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

Prepared for: SRT Marine Technology Limited
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Product Service

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Date: December 2017
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RESPONSIBLE FOR	NAME	DATE	SIGNATURE
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).

TÜV SÜD Product Service
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Product Service

Contents

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 Date	POR006541 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 Transciever		
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 Position held: Project Manager
Date: 13-12-17

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

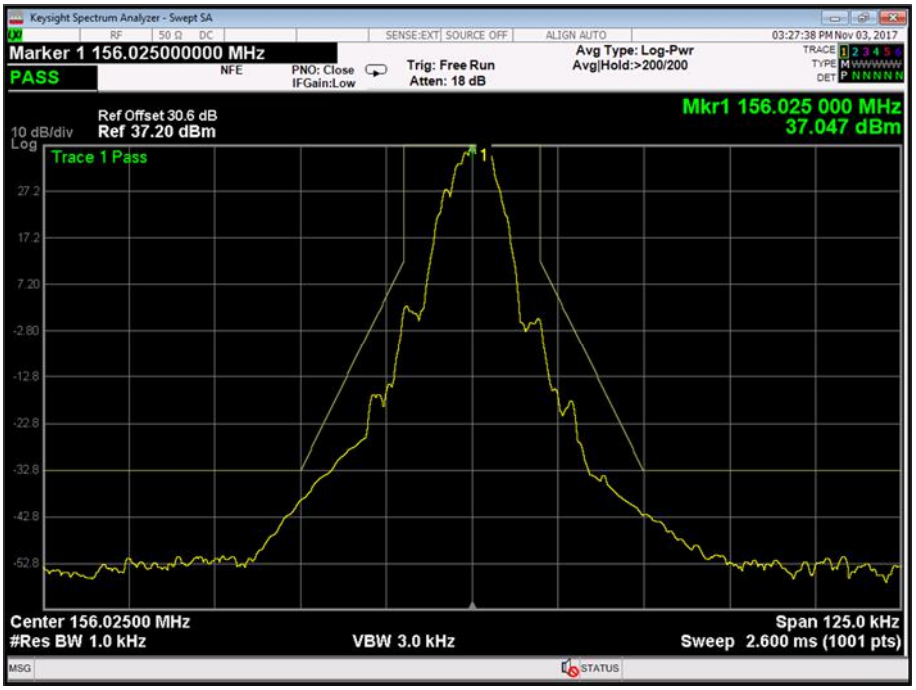

Figure 1 - 156.025 MHz - Tx1

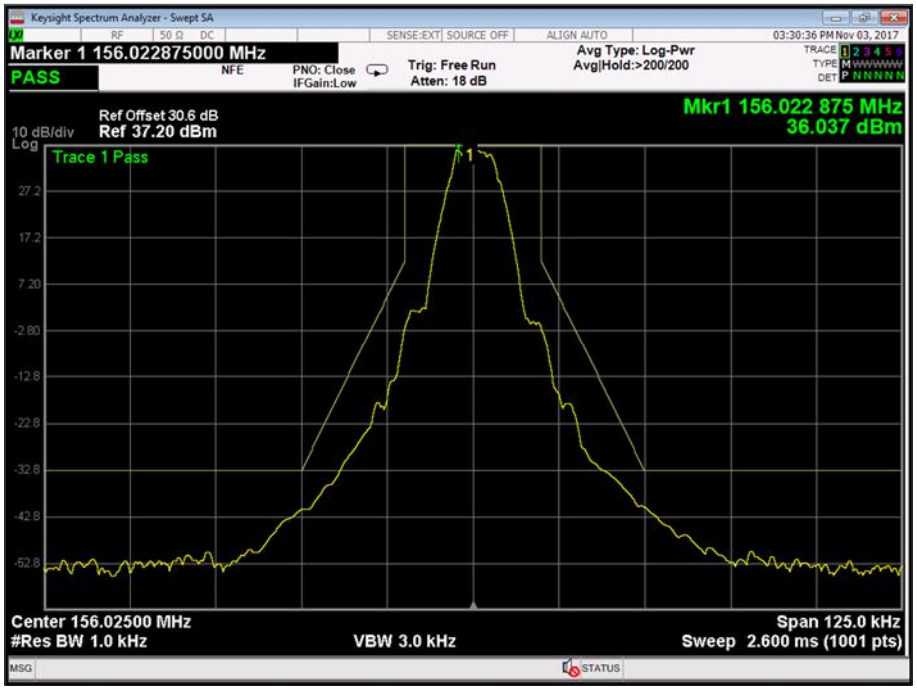

Figure 2 - 156.025 MHz – Tx2

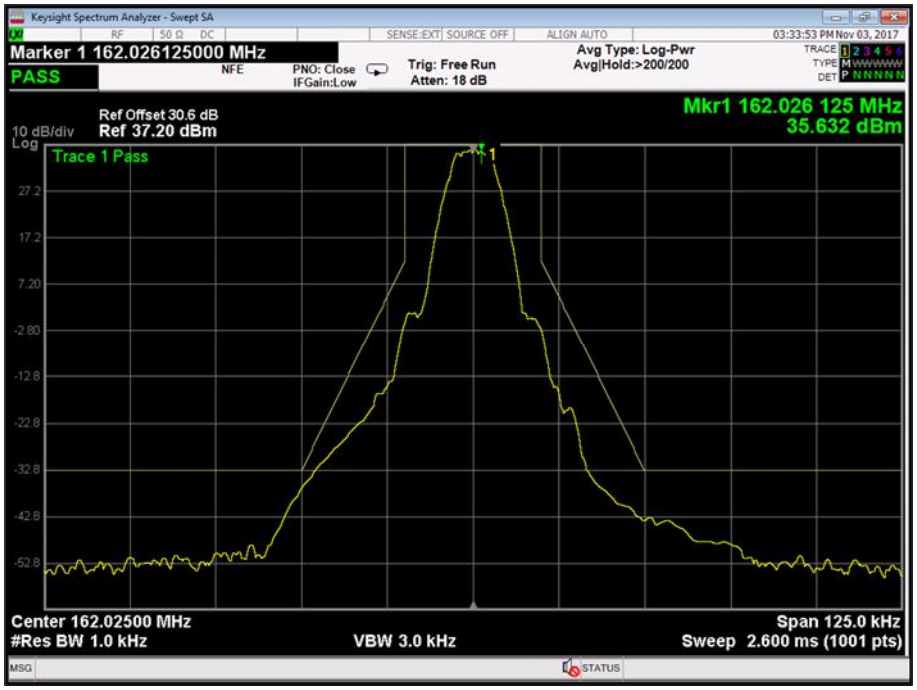

Figure 3 - 162.025 MHz - Tx1

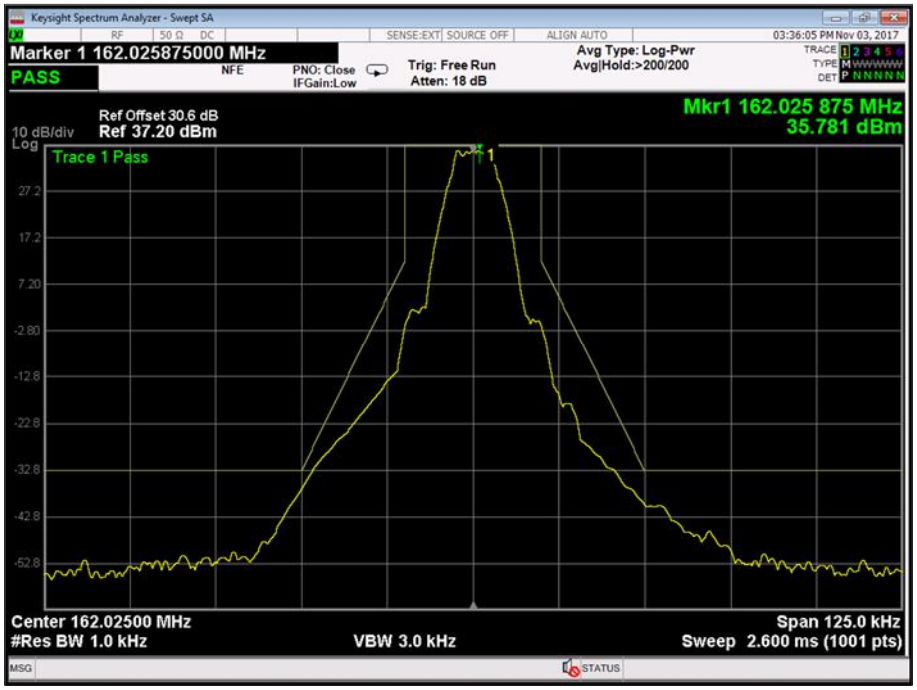

Figure 4 - 162.025 MHz – Tx2

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 ±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.

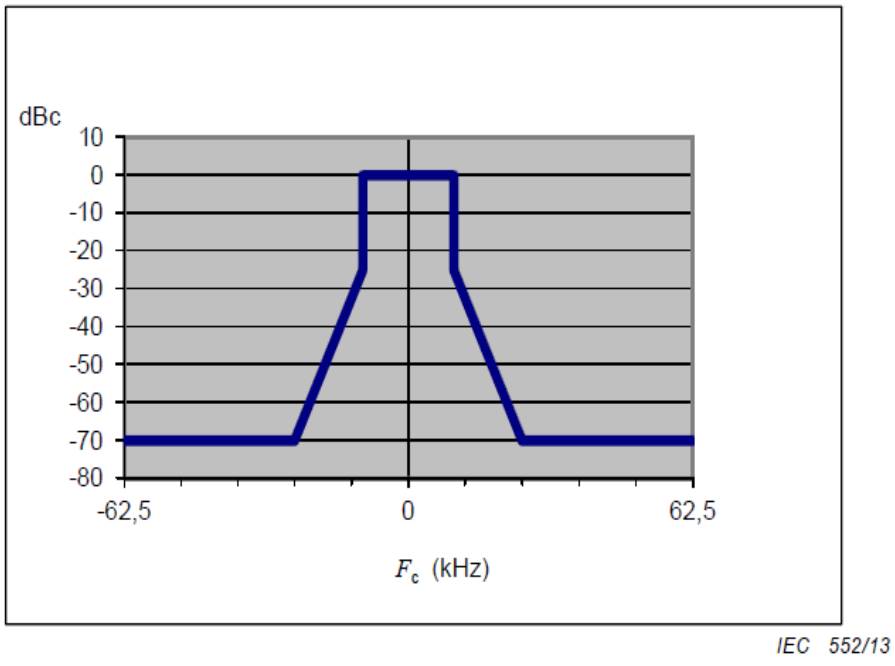

Figure 5 - Transmission Spectrum Mask Limit

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 ºC, 12.0 V DC

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

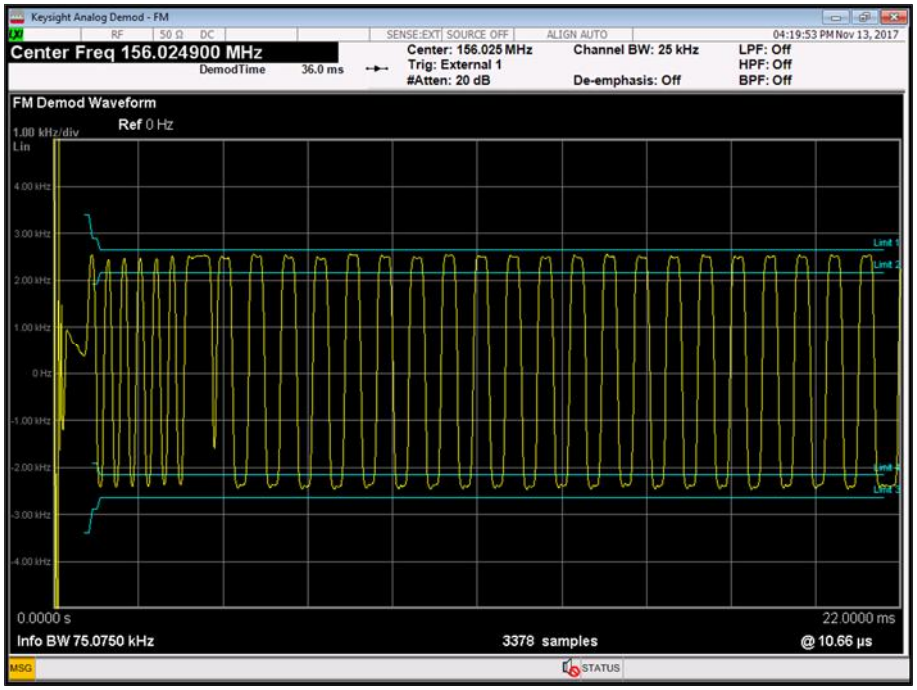

Figure 8 - 156.025 MHz, Test Signal #2, Tx1, +21.9 ºC, 12.0 V DC

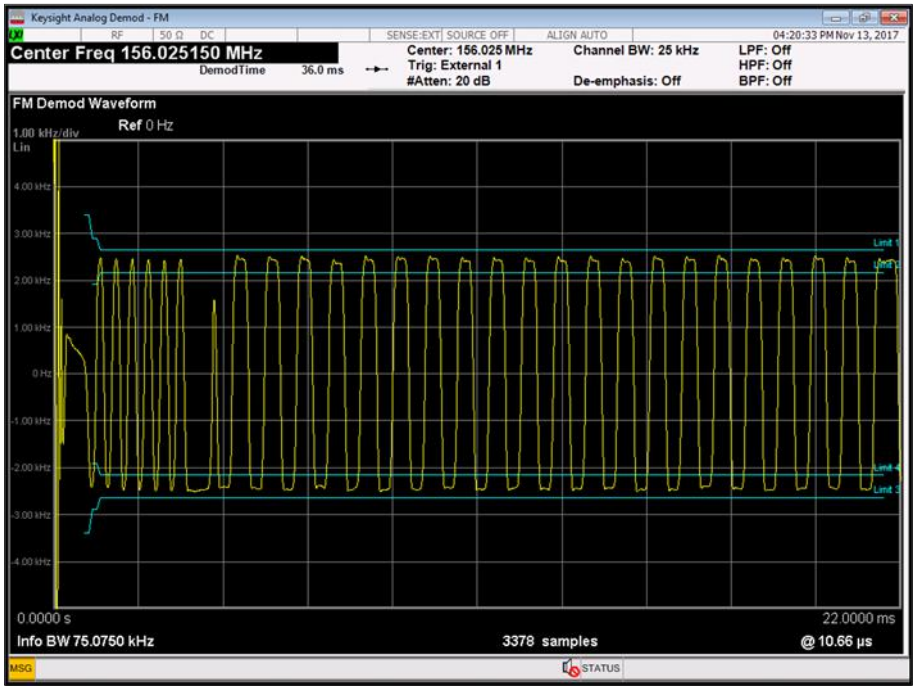

Figure 9 - 156.025 MHz, Test Signal #2, Tx2, +21.9 ºC, 12.0 V DC

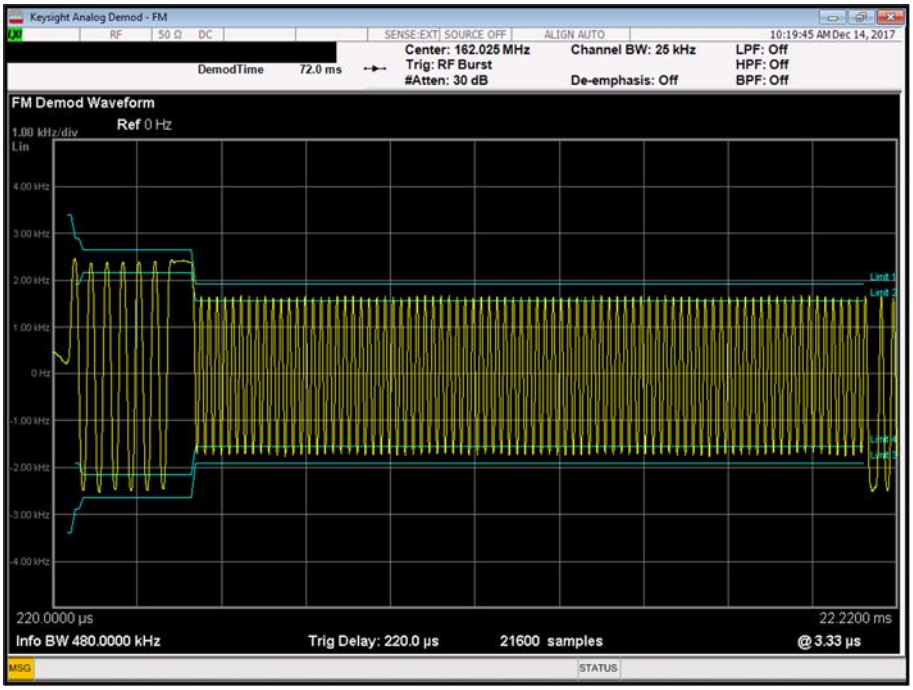

Figure 10 - 162.025 MHz, Test Signal #1, Tx1, +21.9 ºC, 12.0 V DC

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

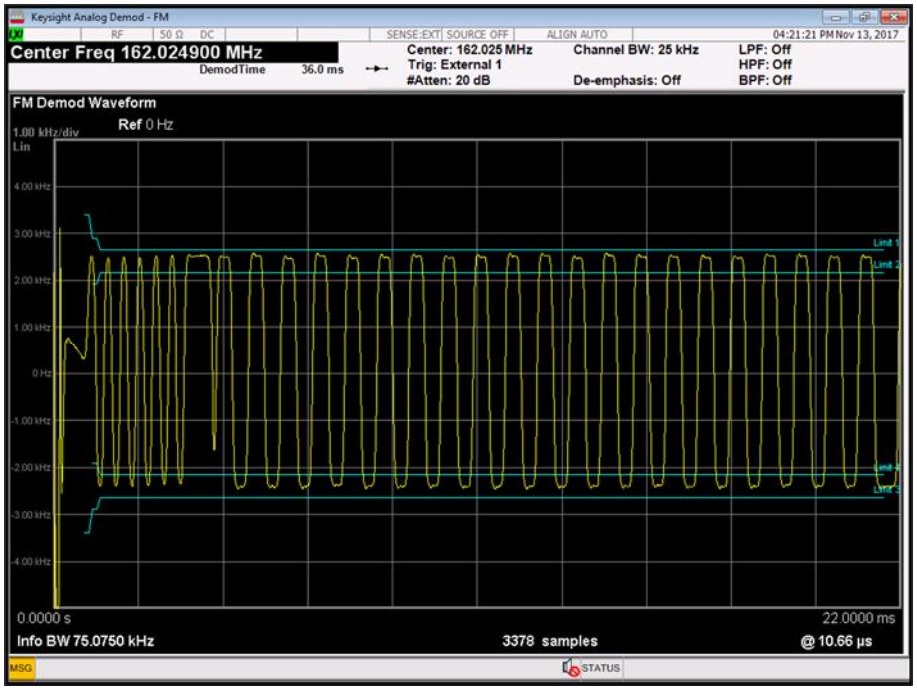

Figure 12 - 162.025 MHz, Test Signal #2, Tx1, +21.9 ºC, 12.0 V DC

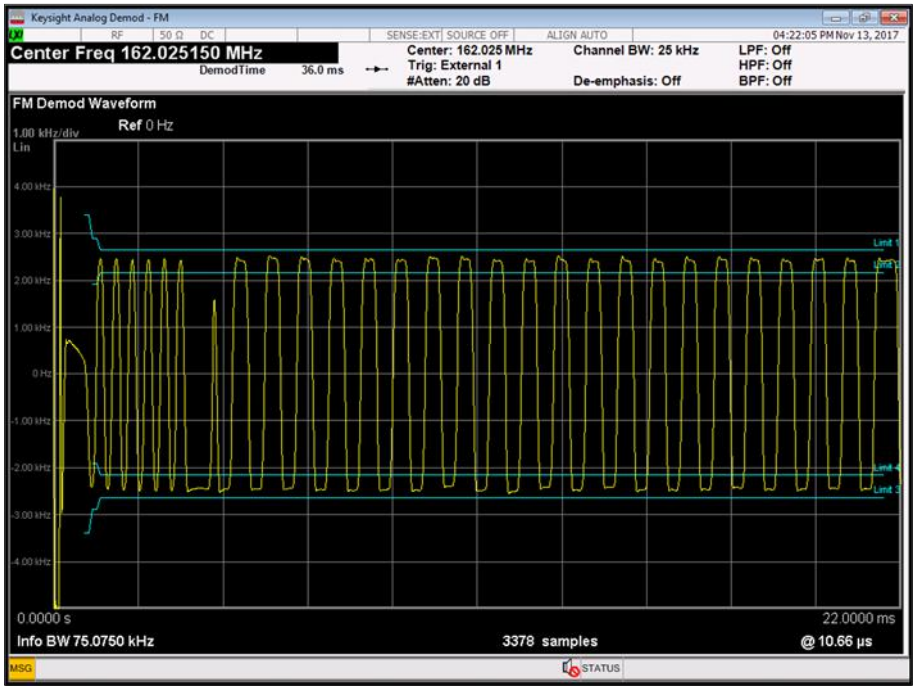

Figure 13 - 162.025 MHz, Test Signal #2, Tx2, +21.9 ºC, 12.0 V DC

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

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

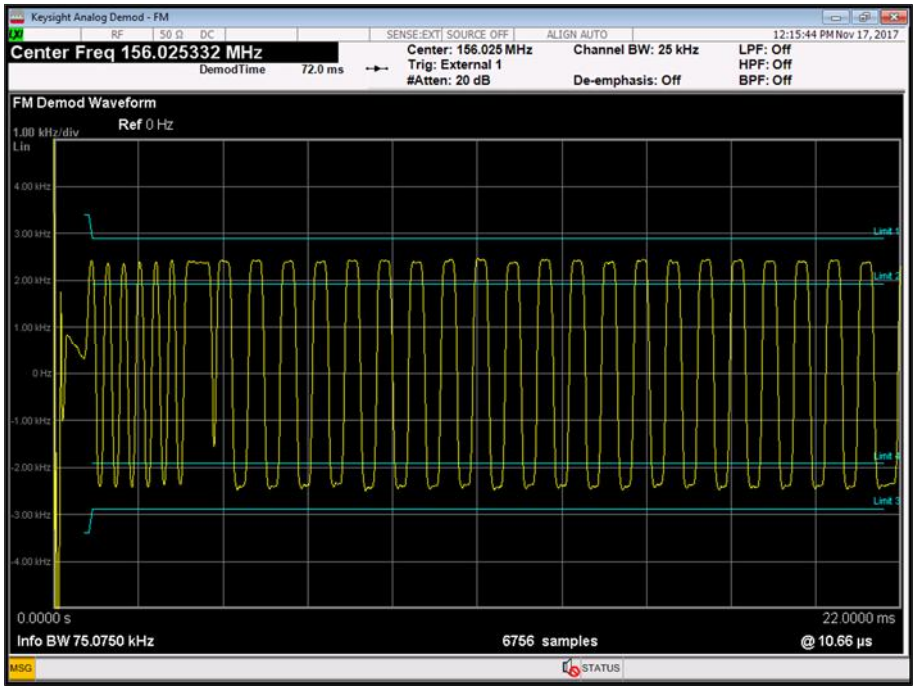

Figure 16 - 156.025 MHz, Test Signal #2, Tx1, -15.0 ºC, 9.6 V DC

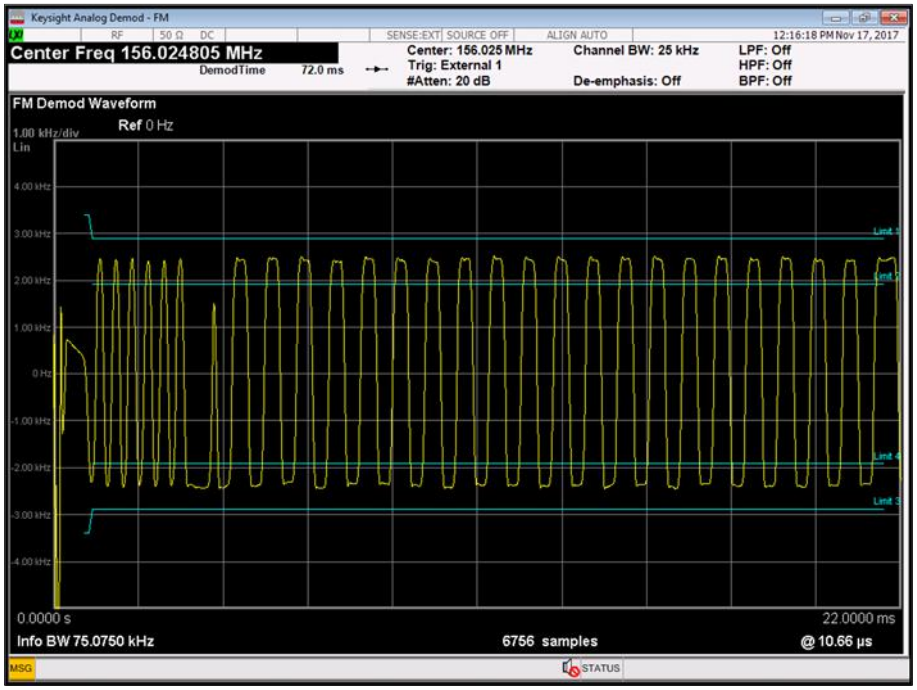

Figure 17 - 156.025 MHz, Test Signal #2, Tx2, -15.0 ºC, 9.6 V DC

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

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

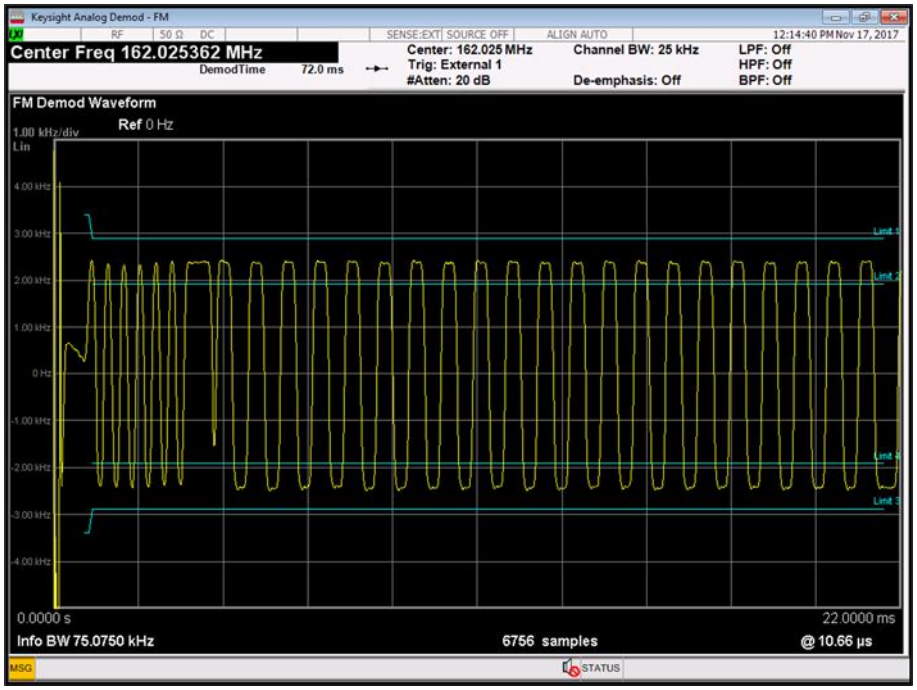

Figure 20 - 162.025 MHz, Test Signal #2, Tx1, -15.0 ºC, 9.6 V DC

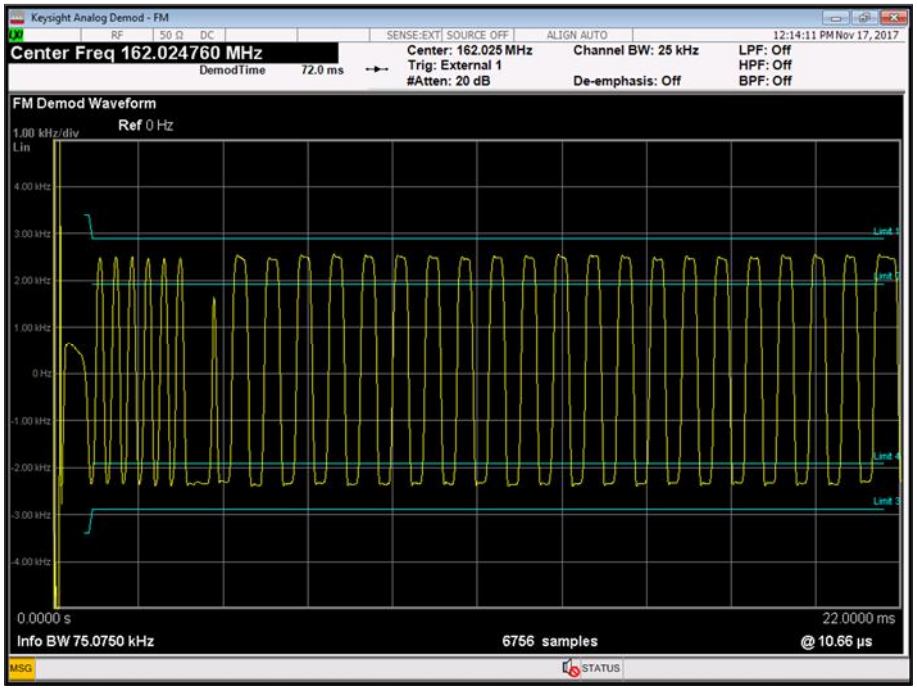

Figure 21 - 162.025 MHz, Test Signal #2, Tx2, -15.0 ºC, 9.6 V DC

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

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

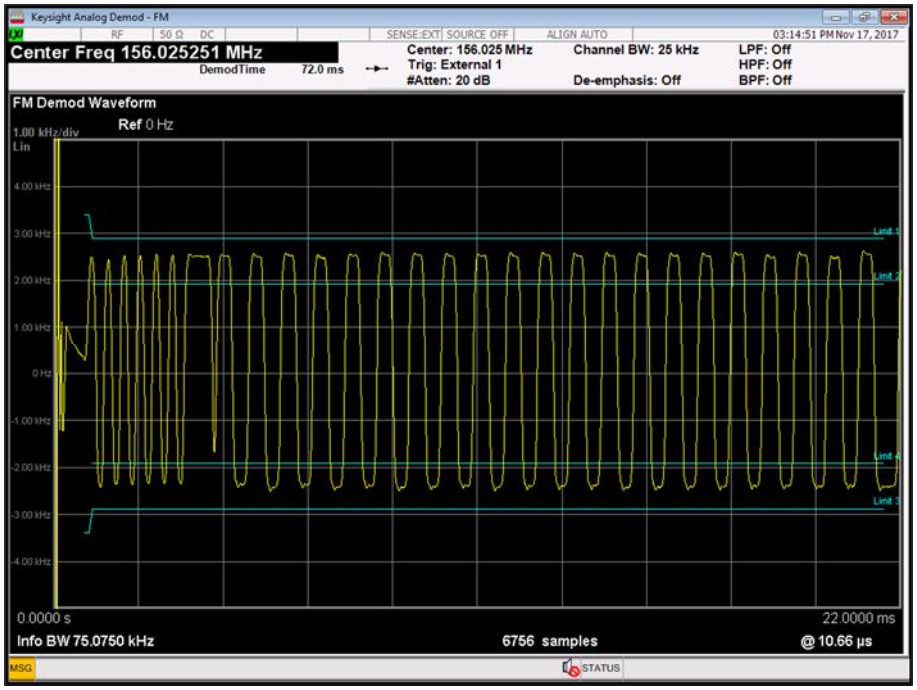

Figure 24 - 156.025 MHz, Test Signal #2, Tx1, +55.0 ºC, 31.2 V DC

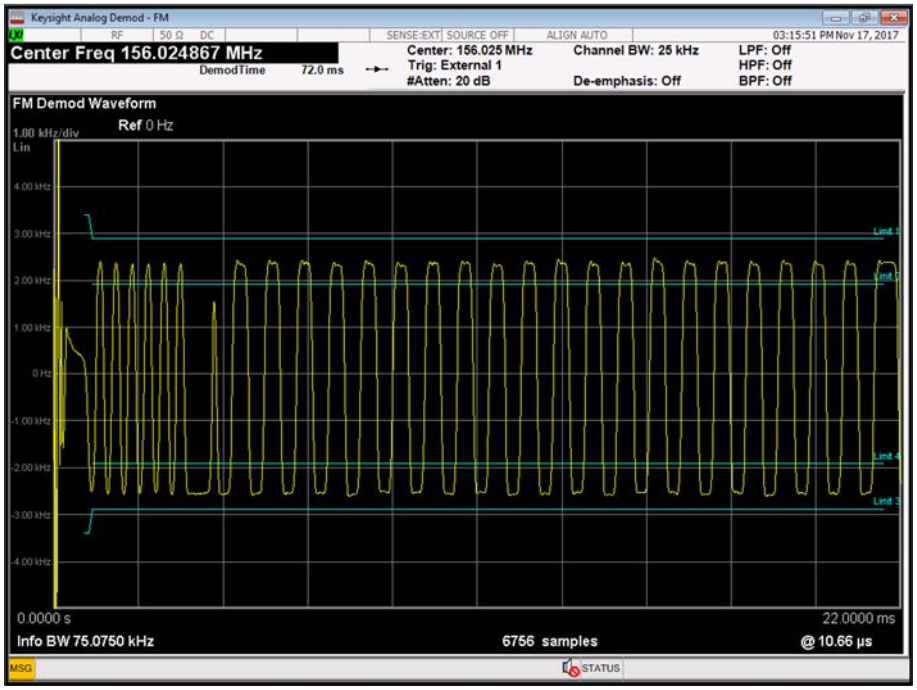

Figure 25 - 156.025 MHz, Test Signal #2, Tx2, +55.0 ºC, 31.2 V DC

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

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

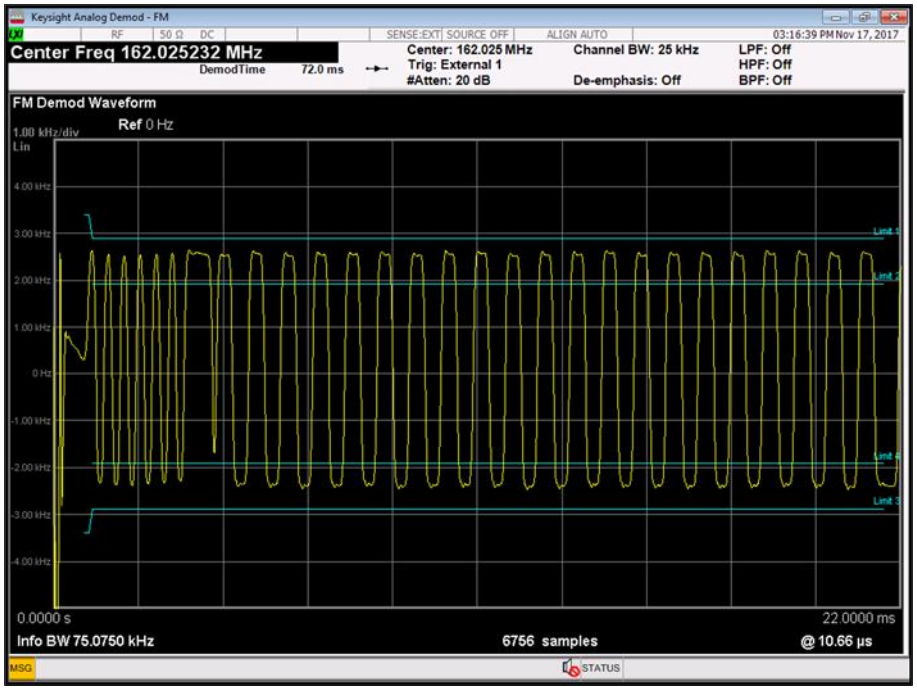

Figure 28 - 162.025 MHz, Test Signal #2, Tx1, +55.0 ºC, 31.2 V DC

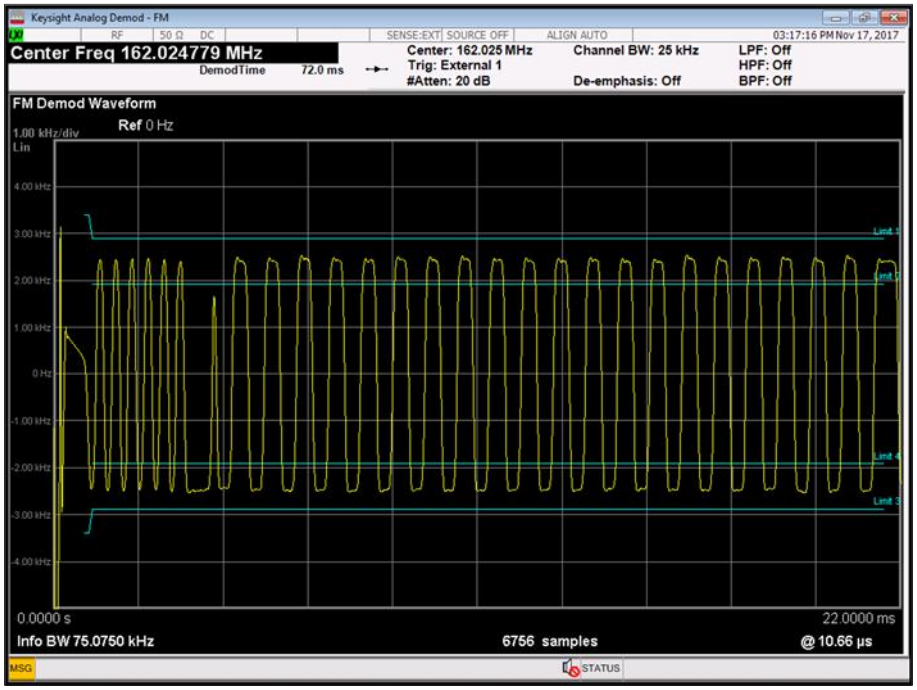

Figure 29 - 162.025 MHz, Test Signal #2, Tx2, +55.0 ºC, 31.2 V DC

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

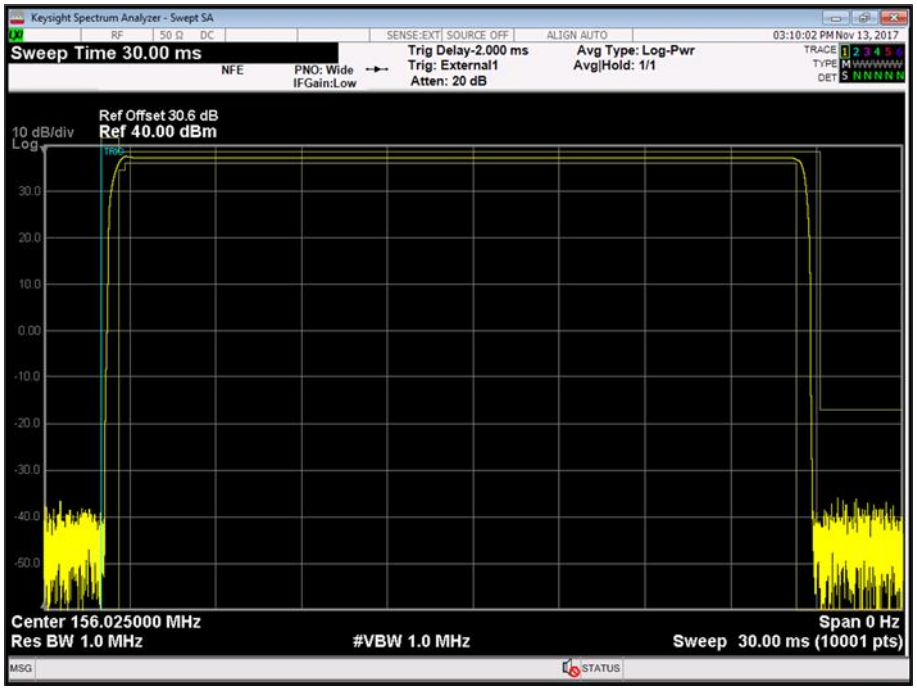

Figure 30 - 156.025 MHz - Tx1 - Complete Burst

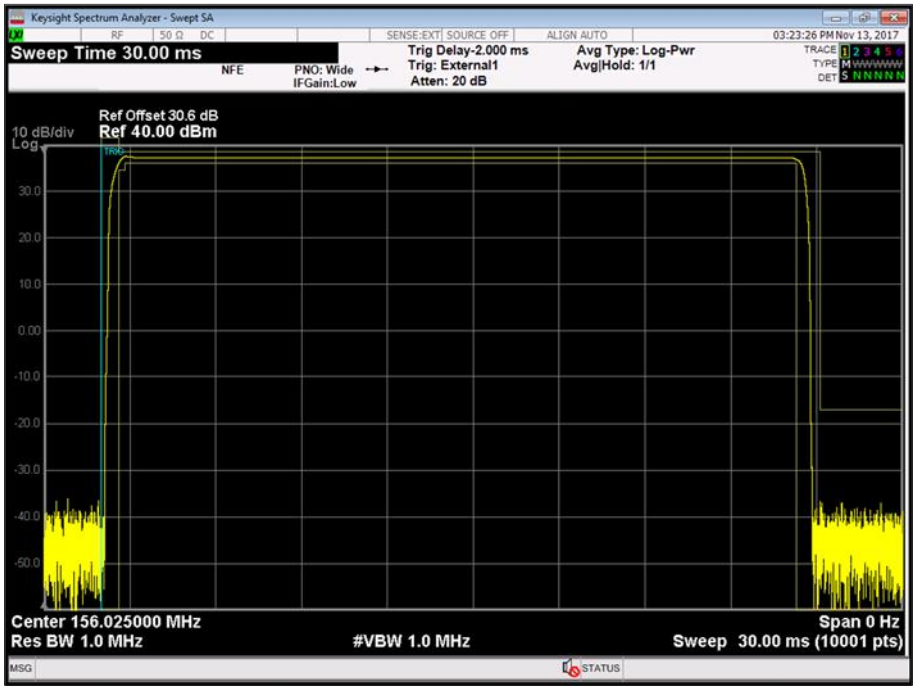

Figure 31 - 156.025 MHz – Tx2 - Complete Burst

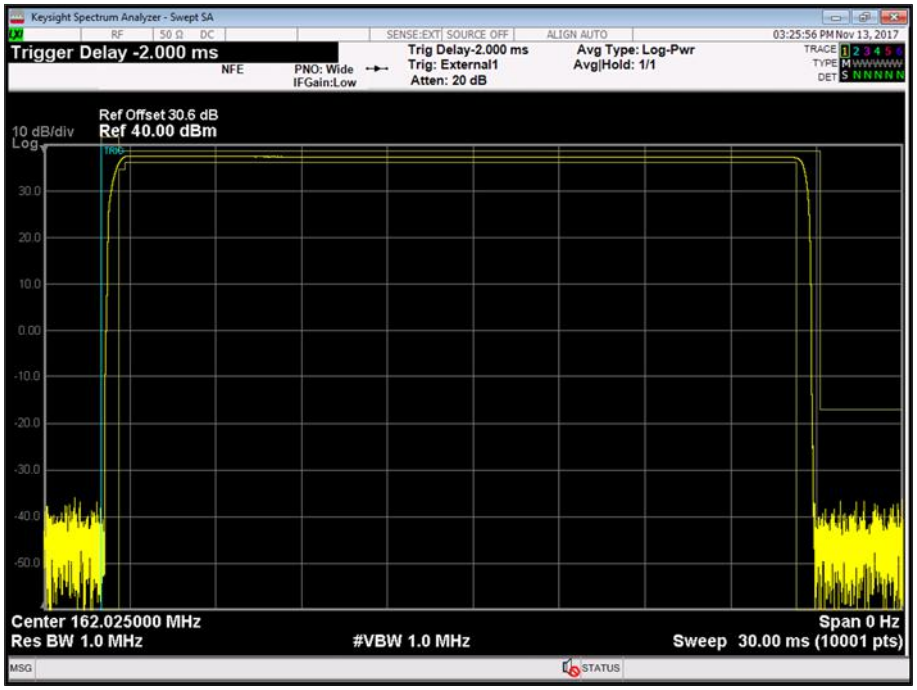

Figure 32 - 162.025 MHz - Tx1 - Complete Burst

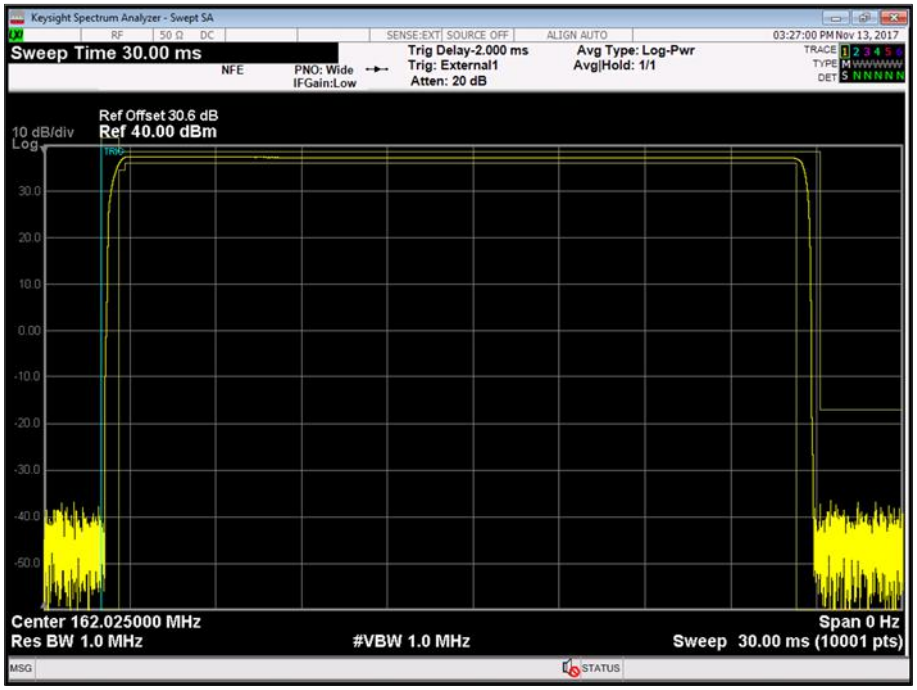

Figure 33 - 162.025 MHz – Tx2 - Complete Burst

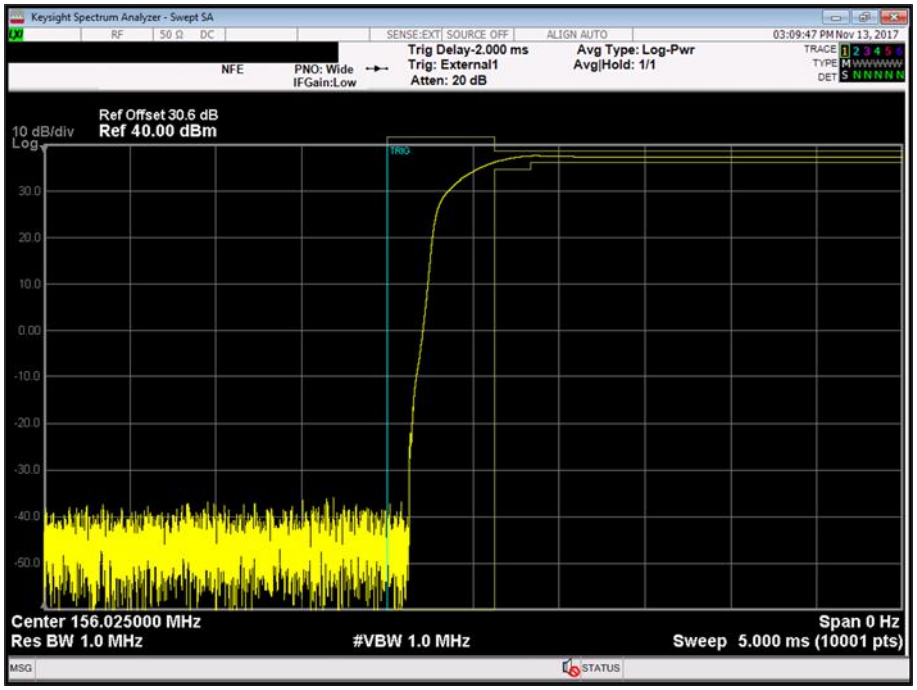

Figure 34 - 156.025 MHz - Tx1 - Ramp Up Zoomed

Figure 35 - 156.025 MHz – Tx2 - Ramp Up Zoomed

Figure 36 - 162.025 MHz - Tx1 - Ramp Up Zoomed

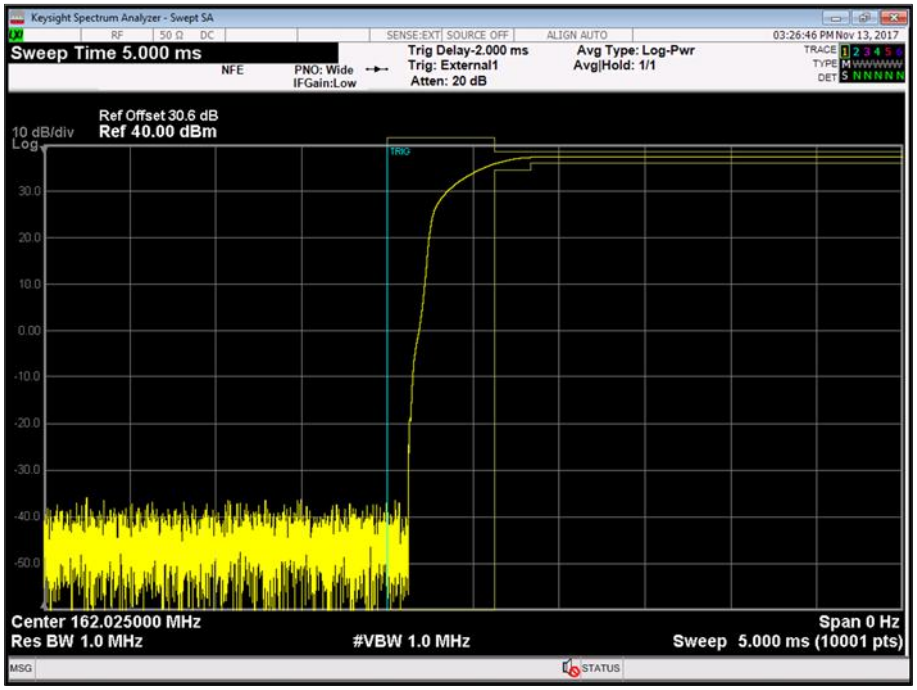

Figure 37 - 162.025 MHz – Tx2 - Ramp Up Zoomed

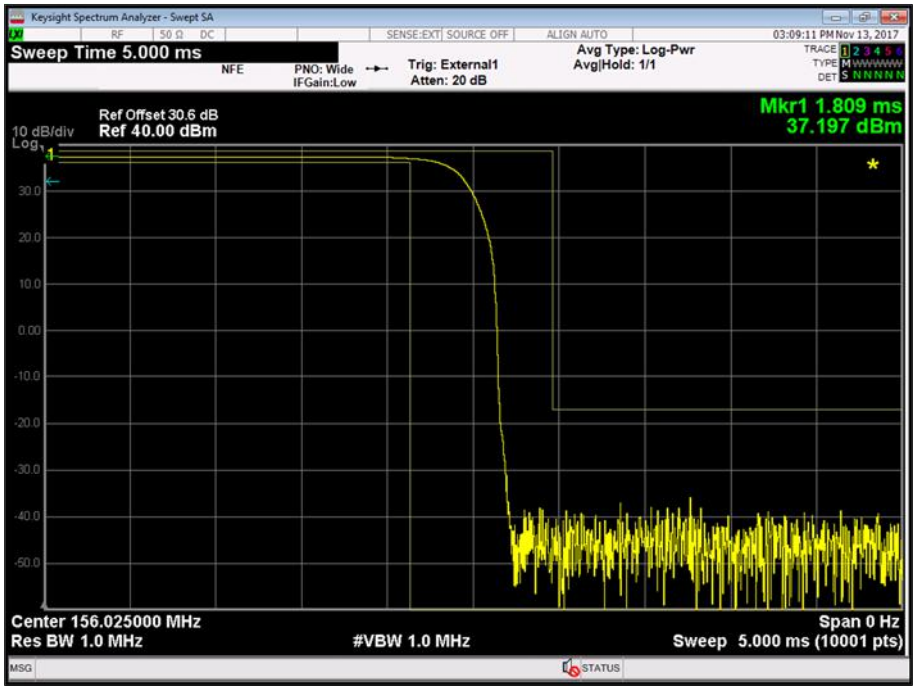

Figure 38 - 156.025 MHz - Tx1 - Ramp Down Zoomed

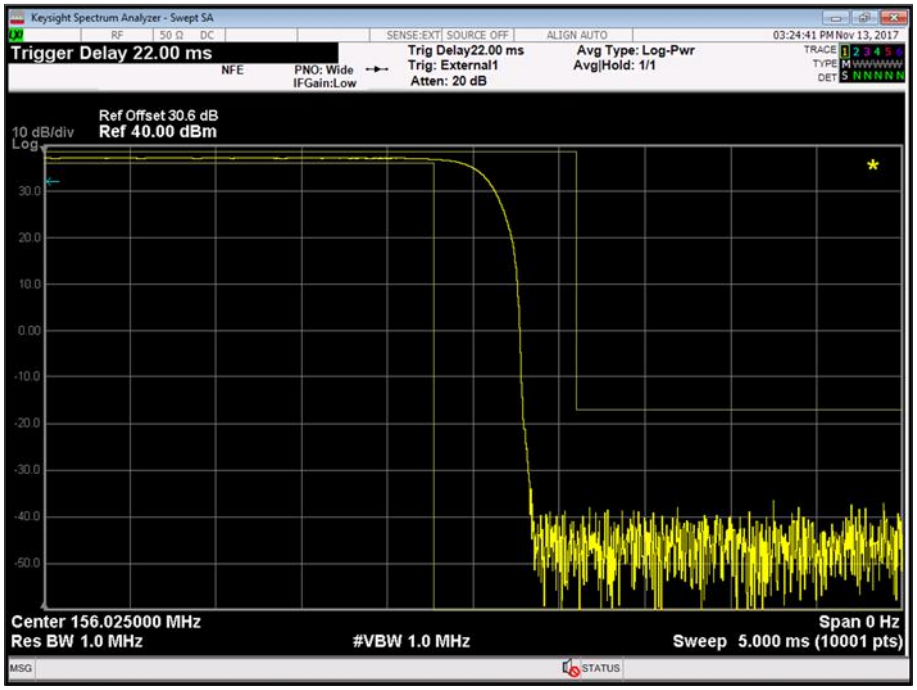

Figure 39 - 156.025 MHz – Tx2 - Ramp Down Zoomed

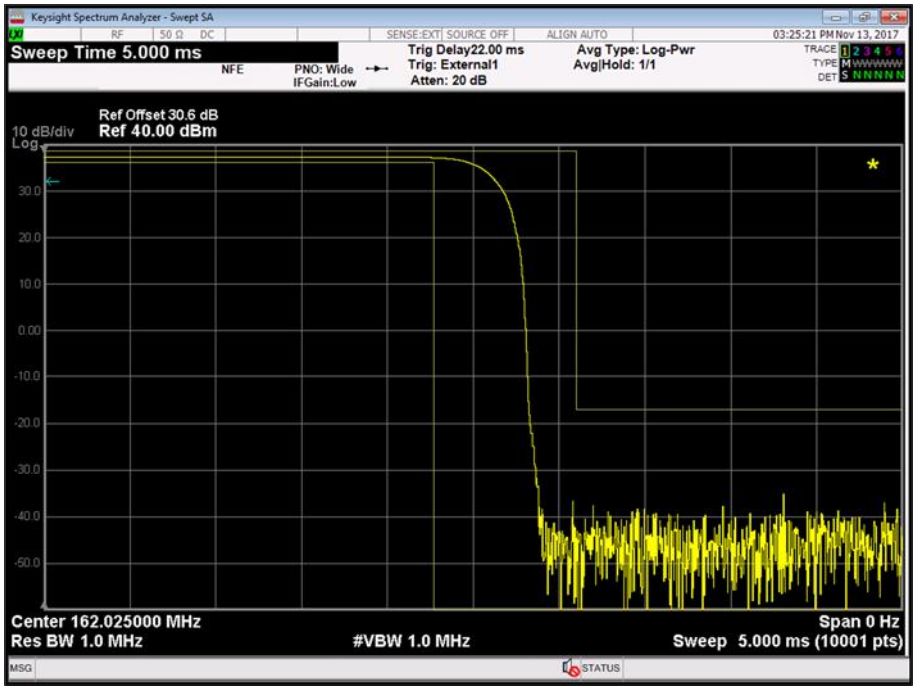

Figure 40 - 162.025 MHz - Tx1 - Ramp Down Zoomed

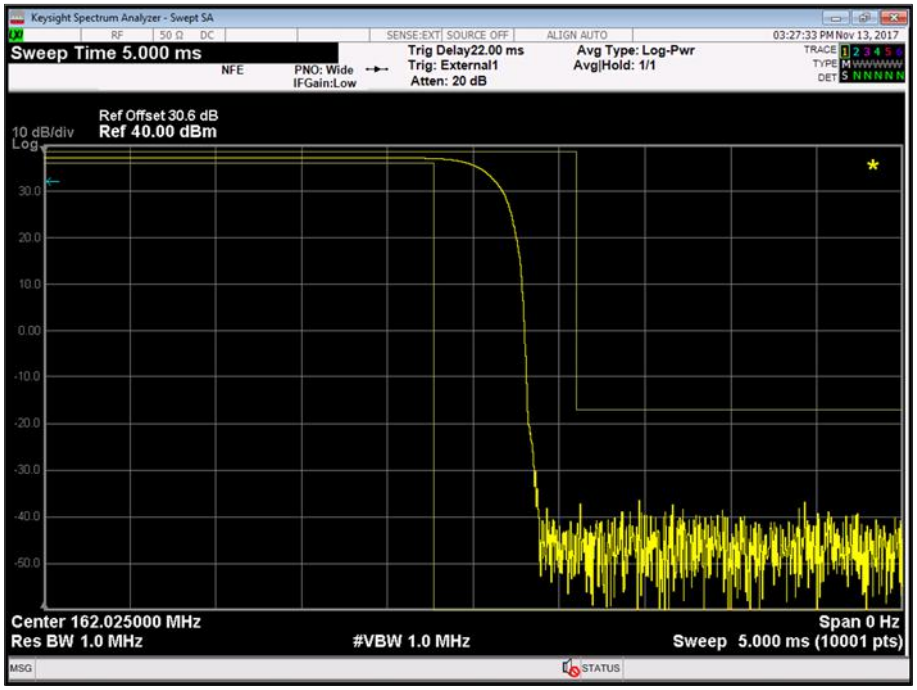

Figure 41 - 162.025 MHz – Tx2 - Ramp Down Zoomed

IEC 62287-2, Limit Clause 11.1.5.3

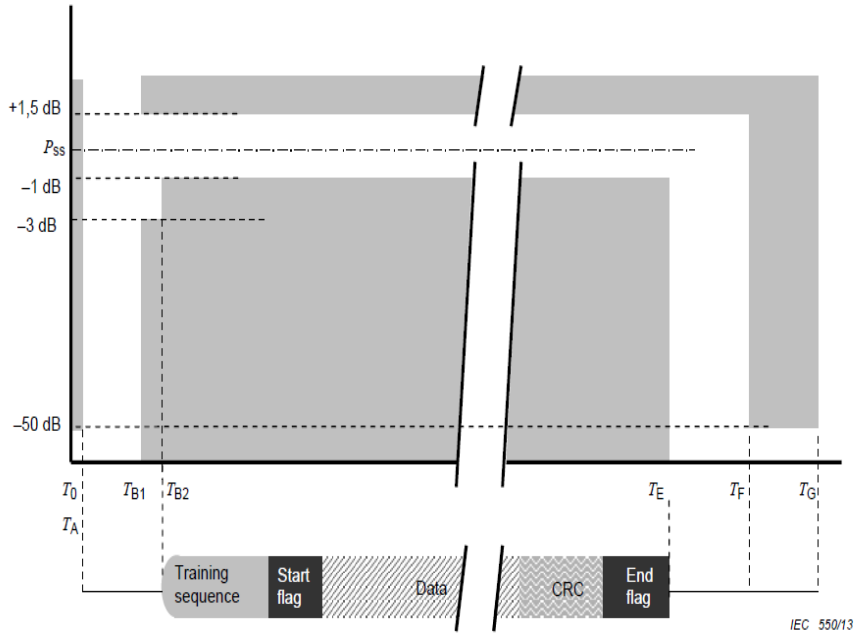

Figure 42 - Power Versus Time Mask

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 SFI1	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 (SFI_1) for Rx1

K	Calculated Frequency (MHz) for SFI1	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 (SFI_2) for Rx1

K	Calculated Frequency (MHz) for SFI1	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 (SFI_1) for Rx2

K	Calculated Frequency (MHz) for SFI2	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 (SFI_2) 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.

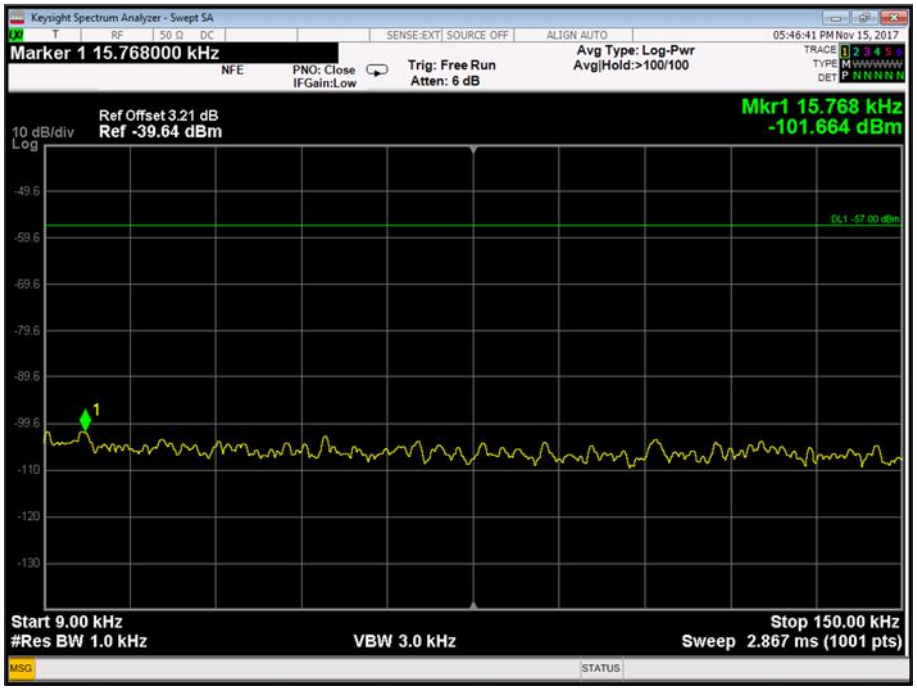

Figure 43 - 156.025 MHz - 9 kHz to 150 kHz

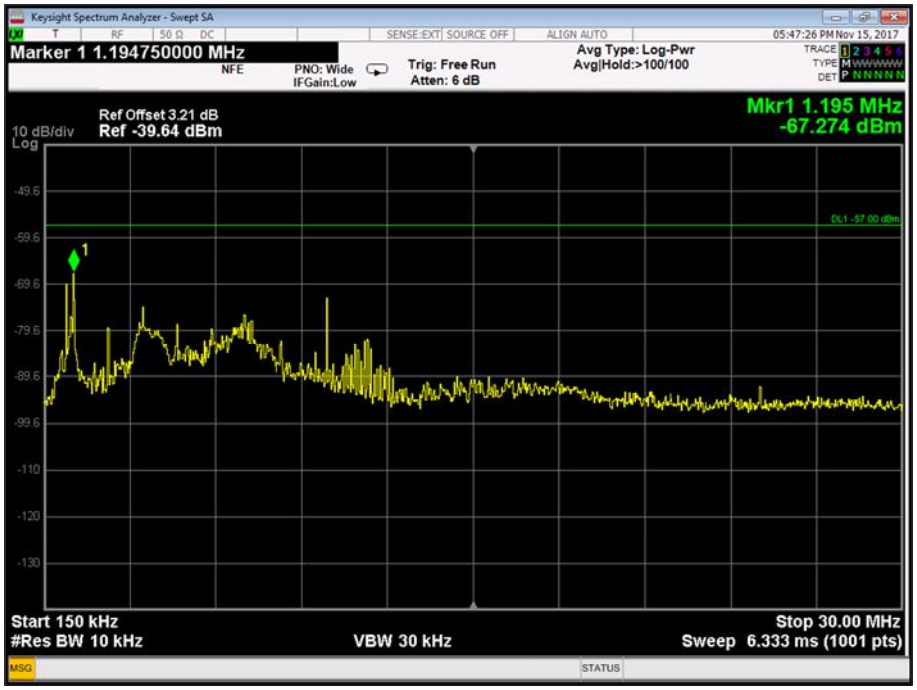

Figure 44 - 156.025 MHz - 150 kHz to 30 MHz

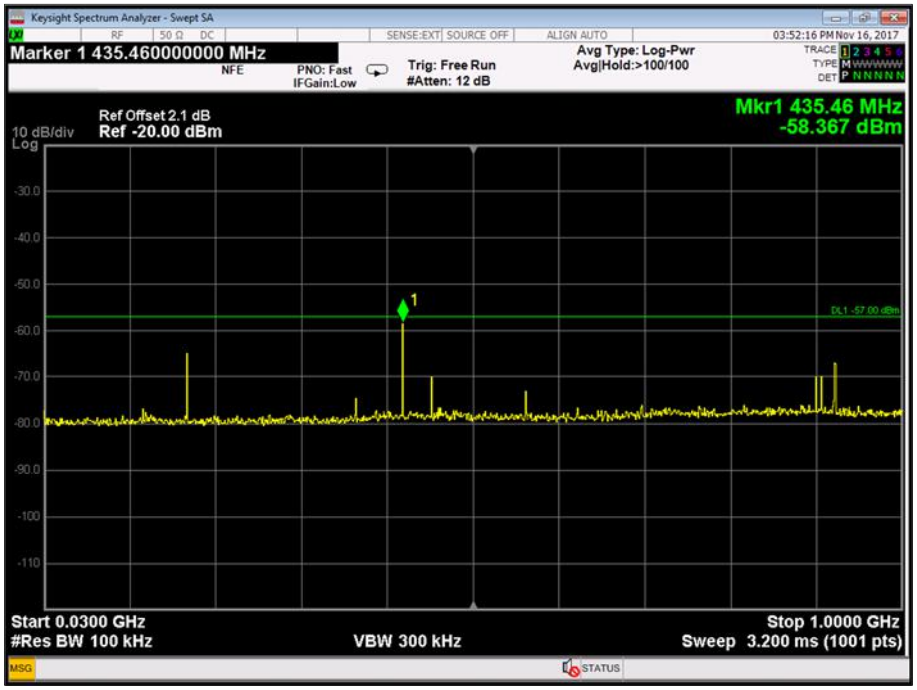

Figure 45 - 156.025 MHz - 30 MHz to 1 GHz

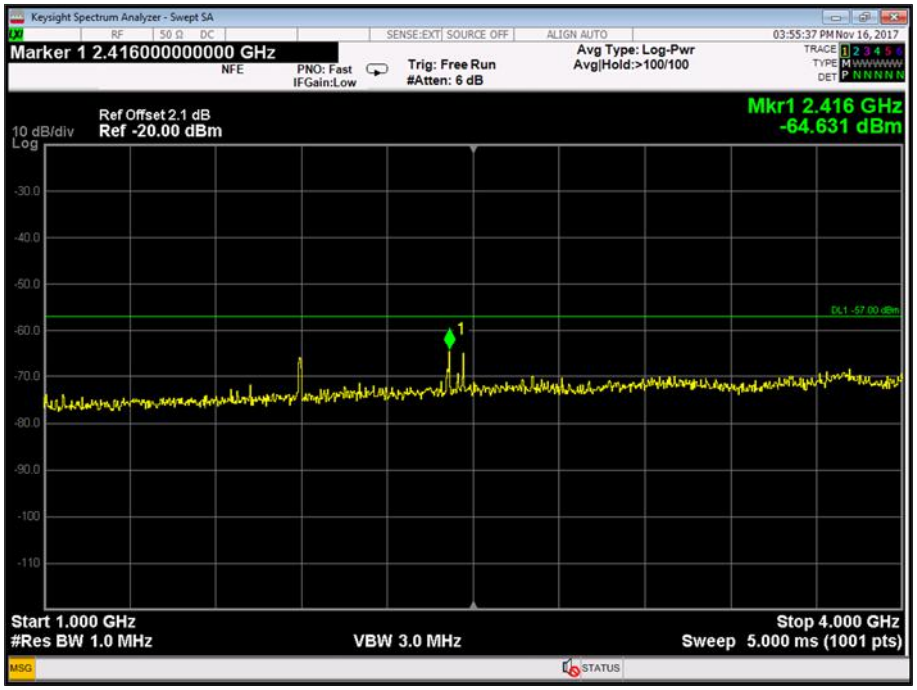

Figure 46 - 156.025 MHz - 1 GHz to 4 GHz

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.

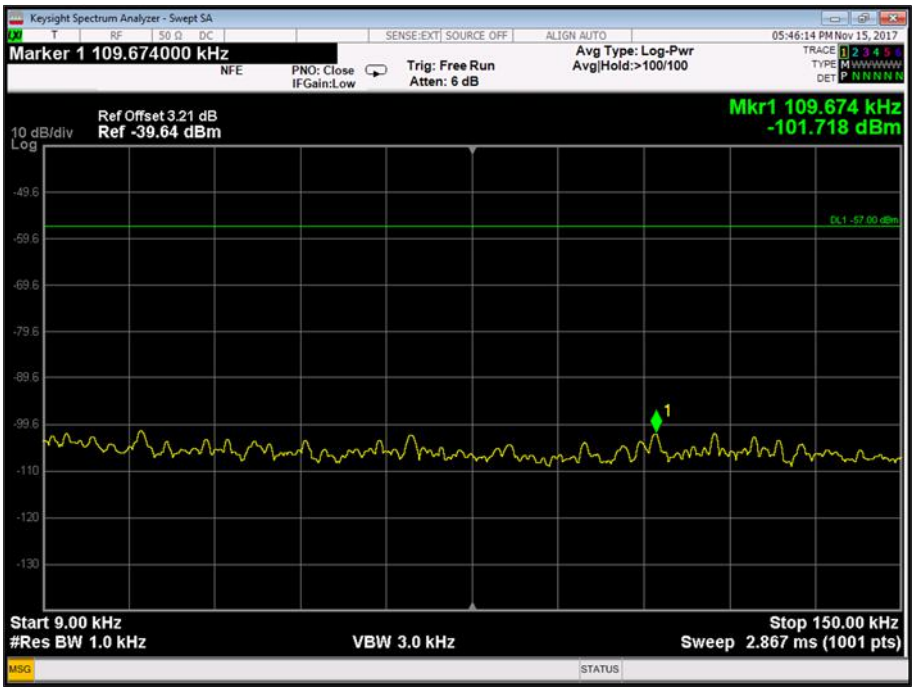

Figure 47 - 162.025 MHz - 9 kHz to 150 kHz

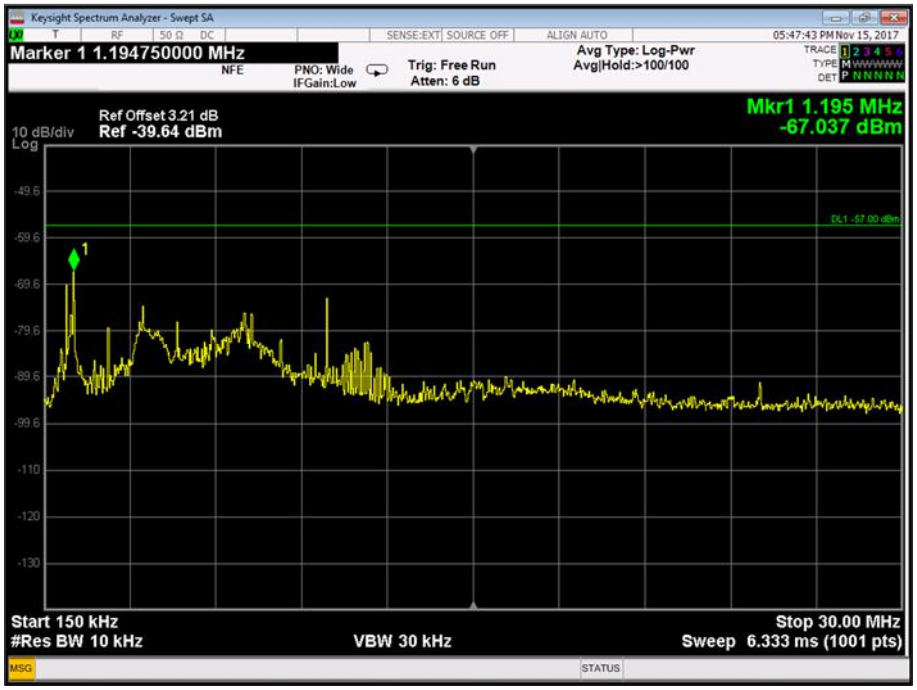

Figure 48 - 162.025 MHz - 150 kHz to 30 MHz

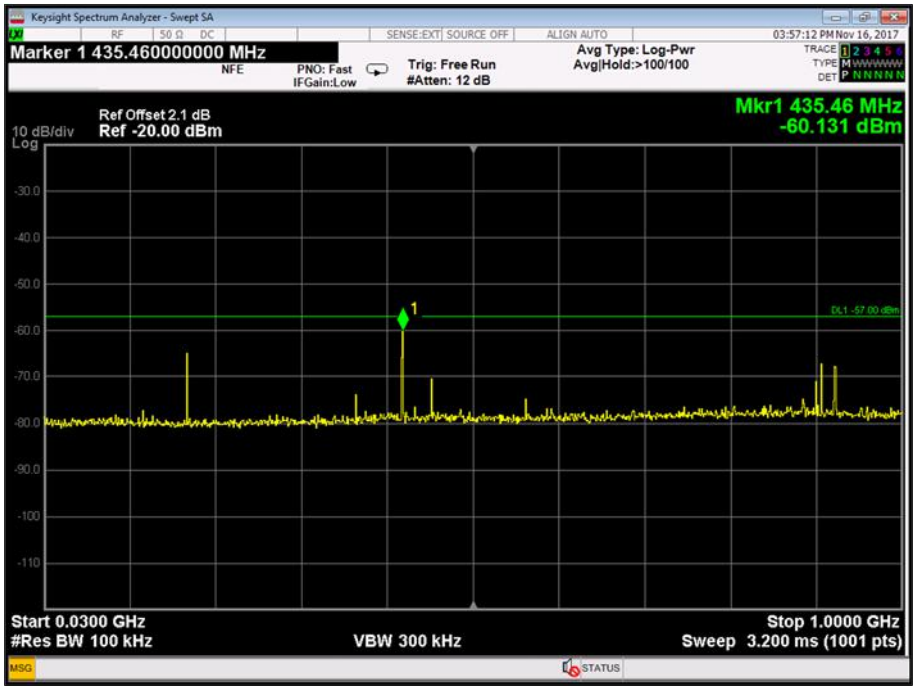

Figure 49 - 162.025 MHz - 30 MHz to 1 GHz

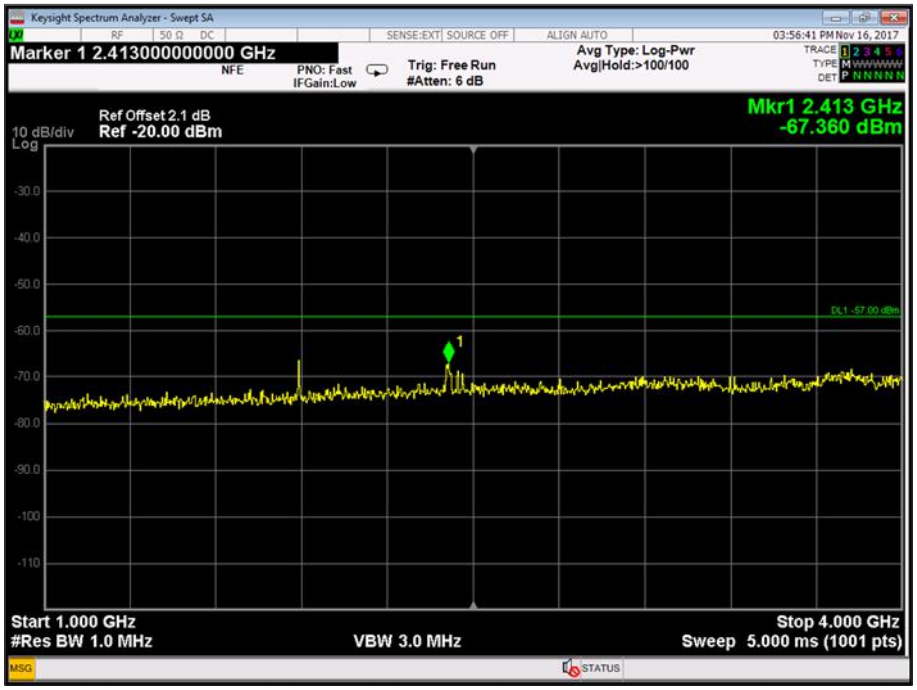

Figure 50 - 162.025 MHz - 1 GHz to 4 GHz

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.

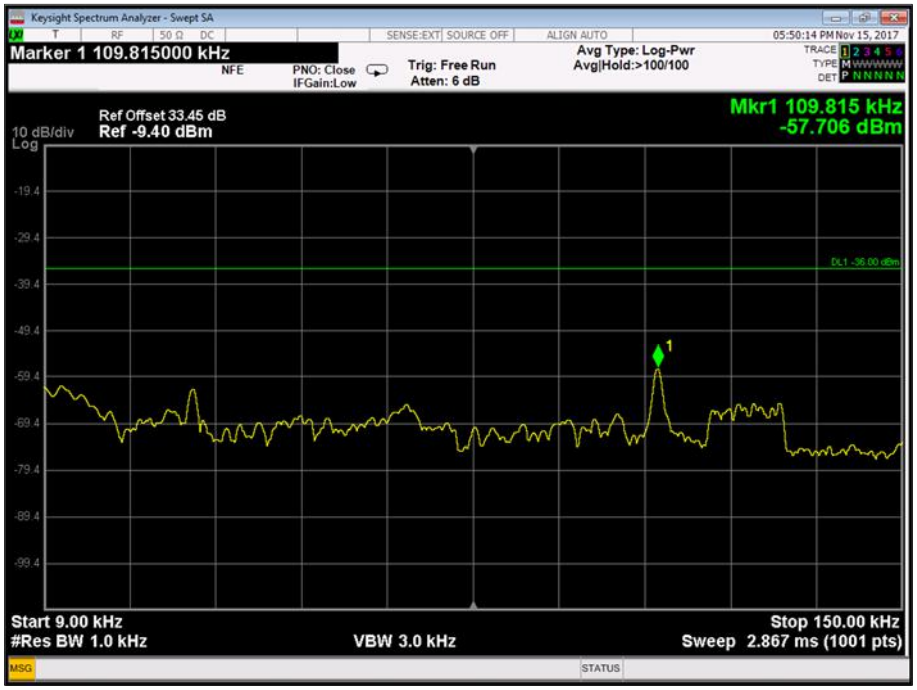

Figure 51 - 156.025 MHz - 9 kHz to 150 kHz

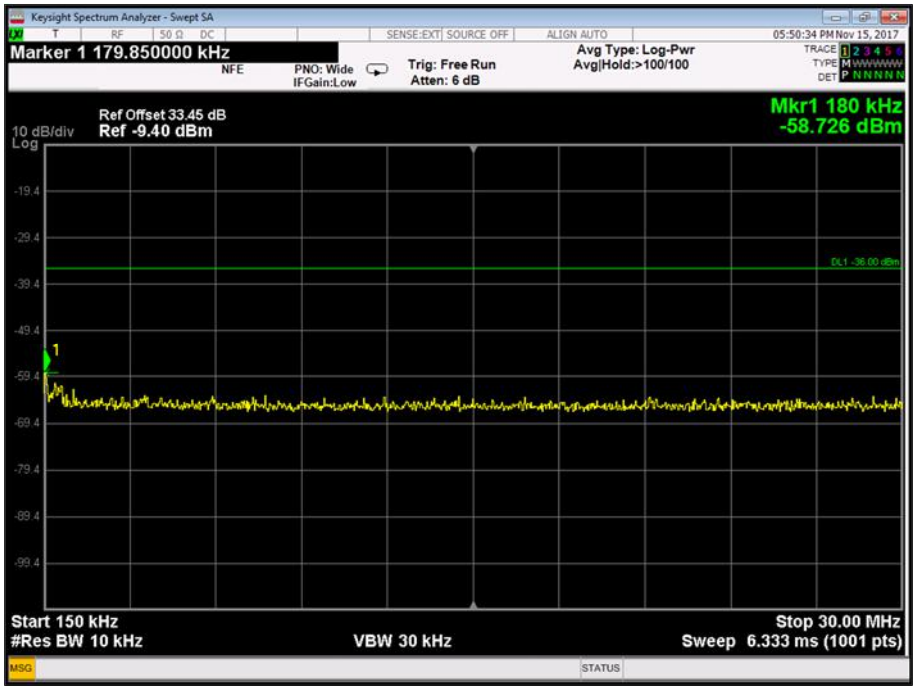

Figure 52 - 156.025 MHz - 150 kHz to 30 MHz

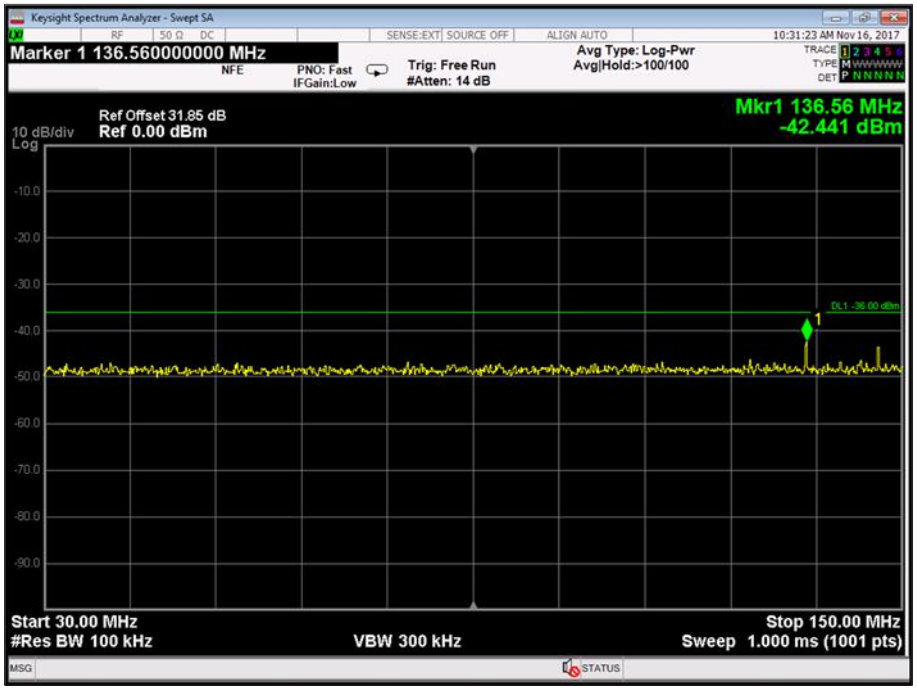

Figure 53 - 156.025 MHz - 30 MHz to 150 MHz

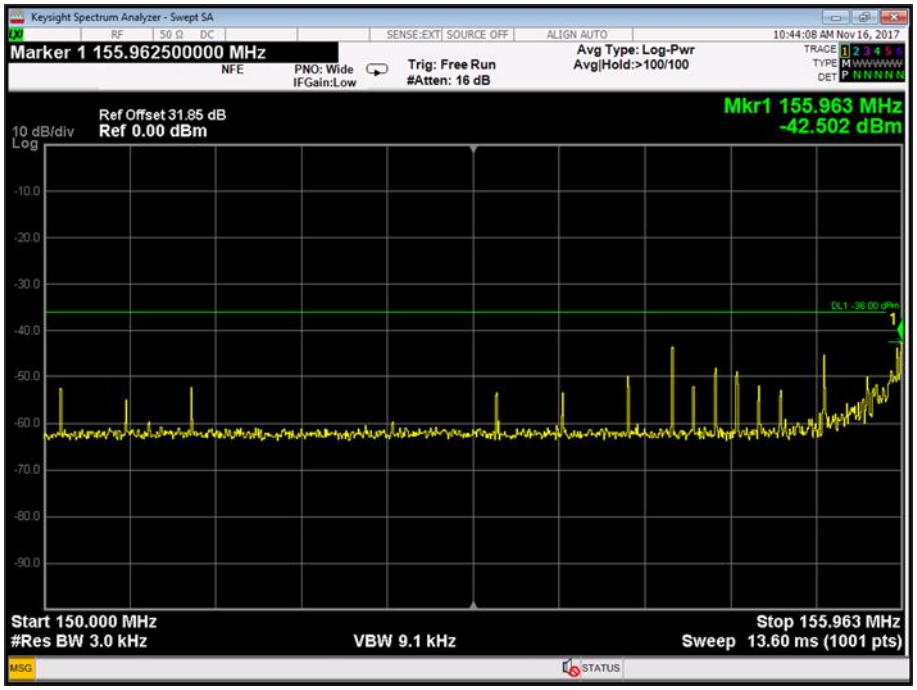

Figure 54 - 156.025 MHz - 150 MHz to 155.9625 MHz

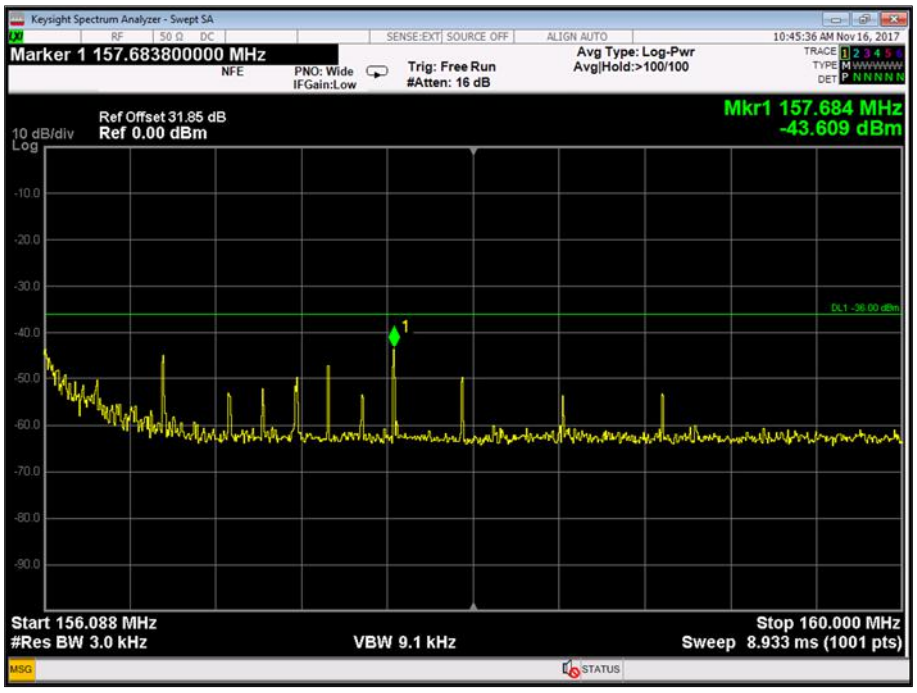

Figure 55 - 156.025 MHz - 156.0875 to 160 MHz

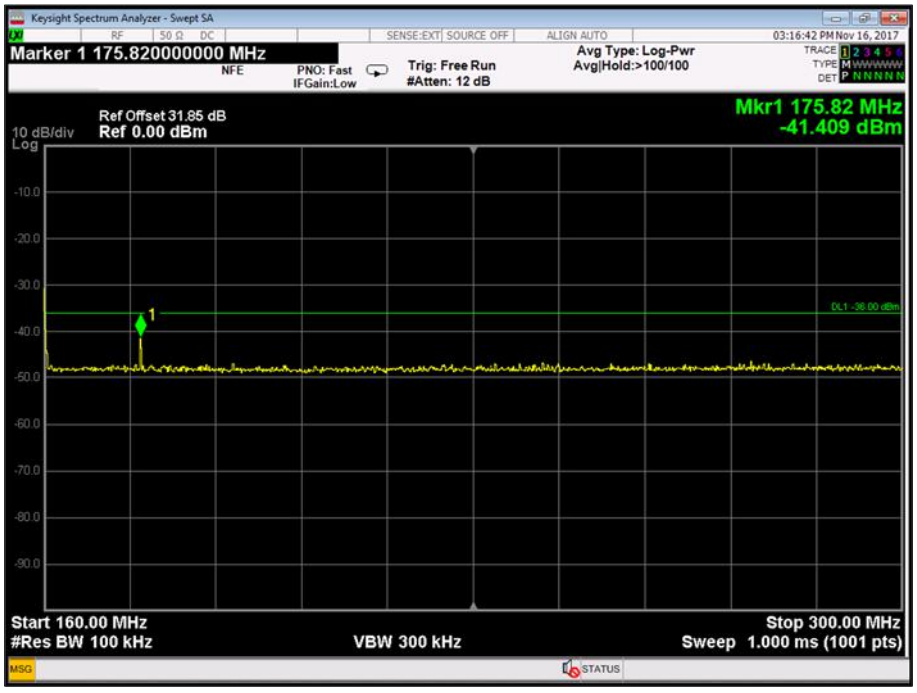

Figure 56 - 156.025 MHz - 160 MHz to 300 MHz

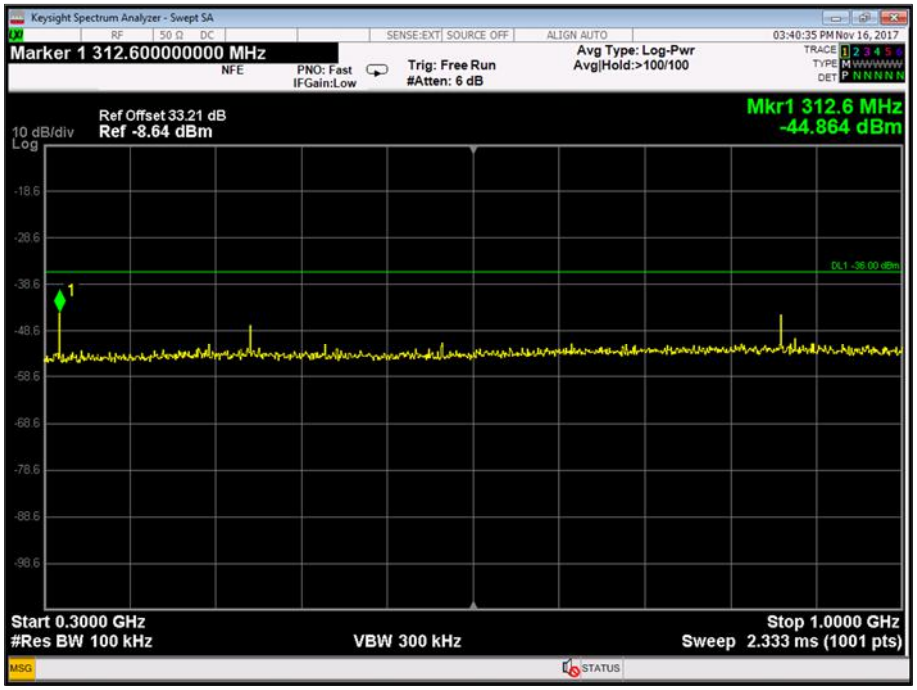

Figure 57 - 156.025 MHz - 300 MHz to 1 GHz

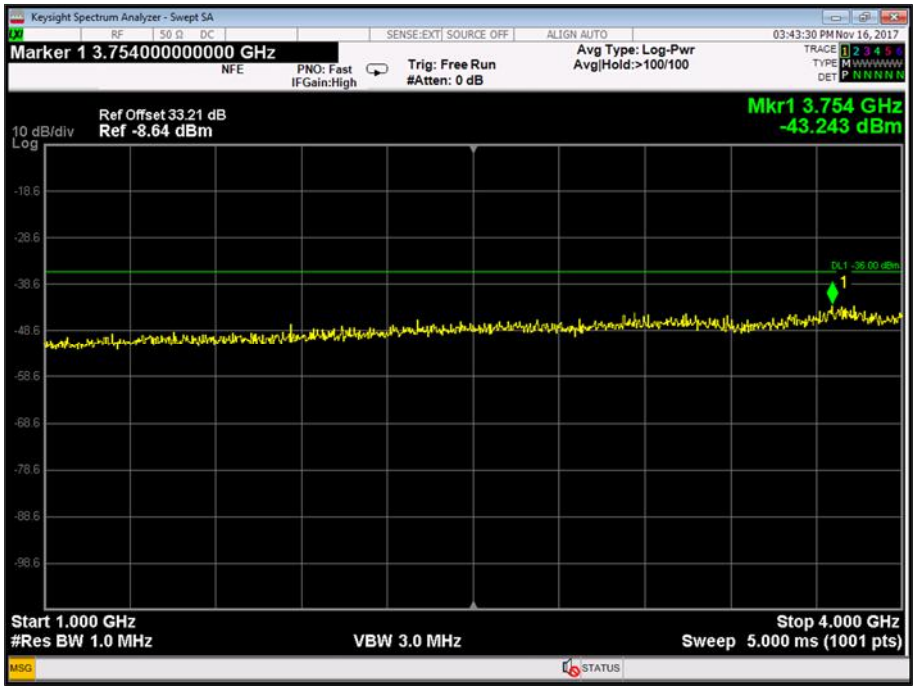

Figure 58 - 156.025 MHz - 1 GHz to 4 GHz

Frequency (MHz)	Level (dBm)
*	

Table 40 - Transmitter Emissions Results - 162.025 MHz

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

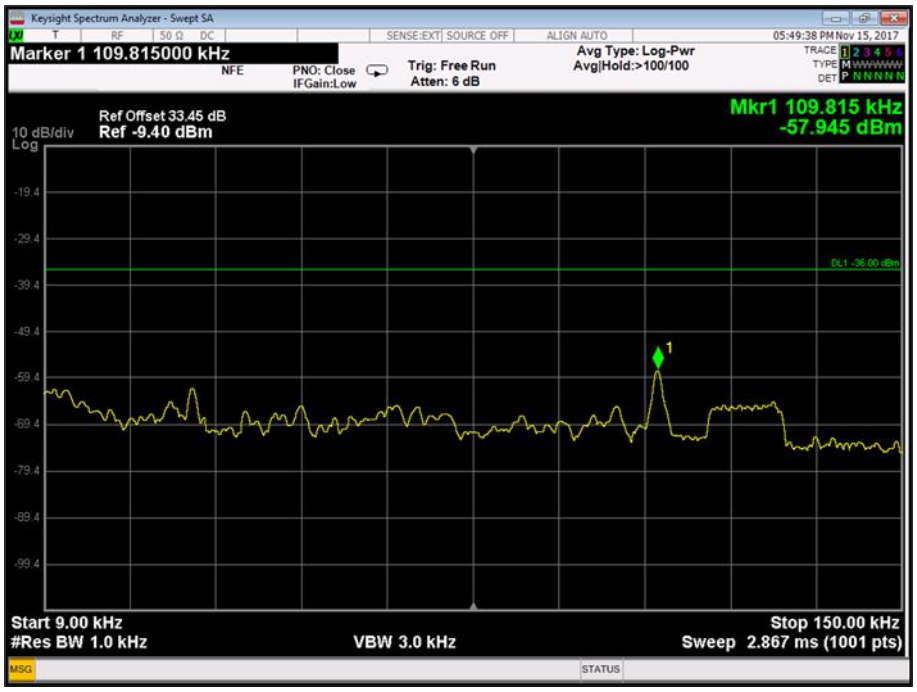

Figure 59 - 162.025 MHz - 9 kHz to 150 kHz

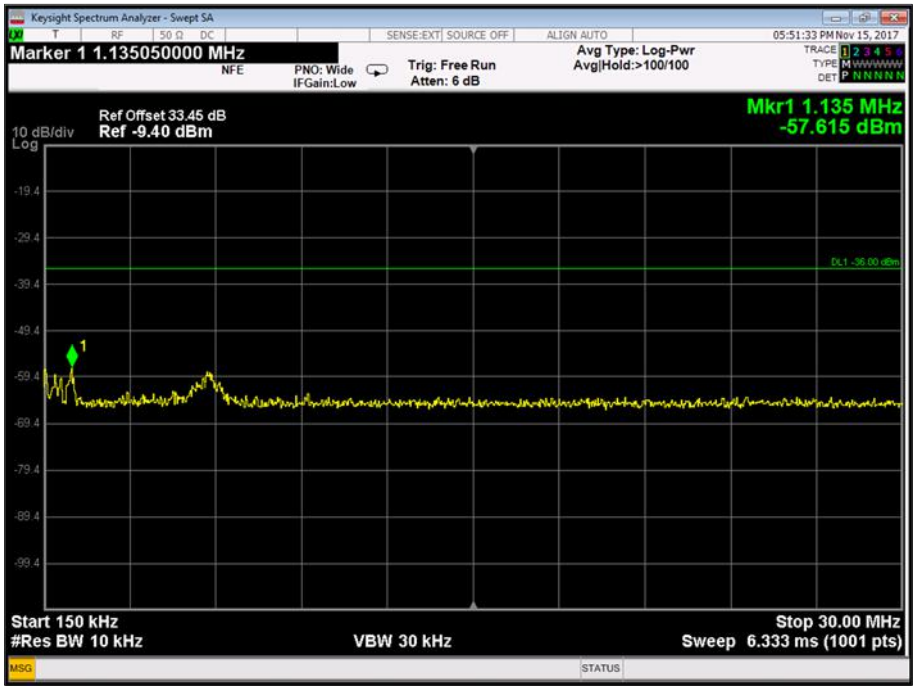

Figure 60 - 162.025 MHz - 150 kHz to 30 MHz

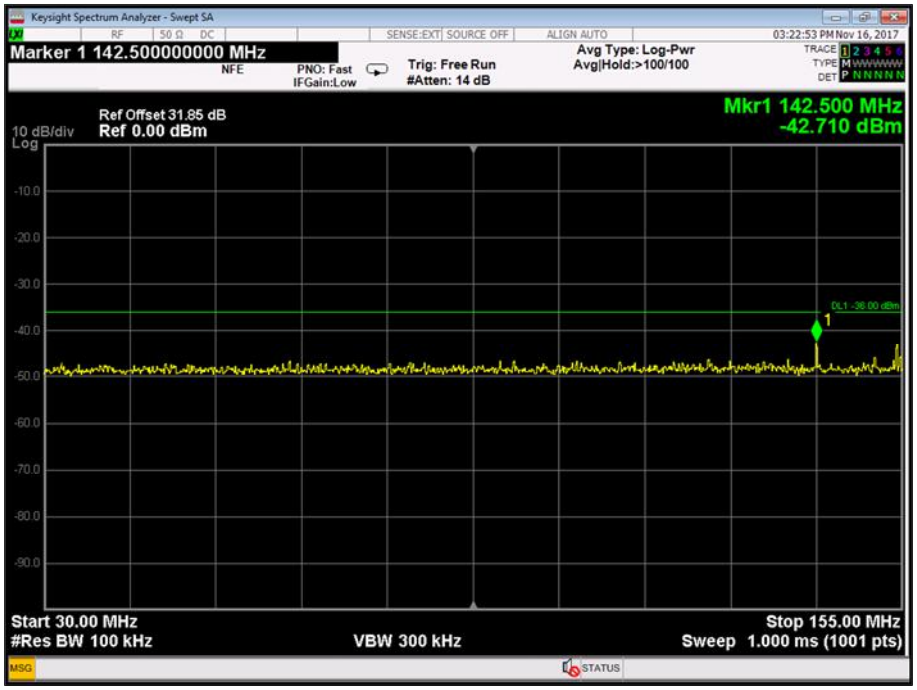

Figure 61 - 162.025 MHz - 30 MHz to 155 MHz

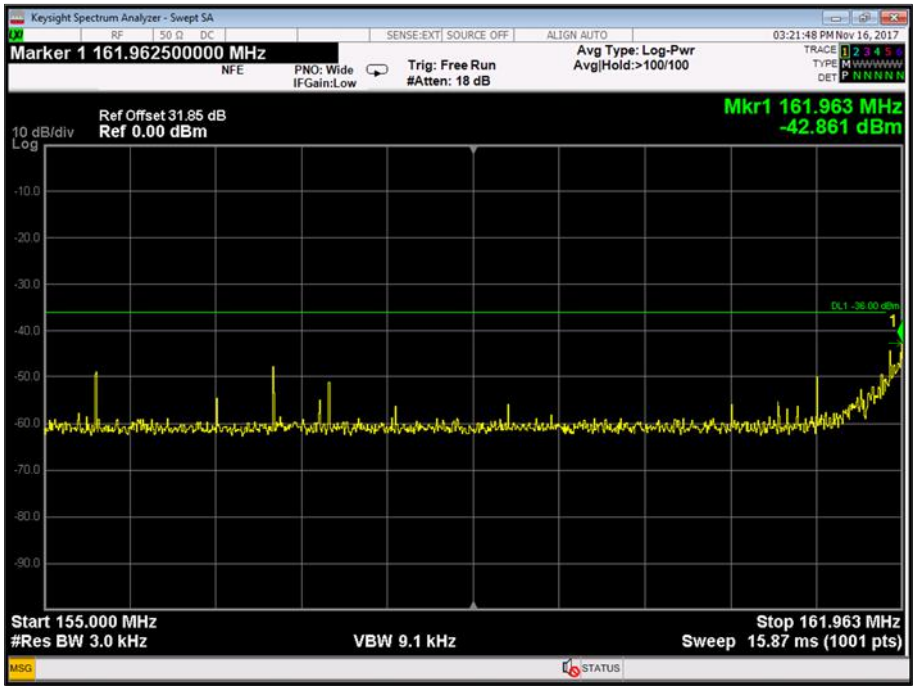

Figure 62 - 162.025 MHz - 155 MHz to 161.9625 MHz

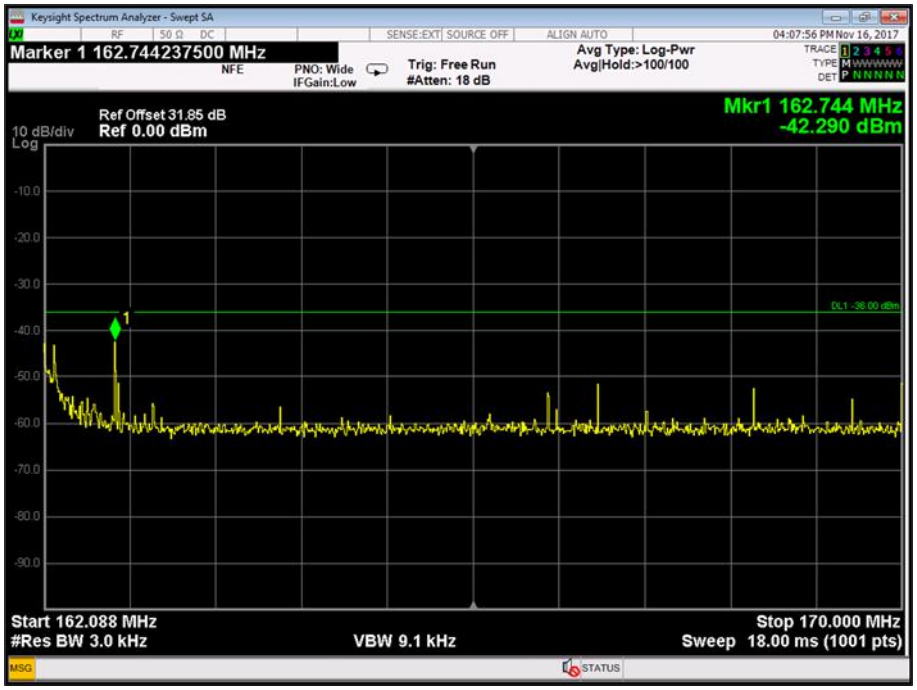

Figure 63 - 162.025 MHz - 162.0875 MHz to 170 MHz

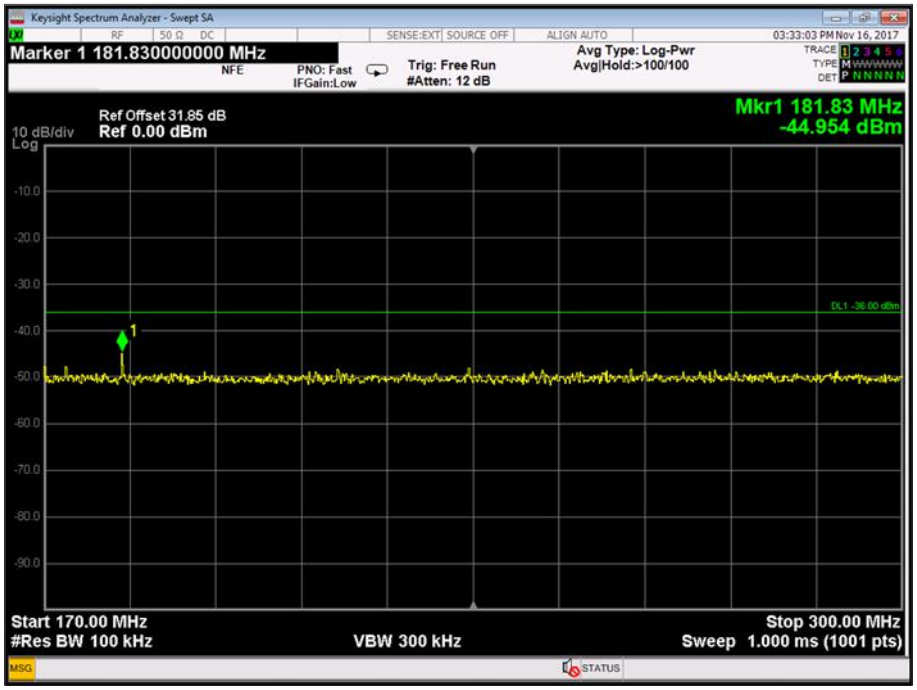

Figure 64 - 162.025 MHz - 170 MHz to 300 MHz

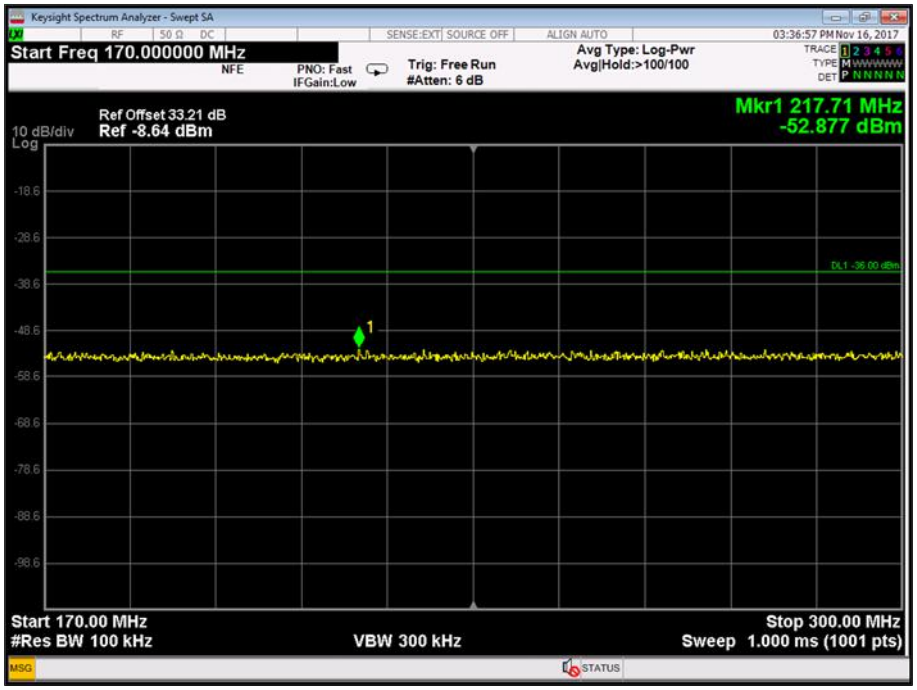

Figure 65 - 162.025 MHz - 300 MHz to 1 GHz

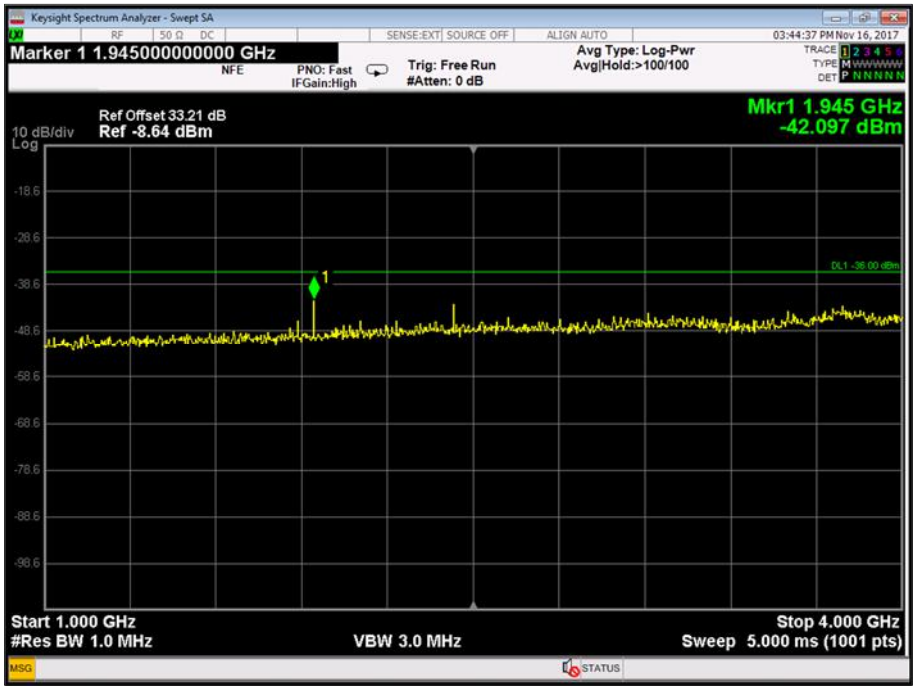

Figure 66 - 162.025 MHz - 1 GHz to 4 GHz

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 µW (–36 dBm) in the frequency range 9 kHz to 1 GHz and 1 µW (–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

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