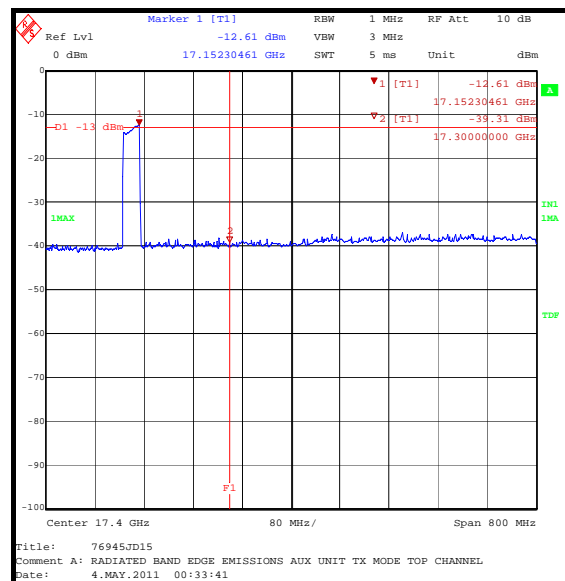
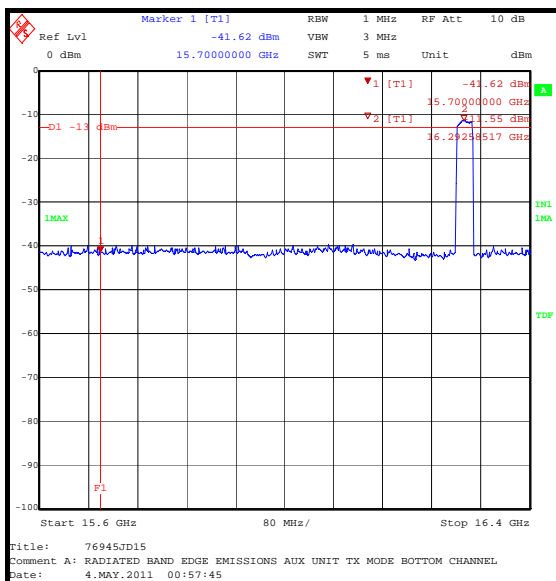
FCC Part:	47CFR2.1053
Test Method Used:	ANSI/TIA-603-C-2004 Section 2.2.12

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	17

Results:

Frequency (MHz)	Peak Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
15700	-41.6	-13.0	28.6	Complied
17300	-39.3	-13.0	26.3	Complied



6. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document "approximately" is interpreted as meaning "effectively" or "for most practical purposes".

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
Radiated Spurious Emissions	30 MHz to 86 GHz	95%	±2.94 dB
Conducted Spurious Emissions	30 MHz to 86 GHz	95%	±0.27 dB
RF Power Output	16.2 GHz to 17.2 GHz	95%	±2.94 dB
Occupied Bandwidth	16.2 GHz to 17.2 GHz	95%	±0.92 ppm

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty the published guidance of the appropriate accreditation body is followed.

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval months
A1033	Harmonic Mixer	Hewlett Packard	11970W	2521A01380	09 Jun 2010	12
A1242	Antenna	Dorado International	12-GH-12-2	0002	Verified before use*	12
A1245	Antenna	Dorado International	GH-10-25	200010	Verified before use*	12
A1490	Attenuator	Weinschel Corp	23-30-34	BH9156	09 Feb 2012	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	06 Jun 2011	12
A1818	Antenna	EMCO	3115	00075692	05 Sep 2011	12
A1916	Antenna	Flann Microwave	25240-25	166399	11 May 2011	12
A1997	Attenuator	Huber + Suhner	6810.17.B	301749	09 Feb 2012	12
A202	Antenna	Flann Microwave	24240-20	116	11 May 2013	36
A203	Antenna	Flann Microwave	22240-20	343	11 May 2013	36
A253	Antenna	Flann Microwave	12240-20	128	05 Sep 2011	12
A254	Antenna	Flann Microwave	14240-20	139	05 Sep 2011	12
A256	Antenna	Flann Microwave	18240-20	400	05 Sep 2011	12
A436	Antenna	Flann Microwave	20240-20	330	05 Sep 2011	12
A553	Antenna	Chase	CBL6111A	1593	26 Mar 2012	12
G0543	Amplifier	Sonoma Instrument	310N	230801	30 Jun 2011	12
G085	Signal Generator	Hewlett Packard	83650L	3614A00104	09 Nov 2012	24
K0001	5m Semi-Anechoic Chamber	Rainford EMC	N/A	N/A	25 June 2011	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	05 Sep 2011	12
M1099	50 Ohm Load	Narda	370 BNF	DC-18GHz	Calibrated before use	-
M1124	Test Receiver	Rohde & Schwarz	ESI26	100046K	22 June 2011	12
M1145	Power Meter	Hewlett Packard	437B	3737U26557	17 Jun 2011	12
M1147	Power Sensor	Hewlett Packard	8485A	2238A00928	14 Sep 2011	12
M1242	Spectrum Analyser	Rohde & Schwarz	FSEM30	845986/022	03 Dec 2011	12
M1253	Spectrum Analyser	Hewlett Packard	8564E	3442A00262	15 Feb 2012	12
M1269	Multimeter	Fluke	179	90250210	15 July 2011	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	04 Feb 2012	12

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval months
M177	Harmonic Mixer	Hewlett Packard	11974V	3001A00273	27 Jul 2011	12
M194	Harmonic Mixer	Hewlett Packard	11970V	2521A01005	09 Feb 2014	36
M197	Harmonic Mixer	Hewlett Packard	11970U	2332A00782	13 Jun 2011	12
S011	DC Power Supply	Instek	PR-3010H	9401270	Calibrated before use	-

* The physical dimensions of the horn aperture have been verified.

NB In accordance with UKAS requirements all the measurement equipment is on a calibration schedule.