



A TEST REPORT
FOR
TEAM SIMOCO Ltd
ON
SB2025NT100W
Private Land Mobile Radio
DOCUMENT NO. TRA-008201-W-US-2

TEST REPORT NO: TRA-008201-W-US-2

COPY NO: 1

ISSUE NO: 1

FCC ID: U89SB2K4354D3D3V

**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: 11th - 20th December 2012



APPROVED BY: _____

J CHARTERS
RADIO
PRODUCT
MANAGER

DATE: 27th December 2012

Distribution:

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

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

CONTENTS

| | PAGE |
|--|--------|
| CERTIFICATE OF CONFORMITY & COMPLIANCE | 4 |
| APPLICANT'S SUMMARY | 5 |
| EQUIPMENT TEST CONDITIONS | 6 |
| TESTS REQUIRED | 6 |
| TEST RESULTS | 7 – 46 |

ANNEX

| | |
|--|---|
| PHOTOGRAPHS | A |
| PHOTOGRAPH No. 1&2: Test setup | |
| PHOTOGRAPH No. 3&4: Equipment overview | |
| APPLICANT'S SUBMISSION OF DOCUMENTATION LIST | B |
| EQUIPMENT CALIBRATION | C |
| MEASUREMENT UNCERTAINTY | D |

Notes:

- | | | | |
|----|---|-----|-------------------------------------|
| 1. | Component failure during test | YES | <input type="checkbox"/> |
| | | NO | <input checked="" type="checkbox"/> |
| 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: U89SB2K4354D3D3V

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: 146MHz – 174MHz

MAXIMUM OUTPUT CONDUCTED: 49.96dBm 99.08W

MODULATION TYPE: F3E, F1E

POWER SOURCE(s): +13.8Vdc

TEST DATE(s): 11th – 20th December 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 |
| 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): | 11 th – 20 th December 2012 |
| TEST REPORT No: | TRA-008201-W-US-2 |

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

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:

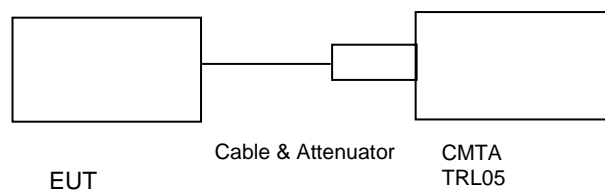
The SB2025NT100W is a radio base station capable of operating in analogue FM and digital P25 modes as a stand-alone repeater or as part of a simulcast/voted system. Inputs are provided for connection to external frequency and 1PPS timing signals to ensure the accurate frequency and modulation synchronisation 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 = 34%
 Supply voltage = +13.8Vdc
 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) |
|---------------|-------------------------|-------------------------------------|------------------------------|----------------------------|--------------------------|------------------------|
| 146.0125* | 9.6 | 40.33 | 49.93 | 98.40 | 50 | 100 |
| 161.0250 | 9.6 | 40.36 | 49.96 | 99.08 | 50 | 100 |
| 173.9875 | 9.5 | 40.45 | 49.95 | 98.86 | 50 | 100 |

* This frequency is not used in the USA and the data is not part of the FCC submission.

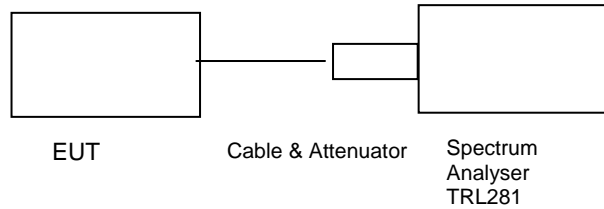
| TYPE OF EQUIPMENT | MAKER/ SUPPLIER | MODEL No | SERIAL No | No | ACTUAL EQUIPMENT USED |
|-------------------------------|-----------------|------------|------------|----------|-----------------------|
| Radio communications Analyser | RHODE & SCHWARZ | CMTA52 | 894715/003 | TRL05 | X |
| CABLE | 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 = 24°C
 Relative humidity = 56%
 Supply voltage = +13.8Vdc
 Channel number = See test results

Radio Laboratory



Note:

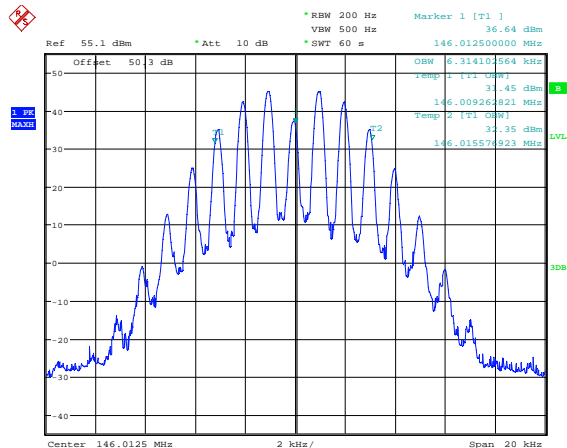
1. Cable and attenuator between EUT and spectrum analyser 50dB
2. See Table below for 99% Power Occupied Bandwidth
3. Internally generated test tone analogue speech
4. P25 Internally generated test tone C4FM

| Frequency Of Operation Channel | Modulation Type |
|--------------------------------------|-------------------------|
| FM 2.5kHz Deviation | |
| 146.0125MHz* | 99% Bandwidth =6.314kHz |
| 161.0250MHz | 99% Bandwidth =6.410kHz |
| 173.9875MHz | 99% Bandwidth =6.346kHz |
| FM 5kHz Deviation | |
| 146.0125MHz* | 99% Bandwidth =8.028kHz |
| 161.0250MHz | 99% Bandwidth =8.173kHz |
| 173.9875MHz | 99% Bandwidth =8.076kHz |
| P25 | |
| 146.0125MHz* | 99% Bandwidth =8.093kHz |
| 161.0250MHz | 99% Bandwidth =8.253kHz |
| 173.9875MHz | 99% Bandwidth =8.092kHz |

* This frequency is not used in the USA and the data is not part of the FCC submission.

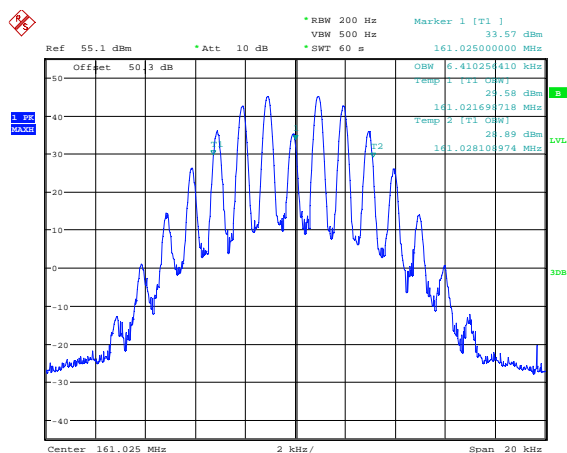
| TYPE OF EQUIPMENT | MAKER/ SUPPLIER | MODEL No | SERIAL No | TRAC No | EQUIPMENT USED |
|-------------------|--------------------|------------|-----------|----------|----------------|
| SPECTRUM ANALYSER | RHODE & SCHWARZ | FSU46 | 200034 | UH281 | X |
| CABLE | TRAC | N/A | N/A | UH271 | X |
| CABLE | 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 |

146.0125MHz 99% Bandwidth 12.5kHz - This frequency is not used in the USA and the data is not part of the FCC submission.



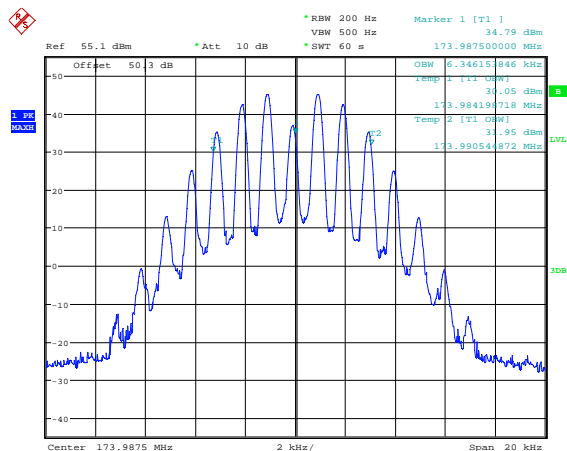
Date: 14.DEC.2012 12:40:04

161.0250MHz 99% Bandwidth 12.5kHz



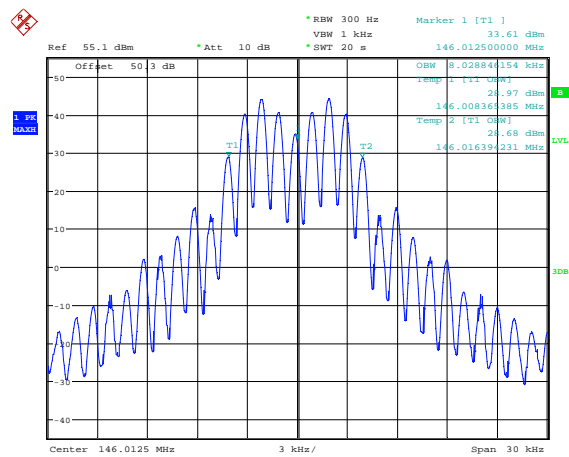
Date: 14.DEC.2012 12:57:14

173.9875MHz 99% Bandwidth 12.5kHz



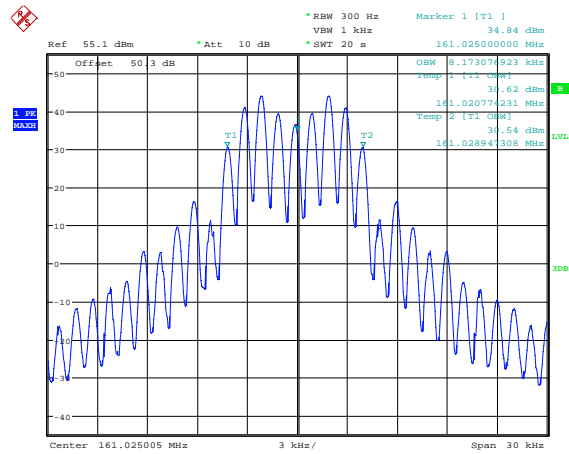
Date: 14.DEC.2012 13:09:58

146.0125MHz 99% Bandwidth 25kHz -This frequency is not used in the USA and the data is not part of the FCC submission.



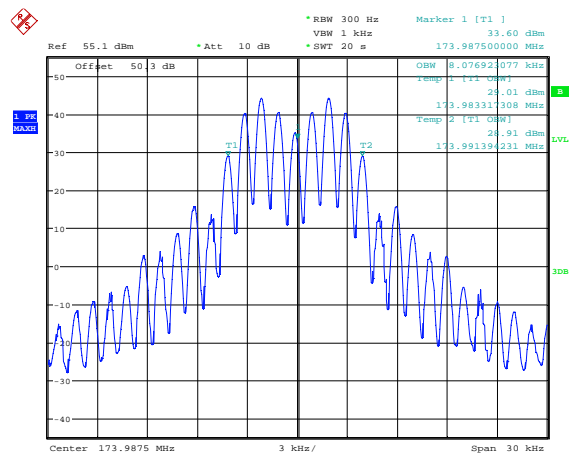
Date: 14.DEC.2012 14:14:23

161.0250MHz 99% Bandwidth 25kHz



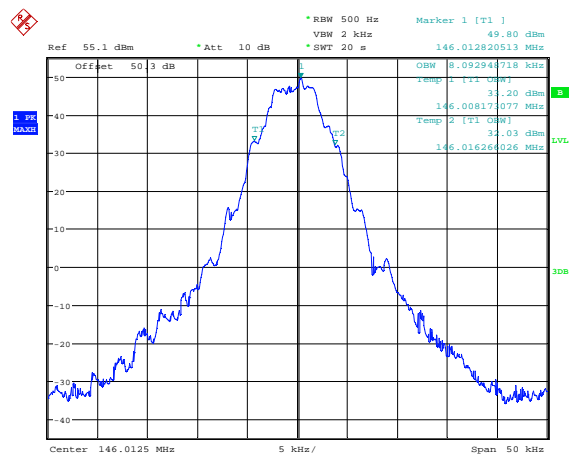
Date: 14.DEC.2012 14:33:11

173.9875MHz 99% Bandwidth 25kHz



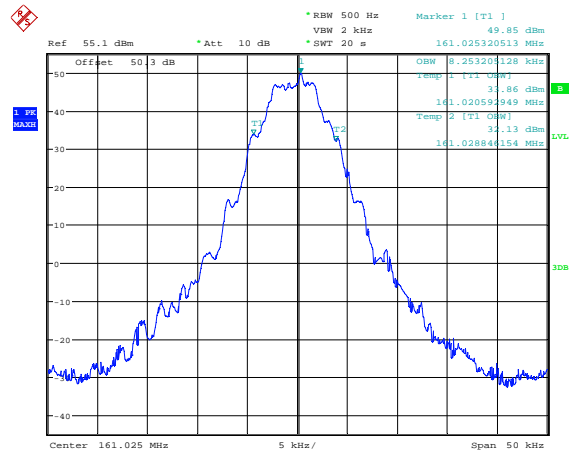
Date: 14.DEC.2012 14:03:09

146.0125MHz 99% Bandwidth P25 -This frequency is not used in the USA and the data is not part of the FCC submission.



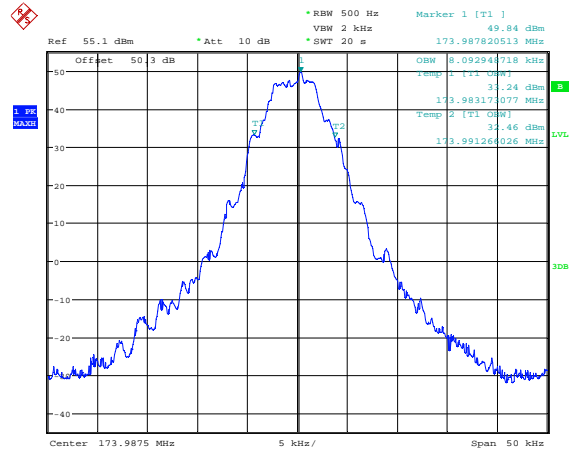
Date: 14.DEC.2012 13:20:54

161.0250MHz 99% Bandwidth P25



Date: 14.DEC.2012 13:31:29

173.9875MHz 99% Bandwidth P25



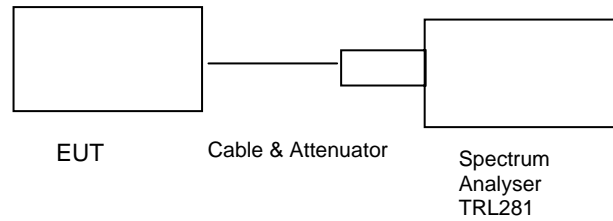
Date: 14.DEC.2012 13:47:23

TRANSMITTER TESTS

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

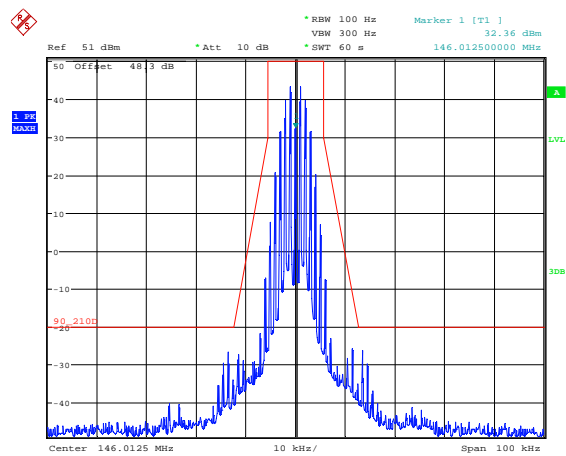
Ambient temperature = 24°C
Relative humidity = 56%
Supply voltage = +13.8Vdc

Radio Laboratory
Test Signal = F3E



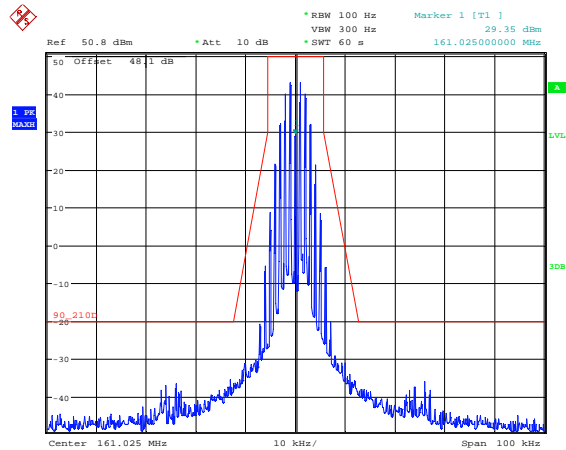
Note: the spectrum masks are defined in: Part 90.210(b) as the transmitter operates in the band 150MHz – 174MHz using an authorized bandwidth of 11.25kHz as per section 90.209(5).

Emission Masks. Part 90.210(d) 146.0125MHz FM 12.5kHz - This frequency is not used in the USA and the data is not part of the FCC submission.



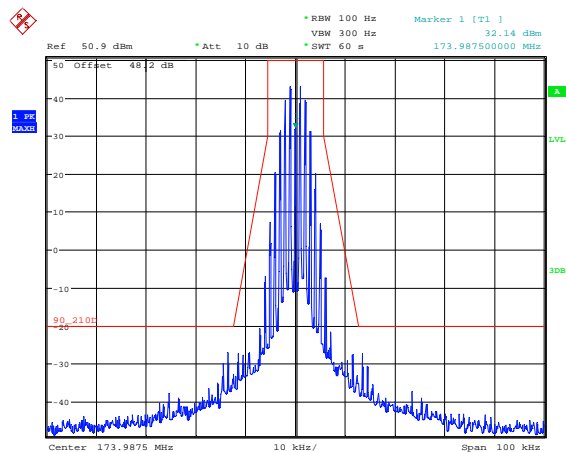
Date: 11.DEC.2012 15:00:54

Emission Masks. Part 90.210(d) 161.0250MHz FM 12.5kHz



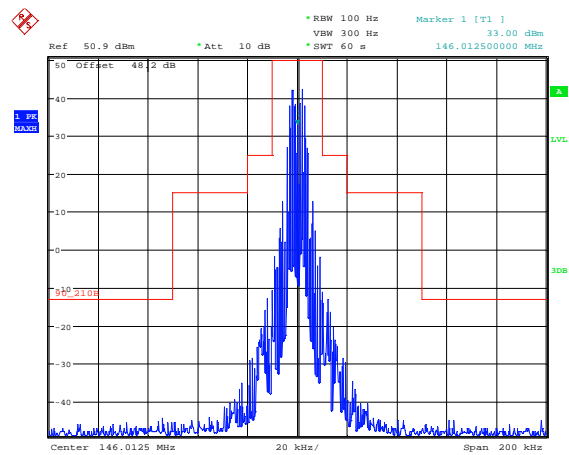
Date: 11.DEC.2012 16:38:16

Emission Masks. Part 90.210(d) 173.9875MHz FM 12.5kHz



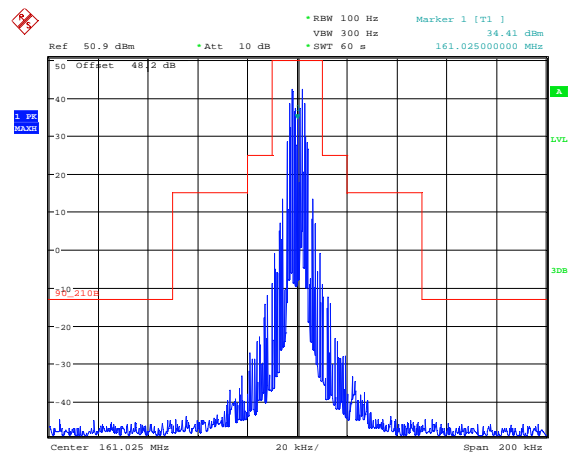
Date: 11.DEC.2012 16:44:38

Emission Masks. Part 90.210(b) 146.0125MHz FM 25kHz - This frequency is not used in the USA and the data is not part of the FCC submission.



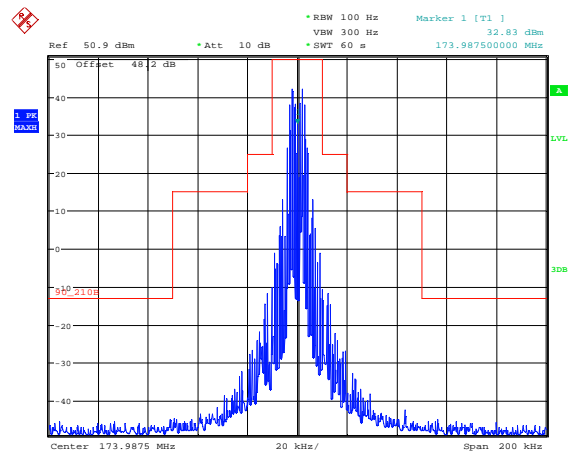
Date: 11.DEC.2012 14:12:12

Emission Masks. Part 90.210(b) 161.0250MHz FM 25kHz



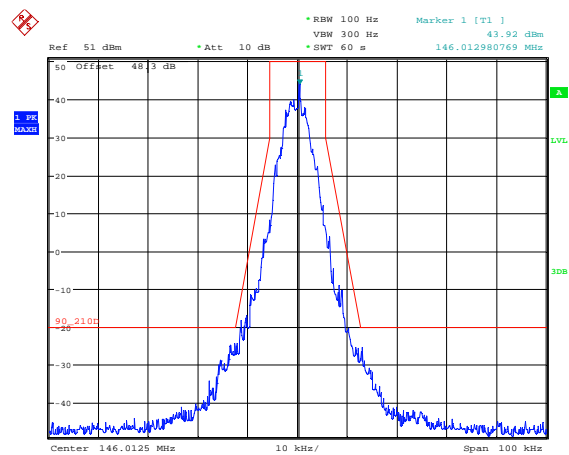
Date: 11.DEC.2012 14:14:43

Emission Masks. Part 90.210(b) 173.9875MHz FM 25kHz



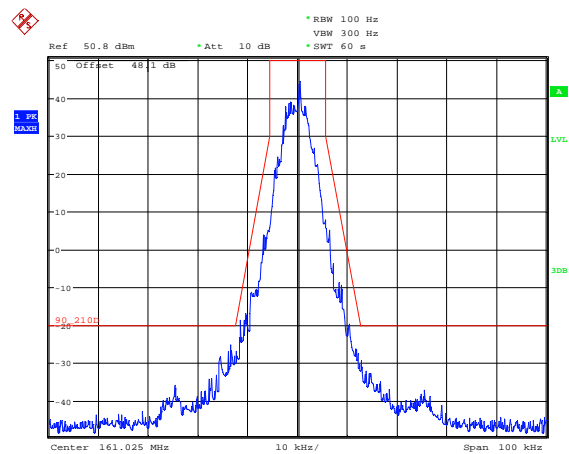
Date: 11.DEC.2012 14:18:47

Emission Masks. Part 90.210(d) 146.0125MHz P25 - This frequency is not used in the USA and the data is not part of the FCC submission.



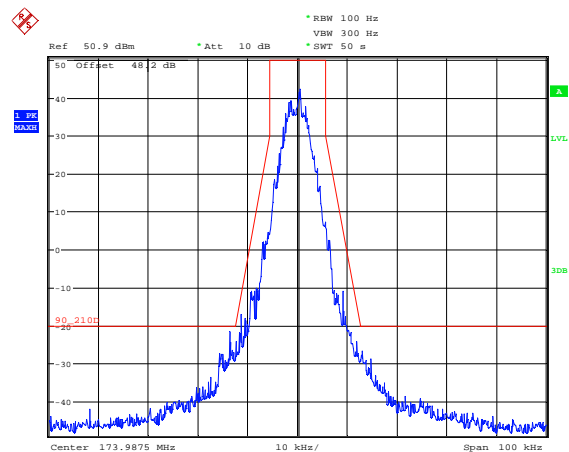
Date: 11.DEC.2012 15:08:16

Emission Masks. Part 90.210(d) 161.0250MHz P25



Date: 11.DEC.2012 13:53:44

Emission Masks. Part 90.210(d) 173.9875MHz P25



Date: 11.DEC.2012 14:02:35

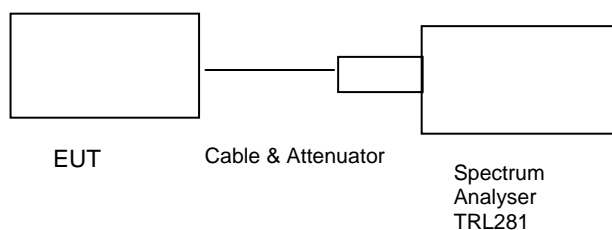
TRANSMITTER TESTS

SPURIOUS EMISSIONS – CONDUCTED – Part 2.1053

146.0125 MHz - This frequency is not used in the USA and the data is not part of the FCC submission.

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

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 centre of the authorised bandwidth by a displacement frequency (fd in kHz) of more than 12.5kHz: At least 50 + 10 log (P) dB or 70dB whichever is the lesser attenuation.

RESULTS

146.0125 MHz This frequency is not used in the USA and the data is not part of the FCC submission.

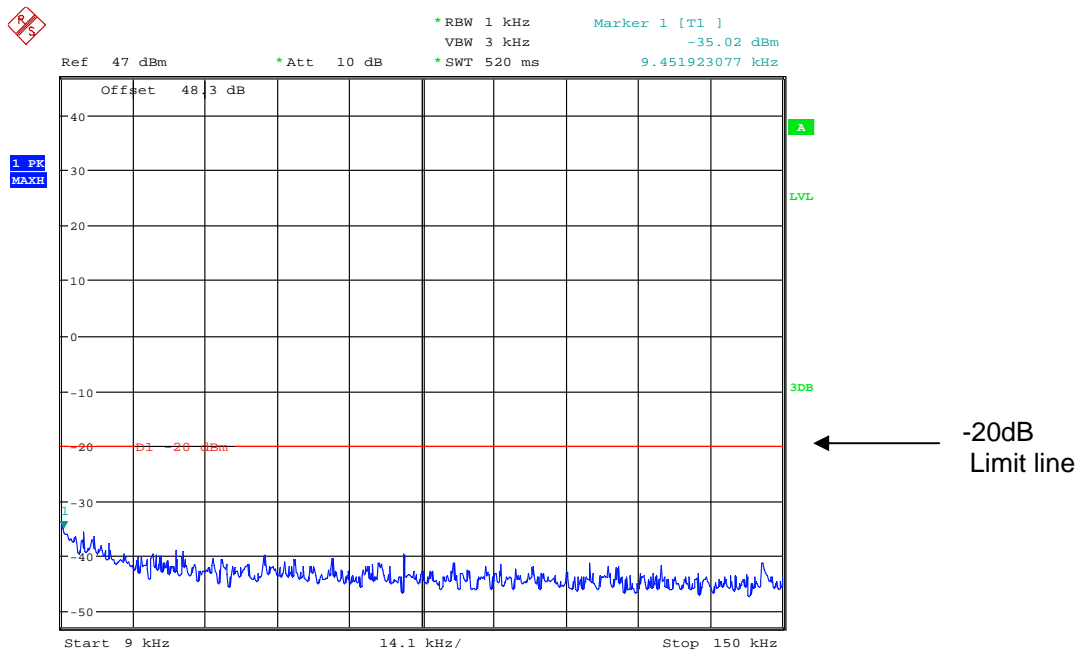
| FREQUENCY RANGE | FREQ. (MHz) | MEASURED LEVEL (dBm) | LIMIT (dBm) |
|-----------------|--|----------------------|-------------|
| 9kHz – 10GHz | No Significant Emissions Within 20 dB of the limit | | |

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 | TELONIC BERKELEY | TTR375-3EE | H | TRLUH265 | X |
| FILTER | TELONIC BERKELEY | TTF2250-055EE | F | TRLUH275 | X |

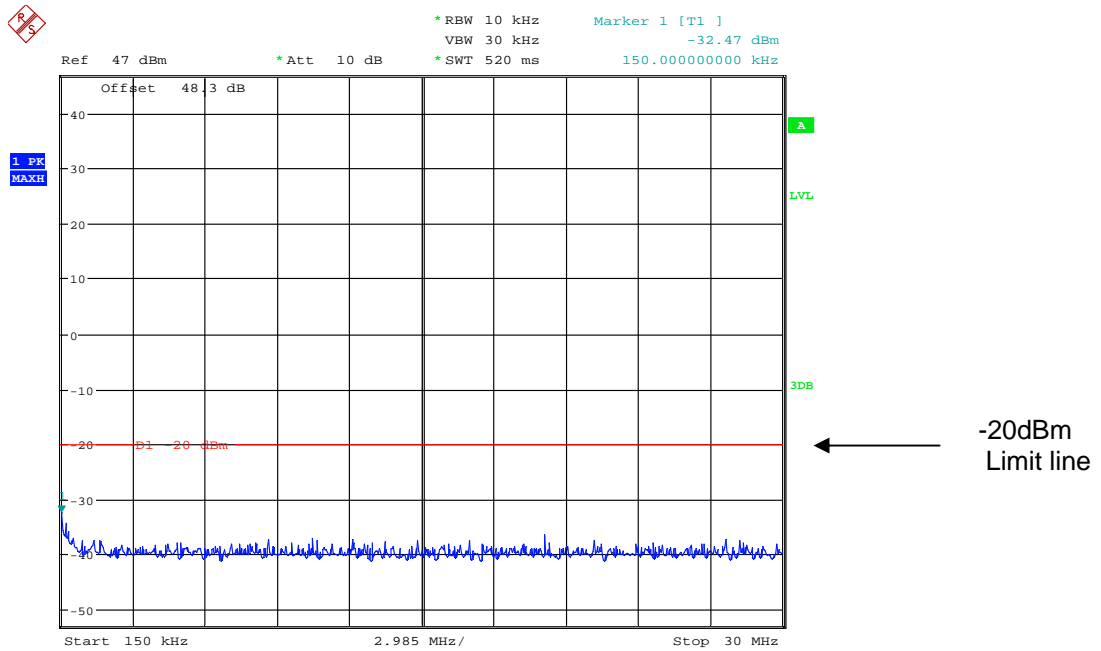
Conducted emissions 146.0125 MHz

146.0125 MHz 9kHz – 150kHz - This frequency is not used in the USA and the data is not part of the FCC submission.



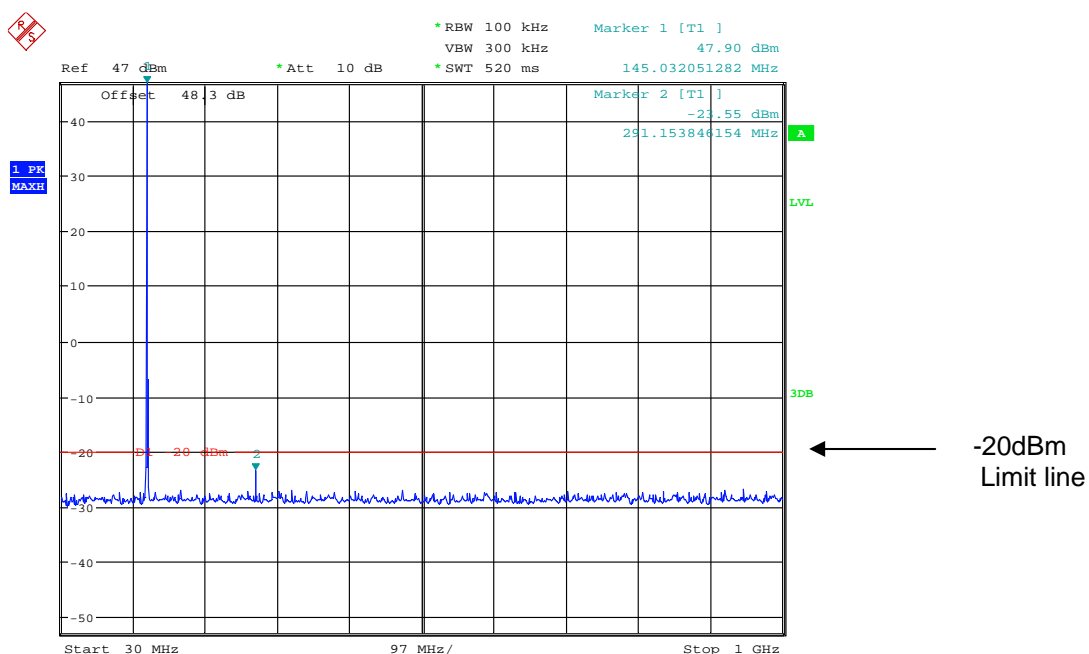
Date: 12.DEC.2012 13:25:43

146.0125 MHz 150kHz-30MHz - This frequency is not used in the USA and the data is not part of the FCC submission.



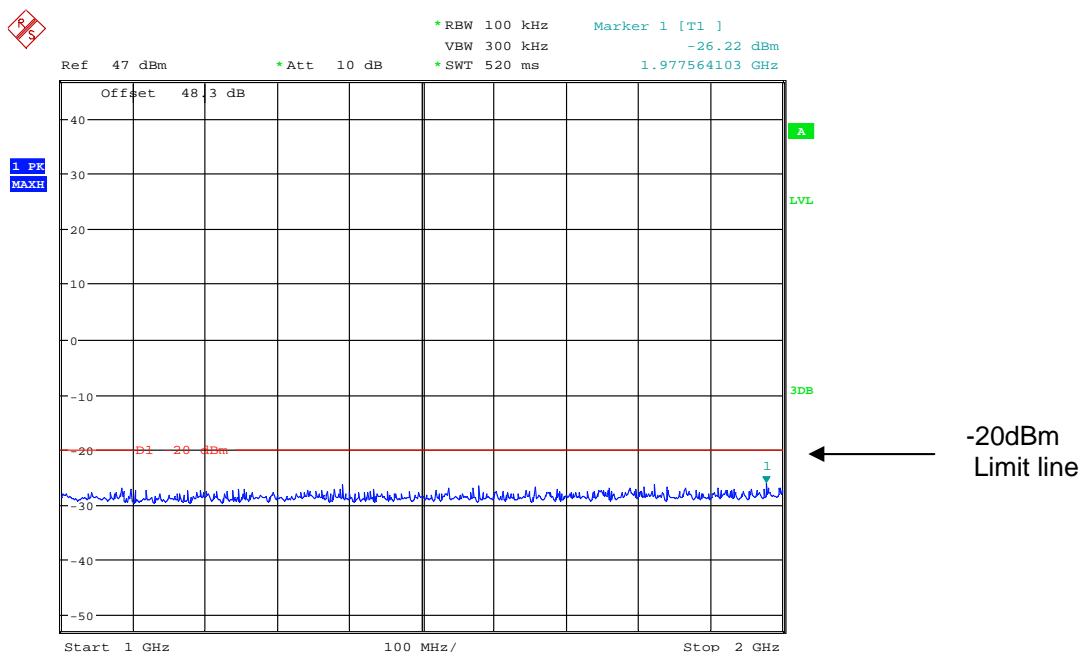
Date: 12.DEC.2012 13:26:13

146.0125 MHz 30MHz-1GHz - This frequency is not used in the USA and the data is not part of the FCC submission.



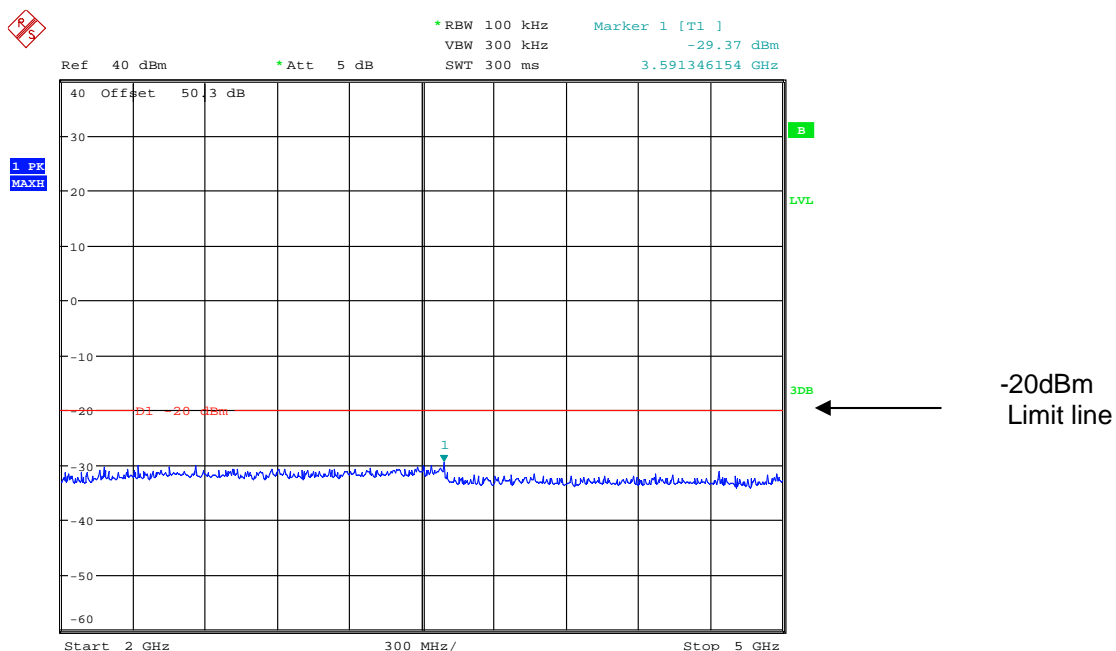
Date: 12.DEC.2012 13:25:03

146.0125 MHz 1GHz – 2GHz - This frequency is not used in the USA and the data is not part of the FCC submission.



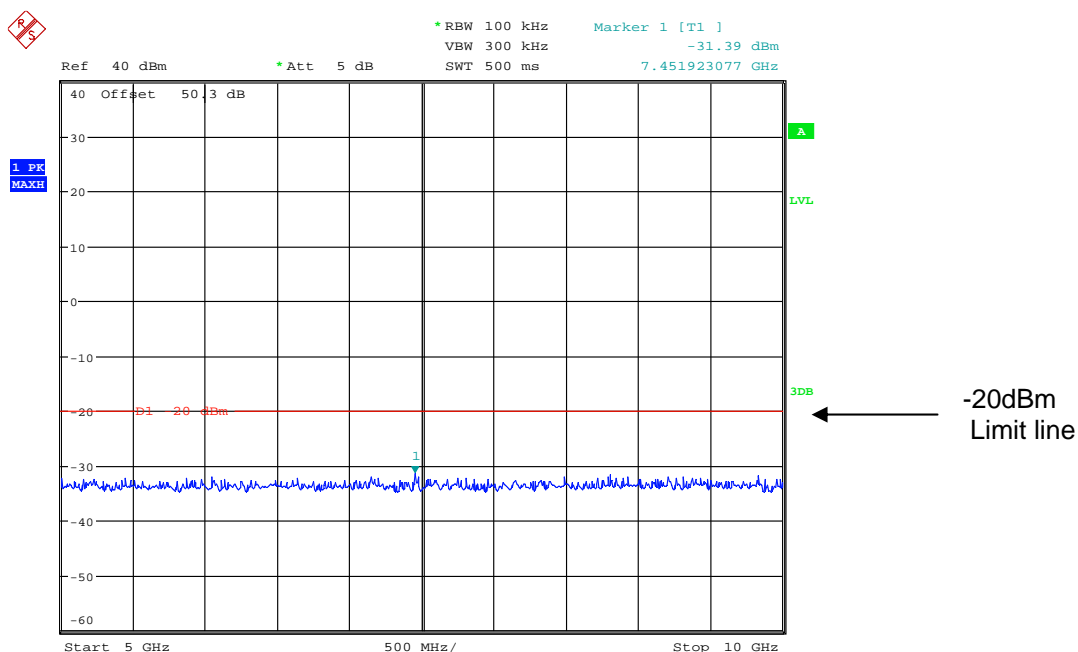
Date: 12.DEC.2012 13:27:09

146.0125 MHz 2GHz – 5GHz - This frequency is not used in the USA and the data is not part of the FCC submission.



Date: 20.DEC.2012 12:03:45

146.0125 MHz 5GHz – 10GHz - This frequency is not used in the USA and the data is not part of the FCC submission.

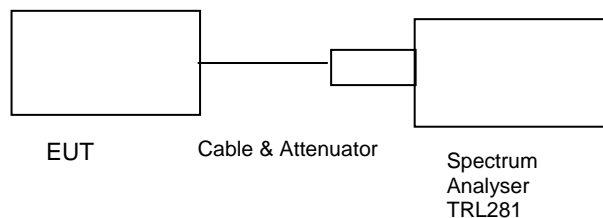


Date: 20.DEC.2012 12:04:04

SPURIOUS EMISSIONS – CONDUCTED – Part 2.1053**161.0250 MHz**

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

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 centre of the authorised bandwidth by a displacement frequency (fd in kHz) of more than 12.5kHz: At least 50 + 10 log (P) dB or 70dB whichever is the lesser attenuation.

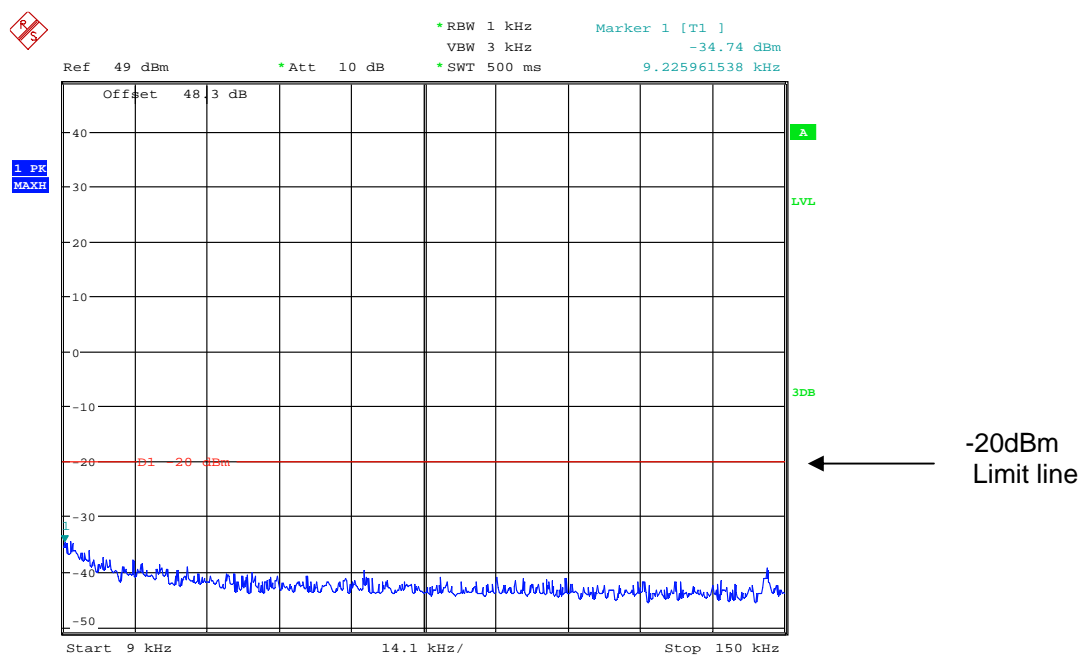
RESULTS**161.0250 MHz**

| FREQUENCY RANGE | FREQ. (MHz) | MEASURED LEVEL (dBm) | LIMIT (dBm) |
|-----------------|--|----------------------|-------------|
| 9kHz – 10GHz | No Significant Emissions Within 20 dB of the limit | | |

The test equipment used for the Transmitter Conducted Emissions:

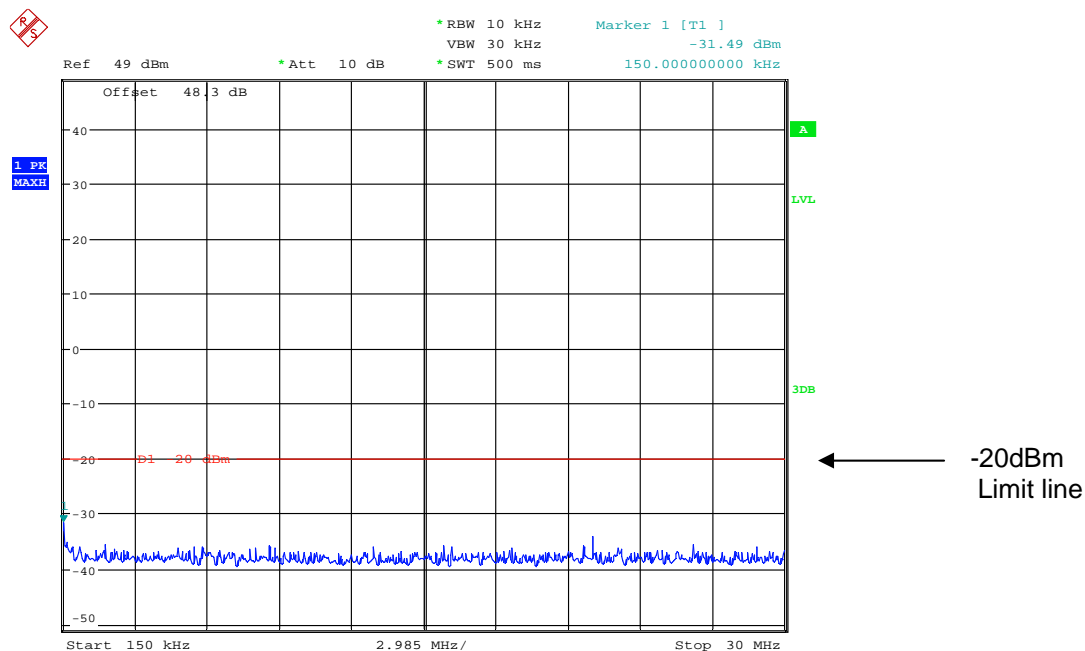
| TYPE OF EQUIPMENT | MAKER/ SUPPLIER | MODEL No | SERIAL No | TRAC No | ACTUAL EQUIPMENT USED |
|-------------------|------------------|---------------|-----------|----------|-----------------------|
| SPECTRUM ANALYSER | RHODE & SCHWARZ | FSU46 | 200034 | UH281 | X |
| CABLE | TRAC | N/A | N/A | UH271 | 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 | TELONIC BERKELEY | TTR375-3EE | H | TRLUH265 | X |
| FILTER | TELONIC BERKELEY | TTF2250-055EE | F | TRLUH275 | X |

161.0250MHz 9kHz – 150kHz



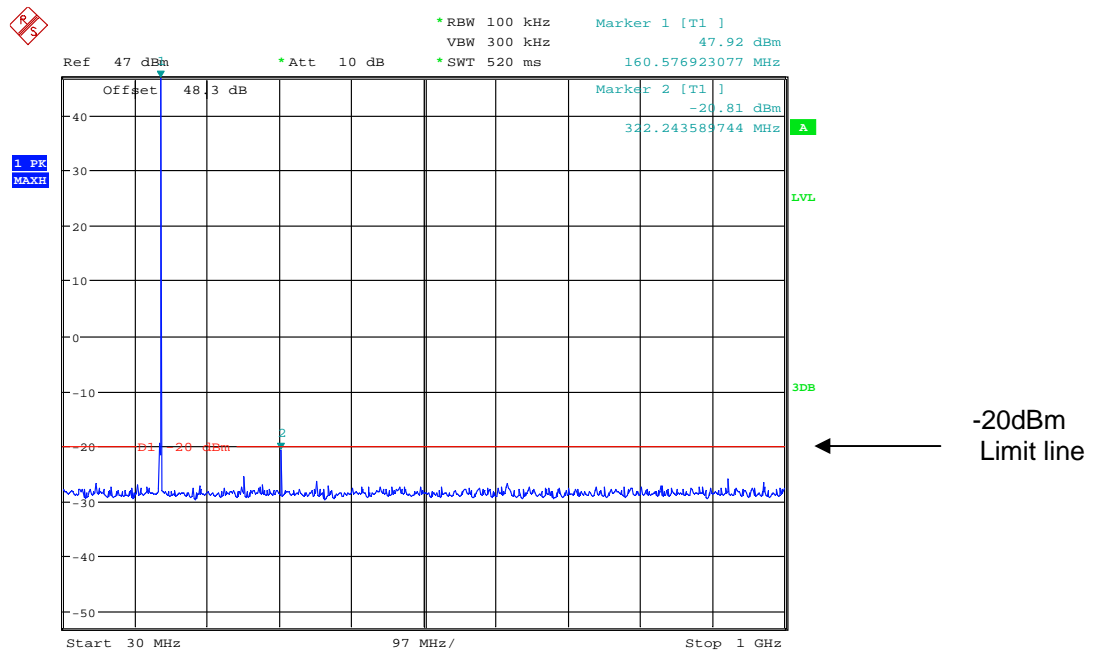
Date: 12.DEC.2012 13:20:01

161.0250MHz 150 kHz -30 MHz



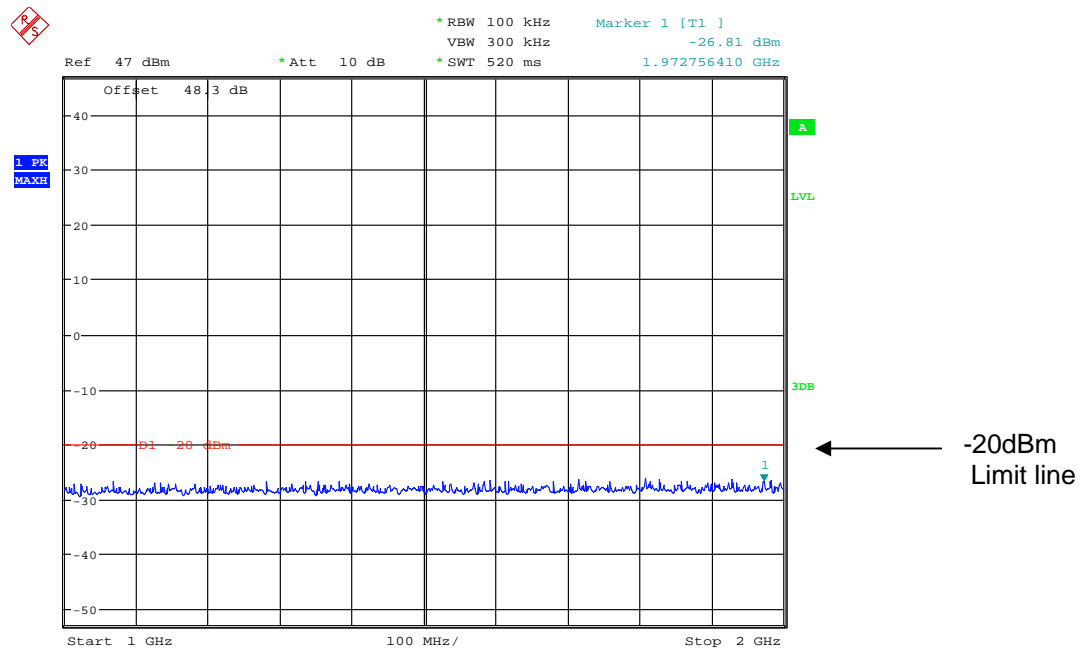
Date: 12.DEC.2012 13:20:37

161.0250MHz 30MHz-1GHz



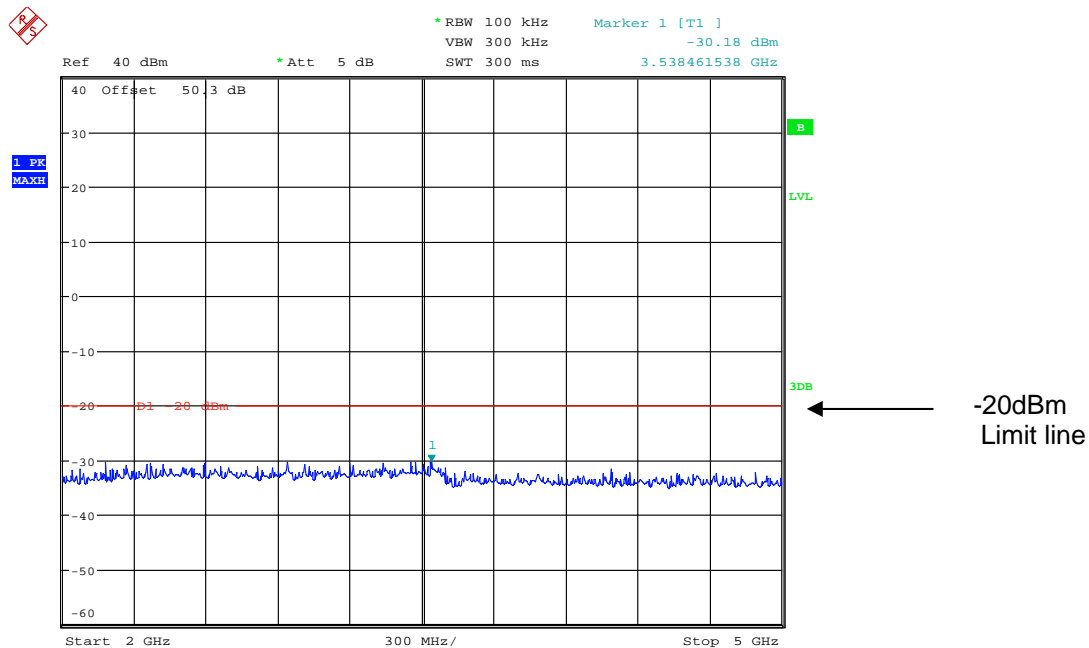
Date: 12.DEC.2012 13:21:51

161.0250MHz 1GHz – 2GHz



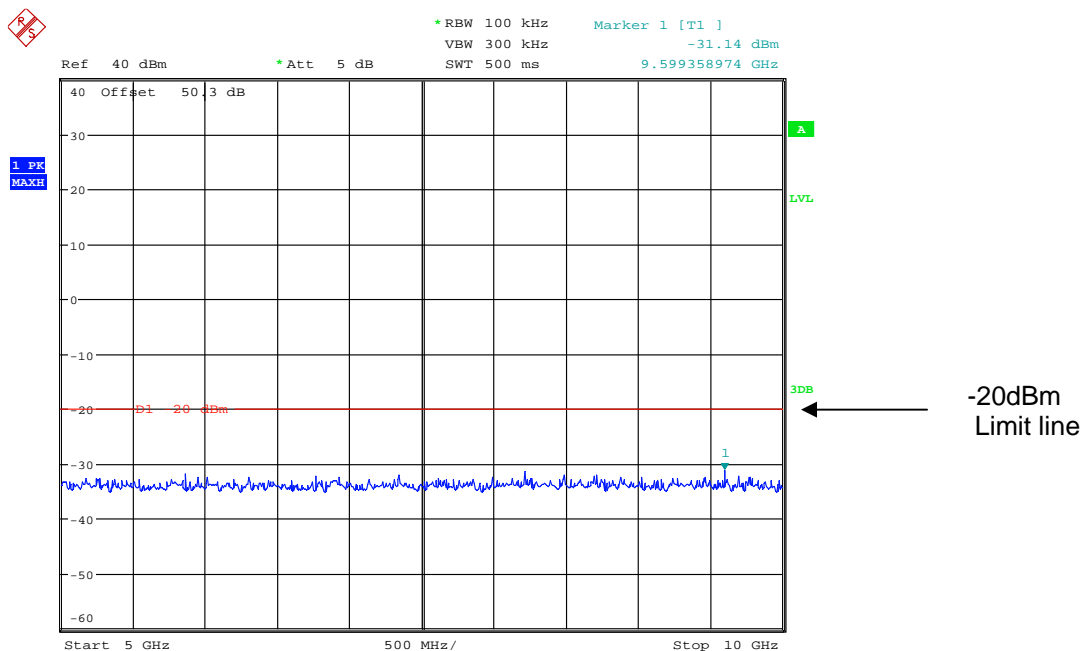
Date: 12.DEC.2012 13:22:40

161.0250MHz 2GHz – 5GHz



Date: 20.DEC.2012 12:05:12

161.0250MHz 5GHz – 10GHz

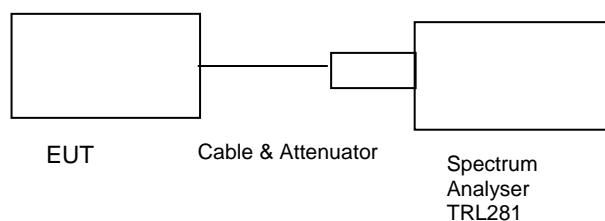


Date: 20.DEC.2012 12:05:00

SPURIOUS EMISSIONS – CONDUCTED – Part 2.1053**173.9875 MHz**

Ambient temperature = 24°C
 Relative humidity = 34%
 Supply voltage = +13.8Vdc

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 centre of the authorised bandwidth by a displacement frequency (fd in kHz) of more than 12.5kHz: At least 50 + 10 log (P) dB or 70dB whichever is the lesser attenuation.

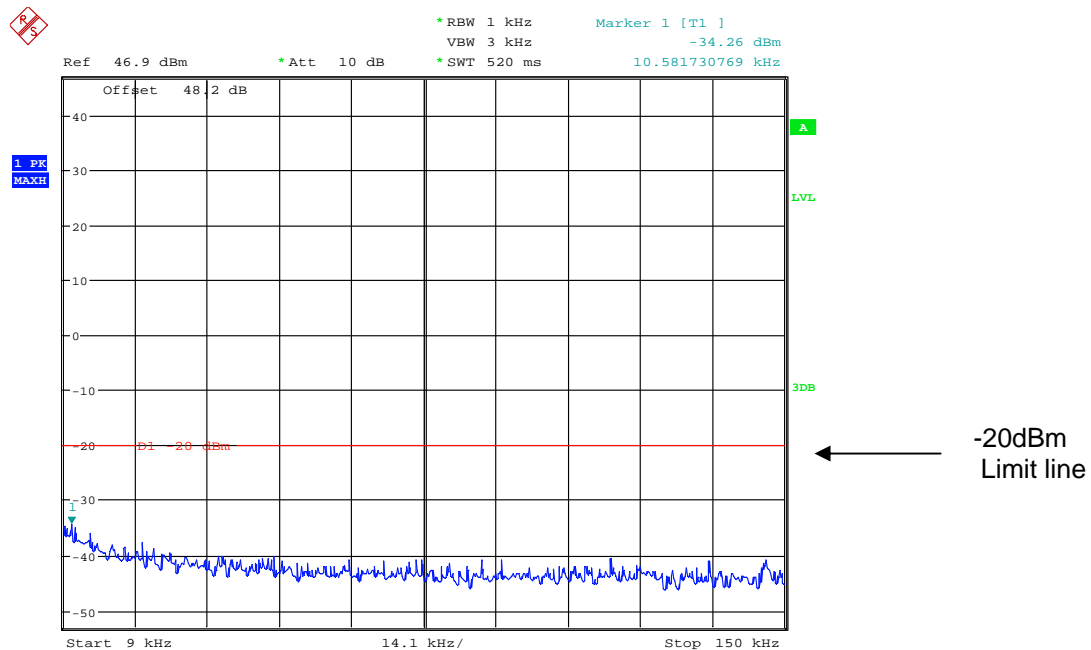
RESULTS**173.9875 MHz**

| FREQUENCY RANGE | FREQ. (MHz) | MEASURED LEVEL (dBm) | LIMIT (dBm) |
|-----------------|-------------|----------------------|-------------|
| 9kHz – 10GHz | 2435.88 | -27.65 | -20 |

The test equipment used for the Transmitter Conducted Emissions:

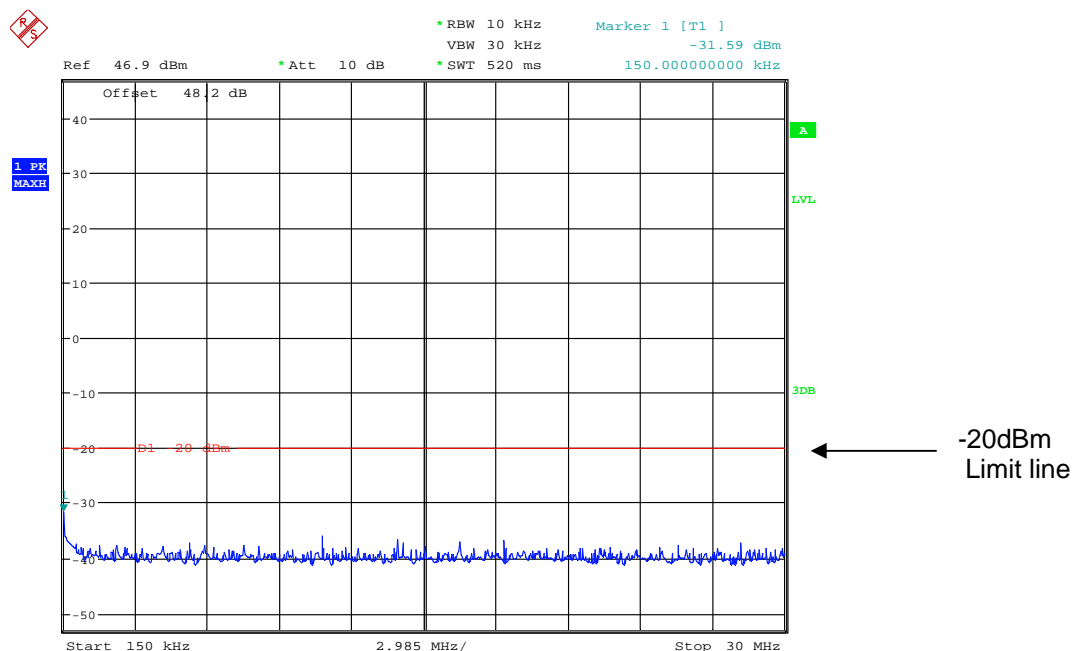
| TYPE OF EQUIPMENT | MAKER/SUPPLIER | MODEL No | SERIAL No | TRAC No | ACTUAL EQUIPMENT USED |
|-------------------|------------------|---------------|-----------|----------|-----------------------|
| SPECTRUM ANALYSER | RHODE & SCHWARZ | FSU46 | 200034 | UH281 | X |
| CABLE | TRAC | N/A | N/A | UH271 | 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 | TELONIC BERKELEY | TTR375-3EE | H | TRLUH265 | X |
| FILTER | TELONIC BERKELEY | TTF2250-055EE | F | TRLUH275 | X |

173.9875MHz 9kHz – 150kHz



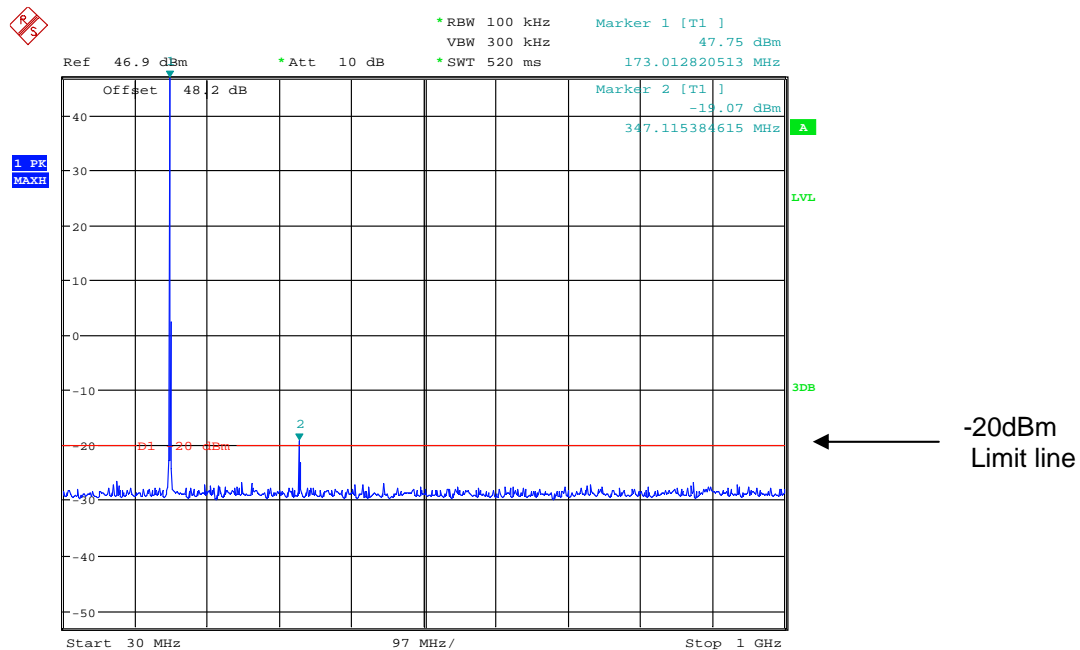
Date: 12.DEC.2012 13:38:00

173.9875MHz 150kHz -30MHz



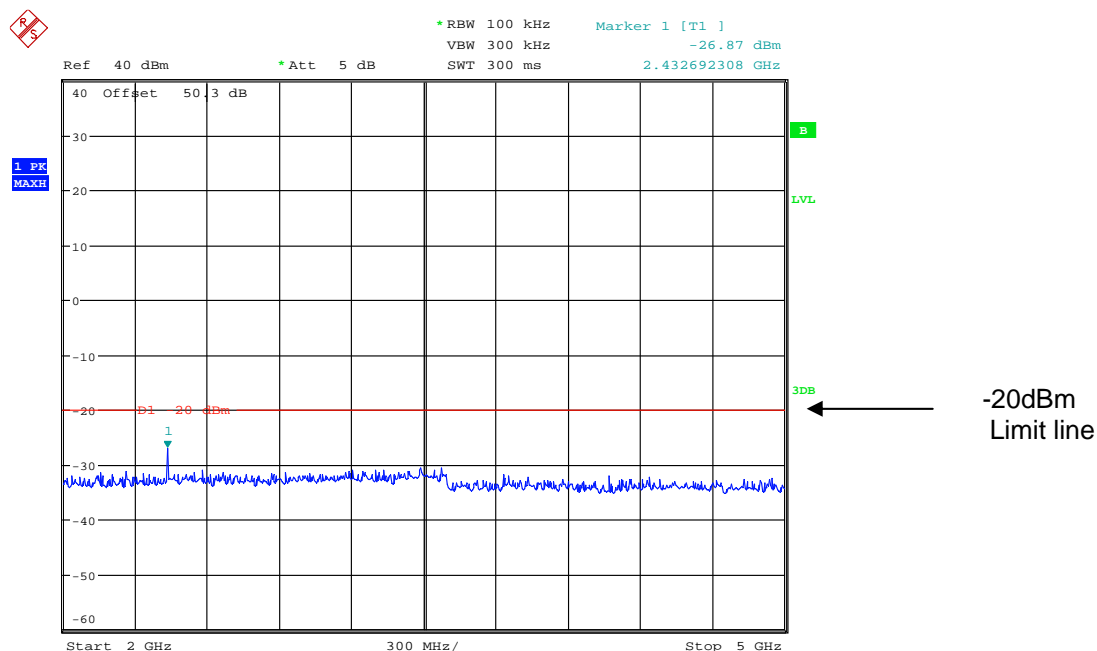
Date: 12.DEC.2012 13:38:29

173.9875MHz 30MHz-1GHz



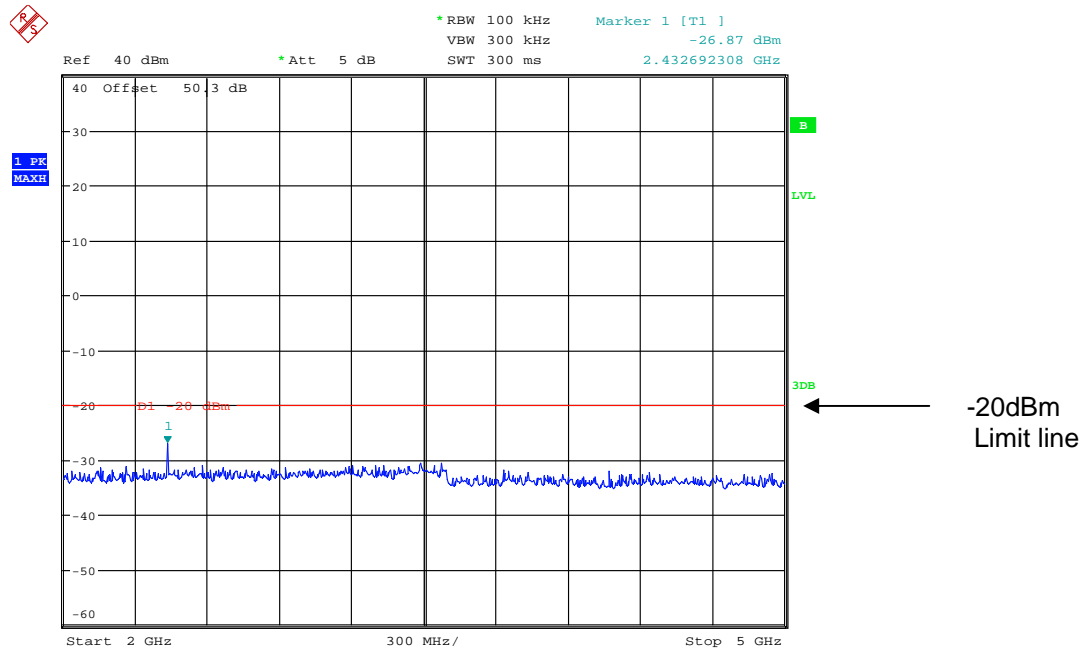
Date: 12.DEC.2012 13:37:07

173.9875MHz 1GHz – 2GHz



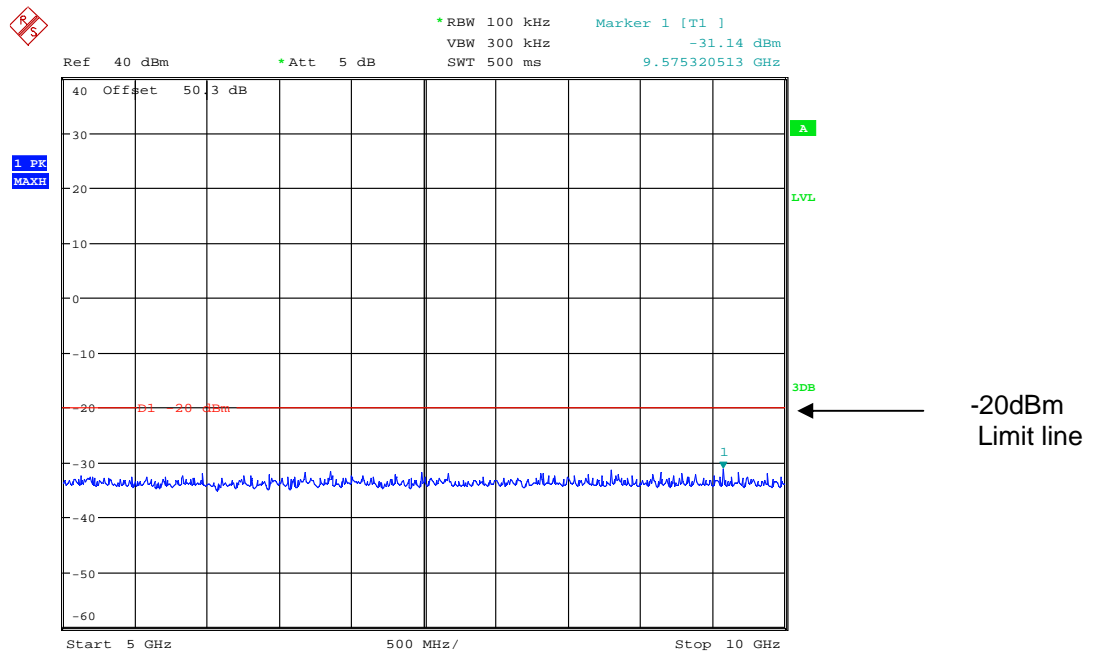
Date: 20.DEC.2012 12:12:56

173.9875MHz 2GHz – 5GHz



Date: 20.DEC.2012 12:12:56

173.9875MHz 5GHz – 10GHz

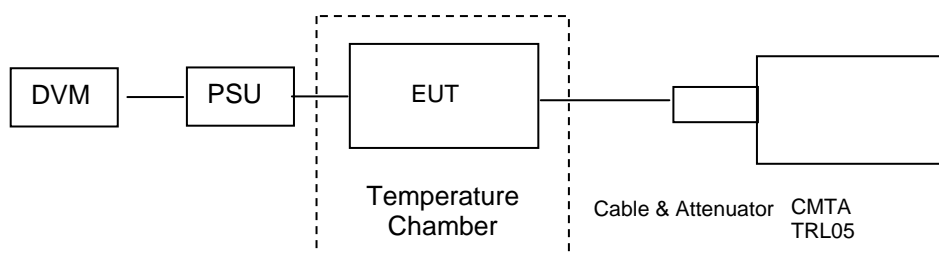


Date: 20.DEC.2012 12:13:18

FREQUENCY STABILITY – CONDUCTED – Part 90.213

Ambient temperature = 24°C
 Relative humidity = 34%
 Supply voltage = +13.8Vdc

Radio Laboratory
 Test Signal = F3E



146.0125 MHz *- This frequency is not used in the USA and the data is not part of the FCC submission.

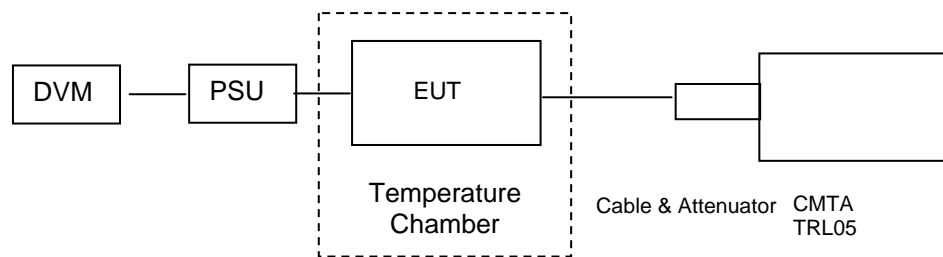
| Temperature °C | Vnom (Vdc) | Measured Frequency (MHz) | Frequency Difference (Hz) | ppm | Limit ± 1.5ppm Pass/Fail |
|----------------|------------|--------------------------|---------------------------|-------|--------------------------|
| +50 | 13.8 | 146.01240 | -0.1000 | -0.68 | Pass |
| +40 | 13.8 | 146.01244 | -0.0600 | -0.41 | Pass |
| +30 | 13.8 | 146.01250 | 0.0000 | 0.00 | Pass |
| +20 | 13.8 | 146.01253 | 0.0300 | 0.21 | Pass |
| +10 | 13.8 | 146.01249 | -0.0100 | -0.07 | Pass |
| 0 | 13.8 | 146.01257 | 0.0700 | 0.48 | Pass |
| -10 | 13.8 | 146.01256 | 0.0600 | 0.41 | Pass |
| -20 | 13.8 | 146.01255 | 0.0500 | 0.34 | Pass |
| -30 | 13.8 | 146.01254 | 0.0400 | 0.27 | Pass |

| | | |
|---------------------------|--------------|---------------|
| Tnom 24 °C | 85%= 11.7Vdc | 115%= 15.9Vdc |
| Frequency (MHz) | 146.01254* | 146.01254* |
| Frequency Difference (Hz) | 0.0400 | 0.0400 |
| ppm | 0.27 | 0.27 |
| Limit ± 1.5 ppm Pass/Fail | Pass | Pass |

* This frequency is not used in the USA and the data is not part of the FCC submission.

Ambient temperature = 24°C
 Relative humidity = 34%
 Supply voltage = +13.8Vdc

Radio Laboratory
 Test Signal = F3E



161.0250 MHz

| Temperature °C | Vnom (Vdc) | Measured Frequency (MHz) | Frequency Difference (Hz) | ppm | Limit ± 1.5 ppm Pass/Fail |
|----------------|------------|--------------------------|---------------------------|-------|---------------------------|
| +50 | 13.8 | 161.02489 | -0.1100 | -0.68 | Pass |
| +40 | 13.8 | 161.02493 | -0.0700 | -0.43 | Pass |
| +30 | 13.8 | 161.02499 | -0.0100 | -0.06 | Pass |
| +20 | 13.8 | 161.02502 | 0.0200 | 0.12 | Pass |
| +10 | 13.8 | 161.02499 | -0.0100 | -0.06 | Pass |
| 0 | 13.8 | 161.02507 | 0.0700 | 0.43 | Pass |
| -10 | 13.8 | 161.02506 | 0.0600 | 0.37 | Pass |
| -20 | 13.8 | 161.02505 | 0.0500 | 0.31 | Pass |
| -30 | 13.8 | 161.02504 | 0.0400 | 0.25 | Pass |

| | | |
|---------------------------|--------------|---------------|
| Tnom 24°C | 85%= 11.7Vdc | 115%= 15.9Vdc |
| Frequency (MHz) | 161.02503 | 161.02503 |
| Frequency Difference (Hz) | 0.0300 | 0.0300 |
| ppm | 0.19 | 0.19 |
| Limit ± 1.5 ppm Pass/Fail | Pass | Pass |

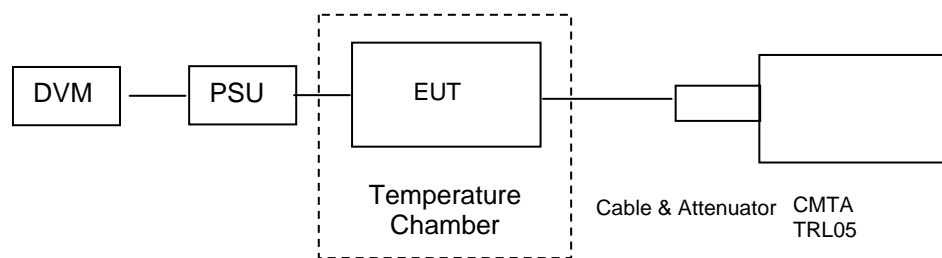
Frequency stability measurements were between -30°C and +50°C in 10°C increments.

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)

Ambient temperature = 24°C
 Relative humidity = 34%
 Supply voltage = +13.8Vdc

Radio Laboratory
 Test Signal = F3E



173.9875 MHz

| Temperature °C | Vnom (Vdc) | Measured Frequency (MHz) | Frequency Difference (Hz) | ppm | Limit ± 1.5 ppm Pass/Fail |
|----------------|------------|--------------------------|---------------------------|-------|---------------------------|
| +50 | 13.8 | 173.98738 | -0.1200 | -0.69 | Pass |
| +40 | 13.8 | 173.98743 | -0.0700 | -0.40 | Pass |
| +30 | 13.8 | 173.98749 | -0.0100 | -0.06 | Pass |
| +20 | 13.8 | 173.98752 | 0.0200 | 0.11 | Pass |
| +10 | 13.8 | 173.98749 | -0.0100 | -0.06 | Pass |
| 0 | 13.8 | 173.98757 | 0.0700 | 0.40 | Pass |
| -10 | 13.8 | 173.98757 | 0.0700 | 0.40 | Pass |
| -20 | 13.8 | 173.98755 | 0.0500 | 0.29 | Pass |
| -30 | 13.8 | 173.98754 | 0.0400 | 0.23 | Pass |

| | | |
|---------------------------|--------------|---------------|
| Tnom 24°C | 85%= 11.7Vdc | 115%= 15.9Vdc |
| Frequency (MHz) | 173.98754 | 173.98754 |
| Frequency Difference (Hz) | 0.0400 | 0.0400 |
| ppm | 0.23 | 0.23 |
| Limit ± 1.5 ppm Pass/Fail | Pass | Pass |

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

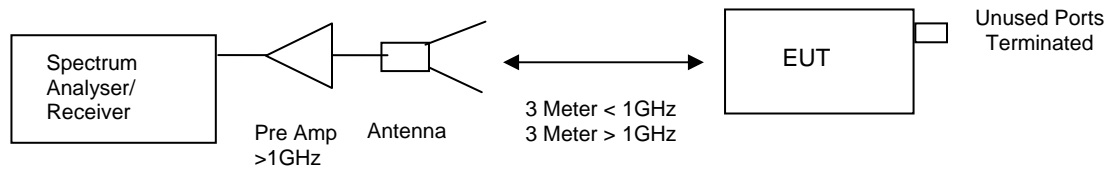
At each temperature the transmitter was given a period of 60 minutes to stabilise. The transmitter was then turned on and the frequency error measured after a period of 1 minute.

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 = 34%
 Conditions = ATS
 Supply voltage = +13.8Vdc
 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.

RESULTS

146.0125 MHz - * This frequency is not used in the USA and the data is not part of the FCC submission.

| FREQUENCY RANGE | FREQ. (MHz) | Measured (dBm) | LIMIT (dBm) |
|-----------------|-------------|----------------|-------------|
| 30MHz – 10GHz | 2482.16 | -37.01 | -20 |
| | 2628.17 | -29.33 | -20 |
| | 2774.04 | -39.19 | -20 |
| | 3066.19 | -42.24 | -20 |
| | 3358.33 | -40.49 | -20 |
| | 5402.38 | -35.30 | -20 |

161.0250 MHz

| FREQUENCY RANGE | FREQ. (MHz) | Measured (dBm) | LIMIT (dBm) |
|-----------------|-------------|----------------|-------------|
| 30MHz – 10GHz | 2415.37 | -37.58 | -20 |
| | 2576.40 | -36.65 | -20 |
| | 2737.40 | -32.18 | -20 |
| | 3059.48 | -38.42 | -20 |
| | 3220.48 | -32.27 | -20 |
| | 5152.76 | -40.70 | -20 |
| | 5313.77 | -32.77 | -20 |
| | 5474.84 | -31.72 | -20 |
| | 5635.82 | -34.53 | -20 |

173.9875 MHz

| FREQUENCY RANGE | FREQ. (MHz) | Measured (dBm) | LIMIT (dBm) |
|-----------------|-------------|----------------|-------------|
| 30MHz – 10GHz | 2435.80 | -35.98 | -20 |
| | 2609.80 | -37.29 | -20 |
| | 2783.77 | -40.15 | -20 |
| | 3131.80 | -38.01 | -20 |
| | 5219.62 | -27.80 | -20 |
| | 5567.54 | -36.41 | -20 |

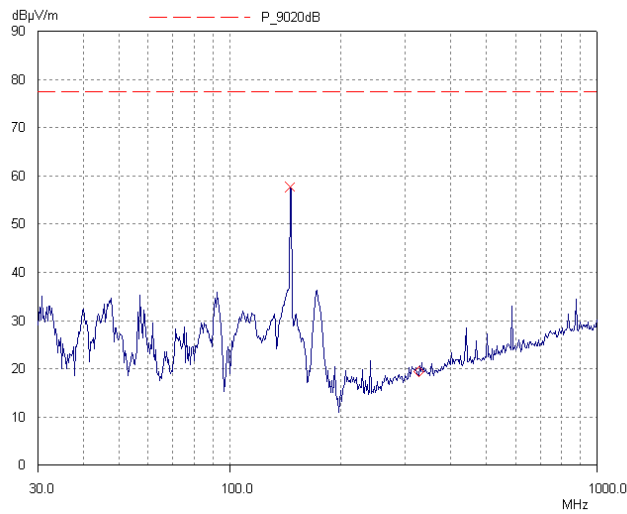
* Note: Emissions that fall below 20dB of the limit are not shown in the above table

The test equipment used for the Transmitter Spurious Emissions:

| TYPE OF EQUIPMENT | MAKER/ SUPPLIER | MODEL No | SERIAL No | TRAC No | ACTUAL EQUIPMENT USED |
|----------------------|--------------------|----------|------------|----------|-----------------------------|
| ANTENNA | R&S | HL050 | 100457 | TRLUH305 | 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 |

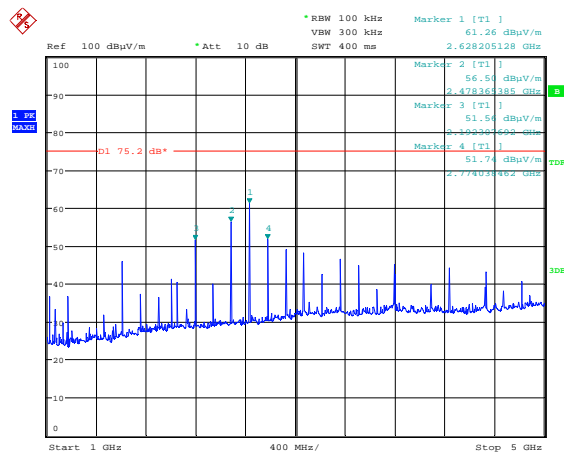
Radiated emissions 146.0125 MHz

146.0125MHz 30MHz – 1GHz - This frequency is not used in the USA and the data is not part of the FCC submission.



← -20dBm Limit line

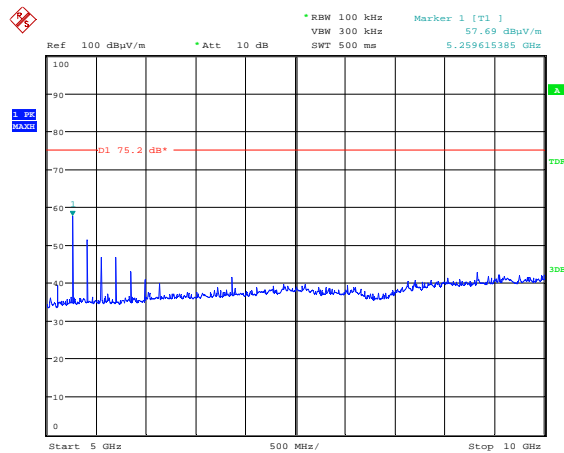
146.0125MHz 1GHz – 5GHz This frequency is not used in the USA and the data is not part of the FCC submission.



← -20dBm Limit line

Date: 19.DEC.2012 13:49:06

146.0125MHz 5GHz – 10GHz * This frequency is not used in the USA and the data is not part of the FCC submission.

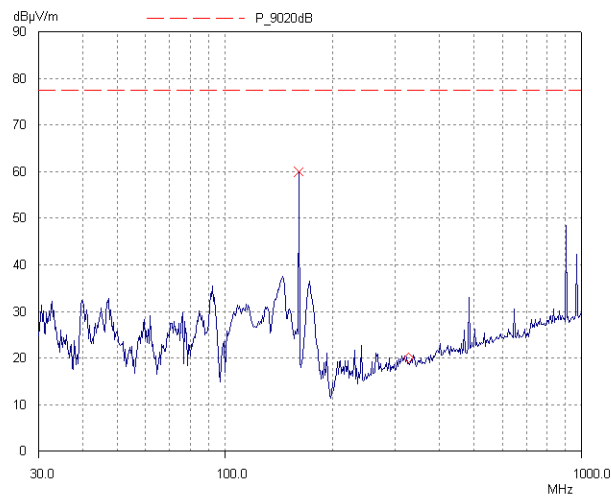


← -20dBm Limit line

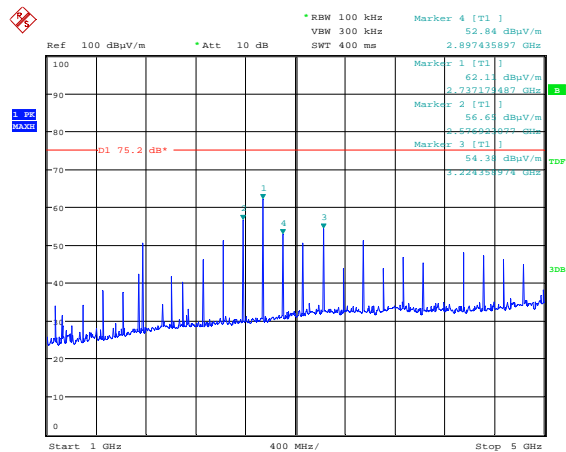
Date: 19.DEC.2012 13:48:11

Radiated emissions 161.0250 MHz

161.0250MHz - 30MHz – 1GHz

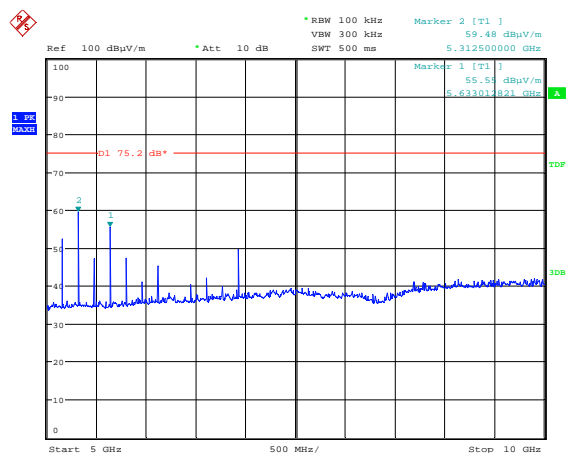


161.0250MHz 1GHz – 5GHz



Date: 19.DEC.2012 13:58:16

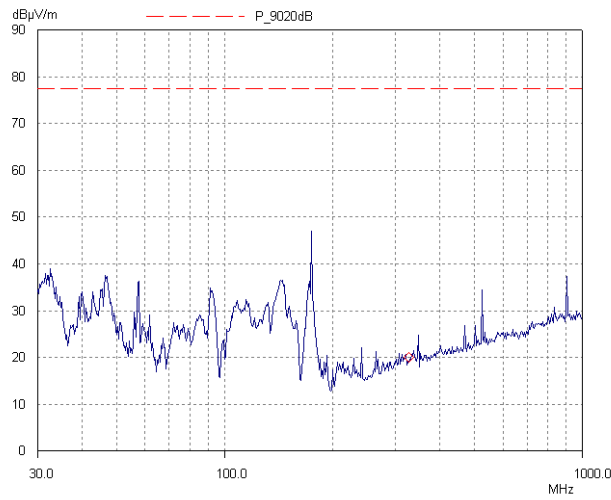
161.0250MHz 5GHz – 10GHz



Date: 19.DEC.2012 13:59:37

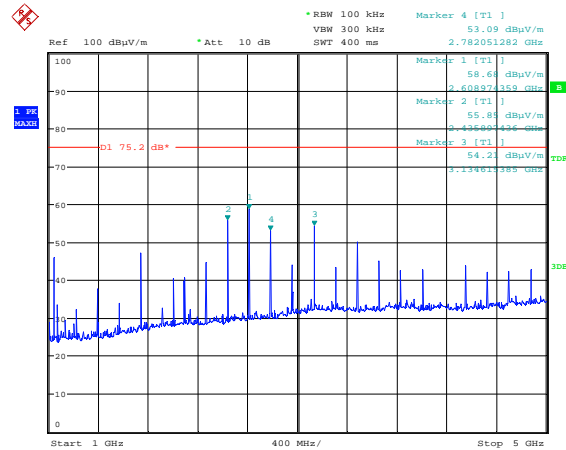
Radiated emissions 173.9875 MHz

173.9875MHz - 30MHz – 1GHz



← -20dBm
Limit line

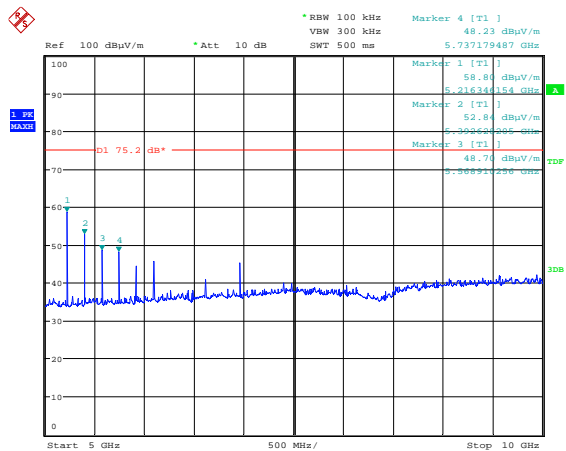
173.9875MHz 1GHz – 5GHz



← -20dBm
Limit line

Date: 19.DEC.2012 14:10:14

173.9875MHz 5GHz – 10GHz



← -20dBm
Limit line

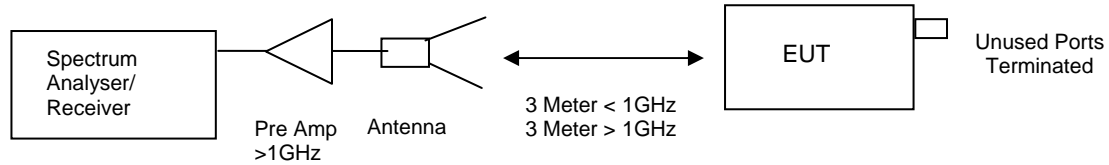
← -20dBm
Limit line

Date: 19.DEC.2012 14:09:13

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

Ambient temperature = 24°C
Relative humidity = 34%
Supply voltage = +13.8Vdc

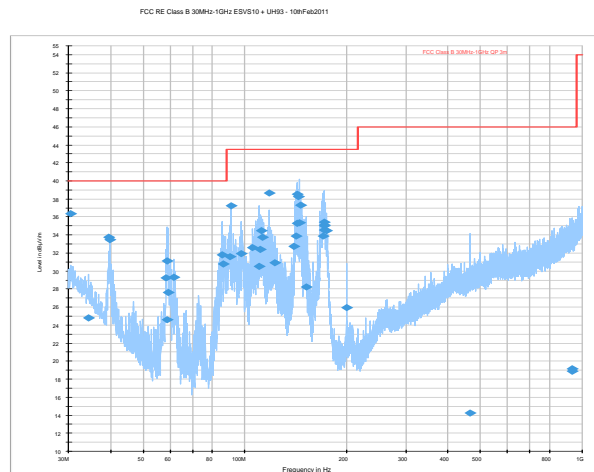
Test Signal = F3E
Conditions = ATS
Supply Frequency = N/A



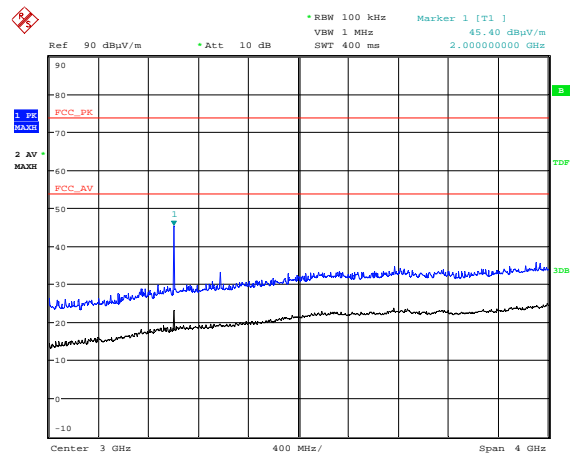
The test was set up as per the diagram, the receiver was tested while in receive mode while attached to a dummy load.

| Freq. (MHz) | Meas. Rx. (dBμV) | Cable Loss (dB) | Ant Factor | Pre Amp (dB) | Field Strength (μV/m) | Extrap (dB) | Field Strength (μV/m) | Limit (μV/m) |
|-----------------------|------------------|-----------------|------------|--------------|-----------------------|-------------|-----------------------|--------------|
| 30.55 | 18.1 | 0.5 | 17.6 | - | 36.2 | - | 64.64 | 100 |
| 34.40 | 8.6 | 0.6 | 15.6 | - | 24.7 | - | 17.26 | 100 |
| 39.45 | 20.3 | 0.6 | 12.8 | - | 33.6 | - | 48.08 | 100 |
| 39.85 | 20.3 | 0.6 | 12.6 | - | 33.5 | - | 47.15 | 100 |
| 58.40 | 22.9 | 0.8 | 5.4 | - | 29.1 | - | 28.44 | 100 |
| 58.75 | 24.8 | 0.8 | 5.4 | - | 30.9 | - | 35.16 | 100 |
| 59.00 | 18.4 | 0.8 | 5.3 | - | 24.5 | - | 16.73 | 100 |
| 59.25 | 21.4 | 0.8 | 5.3 | - | 27.5 | - | 23.58 | 100 |
| 61.45 | 23.2 | 0.8 | 5.2 | - | 29.2 | - | 28.77 | 100 |
| 85.55 | 23.1 | 1.1 | 7.8 | - | 32.0 | - | 39.72 | 100 |
| 86.05 | 22.0 | 1.1 | 7.9 | - | 31.0 | - | 35.44 | 100 |
| 90.35 | 21.9 | 1.2 | 8.8 | - | 31.8 | - | 38.99 | 150 |
| 90.95 | 27.3 | 1.2 | 8.9 | - | 37.4 | - | 73.79 | 150 |
| 97.85 | 20.8 | 1.2 | 10.0 | - | 31.9 | - | 39.54 | 150 |
| 105.70 | 20.5 | 1.2 | 11.1 | - | 32.8 | - | 43.55 | 150 |
| 110.60 | 18.1 | 1.2 | 11.4 | - | 30.7 | - | 34.20 | 150 |
| 111.00 | 19.9 | 1.2 | 11.4 | - | 32.5 | - | 42.17 | 150 |
| 111.80 | 21.9 | 1.3 | 11.4 | - | 34.6 | - | 53.39 | 150 |
| 112.55 | 21.1 | 1.3 | 11.5 | - | 33.9 | - | 49.32 | 150 |
| 118.00 | 25.9 | 1.4 | 11.4 | - | 38.7 | - | 85.90 | 150 |
| 122.60 | 18.2 | 1.3 | 11.6 | - | 31.1 | - | 36.02 | 150 |
| 139.65 | 20.6 | 1.4 | 11.0 | - | 33.0 | - | 44.72 | 150 |
| 141.95 | 22.0 | 1.5 | 10.7 | - | 34.2 | - | 51.05 | 150 |
| 142.75 | 26.6 | 1.5 | 10.7 | - | 38.8 | - | 86.70 | 150 |
| 143.50 | 23.5 | 1.5 | 10.7 | - | 35.6 | - | 60.26 | 150 |
| 144.30 | 26.6 | 1.4 | 10.6 | - | 38.6 | - | 85.21 | 150 |
| 145.05 | 23.8 | 1.4 | 10.5 | - | 35.7 | - | 61.16 | 150 |
| 145.85 | 25.7 | 1.4 | 10.4 | - | 37.5 | - | 75.34 | 150 |
| 152.00 | 17.0 | 1.5 | 9.9 | - | 28.4 | - | 26.27 | 150 |
| 170.20 | 23.4 | 1.5 | 9.0 | - | 33.9 | - | 49.26 | 150 |
| 171.40 | 24.2 | 1.5 | 8.9 | - | 34.6 | - | 53.52 | 150 |
| 171.85 | 24.6 | 1.5 | 8.9 | - | 35.0 | - | 56.10 | 150 |
| 172.05 | 24.7 | 1.5 | 8.9 | - | 35.1 | - | 56.75 | 150 |
| 172.20 | 25.0 | 1.5 | 8.9 | - | 35.4 | - | 58.61 | 150 |
| 174.55 | 24.2 | 1.5 | 8.7 | - | 34.4 | - | 52.42 | 150 |
| 200.00 | 15.6 | 1.7 | 8.7 | - | 26.0 | - | 19.91 | 150 |
| 2000.00 _{pk} | 55.23 | 2.7 | 27.5 | 35.2 | 50.23 | - | 324.71 | 500 |

Rx 30MHz-1GHz

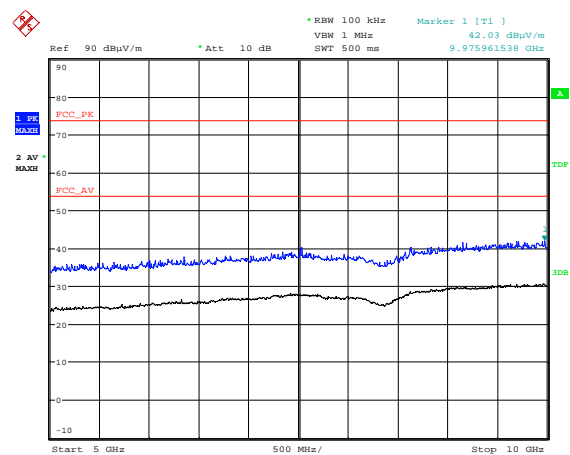


Rx 1GHz- 5GHz



Date: 19.DEC.2012 14:24:03

Rx 5GHz- 10GHz

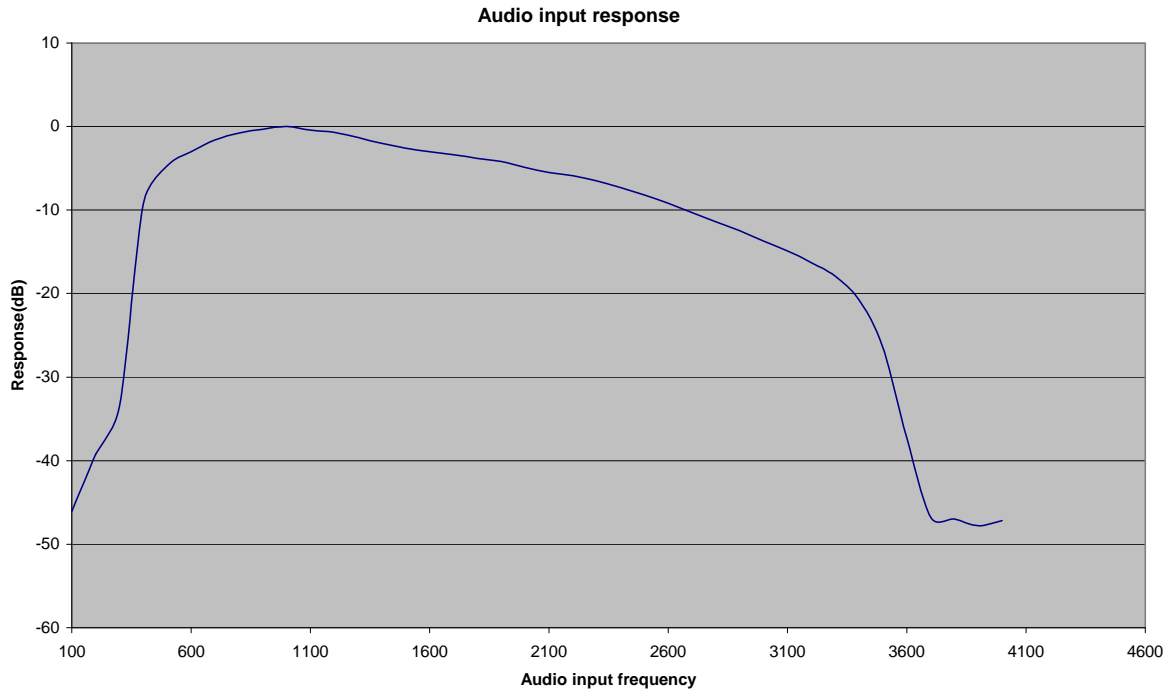


Date: 19.DEC.2012 14:31:14

Modulation Characteristics: 2.1047 (a)

Ambient temperature = 24°C
Relative humidity = 34%
Supply voltage = +13.8Vdc

Radio Laboratory
Test Signal = F3E



Note: The SB2025NT100W 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 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.

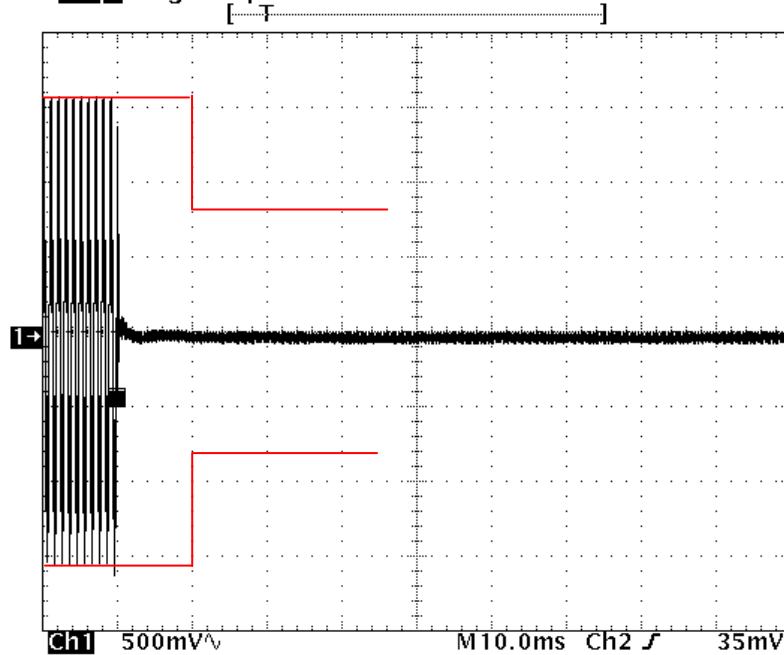
Transient frequency behaviour – Part 15:214

Ambient temperature = 24°C
Relative humidity = 34%
Conditions = ATS
Supply voltage = +13.8Vdc
Supply Frequency = N/A

Test Signal = F3E

146.0125MHz Tx on 12.5kHz This frequency is not used in the USA and the data is not part of the FCC submission.

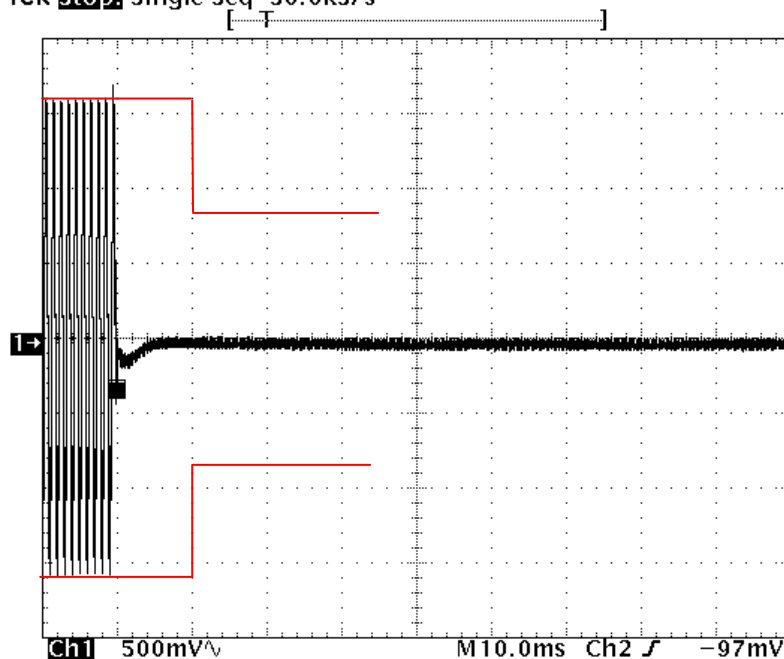
Tek **Stop** Single Seq 50.0kS/s



12 Dec 2012
16:00:48

161.0250MHz Tx on 12.5kHz

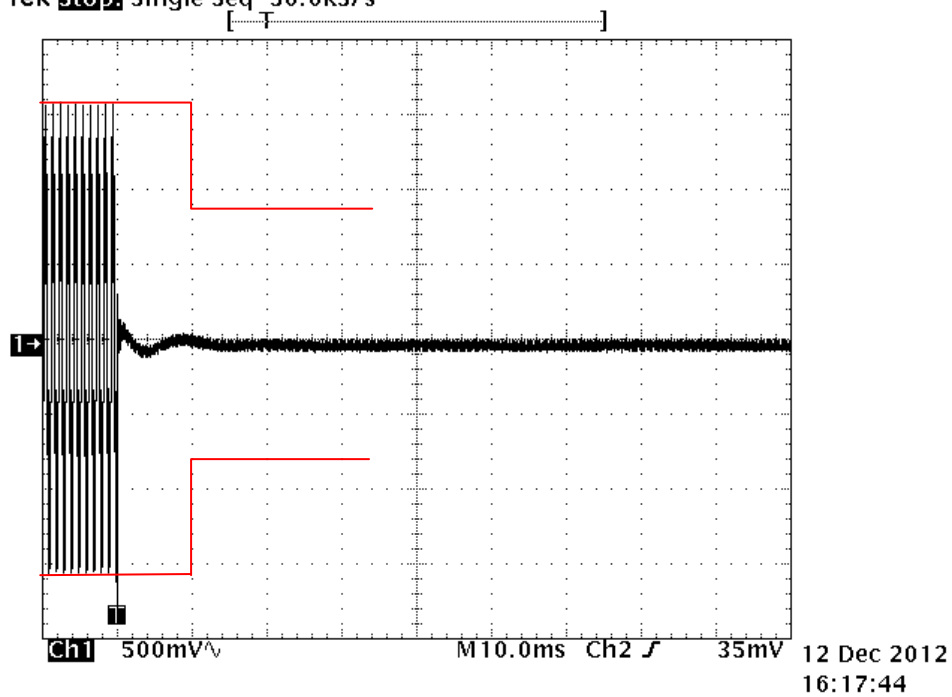
Tek **Stop** Single Seq 50.0kS/s



12 Dec 2012
16:05:33

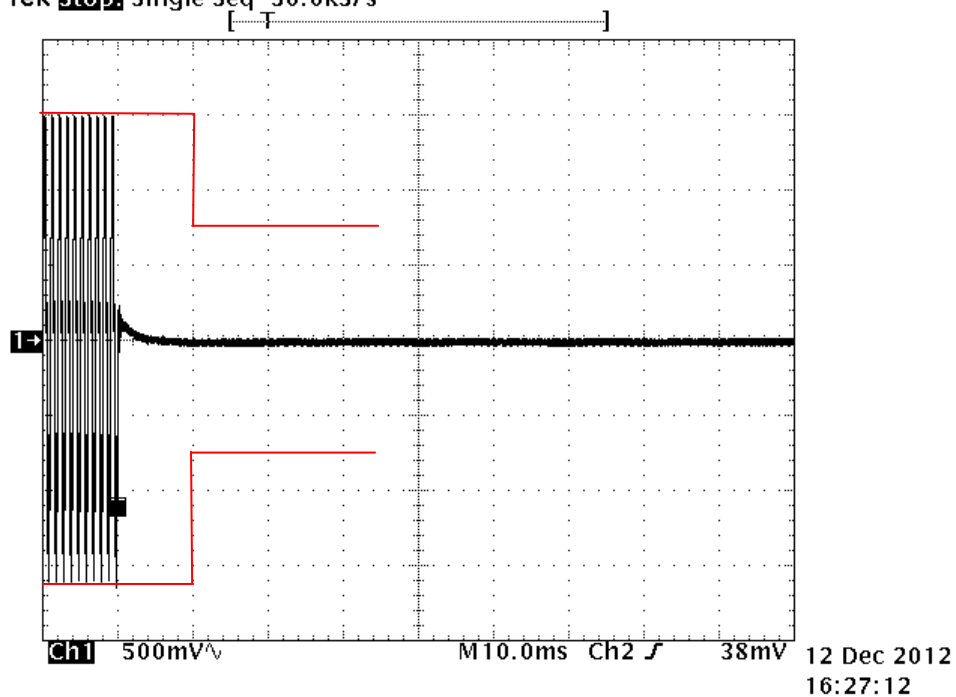
173.9875MHz Tx on 12.5kHz

Tek **Stop** Single Seq 50.0kS/s



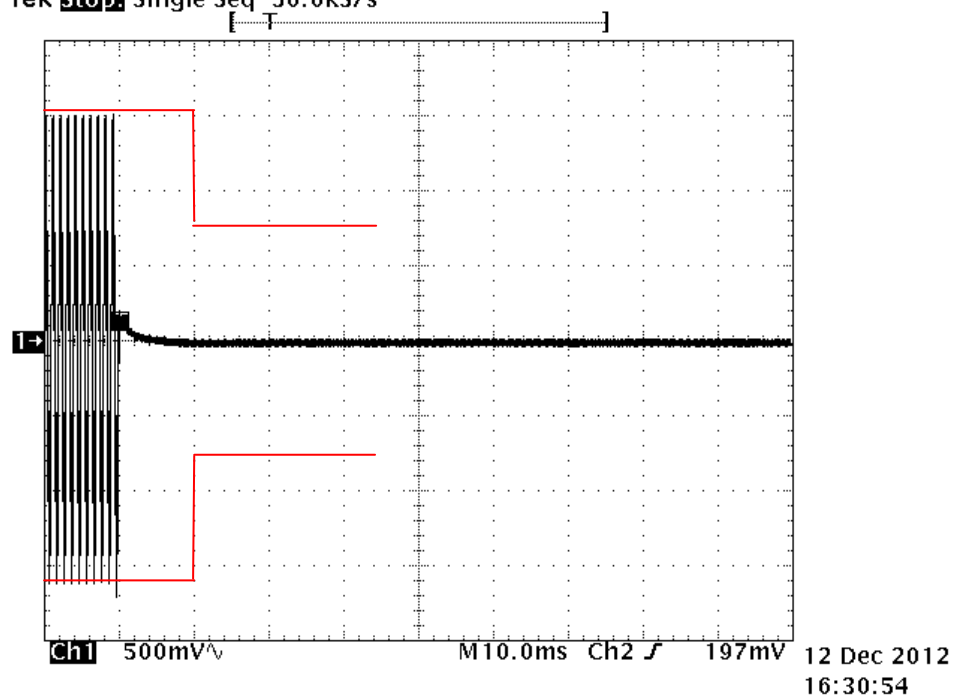
146.0125MHz Tx on 25kHz - This frequency is not used in the USA and the data is not part of the FCC submission.

Tek **Stop** Single Seq 50.0kS/s



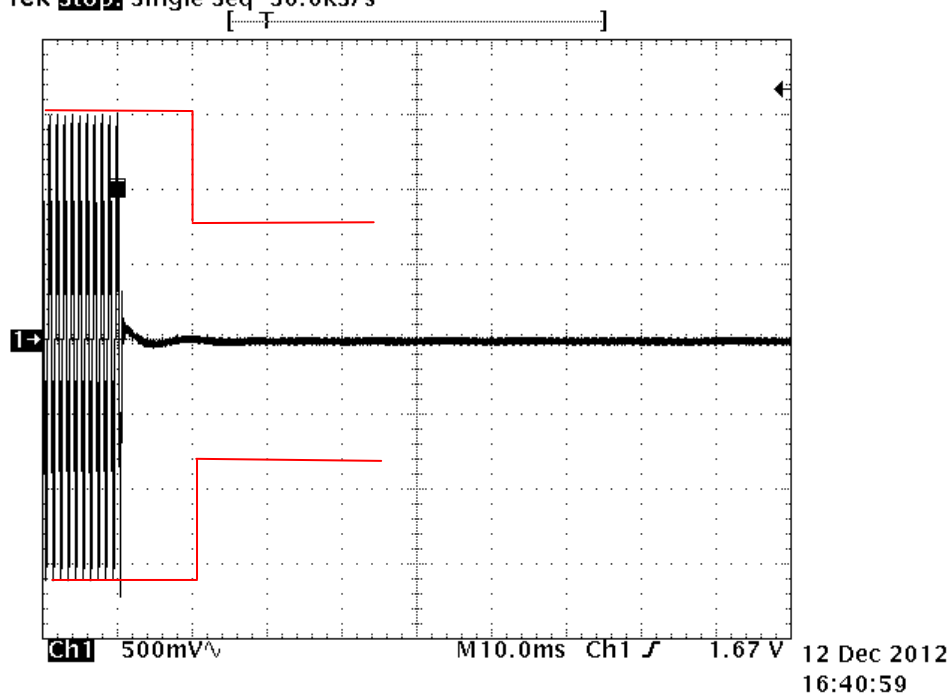
161.0250MHz Tx on 25kHz

Tek **Stop** Single Seq 50.0kS/s

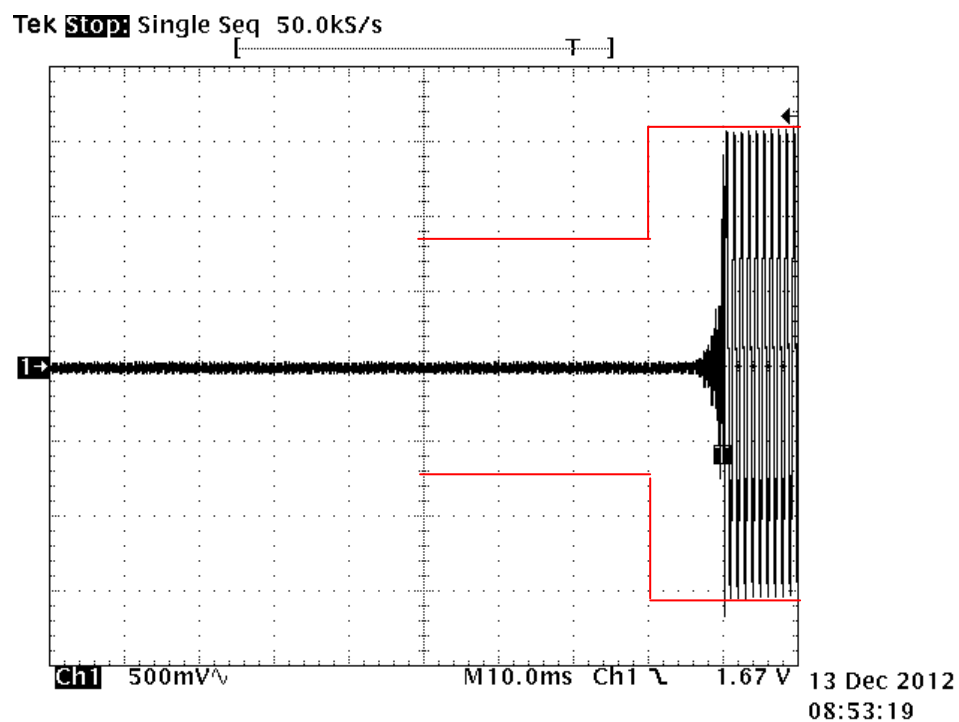


173.9875MHz Tx on 25kHz

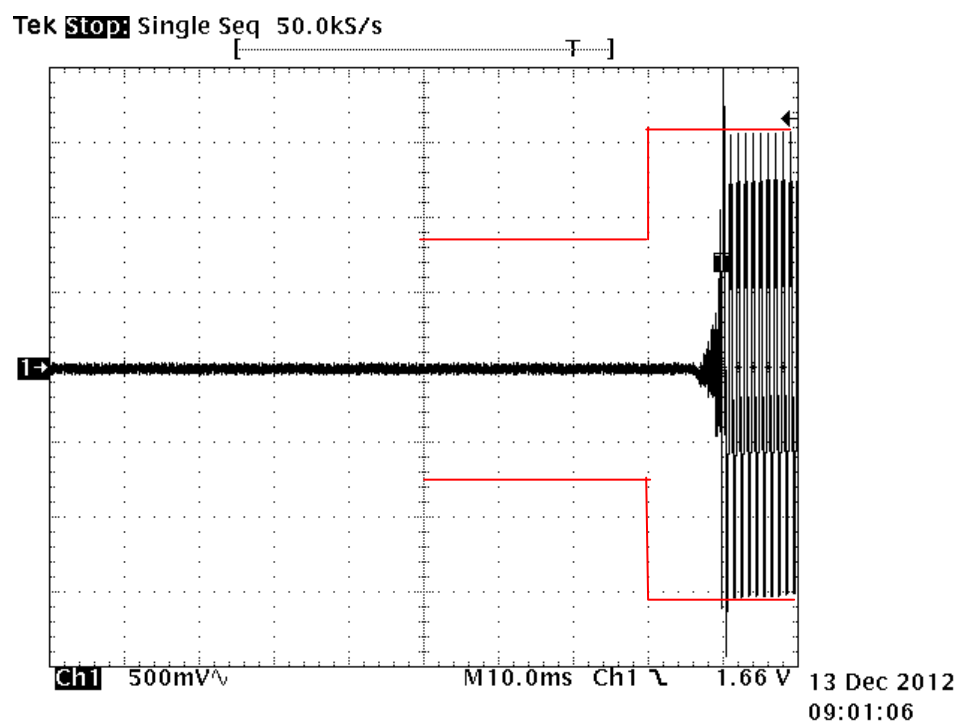
Tek **Stop** Single Seq 50.0kS/s



146.0125MHz Tx off 12.5kHz This frequency is not used in the USA and the data is not part of the FCC submission.

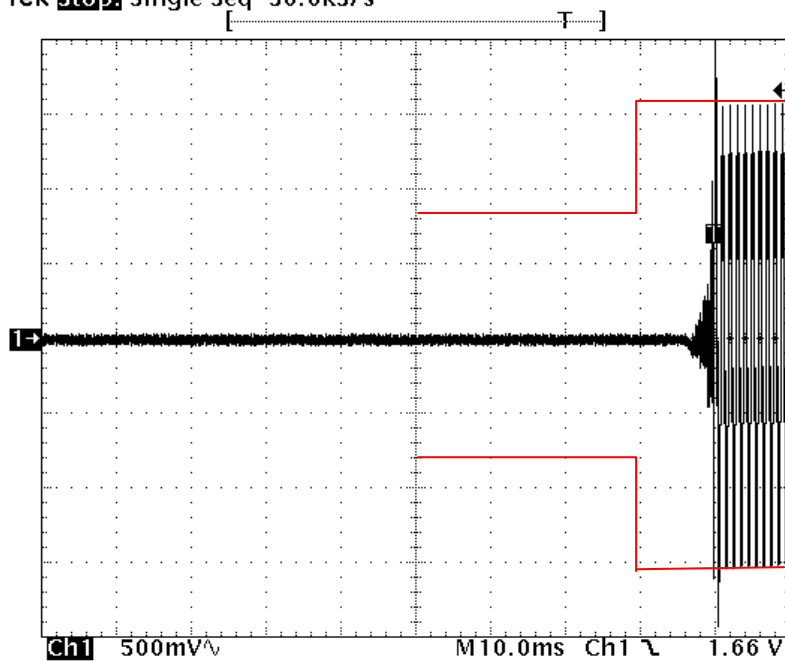


161.0250MHz Tx off 12.5kHz



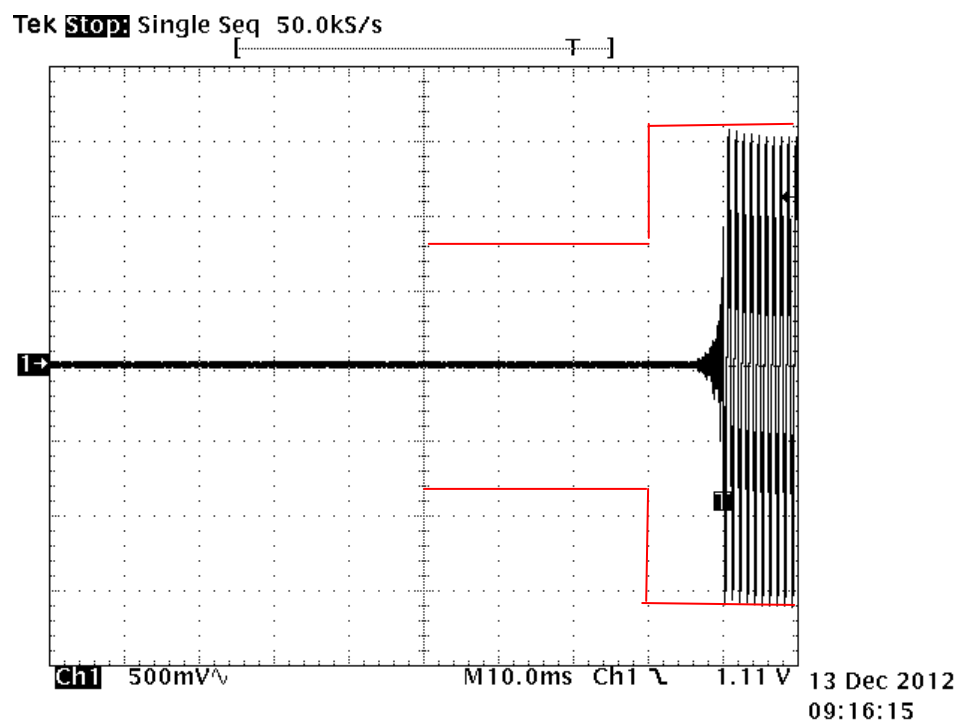
173.9875MHz Tx off 12.5kHz

Tek **Stop** Single Seq 50.0kS/s

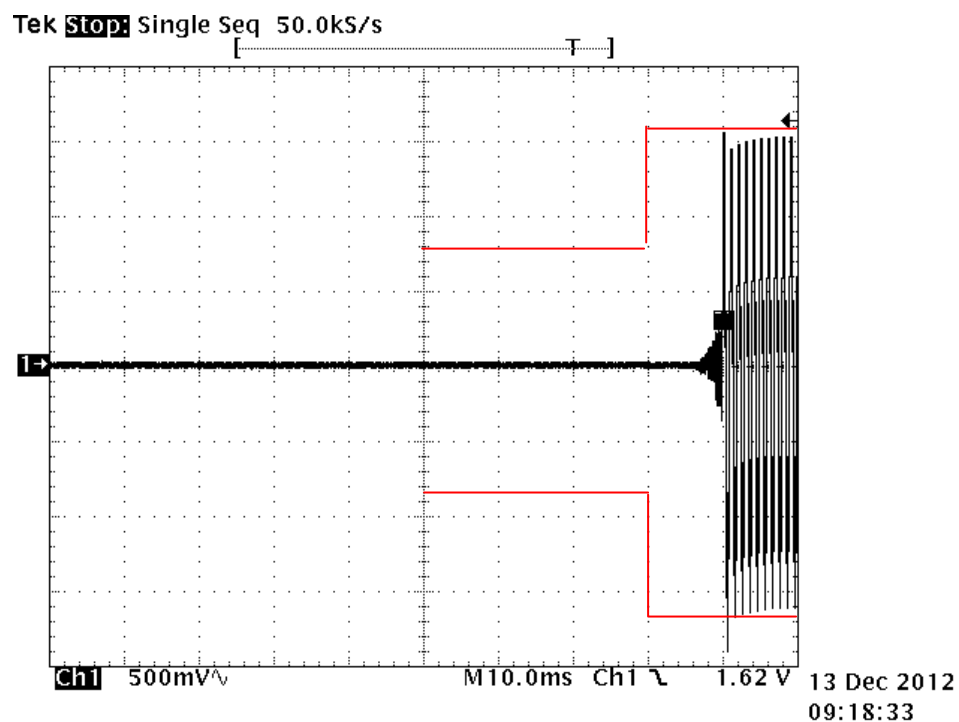


13 Dec 2012
09:01:06

146.0125MHz Tx off 25kHz -This frequency is not used in the USA and the data is not part of the FCC submission.

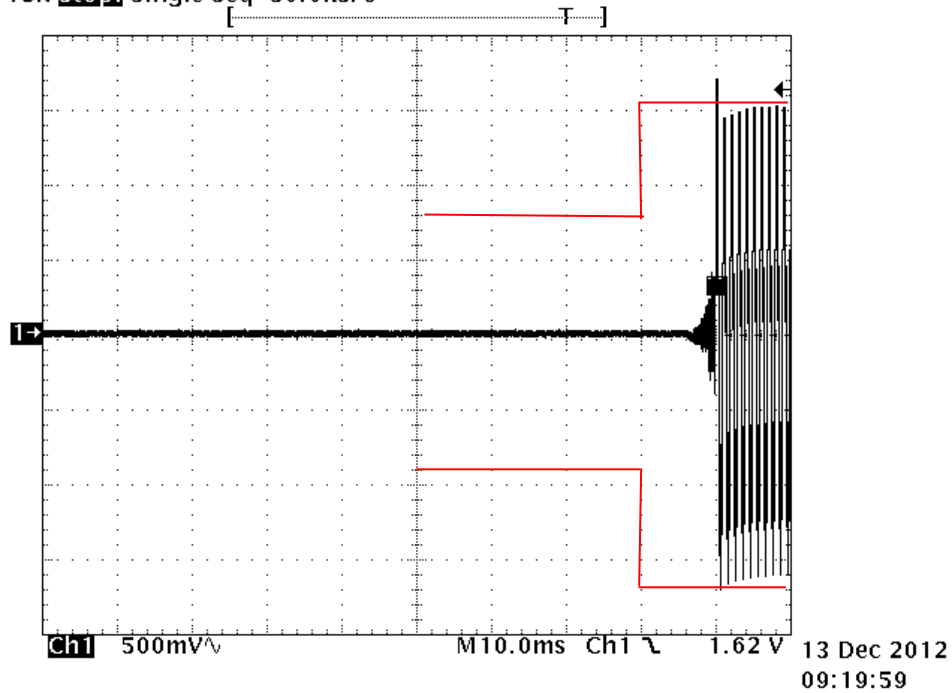


161.0250MHz Tx off 25kHz



173.9875MHz Tx off 25kHz

Tek **Stop** Single Seq 50.0kS/s



ANNEX A
PHOTOGRAPHS

Photograph 1&2: Test Setup



Photograph 3&4: 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 | 09/02/2012 |
| TRL139 | 3115 | Horn Antenna | EMCO | 14/09/2011 |
| TRL572 | 8449B | Pre amp | Agilent | 12/12/2012 |
| 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 | 22/03/2012 |
| TRL11 | - | Environmental Chamber | Sharetree | USE TRL426 |
| TRLUH41 | M3004 | Multimeter | AVOmeter | 04/03/2012 |
| TRLUH194 | AP60/50 | Power Supply | Farnell | USE TRLUH41 |
| TRL05 | CMTA | Radio Analyser | Rhode & Schwarz | 19/03/2012 |
| TRLUH275 | | Filter | | Cal In Use |
| TRLUH265 | | Filter | | Cal In Use |

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%**