

Report on the Radio Testing of the SRT Marine Technology Limited AIS Class B. Model: IRIS In accordance with IEC 62287-2

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Product Service

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| Project Management | Sarah Jones | 18 December 2017 | |
| Authorised Signatory | Simon Bennett | 18 December 2017 | |

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with IEC 62287-2: Edition 2 (2017).

| | |
|--|---|
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| 3 | Measurement Uncertainty | 75 |



1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

| Issue | Description of Change | Date of Issue |
|-------|-----------------------|------------------|
| 1 | First Issue | 18 December 2017 |

Table 1

1.2 Introduction

| | |
|-------------------------------|-------------------------------|
| Applicant | SRT Marine Technology Limited |
| Manufacturer | SRT Marine Technology Limited |
| Model Number(s) | IRIS |
| Serial Number(s) | IRIS EP1#2 and IRIS EP1#40 |
| Hardware Version(s) | v1 |
| Software Version(s) | 150200.01.02 |
| Number of Samples Tested | 2 |
| Test Specification/Issue/Date | IEC 62287-2: Edition 2 (2017) |
| Order Number | POR006541 |
| Date | 15-September-2017 |
| Date of Receipt of EUT | 09-October-2017 |
| Start of Test | 03-November-2017 |
| Finish of Test | 14-December-2017 |
| Name of Engineer(s) | Matthew Russell |



1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with IEC 62287-2 is shown below.

| Section | Specification Clause | Test Description | Result | Comments/Base Standard |
|---|----------------------|---|--------|------------------------|
| Configuration and Mode: DC Powered - SOTDMA Transceiver | | | | |
| 2.1 | 11.1.1 | Frequency Error | Pass | |
| 2.2 | 11.1.2 | Carrier Power | Pass | |
| 2.3 | 11.1.3 | Transmission Spectrum | Pass | |
| 2.4 | 11.1.4 | Modulation Accuracy | Pass | |
| 2.5 | 11.1.5 | Transmitter Output Power Versus Time Function | Pass | |
| 2.6 | 11.2.1 | Sensitivity | Pass | |
| 2.7 | 11.2.2 | Error Behaviour at High Input Levels | Pass | |
| 2.8 | 11.2.3 | Co-channel Rejection | Pass | |
| 2.9 | 11.2.4 | Adjacent Channel Selectivity | Pass | |
| 2.10 | 11.2.5 | Spurious Response Rejection | Pass | |
| 2.11 | 11.2.6 | Intermodulation Response Rejection | Pass | |
| 2.12 | 11.2.7 | Blocking or Desensitisation | Pass | |
| 2.13 | 11.3.1 | Spurious Emissions from the Receiver | Pass | |
| 2.14 | 11.3.2 | Spurious Emissions from the Transmitter | Pass | |
| 2.15 | A.5 | DSC Receiver Tests | - | Test Waiver Applies |

Table 2



1.4 Application Form

| MAIN EUT | |
|---|---|
| MANUFACTURING DESCRIPTION | AIS Class B Transceiver |
| MANUFACTURER | SRT Marine Systems Plc |
| MODEL NAME/NUMBER | Iris |
| PART NUMBER | 428-0002 |
| SERIAL NUMBER | N/A |
| HARDWARE VERSION | v1 |
| SOFTWARE VERSION | 150200.01.02 |
| PSU VOLTAGE/FREQUENCY/CURRENT | 12-24v dc |
| HIGHEST INTERNALLY GENERATED / USED FREQUENCY | 192 MHz |
| FCC ID (if applicable) | UYW-428-0002B |
| INDUSTRY CANADA ID (if applicable) | 7075A-4280002B |
| TECHNICAL DESCRIPTION (a brief description of the intended use and operation) | Class B AIS SOTDMA Transceiver |
| COUNTRY OF ORIGIN | Republic of Ireland |
| RF CHARACTERISTICS (if applicable) | |
| TRANSMITTER FREQUENCY OPERATING RANGE (MHz) | 156.025 MHz, - 162.025MHz |
| RECEIVER FREQUENCY OPERATING RANGE (MHz) | 156.025 MHz, - 162.025MHz |
| INTERMEDIATE FREQUENCIES | 19.655 MHz / 29.255 MHz / 0.455 MHz / Tx - 38.855 MHz |
| EMISSION DESIGNATOR(S): (i.e. G1D, GXW) | 16K0G1D |
| MODULATION TYPES: (i.e. GMSK, QPSK) | GMSK |
| OUTPUT POWER (W or dBm) | 5W |
| SEPARATE BATTERY/POWER SUPPLY (if applicable) | |
| MANUFACTURING DESCRIPTION | |
| MANUFACTURER | |
| TYPE | |
| PART NUMBER | |
| PSU VOLTAGE/FREQUENCY/CURRENT | |
| COUNTRY OF ORIGIN | |
| MODULES (if applicable) | |
| MANUFACTURING DESCRIPTION | |
| MANUFACTURER | |
| TYPE | |
| POWER | |
| FCC ID | |
| INDUSTRY CANADA ID | |
| EMISSION DESIGNATOR | |
| DHSS/FHSS/COMBINED OR OTHER | |
| COUNTRY OF ORIGIN | |
| ANCILLARIES (if applicable) | |
| MANUFACTURING DESCRIPTION | GPS Antenna |
| MANUFACTURER | 2J |
| TYPE | |
| PART NUMBER | 2J9001GF |
| SERIAL NUMBER | |
| COUNTRY OF ORIGIN | |

I hereby declare that the information supplied is correct and complete.

Name: Shaun Horan
 Date: 13-12-17

Position held: Project Manager



1.5 Product Information

1.5.1 Technical Description

AIS Class B Transceiver

1.6 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

1.7 EUT Modification Record

The table below details modifications made to the EUT during the test programme. The modifications incorporated during each test are recorded on the appropriate test pages.

| Modification State | Description of Modification still fitted to EUT | Modification Fitted By | Date Modification Fitted |
|----------------------------|--|------------------------|--------------------------|
| Serial Number: IRIS EP1#2 | | | |
| 0 | As supplied by the customer | Not Applicable | Not Applicable |
| 1 | A modification was made to the V1 PCA to enhance rejection of a spurious response at the image frequency of RX2: Insert a lumped-element parallel LC band reject filter; values 22nH, 22pF into the output path of the antenna splitter amplifier IC52 | Phil Longhurst | 07-December-2017 |
| Serial Number: IRIS EP1#40 | | | |
| 0 | As supplied by the customer | Not Applicable | Not Applicable |

Table 3



1.8 Test Location

TÜV SÜD Product Service conducted the following tests at our Fareham Test Laboratory.

| Test Name | Name of Engineer(s) | Accreditation |
|---|---------------------|---------------|
| Configuration and Mode: DC Powered - SOTDMA Transceiver | | |
| Frequency Error | Matthew Russell | UKAS |
| Carrier Power | Matthew Russell | UKAS |
| Transmission Spectrum | Matthew Russell | UKAS |
| Modulation Accuracy | Matthew Russell | UKAS |
| Transmitter Output Power Versus Time Function | Matthew Russell | UKAS |
| Sensitivity | Matthew Russell | UKAS |
| Error Behaviour at High Input Levels | Matthew Russell | UKAS |
| Adjacent Channel Selectivity | Matthew Russell | UKAS |
| Spurious Response Rejection | Matthew Russell | UKAS |
| Intermodulation Response Rejection | Matthew Russell | UKAS |
| Blocking or Desensitisation | Matthew Russell | UKAS |
| Spurious Emissions from the Receiver | Matthew Russell | UKAS |
| Spurious Emissions from the Transmitter | Matthew Russell | UKAS |
| Co-channel Rejection | Matthew Russell | UKAS |

Table 4

Office Address:

Octagon House
Concorde Way
Segensworth North
Fareham
Hampshire
PO15 5RL
United Kingdom



2 Test Details

2.1 Frequency Error

2.1.1 Specification Reference

IEC 62287-2, Clause 11.1.1

2.1.2 Equipment Under Test and Modification State

IRIS, S/N: IRIS EP1#40 - Modification State 0

2.1.3 Date of Test

03-November-2017 to 17-November-2017

2.1.4 Test Method

This test was performed in accordance with IEC 62287-2, clause 11.1.1.2.

2.1.5 Environmental Conditions

Ambient Temperature 21.9 - 23.5 °C

Relative Humidity 27.7 - 45.9 %

2.1.6 Test Results

DC Powered - SOTDMA Transceiver

| Test Conditions | | 156.025 MHz | | 162.025 MHz | |
|-----------------|-----------|------------------|------------------|------------------|------------------|
| Temperature | Voltage | Error (Hz) - Tx1 | Error (Hz) - Tx2 | Error (Hz) - Tx1 | Error (Hz) - Tx2 |
| + 21.9 °C | 12.0 V DC | -35 | 150 | -35 | 145 |
| -15.0 °C | 9.6 V DC | 332 | -195 | 362 | -240 |
| +55.0 °C | 31.2 V DC | 251 | -133 | 232 | -221 |

Table 5 - Frequency Error Results

IEC 62287-2, Limit Clause 11.1.1.3

The frequency error shall not exceed ± 0.5 kHz under normal and ± 1 kHz under extreme test conditions.



2.1.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1 and RF Chamber 8.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|--------------------------|-----------------------|----------------------------|-------|-----------------------------|-----------------|
| Climatic Chamber | Votsch | VT4002 | 161 | 12 | O/P Mon |
| Multimeter | White Gold | WG022 | 190 | 12 | 24-Nov-2017 |
| Multimeter | Fluke | 75 Mk3 | 455 | 12 | 14-Sep-2018 |
| Power Supply Unit | Farnell | H60-25 | 1092 | - | O/P Mon |
| Rubidium Standard | Rohde & Schwarz | XSRM | 1316 | 6 | 12-Mar-2018 |
| Thermocouple Thermometer | Fluke | 51 | 3174 | 12 | 22-Dec-2017 |
| Hygrometer | Rotronic | I-1000 | 3220 | 12 | 30-Aug-2018 |
| Attenuator (30dB, 150W) | Narda | 769-30 | 3369 | 12 | 31-May-2018 |
| Frequency Standard | Spectracom | Secure Sync 1200-0408-0601 | 4393 | 6 | 12-Mar-2018 |
| 2 metre SMA Cable | Florida Labs | SMS-235SP-78.8-SMS | 4517 | 12 | 19-Sep-2018 |
| PXA Signal Analyser | Keysight Technologies | N9030A | 4654 | 12 | 06-Oct-2018 |

Table 6

O/P Mon – Output Monitored using calibrated equipment



2.2 Carrier Power

2.2.1 Specification Reference

IEC 62287-2, Clause 11.1.2

2.2.2 Equipment Under Test and Modification State

IRIS, S/N: IRIS EP1#40 - Modification State 0

2.2.3 Date of Test

03-November-2017 to 17-November-2017

2.2.4 Test Method

This test was performed in accordance with IEC 62287-2, clause 11.1.2.2.

2.2.5 Environmental Conditions

Ambient Temperature 22.1 - 23.2 °C

Relative Humidity 26.6 - 44.6 %

2.2.6 Test Results

DC Powered - SOTDMA Transceiver

| Test Conditions | | 156.025 MHz | | 162.025 MHz | |
|-----------------|-----------|-------------------|-------------------|-------------------|-------------------|
| Temperature | Voltage | Power (dBm) - Tx1 | Power (dBm) - Tx2 | Power (dBm) - Tx1 | Power (dBm) - Tx2 |
| 22.4 °C | 12.0 V DC | 37.20 | 37.23 | 37.25 | 37.23 |
| -15.0 °C | 9.6 V DC | 37.67 | 37.64 | 37.52 | 37.53 |
| +55.0 °C | 31.2 V DC | 36.94 | 36.95 | 36.99 | 36.93 |

Table 7 - Carrier Power Results - High Power

| Test Conditions | | 156.025 MHz | | 162.025 MHz | |
|-----------------|-----------|-------------------|-------------------|-------------------|-------------------|
| Temperature | Voltage | Power (dBm) - Tx1 | Power (dBm) - Tx2 | Power (dBm) - Tx1 | Power (dBm) - Tx2 |
| 22.4 °C | 12.0 V DC | 30.30 | 30.32 | 30.44 | 30.32 |
| -15.0 °C | 9.6 V DC | 30.73 | 30.65 | 30.79 | 30.82 |
| +55.0 °C | 31.2 V DC | 30.15 | 30.07 | 30.03 | 29.97 |

Table 8 - Carrier Power Results – Low Power

IEC 62287-2, Limit Clause 11.1.2.3

At all test frequencies, the carrier power shall be for high power 37 dBm ± 1,5 dBm and 30 dBm ± 1,5 dBm for low power under normal test conditions.

At all test frequencies, the carrier power shall be for high power 37 dBm ± 3,0 dBm and 30 dBm ± 3,0 dBm for low power under extreme test conditions.



2.2.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|-------------------------------|-----------------------|--------------------|-------|-----------------------------|-----------------|
| Climatic Chamber | Votsch | VT4002 | 161 | 12 | O/P Mon |
| True RMS Multimeter | Fluke | 79 Series III | 411 | 12 | 02-Oct-2018 |
| Multimeter | Fluke | 75 Mk3 | 455 | 12 | 14-Sep-2018 |
| Power Supply Unit | Farnell | H60-25 | 1092 | - | O/P Mon |
| Thermocouple Thermometer | Fluke | 51 | 3174 | 12 | 22-Dec-2017 |
| Hygrometer | Rotronic | I-1000 | 3220 | 12 | 30-Aug-2018 |
| Attenuator (30dB, 150W) | Narda | 769-30 | 3369 | 12 | 31-May-2018 |
| Signal Generator, 9kHz - 3GHz | Rohde & Schwarz | SMA 100A | 3504 | 12 | 17-Oct-2018 |
| 2 metre SMA Cable | Florida Labs | SMS-235SP-78.8-SMS | 4517 | 12 | 19-Sep-2018 |
| PXA Signal Analyser | Keysight Technologies | N9030A | 4653 | 12 | 12-Jan-2018 |

Table 9

O/P Mon – Output Monitored using calibrated equipment



2.3 Transmission Spectrum

2.3.1 Specification Reference

IEC 62287-2, Clause 11.1.3

2.3.2 Equipment Under Test and Modification State

IRIS, S/N: IRIS EP1#40 - Modification State 0

2.3.3 Date of Test

03-November-2017

2.3.4 Test Method

This test was performed in accordance with IEC 62287-2, clause 11.1.3.2.

2.3.5 Environmental Conditions

Ambient Temperature 22.8 °C

Relative Humidity 42.8 %

2.3.6 Test Results

DC Powered - SOTDMA Transceiver

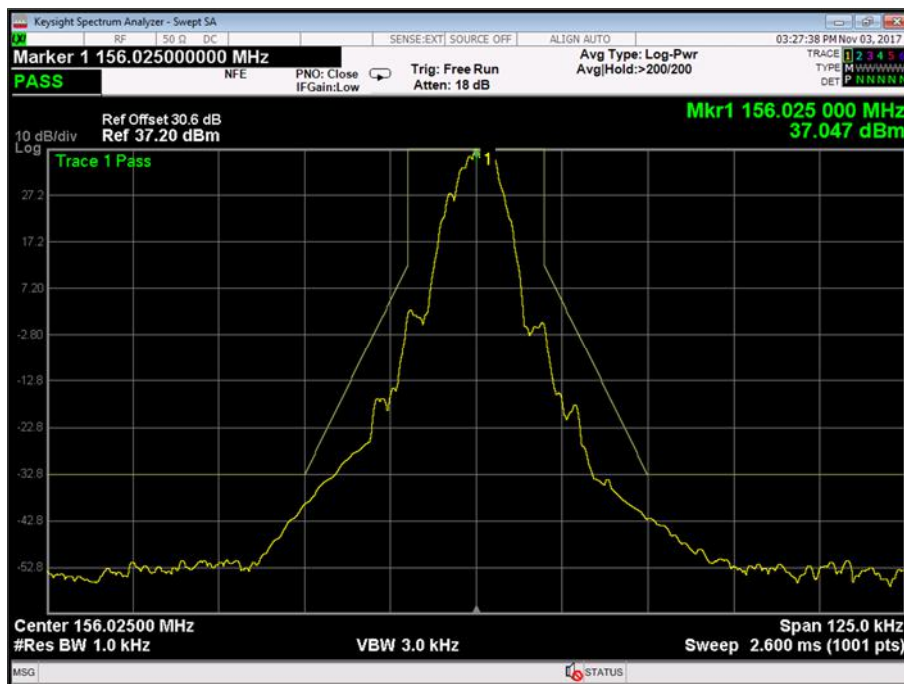


Figure 1 - 156.025 MHz - Tx1

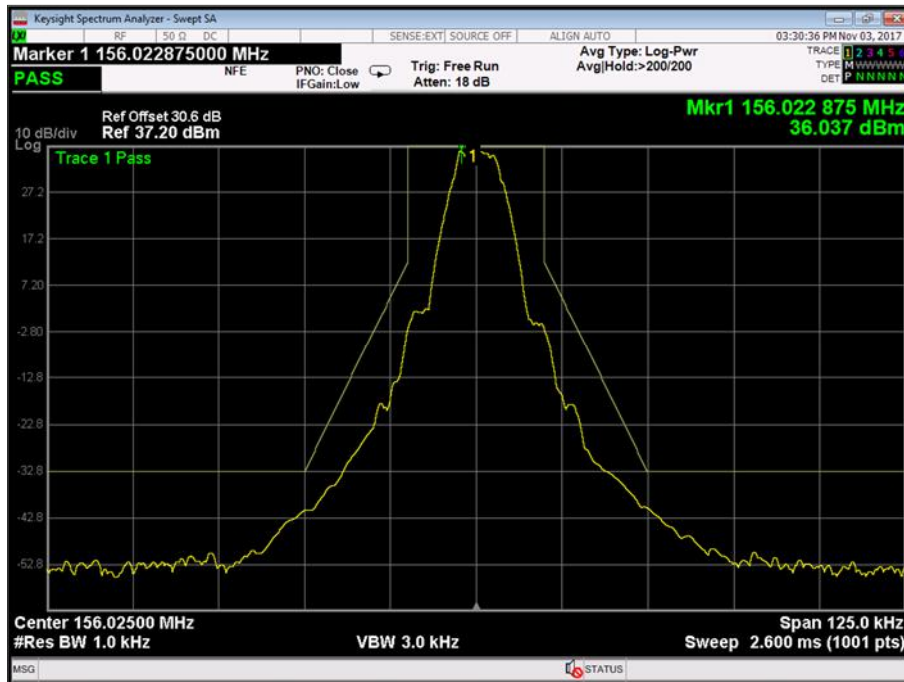


Figure 2 - 156.025 MHz – Tx2

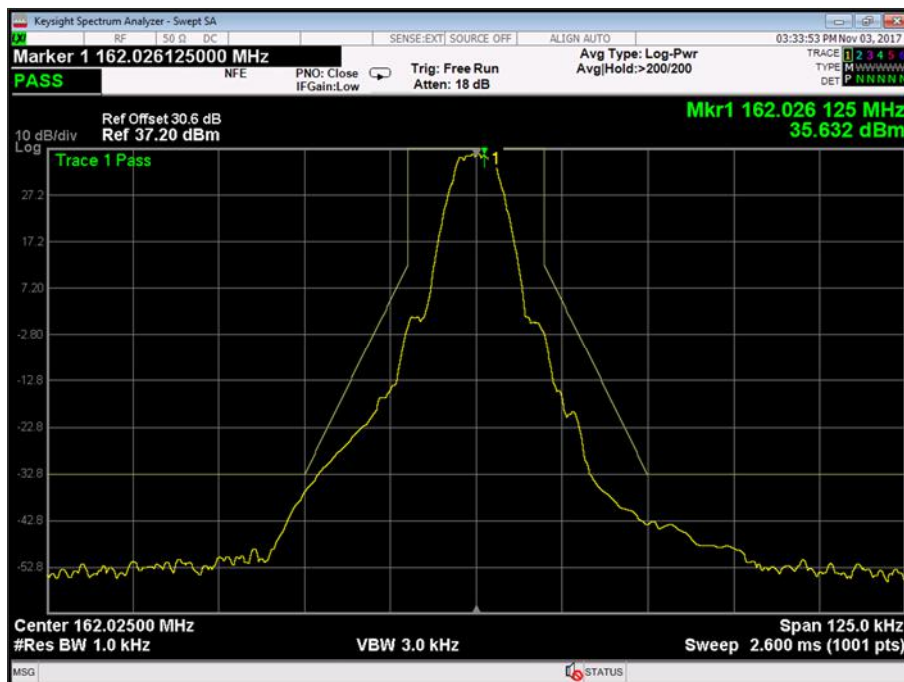


Figure 3 - 162.025 MHz - Tx1

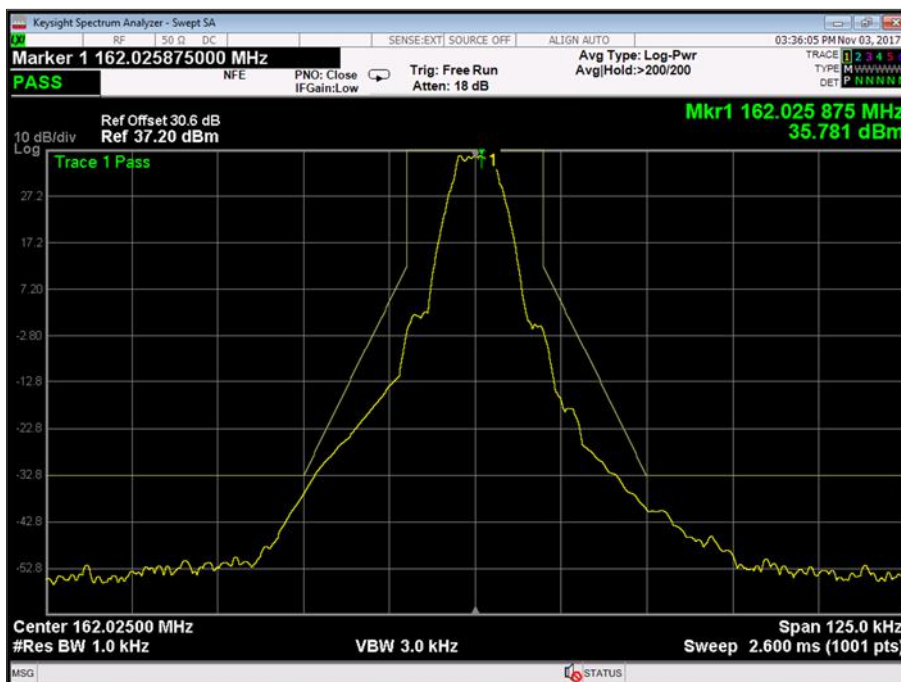


Figure 4 - 162.025 MHz – Tx2

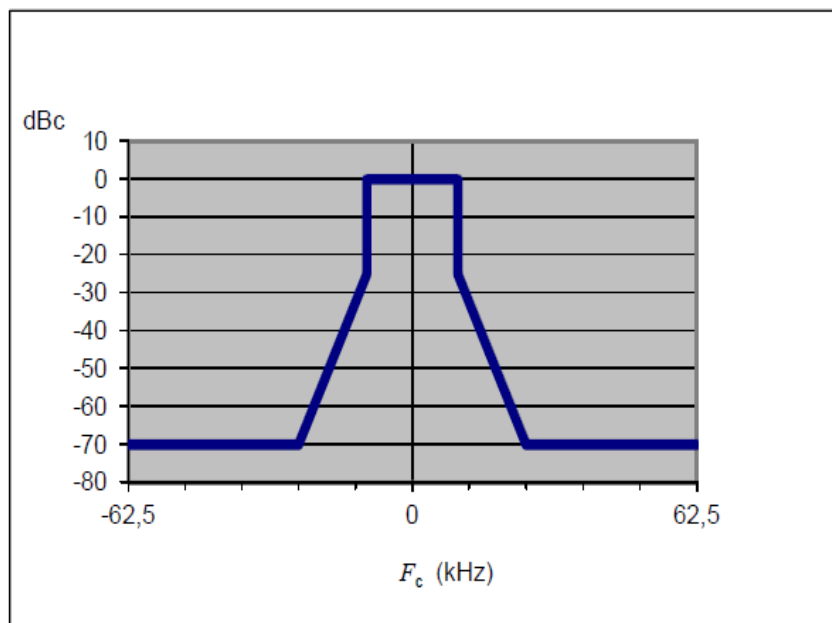
IEC 62287-2, Limit Clause 11.1.3.3

The spectrum for slotted transmission shall be within the emission mask as follows:

- in the region between the carrier and ± 10 kHz removed from the carrier, the modulation and transient sidebands shall be below 0 dBc;
- at ± 10 kHz removed from the carrier, the modulation and transient sidebands shall be below -25 dBc;
- at ± 25 kHz to $\pm 62,5$ kHz removed from the carrier, the modulation and transient sidebands shall be below the lower value of -70 dBc;
- in the region between ± 10 kHz and ± 25 kHz removed from the carrier, the modulation and transient sidebands shall be below a line specified between these two points.

The reference level for the measurement shall be the carrier power (conducted) recorded for the appropriate test frequency in clause 11.1.2 of the test specification.

For information the emission mask specified above is shown below.



IEC 552/13

Figure 5 - Transmission Spectrum Mask Limit



2.3.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|-------------------------|-----------------------|----------------------------|-------|-----------------------------|-----------------|
| True RMS Multimeter | Fluke | 79 Series III | 411 | 12 | 02-Oct-2018 |
| Power Supply Unit | Farnell | H60-25 | 1092 | - | O/P Mon |
| Rubidium Standard | Rohde & Schwarz | XSRM | 1316 | 6 | 12-Mar-2018 |
| Hygrometer | Rotronic | I-1000 | 3220 | 12 | 30-Aug-2018 |
| Attenuator (30dB, 150W) | Narda | 769-30 | 3369 | 12 | 31-May-2018 |
| Frequency Standard | Spectracom | Secure Sync 1200-0408-0601 | 4393 | 6 | 12-Mar-2018 |
| 2 metre SMA Cable | Florida Labs | SMS-235SP-78.8-SMS | 4517 | 12 | 19-Sep-2018 |
| PXA Signal Analyser | Keysight Technologies | N9030A | 4653 | 12 | 12-Jan-2018 |

Table 10

O/P Mon – Output Monitored using calibrated equipment

2.4 Modulation Accuracy

2.4.1 Specification Reference

IEC 62287-2, Clause 11.1.4

2.4.2 Equipment Under Test and Modification State

IRIS, S/N: IRIS EP1#40 - Modification State 0

2.4.3 Date of Test

13-November-2017 to 14-December-2017

2.4.4 Test Method

This test was performed in accordance with IEC 62287-2, clause 11.1.4.2.

2.4.5 Environmental Conditions

Ambient Temperature 21.9 - 23.5 °C

Relative Humidity 27.1 - 29.0 %

2.4.6 Test Results

DC Powered - SOTDMA Transceiver



Figure 6 - 156.025 MHz, Test Signal #1, Tx1, +21.9 °C, 12.0 V DC

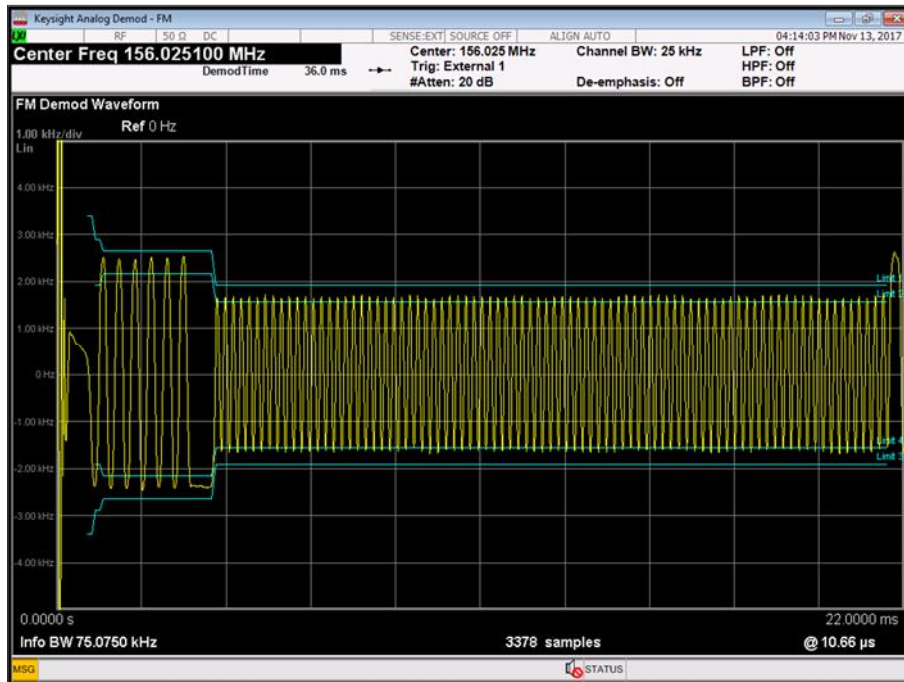


Figure 7 - 156.025 MHz, Test Signal #1, Tx2, +21.9 °C, 12.0 V DC

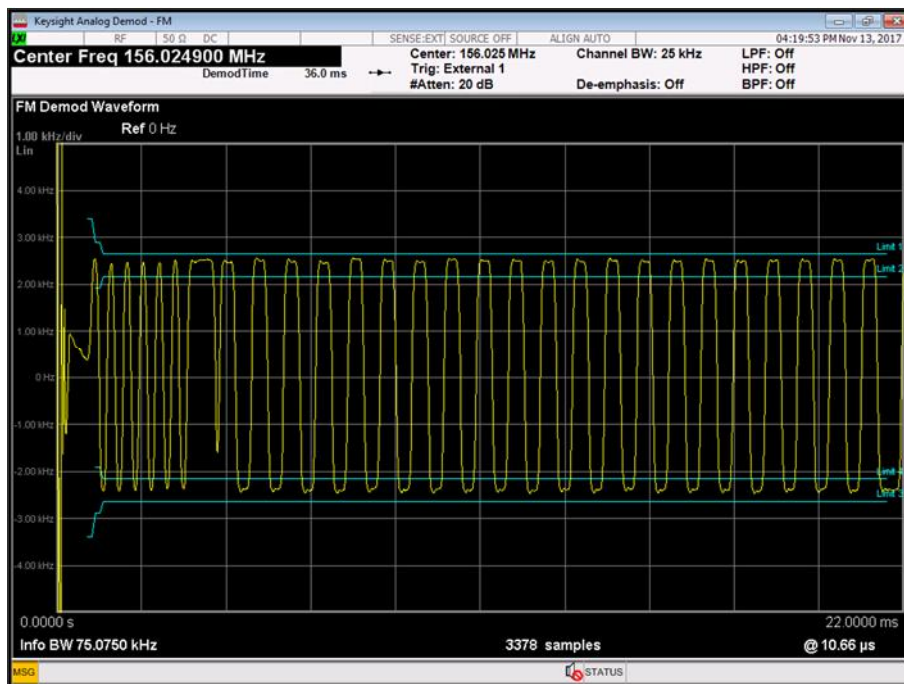


Figure 8 - 156.025 MHz, Test Signal #2, Tx1, +21.9 °C, 12.0 V DC

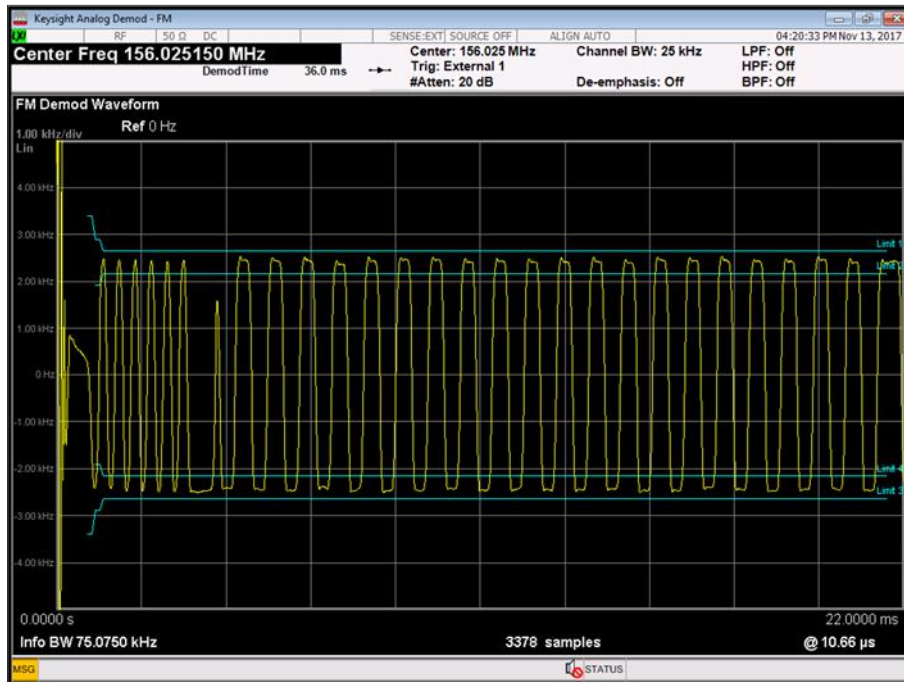


Figure 9 - 156.025 MHz, Test Signal #2, Tx2, +21.9 °C, 12.0 V DC

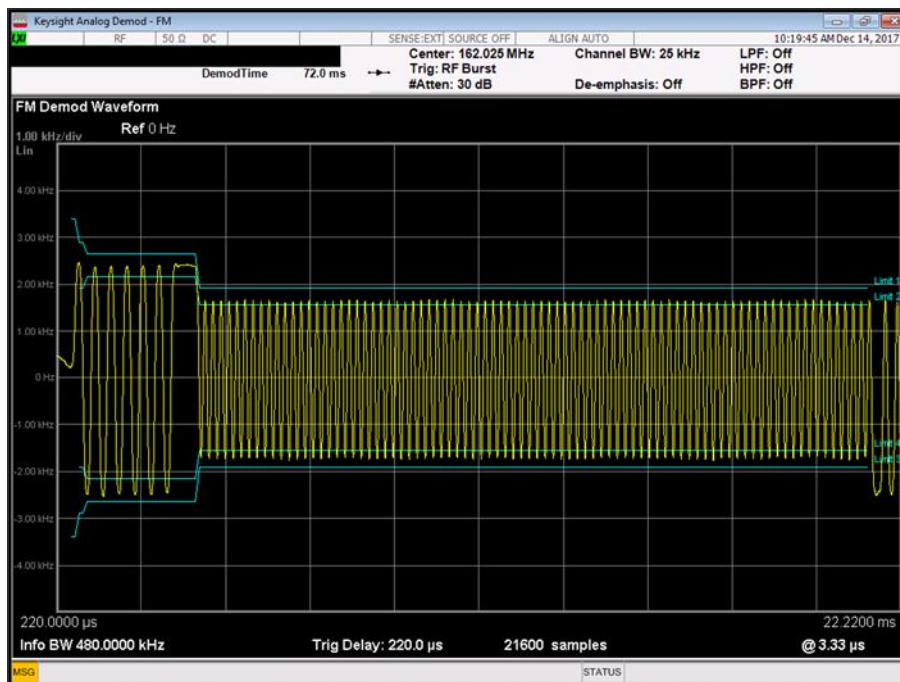


Figure 10 - 162.025 MHz, Test Signal #1, Tx1, +21.9 °C, 12.0 V DC

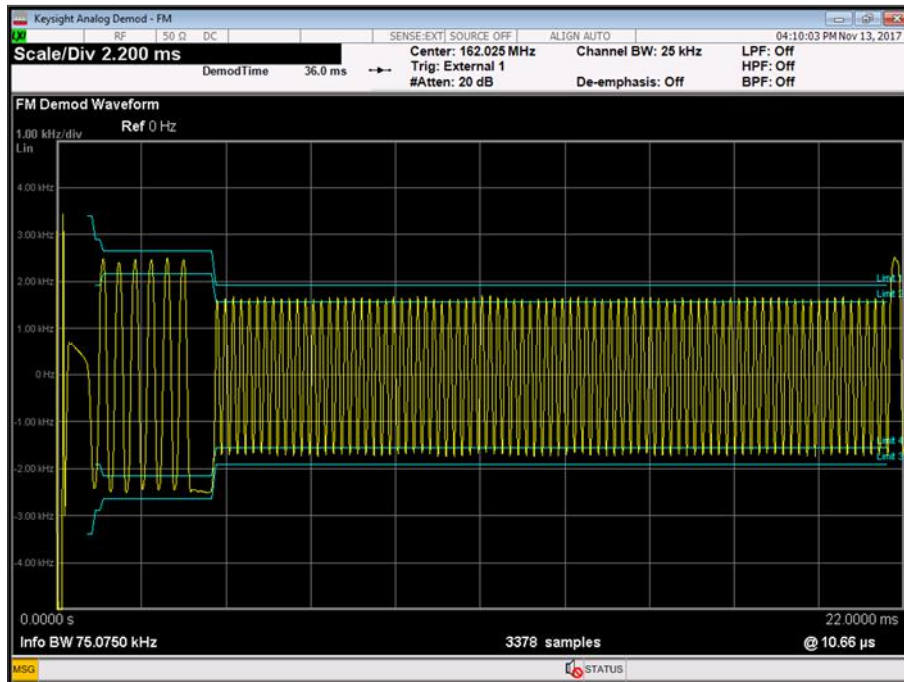


Figure 11 - 162.025 MHz, Test Signal #1, Tx2, +21.9 °C, 12.0 V DC



Figure 12 - 162.025 MHz, Test Signal #2, Tx1, +21.9 °C, 12.0 V DC

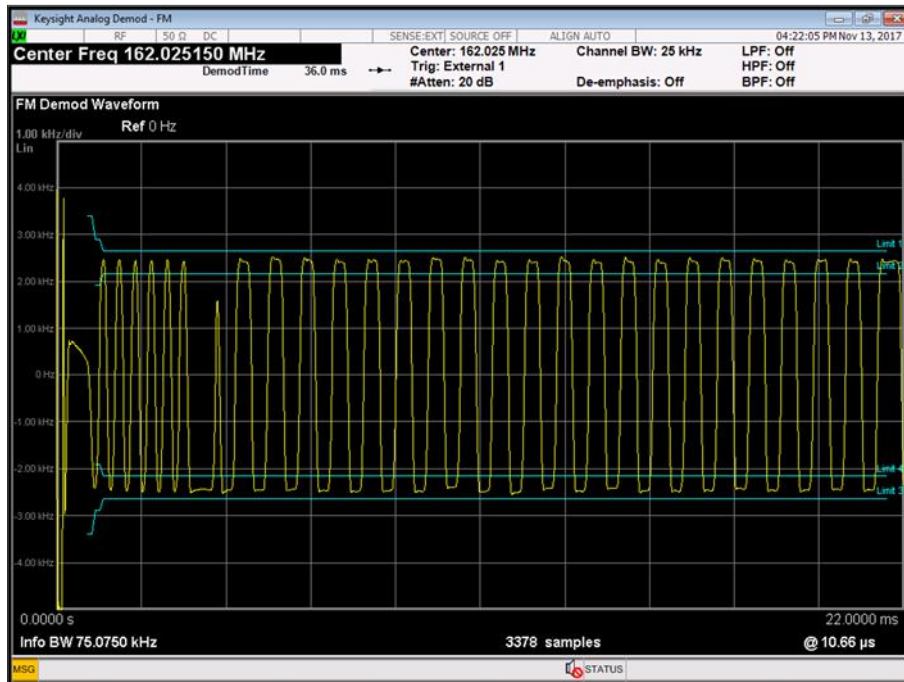


Figure 13 - 162.025 MHz, Test Signal #2, Tx2, +21.9 °C, 12.0 V DC

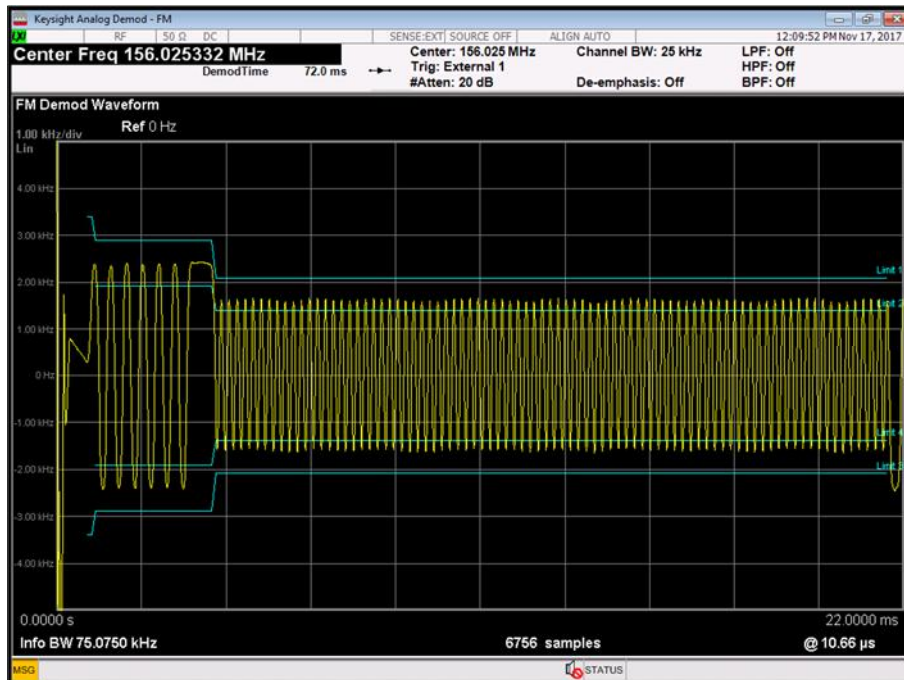


Figure 14 - 156.025 MHz, Test Signal #1, Tx1, -15.0 °C, 9.6 V DC

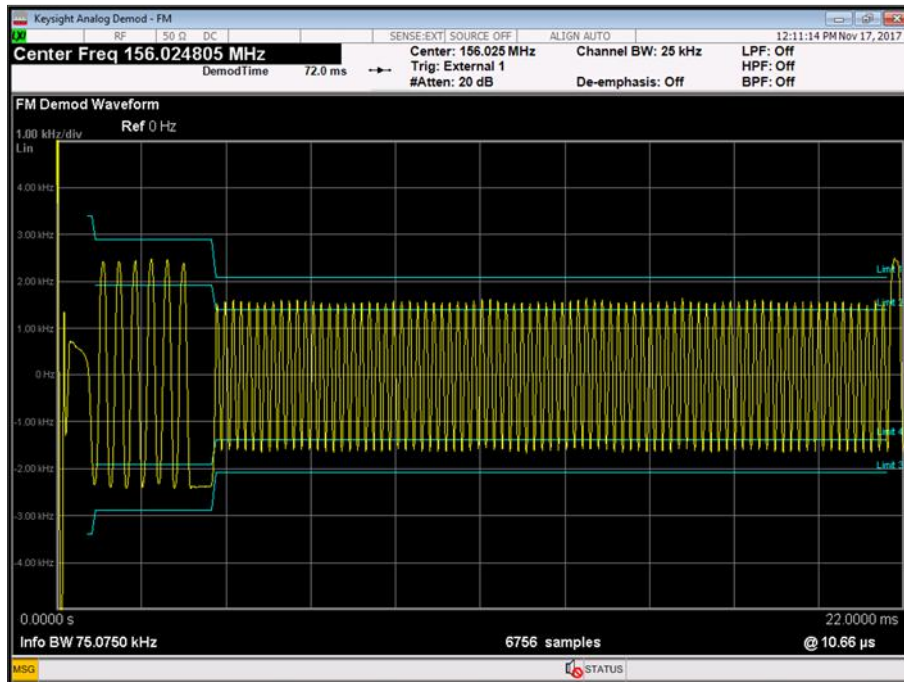


Figure 15 - 156.025 MHz, Test Signal #1, Tx2, -15.0 °C, 9.6 V DC

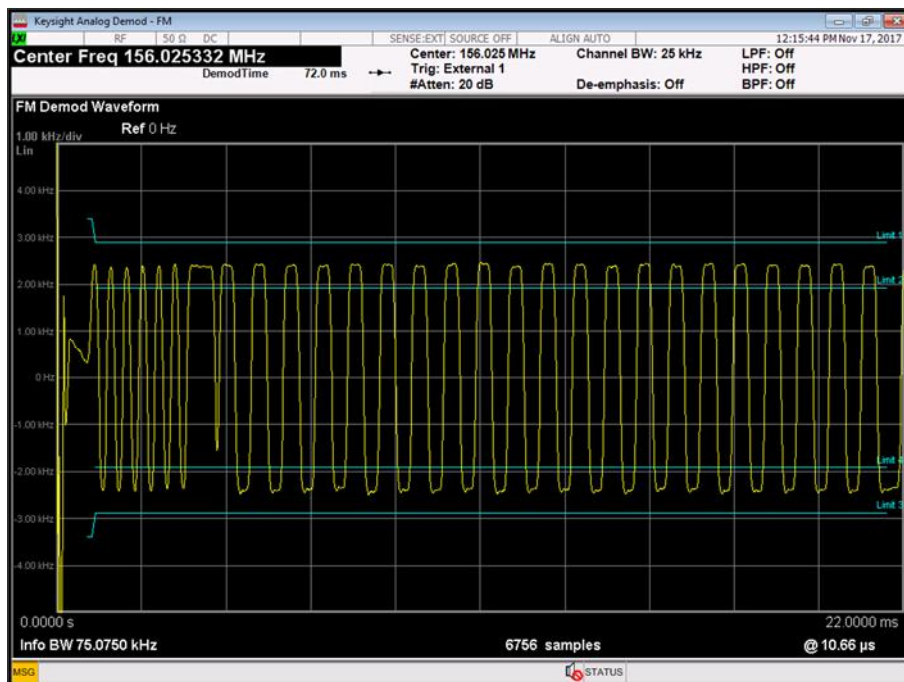


Figure 16 - 156.025 MHz, Test Signal #2, Tx1, -15.0 °C, 9.6 V DC

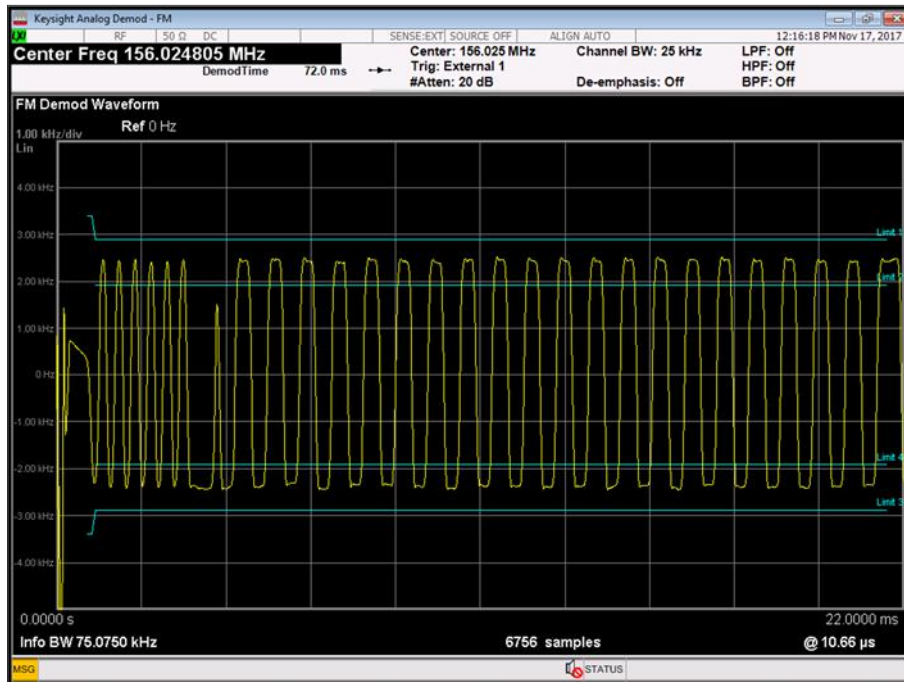


Figure 17 - 156.025 MHz, Test Signal #2, Tx2, -15.0 °C, 9.6 V DC

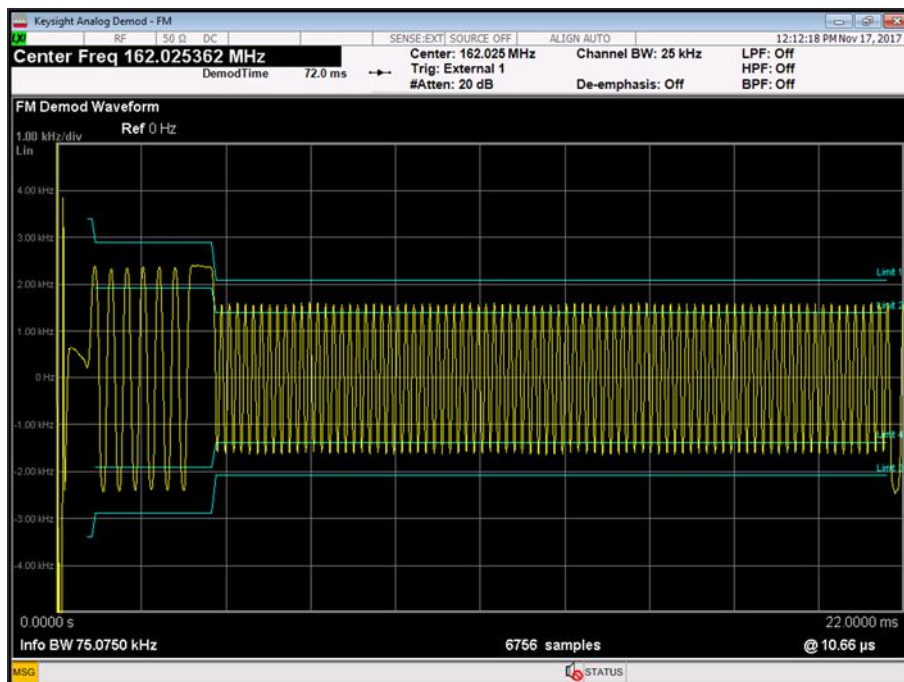


Figure 18 - 162.025 MHz, Test Signal #1, Tx1, -15.0 °C, 9.6 V DC

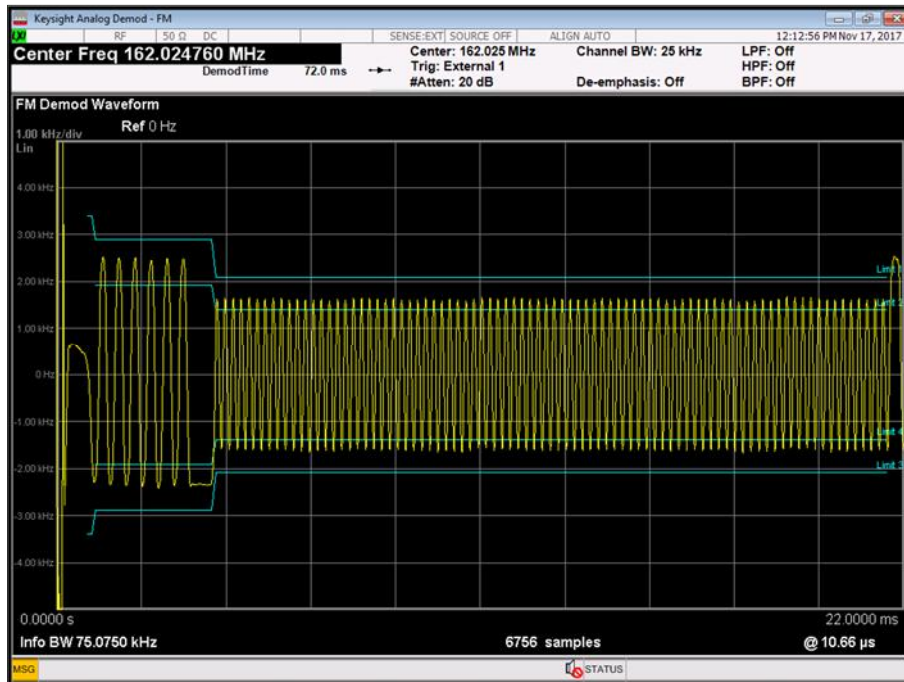


Figure 19 - 162.025 MHz, Test Signal #1, Tx2, -15.0 °C, 9.6 V DC



Figure 20 - 162.025 MHz, Test Signal #2, Tx1, -15.0 °C, 9.6 V DC

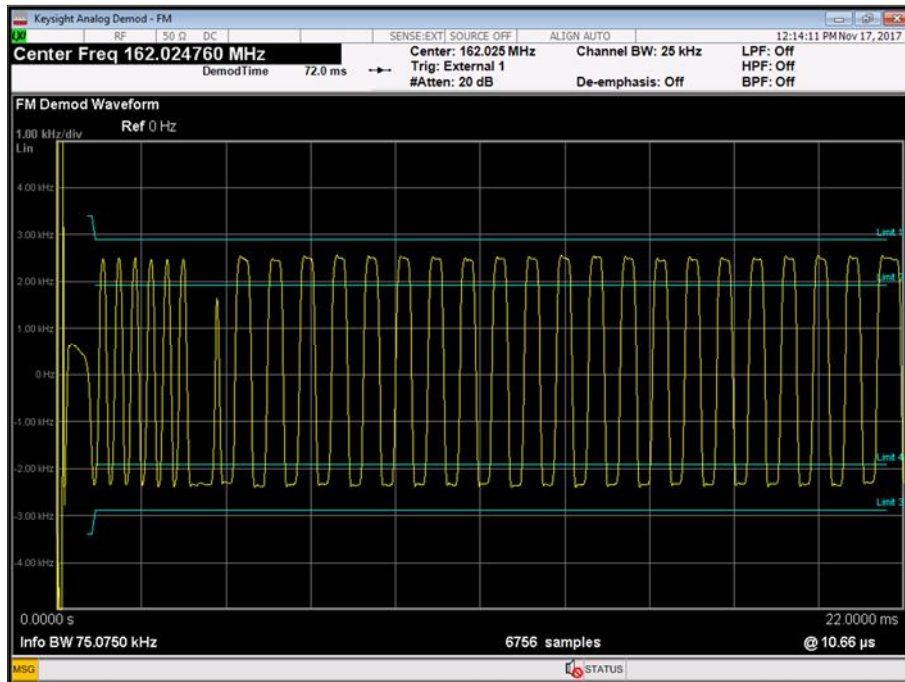


Figure 21 - 162.025 MHz, Test Signal #2, Tx2, -15.0 °C, 9.6 V DC



Figure 22 - 156.025 MHz, Test Signal #1, Tx1, +55.0 °C, 31.2 V DC



Figure 23 - 156.025 MHz, Test Signal #1, Tx2, +55.0 °C, 31.2 V DC

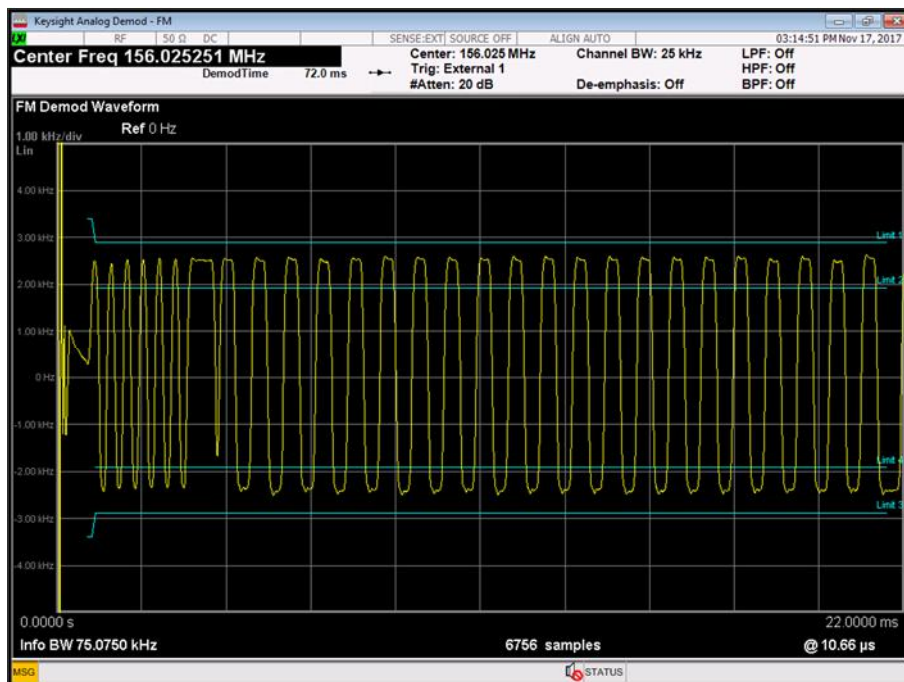


Figure 24 - 156.025 MHz, Test Signal #2, Tx1, +55.0 °C, 31.2 V DC



Figure 25 - 156.025 MHz, Test Signal #2, Tx2, +55.0 °C, 31.2 V DC

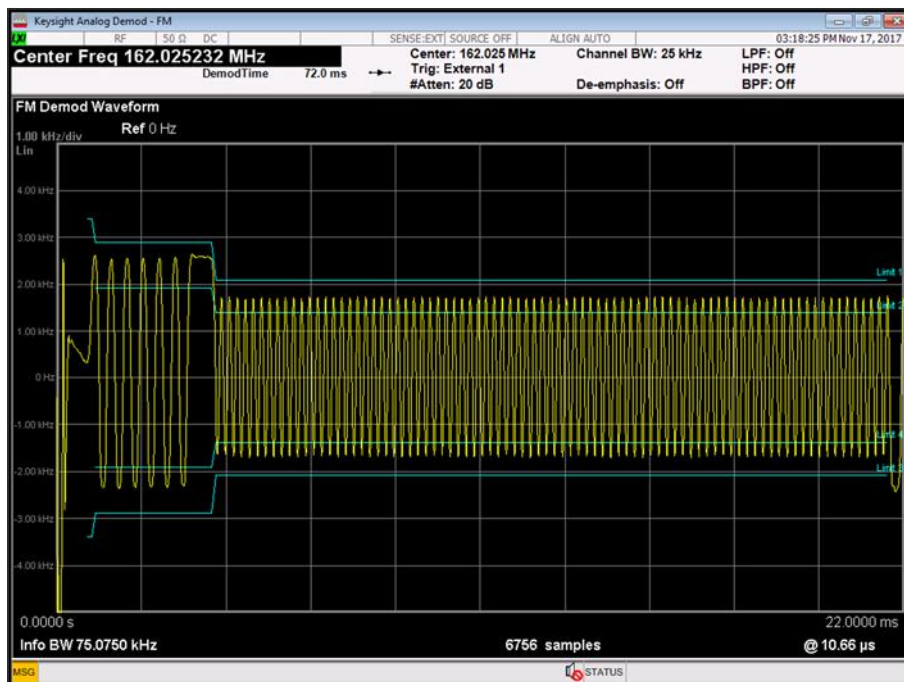


Figure 26 - 162.025 MHz, Test Signal #1, Tx1, +55.0 °C, 31.2 V DC



Figure 27 - 162.025 MHz, Test Signal #1, Tx2, +55.0 °C, 31.2 V DC

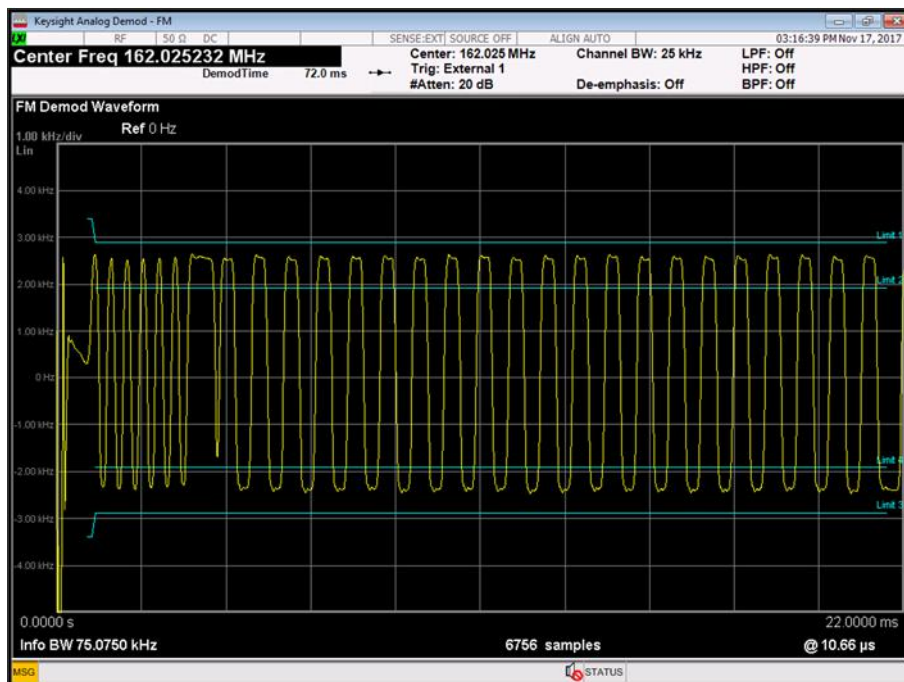


Figure 28 - 162.025 MHz, Test Signal #2, Tx1, +55.0 °C, 31.2 V DC

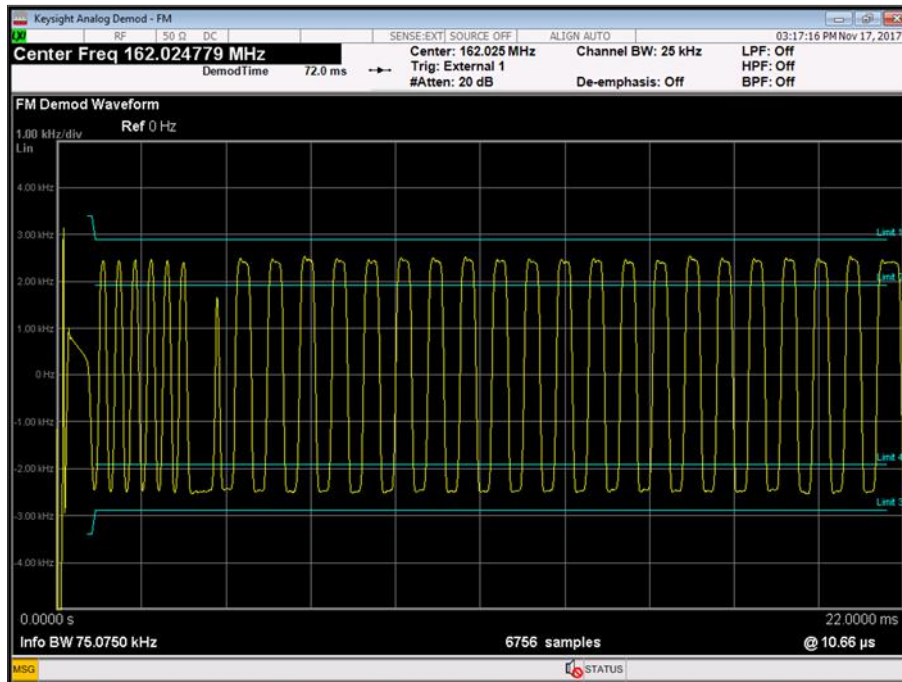


Figure 29 - 162.025 MHz, Test Signal #2, Tx2, +55.0 °C, 31.2 V DC

IEC 62287-2, Limit Clause 11.1.4.3

| Measurement Period from Centre to Centre of each Bit | Test Signal 1 | | Test Signal 2 | |
|--|---------------|---------------|---------------|---------------|
| | Normal | Extreme | Normal | Extreme |
| Ramp Up | < 3400 Hz | | | |
| Bit 0 to Bit 1 | < 3400 Hz | | | |
| Bit 2 to Bit 3 | 2400 ± 480 Hz | | | |
| Bit 4 to Bit 31 | 2400 ± 240 Hz | 2400 ± 480 Hz | 2400 ± 240 Hz | 2400 ± 480 Hz |
| Bit 32 to Bit 199 | 1740 ± 175 Hz | 1740 ± 350 Hz | 2400 ± 240 Hz | 2400 ± 480 Hz |

Table 11 - Peak Frequency Deviation versus Time Limit



2.4.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|-------------------------|-----------------------|----------------------------|-------|-----------------------------|-----------------|
| Climatic Chamber | Votsch | VT4002 | 161 | 12 | O/P Mon |
| Multimeter | White Gold | WG022 | 190 | 12 | 24-Nov-2017 |
| Multimeter | Fluke | 75 Mk3 | 455 | 12 | 14-Sep-2018 |
| Power Supply Unit | Farnell | H60-25 | 1092 | - | O/P Mon |
| Rubidium Standard | Rohde & Schwarz | XSRM | 1316 | 6 | 12-Mar-2018 |
| Hygrometer | Rotronic | I-1000 | 3220 | 12 | 30-Aug-2018 |
| Attenuator (30dB, 150W) | Narda | 769-30 | 3369 | 12 | 31-May-2018 |
| Frequency Standard | Spectracom | Secure Sync 1200-0408-0601 | 4393 | 6 | 12-Mar-2018 |
| 2 metre SMA Cable | Florida Labs | SMS-235SP-78.8-SMS | 4517 | 12 | 19-Sep-2018 |
| PXA Signal Analyser | Keysight Technologies | N9030A | 4653 | 12 | 12-Jan-2018 |

Table 12

O/P Mon – Output Monitored using calibrated equipment



2.5 Transmitter Output Power Versus Time Function

2.5.1 Specification Reference

IEC 62287-2, Clause 11.1.5

2.5.2 Equipment Under Test and Modification State

IRIS, S/N: IRIS EP1#40 - Modification State 0

2.5.3 Date of Test

13-November-2017

2.5.4 Test Method

This test was performed in accordance with IEC 62287-2, clause 11.1.5.2.

2.5.5 Environmental Conditions

Ambient Temperature 21.9 °C

Relative Humidity 26.7 %

2.5.6 Test Results

DC Powered - SOTDMA Transceiver

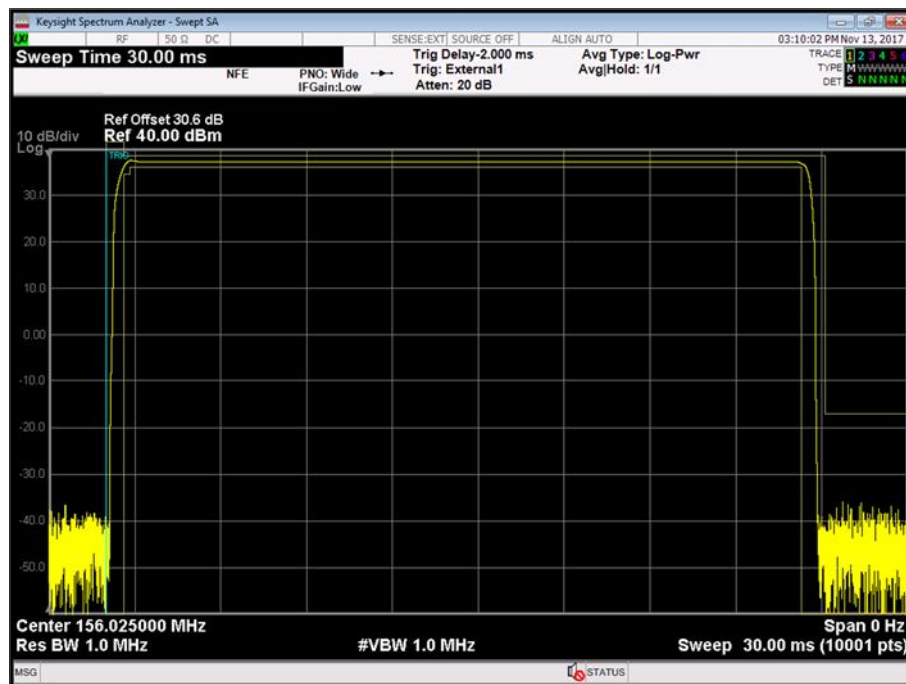


Figure 30 - 156.025 MHz - Tx1 - Complete Burst

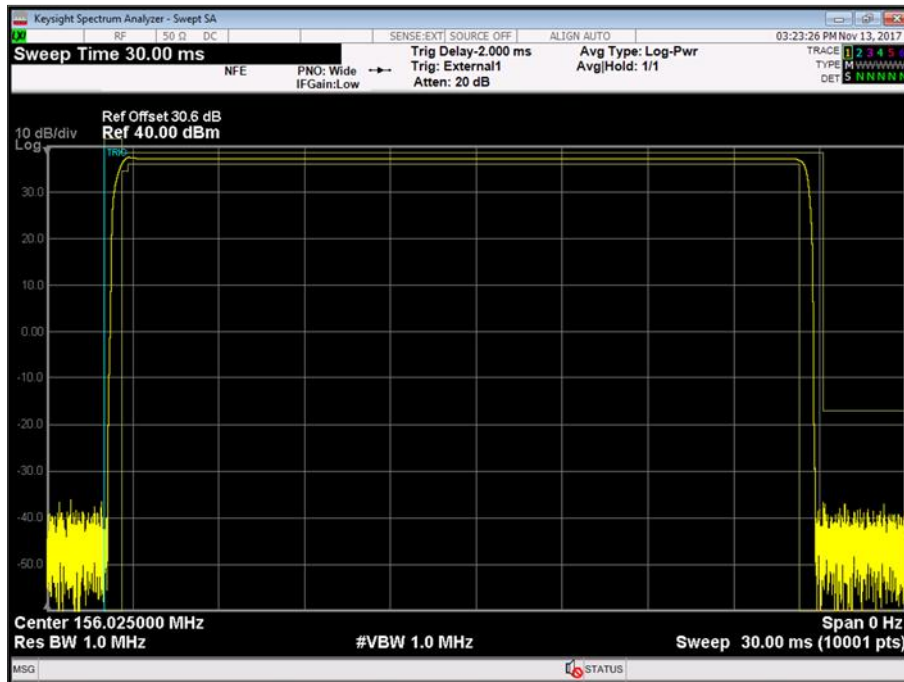


Figure 31 - 156.025 MHz – Tx2 - Complete Burst

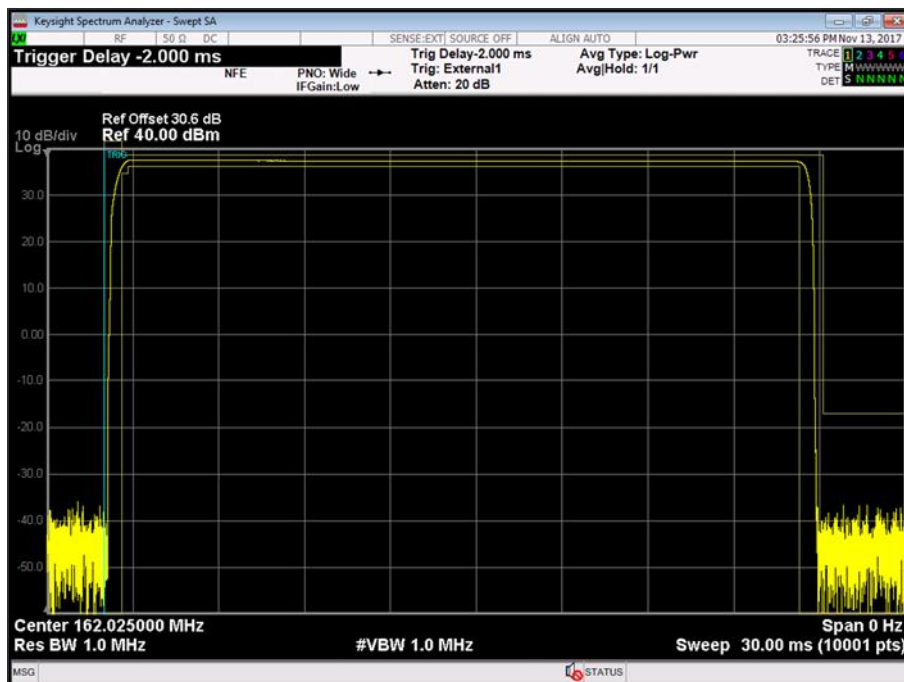


Figure 32 - 162.025 MHz - Tx1 - Complete Burst

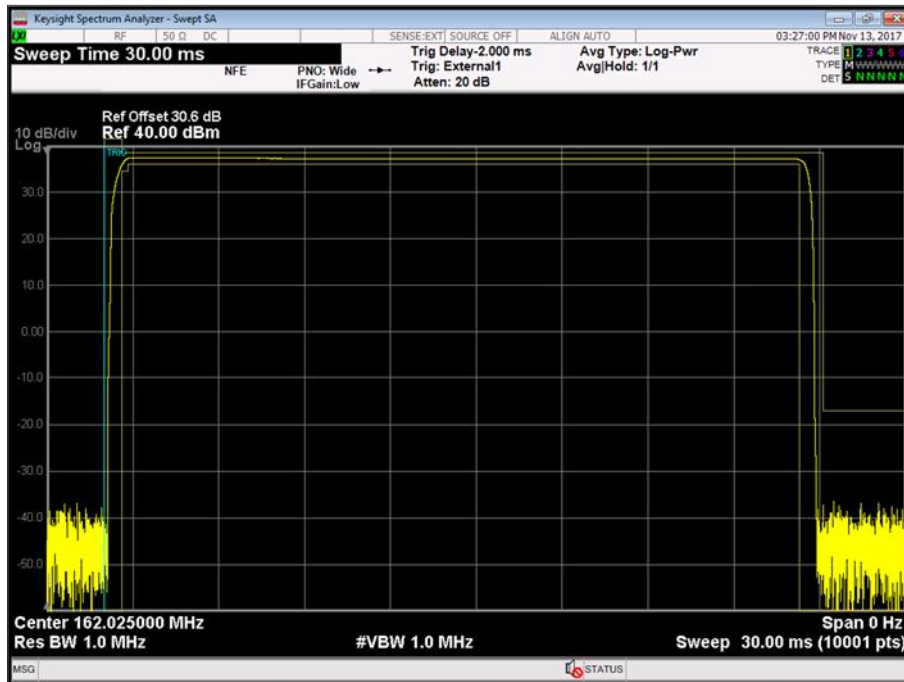


Figure 33 - 162.025 MHz – Tx2 - Complete Burst

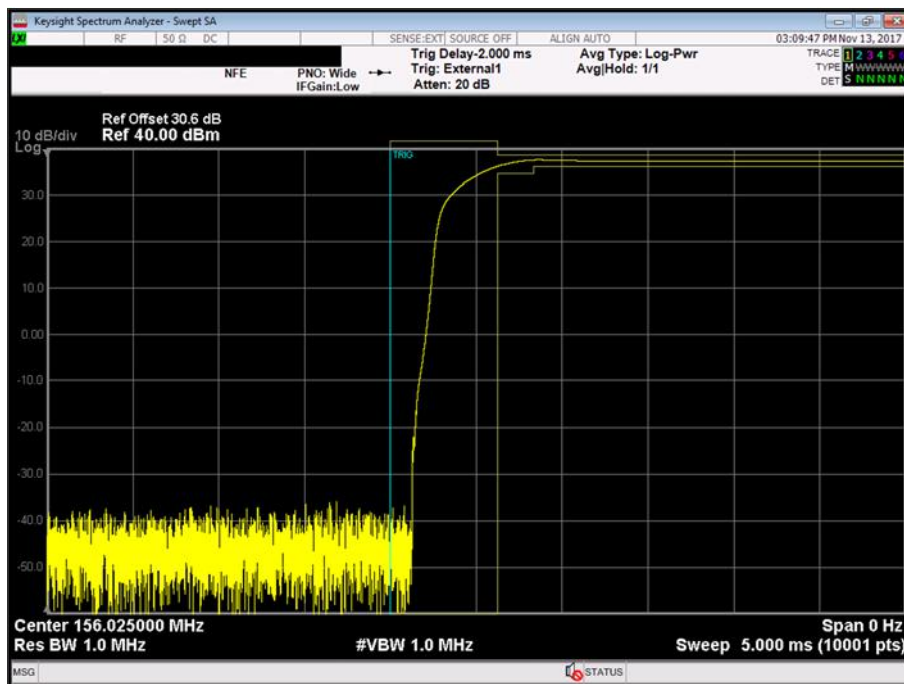


Figure 34 - 156.025 MHz - Tx1 - Ramp Up Zoomed

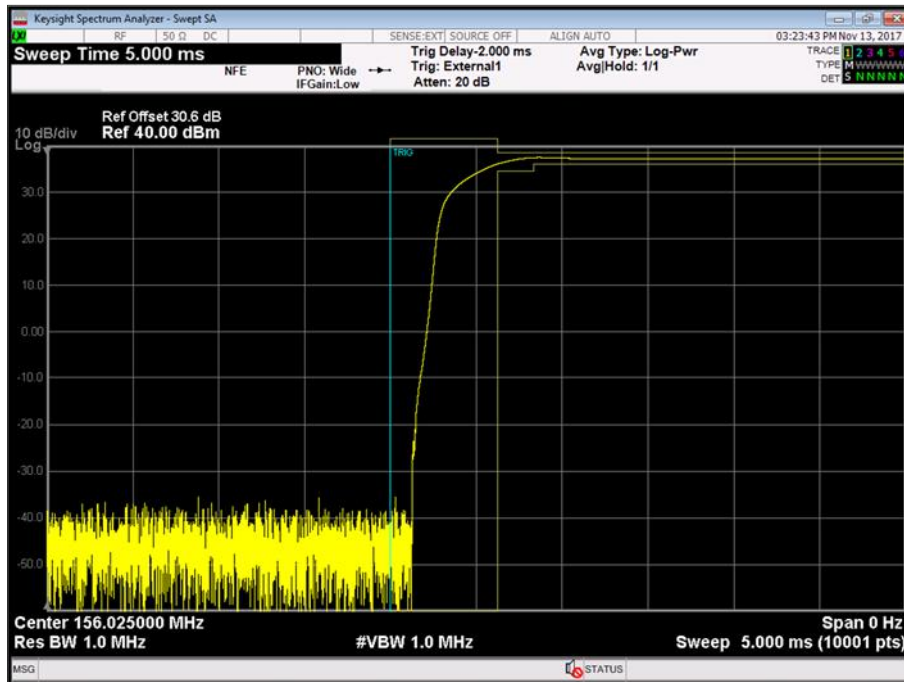


Figure 35 - 156.025 MHz – Tx2 - Ramp Up Zoomed

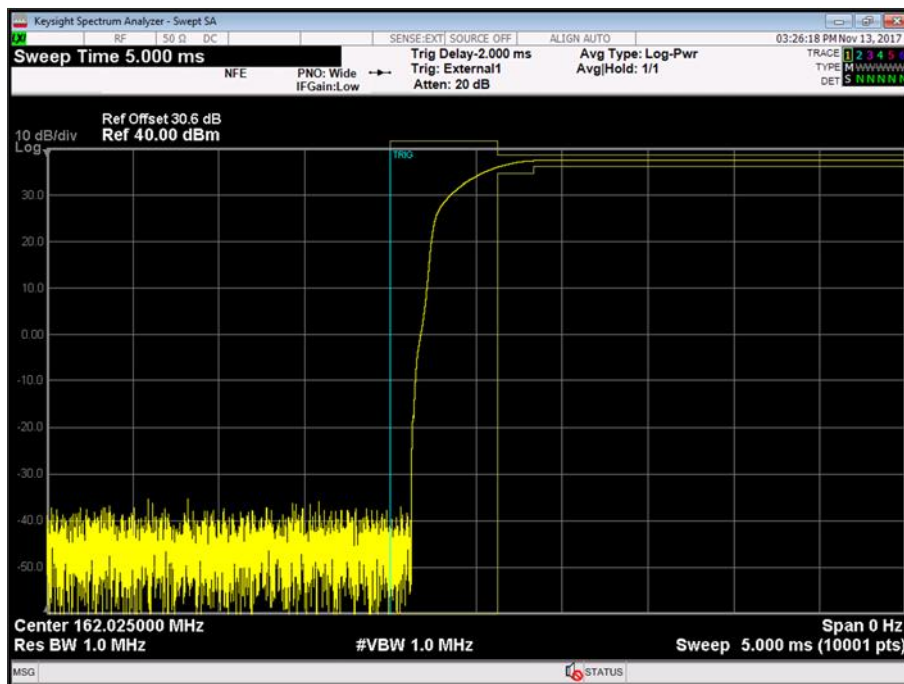


Figure 36 - 162.025 MHz - Tx1 - Ramp Up Zoomed

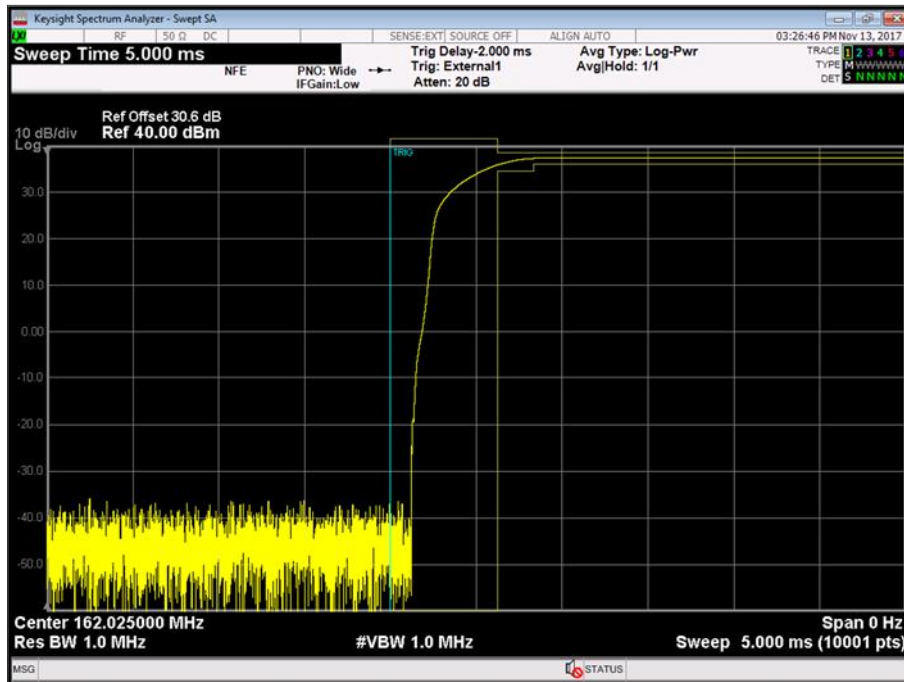


Figure 37 - 162.025 MHz – Tx2 - Ramp Up Zoomed

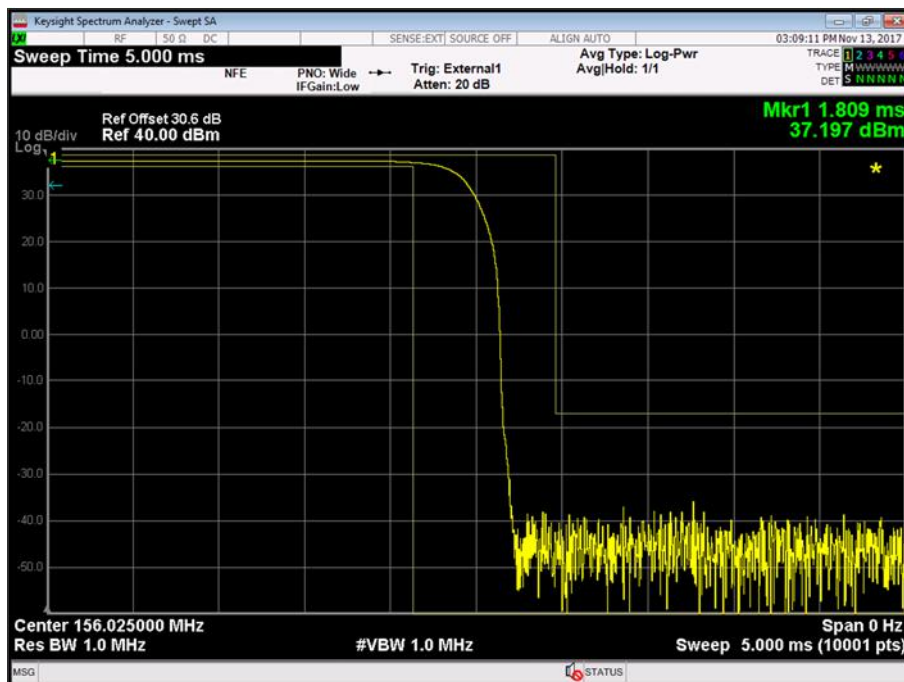


Figure 38 - 156.025 MHz - Tx1 - Ramp Down Zoomed

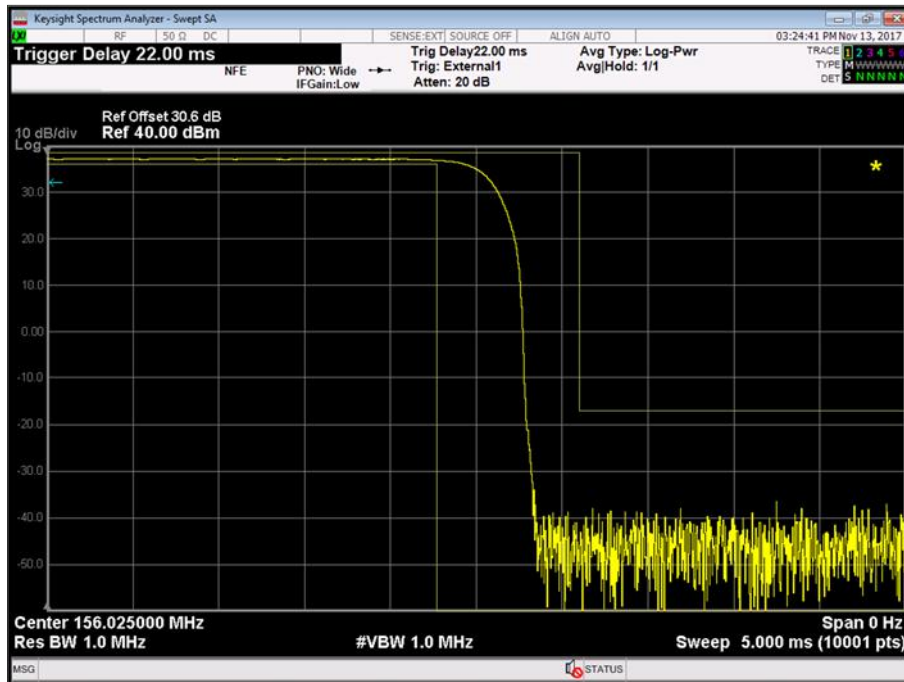


Figure 39 - 156.025 MHz – Tx2 - Ramp Down Zoomed

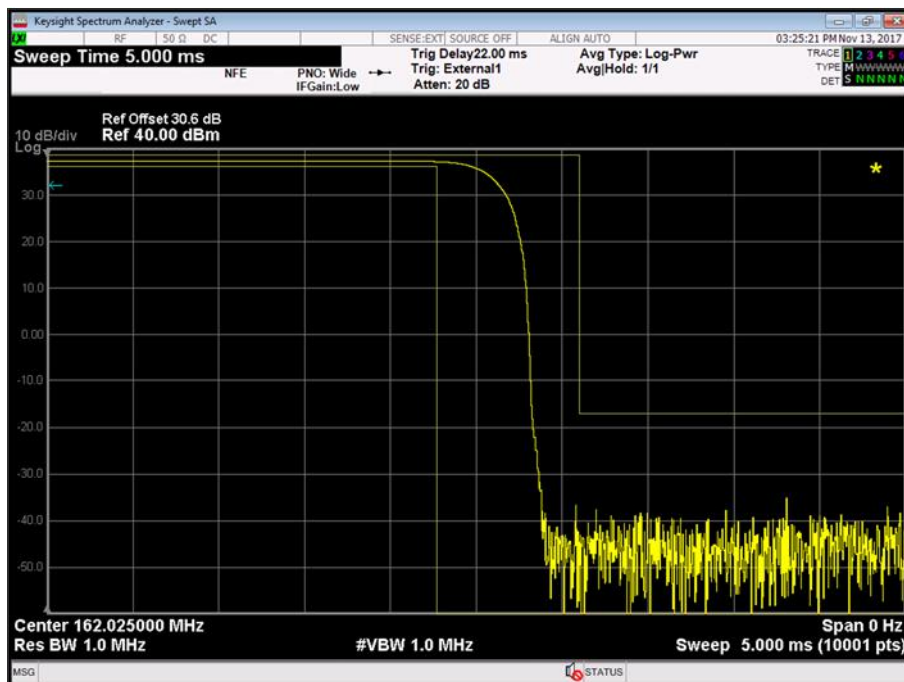


Figure 40 - 162.025 MHz - Tx1 - Ramp Down Zoomed

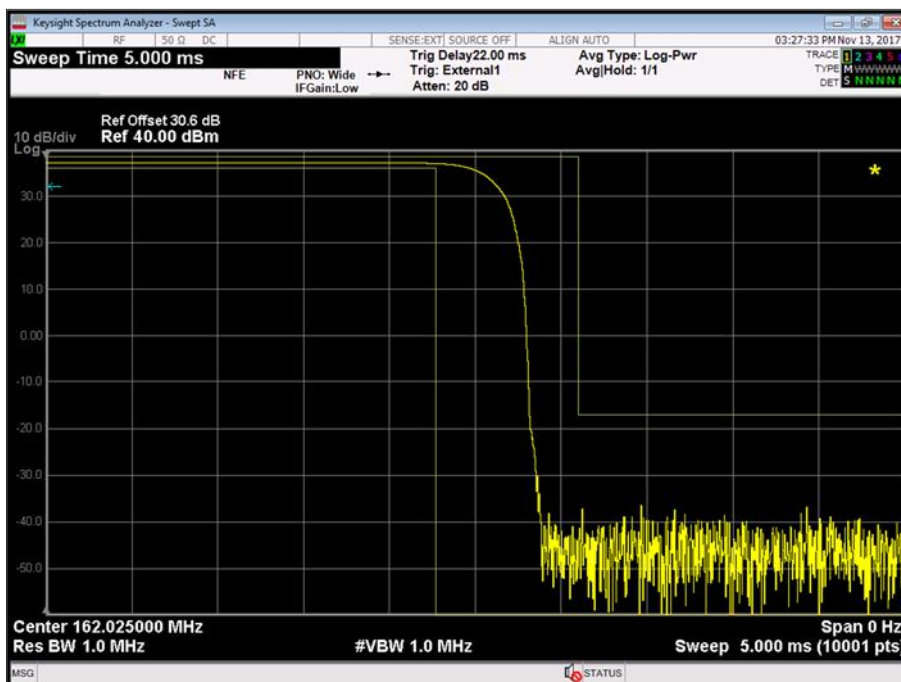


Figure 41 - 162.025 MHz – Tx2 - Ramp Down Zoomed

IEC 62287-2, Limit Clause 11.1.5.3

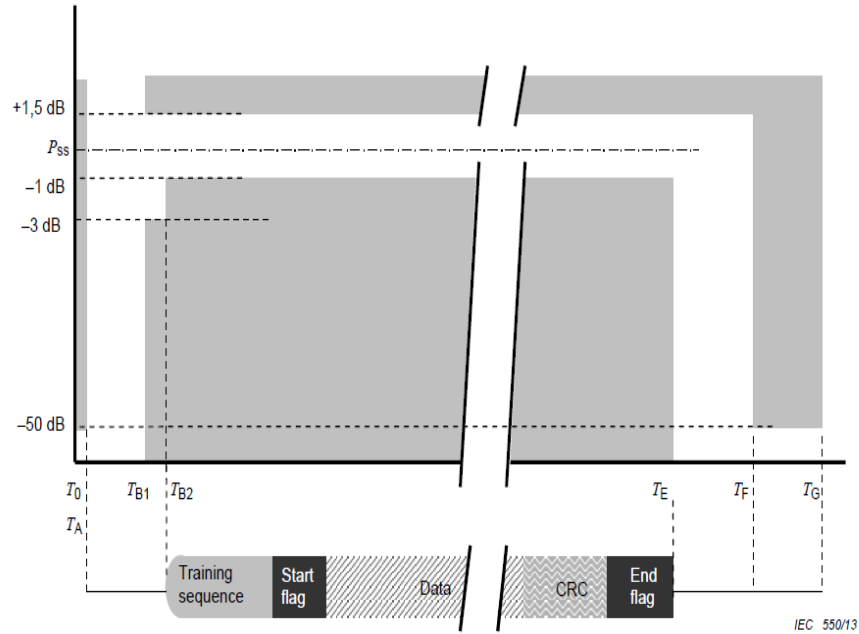


Figure 42 - Power Versus Time Mask

| Reference | Bits | Time (ms) | Definitions | |
|---------------------------------|----------|------------|---|--|
| T_0 | 0 | 0 | Start of transmission slot. Power shall NOT exceed -50 dB of P_{SS} before T_0 | |
| T_A | 0 to 6 | 0 to 0.625 | Power exceeds -50 dB of P_{SS} | |
| T_B | T_{B1} | 6 | 0.625 | Power shall be within ± 1.5 or -3 dB of P_{SS} |
| | T_{B2} | 8 | 0.833 | Power shall be within +1.5 or -1 dB of P_{SS} during the period T_{B2} to T_E (start of training sequence) |
| T_E (includes 1 stuffing bit) | 233 | 24.271 | Power shall remain within +1.5 or -1 dB of P_{SS} during the period T_{BE} to T_E | |
| T_F (includes 1 stuffing bit) | 241 | 25.104 | Power shall be -50 dB of P_{SS} and stay below this | |
| T_G | 256 | 26.667 | Start of next transmission time period | |

Table 13 - Definitions of Timing for Power Versus Time Mask



2.5.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|-------------------------------|-----------------------|--------------------|-------|-----------------------------|-----------------|
| Multimeter | White Gold | WG022 | 190 | 12 | 24-Nov-2017 |
| Power Supply Unit | Farnell | H60-25 | 1092 | - | O/P Mon |
| Hygrometer | Rotronic | I-1000 | 3220 | 12 | 30-Aug-2018 |
| Attenuator (30dB, 150W) | Narda | 769-30 | 3369 | 12 | 31-May-2018 |
| Signal Generator, 9kHz - 3GHz | Rohde & Schwarz | SMA 100A | 3504 | 12 | 17-Oct-2018 |
| 2 metre SMA Cable | Florida Labs | SMS-235SP-78.8-SMS | 4517 | 12 | 19-Sep-2018 |
| PXA Signal Analyser | Keysight Technologies | N9030A | 4653 | 12 | 12-Jan-2018 |

Table 14

O/P Mon – Output Monitored using calibrated equipment



2.6 Sensitivity

2.6.1 Specification Reference

IEC 62287-2, Clause 11.2.1

2.6.2 Equipment Under Test and Modification State

IRIS, S/N: IRIS EP1#2 - Modification State 0

2.6.3 Date of Test

28-November-2017 to 01-December-2017

2.6.4 Test Method

This test was performed in accordance with IEC 62287-2, clause 11.2.1.2.

Three trials of 200 packets were sent for each frequency tested and the average PER was recorded.

2.6.5 Environmental Conditions

Ambient Temperature 21.1 - 22.7 °C

Relative Humidity 25.1 - 32.5 %

2.6.6 Test Results

DC Powered - SOTDMA Transceiver

| Frequency Offset (Hz) | 156.025 MHz | | 162.025 MHz | |
|-----------------------|---------------|---------------|---------------|---------------|
| | PER (%) - Rx1 | PER (%) - Rx2 | PER (%) - Rx1 | PER (%) - Rx2 |
| -500 | 0 | 0 | 0 | 0 |
| 0 | 7.20 | 3.02 | 0.50 | 0.33 |
| 500 | 0.17 | 0.34 | 0 | 0 |

Table 15 - Sensitivity Results at 21.1 °C, 12.0 V DC

| Test Conditions | | 156.025 MHz | | 162.025 MHz | |
|-----------------|-----------|---------------|---------------|---------------|---------------|
| Temperature | Voltage | PER (%) - Rx1 | PER (%) - Rx2 | PER (%) - Rx1 | PER (%) - Rx2 |
| -15.0 °C | 9.6 V DC | 0 | 0 | 0 | 0 |
| +55.0 °C | 31.2 V DC | 0 | 0 | 0 | 0 |

Table 16 - Sensitivity Results at Extreme Test Conditions

IEC 62287-2, Limit Clause 11.2.1.3

The PER shall not exceed 20%.



2.6.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|--|-------------------------|----------------------------|-------|-----------------------------|-----------------|
| Power Splitter | Weinschel | 1506A | 606 | 12 | 05-Apr-2018 |
| Power Supply Unit | Farnell | H60-25 | 1092 | - | O/P Mon |
| Rubidium Standard | Rohde & Schwarz | XSRM | 1316 | 6 | 12-Mar-2018 |
| Climatic Chamber | TAS | Micro 225 | 2892 | - | O/P Mon |
| Thermocouple Thermometer | Fluke | 51 | 3174 | 12 | 22-Dec-2017 |
| Hygrometer | Rotronic | I-1000 | 3220 | 12 | 30-Aug-2018 |
| Programmable Modulation Waveform Generator | Sine Qua Non | PMG1 | 3291 | 12 | O/P Mon |
| DC to TTL Converter | TUV SUD Product Service | - | 3599 | - | TU |
| TRUE RMS MULTIMETER | Fluke | 179 | 4006 | 12 | 13-Dec-2017 |
| Frequency Standard | Spectracom | Secure Sync 1200-0408-0601 | 4393 | 6 | 12-Mar-2018 |
| 2 metre SMA Cable | Florida Labs | SMS-235SP-78.8-SMS | 4517 | 12 | 19-Sep-2018 |
| PXA Signal Analyser | Keysight Technologies | N9030A | 4653 | 12 | 12-Jan-2018 |
| 4 Channel PSU | Rohde & Schwarz | HMP4040 | 4736 | - | O/P Mon |
| Vector Signal Generator | Rohde & Schwarz | SMBV100A | 4886 | 12 | 11-May-2018 |

Table 17

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment



2.7 Error Behaviour at High Input Levels

2.7.1 Specification Reference

IEC 62287-2, Clause 11.2.2

2.7.2 Equipment Under Test and Modification State

IRIS, S/N: IRIS EP1#2 - Modification State 0

2.7.3 Date of Test

29-November-2017

2.7.4 Test Method

This test was performed in accordance with IEC 62287-2, clause 11.2.2.2.

2.7.5 Environmental Conditions

Ambient Temperature 22.2 °C

Relative Humidity 26.9 %

2.7.6 Test Results

DC Powered - SOTDMA Transceiver

| Input Signal Level (dBm) | 156.025 MHz | | 162.025 MHz | |
|--------------------------|---------------|---------------|---------------|---------------|
| | PER (%) - Rx1 | PER (%) - Rx2 | PER (%) - Rx1 | PER (%) - Rx2 |
| -77 | 0 | 0 | 0 | 0 |
| -7 | 0 | 0 | 0 | 0 |

Table 18 - Error Behaviour at High Input Level Results

IEC 62287-2, Limit Clause 11.2.2.3

The PER shall not exceed 2% for an input signal level of -77 dBm and 10% for an input signal level of -7 dBm.



2.7.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|--|-------------------------|----------------------------|-------|-----------------------------|-----------------|
| Power Splitter | Weinschel | 1506A | 606 | 12 | 05-Apr-2018 |
| Power Supply Unit | Farnell | H60-25 | 1092 | - | O/P Mon |
| Rubidium Standard | Rohde & Schwarz | XSRM | 1316 | 6 | 12-Mar-2018 |
| Hygrometer | Rotronic | I-1000 | 3220 | 12 | 30-Aug-2018 |
| Programmable Modulation Waveform Generator | Sine Qua Non | PMG1 | 3291 | 12 | TU |
| DC to TTL Converter | TUV SUD Product Service | - | 3599 | - | TU |
| TRUE RMS MULTIMETER | Fluke | 179 | 4006 | 12 | 13-Dec-2017 |
| Frequency Standard | Spectracom | Secure Sync 1200-0408-0601 | 4393 | 6 | 12-Mar-2018 |
| 2 metre SMA Cable | Florida Labs | SMS-235SP-78.8-SMS | 4517 | 12 | 19-Sep-2018 |
| PXA Signal Analyser | Keysight Technologies | N9030A | 4653 | 12 | 12-Jan-2018 |
| Vector Signal Generator | Rohde & Schwarz | SMBV100A | 4886 | 12 | 11-May-2018 |

Table 19

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment



2.8 Co-channel Rejection

2.8.1 Specification Reference

IEC 62287-2, Clause 11.2.3

2.8.2 Equipment Under Test and Modification State

IRIS, S/N: IRIS EP1#2 - Modification State 0

2.8.3 Date of Test

30-November-2017

2.8.4 Test Method

This test was performed in accordance with IEC 62287-2, clause 11.2.3.2.

Three trials of 200 packets were sent for each frequency tested and the average PER was recorded.

2.8.5 Environmental Conditions

Ambient Temperature 21.3 °C

Relative Humidity 19.4 %

2.8.6 Test Results

DC Powered - SOTDMA Transceiver

| Unwanted Signal Frequency Offset (Hz) | 156.025 MHz | | 162.025 MHz | |
|---------------------------------------|---------------|---------------|---------------|---------------|
| | PER (%) - Rx1 | PER (%) - Rx2 | PER (%) - Rx1 | PER (%) - Rx2 |
| -1000 | 7.37 | 3.02 | 3.69 | 2.18 |
| 0 | 2.01 | 6.03 | 1.17 | 2.35 |
| +1000 | 13.40 | 1.51 | 6.03 | 0.50 |

Table 20 - Co-channel Rejection Results

IEC 62287-2, Limit Clause 11.2.3.3

The PER shall not exceed 20%.



2.8.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|--|-------------------------|----------------------------|-------|-----------------------------|-----------------|
| Power Splitter | Weinschel | 1506A | 606 | 12 | 05-Apr-2018 |
| Power Supply Unit | Farnell | H60-25 | 1092 | - | O/P Mon |
| Rubidium Standard | Rohde & Schwarz | XSRM | 1316 | 6 | 12-Mar-2018 |
| Signal Generator (250kHz to 4GHz) | Agilent Technologies | E4433B | 2893 | 12 | 24-Aug-2018 |
| Hygrometer | Rotronic | I-1000 | 3220 | 12 | 30-Aug-2018 |
| Programmable Modulation Waveform Generator | Sine Qua Non | PMG1 | 3291 | 12 | TU |
| Signal Generator, 9kHz - 3GHz | Rohde & Schwarz | SMA 100A | 3504 | 12 | 17-Oct-2018 |
| DC to TTL Converter | TUV SUD Product Service | - | 3599 | - | TU |
| TRUE RMS MULTIMETER | Fluke | 179 | 4006 | 12 | 13-Dec-2017 |
| Frequency Standard | Spectracom | Secure Sync 1200-0408-0601 | 4393 | 6 | 12-Mar-2018 |
| 2 metre SMA Cable | Florida Labs | SMS-235SP-78.8-SMS | 4517 | 12 | 19-Sep-2018 |
| PXA Signal Analyser | Keysight Technologies | N9030A | 4653 | 12 | 12-Jan-2018 |

Table 21

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment



2.9 Adjacent Channel Selectivity

2.9.1 Specification Reference

IEC 62287-2, Clause 11.2.4

2.9.2 Equipment Under Test and Modification State

IRIS, S/N: IRIS EP1#2 - Modification State 0

2.9.3 Date of Test

29-November-2017

2.9.4 Test Method

This test was performed in accordance with IEC 62287-2, clause 11.2.4.2.

Three trials of 200 packets were sent for each frequency tested and the average PER was recorded.

2.9.5 Environmental Conditions

Ambient Temperature 21.4 °C

Relative Humidity 27.2 %

2.9.6 Test Results

DC Powered - SOTDMA Transceiver

| Unwanted Signal Frequency Offset (kHz) | 156.025 MHz | | 162.025 MHz | |
|--|---------------|---------------|---------------|---------------|
| | PER (%) - Rx1 | PER (%) - Rx2 | PER (%) - Rx1 | PER (%) - Rx2 |
| -25 | 0 | 1.68 | 0 | 0 |
| 25 | 0.34 | 0.67 | 0 | 0 |

Table 22 - Adjacent Channel Selectivity Results

IEC 62287-2, Limit Clause 11.2.4.3

The PER shall not exceed 20%.



2.9.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|--|-------------------------|----------------------------|-------|-----------------------------|-----------------|
| Power Splitter | Weinschel | 1506A | 606 | 12 | 05-Apr-2018 |
| Power Supply Unit | Farnell | H60-25 | 1092 | - | O/P Mon |
| Rubidium Standard | Rohde & Schwarz | XSRM | 1316 | 6 | 12-Mar-2018 |
| Hygrometer | Rotronic | I-1000 | 3220 | 12 | 30-Aug-2018 |
| Programmable Modulation Waveform Generator | Sine Qua Non | PMG1 | 3291 | 12 | TU |
| Signal Generator, 9kHz - 3GHz | Rohde & Schwarz | SMA 100A | 3504 | 12 | 17-Oct-2018 |
| DC to TTL Converter | TUV SUD Product Service | - | 3599 | - | TU |
| TRUE RMS MULTIMETER | Fluke | 179 | 4006 | 12 | 13-Dec-2017 |
| Frequency Standard | Spectracom | Secure Sync 1200-0408-0601 | 4393 | 6 | 12-Mar-2018 |
| 2 metre SMA Cable | Florida Labs | SMS-235SP-78.8-SMS | 4517 | 12 | 19-Sep-2018 |
| PXA Signal Analyser | Keysight Technologies | N9030A | 4653 | 12 | 12-Jan-2018 |
| Vector Signal Generator | Rohde & Schwarz | SMBV100A | 4886 | 12 | 11-May-2018 |

Table 23

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment



2.10 Spurious Response Rejection

2.10.1 Specification Reference

IEC 62287-2, Clause 11.2.5

2.10.2 Equipment Under Test and Modification State

IRIS, S/N: IRIS EP1#40 - Modification State 0
 IRIS, S/N: IRIS EP1#2 - Modification State 0 and Modification State 1.

2.10.3 Date of Test

15-November-2017 to 07-December-2017

2.10.4 Test Method

This test was performed in accordance with IEC 62287-2, clause 11.2.5.4 and 11.2.5.5.

The search over the limited frequency range was performed using the SINAD method. The test sample "IRIS, S/N: IRIS EP1#40" had been modified with AF outputs for Rx1 and Rx2.

Final measurements were performed using the PER method. The test sample "IRIS, S/N: IRIS EP1#2" was used for PER measurements as no modifications had been made to this sample. All testing was performed using modification state 0 except for measuring the PER for responses which were identified during the limited frequency range sweep which were performed using modification state 1 (see section 1.7 for details). Only responses that resulted in a PER > 0% were recorded in the tables below for frequencies that were identified during the limited frequency range search.

2.10.5 Environmental Conditions

Ambient Temperature 21.1 - 23.7 °C
 Relative Humidity 31.3 - 32.5 %

2.10.6 Test Results

DC Powered - SOTDMA Transceiver

| Test Parameter | Value |
|---|--|
| List of Intermediate Frequencies | IF1 = 19.655 MHz (Rx1) IF1 = 29.255 MHz (RF2), IF2 = 0.455 MHz |
| Switching Range of the Receiver | 156.025 MHz to 156.025 MHz |
| Frequency of the Local Oscillator at 162.025 MHz (AIS2) | 142.37 MHz (Rx1), 191.28 MHz (Rx2) |
| Frequency of the Local Oscillator at 156.025 MHz | 136.37 MHz (Rx1), 185.28 MHz (Rx2) |
| Calculated Limited Frequency Range | 113.26 MHz to 165.48 MHz (Rx1), 152.57 MHz to 223.99 MHz (Rx2) |

Table 24 - Test Parameters for Spurious Response Rejection



| Frequency (MHz) | PER (%) |
|-----------------|---------|
| * | |

Table 25 - Spurious Responses - 156.025 MHz

No other responses were identified during the Limited Frequency Range Sweep.

| Frequency (MHz) | PER (%) |
|-----------------|---------|
| * | |

Table 26 - Spurious Responses - 162.025 MHz

*No responses were identified during the Limited Frequency Range Sweep.

| K | Calculated Frequency (MHz) for SF11 | PER (%) - Rx1 | |
|----|-------------------------------------|---------------|-------------|
| | | 156.025 MHz | 162.025 MHz |
| -2 | 265.085 | 0 | 0 |
| 2 | 304.395 | 0 | 0 |
| -3 | 407.455 | 0 | 0 |
| 3 | 446.765 | 0 | 0 |
| -4 | 549.825 | 0 | 0 |
| 4 | 589.135 | 0 | 0 |

Table 27 - Identified Frequencies Spurious Responses (SFI₁) for Rx1

| K | Calculated Frequency (MHz) for SF11 | PER (%) - Rx1 | |
|----|-------------------------------------|---------------|-------------|
| | | 156.025 MHz | 162.025 MHz |
| -2 | 253.085 | 0 | 0 |
| 2 | 292.395 | 0 | 0 |
| -3 | 389.455 | 0 | 0 |
| 3 | 428.765 | 0 | 0 |
| -4 | 525.825 | 0 | 0 |
| 4 | 565.135 | 0 | 0 |

Table 28 - Identified Frequencies Spurious Responses (SFI₂) for Rx1



| K | Calculated Frequency (MHz) for SF11 | PER (%) - Rx2 | |
|----|-------------------------------------|---------------|-------------|
| | | 156.025 MHz | 162.025 MHz |
| -2 | 353.305 | 0 | 0 |
| 2 | 411.815 | 0 | 0 |
| -3 | 544.585 | 0 | 0 |
| 3 | 603.095 | 0 | 0 |
| -4 | 735.865 | 0 | 0 |
| 4 | 794.375 | 0 | 0 |

Table 29 - Identified Frequencies Spurious Responses (SF1₁) for Rx2

| K | Calculated Frequency (MHz) for SF12 | PER (%) - Rx2 | |
|----|-------------------------------------|---------------|-------------|
| | | 156.025 MHz | 162.025 MHz |
| -2 | 341.305 | 0 | 0 |
| 2 | 399.815 | 0 | 0 |
| -3 | 526.585 | 0 | 0 |
| 3 | 585.095 | 0 | 0 |
| -4 | 711.865 | 0 | 0 |
| 4 | 70.375 | 0 | 0 |

Table 30 - - Identified Frequencies Spurious Responses (SF1₂) for Rx2

IEC 62287-2 Limit Clause 11.2.6.3

The PER shall not exceed 20%.



2.10.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|--|-----------------------|----------------------------|-------|-----------------------------|-----------------|
| Power Splitter | Weinschel | 1506A | 606 | 12 | 05-Apr-2018 |
| Power Supply Unit | Farnell | H60-25 | 1092 | - | O/P Mon |
| Rubidium Standard | Rohde & Schwarz | XSRM | 1316 | 6 | 12-Mar-2018 |
| Signal Generator | Rohde & Schwarz | SMY 01 | 1389 | 12 | 09-May-2018 |
| Audio Analyser | Hewlett Packard | 8903B | 1881 | 12 | 17-Nov-2018 |
| Hygrometer | Rotronic | I-1000 | 3220 | 12 | 30-Aug-2018 |
| Programmable Modulation Waveform Generator | Sine Qua Non | PMG1 | 3291 | 12 | TU |
| Signal Generator, 9kHz - 3GHz | Rohde & Schwarz | SMA 100A | 3504 | 12 | 17-Oct-2018 |
| TRUE RMS MULTIMETER | Fluke | 179 | 4006 | 12 | 13-Dec-2017 |
| Frequency Standard | Spectracom | Secure Sync 1200-0408-0601 | 4393 | 6 | 12-Mar-2018 |
| 2 metre SMA Cable | Florida Labs | SMS-235SP-78.8-SMS | 4517 | 12 | 19-Sep-2018 |
| PXA Signal Analyser | Keysight Technologies | N9030A | 4653 | 12 | 12-Jan-2018 |
| Vector Signal Generator | Rohde & Schwarz | SMBV100A | 4886 | 12 | 11-May-2018 |

Table 31

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment



2.11 Intermodulation Response Rejection

2.11.1 Specification Reference

IEC 62287-2, Clause 11.2.6

2.11.2 Equipment Under Test and Modification State

IRIS, S/N: IRIS EP1#2 - Modification State 0

2.11.3 Date of Test

30-November-2017

2.11.4 Test Method

This test was performed in accordance with IEC 62287-2, clause 11.2.6.2.

2.11.5 Environmental Conditions

Ambient Temperature 21.4 °C

Relative Humidity 21.5 %

2.11.6 Test Results

DC Powered - SOTDMA Transceiver

| Test Number | Generator A (Wanted AIS Signal) | Generator B (Unmodulated ±50 kHz) | Generator C (Modulated ±100 kHz) | PER (%) | |
|-------------|---------------------------------------|---|--|---------|-----|
| | | | | Rx1 | Rx2 |
| 1 | 162.025 MHz | 162.075 MHz | 162.125 MHz | 0 | 0 |
| 2 | 162.025 MHz | 161.975 MHz | 161.925 MHz | 0 | 0 |
| 3 | 156.025 MHz | 156.075 MHz | 156.125 MHz | 0 | 0 |
| 4 | 156.025 MHz | 155.975 MHz | 155.925 MHz | 0 | 0 |

Table 32 - Intermodulation Results

IEC 62287-2 Limit clause 11.2.6.3

The PER shall not exceed 20%.



2.11.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|--|-------------------------|----------------------------|-------|-----------------------------|-----------------|
| Power Splitter | Weinschel | 1506A | 606 | 12 | 05-Apr-2018 |
| Power Supply Unit | Farnell | H60-25 | 1092 | - | O/P Mon |
| Rubidium Standard | Rohde & Schwarz | XSRM | 1316 | 6 | 12-Mar-2018 |
| Signal Generator | Rohde & Schwarz | SMY 01 | 1389 | 12 | 09-May-2018 |
| Hygrometer | Rotronic | I-1000 | 3220 | 12 | 30-Aug-2018 |
| Programmable Modulation Waveform Generator | Sine Qua Non | PMG1 | 3291 | 12 | TU |
| Signal Generator, 9kHz - 3GHz | Rohde & Schwarz | SMA 100A | 3504 | 12 | 17-Oct-2018 |
| DC to TTL Converter | TUV SUD Product Service | - | 3599 | - | TU |
| Combiner/Splitter | Weinschel | 1506A | 3877 | 12 | 05-Apr-2018 |
| TRUE RMS MULTIMETER | Fluke | 179 | 4006 | 12 | 13-Dec-2017 |
| Frequency Standard | Spectracom | Secure Sync 1200-0408-0601 | 4393 | 6 | 12-Mar-2018 |
| 2 metre SMA Cable | Florida Labs | SMS-235SP-78.8-SMS | 4517 | 12 | 19-Sep-2018 |
| PXA Signal Analyser | Keysight Technologies | N9030A | 4653 | 12 | 12-Jan-2018 |
| Vector Signal Generator | Rohde & Schwarz | SMBV100A | 4886 | 12 | 11-May-2018 |

Table 33

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment



2.12 Blocking or Desensitisation

2.12.1 Specification Reference

IEC 62287-2, Clause 11.2.7

2.12.2 Equipment Under Test and Modification State

IRIS, S/N: IRIS EP1#2 - Modification State 0

2.12.3 Date of Test

30-November-2017

2.12.4 Test Method

This test was performed in accordance with IEC 62287-2, clause 11.2.7.2.

2.12.5 Environmental Conditions

Ambient Temperature 21.9 °C

Relative Humidity 21.3 %

2.12.6 Test Results

DC Powered - SOTDMA Transceiver

| Unwanted Signal Frequency Offset (MHz) | Packet Error Ratio (%) | | | |
|--|------------------------|-----|-------------|-----|
| | 156.025 MHz | | 162.025 MHz | |
| | Rx1 | Rx2 | Rx1 | Rx2 |
| -10 | 0 | 0 | 0 | 0 |
| -5 | 0 | 0 | 0 | 0 |
| -2 | 0 | 0 | 0 | 0 |
| -1 | 0 | 0 | 0 | 0 |
| -0.5 | 0 | 0 | 0 | 0 |
| 0.5 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 0 | 0 |
| 5 | 0 | 0 | 0 | 0 |
| 10 | 0 | 0 | 0 | 0 |

Table 34 - Blocking Results

IEC 62287-2, Limit Clause 11.2.7.3

The maximum packet error rate shall not exceed 20%.



2.12.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|--|-------------------------|----------------------------|-------|-----------------------------|-----------------|
| Power Splitter | Weinschel | 1506A | 606 | 12 | 05-Apr-2018 |
| Power Supply Unit | Farnell | H60-25 | 1092 | - | O/P Mon |
| Rubidium Standard | Rohde & Schwarz | XSRM | 1316 | 6 | 12-Mar-2018 |
| Hygrometer | Rotronic | I-1000 | 3220 | 12 | 30-Aug-2018 |
| Programmable Modulation Waveform Generator | Sine Qua Non | PMG1 | 3291 | 12 | TU |
| Signal Generator, 9kHz - 3GHz | Rohde & Schwarz | SMA 100A | 3504 | 12 | 17-Oct-2018 |
| DC to TTL Converter | TUV SUD Product Service | - | 3599 | - | TU |
| TRUE RMS MULTIMETER | Fluke | 179 | 4006 | 12 | 13-Dec-2017 |
| Frequency Standard | Spectracom | Secure Sync 1200-0408-0601 | 4393 | 6 | 12-Mar-2018 |
| 2 metre SMA Cable | Florida Labs | SMS-235SP-78.8-SMS | 4517 | 12 | 19-Sep-2018 |
| PXA Signal Analyser | Keysight Technologies | N9030A | 4653 | 12 | 12-Jan-2018 |
| Vector Signal Generator | Rohde & Schwarz | SMBV100A | 4886 | 12 | 11-May-2018 |

Table 35

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment



2.13 Spurious Emissions from the Receiver

2.13.1 Specification Reference

IEC 62287-2, Clause 11.3.1

2.13.2 Equipment Under Test and Modification State

IRIS, S/N: IRIS EP1#2 - Modification State 1

2.13.3 Date of Test

15-November-2017 to 16-November-2017

2.13.4 Test Method

This test was performed in accordance with IEC 62287-1, clause 11.3.1.2.

For spurious emissions below 30 MHz, the EUT was placed inside a screened chamber and the power and RF cables were connected to the test equipment which were situated outside the chamber via a bulkhead to reduce any common-mode noise coupling on to the EUT. The EUT was also powered by a Halford 950295 12 V DC Battery (s/n:950295).

For spurious emission above 30 MHz, testing was performed on the bench in the lab and the EUT antenna port was connected to the spectrum analyser. The EUT was powered using a bench PSU as detailed in the test equipment list.

2.13.5 Environmental Conditions

Ambient Temperature 21.1 - 23.2 °C
Relative Humidity 37.7 - 49.6 %

2.13.6 Test Results

DC Powered - SOTDMA Transceiver

| Frequency (MHz) | Level (dBm) |
|-----------------|-------------|
| 435.46 | -58.37 |

Table 36 - Receiver Emissions Results - 156.025 MHz

No other emissions were detected within 6 dB of the limit.

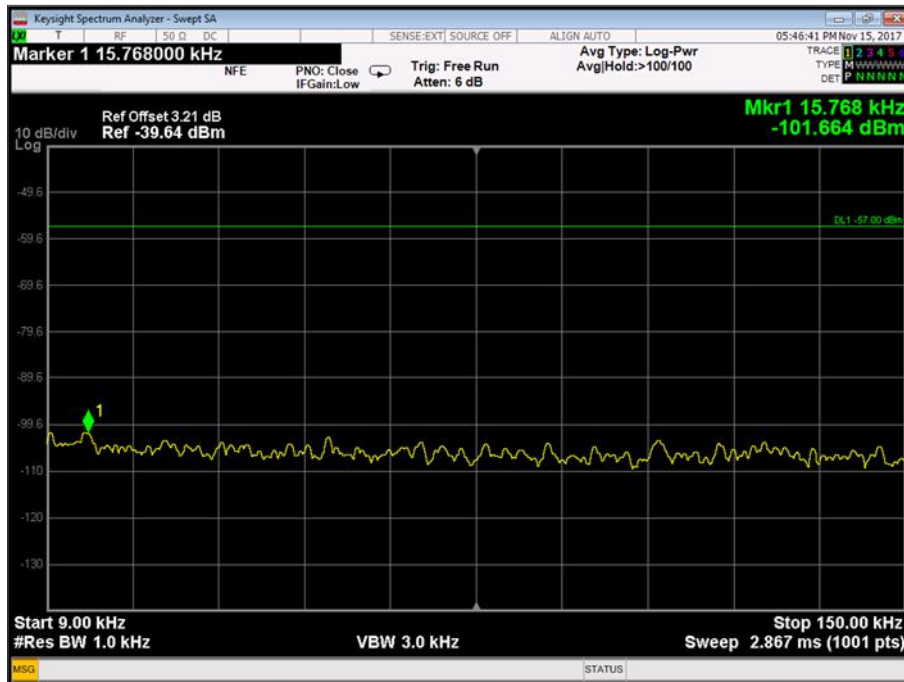


Figure 43 - 156.025 MHz - 9 kHz to 150 kHz

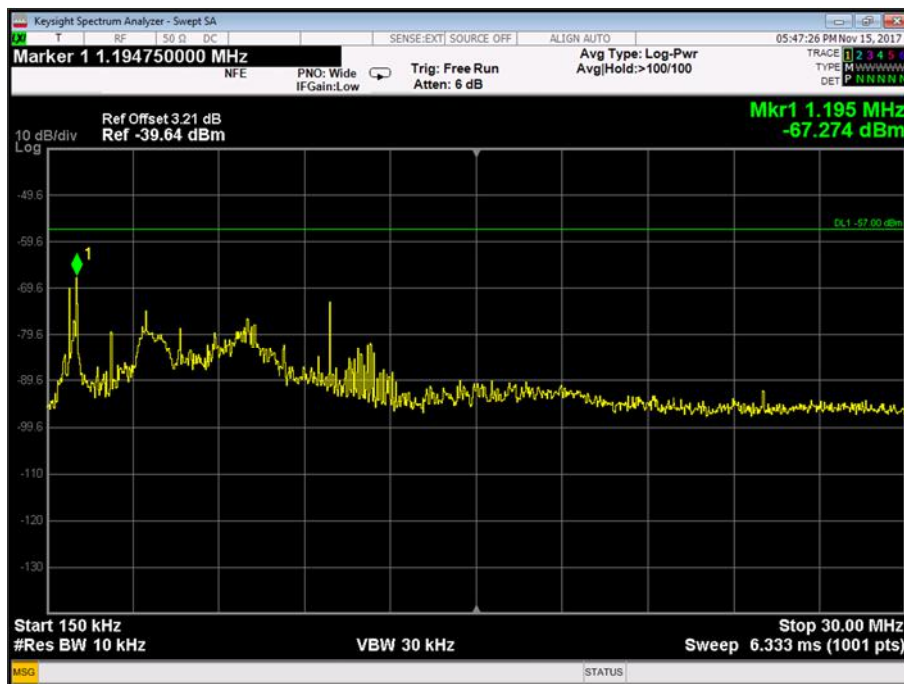


Figure 44 - 156.025 MHz - 150 kHz to 30 MHz

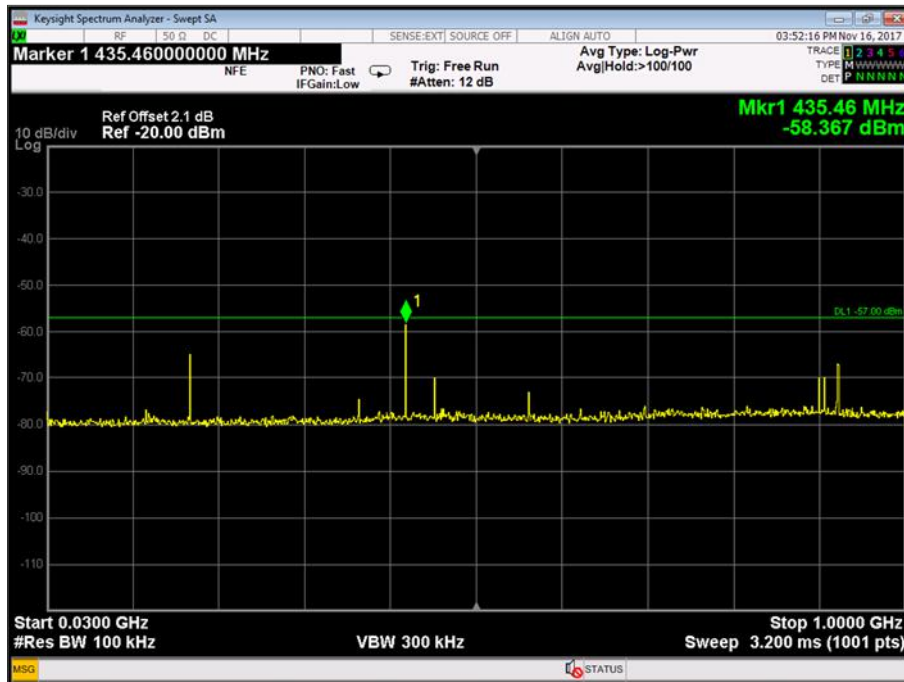


Figure 45 - 156.025 MHz - 30 MHz to 1 GHz

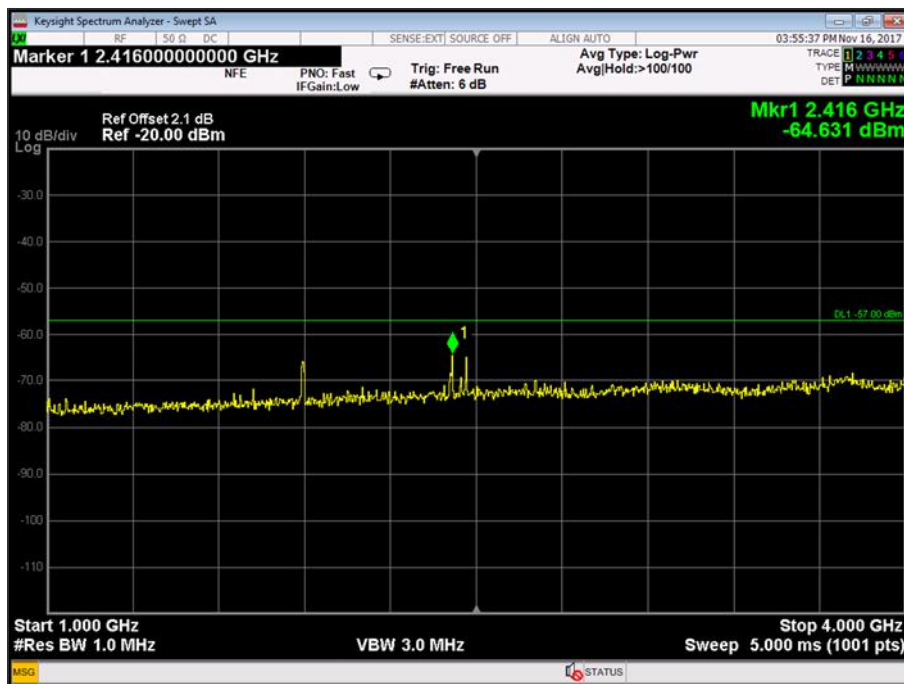


Figure 46 - 156.025 MHz - 1 GHz to 4 GHz



| Frequency (MHz) | Level (dBm) |
|-----------------|-------------|
| 435.46 | -60.13 |

Table 37 - Receiver Emissions Results - 162.025 MHz

No other emissions were detected within 6 dB of the limit.

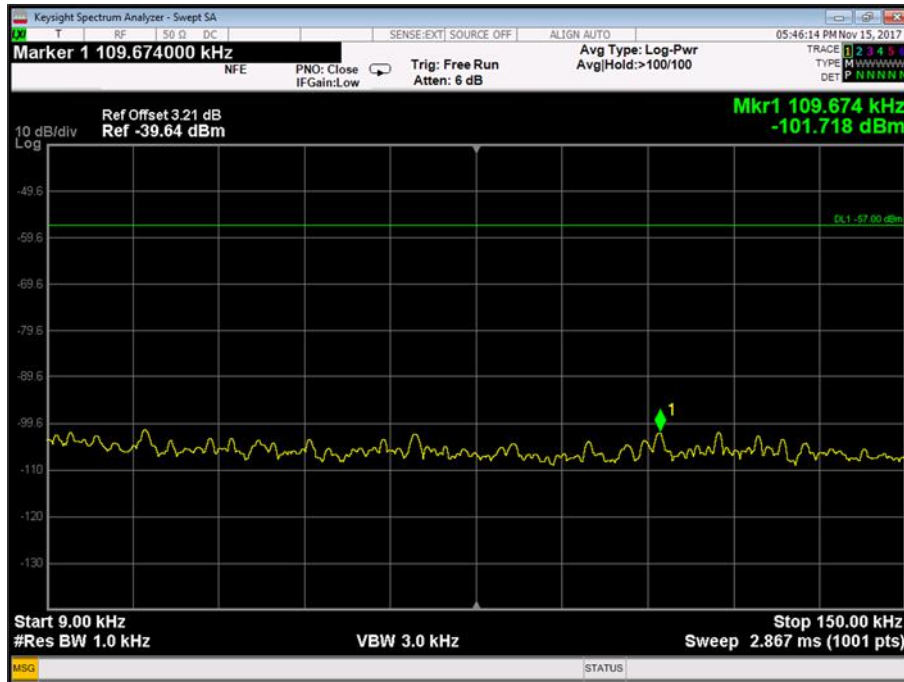


Figure 47 - 162.025 MHz - 9 kHz to 150 kHz

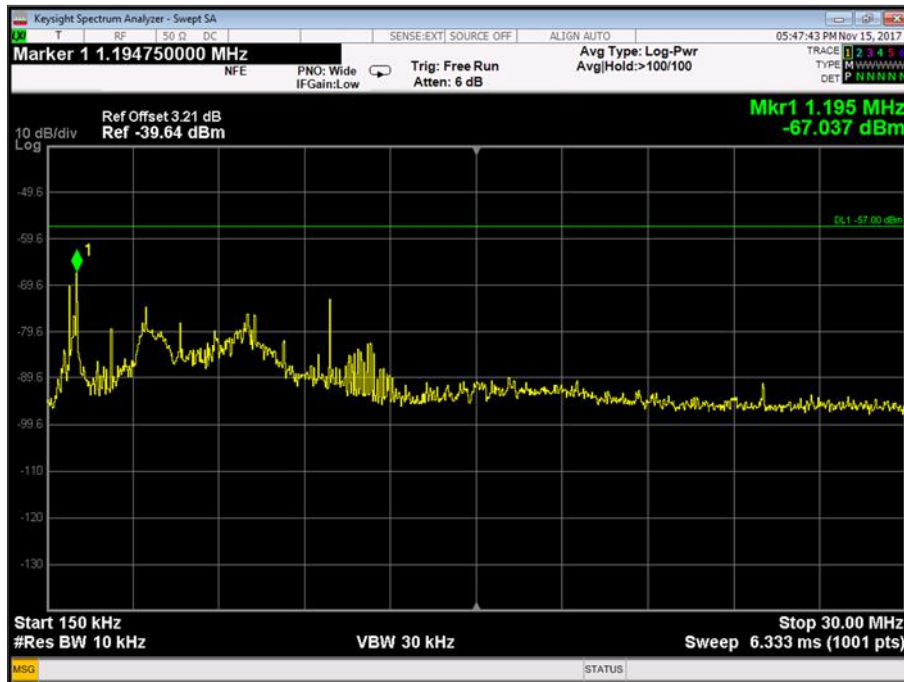


Figure 48 - 162.025 MHz - 150 kHz to 30 MHz

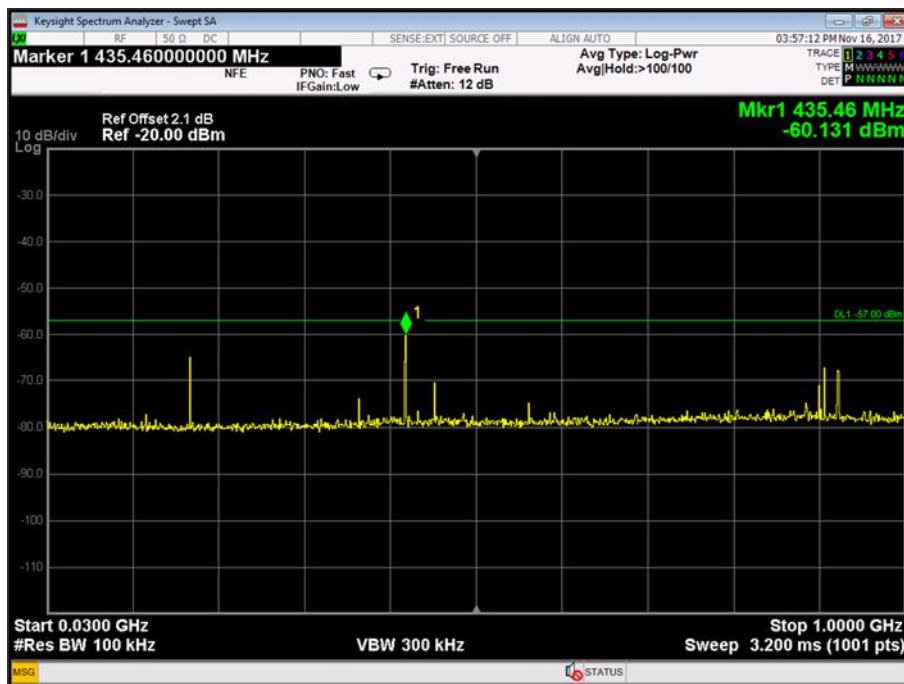


Figure 49 - 162.025 MHz - 30 MHz to 1 GHz

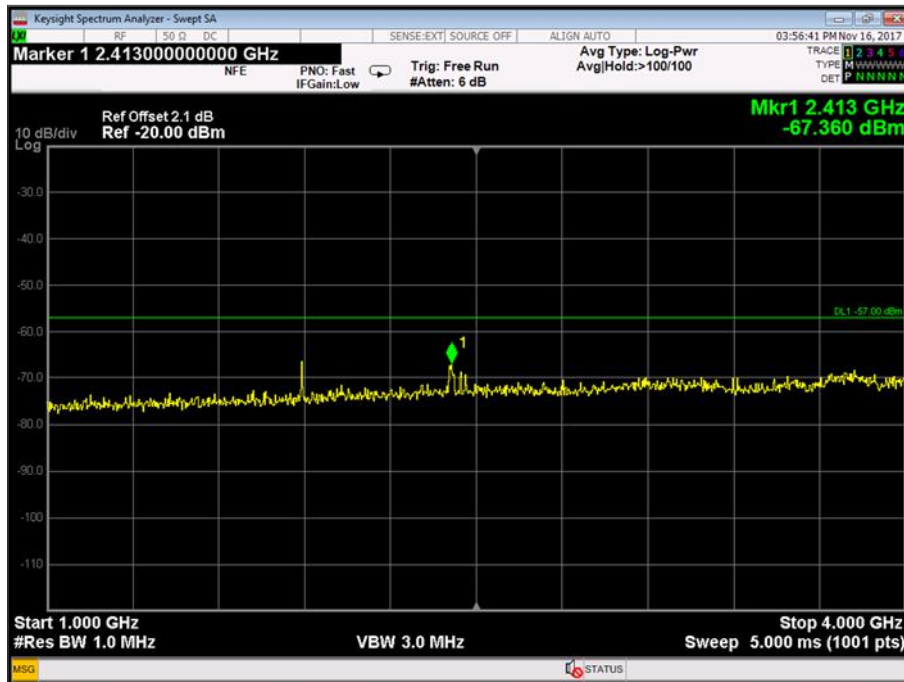


Figure 50 - 162.025 MHz - 1 GHz to 4 GHz

IEC 62287-2, Limit Clause 11.3.1.3

The power of any spurious emission in the specified range at the antenna terminal shall not exceed -57 dBm (2 nW) in the frequency range 9 kHz to 1 GHz and -47 dBm (20 nW) in the frequency range 1 GHz to 4 GHz.



2.13.7 Test Location and Test Equipment Used

This test was carried out in RF Chamber 8 and RF Laboratory 1.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|---------------------|-----------------------|----------|-------|-----------------------------|-----------------|
| Multimeter | Fluke | 75 Mk3 | 455 | 12 | 14-Sep-2018 |
| Power Supply Unit | Farnell | H60-25 | 1092 | - | O/P Mon |
| Screened Room (8) | Rainford | Rainford | 1548 | 12 | 09-Dec-2017 |
| Hygrometer | Rotronic | I-1000 | 2882 | 12 | 24-Nov-2017 |
| Hygrometer | Rotronic | I-1000 | 3220 | 12 | 30-Aug-2018 |
| Network Analyser | Rohde & Schwarz | ZVA 40 | 3548 | 12 | 02-Oct-2018 |
| Calibration Unit | Rohde & Schwarz | ZV-Z54 | 4368 | 12 | 19-Sep-2018 |
| PXA Signal Analyser | Keysight Technologies | N9030A | 4653 | 12 | 12-Jan-2018 |
| PXA Signal Analyser | Keysight Technologies | N9030A | 4654 | 12 | 06-Oct-2018 |

Table 38

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

2.14 Spurious Emissions from the Transmitter

2.14.1 Specification Reference

IEC 62287-2, Clause 11.3.2

2.14.2 Equipment Under Test and Modification State

IRIS, S/N: IRIS EP1#2 - Modification State 0

2.14.3 Date of Test

15-November-2017 to 16-November-2017

2.14.4 Test Method

This test was performed in accordance with IEC 62287-2, clause 11.3.2.2.

For spurious emissions below 30 MHz, the EUT was placed inside a screened chamber and the power and RF cables were connected to the test equipment which were situated outside the chamber via a bulkhead to reduce any common-mode noise coupling on to the EUT. The EUT was also powered by a Halford 950295 12 V DC Battery (s/n:950295).

For spurious emission above 30 MHz, testing was performed on the bench in the lab and the EUT antenna port was connected to the spectrum analyser via an attenuator/filter. The EUT was powered using a bench PSU as detailed in the test equipment list.

Both Tx1 and Tx2 were repeatedly transmitted and the trace was allowed to stabilise.

2.14.5 Environmental Conditions

Ambient Temperature 21.1 - 22.8 °C
Relative Humidity 32.5 - 49.6 %

2.14.6 Test Results

DC Powered - SOTDMA Transceiver

| Frequency (MHz) | Level (dBm) |
|-----------------|-------------|
| * | |

Table 39 - Transmitter Emissions Results - 156.025 MHz

*No emissions were detected within 6 dB of the limit.

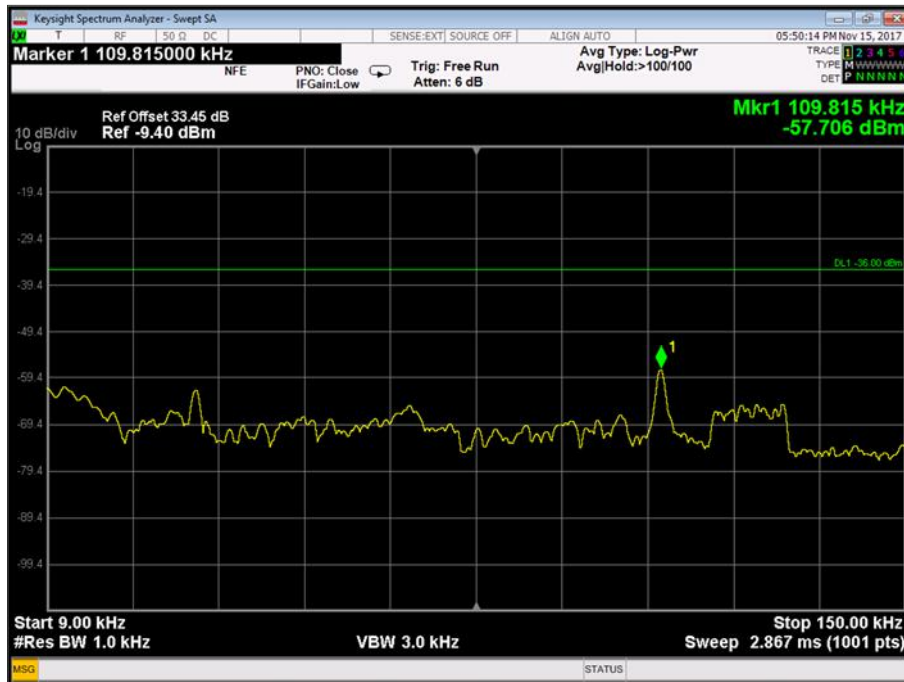


Figure 51 - 156.025 MHz - 9 kHz to 150 kHz

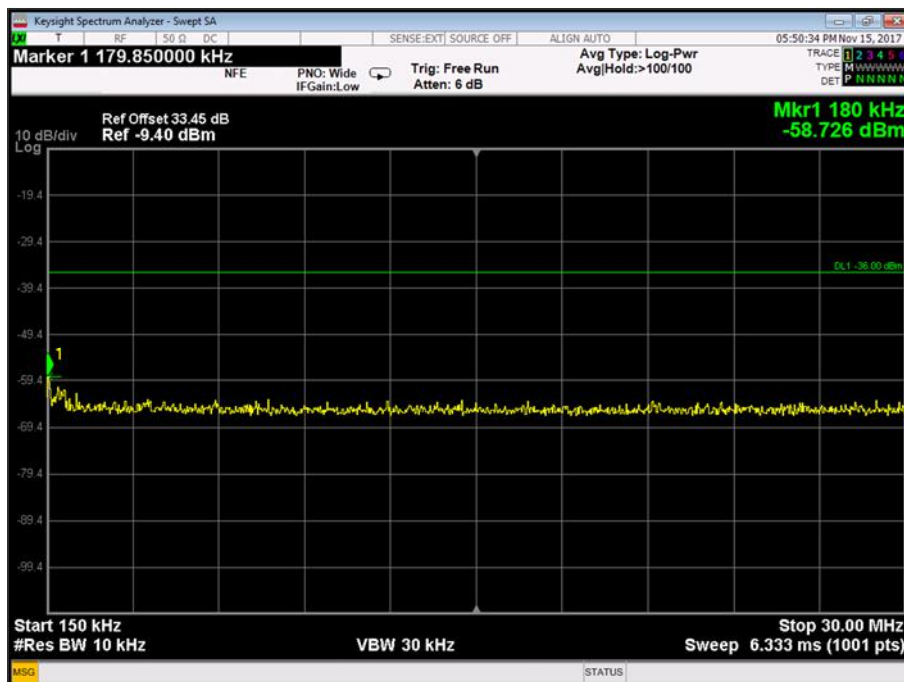


Figure 52 - 156.025 MHz - 150 kHz to 30 MHz

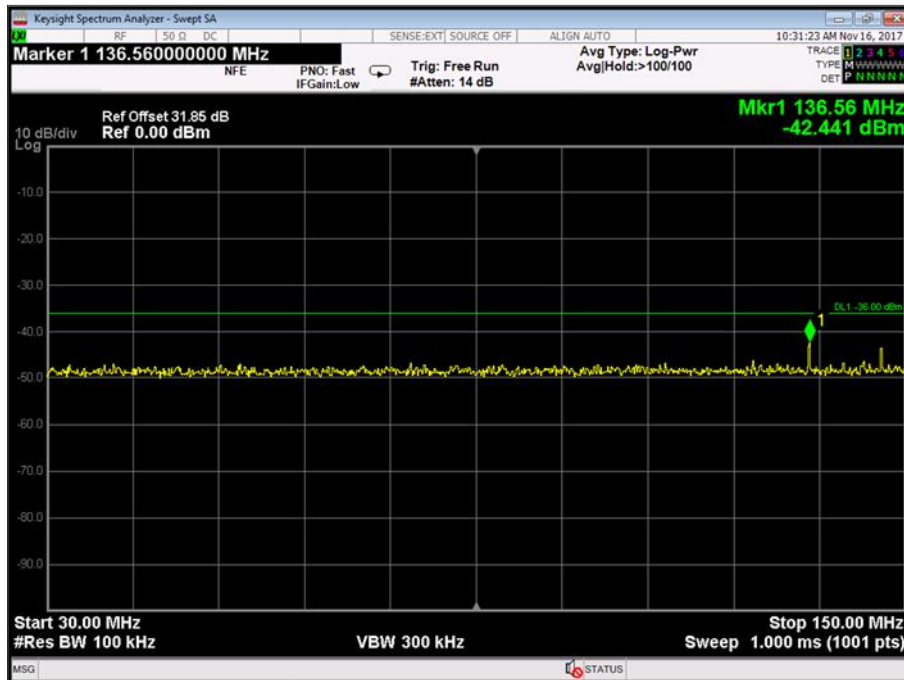


Figure 53 - 156.025 MHz - 30 MHz to 150 MHz

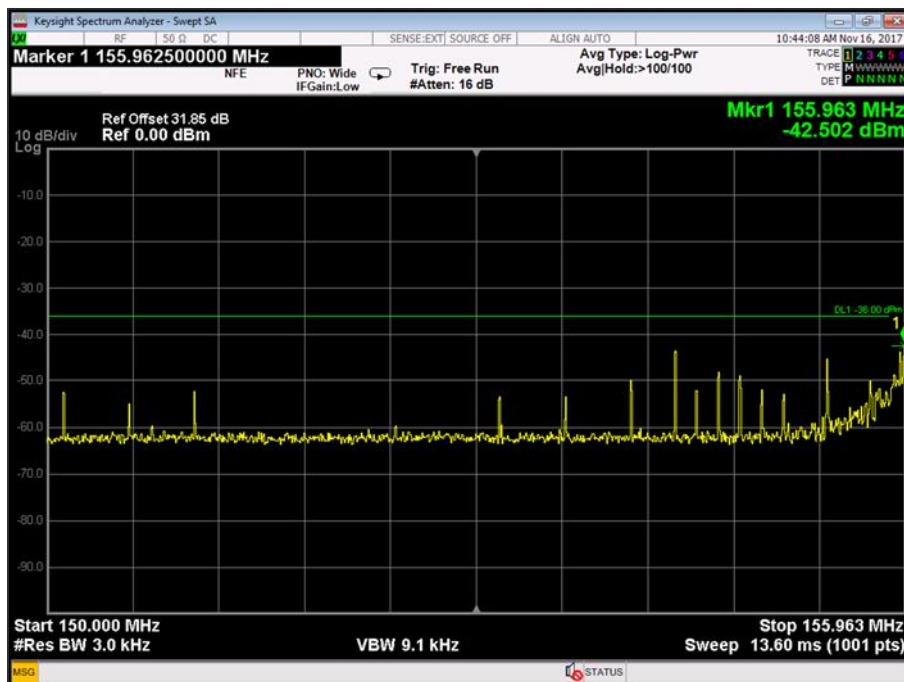


Figure 54 - 156.025 MHz - 150 MHz to 155.9625 MHz

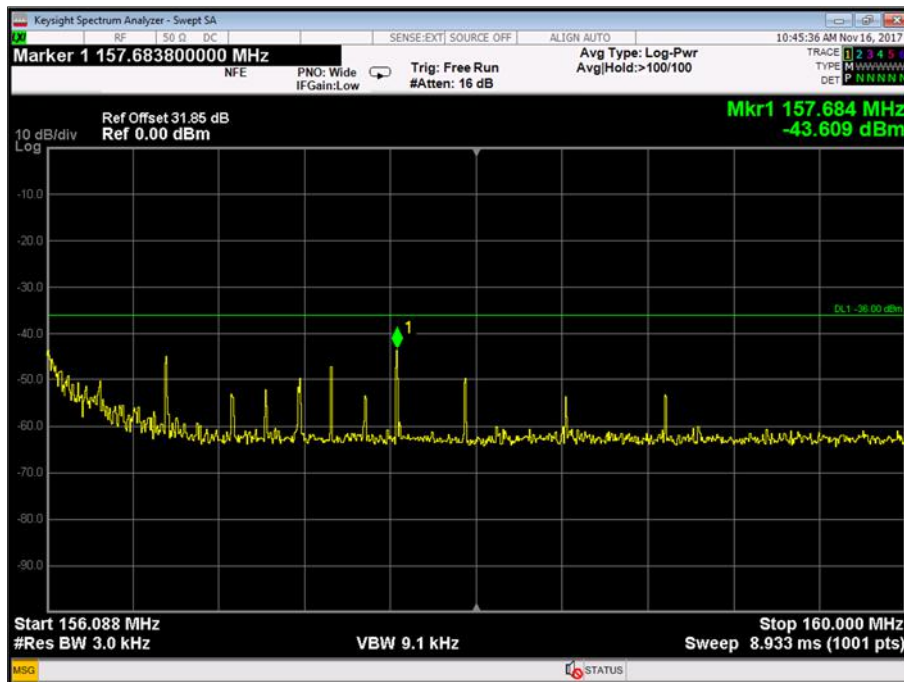


Figure 55 - 156.025 MHz - 156.0875 to 160 MHz

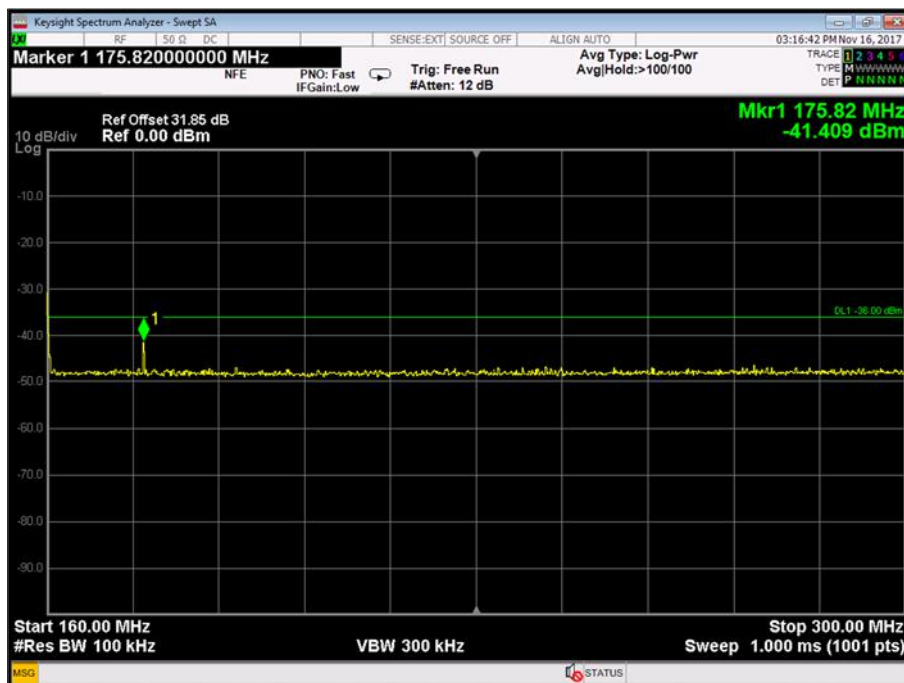


Figure 56 - 156.025 MHz - 160 MHz to 300 MHz

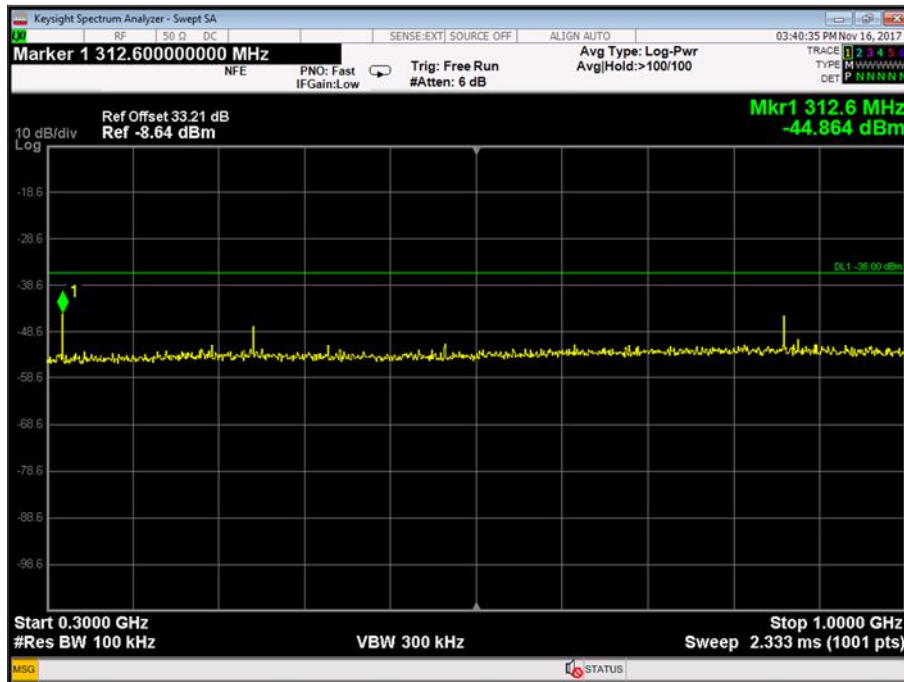


Figure 57 - 156.025 MHz - 300 MHz to 1 GHz

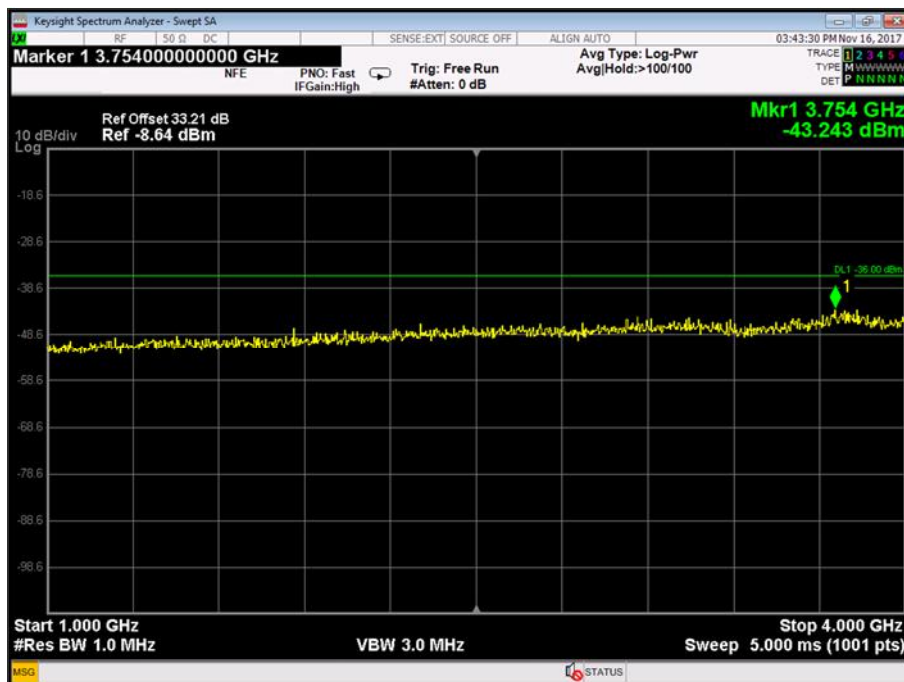


Figure 58 - 156.025 MHz - 1 GHz to 4 GHz



| Frequency (MHz) | Level (dBm) |
|-----------------|-------------|
| * | |

Table 40 - Transmitter Emissions Results - 162.025 MHz

*No emissions were detected within 6 dB of the limit.

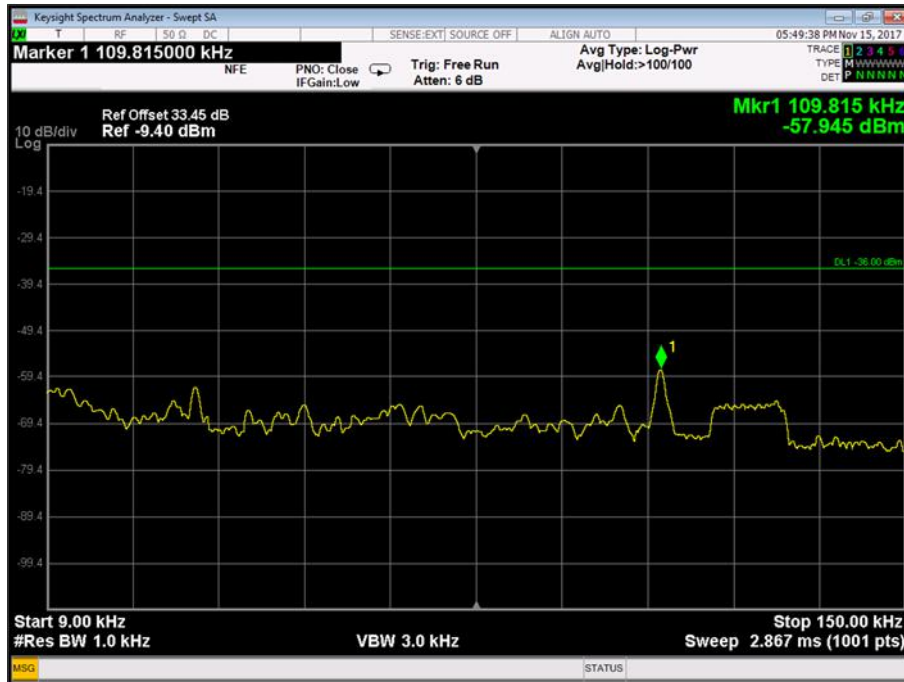


Figure 59 - 162.025 MHz - 9 kHz to 150 kHz

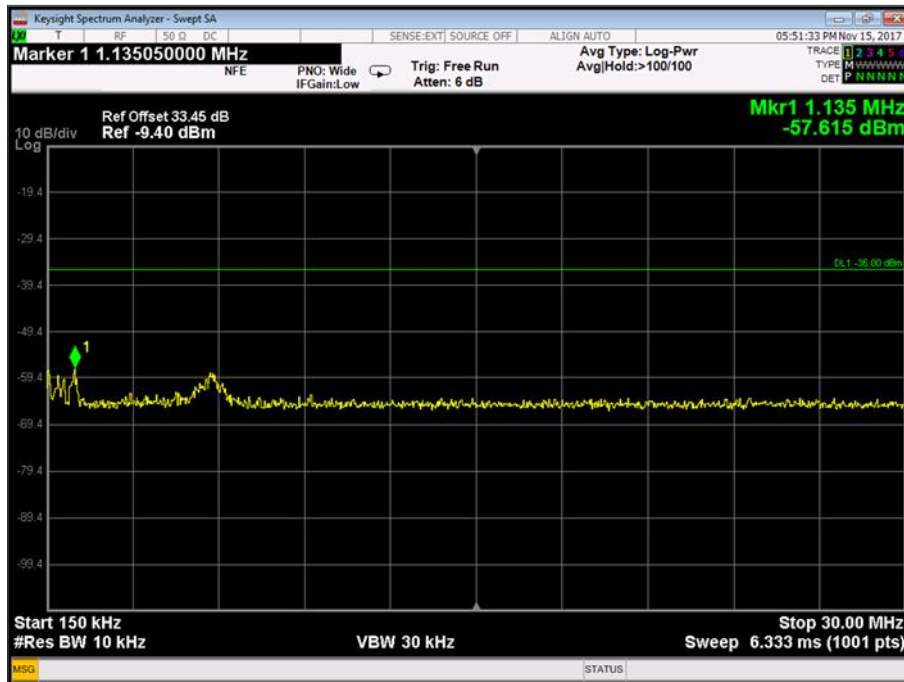


Figure 60 - 162.025 MHz - 150 kHz to 30 MHz

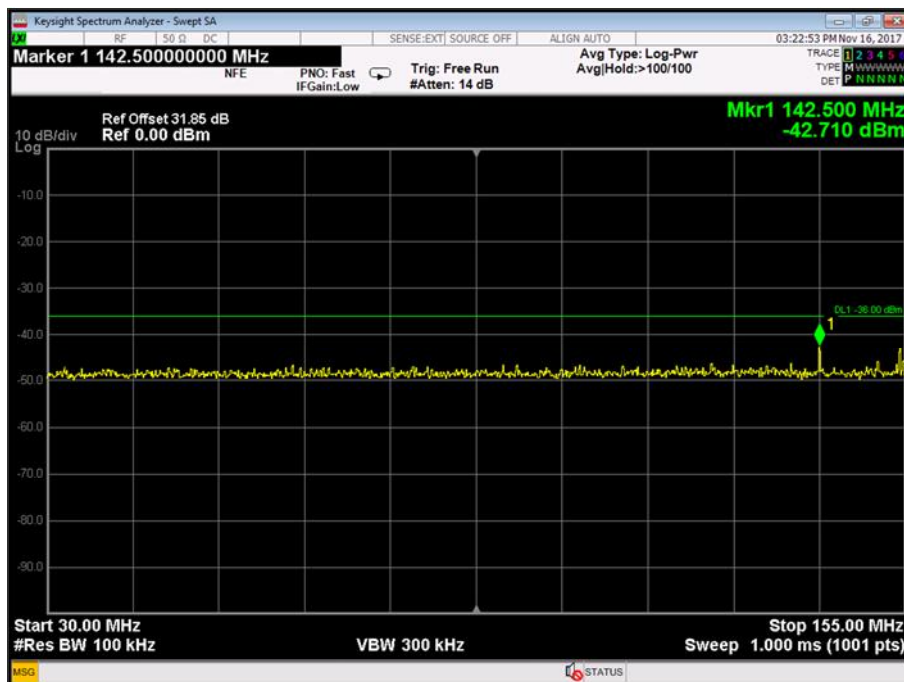


Figure 61 - 162.025 MHz - 30 MHz to 155 MHz

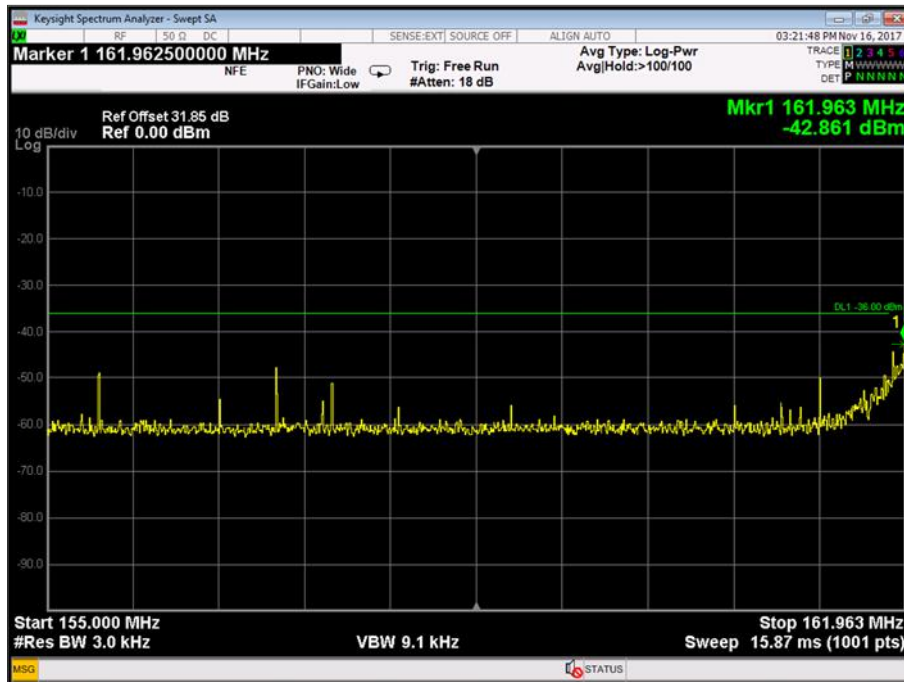


Figure 62 - 162.025 MHz - 155 MHz to 161.9625 MHz

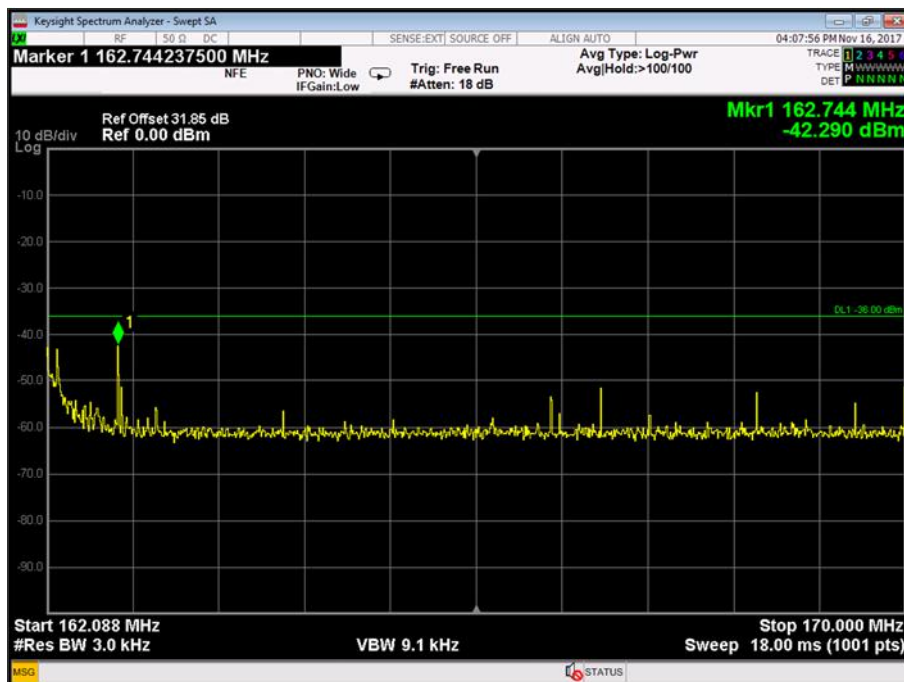


Figure 63 - 162.025 MHz - 162.0875 MHz to 170 MHz

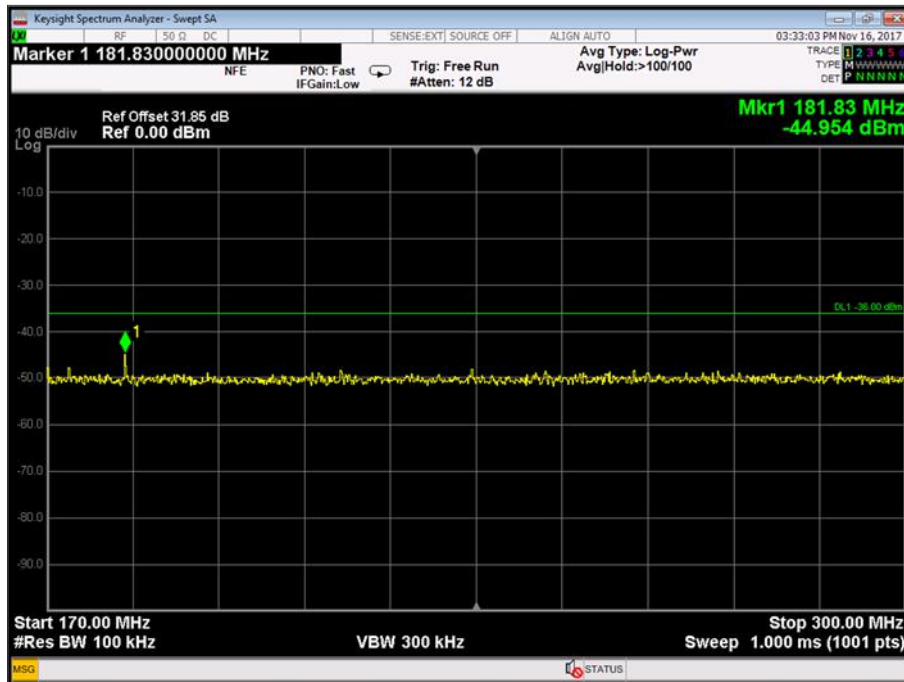


Figure 64 - 162.025 MHz - 170 MHz to 300 MHz

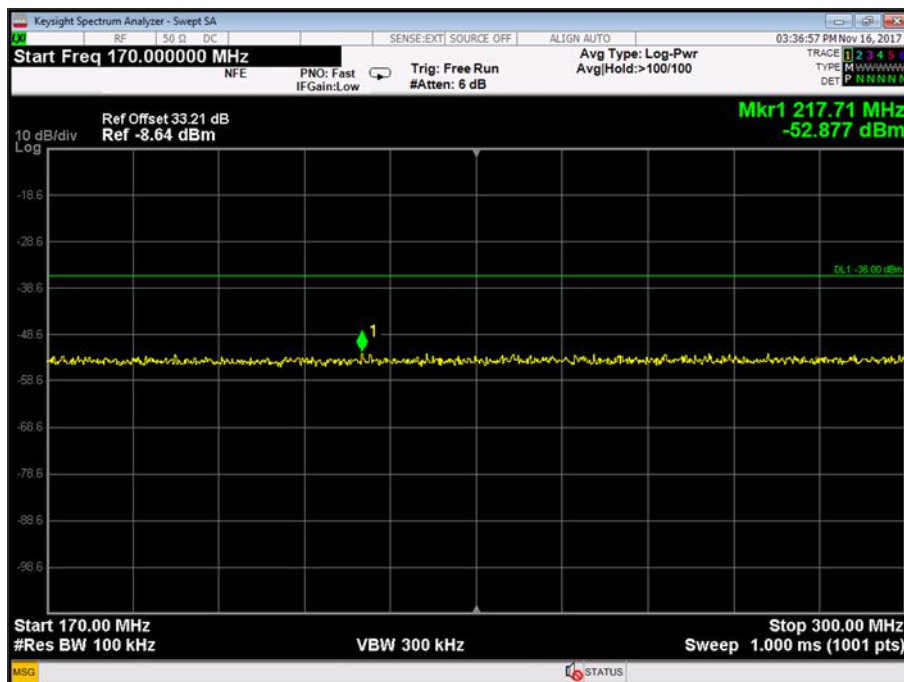


Figure 65 - 162.025 MHz - 300 MHz to 1 GHz

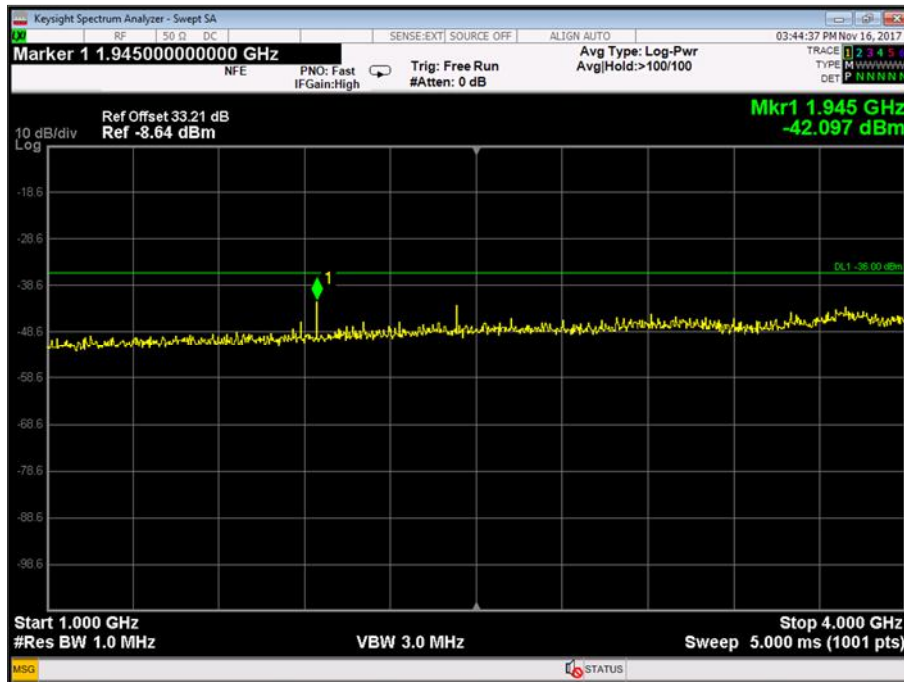


Figure 66 - 162.025 MHz - 1 GHz to 4 GHz

Remarks

When operating on 156.025 MHz, the spurious emissions shown on the plots at approx. 136 MHz, 146 MHz and 175 MHz were investigated and when measured in the lowest bandwidth available which was greater than the spectral width of the spurious component being measured, were confirmed to be of a level > 6 dB from the limit.

IEC 62287-2, Limit Clause 11.3.2.3

The power of any spurious emission on any discrete frequency shall not exceed 0,25 μ W (-36 dBm) in the frequency range 9 kHz to 1 GHz and 1 μ W (-30 dBm) in the frequency range 1 GHz to 4 GHz.



2.14.7 Test Location and Test Equipment Used

This test was carried out in RF Chamber 8 and RF Laboratory 1.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due |
|-------------------------|-----------------------|----------|-------|-----------------------------|-----------------|
| Power Supply Unit | Farnell | H60-25 | 1092 | - | O/P Mon |
| Screened Room (8) | Rainford | Rainford | 1548 | 12 | 09-Dec-2017 |
| High Pass Filter | Mini-Circuits | NHP-300 | 1640 | 12 | 18-Sep-2018 |
| Hygrometer | Rotronic | I-1000 | 2882 | 12 | 24-Nov-2017 |
| Hygrometer | Rotronic | I-1000 | 3220 | 12 | 30-Aug-2018 |
| Attenuator (30dB, 150W) | Narda | 769-30 | 3369 | 12 | 31-May-2018 |
| Network Analyser | Rohde & Schwarz | ZVA 40 | 3548 | 12 | 02-Oct-2018 |
| Calibration Unit | Rohde & Schwarz | ZV-Z54 | 4368 | 12 | 19-Sep-2018 |
| PXA Signal Analyser | Keysight Technologies | N9030A | 4653 | 12 | 12-Jan-2018 |
| PXA Signal Analyser | Keysight Technologies | N9030A | 4654 | 12 | 06-Oct-2018 |

Table 41

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment



Product Service



Product Service

2.15 DSC Receiver Tests

2.15.1 Specification Reference

IEC 62287-2, Clause A.5

2.15.2 Equipment Under Test

IRIS

2.15.3 Test Results

The tests in IEC 62287-2, Clause A.5.2 to A.5.7, were waived as described in IEC 62287-2, clause A.5.1.



3 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

| Test Name | Measurement Uncertainty |
|---|-------------------------|
| Frequency Error | ± 11 Hz |
| Carrier Power | ± 0.45 dB |
| Transmission Spectrum | ± 2.0 dB |
| Modulation Accuracy | ± 2.0 dB |
| Transmitter Output Power Versus Time Function | ± 2.0 dB |
| Sensitivity | ± 1.8 dB |
| Error Behaviour at High Input Levels | ± 1.8 dB |
| Adjacent Channel Selectivity | ± 2.6 dB |
| Spurious Response Rejection | ± 2.6 dB |
| Intermodulation Response Rejection | ± 1.7 dB |
| Blocking or Desensitisation | ± 2.6 dB |
| Spurious Emissions from the Receiver | ± 3.45 dB |
| Spurious Emissions from the Transmitter | ± 3.45 dB |
| Co-channel Rejection | ± 2.6 dB |

Table 42