

# Test report

**322811-2TRFWL**

Date of issue: March 22, 2018

Applicant:

**Barrett Communications Pty Ltd**

Product:

**Barrett 4050 HF Transceiver**

Model:

**4050**

FCC ID:

**OW4-4050HF**

Specifications:

**FCC 47 CFR Part 87**

Aviation Services

#### Test location

|              |                                    |
|--------------|------------------------------------|
| Company name | Nemko Canada Inc.                  |
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| Website      | www.nemko.com                      |
| Site number  | FCC: CA2040; IC: 2040A-4 (3 m SAC) |

|             |                                                                                     |
|-------------|-------------------------------------------------------------------------------------|
| Tested by   | Kevin Rose, Wireless/EMC Specialist                                                 |
| Reviewed by | Andrey Adelberg, Senior Wireless/EMC Specialist                                     |
| Date        | March 22, 2018                                                                      |
| Signature   |  |

#### Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

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## Section 1. Report summary

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### 1.1 Applicant and manufacturer

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|                 |                                |
|-----------------|--------------------------------|
| Company name    | Barrett Communications Pty Ltd |
| Address         | 47 Discovery Drive, Bibra Lake |
| City            | Perth                          |
| Province/State  | Western Australia              |
| Postal/Zip code | 6163                           |
| Country         | Australia                      |

### 1.2 Test specifications

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|                    |                   |
|--------------------|-------------------|
| FCC 47 CFR Part 87 | Aviation Services |
|--------------------|-------------------|

### 1.3 Test methods

---

|                  |                                                                                                   |
|------------------|---------------------------------------------------------------------------------------------------|
| ANSI C63.26:2015 | American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services |
|------------------|---------------------------------------------------------------------------------------------------|

### 1.4 Statement of compliance

---

In the configuration tested, the EUT was found compliant.

Testing was completed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See "Summary of test results" for full details.

### 1.5 Exclusions

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None

### 1.6 Test report revision history

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| Revision # | Details of changes made to test report |
|------------|----------------------------------------|
| TRF        | Original report issued                 |



Section 2. Summary of test results

2.1 FCC Part 87 test results

| Part      | Test description                          | Verdict  |
|-----------|-------------------------------------------|----------|
| §87.131   | Power and emissions                       | Pass     |
| 2.1047    | Modulation characteristics                | Reported |
| 87.139(c) | Emission limits, emission mask, bandwidth | Pass     |
| 87.141(d) | Modulation requirements                   | Pass     |
| 87.139(c) | Emission limits, conducted method         | Pass     |
| 87.139(c) | Emission limits, radiated method          | Pass     |
| 87.133(c) | Frequency stability                       | Pass     |

Notes: None

## Section 3. Equipment under test (EUT) details

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### 3.1 Sample information

---

|                        |                  |
|------------------------|------------------|
| Receipt date           | February 8, 2017 |
| Nemko sample ID number | 1                |

### 3.2 EUT information

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|               |                             |
|---------------|-----------------------------|
| Product name  | Barrett 4050 HF Transceiver |
| Model         | 4050 HF                     |
| Serial number | 405010056                   |

### 3.3 Technical information

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|                           |                                                              |
|---------------------------|--------------------------------------------------------------|
| Operating band            | 1.6–30 MHz                                                   |
| Test frequencies          | 2.182, 11.363, and 21.964 MHz                                |
| Modulation type           | J3E and H3E                                                  |
| Occupied bandwidth (99 %) | 2.7 kHz (J3E), 3 kHz (H3E)                                   |
| Power requirements        | 13.8 Vdc for 125 Watt system and 24 Vdc for 150 Watt system. |
| Emission designator       | 2K70J3E, 3K00H3E                                             |
| Antenna information       | Various types with standard PL-259 connector                 |

### 3.4 Product description and theory of operation

---

The Barrett 4050 Transceiver is a SDR based, 1000 channel HF SSB Transceiver with a frequency range of 1.6 to 30 MHz (250 kHz to 30 MHz in receive). The Barrett 4050 is designed using the latest technology including a high-resolution touch screen, IP connectivity, multi-language support, enhanced DSP noise reduction, secure digital voice, integrated GPS interface, ALE and advanced calling features.

### 3.5 EUT exercise details

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The EUT was programmed for the low, mid, and high channels J3E used 400 and 1800 Hz input tone and H3E used 1500 Hz

3.6 EUT setup diagram

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Figure 3.6-1: Setup diagram

3.7 EUT sub assemblies

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Table 3.7-1: EUT sub assemblies

| Description           | Brand name | Model/Part number | Serial number |
|-----------------------|------------|-------------------|---------------|
| Power supply 13.8 VDC | Barrett    | 2022              | 202207554     |
| Power supply 24 VDC   | Barrett    | 4022              | 402410203     |

**Section 4.**    Engineering considerations

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**4.1**    Modifications incorporated in the EUT

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There were no modifications performed to the EUT during this assessment.

**4.2**    Technical judgment

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None

**4.3**    Deviations from laboratory tests procedures

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No deviations were made from laboratory procedures.

## Section 5. Test conditions

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### 5.1 Atmospheric conditions

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|                   |               |
|-------------------|---------------|
| Temperature       | 15–30 °C      |
| Relative humidity | 20–75 %       |
| Air pressure      | 860–1060 mbar |

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

### 5.2 Power supply range

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The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages  $\pm 5\%$ , for which the equipment was designed.



# Section 6. Measurement uncertainty

## 6.1 Uncertainty of measurement

UKAS Lab 34 and TIA-603-B have been used as guidance for measurement uncertainty reasonable estimations with regards to previous experience and validation of data. Nemko Canada, Inc. follows these test methods in order to satisfy ISO/IEC 17025 requirements for estimation of uncertainty of measurement for wireless products.

Measurement uncertainty budgets for the tests are detailed below. Measurement uncertainty calculations assume a coverage factor of  $K = 2$  with 95% certainty.

| Test name                         | Measurement uncertainty, dB |
|-----------------------------------|-----------------------------|
| All antenna port measurements     | 0.55                        |
| Conducted spurious emissions      | 1.13                        |
| Radiated spurious emissions       | 3.78                        |
| AC power line conducted emissions | 3.55                        |

## Section 7. Test equipment

### 7.1 Test equipment list

*Table 7.1-1: Equipment list*

| Equipment                         | Manufacturer    | Model no. | Asset no. | Cal cycle | Next cal.   |
|-----------------------------------|-----------------|-----------|-----------|-----------|-------------|
| 3 m EMI test chamber              | TDK             | SAC-3     | FA002047  | 1 year    | Dec. 1/17   |
| Flush mount turntable             | Sunol           | FM2022    | FA002082  | —         | NCR         |
| Controller                        | Sunol           | SC104V    | FA002060  | —         | NCR         |
| Antenna mast                      | Sunol           | TLT2      | FA002061  | —         | NCR         |
| Active loop antenna (0.01–30 MHz) | Com-Power       | AL-130    | FA002674  | 1 year    | June 21/18  |
| Bilog antenna (20–3000 MHz)       | Sunol           | JB3       | FA002108  | 1 year    | April 28/17 |
| Spectrum analyzer                 | Rohde & Schwarz | FSP       | FA001920  | 1 year    | Aug. 20/17  |
| Spectrum analyzer                 | Rohde & Schwarz | FSU       | FA001877  | 1 year    | July. 15/17 |
| 50 Ω coax cable                   | Huber + Suhner  | None      | FA002074  | 1 year    | April 26/17 |
| 50 Ω coax cable                   | Huber + Suhner  | None      | FA002830  | 1 year    | July 29/17  |
| Frequency counter                 | HP              | 5352B     | FA001915  | 2 year    | Apr.05/18   |

Note: NCR - no calibration required, VOU - verify on use

## Section 8. Testing data

### 8.1 FCC 87.131 Power and emissions

#### 8.1.1 Definitions and limits

| Class of station                            | Frequency band/frequency | Authorized emission(s) <sup>2</sup> | Maximum power <sup>1</sup> |
|---------------------------------------------|--------------------------|-------------------------------------|----------------------------|
| Aeronautical enroute and aeronautical fixed | HF                       | R3E, H3E, J3E, J7B, H2B, J2D        | 6 kW                       |

<sup>1</sup>The power is measured at the transmitter output terminals and the type of power is determined according to the emission designator as follows:

- (i) Mean power (pY) for amplitude modulated emissions and transmitting both sidebands using unmodulated full carrier.
- (ii) Peak envelope power (pX) for all emission designators other than those referred to in paragraph (i) of this note.

<sup>2</sup>Excludes automatic link establishment.

#### 8.1.2 Test summary

|               |                   |                   |           |
|---------------|-------------------|-------------------|-----------|
| Test date     | February 21, 2017 | Temperature       | 22 °C     |
| Test engineer | Kevin Rose        | Air pressure      | 1003 mbar |
| Verdict       | Pass              | Relative humidity | 32 %      |

#### 8.1.3 Observations, settings and special notes

J3E – two tones at frequencies of 400 Hz and 1800 Hz, H3E one tone at a frequency of 1500 Hz

Test receiver settings:

|                      |          |
|----------------------|----------|
| Detector mode        | Peak     |
| Resolution bandwidth | >OBW     |
| Video bandwidth      | >RBW     |
| Trace mode           | Max Hold |
| Measurement time     | Auto     |

#### 8.1.4 Test data

*Table 8.1-1: results 125 W system operation*

| Modulation | Frequency, MHz | RF output power, dBm | Limit, dBm | Margin, dB |
|------------|----------------|----------------------|------------|------------|
| J3E        | 2.182          | 49.79                | 67.78      | 17.99      |
| J3E        | 11.363         | 50.09                | 67.78      | 17.69      |
| J3E        | 21.964         | 50.02                | 67.78      | 17.76      |

*Table 8.1-2: results 125 W system operation*

| Modulation | Frequency, MHz | RF output power, dBm | Limit, dBm | Margin, dB |
|------------|----------------|----------------------|------------|------------|
| H3E        | 2.182          | 49.56                | 67.78      | 18.22      |
| H3E        | 11.363         | 49.85                | 67.78      | 17.93      |
| H3E        | 21.964         | 49.86                | 67.78      | 17.92      |

*Table 8.1-3: results 150 W system operation*

| Modulation | Frequency, MHz | RF output power, dBm | Limit, dBm | Margin, dB |
|------------|----------------|----------------------|------------|------------|
| J3E        | 2.182          | 51.23                | 67.78      | 16.55      |
| J3E        | 11.363         | 51.59                | 67.78      | 16.19      |
| J3E        | 21.964         | 51.44                | 67.78      | 16.34      |

*Table 8.1-4: results 150 W system operation*

| Modulation | Frequency, MHz | RF output power, dBm | Limit, dBm | Margin, dB |
|------------|----------------|----------------------|------------|------------|
| H3E        | 2.182          | 51.25                | 67.78      | 16.53      |
| H3E        | 11.363         | 51.45                | 67.78      | 16.33      |
| H3E        | 21.964         | 51.31                | 67.78      | 16.47      |

## 8.2 FCC 2.1047 Modulation characteristics

### 8.2.1 Definitions and limits

(a) Voice modulated communication equipment. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.

(c) Single sideband and independent sideband radiotelephone transmitters which employ a device or circuit to limit peak envelope power. A curve showing the peak envelope power output versus the modulation input voltage shall be supplied. The modulating signals shall be the same in frequency as specified in paragraph (c) of §2.1049 for the occupied bandwidth tests.

### 8.2.2 Test summary

|               |                   |                   |           |
|---------------|-------------------|-------------------|-----------|
| Test date     | February 21, 2017 | Temperature       | 22 °C     |
| Test engineer | Kevin Rose        | Air pressure      | 1003 mbar |
| Verdict       | Pass              | Relative humidity | 32 %      |

### 8.2.3 Observations, settings and special notes

settings and special notes

|                      |      |
|----------------------|------|
| Detector mode        |      |
| Resolution bandwidth |      |
| Video bandwidth      |      |
| Trace mode           | Peak |

8.2.4 Test data

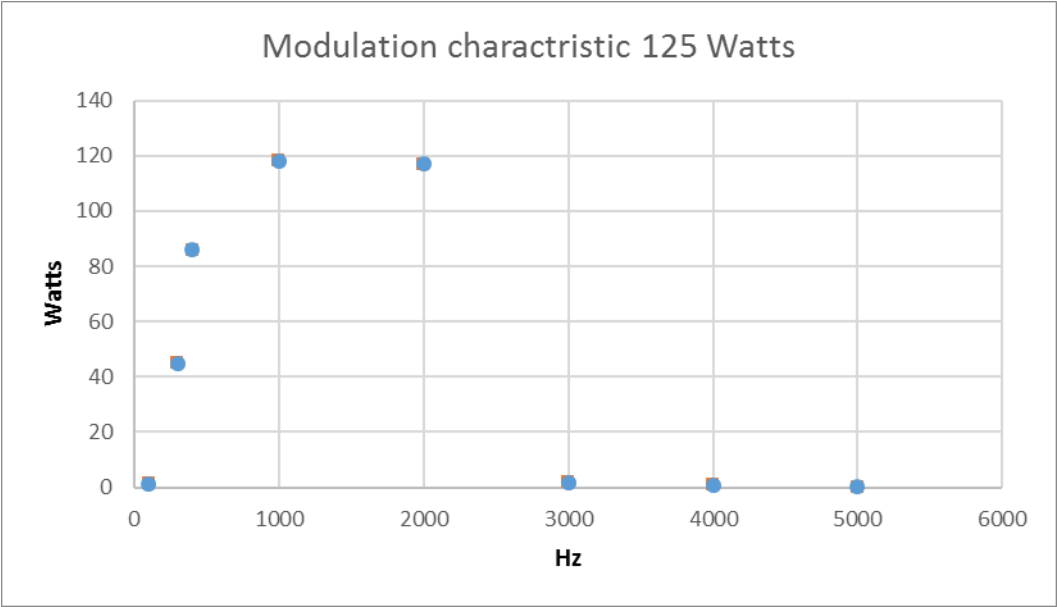


Figure 8.2-1: Modulation Characteristic 125 Watts

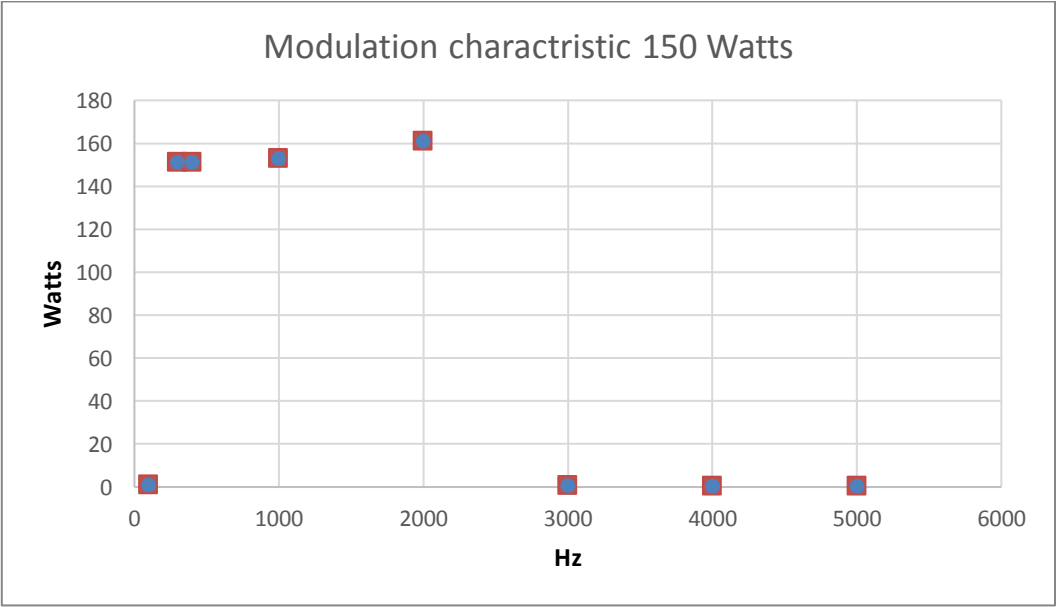


Figure 8.2-2: Modulation Characteristic 150 Watts

**Table 8.2-1: Modulation Characteristic results 150 Watts**

| Hz   | Watts |
|------|-------|
| 100  | 1.4   |
| 300  | 46    |
| 400  | 97    |
| 1000 | 145   |
| 2000 | 142   |
| 3000 | 1.9   |
| 4000 | 0.6   |
| 5000 | 0.2   |

**Table 8.2-2: Modulation Characteristic results 125 Watts**

| Hz   | Watts |
|------|-------|
| 100  | 1.3   |
| 300  | 45    |
| 400  | 86    |
| 1000 | 118   |
| 2000 | 117   |
| 3000 | 1.8   |
| 4000 | 0.9   |
| 5000 | 0.2   |

**Table 8.2-3: Modulation Limiting results 125 Watts**

| 2.182 MHz    |                     | 11.363 MHz   |                     | 21.964 MHz   |                     |
|--------------|---------------------|--------------|---------------------|--------------|---------------------|
| Input Audio, | Output power, Watts | Input Audio, | Output power, Watts | Input Audio, | Output power, Watts |
| 0.01         | 0.04                | 0.01         | 0.05                | 0.01         | 0.05                |
| 0.02         | 0.2                 | 0.02         | 0.3                 | 0.02         | 0.2                 |
| 0.04         | 2                   | 0.04         | 3.5                 | 0.04         | 1.5                 |
| 0.05         | 4                   | 0.05         | 7.6                 | 0.05         | 3                   |
| 0.07         | 14                  | 0.07         | 24                  | 0.07         | 9                   |
| 0.1          | 45                  | 0.1          | 67                  | 0.1          | 33                  |
| 0.15         | 112                 | 0.15         | 114                 | 0.15         | 106                 |
| 0.2          | 123                 | 0.2          | 119                 | 0.2          | 114                 |
| 0.3          | 123                 | 0.3          | 118                 | 0.3          | 118                 |

**Table 8.2-4: Modulation Limiting results 150 Watts**

| 2.182 MHz    |                     | 11.363 MHz   |                     | 21.964 MHz   |                     |
|--------------|---------------------|--------------|---------------------|--------------|---------------------|
| Input Audio, | Output power, Watts | Input Audio, | Output power, Watts | Input Audio, | Output power, Watts |
| 0.01         | 0.04                | 0.01         | 0.05                | 0.01         | 0.08                |
| 0.02         | 0.2                 | 0.02         | 0.3                 | 0.02         | 0.5                 |
| 0.04         | 1.6                 | 0.04         | 3                   | 0.04         | 4                   |
| 0.05         | 3.5                 | 0.05         | 7                   | 0.05         | 9                   |
| 0.07         | 11                  | 0.07         | 22                  | 0.07         | 29                  |
| 0.1          | 39                  | 0.1          | 69                  | 0.1          | 90                  |
| 0.15         | 134                 | 0.15         | 150                 | 0.15         | 139                 |
| 0.2          | 146                 | 0.2          | 164                 | 0.2          | 140                 |
| 0.3          | 142                 | 0.3          | 164                 | 0.3          | 142                 |

## 8.3 FCC 87.139(c) Emission limits, emission mask, bandwidth

### 8.3.1 Definitions and limits

(c) For aircraft station transmitters first installed after February 1, 1983, and for aeronautical station transmitters in use after February 1, 1983, and using H2B, H3E, J3E, J7B or J9W, the peak envelope power of any emissions must be attenuated below the peak envelope power of the transmitter (pX) as follows:

- 1) When the frequency is removed from the assigned frequency by more than 50 percent up to and including 150 percent of the authorized bandwidth of 3.0 kHz, the attenuation must be at least 30 dB.
- 2) When the frequency is removed from the assigned frequency by more than 150 percent up to and including 250 percent of the authorized bandwidth of 3.0 kHz, the attenuation must be at least 38 dB.
- 3) When the frequency is removed from the assigned frequency by more than 250 percent of the authorized bandwidth of 3.0 kHz for aircraft transmitters the attenuation must be at least 43 dB. For aeronautical station transmitters with transmitter power up to and including 50 watts the attenuation must be at least  $43 + 10 \log_{10} pX$  dB and with transmitter power more than 50 watts the attenuation must be at least 60 dB.

### 8.3.2 Test summary

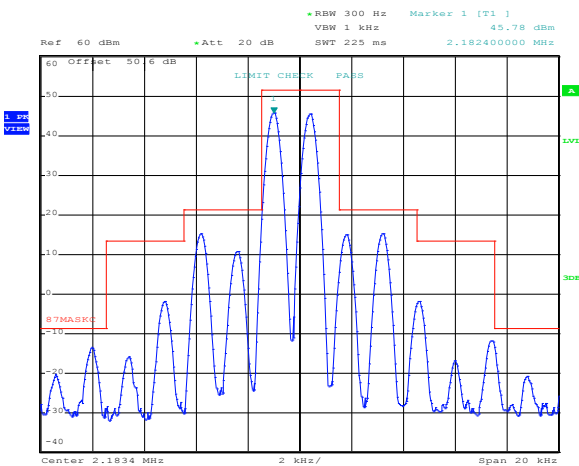
|               |                   |                   |           |
|---------------|-------------------|-------------------|-----------|
| Test date     | February 21, 2017 | Temperature       | 22 °C     |
| Test engineer | Kevin Rose        | Air pressure      | 1003 mbar |
| Verdict       | Pass              | Relative humidity | 32 %      |

### 8.3.3 Observations, settings and special notes

Spectrum analyzer settings:

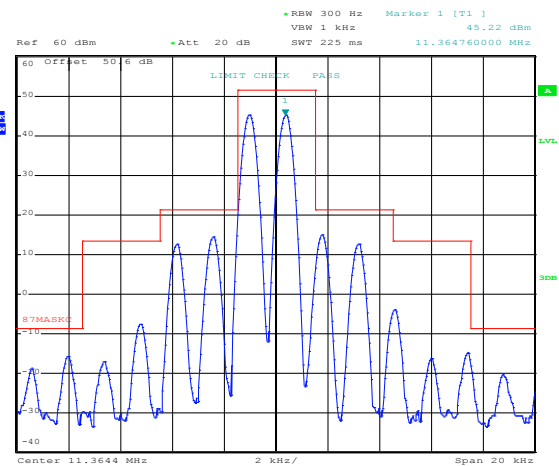
|                      |                 |
|----------------------|-----------------|
| Detector mode        | Peak            |
| Resolution bandwidth | 300 Hz or 30 Hz |
| Video bandwidth      | RBW × 3         |
| Trace mode           | Max Hold        |

### 8.3.4 Test data



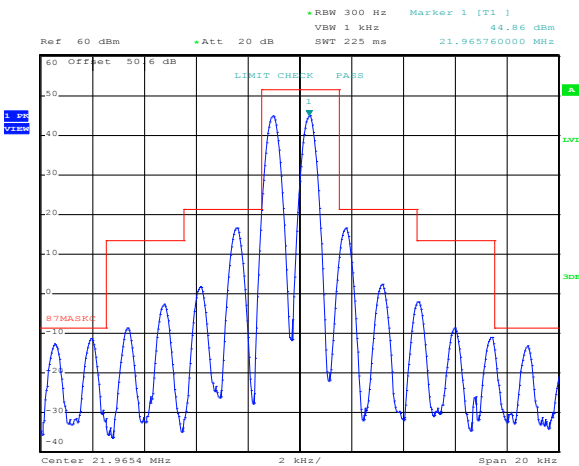
Date: 22.FEB.2017 15:51:43

Figure 8.3-1: Low channel Mask 125W 400 Hz and 1800 Hz



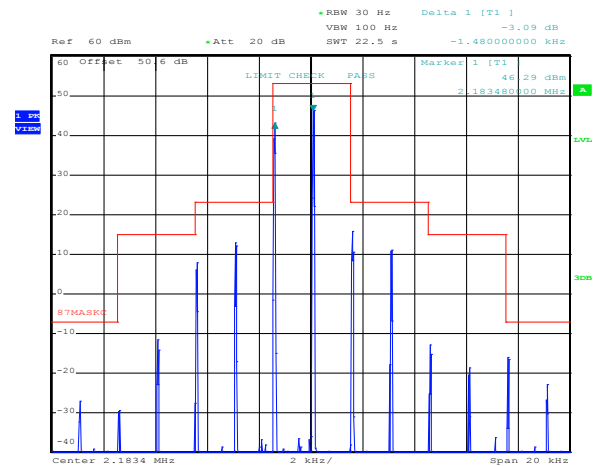
Date: 22.FEB.2017 15:53:54

Figure 8.3-2: Mid channel Mask 125W 400 Hz and 1800 Hz



Date: 22.FEB.2017 15:55:03

Figure 8.3-3: High channel Mask 125W 400 Hz and 1800 Hz

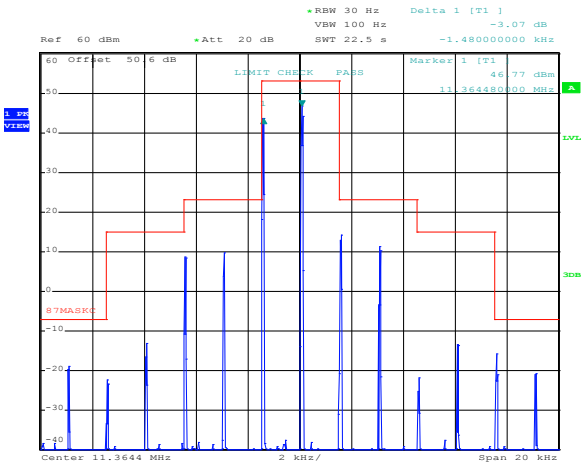


Date: 22.FEB.2017 20:06:47

Figure 8.3-4: Low channel Mask 125W 1500 Hz

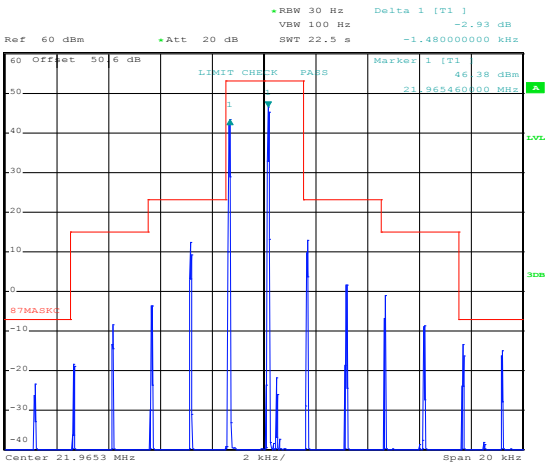
Section 8  
Test name  
Specification

Testing data  
FCC 87.139(c) Emission limits, emission mask, bandwidth  
FCC Part 87



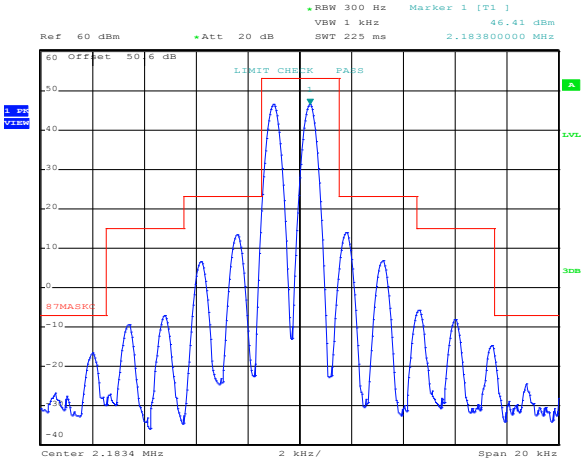
Date: 22.FEB.2017 20:04:41

Figure 8.3-5: : Mid channel Mask 125W 1500 Hz



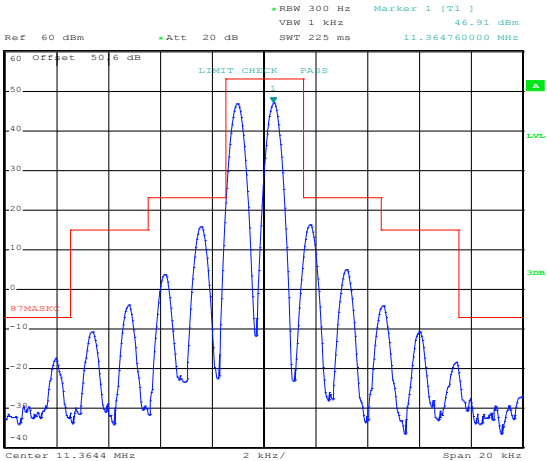
Date: 22.FEB.2017 20:02:58

Figure 8.3-6: High channel Mask 125W 1500 Hz



Date: 22.FEB.2017 16:53:32

Figure 8.3-7: Low channel Mask 150W 400 Hz and 1800 Hz

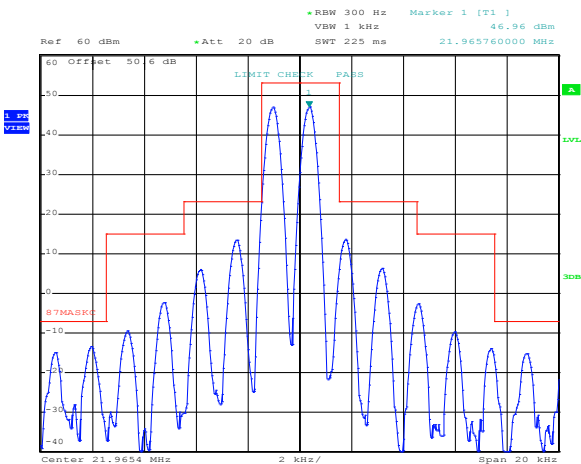


Date: 22.FEB.2017 16:53:00

Figure 8.3-8: Mid channel Mask 150W 400 Hz and 1800 Hz

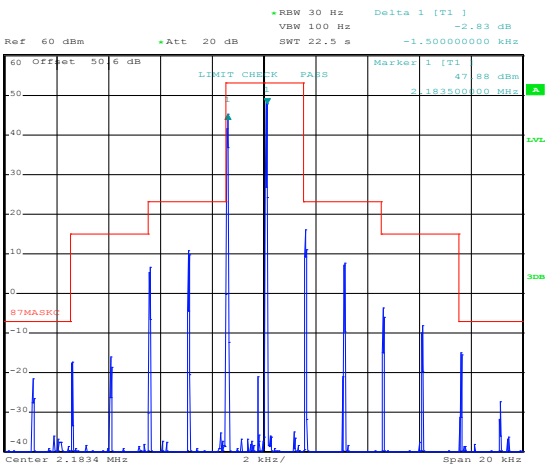
Section 8  
Test name  
Specification

Testing data  
FCC 87.139(c) Emission limits, emission mask, bandwidth  
FCC Part 87



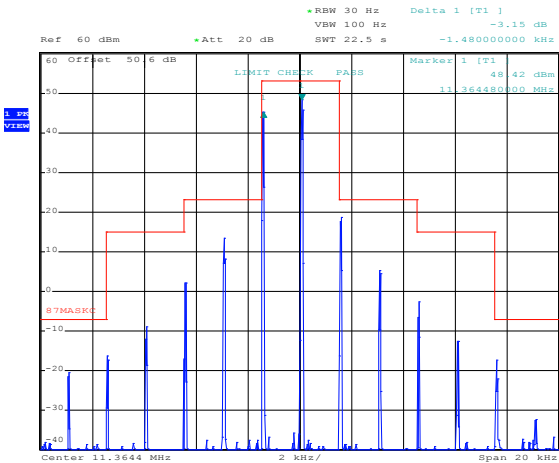
Date: 22.FEB.2017 16:52:17

Figure 8.3-9: High channel Mask 150W 400 Hz and 1800 Hz



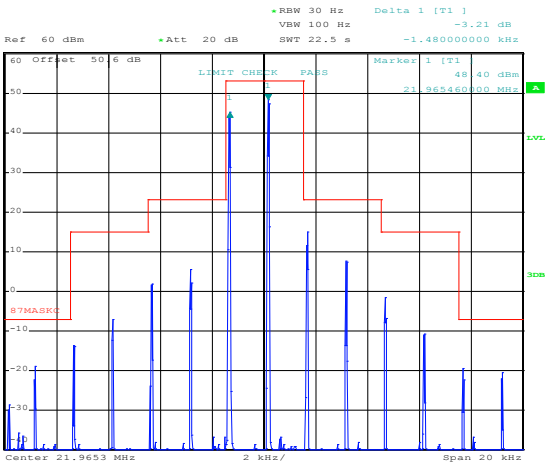
Date: 22.FEB.2017 19:05:00

Figure 8.3-10: Low channel Mask 150W 1500 Hz



Date: 22.FEB.2017 19:10:09

Figure 8.3-11: Mid channel Mask 150W 1500 Hz



Date: 22.FEB.2017 19:42:05

Figure 8.3-12: High channel Mask 150W 1500 Hz

## 8.4 FCC 87.141(d) Modulation requirements

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### 8.4.1 Definitions and limits

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(d) Single sideband transmitters must be able to operate in the following modes:

| <b>Carrier mode</b>      | <b>Level N(dB) of the carrier with respect to peak envelope power</b> |
|--------------------------|-----------------------------------------------------------------------|
| Full carrier (H3E)       | 0>N>-6                                                                |
| Suppressed carrier (J3E) | Aeronautical stations N<-40.                                          |

### 8.4.2 Test summary

---

|               |                   |                   |           |
|---------------|-------------------|-------------------|-----------|
| Test date     | February 21, 2017 | Temperature       | 22 °C     |
| Test engineer | Kevin Rose        | Air pressure      | 1003 mbar |
| Verdict       | Pass              | Relative humidity | 32 %      |

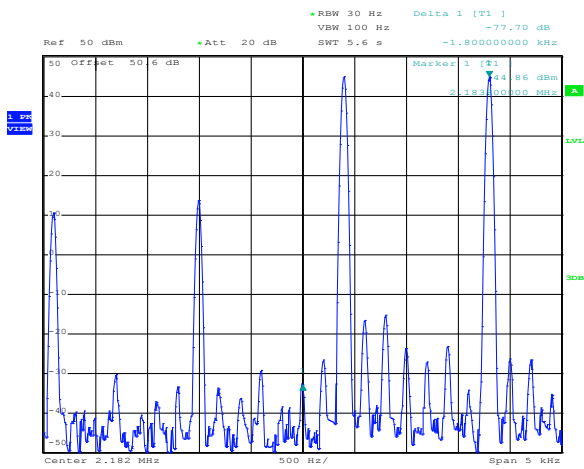
### 8.4.3 Observations, settings and special notes

---

Spectrum analyzer settings:

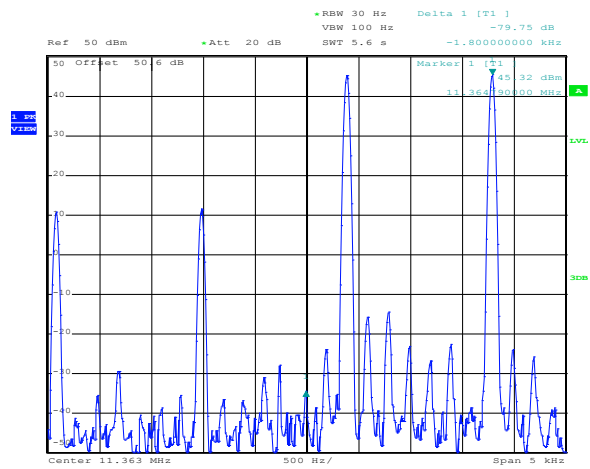
|                      |          |
|----------------------|----------|
| Detector mode        | Peak     |
| Resolution bandwidth | 30 Hz    |
| Video bandwidth      | RBW × 3  |
| Trace mode           | Max Hold |

## 8.4.4 Test data



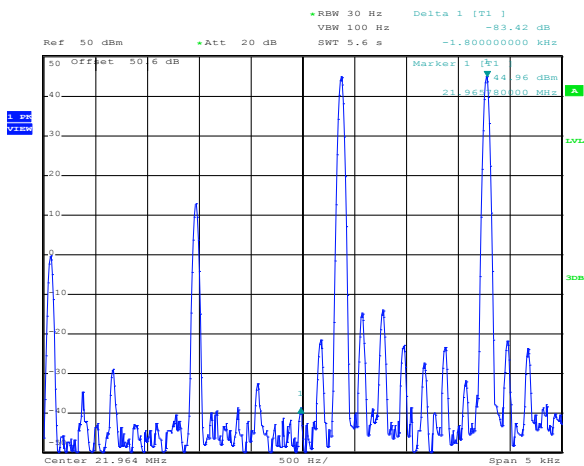
Date: 22.FEB.2017 17:25:53

Figure 8.4-1: Low channel 125W 400 Hz and 1800 Hz 40 dB



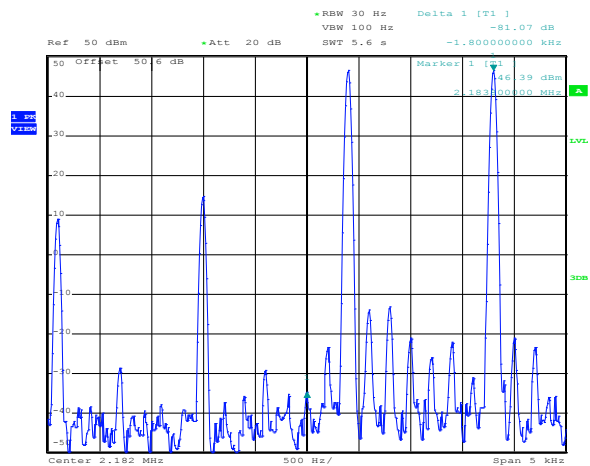
Date: 22.FEB.2017 17:23:14

Figure 8.4-2: Mid channel 125W 400 Hz and 1800 Hz 40 dB



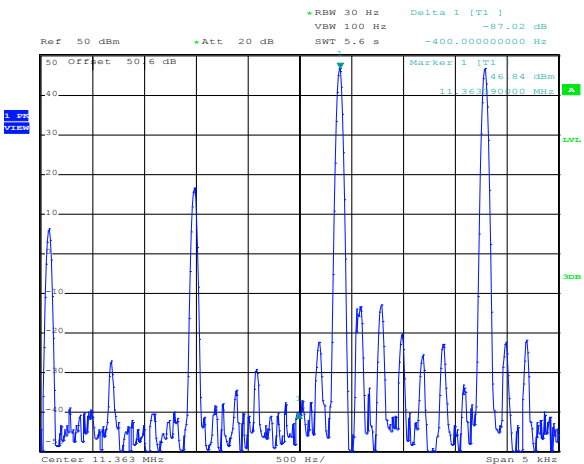
Date: 22.FEB.2017 17:22:06

Figure 8.4-3: High channel 125W 400 Hz and 1800 Hz 40 dB



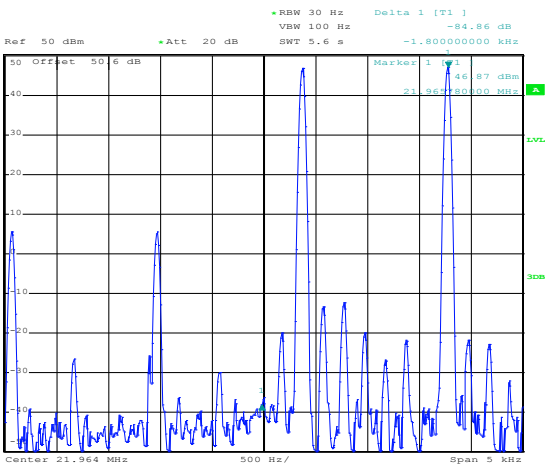
Date: 22.FEB.2017 17:12:14

Figure 8.4-4: Low channel 150W 400 Hz and 1800 Hz 40 dB



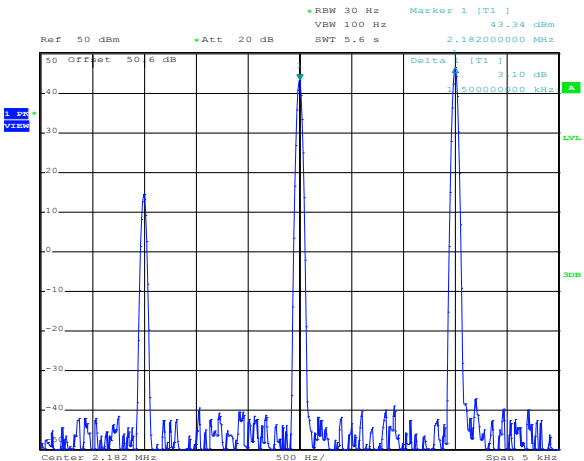
Date: 22.FEB.2017 17:14:27

Figure 8.4-5: Mid channel 150W 400 Hz and 1800 Hz 40 dB



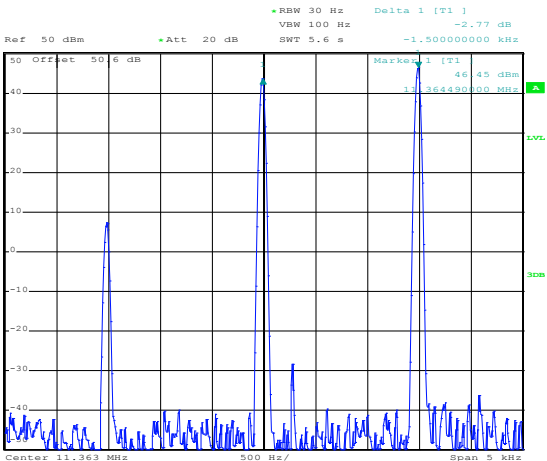
Date: 22.FEB.2017 17:18:50

Figure 8.4-6: High channel 125W 400 Hz and 1800 Hz 40 dB



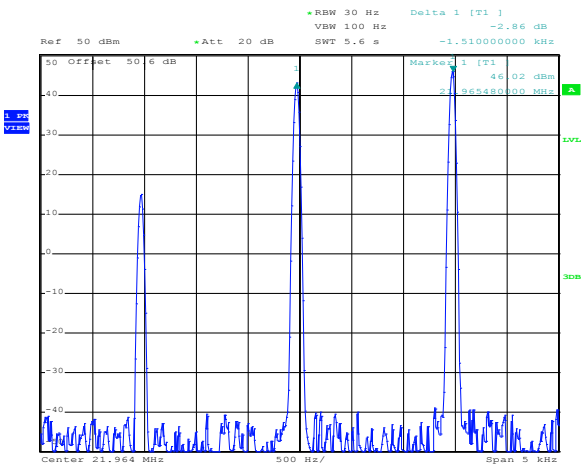
Date: 22.FEB.2017 17:45:22

Figure 8.4-7: Low channel 125W 1500 Hz 6 dB



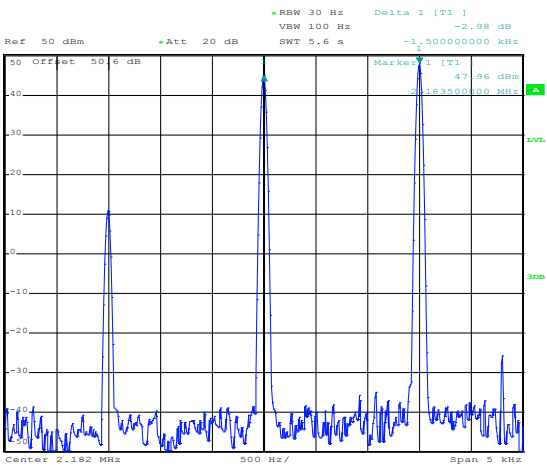
Date: 22.FEB.2017 18:45:39

Figure 8.4-8: Mid channel 125W 1500 Hz 6 dB



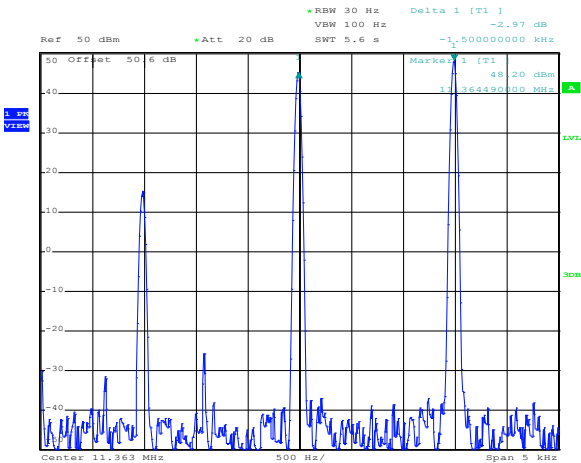
Date: 22.FEB.2017 18:46:51

Figure 8.4-9: High channel 125W 1500 Hz 6 dB



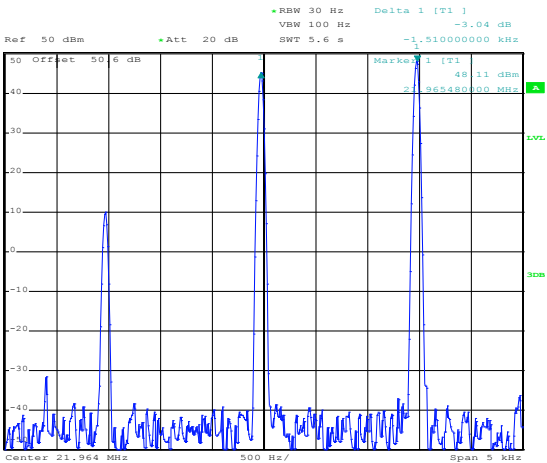
Date: 22.FEB.2017 18:52:34

Figure 8.4-10: Low channel 150W 1500 Hz 6 dB



Date: 22.FEB.2017 18:51:25

Figure 8.4-11: Mid channel 150W 1500 Hz 6 dB



Date: 22.FEB.2017 18:50:22

Figure 8.4-12: High channel 125W 1500 Hz 6 dB

## 8.5 FCC 87.139(c) Emission limits, conducted method

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### 8.5.1 Definitions and limits

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(c) For aircraft station transmitters first installed after February 1, 1983, and for aeronautical station transmitters in use after February 1, 1983, and using H2B, H3E, J3E, J7B or J9W, the peak envelope power of any emissions must be attenuated below the peak envelope power of the transmitter (pX) as follows:

- 4) When the frequency is removed from the assigned frequency by more than 50 percent up to and including 150 percent of the authorized bandwidth of 3.0 kHz, the attenuation must be at least 30 dB.
- 5) When the frequency is removed from the assigned frequency by more than 150 percent up to and including 250 percent of the authorized bandwidth of 3.0 kHz, the attenuation must be at least 38 dB.
- 6) When the frequency is removed from the assigned frequency by more than 250 percent of the authorized bandwidth of 3.0 kHz for aircraft transmitters the attenuation must be at least 43 dB. For aeronautical station transmitters with transmitter power up to and including 50 watts the attenuation must be at least  $43 + 10 \log_{10} pX$  dB and with transmitter power more than 50 watts the attenuation must be at least 60 dB.

### 8.5.2 Test summary

---

|               |                   |                   |           |
|---------------|-------------------|-------------------|-----------|
| Test date     | February 22, 2017 | Temperature       | 22 °C     |
| Test engineer | Kevin Rose        | Air pressure      | 1003 mbar |
| Verdict       | Pass              | Relative humidity | 32 %      |

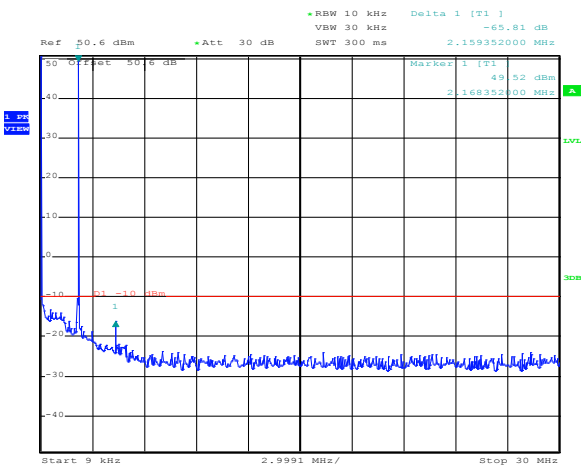
### 8.5.3 Observations, settings and special notes

---

Spectrum analyzer settings:

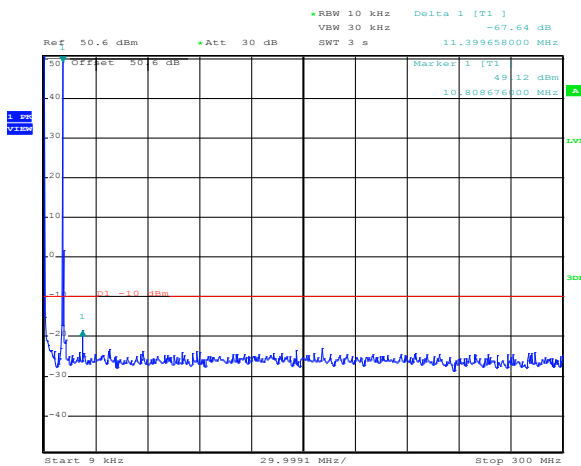
|                      |          |
|----------------------|----------|
| Detector mode        | Peak     |
| Resolution bandwidth | 10 kHz   |
| Video bandwidth      | RBW × 3  |
| Trace mode           | Max Hold |

## 8.5.4 Test data



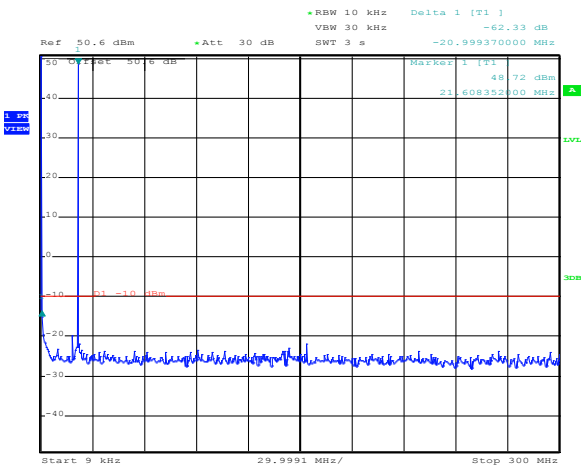
Date: 22.FEB.2017 21:37:34

Figure 8.5-1: Low channel Conducted Spurious 125W 1500 Hz



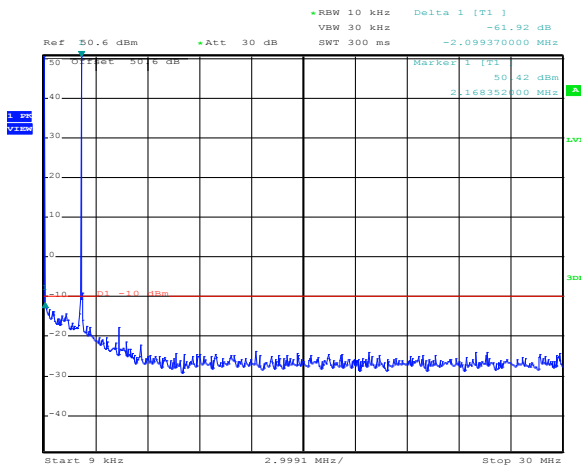
Date: 22.FEB.2017 21:39:28

Figure 8.5-2: Mid channel Conducted Spurious 125W 1500 Hz



Date: 22.FEB.2017 21:40:25

Figure 8.5-3: High channel Conducted Spurious 125W 1500 Hz

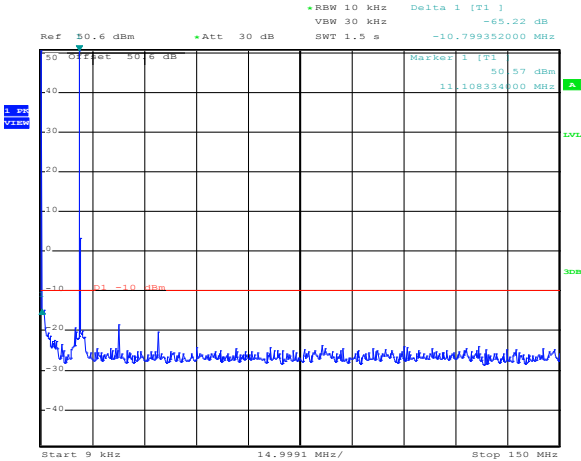


Date: 22.FEB.2017 22:09:02

Figure 8.5-4: Low channel Conducted Spurious 125W 1800 Hz and 400 Hz

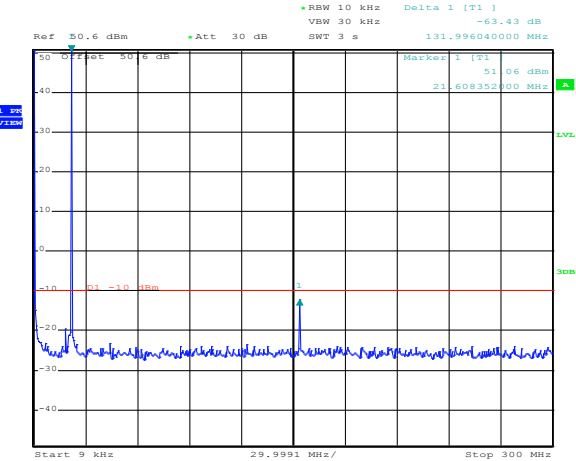
Section 8  
Test name  
Specification

Testing data  
FCC 87.139(c) Emission limits, conducted method  
FCC Part 87



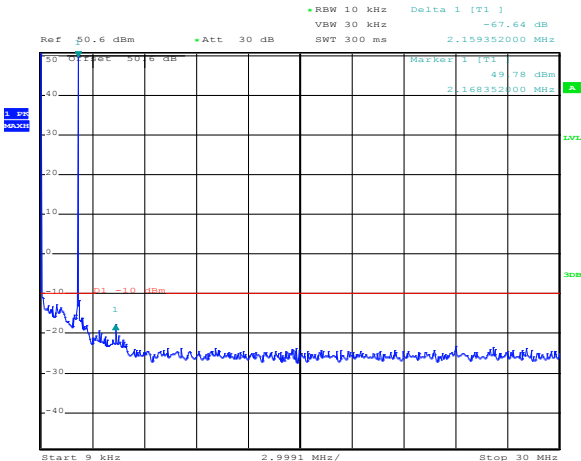
Date: 22.FEB.2017 22:08:24

Figure 8.5-5: Mid channel Conducted Spurious 125W 1800 Hz and 400 Hz



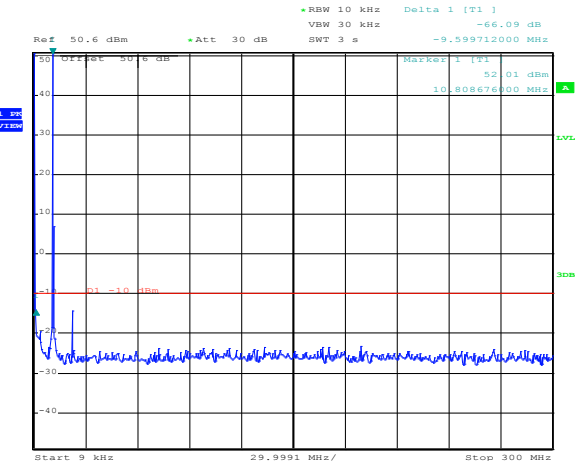
Date: 22.FEB.2017 22:07:30

Figure 8.5-6: High channel Conducted Spurious 125W 1800 Hz and 400 Hz



Date: 22.FEB.2017 21:51:27

Figure 8.5-7: Low channel Conducted Spurious 150W 1500 Hz

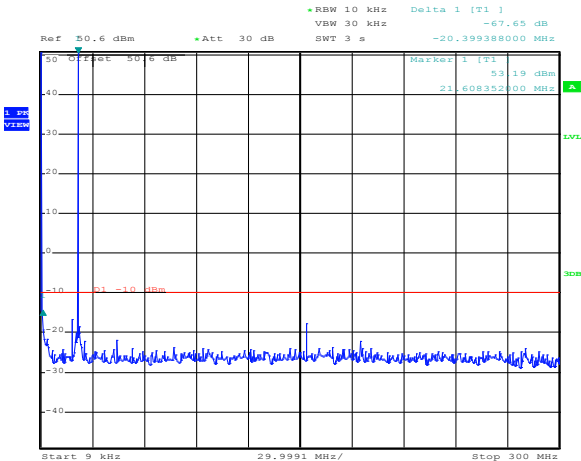


Date: 22.FEB.2017 21:49:45

Figure 8.5-8: Mid channel Conducted Spurious 150W 1500 Hz

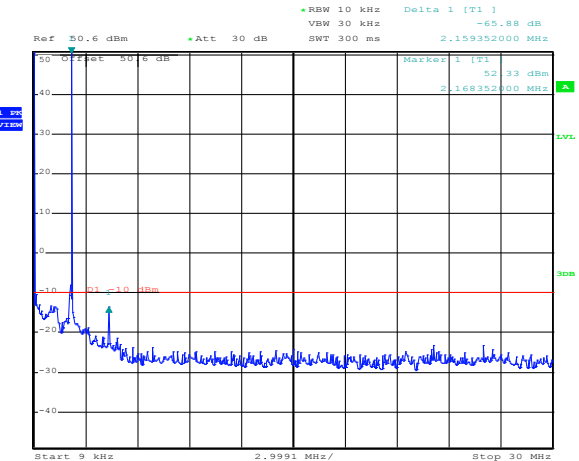
Section 8  
Test name  
Specification

Testing data  
FCC 87.139(c) Emission limits, conducted method  
FCC Part 87



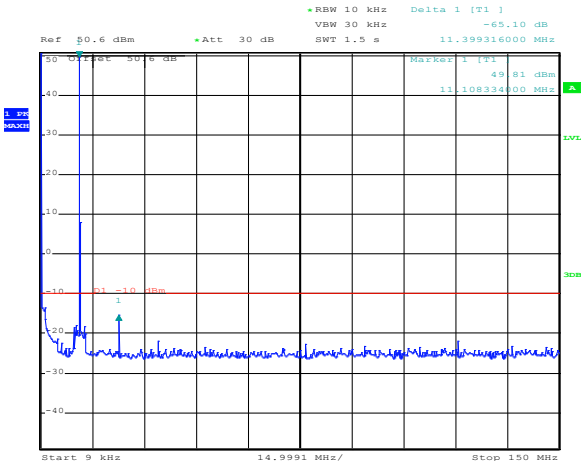
Date: 22.FEB.2017 21:48:39

Figure 8.5-9: High channel Conducted Spurious 150W 1500 Hz



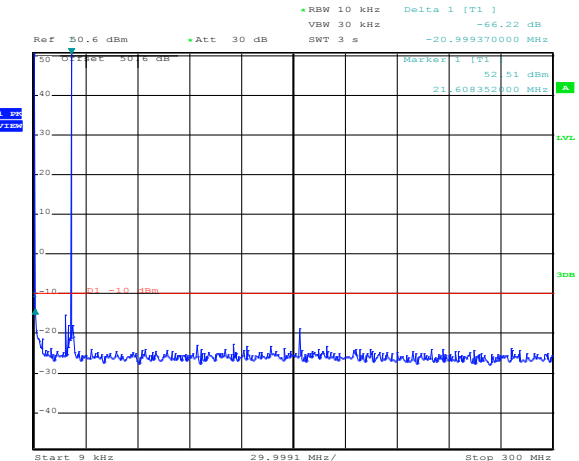
Date: 22.FEB.2017 21:55:59

Figure 8.5-10: Low channel Conducted Spurious 150W 1800 Hz and 400 Hz



Date: 22.FEB.2017 21:57:38

Figure 8.5-11: Mid channel Conducted Spurious 150W 1800 Hz and 400 Hz



Date: 22.FEB.2017 21:58:31

Figure 8.5-12: High channel Conducted Spurious 150W 1800 Hz and 400 Hz

## 8.6 FCC 87.139(c) Emission limits, radiated method

### 8.6.1 Definitions and limits

- (1) When the frequency is removed from the assigned frequency by more than 50 percent up to and including 150 percent of the authorized bandwidth of 3.0 kHz, the attenuation must be at least 30 dB.
- (2) When the frequency is removed from the assigned frequency by more than 150 percent up to and including 250 percent of the authorized bandwidth of 3.0 kHz, the attenuation must be at least 38 dB.
- (c) For aircraft station transmitters first installed after February 1, 1983, and for aeronautical station transmitters in use after February 1, 1983, and using H2B, H3E, J3E, J7B or J9W, the peak envelope power of any emissions must be attenuated below the peak envelope power of the transmitter (pX) as follows:
- (3) When the frequency is removed from the assigned frequency by more than 250 percent of the authorized bandwidth of 3.0 kHz for aircraft transmitters the attenuation must be at least 43 dB. For aeronautical station transmitters with transmitter power up to and including 50 watts the attenuation must be at least 43 + 10 log<sub>10</sub> pX dB and with transmitter power more than 50 watts the attenuation must be at least 60 dB.

### 8.6.2 Test summary

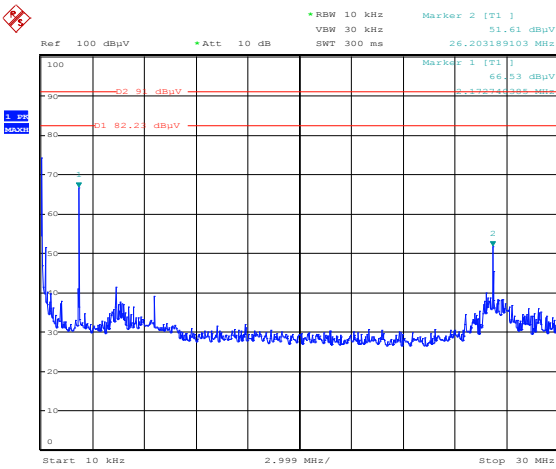
|               |                   |                   |           |
|---------------|-------------------|-------------------|-----------|
| Test date     | February 22, 2017 | Temperature       | 22 °C     |
| Test engineer | Kevin Rose        | Air pressure      | 1003 mbar |
| Verdict       | Pass              | Relative humidity | 32 %      |

### 8.6.3 Observations, settings and special notes

Spectrum analyzer settings:

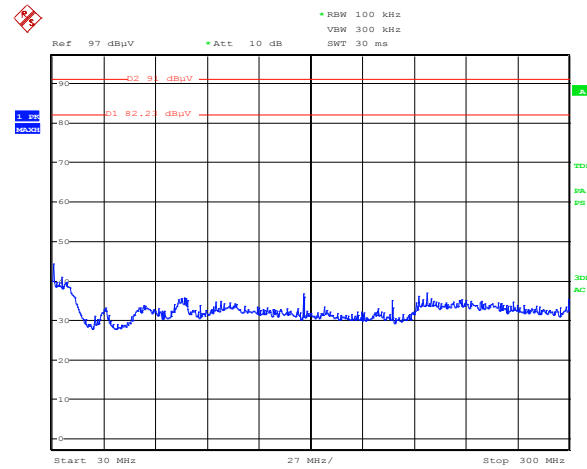
|                      |          |
|----------------------|----------|
| Detector mode        | Peak     |
| Resolution bandwidth | 10 kHz   |
| Video bandwidth      | RBW × 3  |
| Trace mode           | Max Hold |

## 8.6.4 Test data



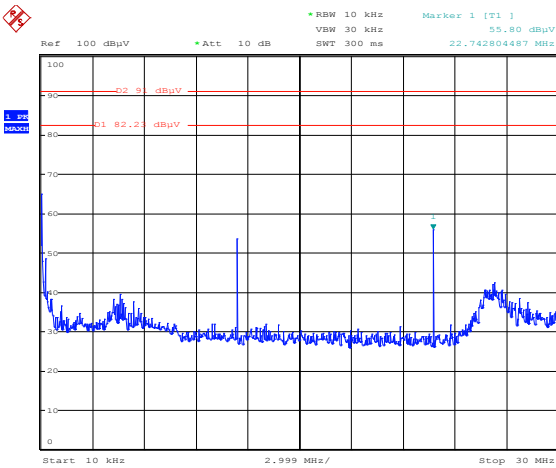
Date: 27.APR.2017 03:49:42

Figure 8.6-1: Low channel Radiated Spurious 125W



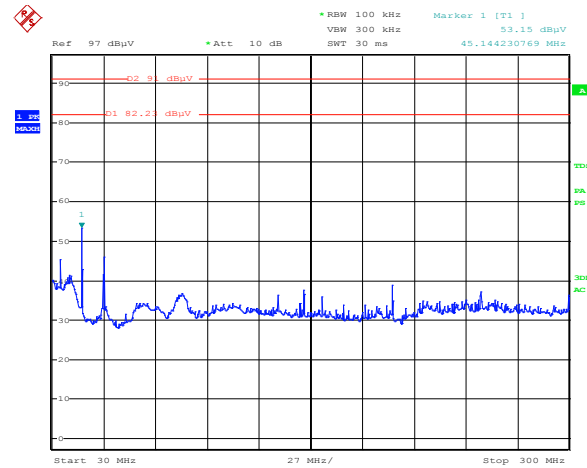
Date: 27.APR.2017 03:03:49

Figure 8.6-2: Low channel Radiated Spurious 125W



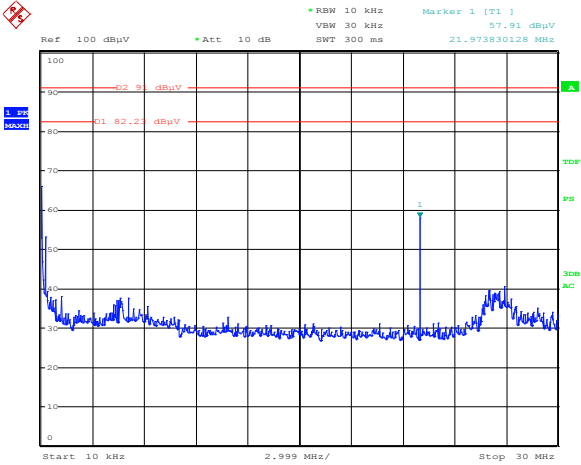
Date: 27.APR.2017 03:48:39

Figure 8.6-3: Mid channel Radiated Spurious 125W



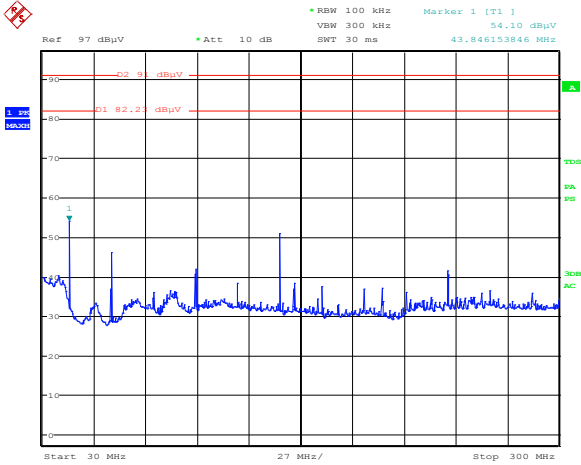
Date: 27.APR.2017 03:05:46

Figure 8.6-4: Mid channel Radiated Spurious 125W



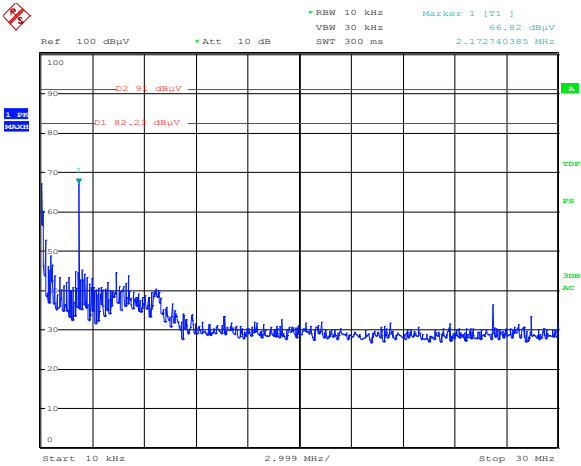
Date: 27.APR.2017 03:46:58

Figure 8.6-5: High channel Radiated Spurious 125W



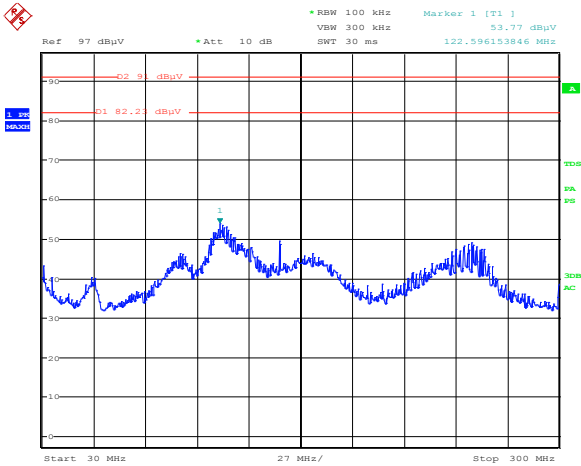
Date: 27.APR.2017 03:09:31

Figure 8.6-6: High channel Radiated Spurious 125W



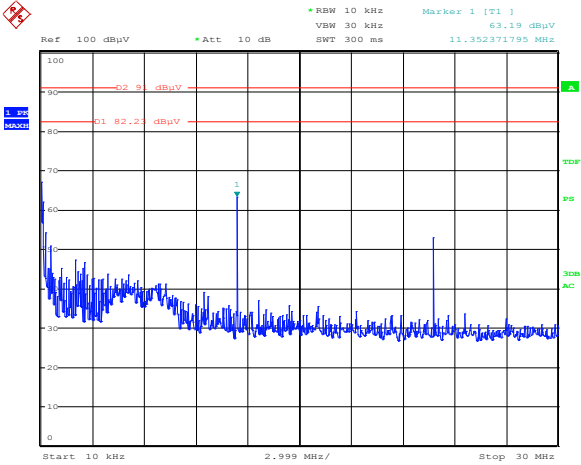
Date: 27.APR.2017 03:37:11

Figure 8.6-7: Low channel Radiated Spurious 150W



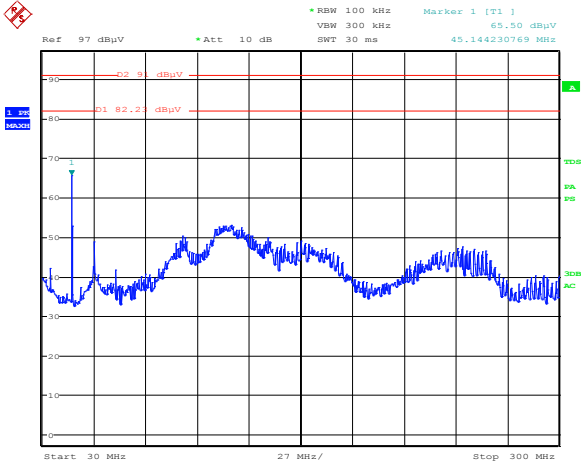
Date: 27.APR.2017 03:19:07

Figure 8.6-8: Low channel Radiated Spurious 150W



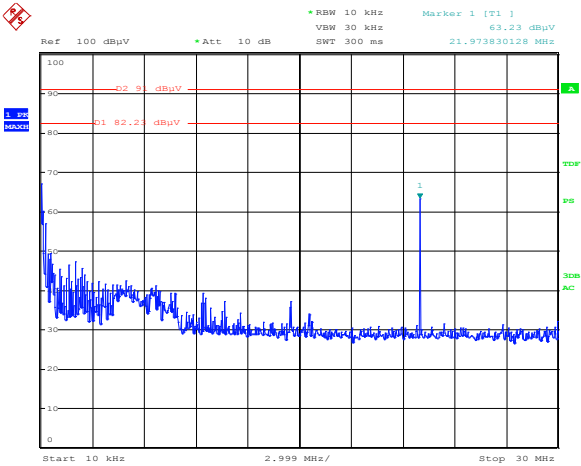
Date: 27.APR.2017 03:38:08

Figure 8.6-9: Mid channel Radiated Spurious 150W



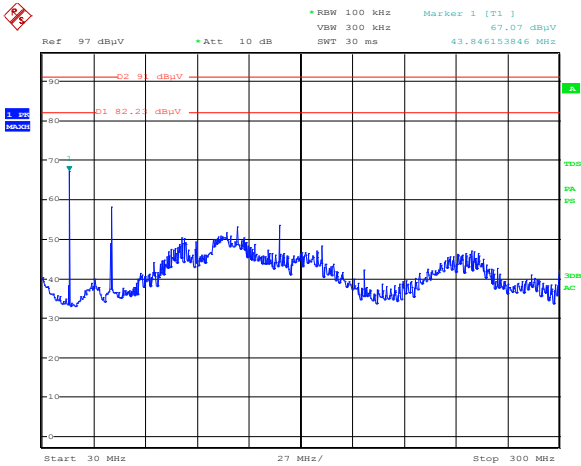
Date: 27.APR.2017 03:17:57

Figure 8.6-10: Mid channel Radiated Spurious 150W



Date: 27.APR.2017 03:40:07

Figure 8.6-11: High channel Radiated Spurious 150W



Date: 27.APR.2017 03:15:37

Figure 8.6-12: High channel Radiated Spurious 150W

## 8.7 FCC 87.133 Frequency stability

### 8.7.1 Definitions and limits

(c) For single-sideband transmitters, the tolerance is:

(1) All aeronautical stations on land: 10 Hz.

### 8.7.2 Test summary

|               |                   |                   |           |
|---------------|-------------------|-------------------|-----------|
| Test date     | February 21, 2017 | Temperature       | 22 °C     |
| Test engineer | Kevin Rose        | Air pressure      | 1003 mbar |
| Verdict       | Pass              | Relative humidity | 32 %      |

### 8.7.3 Observations, settings and special notes

1500 Hz tone was used during testing

### 8.7.4 Test data

**Table 8.7-1:** Frequency drift measurement FCC Part 87 results 125 watt

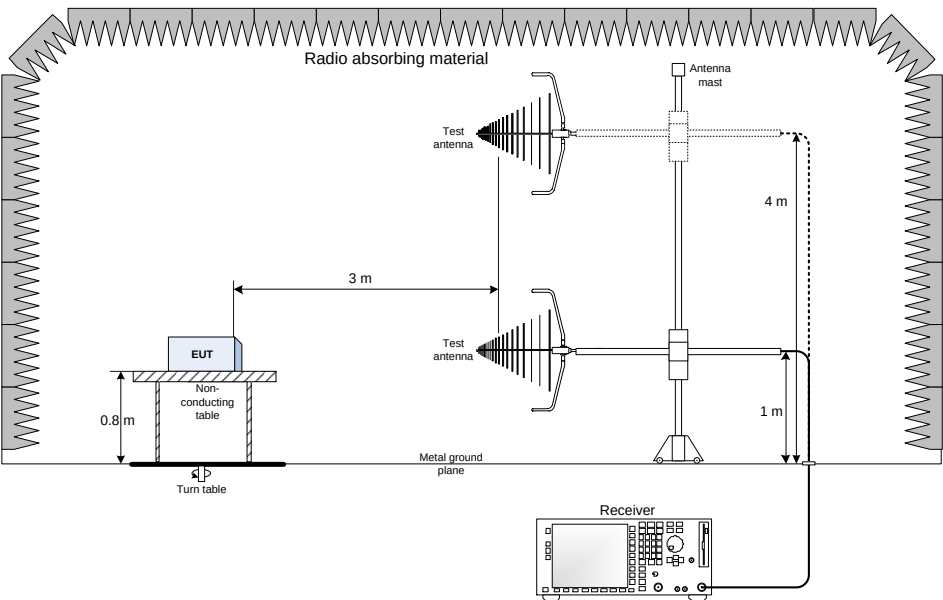
| Test conditions | Frequency, Hz | Drift, Hz | Limit ±10 Hz |
|-----------------|---------------|-----------|--------------|
| +50 °C, Nominal | 11364384      | -2        | ±10 Hz       |
| +40 °C, Nominal | 11364384      | -2        | ±10 Hz       |
| +30 °C, Nominal | 11364385      | -1        | ±10 Hz       |
| +20 °C, +15 %   | 11364386      | 0         | ±10 Hz       |
| +20 °C, Nominal | 11364386      | 0         | Reference    |
| +20 °C, -15 %   | 11364386      | 0         | ±10 Hz       |
| +10 °C, Nominal | 11364387      | 1         | ±10 Hz       |
| 0 °C, Nominal   | 11364388      | 2         | ±10 Hz       |
| -10 °C, Nominal | 11364387      | 1         | ±10 Hz       |
| -20 °C, Nominal | 11364387      | 1         | ±10 Hz       |
| -30 °C, Nominal | 11364389      | 3         | ±10 Hz       |

**Table 8.7-2:** Frequency drift measurement FCC Part 87. results 150 watt

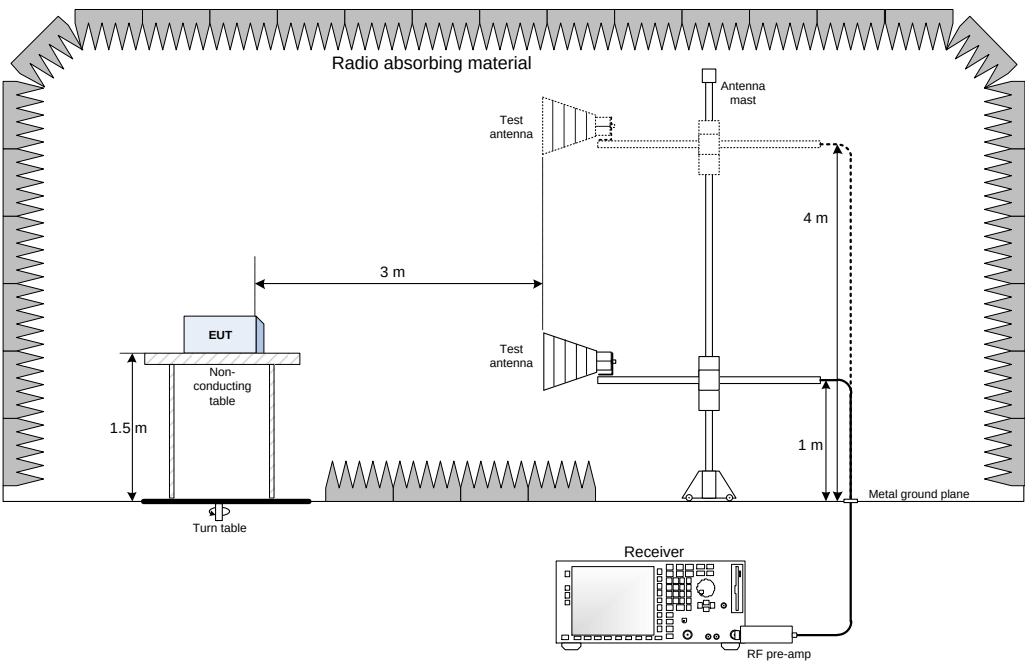
| Test conditions | Frequency, Hz | Drift, Hz | Limit ±10 Hz |
|-----------------|---------------|-----------|--------------|
| +50 °C, Nominal | 11364384      | -2        | ±10 Hz       |
| +40 °C, Nominal | 11364384      | -2        | ±10 Hz       |
| +30 °C, Nominal | 11364385      | -1        | ±10 Hz       |
| +20 °C, +15 %   | 11364386      | 0         | ±10 Hz       |
| +20 °C, Nominal | 11364386      | 0         | Reference    |
| +20 °C, -15 %   | 11364386      | 0         | ±10 Hz       |
| +10 °C, Nominal | 11364387      | 1         | ±10 Hz       |
| 0 °C, Nominal   | 11364388      | 2         | ±10 Hz       |
| -10 °C, Nominal | 11364387      | 1         | ±10 Hz       |
| -20 °C, Nominal | 11364388      | 2         | ±10 Hz       |
| -30 °C, Nominal | 11364388      | 2         | ±10 Hz       |

# Section 9. Block diagrams of test set-ups

## 9.1 Radiated emissions set-up for frequencies below 1 GHz

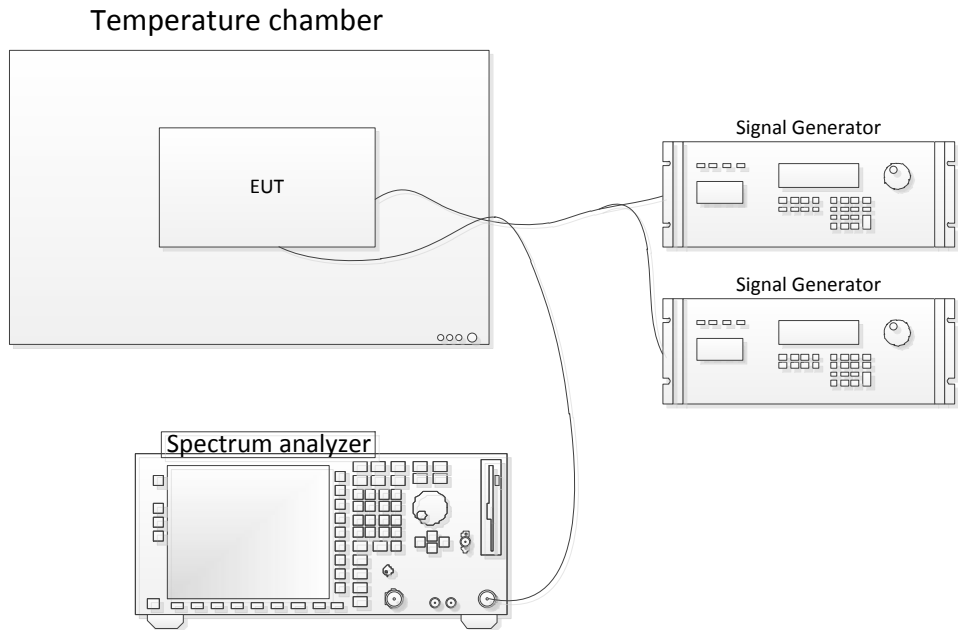


## 9.2 Radiated emissions set-up for frequencies above 1 GHz



9.3 Frequency stability

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9.4 Power limits, Modulation Characteristics, Emission limits, emission mask, bandwidth, Emission limits, conducted method

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