

Report on the Radio Testing
For
Cambium Networks Ltd
on
PMP/PTP 450i
Report no. TRA-040203-47-00B
3 April 2018

RF930



Report Number: TRA-040203-47-00B
Issue: B

REPORT ON THE RADIO TESTING OF A
Cambium Networks Ltd
PMP/PTP 450i
WITH RESPECT TO SPECIFICATION
FCC 47CFR Subpart E

TEST DATE: 2018/01/29 to 2018/02/14

Written by: D Moncayola

Daniel Moncayola
Radio Test Engineer

Approved by:

John Charters
Department Manager-Radio

Date: 3 April 2018

Disclaimers:

- [1] THIS DOCUMENT MAY BE REPRODUCED ONLY IN ITS ENTIRETY AND WITHOUT CHANGE
[2] THE RESULTS CONTAINED IN THIS DOCUMENT RELATE ONLY TO THE ITEM(S) TESTED

RF930

1 Revision Record

<i>Issue Number</i>	<i>Issue Date</i>	<i>Revision History</i>
A	2018/07/07	Original
B	2018/04/03	Up dates

2 Summary

TEST REPORT NUMBER:	TRA-040203-47-00B
WORKS ORDER NUMBER	TRA-040203-00
PURPOSE OF TEST:	Testing of radio frequency equipment per the relevant authorization procedure of chapter 47 of CFR (code of federal regulations) Part 2, subpart J.
TEST SPECIFICATION:	47CFR15 Subpart E
EQUIPMENT UNDER TEST (EUT):	PMP/PTP 450i
FCC IDENTIFIER:	QWP-50450I
EUT SERIAL NUMBER:	not applicable
MANUFACTURER/AGENT:	Cambium Networks Ltd
ADDRESS:	Unit B2 Linhay Business Park Eastern Road Ashburton Devon TQ13 7UP United Kingdom
CLIENT CONTACT:	Don Reid ☎ 01364 655667 ✉ Don.Reid@Cambiumnetworks.com
ORDER NUMBER:	#NP82693728
TEST DATE:	2018/01/29 to 2018/02/14
TESTED BY:	Daniel Moncayola Steve Garwell Element

2.1 Test Summary

Test Method and Description		Requirement Clause	Applicable to this equipment	Result / Note
		47CFR15		
Radiated spurious emissions (restricted bands of operation and cabinet radiation)		15.205	☒	Pass
AC power line conducted emissions		15.207	☒	Pass
Occupied bandwidth		15.407(e)	☒	Pass
Output power	Conducted	15.407(a)	☒	Pass
	PSD		☒	
	RPE		☐	
Conducted / radiated RF power out-of-band		15.407(b)	☒	Pass
TPC and DFS		15.407(h)	☐	Note 1
U-NII detection bandwidth		15.407(h)(2)	☐	Note 1
CAC		15.407(h)(2)(ii)	☐	Note 1
In-service monitoring		15.407(h)(2)(iii) & 15.407(h)(2)(iv)	☐	Note 1

Notes:

Note 1: Not Applicable, unit transmitting only in U-NII-3.

The results contained in this report relate only to the items tested, in the condition at time of test, and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

The apparatus was set-up and exercised using the configurations, modes of operation and arrangements defined in this report only. Any modifications made are identified in Section 8 of this report.

Particular operating modes, apparatus monitoring methods and performance criteria required by the standards tested to have been performed except where identified in Section 5.2 of this test report (Deviations from Test Standards).

3 Contents

1	Revision Record	3
2	Summary	4
2.1	Test Summary	5
3	Contents	6
4	Introduction	7
5	Test Specifications	8
5.1	Normative References	8
5.2	Deviations from Test Standards	8
6	Glossary of Terms	9
7	Equipment Under Test	10
7.1	EUT Identification	10
7.2	System Equipment	10
7.3	EUT Mode of Operation	10
7.4	EUT Radio Frequency Parameters	11
7.4.1	General	11
7.4.2	Antennas	11
7.5	EUT Description	11
8	Modifications	12
9	EUT Test Setup	12
9.1	Block Diagram	12
9.2	General Set-up Photograph	13
10	General Technical Parameters	15
10.1	Normal Conditions	15
10.2	Varying Test Conditions	15
11	Radiated emissions	16
11.1	Definitions	16
11.2	Test Parameters	16
11.3	Test Method	16
11.4	Test Equipment	19
11.5	Test Results	20
12	AC power-line conducted emissions	29
12.1	Definition	29
12.2	Test Parameters	29
12.3	Test Method	29
12.4	Test Equipment	31
12.5	Test Results	31
13	Occupied Bandwidth	32
13.1	Definition	32
13.2	Test Parameters	32
13.3	Test Method	32
13.4	Test Equipment	33
13.5	Test Results	33
14	Maximum conducted output power	41
14.1	Definition	41
14.2	Test Parameters	41
14.3	Test Method	41
14.4	Test Equipment	42
14.5	Test Results	42
15	Power spectral density	44
15.1	Definition	44
15.2	Test Parameters	44
15.3	Test Method	45
15.4	Test Equipment	45
15.5	Test Results	45
16	Out-of-band spurious emissions	50
16.1	Definition	50
16.2	Test Parameters	50
16.3	Test Method	51
16.4	Test Equipment	51
16.5	Test Results	51
17	Measurement Uncertainty	59

4 Introduction

This report TRA-040203-47-00B presents the results of the Radio testing on a Cambium Networks Ltd, PMP/PTP 450i to specification 47CFR15 Radio Frequency Devices.

The testing was carried out for Cambium Networks Ltd by Element, at the address detailed below.

☐	Element Hull Unit E South Orbital Trading Park Hedon Road Hull HU9 1NJ UK	☒	Element Skelmersdale Unit 1 Pendle Place Skelmersdale West Lancashire WN8 9PN UK
--------------------------	---	-------------------------------------	--

This report details the configuration of the equipment, the test methods used and any relevant modifications where appropriate.

FCC Site Listing:

The test laboratory is accredited for the above sites under the US-EU MRA, Designation number UK0009.

ISED Registration Number(s):

Element Skelmersdale	3930B
Element Hull	3483A

The test site requirements of ANSI C63.4-2014 are met up to 1GHz.

The test site SVSWR requirements of CISPR 16-1-4:2010 are met over the frequency range 1 GHz to 18 GHz.

5 Test Specifications

5.1 Normative References

- FCC 47 CFR Ch. I – Part 15 – Radio Frequency Devices.
- FCC KDB Publication 789033 D02 v02r01 – Guidelines For Compliance Testing Of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E
- ANSI C63.10-2013 – American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.
- ANSI C63.4-2014 – American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

5.2 Deviations from Test Standards

There were no deviations from the test standard.

6 Glossary of Terms

§	denotes a section reference from the standard, not this document
AC	Alternating Current
ANSI	American National Standards Institute
BW	bandwidth
C	Celsius
CAC	Channel Availability Check
CFR	Code of Federal Regulations
CW	Continuous Wave
dB	decibel
dBm	dB relative to 1 milliwatt
DC	Direct Current
DFS	Dynamic Frequency Selection
DSSS	Direct Sequence Spread Spectrum
EIRP	Equivalent Isotropically Radiated Power
ERP	Effective Radiated Power
EUT	Equipment Under Test
FCC	Federal Communications Commission
FHSS	Frequency Hopping Spread Spectrum
Hz	hertz
IC	Industry Canada (now ISED)
ISED	Innovation, Science and Economic Development Canada
ITU	International Telecommunication Union
LBT	Listen Before Talk
LE-LAN	Licence-Exempt Local Area Network
m	metre
max	maximum
MIMO	Multiple Input and Multiple Output
min	minimum
MRA	Mutual Recognition Agreement
N/A	Not Applicable
PCB	Printed Circuit Board
PDF	Portable Document Format
Pt-mpt	Point-to-multipoint
Pt-pt	Point-to-point
PSD	Power Spectral Density
RF	Radio Frequency
RH	Relative Humidity
RMS	Root Mean Square
Rx	receiver
s	second
SVSWR	Site Voltage Standing Wave Ratio
TPC	Transmitter Power Control
Tx	transmitter
UKAS	United Kingdom Accreditation Service
U-NII	Unlicensed-National Information Infrastructure
V	volt
W	watt
Ω	ohm

7 Equipment Under Test

7.1 EUT Identification

- Name: PMP/PTP 450i
- Serial Number: not applicable
- Model Number: 450i
- Software Revision: Test software
- Build Level / Revision Number: R5

7.2 System Equipment

Equipment listed below forms part of the overall test setup and is required for equipment functionality and/or monitoring during testing. The compliance levels achieved in this report relate only to the EUT and not items given in the following list.

- Name: Cambium Networks Power Injector AC + DC
- Serial Number: 1611000125
- Model Number: E100109B G
- Build Level / Revision Number: 02
- Name: Dell Latitude Laptop PC
- Serial Number: 2CE00223BK
- Model Number: E6440

7.3 EUT Mode of Operation

The mode of operation for tests was as follows:

EUT is set to permanently transmit on the required frequency, modulation type and operational mode with two different antenna settings, sector integral and sector connectorized.

Power GUI settings:

GUI Power setting 5 MHz bandwidth channels				
Mod modes Freq. (MHz)	QPSK	16 QAM	64 QAM	256 QAM
5727.5	19.5	19.5	19.5	19.5
5788	19.5	19.5	19.5	19.5
5847.5	18.25	18.25	18.25	18.25

GUI Power setting 40 MHz bandwidth channels				
Mod modes Freq. (MHz)	QPSK	16 QAM	64 QAM	256 QAM
5745	19.5	19.5	19.5	19.5
5788	19.5	19.5	19.5	19.5
5830	18.5	18.5	18.5	18.5

7.4 EUT Radio Frequency Parameters

7.4.1 General

Band of operation:	5725 MHz to 5850 MHz
Modulation type(s):	QPSK, 16 QAM, 64 QAM and 256 QAM
Occupied channel bandwidth(s):	5 MHz and 40 MHz
Channel spacing:	5 MHz and 40 MHz
Declared output power(s):	19 dBm + 17 dBi antenna gain
Warning against use of alternative antennas in user manual (yes/no):	Not Applicable
Nominal Supply Voltage:	-48 Vdc (POE)
Location of notice for license exempt use:	User manual
Method of prevention of use on non-US frequencies:	Digitally signed software / licence key

7.4.2 Antennas

Type:	Integrated and connectorized 90 degree sector antenna
Frequency range:	4900 MHz to 5925 MHz
Impedance:	50 Ohm
Gain:	17 dBi $\pm$ 1 dBi integrated 90° sector or external
Polarisation:	Sector 90 °
Connector type:	50 Ohm, N-Type (Connectorized version only)
Dimensions:	Connectorized 26.0 x 13.4 x 6.4 cm (10.3" x 5.3" x 3.3") Integrated 59.5 x 15.7 x 15.5 cm (23.4" x 6.2" x 6.1")
Weight:	Connectorized Approx. 2 kg (4.5 lbs) Integrated Approx. 6.8 kg (15 lbs)
Environmental limits:	IP67, IP66

7.5 EUT Description

The equipment under test is a transceiver operating in the 5725 MHz to 5850 MHz band. The test has been performed with two different antenna configurations: sectorised integral and sectorised external.

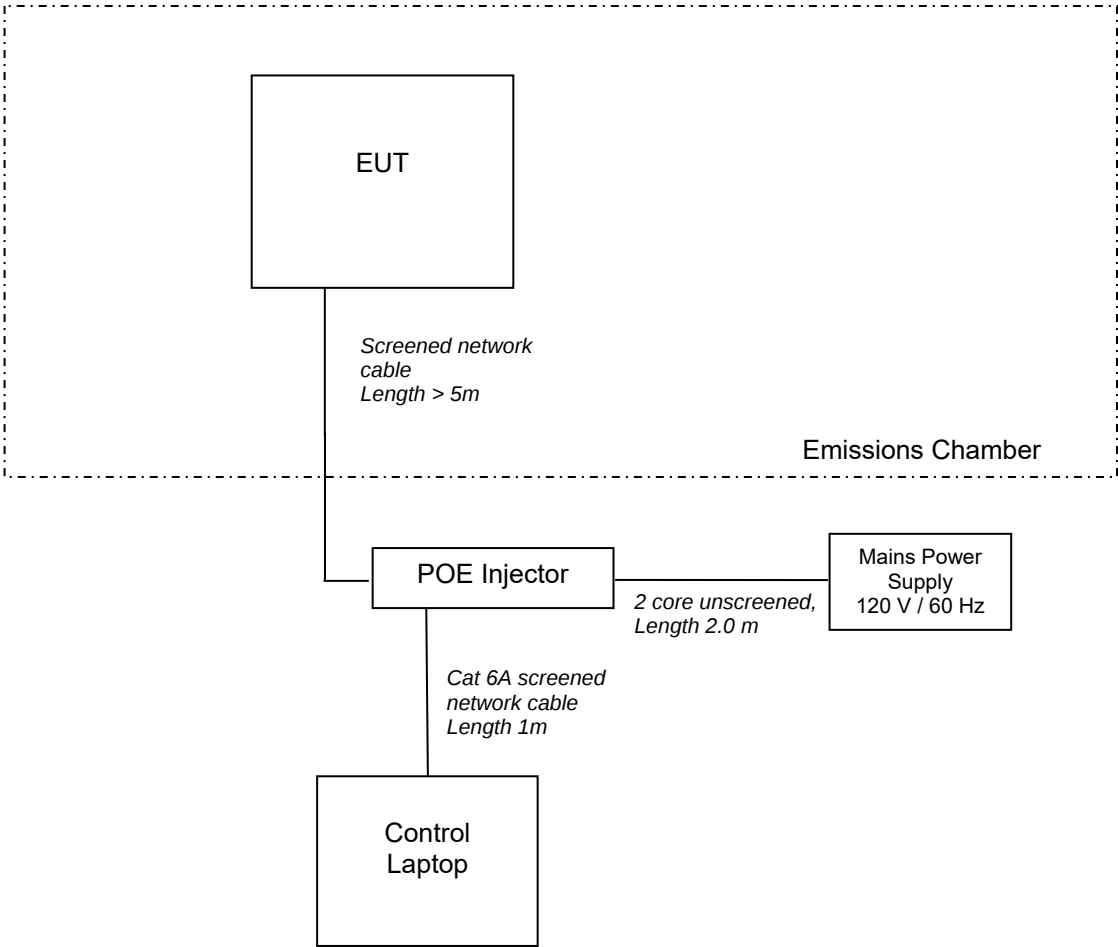
8 Modifications

No modifications were performed during this assessment.

9 EUT Test Setup

9.1 Block Diagram

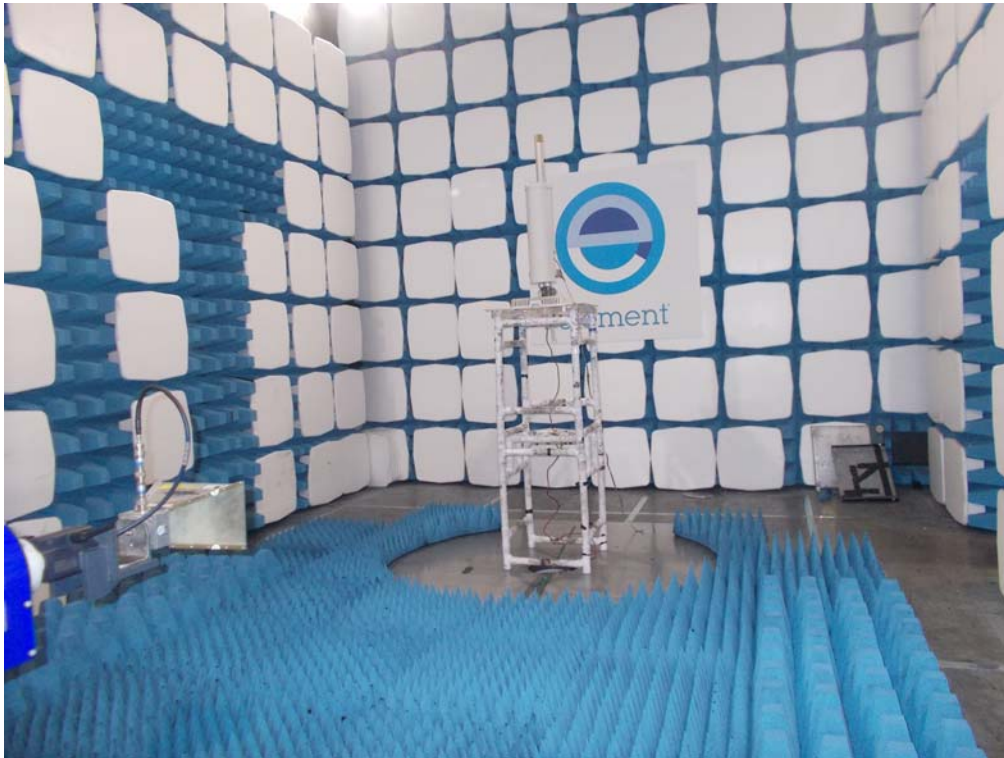
The following diagram shows basic EUT interconnections with cable type and cable lengths identified:



9.2 General Set-up Photograph

The following photograph shows basic EUT set-up:

Integral antenna setup



External antenna setup



10 General Technical Parameters

10.1 Normal Conditions

The E U T was tested under the normal environmental conditions of the test laboratory, except where otherwise stated. The normal power source applied was -48V dc from a power over Ethernet adaptor.

10.2 Varying Test Conditions

Variation of supply voltage is required to ensure stability of the declared output power and frequency. During carrier power testing the following variations were made:

	Category	Nominal	Variation
☐	Mains	110 V ac	85% and 115%
☒	Adaptor	-48 Vdc	N/A

11 Radiated emissions

11.1 Definitions

Spurious emissions

Emissions on a frequency or frequencies, which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude out-of-band emissions.

Restricted bands

A frequency band in which intentional radiators are permitted to radiate only spurious emissions but not fundamental signals.

11.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Chamber
Test Standard and Clause:	ANSI C63.10-2013, Clause 6.5 and 6.6
EUT Frequencies Measured:	5727.5 MHz / 5788 MHz / 5847.5 MHz
EUT Channel Bandwidths:	5 MHz
Deviations From Standard:	None
Measurement BW:	30 MHz to 1 GHz: 120 kHz Above 1 GHz: 1 MHz
Measurement Detector:	Up to 1 GHz: quasi-peak Above 1 GHz: RMS average and Peak

Environmental Conditions (Normal Environment)

Temperature: 25 °C	+15 °C to +35 °C (as declared)
Humidity: 32 %RH	20%RH to 75%RH (as declared)
Supply: -48 Vdc	-48 Vdc (as declared)

Test Limits

Unwanted emissions that fall within the restricted frequency bands shall comply with the limits specified:

General Field Strength Limits for License-Exempt Transmitters at Frequencies Above 30 MHz

<i>Frequency (MHz)</i>	<i>Field Strength (μV/m at 3m)</i>
30-88	100
88-216	150
216-960	200
Above 960	500

11.3 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure i, the emissions from the EUT were measured on a spectrum analyzer / EMI receiver.

Radiated electromagnetic emissions from the EUT are checked first by preview scans. Preview scans for all spectrum and modulation characteristics are checked, using a peak detector and where applicable worst-case determined for function, operation, orientation, etc. for both vertical and horizontal polarisations. Pre-scan plots are shown with a peak detector and 100kHz RBW.

If the EUT connects to auxiliary equipment and is table or floor standing, the configurations prescribed in ANSI C63.10 are followed. Alternatively, a layout closest to normal use (as declared by the provider) is employed, (see EUT setup photographs for more detail).

Emissions between 30 MHz and 1 GHz are measured using calibrated broadband antennas. Emissions above 1 GHz are characterized using standard gain horn antennas. Pre-amplifiers and filters are used where required. Care is taken to ensure that test receiver resolution bandwidth, video bandwidth and detector type(s) meet the regulatory requirements.

For both horizontal and vertical polarizations, the EUT is then rotated through 360 degrees in azimuth until the highest emission is detected. At the previously determined azimuth the test antenna is raised and lowered from 1 to 4 m in height until a maximum emission level is detected, this maximum value is recorded.

Power values measured on the test receiver / analyzer are converted to field strength, FS, in dB μ V/m at the regulatory distance, using:

$$FS = PR + CL + AF - PA + DC - CF$$

Where,

PR is the power recorded on the receiver / spectrum analyzer in dB μ V;

CL is the cable loss in dB;

AF is the test antenna factor in dB/m;

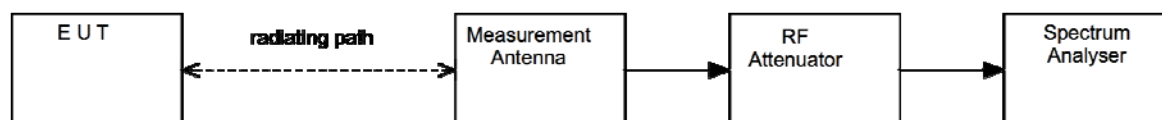
PA is the pre-amplifier gain in dB (where used);

DC is the duty correction factor in dB (where used, e.g. where average detector on pulsed harmonic understates the power);

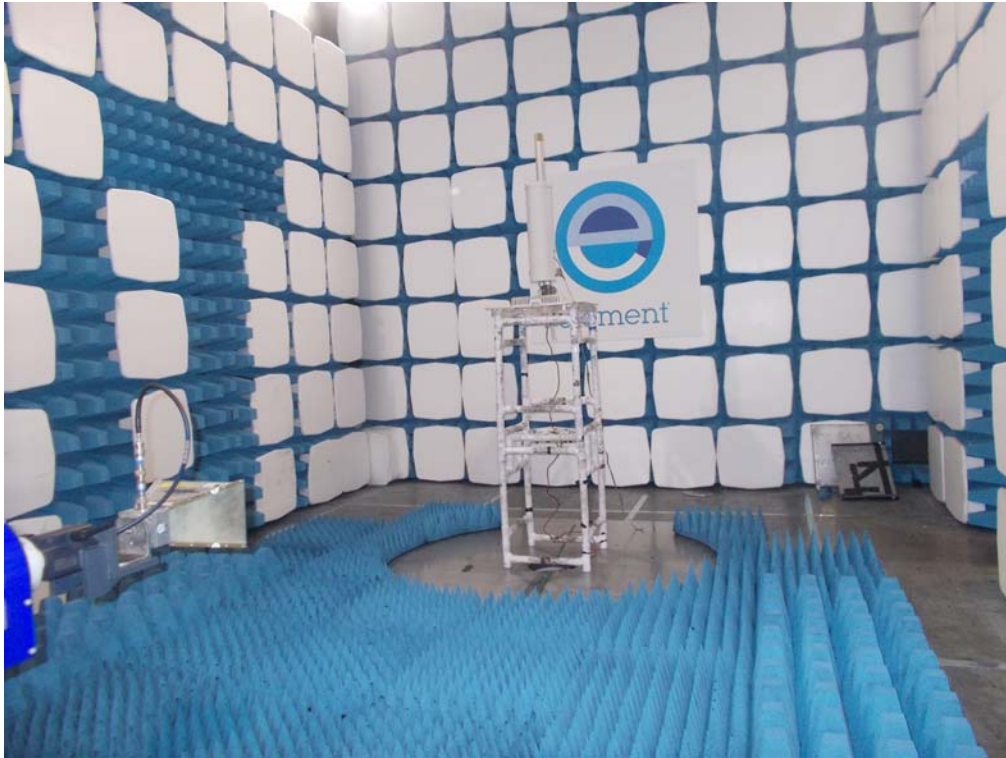
CF is the distance factor in dB (where measurement distance different to limit distance);

This field strength value is then compared with the regulatory limit.

Figure i Test Setup



Test Setup Photograph(s)

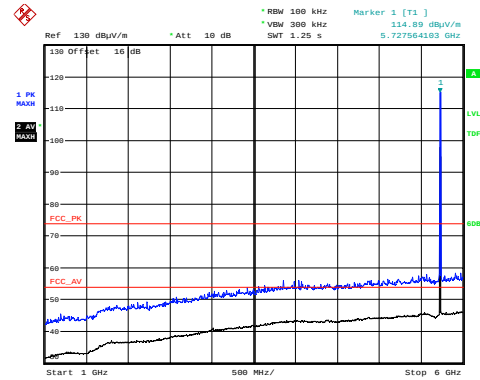
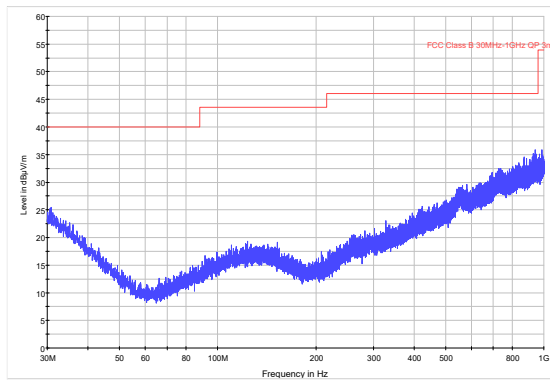


11.4 Test Equipment

Equipment Description	Manufacturer	Equipment Type	Element No	Last Cal Calibration	Calibration Period	Due For Calibration
Bilog	Chase	CBL611/A	U191	2017-02-23	24	2019-02-23
Receiver	R&S	ESVS10	L352	2017-07-28	12	2018-07-28
Spectrum Analyser	R&S	FSU46	U281	2017-06-19	12	2018-06-19
1-18GHz Horn	EMCO	3115	L139	2017-09-25	24	2019-09-25
Pre Amp	Agilent	8449B	L572	2017-09-28	12	2018-09-28
Horn 18-26GHz (&U330)	Flann	20240-20	L300	2016-04-07	24	2018-04-07
Standard Gain Horn 26-40	Flann	22240-20	L301	2017-07-25	12	2018-07-25
6 dB Attenuator	Bird	8304-060-N	U376	Calibrate in Use		
10 dB Attenuator	Bird	8304-100-N	L222	Calibrate in Use		
High Pass Filter	Atlantic Microwave Ltd	AFH-0700	U558	Calibrate in Use		

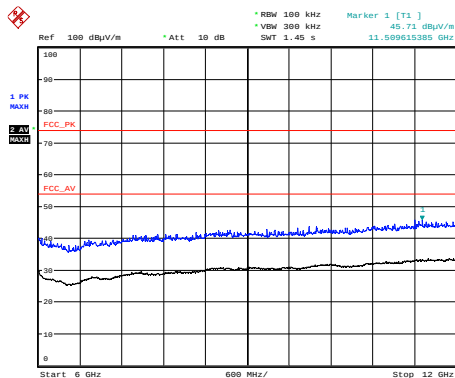
11.5 Test Results

Integral antenna



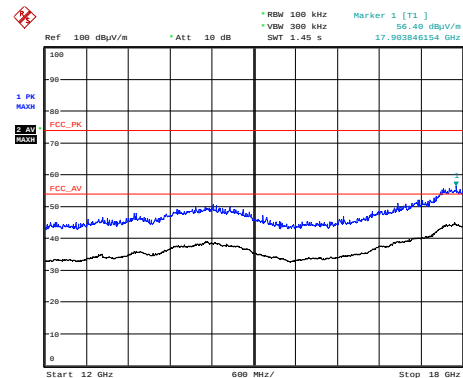
Date: 9.FEB.2018 14:50:26

30 MHz to 1 GHz



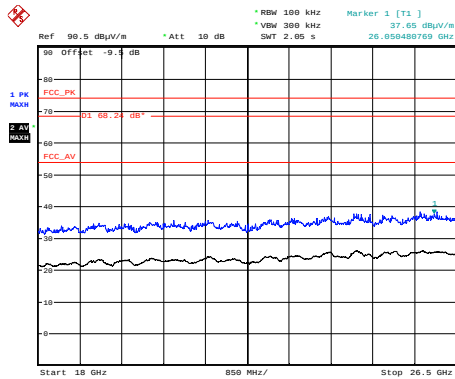
Date: 9.FEB.2018 15:49:04

1 GHz to 6 GHz



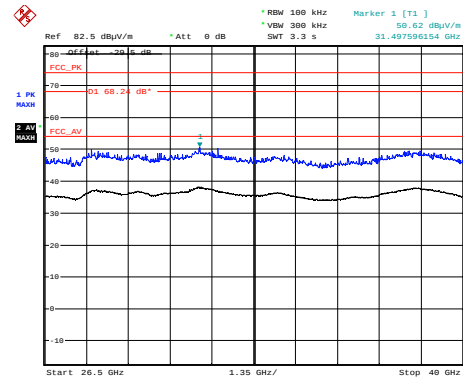
Date: 9.FEB.2018 17:22:36

6 GHz to 12 GHz



Date: 8.FEB.2018 19:08:58

12 GHz to 18 GHz



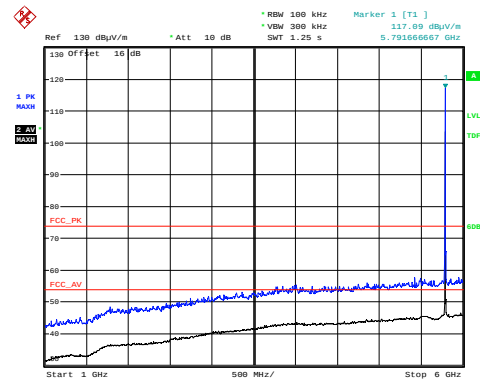
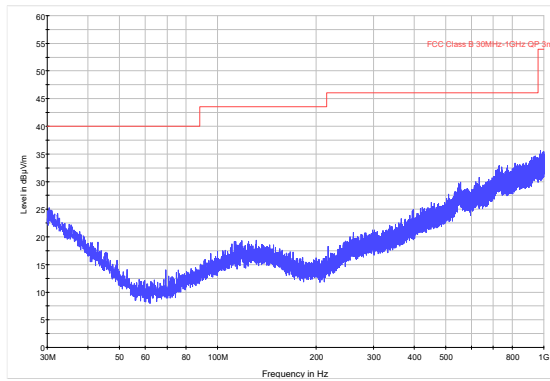
Date: 8.FEB.2018 20:06:23

18 GHz to 26.5 GHz

26.5 GHz to 40 GHz

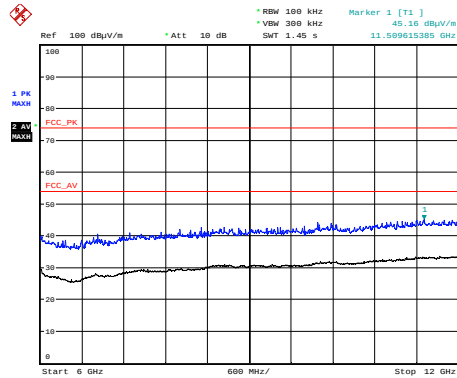
High Power: 19.5 dBm; Bandwidth: 5 MHz; Mod mode: QPSK; Channel: 5727.5 MHz; Integral antenna

Detector	Freq. (MHz)	Meas'd Emission (dBμV)	Cable Loss (dB)	Antenna Factor (dB/m)	Pre-amp Gain (dB)	Duty Cycle Corr'n (dB)	Field Strength (dBμV/m)	Distance Extrap'n Factor (dB)	Field Strength (μV/m)	Limit (μV/m)
No Emission within 20 dB to the limit										



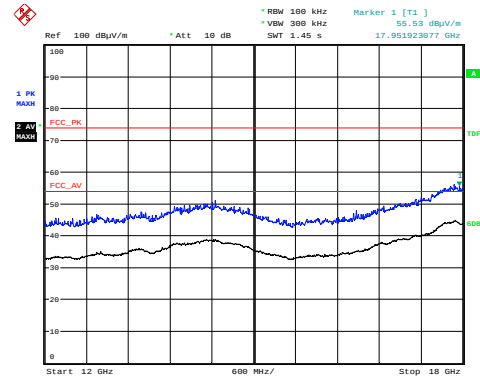
Date: 9.FEB.2018 14:55:36

30 MHz to 1 GHz



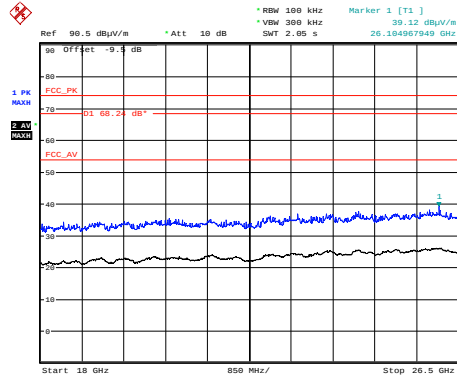
Date: 9.FEB.2018 15:54:27

1 GHz to 6 GHz



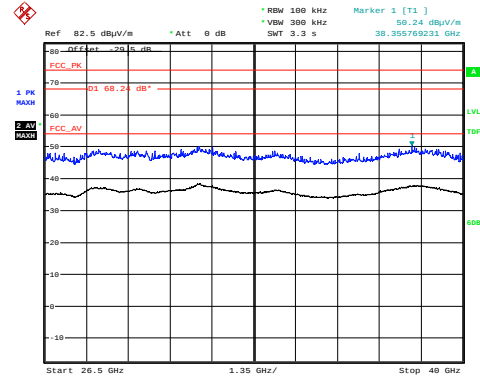
Date: 9.FEB.2018 17:28:41

6 GHz to 12 GHz



Date: 8.FEB.2018 19:24:43

12 GHz to 18 GHz



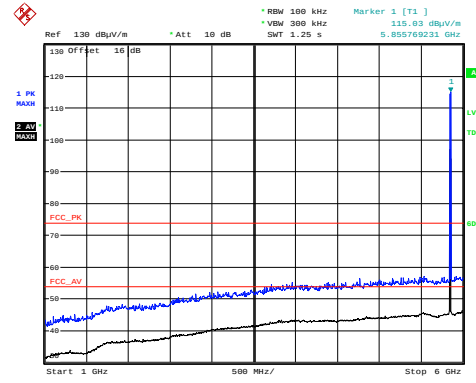
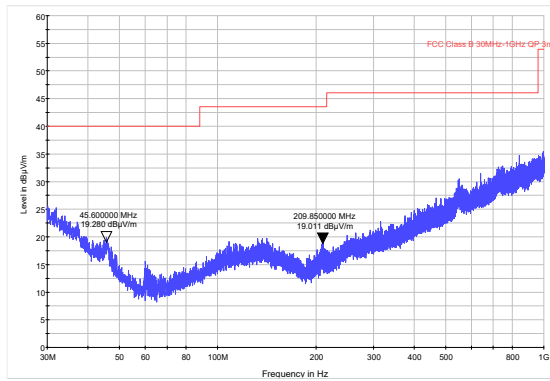
Date: 8.FEB.2018 20:18:09

18 GHz to 26.5 GHz

26.5 GHz to 40 GHz

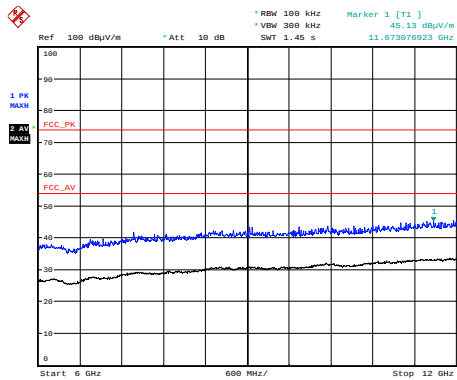
High Power: 19.5 dBm; Bandwidth: 5 MHz; Mod mode: QPSK; Channel: 5788 MHz; Integral antenna

Detector	Freq. (MHz)	Meas'd Emission (dBμV)	Cable Loss (dB)	Antenna Factor (dB/m)	Pre-amp Gain (dB)	Duty Cycle Corr'n (dB)	Field Strength (dBμV/m)	Distance Extrap'n Factor (dB)	Field Strength (μV/m)	Limit (μV/m)
No Emission within 20 dB to the limit										



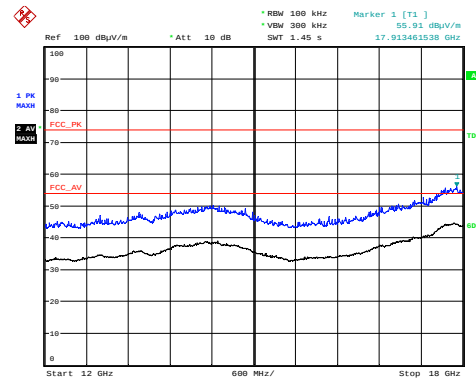
Date: 9.FEB.2018 14:59:23

30 MHz to 1 GHz



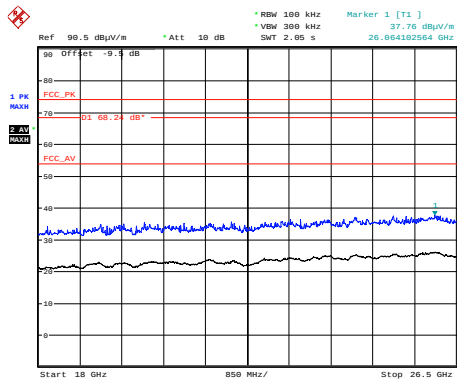
Date: 9.FEB.2018 16:24:00

1 GHz to 6 GHz



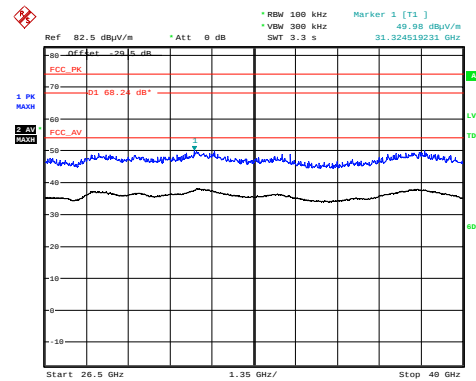
Date: 9.FEB.2018 17:38:37

6 GHz to 12 GHz



Date: 8.FEB.2018 19:50:02

12 GHz to 18 GHz



Date: 8.FEB.2018 20:28:35

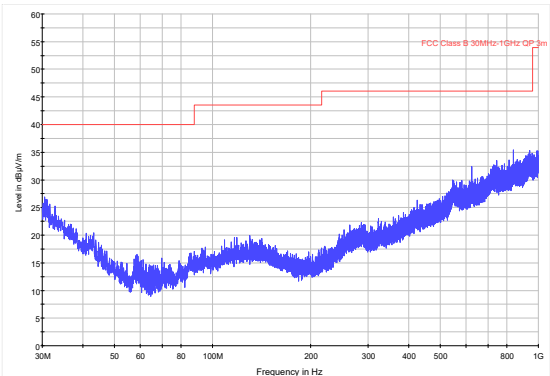
18 GHz to 26.5 GHz

26.5 GHz to 40 GHz

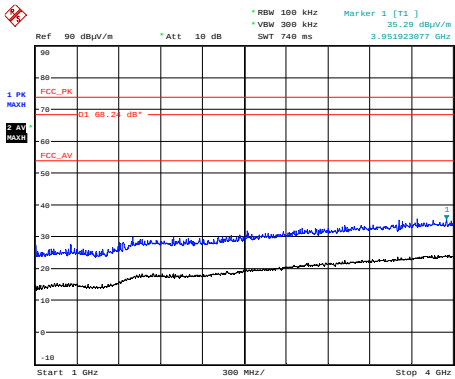
High Power: 19.5 dBm; Bandwidth: 5 MHz; Mod mode: QPSK; Channel: 5847.5 MHz; Integral antenna

Detector	Freq. (MHz)	Meas'd Emission (dBμV)	Cable Loss (dB)	Antenna Factor (dB/m)	Pre-amp Gain (dB)	Duty Cycle Corr'n (dB)	Field Strength (dBμV/m)	Distance Extrap'n Factor (dB)	Field Strength (μV/m)	Limit (μV/m)
No Emission within 20 dB to the limit										

External antenna

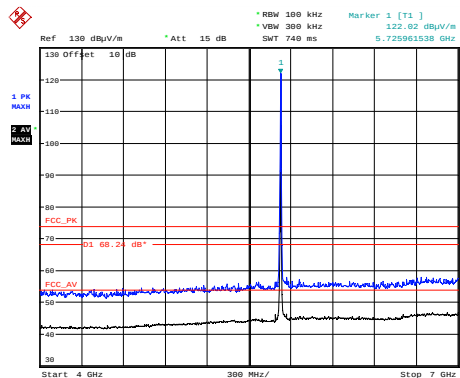


30 MHz to 1 GHz.



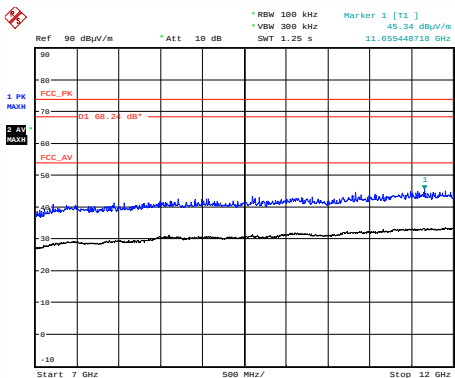
Date: 15.FEB.2018 13:32:00

1 GHz to 4 GHz.



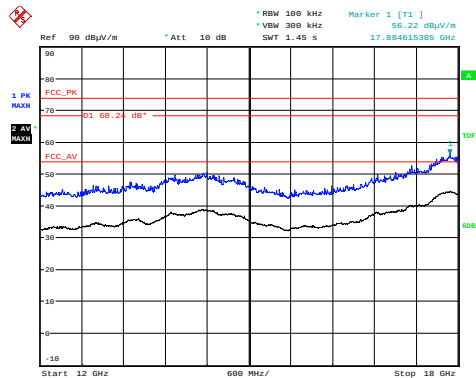
Date: 15.FEB.2018 12:28:38

4 GHz to 7 GHz.



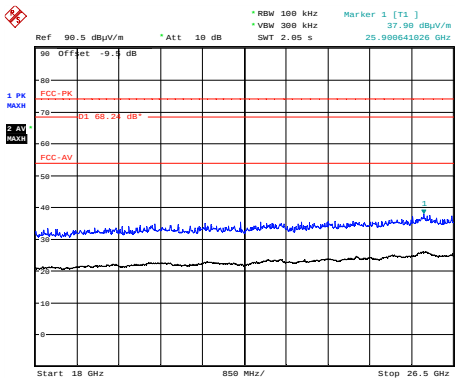
Date: 15.FEB.2018 13:34:57

7 GHz to 12 GHz.



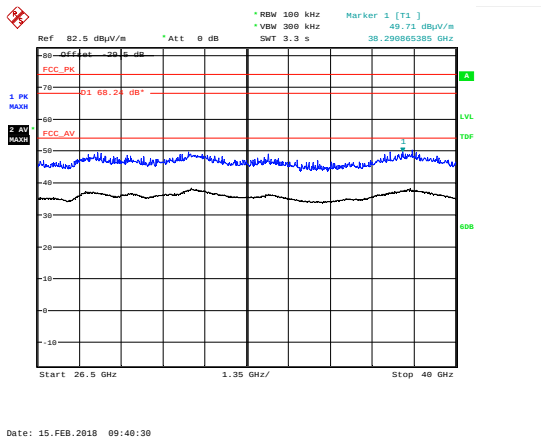
Date: 15.FEB.2018 13:36:01

12 GHz to 18 GHz.



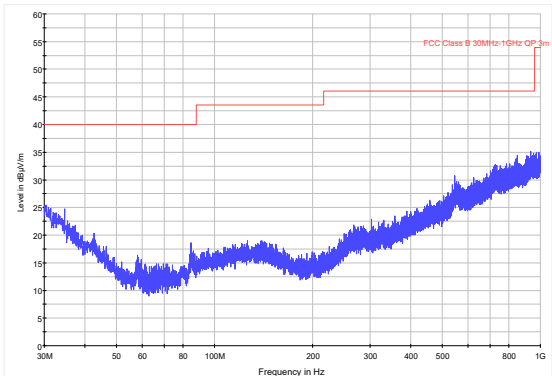
Date: 14.FEB.2018 14:02:29

18 GHz to 26.5 GHz.

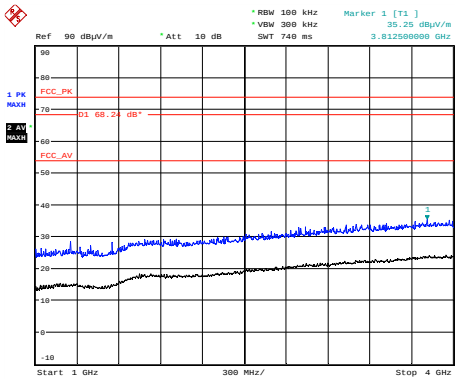


26.5 GHz to 40 GHz.

High Power: 19.5 dBm; Bandwidth: 5 MHz; Mod mode: QPSK; Channel: 5727.5 MHz; External antenna										
Detector	Freq. (MHz)	Meas'd Emission (dBμV)	Cable Loss (dB)	Antenna Factor (dB/m)	Pre-amp Gain (dB)	Duty Cycle Corr'n (dB)	Field Strength (dBμV/m)	Distance Extrap'n Factor (dB)	Field Strength (μV/m)	Limit (μV/m)
No Emission within 20 dB to the limit										

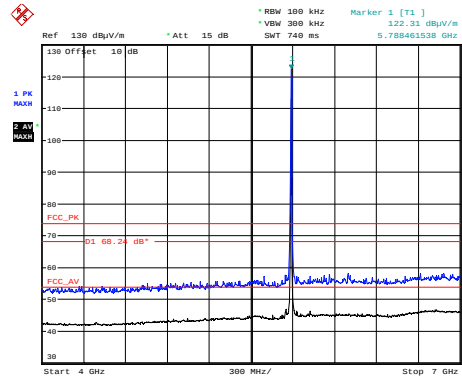


30 MHz to 1 GHz.



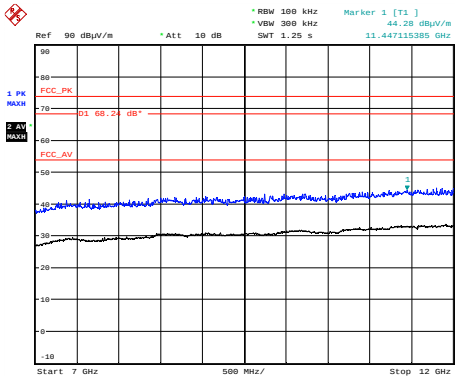
Date: 15.FEB.2018 13:43:28

1 GHz to 4 GHz.



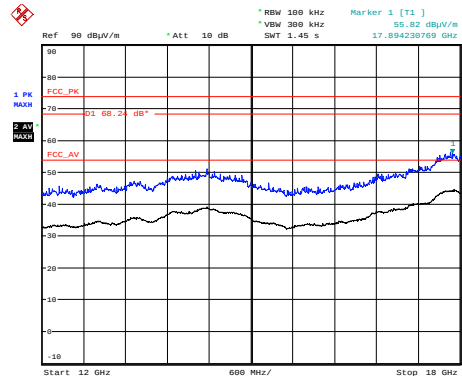
Date: 15.FEB.2018 12:34:23

4 GHz to 7 GHz.



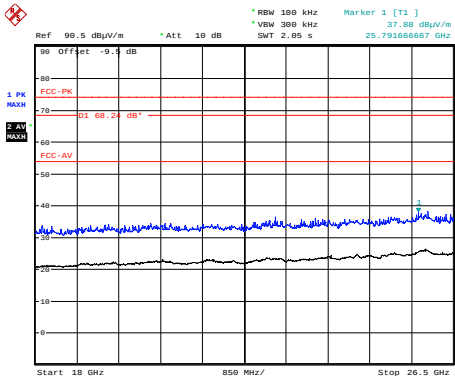
Date: 15.FEB.2018 13:40:18

7 GHz to 12 GHz.



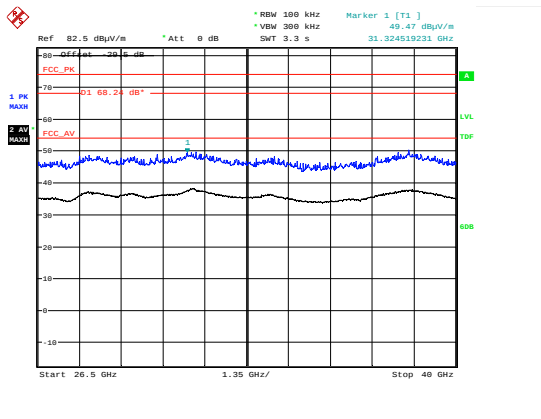
Date: 15.FEB.2018 13:38:13

12 GHz to 18 GHz.



Date: 14.FEB.2018 14:03:37

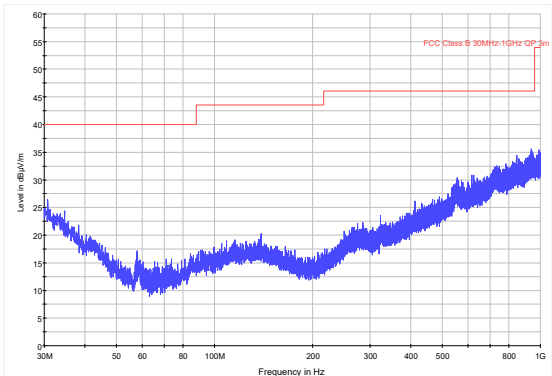
18 GHz to 26.5 GHz.



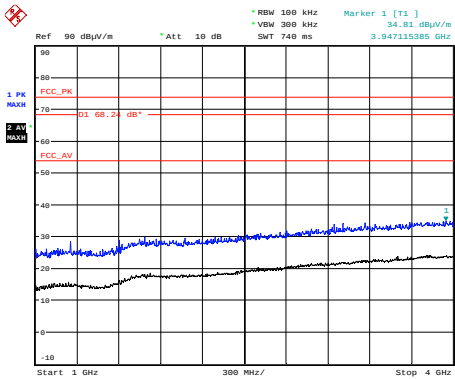
Date: 15.FEB.2018 09:41:11

26.5 GHz to 40 GHz.

High Power: 19.5 dBm; Bandwidth: 5 MHz; Mod mode: QPSK; Channel: 5788 MHz; External antenna										
Detector	Freq. (MHz)	Meas'd Emission (dBμV)	Cable Loss (dB)	Antenna Factor (dB/m)	Pre-amp Gain (dB)	Duty Cycle Corr'n (dB)	Field Strength (dBμV/m)	Distance Extrap'n Factor (dB)	Field Strength (μV/m)	Limit (μV/m)
No Emission within 20 dB to the limit										

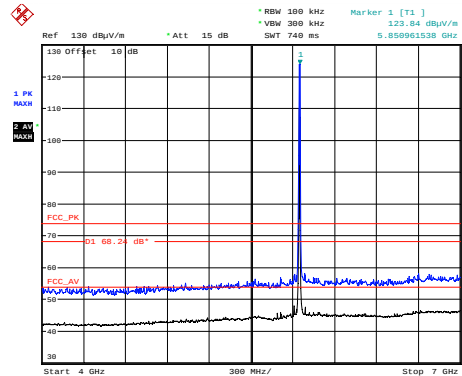


30 MHz to 1 GHz.



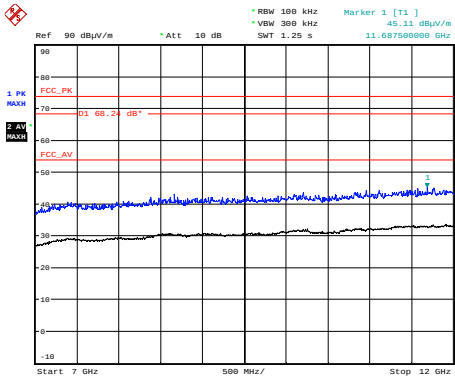
Date: 15.FEB.2018 13:44:47

1 GHz to 4 GHz.



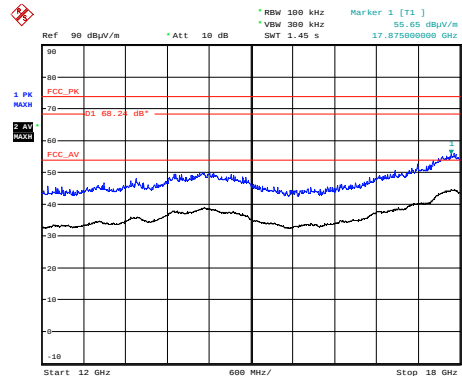
Date: 15.FEB.2018 12:35:42

4 GHz to 7 GHz.



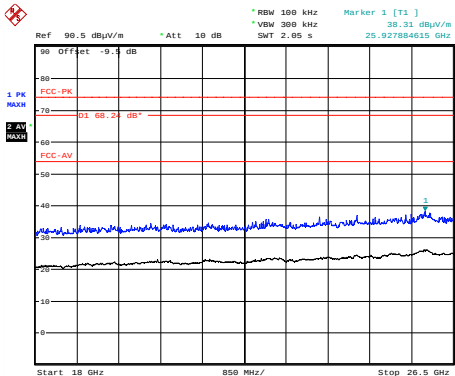
Date: 15.FEB.2018 13:48:00

7 GHz to 12 GHz.



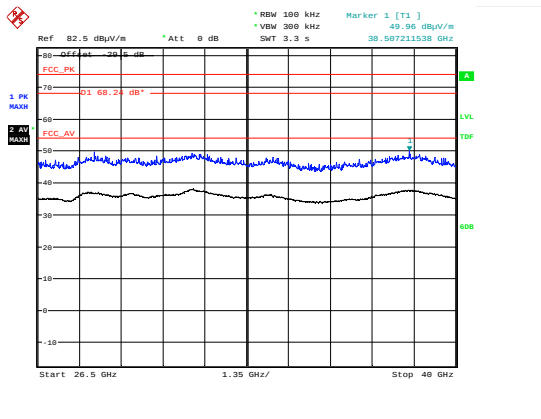
Date: 15.FEB.2018 13:49:08

12 GHz to 18 GHz.



Date: 14.FEB.2018 14:06:54

18 GHz to 26.5 GHz.



Date: 15.FEB.2018 09:42:56

26.5 GHz to 40 GHz.

High Power: 19.5 dBm; Bandwidth: 5 MHz; Mod mode: QPSK; Channel: 5847.5 MHz; External antenna										
Detector	Freq. (MHz)	Meas'd Emission (dBμV)	Cable Loss (dB)	Antenna Factor (dB/m)	Pre-amp Gain (dB)	Duty Cycle Corr'n (dB)	Field Strength (dBμV/m)	Distance Extrap'n Factor (dB)	Field Strength (μV/m)	Limit (μV/m)
No Emission within 20 dB to the limit										

12 AC power-line conducted emissions

12.1 Definition

Line-to-ground radio-noise voltage that is conducted from all of the EUT current-carrying power input terminals that are directly (or indirectly via separate transformers or power supplies) connected to a public power network.

12.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Laboratory
Test Standard and Clause:	ANSI C63.10-2013, Clause 6.2
EUT Frequency of operation:	5788 MHz
EUT Channel Bandwidths:	5 MHz
EUT Modulation:	QPSK
Deviations From Standard:	None
Measurement BW:	10 kHz
Measurement Detectors:	Quasi-Peak and Average, RMS

Environmental Conditions (Normal Environment)

Temperature: 24 °C	+15 °C to +35 °C (as declared)
Humidity: 30 %RH	20%RH to 75%RH (as declared)
Supply: -48 V dc	-48 V dc (as declared)

Test Limits

A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz-30 MHz, shall not exceed the limits in Table 3.

Table 3 – AC Power Line Conducted Emission Limits

Frequency (MHz)	Conducted limit (dB μ V)	
	Quasi-Peak	Average**
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5.0	56	46
5.0 – 30.0	60	50

* The level decreases linearly with the logarithm of the frequency.

** A linear average detector is required.

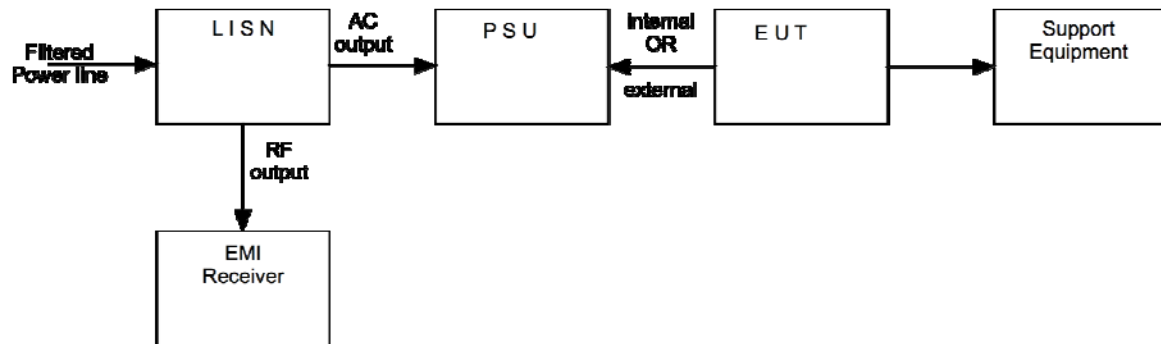
12.3 Test Method

With the EUT setup in a screened room, as per section 9 of this report and connected as per Figure ii, the power line emissions were measured on a spectrum analyzer / EMI receiver.

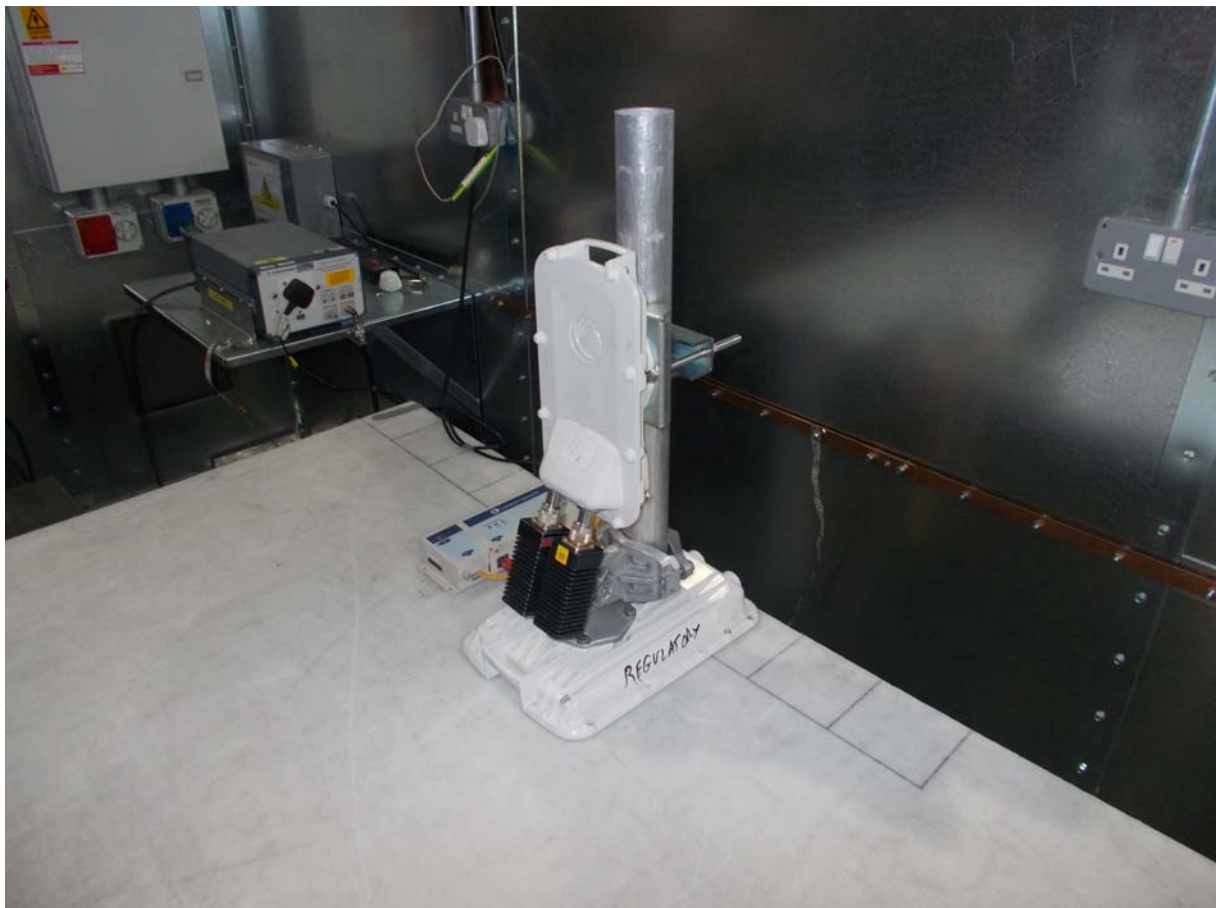
AC power line conducted emissions from the EUT are checked first by preview scans with peak and average detectors covering both live and neutral lines. A spectrum analyzer is used to determine if any periodic emissions are present.

Formal measurements using the correct detector(s) and bandwidth are made on frequencies identified from the preview scans. Final measurements were performed with EUT set at its maximum duty in transmit and receive modes.

Figure ii Test Setup



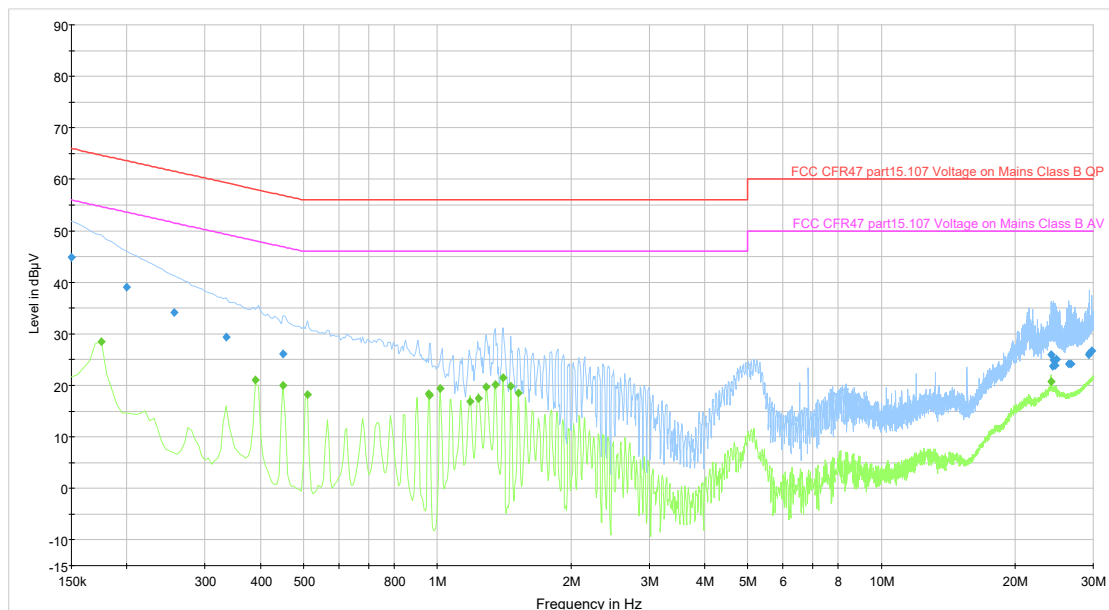
Test Setup Photograph(s)



12.4 Test Equipment

Equipment Description	Manufacturer	Equipment Type	Element No	Last Cal Calibration	Calibration Period	Due For Calibration
Lisn	R&S	ESH3-Z5.831.5	U195	2017-08-16	12	2018-08-16
Receiver	R&S	ESHS10	U187	2017-11-08	12	2018-11-08

12.5 Test Results



AC power-line conducted emissions, Transmit mode						
Results measured using the average detector						
Reference Number	Frequency (MHz)	Conductor	Result (dBuV)	Specification Limit (dBuV)	Margin (dB)	Result Summary
No Emission within 20 dB to the limit						PASS
Results measured using the quasi-peak detector						
Reference Number	Frequency (MHz)	Conductor	Result (dBuV)	Specification Limit (dBuV)	Margin (dB)	Result Summary
No Emission within 20 dB to the limit						PASS

13 Occupied Bandwidth

13.1 Definition

The emission bandwidth (x dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated x dB below the maximum in-band spectral density of the modulated signal.

13.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Laboratory
Test Standard and Clause:	ANSI C63.10-2013, Clause 6.9
EUT Frequencies Measured:	5727.5 MHz, 5788 MHz, 5847.5 MHz 5745 MHz, 5788 MHz, 5830 MHz
EUT Channel Bandwidths:	5 MHz and 40 MHz
EUT Test Modulations:	QPSK, 16 QAM, 64 QAM and 256 QAM
Deviations From Standard:	None
Measurement BW:	100 kHz
(FCC requirement: 100 kHz)	
Spectrum Analyzer Video BW:	300 kHz
(requirement at least 3x RBW)	
Measurement Span:	10 MHz and 80 MHz
(requirement 2 to 5 times OBW)	
Measurement Detector:	Peak

Environmental Conditions (Normal Environment)

Temperature: 24 °C	+15 °C to +35 °C (as declared)
Humidity: 32 %RH	20%RH to 75%RH (as declared)
Supply: -48 Vdc	-48 Vdc (as declared)

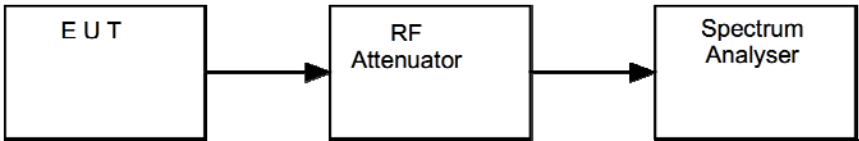
Test Limits

Within the 5.725–5.85 GHz band, the minimum 6 dB bandwidth of U–NII devices shall be at least 500 kHz.

13.3 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure iii, the bandwidth of the EUT was measured on a spectrum analyser.
The measurements were performed with EUT set at its maximum duty. All modulation schemes, data rates and power settings were used to observe the worst-case configuration in each bandwidth.

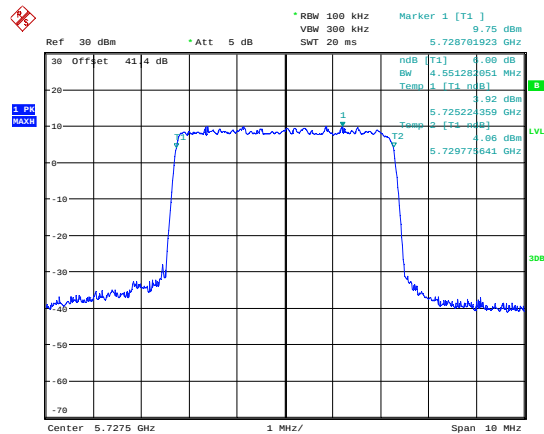
Figure iii Test Setup



13.4 Test Equipment

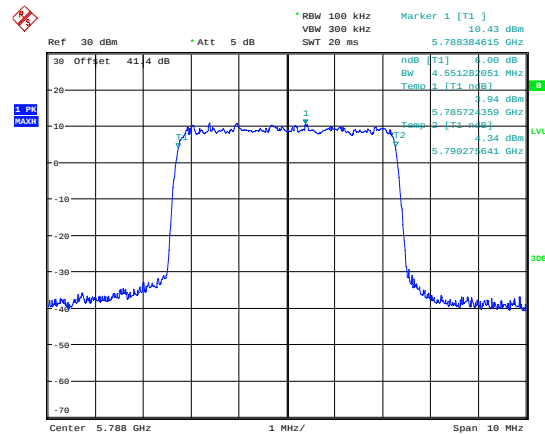
Equipment Description	Manufacturer	Equipment Type	Element No	Last Cal Calibration	Calibration Period	Due For Calibration
Spectrum Analyser	R&S	FSU46	U281	2017/06/19	12	2018/06/19

13.5 Test Results



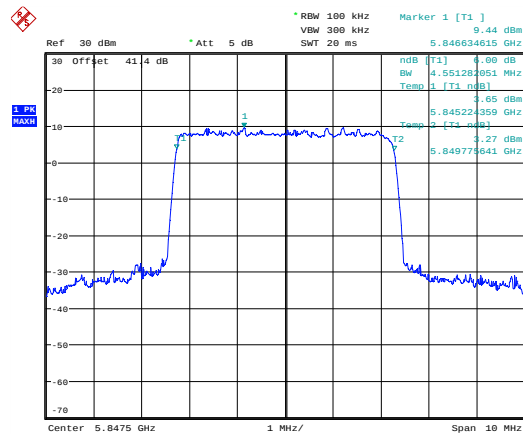
Date: 8.FEB.2018 15:33:02

6 dB Bandwidth QPSK; 5727.5 MHz.



Date: 8.FEB.2018 15:30:29

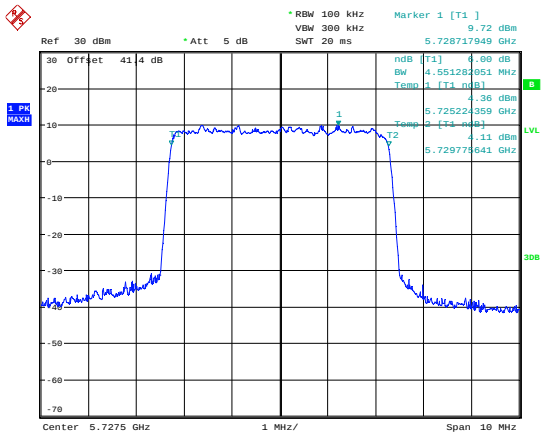
6 dB Bandwidth QPSK; 5788 MHz.



Date: 8.FEB.2018 15:16:31

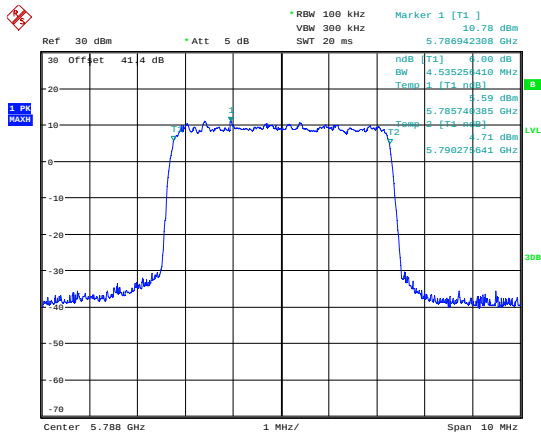
6 dB Bandwidth QPSK; 5847.5 MHz.

Modulation Mode: QPSK; 5 MHz				
Frequency (MHz)	F_L (MHz)	F_H (MHz)	6dB Bandwidth (KHz)	Result
5727.5	5725.224	5729.776	4552	PASS
5788	5785.724	5790.276	4552	PASS
5847.5	5845.224	5849.776	4552	PASS



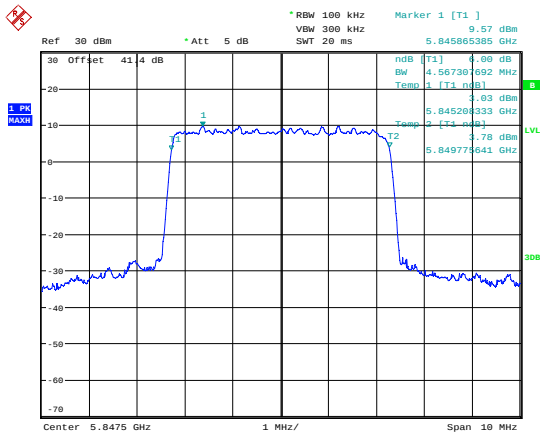
Date: 8.FEB.2018 15:34:40

6 dB Bandwidth 16 QAM; 5727.5 MHz.



Date: 8.FEB.2018 15:29:30

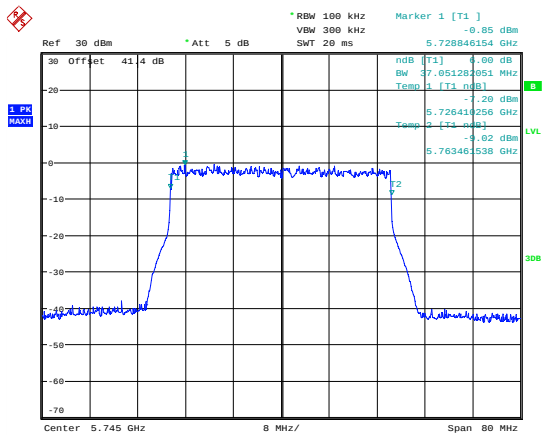
6 dB Bandwidth 16 QAM; 5788 MHz.



Date: 8.FEB.2018 15:14:57

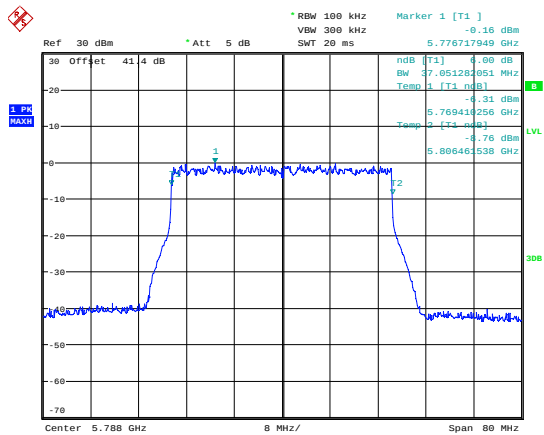
6 dB Bandwidth 16 QAM; 5847.5 MHz.

Modulation Mode: 16 QAM; 5 MHz				
Frequency (MHz)	F_L (MHz)	F_H (MHz)	6dB Bandwidth (kHz)	Result
5727.5	5725.224	5729.776	4552	PASS
5788	5785.74	5790.276	4536	PASS
5847.5	5845.208	5849.776	4568	PASS



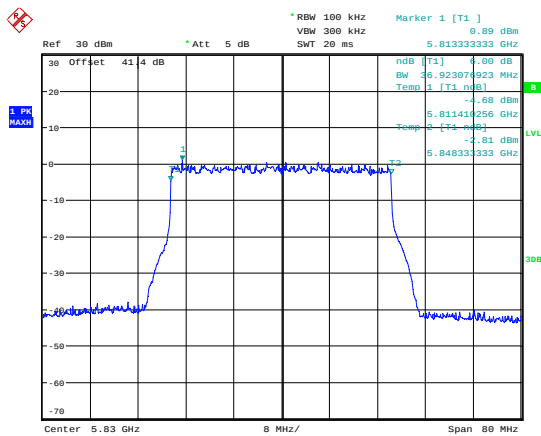
Date: 8.FEB.2018 15:52:48

6 dB Bandwidth QPSK; 5745 MHz.



Date: 8.FEB.2018 15:43:44

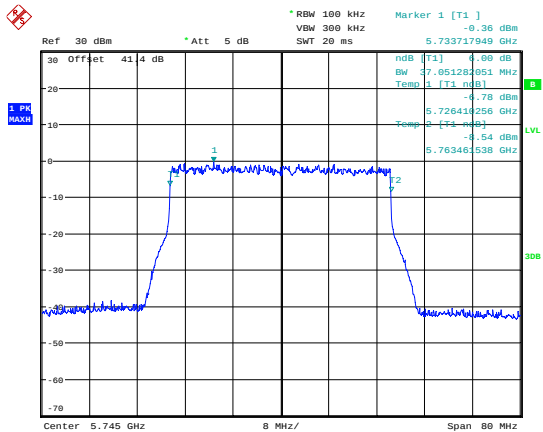
6 dB Bandwidth QPSK; 5788 MHz.



Date: 8.FEB.2018 15:50:22

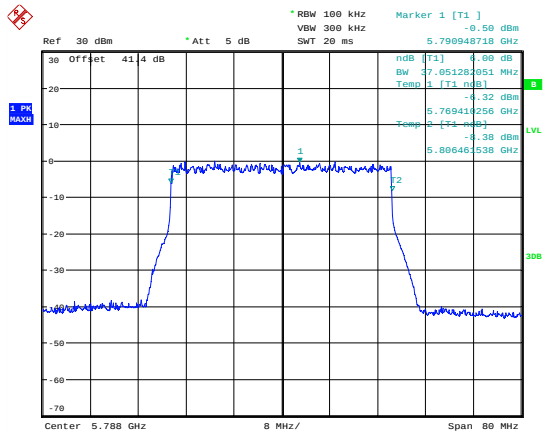
6 dB Bandwidth QPSK; 5830 MHz.

Modulation Mode: QPSK; 40 MHz				
Frequency (MHz)	F_L (MHz)	F_H (MHz)	6dB Bandwidth (kHz)	Result
5745	5726.41	5763.462	37052	PASS
5788	5769.41	5806.462	37052	PASS
5830	5811.41	5848.333	36923	PASS



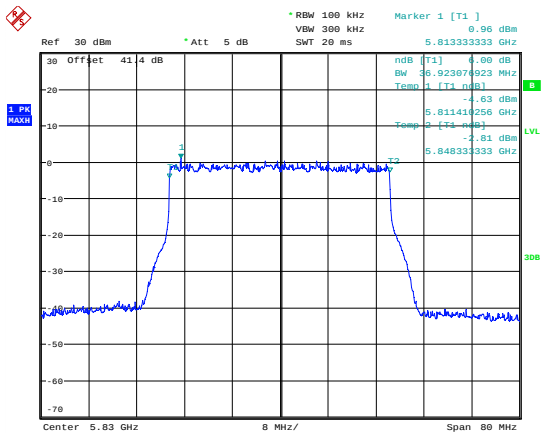
Date: 8.FEB.2018 15:53:28

6 dB Bandwidth 16 QAM; 5745 MHz.



Date: 8.FEB.2018 15:44:22

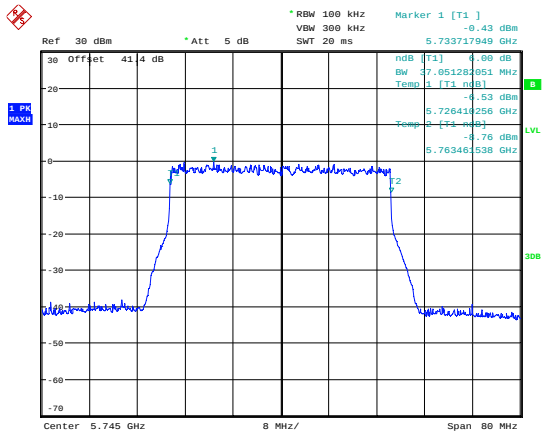
6 dB Bandwidth 16 QAM; 5788 MHz.



Date: 8.FEB.2018 15:49:57

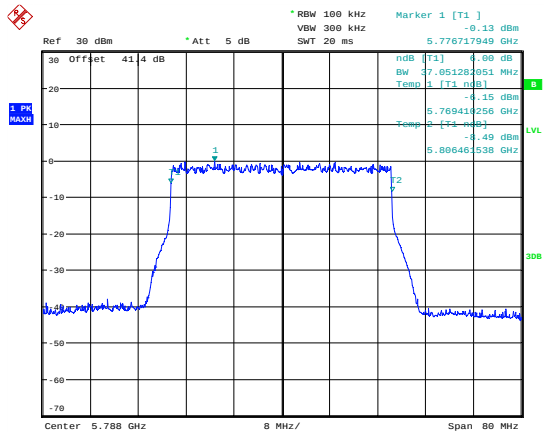
6 dB Bandwidth 16 QAM; 5830 MHz.

Modulation Mode: 16 QAM; 40 MHz				
Frequency (MHz)	F_L (MHz)	F_H (MHz)	6dB Bandwidth (kHz)	Result
5745	5726.41	5763.462	37052	PASS
5788	5769.41	5806.462	37052	PASS
5830	5811.41	5848.333	36923	PASS



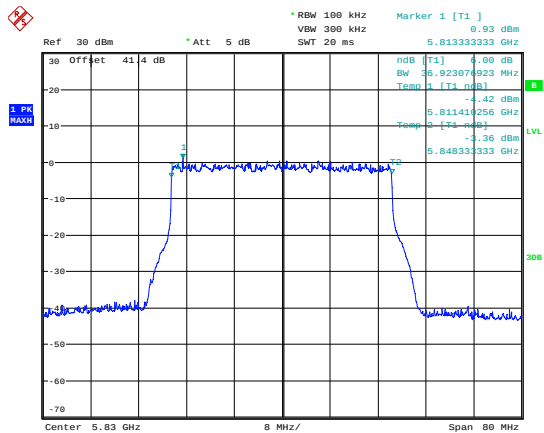
Date: 8.FEB.2018 15:56:01

6 dB Bandwidth 64 QAM; 5745 MHz.



Date: 8.FEB.2018 15:45:29

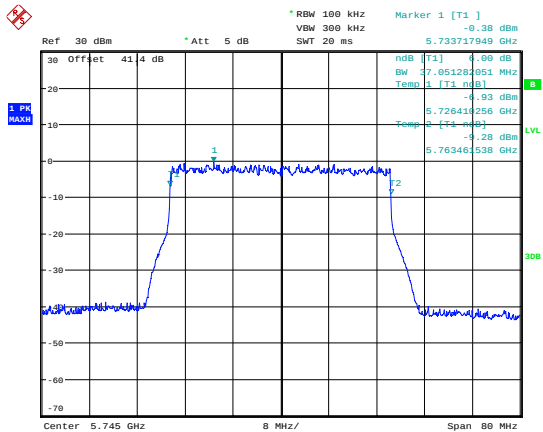
6 dB Bandwidth 64 QAM; 5788 MHz.



Date: 8.FEB.2018 15:49:04

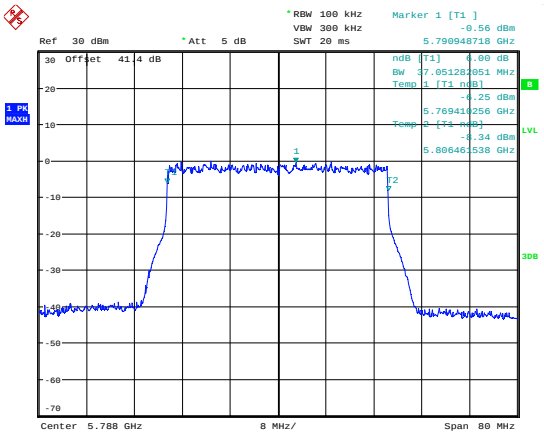
6 dB Bandwidth 64 QAM; 5830 MHz.

Modulation Mode: 64 QAM; 40 MHz				
Frequency (MHz)	F_L (MHz)	F_H (MHz)	6dB Bandwidth (kHz)	Result
5745	5726.41	5763.462	37052	PASS
5788	5769.41	5806.462	37052	PASS
5830	5811.41	5848.333	36923	PASS



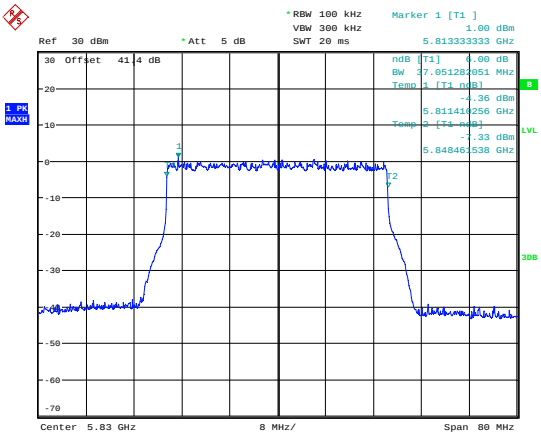
Date: 8.FEB.2018 15:56:26

6 dB Bandwidth 256 QAM; 5745 MHz.



Date: 8.FEB.2018 15:45:55

6 dB Bandwidth 256 QAM; 5788 MHz.



Date: 8.FEB.2018 15:48:35

6 dB Bandwidth 256 QAM; 5830 MHz.

Modulation Mode: 256 QAM; 40 MHz				
Frequency (MHz)	F_L (MHz)	F_H (MHz)	6dB Bandwidth (kHz)	Result
5745	5726.41	5763.462	37052	PASS
5788	5769.41	5806.462	37052	PASS
5830	5811.41	5848.462	37052	PASS

14 Maximum conducted output power

14.1 Definition

The maximum conducted output power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level.

14.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Laboratory
Test Standard and Clause:	ANSI C63.10-2013, Clause 12.3
EUT Frequencies Measured:	5727.5 MHz, 5788 MHz, 5847.5 MHz 5745 MHz, 5788 MHz, 5830 MHz
EUT Occupied Bandwidths:	5 MHz and 40 MHz
EUT Duty Cycle:	100 %
Deviations From Standard:	None
Measurement Detector:	RMS
Voltage Extreme Environment Test Range:	-48 Vdc (as declared)

Environmental Conditions (Normal Environment)

Temperature: 24 °C	+15 °C to +35 °C (as declared)
Humidity: 32 %RH	20%RH to 75%RH (as declared)

Test Limits

For an access point operating in the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

For mobile and portable client devices in the 5.15–5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW.

For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz.

For the band 5.725–5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Fixed point-to-point U-NII devices operating in the band 5.725-5.85 GHz may employ antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power.

Fixed point-to-point U-NII devices operating in other bands may employ antennas with directional gain up to 23dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.

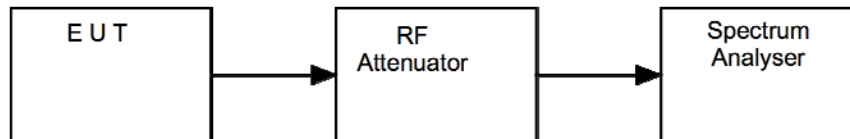
14.3 Test Method

The EUT was setup as per section 9 of this report and, as per Figure iv, the analyser was used to measure each antenna output in turn, having taken account of all path losses. The resolution

bandwidth of the spectrum analyser was set between 1 and 5 % of the EUT occupied bandwidth and the analyser band power function used to calculate the average power. The results were summed as in the tables below.

The measurements were performed with EUT set at its maximum duty. All modulation schemes, data rates and power settings were used to observe the worst case configuration in each bandwidth.

Figure iv Test Setup



Note: The test was performed with two wide band power meter working simultaneously giving the end result of the as combined output power.

14.4 Test Equipment

<i>Equipment Description</i>	<i>Manufacturer</i>	<i>Equipment Type</i>	<i>Element No</i>	<i>Last Cal Calibration</i>	<i>Calibration Period</i>	<i>Due For Calibration</i>
Power Meter	Dare	RPR3006W	REF2223	2017-09-24	12	2018-09-24
Power Meter	Dare	RPR3006W	REF2083	2017-11-17	12	2018-11-17

14.5 Test Results

<i>Maximum Antenna Gain (dBi)</i>	<i>Cable loss (From Antenna to Antenna Connector dB)</i>	<i>Total System Antenna Gain (dBi)</i>
17	0.6	16.4

Note: This device is professionally installed. The installation need to ensure at least 0.6 dB loss in the antenna system or reduce the power consequently.

<i>5 MHz Bandwidth output power level</i>				
<i>Frequency (MHz)</i>	<i>Modulation</i>	<i>Total Combined Power (dBm)</i>	<i>Limit (dBm)</i>	<i>Result</i>
5727.5	QPSK	19.2	19.6	PASS
5727.5	16 QAM	19.1	19.6	PASS
5727.5	64 QAM	19.2	19.6	PASS
5727.5	256 QAM	19.1	19.6	PASS

<i>5 MHz Bandwidth output power level</i>				
<i>Frequency (MHz)</i>	<i>Modulation</i>	<i>Total Combined Power (dBm)</i>	<i>Limit (dBm)</i>	<i>Result</i>
5788	QPSK	19.5	19.6	PASS
5788	16 QAM	19.5	19.6	PASS
5788	64 QAM	19.5	19.6	PASS
5788	256 QAM	19.5	19.6	PASS

<i>5 MHz Bandwidth output power level</i>				
<i>Frequency (MHz)</i>	<i>Modulation</i>	<i>Total Combined Power (dBm)</i>	<i>Limit (dBm)</i>	<i>Result</i>
5847.5	QPSK	19.5	19.6	PASS
5847.5	16 QAM	19.5	19.6	PASS
5847.5	64 QAM	19.5	19.6	PASS
5847.5	256 QAM	19.5	19.6	PASS

40 MHz Bandwidth output power level				
Frequency (MHz)	Modulation	Total Combined Power (dBm)	Limit (dBm)	Result
5745	QPSK	19.4	19.6	PASS
5745	16 QAM	19.4	19.6	PASS
5745	64 QAM	19.4	19.6	PASS
5745	256 QAM	19.4	19.6	PASS

40 MHz Bandwidth output power level				
Frequency (MHz)	Modulation	Total Combined Power (dBm)	Limit (dBm)	Result
5788	QPSK	19.3	19.6	PASS
5788	16 QAM	19.3	19.6	PASS
5788	64 QAM	19.4	19.6	PASS
5788	256 QAM	19.3	19.6	PASS

40 MHz Bandwidth output power level				
Frequency (MHz)	Modulation	Total Combined Power (dBm)	Limit (dBm)	Result
5830	QPSK	19.4	19.6	PASS
5830	16 QAM	19.4	19.6	PASS
5830	64 QAM	19.4	19.6	PASS
5830	256 QAM	19.4	19.6	PASS

15 Power spectral density

15.1 Definition

The power spectral density is the total energy output per unit bandwidth from a pulse or sequence of pulses for which the transmit power is at its maximum level, divided by the total duration of the pulses.

15.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Laboratory
Test Standard and Clause:	ANSI C63.10-2013, Clause 12.5
EUT Frequencies Measured:	5727.5 MHz / 5788 MHz / 5847.5 MHz
EUT Channel Bandwidths:	5 MHz
Deviations From Standard:	None
Measurement BW:	500 kHz
Spectrum Analyzer Video BW: (requirement at least 3x RBW)	5 MHz
Measurement Span: (requirement 1.5 times Channel BW)	10 MHz
Measurement Detector:	RMS

Environmental Conditions (Normal Environment)

Temperature: 24 °C	+15 °C to +35 °C (as declared)
Humidity: 32 %RH	20%RH to 75%RH (as declared)
Supply: -48 Vdc	-48Vdc (as declared)

Test Limits

For an access point operating in the band 5.15–5.25 GHz the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band.

For mobile and portable client devices in the 5.15–5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

For the band 5.725–5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.

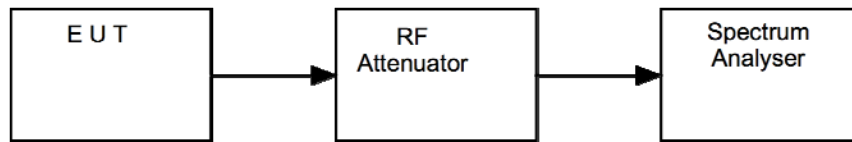
If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Fixed point-to-point U-NII-1 devices may employ antennas with directional gain up to 23dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.

15.3 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure v, the peak emission of the EUT was measured on a spectrum analyser, with path losses taken into account. The measurements were performed with EUT set at its maximum duty. All modulation schemes, data rates and power settings were used to observe the worst case configuration in each bandwidth.

Figure v Test Setup

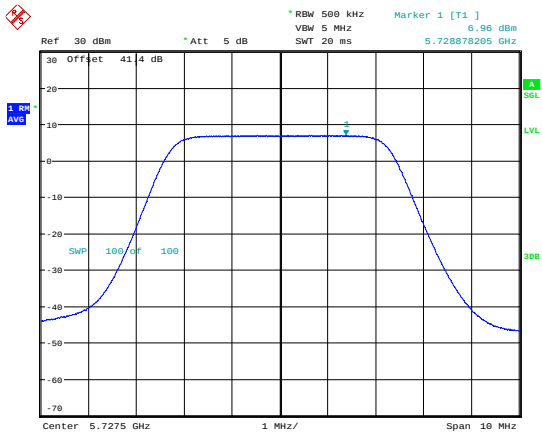


15.4 Test Equipment

<i>Equipment Description</i>	<i>Manufacturer</i>	<i>Equipment Type</i>	<i>Element No</i>	<i>Last Cal Calibration</i>	<i>Calibration Period</i>	<i>Due For Calibration</i>
Spectrum Analyser	R&S	FSU46	U281	2017-06-19	12	2018-06-19

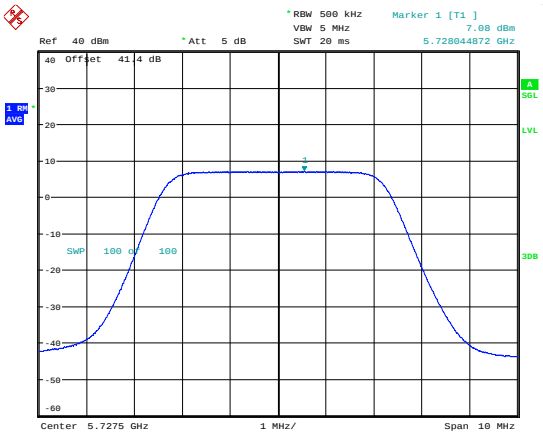
15.5 Test Results

<i>Maximum Antenna gain (dBi)</i>	<i>Maximum antenna gain permitted without restriction(dBi)</i>	<i>Limit (dBm)</i>
17	6	19



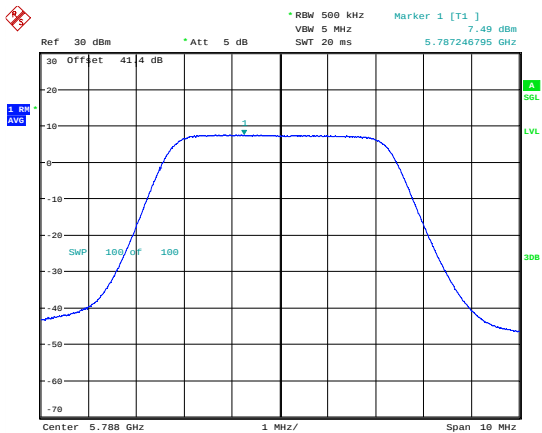
Date: 8.FEB.2018 13:23:14

PSD QPSK Port A; 5727.5 MHz.



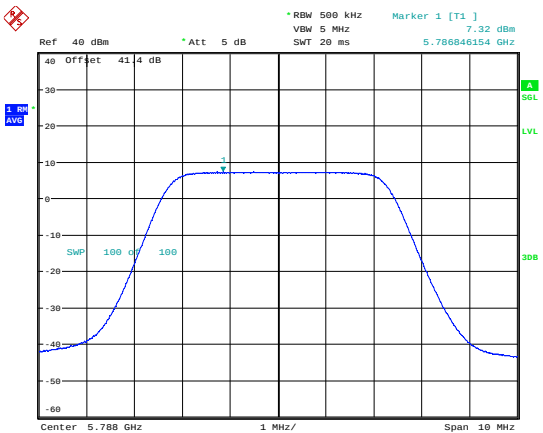
Date: 8.FEB.2018 14:53:12

PSD QPSK Port B; 5727.5 MHz.



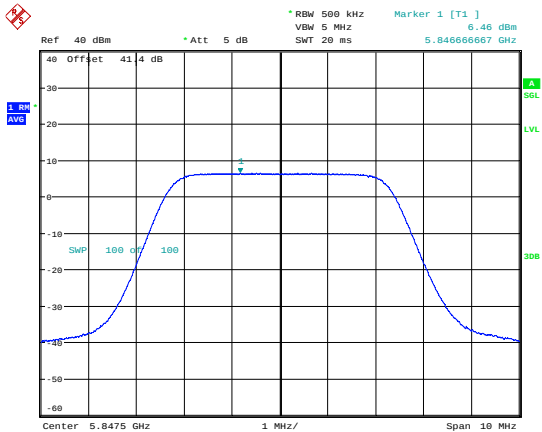
Date: 8.FEB.2018 13:30:17

PSD QPSK Port A; 5788 MHz.



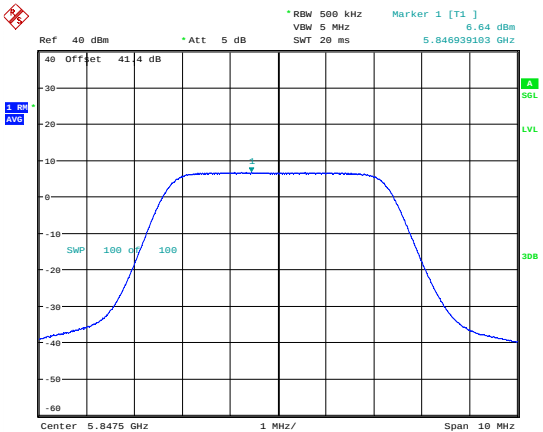
Date: 8.FEB.2018 15:02:44

PSD QPSK Port B; 5788 MHz.



Date: 8.FEB.2018 13:43:41

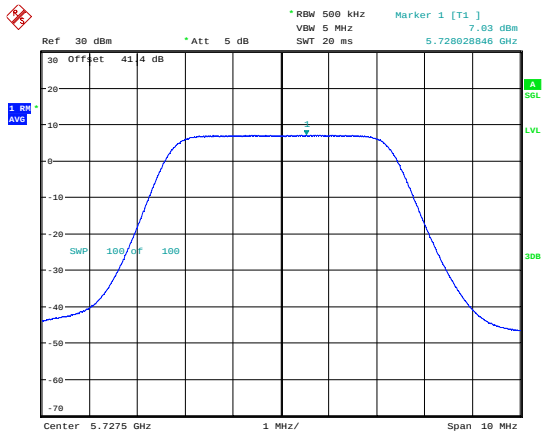
PSD QPSK Port A; 5847.5 MHz.



Date: 8.FEB.2018 15:08:29

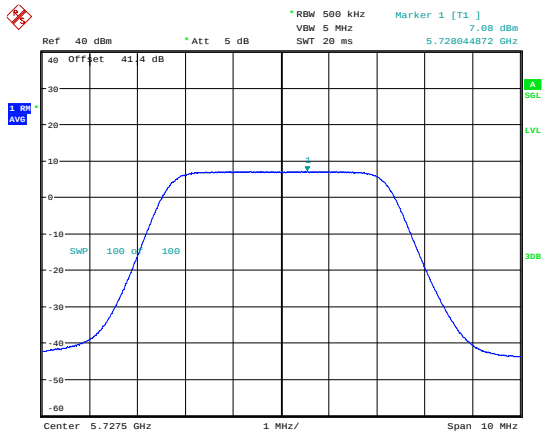
PSD QPSK Port B; 5847.5 MHz.

<i>Frequency (MHz)</i>	<i>Modulation</i>	<i>Port A Power (dBm)</i>	<i>Port B Power (dBm)</i>	<i>Combined Power (dBm)</i>	<i>Limit (dBm)</i>	<i>Result</i>
5727.5	QPSK	6.96	7.08	10.03	19	PASS
5788	QPSK	7.49	7.32	10.39	19	PASS
5847.5	QPSK	6.46	6.64	9.56	19	PASS



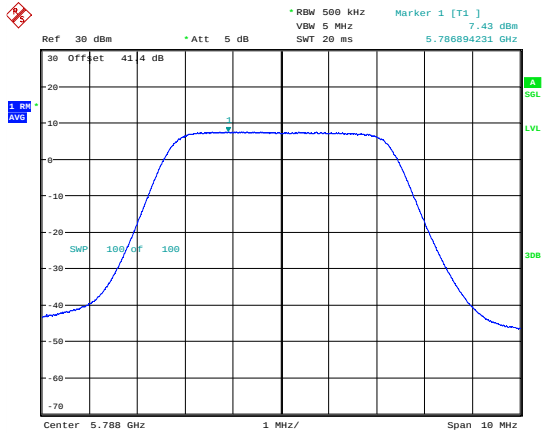
Date: 8.FEB.2018 13:24:24

PSD 16 QAM Port A; 5727.5 MHz.



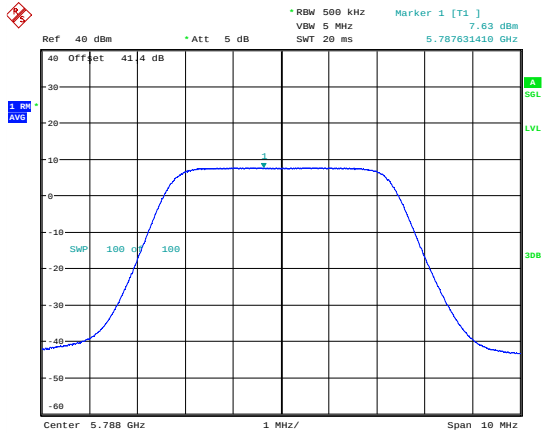
Date: 8.FEB.2018 14:52:44

PSD 16 QAM Port B; 5727.5 MHz.



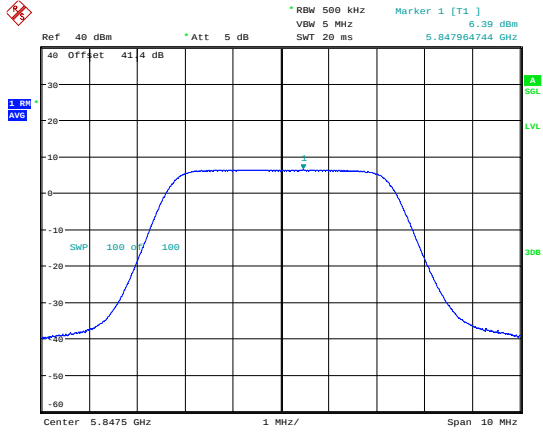
Date: 8.FEB.2018 13:29:40

PSD 16 QAM Port A; 5788 MHz.



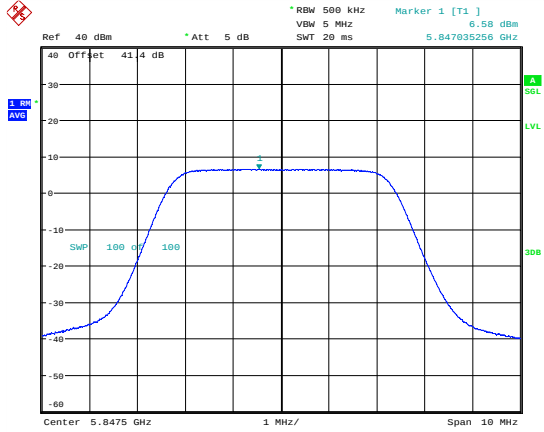
Date: 8.FEB.2018 15:03:40

PSD 16 QAM Port B; 5788 MHz.



Date: 8.FEB.2018 13:44:29

PSD 16 QAM Port A; 5847.5 MHz.



Date: 8.FEB.2018 15:10:10

PSD 16 QAM Port B; 5847.5 MHz.

<i>Frequency (MHz)</i>	<i>Modulation</i>	<i>Port A Power (dBm)</i>	<i>Port B Power (dBm)</i>	<i>Combined Power (dBm)</i>	<i>Limit (dBm)</i>	<i>Result</i>
5727.5	16 QAM	7.03	7.08	10.07	19	PASS
5788	16 QAM	7.43	7.63	10.57	19	PASS
5847.5	16 QAM	6.39	6.58	9.50	19	PASS

16 Out-of-band spurious emissions

16.1 Definition

Out-of-band emission.

Emission on a frequency or frequencies immediately outside the necessary bandwidth that results from the modulation process but excluding spurious emissions.

Spurious emission.

Emission on a frequency or frequencies that are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products, and frequency conversion products, but exclude out-of-band emissions.

16.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Chamber
Test Standard and Clause:	ANSI C63.10-2013, Clause 12.7.3
EUT Frequencies Measured: (requirement as close to upper and lower frequency band edges as the design of the equipment permits).	5727.5 MHz / 5847.5 MHz; 5745 MHz / 5830 MHz;
EUT Channel Bandwidths:	5 MHz and 40 MHz
Deviations From Standard:	None
Measurement BW:	1 MHz
Spectrum Analyzer Video BW: (requirement at least 3x RBW)	3 MHz
Measurement Detector:	Peak
Measurement Range:	1 GHz to 40 GHz
Antenna Gain: (required if conducted measurement made)	17 dBi (information only)

Environmental Conditions (Normal Environment)

Temperature: 24 °C	+15 °C to +35 °C (as declared)
Humidity: 30 %RH	20%RH to 75%RH (as declared)
Supply: -48 Vdc	-48 dc (as declared)

Test Limits

15.407(b):

(1) For transmitters operating in the 5.15–5.25 GHz band: All emissions outside of the 5.15–5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(2) For transmitters operating in the 5.25–5.35 GHz band: All emissions outside of the 5.15–5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(3) For transmitters operating in the 5.47–5.725 GHz band: All emissions outside of the 5.47–5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

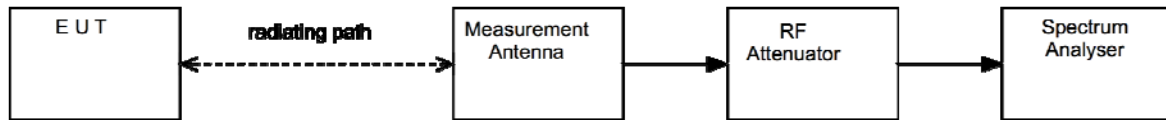
(4) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

16.3 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure vii, the emissions from the EUT were measured on a spectrum analyser.

The measurements were performed with EUT set at its maximum duty. All modulation schemes, data rates and power settings were used to observe the worst case configuration in each bandwidth.

Figure vii Test Setup

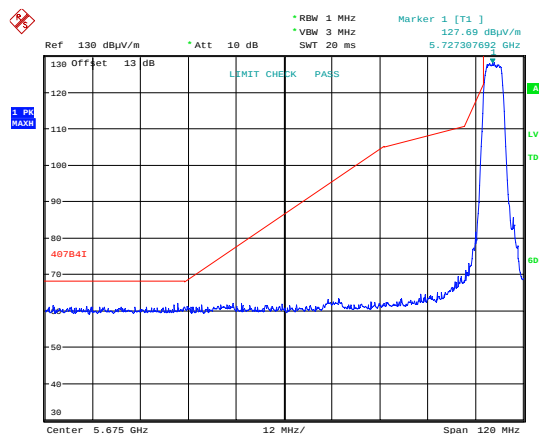


16.4 Test Equipment

Equipment Description	Manufacturer	Equipment Type	Element No	Last Cal Calibration	Calibration Period	Due For Calibration
Spectrum Analyser	R&S	FSU46	U281	2017-06-19	12	2018-06-19
1-18GHz Horn	EMCO	3115	L139	2017-09-25	24	2019-09-25
Pre Amp	Agilent	8449B	L572	2017-09-28	12	2018-09-28
6 dB Attenuator	Bird	8304-060-N	U376	Calibrate in Use		
10 dB Attenuator	Bird	8304-100-N	L222	Calibrate in Use		

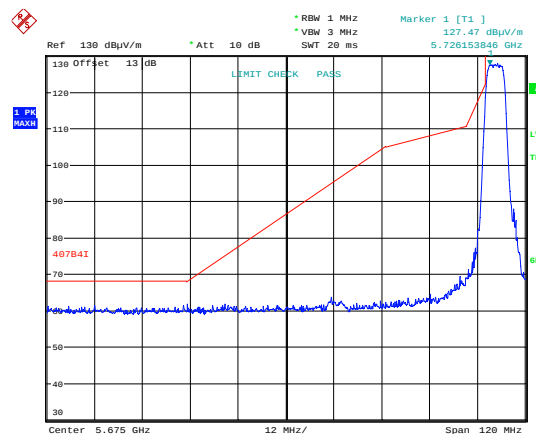
16.5 Test Results

5 MHz bandwidth Band Edge compliance (Integral Antenna)



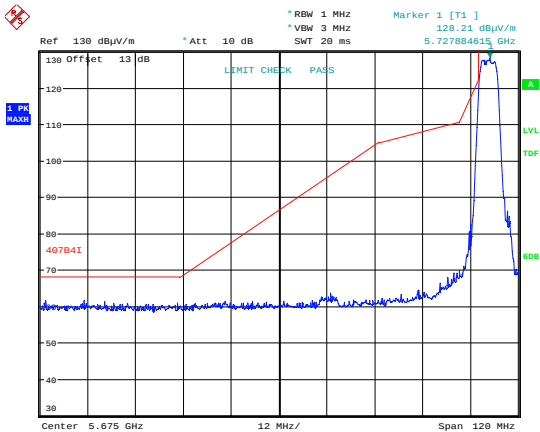
Date: 9.FEB.2018 14:18:11

Band Edge QPSK; 5727.5 MHz.

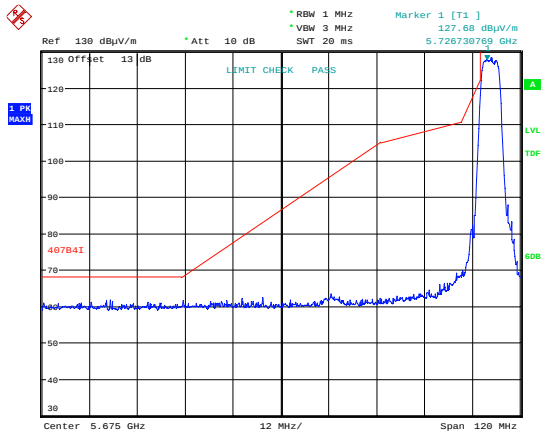


Date: 9.FEB.2018 14:18:38

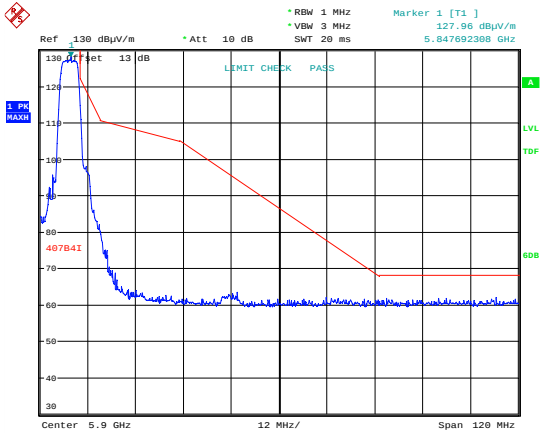
Band Edge 16 QAM; 5727.5 MHz.



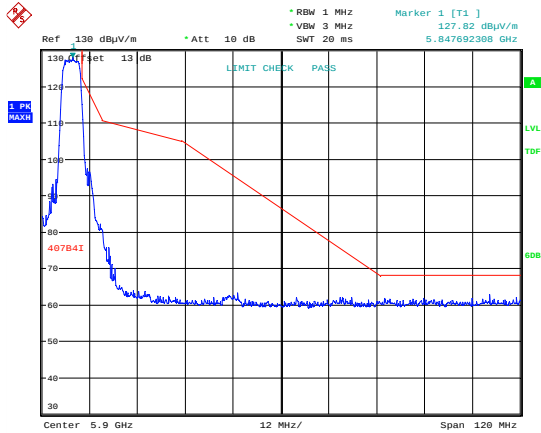
Date: 9.FEB.2018 14:18:58
Band Edge 64 QAM; 5727.5 MHz.



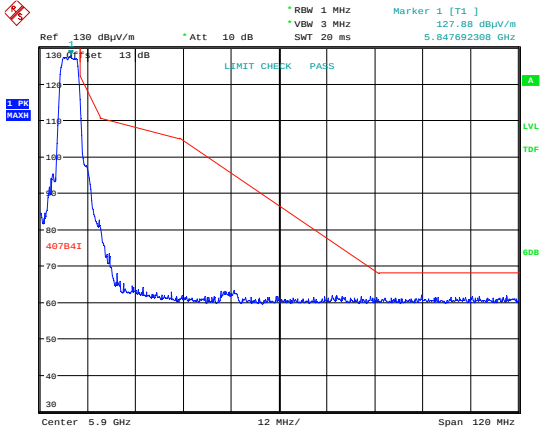
Date: 9.FEB.2018 14:19:23
Band Edge 256 QAM; 5727.5 MHz.



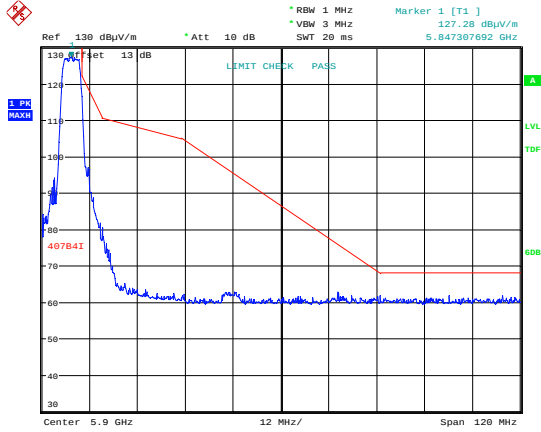
Date: 9.FEB.2018 14:11:39
Band Edge QPSK; 5847.5 MHz.



Date: 9.FEB.2018 14:10:59
Band Edge 16 QAM; 5847.5 MHz.

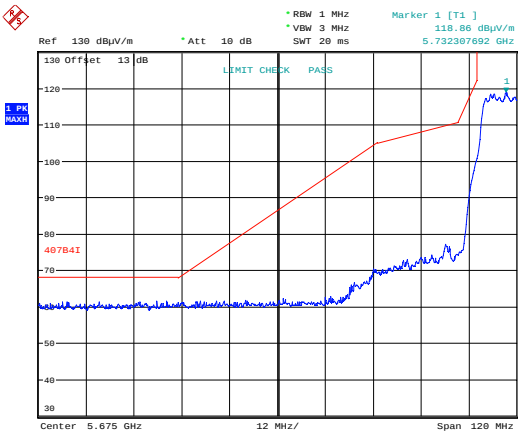


Date: 9.FEB.2018 14:10:27
Band Edge 64 QAM; 5847.5 MHz.



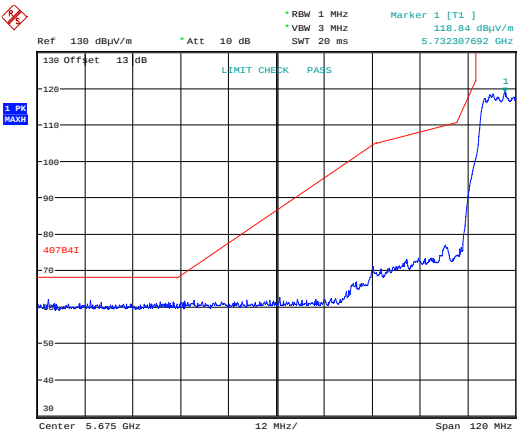
Date: 9.FEB.2018 14:08:55
Band Edge 256 QAM; 5847.5 MHz.

40 MHz bandwidth Band Edge compliance (Integral Antenna)



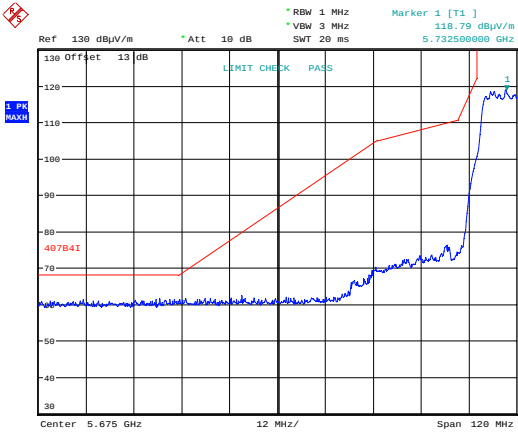
Date: 9.FEB.2018 14:28:04

Band Edge QPSK; 5745 MHz.



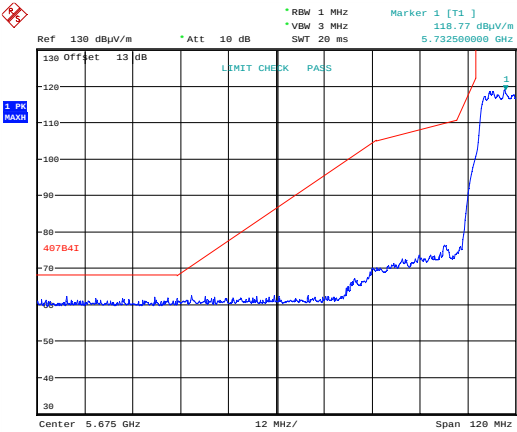
Date: 9.FEB.2018 14:27:29

Band Edge 16 QAM; 5745 MHz.



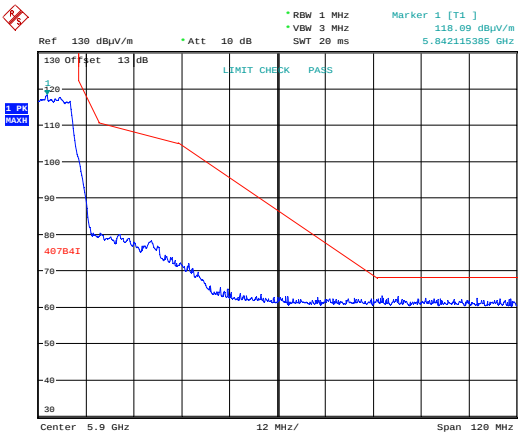
Date: 9.FEB.2018 14:27:02

Band Edge 64 QAM; 5745 MHz.



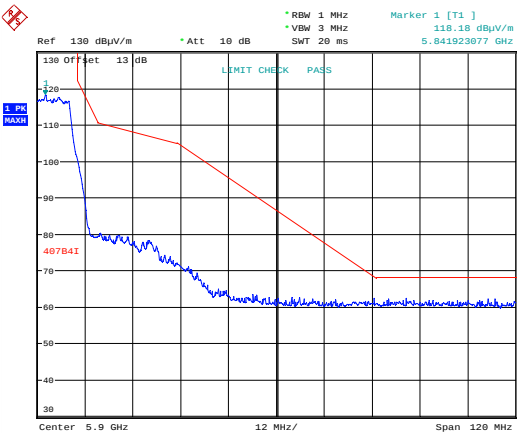
Date: 9.FEB.2018 14:26:30

Band Edge 256 QAM; 5745 MHz.



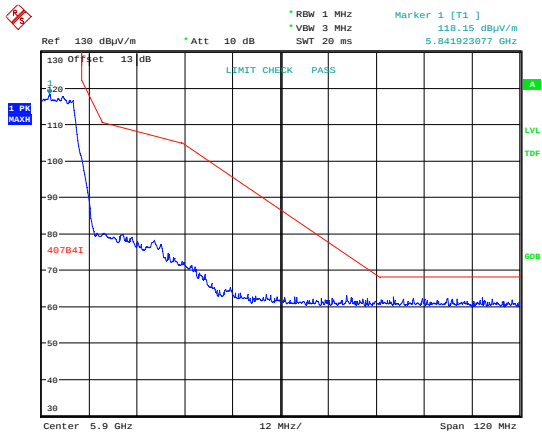
Date: 9.FEB.2018 14:31:11

Band Edge QPSK; 5830 MHz.



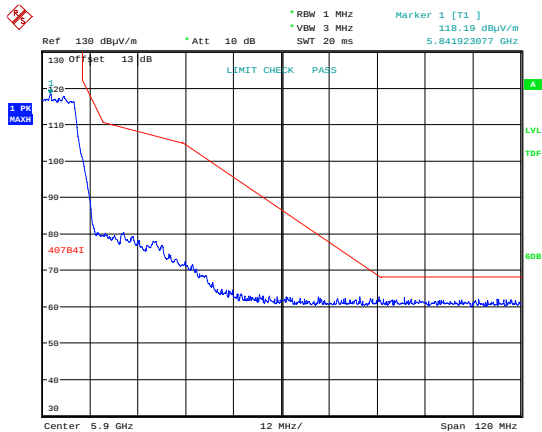
Date: 9.FEB.2018 14:31:39

Band Edge 16 QAM; 5830 MHz.



Date: 9.FEB.2018 14:32:17

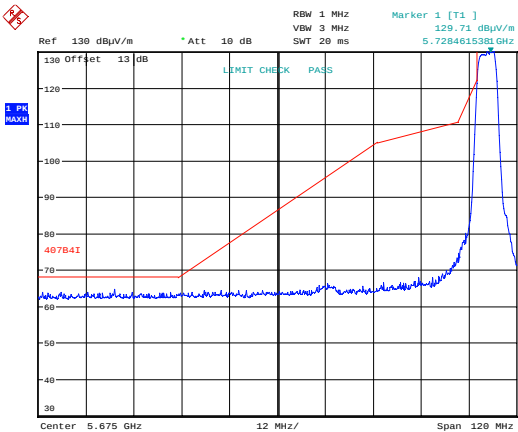
Band Edge 64 QAM; 5830 MHz.



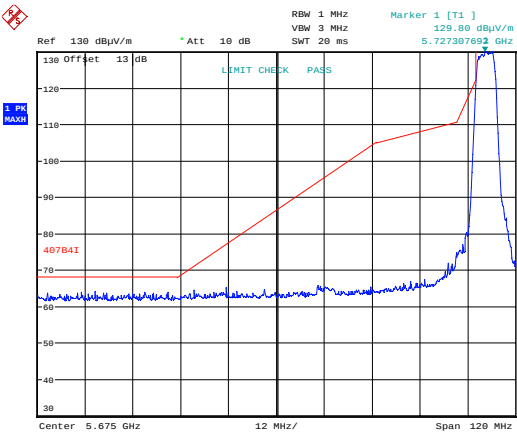
Date: 9.FEB.2018 14:32:53

Band Edge 256 QAM; 5830 MHz.

5 MHz bandwidth Band Edge compliance (External Antenna)

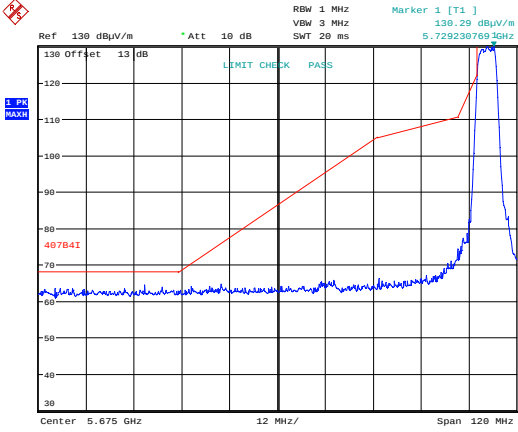


Date: 7.FEB.2018 18:10:06



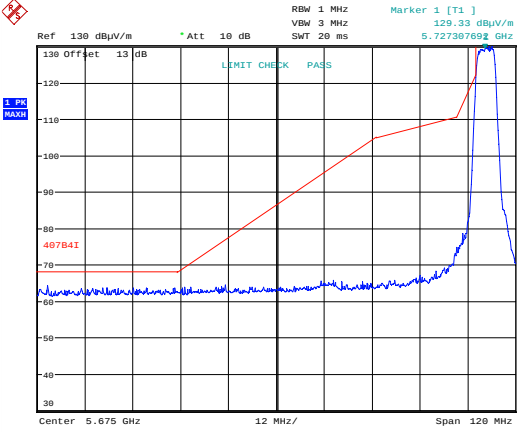
Date: 7.FEB.2018 18:10:38

Band Edge QPSK; 5727.5 MHz.



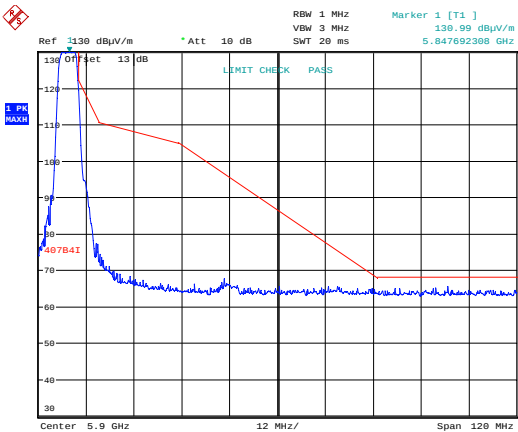
Date: 7.FEB.2018 18:11:02

Band Edge 16 QAM; 5727.5 MHz.



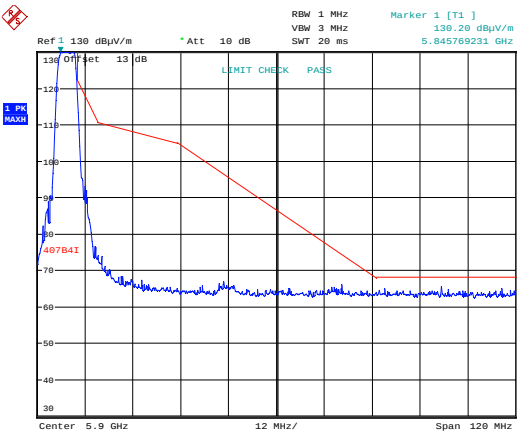
Date: 7.FEB.2018 18:11:37

Band Edge 64 QAM; 5727.5 MHz.



Date: 7.FEB.2018 18:12:34

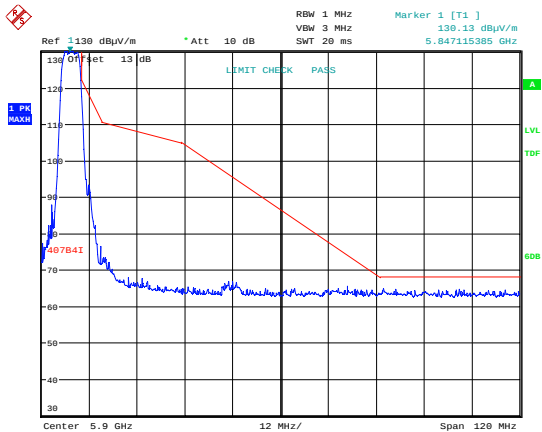
Band Edge 256 QAM; 5727.5 MHz.



Date: 7.FEB.2018 18:14:07

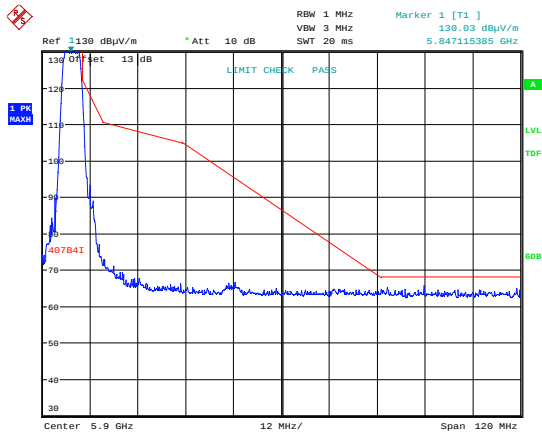
Band Edge QPSK; 5847.5 MHz.

Band Edge 16 QAM; 5847.5 MHz.



Date: 7.FEB.2018 18:14:31

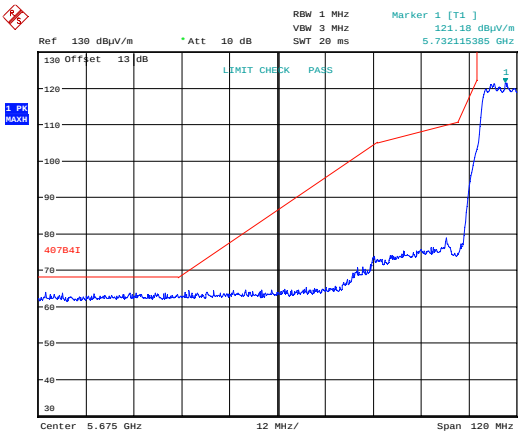
Band Edge 64 QAM; 5847.5 MHz.



Date: 7.FEB.2018 18:14:53

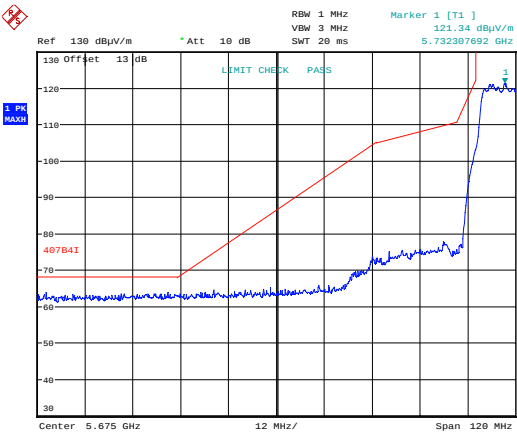
Band Edge 256 QAM; 5847.5 MHz.

40 MHz bandwidth Band Edge compliance (External Antenna)



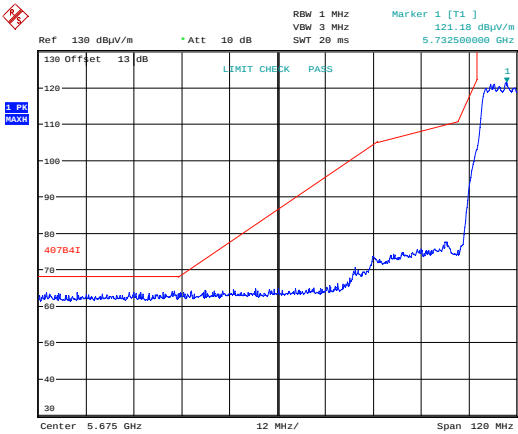
Date: 7.FEB.2018 18:18:58

Band Edge QPSK; 5745 MHz.



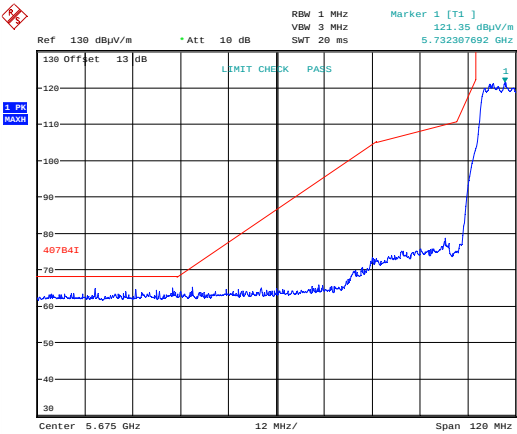
Date: 7.FEB.2018 18:19:25

Band Edge 16 QAM; 5745 MHz.



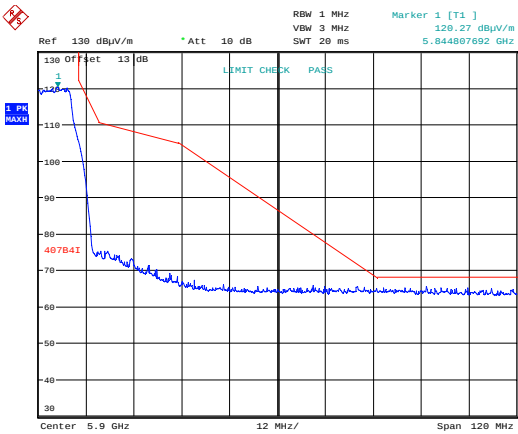
Date: 7.FEB.2018 18:19:45

Band Edge 64 QAM; 5745 MHz.



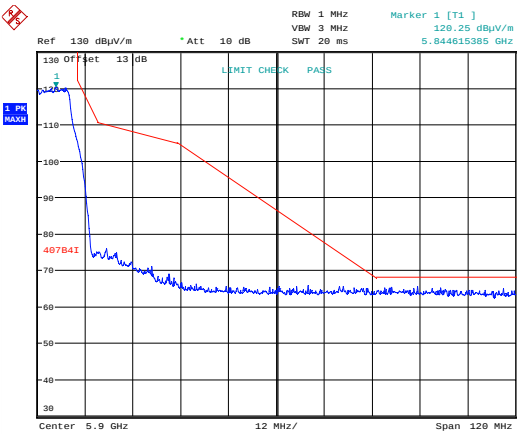
Date: 7.FEB.2018 18:20:09

Band Edge 256 QAM; 5745 MHz.



Date: 7.FEB.2018 18:17:01

Band Edge QPSK; 5830 MHz.



Date: 7.FEB.2018 18:17:26

Band Edge 16 QAM; 5830 MHz.

17 Measurement Uncertainty

Calculated Measurement Uncertainties

All statements of uncertainty are expanded standard uncertainty using a coverage factor of 1.96 to give a 95% confidence:

[1] Radiated spurious emissions

Uncertainty in test result (30MHz – 1GHz) = **4.6dB**,

Uncertainty in test result (1GHz – 18GHz) = **4.7dB**

[2] AC power line conducted emissions

Uncertainty in test result = **3.4dB**

[3] Occupied bandwidth

Uncertainty in test result = **15.5%**

[4] Conducted carrier power

Uncertainty in test result (Power Meter) = **1.08dB**

[5] Conducted / radiated RF power out-of-band

Uncertainty in test result – Up to 8.1GHz = **3.31dB**

Uncertainty in test result – 8.1GHz – 15.3GHz = **4.43dB**

Uncertainty in test result (30MHz – 1GHz) = **4.6dB**,

Uncertainty in test result (1GHz – 18GHz) = **4.7dB**

[6] Power spectral density

Uncertainty in test result (Spectrum Analyser) = **2.48dB**