A TEST REPORT

FOR

TEAM SIMOCO Ltd

ON

SDP670 AC Band DMR BASE STATION

Private Land Mobile Radio

DOCUMENT NO. TRA-014138-W-US-1

TEST REPORT NO: TRA-014138-W-US-1

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ISSUE NO: 1

FCC ID: U89SDB670AC01

REPORT ON THE CERTIFICATION TESTING OF A
TEAM SIMOCO
SDP670 AC Band DMR BASE STATION
WITH RESPECT TO
THE FCC RULES CFR 47,
PART 90

PRIVATE LAND MOBILE RADIO.

TEST DATE: 3rd June – 28th August 2013

APPROVED BY: _____ J CHARTERS
RADIO
PRODUCT
MANAGER

DATE: 30th August 2013

Distribution:

Copy Nos: 1. Team Simoco

2. TRaC Global

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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:	U89SDB670AC01
PURPOSE OF TEST:	Certification
TEST SPECIFICATION:	FCC RULES CFR 47, Part 90
TEST RESULT:	Compliant to Specification
EQUIPMENT UNDER TEST:	AC Band DMR Base Station
EQUIPMENT TYPE:	Private Land Mobile Radio
FREQUENCY OF OPERATION:	136.00MHz –174.00MHz
MAXIMUM OUTPUT CONDUCTED:	44.4dBm 27.54W
MODULATION TYPE:	F3E, F1E
POWER SOURCE(s):	+13.8Vdc
TEST DATE(s):	3rd June – 28th August 2013
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):	AC Band DMR Base Station
EQUIPMENT TYPE:	Private Land Mobile Radio
PURPOSE OF TEST:	Certification
TEST SPECIFICATION(s):	FCC RULES CFR 47, Part 90
TEST RESULT:	COMPLIANT Yes [X] No [ ]
APPLICANT'S CATEGORY:	MANUFACTURER [X] IMPORTER [ ] DISTRIBUTOR [ ] TEST HOUSE [ ] AGENT [ ]
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):	3rd June – 28th August 2013
TEST REPORT No:	TRA-014138-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 [X] Class B [ ]

3. Product Use: Private Land Mobile Radio

4. Emission Designator: F3E, F1E

5. Temperatures: Ambient (Tnom) 21^{o}C

6. Supply Voltages: Vnom +13.8Vdc

Note: Vnom voltages are as stated above unless otherwise shown on the test report page

7. Equipment Category:
   Single channel [ ]
   Two channel [ ]
   Multi-channel [X]

8. Channel spacing:
   Narrowband [X]
   Wideband [ ]

9. Test Location TRaC Global
   Skelmersdale [X]

10. Modifications made during test program No modifications were performed.

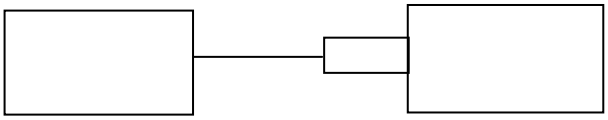
System description:

The SDB670 is a fully integrated Digital Mobile Radio (DMR) base station repeater. Conforming to ETSI open standards, SDB670 combines Simoco's DSP technology with advanced digital radio modules. The platform supports DMR Tier II and Tier III operation as standard with features being enabled via software licensing. Use of Ethernet networks enables the deployment of multi-site radio systems and synchronous 1PPS timing allows for simultaneous wide area coverage.

COMPLIANCE TESTS

RF OUTPUT POWER – CONDUCTED – PART 2.1046

Ambient temperature	=	21°C	Radio Laboratory
Relative humidity	=	44%	
Supply voltage	=	+13.8Vdc	
Channel number	=	See test results	



EUT | Cable & Attenuator | Spectrum Analyser TRL281

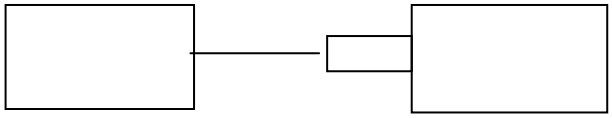
Frequency MHz	Level at Analyser (dBm)	Output Cable & Attenuator loss (dB)	Conducted Output Power (dBm)	Conducted Output Power (W)	Rated output Power (dBm)	Rated output Power (W)
141.0000	13.7	30.23	43.93	24.71	44.0	25
148.9500	14.0	30.22	44.22	26.42	44.0	25
162.0250	14.1	30.30	44.40	27.54	44.0	25

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	R&S	FSU46	200034	TRL281	**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	

TRANSMITTER TESTS

99% Bandwidth – CONDUCTED – Part 90.209

Ambient temperature	=	21°C	Radio Laboratory
Relative humidity	=	39%	
Supply voltage	=	+13.8Vdc	
Channel number	=	See test results	



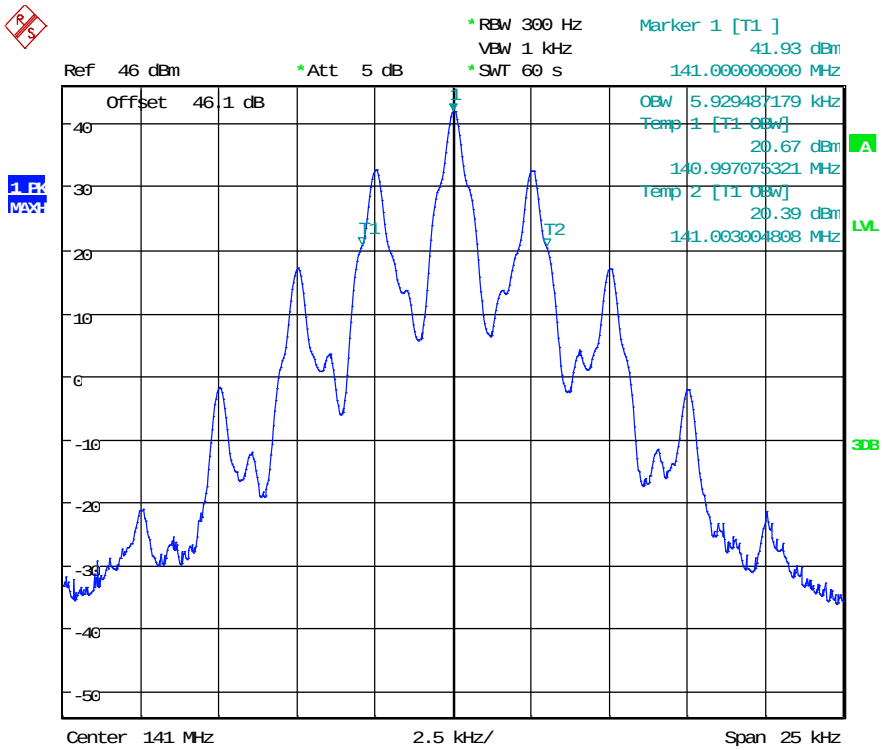
Note:

1. Cable and attenuator between EUT and spectrum analyser 47dB
2. See Table below for 99% Power Occupied Bandwidth
3. Test tone for analogue speech via T/T signal generator fed into receiver and talk through selected
4. DMR Internally generated test tone 4FSK

Frequency Of Operation Channel	Modulation Type
FM 12.5kHz Channel spacing	
141.0000	99% Bandwidth =5.92kHz
148.9500	99% Bandwidth =5.92kHz
162.0250	99% Bandwidth =5.96kHz
DMR Modulation	
141.0000	99% Bandwidth =8.13kHz
148.9500	99% Bandwidth =8.07kHz
162.0250	99% Bandwidth =8.13kHz

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**

141.00 MHz analogue speech



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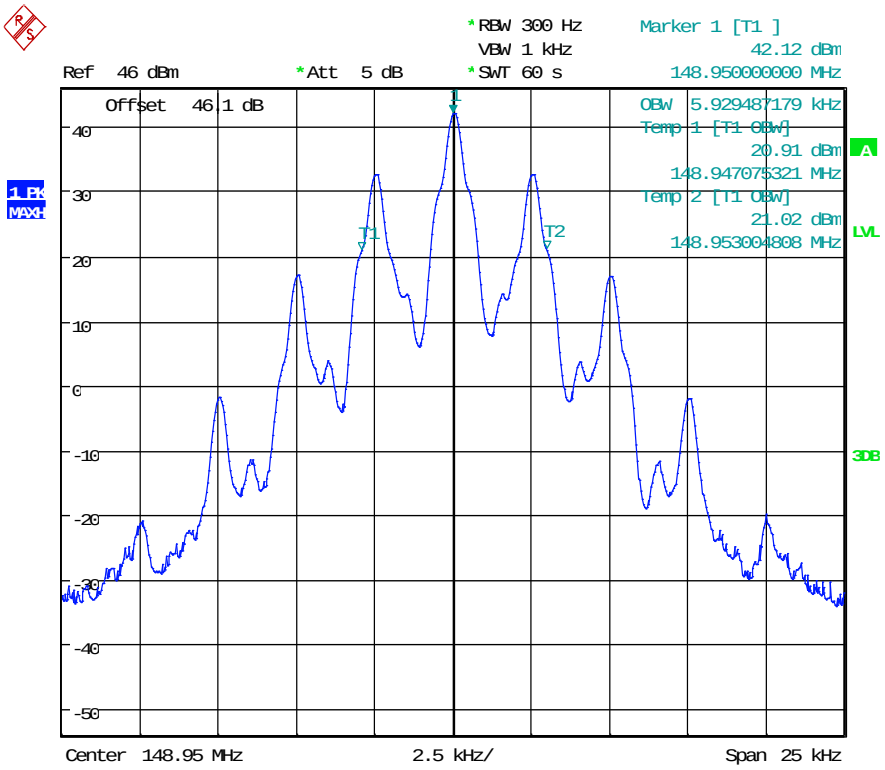
148.95MHz analogue speech



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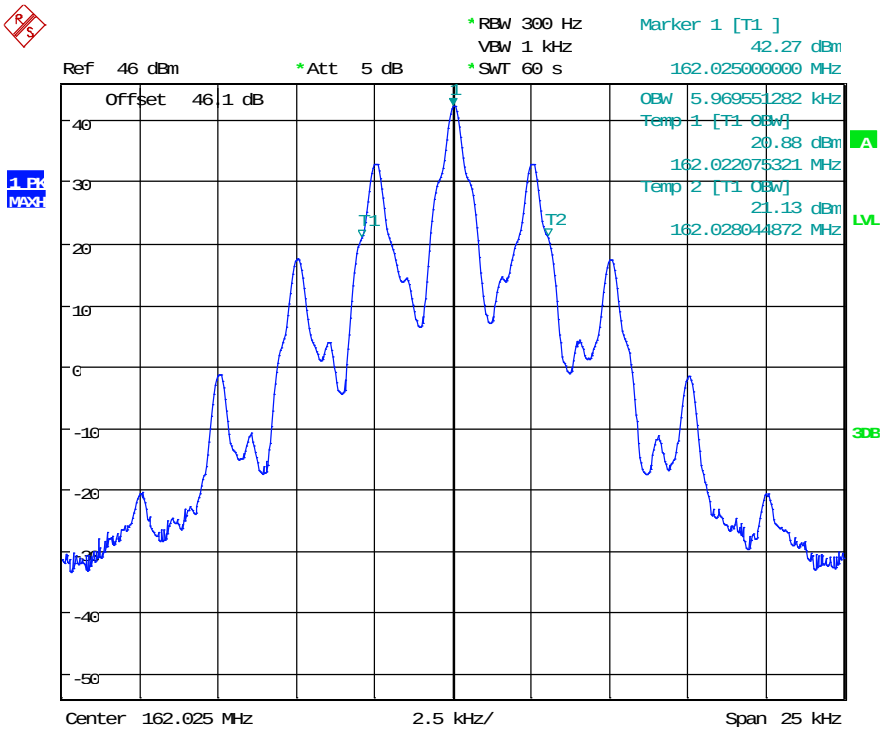
162.0250MHz analogue speech



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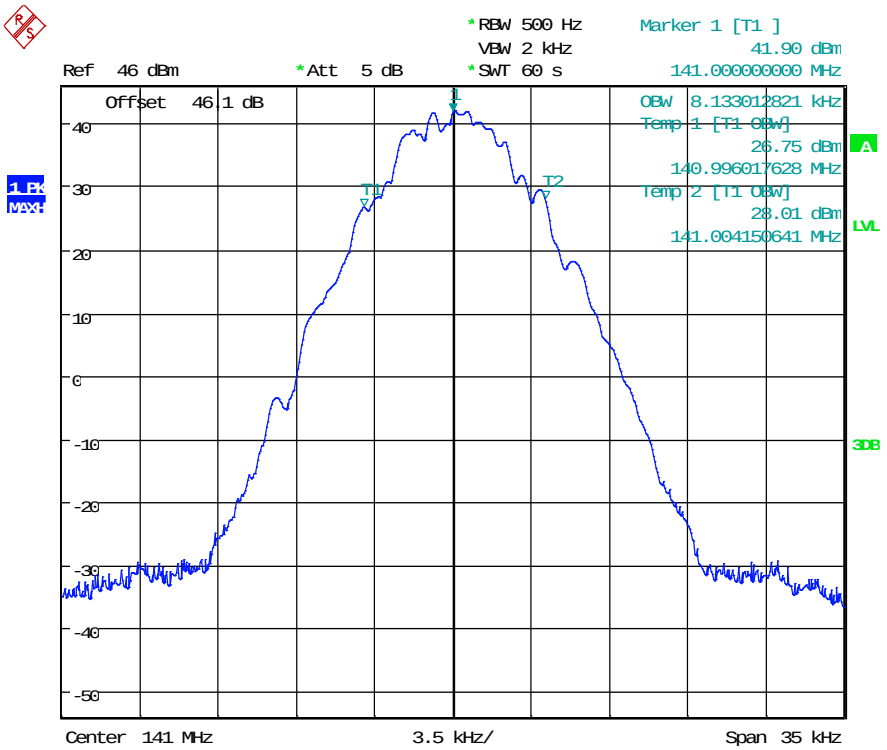
141.00 DMR Modulation



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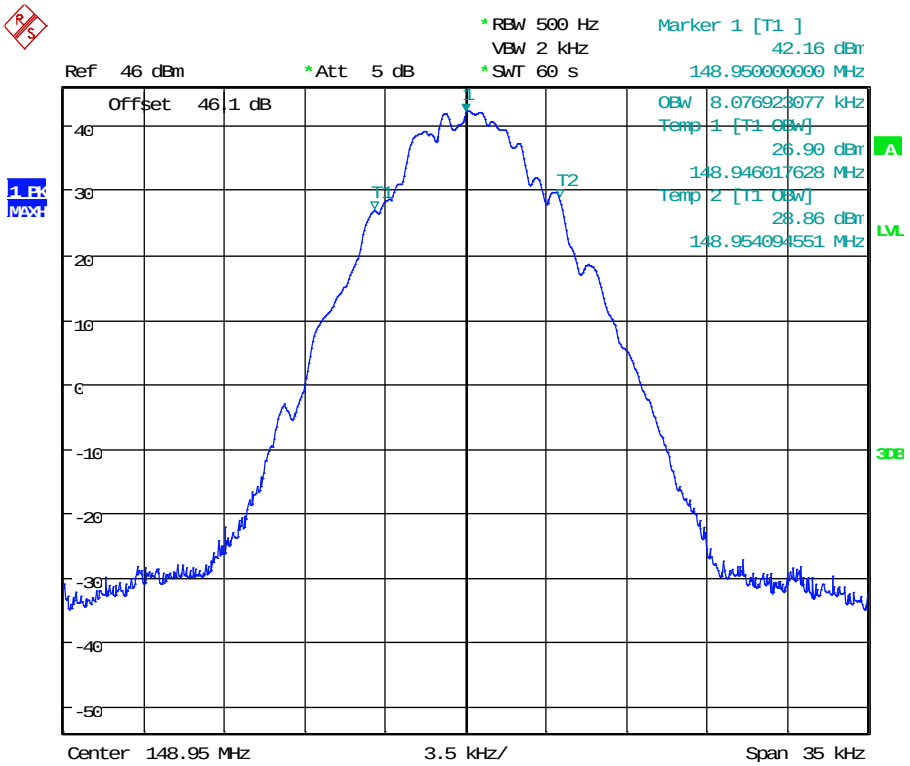
148.95MHz DMR Modulation



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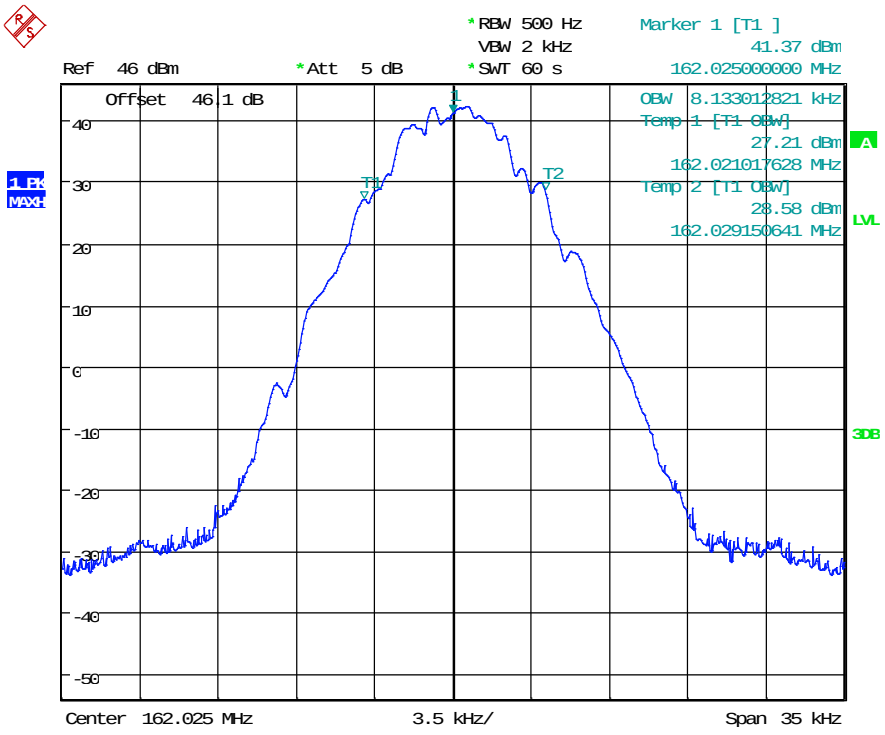
162.025MHz DMR Modulation

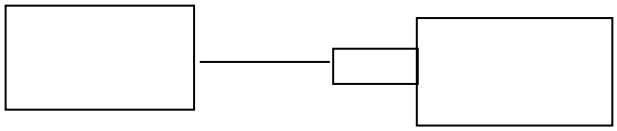


Date: 27.JUN.2013 11:58:44

TRANSMITTER TESTS

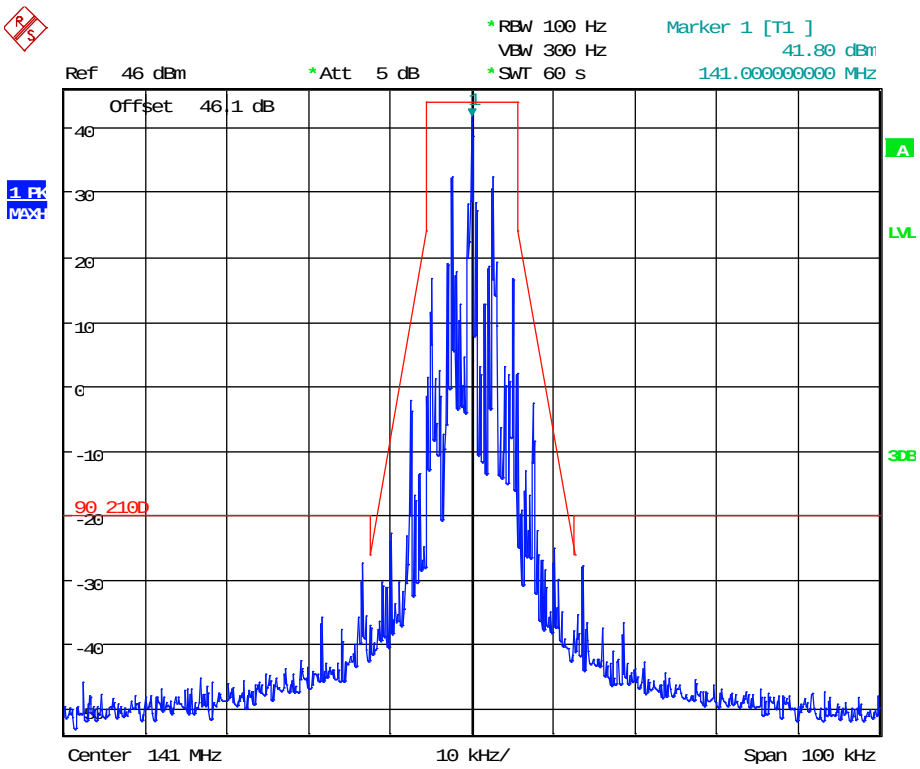
Occupied Bandwidth
Emission Masks. Part 90.210(d)

Ambient temperature	=	21°C	Radio Laboratory		
Relative humidity	=	39%	Test Signal	=	F3E
Supply voltage	=	+13.8Vdc			



EUT | Cable & Attenuator | Spectrum Analyser TRL281

141.00MHz: 12.5kHz channel spacing Emission Mask D (FM speech)



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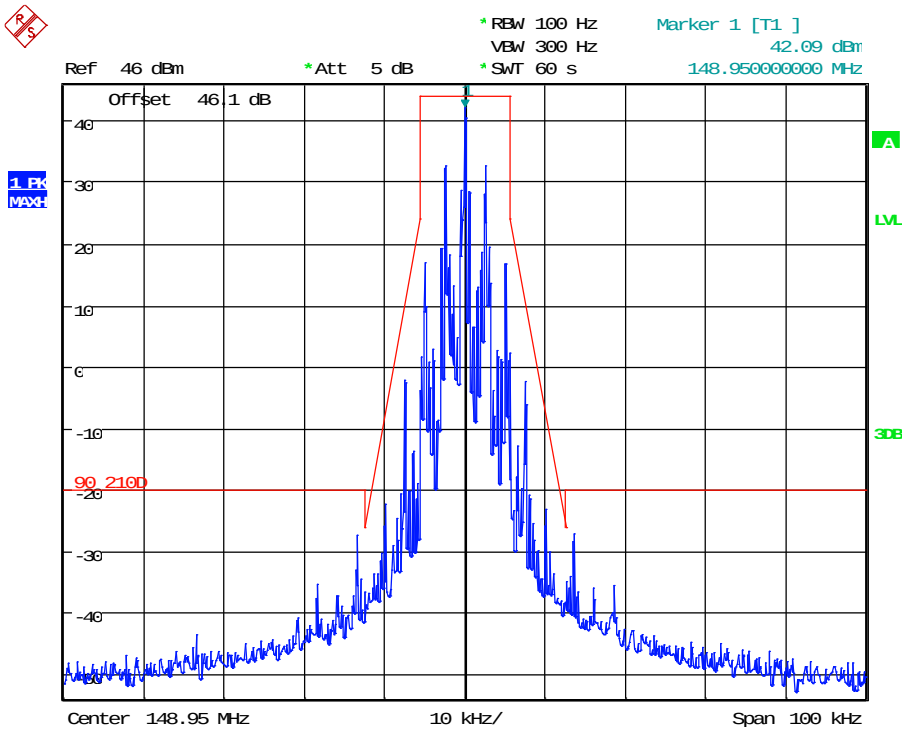
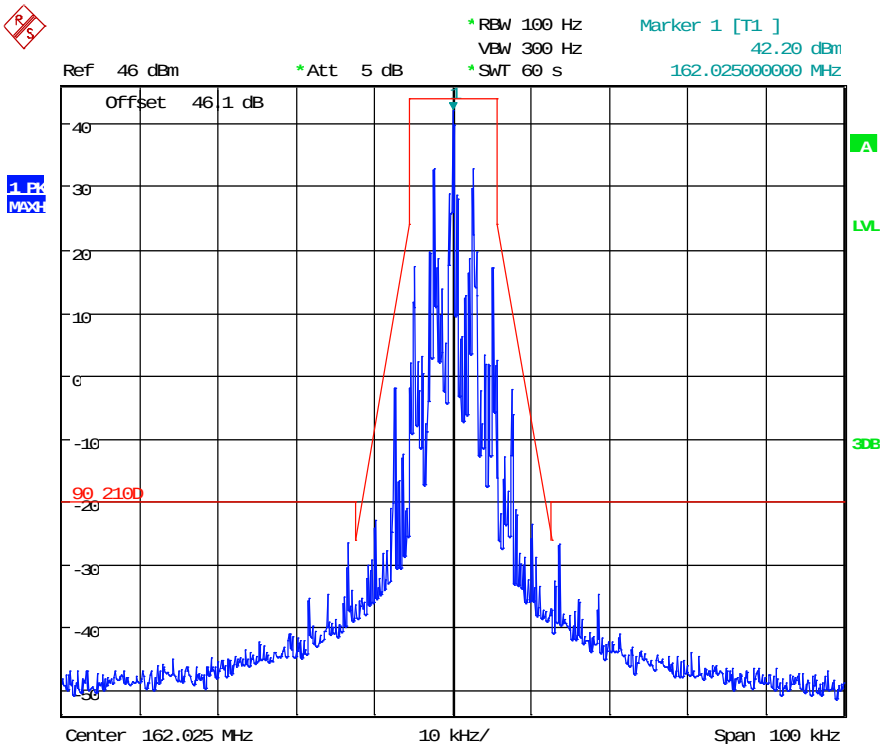
148.95MHz:12.5kHz channel spacing Emission Mask D (FM speech)



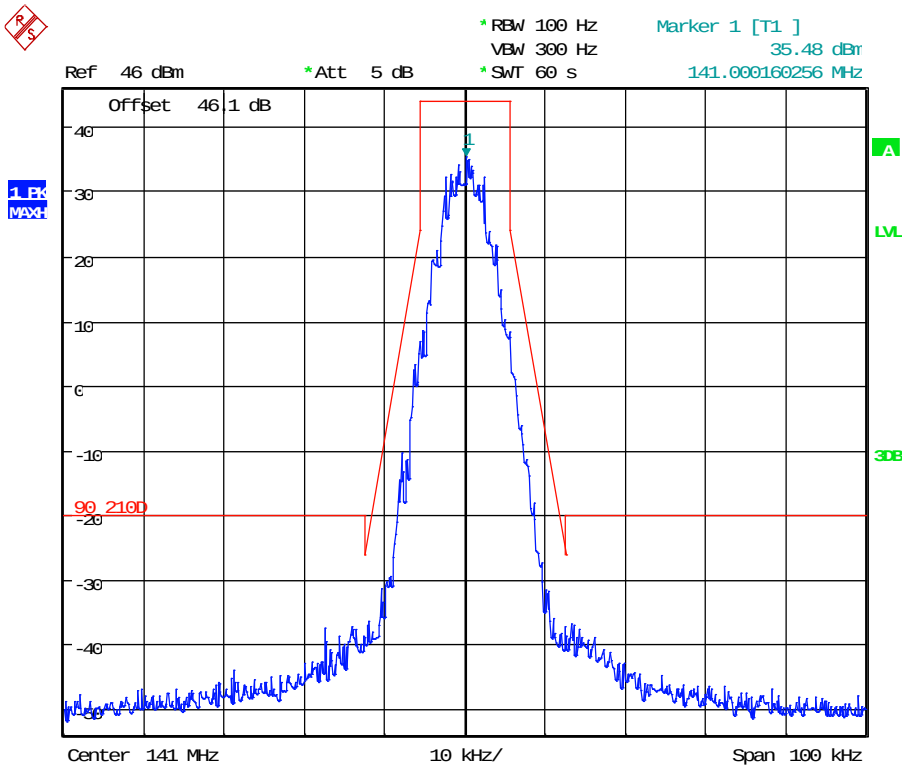
Date: 27.JUN.2013 12:24:45

162.025MHz:12.5kHz channel spacing Emission Mask D (FM speech)



Date: 27.JUN.2013 12:20:50

141.00MHz: 12.5kHz channel spacing Emission Mask D (DMR)



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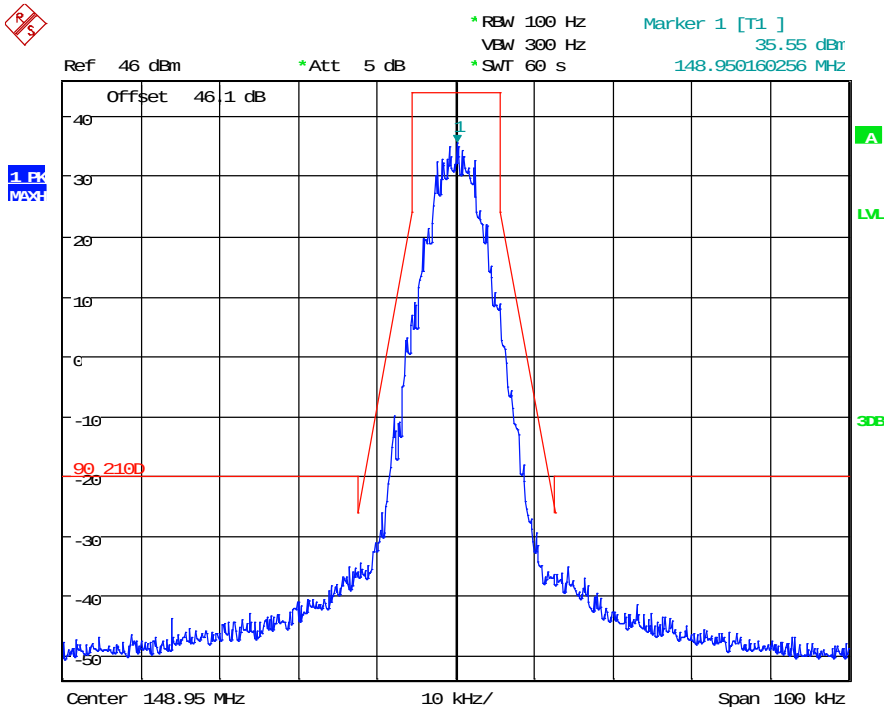
148.95MHz: 12.5kHz channel spacing Emission Mask D (DMR)



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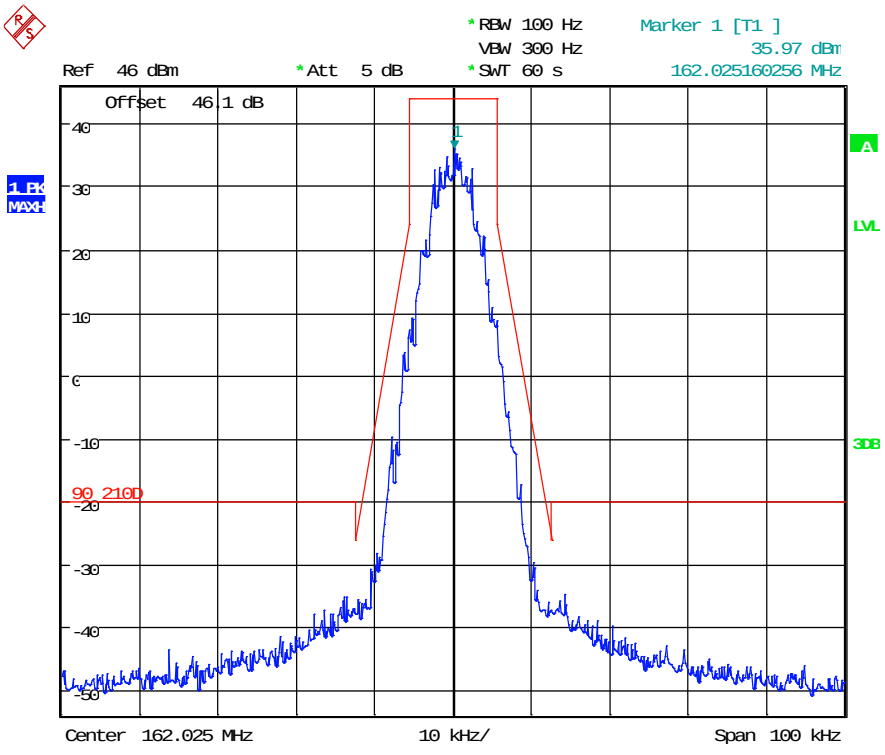
162.025MHz: 12.5kHz channel spacing Emission Mask D (DMR)

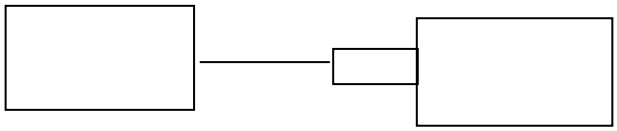


Date: 27.JUN.2013 12:44:41

TRANSMITTER TESTS

SPURIOUS EMISSIONS – CONDUCTED – Part 2.1053

Ambient temperature	=	21°C	Radio Laboratory		
Relative humidity	=	39%	Test Signal	=	F3E
Supply voltage	=	+13.8Vdc			



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 centre of the authorized bandwidth by a displacement frequency (fd in kHz) of more than12.5kHz:At least 50+10log(P) or 70dB whichever is the lesser attenuation.

50+10log(100W)= 70dBc = 50dBm-70= -20dBm

Note: Emission preview plots were taken in a 100kHz resolution bandwidth to reduce the noise floor. Any emissions relating to the DUT were re measured using a 1MHz resolution bandwidth.

The plots in this report are indication of worse case results, testing was performed on all modulation types.

RESULTS

141.00MHz

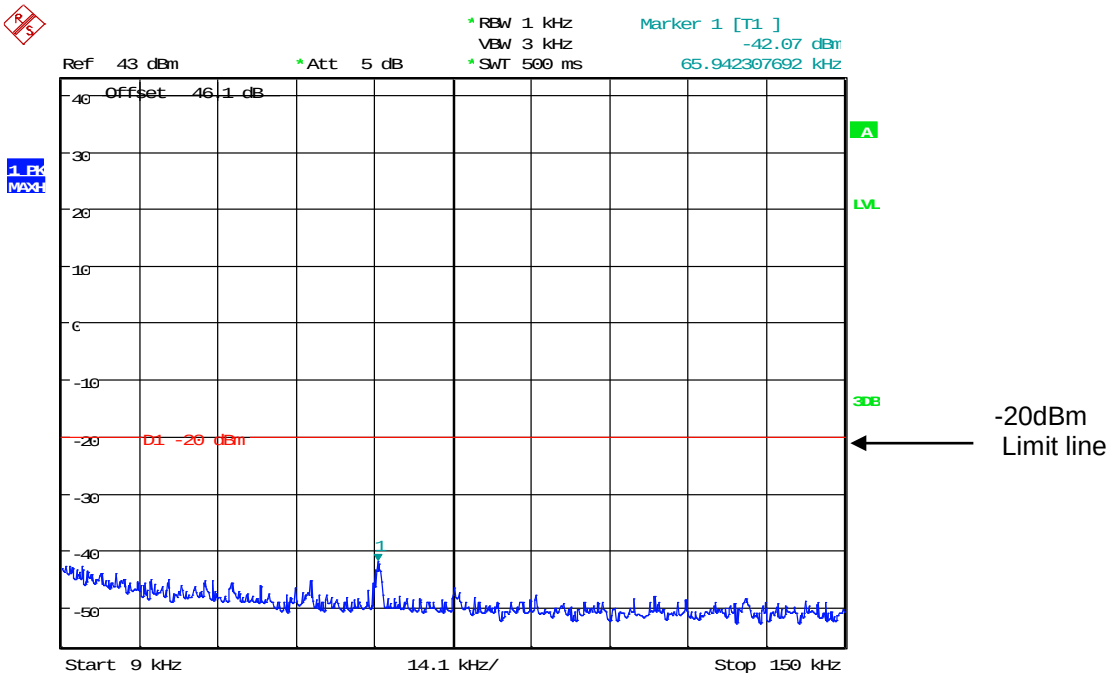
FREQUENCY RANGE	FREQ. (GHz)	MEASURED LEVEL (dBm)	LIMIT (dBm)
9kHz – 10GHz	No significant emissions within 20dB of the limit		-20

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**
FILTER H	TELONIC BERKELEY	TTR375-3EE	60011-3	TRLUH265	**X**

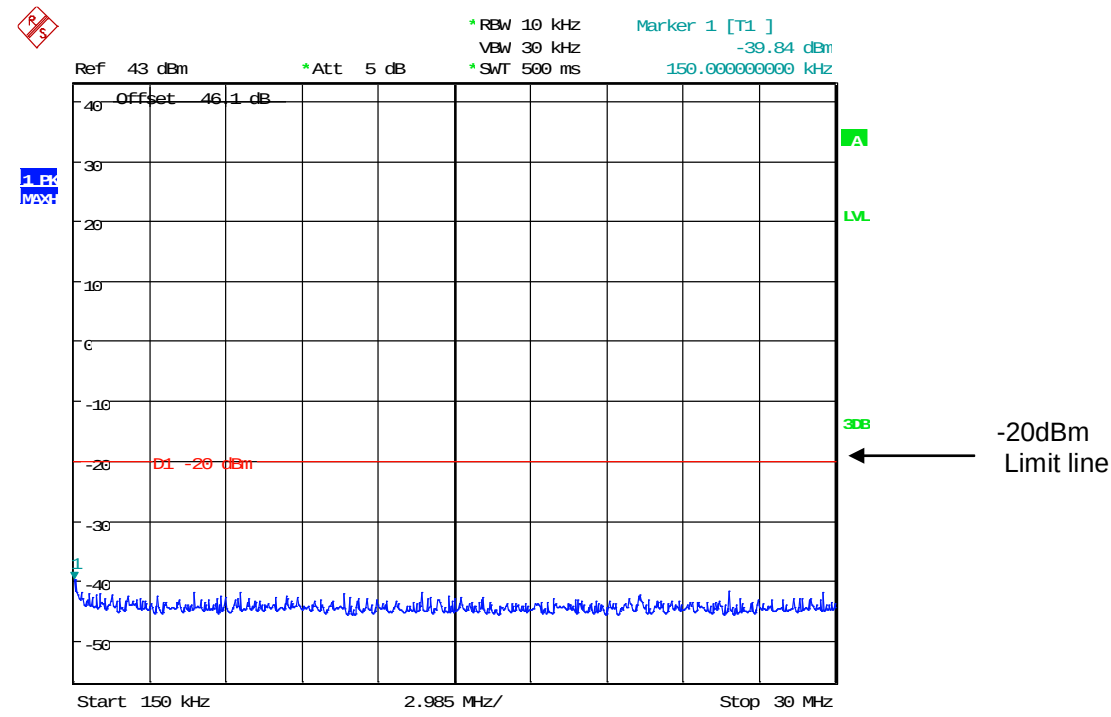
Conducted emissions 141.00MHz

141.00MHz 9kHz – 150kHz



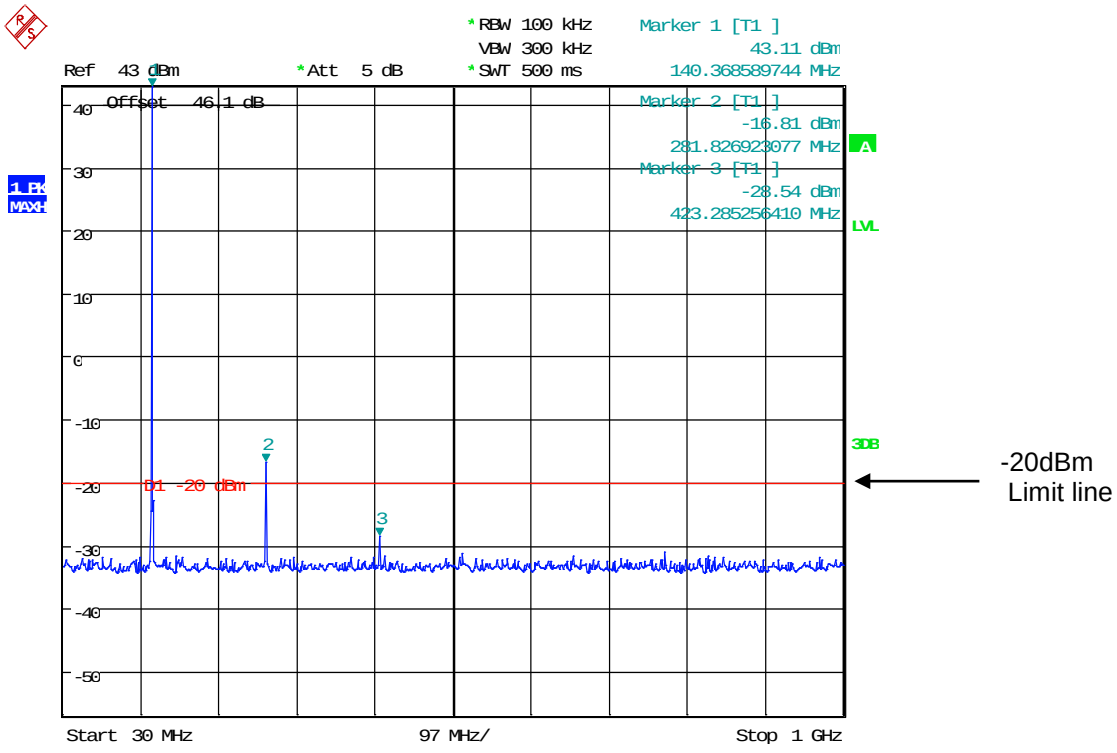
Date: 27.JUN.2013 12:50:54

141.00MHz 150kHz-30MHz



Date: 27.JUN.2013 12:51:57

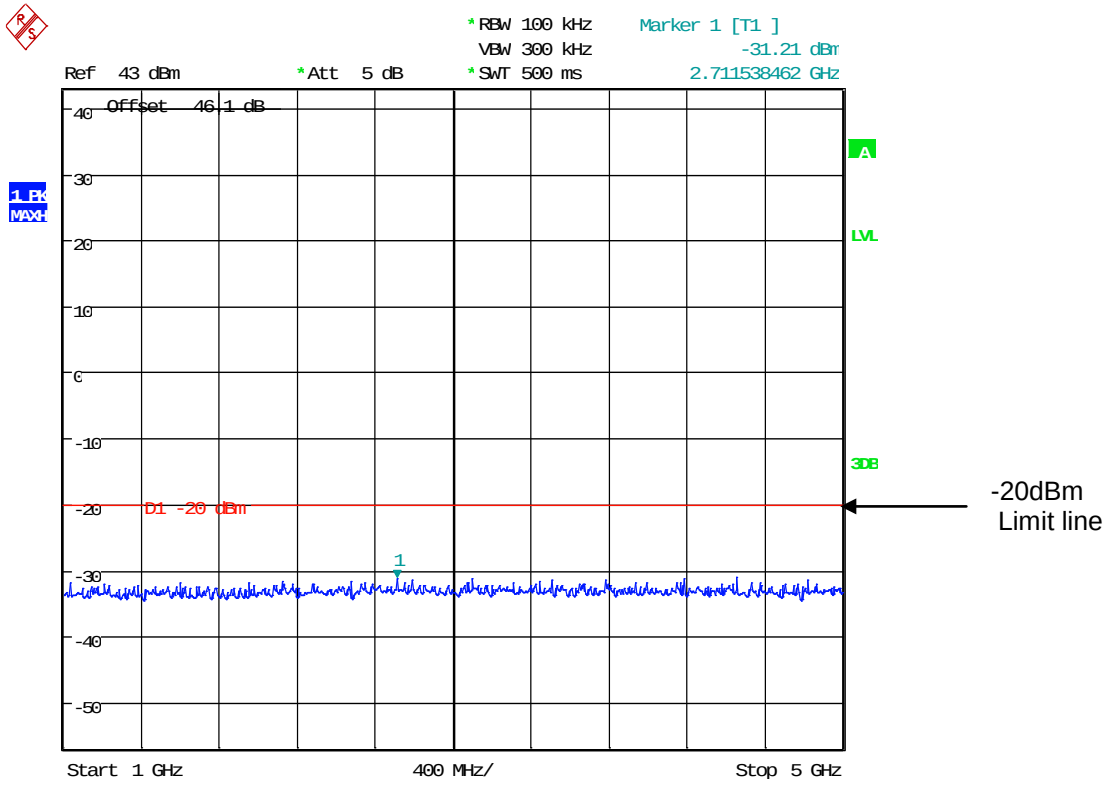
141.00MHz 30MHz-1GHz



-20dBm
Limit line

Date: 27.JUN.2013 12:52:36

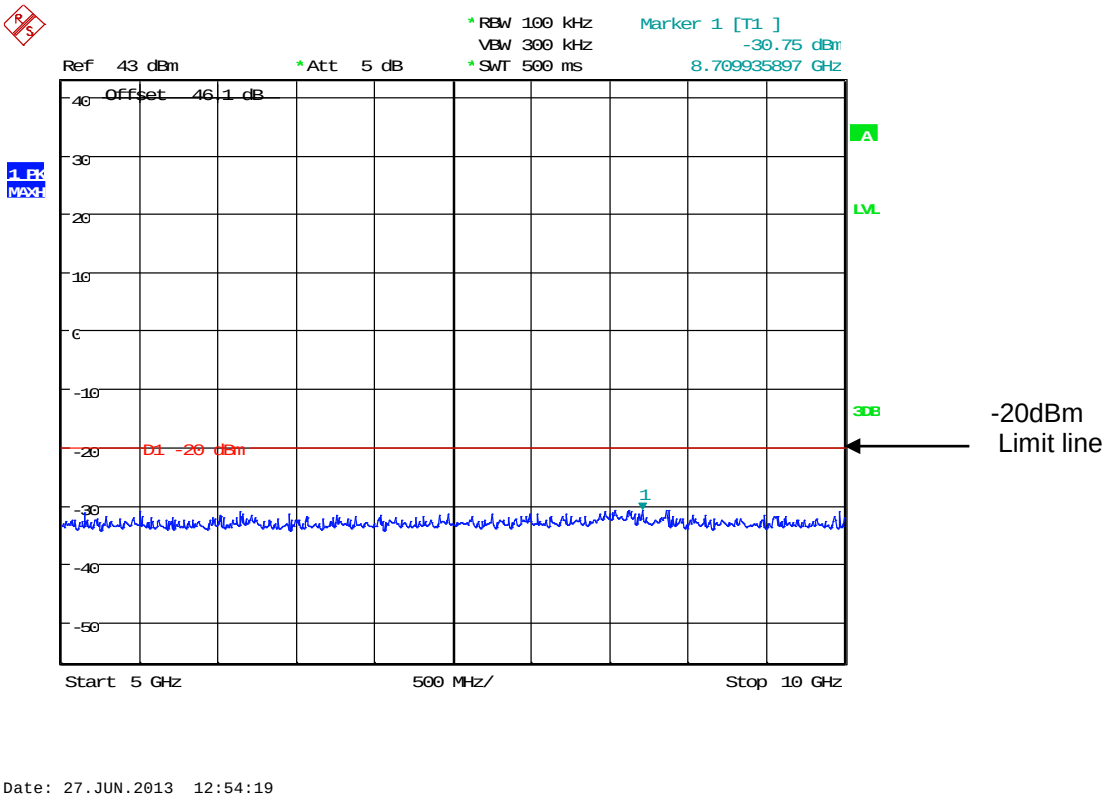
141.00MHz 1GHz – 5GHz



-20dBm
Limit line

Date: 27.JUN.2013 12:53:30

141.00MHz 5GHz-10GHz

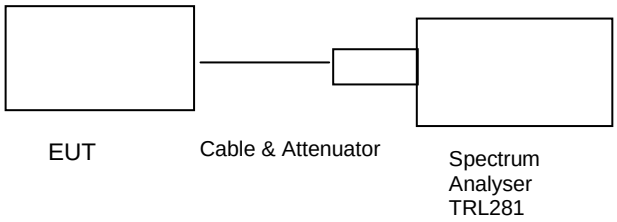


Date: 27.JUN.2013 12:54:19

Note: The plots are taken without the use of a notch filter, the results tables take into account the use of the notch filter to reduce the fundamental.

SPURIOUS EMISSIONS – CONDUCTED – Part 2.1053

Ambient temperature	=	21°C	Radio Laboratory		
Relative humidity	=	39%	Test Signal	=	F3E
Supply voltage	=	+13.8Vdc			



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 centre of the authorized bandwidth by a displacement frequency (fd in kHz) of more than12.5kHz:At least 50+10log(P) or 70dB whichever is the lesser attenuation.

50+10log(100W)= 70dBc = 50dBm-70= -20dBm

Note: Emission preview plots were taken in a 100kHz resolution bandwidth to reduce the noise floor. Any emissions relating to the DUT were re measured using a 1MHz resolution bandwidth.

The plots in this report are indication of worse case results, testing was performed on all modulation types.

RESULTS

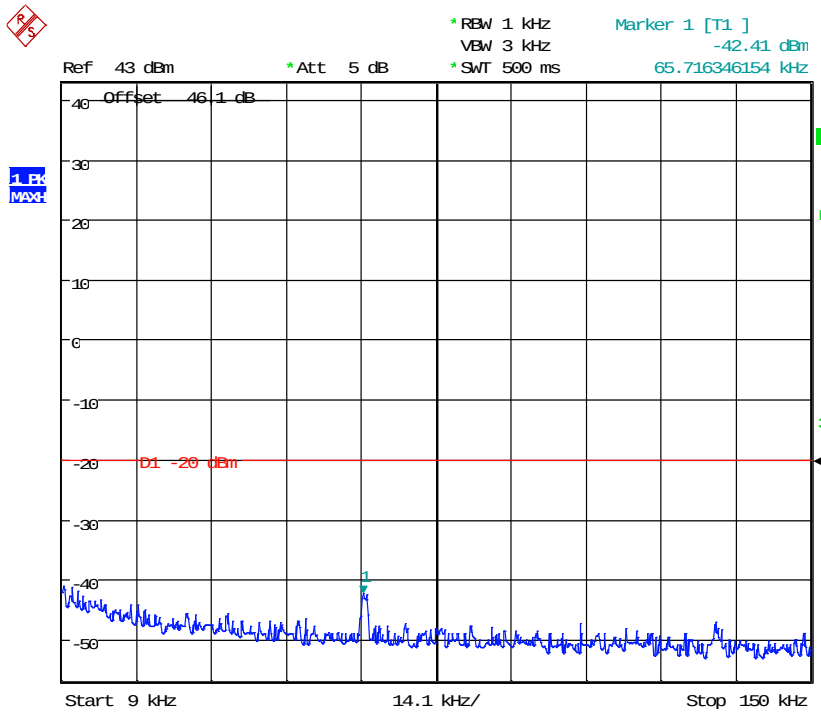
148.95MHz

FREQUENCY RANGE	**FREQ. (MHz)**	**MEASURED LEVEL (dBm)**	**LIMIT (dBm)**
9kHz – 10GHz	No significant emissions within 20dB of the limit		-20

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**
FILTER H	TELONIC BERKELEY	TTR375-3EE	60011-3	TRLUH265	**X**

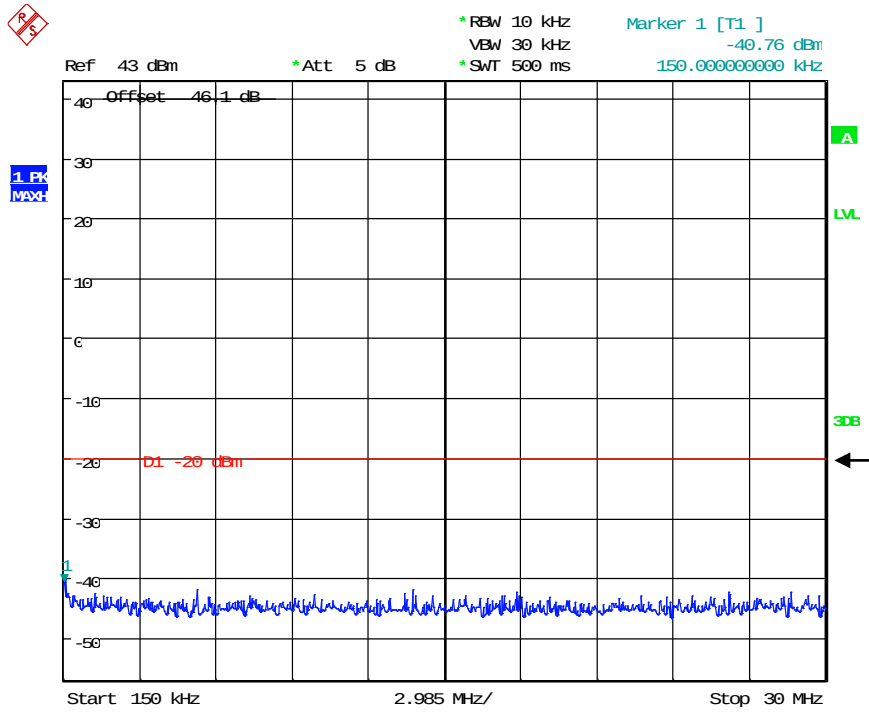
148.95MHz 9kHz – 150kHz



-20dBm Limit line

Date: 27.JUN.2013 14:10:35

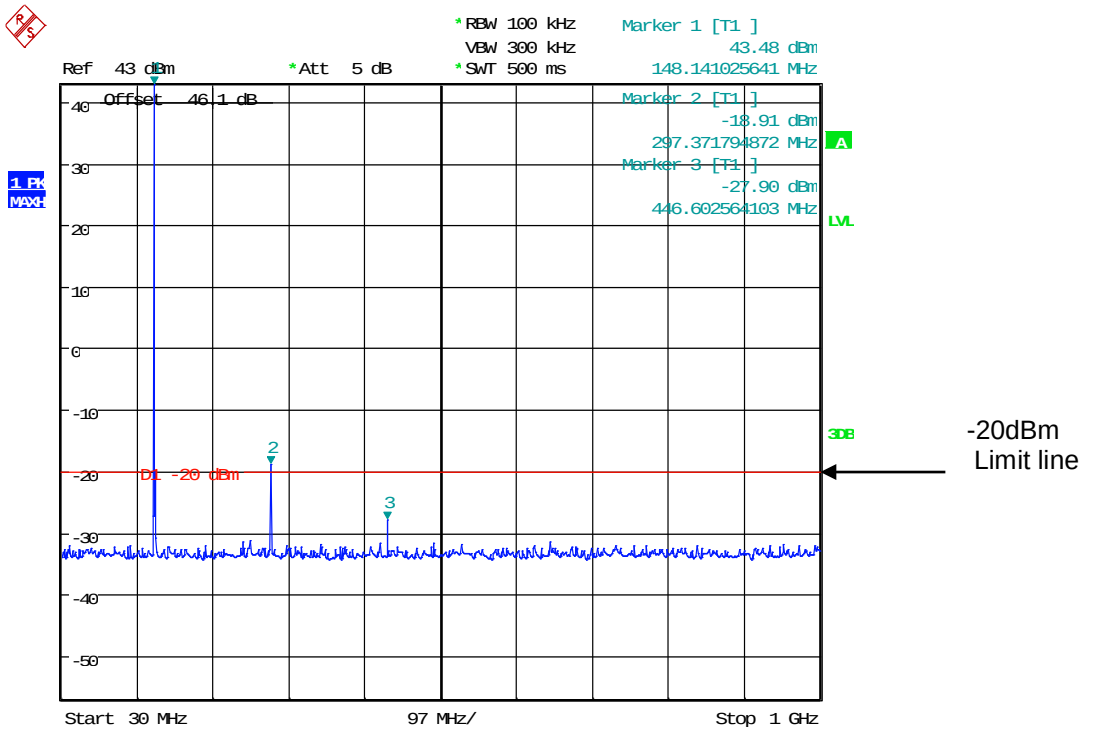
148.95MHz 150kHz – 30MHz



-20dBm Limit line

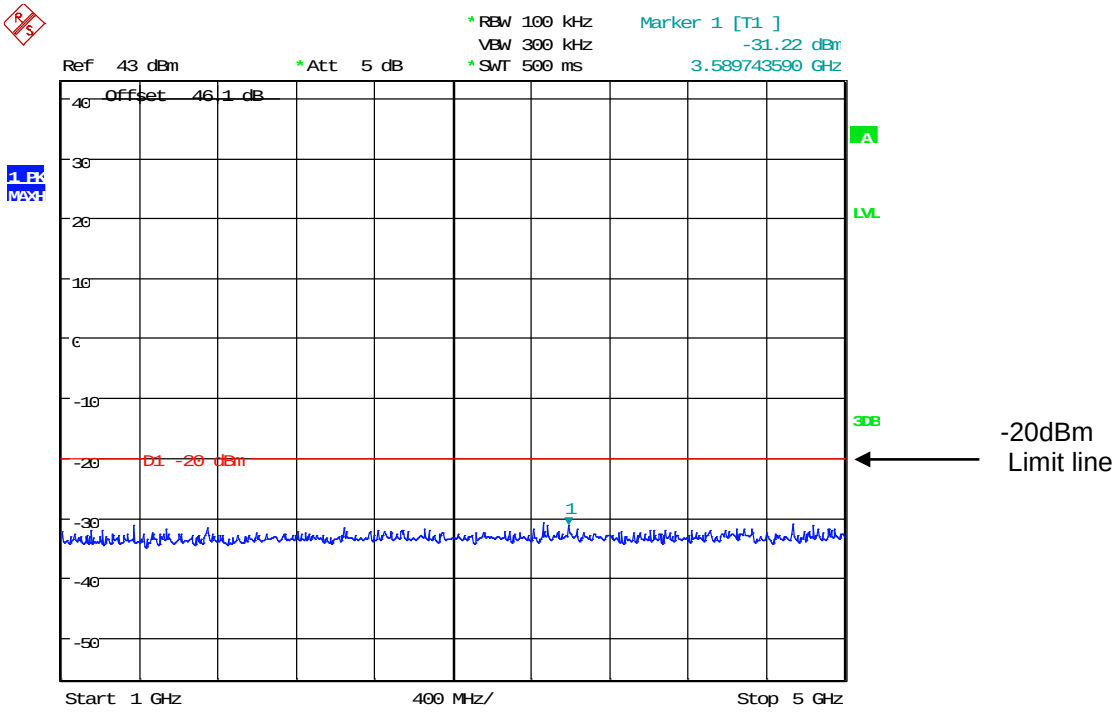
Date: 27.JUN.2013 14:11:47

148.95MHz 30MHz- 1GHz



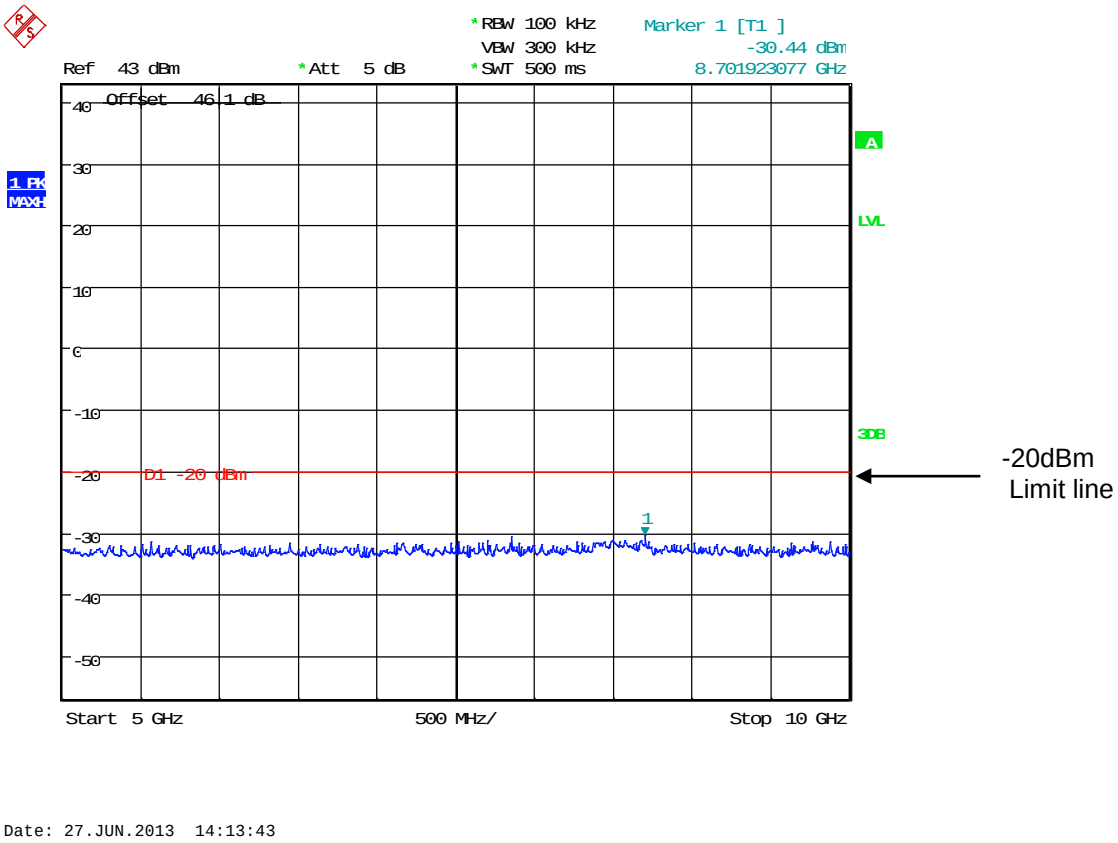
Date: 27.JUN.2013 14:12:23

148.95MHz 1GHz – 5GHz



Date: 27.JUN.2013 14:12:59

148.95MHz 5GHz – 10GHz

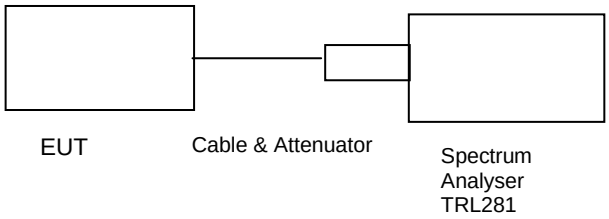


Date: 27.JUN.2013 14:13:43

Note: The plots are taken without the use of a notch filter, the results tables take into account the use of the notch filter to reduce the fundamental.

SPURIOUS EMISSIONS – CONDUCTED – Part 2.1053

Ambient temperature	=	21°C	Radio Laboratory		
Relative humidity	=	39%	Test Signal	=	F3E
Supply voltage	=	+13.8Vdc			



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 centre of the authorized bandwidth by a displacement frequency (fd in kHz) of more than12.5kHz:At least 50+10log(P) or 70dB whichever is the lesser attenuation.

50+10log(100W)= 70dBc = 50dBm-70= -20dBm

Note: Emission preview plots were taken in a 100kHz resolution bandwidth to reduce the noise floor. Any emissions relating to the DUT were re measured using a 1MHz resolution bandwidth.

The plots in this report are indication of worse case results, testing was performed on all modulation types.

RESULTS

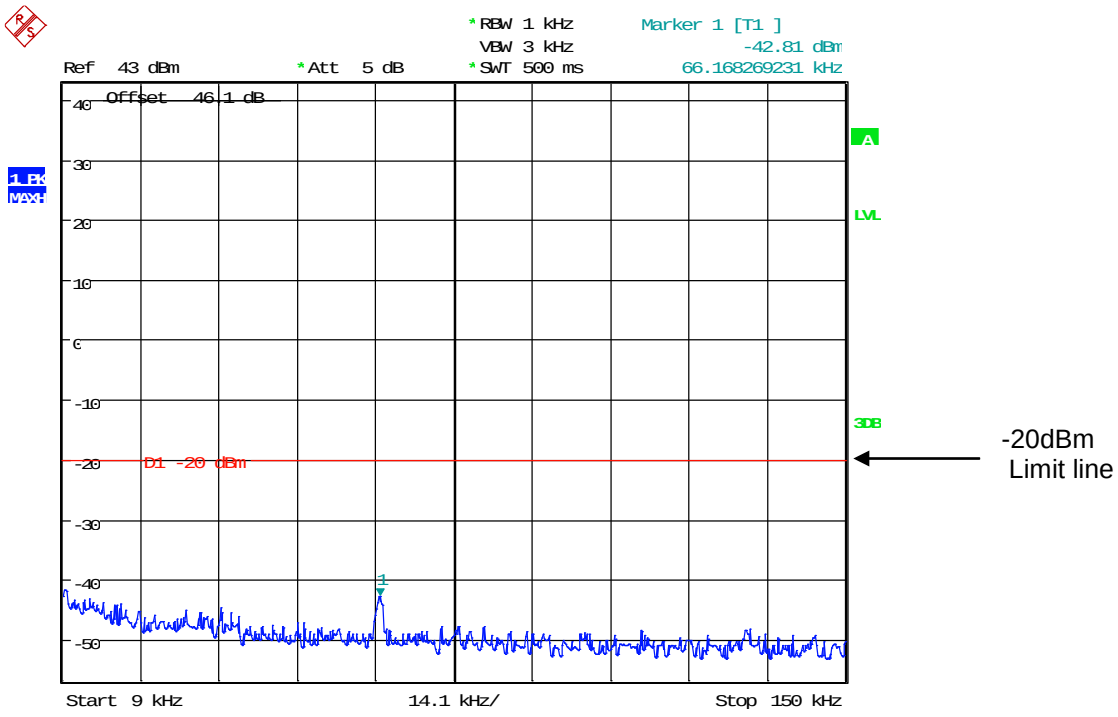
162.0250MHz

FREQUENCY RANGE	FREQ. (MHz)	MEASURED LEVEL (dBm)	LIMIT (dBm)
9kHz – 10GHz	No significant emissions within 20dB of the limit		-20

The test equipment used for the Transmitter Conducted Emissions:

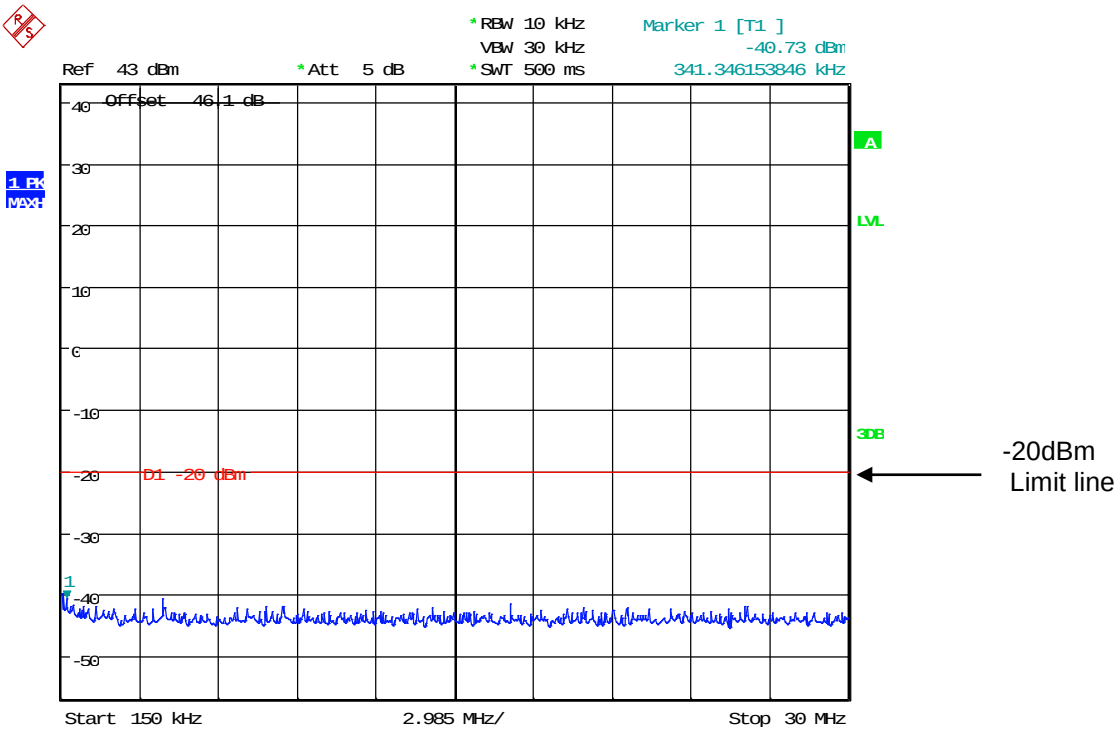
TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRAC No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU46	200034	UH281	**X**
CABLE	TRAC	N/A	N/A	UH271	**X**
CABLE	TRAC	N/A	N/A	UH272	**X**
ATTENUATOR	SPINNER	745357	N/A	TRLUH225	**X**
ATTENUATOR	-	-	-	20dB	**X**
ATTENUATOR	BIRD	8304-100-N	N/A	222	**X**
FILTER H	TELONIC BERKELEY	TTR375-3EE	60011-3	TRLUH265	**X**

162.0250MHz 9kHz – 150kHz



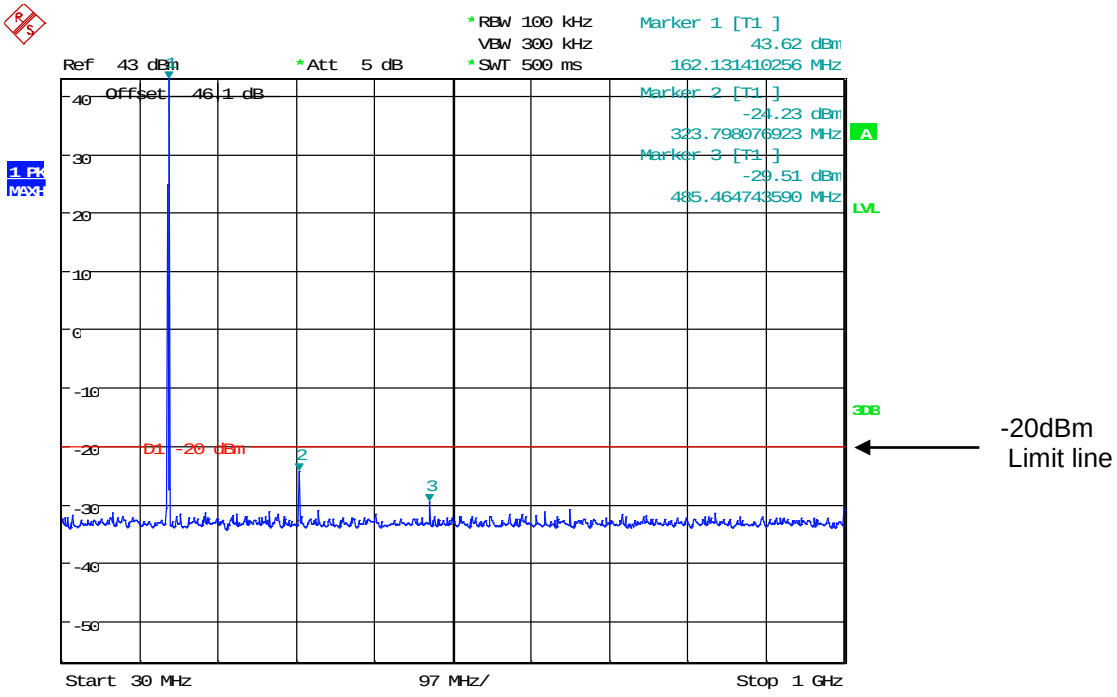
Date: 27.JUN.2013 14:14:28

162.025MHz 150kHz -30MHz



Date: 27.JUN.2013 14:15:40

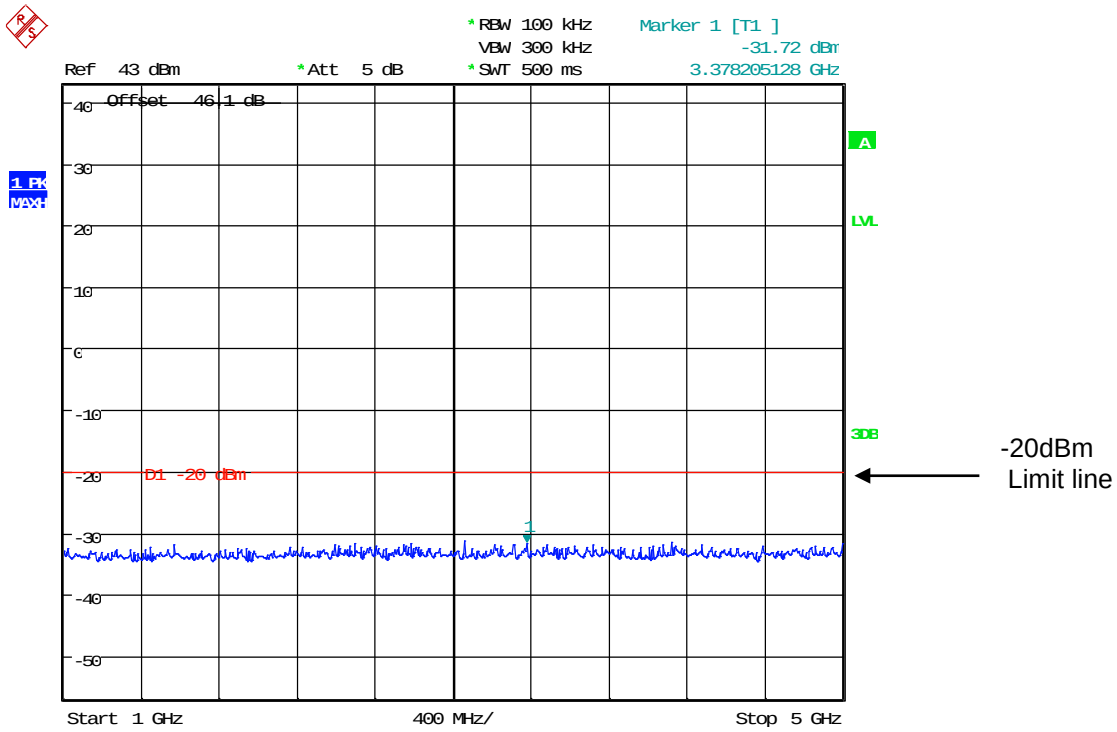
162.025MHz 30MHz-1GHz



-20dBm Limit line

Date: 27.JUN.2013 14:16:36

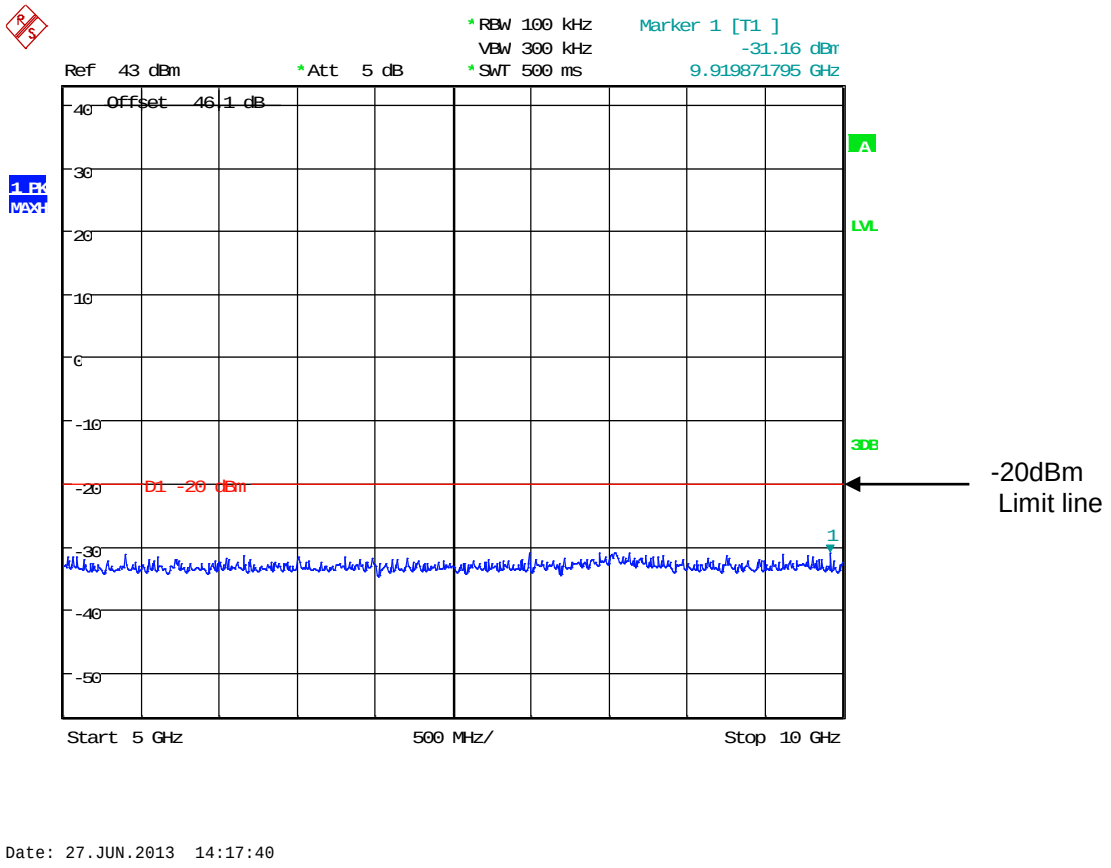
162.025MHz 1GHz – 5GHz



-20dBm Limit line

Date: 27.JUN.2013 14:17:13

162.025MHz 5GHz – 10GHz



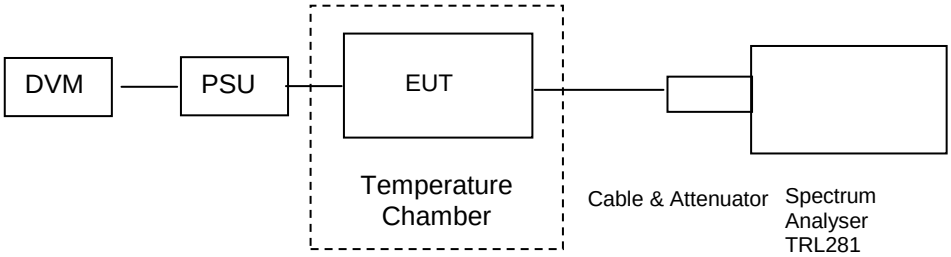
-20dBm
Limit line

Note: The plots are taken without the use of a notch filter, the results tables take into account the use of the notch filter to reduce the fundamental.

FREQUENCY STABILITY – CONDUCTED – Part 90.213

Ambient temperature = 21°C
Relative humidity = 39%
Supply voltage = +13.8Vdc

Radio Laboratory
Test Signal = F3E



141.00MHz

Temperature °C	Vnom (Vdc)	Measured Frequency (MHz)	Frequency Difference (kHz)	ppm	Limit ± 1.5ppm Pass/Fail
+50	13.8	140.99998	0.0100	0.07	Pass
+40	13.8	140.99999	0.0200	0.14	Pass
+30	13.8	140.99998	0.0100	0.07	Pass
+20	13.8	140.99997	0.0000	0.00	Pass
+10	13.8	140.99996	-0.0100	-0.07	Pass
0	13.8	140.99996	-0.0100	-0.07	Pass
-10	13.8	140.99999	0.0200	0.14	Pass
-20	13.8	140.99998	0.0100	0.07	Pass
-30	13.8	140.99996	-0.0100	-0.07	Pass

Tnom 21 °C	85%= 11.7Vdc	115%= 15.9Vdc
Frequency (MHz)	140.999990	140.999980
Frequency Difference (kHz)	0.02	0.01
ppm	0.14	0.07
Limit ± 1.5 ppm Pass/Fail	Pass	Pass

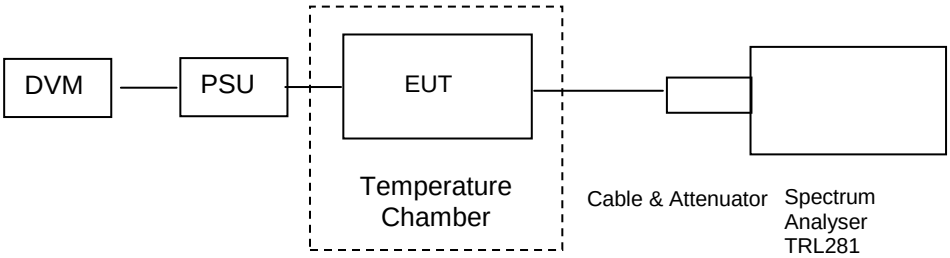
Frequency stability measurements were between -30°C and +50°C in 10°C increments.

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).

Ambient temperature = 21°C
Relative humidity = 39%
Supply voltage = +13.8Vdc

Radio Laboratory
Test Signal = F3E



148.95MHz

Temperature °C	Vnom (Vdc)	Measured Frequency (MHz)	Frequency Difference (kHz)	ppm	Limit ± 1.5 ppm Pass/Fail
+50	13.8	148.94998	0.0000	0.00	Pass
+40	13.8	148.94998	0.0000	0.00	Pass
+30	13.8	148.94998	0.0000	0.00	Pass
+20	13.8	148.94998	0.0000	0.00	Pass
+10	13.8	148.94997	-0.0100	-0.07	Pass
0	13.8	148.94996	-0.0200	-0.13	Pass
-10	13.8	148.94999	0.0100	0.07	Pass
-20	13.8	148.94999	0.0100	0.07	Pass
-30	13.8	148.94997	-0.0100	-0.07	Pass

Tnom 21.5°C	85%= 11.7Vdc	115%= 15.9Vdc
Frequency (MHz)	148.949990	148.949990
Frequency Difference (kHz)	0.01	0.01
ppm	0.06	0.06
Limit ± 1.5 ppm Pass/Fail	Pass	Pass

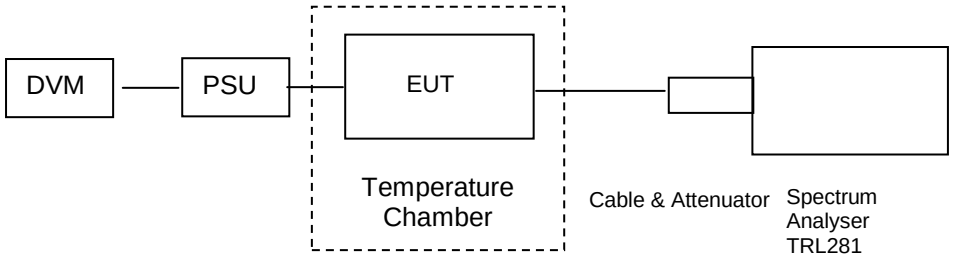
Frequency stability measurements were between -30°C and +50°C in 10°C increments.

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).

Ambient temperature = 21°C
Relative humidity = 39%
Supply voltage = +13.8Vdc

Radio Laboratory
Test Signal = F3E



162.025MHz

Temperature °C	Vnom (Vdc)	Measured Frequency (MHz)	Frequency Difference (kHz)	ppm	Limit ± 1.5 ppm Pass/Fail
+50	13.8	162.02497	-0.0100	-0.06	Pass
+40	13.8	162.02498	0.0000	0.00	Pass
+30	13.8	162.02497	-0.0100	-0.06	Pass
+20	13.8	162.02498	0.0000	0.00	Pass
+10	13.8	162.02496	-0.0200	-0.12	Pass
0	13.8	162.02496	-0.0200	-0.12	Pass
-10	13.8	162.02499	0.0100	0.06	Pass
-20	13.8	162.02499	0.0100	0.06	Pass
-30	13.8	162.02496	-0.0200	-0.12	Pass

Tnom 21.5°C	85%= 11.7Vdc	115%= 15.9Vdc
Frequency (MHz)	162.024980	162.024990
Frequency Difference (kHz)	0.0	0.01
ppm	0.0	0.06
Limit ± 1.5 ppm Pass/Fail	Pass	Pass

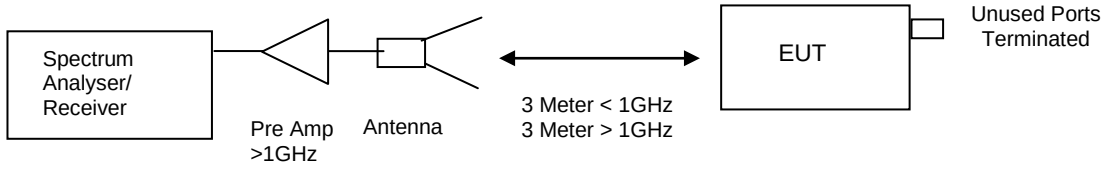
Frequency stability measurements were between -30°C and +50°C in 10°C increments.

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).

INTENTIONAL RADIATOR SPURIOUS EMISSIONS – RADIATED – Part 2.1053

Ambient temperature	=	24°C	Test Signal	=	F3E
Relative humidity	=	56%			
Conditions	=	ATS			
Supply voltage	=	+13.8Vdc/+28.0Vdc			
Supply Frequency	=	N/A			



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 centre of the authorized bandwidth by a displacement frequency (fd in kHz) of more than12.5kHz:At least 50+10log(P) or 70dB whichever is the lesser attenuation.

50+10log(100W)= 70dBc = 50dBm-70= -20dBm

141.00MHz

FREQUENCY RANGE	FREQ. (GHz)	Measured (dBm)	LIMIT (dBm)
30MHz – 10GHz	No significant emissions within 20dB of the Limit		-20

148.95MHz

FREQUENCY RANGE	FREQ. (GHz)	Measured (dBm)	LIMIT (dBm)
30MHz – 10GHz	No significant emissions within 20dB of the Limit		-20

162.0250MHz

FREQUENCY RANGE	FREQ. (GHz)	Measured (dBm)	LIMIT (dBm)
30MHz – 10GHz	No significant emissions within 20dB of the Limit		-20

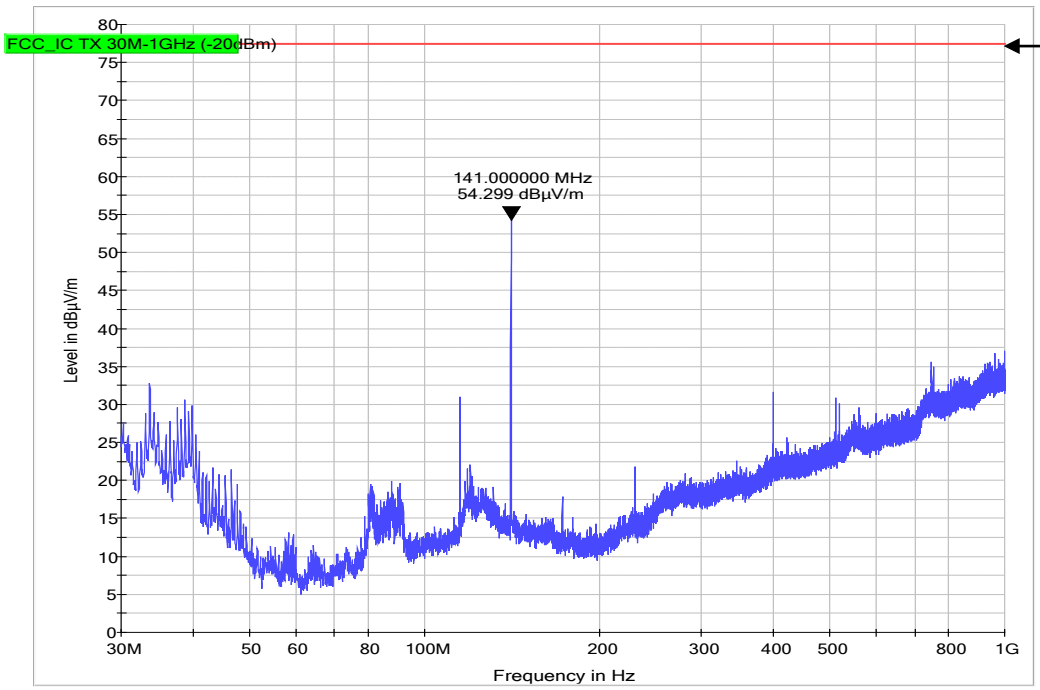
* Note: Emissions that fall below 20dB of the limit are not shown in the above table

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	**X**
SPECTRUM ANALYSER	R&S	FSU46	200034	TRL281	**X**
PRE AMPLIFIER	HP	8449B	3008A016	572	**X**
ANTENNA	YORK	CBL611/A	1618	UH191	**X**
RECEIVER	R&S	ESVS10	825892/006	UH04	**X**

Radiated emissions

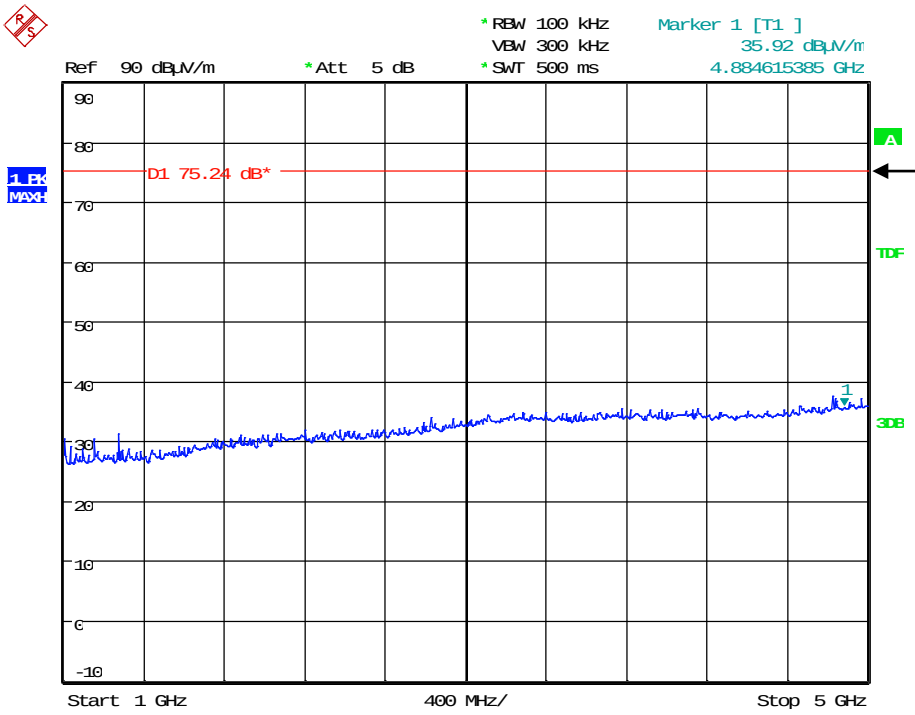
141.00MHz 30MHz – 1GHz



-20dBm
Limit line

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

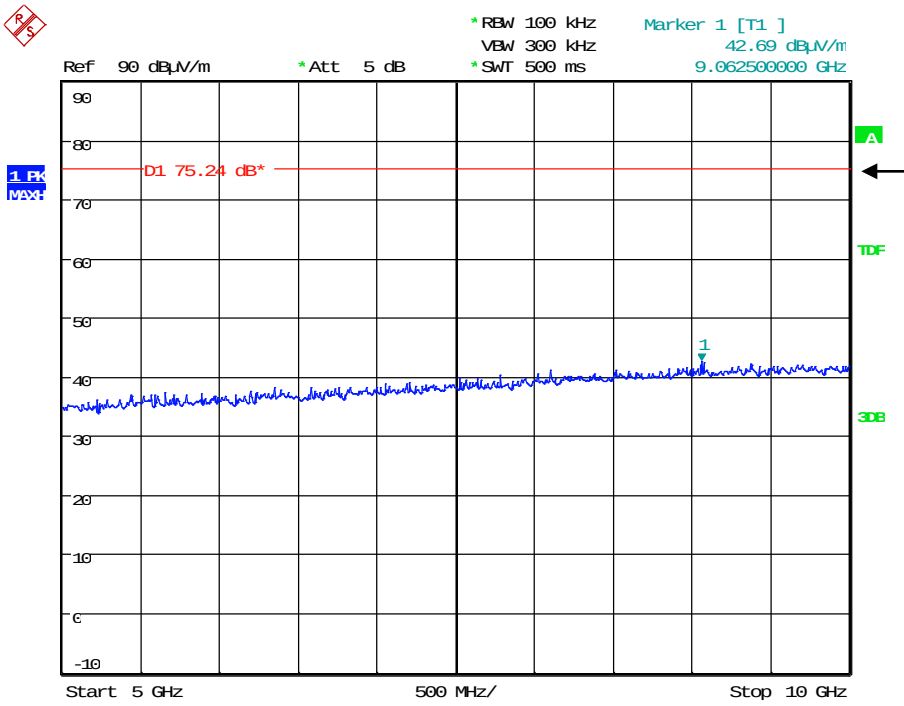
141.00MHz 1GHz – 5GHz



-20dBm Limit line

Date: 28.JUN.2013 11:09:57

141.00MHz 5GHz – 10GHz

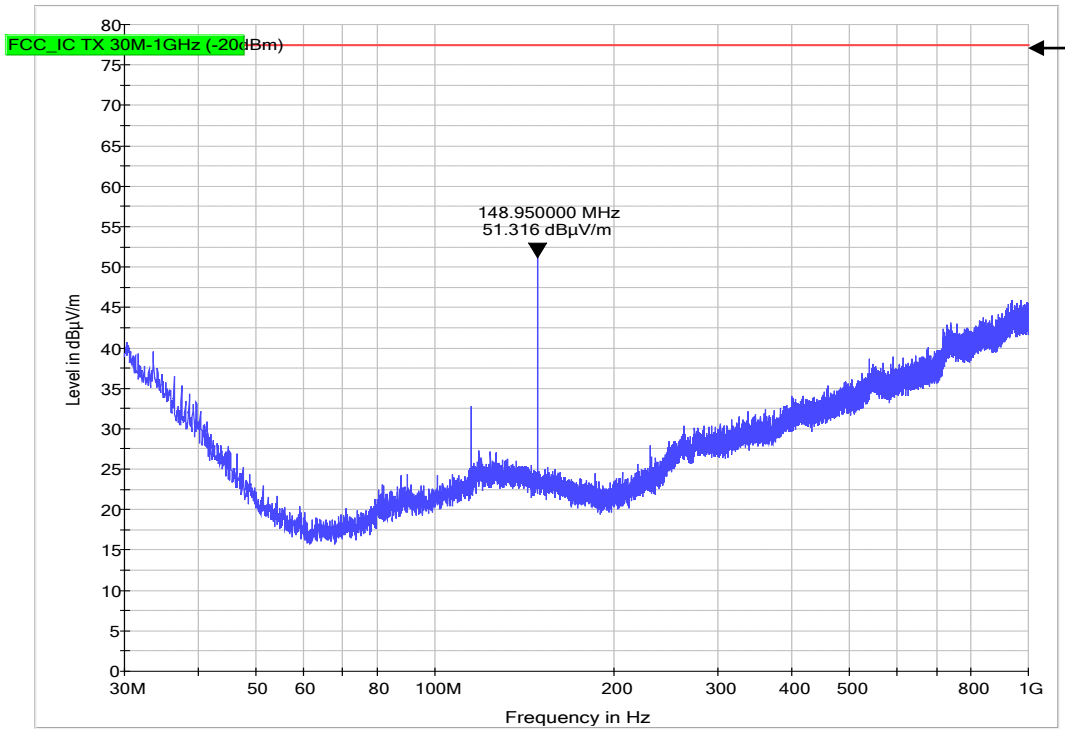


-20dBm Limit line

Date: 28.JUN.2013 11:16:31

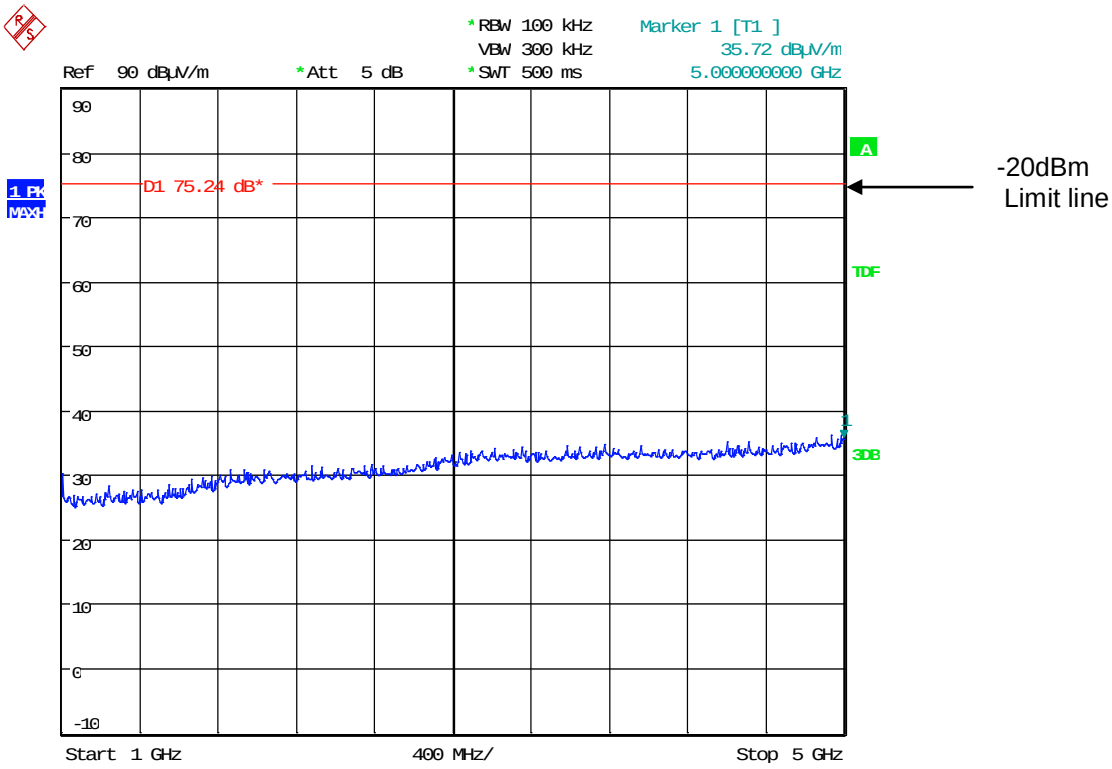
Radiated emissions

148.95MHz 30MHz – 1GHz



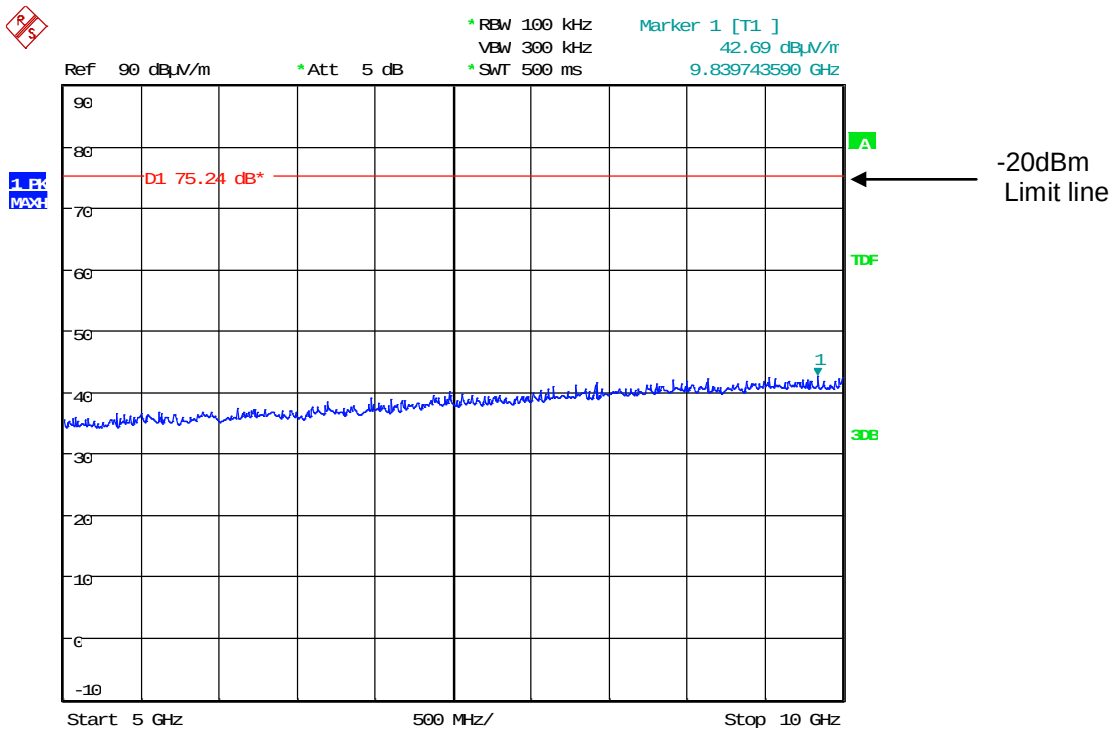
The above test results show that there were no emissions within 20dBs of the –20dBm limit.

148.95MHz 1GHz – 5GHz



Date: 28.JUN.2013 11:36:58

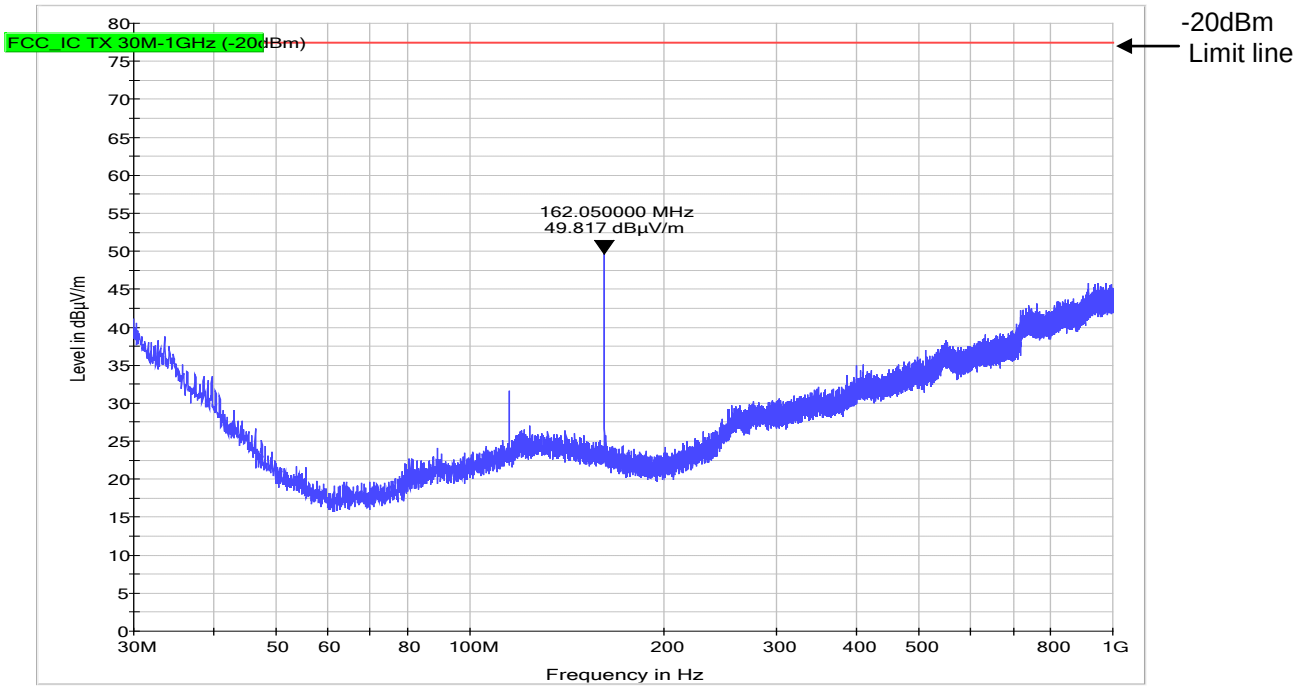
148.95MHz 5GHz – 10GHz



Date: 28.JUN.2013 11:30:18

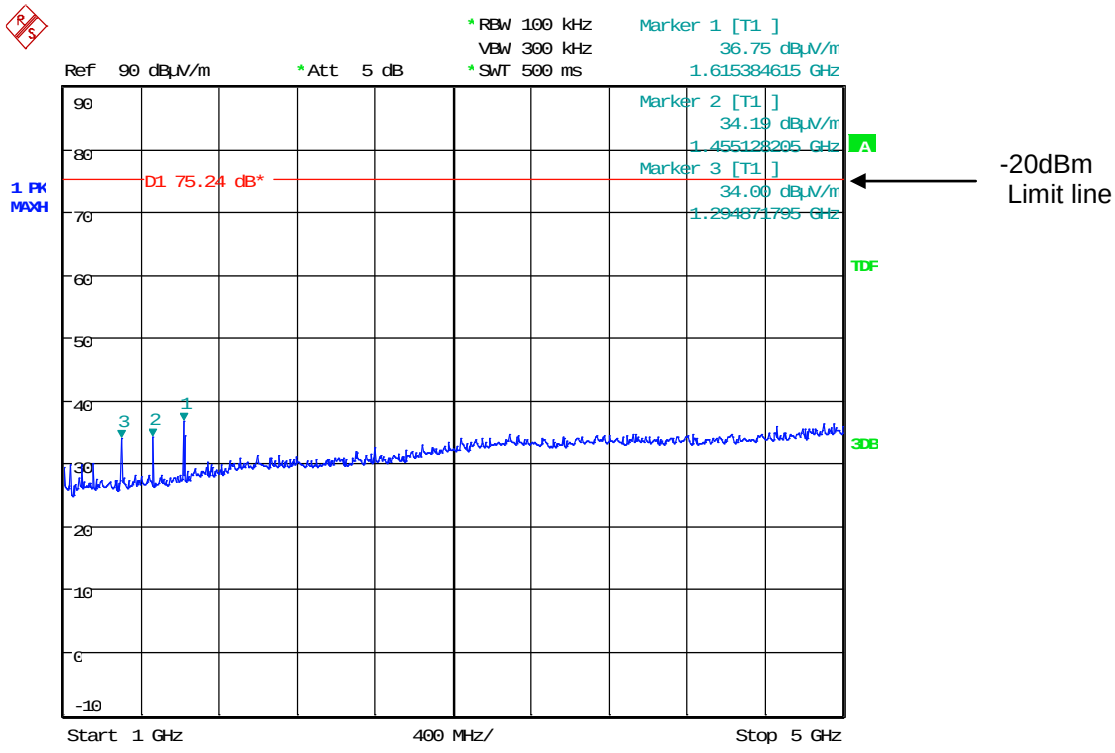
Radiated emissions

162.0250MHz - 30MHz – 1GHz



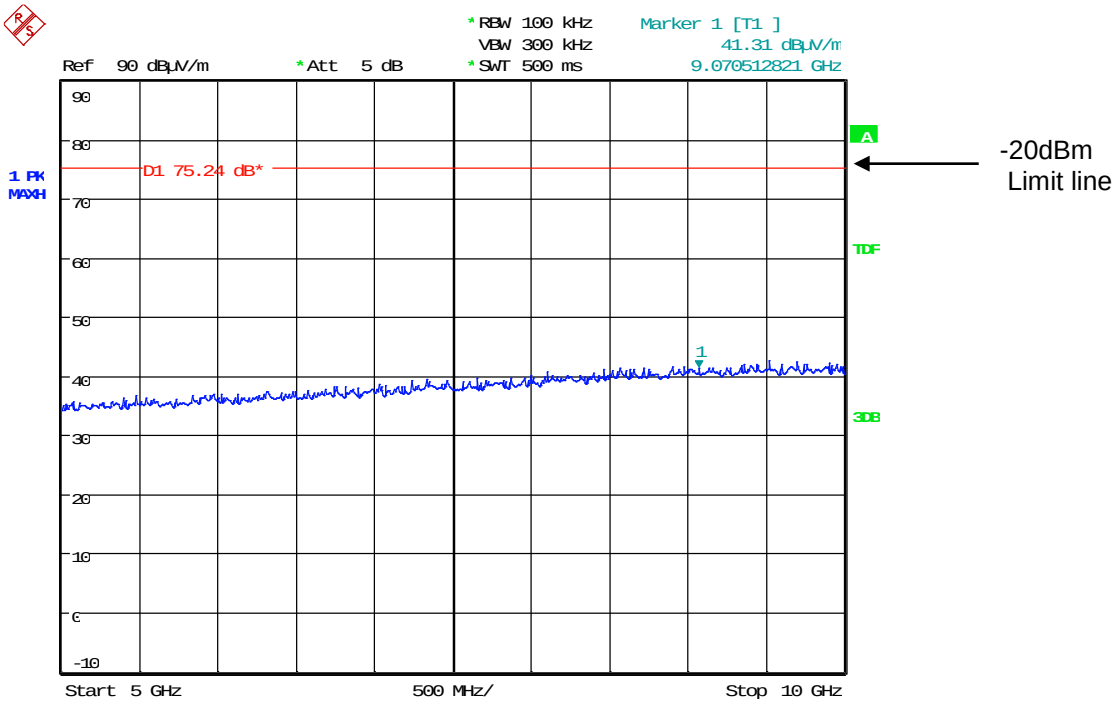
The above test results show that there were no emissions within 20dBs of the –20dBm limit.

162.0250MHz 1GHz – 5GHz



Date: 28.JUN.2013 12:08:39

162.0250MHz 5GHz – 10GHz



Date: 28.JUN.2013 12:10:18

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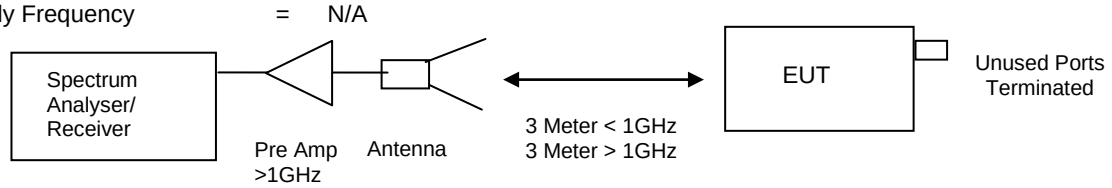
UN-INTENTIONAL RADIATOR SPURIOUS EMISSIONS – RADIATED – Part 15:109

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

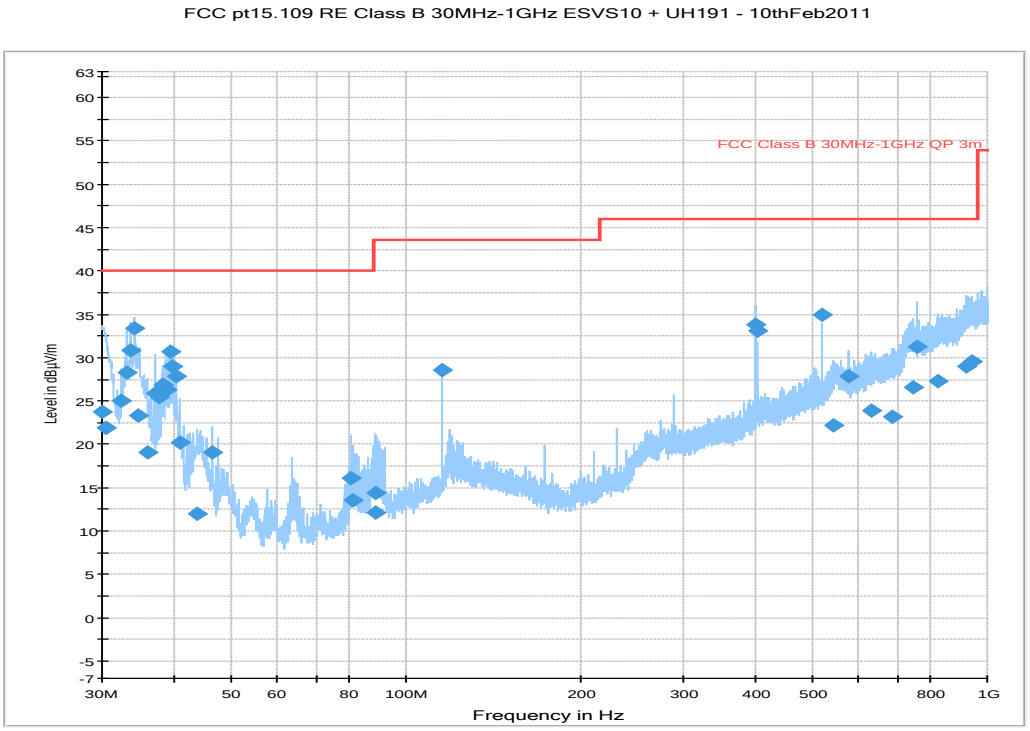
Test Signal = F3E



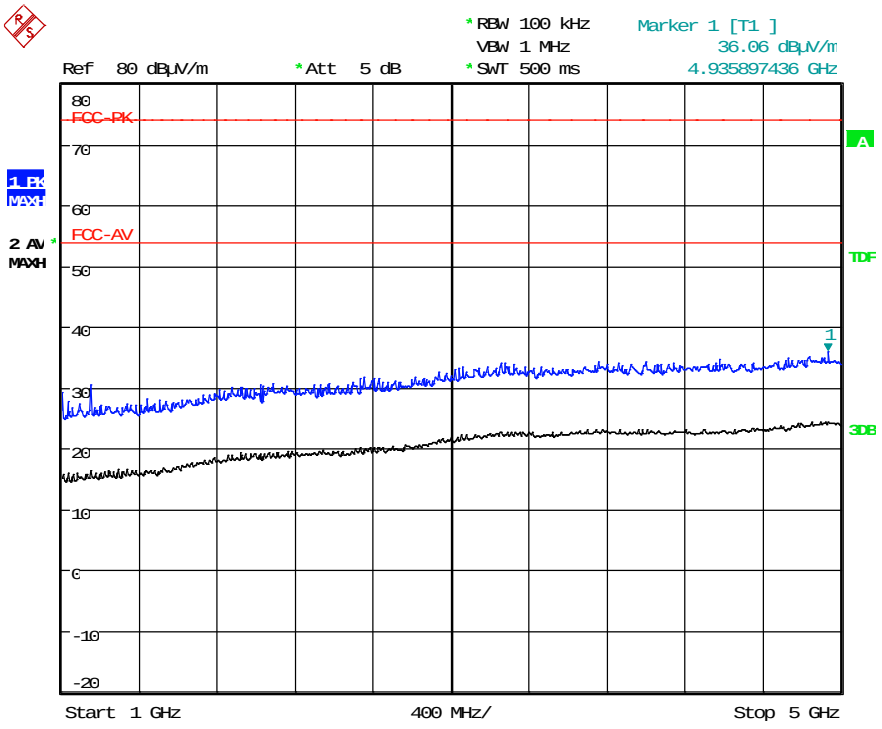
The test was set up as per the diagram, the receiver was tested while in receive mode while attached to a dummy load.
30MHz -1GHz worse case Rx mode

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)
30.00	5.4	0.5	17.8	N/A	23.7	15.31	40.00	100
30.55	3.8	0.5	17.5	N/A	21.8	12.30	40.00	100
32.45	8.1	0.5	16.5	N/A	25.1	17.98	40.00	100
33.05	11.6	0.5	16.2	N/A	28.3	26.00	40.00	100
33.60	14.4	0.6	15.9	N/A	30.9	35.07	40.00	100
34.15	17.2	0.6	15.6	N/A	33.4	46.77	40.00	100
34.70	7.4	0.6	15.3	N/A	23.3	14.60	40.00	100
36.95	11.2	0.6	14.1	N/A	25.9	19.72	40.00	100
37.50	11.1	0.6	13.8	N/A	25.5	18.83	40.00	100
38.10	12.9	0.6	13.4	N/A	26.9	22.13	40.00	100
38.65	12.7	0.5	13.1	N/A	26.3	20.65	40.00	100
39.20	17.3	0.6	12.8	N/A	30.7	34.27	40.00	100
39.75	15.9	0.6	12.5	N/A	29.0	28.18	40.00	100
40.30	15.0	0.6	12.3	N/A	27.9	24.83	40.00	100
40.90	7.5	0.7	12.0	N/A	20.2	10.23	40.00	100
115.20	15.7	1.4	11.5	N/A	28.6	26.91	43.50	150
400.00	15.2	2.6	15.9	N/A	33.7	48.41	46.00	200
518.40	14.6	2.8	17.6	N/A	35.0	56.23	46.00	200
576.00	6.1	3.0	18.8	N/A	27.9	24.83	46.00	200
756.00	8.2	3.2	19.9	N/A	31.3	36.72	46.00	200

Rx 30MHz-1GHz

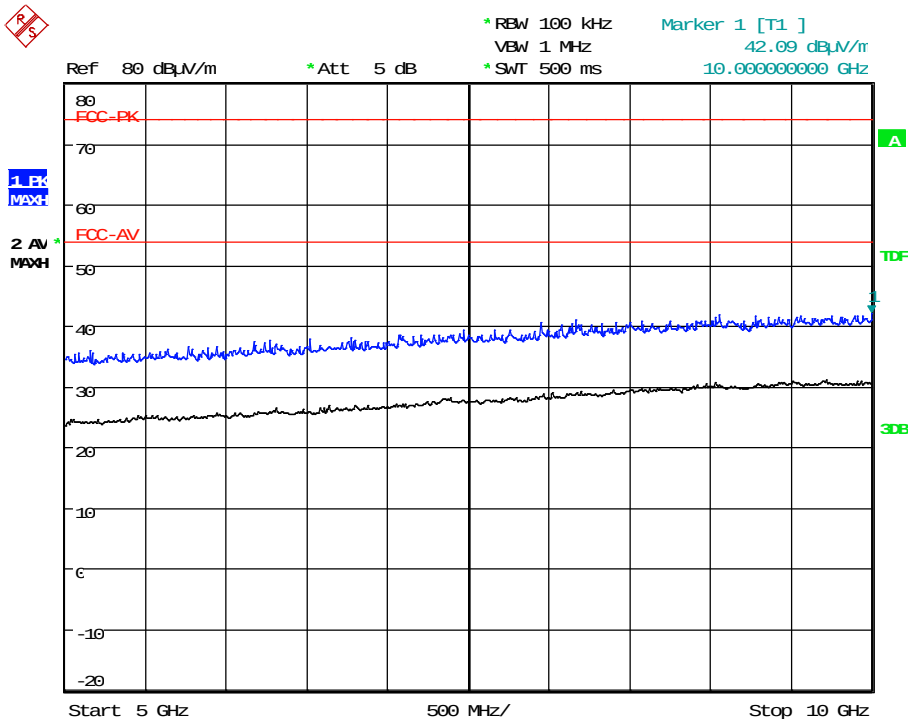


Rx 1GHz – 5GHz



Date: 28.JUN.2013 14:21:16

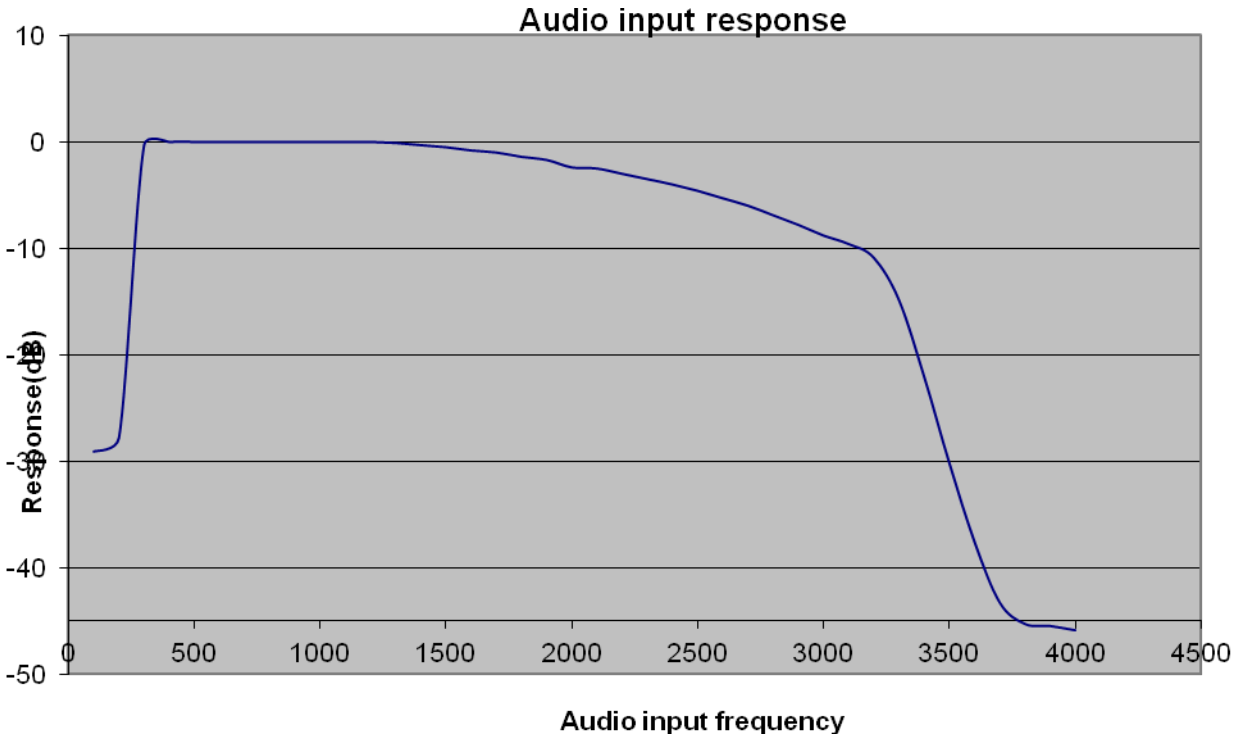
Rx 5GHz – 10GHz



Date: 28.JUN.2013 14:22:29

Modulation Characteristics: 2.1047 (a)

Ambient temperature	=	21°C	Radio Laboratory		
Relative humidity	=	39%	Test Signal	=	F3E
Supply voltage	=	+13.8Vdc			



Note: The AC Band DMR Base Station unit is capable of transmitting analogue speech and DMR 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 AC Band DMR Base Station is capable of transmitting analogue speech and DMR 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.

Transient frequency Behaviour: Part 90.214

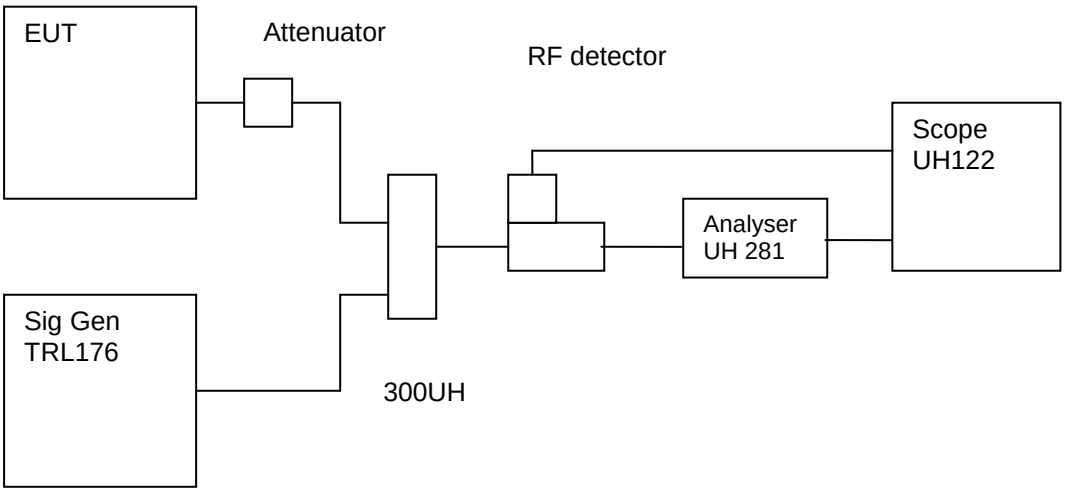
Tnom = 22°C

RHnom = 56%

Tx Pnom = 25W

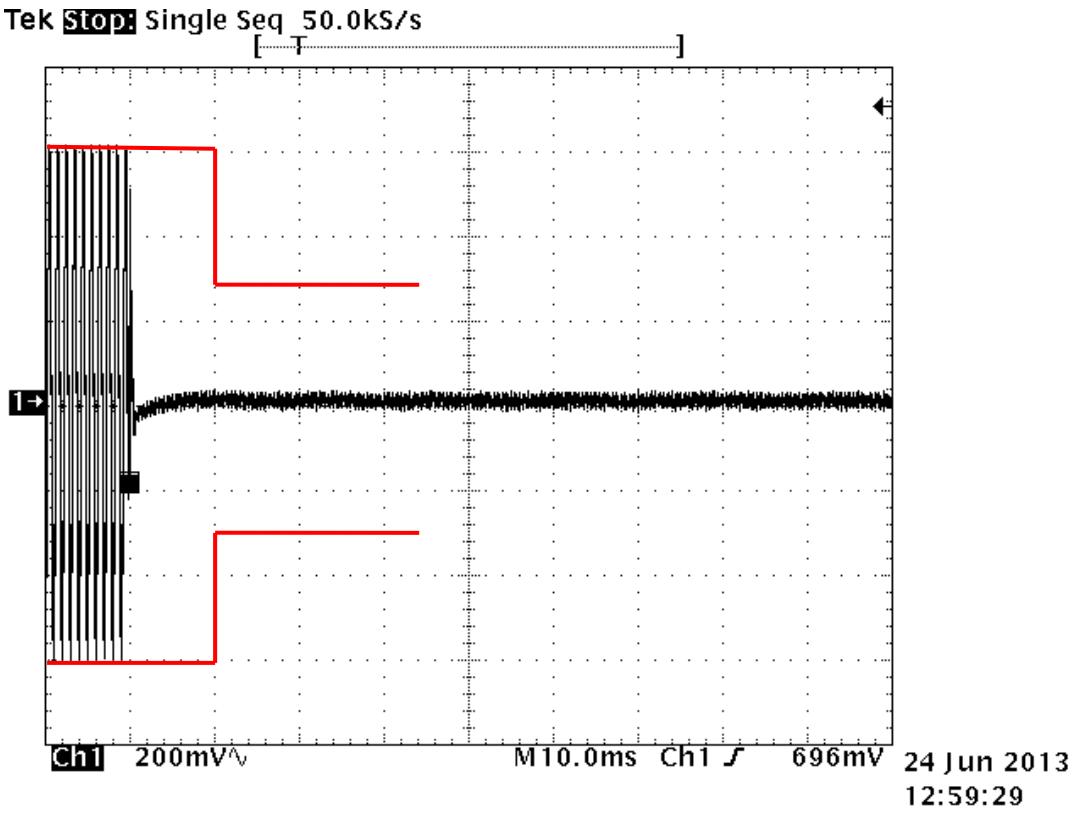
Method

Channel Spacing = 12.5kHz

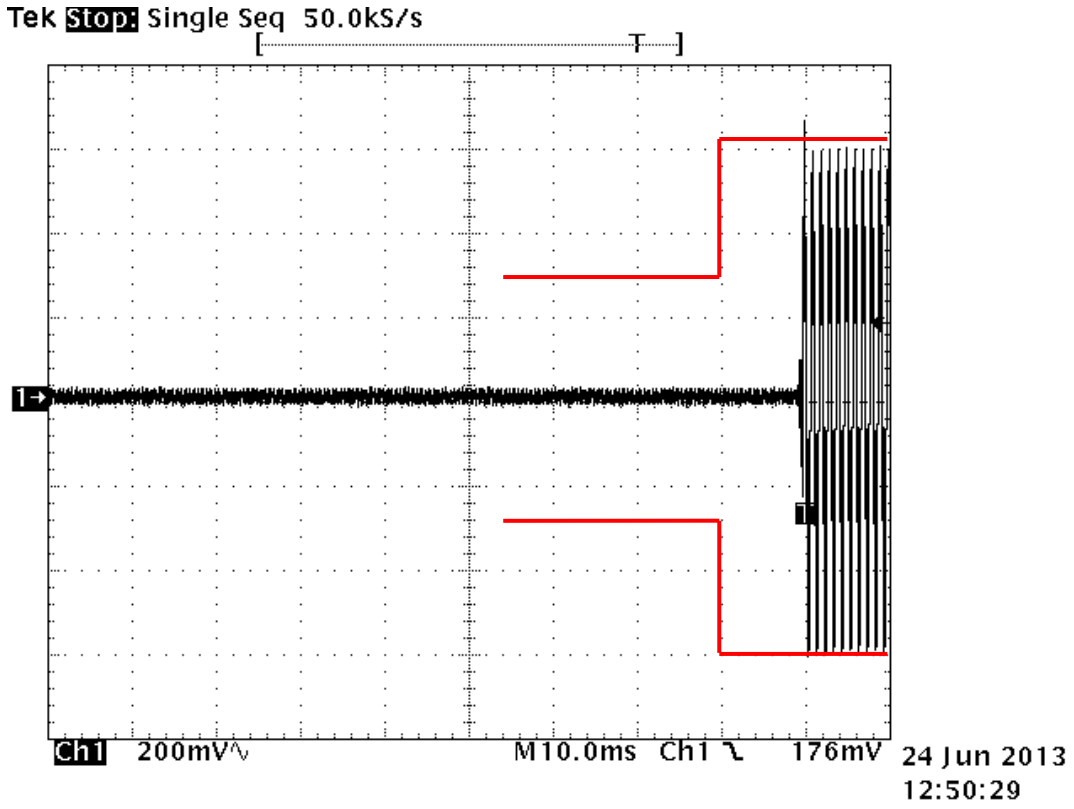


Channel		141.00 MHz	148.95 MHz	162.025 MHz
Time, t1 Transient Frequency		Compliant	Compliant	Compliant
Time, t2 Transient Frequency		Compliant	Compliant	Compliant
Time, t3 Transient Frequency		Compliant	Compliant	Compliant
Limits Clause	t1	10ms @ 12.5kHz		
	t2	25ms @ 6.25kHz		
	t3	10ms @ 12.5kHz		

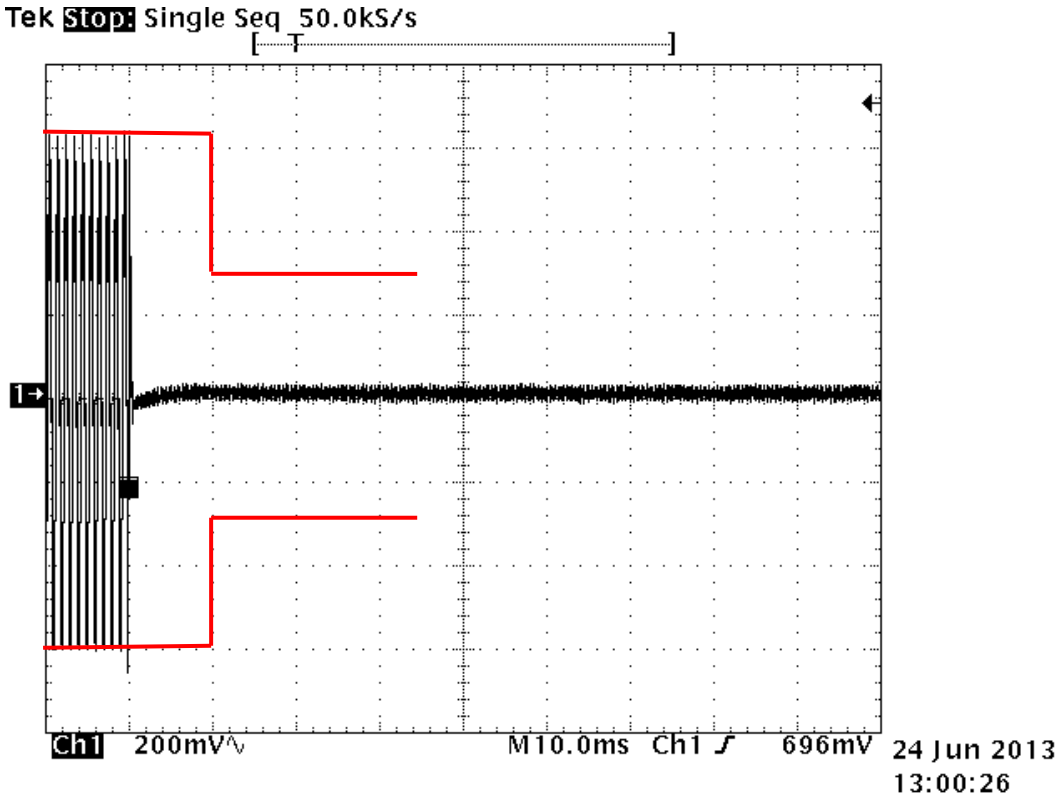
141.00MHz Tx on



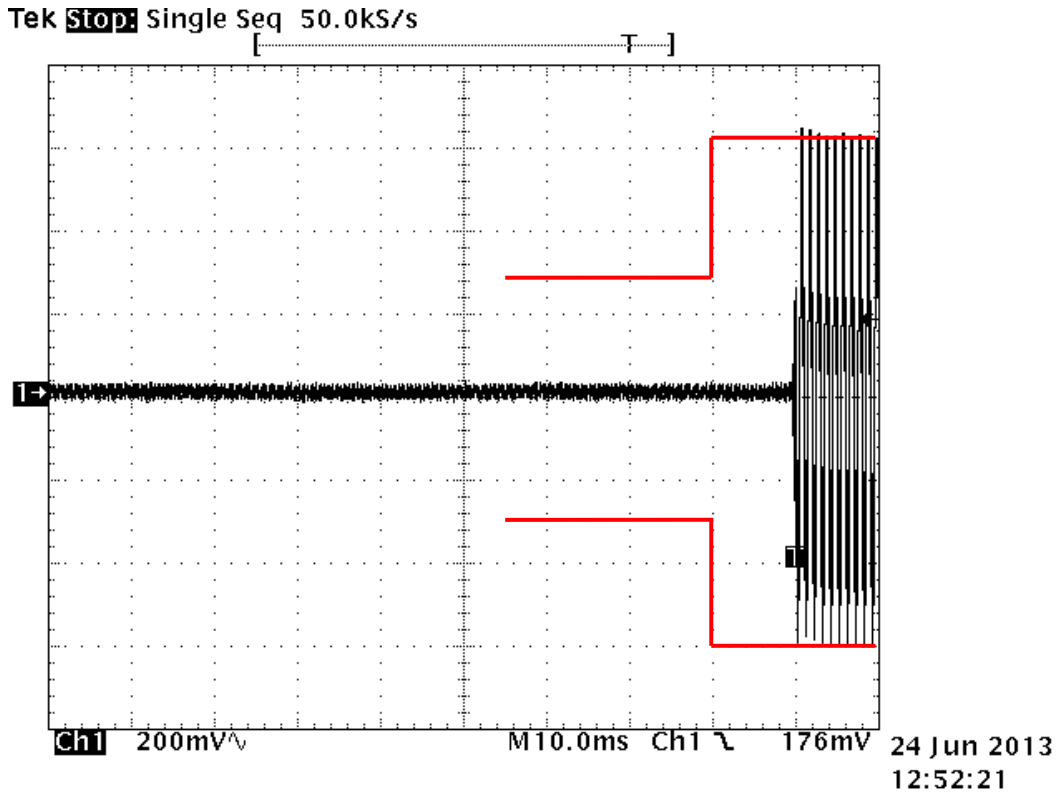
141.00MHz Tx off



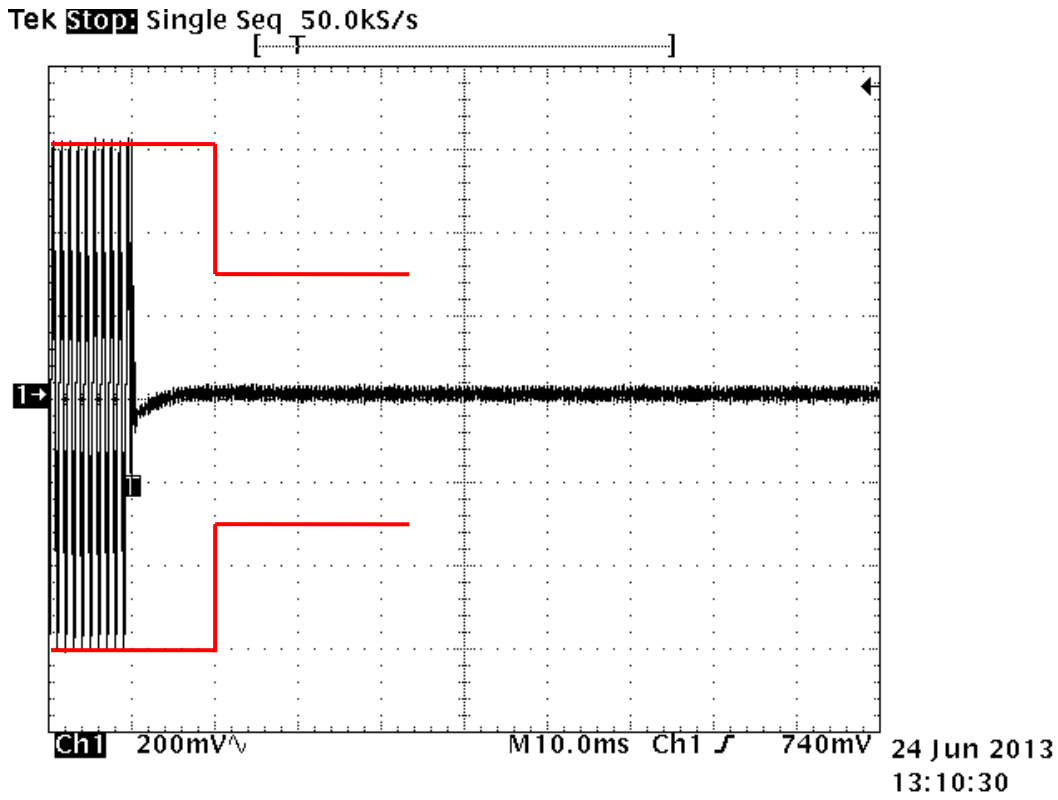
148.95MHz Tx on



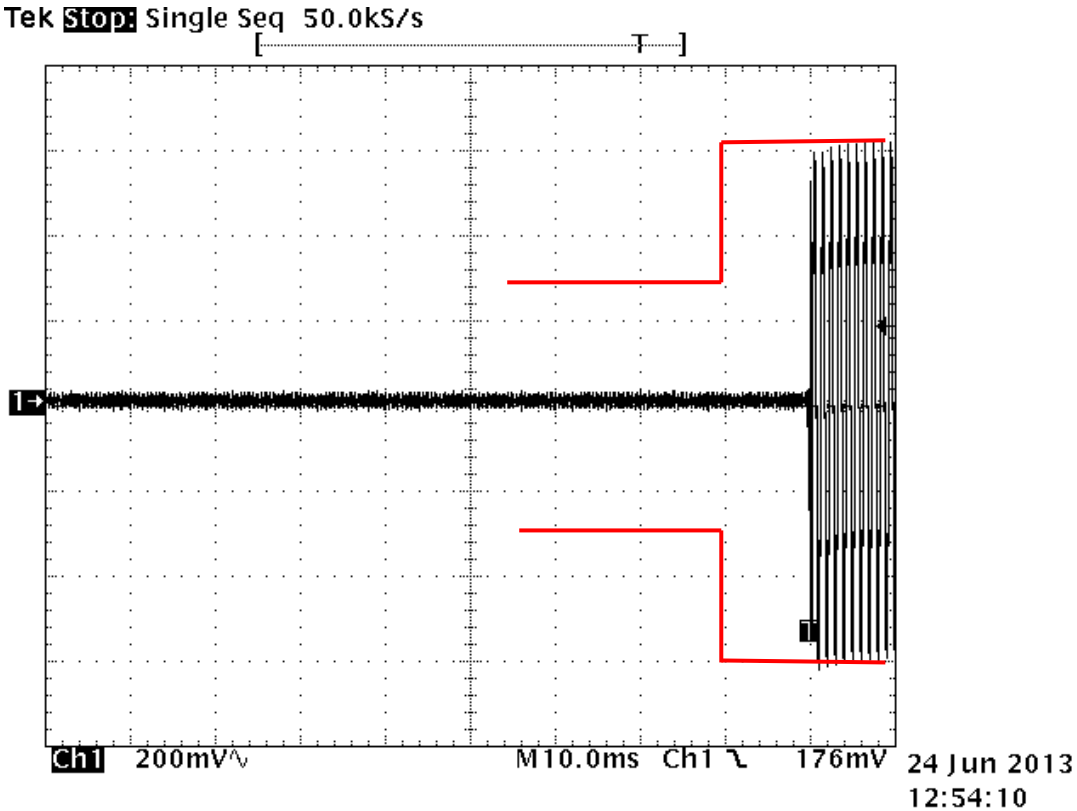
148.95MHz Tx off



162.025MHz Tx on



162.025MHz Tx off



ANNEX A

PHOTOGRAPHS

Photograph 1&2: Test Setup

Photograph 3&4: Equipment overview

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	06/03/2013
TRL139	3115	Horn Antenna	EMCO	14/09/2011
TRL572	8449B	Pre amp	Agilent	12/12/2012
TRLUH04	ESVS10	Receiver	Rhode & Schwarz	11/02/2013
TRLUH191	CBL611A	Antenna	Chase	13/12/2012
TRL222	8304-100-N	ATTENUATOR	BIRD	Cal In Use
TRLUH225	745357	ATTENUATOR	SPINNER	Cal In Use
REF916	SMBV100A	Signal Generator	Rhode & Schwarz	23/07/2012
TRL426	52 Series 11	Temperature Indicator	Fluke	29/04/2013
TRL11	-	Environmental Chamber	Sharetree	USE TRL426
REF976	34405A	Multimeter	Agilent	26/04/2013
TRLUH194	AP60/50	Power Supply	Farnell	USE REF976
TRLUH265	TTR375-3EE	FILTER (h)	Telonic Berkeley	Cal In Use
L005	CMTA 52	Communications Analyser	Rhode & Schwarz	27/03/2013

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%**

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