

Report on the Radio Testing  
For  
Dyson Technology Ltd  
on  
LightCycle Desk/Floor LED Lamp  
Report no. TRA-041476-45-02B  
2019-11-08

RF915 5.0

Report Number: TRA-041476-45-02B  
Issue: B

REPORT ON THE RADIO TESTING OF A  
Dyson Technology Ltd  
LightCycle Desk/Floor LED Lamp  
WITH RESPECT TO SPECIFICATION  
FCC 47CFR 15.247

TEST DATE: 2018-July-19th to 2019 October 21st

Written by:

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Radio Test Engineers

Approved by:

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Department Manager - Radio

Date: 2019-11-08

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

RF915 5.0

## 1 Revision Record

<i>Issue Number</i>	<i>Issue Date</i>	<i>Revision History</i>
A	2018 October 19th	Original
B	2019 October 21st	Additional testing to support Class II permissive change. Test Report is an up-issue of previous one with the additional sections of 12, 13, 14, 15 and 19.

## 2 Summary

TEST REPORT NUMBER: TRA-041476-45-02B

WORKS ORDER NUMBER: TRA-046854-03

PURPOSE OF TEST: USA: 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: 47CFR15.247

EQUIPMENT UNDER TEST (EUT): LightCycle Desk/Floor LED Lamp

FCC IDENTIFIER: QVHLIGHTCYCLE

EUT SERIAL NUMBERS: YR5-US-FBA0037A, YU2-JP-FBA0057A, YR4-US-FBA0039A, E7A-UK-MHA0027A, E7D-UK-MHA0053A

MANUFACTURER/AGENT: Dyson Technology Ltd

ADDRESS: Tetbury Hill  
Malmesbury  
Wiltshire  
SN16 0RP  
United Kingdom

CLIENT CONTACT: Neil Taylor  
☎ 01666 834364  
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ORDER NUMBER: 6000005014

TEST DATE: 2018-July-19th to 2019 October 21st

TESTED BY: David Garvey, Steven Garwell, Daniel Moncayola  
Radio Test Engineers  
Element

## 2.1 Test Summary

Test Method and Description		Clause	Applicable to this equipment	Result / Note
		47CFR15		
Radiated spurious emissions (restricted bands of operation and cabinet radiation)		15.205	<input checked="" type="checkbox"/>	PASS
AC power line conducted emissions		15.207	<input checked="" type="checkbox"/>	PASS
Occupied bandwidth		15.247(a)(2)	<input checked="" type="checkbox"/>	PASS
Conducted carrier power	Peak	15.247(b)(3)	<input checked="" type="checkbox"/>	PASS
	Max.		<input type="checkbox"/>	
Conducted / radiated RF power out-of-band		15.247(d)	<input checked="" type="checkbox"/>	PASS
Power spectral density, conducted		15.247(e)	<input checked="" type="checkbox"/>	PASS
Calculation of duty correction		15.35(c)	<input type="checkbox"/>	N/A

### Notes:

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).

**Note 1:** Additional testing for Desk-standing LED lamp with Bluetooth Low Energy (see results in sections 12 and 17). The electronics are identical in this as in previous models of the lamp and are identical to the CF06 except for a shorter cable to accommodate the shorter stand. The client has requested limited tests in order to show no change to performance, then for the new models to be added to the existing reports. These updated reports will then be used to support various GMA activities

**Note 2:** Additional testing for Floor-standing LED lamp with Bluetooth Low Energy (see results in sections 13 and 17). The electronics are identical in this as in previous versions of the lamp, and are identical to the CD06 except for a longer cable to accommodate the longer stand. The client has requested limited tests in order to show no change to performance, then for the new models to be added to the existing reports. These updated reports will then be used to support various GMA activities.

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## 4 Introduction

This report TRA-041476-45-02B presents the results of the Radio testing on a Dyson Technology Ltd, LightCycle Desk/Floor LED Lamp to specification 47CFR15 Radio Frequency Devices.

The testing was carried out for Dyson Technology Ltd by Element, at the address(es) detailed below.

<input checked="" type="checkbox"/>	Element Hull Unit E South Orbital Trading Park Hedon Road Hull HU9 1NJ UK	<input checked="" type="checkbox"/>	Element Skelmersdale Unit 1 Pendle Place Skemersdale West Lancashire WN8 9PN UK
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This report details the configuration of the equipment, the test methods used and any relevant modifications where appropriate.

All test and measurement equipment under the control of the laboratory and requiring calibration is subject to an established programme and procedures to control and maintain measurement standards. The quality management system meets the principles of ISO 9001, and has quality control procedures for monitoring the validity of tests undertaken. Records and sufficient detail are retained to establish an audit trail of calibration records relating to its test results for a defined period. Under control of the established calibration programme, key quantities or values of the test & measurement instrumentation are within specification and comply with the relevant traceable internationally recognised and appropriate standard specifications, which are UKAS calibrated as such where these properties have a significant effect on results. Participation in inter-laboratory comparisons and proficiency testing ensures satisfactory correlation of results conform to Elements own procedures, as well as statistical techniques for analysis of test data providing the appropriate confidence in measurements.

Throughout this report EUT denotes equipment under test.

FCC Site Listing:

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

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.
- 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

<b>§</b>	denotes a section reference from the standard, not this document
<b>AC</b>	Alternating Current
<b>ANSI</b>	American National Standards Institute
<b>BW</b>	bandwidth
<b>C</b>	Celsius
<b>CFR</b>	Code of Federal Regulations
<b>CW</b>	Continuous Wave
<b>dB</b>	decibel
<b>dBm</b>	dB relative to 1 milliwatt
<b>DC</b>	Direct Current
<b>DSSS</b>	Direct Sequence Spread Spectrum
<b>EIRP</b>	Equivalent Isotropically Radiated Power
<b>ERP</b>	Effective Radiated Power
<b>EUT</b>	Equipment Under Test
<b>FCC</b>	Federal Communications Commission
<b>FHSS</b>	Frequency Hopping Spread Spectrum
<b>Hz</b>	hertz
<b>IC</b>	Industry Canada
<b>ITU</b>	International Telecommunication Union
<b>LBT</b>	Listen Before Talk
<b>m</b>	metre
<b>max</b>	maximum
<b>MIMO</b>	Multiple Input and Multiple Output
<b>min</b>	minimum
<b>MRA</b>	Mutual Recognition Agreement
<b>N/A</b>	Not Applicable
<b>PCB</b>	Printed Circuit Board
<b>PDF</b>	Portable Document Format
<b>Pt-mpt</b>	Point-to-multipoint
<b>Pt-pt</b>	Point-to-point
<b>RF</b>	Radio Frequency
<b>RH</b>	Relative Humidity
<b>RMS</b>	Root Mean Square
<b>Rx</b>	receiver
<b>s</b>	second
<b>SVSWR</b>	Site Voltage Standing Wave Ratio
<b>Tx</b>	transmitter
<b>UKAS</b>	United Kingdom Accreditation Service
<b>V</b>	volt
<b>W</b>	watt
<b>Ω</b>	ohm

## **7 Equipment Under Test**

### **7.1 EUT Identification**

- Name: LightCycle Desk/Floor LED Lamp
- Serial Number: YR5-US-FBA0037A, YU2-JP-FBA0057A, YR4-US-FBA0039A, E7A-UK-MHA0027A, E7D-UK-MHA0053A
- Model Number: CD04, CD05,CF04, CD06 and CF06
- Software Revision: Not Applicable
- Build Level / Revision Number: Not Applicable

### **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.

Test Jig TRA-041476S07  
Laptop TRA-041476S13

### **7.3 EUT Mode of Operation**

#### **7.3.1 Transmission**

The mode of operation for transmitter tests was a transmitting modulated carrier on the frequencies indicated.

## 7.4 EUT Radio Parameters

### 7.4.1 General

<b>Frequencies of operation:</b>	2402 MHz - 2480 MHz
<b>Modulation type:</b>	GFSK
<b>Occupied channel bandwidth:</b>	1 MHz
<b>Channel spacing:</b>	2 MHz
<b>Declared output power:</b>	5 dBm
<b>Warning against use of alternative antennas in user manual (yes/no):</b>	N/A
<b>Nominal Supply Voltage:</b>	24 V dc via mains adapter 110 V ac
<b>Location of notice for license exempt use:</b>	Label / user manual / both.

### 7.4.2 Antennas

<b>Type:</b>	Patch antenna
<b>Frequency range:</b>	2402 MHz - 2480 MHz
<b>Antenna Gain:</b>	4.39 dBi

## 7.5 EUT Description

The EUT is a LED luminaire with Bluetooth LE functionality (to change brightness etc.) for use on desks or floors etc. Five models were submitted for testing these were the CD04, CD05, CD06, CF04 and CF06. The CD04, CD05 and CD06 are desk lamps and the CF04 and CF06 are floor lamps. All lamps tested shared the same radio board.

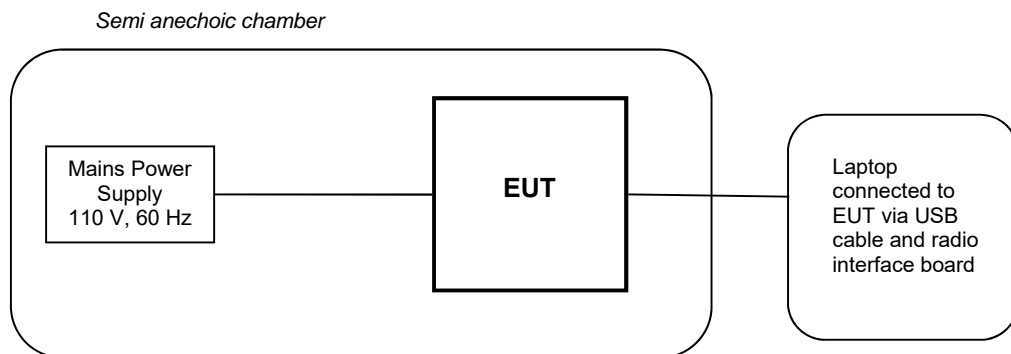
## 8 Modifications

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:

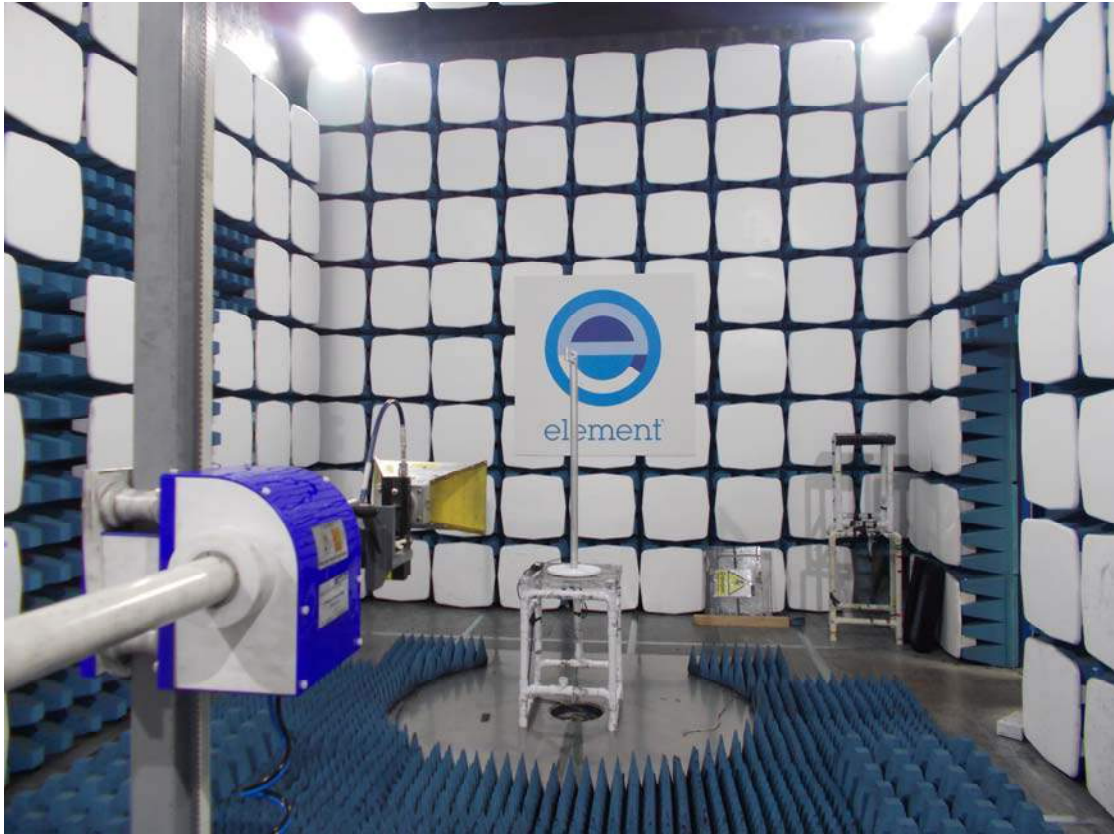


### 9.2 General Set-up Photograph

The following photograph shows basic EUT set-up:



CD06 Sample 10



CF06 Sample 13



CF04 Element Sample 22





CD04 Element Sample 24



CD05 Element Sample 26

## 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 approx. 24 V dc from the adaptor powered by 110 V ac, 60 Hz, from the mains.

### 10.2 Varying Test Conditions

There are no specific frequency stability requirements for the type of device. The results contained in this report demonstrate that the occupied bandwidth is contained within the authorised band and the manufacturer has declared sufficient frequency stability (refer to section 7.4).

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

	<b>Category</b>	<b>Nominal</b>	<b>Variation</b>
<input checked="" type="checkbox"/>	Mains	110 V ac +/-2 %	85 % and 115 %
<input type="checkbox"/>	Battery	New battery	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 Hull
Test Chamber:	Wireless Lab 2
Test Standard and Clause:	ANSI C63.10-2013, Clause 6.5 and 6.6
EUT Frequencies Measured:	2402 MHz, 2440 MHz, 2480 MHz
EUT Channel Bandwidths:	2 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: 23 °C	+15 °C to +35 °C (as declared)
Humidity: 50 % RH	20 % RH to 75 % RH (as declared)
Supply: 110 V ac	110 V ac ±10 % (as declared)

### 11.3 Test Limit

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 (<math>\mu</math>V/m at 3 m)</i>
30 to 88	100
88 to 216	150
216 to 960	200
Above 960	500

## 11.4 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 100 kHz 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 $\mu$ 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 $\mu$ V;

CL is the cable loss in dB;

AF is the test antenna factor in dB/m;

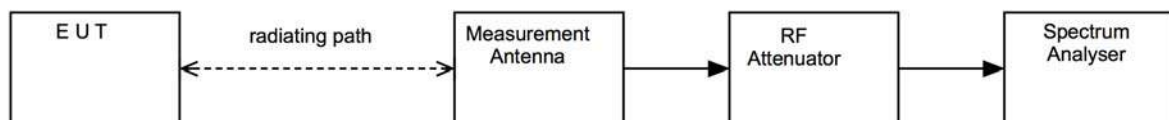
PA is the pre-amplifier gain in dB (where used);

DC is the duty correction factor in dB (where used, e.g. harmonics of pulsed fundamental);

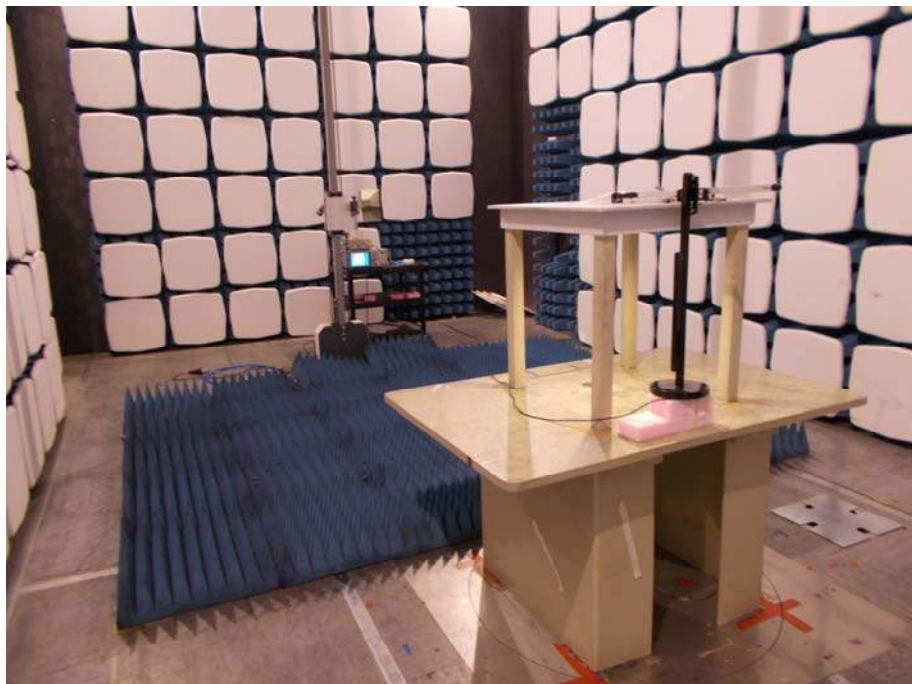
CF is the distance factor in dB (where measurement distance different to limit distance);

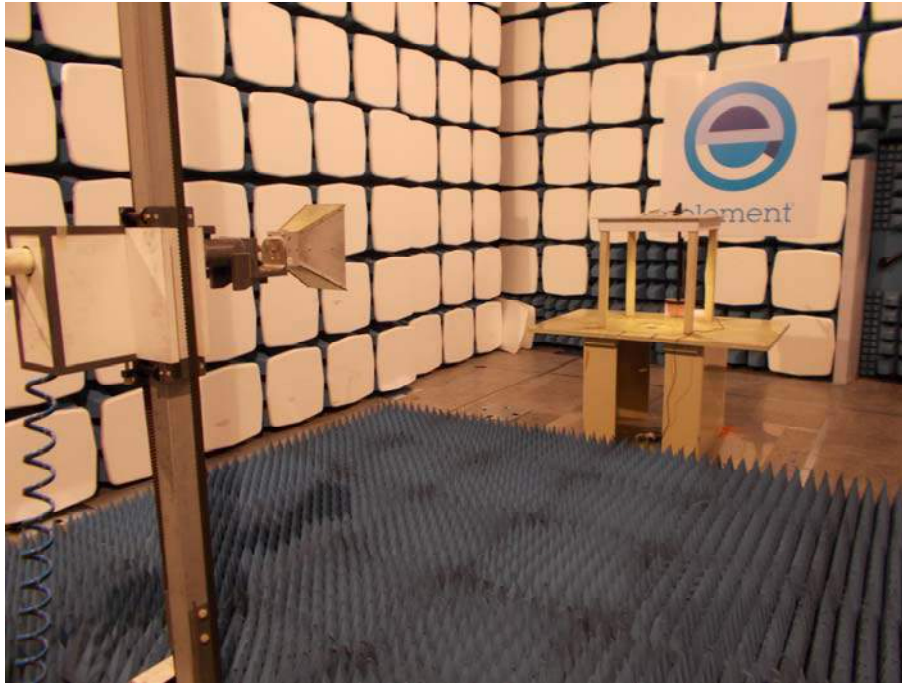
This field strength value is then compared with the regulatory limit.

**Figure viii Test Setup**



**Test Setup Photograph(s)**





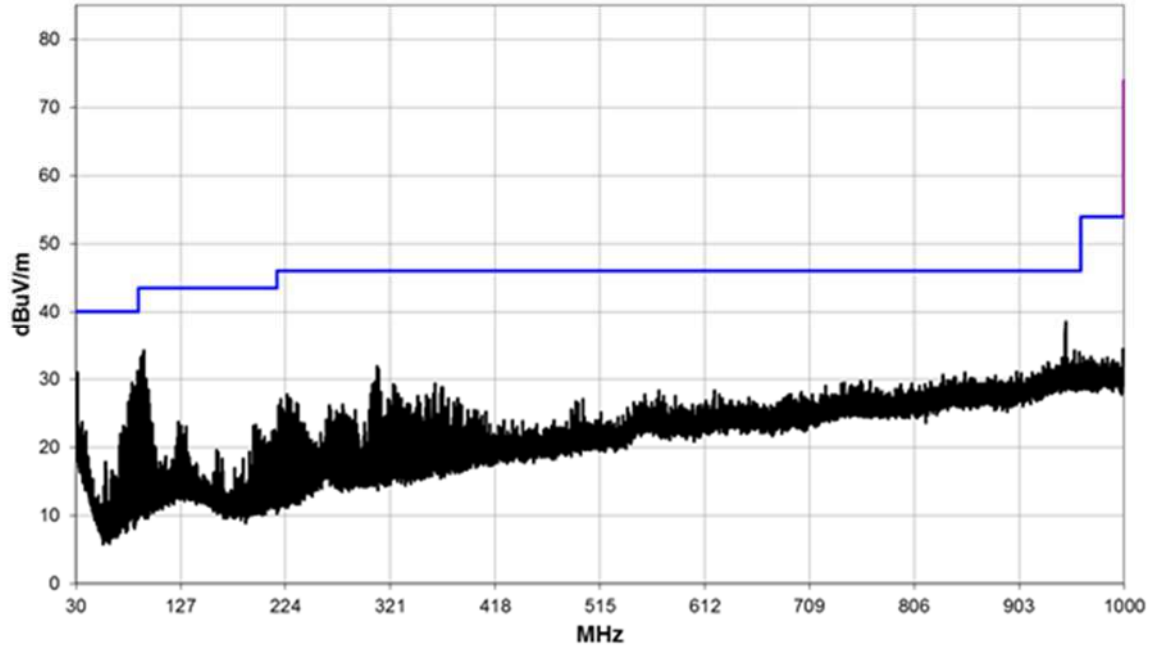
**11.5 Test Equipment**

Equipment Type	Manufacturer	Equipment Description	Element No	Due For Calibration
FSU46	R&S	Spectrum Analyser	U281	2018-06-19
310	Sonoma	Pre-Amp (9kHz – 1GHz)	REF927	2019-05-22
CBL6111B	Chase	Bilog Antenna	REF2218	2019-11-06
ATS	Rainford	Ferrite Lined Chamber	REF886	2019-07-24
3115	EMCO	Horn Antenna	RFG129	2020-02-12
Antenna	Q-Par	Horn Antenna	RFG629	2019-09-26

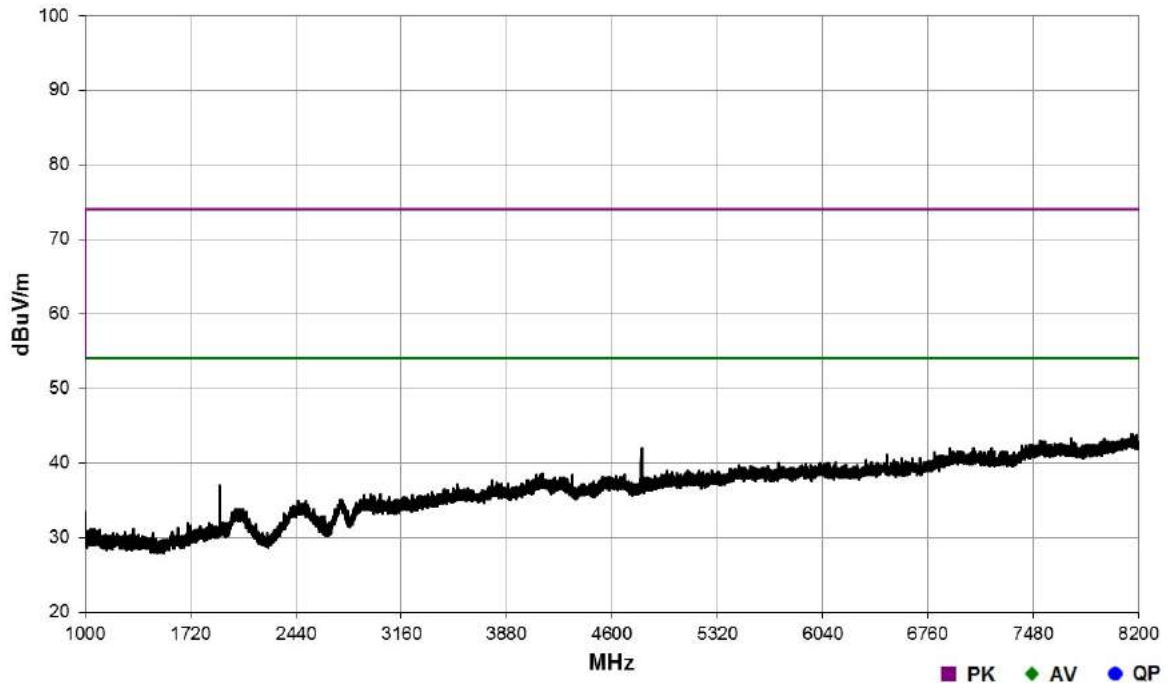
### 11.6 Test Results

Sample S22 CF04 SN:YR5-US-FBA0037A; Channel: 2402 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dB $\mu$ V)	Factor (dB)	Field Strength (dB $\mu$ V/m)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
There were no emissions within 10 dB of the limit.						

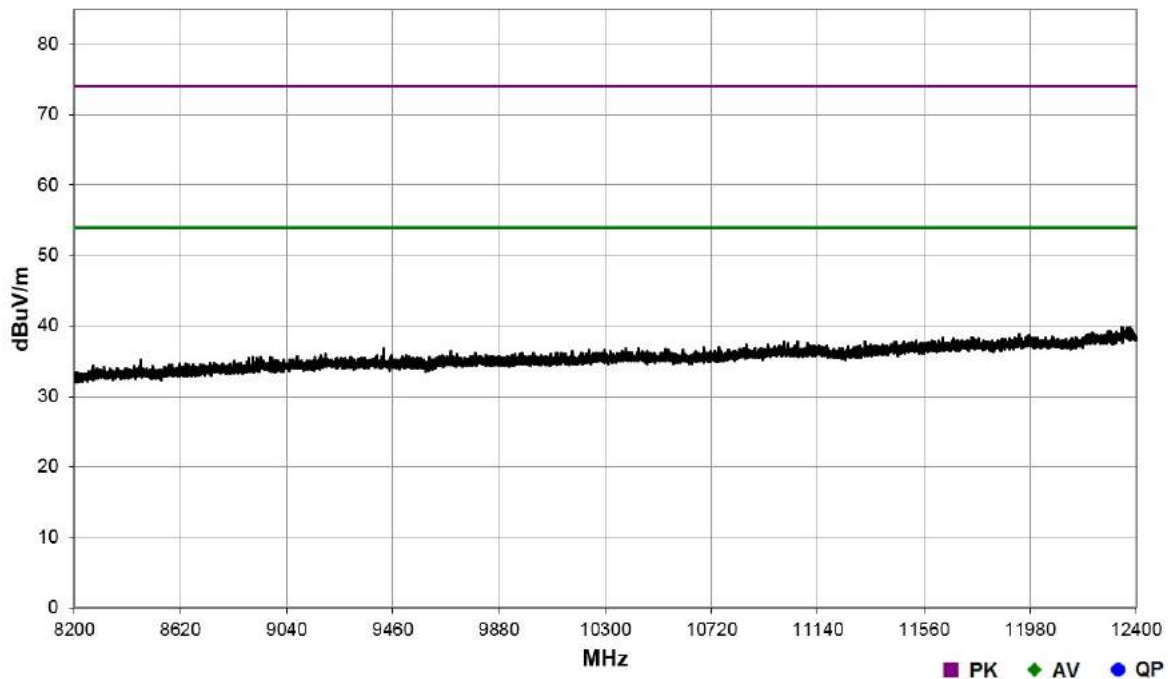
30 MHz to 1 GHz



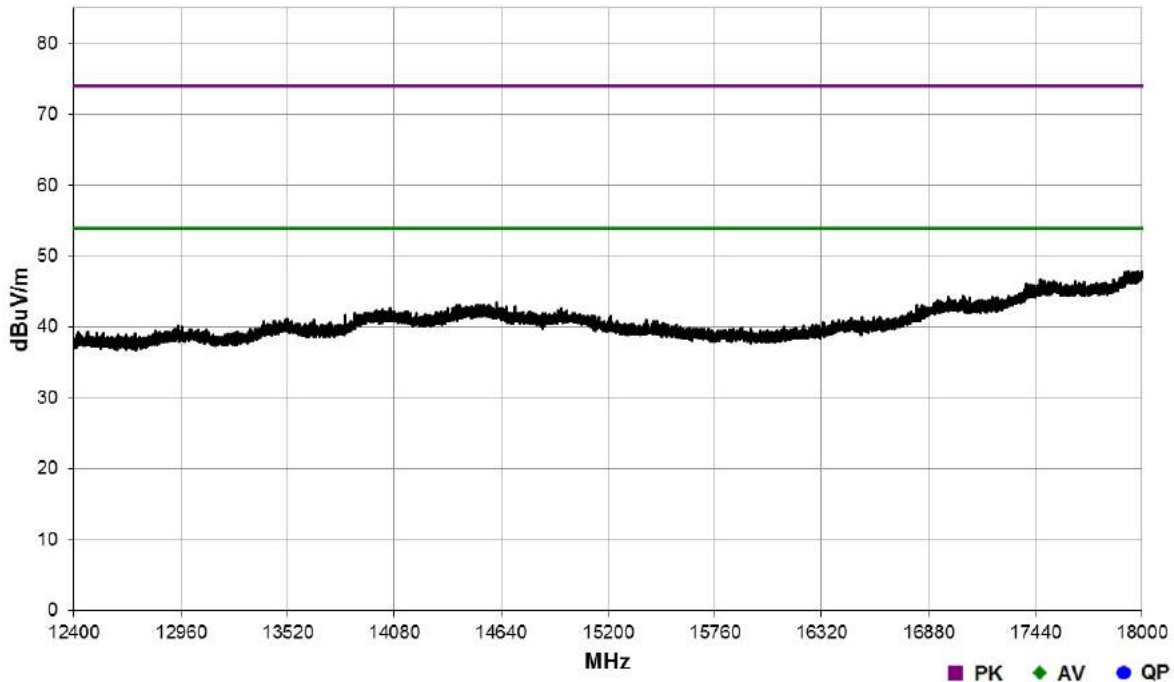
1 GHz to 8.2 GHz



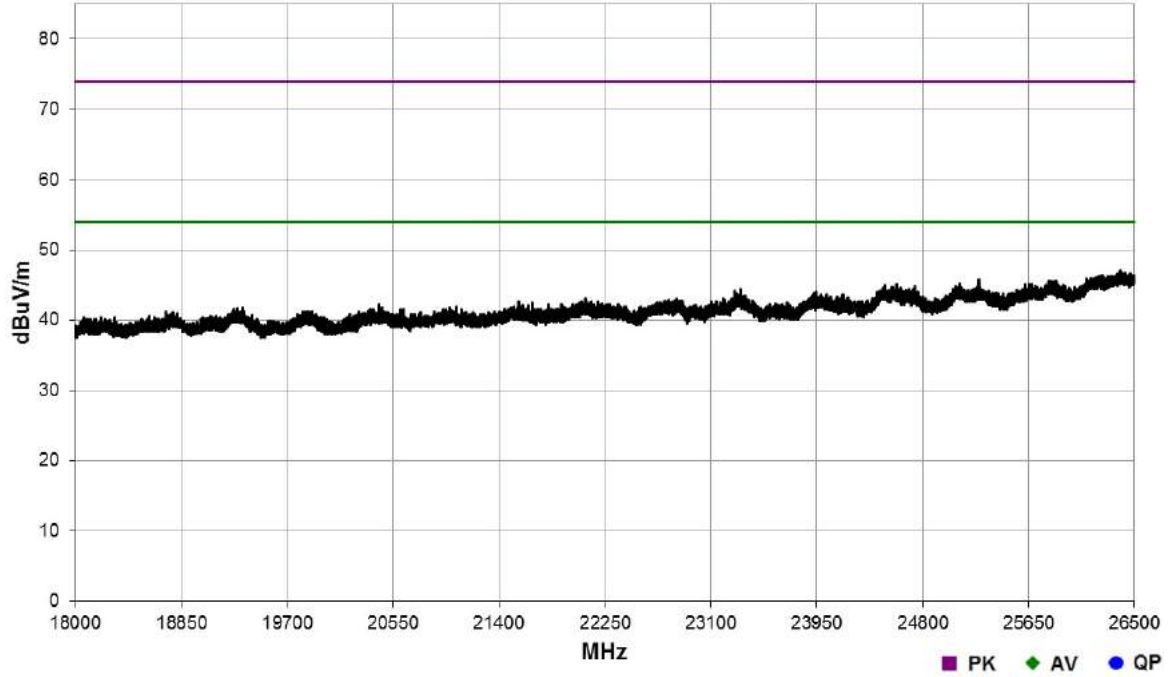
8.2 GHz to 12.4 GHz



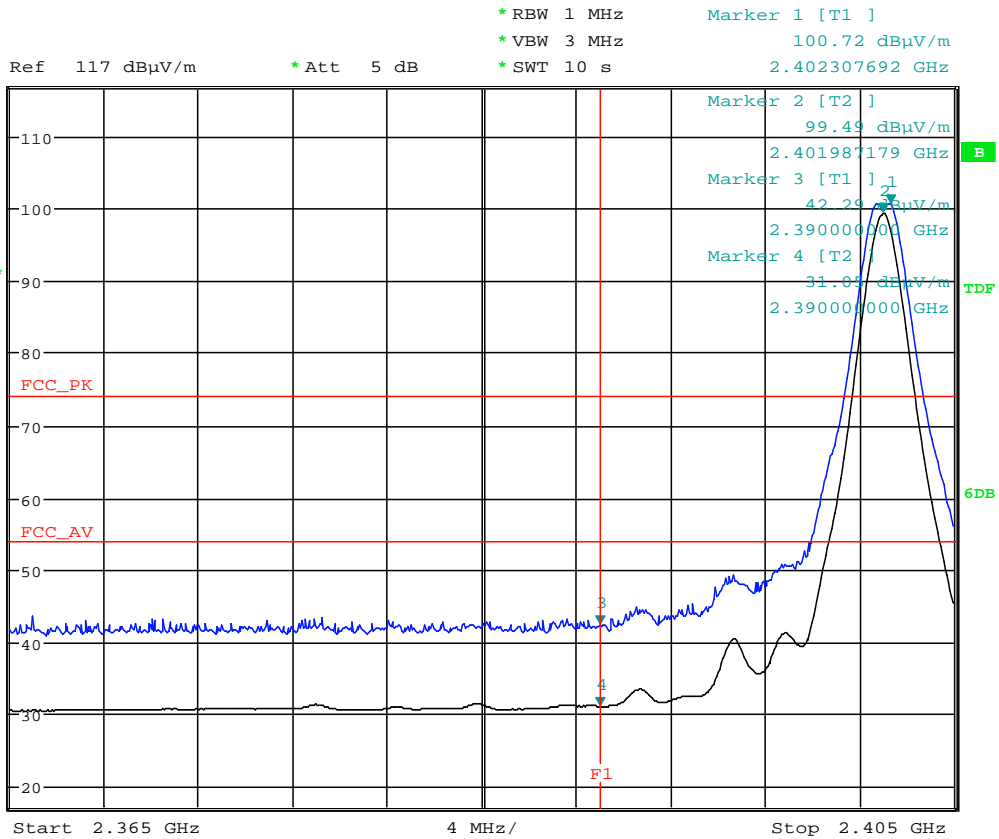
12.4 GHz to 18 GHz



18 GHz to 26.5 GHz



Band Edge

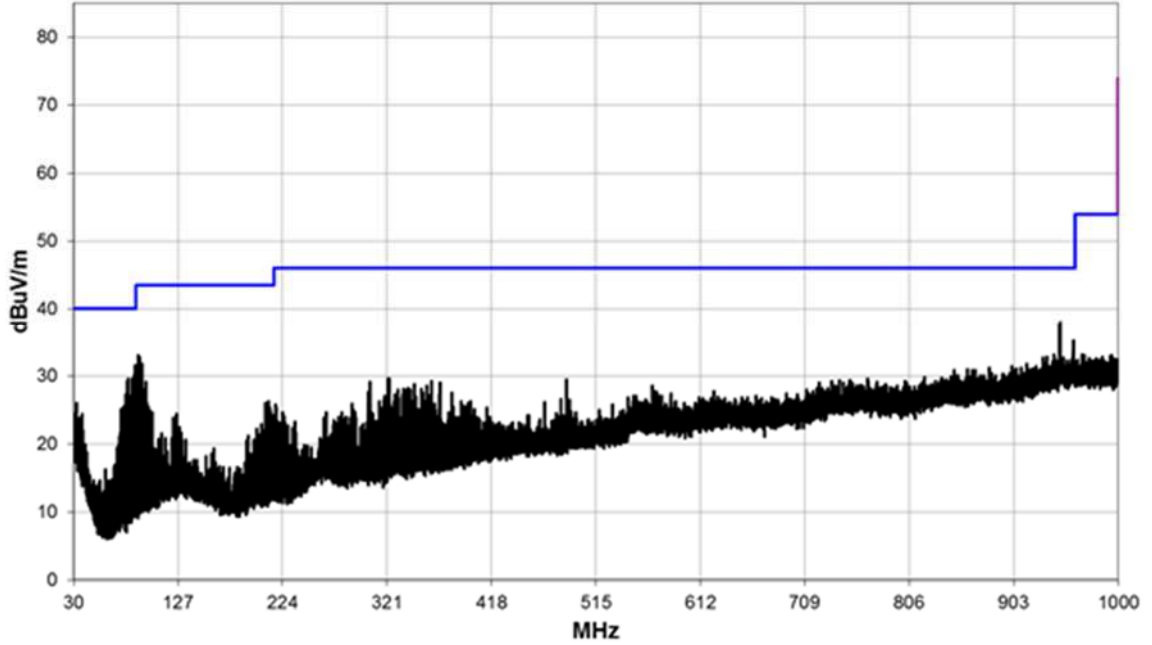


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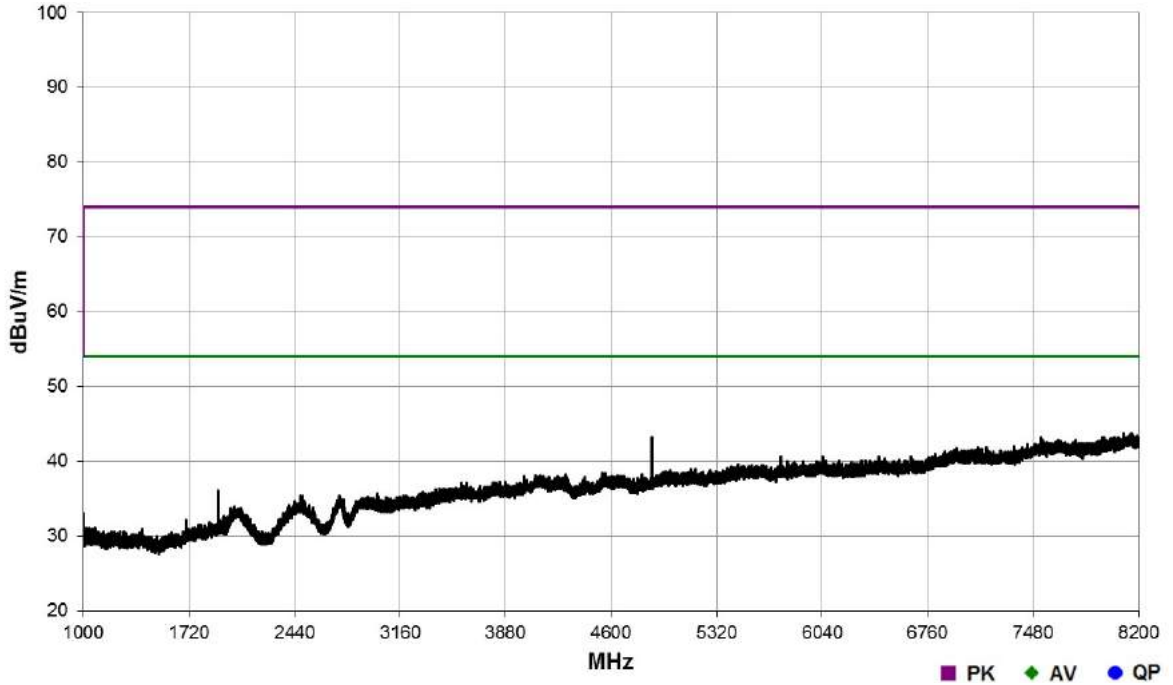


Sample S22 CF04 SN:YR5-US-FBA0037A; Channel: 2440 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dBμV)	Factor (dB)	Field Strength (dBμV/m)	Field Strength (μV/m)	Limit (μV/m)
There were no emissions within 10 dB of the limit.						

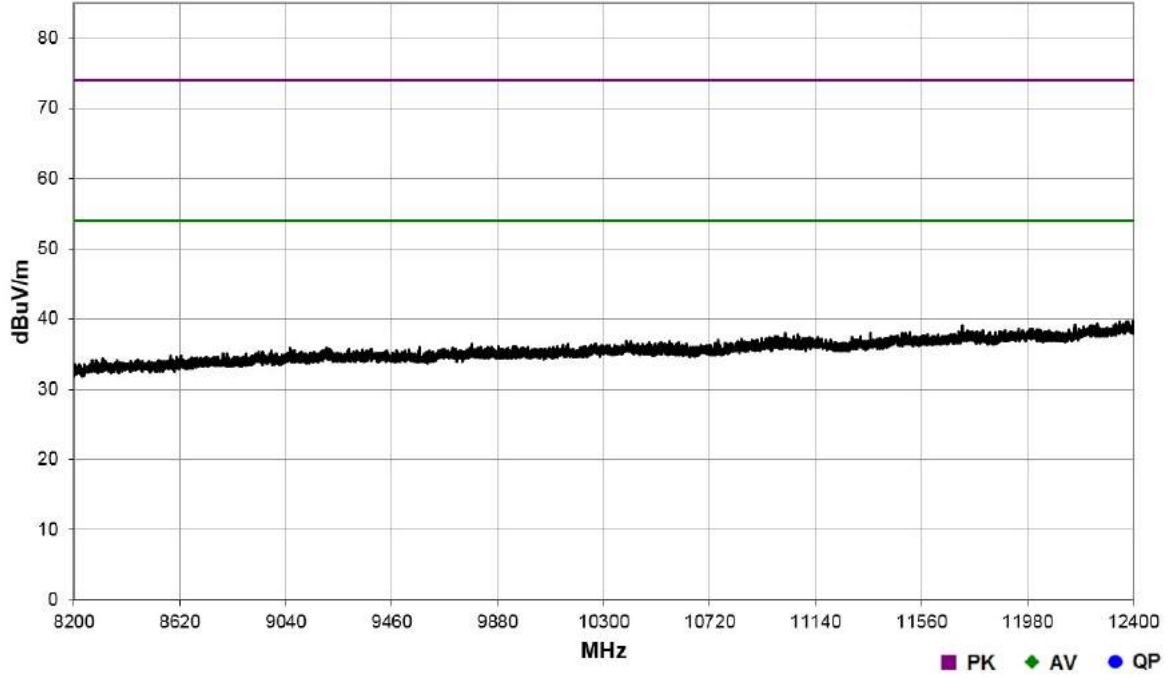
30 MHz to 1 GHz



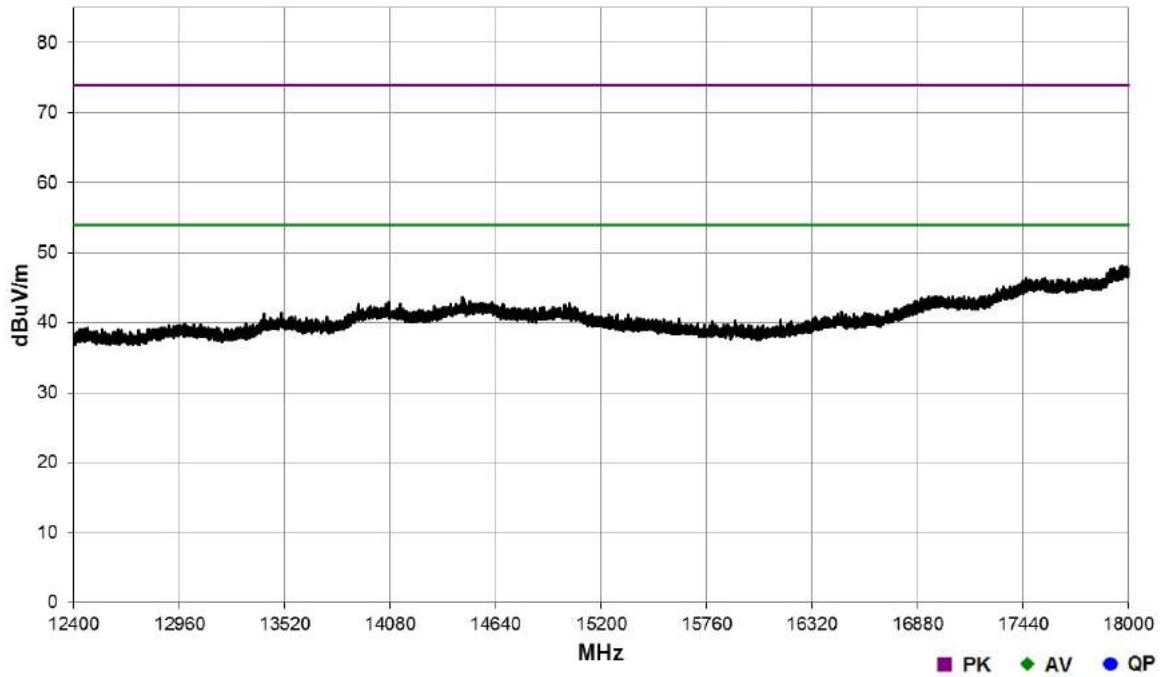
1 GHz to 8.2 GHz



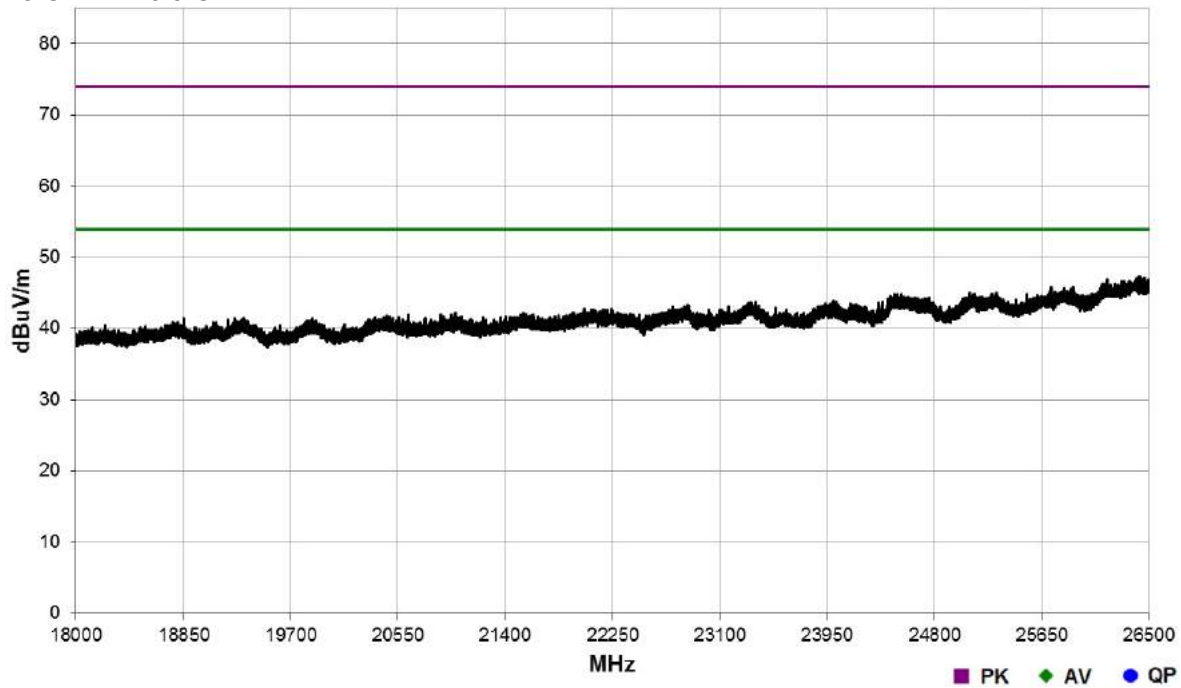
8.2 GHz to 12.4 GHz



12.4 GHz to 18 GHz

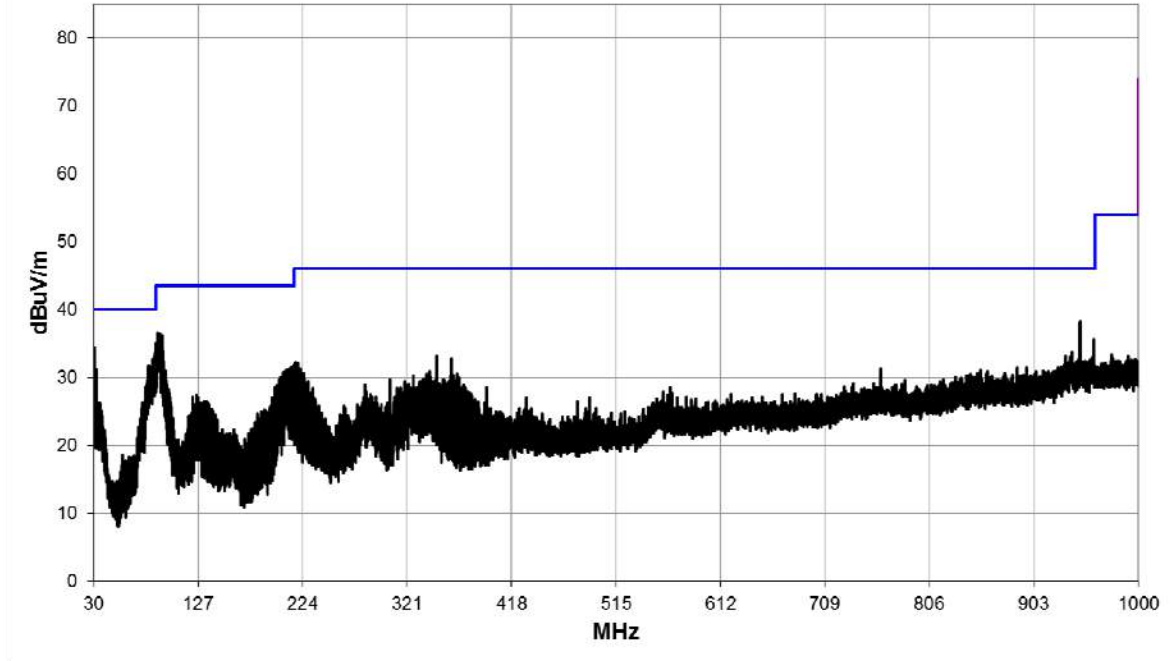


### 18 GHz to 26.5 GHz

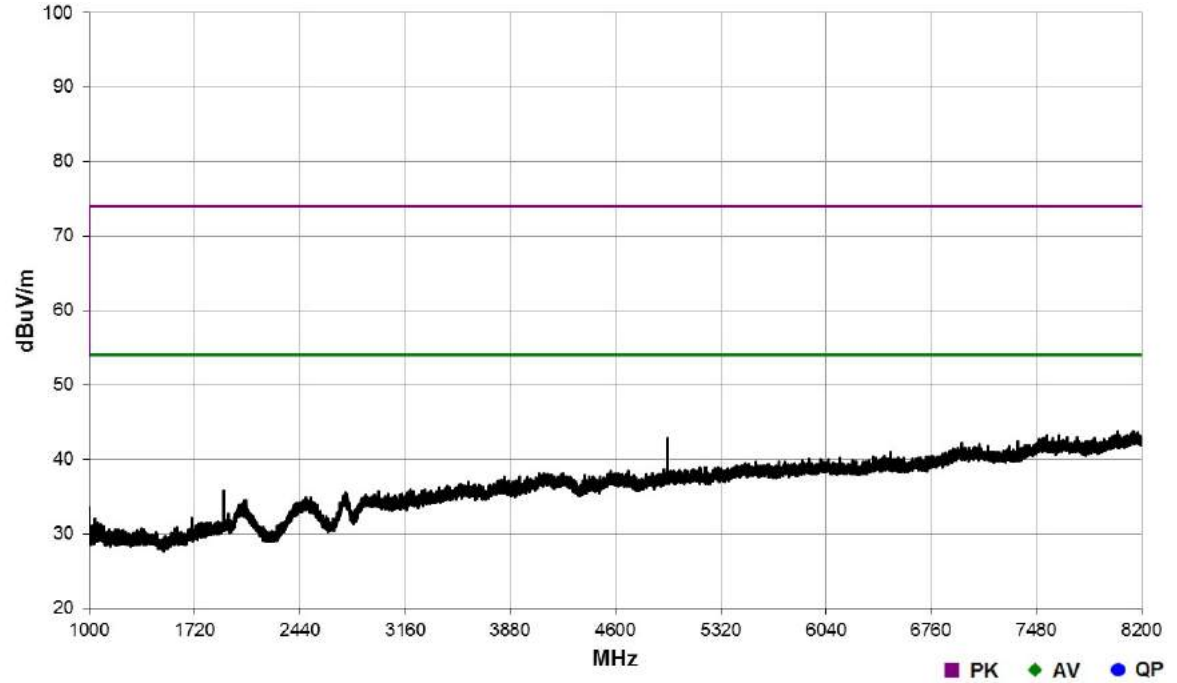


Sample S22 CF04 SN:YR5-US-FBA0037A; Channel: 2480 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dB $\mu$ V)	Factor (dB)	Field Strength (dB $\mu$ V/m)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
There were no emissions within 10 dB of the limit.						

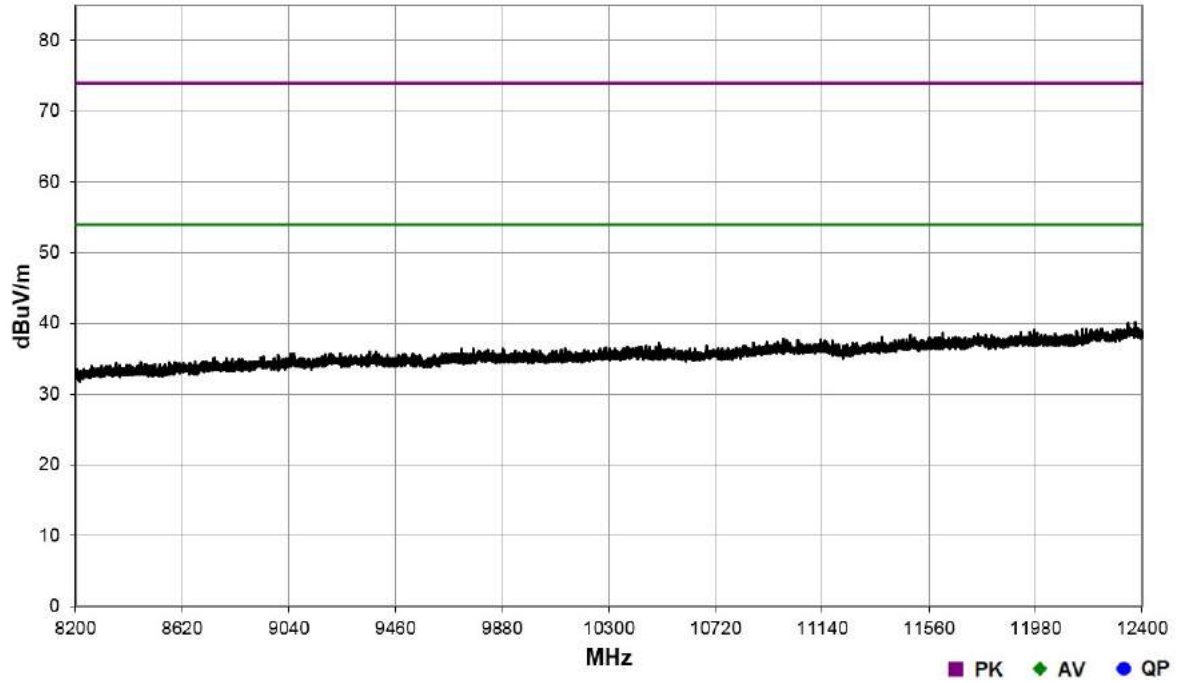
30 MHz to 1 GHz



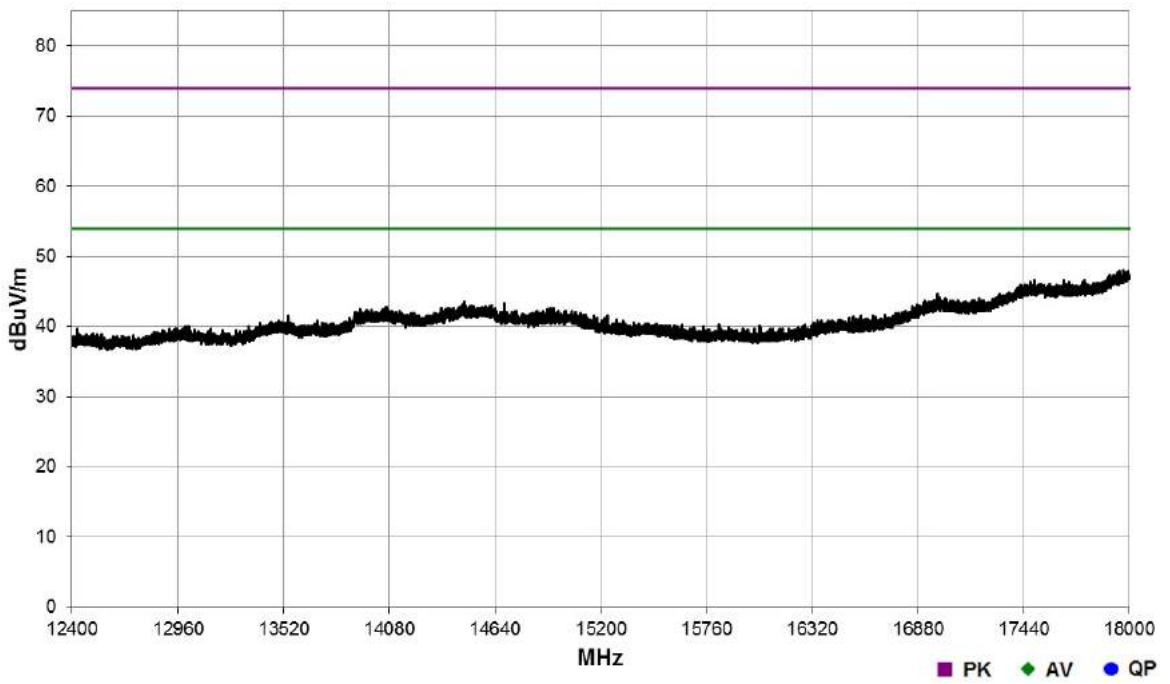
1 GHz to 8.2 GHz



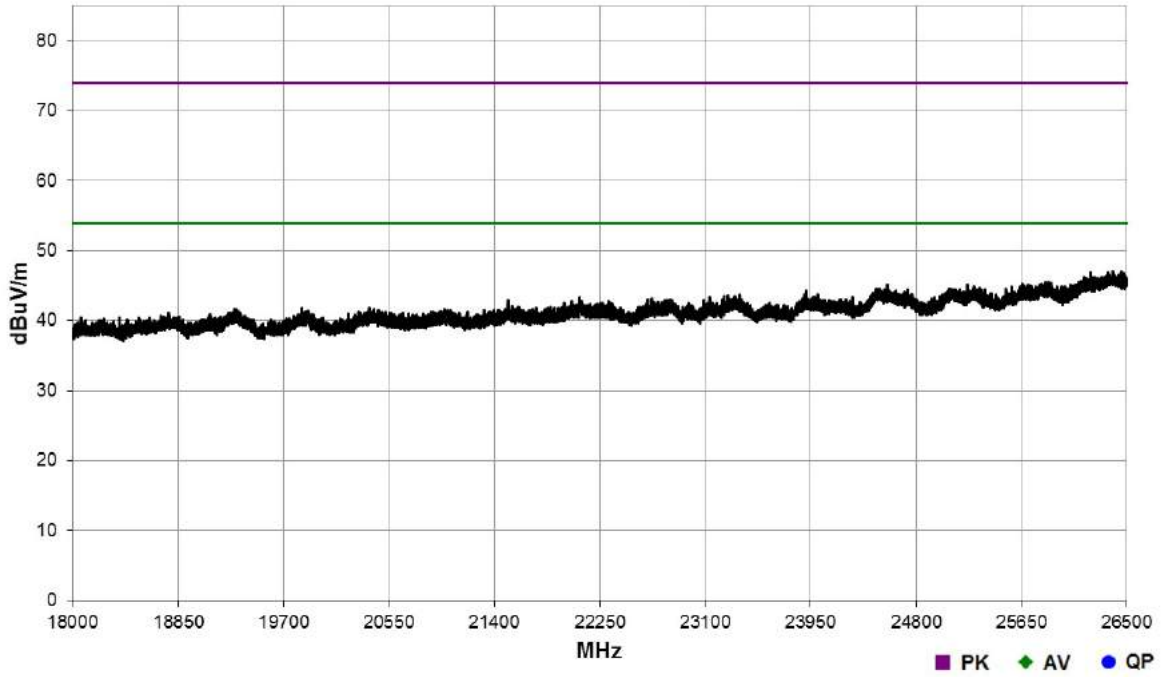
### 8.2 GHz to 12.4 GHz



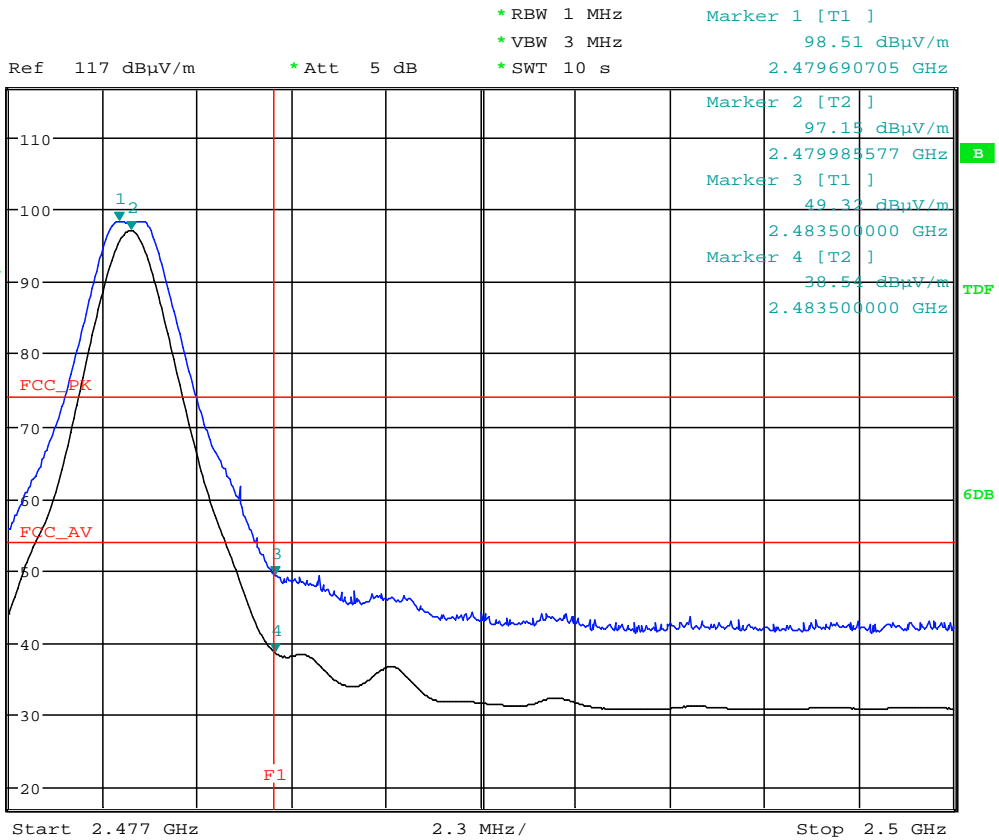
### 12.4 GHz to 18 GHz



18 GHz to 26.5 GHz



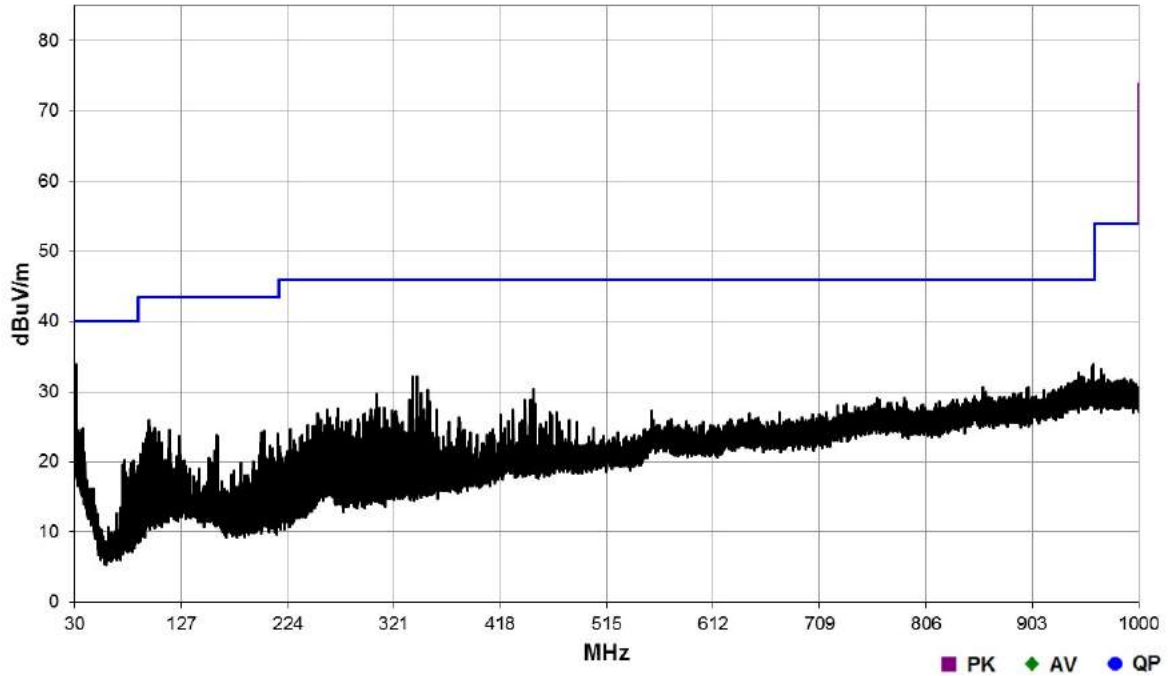
Band Edge



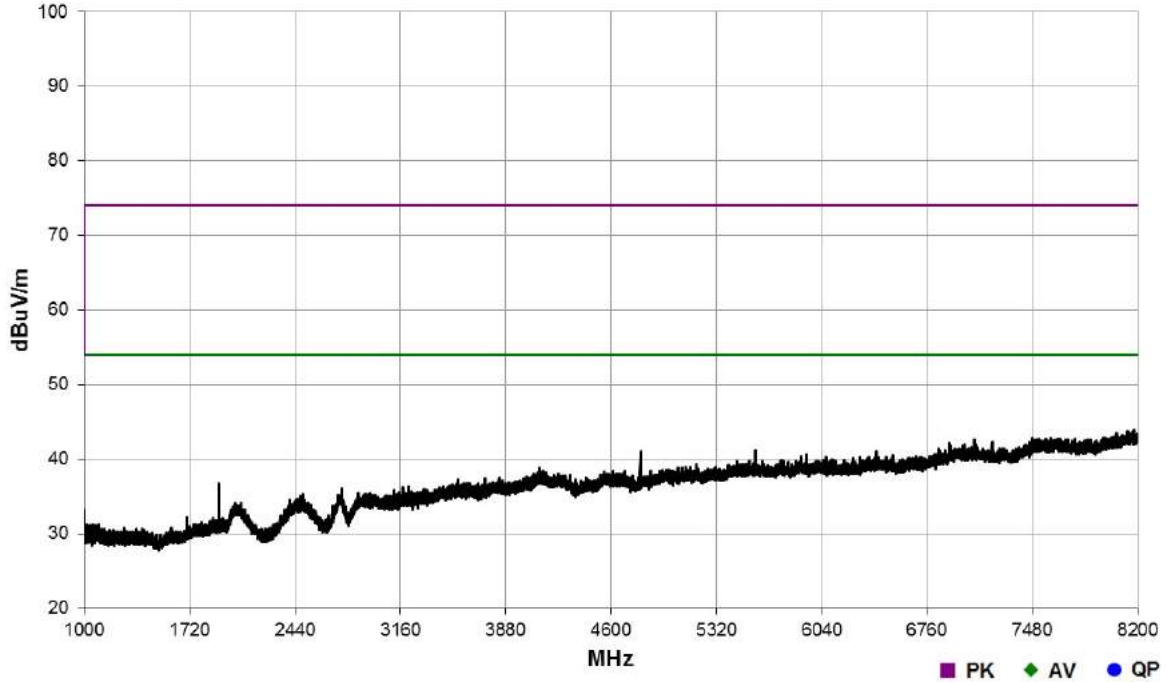
Date: 7.AUG.2018 08:06:27

Sample S24 CD04 SN:YU2-JP-FBA0057A; Channel: 2402 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dBμV)	Factor (dB)	Field Strength (dBμV/m)	Field Strength (μV/m)	Limit (μV/m)
There were no emissions within 10 dB of the limit.						

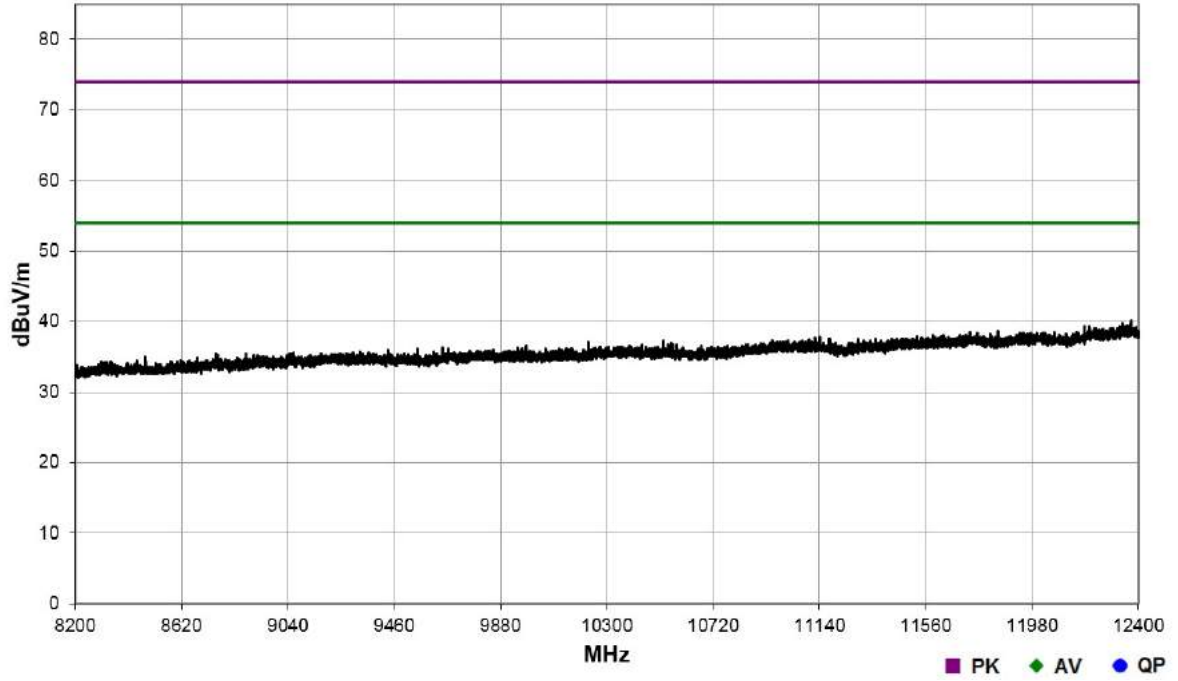
30 MHz to 1 GHz



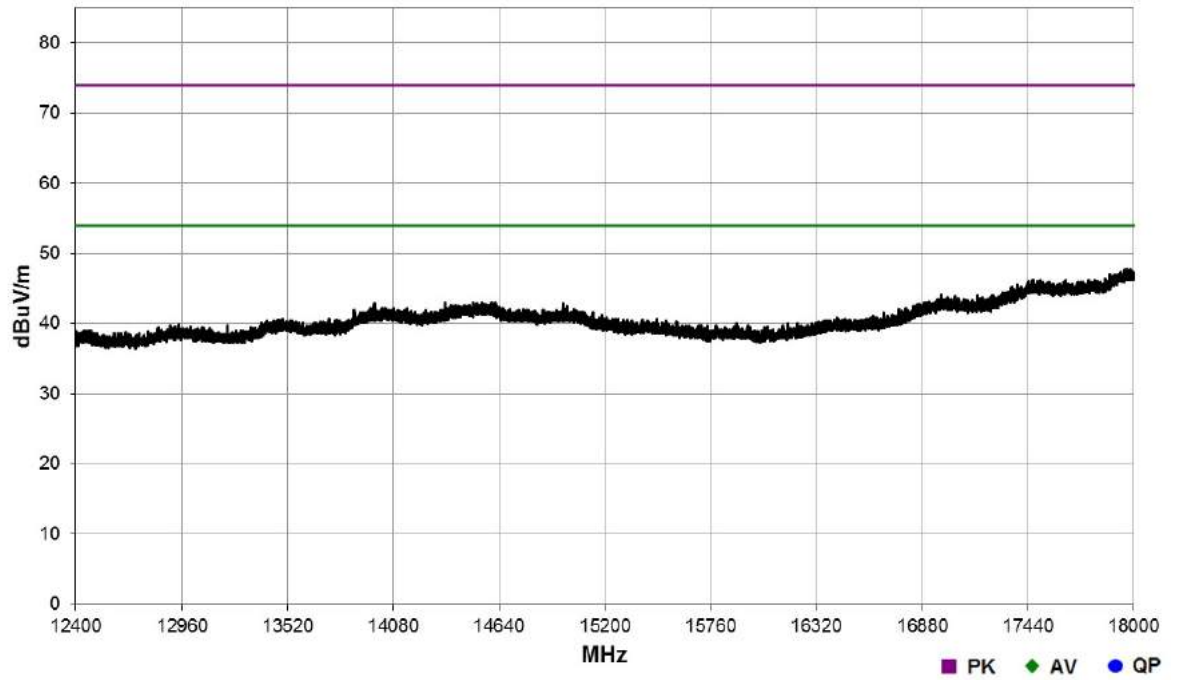
1 GHz to 8.2 GHz



8.2 GHz to 12.4 GHz

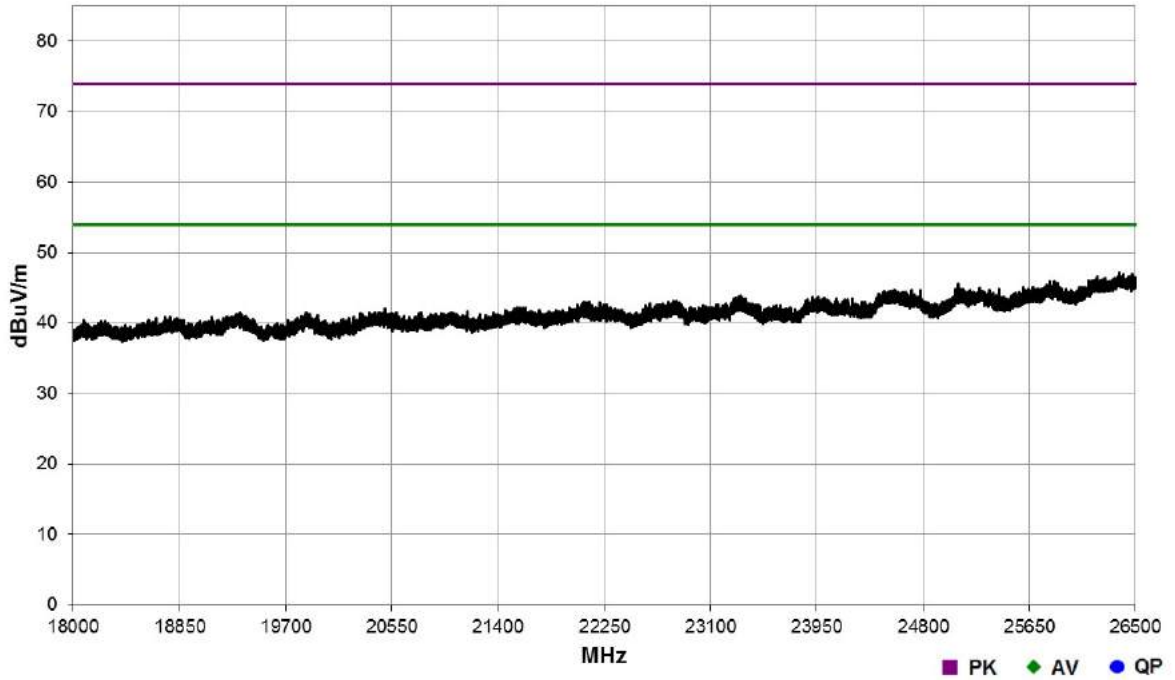


12.4 GHz to 18 GHz

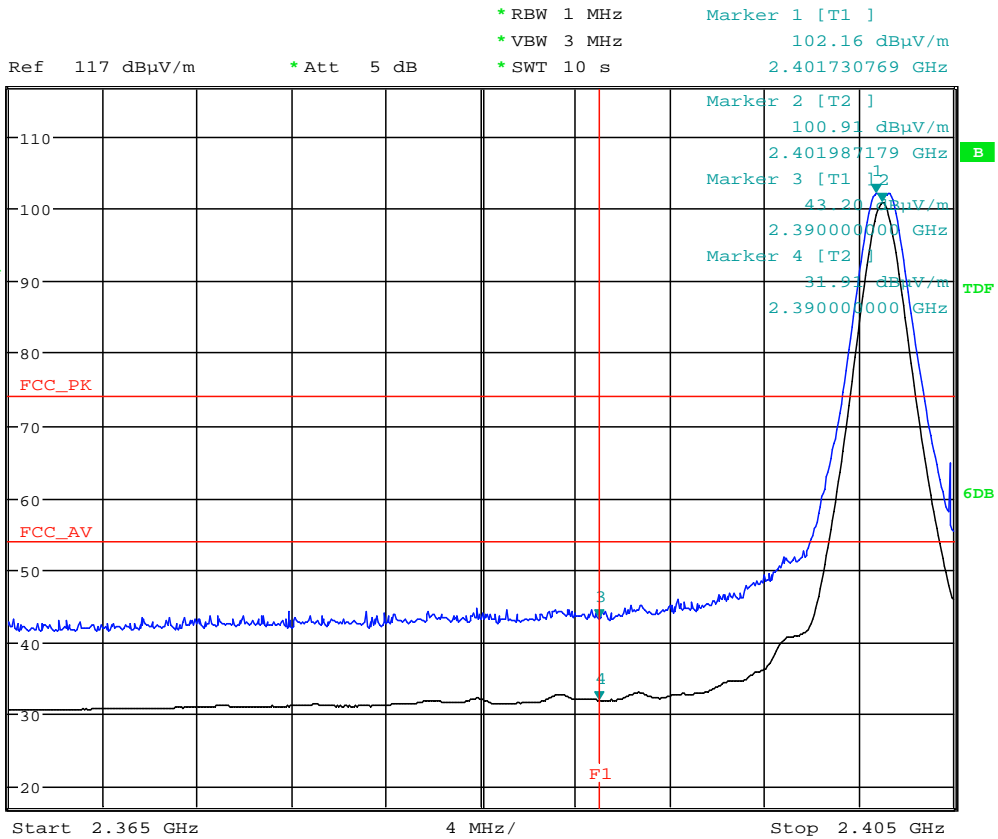




18 GHz to 26.5 GHz



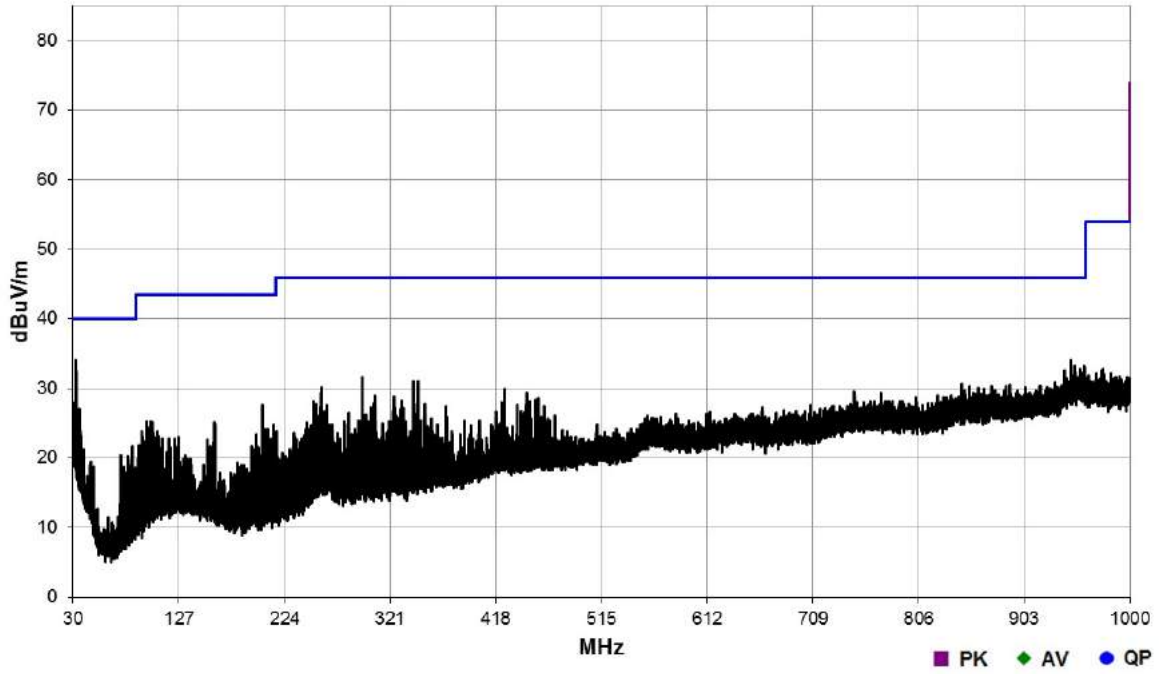
Band Edge



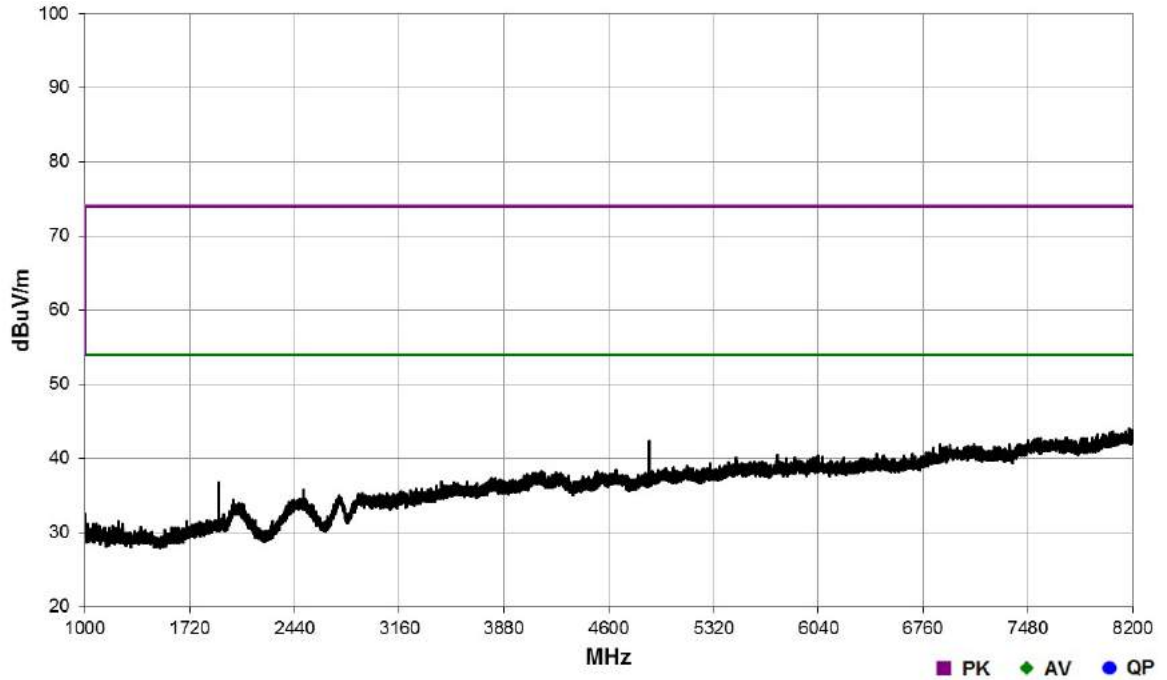
Date: 7.AUG.2018 10:45:49

Sample S24 CD04 SN:YU2-JP-FBA0057A; Channel: 2440 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dB $\mu$ V)	Factor (dB)	Field Strength (dB $\mu$ V/m)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
There were no emissions within 10 dB of the limit.						

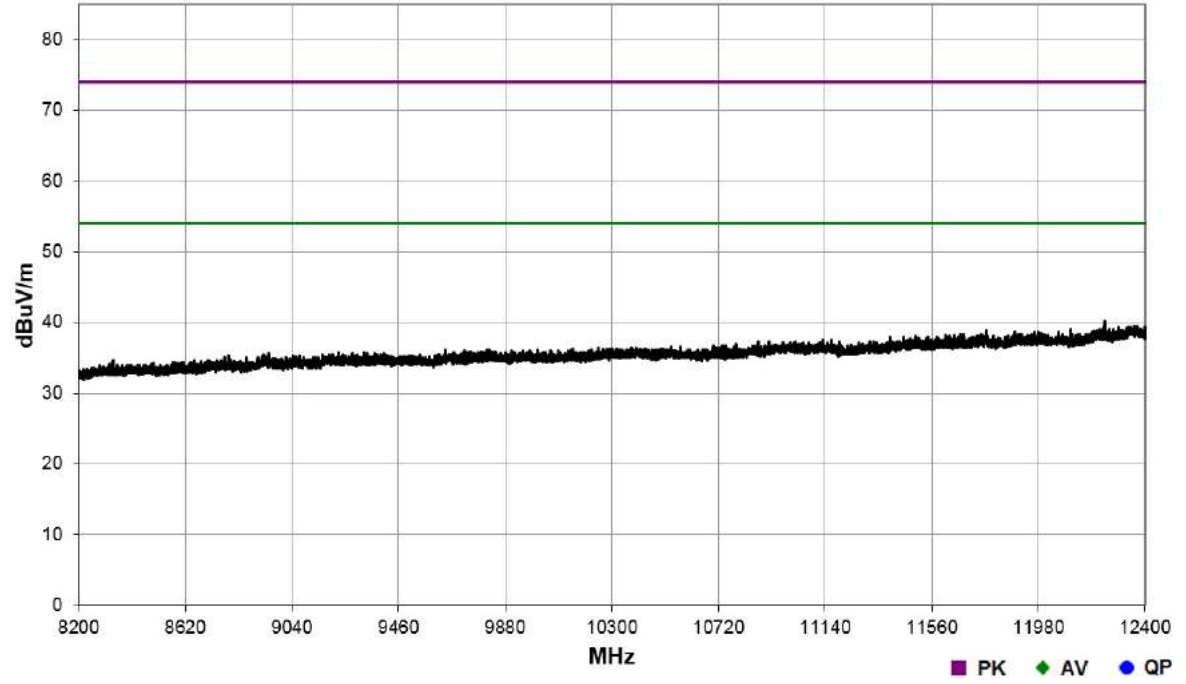
30 MHz to 1 GHz



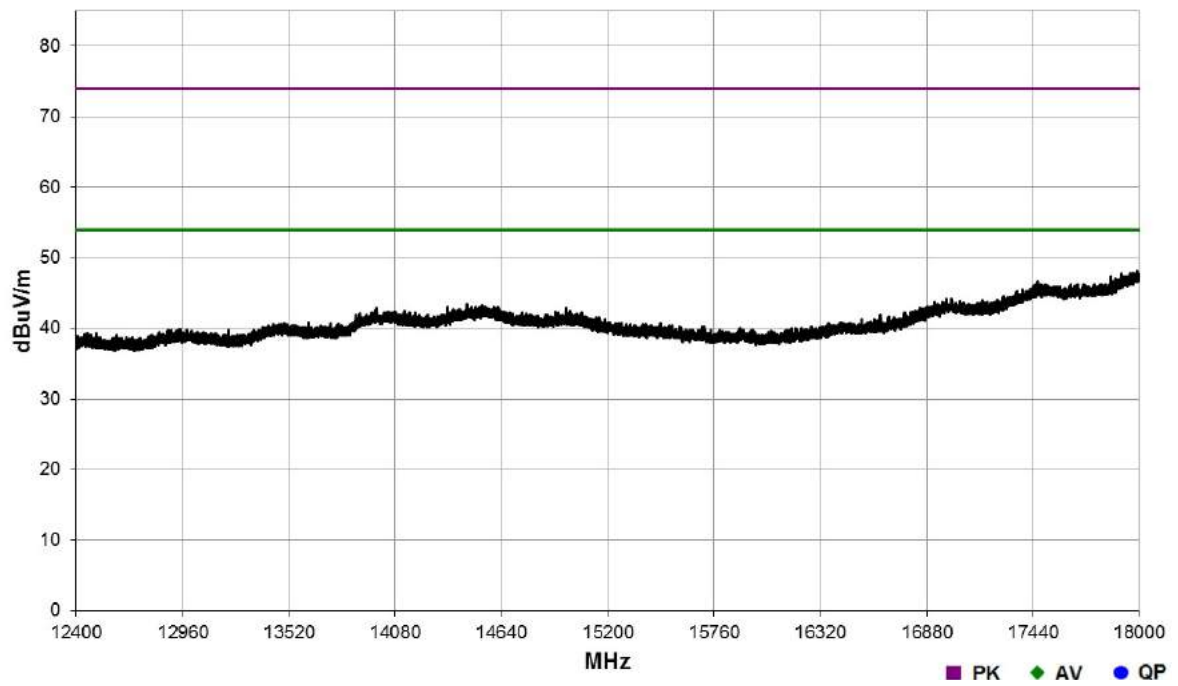
1 GHz to 8.2 GHz



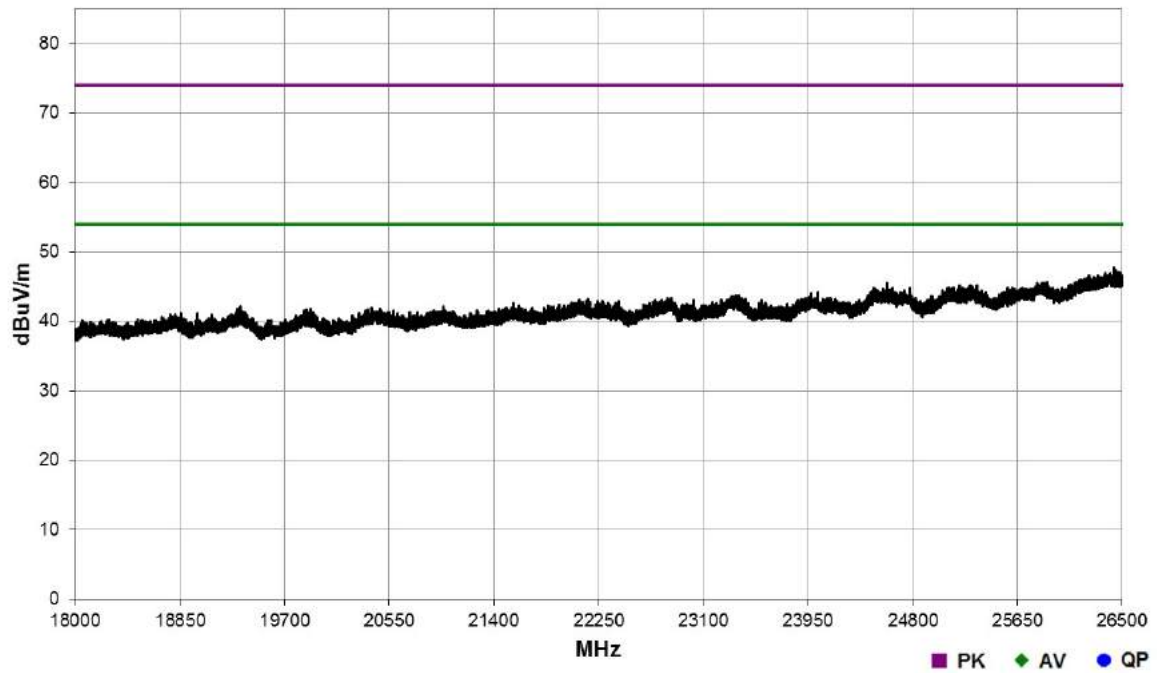
### 8.2 GHz to 12.4 GHz



### 12.4 GHz to 18 GHz

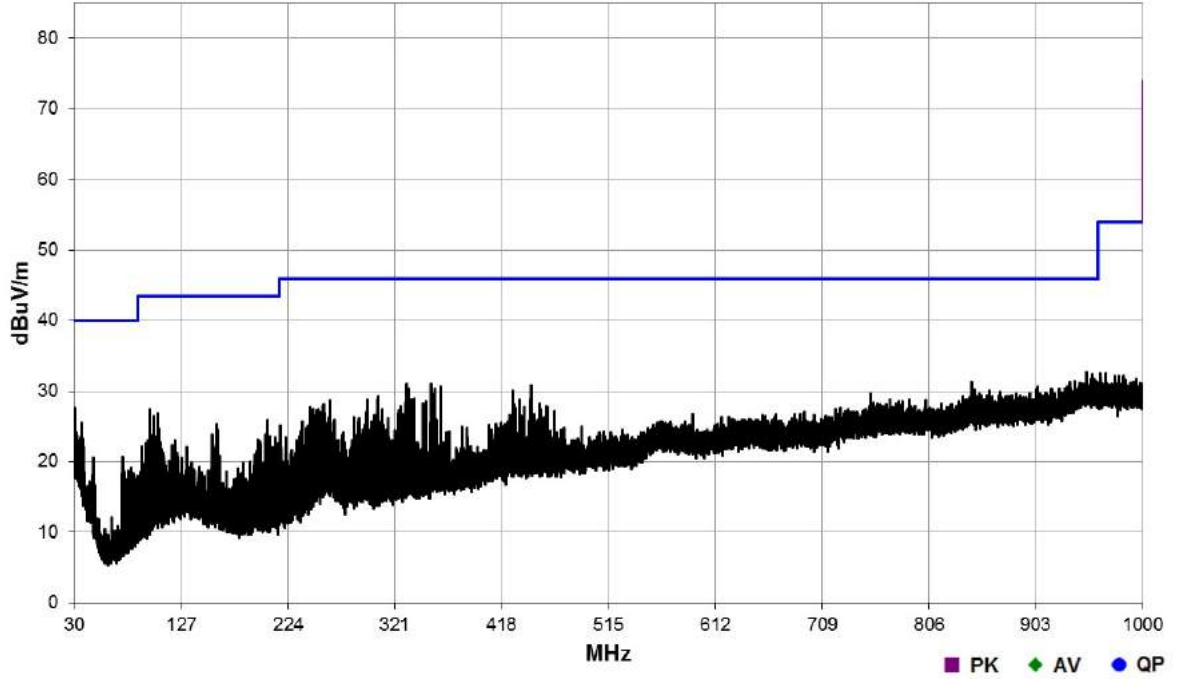


### 18 GHz to 26.5 GHz

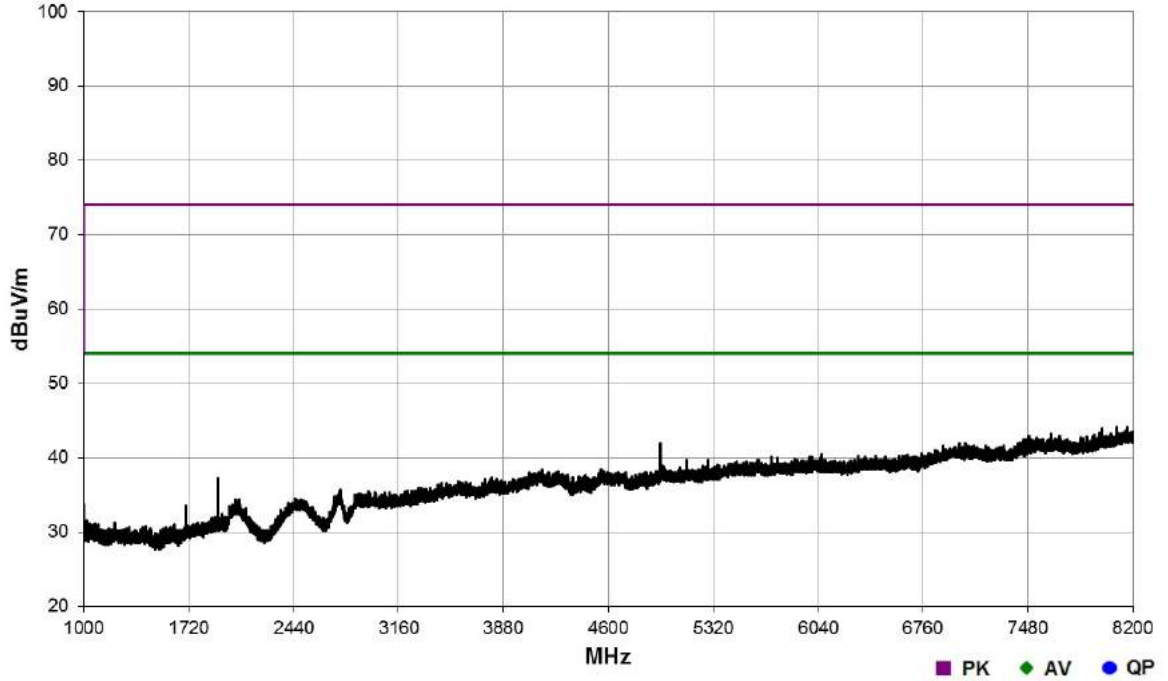


Sample S24 CD04 SN:YU2-JP-FBA0057A; Channel: 2480 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dBμV)	Factor (dB)	Field Strength (dBμV/m)	Field Strength (μV/m)	Limit (μV/m)
There were no emissions within 10 dB of the limit.						

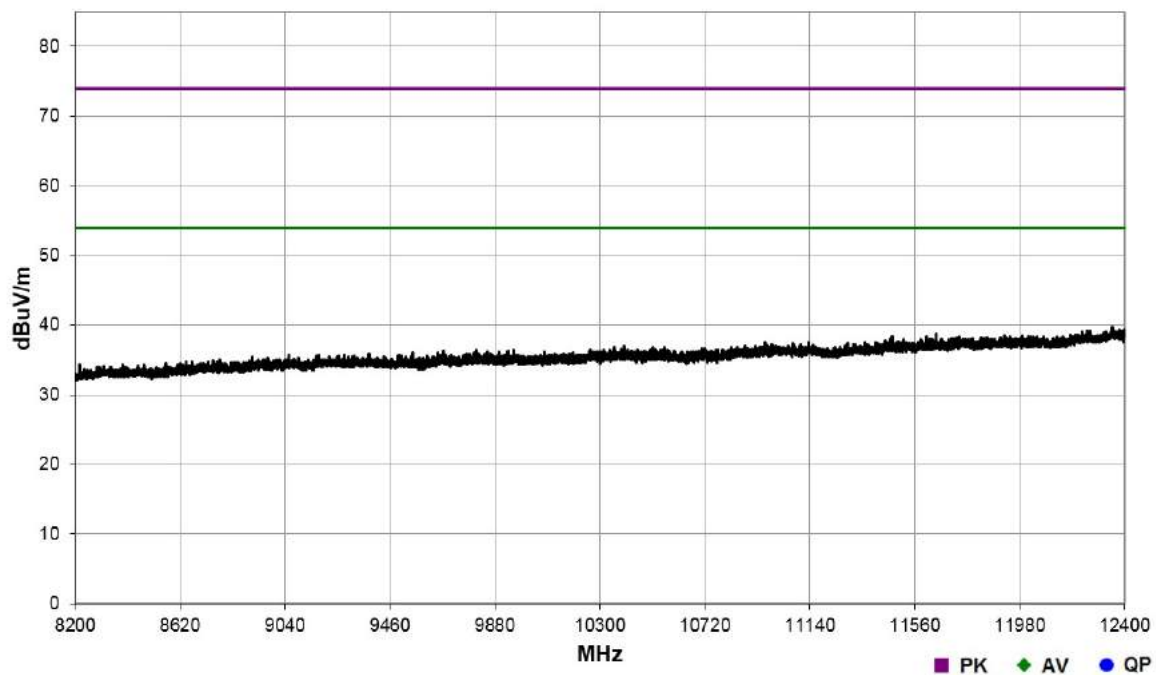
30 MHz to 1 GHz



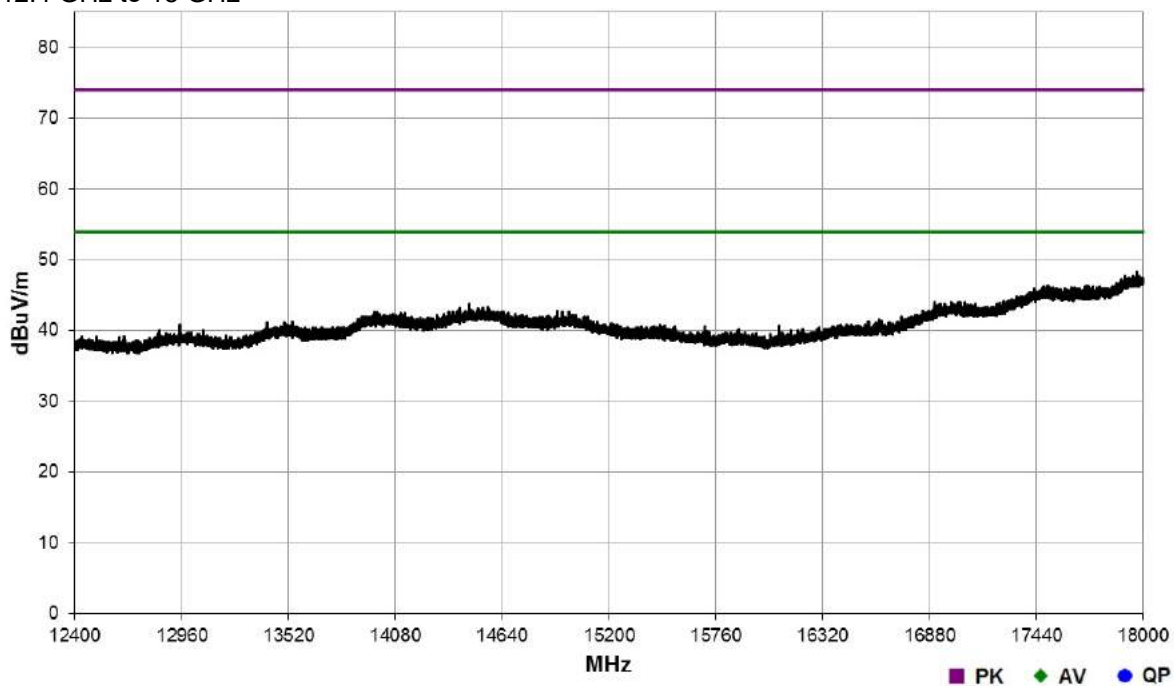
1 GHz to 8.2 GHz



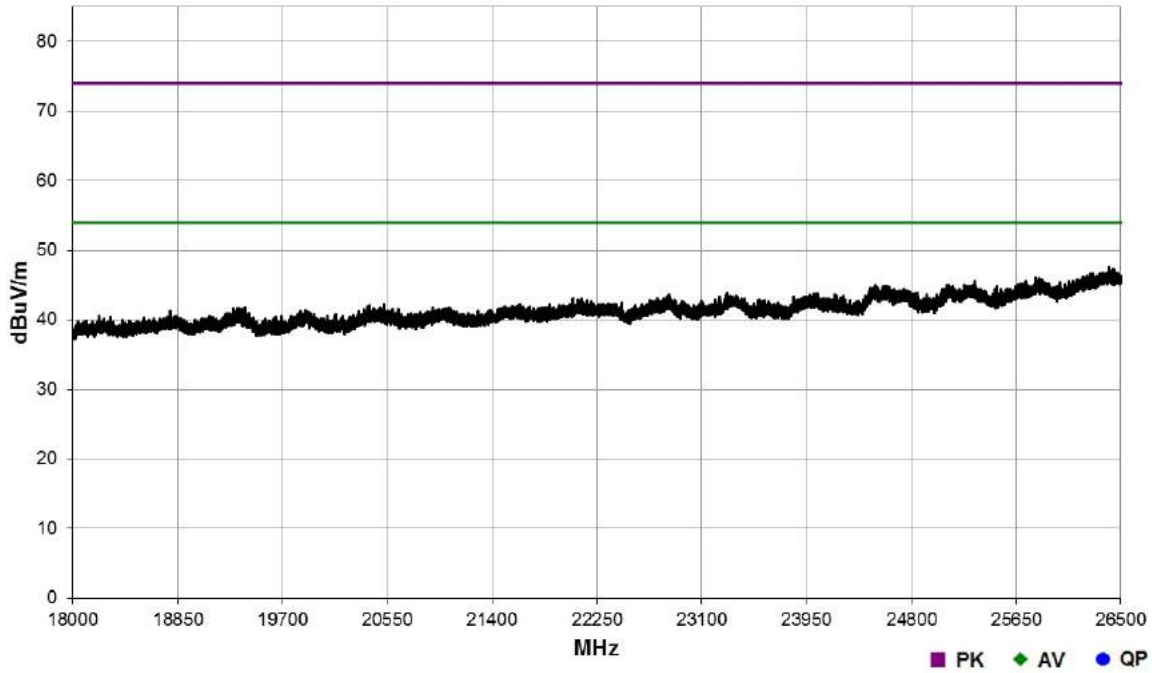
### 8.2 GHz to 12.4 GHz



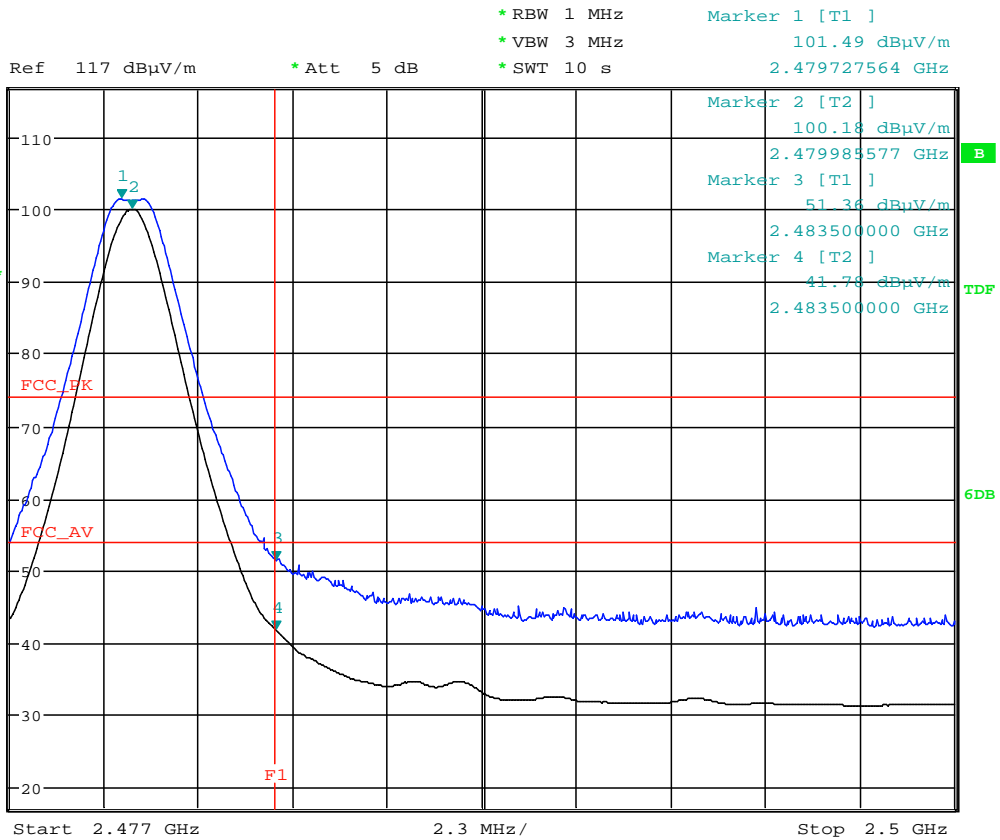
### 12.4 GHz to 18 GHz



18 GHz to 26.5 GHz



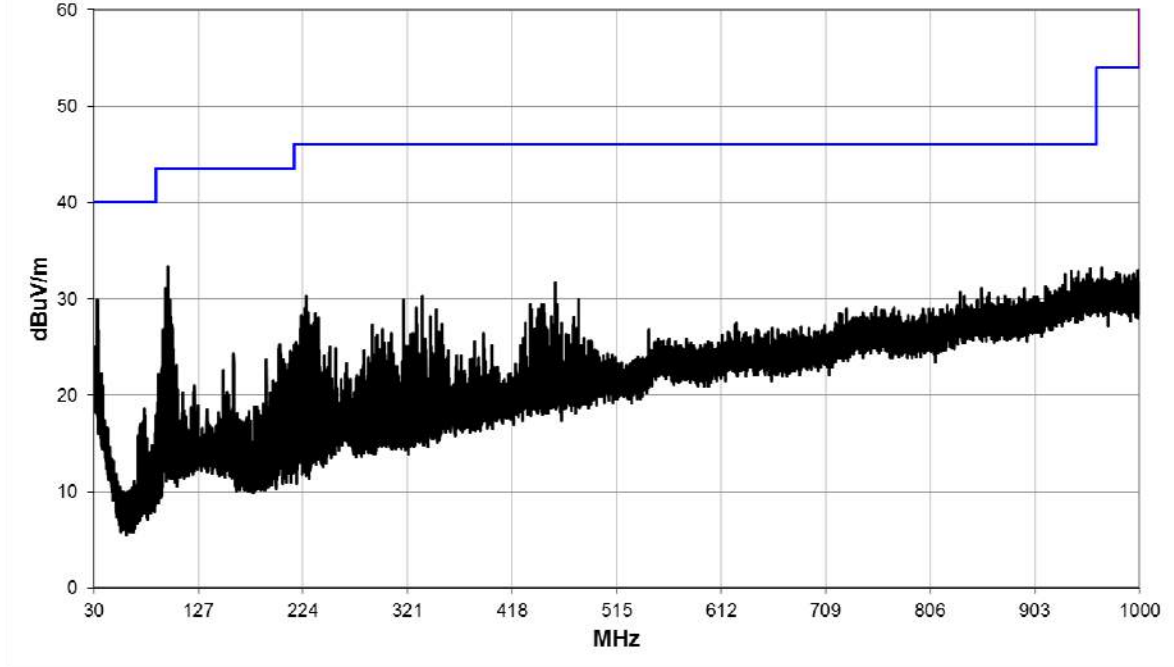
Band Edge



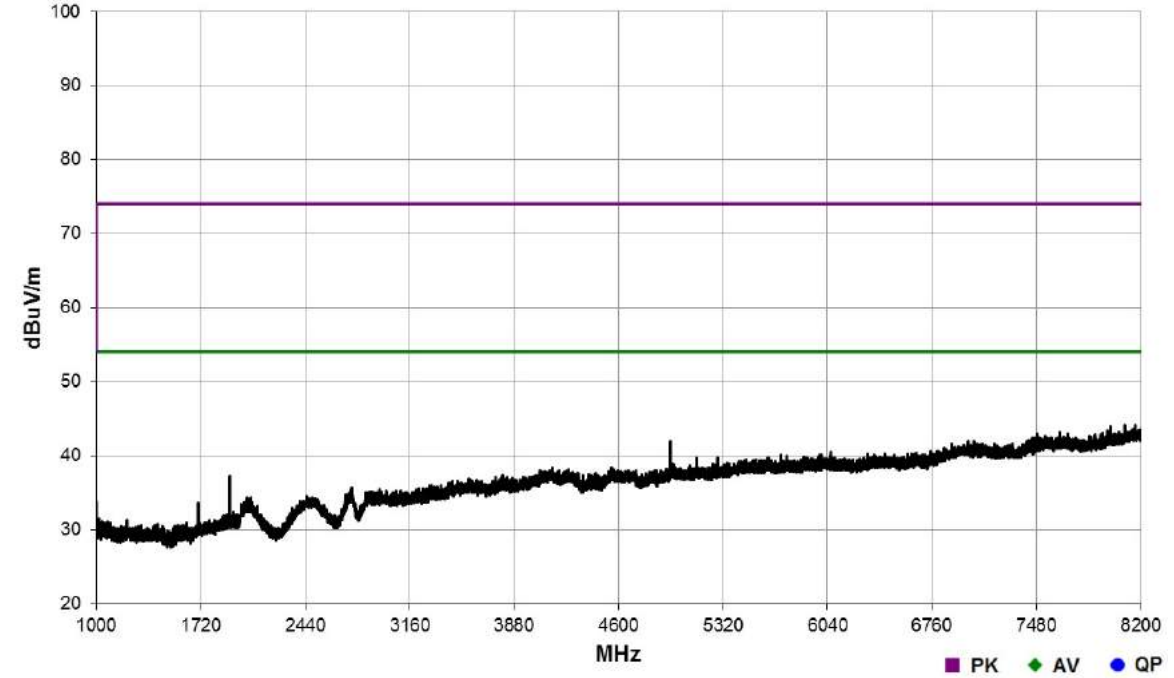
Date: 7.AUG.2018 10:26:51

Sample S26 CD05 SN: YR4-US-FBA0039A; Channel: 2402 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dB $\mu$ V)	Factor (dB)	Field Strength (dB $\mu$ V/m)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
There were no emissions within 10 dB of the limit.						

30 MHz to 1 GHz

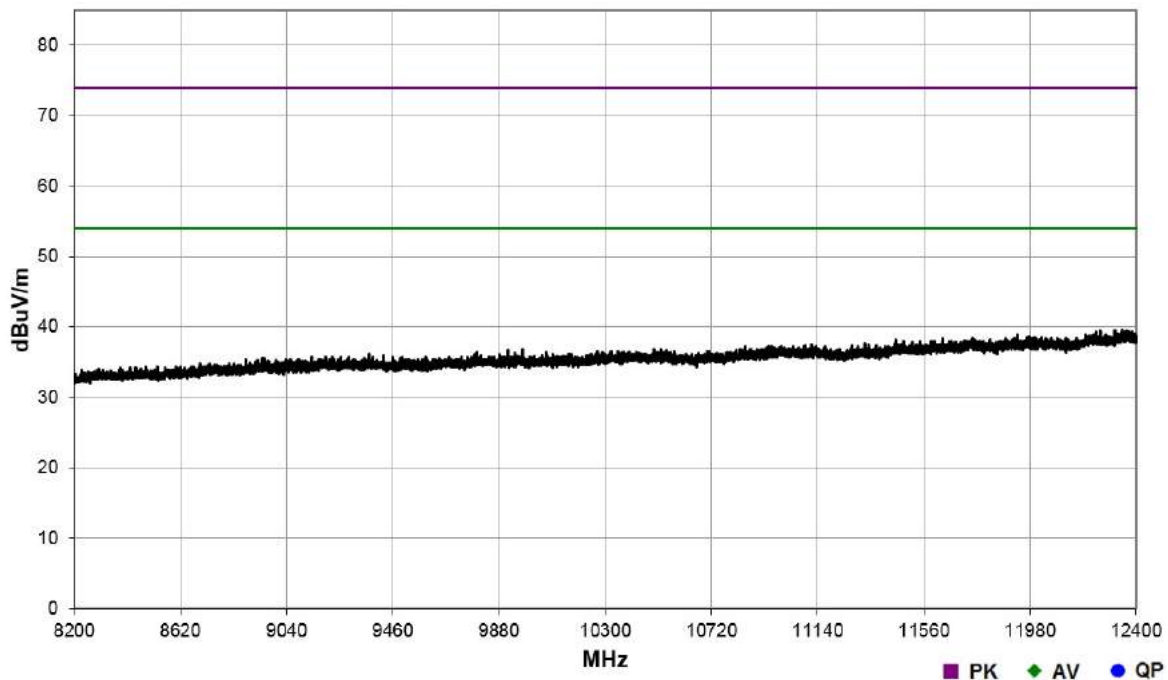


1 GHz to 8.2 GHz

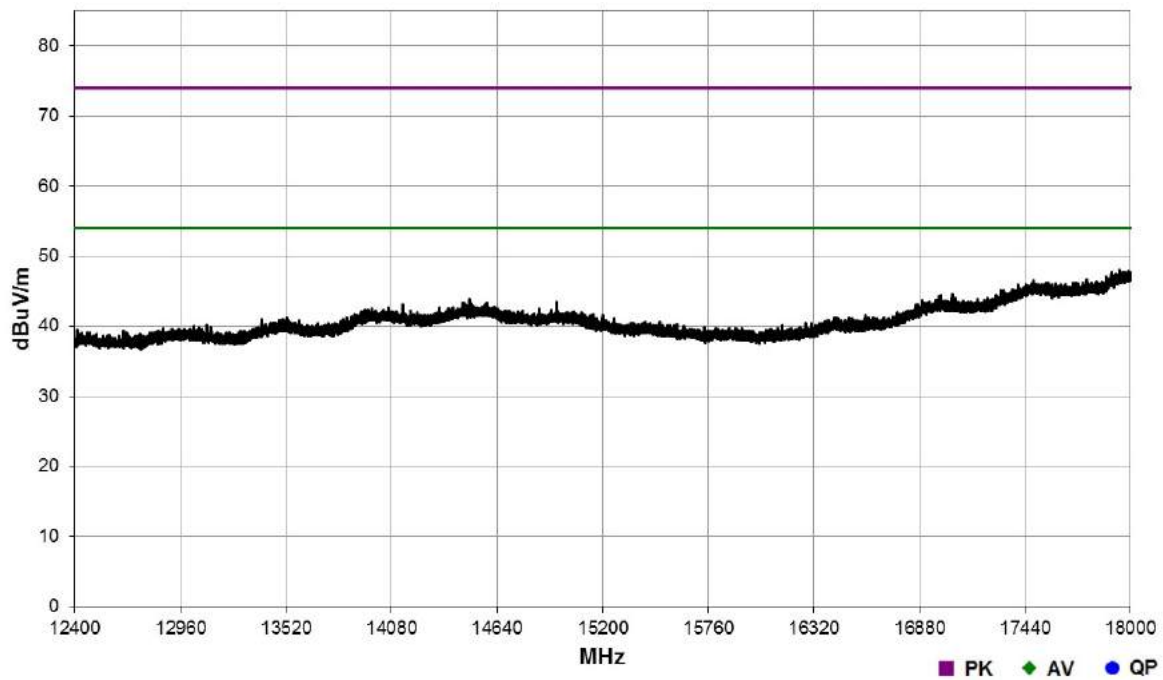




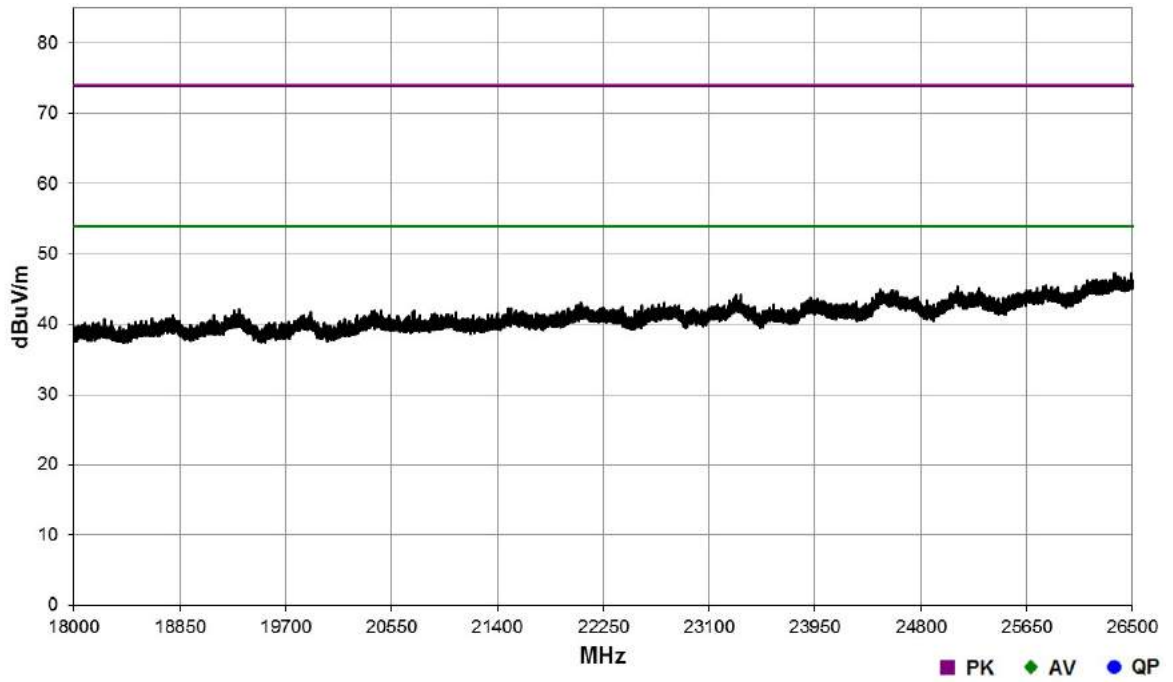
### 8.2 GHz to 12.4 GHz



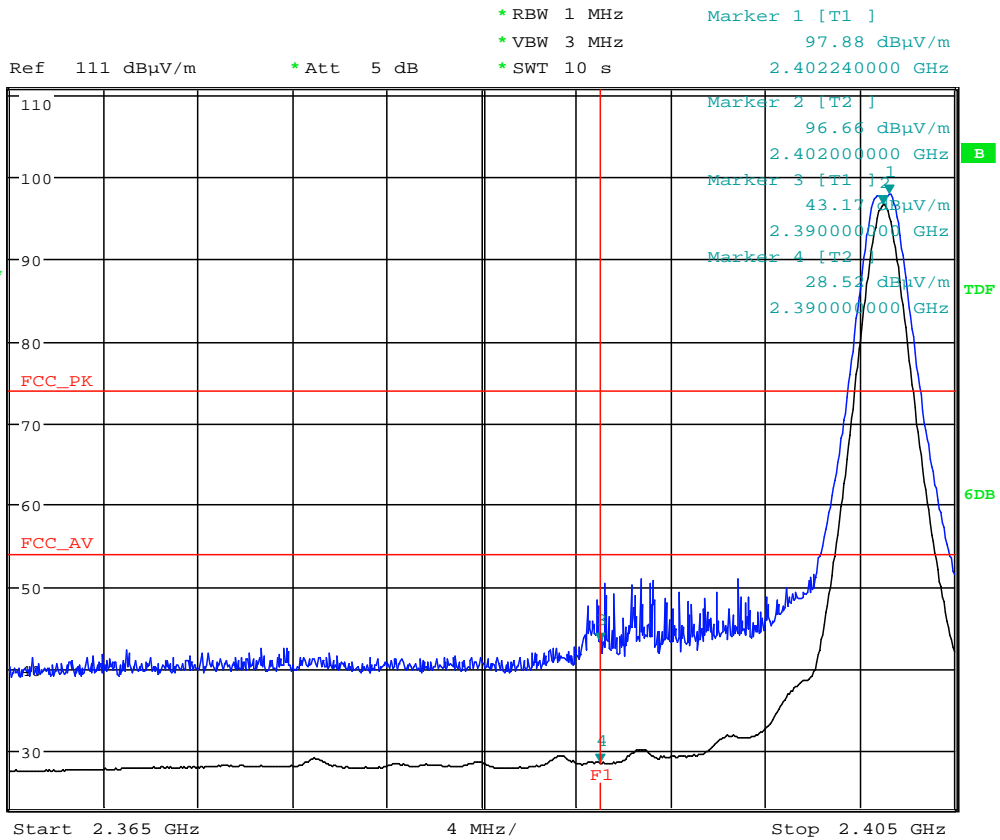
### 12.4 GHz to 18 GHz



18 GHz to 26.5 GHz



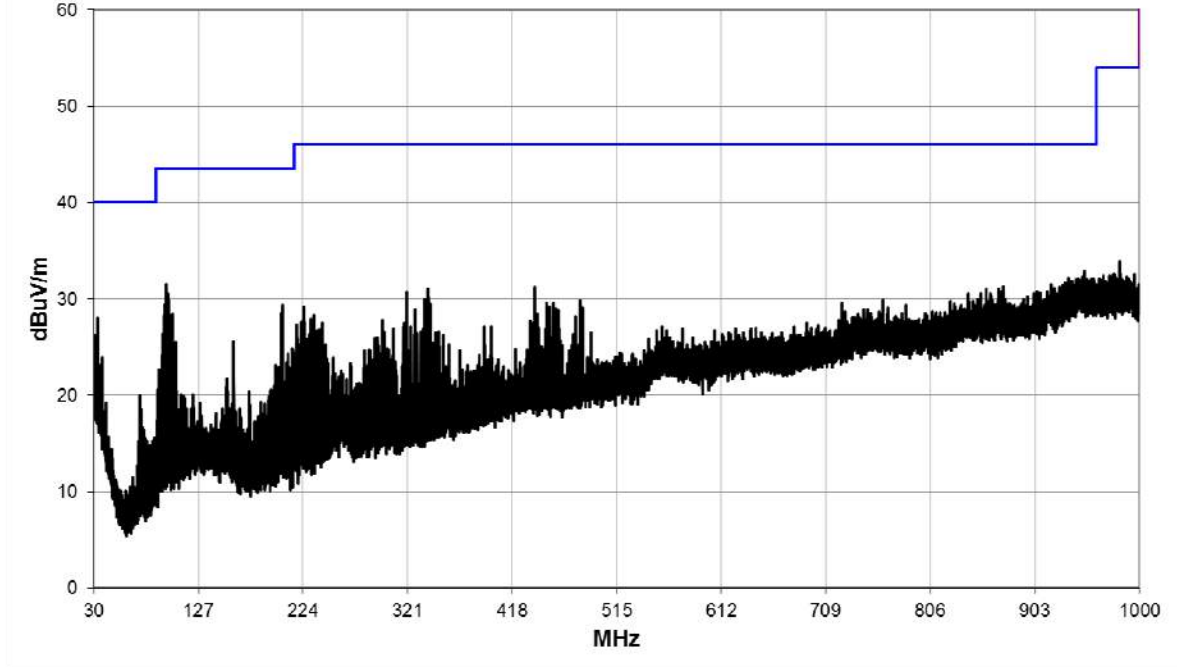
Band Edge



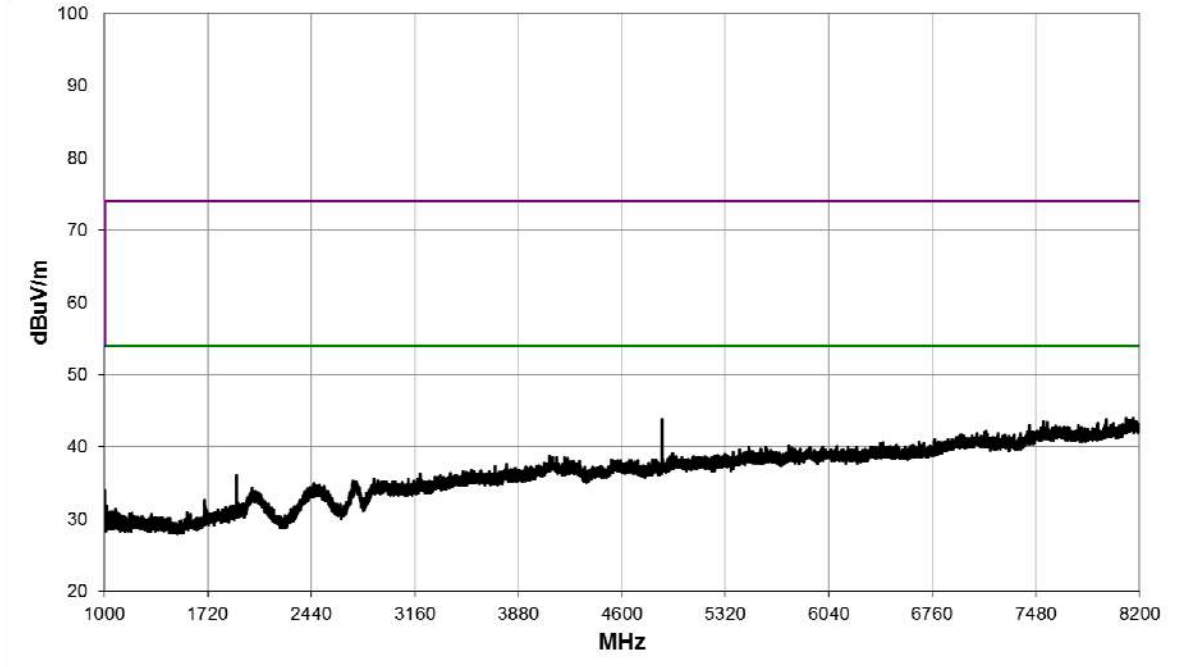
Date: 2.AUG.2018 08:10:15

Sample S26 CD05 SN: YR4-US-FBA0039A; Channel: 2440 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dB $\mu$ V)	Factor (dB)	Field Strength (dB $\mu$ V/m)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
There were no emissions within 10 dB of the limit.						

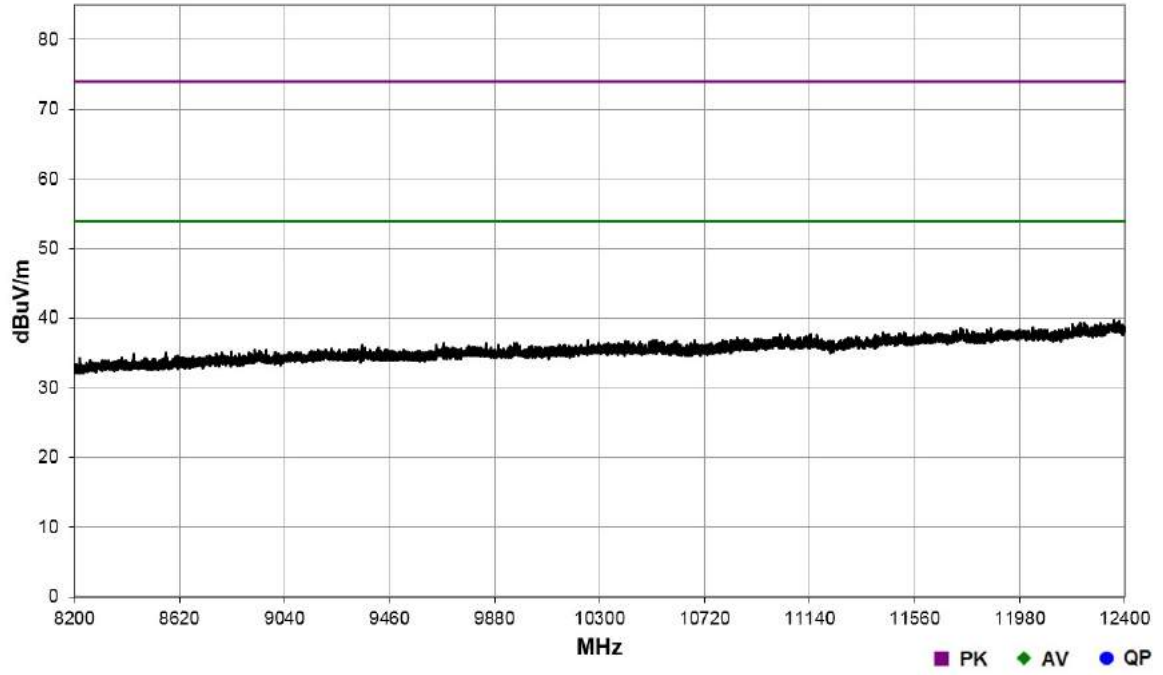
30 MHz to 1 GHz



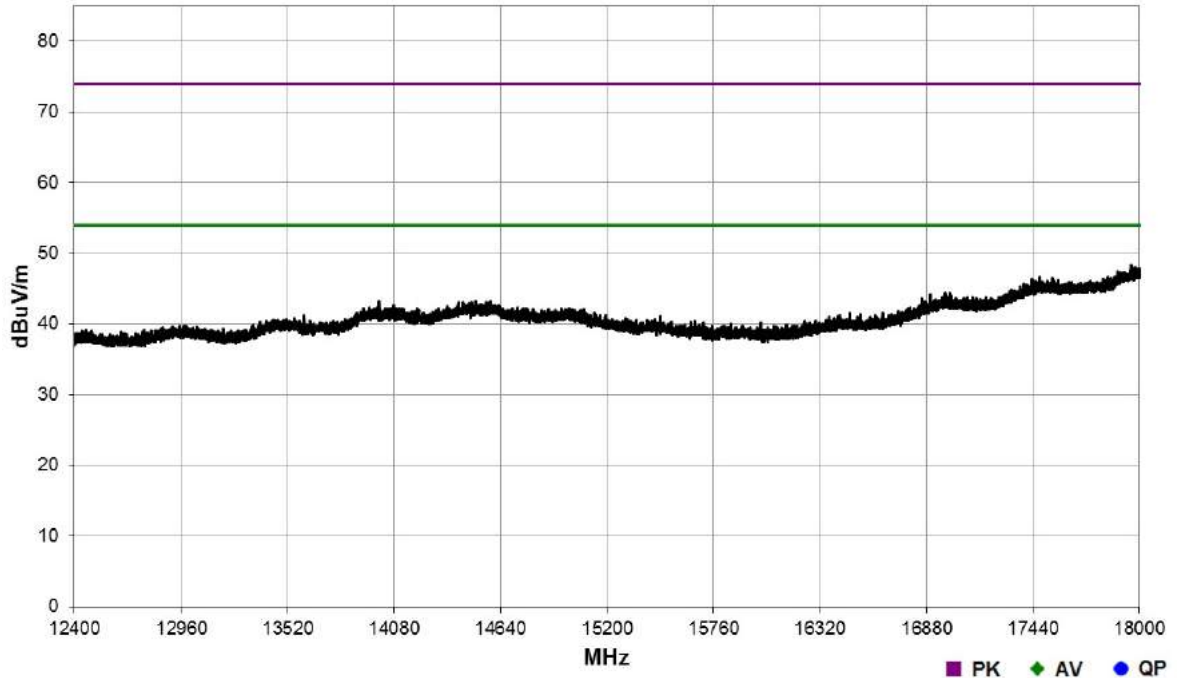
1 GHz to 8.2 GHz



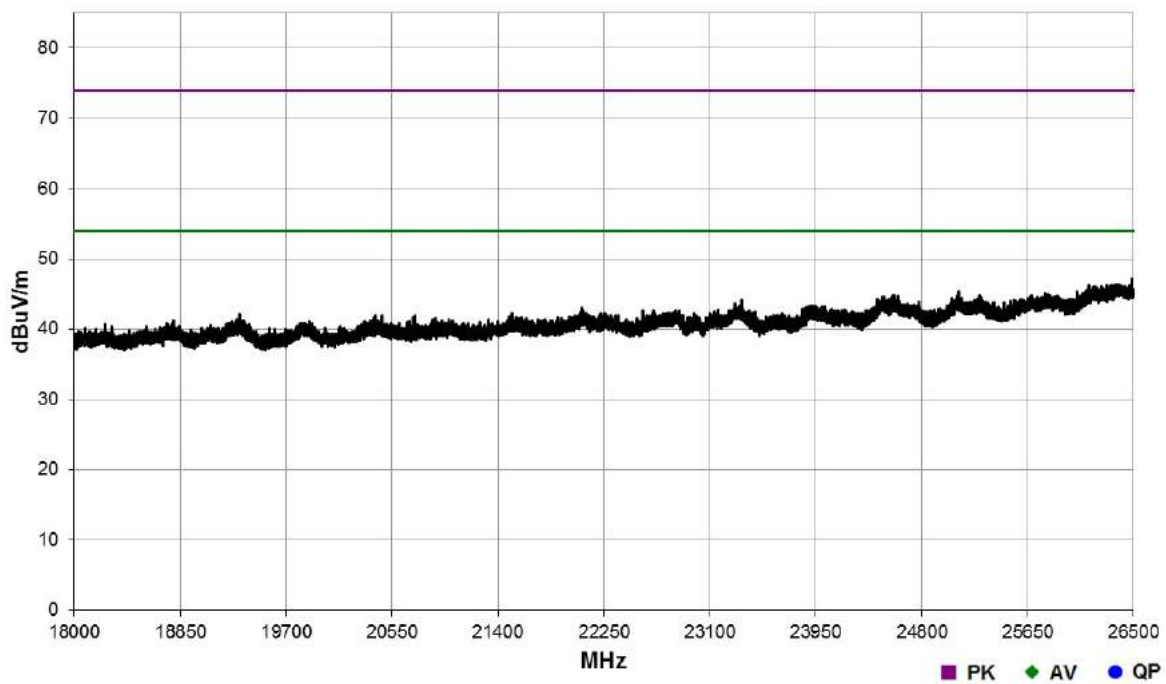
8.2 GHz to 12.4 GHz



12.4 GHz to 18 GHz

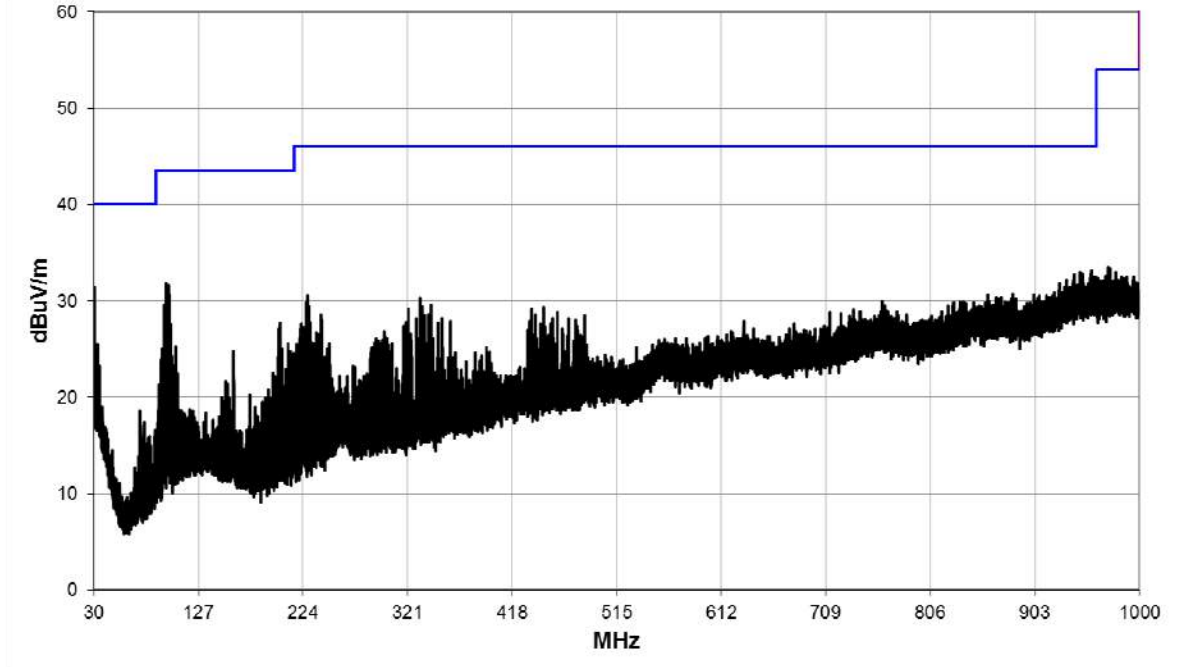


18 GHz to 26.5 GHz

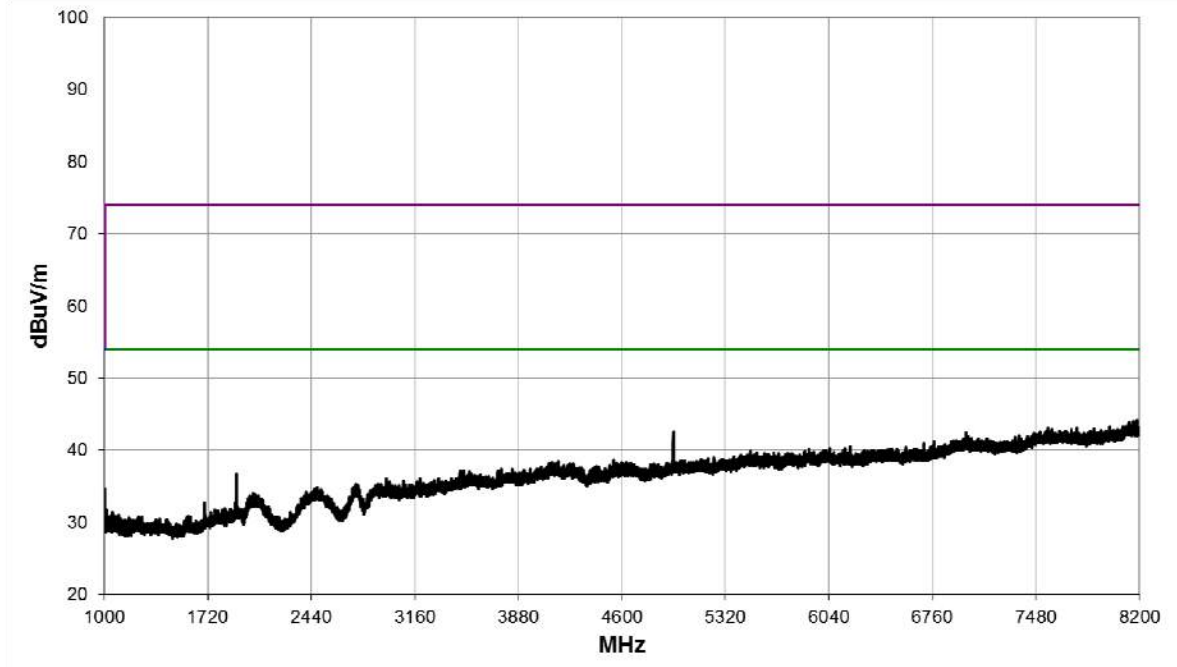


Sample S26 CD05 SN: YR4-US-FBA0039A; Channel: 2480 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dB $\mu$ V)	Factor (dB)	Field Strength (dB $\mu$ V/m)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
There were no emissions within 10 dB of the limit.						

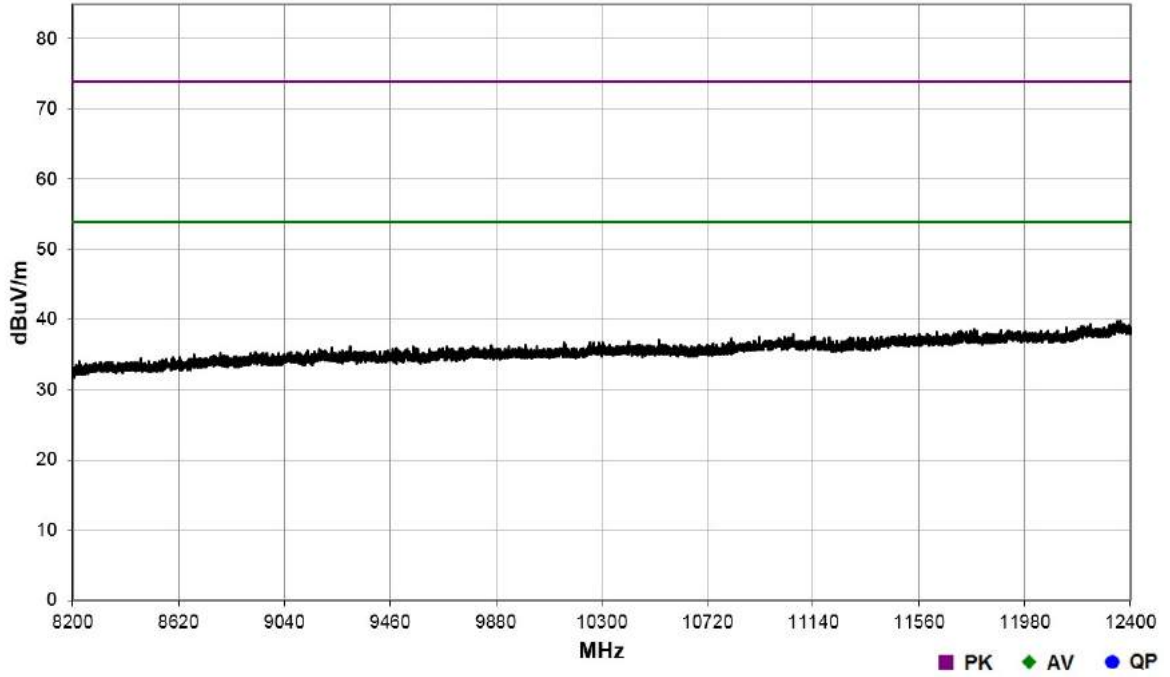
30 MHz to 1 GHz



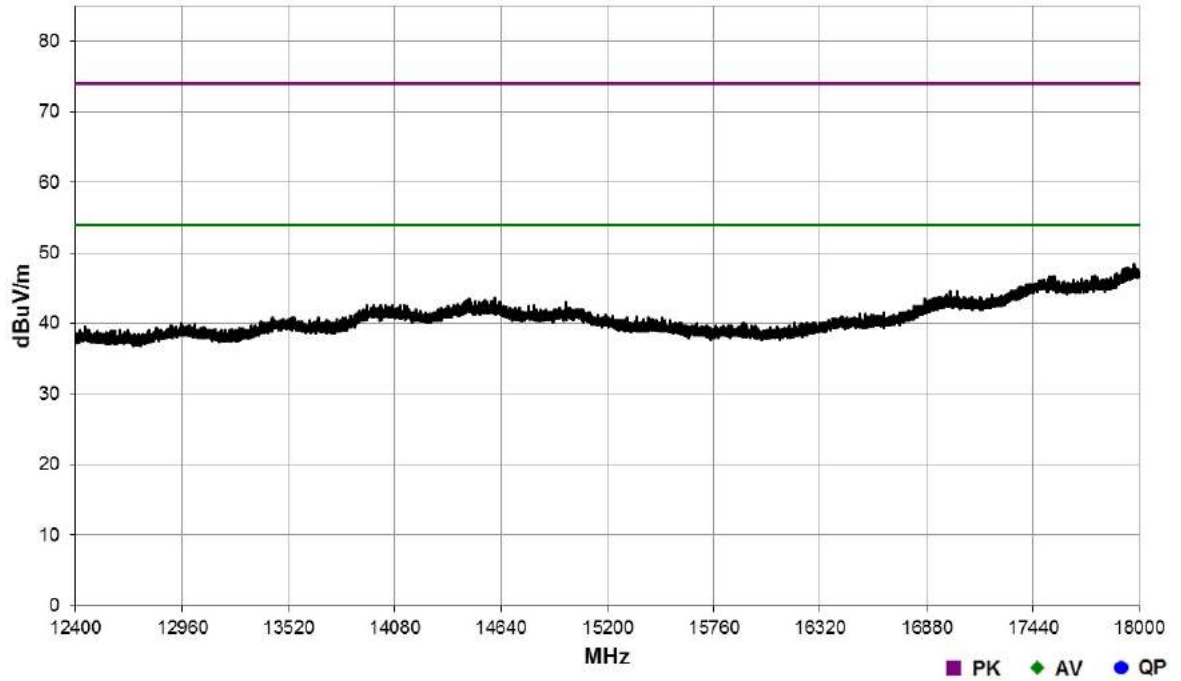
1 GHz to 8.2 GHz



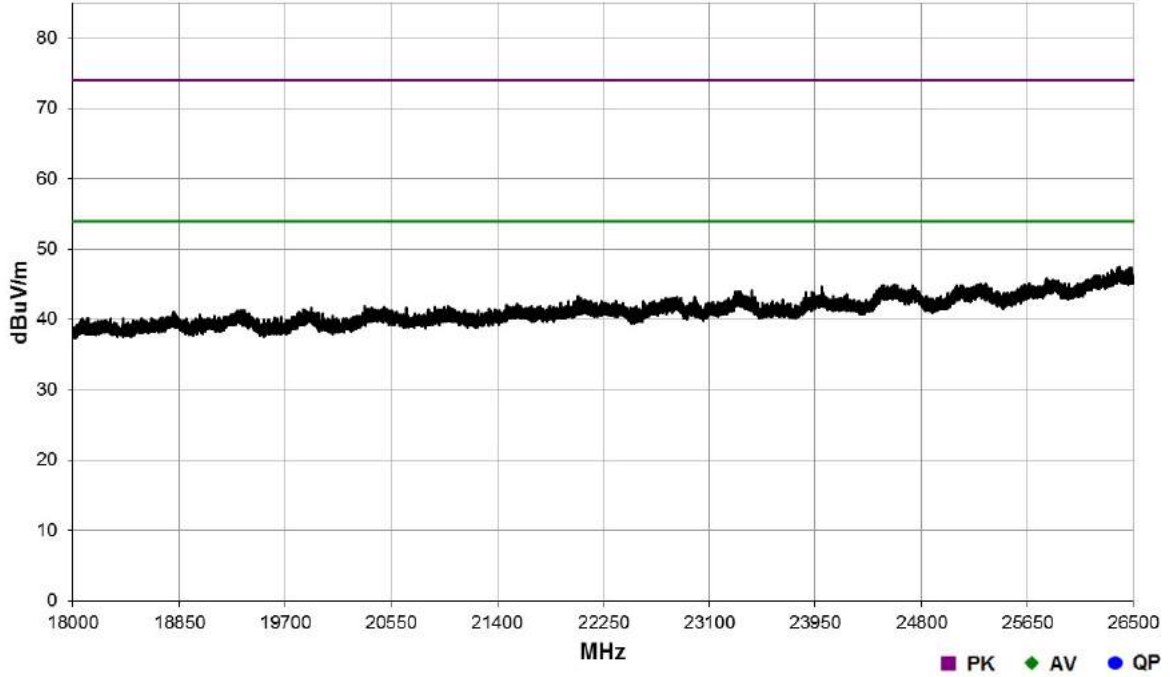
8.2 GHz to 12.4 GHz



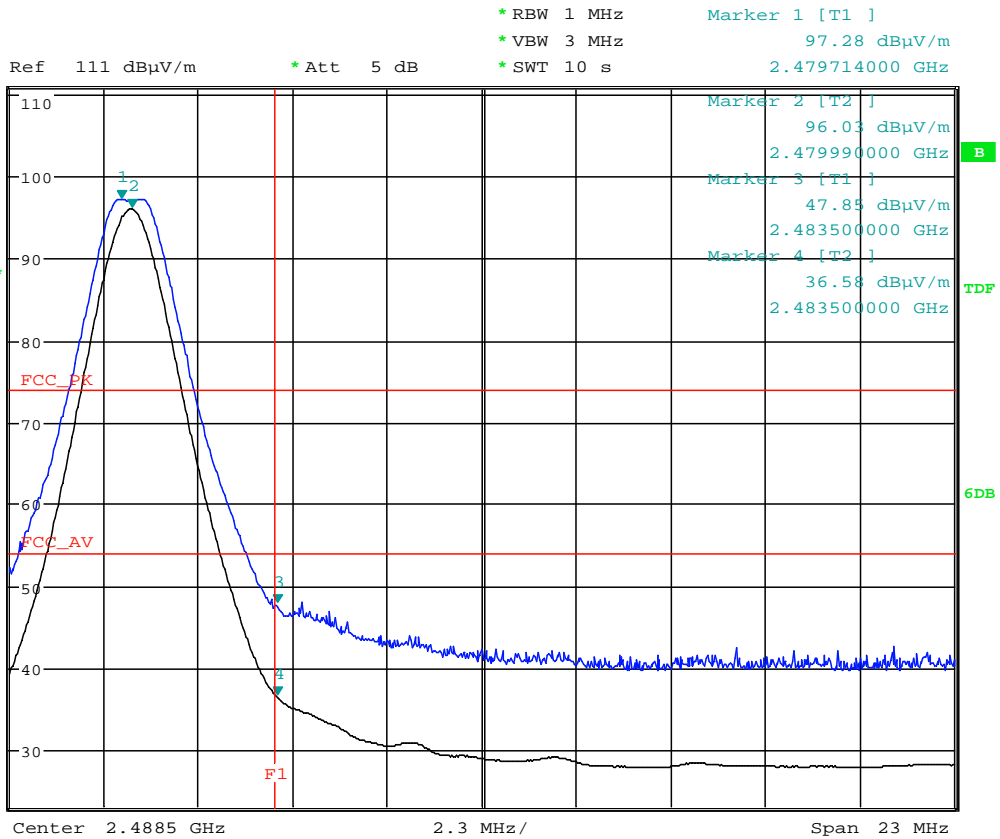
12.4 GHz to 18 GHz



18 GHz to 26.5 GHz



Band Edge

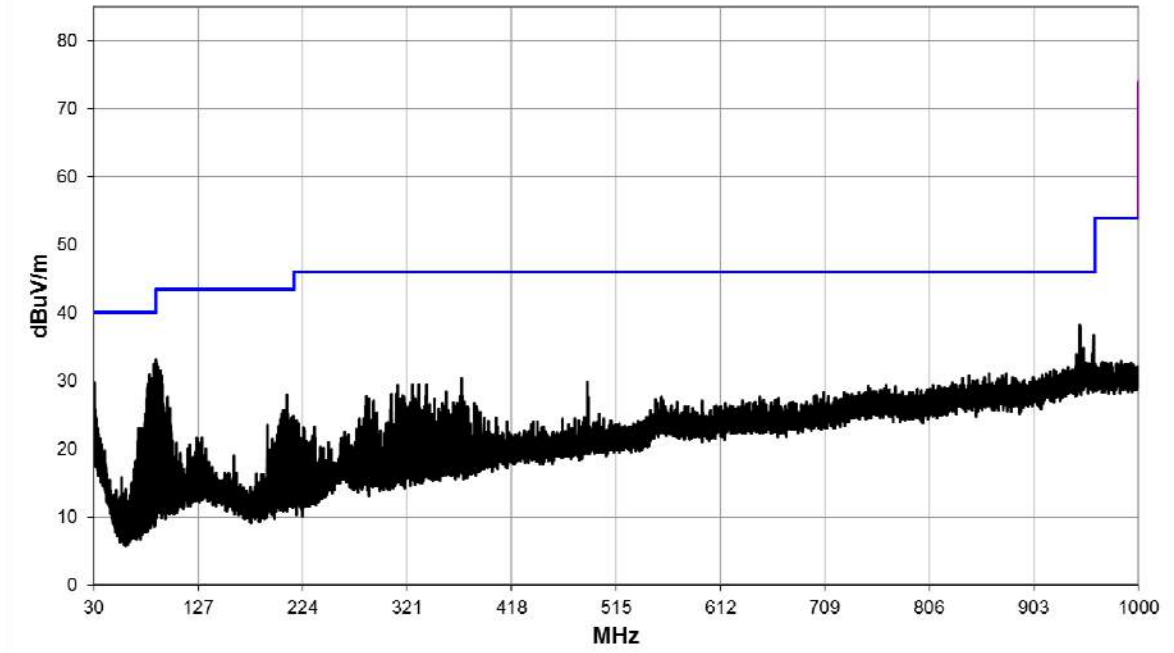


Date: 2.AUG.2018 08:42:48

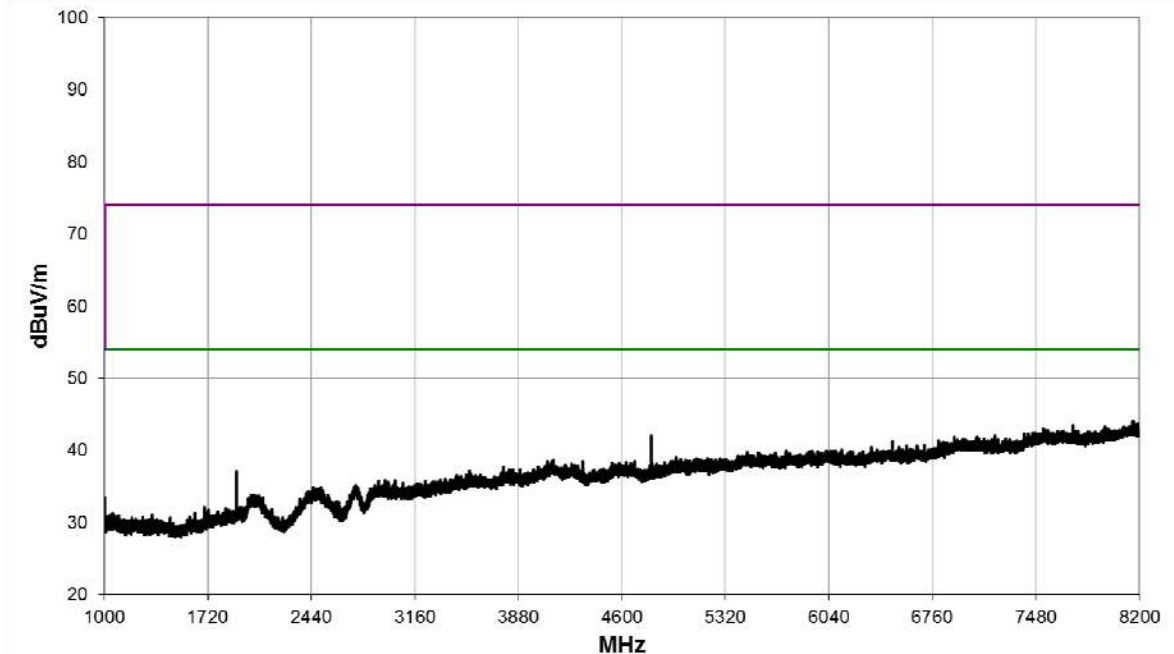


Sample S22 CF04 SN:YR5-US-FBA0037A; Channel: 2402 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dB $\mu$ V)	Factor (dB)	Field Strength (dB $\mu$ V/m)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
There were no emissions within 10 dB of the limit.						

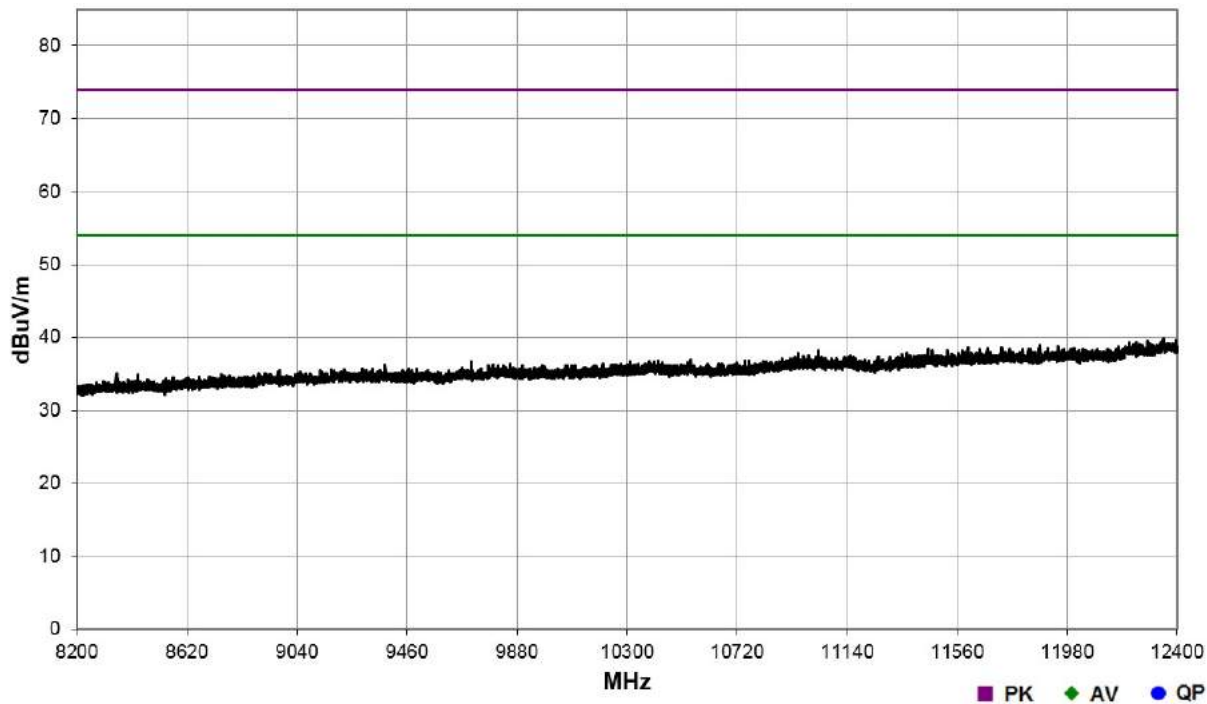
30 MHz to 1 GHz



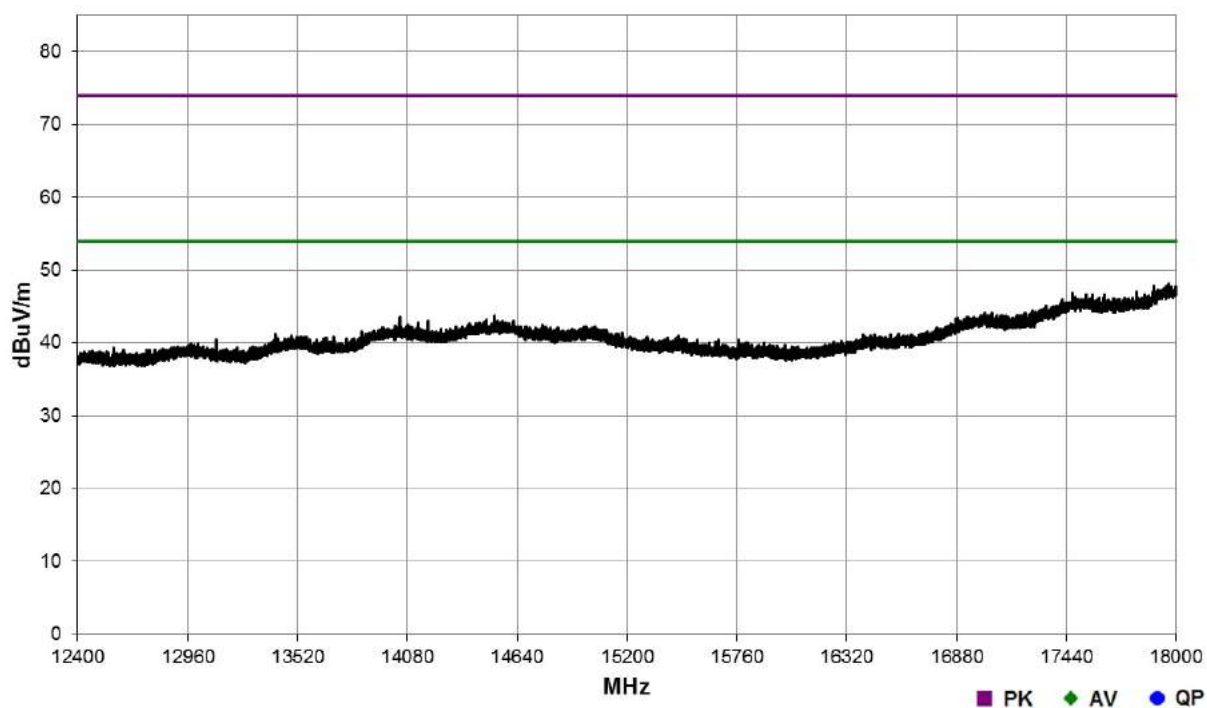
1 GHz to 8.2 GHz



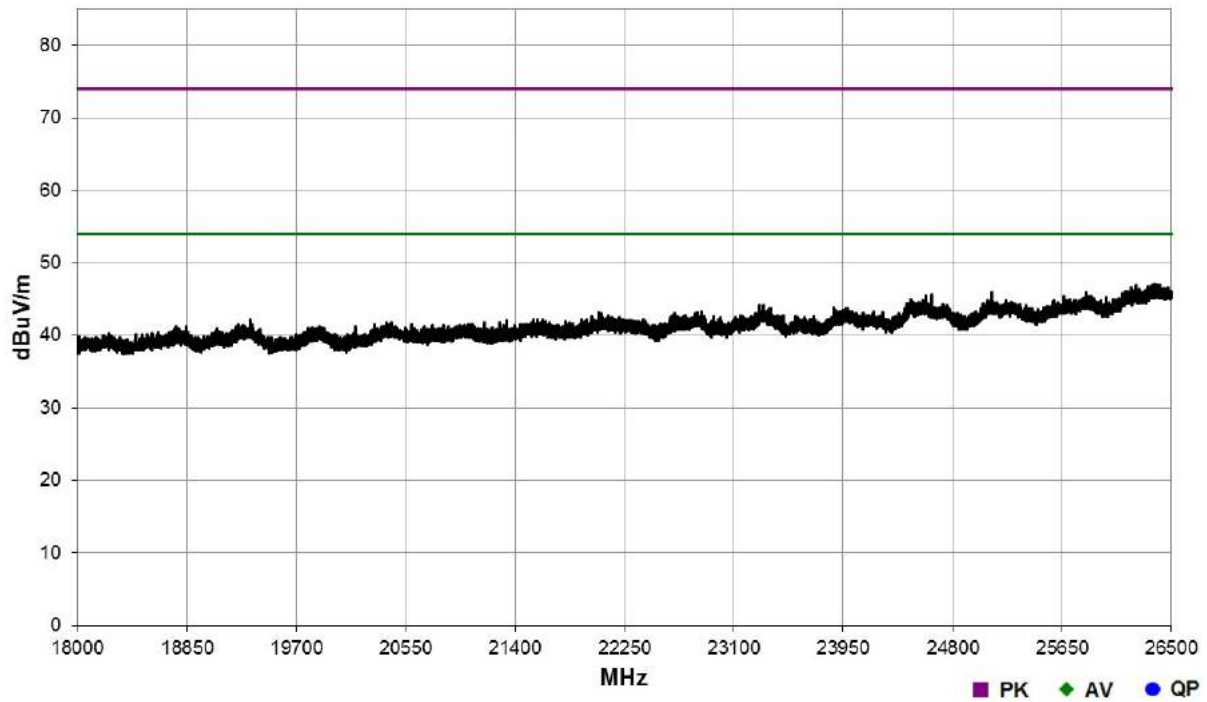
### 8.2 GHz to 12.4 GHz



### 12.4 GHz to 18 GHz

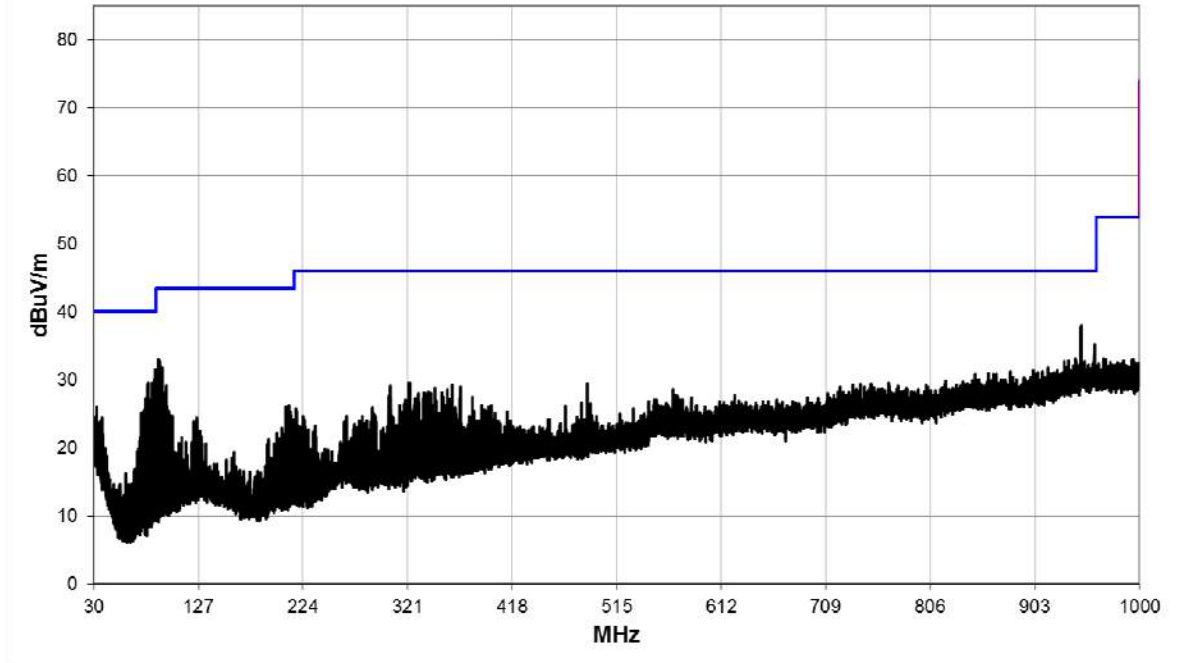


18 GHz to 26.5 GHz

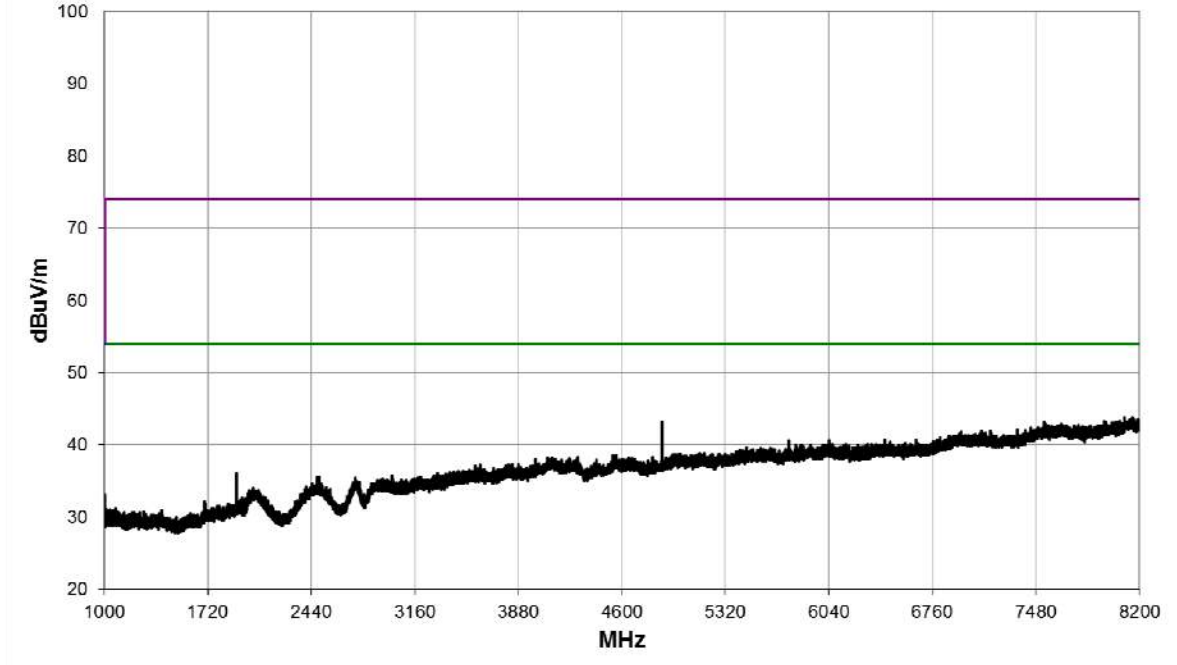


Sample S22 CF04 SN:YR5-US-FBA0037A; Channel: 2440 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dBμV)	Factor (dB)	Field Strength (dBμV/m)	Field Strength (μV/m)	Limit (μV/m)
There were no emissions within 10 dB of the limit.						

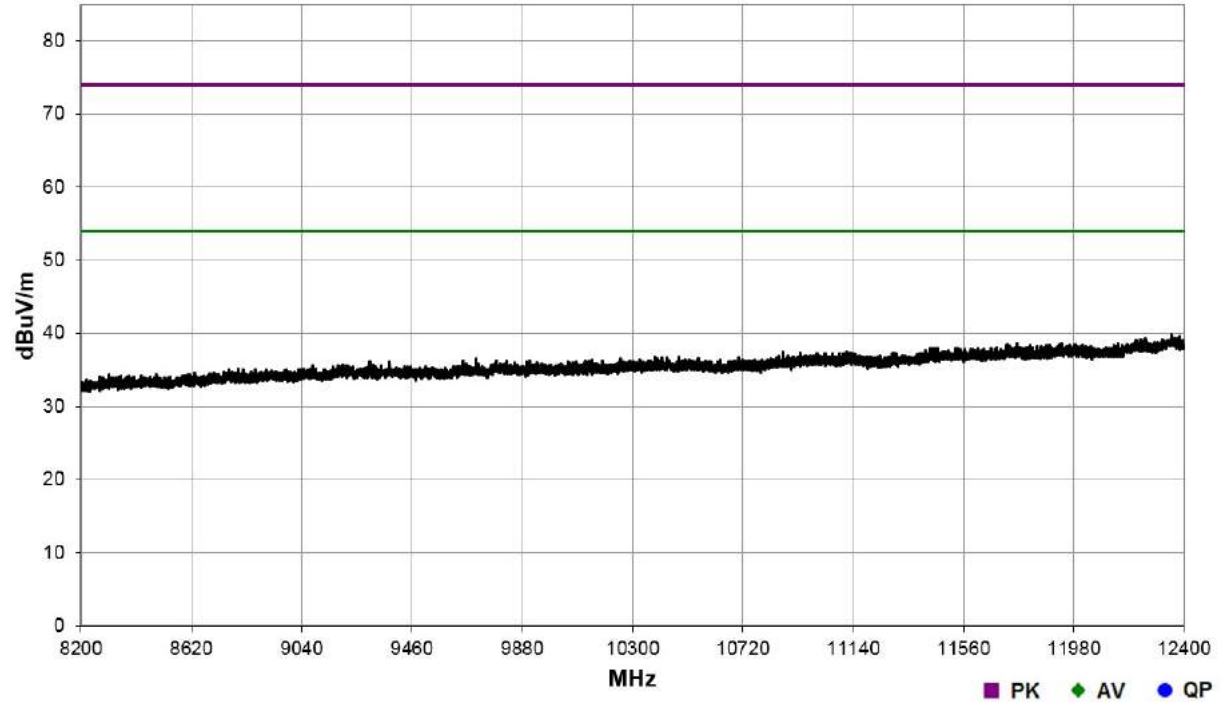
30 MHz to 1 GHz



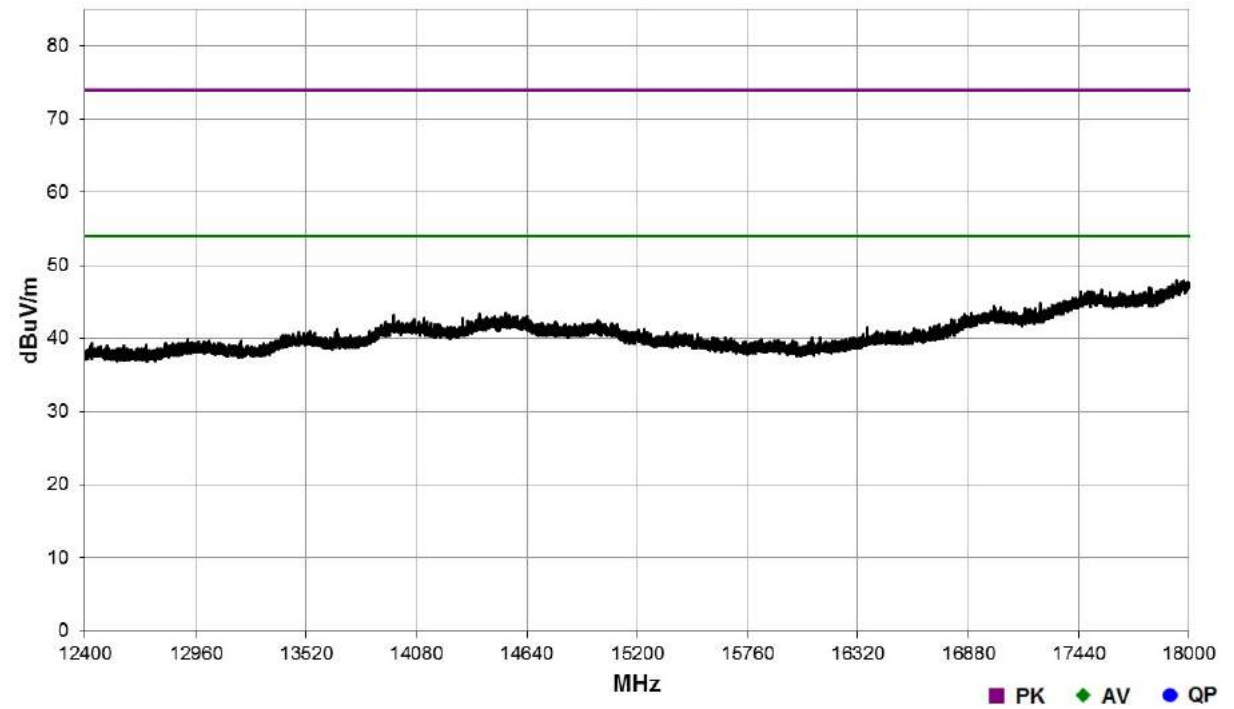
1 GHz to 8.2 GHz



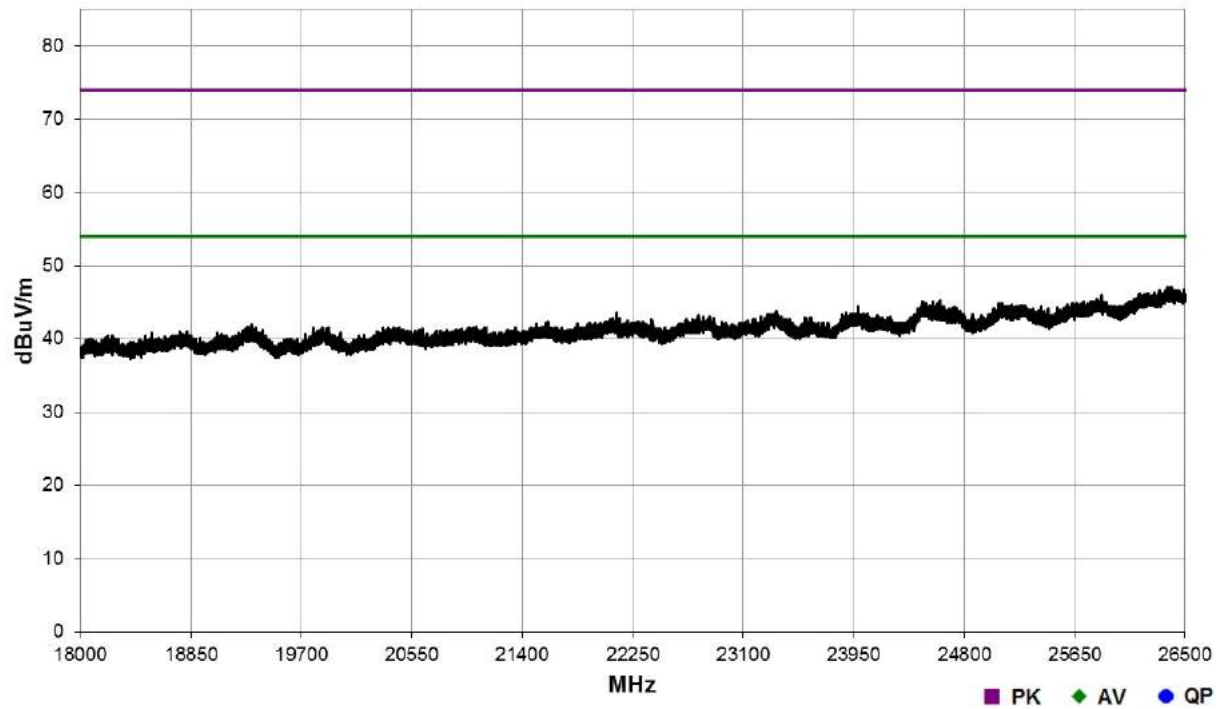
8.2 GHz to 12.4 GHz



12.4 GHz to 18 GHz

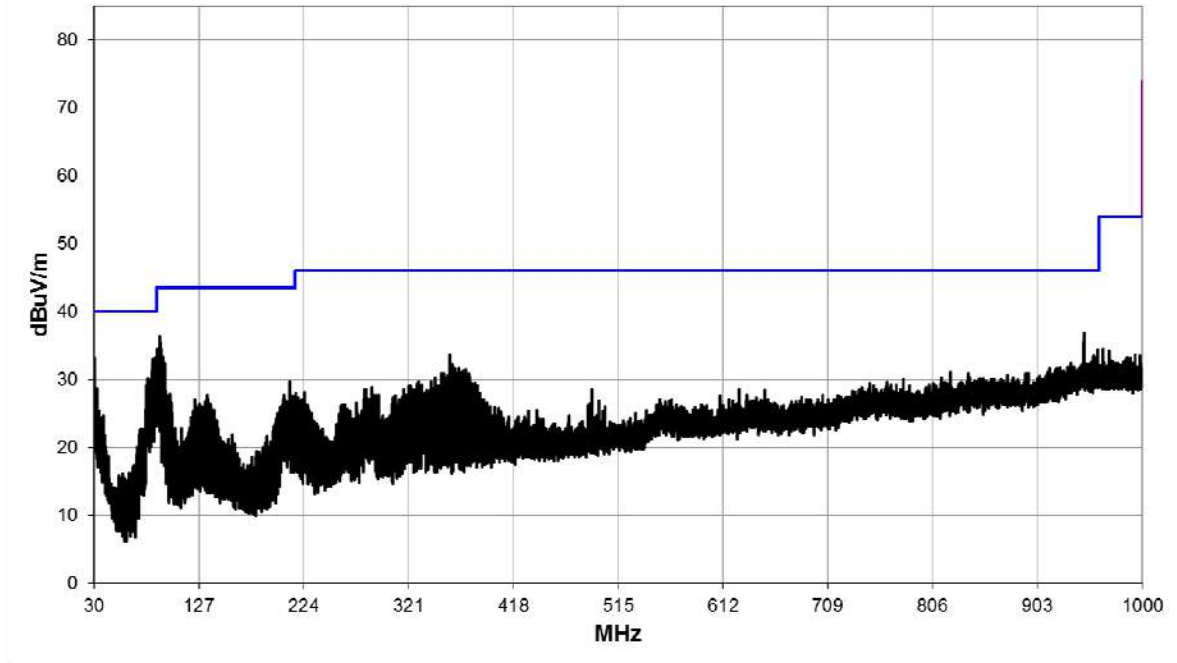


18 GHz to 26.5 GHz

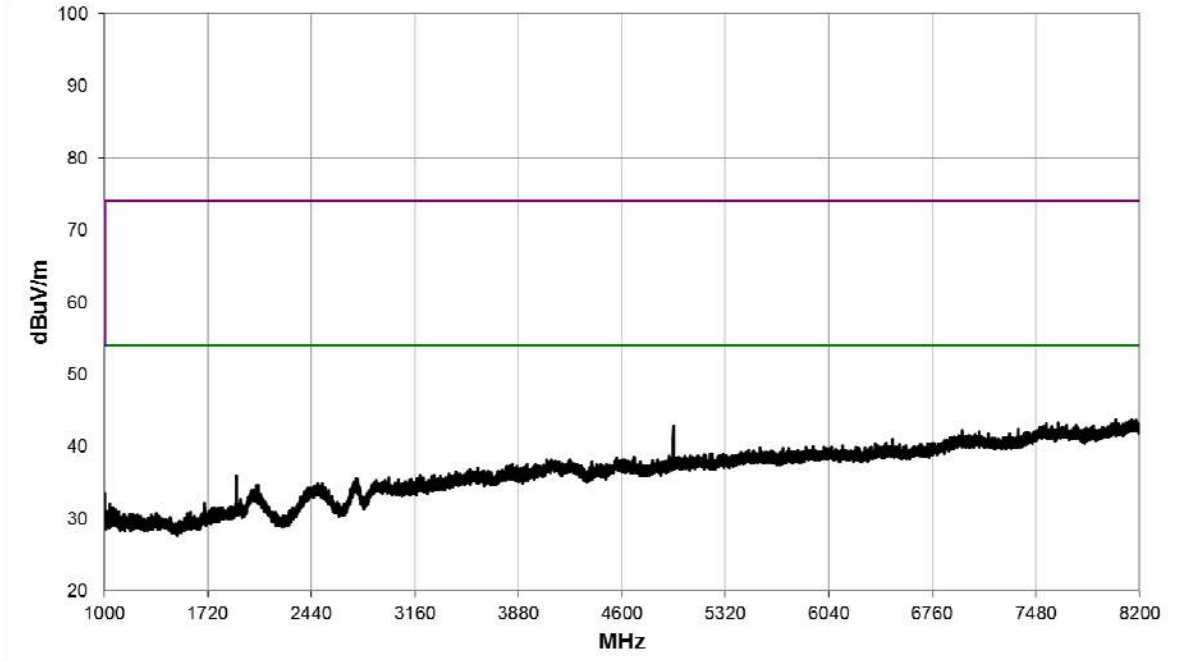


Sample S22 CF04 SN:YR5-US-FBA0037A; Channel: 2480 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dB $\mu$ V)	Factor (dB)	Field Strength (dB $\mu$ V/m)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
There were no emissions within 10 dB of the limit.						

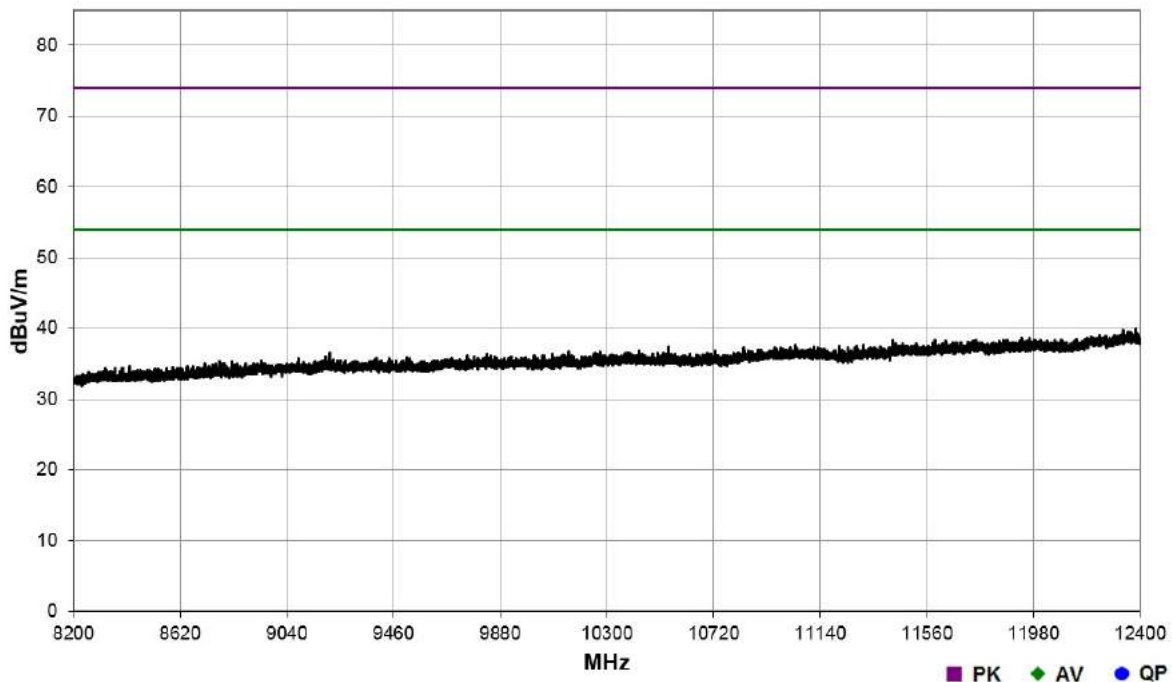
30 MHz to 1 GHz



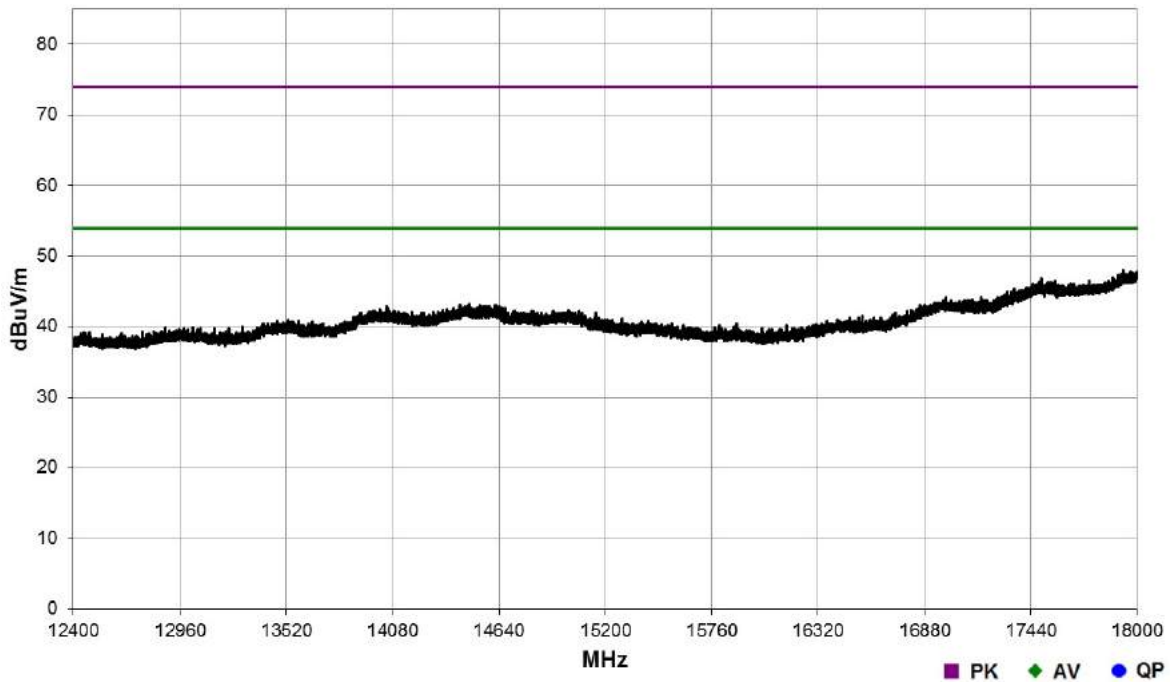
1 GHz to 8.2 GHz



8.2 GHz to 12.4 GHz

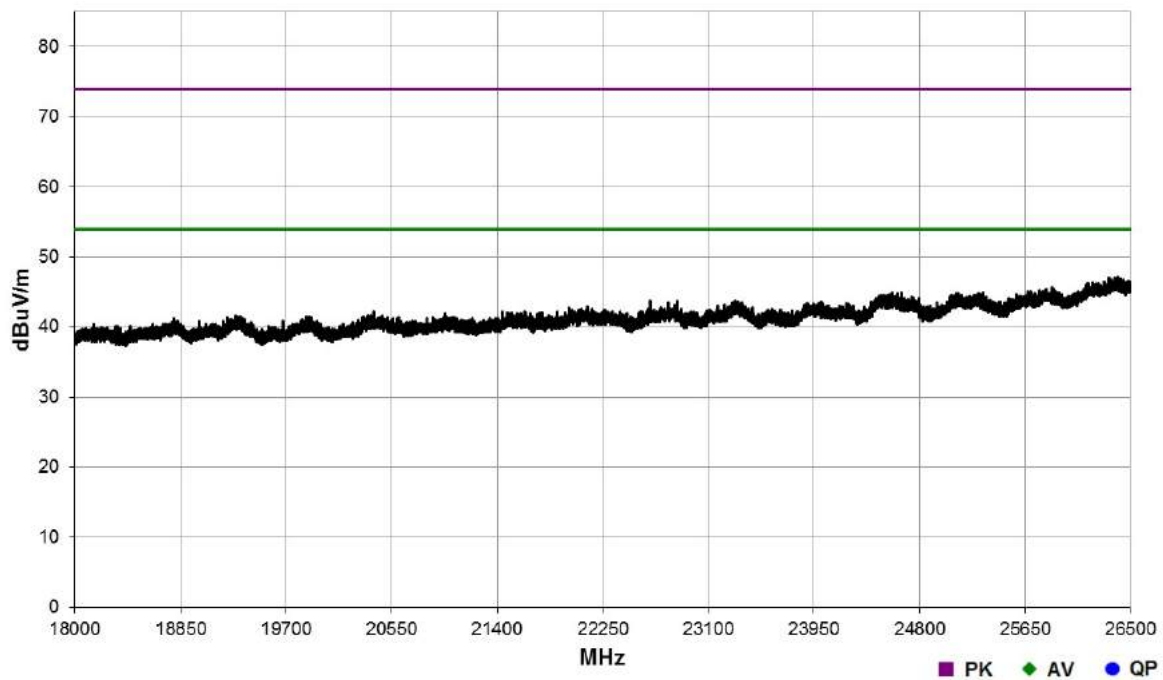


12.4 GHz to 18 GHz



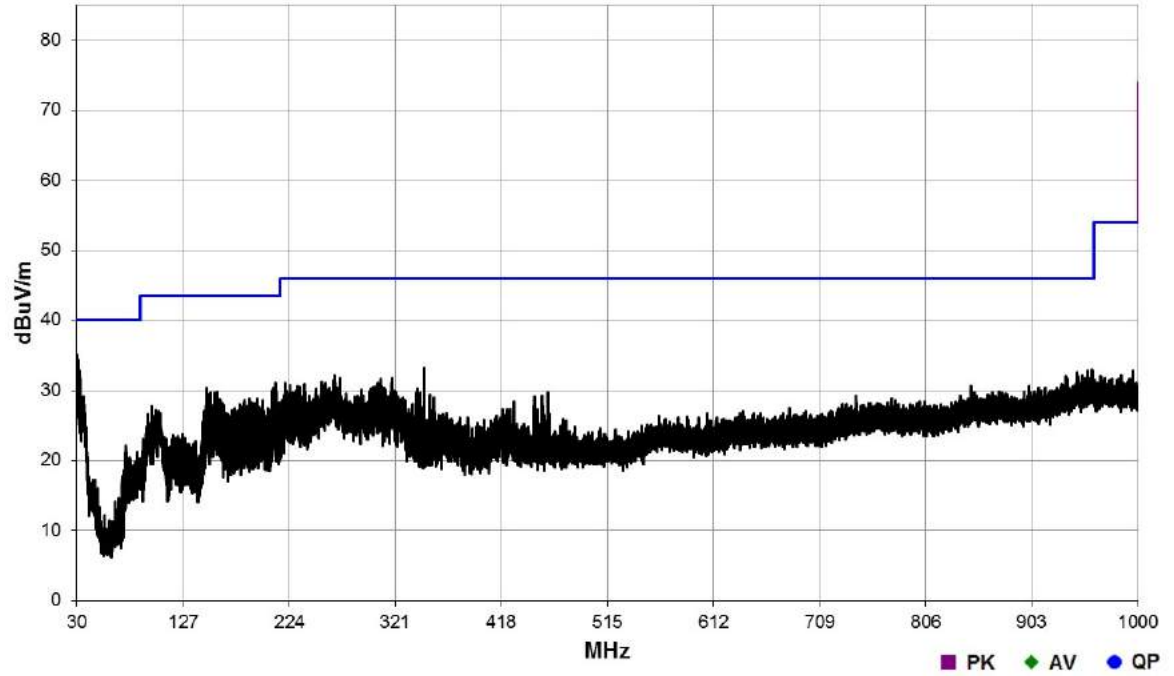


18 GHz to 26.5 GHz

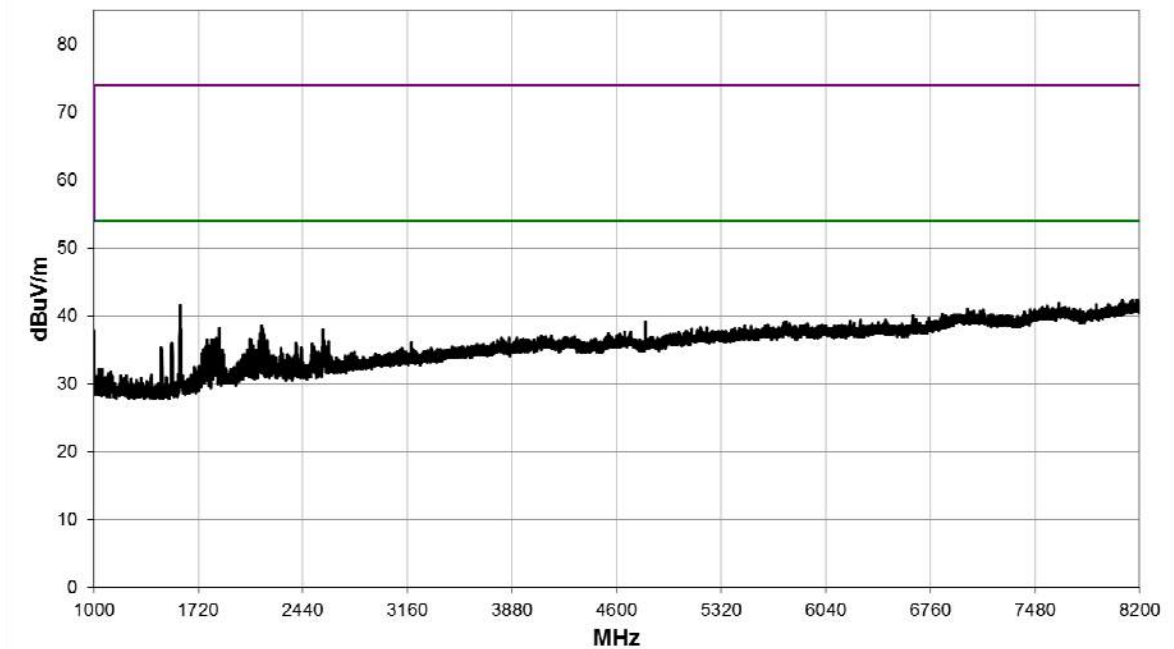


Sample S24 CD04 SN:YU2-JP-FBA0057A; Channel: 2402 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dB $\mu$ V)	Factor (dB)	Field Strength (dB $\mu$ V/m)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
There were no emissions within 10 dB of the limit.						

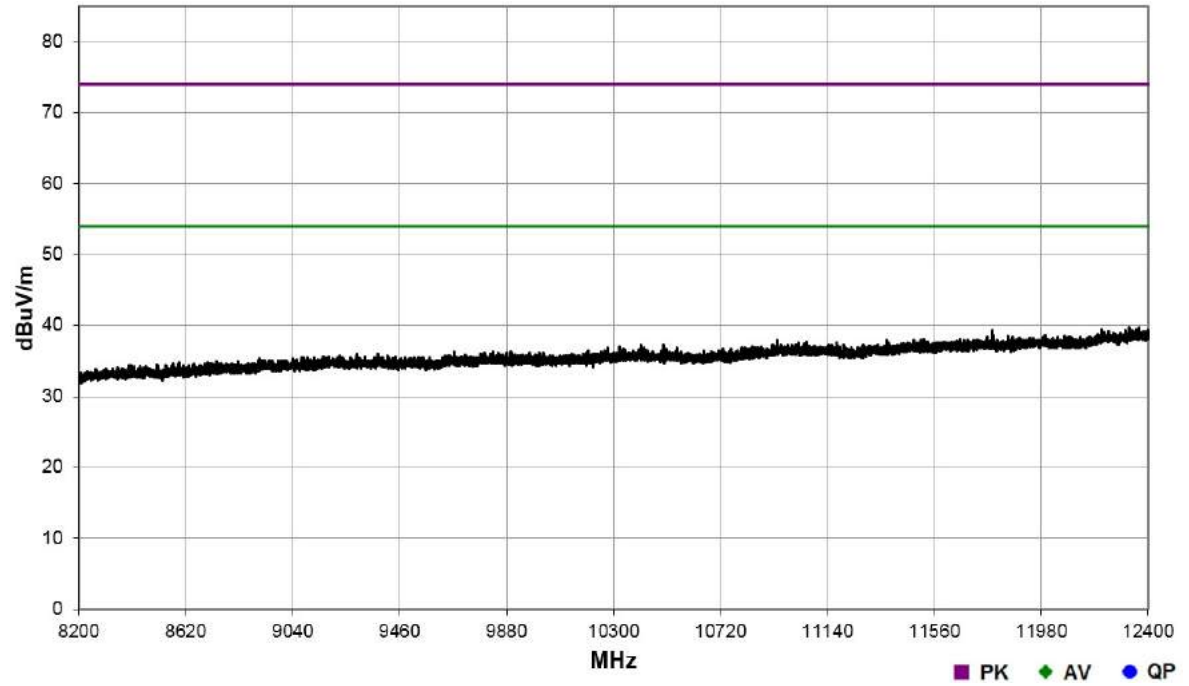
30 MHz to 1 GHz



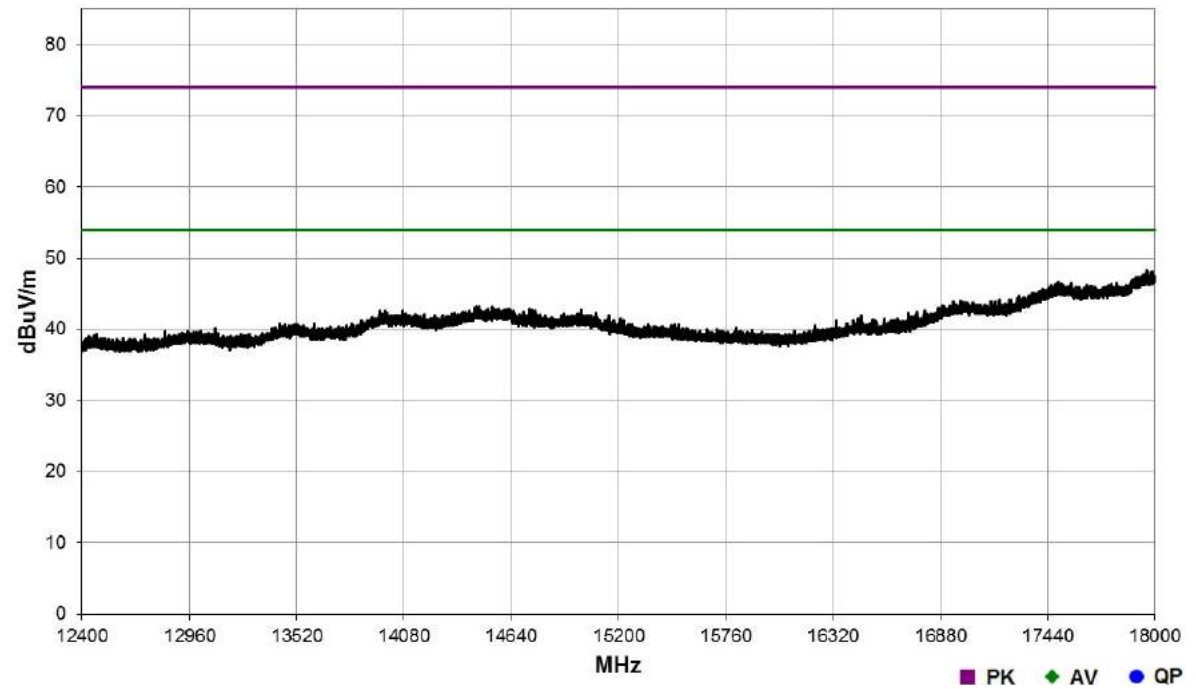
1 GHz to 8.2 GHz



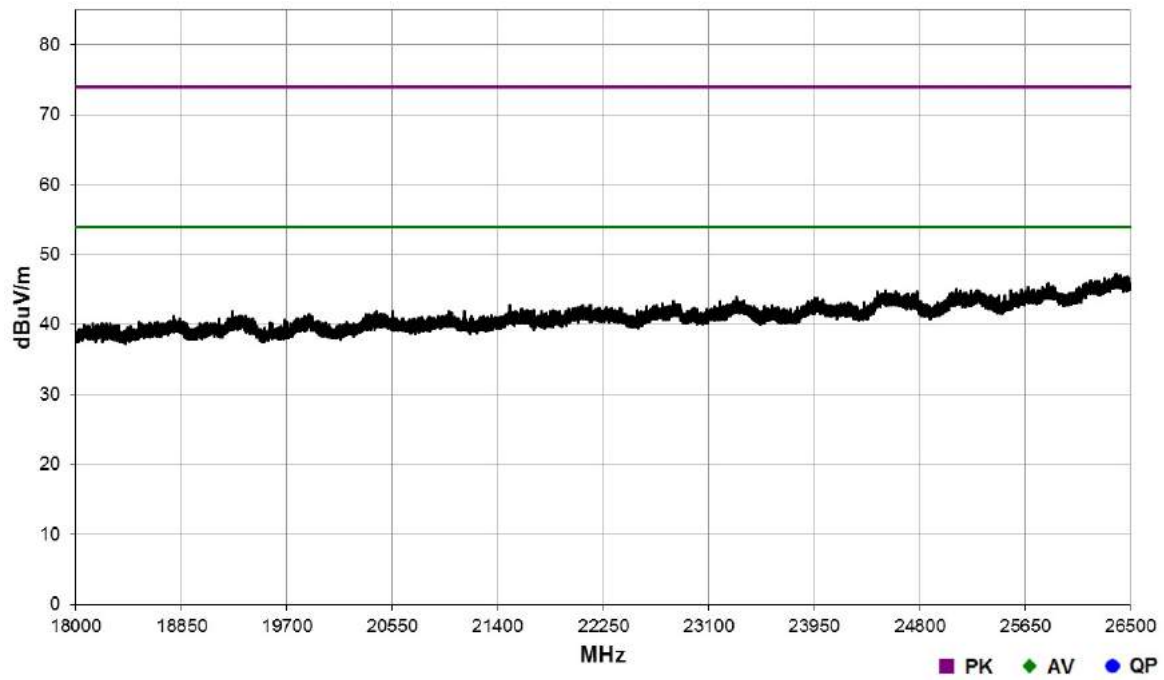
### 8.2 GHz to 12.4 GHz



### 12.4 GHz to 18 GHz

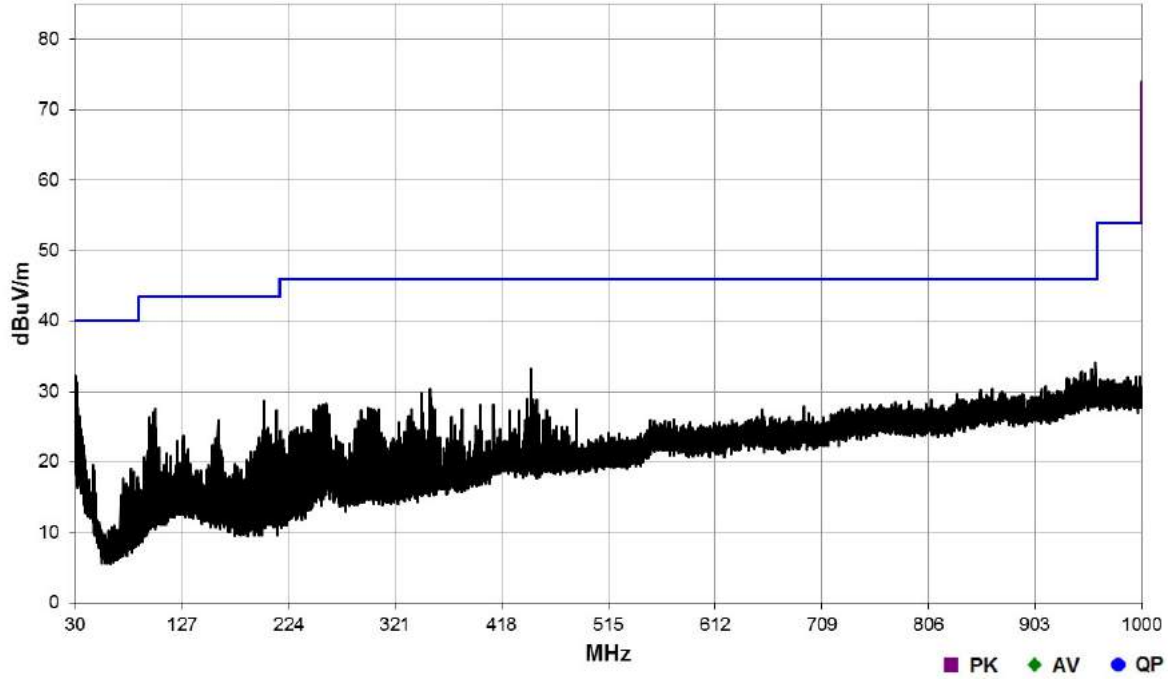


18 GHz to 26.5 GHz

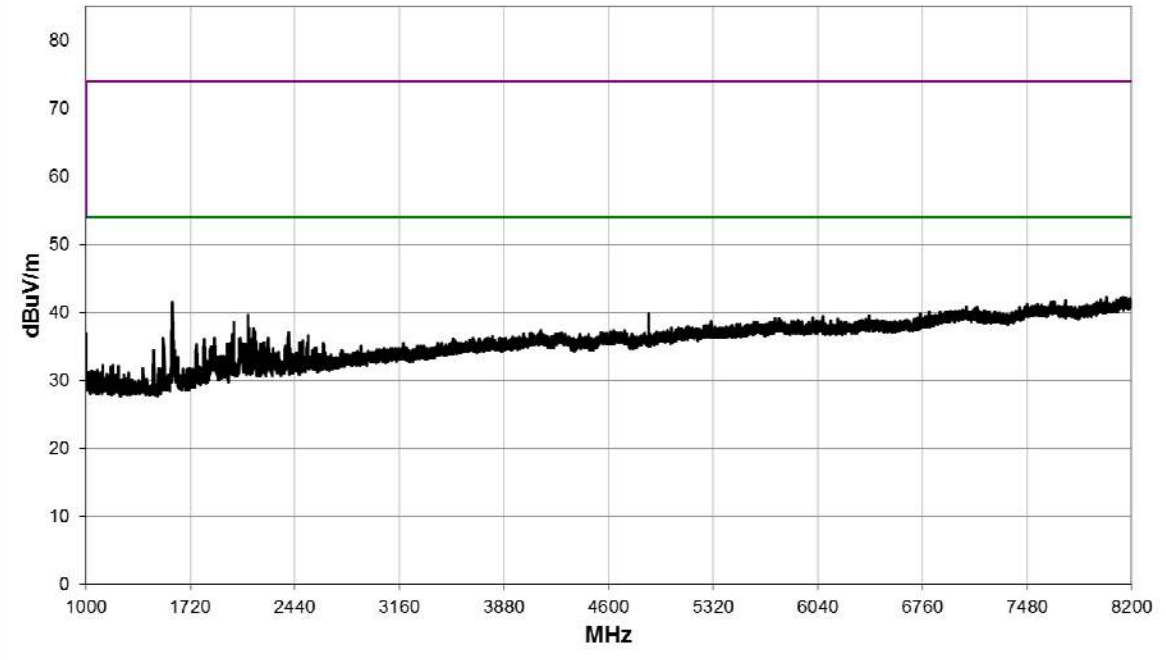


Sample S24 CD04 SN:YU2-JP-FBA0057A; Channel: 2440 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dBμV)	Factor (dB)	Field Strength (dBμV/m)	Field Strength (μV/m)	Limit (μV/m)
There were no emissions within 10 dB of the limit.						

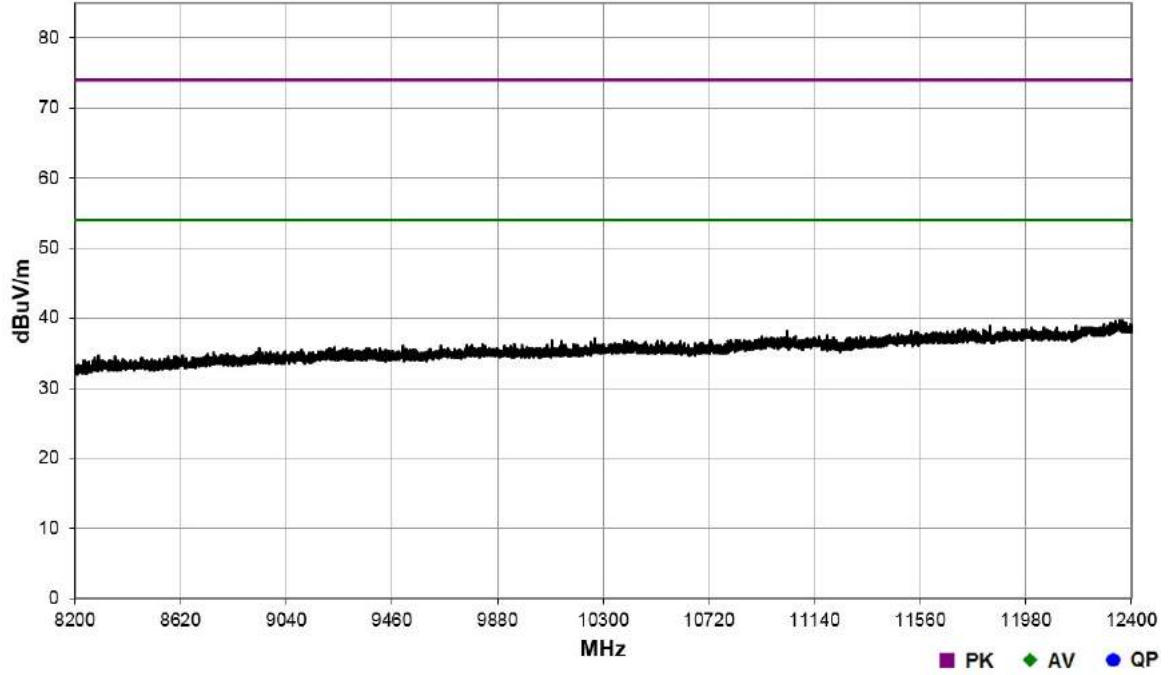
30 MHz to 1 GHz



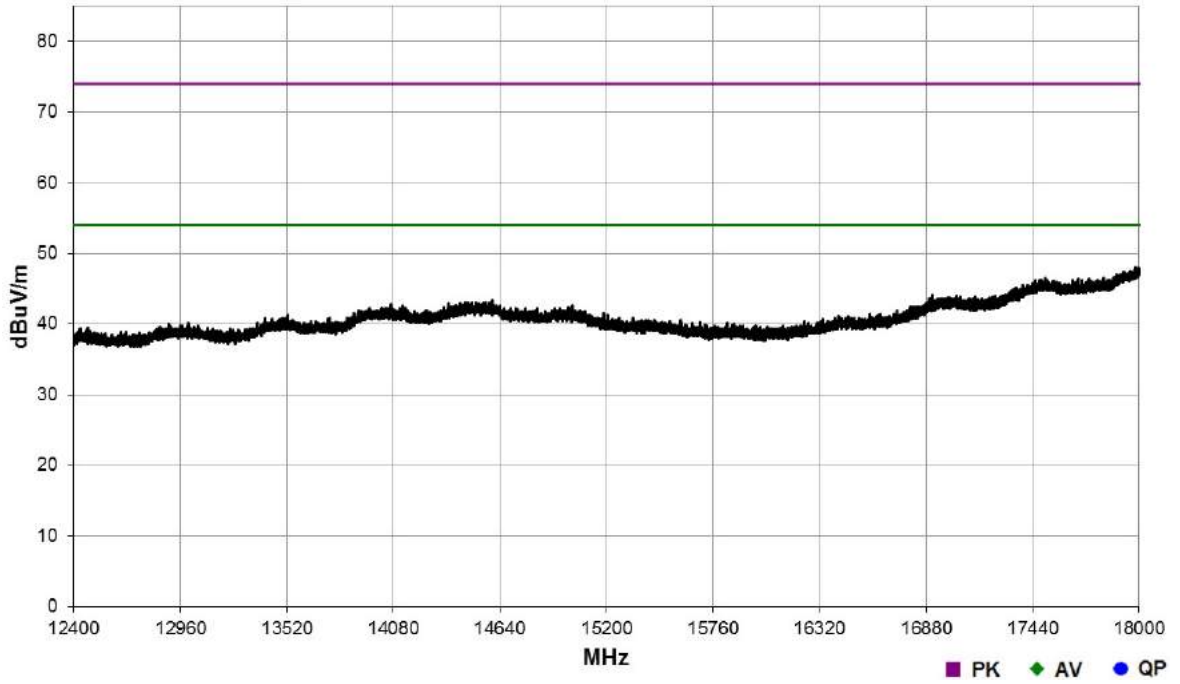
1 GHz to 8.2 GHz



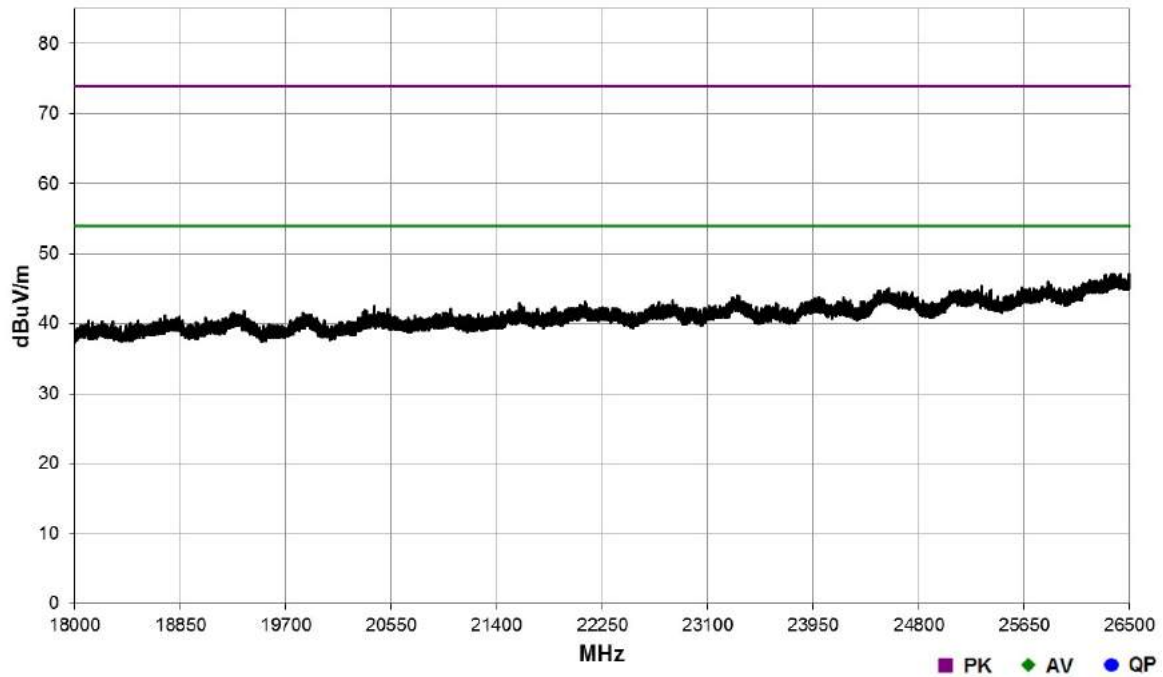
8.2 GHz to 12.4 GHz



12.4 GHz to 18 GHz

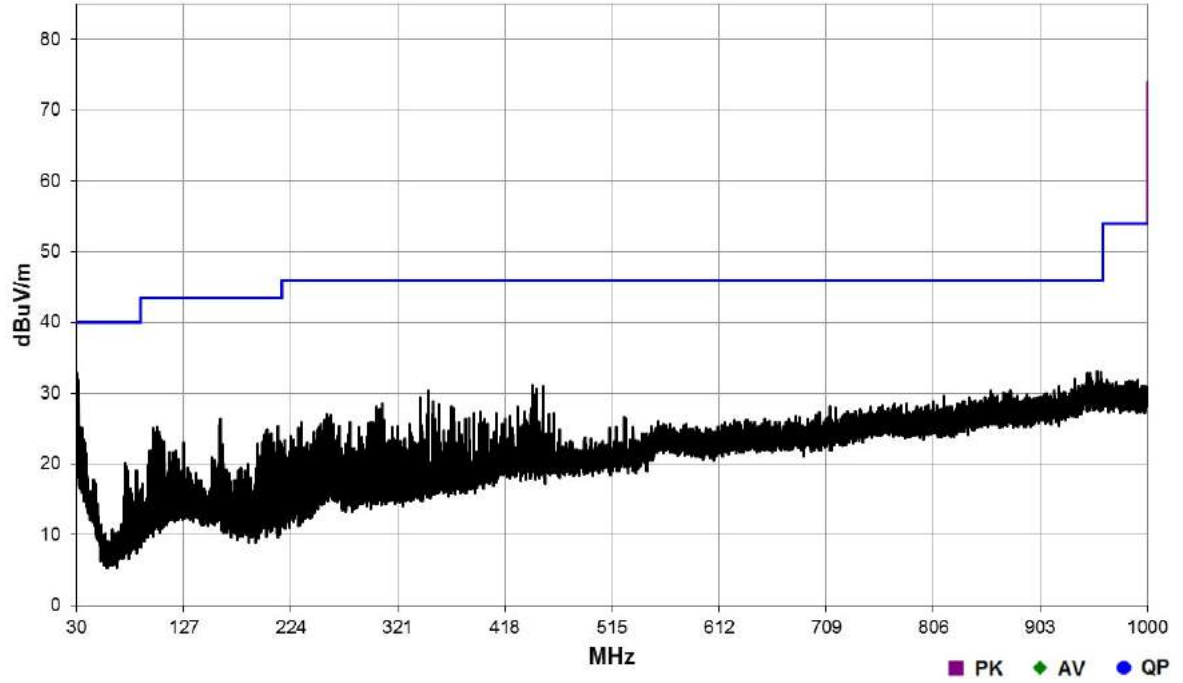


18 GHz to 26.5 GHz

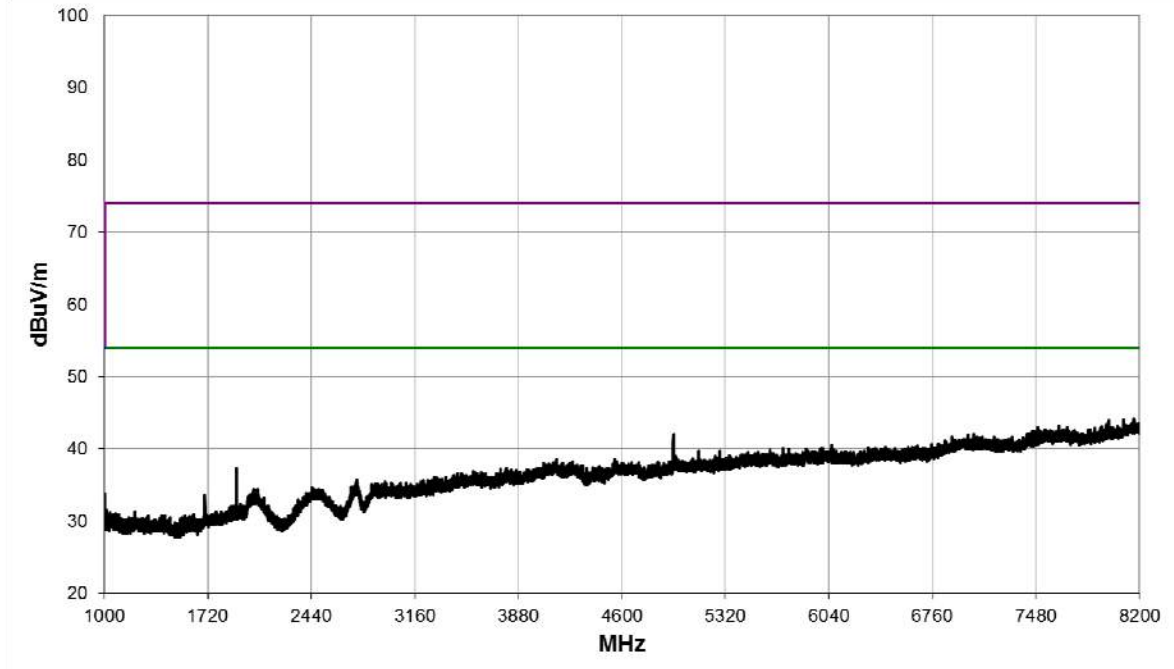


Sample S24 CD04 SN:YU2-JP-FBA0057A; Channel: 2480 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dBμV)	Factor (dB)	Field Strength (dBμV/m)	Field Strength (μV/m)	Limit (μV/m)
There were no emissions within 10 dB of the limit.						

30 MHz to 1 GHz

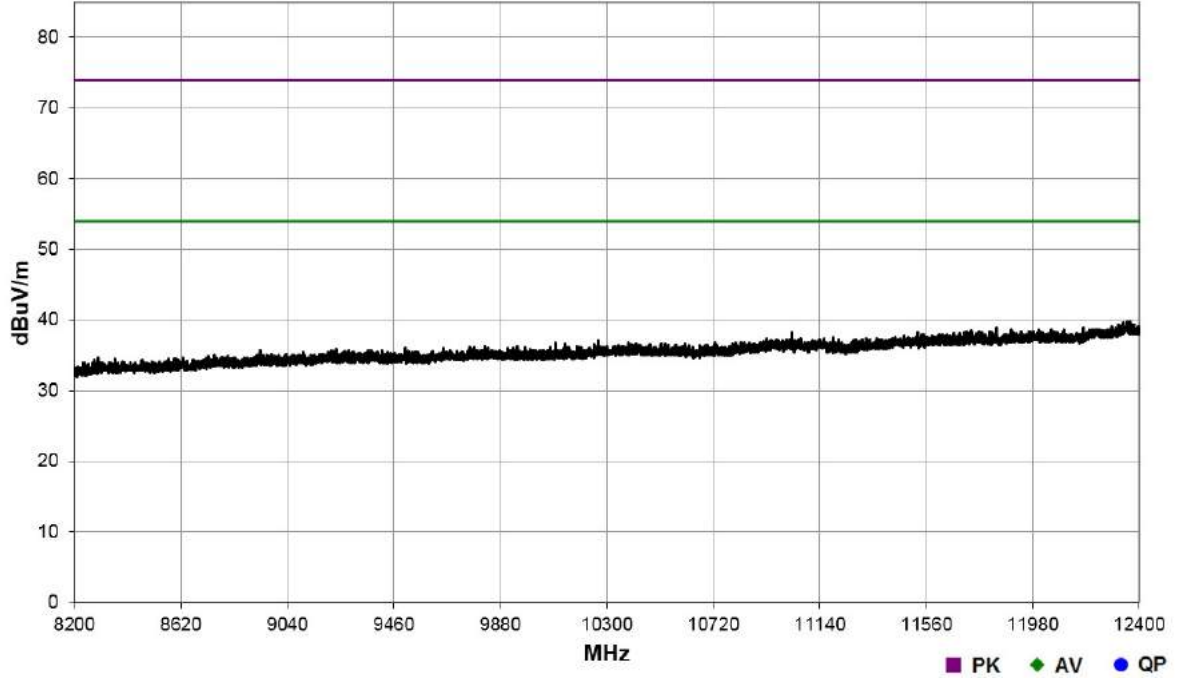


1 GHz to 8.2 GHz

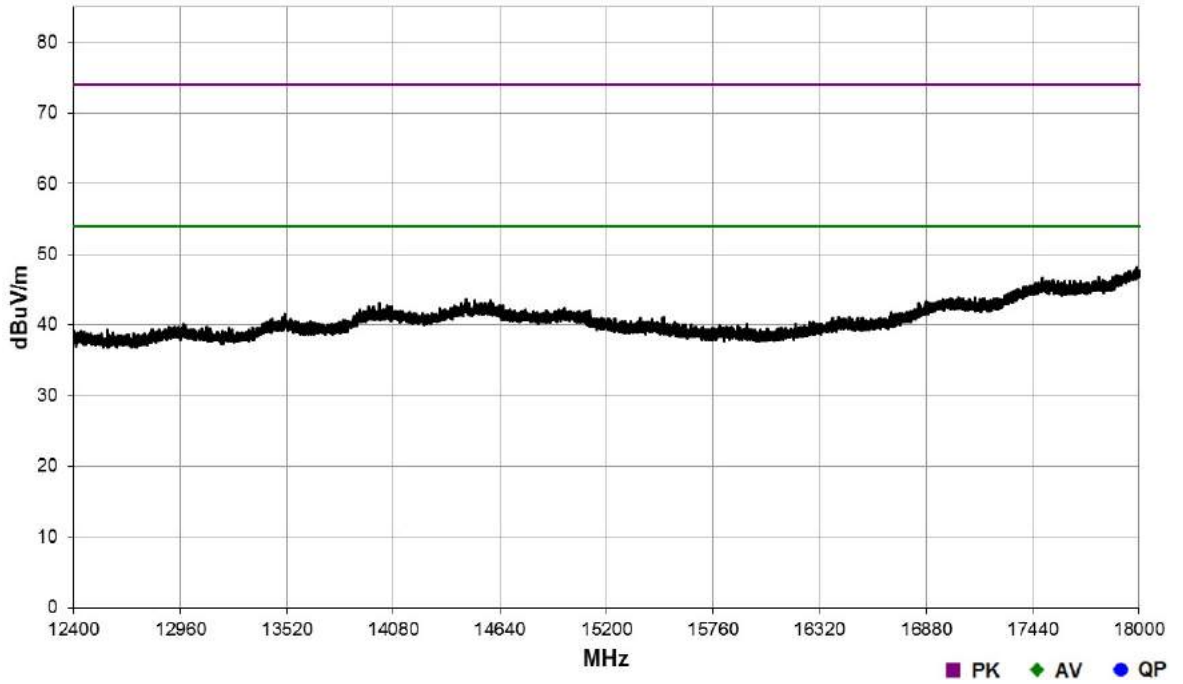




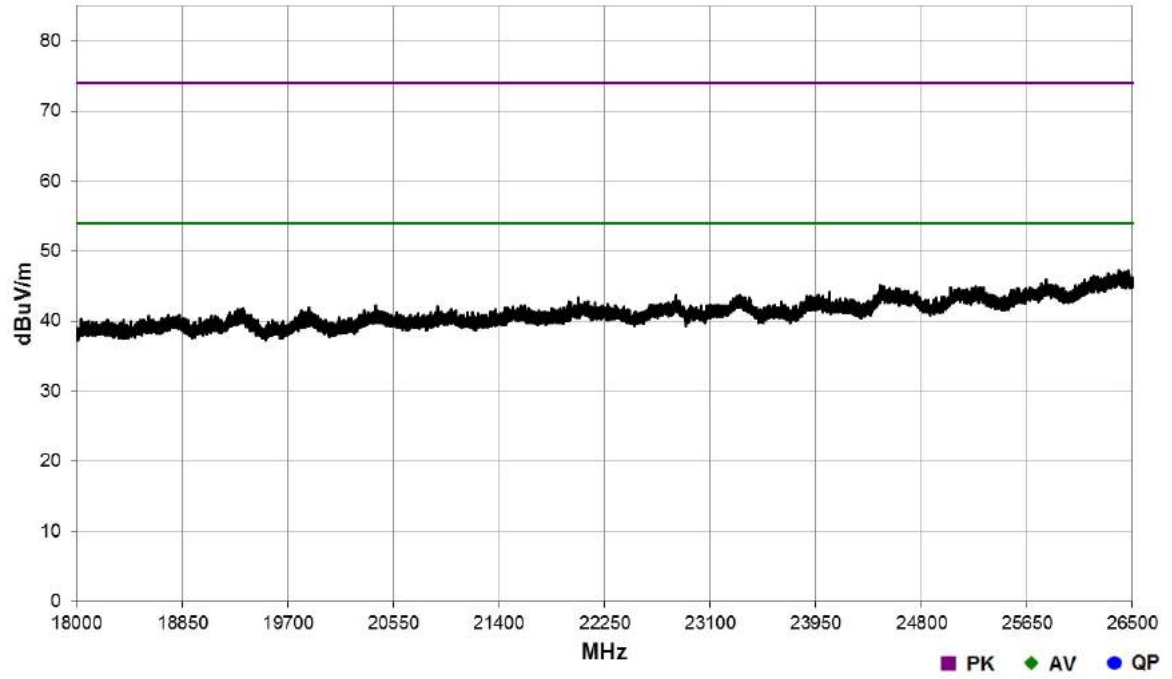
8.2 GHz to 12.4 GHz



12.4 GHz to 18 GHz

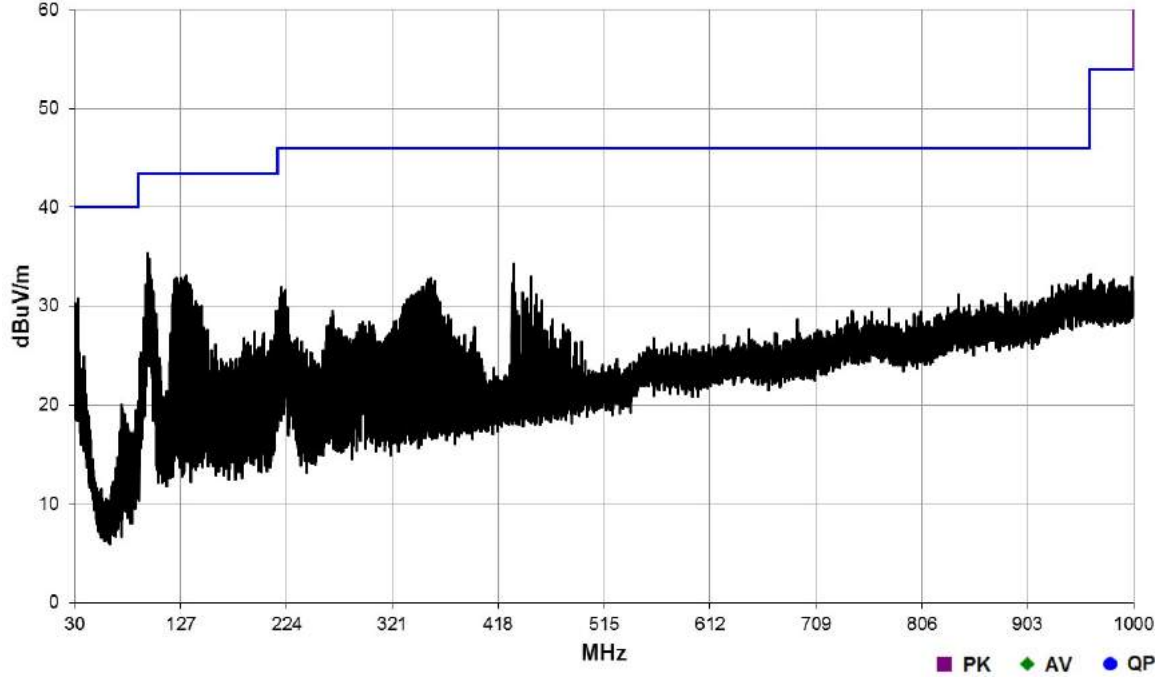


### 18 GHz to 26.5 GHz

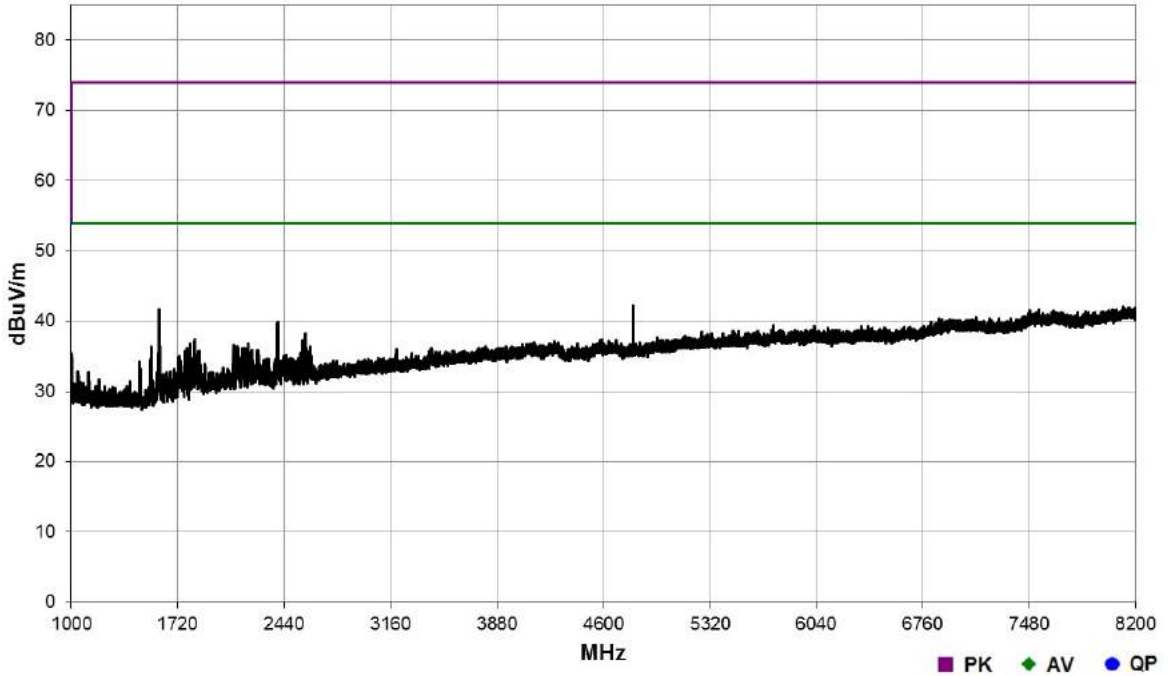


Sample S26 CD05 SN: YR4-US-FBA0039A; Channel: 2402 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dBμV)	Factor (dB)	Field Strength (dBμV/m)	Field Strength (μV/m)	Limit (μV/m)
There were no emissions within 10 dB of the limit.						

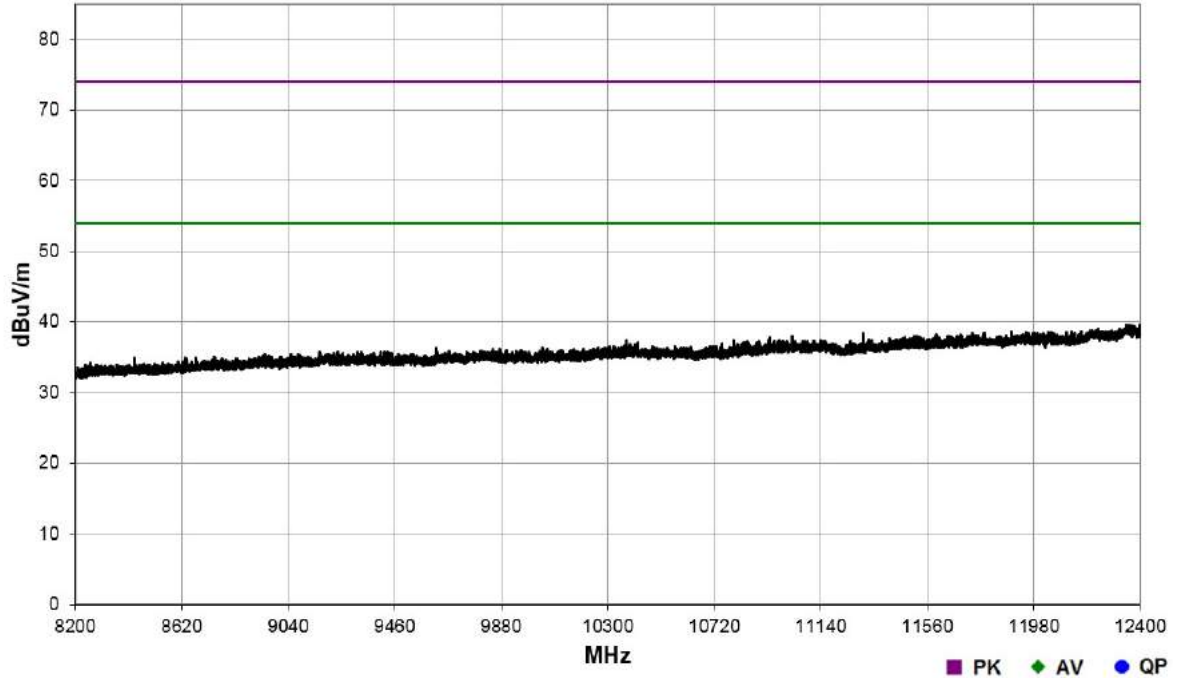
30 MHz to 1 GHz



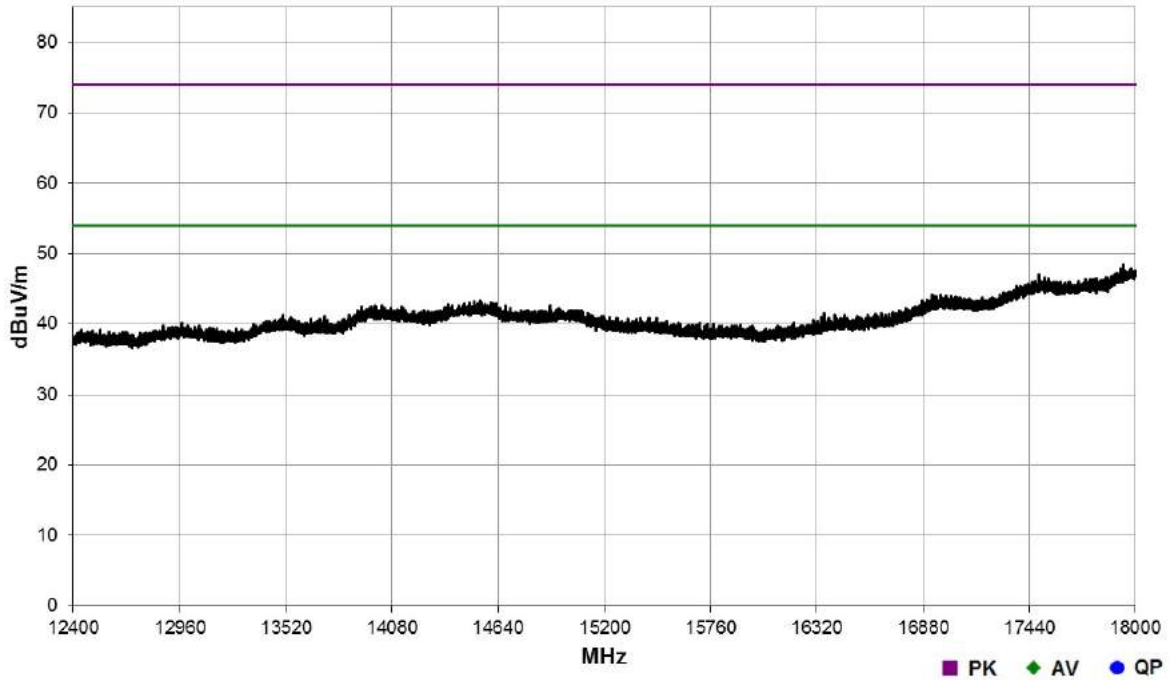
1 GHz to 8.2 GHz



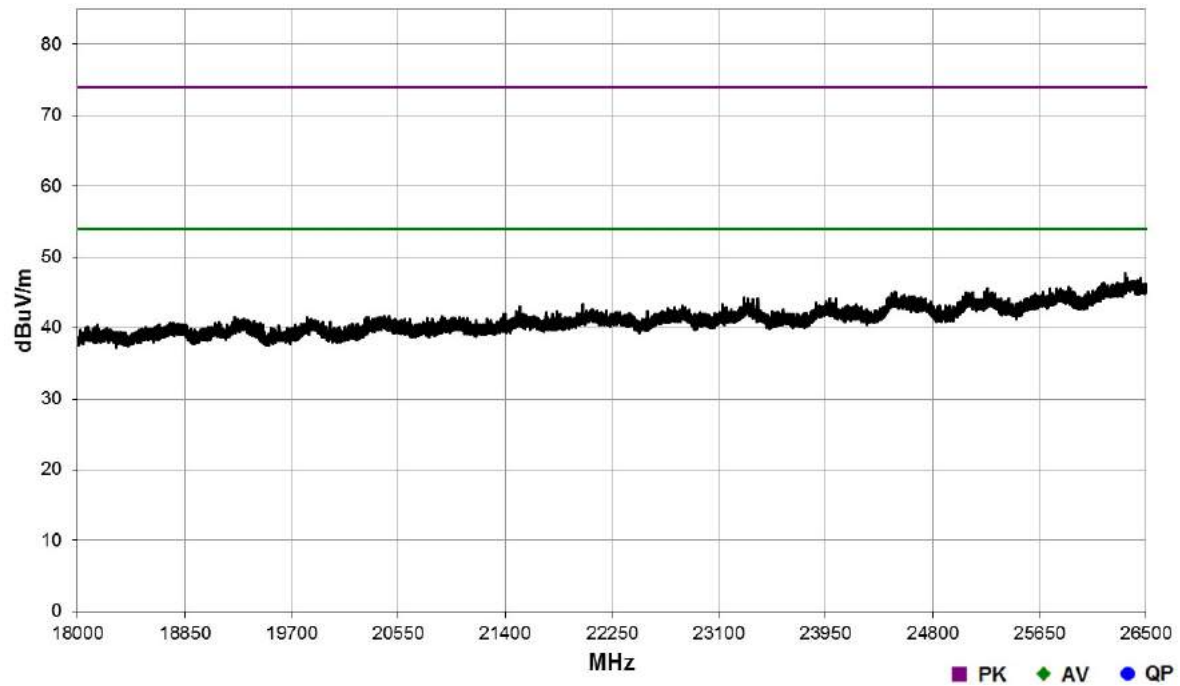
8.2 GHz to 12.4 GHz



12.4 GHz to 18 GHz

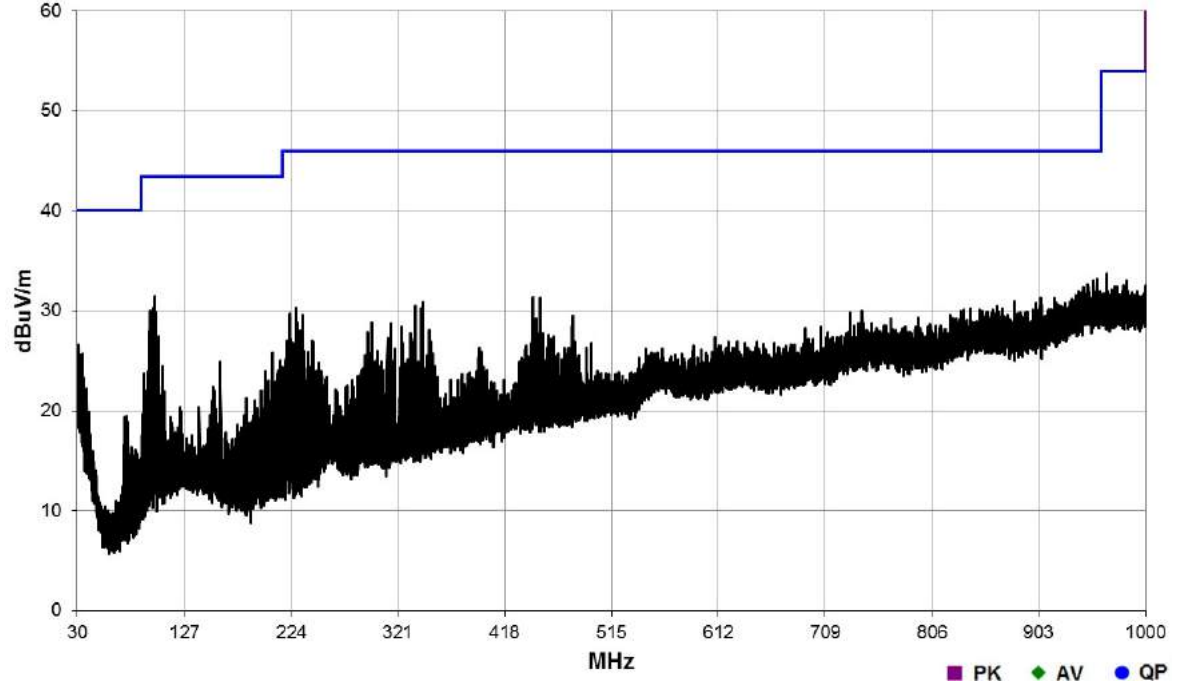


18 GHz to 26.5 GHz

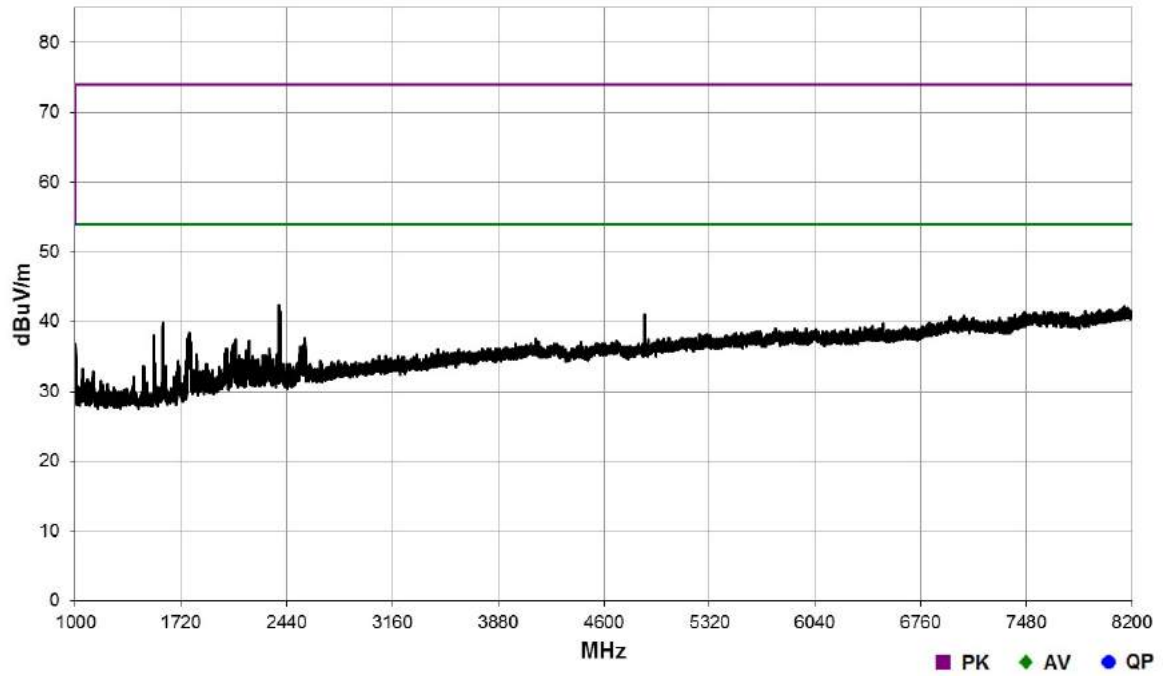


Sample S26 CD05 SN: YR4-US-FBA0039A; Channel: 2440 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dBμV)	Factor (dB)	Field Strength (dBμV/m)	Field Strength (μV/m)	Limit (μV/m)
There were no emissions within 10 dB of the limit.						

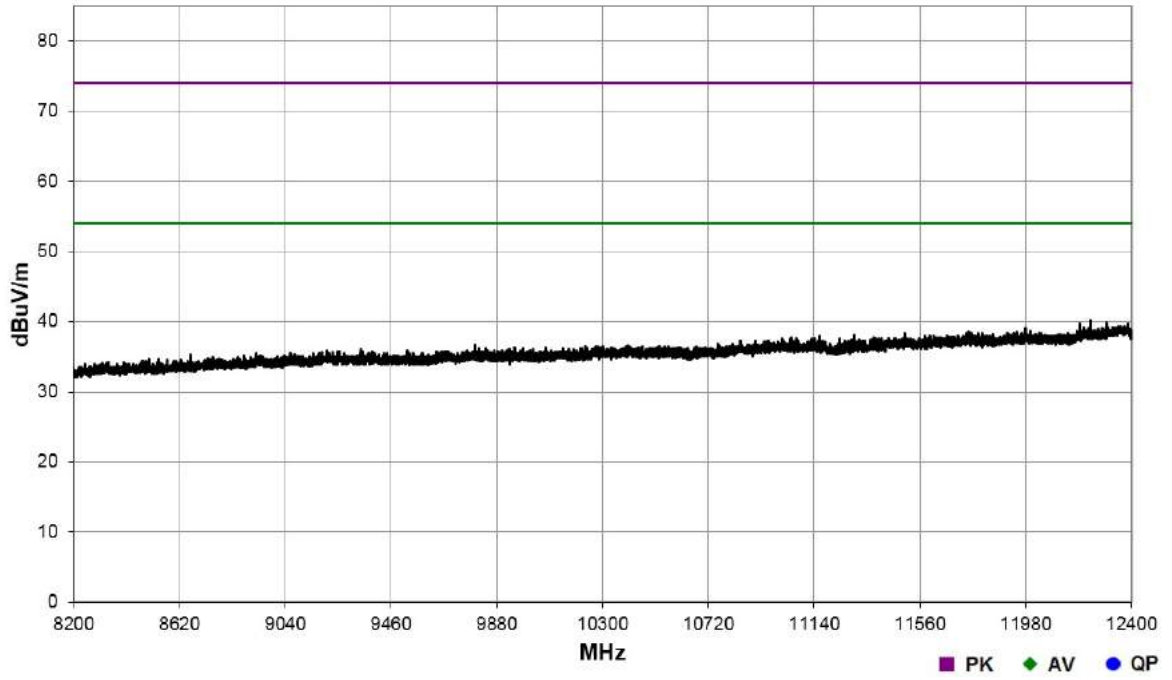
30 MHz to 1 GHz



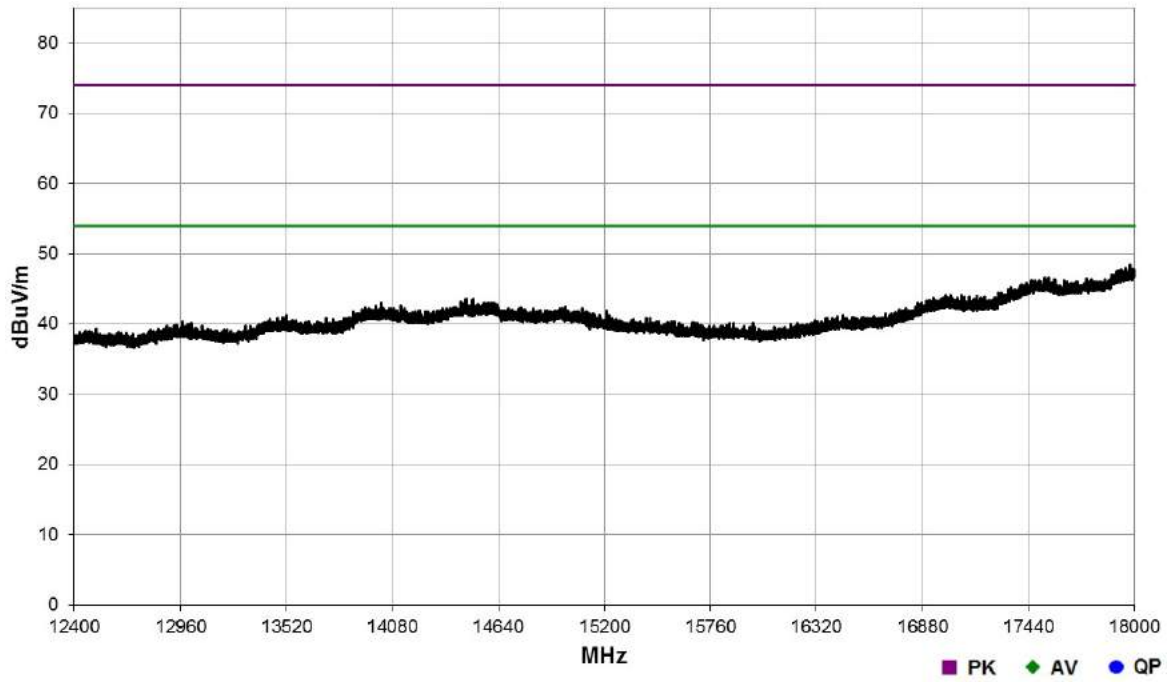
1 GHz to 8.2 GHz



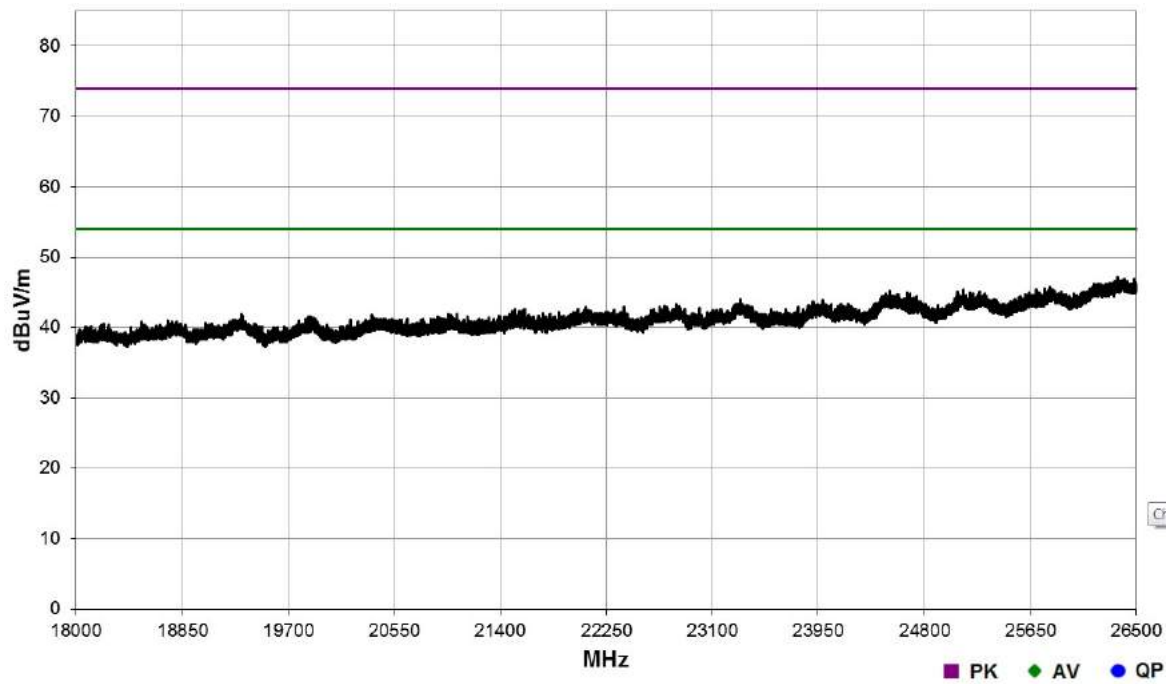
8.2 GHz to 12.4 GHz



12.4 GHz to 18 GHz



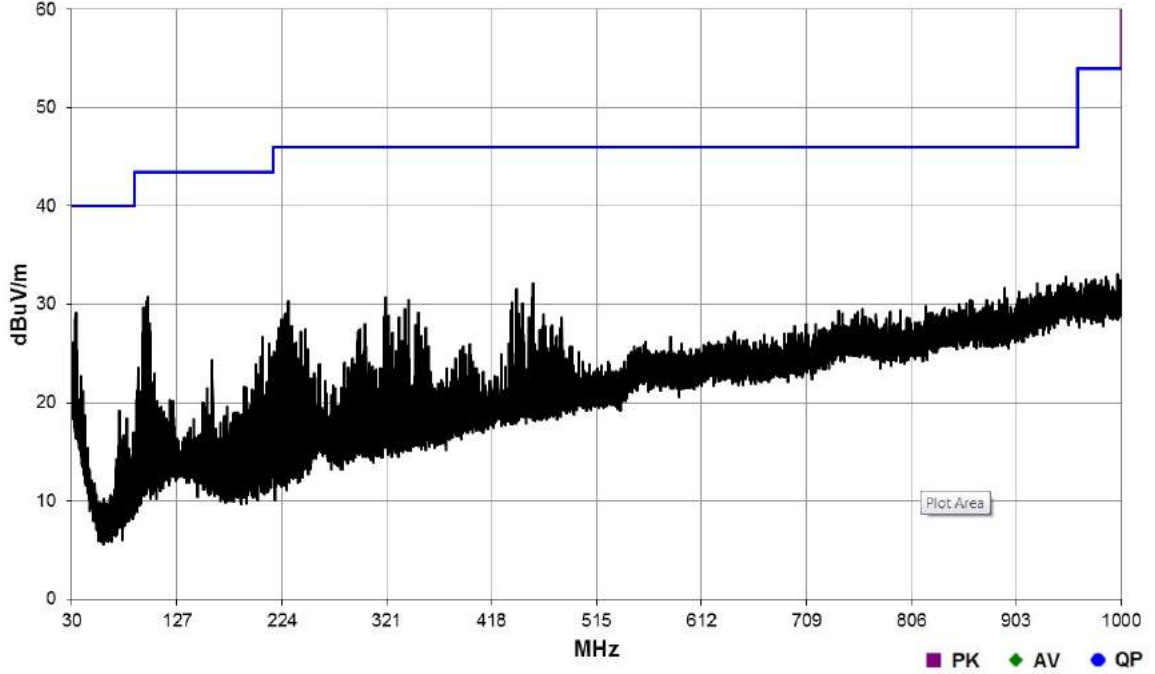
18 GHz to 26.5 GHz



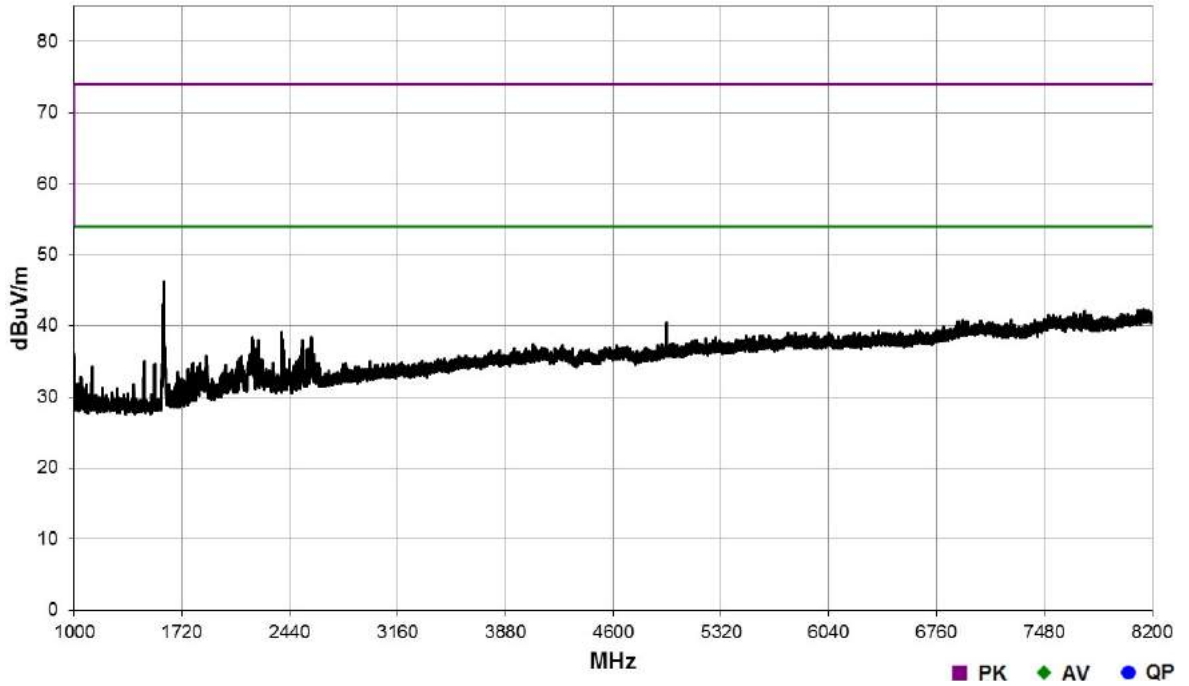


Sample S26 CD05 SN: YR4-US-FBA0039A; Channel: 2480 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dBμV)	Factor (dB)	Field Strength (dBμV/m)	Field Strength (μV/m)	Limit (μV/m)
There were no emissions within 10 dB of the limit.						

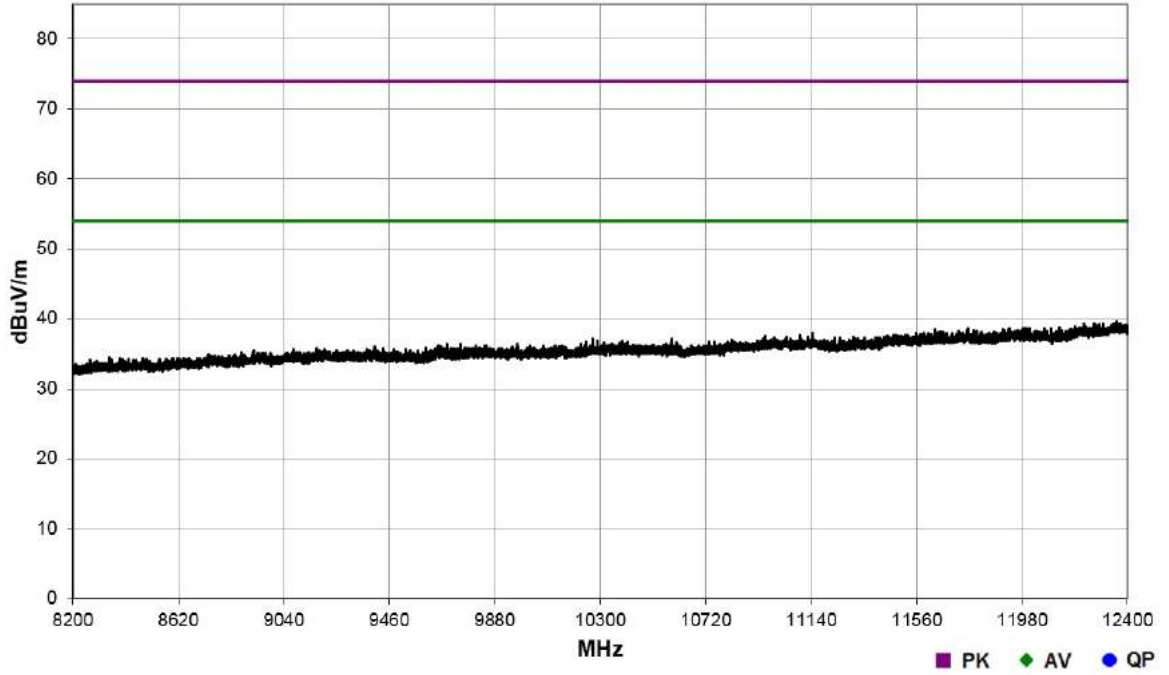
30 MHz to 1 GHz



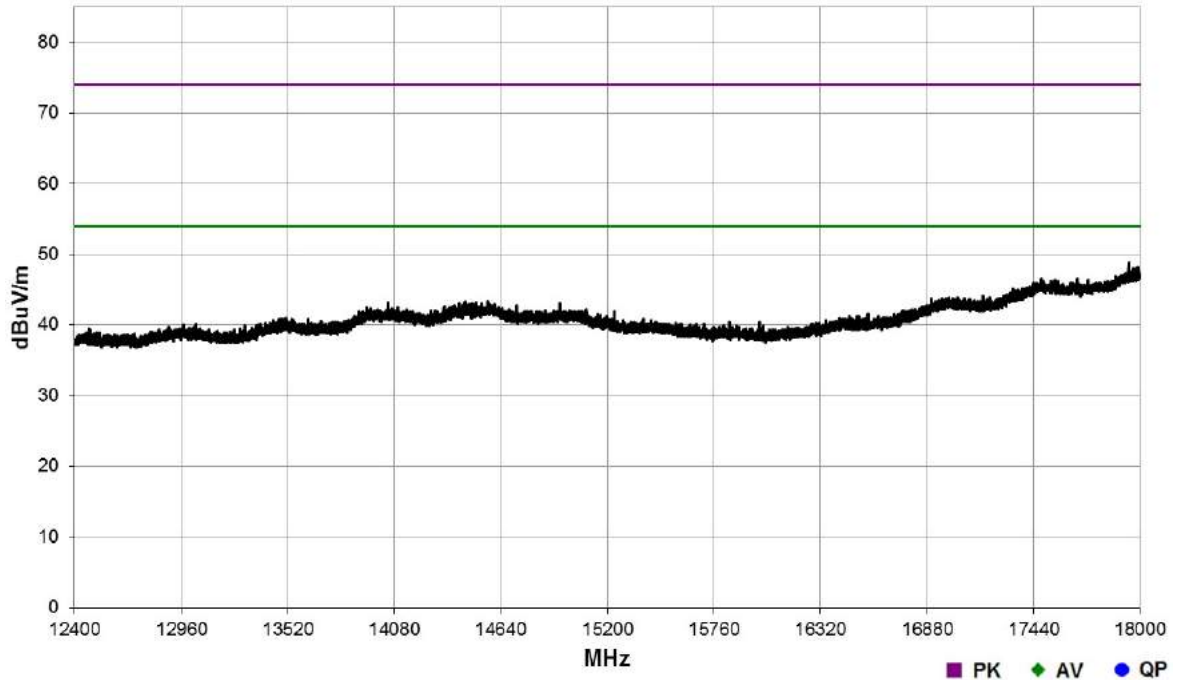
1 GHz to 8.2 GHz



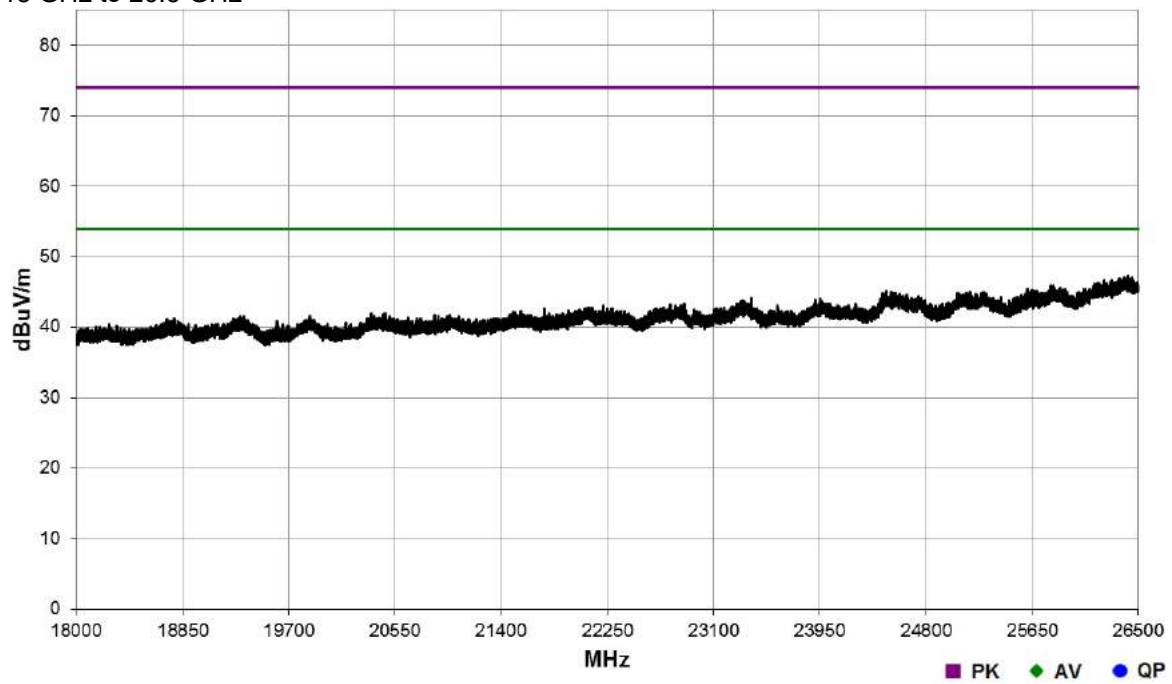
8.2 GHz to 12.4 GHz



12.4 GHz to 18 GHz



18 GHz to 26.5 GHz



## 12 CD06 Radiated emissions

### 12.1 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.

### 12.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Chamber 3
Test Standard and Clause:	ANSI C63.10-2013, Clause 6.5 and 6.6
EUT Frequencies Measured:	2402 MHz, 2440 MHz, 2480 MHz
EUT Channel Bandwidth:	2 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: 18 °C	+15 °C to +35 °C (as declared)
Humidity: 47 % RH	20 % RH to 75 % RH (as declared)
Supply: 24 Vdc (via mains adaptor)	24 Vdc (as declared)

### 12.3 Test Limit

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 (<math>\mu</math>V/m at 3 m)</i>
30 to 88	100
88 to 216	150
216 to 960	200
Above 960	500

## 12.4 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 100 kHz 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 $\mu$ V/m at the regulatory distance, using:

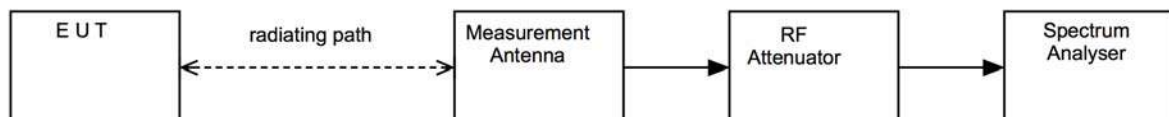
$$FS = PR + CL + AF - PA + DC - CF$$

Where,

PR is the power recorded on the receiver / spectrum analyzer in dB $\mu$ 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. harmonics of pulsed fundamental);  
 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 viii Test Setup**



## Test Setup Photograph

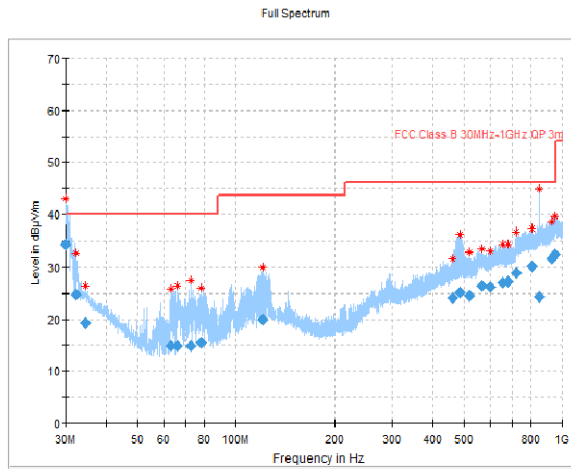


### 12.5 Test Equipment

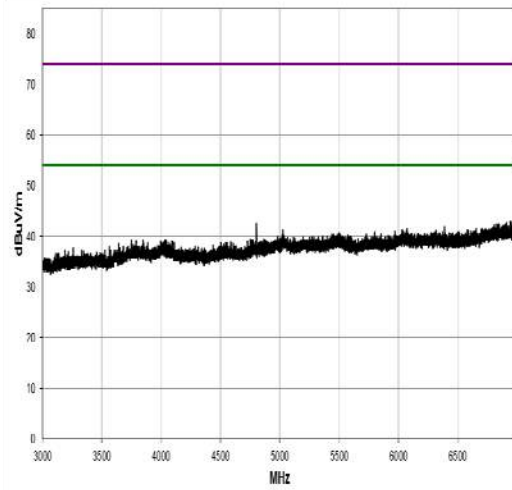
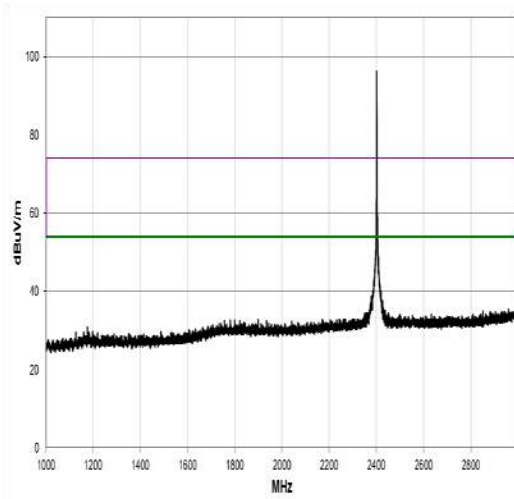
<i>Equipment Description</i>	<i>Manufacturer</i>	<i>Equipment Type</i>	<i>Element No</i>	<i>Due For Calibration</i>
Spectrum Analyser	R&S	FSU26	REF909	2020-06-21
Bilog	Chase	CBL611/A	U573	2021-09-19
Log Periodic Ant	Chase	UPA6108	L203	2020-06-11
PreAmp	Watkins Johnson	6201-69	U372	2020-02-25
8449B	Agilent	Pre Amp	L572	2020-10-15
1-18GHz Horn	EMCO	3115	U223	2019-10-25
1-18GHz Horn	EMCO	3115	L139	2021-07-16

## 12.6 Test Results

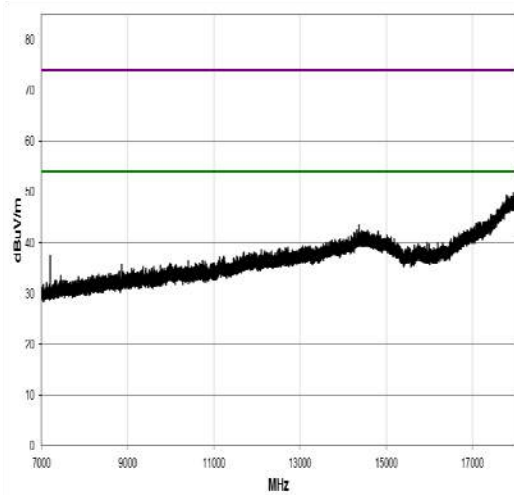
Frequency 2402 MHz



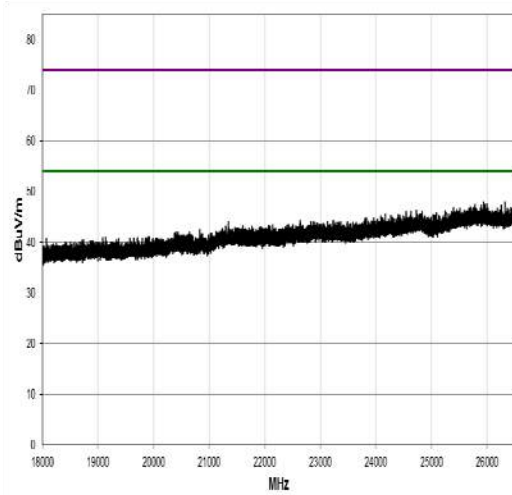
30 MHz to 1 GHz



1 GHz to 3 GHz



3 GHz to 7 GHz



7 GHz to 18 GHz

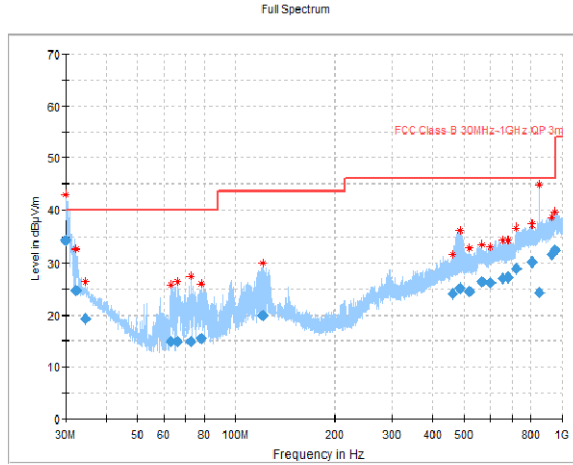
18 GHz to 26.5 GHz

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.050000	34.36	40.00	5.64	2000.0	120.000	111.0	V	218.0	25.3
32.300000	24.71	40.00	15.29	2000.0	120.000	133.0	V	250.0	24.5
34.550000	19.37	40.00	20.63	2000.0	120.000	133.0	V	0.0	23.3
63.450000	14.85	40.00	25.15	2000.0	120.000	111.0	V	98.0	13.0
66.000000	14.87	40.00	25.13	2000.0	120.000	152.0	V	123.0	13.2
72.950000	14.97	40.00	25.03	2000.0	120.000	141.0	V	69.0	13.7
78.600000	15.50	40.00	24.50	2000.0	120.000	106.0	V	89.0	14.2
121.350000	20.00	43.52	23.52	2000.0	120.000	122.0	V	88.0	19.5
459.600000	24.00	46.02	22.02	2000.0	120.000	248.0	V	176.0	26.1
486.800000	25.06	46.02	20.96	2000.0	120.000	225.0	V	196.0	26.5
519.650000	24.53	46.02	21.49	2000.0	120.000	346.0	V	14.0	27.1
567.150000	26.44	46.02	19.58	2000.0	120.000	178.0	V	-41.0	29.3
600.700000	26.16	46.02	19.86	2000.0	120.000	291.0	V	-142.0	29.0
654.600000	27.10	46.02	18.92	2000.0	120.000	231.0	V	-94.0	29.8
680.200000	27.23	46.02	18.79	2000.0	120.000	354.0	V	76.0	30.0
724.550000	28.87	46.02	17.15	2000.0	120.000	247.0	V	0.0	30.8
805.650000	30.12	46.02	15.90	2000.0	120.000	400.0	V	141.0	32.1
852.600000	24.31	46.02	21.71	2000.0	120.000	122.0	H	210.0	26.2
931.900000	31.66	46.02	14.36	2000.0	120.000	400.0	V	208.0	33.9
948.400000	32.45	46.02	13.57	2000.0	120.000	185.0	V	80.0	34.7

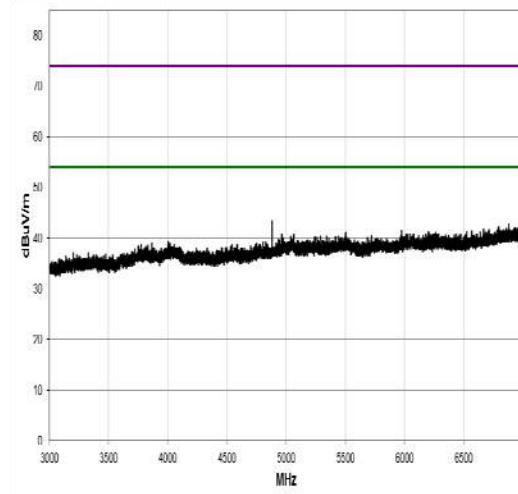
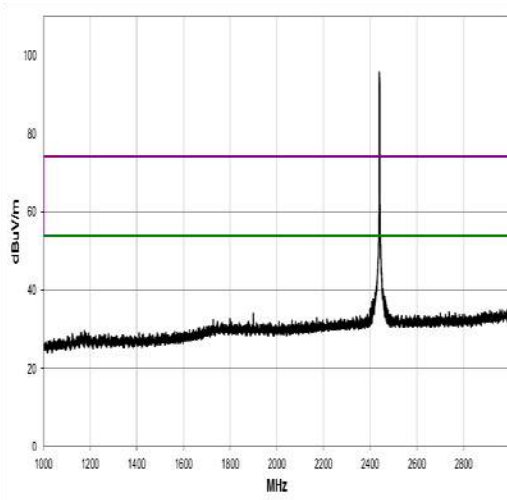
Freq (MHz)	Amplitude (dBµV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBµV/m)	Spec. Limit (dBµV/m)	Compared to Spec. (dB)
4803.925	48.2	3.1	2.18	341.0	0.0	Horz	PK	0.0	51.3	74.0	-22.7
4803.983	38.1	3.1	2.18	341.0	0.0	Horz	AV	0.0	41.2	54.0	-12.8
4803.417	47.4	3.1	2.31	277.1	0.0	Vert	PK	0.0	50.5	74.0	-23.5
4803.983	37.8	3.1	2.31	277.1	0.0	Vert	AV	0.0	40.9	54.0	-13.1



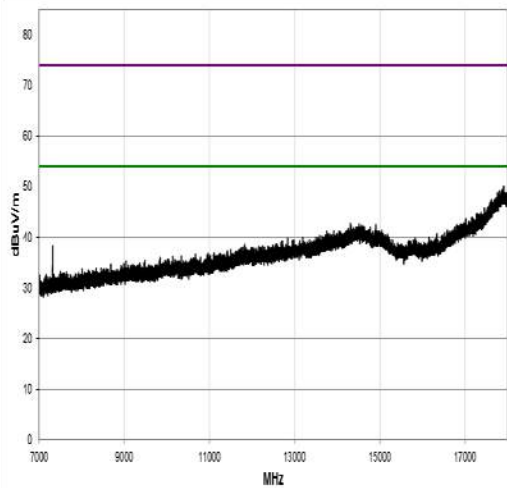
### Frequency 2440 MHz



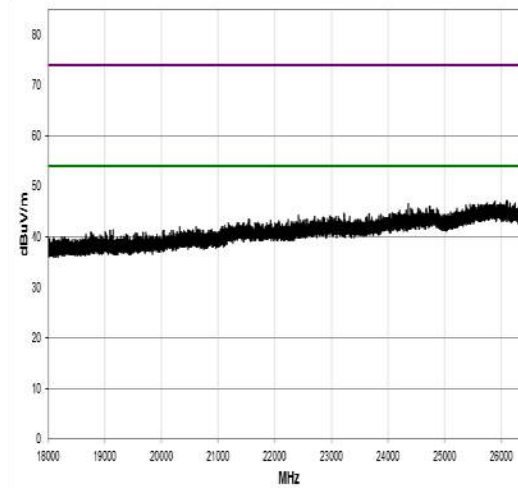
### 30 MHz to 1 GHz



### 1 GHz to 3 GHz



### 3 GHz to 7 GHz



### 7 GHz to 18 GHz

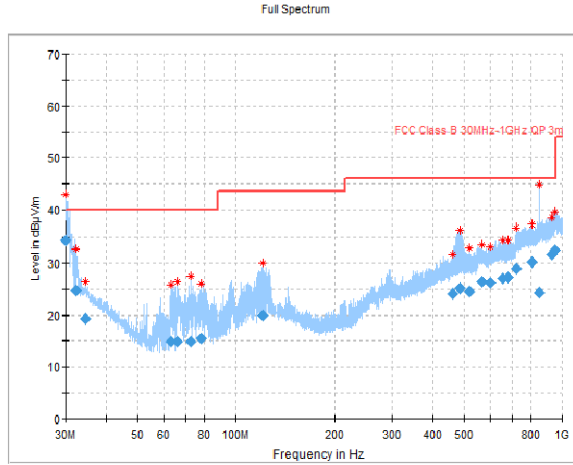
### 18 GHz to 26.5 GHz

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.050000	34.36	40.00	5.64	2000.0	120.000	111.0	V	218.0	25.3
32.300000	24.71	40.00	15.29	2000.0	120.000	133.0	V	250.0	24.5
34.550000	19.37	40.00	20.63	2000.0	120.000	133.0	V	0.0	23.3
63.450000	14.85	40.00	25.15	2000.0	120.000	111.0	V	98.0	13.0
66.000000	14.87	40.00	25.13	2000.0	120.000	152.0	V	123.0	13.2
72.950000	14.97	40.00	25.03	2000.0	120.000	141.0	V	69.0	13.7
78.600000	15.50	40.00	24.50	2000.0	120.000	106.0	V	89.0	14.2
121.350000	20.00	43.52	23.52	2000.0	120.000	122.0	V	88.0	19.5
459.600000	24.00	46.02	22.02	2000.0	120.000	248.0	V	176.0	26.1
486.800000	25.06	46.02	20.96	2000.0	120.000	225.0	V	196.0	26.5
519.650000	24.53	46.02	21.49	2000.0	120.000	346.0	V	14.0	27.1
567.150000	26.44	46.02	19.58	2000.0	120.000	178.0	V	-41.0	29.3
600.700000	26.16	46.02	19.86	2000.0	120.000	291.0	V	-142.0	29.0
654.600000	27.10	46.02	18.92	2000.0	120.000	231.0	V	-94.0	29.8
680.200000	27.23	46.02	18.79	2000.0	120.000	354.0	V	76.0	30.0
724.550000	28.87	46.02	17.15	2000.0	120.000	247.0	V	0.0	30.8
805.650000	30.12	46.02	15.90	2000.0	120.000	400.0	V	141.0	32.1
852.600000	24.31	46.02	21.71	2000.0	120.000	122.0	H	210.0	26.2
931.900000	31.66	46.02	14.36	2000.0	120.000	400.0	V	208.0	33.9
948.400000	32.45	46.02	13.57	2000.0	120.000	185.0	V	80.0	34.7

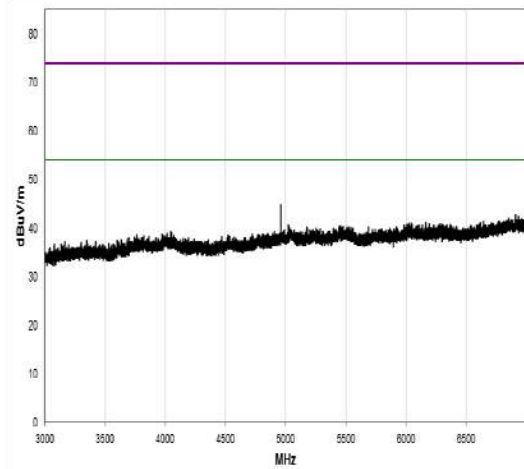
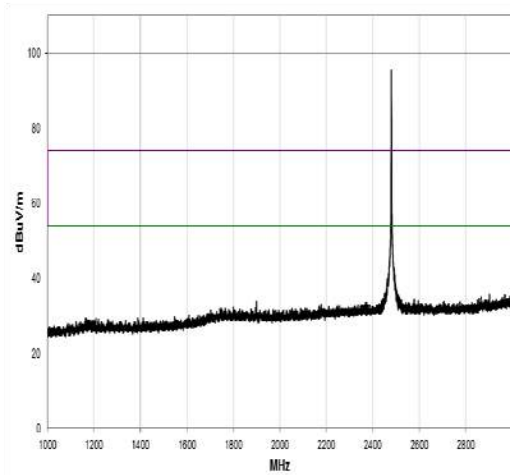
Freq (MHz)	Amplitude (dBµV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBµV/m)	Spec. Limit (dBµV/m)	Compared to Spec. (dB)
4880.175	47.4	3.3	1.58	308.1	0.0	Horz	PK	0.0	50.7	74.0	-23.3
4879.942	34.9	3.3	1.58	308.1	0.0	Horz	AV	0.0	38.2	54.0	-15.8
4880.242	49.1	3.3	1.83	277.0	0.0	Vert	PK	0.0	52.4	74.0	-21.6
4880.033	39.4	3.3	1.83	277.0	0.0	Vert	AV	0.0	42.7	54.0	-11.3

Freq (MHz)	Amplitude (dBµV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBµV/m)	Spec. Limit (dBµV/m)	Compared to Spec. (dB)
7319.358	48.3	7.4	2.34	213.1	0.0	Horz	PK	-9.5	46.2	74.0	-27.8
7319.350	36.1	7.4	2.34	213.1	0.0	Horz	AV	-9.5	34.0	54.0	-20.0
7319.308	47.1	7.4	1.8	343.1	0.0	Vert	PK	-9.5	45.0	74.0	-29.0
7319.325	34.2	7.4	1.8	343.1	0.0	Vert	AV	-9.5	32.1	54.0	-21.9

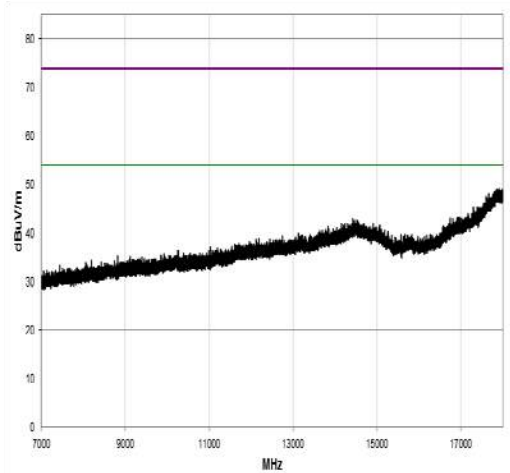
### Frequency 2480 MHz



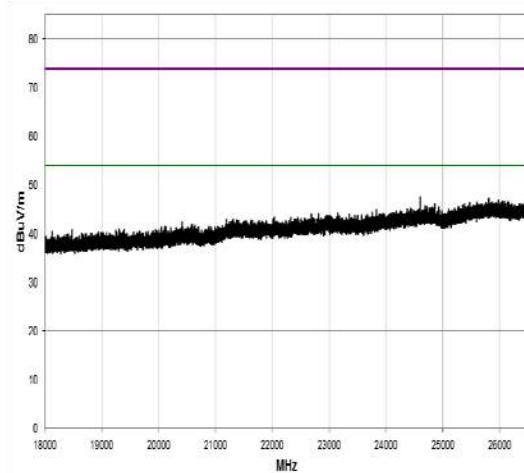
### 30 MHz to 1 GHz



### 1 GHz to 3 GHz



### 3 GHz to 7 GHz



### 7 GHz to 18 GHz



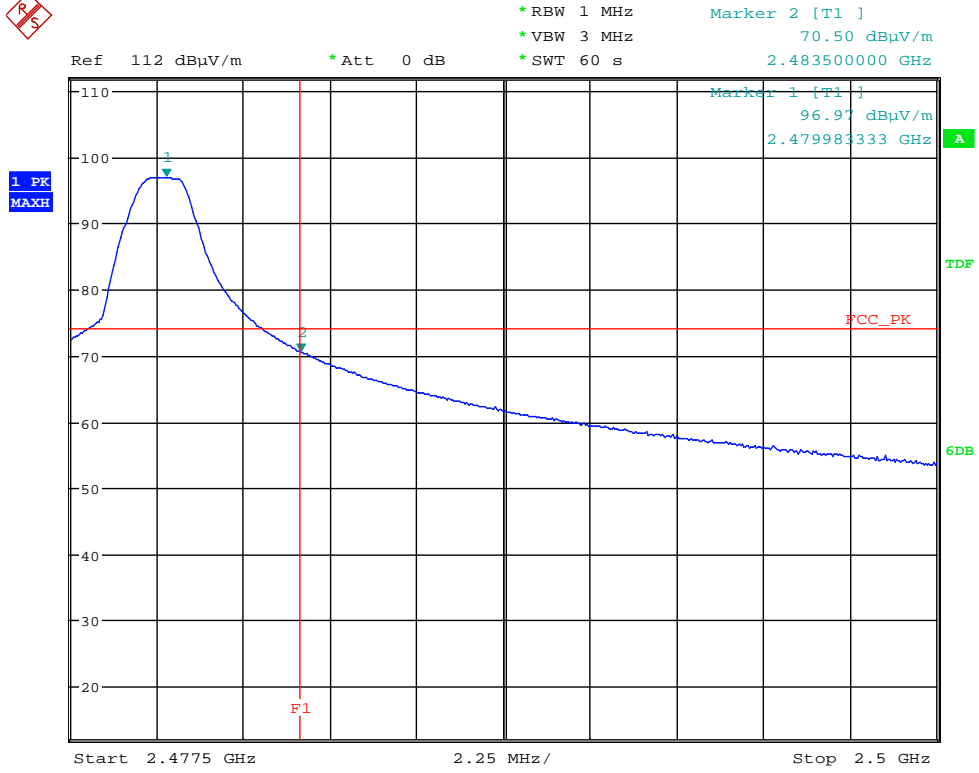
### 18 GHz to 26.5 GHz



Frequency (MHz)	QuasiPeak (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.050000	34.36	40.00	5.64	2000.0	120.000	111.0	V	218.0	25.3
32.300000	24.71	40.00	15.29	2000.0	120.000	133.0	V	250.0	24.5
34.550000	19.37	40.00	20.63	2000.0	120.000	133.0	V	0.0	23.3
63.450000	14.85	40.00	25.15	2000.0	120.000	111.0	V	98.0	13.0
66.000000	14.87	40.00	25.13	2000.0	120.000	152.0	V	123.0	13.2
72.950000	14.97	40.00	25.03	2000.0	120.000	141.0	V	69.0	13.7
78.600000	15.50	40.00	24.50	2000.0	120.000	106.0	V	89.0	14.2
121.350000	20.00	43.52	23.52	2000.0	120.000	122.0	V	88.0	19.5
459.600000	24.00	46.02	22.02	2000.0	120.000	248.0	V	176.0	26.1
486.800000	25.06	46.02	20.96	2000.0	120.000	225.0	V	196.0	26.5
519.650000	24.53	46.02	21.49	2000.0	120.000	346.0	V	14.0	27.1
567.150000	26.44	46.02	19.58	2000.0	120.000	178.0	V	-41.0	29.3
600.700000	26.16	46.02	19.86	2000.0	120.000	291.0	V	-142.0	29.0
654.600000	27.10	46.02	18.92	2000.0	120.000	231.0	V	-94.0	29.8
680.200000	27.23	46.02	18.79	2000.0	120.000	354.0	V	76.0	30.0
724.550000	28.87	46.02	17.15	2000.0	120.000	247.0	V	0.0	30.8
805.650000	30.12	46.02	15.90	2000.0	120.000	400.0	V	141.0	32.1
852.600000	24.31	46.02	21.71	2000.0	120.000	122.0	H	210.0	26.2
931.900000	31.66	46.02	14.36	2000.0	120.000	400.0	V	208.0	33.9
948.400000	32.45	46.02	13.57	2000.0	120.000	185.0	V	80.0	34.7

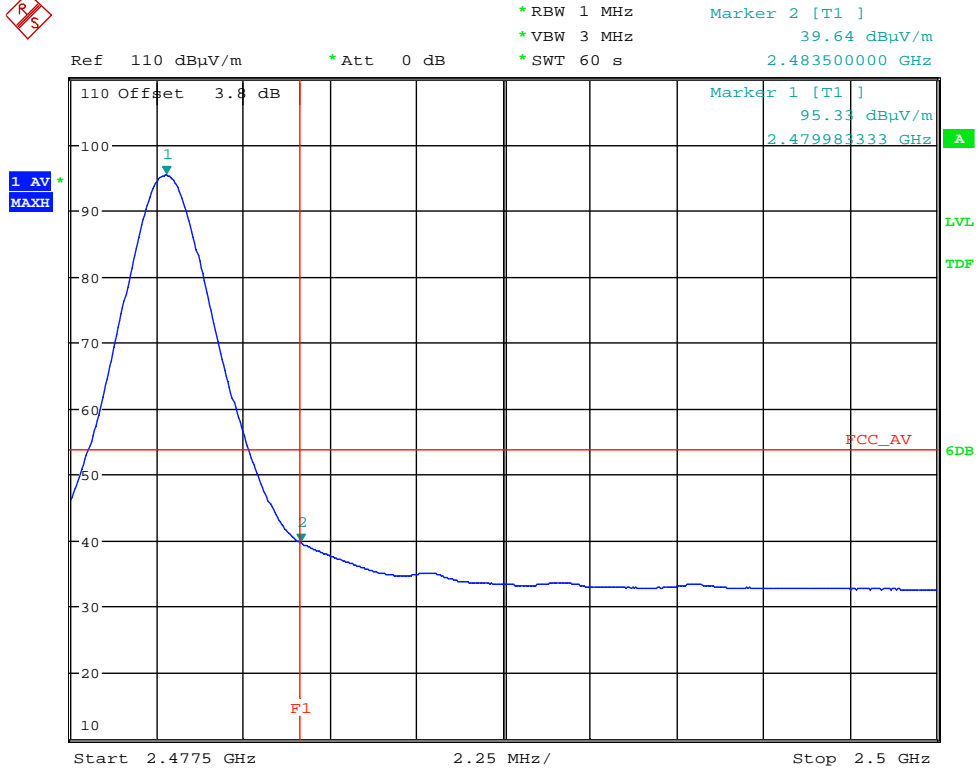
Freq (MHz)	Amplitude (dB $\mu$ V)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dB $\mu$ V/m)	Spec. Limit (dB $\mu$ V/m)	Compared to Spec. (dB)
4959.450	47.1	3.5	1.5	10.0	0.0	Horz	PK	0.0	50.6	74.0	-23.4
4959.992	34.2	3.5	1.5	10.0	0.0	Horz	AV	0.0	37.7	54.0	-16.3
4960.775	48.5	3.5	2.25	274.1	0.0	Vert	PK	0.0	52.0	74.0	-22.0
4959.983	38.2	3.5	2.25	274.1	0.0	Vert	AV	0.0	41.7	54.0	-12.3

Freq (MHz)	Amplitude (dB $\mu$ V)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dB $\mu$ V/m)	Spec. Limit (dB $\mu$ V/m)	Compared to Spec. (dB)
7439.200	45.9	7.5	1.97	228.0	0.0	Horz	PK	-9.5	43.9	74.0	-30.1
7439.317	33.1	7.5	1.97	228.0	0.0	Horz	AV	-9.5	40.6	54.0	-13.4
7439.825	45.4	7.5	1.8	341.0	0.0	Vert	PK	-9.5	43.4	74.0	-30.6
7439.342	32.7	7.5	1.8	341.0	0.0	Vert	AV	-9.5	40.2	54.0	-13.8



Date: 23.OCT.2019 21:18:57

2480 MHz – upper band edge peak



Date: 23.OCT.2019 21:17:03

2480 MHz – upper band edge average

## 13 CF06 Radiated emissions

### 13.1 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.

### 13.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Chamber 3
Test Standard and Clause:	ANSI C63.10-2013, Clause 6.5 and 6.6
EUT Frequencies Measured:	2402 MHz, 2440 MHz, 2480 MHz
EUT Channel Bandwidths:	2 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: 18 °C	+15 °C to +35 °C (as declared)
Humidity: 47 % RH	20 % RH to 75 % RH (as declared)
Supply: 24 Vdc (via mains adaptor)	24 Vdc (as declared)

### 13.3 Test Limit

#### Note:

Only radio communication receivers operating in stand-alone mode within the band 30 to 960 MHz, as well as scanner receivers, are subject to requirements, as described above. All other receivers are exempted from any certification, testing, labelling and reporting requirements.

However, all receivers in all frequency bands shall comply with the limits set forth in FCC 47CFR15B / IC RSS-Gen even in cases where testing, reporting and/or certification are not required.

### Receiver Radiated Limits

Frequency (MHz)	Field Strength ( $\mu\text{V/m}$ at 3 m)
30 to 88	100
88 to 216	150
216 to 960	200
Above 960	500

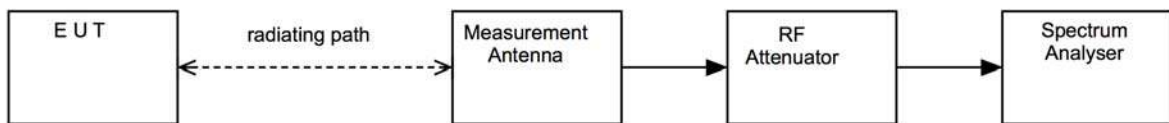
#### 13.4 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure viii, the emissions from the EUT were measured on a spectrum analyzer / EMI receiver. The EUT was rotated in three orthogonal planes and the measurement antenna height scanned (below 1 GHz, from 1 to 4 m; above 1 GHz as necessary) in order to maximise emissions.

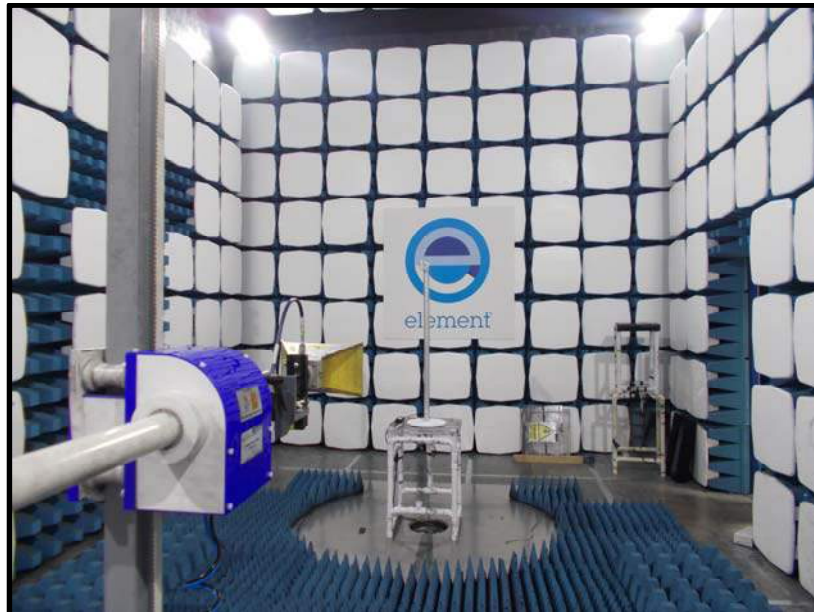
The measurements were performed with EUT set at its maximum duty. All modulation schemes, data rates and power settings were used to observe the worst-case configuration at each frequency.

Pre-scan plots are shown with a peak detector and 100 kHz RBW.

**Figure viii Test Setup**



**Test Setup Photograph**



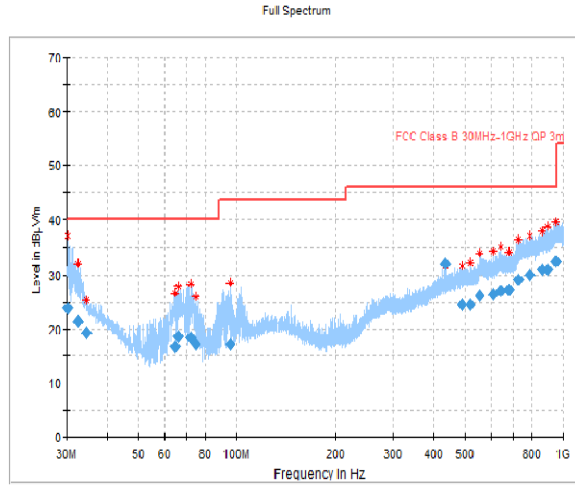


**13.5 Test Equipment**

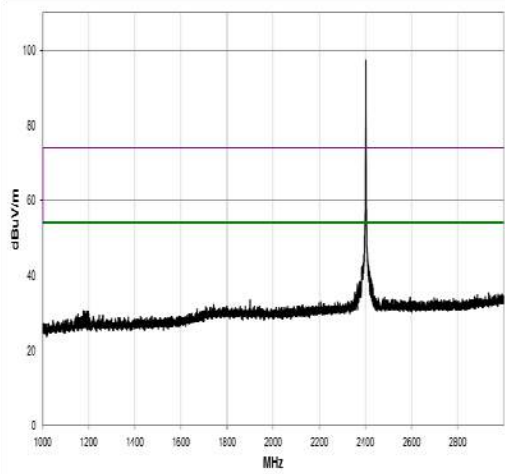
<b><i>Equipment Description</i></b>	<b><i>Manufacturer</i></b>	<b><i>Equipment Type</i></b>	<b><i>Element No</i></b>	<b><i>Due For Calibration</i></b>
Spectrum Analyser	R&S	FSU26	REF909	2020-06-21
Bilog	Chase	CBL611/A	U573	2021-09-19
Log Periodic Ant	Chase	UPA6108	L203	2020-06-11
PreAmp	Watkins Johnson	6201-69	U372	2020-02-25
8449B	Agilent	Pre Amp	L572	2020-10-15
1-18GHz Horn	EMCO	3115	U223	2019-10-25
1-18GHz Horn	EMCO	3115	L139	2021-07-16

### 13.6 Test Results

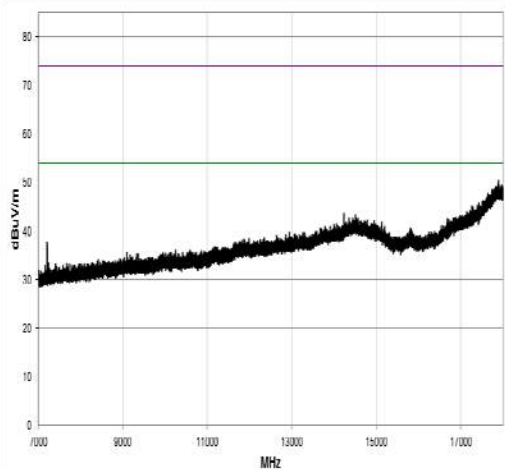
Frequency 2402 MHz



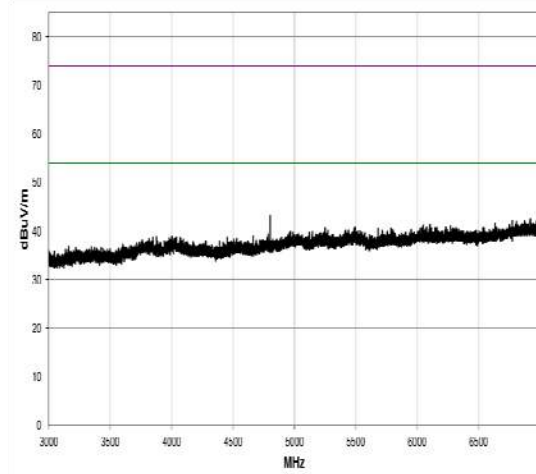
30 MHz to 1 GHz



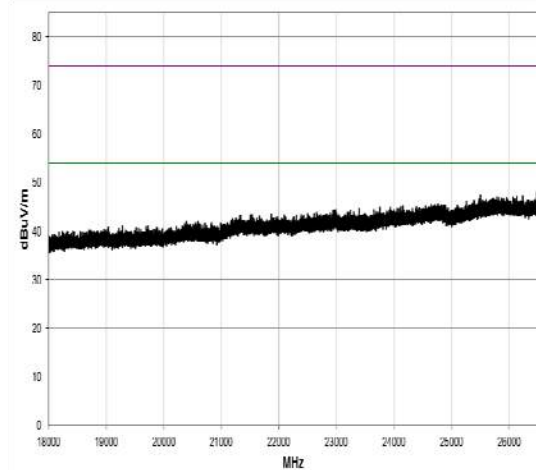
1 GHz to 3 GHz



7 GHz to 18 GHz



3 GHz to 7 GHz

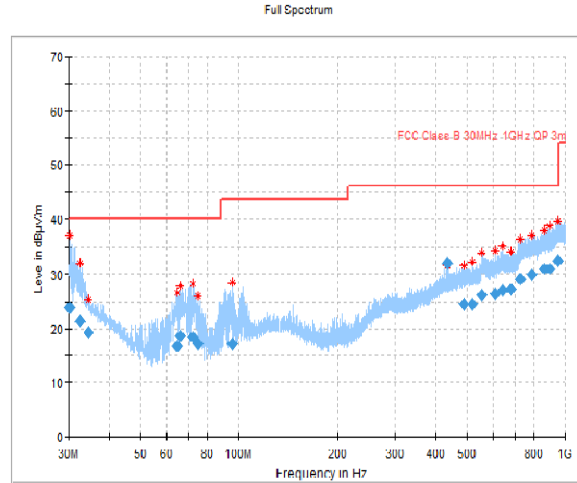


18 GHz to 26.5 GHz

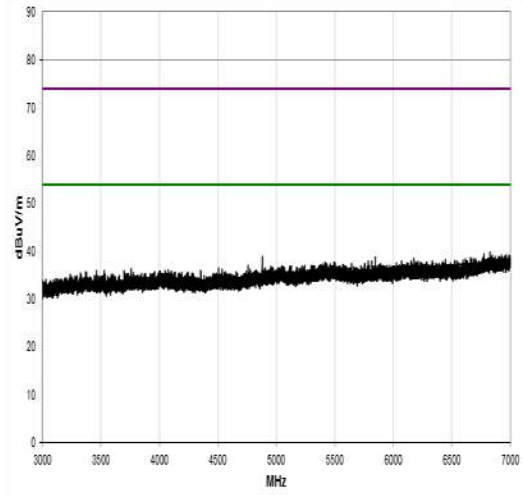
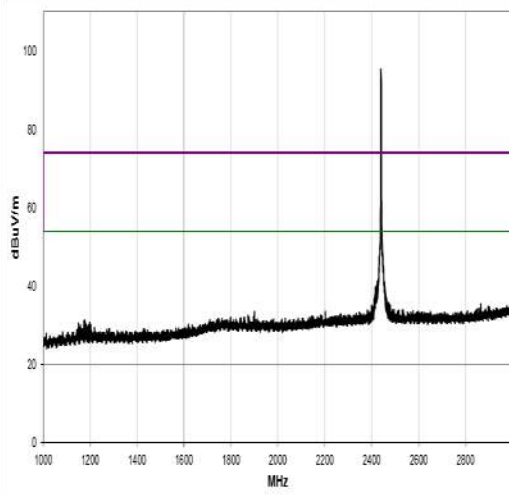
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.200000	23.93	40.00	16.07	2000.0	120.000	209.0	V	69.0	25.3
32.550000	21.42	40.00	18.58	2000.0	120.000	106.0	V	0.0	24.4
34.600000	19.20	40.00	20.80	2000.0	120.000	100.0	V	77.0	23.3
64.850000	16.76	40.00	23.24	2000.0	120.000	111.0	V	-110.0	13.1
66.000000	18.56	40.00	21.44	2000.0	120.000	117.0	V	28.0	13.2
72.250000	18.38	40.00	21.62	2000.0	120.000	185.0	V	25.0	13.7
74.900000	17.18	40.00	22.82	2000.0	120.000	111.0	V	46.0	13.9
95.600000	17.27	43.52	26.25	2000.0	120.000	122.0	V	77.0	16.7
434.100000	32.06	46.02	13.96	2000.0	120.000	218.0	V	65.0	25.6
489.100000	24.53	46.02	21.49	2000.0	120.000	212.0	V	-46.0	26.5
517.100000	24.50	46.02	21.52	2000.0	120.000	400.0	V	-25.0	27.0
554.350000	26.16	46.02	19.86	2000.0	120.000	299.0	V	165.0	29.0
611.550000	26.34	46.02	19.68	2000.0	120.000	167.0	V	18.0	29.1
642.800000	27.00	46.02	19.02	2000.0	120.000	151.0	V	97.0	29.9
681.650000	27.21	46.02	18.81	2000.0	120.000	133.0	V	143.0	30.0
730.050000	29.15	46.02	16.87	2000.0	120.000	298.0	V	350.0	31.1
789.250000	30.06	46.02	15.96	2000.0	120.000	218.0	V	283.0	32.0
860.050000	31.02	46.02	15.00	2000.0	120.000	400.0	V	216.0	33.0
895.650000	31.01	46.02	15.01	2000.0	120.000	178.0	V	14.0	33.0
951.150000	32.53	46.02	13.49	2000.0	120.000	211.0	V	-117.0	34.8

Freq (MHz)	Amplitude (dBµV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBµV/m)	Spec. Limit (dBµV/m)	Compared to Spec. (dB)
4803.900	46.0	3.1	1.5	170.9	0.0	Horz	PK	0.0	49.1	74.0	-24.9
4803.992	32.9	3.1	1.5	170.9	0.0	Horz	AV	0.0	36.0	54.0	-18.0
4803.742	49.1	3.1	1.68	274.9	0.0	Vert	PK	0.0	52.2	74.0	-21.8
4803.983	38.4	3.1	1.68	274.9	0.0	Vert	AV	0.0	41.5	54.0	-12.5

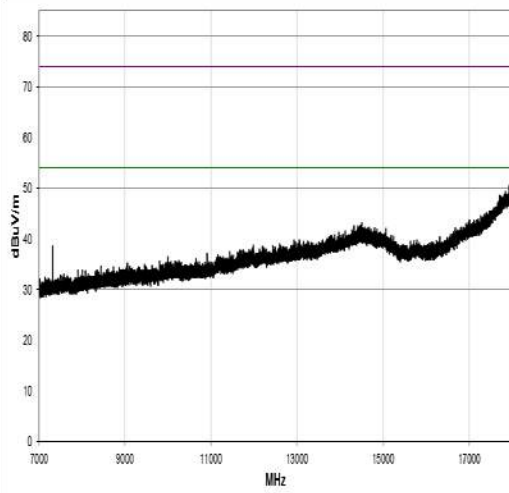
### Frequency 2440 MHz



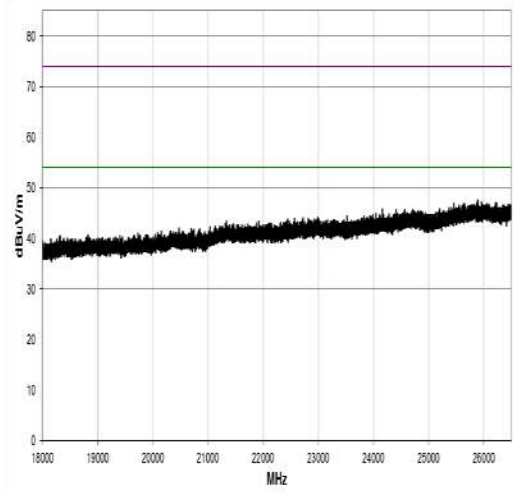
### 30 MHz to 1 GHz



### 1 GHz to 3 GHz



### 3 GHz to 7 GHz



### 7 GHz to 18 GHz

### 18 GHz to 26.5 GHz

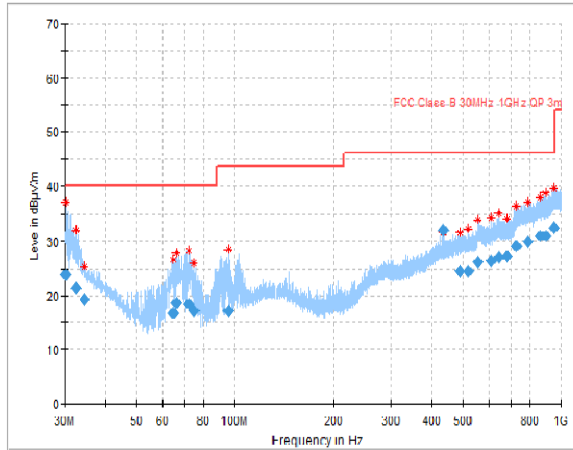
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.200000	23.93	40.00	16.07	2000.0	120.000	209.0	V	69.0	25.3
32.550000	21.42	40.00	18.58	2000.0	120.000	106.0	V	0.0	24.4
34.600000	19.20	40.00	20.80	2000.0	120.000	100.0	V	77.0	23.3
64.850000	16.76	40.00	23.24	2000.0	120.000	111.0	V	-110.0	13.1
66.000000	18.56	40.00	21.44	2000.0	120.000	117.0	V	28.0	13.2
72.250000	18.38	40.00	21.62	2000.0	120.000	185.0	V	25.0	13.7
74.900000	17.18	40.00	22.82	2000.0	120.000	111.0	V	46.0	13.9
95.600000	17.27	43.52	26.25	2000.0	120.000	122.0	V	77.0	16.7
434.100000	32.06	46.02	13.96	2000.0	120.000	218.0	V	65.0	25.6
489.100000	24.53	46.02	21.49	2000.0	120.000	212.0	V	-46.0	26.5
517.100000	24.50	46.02	21.52	2000.0	120.000	400.0	V	-25.0	27.0
554.350000	26.16	46.02	19.86	2000.0	120.000	299.0	V	165.0	29.0
611.550000	26.34	46.02	19.68	2000.0	120.000	167.0	V	18.0	29.1
642.800000	27.00	46.02	19.02	2000.0	120.000	151.0	V	97.0	29.9
681.650000	27.21	46.02	18.81	2000.0	120.000	133.0	V	143.0	30.0
730.050000	29.15	46.02	16.87	2000.0	120.000	298.0	V	350.0	31.1
789.250000	30.06	46.02	15.96	2000.0	120.000	218.0	V	283.0	32.0
860.050000	31.02	46.02	15.00	2000.0	120.000	400.0	V	216.0	33.0
895.650000	31.01	46.02	15.01	2000.0	120.000	178.0	V	14.0	33.0
951.150000	32.53	46.02	13.49	2000.0	120.000	211.0	V	-117.0	34.8

Freq (MHz)	Amplitude (dBµV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBµV/m)	Spec. Limit (dBµV/m)	Compared to Spec. (dB)
4879.383	46.4	2.1	1.8	61.0	0.0	Horz	PK	0.0	48.5	74.0	-25.5
4879.925	34.1	2.1	1.8	61.0	0.0	Horz	AV	0.0	36.2	54.0	-17.8
4880.450	49.0	2.1	1.7	285.0	0.0	Vert	PK	0.0	51.1	74.0	-22.9
4880.033	39.4	2.1	1.7	285.0	0.0	Vert	AV	0.0	41.5	54.0	-12.5

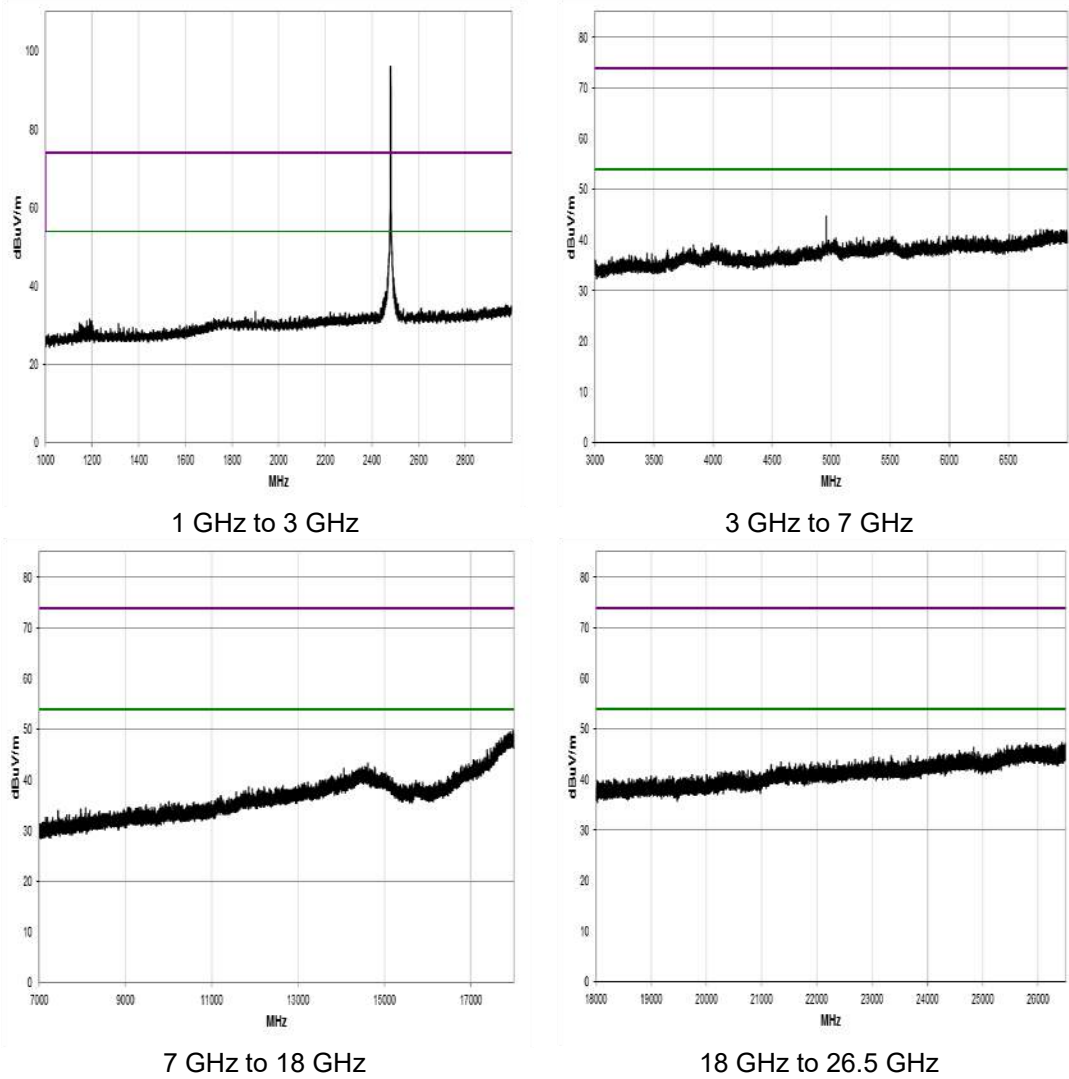
Freq (MHz)	Amplitude (dBµV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBµV/m)	Spec. Limit (dBµV/m)	Compared to Spec. (dB)
7320.717	49.1	7.4	2.06	291.9	0.0	Horz	PK	-9.5	47.0	74.0	-27.0
7319.367	37.4	7.4	2.06	291.9	0.0	Horz	AV	-9.5	35.3	54.0	-18.7
7320.533	48.0	7.4	2.34	272.1	0.0	Vert	PK	-9.5	45.9	74.0	-28.1
7319.358	35.7	7.4	2.34	272.1	0.0	Vert	AV	-9.5	33.6	54.0	-20.4

# Frequency 2480 MHz

Full Spectrum



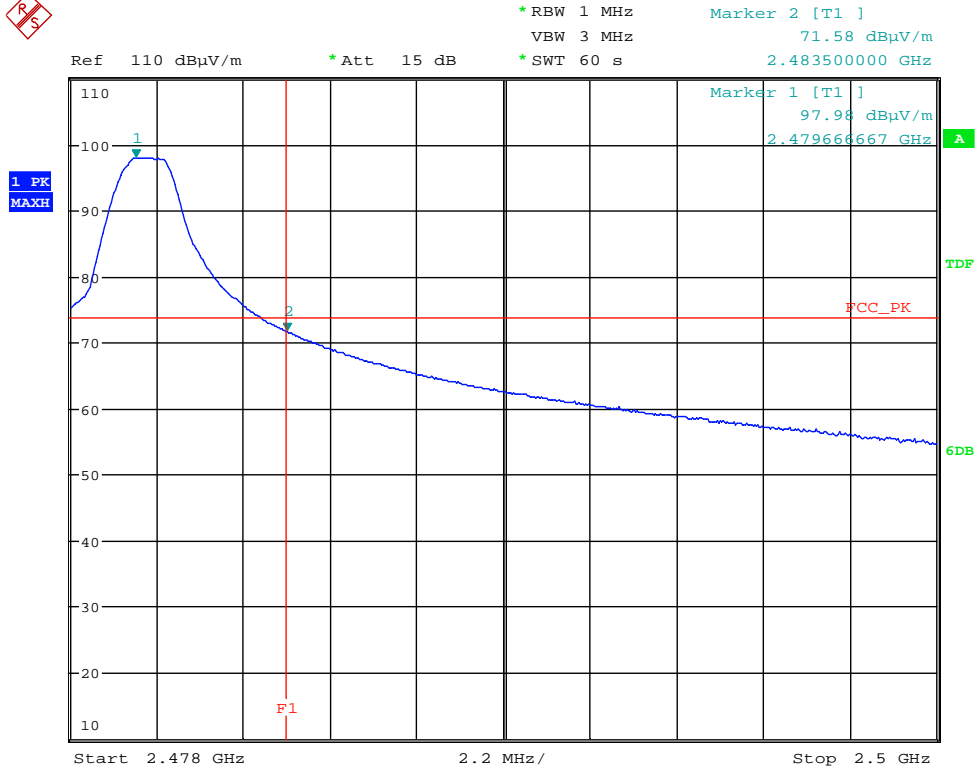
### 30 MHz to 1 GHz



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.200000	23.93	40.00	16.07	2000.0	120.000	209.0	V	69.0	25.3
32.550000	21.42	40.00	18.58	2000.0	120.000	106.0	V	0.0	24.4
34.600000	19.20	40.00	20.80	2000.0	120.000	100.0	V	77.0	23.3
64.850000	16.76	40.00	23.24	2000.0	120.000	111.0	V	-110.0	13.1
66.000000	18.56	40.00	21.44	2000.0	120.000	117.0	V	28.0	13.2
72.250000	18.38	40.00	21.62	2000.0	120.000	185.0	V	25.0	13.7
74.900000	17.18	40.00	22.82	2000.0	120.000	111.0	V	46.0	13.9
95.600000	17.27	43.52	26.25	2000.0	120.000	122.0	V	77.0	16.7
434.100000	32.06	46.02	13.96	2000.0	120.000	218.0	V	65.0	25.6
489.100000	24.53	46.02	21.49	2000.0	120.000	212.0	V	-46.0	26.5
517.100000	24.50	46.02	21.52	2000.0	120.000	400.0	V	-25.0	27.0
554.350000	26.16	46.02	19.86	2000.0	120.000	299.0	V	165.0	29.0
611.550000	26.34	46.02	19.68	2000.0	120.000	167.0	V	18.0	29.1
642.800000	27.00	46.02	19.02	2000.0	120.000	151.0	V	97.0	29.9
681.650000	27.21	46.02	18.81	2000.0	120.000	133.0	V	143.0	30.0
730.050000	29.15	46.02	16.87	2000.0	120.000	298.0	V	350.0	31.1
789.250000	30.06	46.02	15.96	2000.0	120.000	218.0	V	283.0	32.0
860.050000	31.02	46.02	15.00	2000.0	120.000	400.0	V	216.0	33.0
895.650000	31.01	46.02	15.01	2000.0	120.000	178.0	V	14.0	33.0
951.150000	32.53	46.02	13.49	2000.0	120.000	211.0	V	-117.0	34.8

Freq (MHz)	Amplitude (dBµV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBµV/m)	Spec. Limit (dBµV/m)	Compared to Spec. (dB)
4960.392	47.0	3.5	1.5	23.1	0.0	Horz	PK	0.0	50.5	74.0	-23.5
4959.700	32.7	3.5	1.5	23.1	0.0	Horz	AV	0.0	36.2	54.0	-17.8
4959.417	48.9	3.5	2.08	281.0	0.0	Vert	PK	0.0	52.4	74.0	-21.6
4959.942	36.9	3.5	2.08	281.0	0.0	Vert	AV	0.0	40.4	54.0	-13.6

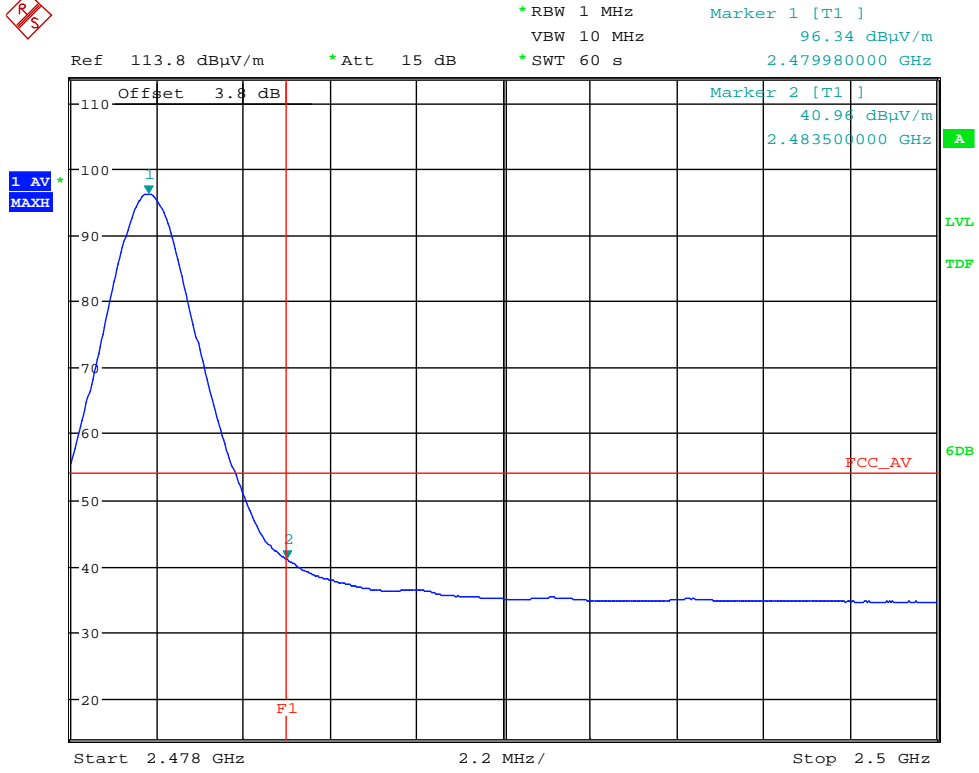
Freq (MHz)	Amplitude (dBµV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBµV/m)	Spec. Limit (dBµV/m)	Compared to Spec. (dB)
7440.175	47.2	7.5	2.13	287.0	0.0	Horz	PK	-9.5	45.2	74.0	-28.8
7439.333	34.2	7.5	2.13	287.0	0.0	Horz	AV	-9.5	32.2	54.0	-21.8
7439.400	46.2	7.5	2.38	255.9	0.0	Vert	PK	-9.5	44.2	74.0	-29.8
7439.342	33.3	7.5	2.38	255.9	0.0	Vert	AV	-9.5	31.3	54.0	-22.7



Date: 23.OCT.2019 20:34:50

2480 MHz upper band edge – peak





Date: 23.OCT.2019 20:36:38

2480 MHz – upper band edge average

## 14 CD06 AC power-line conducted emissions

### 14.1 Test Purpose

This test measures conducted noise that may be present on an EUT's power supply cable. This test ensures the protection of broadcast and telecommunication services used in the vicinity of the EUT. Specifically, but not limited to Long Wave and Medium Wave broadcast.

### 14.2 Test Parameters

Test Chamber:	Transient 1
Test Standard:	FCC CFR 47 part 15B – 15.107 ANSI C63.4:2014
Power Lines Tested:	[1] AC Power
EUT Classification:	Class B
Frequency Range:	150 kHz to 30 MHz
Frequency Step Size:	4.5 kHz
Measurement Bandwidth:	9 kHz
Detectors:	Peak (Pre-scan) Quasi-peak (Final Measurements) CISPR Average (Final Measurements)
Quasi-peak Detector Dwell:	Minimum 2 s per frequency point
LISN Type:	CISPR 16, 50 $\Omega$ // 50 $\mu$ H
EUT Measurement Height:	0.8 m Insulated Support (Table)
EUT Operation Voltage:	120
EUT Operating Frequency:	60
Operating Mode:	Emissions operating mode as defined in section 7.6
Deviations from Standard:	None
Test Result:	Pass

### 14.3 Environmental Conditions

Temperature:	20°C
Humidity:	44% RH

Limits: No specific environmental conditions exist for this test.

## 14.4 Test Limits

### 14.4.1 Class B

<i>Detector</i>	<i>Frequency Range</i>	<i>Limit</i>
Quasi-Peak	150 kHz to 500 kHz	66 dB $\mu$ V to 56 dB $\mu$ V*
	500 kHz to 5 MHz	56 dB $\mu$ V
	5 MHz to 30 MHz	60 dB $\mu$ V
Average	150 kHz to 500 kHz	56 dB $\mu$ V to 46 dB $\mu$ V*
	500 kHz to 5 MHz	46 dB $\mu$ V
	5 MHz to 30 MHz	50 dB $\mu$ V

\*Decreasing Linearly with the logarithm of frequency

## 14.5 Test Method

This test measures conducted noise that may be present on an EUT's power supply cable. This test ensures the protection of broadcast and telecommunication services used in the vicinity of the EUT.

The test setup used complies with all the dimension requirements set out in ANSI C63.4:2014. Reference is made to company procedure RTP1029 and RTP1002. Measurement instrumentation used meets the requirements of CISPR16-1-1:2010 or CISPR 16-1-2:2006 as appropriate, and uncertainties of CISPR 16-4-2:2011. Expanded laboratory uncertainties  $U_{lab}$  are less than or equal to CISPR 16-4-2:2011  $U_{CISPR}$  Table 1. Therefore, no compensation is required to the actual measured level in determining compliance with the applied limit.

An initial scan is carried out in order to establish a frequency list that is attributable to the EUT, using automated R&S EMC32 measurement software. Receiver/analyser scan speed and bandwidth adjustments where applicable are in accordance with the reference standard, appropriate to the intercepted signal being resolved. Any emissions measurements that fall within 20 dB $\mu$ V of the Average or Quasi-Peak limit line are then re-measured using the associated CISPR detector for each frequency of interest.

**14.6 Test Equipment**

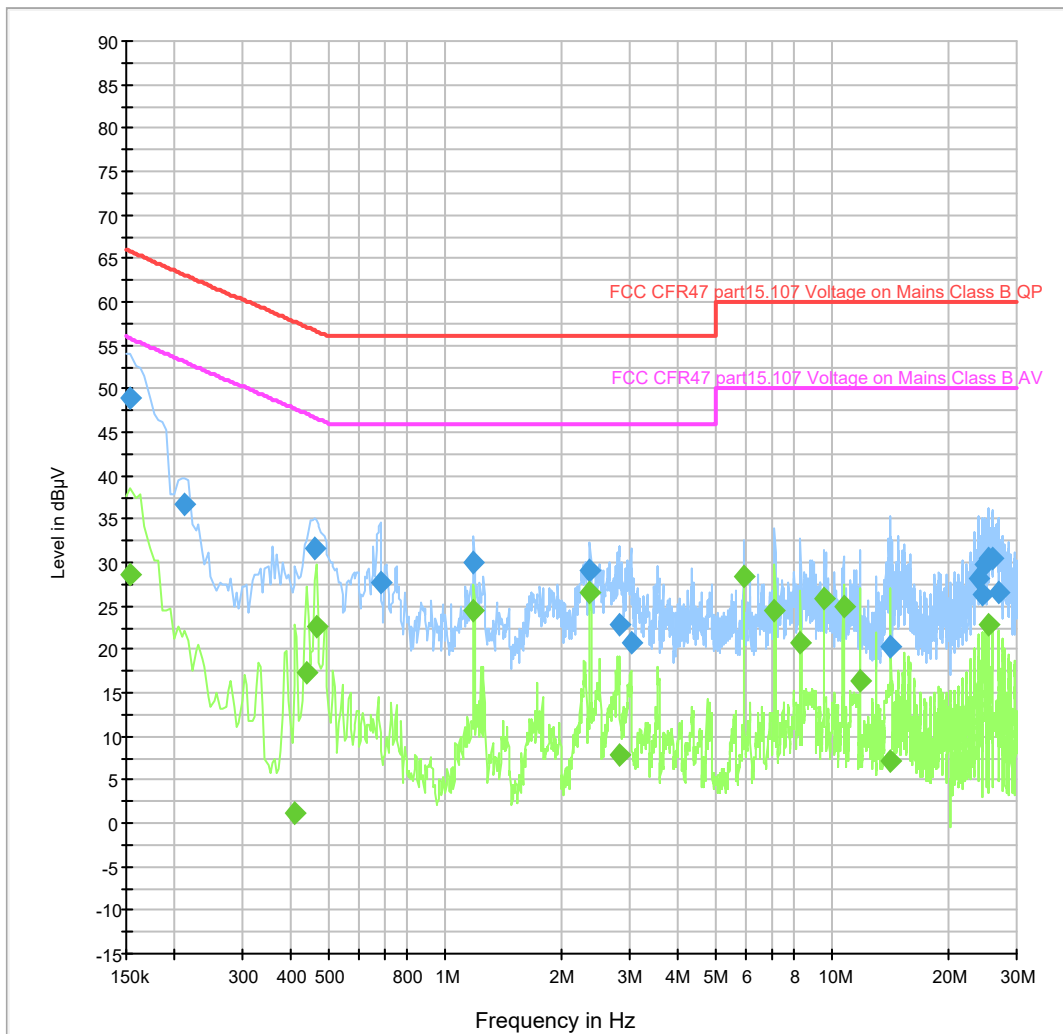
<i>Type of Equipment</i>	<i>Maker/Supplier</i>	<i>Model Number</i>	<i>Serial Number</i>	<i>Element Number</i>	<i>Actual Equipment Used</i>	<i>Calibration Date</i>	<i>Interval</i>
Receiver	Rohde & Schwarz	ESHS10	830051/001	UH03			
Receiver	Rohde & Schwarz	ESHS10	841429/012	UH187	X	29/11/18	1 YEAR
Receiver	Rohde & Schwarz	ESR7	101227	UH456			
Receiver	Rohde & Schwarz	ESR26	101245	UH489			
LISN	Rohde & Schwarz	ESH3-Z5	863906/018	UH05			
LISN	Rohde & Schwarz	ESH3-Z5	8407 31/015	UH195	X	02/10/2019	1 YEAR
LISN	Rohde & Schwarz	ENV216	101027	UH396			
3 Phase LISN	Cranage	VN3-635	001959	UH417			
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	0357.8810.54	UH443	X	17/10/2019	1 YEAR
CH4 N-Type Coaxial Cable	Element	N/A	None	UH445	X	17/10/2019	1 YEAR
Weather Station	Imagtronix	IM1285	NONE	UH466	X	11/07/2019	1 YEAR
L.F. Chamber	Rainford EMC	35685	515-TR-001	UH404	X	N/A	N/A

## 14.7 Test Results

### 14.7.1 Conducted Emissions Test Data

Element Project Number: TRA-046854-03  
 Manufacturer: Dyson  
 Model Name: LightCycle Morph Desk LED Lamp  
 Model Number: CD06  
 Serial Number: E5D-CN-MHA0013A  
 Specification: FCC CFR47 Part 15 Class B  
 Test Location: UH404, UH187, UH443, UH195, UH466, UH445  
 Test Engineer: PRS, MUS  
 Line Tested: Live / Neutral  
 Voltage: 120 V AC  
 Frequency: 60 Hz  
 EUT Mode: EUT Communicating over BLE cycling light every 11 second  
 Modification State: 0  
 Comment: 20C, 44%, 1012mb

Conducted emissions on Mains 9kHz-30MHz ESHS10 + UH195+UH443PL



## EMI Auto Test Template: Conducted emissions on Mains 9kHz-30MHz ESHS10 + UH195+UH443PL

Hardware Setup:	LF Lab CE Voltage on Mains 9kHz-30MHz ESHS10 + UH195+UH443PL
Measurement Type:	2 Line LISN
Frequency Range:	150 kHz - 30 MHz
Graphics Level Range:	-15 dB $\mu$ V - 90 dB $\mu$ V
Preview Measurements:	
Scan Test Template:	Conducted 9kHz-30MHz ESHS10+UH195+UH443PL (Pre+Zoom)
Data Reduction:	
Limit Line #1:	FCC CFR47 part15.107 Voltage on Mains Class B QP
Limit Line #2:	FCC CFR47 part15.107 Voltage on Mains Class B AV
Peak Search:	6 dB , Maximum Results: 20
Subrange Maxima:	20 Subranges , Maxima per Subrange: 1
Maximum Number of Results:	15
After Data Reduction:	Interactive data reduction
Final Measurements:	
Template for Single Meas.:	Conducted 9kHz-30MHz ESHS10+UH195+UH443PL (Final)
Report Settings:	
Report Template:	Commercial CE
Create Electronic Report:	RTF PDF
Document Name:	EMI Report

## Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.154500	48.8	2000.0	10.000	GN	N	9.9	16.9	65.8	
0.213000	36.6	2000.0	10.000	GN	L1	9.9	26.5	63.1	
0.460500	31.5	2000.0	10.000	GN	N	10.0	25.1	56.7	
0.681000	27.7	2000.0	10.000	GN	N	10.0	28.3	56.0	
1.185000	29.9	2000.0	10.000	GN	L1	10.0	26.1	56.0	
2.373000	29.0	2000.0	10.000	GN	N	10.0	27.0	56.0	
2.809500	22.9	2000.0	10.000	GN	L1	10.1	33.1	56.0	
3.016500	20.7	2000.0	10.000	GN	N	10.1	35.3	56.0	
14.221500	20.3	2000.0	10.000	GN	L1	10.8	39.7	60.0	
23.851500	28.2	2000.0	10.000	GN	N	11.2	31.8	60.0	
24.373500	26.2	2000.0	10.000	GN	N	11.3	33.8	60.0	
24.922500	29.7	2000.0	10.000	GN	N	11.3	30.3	60.0	
25.435500	30.4	2000.0	10.000	GN	N	11.3	29.6	60.0	
25.944000	30.5	2000.0	10.000	GN	N	11.3	29.5	60.0	
26.965500	26.6	2000.0	10.000	GN	N	11.3	33.4	60.0	

## Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.154500	28.7	2000.0	10.000	GN	L1	10.0	27.1	55.8	
0.411000	1.2	2000.0	10.000	GN	N	10.0	46.4	47.6	
0.438000	17.3	2000.0	10.000	GN	N	10.0	29.8	47.1	
0.465000	22.6	2000.0	10.000	GN	N	10.0	24.0	46.6	
1.185000	24.5	2000.0	10.000	GN	L1	10.0	21.5	46.0	
2.373000	26.6	2000.0	10.000	GN	N	10.0	19.4	46.0	
2.827500	7.9	2000.0	10.000	GN	L1	10.1	38.1	46.0	
5.932500	28.4	2000.0	10.000	GN	L1	10.2	21.6	50.0	
7.120500	24.5	2000.0	10.000	GN	N	10.3	25.5	50.0	
8.317500	20.7	2000.0	10.000	GN	L1	10.4	29.3	50.0	
9.496500	25.8	2000.0	10.000	GN	L1	10.4	24.2	50.0	
10.689000	25.0	2000.0	10.000	GN	N	10.5	25.0	50.0	
11.877000	16.3	2000.0	10.000	GN	N	10.5	33.7	50.0	
14.221500	7.2	2000.0	10.000	GN	L1	10.8	42.8	50.0	
25.458000	22.8	2000.0	10.000	GN	N	11.3	27.2	50.0	

### 14.8 Test Photograph





## 15 CF06 AC power-line conducted emissions

### 15.1 Test Purpose

This test measures conducted noise that may be present on an EUT's power supply cable. This test ensures the protection of broadcast and telecommunication services used in the vicinity of the EUT. Specifically, but not limited to Long Wave and Medium Wave broadcast.

### 15.2 Test Parameters

Test Chamber:	LF Lab
Test Standard:	FCC CFR 47 part 15B – 15.107 ANSI C63.4:2014
Power Lines Tested:	[1] AC Mains
EUT Classification:	Class B
Frequency Range:	150 kHz to 30 MHz
Frequency Step Size:	4.5 kHz
Measurement Bandwidth:	9 kHz
Detectors:	Peak (Pre-scan) Quasi-peak (Final Measurements) CISPR Average (Final Measurements)
Quasi-peak Detector Dwell:	Minimum 2 s per frequency point
LISN Type:	CISPR 16, 50 $\Omega$ // 50 $\mu$ H
EUT Measurement Height:	0.8 m Insulated Support (Table)
EUT Operation Voltage:	120 V
EUT Operating Frequency:	60 Hz
Operating Mode:	Emissions operating mode as defined in section 7.6
Deviations from Standard:	None
Test Result:	Pass

### 15.3 Environmental Conditions

Temperature:	19.7°C
Humidity:	46% RH

Limits: No specific environmental conditions exist for this test.

## 15.4 Test Limits

### 15.4.1 Class B

<i>Detector</i>	<i>Frequency Range</i>	<i>Limit</i>
Quasi-Peak	150 kHz to 500 kHz	66 dB $\mu$ V to 56 dB $\mu$ V*
	500 kHz to 5 MHz	56 dB $\mu$ V
	5 MHz to 30 MHz	60 dB $\mu$ V
Average	150 kHz to 500 kHz	56 dB $\mu$ V to 46 dB $\mu$ V*
	500 kHz to 5 MHz	46 dB $\mu$ V
	5 MHz to 30 MHz	50 dB $\mu$ V

\*Decreasing Linearly with the logarithm of frequency

## 15.5 Test Method

This test measures conducted noise that may be present on an EUT's power supply cable. This test ensures the protection of broadcast and telecommunication services used in the vicinity of the EUT.

The test setup used complies with all the dimension requirements set out in ANSI C63.4:2014. Reference is made to company procedure RTP1029 and RTP1002. Measurement instrumentation used meets the requirements of CISPR16-1-1:2010 or CISPR 16-1-2:2006 as appropriate, and uncertainties of CISPR 16-4-2:2011. Expanded laboratory uncertainties  $U_{lab}$  are less than or equal to CISPR 16-4-2:2011  $U_{CISPR}$  Table 1. Therefore, no compensation is required to the actual measured level in determining compliance with the applied limit.

An initial scan is carried out in order to establish a frequency list that is attributable to the EUT, using automated R&S EMC32 measurement software. Receiver/analyser scan speed and bandwidth adjustments where applicable are in accordance with the reference standard, appropriate to the intercepted signal being resolved. Any emissions measurements that fall within 20 dB $\mu$ V of the Average or Quasi-Peak limit line are then re-measured using the associated CISPR detector for each frequency of interest.

**15.6 Test Equipment**

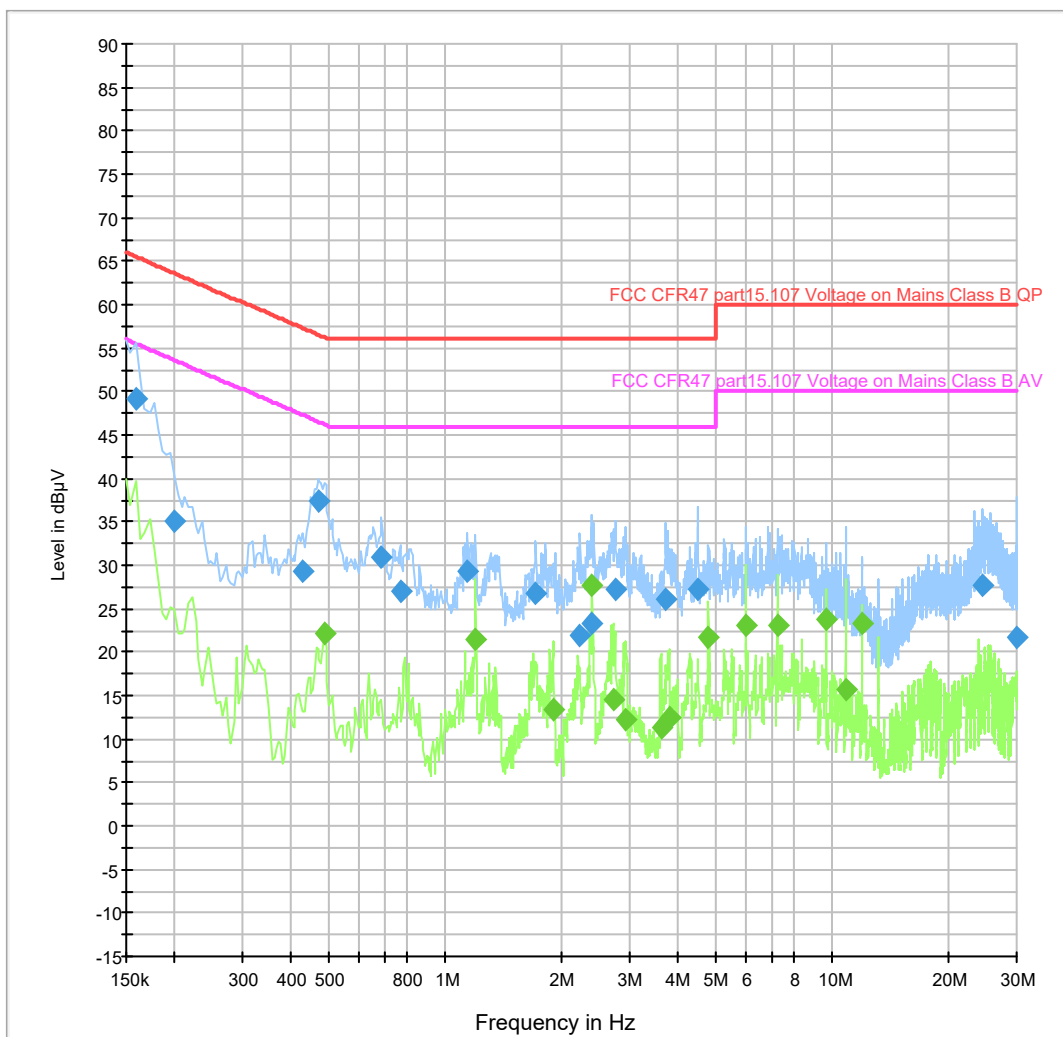
<i>Type of Equipment</i>	<i>Maker/Supplier</i>	<i>Model Number</i>	<i>Serial Number</i>	<i>Element Number</i>	<i>Actual Equipment Used</i>	<i>Calibration Date</i>	<i>Interval</i>
Receiver	Rohde & Schwarz	ESHS10	830051/001	UH03			
Receiver	Rohde & Schwarz	ESHS10	841429/012	UH187	X	29/11/18	1 YEAR
Receiver	Rohde & Schwarz	ESR7	101227	UH456			
Receiver	Rohde & Schwarz	ESR26	101245	UH489			
LISN	Rohde & Schwarz	ESH3-Z5	863906/018	UH05			
LISN	Rohde & Schwarz	ESH3-Z5	8407 31/015	UH195	X	02/10/2019	1 YEAR
LISN	Rohde & Schwarz	ENV216	101027	UH396			
3 Phase LISN	Cranage	VN3-635	001959	UH417			
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	0357.8810.54	UH443	X	17/10/2019	1 YEAR
CH4 N-Type Coaxial Cable	Element	N/A	None	UH445	X	17/10/2019	1 YEAR
Weather Station	Imagtronix	IM1285	NONE	UH466	X	11/07/2019	1 YEAR
L.F. Chamber	Rainford EMC	35685	515-TR-001	UH404	X	N/A	N/A

## 15.7 Test Results

### 15.7.1 Conducted Emissions Test Data

Element Project Number: TRA-046854-03  
 Manufacturer: Dyson  
 Model Name: LightCycle Morph Floor LED Lamp  
 Model Number: CF06  
 Serial Number: E7D-UK-MHA0055A  
 Specification: FCC CFR47 Part 15 Class B  
 Test Location: UH404, UH187, UH443, UH195, UH466, UH445  
 Test Engineer: PRS, MUS  
 Line Tested: Live / Neutral  
 Voltage: 120 V AC  
 Frequency: 60 Hz  
 EUT Mode: EUT Communicating over BLE cycling light every 11 second  
 Modification State: 0  
 Comment: 20C, 44%, 1012mb

Conducted emissions on Mains 9kHz-30MHz ESHS10 + UH195+UH443PL



# EMI Auto Test Template: Conducted emissions on Mains 9kHz-30MHz ESHS10 + UH195+UH443PL

Hardware Setup: LF Lab CE Voltage on Mains 9kHz-30MHz ESHS10 + UH195+UH443PL  
 Measurement Type: 2 Line LISN  
 Frequency Range: 150 kHz - 30 MHz  
 Graphics Level Range: -15 dBµV - 90 dBµV

Preview Measurements:  
 Scan Test Template: Conducted 9kHz-30MHz ESHS10+UH195+UH443PL (Pre+Zoom)

Data Reduction:  
 Limit Line #1: FCC CFR47 part15.107 Voltage on Mains Class B QP  
 Limit Line #2: FCC CFR47 part15.107 Voltage on Mains Class B AV  
 Peak Search: 6 dB , Maximum Results: 20  
 Subrange Maxima: 20 Subranges , Maxima per Subrange: 1  
 Maximum Number of Results: 15  
 After Data Reduction: Interactive data reduction

Final Measurements:  
 Template for Single Meas.: Conducted 9kHz-30MHz ESHS10+UH195+UH443PL (Final)

Report Settings:  
 Report Template: Commercial CE  
 Create Electronic Report: RTF PDF  
 Document Name: EMI Report

## Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.159000	49.2	2000.0	10.000	GN	L1	10.0	16.3	65.5	
0.199500	35.2	2000.0	10.000	GN	N	9.9	28.5	63.6	
0.429000	29.3	2000.0	10.000	GN	L1	10.0	28.0	57.3	
0.469500	37.3	2000.0	10.000	GN	L1	10.0	19.2	56.5	
0.685500	30.9	2000.0	10.000	GN	N	10.0	25.1	56.0	
0.766500	26.9	2000.0	10.000	GN	N	10.0	29.1	56.0	
1.140000	29.3	2000.0	10.000	GN	L1	10.0	26.7	56.0	
1.711500	26.7	2000.0	10.000	GN	L1	10.0	29.3	56.0	
2.238000	22.0	2000.0	10.000	GN	L1	10.0	34.0	56.0	
2.391000	23.3	2000.0	10.000	GN	N	10.0	32.7	56.0	
2.769000	27.2	2000.0	10.000	GN	L1	10.1	28.8	56.0	
3.723000	26.0	2000.0	10.000	GN	L1	10.1	30.0	56.0	
4.479000	27.3	2000.0	10.000	GN	N	10.1	28.7	56.0	
24.513000	27.8	2000.0	10.000	GN	N	11.3	32.2	60.0	
30.000000	21.7	2000.0	10.000	GN	N	11.4	38.3	60.0	

## Final Result 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.487500	22.2	2000.0	10.000	GN	L1	10.0	24.0	46.2	
1.198500	21.5	2000.0	10.000	GN	L1	10.0	24.5	46.0	
1.900500	13.4	2000.0	10.000	GN	N	10.0	32.6	46.0	
2.400000	27.7	2000.0	10.000	GN	N	10.0	18.3	46.0	
2.710500	14.4	2000.0	10.000	GN	L1	10.1	31.6	46.0	
2.935500	12.3	2000.0	10.000	GN	N	10.1	33.7	46.0	
3.610500	11.3	2000.0	10.000	GN	L1	10.1	34.7	46.0	
3.790500	12.5	2000.0	10.000	GN	L1	10.1	33.5	46.0	
4.803000	21.7	2000.0	10.000	GN	L1	10.2	24.3	46.0	
6.004500	23.0	2000.0	10.000	GN	N	10.2	27.0	50.0	
7.215000	23.1	2000.0	10.000	GN	L1	10.3	26.9	50.0	
9.604500	23.8	2000.0	10.000	GN	N	10.4	26.2	50.0	
10.819500	15.7	2000.0	10.000	GN	L1	10.5	34.3	50.0	
12.012000	23.3	2000.0	10.000	GN	L1	10.6	26.7	50.0	

### 15.8 Test Photograph



## 16 AC power-line conducted emissions

### 16.1 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.

### 16.2 Test Parameters

Test Location:	Element Hull
Test Chamber:	Screen Room 2
Test Standard and Clause:	ANSI C63.10-2013, Clause 6.2
EUT Frequency Measured:	2440 MHz
Deviations From Standard:	None
Measurement Detectors:	Quasi-Peak and Average

### Environmental Conditions (Normal Environment)

Temperature: 22 °C	+15 °C to +35 °C (as declared)
Humidity: 48 % RH	20 % RH to 75 % RH (as declared)
Supply: 110 Vac	110 V ac $\pm$ 10 % (as declared)

### 16.3 Test Limit

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 to 30 MHz, shall not exceed the limits in Table 3.

**Table 3 – AC Power Line Conducted Emission Limits**

Frequency (MHz)	Conducted limit (dB $\mu$ V)	
	Quasi-Peak	Average**
0.15 to 0.5	66 to 56 <sup>*</sup>	56 to 46 <sup>*</sup>
0.5 to 5	56	46
5 to 30	60	50

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

\*\*A linear average detector is required.

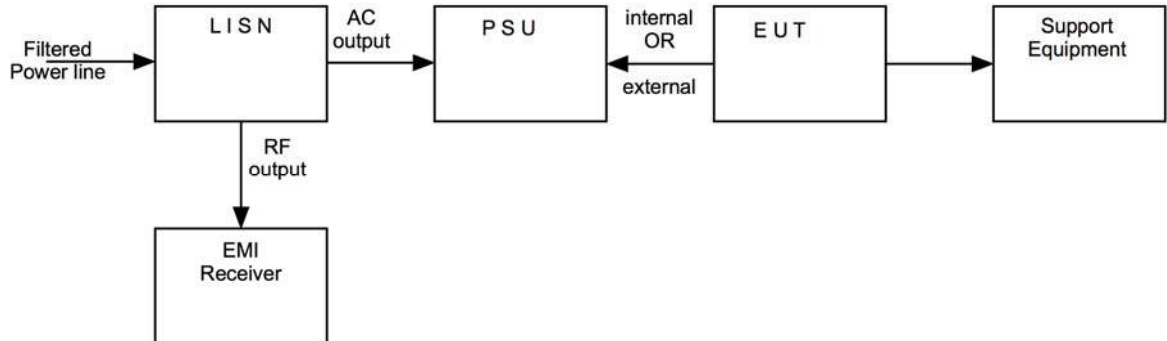
### 16.4 Test Method

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

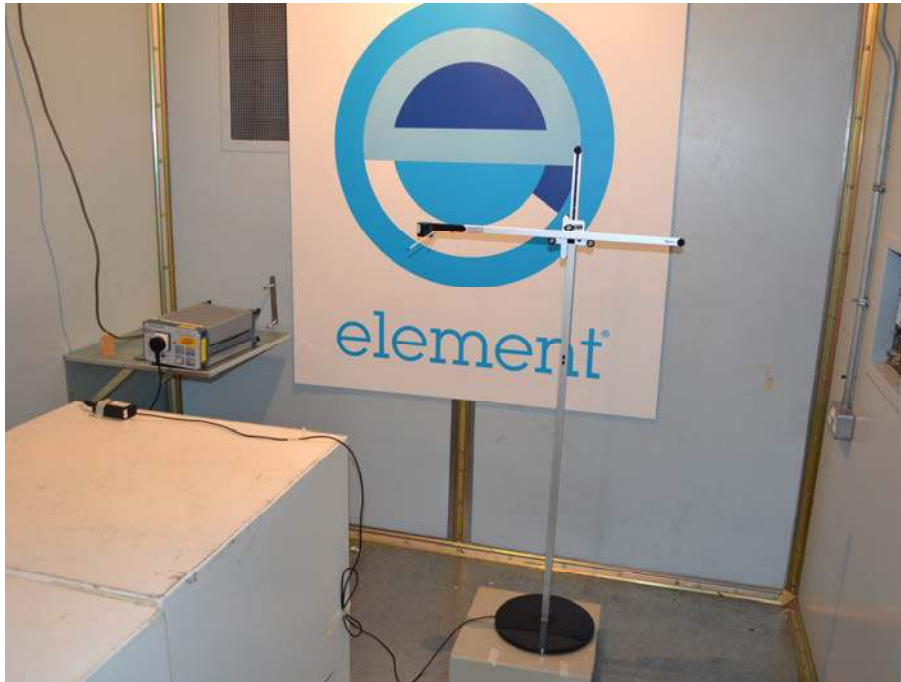
AC power line conducted emissions from the EUT are checked first by preview scans with peak and average detectors covering both live and neutral lines. A spectrum analyzer is used to determine if any periodic emissions are present.

Formal measurements using the correct detectors 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**



### 16.5 Test Set-up Photograph







**16.6 Test Equipment**

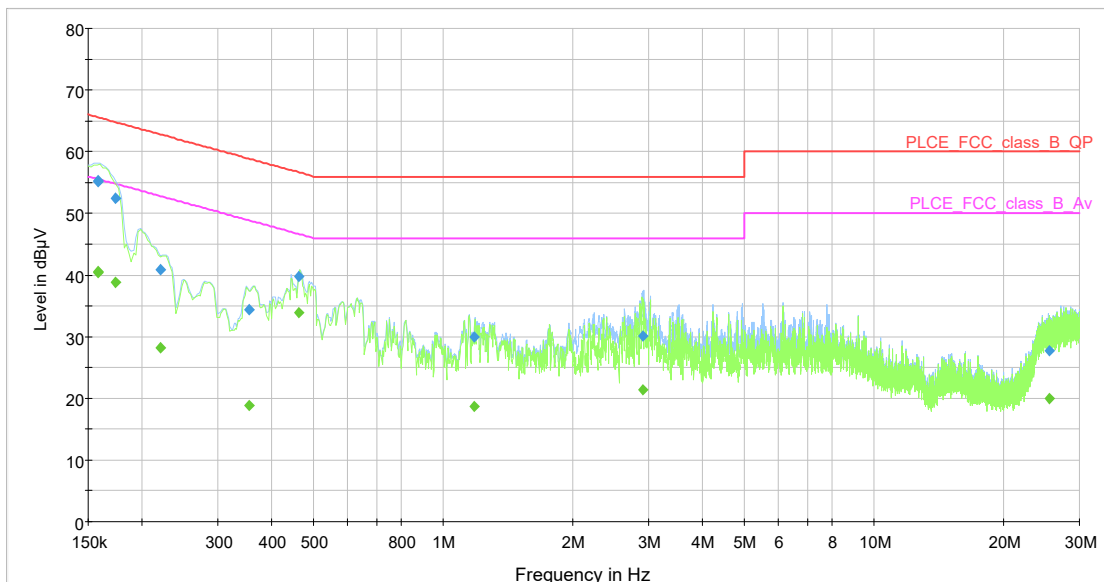
<i>Equipment Description</i>	<i>Manufacturer</i>	<i>Equipment Type</i>	<i>Element No</i>	<i>Due For Calibration</i>
ESC17	R&S	Measuring Receiver	RFG715	2018-11-03
ESH3-Z5	R&S	LISN	RFG732	2019-05-22

### 16.7 Test Results

Sample S22 SN:YR5-US-FBA0037A

Frequency (MHz)	Quasi-Peak (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.158000	55.2	15000.0	9.000	GND	L1	10.1	10.3	65.6
0.158000	55.1	15000.0	9.000	GND	L1	10.1	10.5	65.6
0.173575	52.4	15000.0	9.000	GND	L1	10.1	12.4	64.8
0.221100	40.8	15000.0	9.000	GND	N	10.1	22.0	62.8
0.354350	34.4	15000.0	9.000	GND	N	10.1	24.4	58.9
0.462750	39.8	15000.0	9.000	GND	L1	10.2	16.8	56.6
1.182975	29.9	15000.0	9.000	GND	N	10.2	26.1	56.0
2.908125	30.1	15000.0	9.000	GND	N	10.3	25.9	56.0
25.545000	27.7	15000.0	9.000	GND	L1	11.7	32.3	60.0

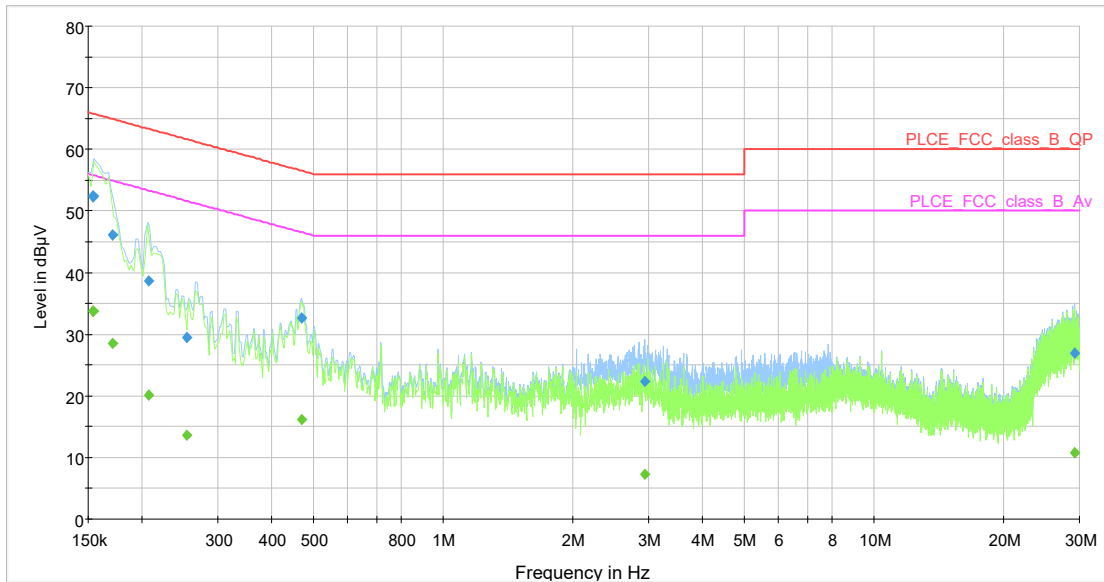
Frequency (MHz)	Average (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.158000	40.4	15000.0	9.000	GND	L1	10.1	15.1	55.6
0.158000	40.6	15000.0	9.000	GND	L1	10.1	15.0	55.6
0.173575	38.8	15000.0	9.000	GND	L1	10.1	16.0	54.8
0.221100	28.2	15000.0	9.000	GND	N	10.1	24.6	52.8
0.354350	18.8	15000.0	9.000	GND	N	10.1	30.1	48.9
0.462750	33.9	15000.0	9.000	GND	L1	10.2	12.8	46.6
1.182975	18.6	15000.0	9.000	GND	N	10.2	27.4	46.0
2.908125	21.3	15000.0	9.000	GND	N	10.3	24.7	46.0
25.545000	20.0	15000.0	9.000	GND	L1	11.7	30.0	50.0



Sample S24 SN:YU2-JP-FBA0057A

Frequency (MHz)	Quasi-Peak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.154000	52.3	15000.0	9.000	GND	N	10.1	13.4	65.8
0.154000	52.4	15000.0	9.000	GND	N	10.1	13.4	65.8
0.171150	46.1	15000.0	9.000	GND	L1	10.1	18.8	64.9
0.207275	38.7	15000.0	9.000	GND	N	10.1	24.6	63.3
0.254325	29.5	15000.0	9.000	GND	L1	10.1	32.1	61.6
0.469175	32.7	15000.0	9.000	GND	N	10.1	23.8	56.5
2.932250	22.4	15000.0	9.000	GND	N	10.3	33.6	56.0
29.197500	27.0	15000.0	9.000	GND	L1	11.5	33.0	60.0

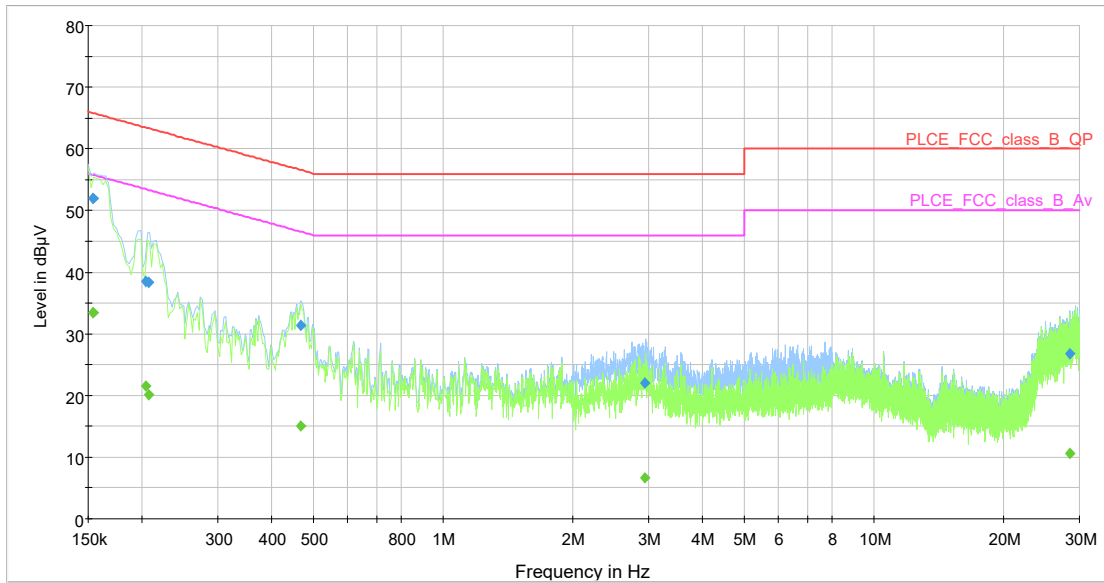
Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.154000	33.7	15000.0	9.000	GND	N	10.1	22.1	55.8
0.154000	33.7	15000.0	9.000	GND	N	10.1	22.0	55.8
0.171150	28.6	15000.0	9.000	GND	L1	10.1	26.3	54.9
0.207275	20.2	15000.0	9.000	GND	N	10.1	33.1	53.3
0.254325	13.6	15000.0	9.000	GND	L1	10.1	38.0	51.6
0.469175	16.1	15000.0	9.000	GND	N	10.1	30.4	46.5
2.932250	7.2	15000.0	9.000	GND	N	10.3	38.8	46.0
29.197500	10.8	15000.0	9.000	GND	L1	11.5	39.2	50.0



S26 SN: YR4-US-FBA0039A

Frequency (MHz)	Quasi-Peak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.154000	51.9	15000.0	9.000	GND	N	10.1	13.9	65.8
0.154000	51.9	15000.0	9.000	GND	N	10.1	13.9	65.8
0.204000	38.4	15000.0	9.000	GND	N	10.1	25.0	63.4
0.207275	38.4	15000.0	9.000	GND	N	10.1	25.0	63.3
0.467600	31.4	15000.0	9.000	GND	N	10.1	25.2	56.6
2.934800	22.0	15000.0	9.000	GND	N	10.3	34.0	56.0
28.547500	26.8	15000.0	9.000	GND	L1	11.5	33.2	60.0

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.154000	33.4	15000.0	9.000	GND	N	10.1	22.4	55.8
0.154000	33.4	15000.0	9.000	GND	N	10.1	22.3	55.8
0.204000	21.6	15000.0	9.000	GND	N	10.1	31.9	53.4
0.207275	20.2	15000.0	9.000	GND	N	10.1	33.2	53.3
0.467600	15.0	15000.0	9.000	GND	N	10.1	31.5	46.6
2.934800	6.7	15000.0	9.000	GND	N	10.3	39.3	46.0
28.547500	10.6	15000.0	9.000	GND	L1	11.5	39.4	50.0



## 17 Occupied Bandwidth

### 17.1 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.

The 99% emission bandwidth is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained.

### 17.2 Test Parameters

Test Location:	Element Hull
Test Chamber:	Wireless Lab 1
Test Standard and Clauses:	6 dB Bandwidth: ANSI C63.10-2013, Clause 11.8 99% Bandwidth: ANSI C63.10-2013, Clause 6.9
EUT Frequencies Measured:	2402 MHz, 2440 MHz & 2480 MHz
Deviations From Standard:	None
Measurement Detector:	Peak

### Environmental Conditions (Normal Environment)

Temperature: 22 °C	+15 °C to +35 °C (as declared)
Humidity: 45 % RH	20 % RH to 75 % RH (as declared)

### 17.3 Test Limit

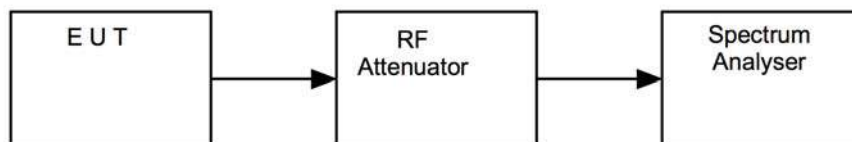
The minimum -6 dB bandwidth shall be at least 500 kHz.

### 17.4 Test Method

With the EUT 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**

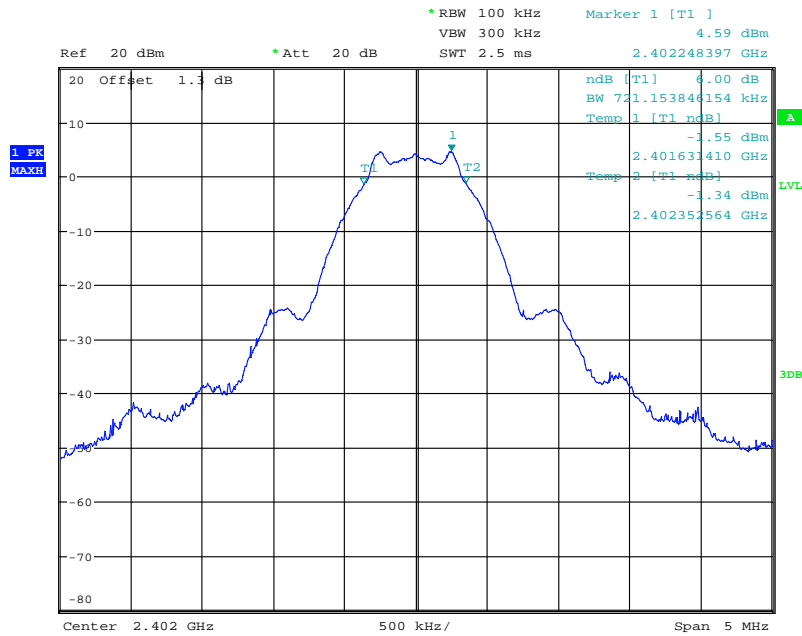


### 17.5 Test Equipment

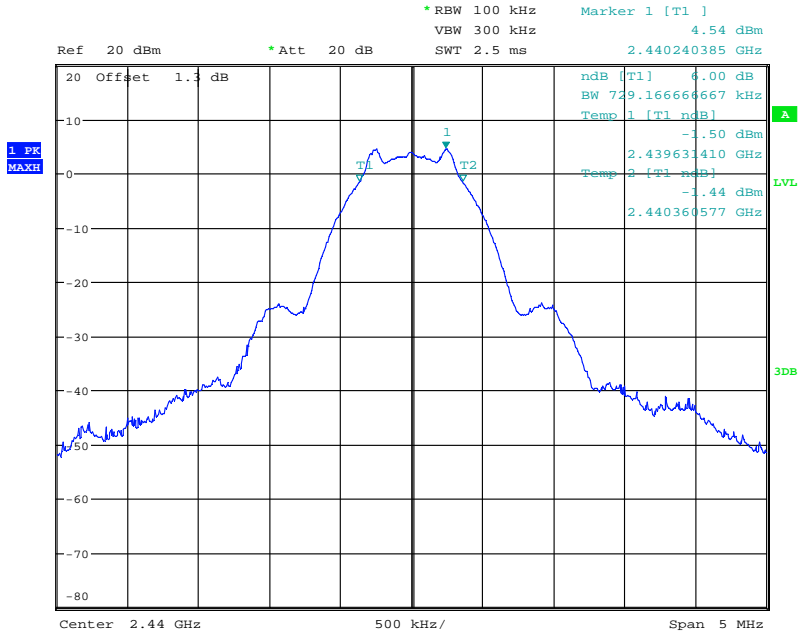
Equipment Description	Manufacturer	Equipment Type	Element No	Due For Calibration
Spectrum Analyser	R&S	FSU26	REF909	2019-06-15

### 17.6 Test Results

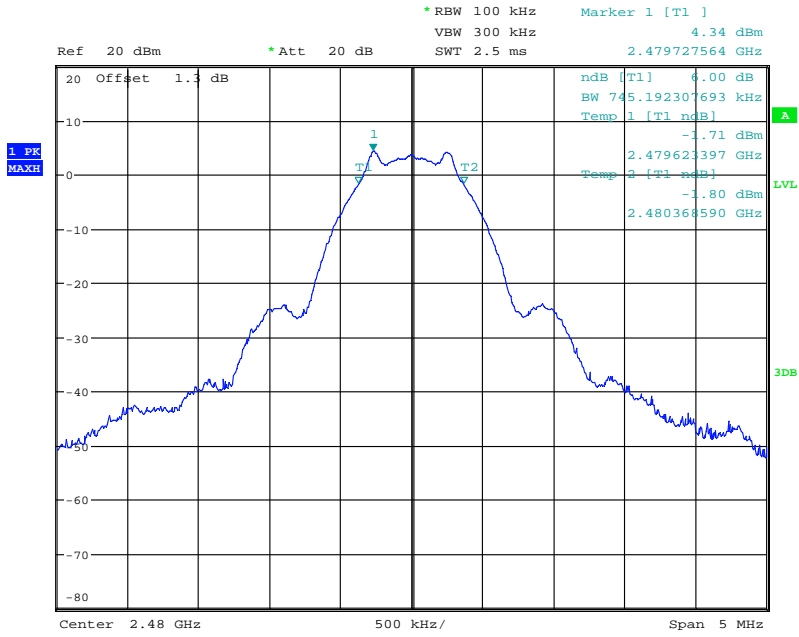
Test: 6 dB Bandwidth; Power Setting: 5 dBm				
Channel Frequency (MHz)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	6dB Bandwidth (kHz)	Result
2402	2401.631410	2402.352564	721.154	PASS
2440	2439.631410	2440.360577	729.167	PASS
2480	2479.623397	2480.368590	745.193	PASS



Date: 26.JUL.2018 16:43:18

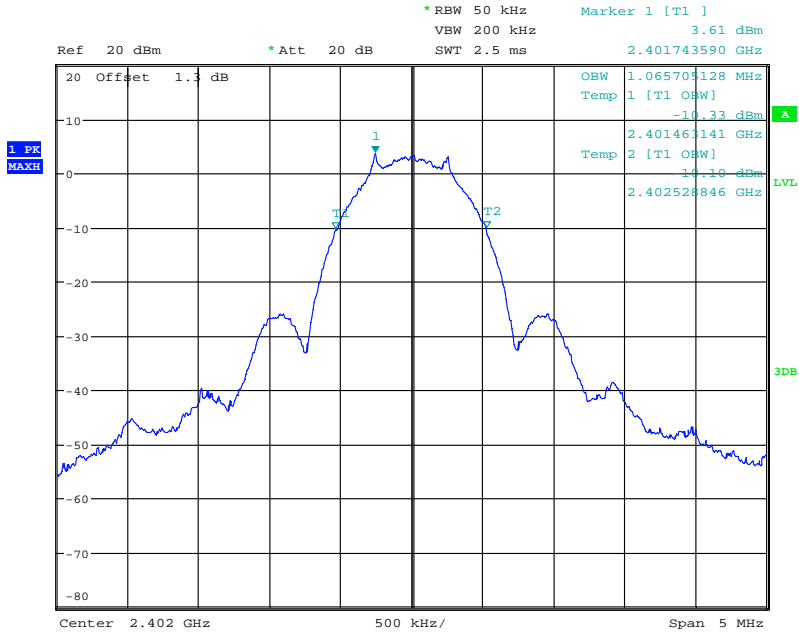


Date: 26.JUL.2018 16:41:07



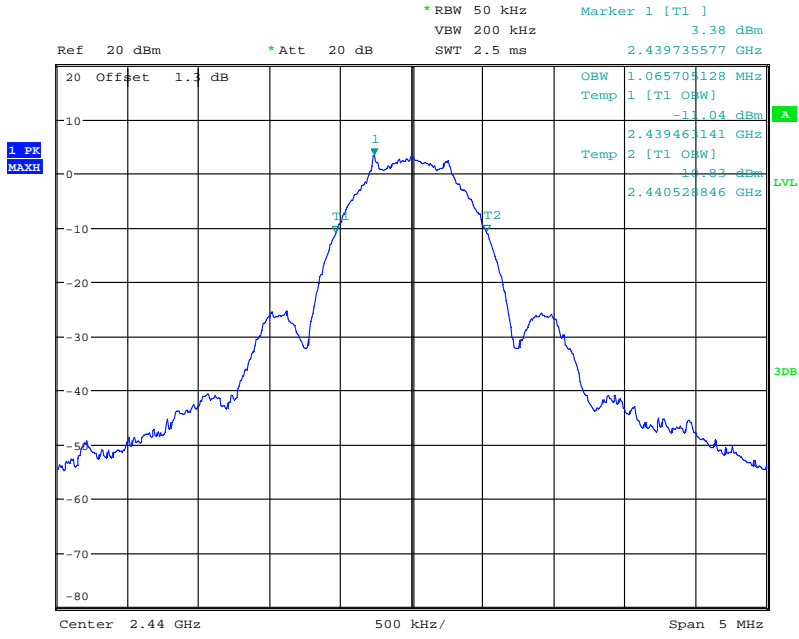
Date: 26.JUL.2018 16:39:37

Test: 99% Bandwidth; Power Setting: 5 dBm				
Channel Frequency (MHz)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	99% Bandwidth (kHz)	Result
2402	2401.463141	2402.528846	1065.705	PASS
2440	2439.463141	2440.528846	1065.705	PASS
2480	2479.463141	2480.528846	1065.705	PASS

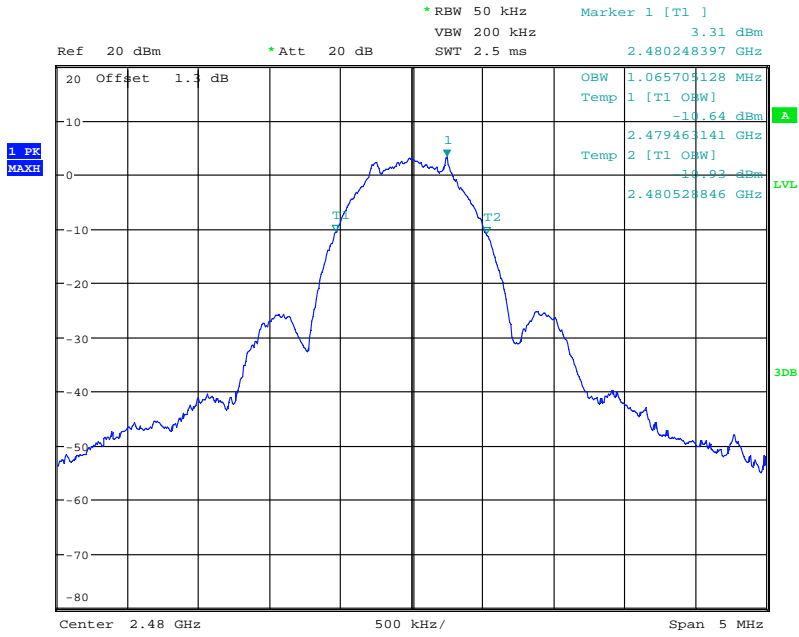


Date: 26.JUL.2018 16:23:31





Date: 26.JUL.2018 16:25:28



Date: 26.JUL.2018 16:37:26

## 18 Maximum peak conducted output power

### 18.1 Definition

The maximum peak conducted output power is defined as the maximum power level measured with a peak detector using a filter with width and shape of which is sufficient to accept the signal bandwidth.

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.

### 18.2 Test Parameters

Test Location:	Element Hull
Test Chamber:	Wireless Lab 1
Test Standard and Clause:	ANSI C63.10-2013, Clause 11.9.1
EUT Frequencies Measured:	2402 MHz, 2440 MHz & 2480 MHz
Deviations From Standard:	None
Measurement Detector:	Peak

### Environmental Conditions (Normal Environment)

Temperature: 22 °C	+15 °C to +35 °C (as declared)
Humidity: 45 % RH	20 % RH to 75 % RH (as declared)

### 18.3 Test Limit

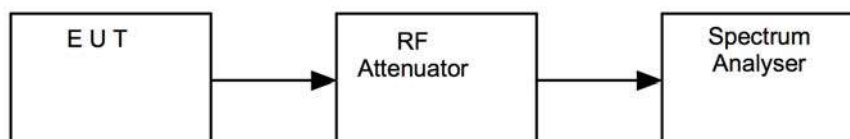
For systems employing digital modulation techniques operating in the bands 902 to 928 MHz, 2400 to 2483.5 MHz and 5725 to 5850 MHz, the maximum peak conducted output power shall not exceed 1 W.

### 18.4 Test Method

With the EUT connected as per Figure iv, the resolution bandwidth of the spectrum analyser was increased above the EUT occupied bandwidth and the peak emission data noted.

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**

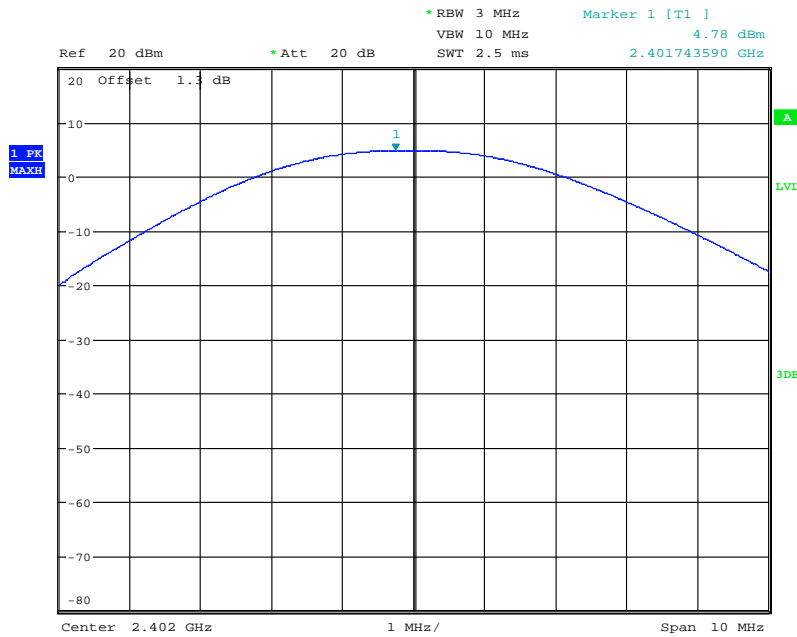


### 18.5 Test Equipment

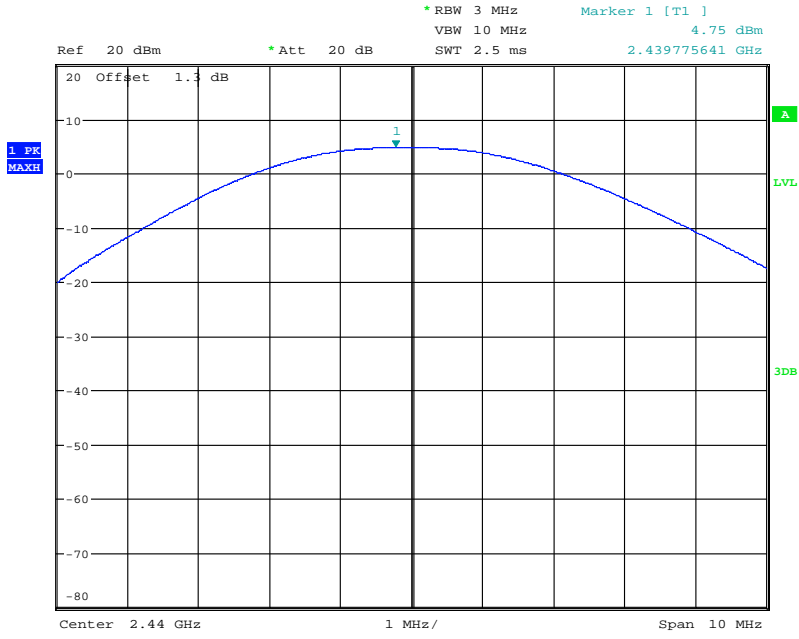
Equipment Description	Manufacturer	Equipment Type	Element No	Due For Calibration
Spectrum Analyser	R&S	FSU26	REF909	2019-06-15

### 18.6 Test Results

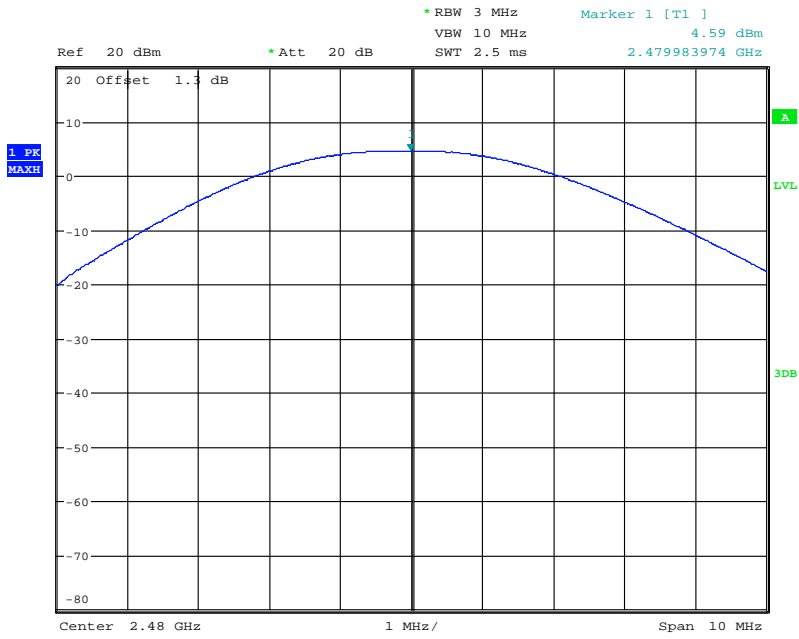
Power Setting: 5 dBm						
Channel Frequency (MHz)	Maximum peak conducted output power		Antenna gain (dBi)	E.I.R.P.		Result
	(dBm)	(W)		(dBm)	(W)	
2402	4.78	0.0030	4.39	9.17	0.0083	PASS
2440	4.75	0.0030	4.39	9.14	0.0082	PASS
2480	4.59	0.0029	4.39	8.98	0.0079	PASS



Date: 26.JUL.2018 17:32:28



Date: 26.JUL.2018 18:15:08



Date: 26.JUL.2018 17:34:13

## 19 CD06 / CF06 Maximum peak conducted output power

### 19.1 Definition

The maximum peak conducted output power is defined as the maximum power level measured with a peak detector using a filter with width and shape of which is sufficient to accept the signal bandwidth.

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.

### 19.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Laboratory
Test Standard and Clause:	ANSI C63.10-2013, Clause 11.9.1
EUT Frequencies Measured:	2402 MHz, 2440 MHz, 2480 MHz
Deviations From Standard:	None
Measurement Detector:	Peak

### Environmental Conditions (Normal Environment)

Temperature: 22 °C	+15 °C to +35 °C (as declared)
Humidity: 45 % RH	20 % RH to 75 % RH (as declared)

### 19.3 Test Limit

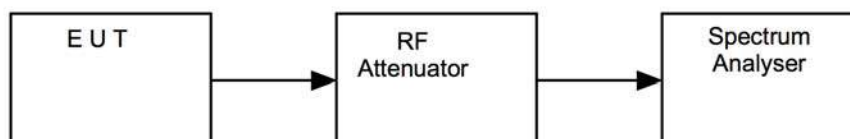
For systems employing digital modulation techniques operating in the bands 902 to 928 MHz, 2400 to 2483.5 MHz and 5725 to 5850 MHz, the maximum peak conducted output power shall not exceed 1 W.

### 19.4 Test Method

With the EUT connected as per Figure iv, the resolution bandwidth of the spectrum analyser was increased above the EUT occupied bandwidth and the peak emission data noted.

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**

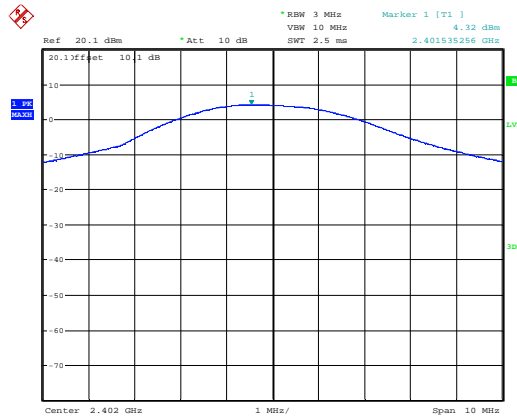


**19.5 Test Equipment**

Equipment Description	Manufacturer	Equipment Type	Element No	Due For Calibration
Spectrum Analyser	R&S	FSU26	REF909	2020-06-21
Attenuator	AtlanTecRF Microwave	10dB SMA	U633	In Use

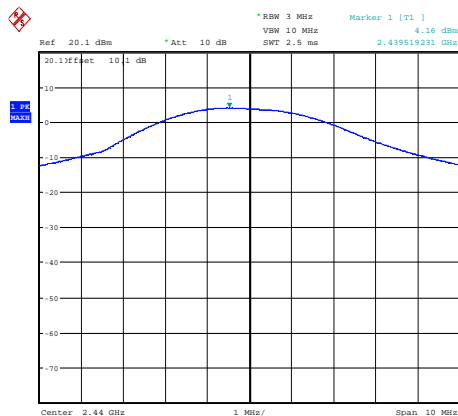
**19.6 Test Results**

Power Setting: 5 dBm						
Channel Frequency (MHz)	Maximum peak conducted output power		Antenna gain (dBi)	E.I.R.P.		Result
	(dBm)	(W)		(dBm)	(W)	
2402	4.32	0.00270	4.4	8.72	0.00745	PASS
2440	4.16	0.00261	4.4	8.56	0.00718	PASS
2480	3.89	0.00245	4.4	8.29	0.00675	PASS



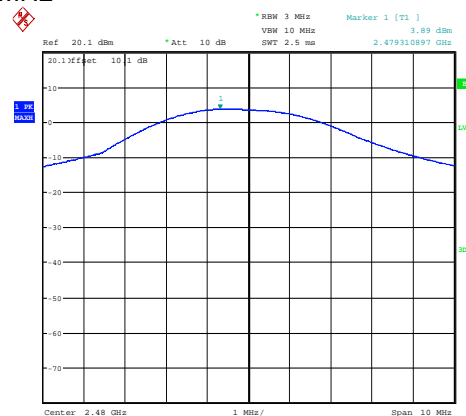
Date: 23.OCT.2019 17:20:54

**2402 MHz**



Date: 23.OCT.2019 17:30:32

**2440 MHz**



Date: 23.OCT.2019 17:31:56

**2480 MHz**

## 20 Out-of-band and conducted spurious emissions

### 20.1 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.

### 20.2 Test Parameters

Test Location:	Element Hull
Test Chamber:	Wireless Lab 1
Test Standard and Clause:	ANSI C63.10-2013, Clause 11.11
EUT Frequencies Measured:	2402 MHz, 2440 MHz & 2480 MHz
Deviations From Standard:	None
Measurement BW:	100 kHz
Spectrum Analyzer Video BW:	300 kHz
Measurement Detector:	Peak
Measurement Range:	9 kHz to 25 GHz

### Environmental Conditions (Normal Environment)

Temperature: 22 °C	+15 °C to +35 °C (as declared)
Humidity: 45 % RH	20 % RH to 75 % RH (as declared)

### 20.3 Test Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits.

If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB.

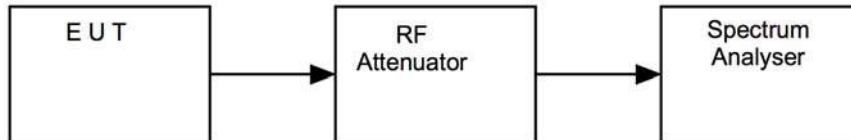
Attenuation below the general field strength limits specified in FCC 47CFR15.209 (a) / RSS-Gen is not required.

## 20.4 Test Method

With the EUT connected as per Figure v, 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 v Test Setup**

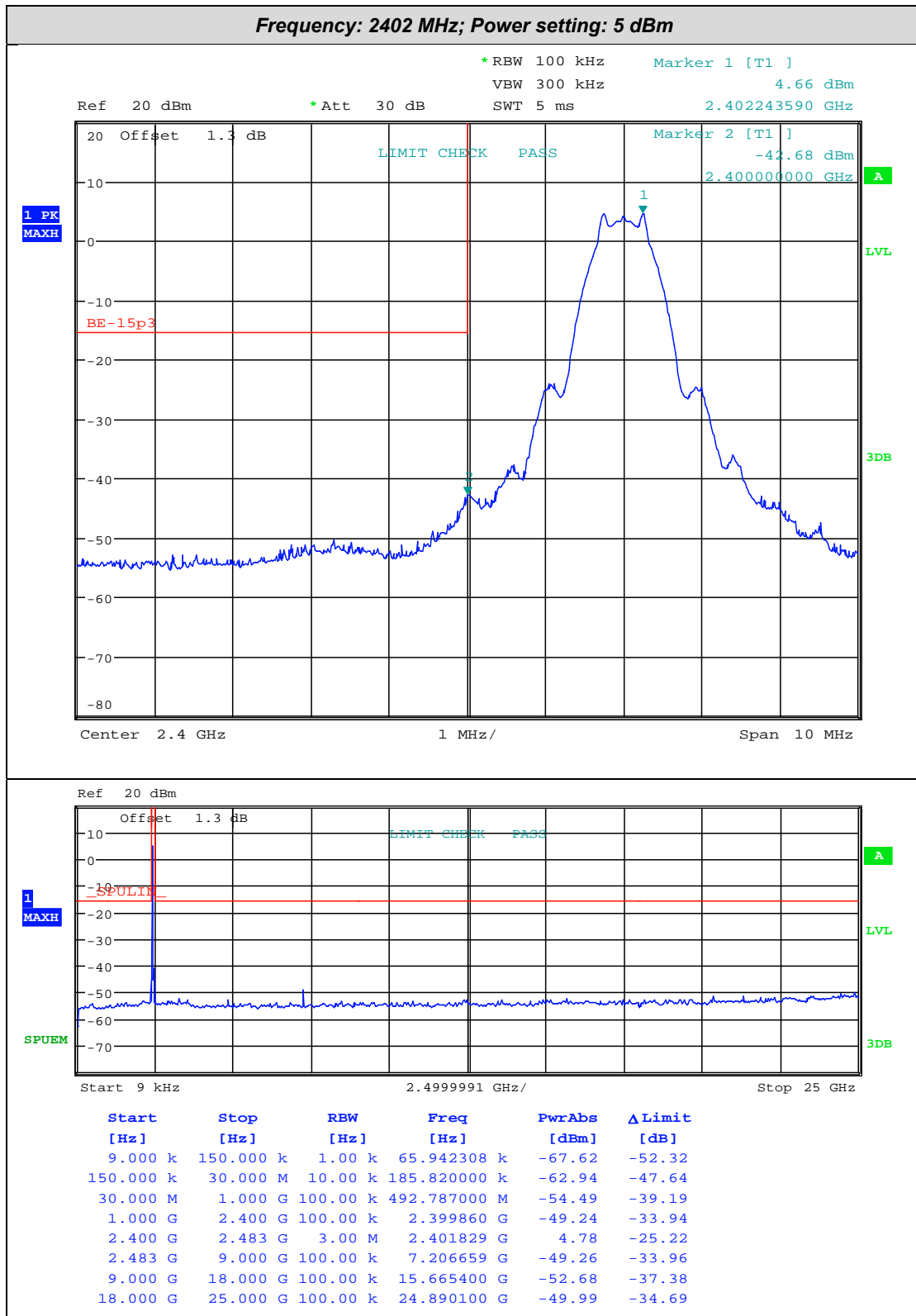


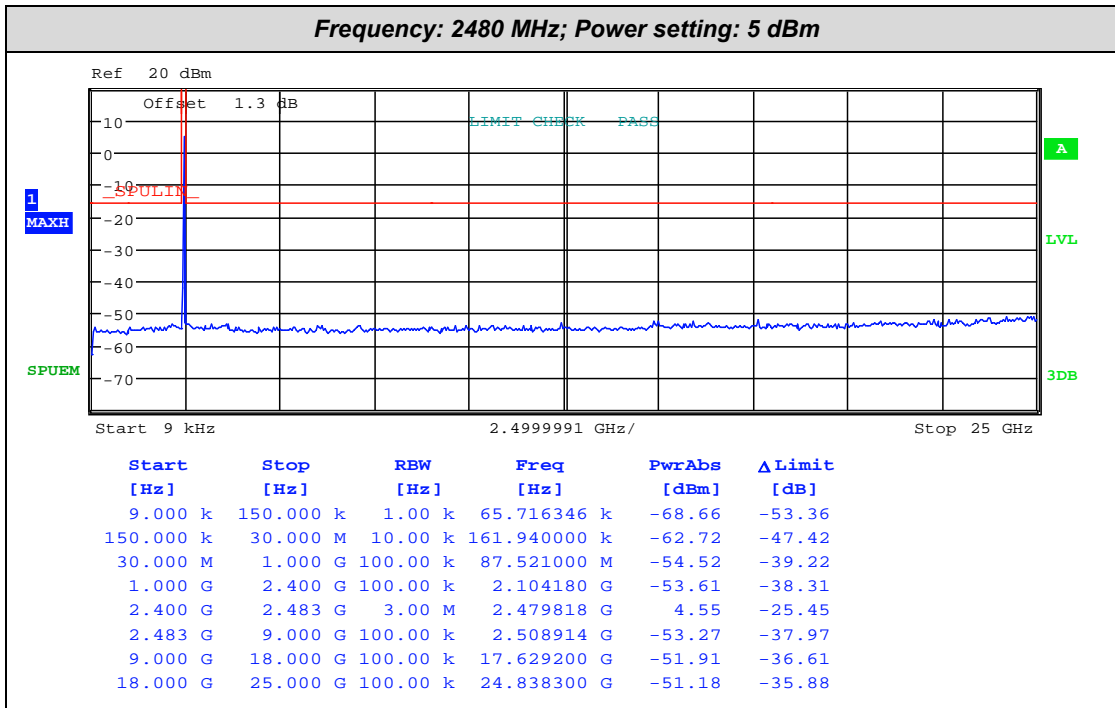
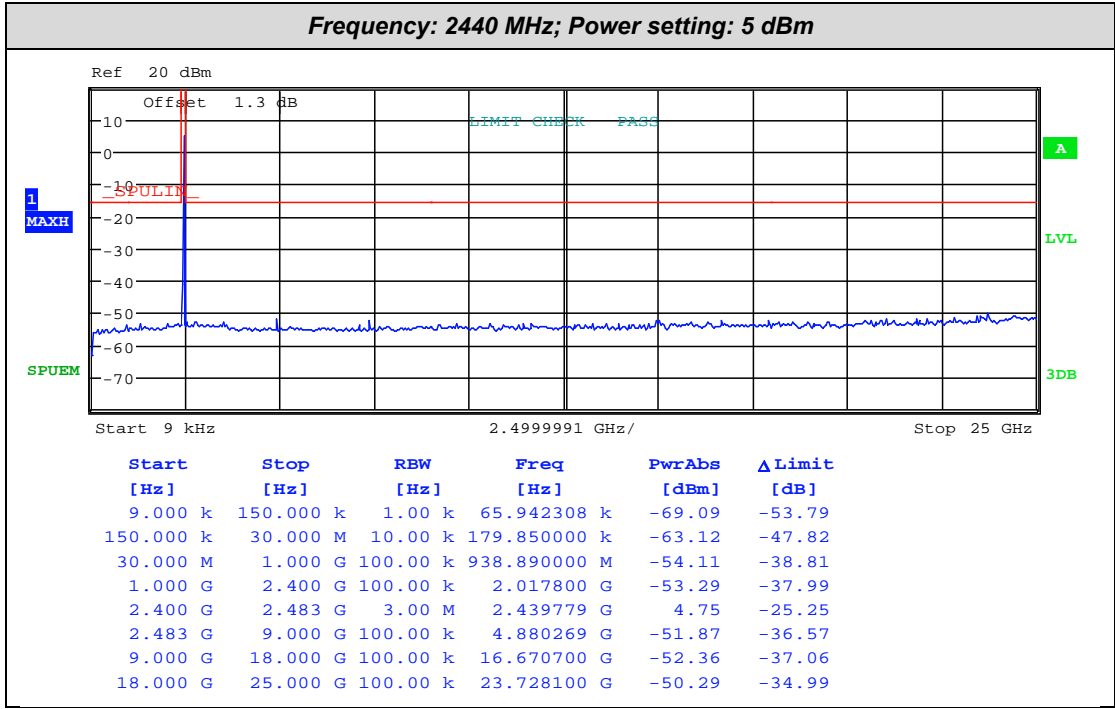
## 20.5 Test Equipment

<i>Equipment Description</i>	<i>Manufacturer</i>	<i>Equipment Type</i>	<i>Element No</i>	<i>Due For Calibration</i>
Spectrum Analyser	R&S	FSU26	REF909	2019-06-15



### 20.6 Test Results





## 21 Power spectral density

### 21.1 Definition

The power per unit bandwidth.

### 21.2 Test Parameters

Test Location:	Element Hull
Test Chamber:	Wireless Lab 1
Test Standard and Clause:	ANSI C63.10-2013, Clause 11.10
EUT Frequencies Measured:	2402 MHz, 2440 MHz & 2480 MHz
Deviations From Standard:	None
Measurement Detector:	Peak

### Environmental Conditions (Normal Environment)

Temperature: 22 °C	+15 °C to +35 °C (as declared)
Humidity: 45 % RH	20 % RH to 75 % RH (as declared)

### 21.3 Test Limit

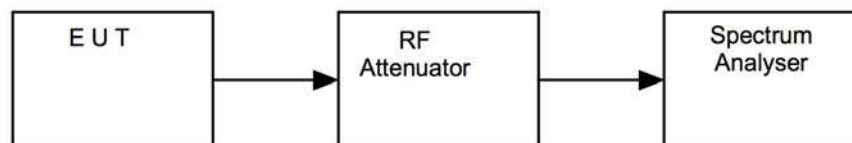
The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### 21.4 Test Method

With the EUT connected as per Figure vi, 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 vi Test Setup**

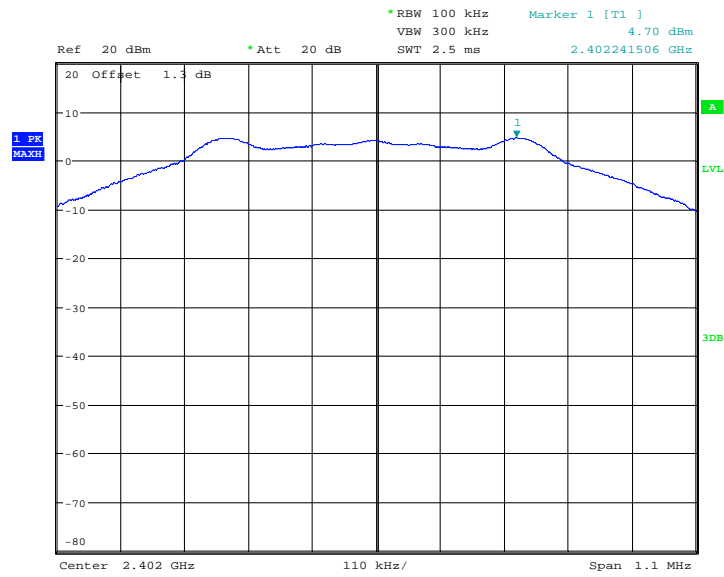


### 21.5 Test Equipment

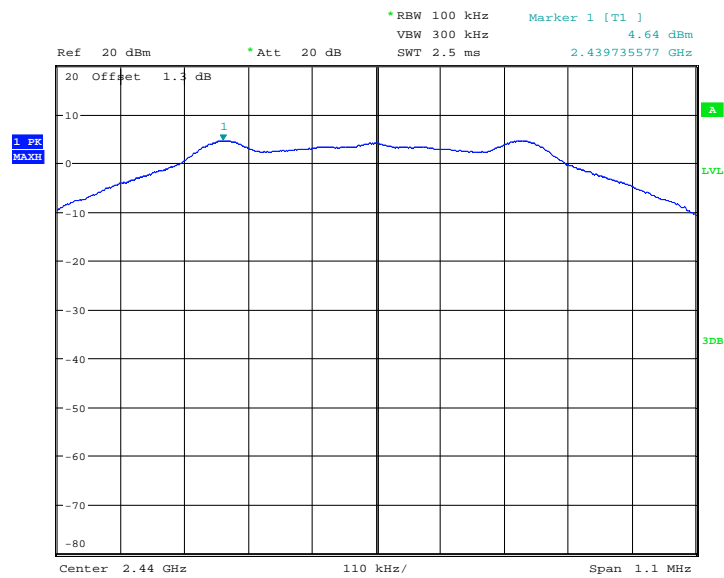
<i>Equipment Description</i>	<i>Manufacturer</i>	<i>Equipment Type</i>	<i>Element No</i>	<i>Due For Calibration</i>
Spectrum Analyser	R&S	FSU26	REF909	2019-06-15

21.6 Test Results

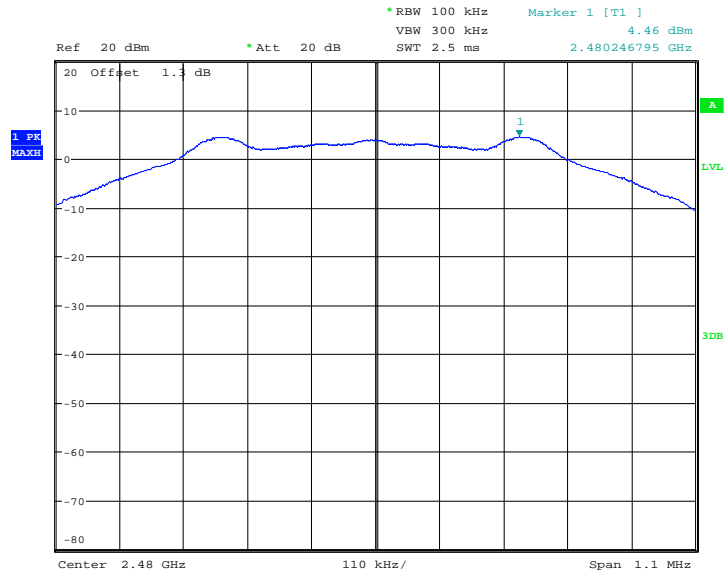
Power Setting: 5 dBm				
Channel Frequency (MHz)	Analyzer Level (dBm)	Cable loss (dB)	Power (dBm)	Result
2402	4.70	0.0	4.70	PASS
2440	4.64	0.0	4.64	PASS
2480	4.46	0.0	4.46	PASS



Date: 26.JUL.2018 18:23:20



Date: 26.JUL.2018 18:20:49



Date: 26.JUL.2018 18:26:22

## 22 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 (30 MHz to 1 GHz) = **4.75 dB**

Uncertainty in test result (1 GHz to 18 GHz) = **4.46 dB**

#### [2] AC power line conducted emissions

Uncertainty in test result = **3.2 dB**

#### [3] Occupied bandwidth

Uncertainty in test result = **15.58 %**

#### [4] Conducted carrier power

Uncertainty in test result (Power Meter) = **0.93 dB**

#### [5] Conducted RF power out-of-band

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

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

#### [6] Radiated RF power out-of-band

Uncertainty in test result (30 MHz to 1 GHz) = **4.75 dB**

Uncertainty in test result (1 GHz to 18 GHz) = **4.46 dB**

#### [7] Power spectral density

Uncertainty in test result (Spectrum Analyser) = **3.11 dB**

#### [8] ERP / EIRP

Uncertainty in test result (Laboratory) = **4.71 dB**

Uncertainty in test result (Pershore OATS) = **4.26 dB**

## 23 RF Exposure

### General SAR test reduction and exclusion guidance 447498

**KDB**

#### Section 4.3 General SAR test reduction and exclusion guidance

For Standalone SAR exclusion consideration, when the considering SAR exclusion Threshold requirement in KDB 447498 is satisfied standalone SAR evaluation for general population exposure conditions by measurement or numerical simulation is not required.

In the frequency range below 100 MHz to 6 GHz and test separation distance of 50mm, the SAR Test Exclusion Threshold will be determined as follows

SAR Exclusion Threshold (SARET)

SAR Exclusion Threshold = Step 1 + Step 2

#### Step 1

$$NT = [(MP/TSD^A) * \sqrt{f_{GHz}}]$$

NT = Numeric Threshold (3.0 for 1-g SAR and 7.5 for 10-g SAR)  
 MP = Max Power of channel (mW) (inc tune up)  
 TSD<sup>A</sup> = Min Test separation Distance or 50mm (whichever is lower) = 20  
 f<sub>GHz</sub> = Transmit frequency (or 100MHz if lower) = 2405

We can transpose this formula to allow us to find the maximum power of a channel allowed and compare this to the measured maximum power.

$$MP = [(NT \times TSD^A) / \sqrt{f_{GHz}}]$$

For Distances Greater than 50 mm Step 2 applies

#### Step 2

$$(TSD^B - 50mm) * f_{(MHz)}/150$$

Where:

f<sub>MHz</sub> = Transmit frequency  
 TSD<sup>B</sup> = Min Test separation Distance (mm) = 20

$$\begin{aligned}
 \text{SARET} &= \{ [(NT \times TSD^A) / \sqrt{f_{GHz}}] + (TSD^B - 50) * (2405/150) \} \\
 \text{SARET} &= \{ [(3.0 \times 20) / \sqrt{2405}] + (20 - 50) * (2405/150) \} \\
 \text{SARET} &= (1.22 + -481) \\
 \text{SARET} &= 479.77 \text{ mW}
 \end{aligned}$$

The calculated output power is 8.3 mW (eirp) is less than the SAR Exclusion Threshold of 479.77 mW, at 20mm test separation distance, for general population and uncontrolled exposure.

Therefore standalone SAR evaluation for general population exposure conditions by measurement or numerical simulation is not required.