



**A TEST REPORT**  
**FOR**  
**TEAM SIMOCO Ltd**  
**ON**  
**SB2025NT100W**  
**Private Land Mobile Radio**  
**DOCUMENT NO. TRA-009039-W-US-1**

TEST REPORT NO: TRA-009039-W-US-1

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FCC ID: U89SB2K5354TRV

**REPORT ON THE CERTIFICATION TESTING OF A  
TEAM SIMOCO  
SB2025NT100W  
WITH RESPECT TO  
THE FCC RULES CFR 47,  
PART 90**

**PRIVATE LAND MOBILE RADIO.**

TEST DATE: 15<sup>th</sup> – 23<sup>rd</sup> February 2012

**TRaC**  
testing regulatory and compliance



APPROVED BY: \_\_\_\_\_

J CHARTERS  
RADIO  
PRODUCT  
MANAGER

DATE: 14<sup>th</sup> March 2012

Distribution:

- Copy Nos:
1. Team Simoco
  2. TRaC Global

THIS DOCUMENT MAY BE REPRODUCED ONLY IN ITS ENTIRETY AND WITHOUT CHANGE

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### Notes:

1. Component failure during test
 

YES	[ ]
NO	[X]
2. If Yes, details of failure:
3. The facilities used for the testing of the product contain in this report are FCC Listed.

**CERTIFICATE OF CONFORMITY & COMPLIANCE**

FCC IDENTITY: U89SB2K5354TRV

PURPOSE OF TEST: Certification

TEST SPECIFICATION: FCC RULES CFR 47, Part 90

TEST RESULT: Compliant to Specification

EQUIPMENT UNDER TEST: SB2025NT100W

EQUIPMENT TYPE: Private Land Mobile Radio

FREQUENCY OF OPERATION: 850MHz – 870MHz

MAXIMUM OUTPUT CONDUCTED: 49.87dBm 97.05W

MODULATION TYPE: F3E, F1E

POWER SOURCE(s): +13.8Vdc/28Vdc

TEST DATE(s): 15<sup>th</sup> – 23<sup>rd</sup> February 2012

APPLICANT: Team Simoco

ADDRESS: Team Simoco Ltd  
Field House  
Uttoxeter Old Road  
Derby  
DE1 1NH

APPROVED BY:



RADIO  
PRODUCT  
MANAGER

## APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT):	SB2025NT100W 800MHz
EQUIPMENT TYPE:	Private Land Mobile Radio
PURPOSE OF TEST:	Certification
TEST SPECIFICATION(s):	FCC RULES CFR 47, Part 90
TEST RESULT:	COMPLIANT      Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
APPLICANT'S CATEGORY:	MANUFACTURER <input checked="" type="checkbox"/> IMPORTER <input type="checkbox"/> DISTRIBUTOR <input type="checkbox"/> TEST HOUSE <input type="checkbox"/> AGENT <input type="checkbox"/>
APPLICANT'S CONTACT PERSON(s):	Mr Richard Stimson
EMAIL ADDRESS	Richard.stimson@teamsimoco.com
APPLICANT:	Team Simoco Ltd
ADDRESS:	Team Simoco Ltd Field House Uttoxeter Old Road Derby DE1 1NH
TEL:	01332 375414
MANUFACTURER:	Team Simoco Ltd
EUT(s) COUNTRY OF ORIGIN:	United Kingdom
TEST LABORATORY:	TRaC Global
TEST DATE(s):	15 <sup>th</sup> – 23 <sup>rd</sup> February 2012
TEST REPORT No:	TRA-009039-W-US-1

## EQUIPMENT TEST / EXAMINATIONS REQUIRED

1.	TEST/EXAMINATION	RULE PART	APPLICABILITY	RESULT
	RF Power Output	90.205	Yes	Complies
	Audio Frequency Response (a)	2.1047	Yes	Complies
	Modulation Limiting	2.1047	No	N/a
	Occupied Bandwidth	90.210	Yes	Complies
	Spurious Emissions at Antenna Terminals	90.210	Yes	Complies
	Field Strength of Spurious Emissions	90.210	Yes	Complies
	Field Strength of Un- Intentional Spurious Emissions	15.109	Yes	Complies
	Frequency Stability	90.213	Yes	Complies
	Transient behaviour	90.214	No	Complies
	Emission Mask	90.210(d)	Yes	Complies

2. Product class: Class A ☒ Class B ☐
3. Product Use: Private Land Mobile Radio
4. Emission Designator: F3E, F1E
5. Temperatures: Ambient (Tnom) 24°C
6. Supply Voltages: Vnom +13.8Vdc  
+28.0Vdc  
Note: Vnom voltages are as stated above unless otherwise shown on the test report page
7. Equipment Category: Single channel ☐  
Two channel ☐  
Multi-channel ☒
8. Channel spacing: Narrowband ☐  
Wideband ☒
9. Test Location TRaC Global  
Skelmersdale ☒
10. Modifications made during test program No modifications were performed.

### System description:

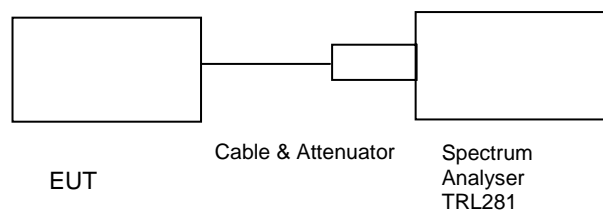
The SB2025NT100W is a radio base station capable of operating in analogue FM and digital P25 modes as a stand-alone repeater or as part of a simulcast/voted system. Inputs are provided for connection to external frequency and 1PPS timing signals to ensure the accurate frequency and modulation synchronisation necessary for simulcast operation. Dispatcher connection is via Ethernet using the TIA DFSI protocol."

## COMPLIANCE TESTS

### RF OUTPUT POWER – CONDUCTED – PART 2.1046

Ambient temperature = 24°C  
 Relative humidity = 56%  
 Supply voltage = +13.8Vdc/+28.0Vdc  
 Channel number = See test results

Radio Laboratory



Frequency MHz	Level at Analyser (dBm)	Output Cable & Attenuator loss (dB)	Conducted Output Power (dBm)	Conducted Output Power (W)	Rated output Power (dBm)	Rated output Power (W)
850.0125	9.20	40.63	49.83	96.16	50	100
860.0000	9.20	40.60	49.80	95.49	50	100
869.9875	9.20	40.87	49.87	97.05	50	100

Notes: Power and antenna height clause 90.205(k) refers to limitations specified in clause 90.635 in the band 850MHz – 870MHz. the maximum allowable station effective radiated power (ERP) is dependent upon the station's antenna AAT and the required service area.

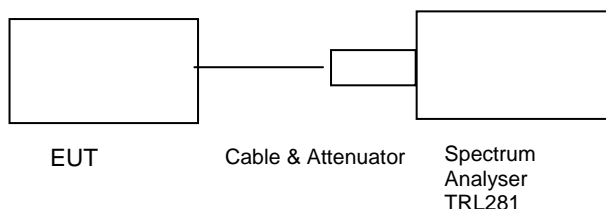
TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	R&S	FSU46	200034	TRL281	<b>X</b>
CABLE	TRAC	N/A	N/A	UH271	<b>X</b>
CABLE	TRAC	N/A	N/A	UH272	<b>X</b>
ATTENUATOR	SPINNER	745357	N/A	TRLUH225	<b>X</b>
ATTENUATOR	-	-	-	20dB	<b>X</b>
ATTENUATOR	BIRD	8304-100-N	N/A	222	

## TRANSMITTER TESTS

### 99% Bandwidth – CONDUCTED – Part 90.209

Ambient temperature = 24°C  
 Relative humidity = 56%  
 Supply voltage = +13.8Vdc/+28.0Vdc  
 Channel number = See test results

Radio Laboratory



Note:

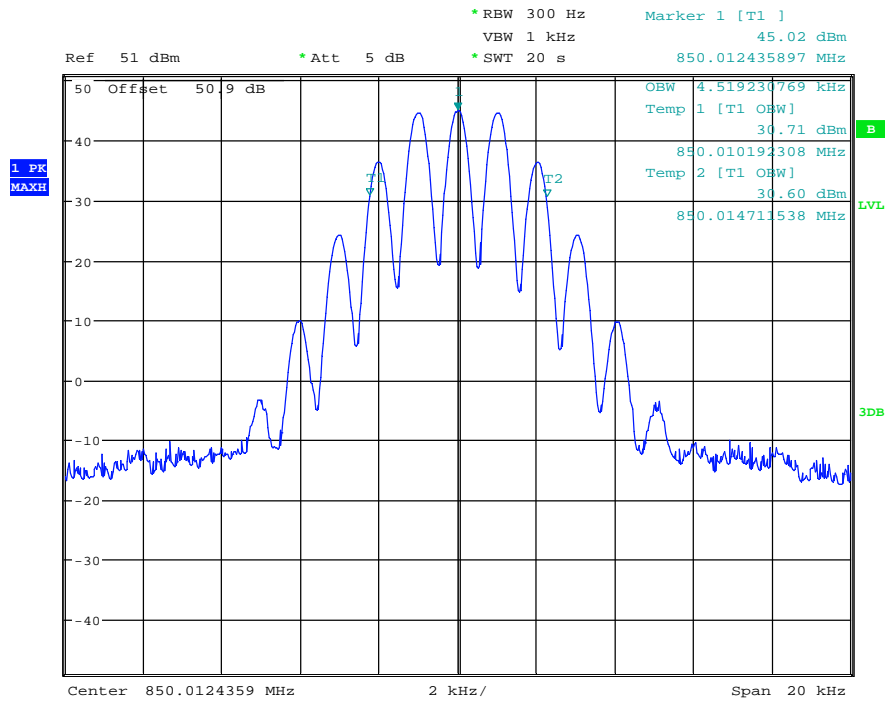
1. Cable and attenuator between EUT and spectrum analyser 50dB
2. See Table below for 99% Power Occupied Bandwidth
3. Internally generated test tone analogue speech
4. P25 Internally generated test tone C4FM

Frequency Of Operation Channel	Modulation Type
FM 2.5kHz Deviation	
850.0125MHz	99% Bandwidth =4.51kHz
860.0000MHz	99% Bandwidth =4.51kHz
869.9875MHz	99% Bandwidth =4.51kHz
P25 Modulation	
850.0125MHz	99% Bandwidth =9.21kHz
860.0000MHz	99% Bandwidth =9.21kHz
869.9875MHz	99% Bandwidth =9.05kHz

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRAC No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU46	200034	UH281	<b>X</b>
CABLE	TRAC	N/A	N/A	UH271	<b>X</b>
CABLE	TRAC	N/A	N/A	UH272	<b>X</b>
ATTENUATOR	SPINNER	745357	N/A	TRLUH225	<b>X</b>
ATTENUATOR	-	-	-	20dB	<b>X</b>
ATTENUATOR	BIRD	8304-100-N	N/A	222	<b>X</b>

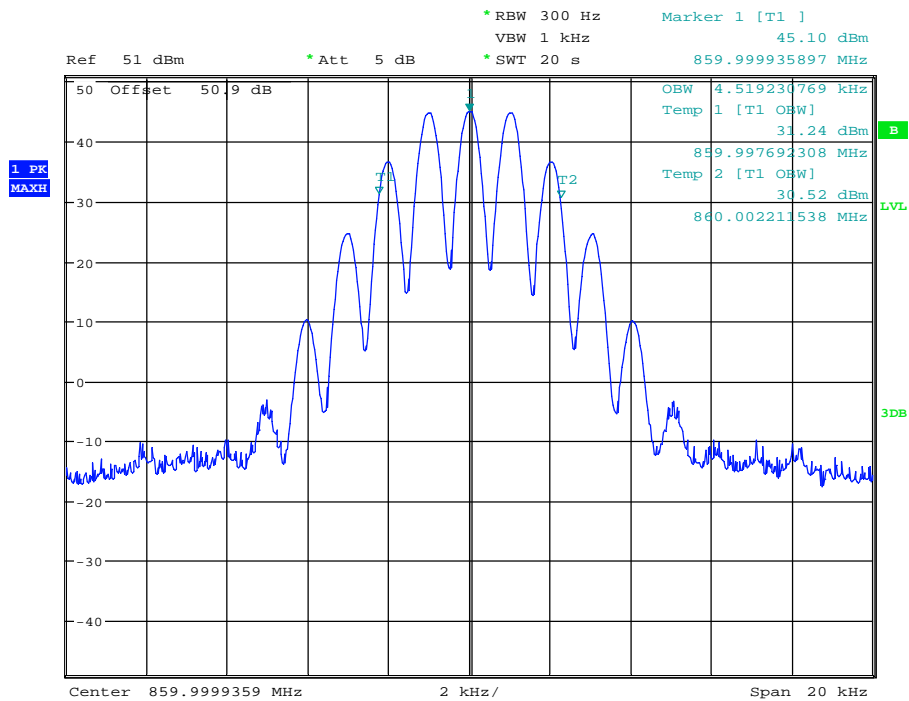


## 850.0125MHz analogue speech



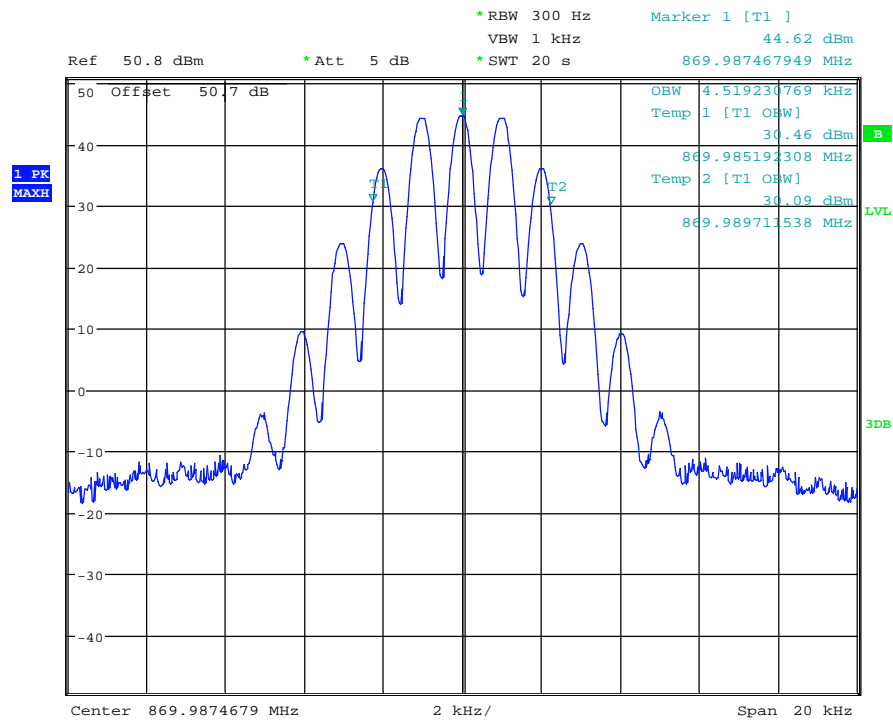
Date: 17.FEB.2012 12:52:11

## 860MHz analogue speech



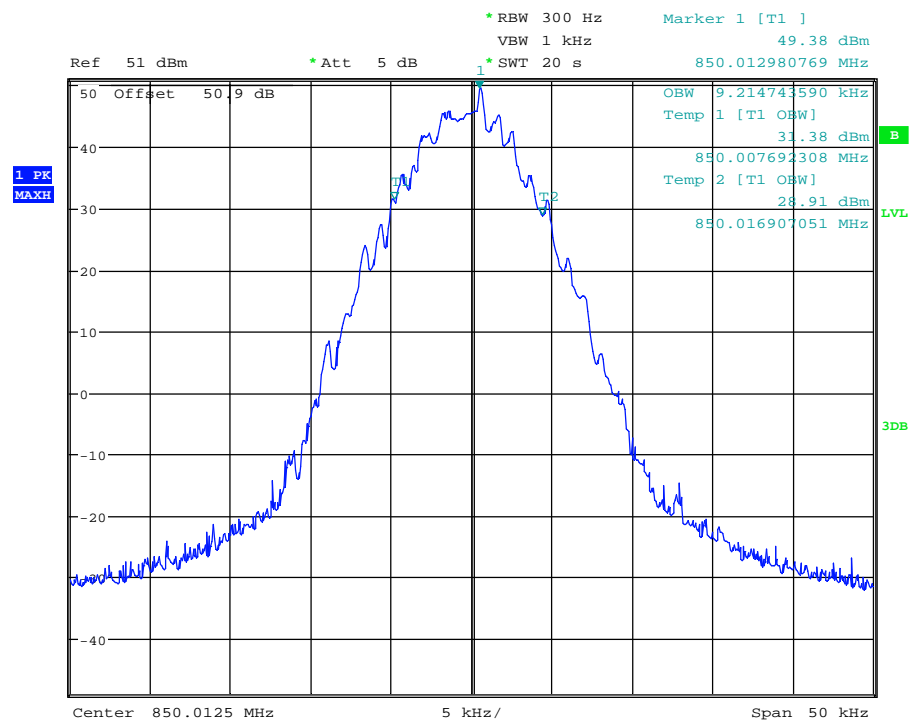
Date: 17.FEB.2012 13:02:31

# 869.9875MHz analogue speech



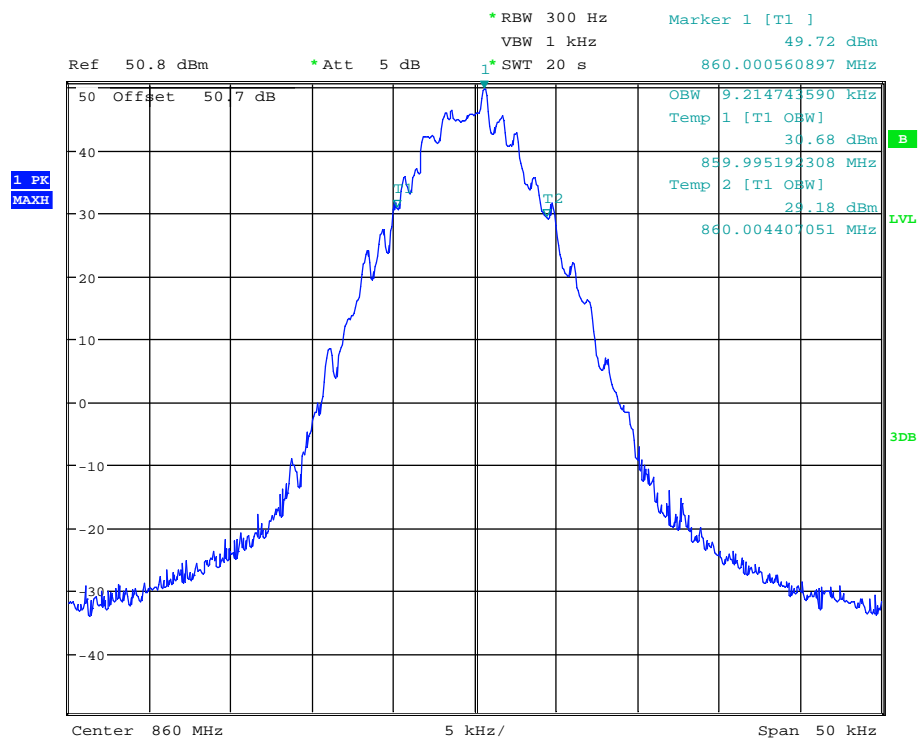
Date: 17.FEB.2012 13:08:04

## 850.0125MHz P25 Modulation



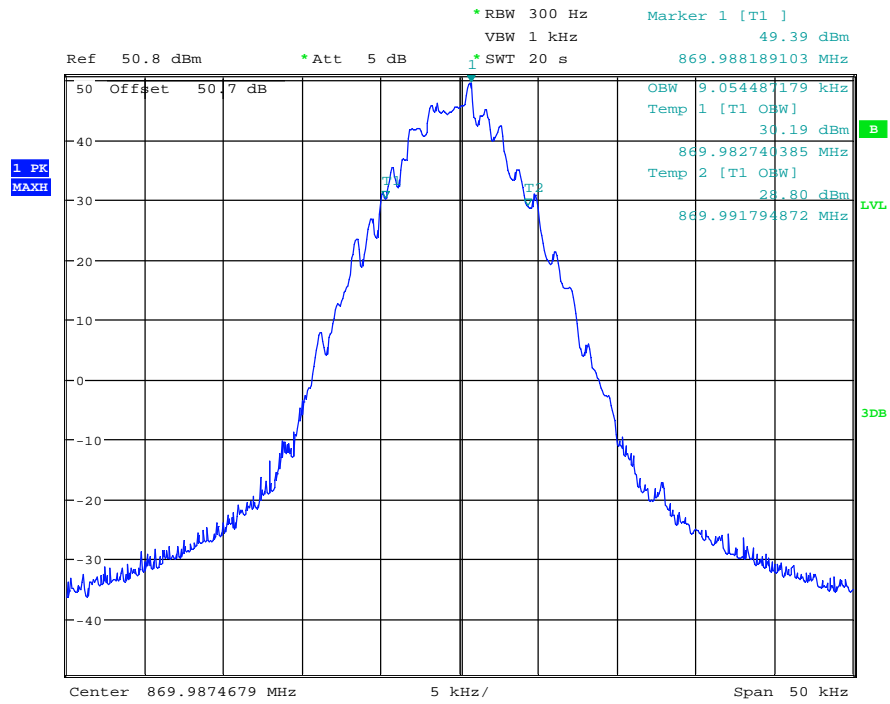
Date: 17.FEB.2012 13:38:28

## 860.00MHz P25 Modulation



Date: 17.FEB.2012 13:27:09

# 869.9875MHz P25 Modulation



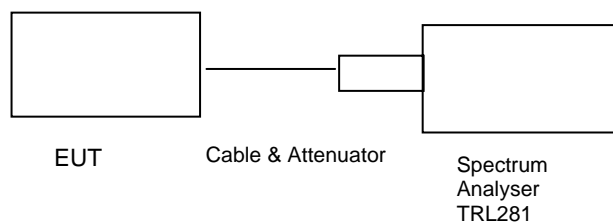
Date: 17.FEB.2012 13:19:11

## TRANSMITTER TESTS

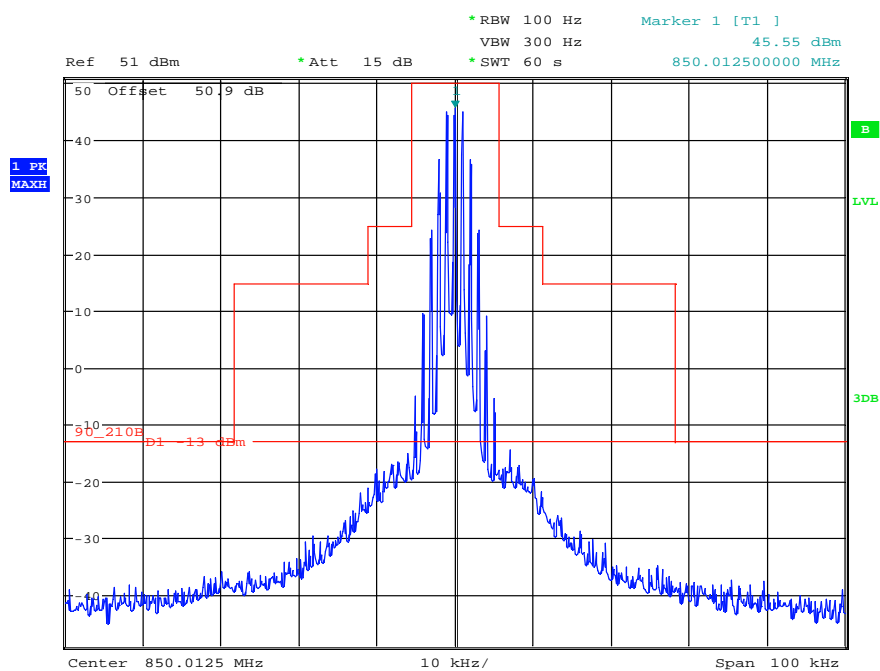
### Occupied Bandwidth Emission Masks. Part 90.210(b)

Ambient temperature = 24°C  
Relative humidity = 56%  
Supply voltage = +13.8Vdc/+28.0Vdc

Radio Laboratory  
Test Signal = F3E

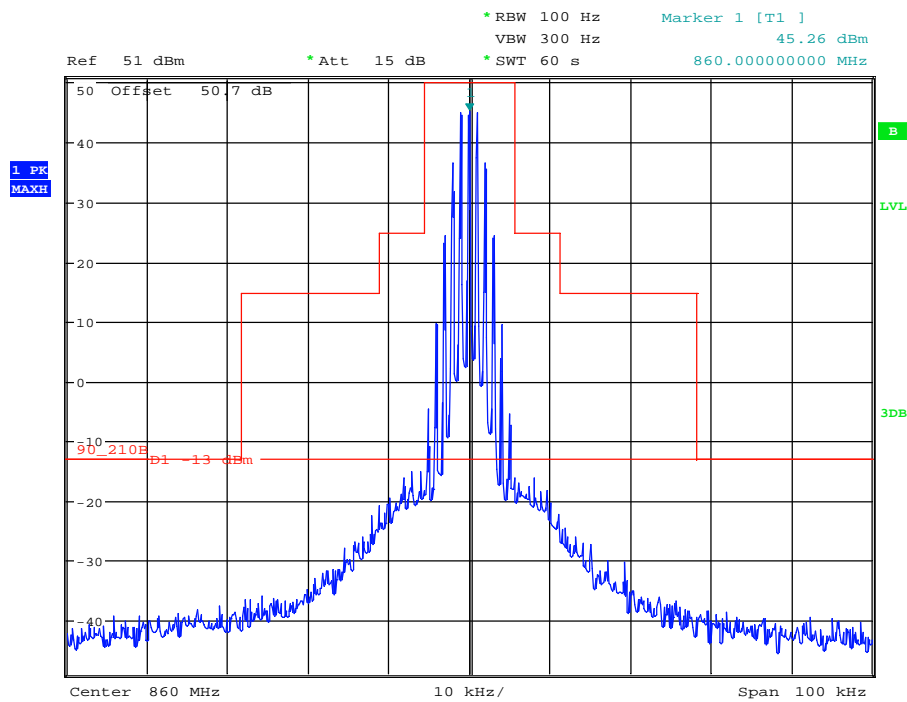


Part 90 Bottom channel: F3E 12.5kHz channel spacing



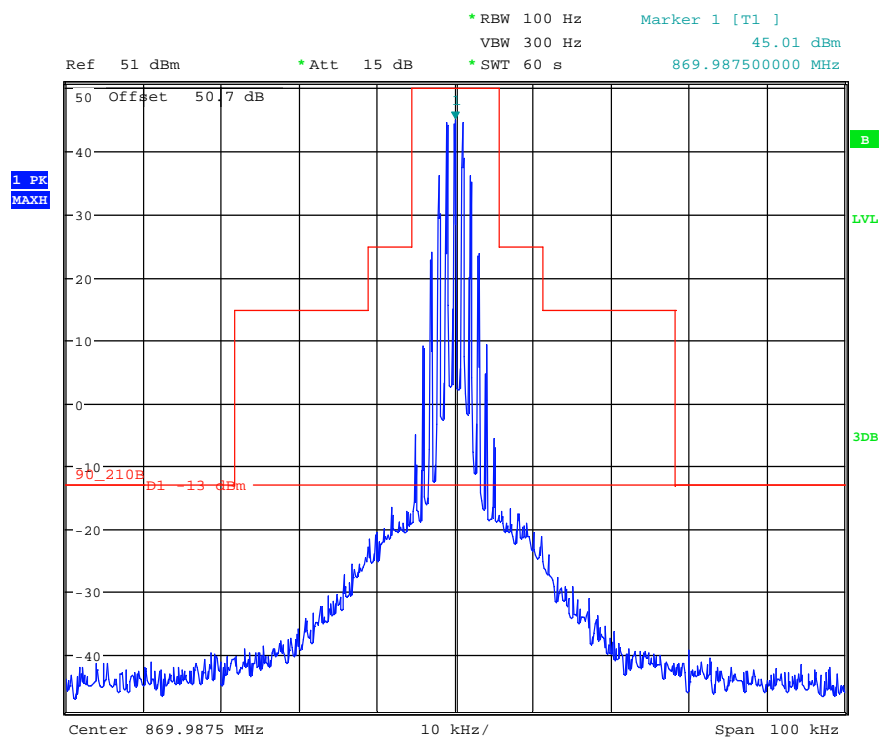
Date: 20.FEB.2012 14:04:27

## Part 90 Middle channel: F1E 12.5kHz channel spacing



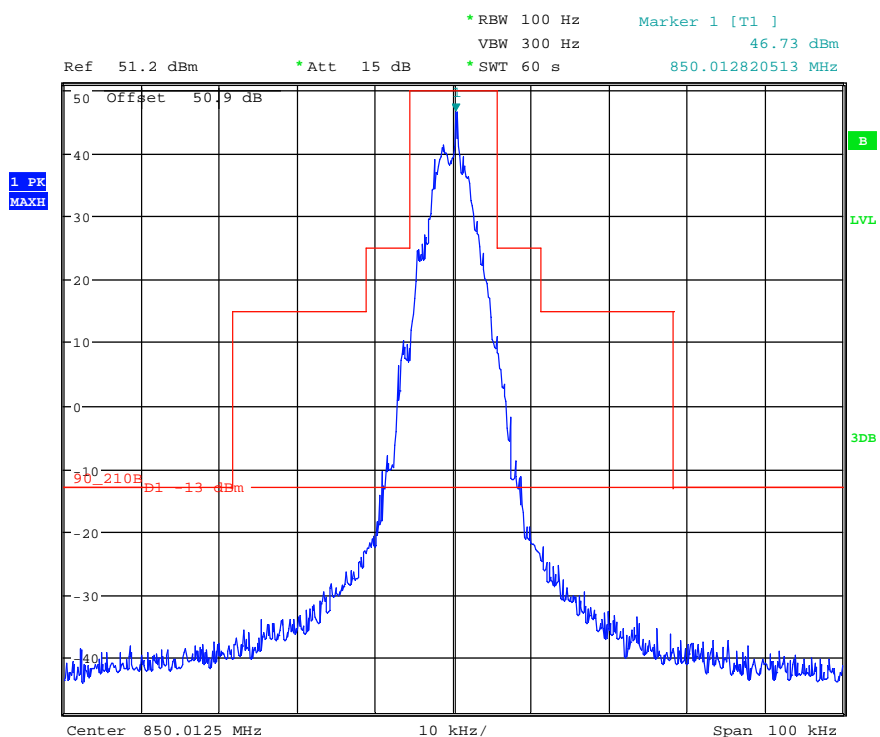
Date: 20.FEB.2012 14:10:17

## Part 90 Top channel: F3E 12.5kHz channel spacing



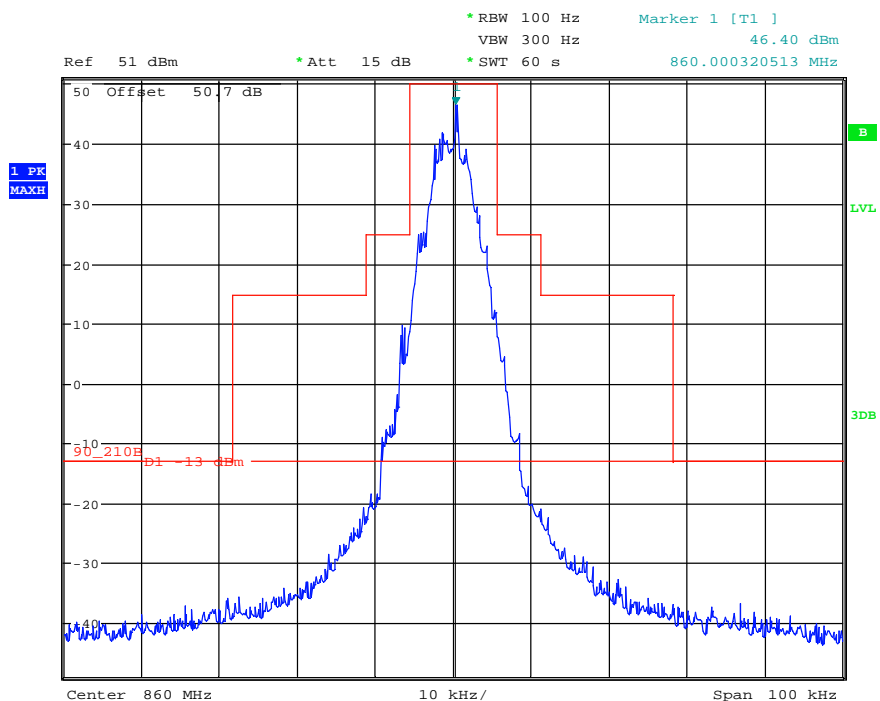
Date: 20.FEB.2012 14:17:05

## Part 90 bottom channel: F1E 12.5kHz channel spacing



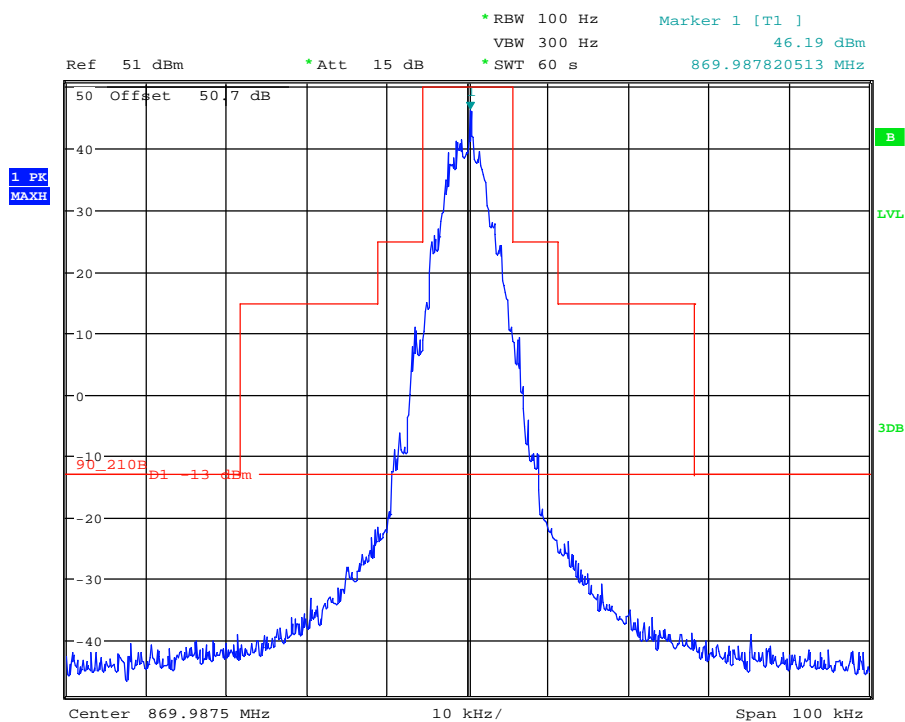
Date: 20.FEB.2012 14:28:04

## Part 90 Middle channel: F3E 12.5kHz channel spacing



Date: 20.FEB.2012 14:37:38

## Part 90 Top channel: F1E 12.5kHz channel spacing



Date: 20.FEB.2012 14:43:37

Note: the spectrum masks are defined in: Part 90.210(b) as the transmitter operates in the band 850MHz- 870MHz using an authorized bandwidth of 11.25kHz as per section 90.209(5).

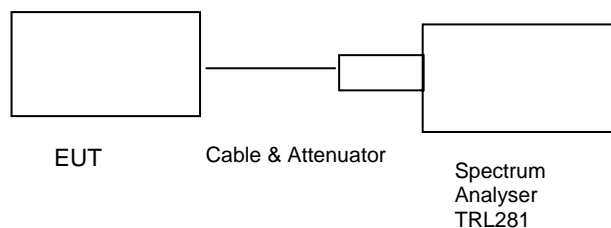


## TRANSMITTER TESTS

### SPURIOUS EMISSIONS – CONDUCTED – Part 2.1053 Bottom Channel

Ambient temperature = 24°C  
Relative humidity = 56%  
Supply voltage = +13.8Vdc/+28.0Vdc

Radio Laboratory  
Test Signal = F3E



The test was set up as per the diagram. The unit was tested operating at maximum power.

The Spurious limit was calculated as follows:

On any frequency removed from the assigned frequency by more that 250% of the authorised bandwidth

At least 43 + 10 log PdB

$(10\log P_{\text{watts}}) - (43 + 10\log (P_{\text{watts}} * 1000)) = \text{LIMIT} = -13 \text{ dBm}$

## RESULTS

### Bottom Channel

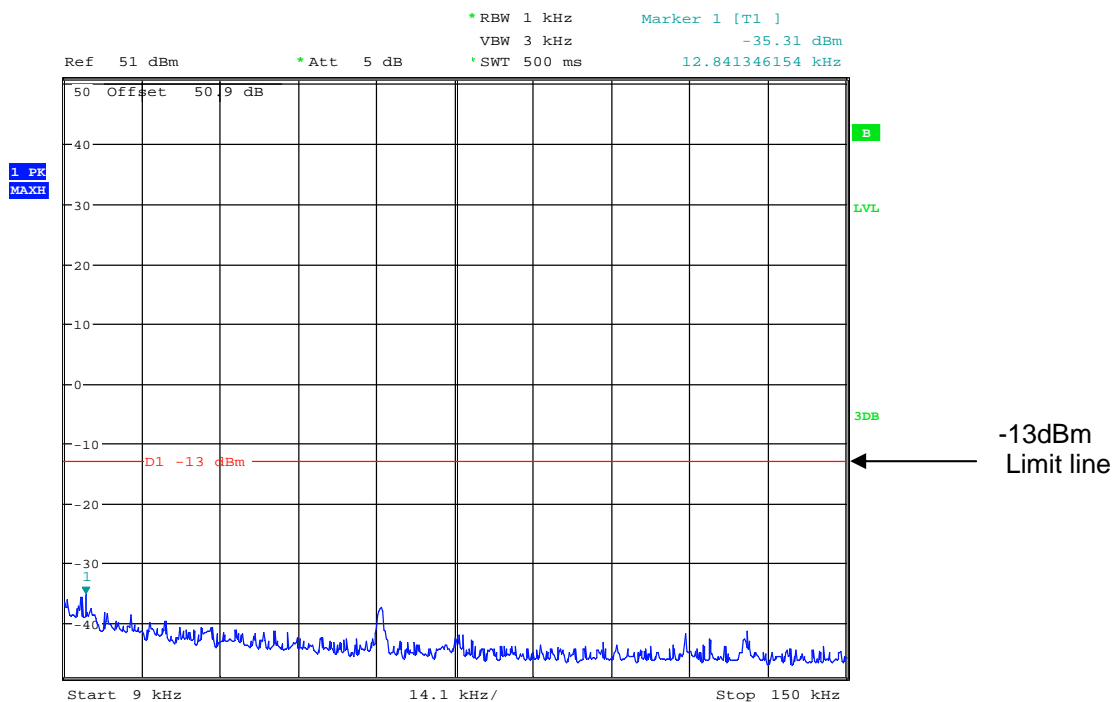
FREQUENCY RANGE	FREQ. (GHz)	MEASURED LEVEL (dBm)	LIMIT (dBm)
9kHz – 10GHz	1.69871 2.55128	-16.90 -19.34	-13 -13

The test equipment used for the Transmitter Conducted Emissions:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRAC No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU46	200034	UH281	<b>X</b>
CABLE	TRAC	N/A	N/A	UH271	<b>X</b>
CABLE	TRAC	N/A	N/A	UH272	<b>X</b>
ATTENUATOR	SPINNER	745357	N/A	TRLUH225	<b>X</b>
ATTENUATOR	-	-	-	20dB	<b>X</b>
ATTENUATOR	BIRD	8304-100-N	N/A	222	<b>X</b>

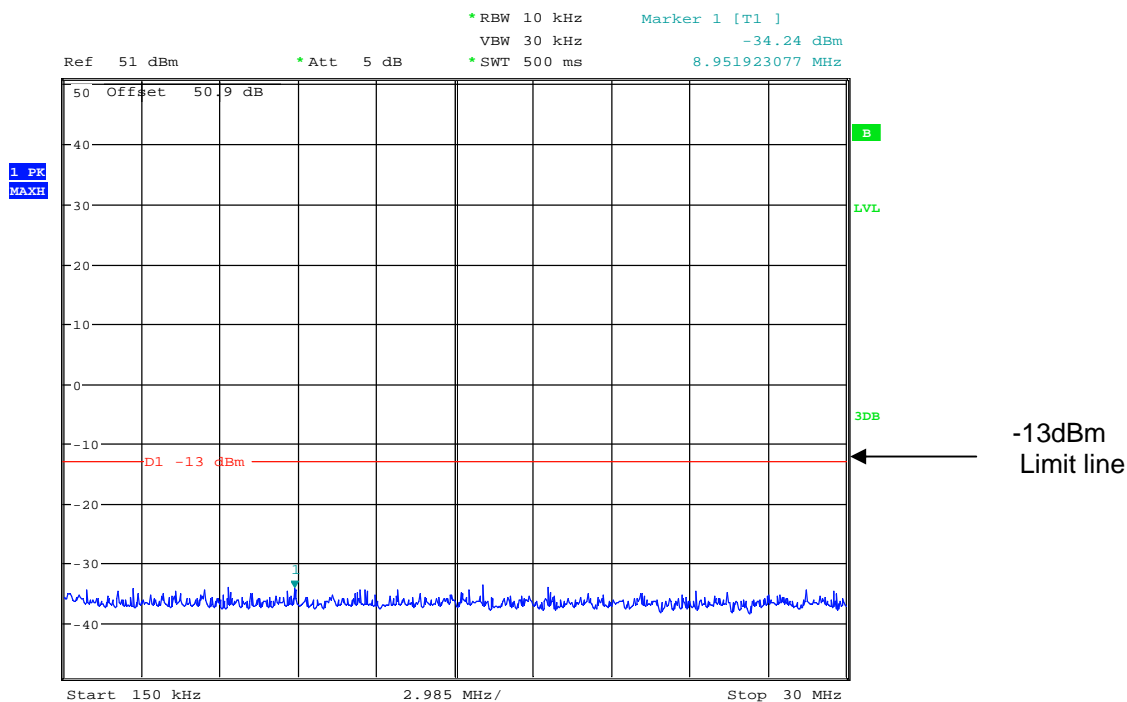
## Conducted emissions Bottom Channel

850.0125MHz 9kHz – 150kHz



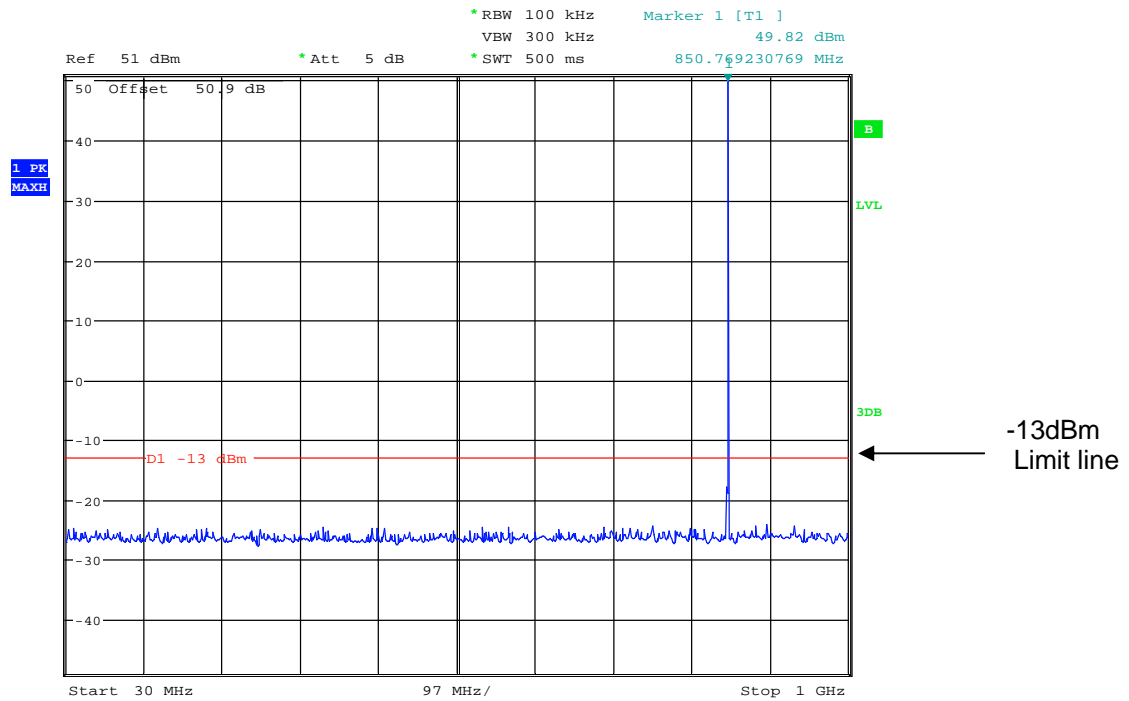
Date: 17.FEB.2012 11:09:57

850.0125MHz 150kHz-30MHz



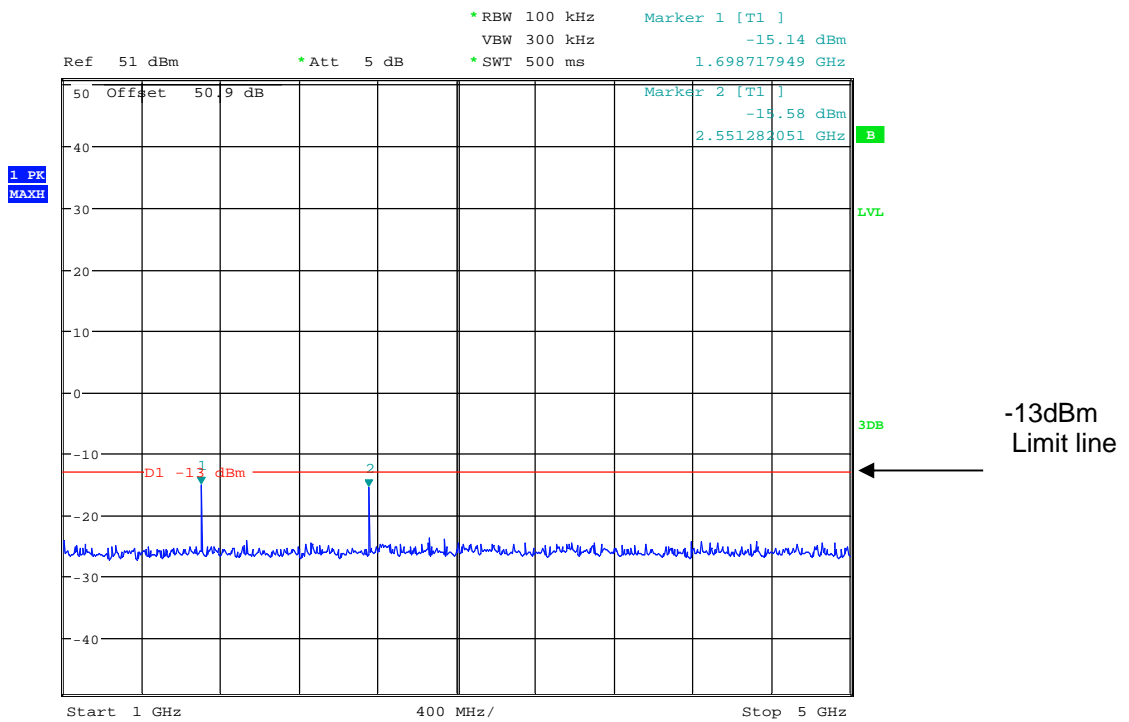
Date: 17.FEB.2012 11:10:51

## 850.0125MHz 30MHz-1GHz



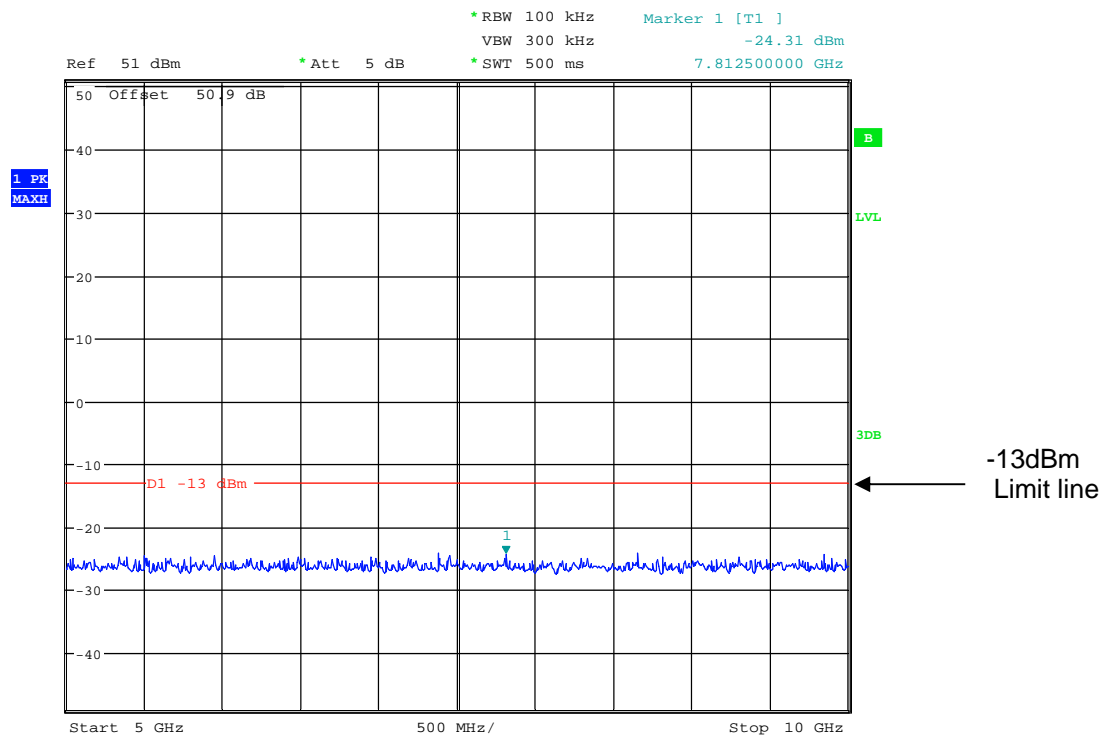
Date: 17.FEB.2012 11:11:24

## 850.0125MHz 1GHz – 5GHz



Date: 17.FEB.2012 11:12:11

# 850.0125MHz 5GHz-10GHz



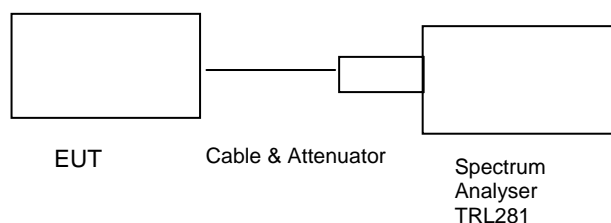
Date: 17.FEB.2012 11:12:49

## SPURIOUS EMISSIONS – CONDUCTED – Part 2.1053

### Middle Channel

Ambient temperature = 24°C  
 Relative humidity = 56%  
 Supply voltage = +13.8Vdc/+28.0Vdc

Radio Laboratory  
 Test Signal = F3E



The test was set up as per the diagram. The unit was tested operating at maximum power.

The Spurious limit was calculated as follows:

On any frequency removed from the assigned frequency by more than 250% of the authorised bandwidth

At least  $43 + 10 \log P_{dB}$

$(10 \log P_{watts}) - (43 + 10 \log (P_{watts} * 1000)) = \text{LIMIT} = -13 \text{ dBm}$

## RESULTS

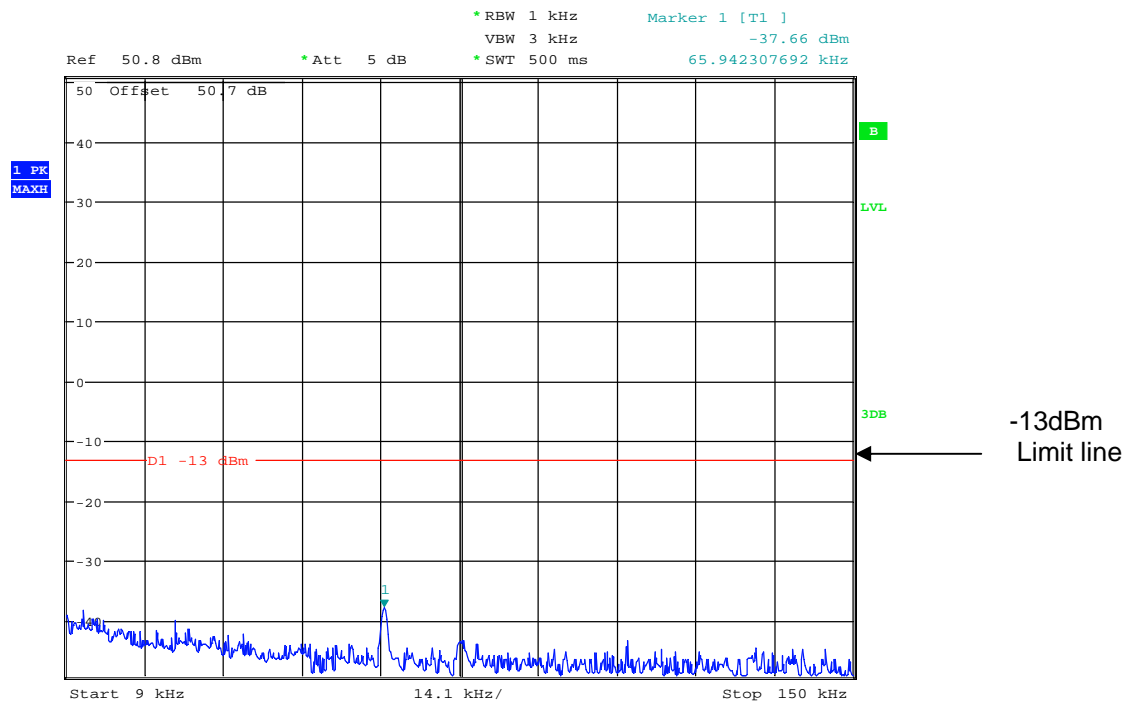
### Middle Channel

FREQUENCY RANGE	FREQ. (GHz)	MEASURED LEVEL (dBm)	LIMIT (dBm)
9kHz – 10GHz	1.7179	-19.52	-13
	2.5769	-19.56	-13

The test equipment used for the Transmitter Conducted Emissions:

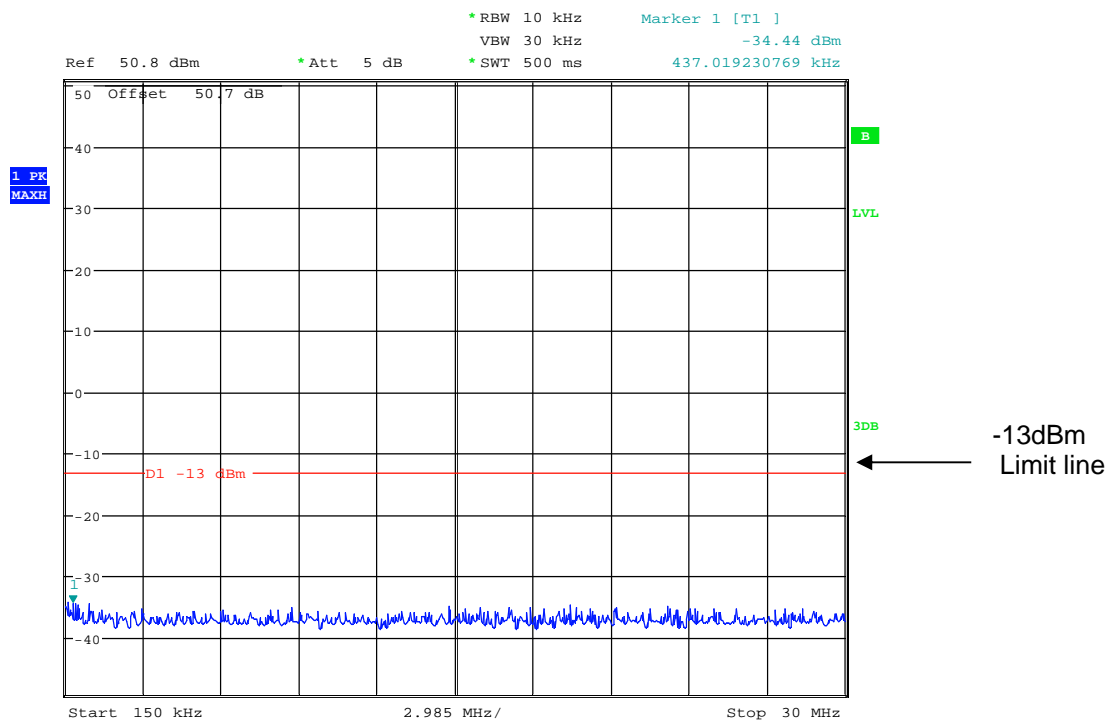
TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRAC No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU46	200034	UH281	X
CABLE	TRAC	N/A	N/A	UH271	X
CABLE	TRAC	N/A	N/A	UH272	X
ATTENUATOR	SPINNER	745357	N/A	TRLUH225	X
ATTENUATOR	-	-	-	20dB	X
ATTENUATOR	BIRD	8304-100-N	N/A	222	X

# 860.00MHz 9kHz – 150kHz



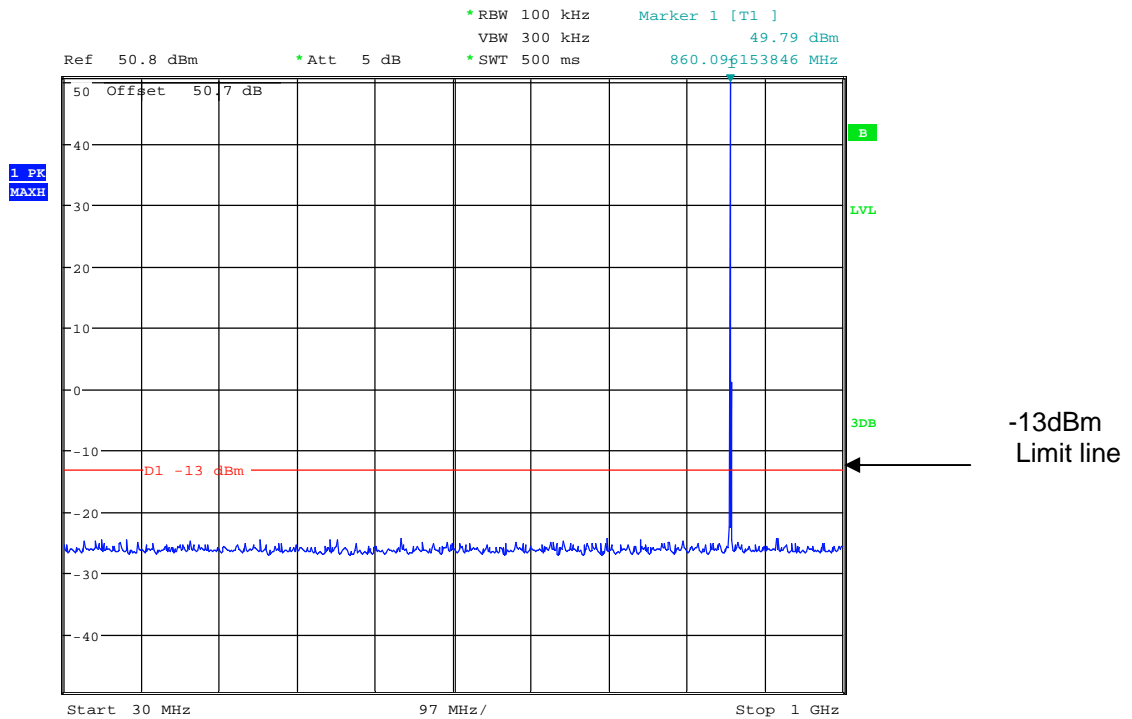
Date: 17.FEB.2012 11:14:39

# 860.00MHz 150kHz – 30MHz



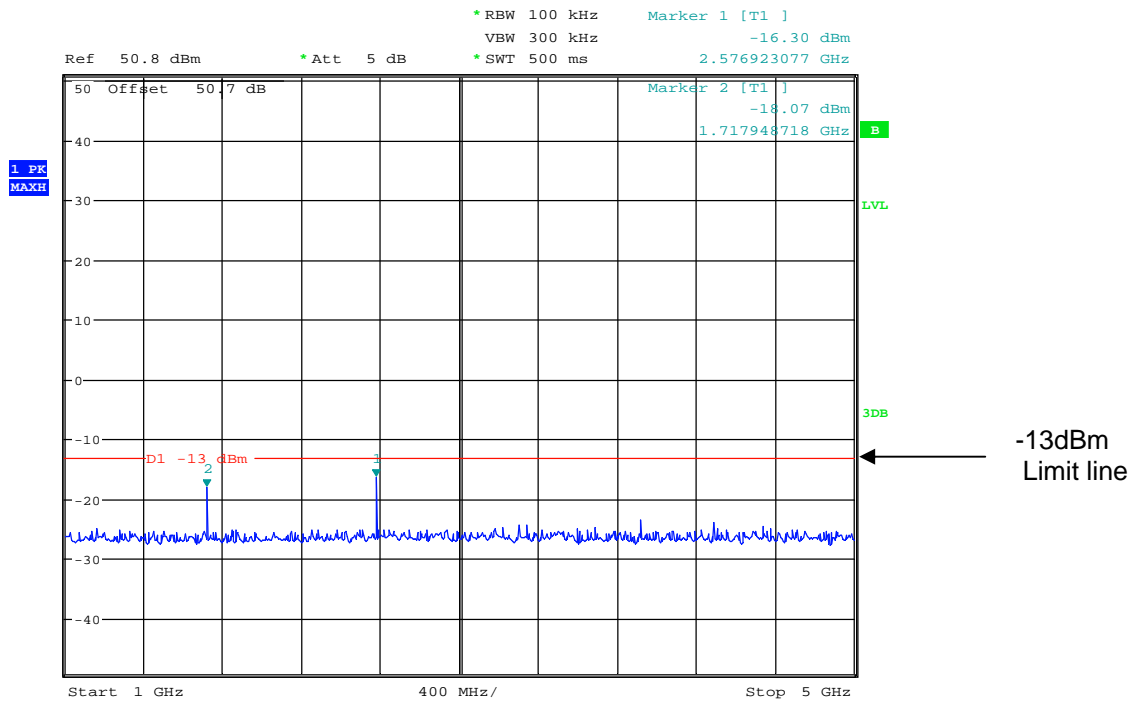
Date: 17.FEB.2012 11:15:15

## 860.00MHz 30MHz- 1GHz



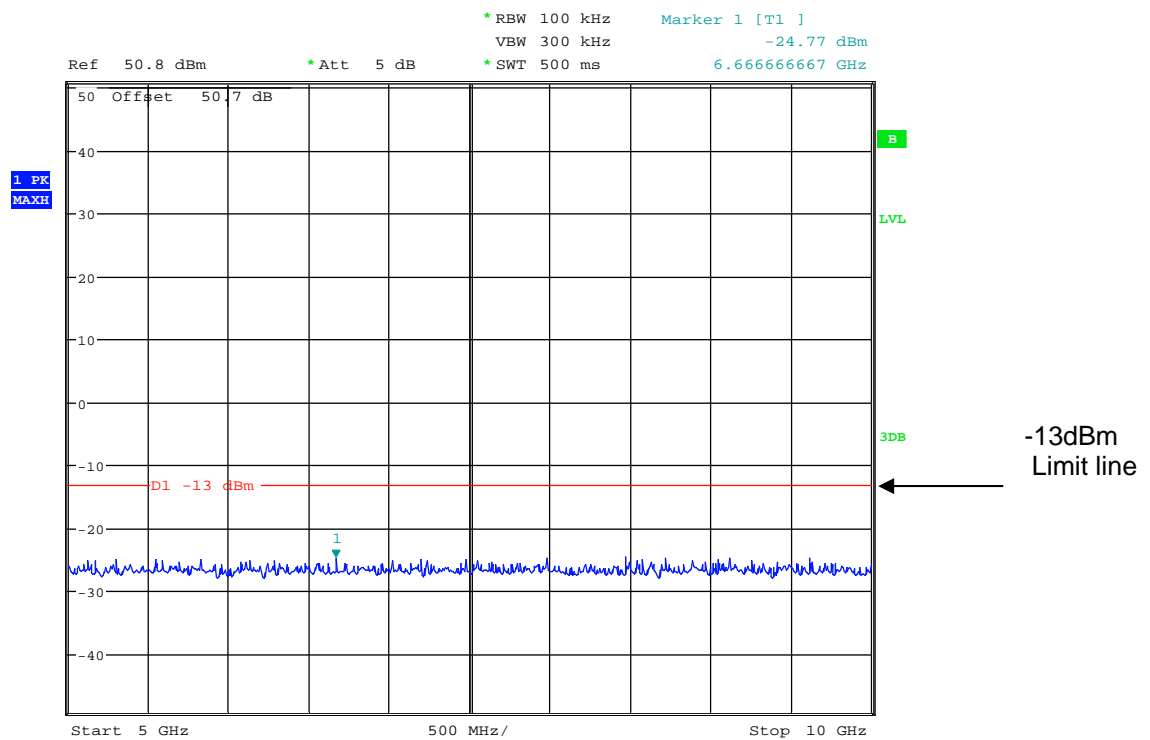
Date: 17.FEB.2012 11:14:03

## 860.00MHz 1GHz – 5GHz



Date: 17.FEB.2012 11:15:55

860.00MHz 5GHz – 10GHz



Date: 17.FEB.2012 11:16:25

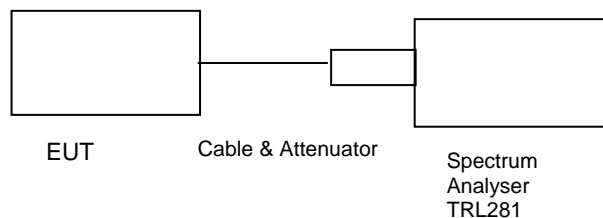


## SPURIOUS EMISSIONS – CONDUCTED – Part 2.1053

### Top Channel

Ambient temperature = 24°C  
 Relative humidity = 56%  
 Supply voltage = +13.8Vdc/+28.0Vdc

Radio Laboratory  
 Test Signal = F3E



The test was set up as per the diagram. The unit was tested operating at maximum power .

The Spurious limit was calculated as follows:

On any frequency removed from the assigned frequency by more that 250% of the authorised bandwidth

At least  $43 + 10 \log P_{dB}$

$(10 \log P_{watts}) - (43 + 10 \log (P_{watts} * 1000)) = \text{LIMIT} = -13 \text{ dBm}$

## RESULTS

### Top Channel

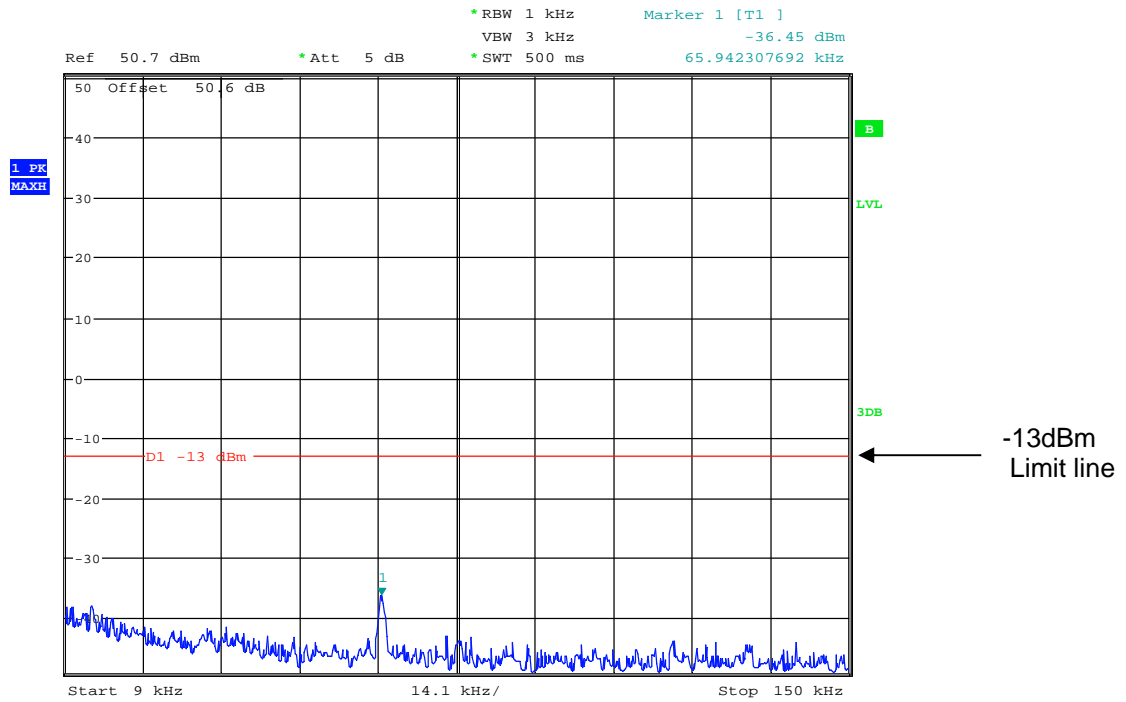
FREQUENCY RANGE	FREQ. (GHz)	MEASURED LEVEL (dBm)	LIMIT (dBm)
9kHz – 10GHz	1.7371	-20.23	-13
	2.6087	-19.35	-13

The test equipment used for the Transmitter Conducted Emissions:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRAC No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU46	200034	UH281	<b>X</b>
CABLE	TRAC	N/A	N/A	UH271	<b>X</b>
CABLE	TRAC	N/A	N/A	UH272	<b>X</b>
ATTENUATOR	SPINNER	745357	N/A	TRLUH225	<b>X</b>
ATTENUATOR	-	-	-	20dB	<b>X</b>
ATTENUATOR	BIRD	8304-100-N	N/A	222	<b>X</b>

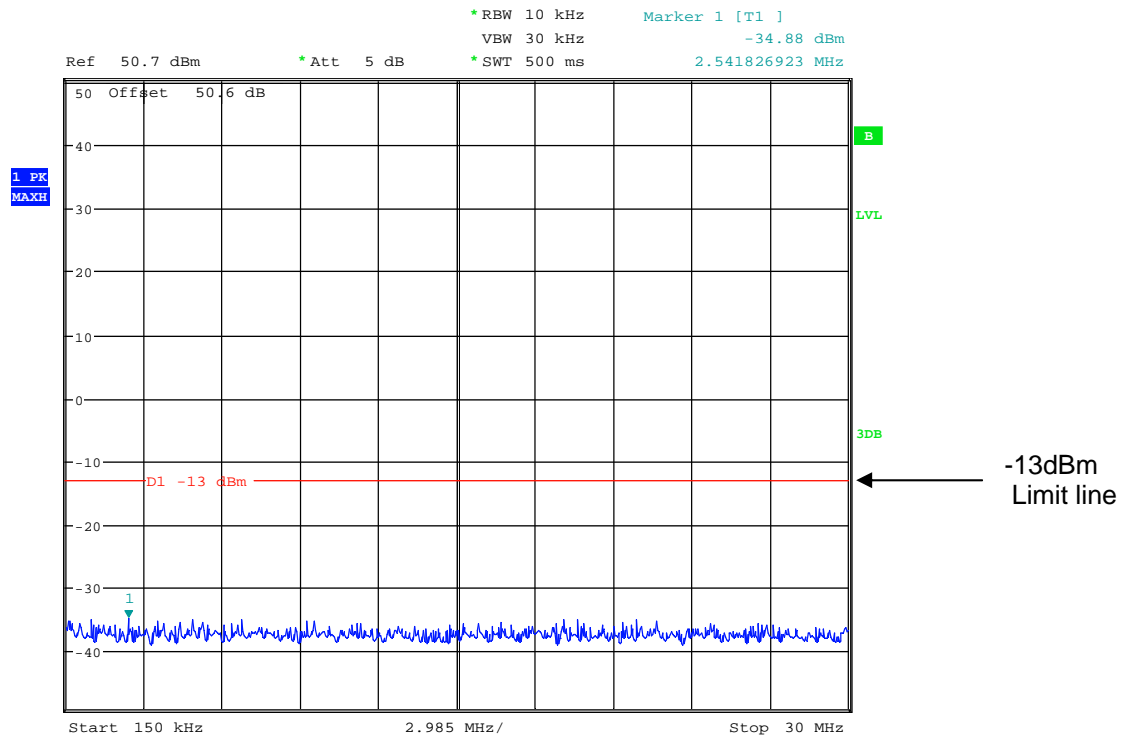
## Conducted emissions Top Channel

869.9875MHz 9kHz – 150kHz



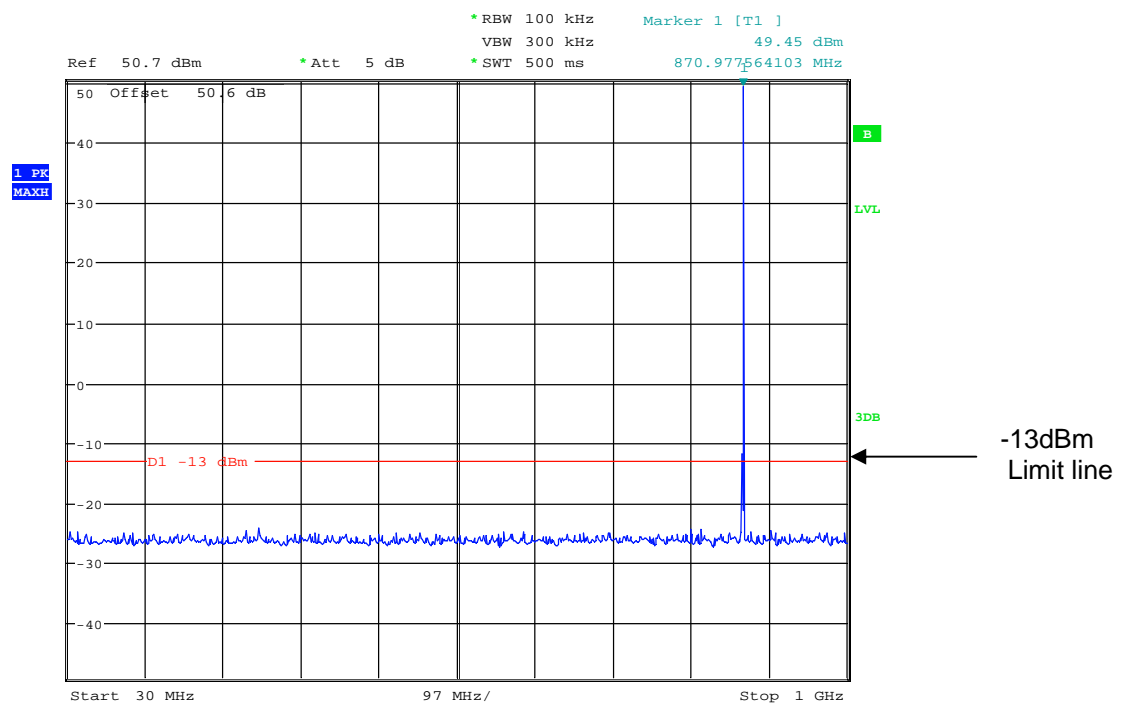
Date: 17.FEB.2012 11:19:03

869.9875MHz 150kHz -30MHz



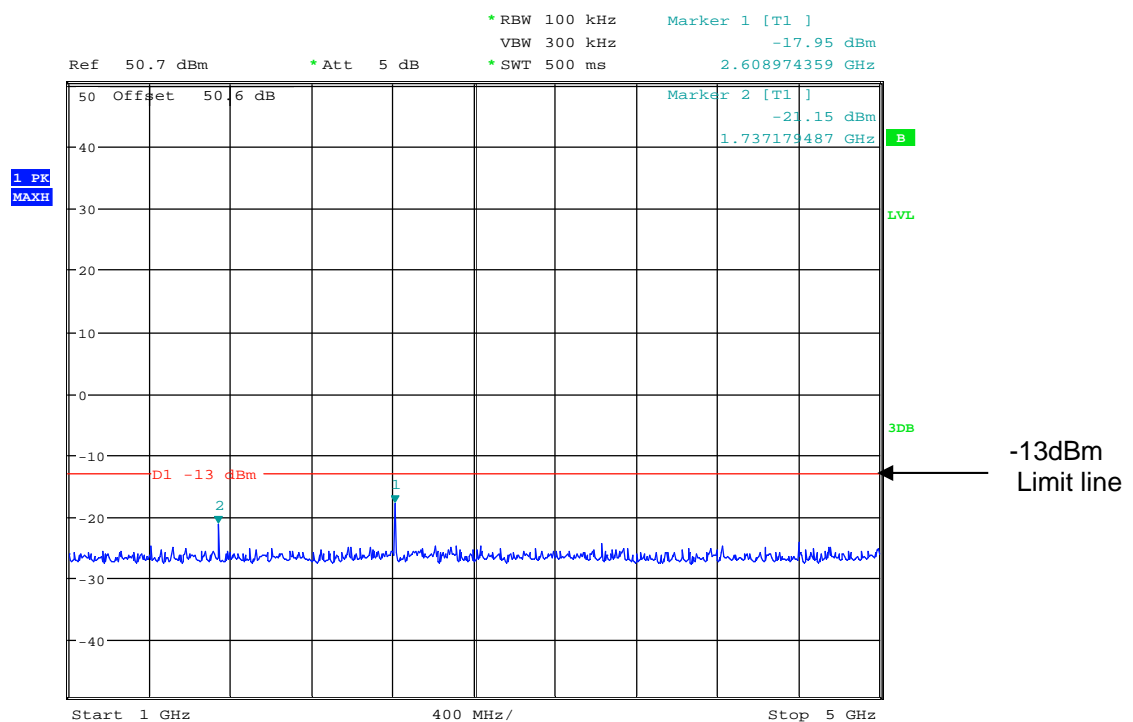
Date: 17.FEB.2012 11:19:32

# 869.9875MHz 30MHz-1GHz



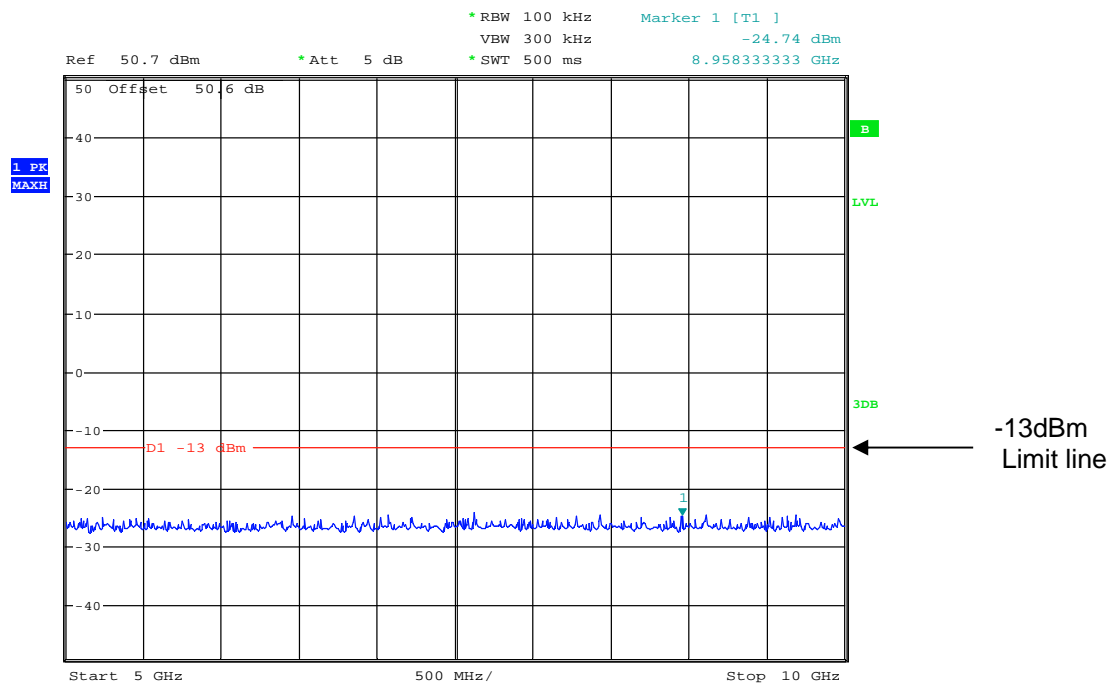
Date: 17.FEB.2012 11:18:29

# 869.9875MHz 1GHz – 5GHz



Date: 17.FEB.2012 11:20:04

# 869.9875MHz 5GHz – 10GHz

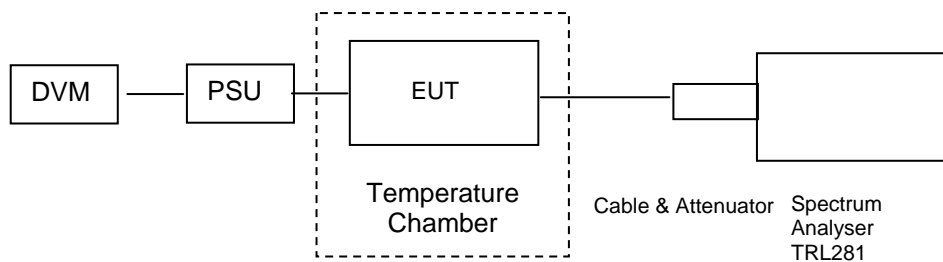


Date: 17.FEB.2012 11:20:38

## FREQUENCY STABILITY – CONDUCTED – Part 90.213

Ambient temperature = 24°C  
 Relative humidity = 56%  
 Supply voltage = +13.8Vdc/+28.0Vdc

Radio Laboratory  
 Test Signal = F3E



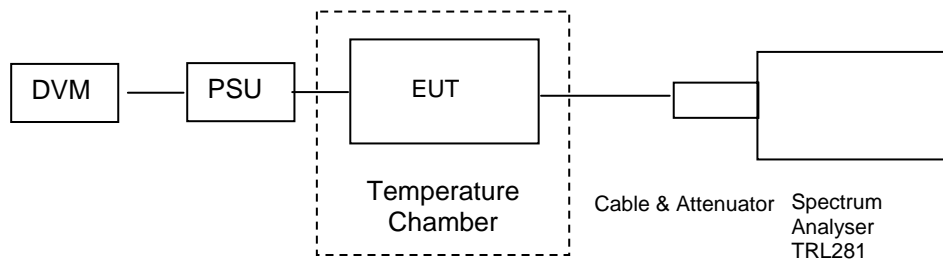
Bottom Channel

Temperature °C	Vnom (Vdc)	Measured Frequency (MHz)	Frequency Difference (Hz)	ppm	Limit ± 1.0ppm Pass/Fail
+50	13.8	850.01249	-10	0.01	Pass
+40	13.8	850.01249	-10	0.01	Pass
+30	13.8	850.01249	-10	0.01	Pass
+20	13.8	850.01249	-10	0.01	Pass
+10	13.8	850.01250	0	0	Pass
0	13.8	850.01249	-10	0.01	Pass
-10	13.8	850.01251	+10	0.01	Pass
-20	13.8	850.01251	+10	0.01	Pass
-30	13.8	850.01251	+10	0.01	Pass

Tnom 25 °C	85%= 11.7Vdc	115%= 15.9Vdc
Frequency (MHz)	850.01249	850.01249
Frequency Difference (Hz)	10	10
ppm	0.01	0.01
Limit ± 1 ppm Pass/Fail	Pass	Pass

Ambient temperature = 24°C  
 Relative humidity = 56%  
 Supply voltage = +13.8Vdc/+28.0Vdc

Radio Laboratory  
 Test Signal = F3E



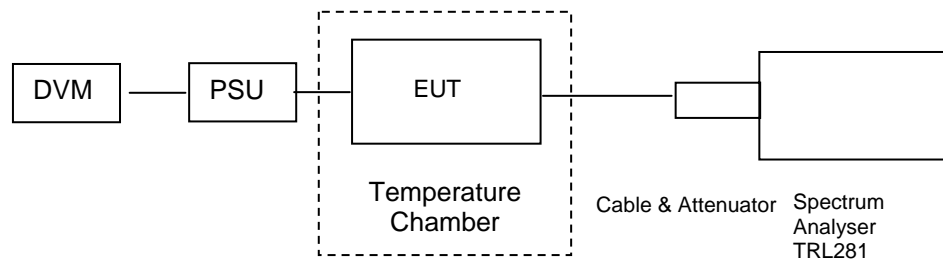
Middle Channel

Temperature °C	Vnom (Vdc)	Measured Frequency (MHz)	Frequency Difference (Hz)	ppm	Limit ± 1.5 ppm Pass/Fail
+50	13.8	859.99999	-10	0.01	Pass
+40	13.8	859.99999	-10	0.01	Pass
+30	13.8	859.99999	-10	0.01	Pass
+20	13.8	859.99999	-10	0.01	Pass
+10	13.8	860.00000	0	0	Pass
0	13.8	859.99999	-10	0.01	Pass
-10	13.8	860.00001	+10	0.01	Pass
-20	13.8	860.00001	+10	0.01	Pass
-30	13.8	860.00001	+10	0.01	Pass

Tnom 21.5°C	85%= 11.7Vdc	115%= 15.9Vdc
Frequency (MHz)	859.99999	859.99999
Frequency Difference (Hz)	-10	-10
ppm	0.01	0.01
Limit ± 2.5 ppm Pass/Fail	Pass	Pass

Ambient temperature = 24°C  
 Relative humidity = 56%  
 Supply voltage = +13.8Vdc/+28.0Vdc

Radio Laboratory  
 Test Signal = F3E



Top Channel

Temperature °C	Vnom (Vdc)	Measured Frequency (MHz)	Frequency Difference (Hz)	ppm	Limit ± 1.5 ppm Pass/Fail
+50	13.8	860.98749	-10	0.01	Pass
+40	13.8	860.98749	-10	0.01	Pass
+30	13.8	860.98749	-10	0.01	Pass
+20	13.8	860.98749	-10	0.01	Pass
+10	13.8	860.98750	0	0	Pass
0	13.8	860.98750	0	0	Pass
-10	13.8	860.98751	+10	0.01	Pass
-20	13.8	860.98751	+10	0.01	Pass
-30	13.8	860.98751	+10	0.01	Pass

Tnom 21.5°C	85%= 11.7Vdc	115%= 15.9Vdc
Frequency (MHz)	860.98749	860.98749
Frequency Difference (Hz)	-10	-10
ppm	0.01	0.01
Limit ± 1.5 ppm Pass/Fail	Pass	Pass

Frequency stability measurements were between -30°C and +50°C in 10°C increments.

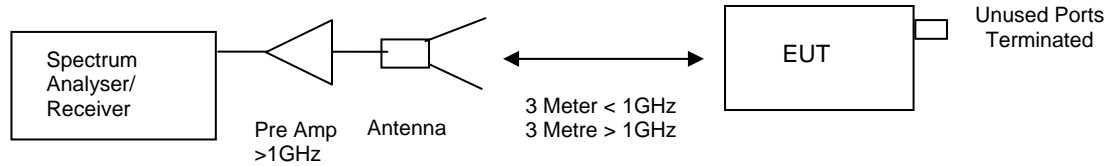
At each temperature the transmitter was given a period of 60 minutes to stabilise. The transmitter was then turned on and the frequency error measured after a period of 1 minute.

Measurements were also made with the supply voltage varied between 115% and 85% of the nominal supply voltage(13.8Vdc). 13.8Vdc supply controls the frequency generation & stability circuits (see annex E)

## INTENTIONAL RADIATOR SPURIOUS EMISSIONS – RADIATED – Part 2.1053

Ambient temperature = 24°C  
 Relative humidity = 56%  
 Conditions = ATS  
 Supply voltage = +13.8Vdc/+28.0Vdc  
 Supply Frequency = N/A

Test Signal = F3E



The test was set up as per the diagram. The unit was tested operating maximum power on three test frequencies with a 50 ohm load on the output.

The Spurious limit was calculated as follows:

On any frequency removed from the assigned frequency by more that 250% of the authorised bandwidth

At least  $43 + 10 \log P_{dB}$

$(10 \log P_{watts}) - (43 + 10 \log (P_{watts} * 1000)) = \text{LIMIT} = -13 \text{ dBm}$

### RESULTS

#### Bottom Channel

FREQUENCY RANGE	FREQ. (GHz)	Measured (dBm)	LIMIT (dBm)
30MHz – 10GHz	2.22500	-18.79	-13
	3.40000	-20.92	-13
	4.25010	-31.96	-13
	5.10000	-28.56	-13

#### Middle Channel

FREQUENCY RANGE	FREQ. (GHz)	Measured (dBm)	LIMIT (dBm)
30MHz – 10GHz	2.5800	-16.33	-13
	3.4399	-29.70	-13
	4.3000	-31.08	-13
	5.1600	-28.23	-13

#### Top Channel

FREQUENCY RANGE	FREQ. (GHz)	Measured (dBm)	LIMIT (dBm)
30MHz – 10GHz	2.6099	-22.09	-13
	4.3499	-28.25	-13

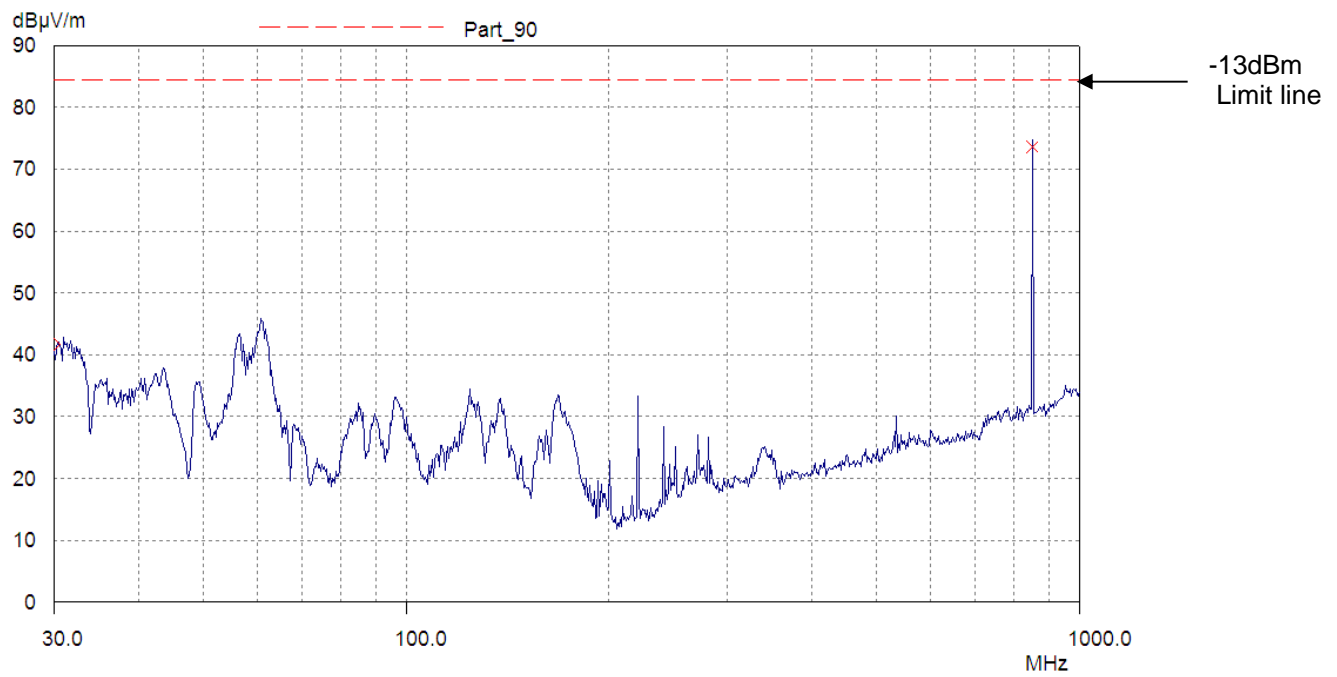
\* Note: Emissions that fall below 20dB of the limit are not shown in the above table



The test equipment used for the Transmitter Spurious Emissions:

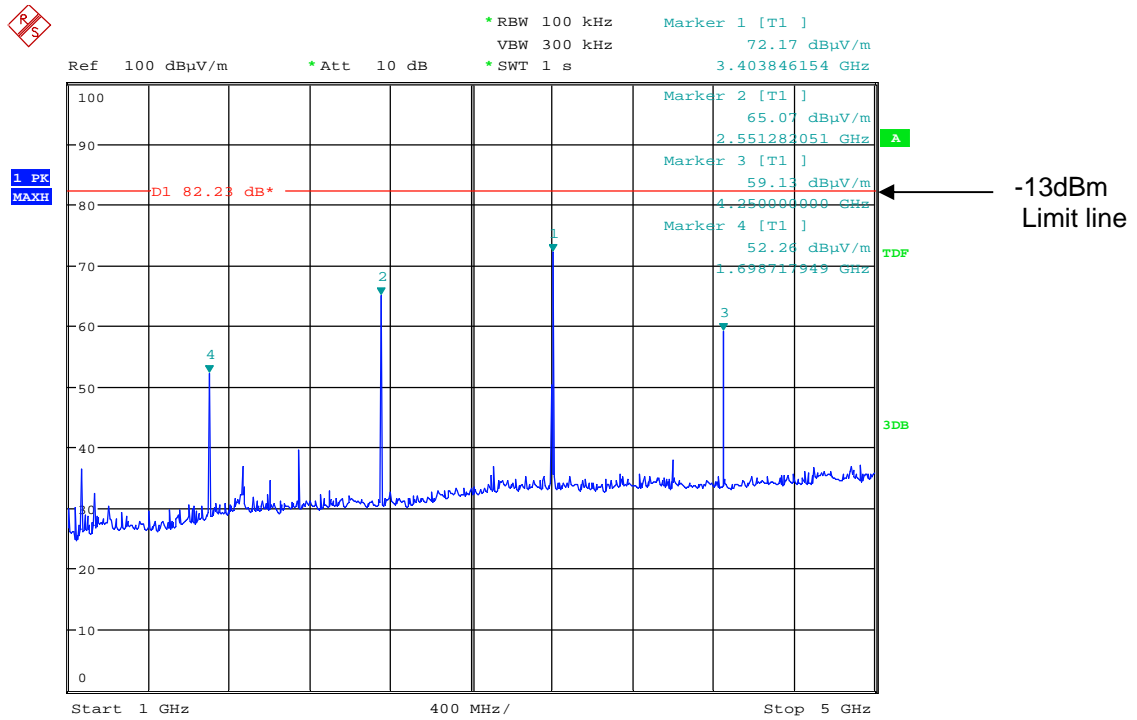
TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRAC No	ACTUAL EQUIPMENT USED
HORN	EMCO	3115	9010-3580	138	<b>X</b>
SPECTRUM ANALYSER	R&S	FSU46	200034	TRL281	<b>X</b>
PRE AMPLIFIER	HP	8449B	3008A016	572	<b>X</b>
ANTENNA	YORK	CBL611/A	1618	UH191	<b>X</b>
RECEIVER	R&S	ESVS10	825892/006	UH04	<b>X</b>

Radiated emissions Bottom Channel  
850.0125MHz 30MHz – 1GHz



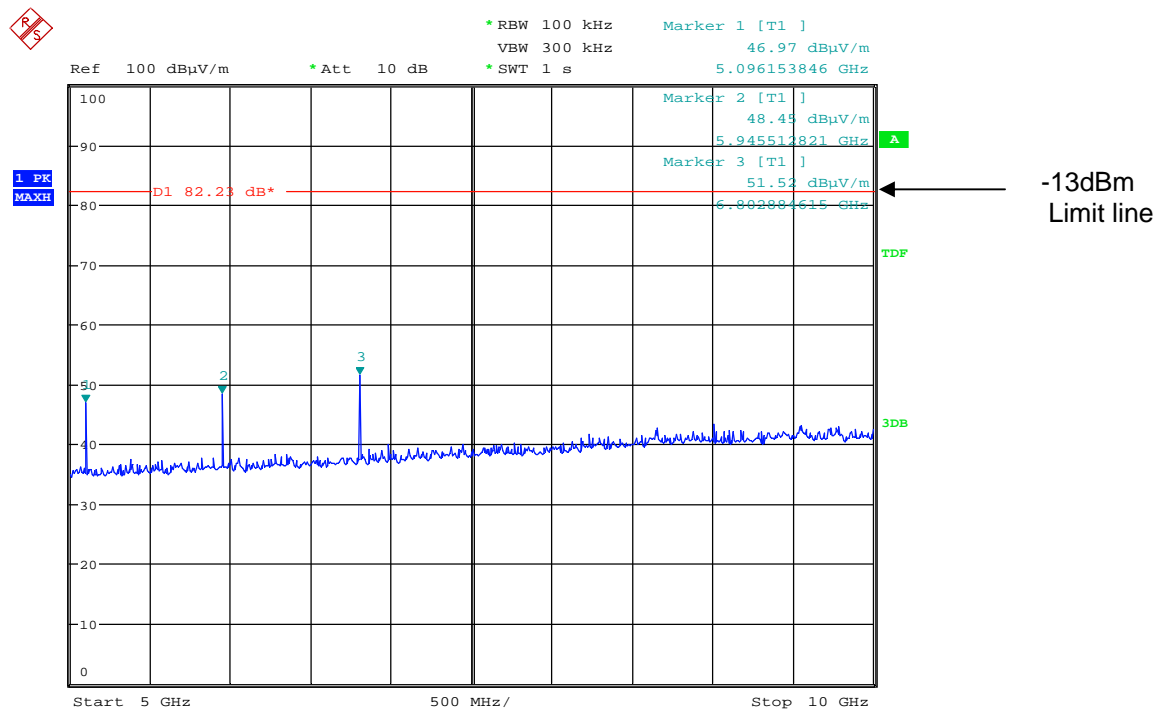
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

## 850.0125MHz 1GHz – 5GHz



Date: 22.FEB.2012 16:22:34

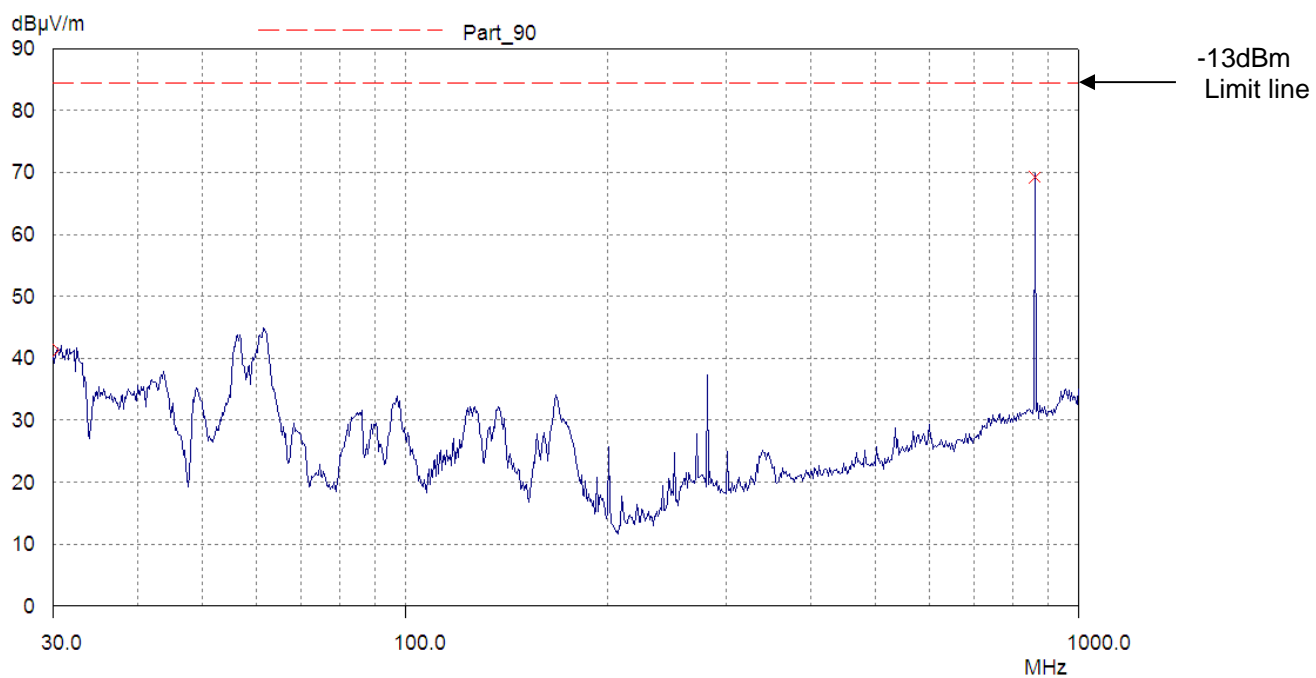
## 850.0125MHz 5GHz – 10GHz



Date: 22.FEB.2012 16:24:14

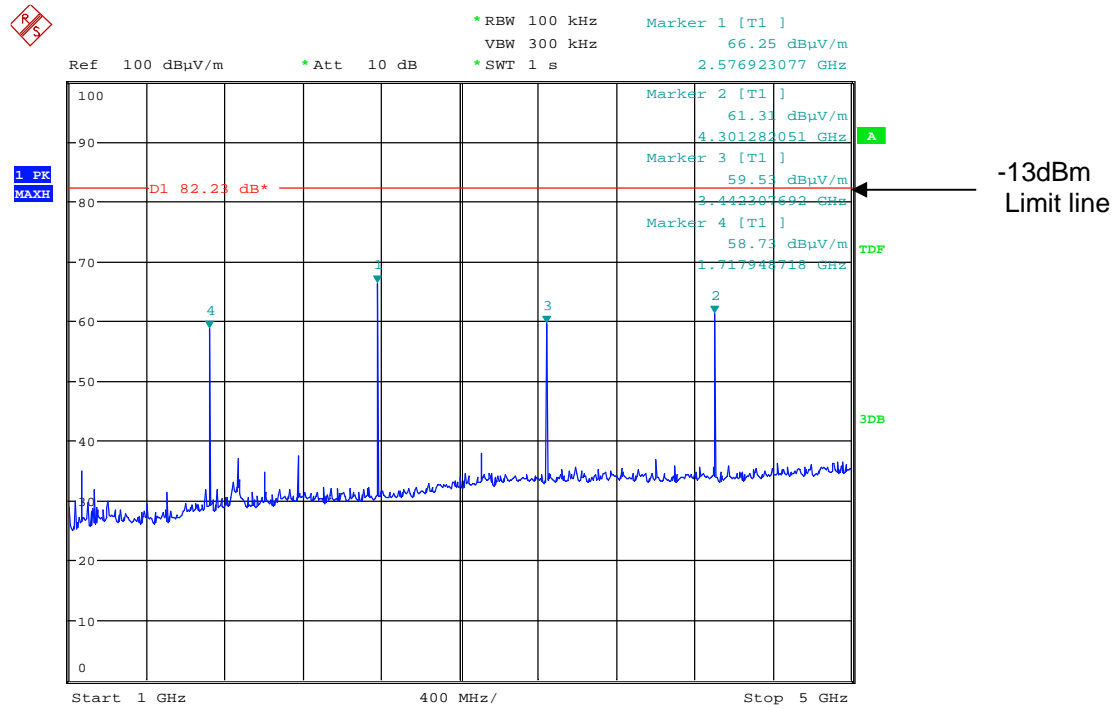
# Radiated emissions Middle Channel

860.00MHz 30MHz – 1GHz



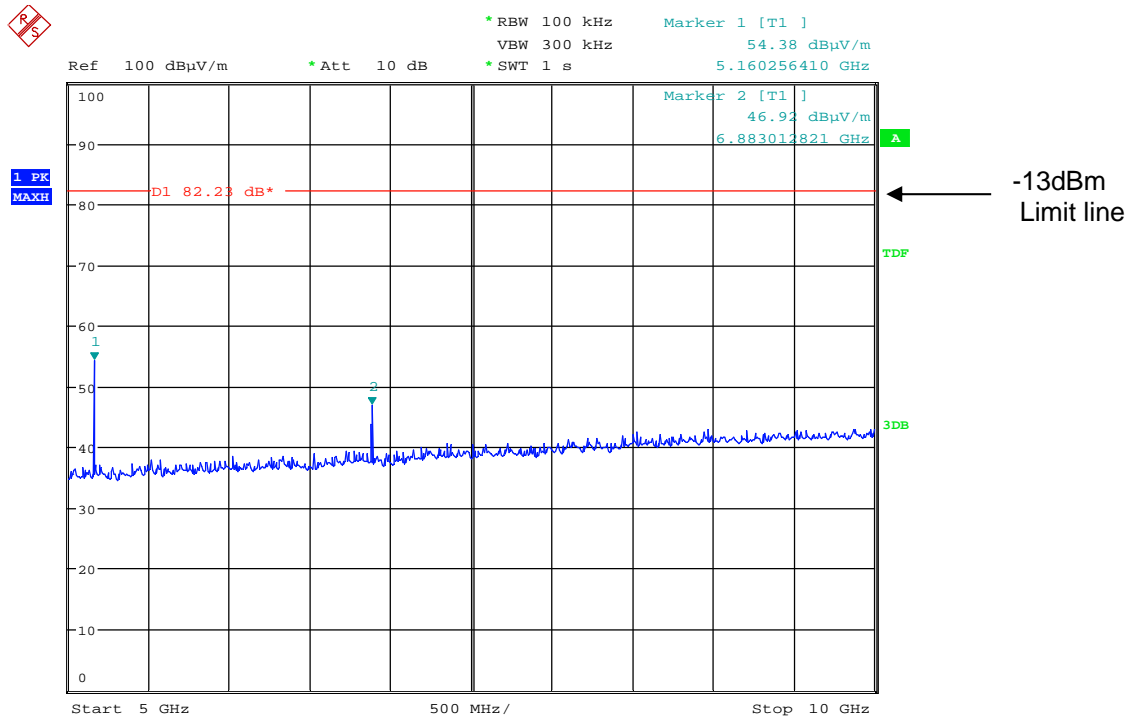
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

## 860.00MHz 1GHz – 5GHz



Date: 22.FEB.2012 16:26:19

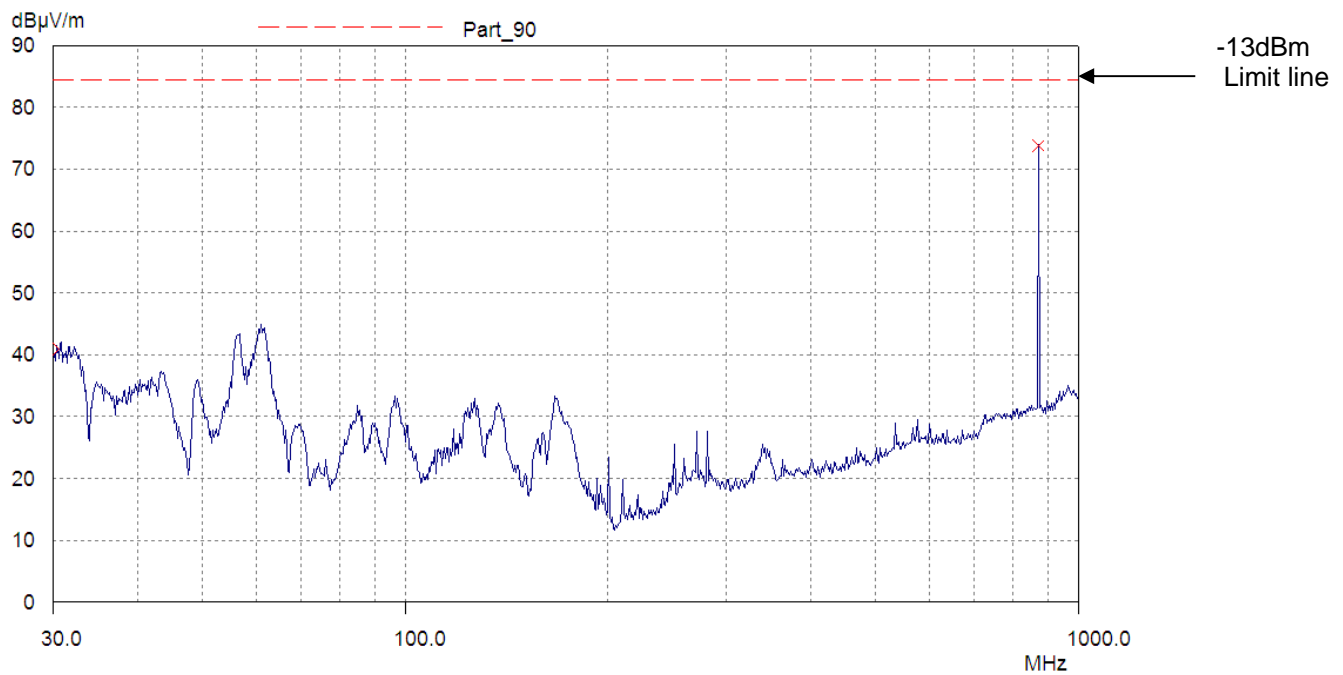
## 860.00MHz 5GHz – 10GHz



Date: 22.FEB.2012 16:28:51

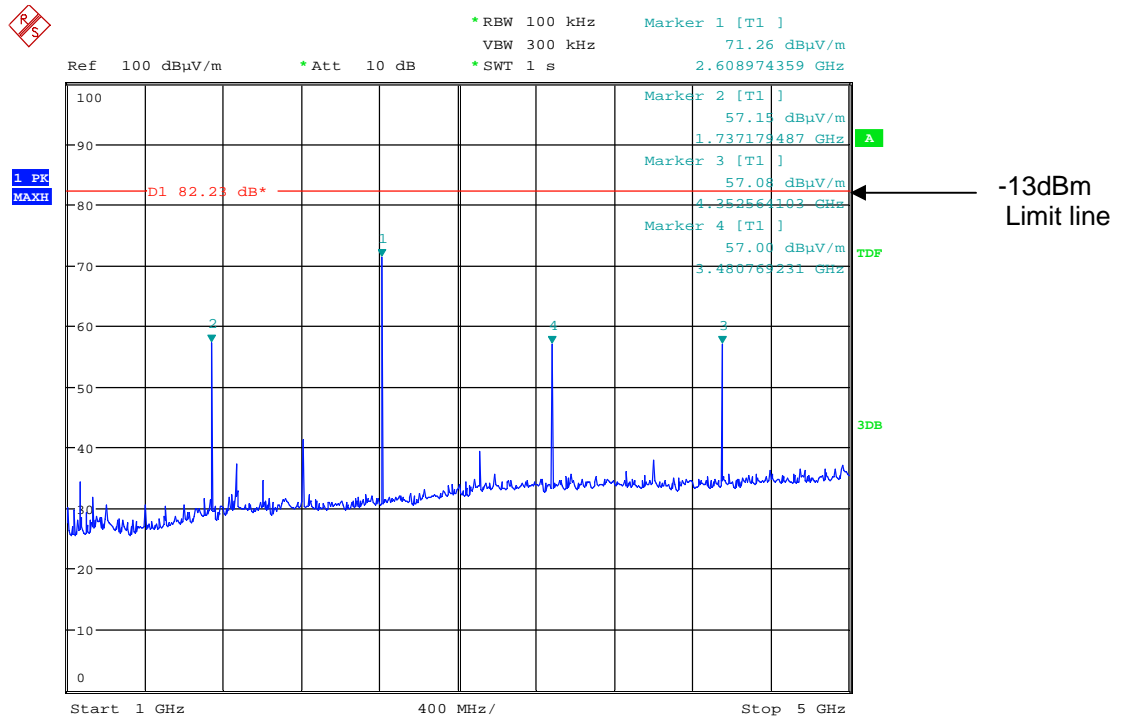
# Radiated emissions Top Channel

869.9875MHz - 30MHz – 1GHz



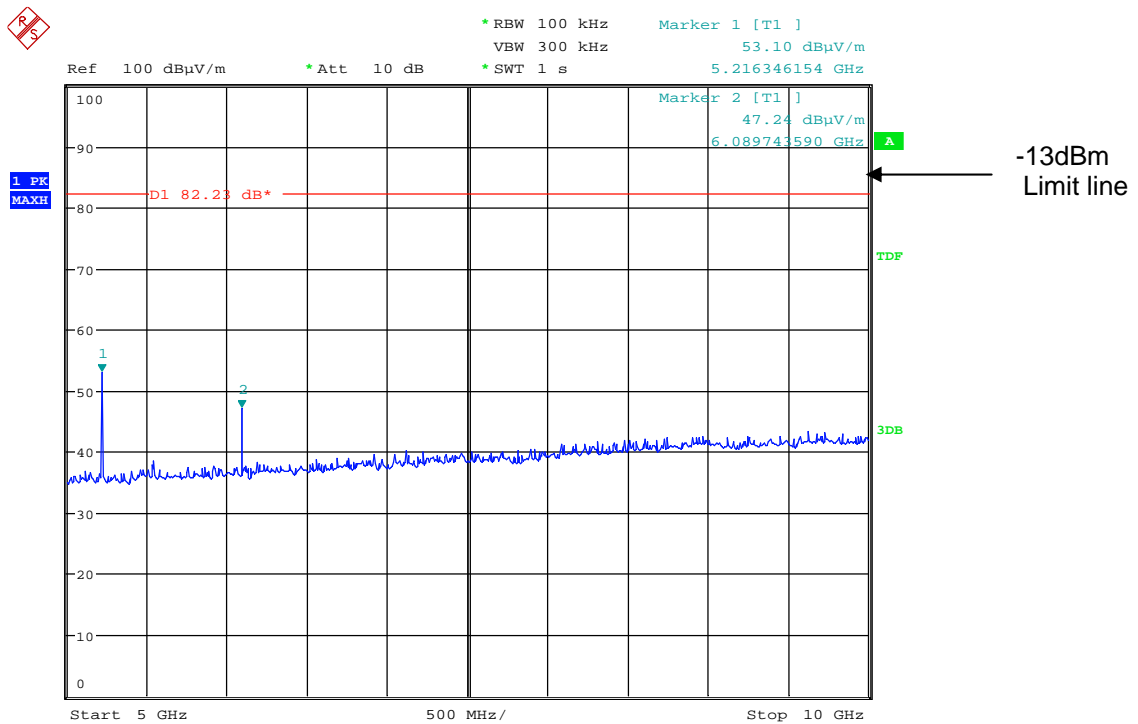
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

## 869.9875MHz 1GHz – 5GHz



Date: 22.FEB.2012 16:31:00

## 869.9875MHz 5GHz – 10GHz

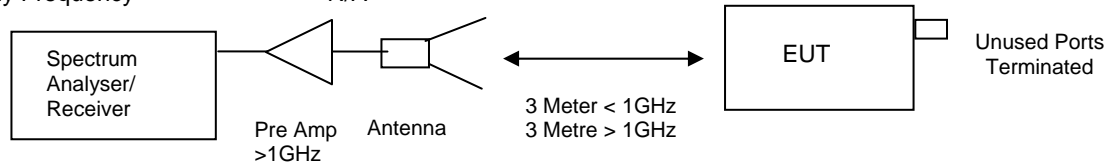


Date: 22.FEB.2012 16:33:45

## UN-INTENTIONAL RADIATOR SPURIOUS EMISSIONS – RADIATED – Part 15:109

Ambient temperature = 24°C  
 Relative humidity = 56%  
 Conditions = ATS  
 Supply voltage = +13.8Vdc/+28.0Vdc  
 Supply Frequency = N/A

Test Signal = F3E



The test was set up as per the diagram, the receiver was tested while in receive mode while attached to a dummy load.

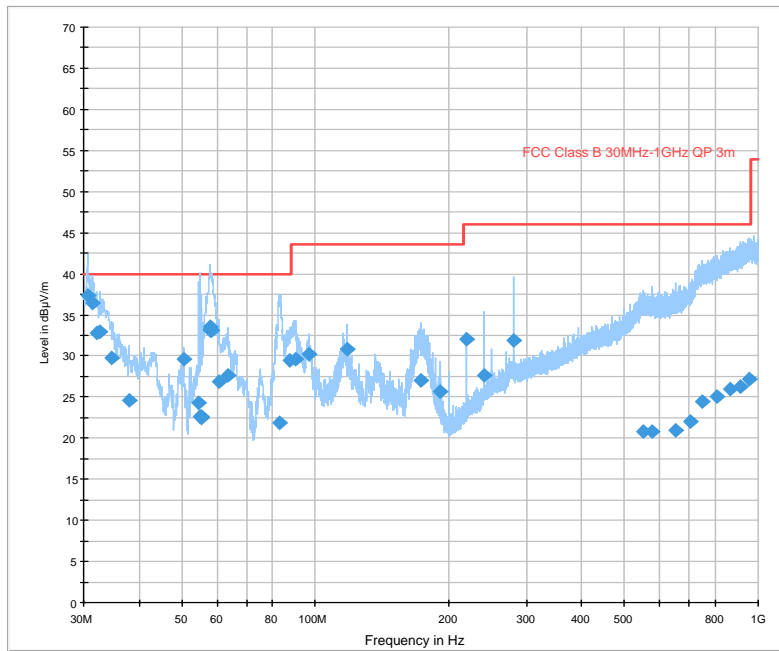
30MHz -1GHz worse case Rx mode

FREQ. (MHz)	MEAS. Rx. (dBμV)	Cable Loss (dB)	Ant Factor	Pre Amp (dB)	FIELD STRENGTH (dBμV/m)	FIELD STRENGTH (μV/m)	Limit (dBμV/m)	Limit (μV/m)
30.65	17.90	0.4	19.0	-	37.30	73.28	40.00	100
31.40	17.50	0.4	18.6	-	36.50	66.83	40.00	100
32.05	14.30	0.4	18.2	-	32.90	44.15	40.00	100
32.60	14.70	0.4	17.9	-	33.00	44.66	40.00	100
34.60	12.50	0.4	16.9	-	29.80	30.90	40.00	100
37.95	9.10	0.4	15.1	-	24.60	16.98	40.00	100
50.45	20.50	0.4	8.7	-	29.60	30.20	40.00	100
54.65	16.70	0.4	7.2	-	24.30	16.40	40.00	100
54.85	15.10	0.4	7.1	-	22.60	13.49	40.00	100
55.15	14.90	0.4	7.1	-	22.40	13.18	40.00	100
55.30	15.20	0.4	7.0	-	22.60	13.49	40.00	100
57.85	26.40	0.4	6.5	-	33.30	46.23	40.00	100
57.95	26.30	0.4	6.5	-	33.20	45.70	40.00	100
58.10	26.60	0.4	6.5	-	33.50	47.31	40.00	100
58.60	26.30	0.4	6.4	-	33.10	45.18	40.00	100
60.65	20.50	0.4	6.0	-	26.90	22.13	40.00	100
63.40	21.10	0.5	6.1	-	27.60	23.98	40.00	100
83.05	12.90	0.6	8.4	-	21.90	12.44	40.00	100
87.50	19.80	0.6	9.1	-	29.50	29.85	40.00	100
90.10	19.60	0.6	9.4	-	29.60	30.20	43.52	150
96.70	19.20	0.6	10.4	-	30.20	32.35	43.52	150
118.00	18.00	0.7	12.2	-	30.90	35.07	43.52	150
173.20	16.50	0.9	9.6	-	27.00	22.38	43.52	150
192.00	16.40	0.9	8.4	-	25.70	19.27	43.52	150
220.00	21.60	1.0	9.4	-	32.00	39.81	46.02	200
240.00	16.10	1.0	10.5	-	27.60	23.98	46.02	200
280.00	18.40	1.0	12.5	-	31.90	39.35	46.02	200

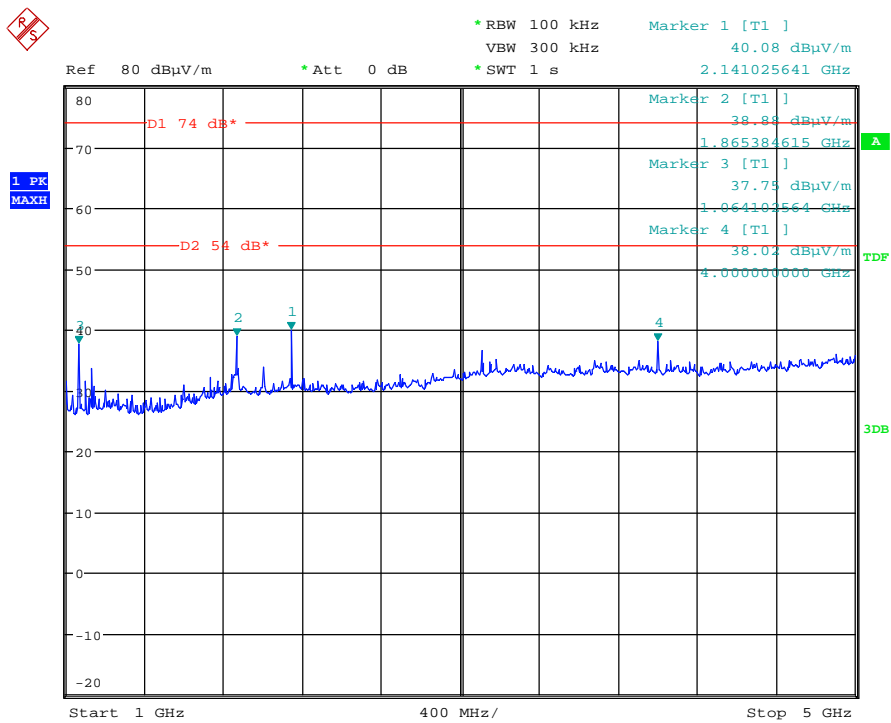


FREQ. (MHz)	MEAS. Rx. (dBµV)	Cable Loss (dB)	Ant Factor	Pre Amp (dB)	FIELD STRENGTH (dBµV/m)	FIELD STRENGTH (µV/m)	Limit (dBµV/m)	Limit (µV/m)
1066.6	55.98	1.6	24.8	37.5	44.88pk	175.38pk	74.0pk	5011pk
1066.6	45.51	1.6	24.8	37.5	34.41Av	52.54Av	54.0Av	500Av
1866.6	66.68	2.1	27.4	35.9	60.28pk	1032.76pk	74.0pk	5011pk
1866.6	46.39	2.1	27.4	35.9	39.99Av	99.88Av	54.0Av	500Av
2000.0	56.05	2.1	27.5	35.6	50.05pk	318.05pk	74.0pk	5011pk
2000.0	41.60	2.1	27.5	35.6	35.60Av	60.25Av	54.0Av	500Av
2145.1Bc	54.33	2.1	27.8	35.6	48.63pk	270.08pk	74.0pk	5011pk
2145.1Bc	49.24	2.1	27.8	35.6	43.54Av	150.31Av	54.0Av	500Av
2175.0Mc	53.65	2.1	27.8	35.6	47.95pk	249.74pk	74.0pk	5011pk
2175.0Mc	47.53	2.1	27.8	35.6	41.83Av	123.45Av	54.0Av	500Av
2204.0Tc	54.23	2.1	27.8	35.6	48.53pk	266.99pk	74.0pk	5011pk
2204.0Tc	48.68	2.1	27.8	35.6	42.98Av	140.92Av	54.0Av	500Av

Note: Bc denotes radiated emission tested whilst operating on the bottom channel  
Mc denotes radiated emission tested whilst operating on the middle channel  
Tc denotes radiated emission tested whilst operating on the top channel  
All other emissions not channel dependant

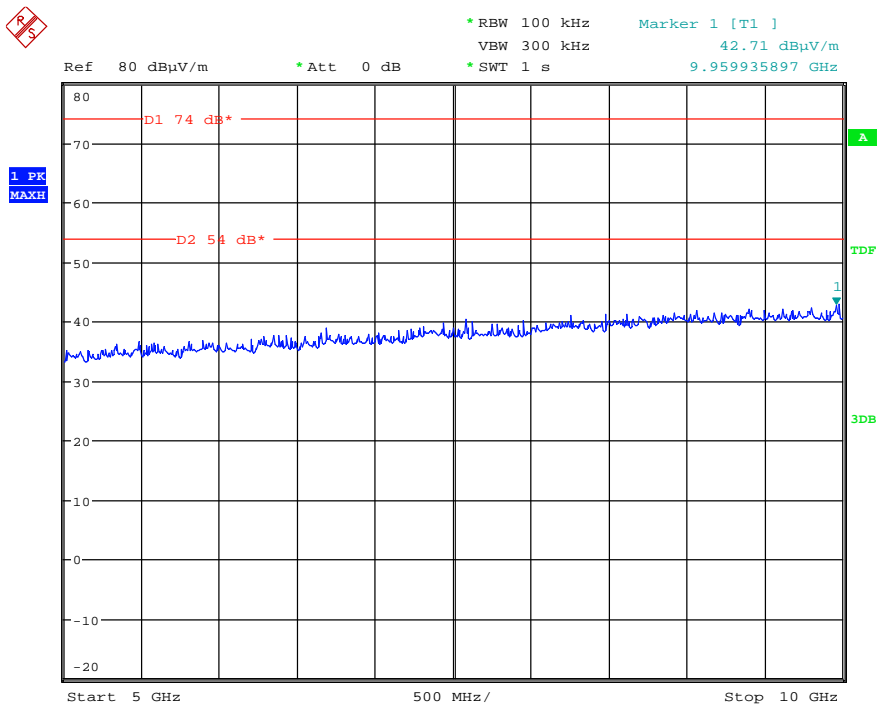


## Rx 1GHz – 5GHz



Date: 22.FEB.2012 14:48:26

## Rx 5GHz – 10GHz

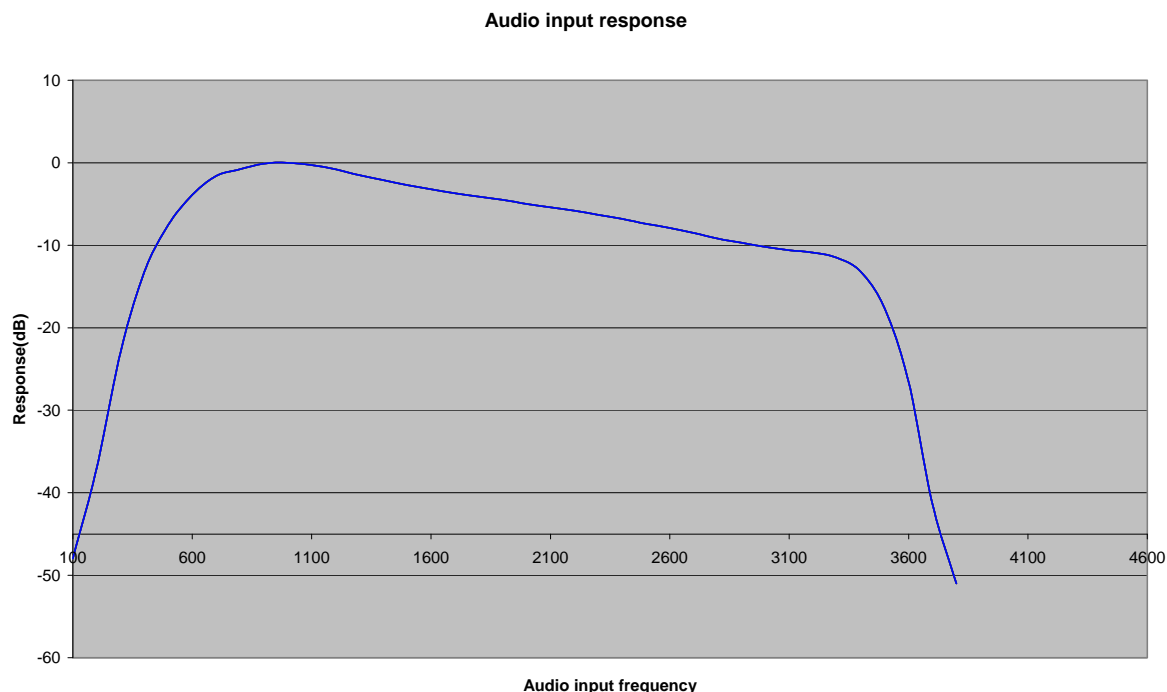


Date: 22.FEB.2012 14:49:10

### Modulation Characteristics: 2.1047 (a)

Ambient temperature = 24°C  
Relative humidity = 56%  
Supply voltage = +13.8Vdc

Radio Laboratory  
Test Signal = F3E



Note: The SB2025NT100W 800MHz unit is capable of transmitting analogue speech and P25 digital audio modulation.

There are no transmitter audio frequency inputs available via a microphone socket or any other audio frequency input.

The transmitter was tested whilst operating under the following conditions:

- 1) A signal generator was connected into the receiver RF input, tuned to the receiver frequency, and the deviation level set to 2.5kHz, the audio frequency was then varied between 100Hz and 5kHz.
- 2) testing was carried out with the talk through feature enabled.  
(therefore the audio response will take into account the pre emphasis and de emphasis of the receiver and transmitter).
- 3) A 1kHz audio signal was applied which was used as a 0dB response reference.

The above plot shows the audio response of the transmitter.

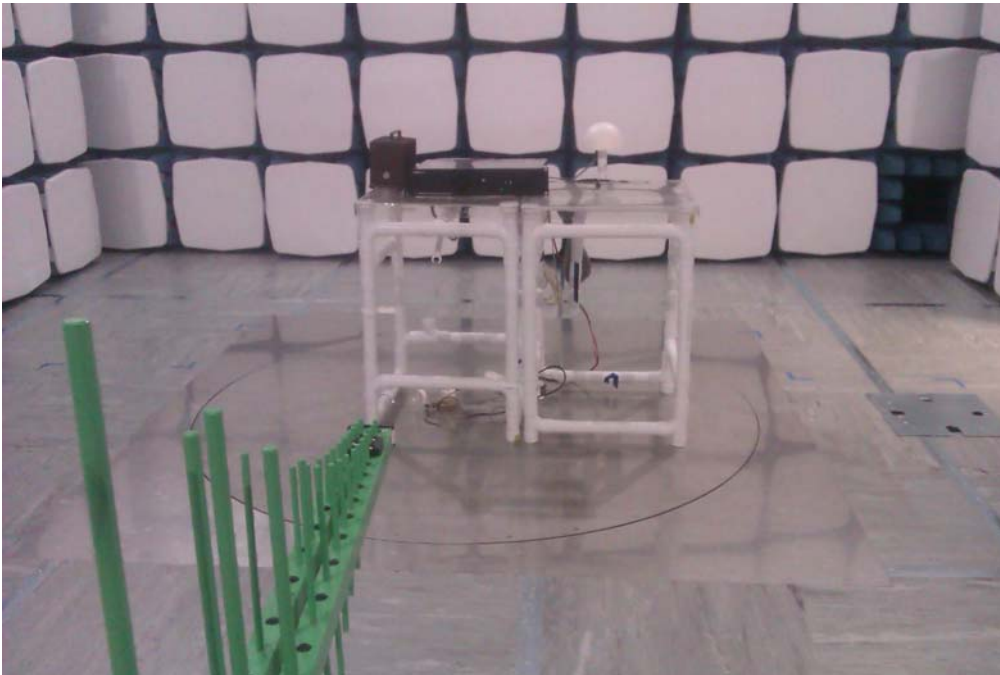
### Modulation Characteristics: 2.1047 (b)

Note: The SB2025NT100W 800MHz unit is capable of transmitting analogue speech and P25 digital audio modulation.

There are no transmitter external audio inputs available via a microphone socket etc, and therefore the test was not performed. The external audio is via the receiver RF input or the digital audio input.

**ANNEX A**  
**PHOTOGRAPHS**

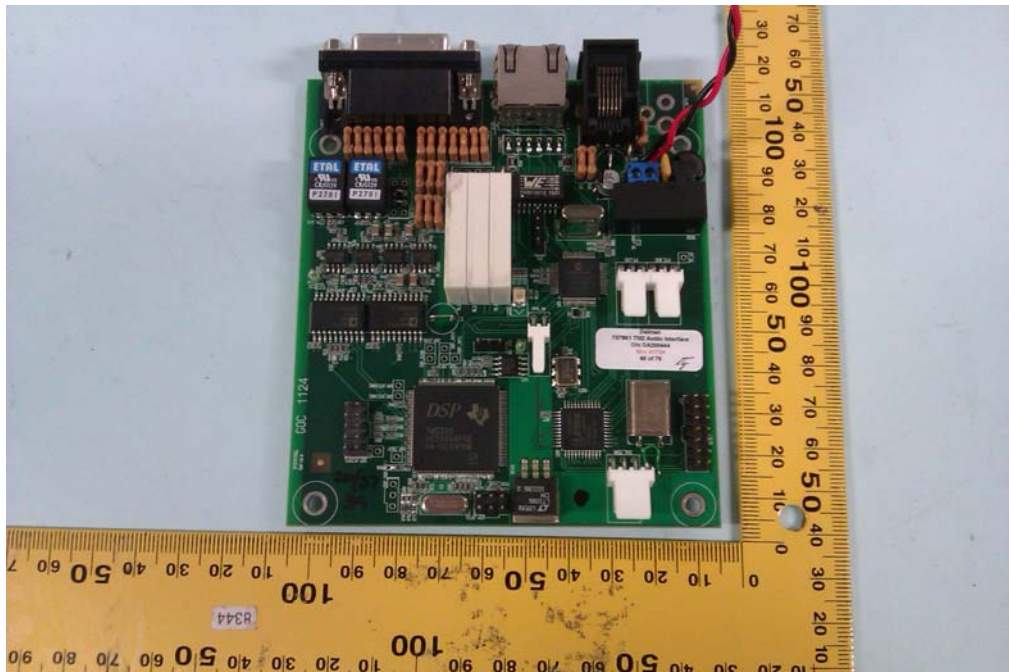
Photograph 1&2: Test Setup



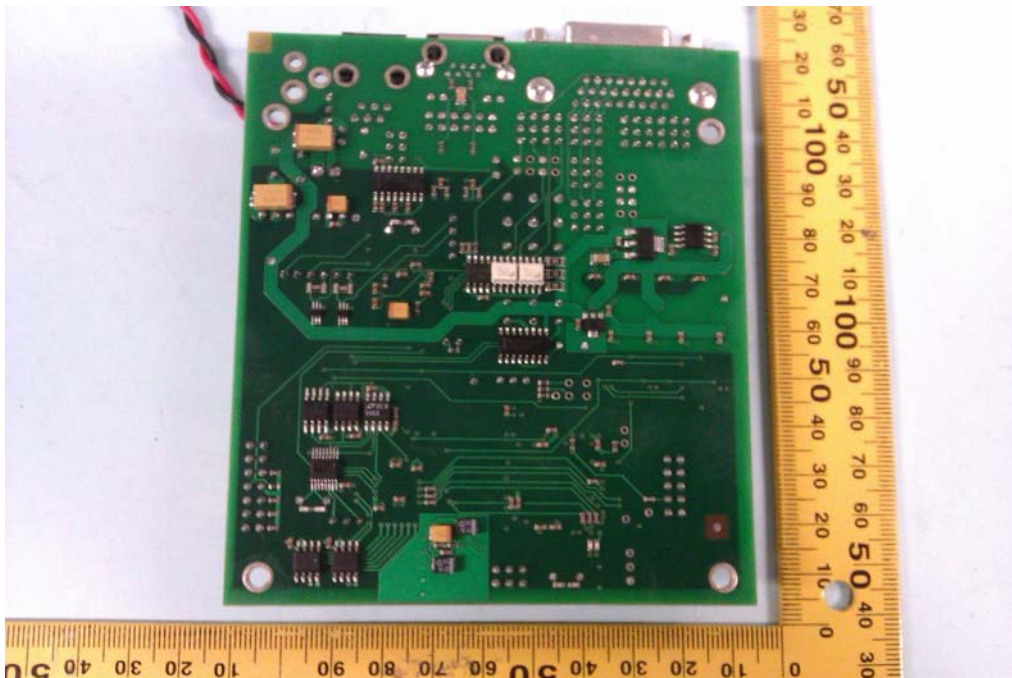
Photograph 3&4: Equipment overview



Photograph 5&6: Top View Main Audio PC



Underside view Main Audio PC

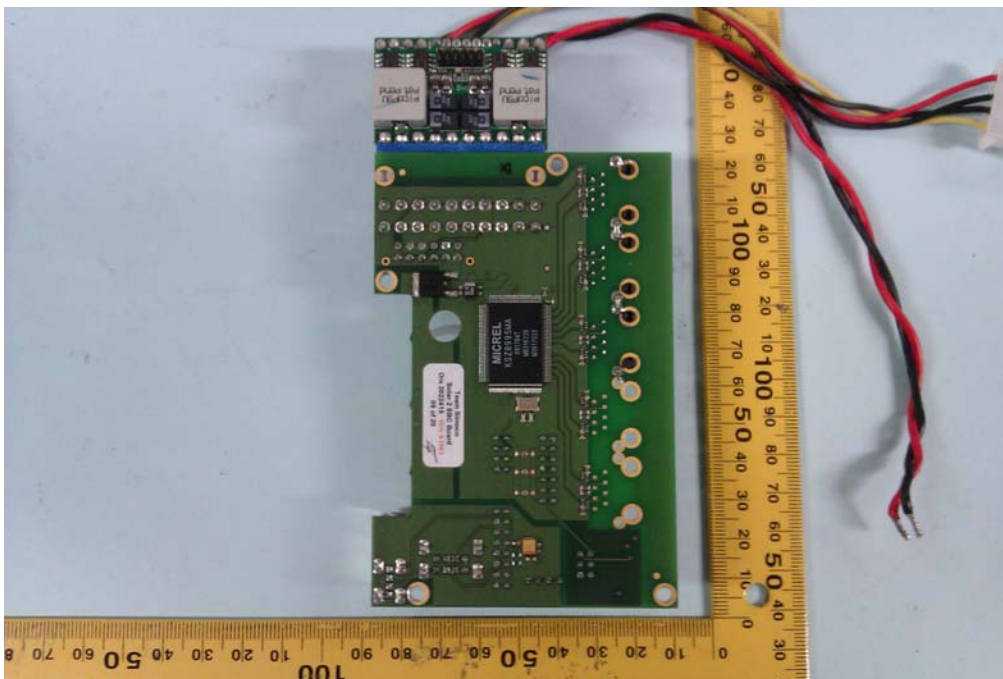




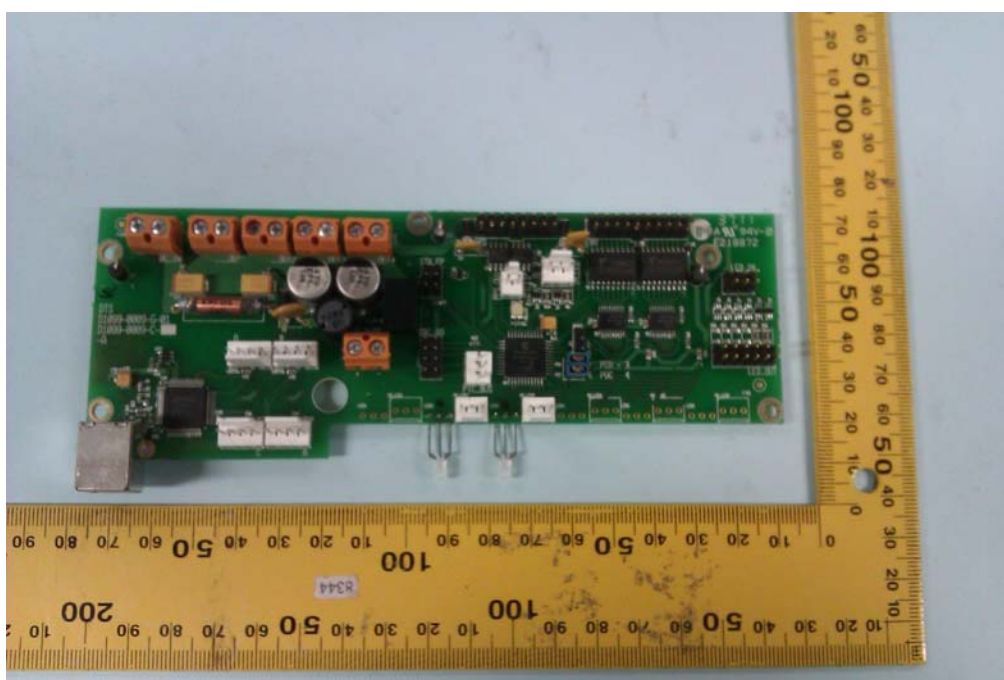
Photograph 7&8: Top View SBC Support PCB



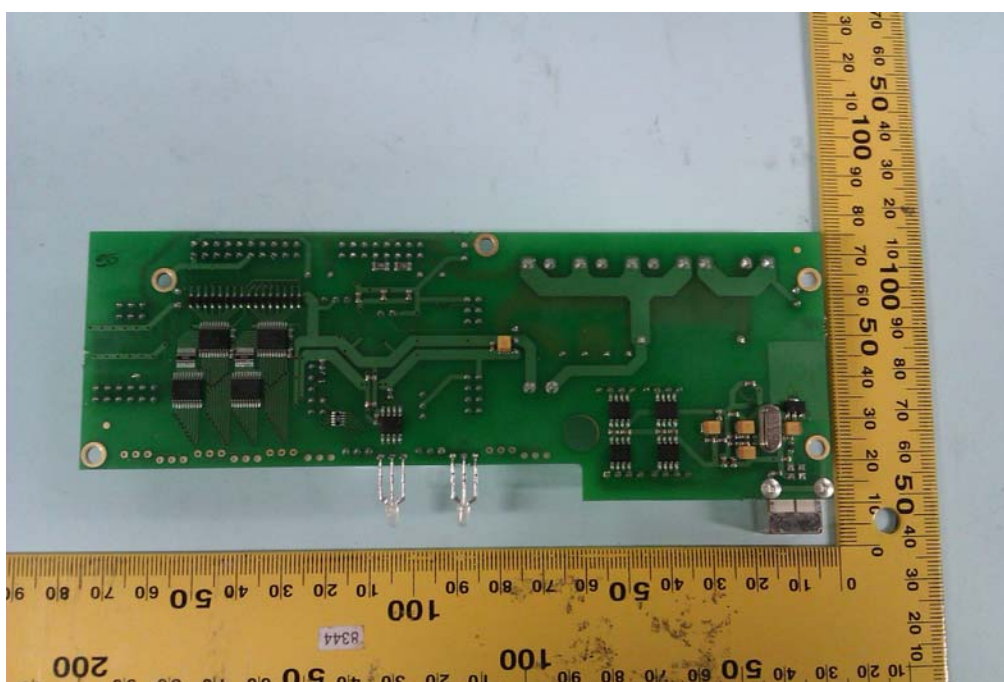
Underside view SBC Support PCB



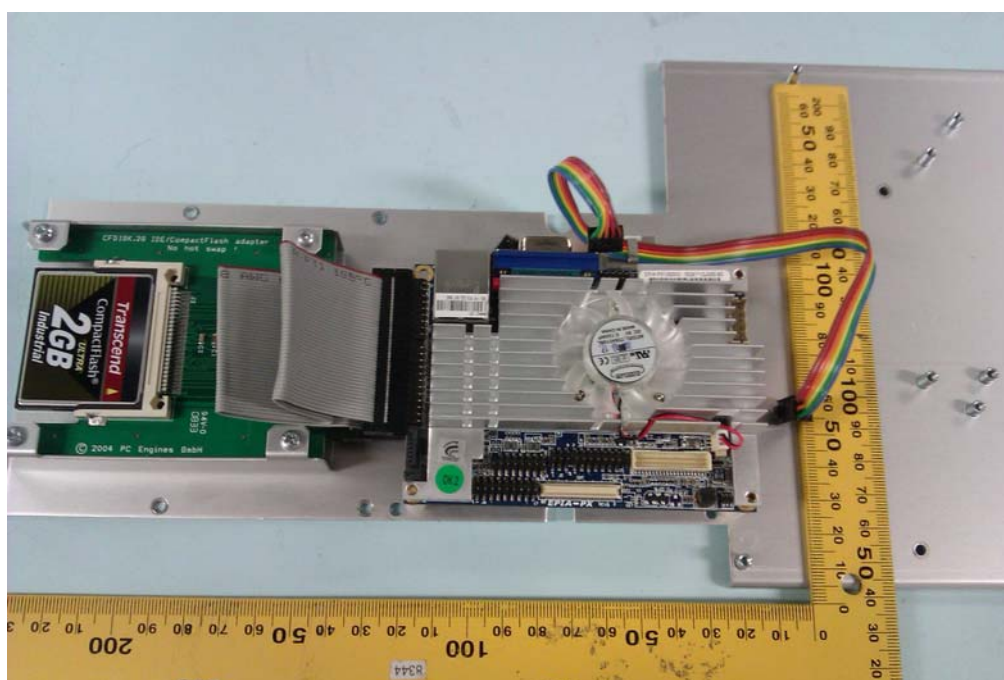
Photograph 9&10: Top View Aux PCB



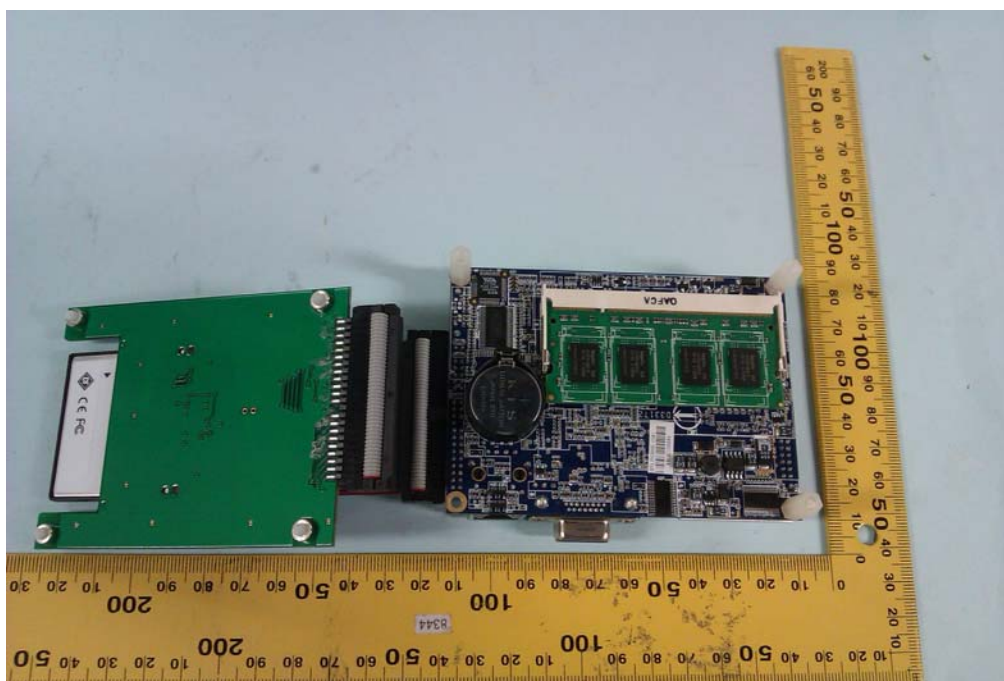
Underside view Aux PCB



Photograph 11&12: Top View SBC

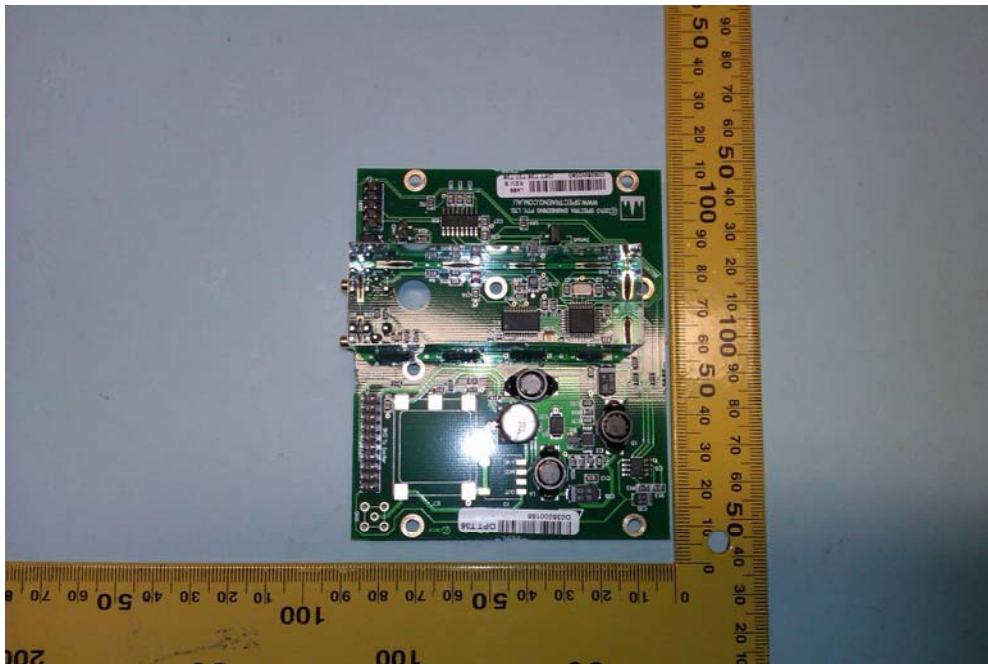


Underside view SBC

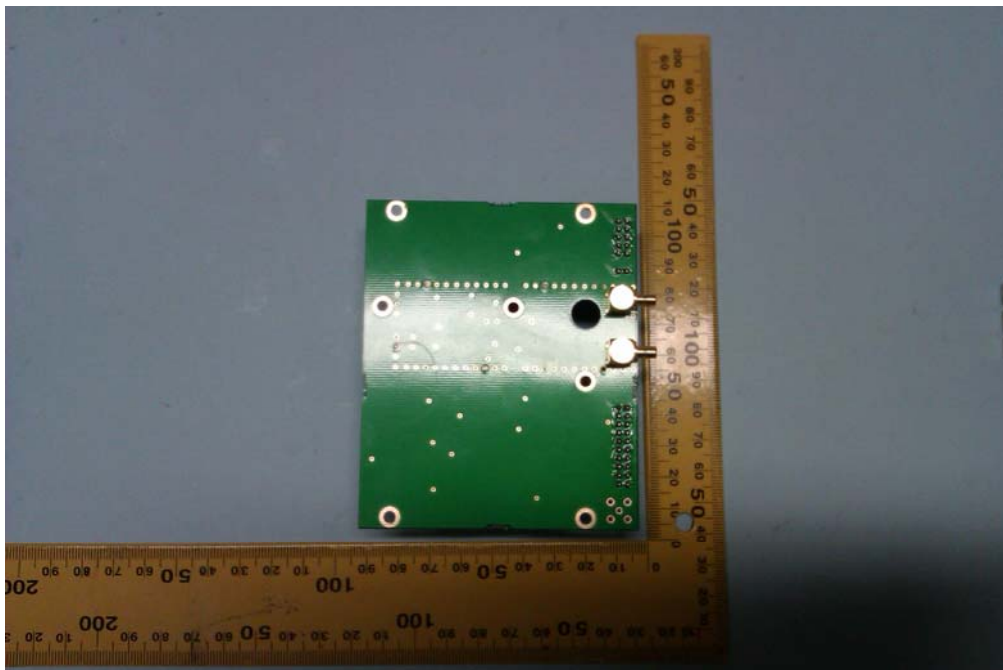




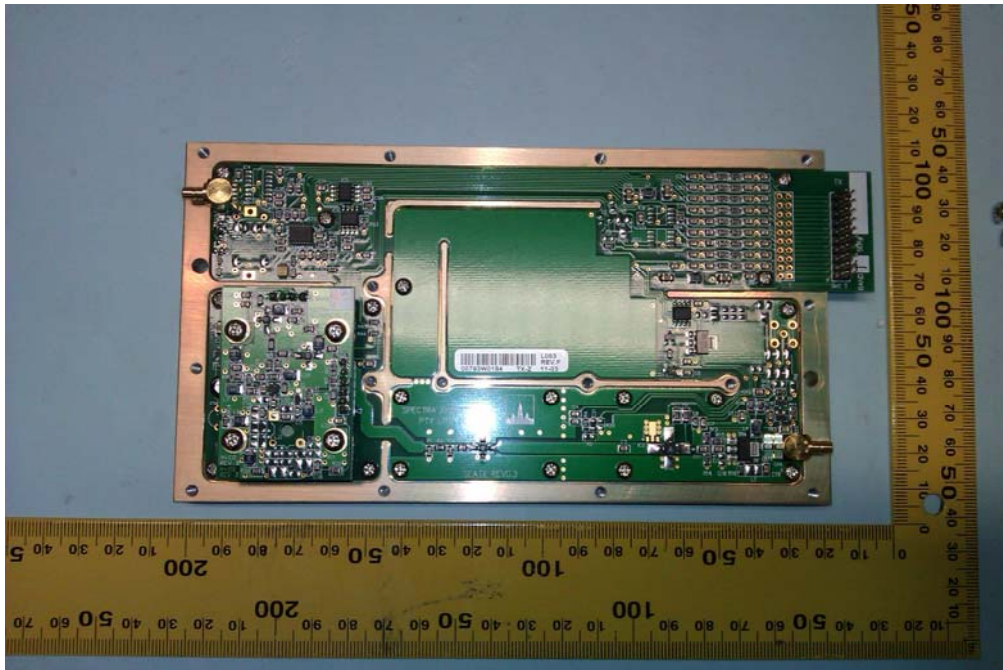
Photograph 13&14: Top View T36 Option PCB



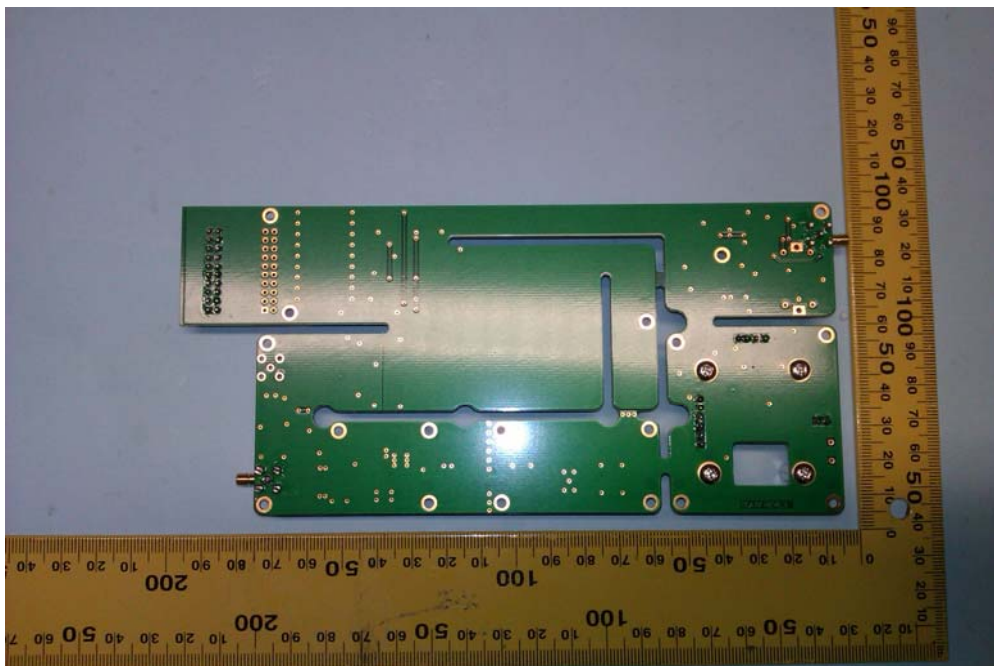
Underside view T36 Option PCB



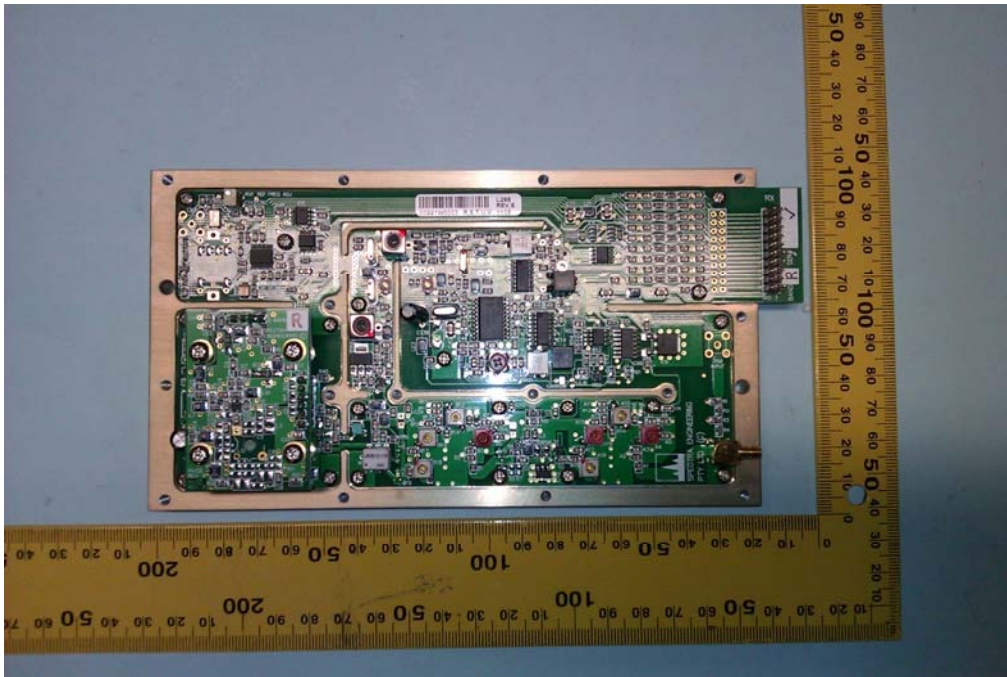
Photograph 15&16: Top View Tx'er exciter PCB



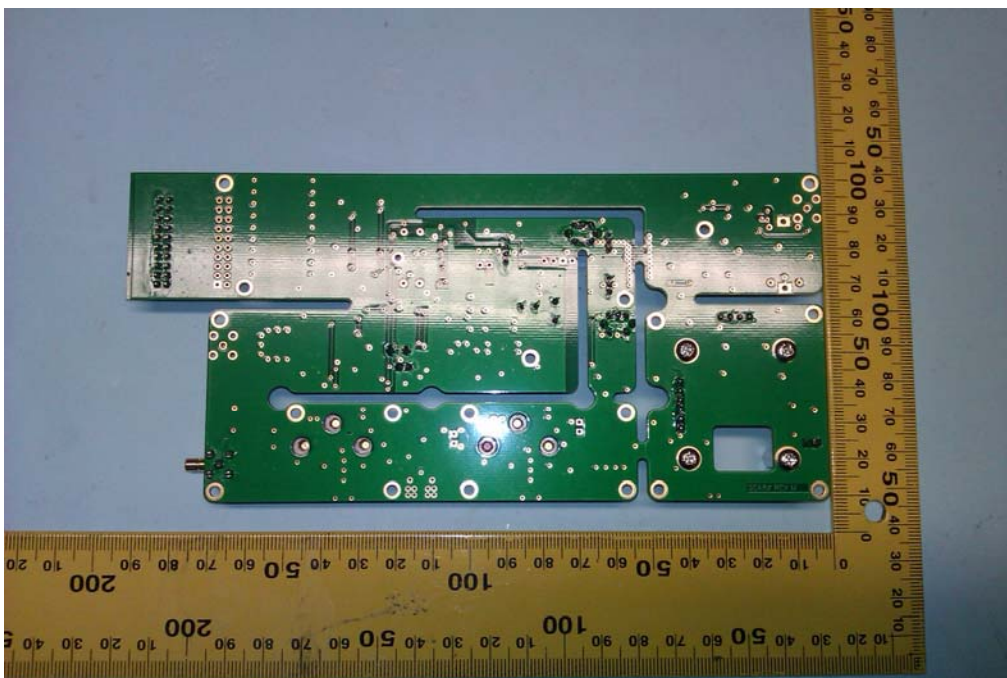
Underside view Tx'er exciter PCB



Photograph 17&18: Top View Rx'er PCB



Underside view Rx'er PCB

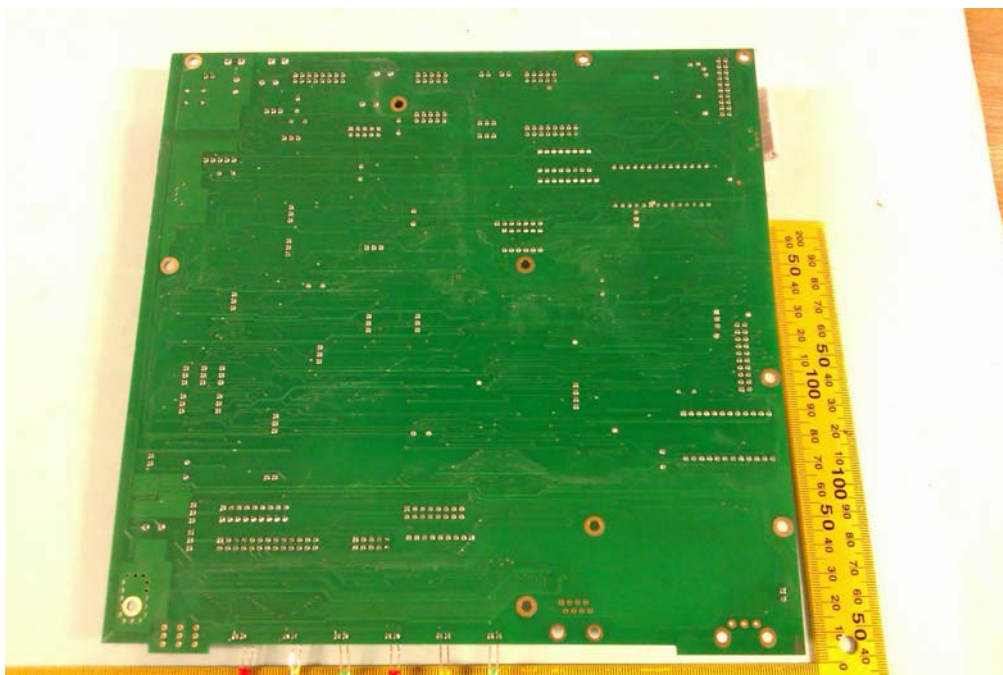




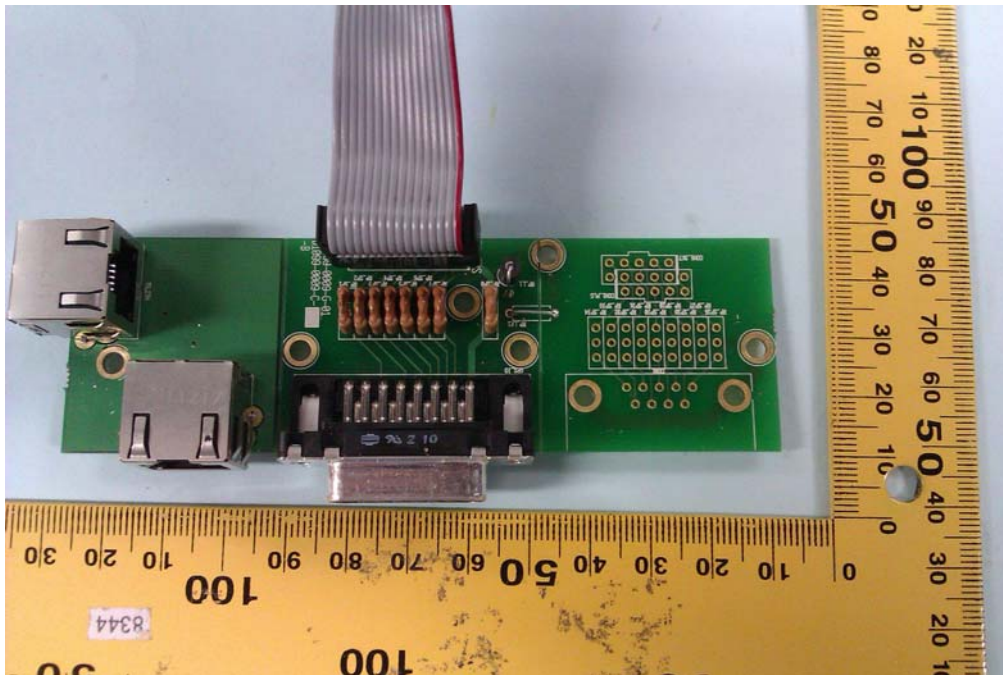
Photograph 19&20: Top View Controller PCB



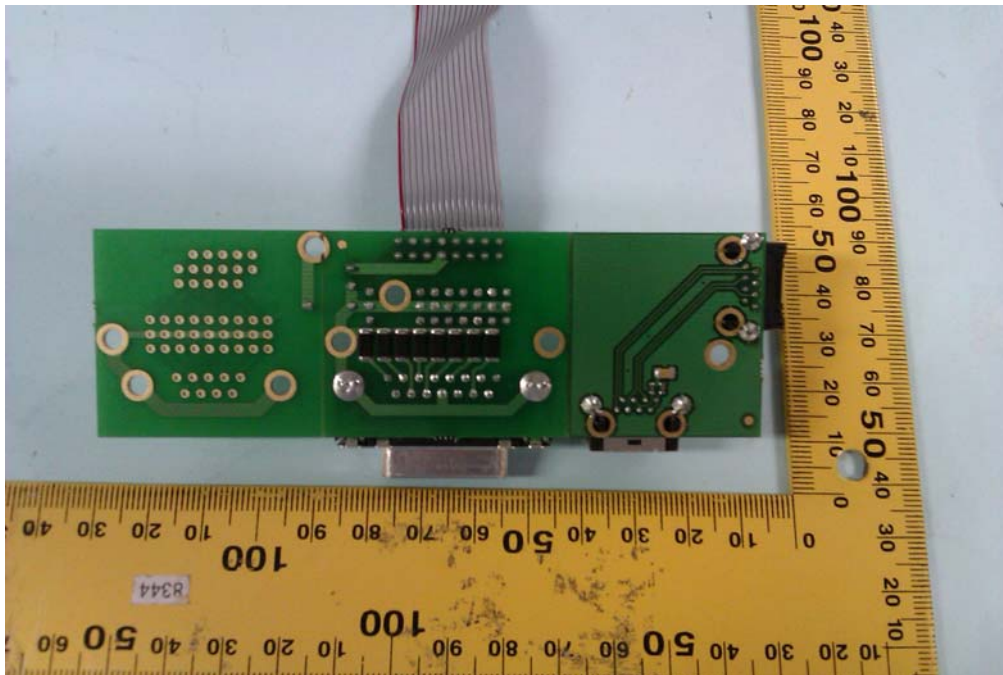
Underside view Controller PCB



Photograph 21&22 Top View Digital I/O PCB

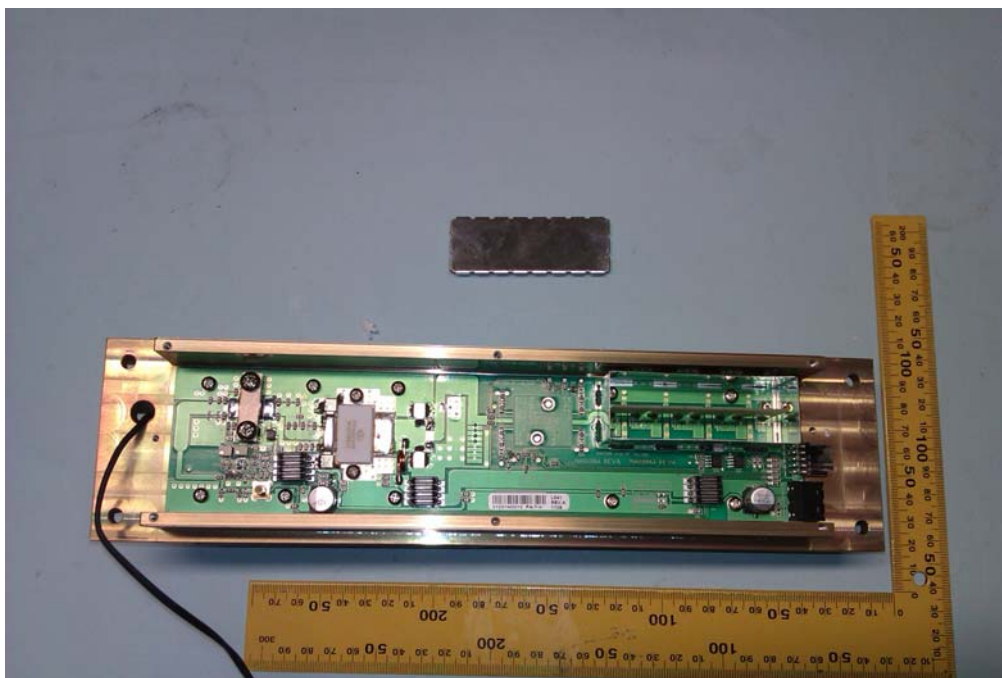


Underside view Digital I/O PCB





Photograph 23: Top View 100W P. A. PCB



**ANNEX B**  
**APPLICANT'S SUBMISSION OF DOCUMENTATION LIST**

## APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

a.	TCB	-	APPLICATION	[X]
		-	FEE	[X]
b.	AGENT'S LETTER OF AUTHORISATION	-		[X]
c.	MODEL(s) vs IDENTITY	-		[ ]
d.	ALTERNATIVE TRADE NAME DECLARATION(s)	-		[ ]
e.	LABELLING	-	PHOTOGRAPHS	[ ]
		-	DECLARATION	[ ]
		-	DRAWINGS	[ ]
f.	TECHNICAL DESCRIPTION	-		[X]
g.	BLOCK DIAGRAMS	-	Tx	[X]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
h.	CIRCUIT DIAGRAMS	-	Tx	[X]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
i.	COMPONENT LOCATION	-	Tx	[ ]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
j.	PCB TRACK LAYOUT	-	Tx	[ ]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
k.	BILL OF MATERIALS	-	Tx	[X]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
l.	USER INSTALLATION / OPERATING INSTRUCTIONS	-		[X]

**ANNEX C**  
**EQUIPMENT CALIBRATION**

TRAC Ref	Type	Description	Manufacturer	Date Calibrated.
TRL281	FSU46	Spectrum Analyser	Rhode & Schwarz	09/02/2011
TRL139	3115	Horn Antenna	EMCO	14/09/2011
TRL572	8449B	Pre amp	Agilent	20/04/2011
TRLUH04	ESVS10	Receiver	Rhode & Schwarz	12/01/2012
TRLUH93	CBL6112B	Antenna	Chase	20/06/2011
TRL222	8304-100-N	ATTENUATOR	BIRD	Cal In Use
TRLUH225	745357	ATTENUATOR	SPINNER	Cal In Use
REF916	SMBV100A	Signal Generator	Rhode & Schwarz	Level checked as required
TRL426	52 Series 11	Temperature Indicator	Fluke	04/03/2011
TRL11	-	Environmental Chamber	Sharetree	USE TRL426
TRLUH41	M3004	Multimeter	AVOmeter	04/03/2011
TRLUH194	AP60/50	Power Supply	Farnell	USE TRLUH41

**ANNEX D**  
**MEASUREMENT UNCERTAINTY**

## **Radio Testing – General Uncertainty Schedule**

*All statements of uncertainty are expanded standard uncertainty using a coverage factor of 1.96 to give a 95% confidence where no required test level exists.*

### **[1] Adjacent Channel Power**

Uncertainty in test result = **1.86dB**

### **[2] Carrier Power**

Uncertainty in test result (Power Meter) = **1.08dB**

Uncertainty in test result (Spectrum Analyser) = **2.48dB**

### **[3] Effective Radiated Power**

Uncertainty in test result = **4.71dB**

### **[4] Spurious Emissions**

Uncertainty in test result = **4.75dB**

### **[5] Maximum frequency error**

Uncertainty in test result (Power Meter) = **0.113ppm**

Uncertainty in test result (Spectrum Analyser) = **0.265ppm**

### **[6] Radiated Emissions, field strength OATS 14kHz-18GHz Electric Field**

Uncertainty in test result (14kHz – 30MHz) = **4.8dB**,

Uncertainty in test result (30MHz – 1GHz) = **4.6dB**,

Uncertainty in test result (1GHz – 18GHz) = **4.7dB**

### **[7] Frequency deviation**

Uncertainty in test result = **3.2%**

### **[8] Magnetic Field Emissions**

Uncertainty in test result = **2.3dB**

### **[9] Conducted Spurious**

Uncertainty in test result – Up to 8.1GHz = **3.31dB**

Uncertainty in test result – 8.1GHz – 15.3GHz = **4.43dB**

Uncertainty in test result – 15.3GHz – 21GHz = **5.34dB**

Uncertainty in test result – Up to 26GHz = **3.14dB**

### **[10] Channel Bandwidth**

Uncertainty in test result = **15.5%**

### **[11] Amplitude and Time Measurement – Oscilloscope**

Uncertainty in overall test level = **2.1dB**,

Uncertainty in time measurement = **0.59%**,

Uncertainty in Amplitude measurement = **0.82%**

### **[12] Power Line Conduction**

Uncertainty in test result = **3.4dB**

**[13] Spectrum Mask Measurements**

Uncertainty in test result = **2.59% (frequency)**  
Uncertainty in test result = **1.32dB (amplitude)**

**[14] Adjacent Sub Band Selectivity**

Uncertainty in test result = **1.24dB**

**[15] Receiver Blocking – Listen Mode, Radiated**

Uncertainty in test result = **3.42dB**

**[16] Receiver Blocking – Talk Mode, Radiated**

Uncertainty in test result = **3.36dB**

**[17] Receiver Blocking – Talk Mode, Conducted**

Uncertainty in test result = **1.24dB**

**[18] Receiver Threshold**

Uncertainty in test result = **3.23dB**

**[19] Transmission Time Measurement**

Uncertainty in test result = **7.98%**



**ANNEX E**  
**CUSTOMER DECLARATION**



Field House  
Uttoxeter Old Road  
Derby  
DE1 1NH

24-Feb-2012

Federal Communications Commission  
Authorization and Evaluation Division  
7435 Oakland Mills Road  
Columbia, MD 21046

Subject: SB2025 Dual Power Supply

Dear Sir/Madam

The 800MHz 100Watt version of the SB2025NT/Atlas 4200 uses a split rail power supply with 28VDC feeding the power amplifier only and 13.8VDC feeding the rest of the circuits. There is no connection between these supply rails and variations in the 28V supply voltage will have no effect on the frequency determining components in the transmitter exciter.

Yours faithfully

**Richard Stimson**  
Development Manager



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