

Report on the Radio Testing  
For  
Dyson Technology Ltd  
on  
LightCycle Desk/Floor LED Lamp  
Report no. TRA-041476-45-02A  
29 October 2018

RF915 5.0

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

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: 2018-07-19 to 2018-08-07

Written by:



David Garvey  
Radio Test Engineer

Approved by:

Date: 29 October 2018

John Charters  
Department Manager - Radio

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	29 October 2018	Original

## 2 Summary

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

WORKS ORDER NUMBER: TRA-041476-02

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 NUMBER: YR5-US-FBA0037A, YU2-JP-FBA0057A, YR4-US-FBA0039A

MANUFACTURER/AGENT: Dyson Technology Ltd

ADDRESS: Tetbury Hill  
Malmesbury  
Wiltshire  
SN16 0RP  
United Kingdom

CLIENT CONTACT: Neil Taylor  
☎ 01666 834364  
✉ neil.taylor@dyson.com

ORDER NUMBER: 450041641

TEST DATE: 2018-07-19 to 2018-08-07

TESTED BY: David Garvey  
Radio Test Engineer  
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).

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## 4 Introduction

This report TRA-041476-45-02A 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 detailed below.

<input checked="" type="checkbox"/>	Element Hull Unit E South Orbital Trading Park Hedon Road Hull HU9 1NJ UK	<input 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.

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
- Model Number: CD04, CD05 and CF04
- 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.

#### **7.3.2 Reception**

The mode of operation for receiver tests was a receiving mode on the frequencies indicated.

## 7.4 EUT Radio Parameters

### 7.4.1 General

<b>Frequency of operation:</b>	2402-2480 MHz
<b>Modulation type(s):</b>	GFSK
<b>Occupied channel bandwidth(s):</b>	1 MHz
<b>Channel spacing:</b>	2 MHz
<b>Declared output power(s):</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>	2402-2480 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. Three models were submitted for tested were the CD04, CD05 and CF04. The CD04 and CD05 were both deck lamps and the CF04 was a floor lamp. All lamps tested shared the same radio board.

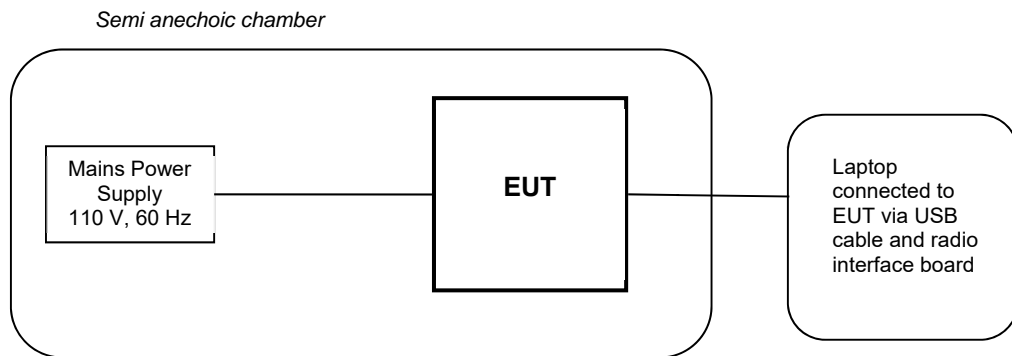
## **8 Modifications**

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:



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 Channels / Frequencies Measured:	Low / Mid / High – 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 $\pm$ 10 % (as declared)

### 11.3 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

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

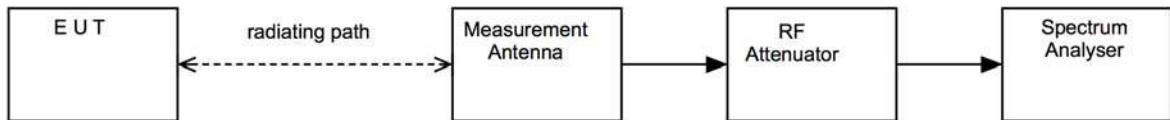
#### 11.4 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure 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.

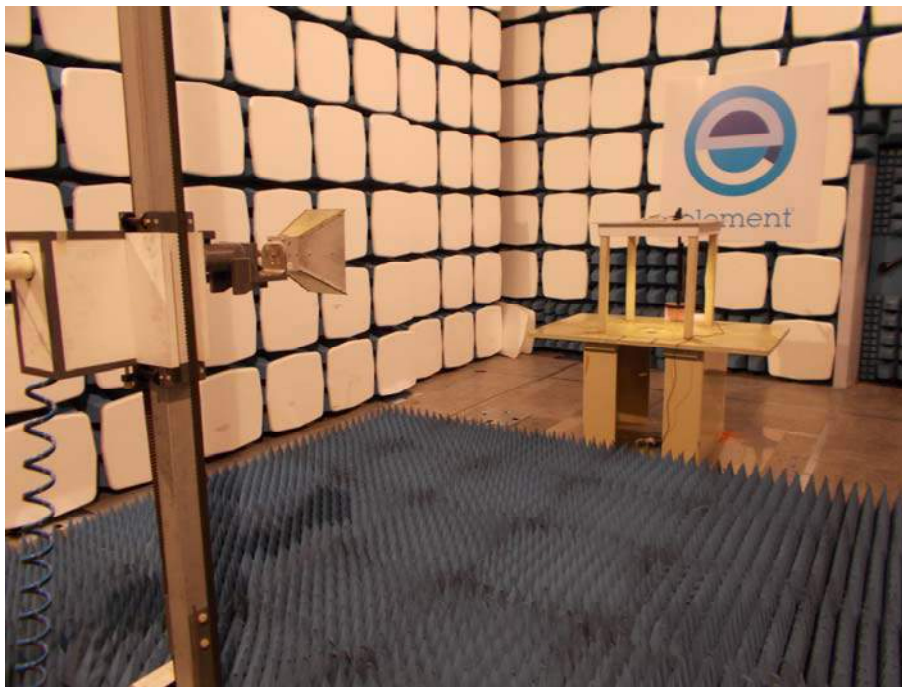
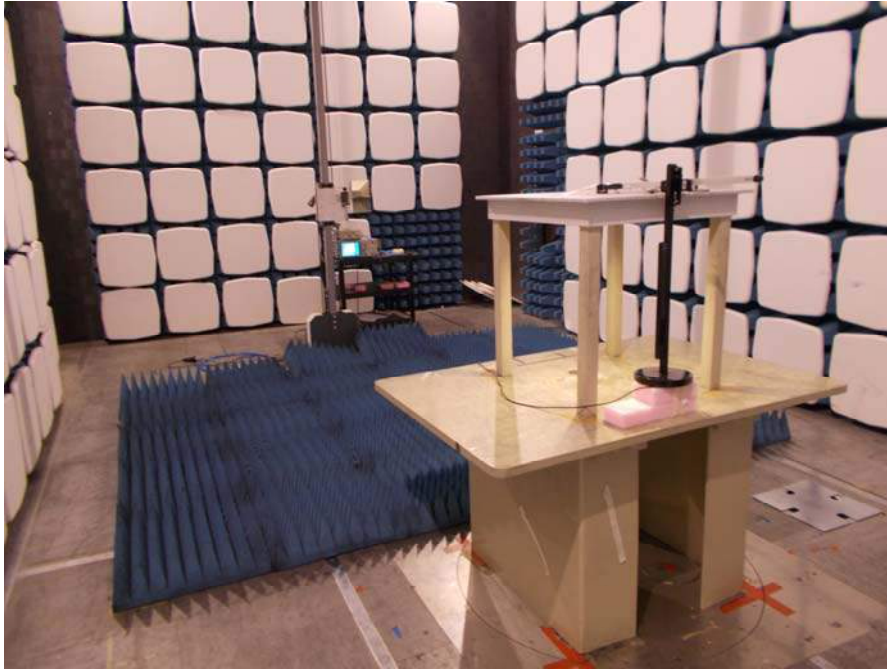
Pre-scan plots are shown with a peak detector and 100 kHz RBW.

**Figure viii Test Setup**



**Test Setup Photograph(s)**





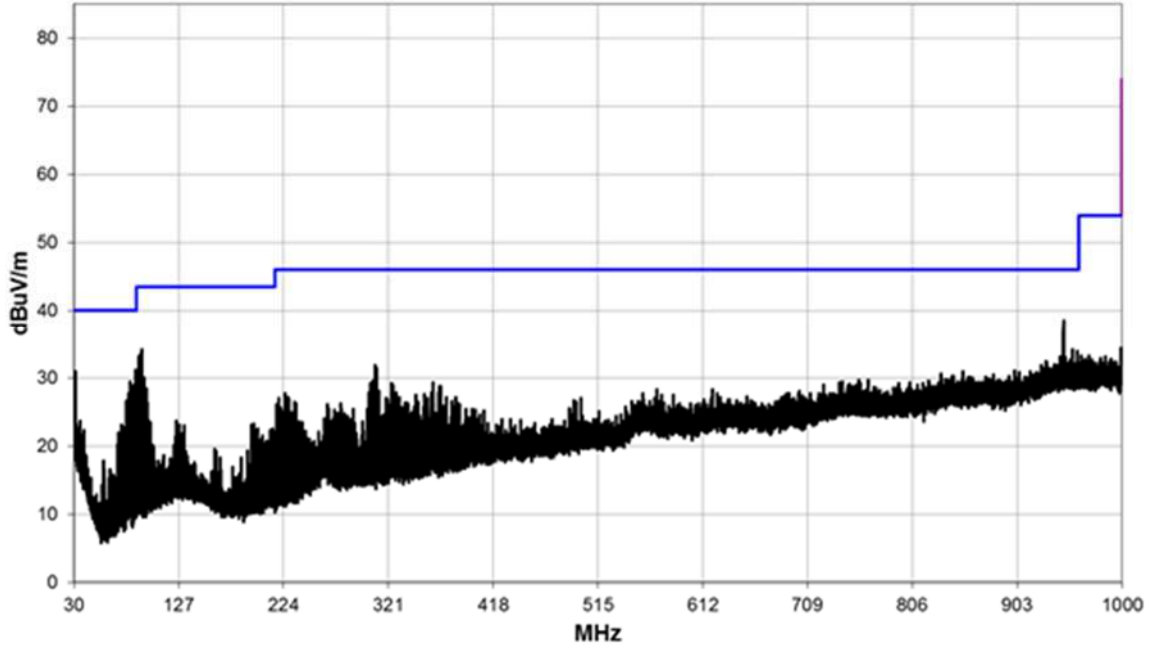
**11.5 Test Equipment**

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

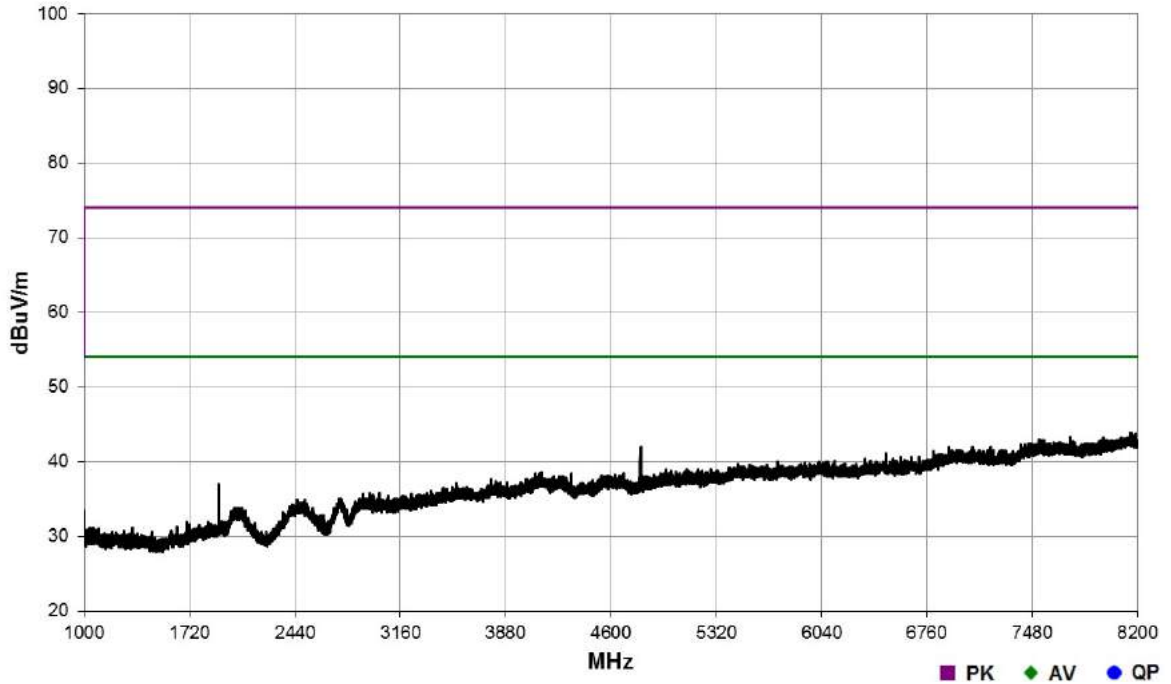
### 11.6 Test Results

Sample S22 CF04 SN:YR5-US-FBA0037A; Channel: 2402 MHz; Modulation: GFSK; Data Rate: 1 Mbps; Power Setting: 5 dBm						
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.						

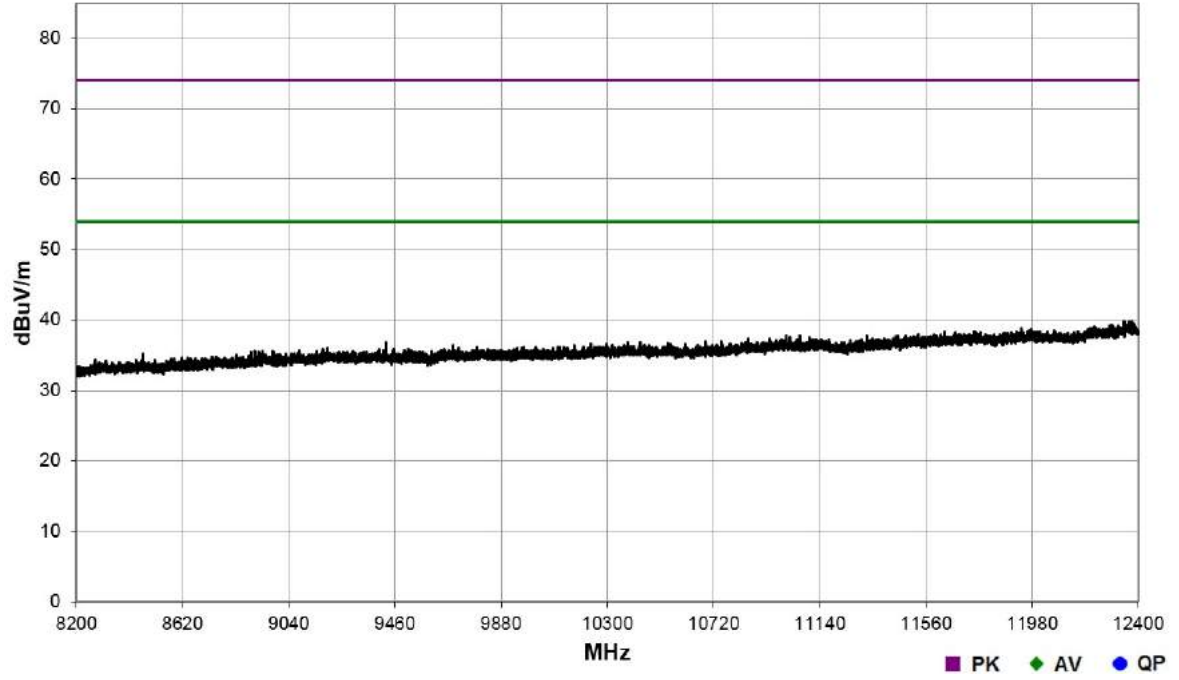
30 MHz to 1 GHz



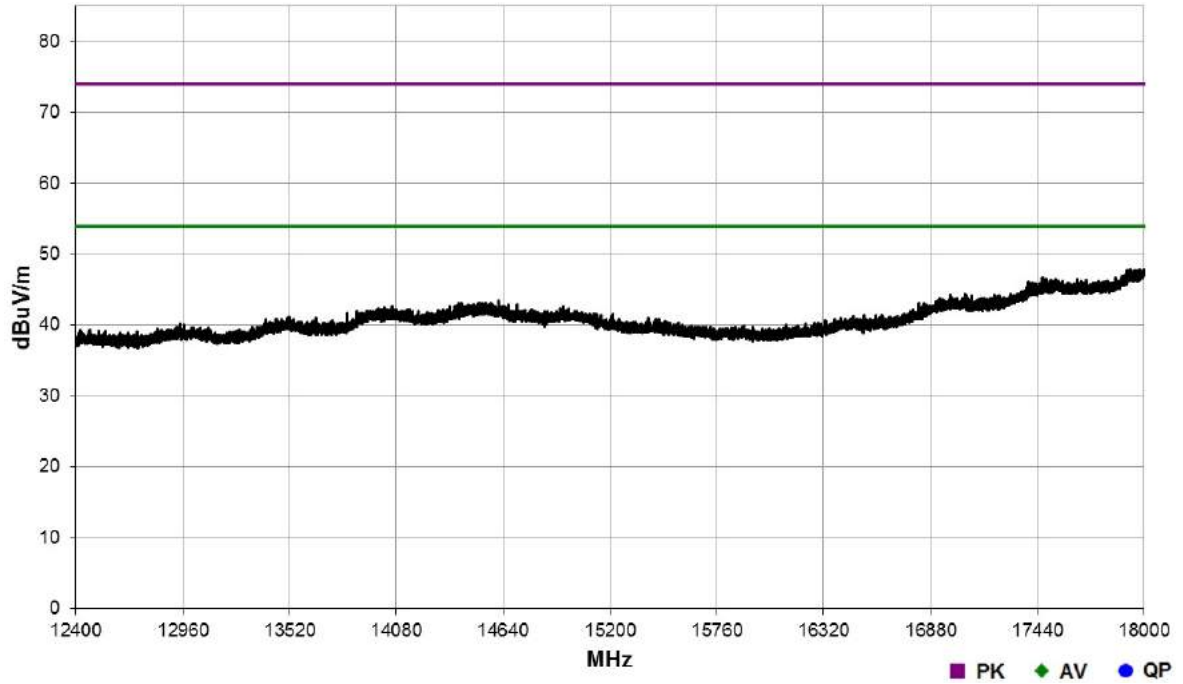
1 GHz to 8.2 GHz



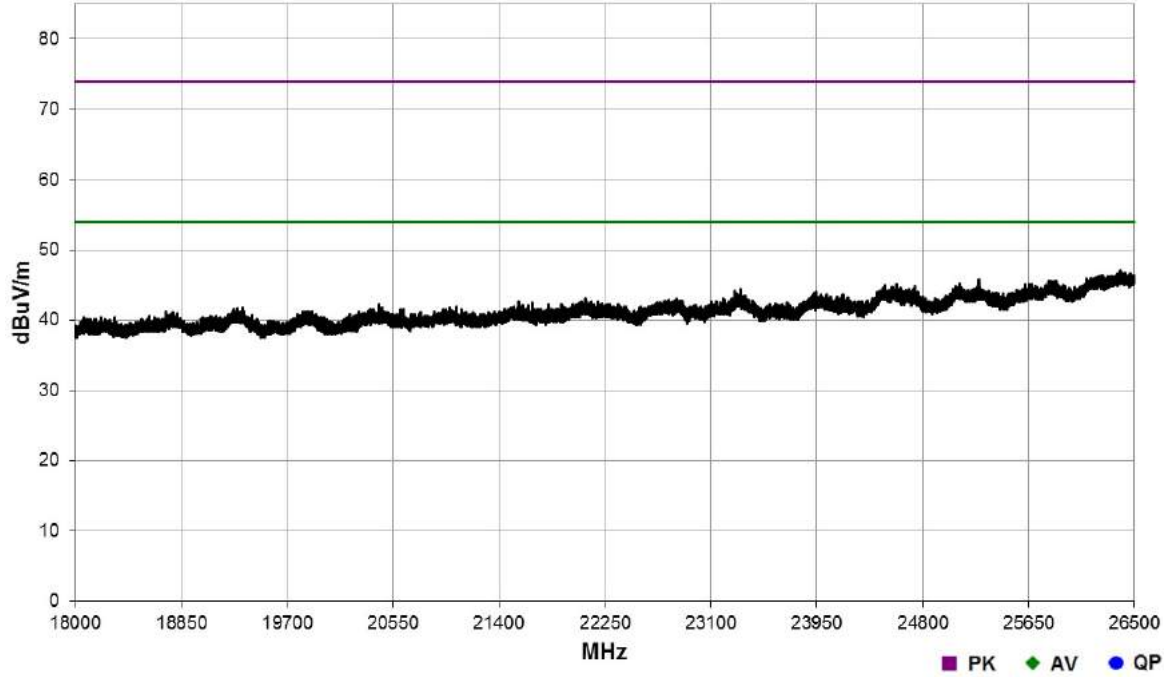
8.2 GHz to 12.4 GHz



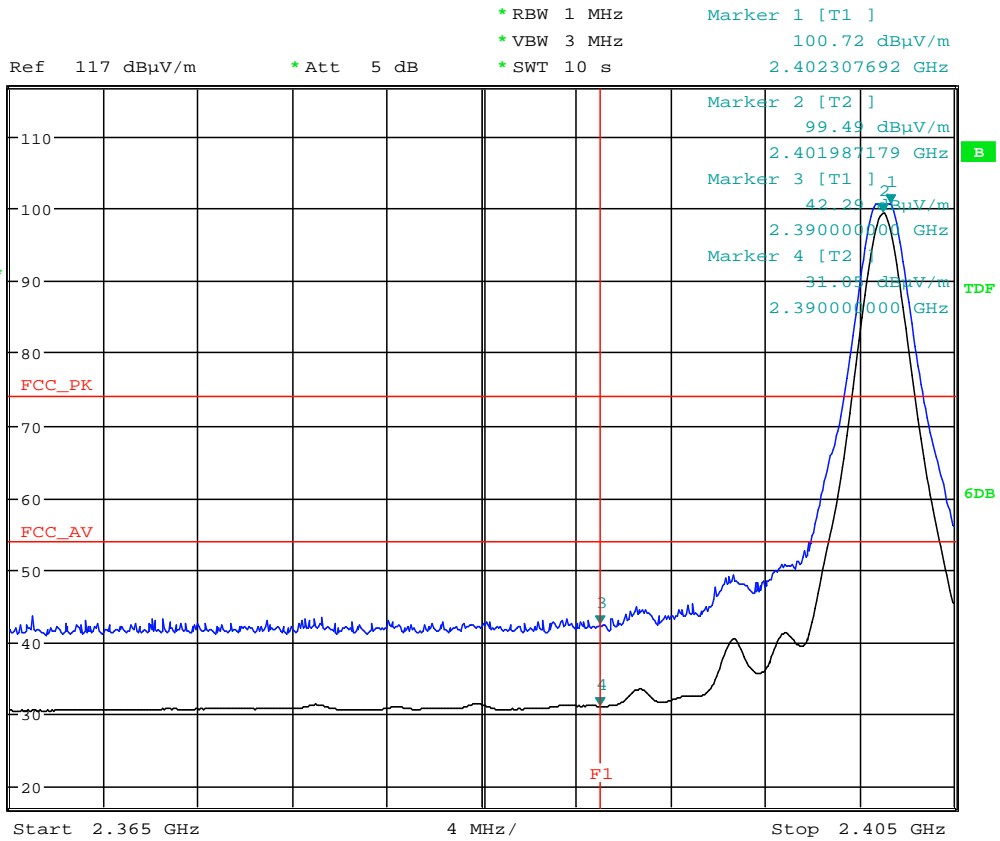
12.4 GHz to 18 GHz



18 GHz to 26.5 GHz



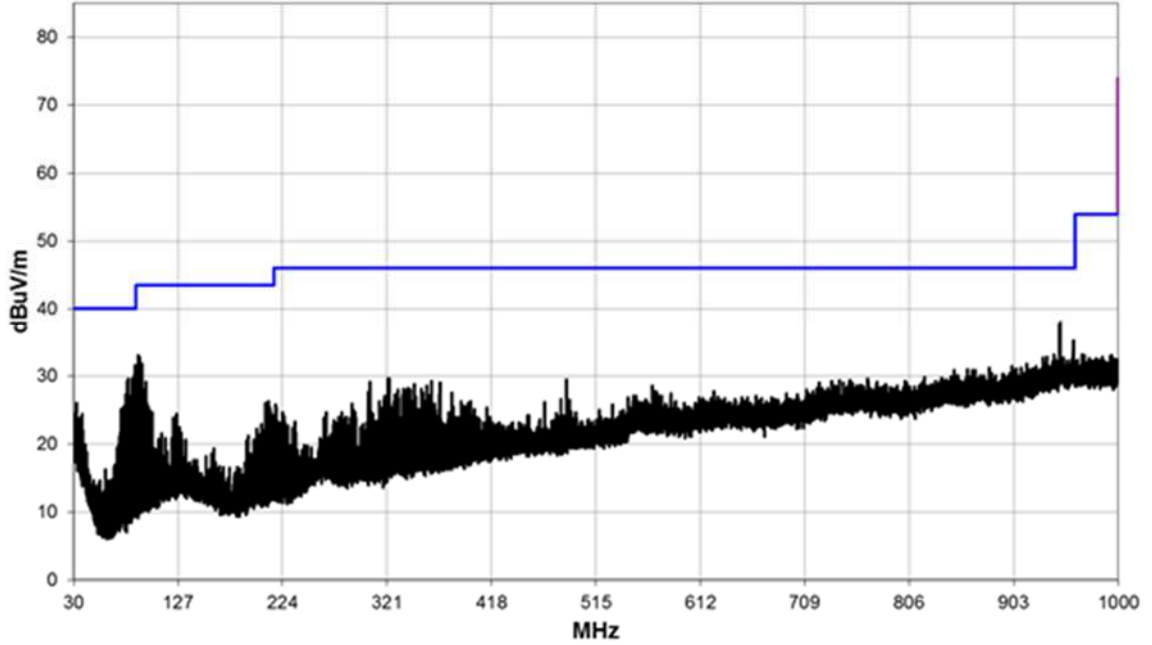
Band Edge



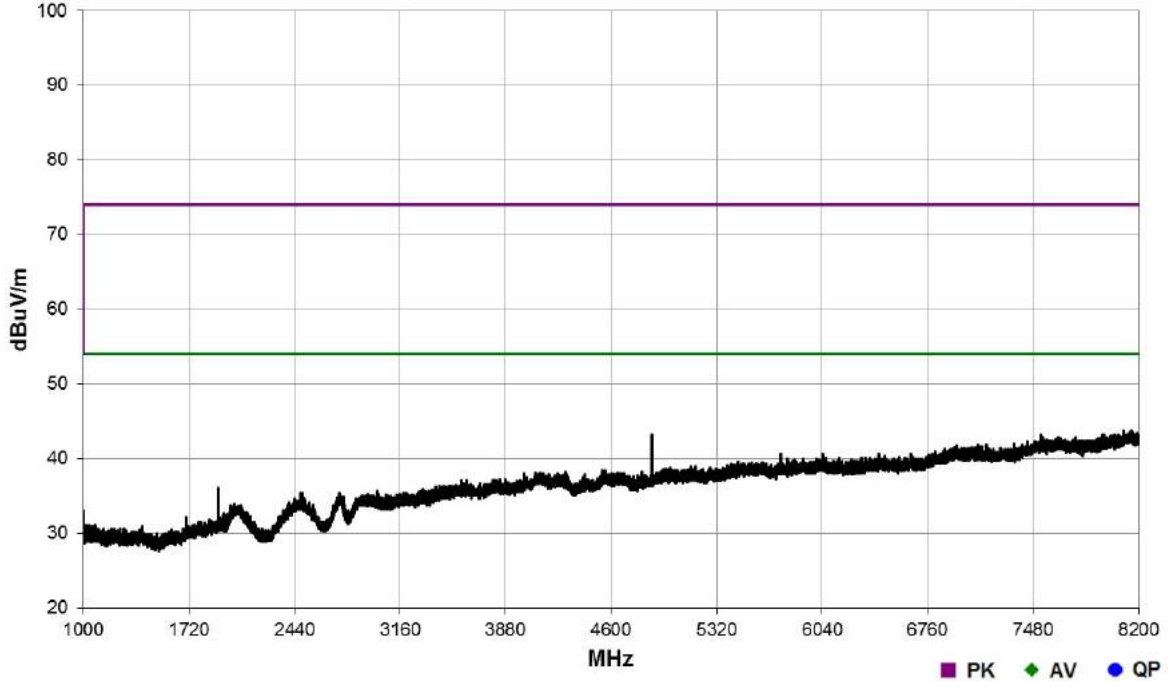
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Sample S22 CF04 SN:YR5-US-FBA0037A; Channel: 2440 MHz; Modulation: GFSK; Data Rate: 1 Mbps; Power Setting: 5 dBm						
Detector	Freq. (MHz)	Meas'd Emission (dB $\mu$ V)	Factor (dB)	Field Strength (dB $\mu$ V/m)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
There were no emissions within 10 dB of the limit.						

30 MHz to 1 GHz

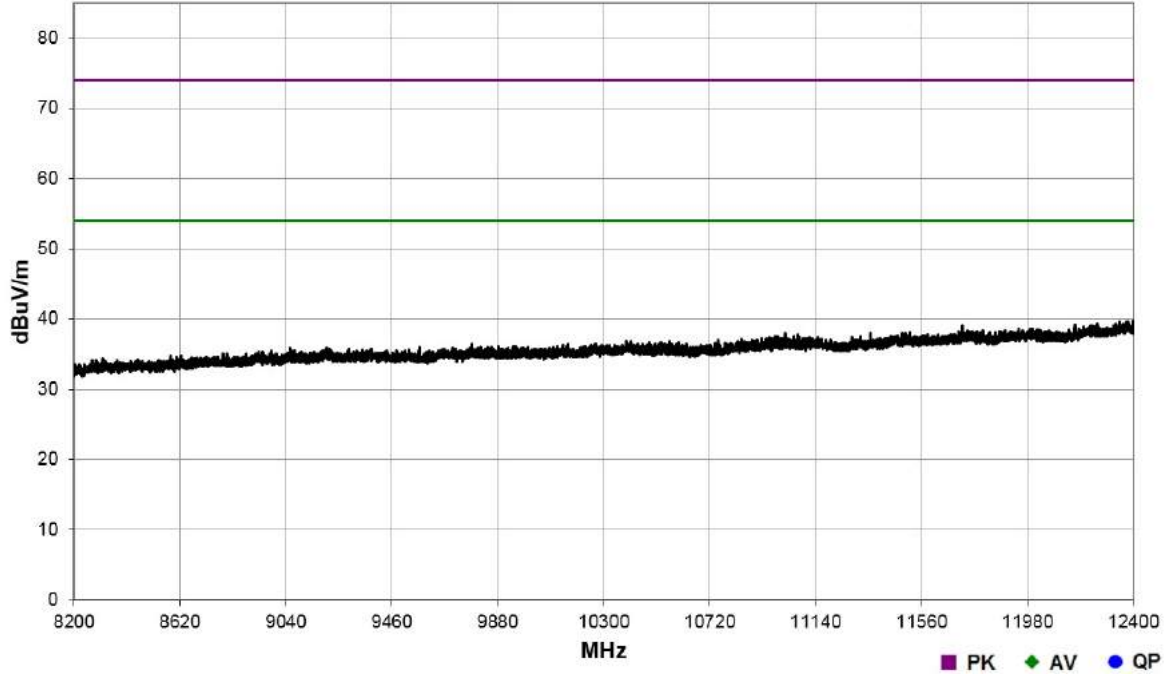


1 GHz to 8.2 GHz

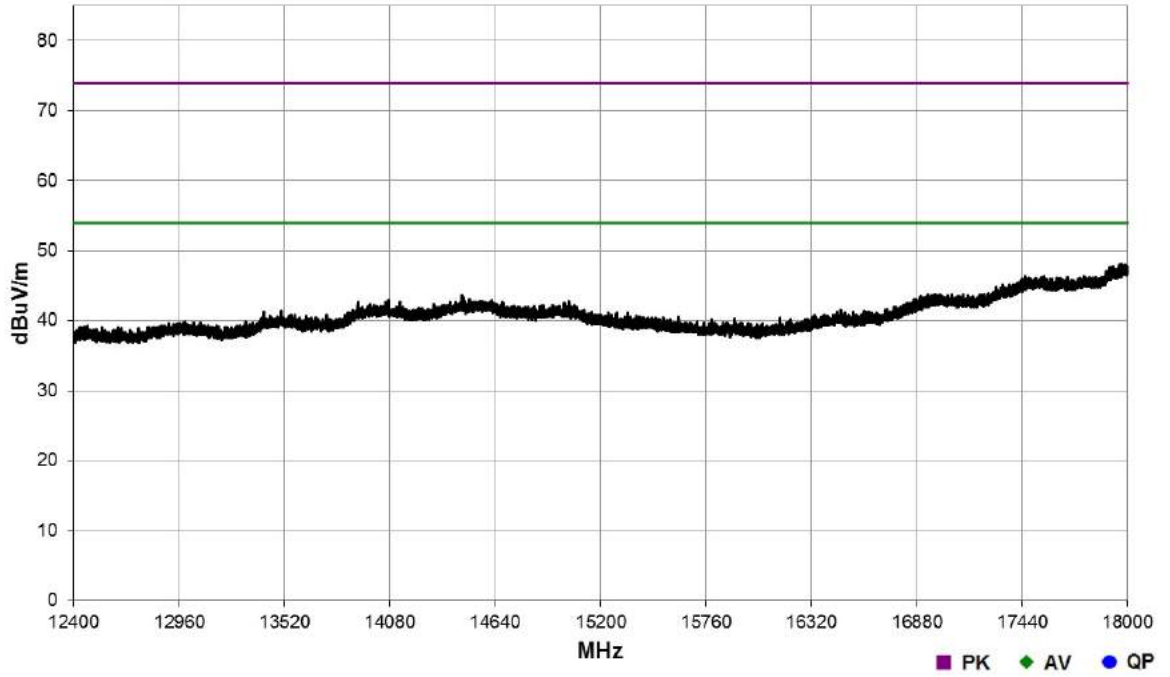




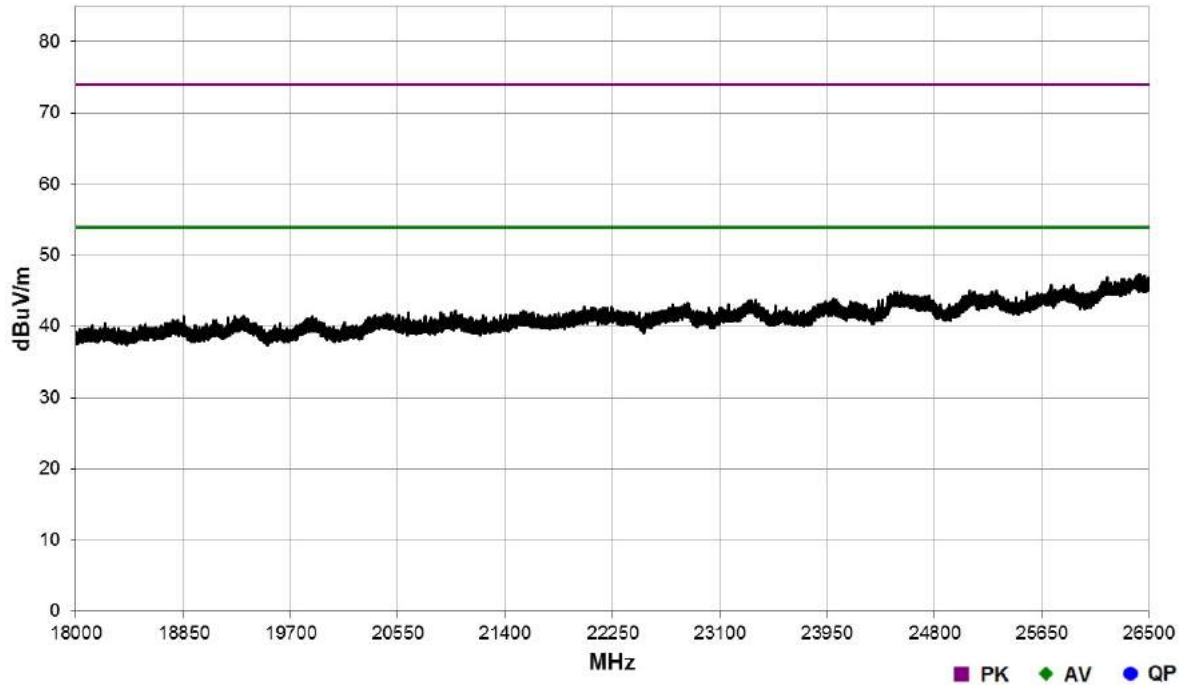
8.2 GHz to 12.4 GHz



12.4 GHz to 18 GHz

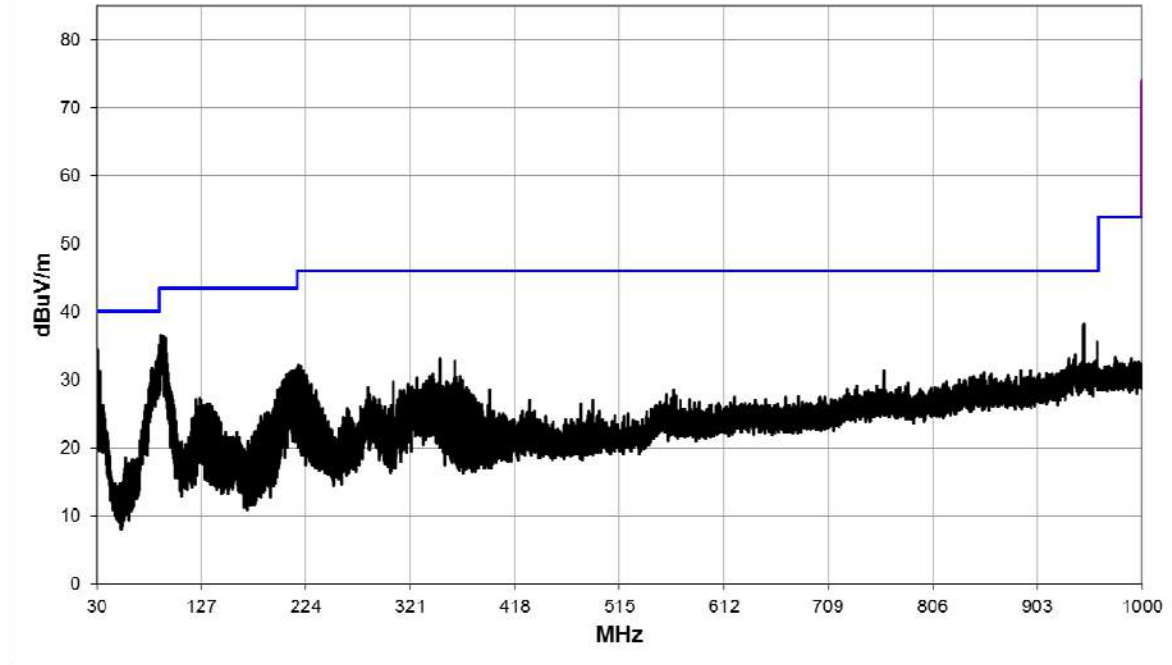


18 GHz to 26.5 GHz

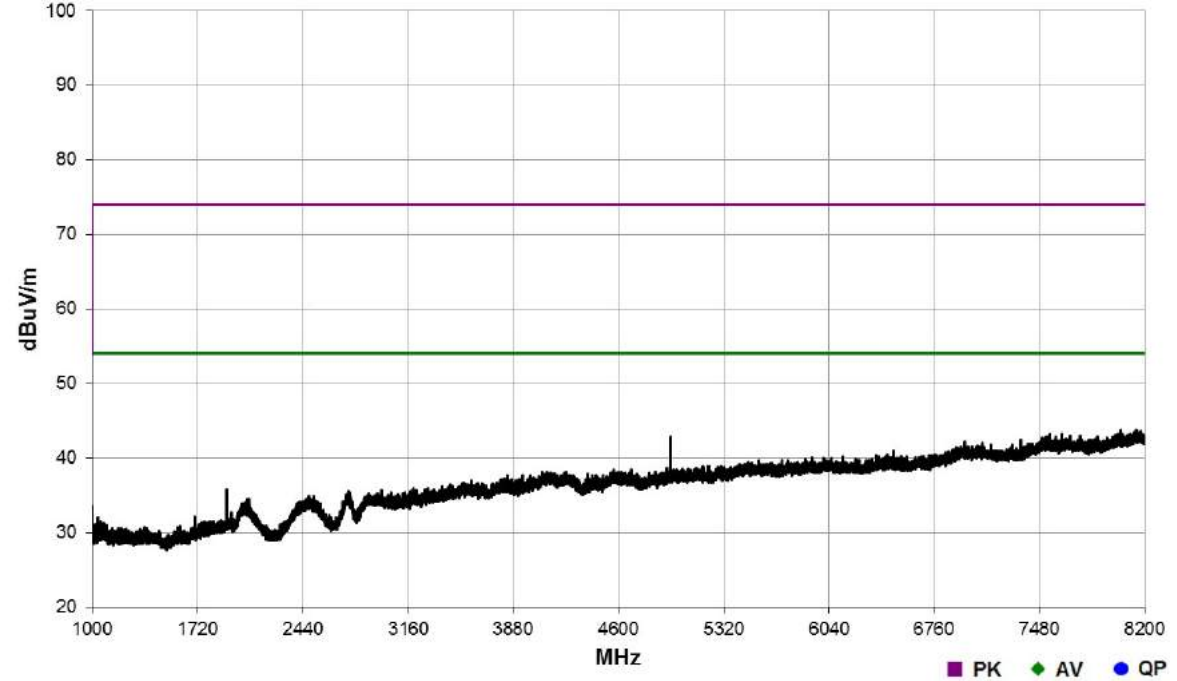


Sample S22 CF04 SN:YR5-US-FBA0037A; Channel: 2480 MHz; Modulation: GFSK; Data Rate: 1 Mbps; Power Setting: 5 dBm						
Detector	Freq. (MHz)	Meas'd Emission (dB $\mu$ V)	Factor (dB)	Field Strength (dB $\mu$ V/m)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
There were no emissions within 10 dB of the limit.						

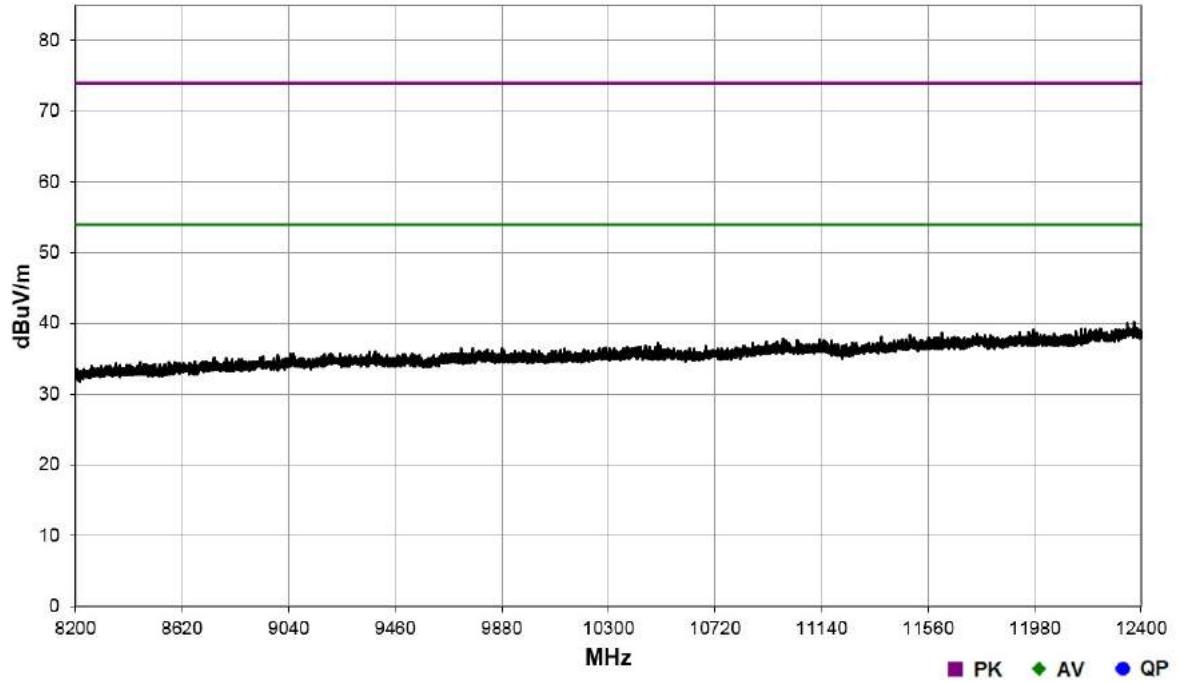
30 MHz to 1 GHz



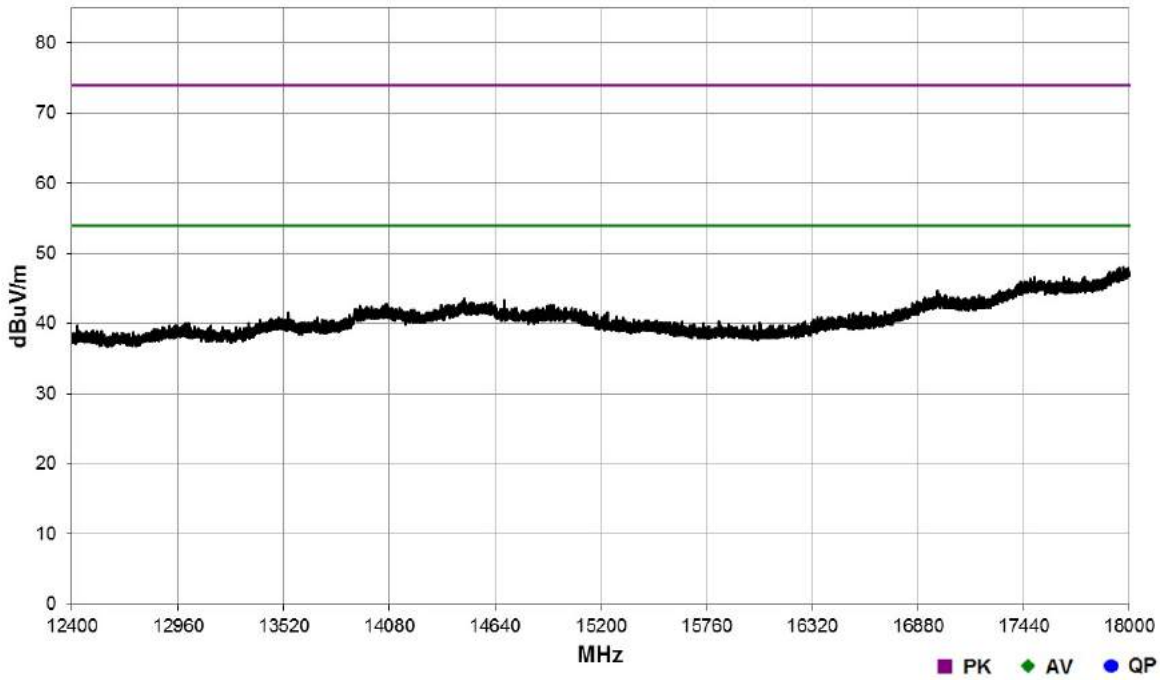
1 GHz to 8.2 GHz



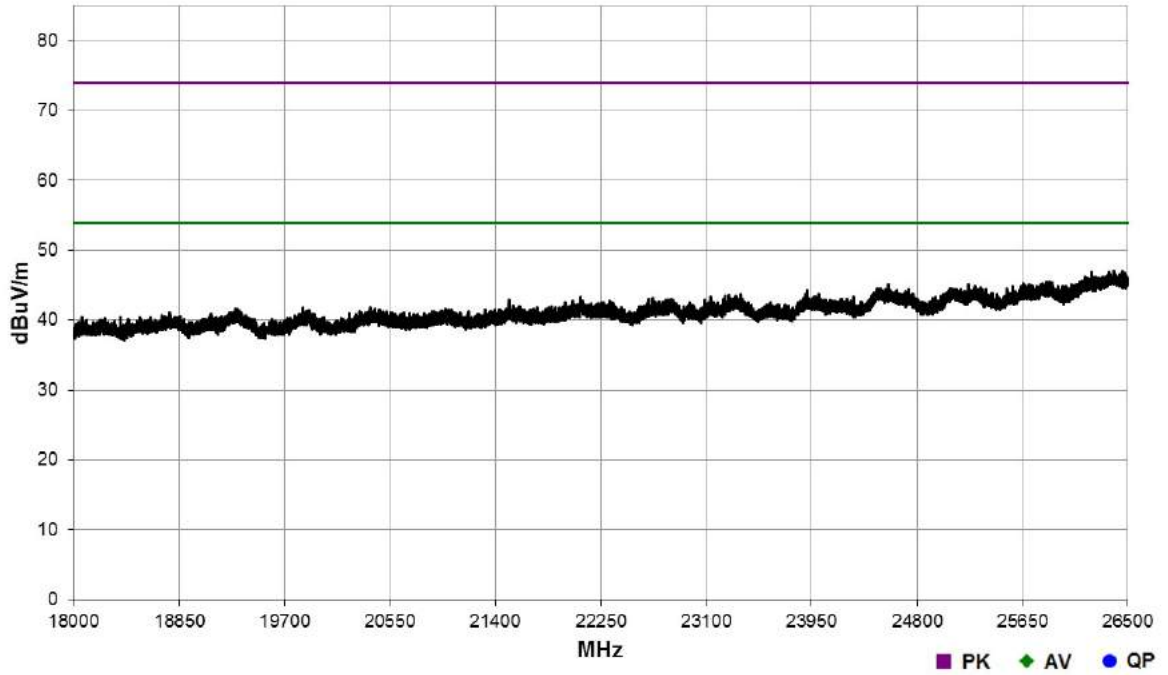
### 8.2 GHz to 12.4 GHz



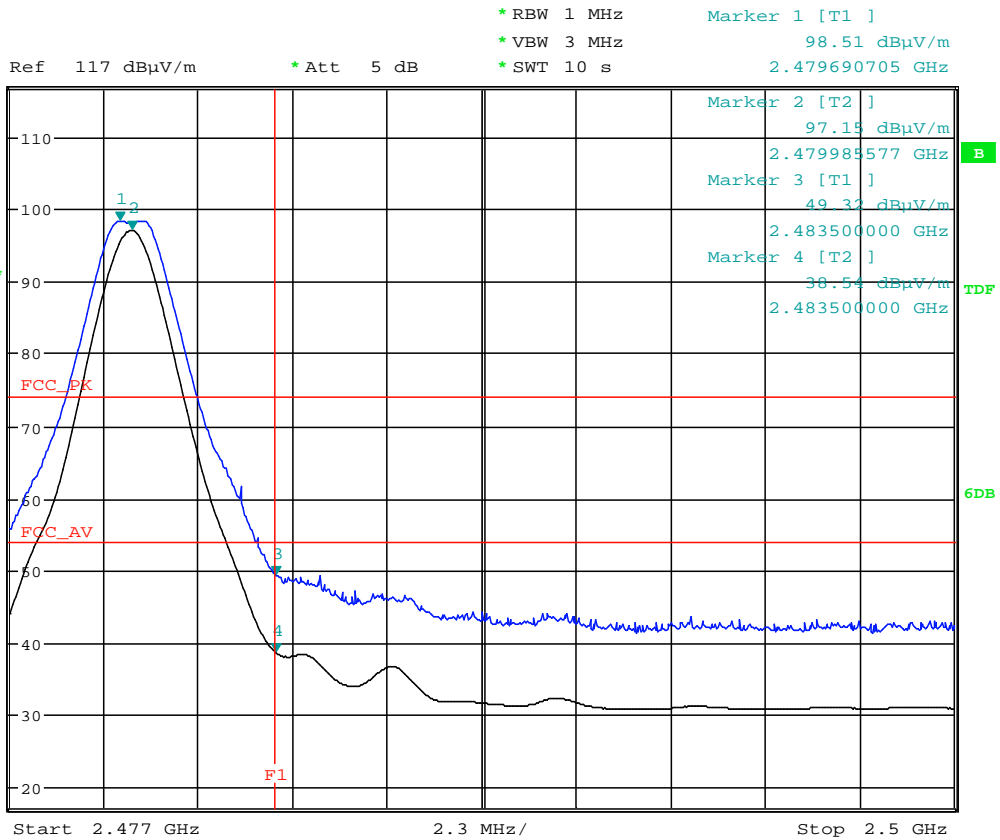
### 12.4 GHz to 18 GHz



18 GHz to 26.5 GHz



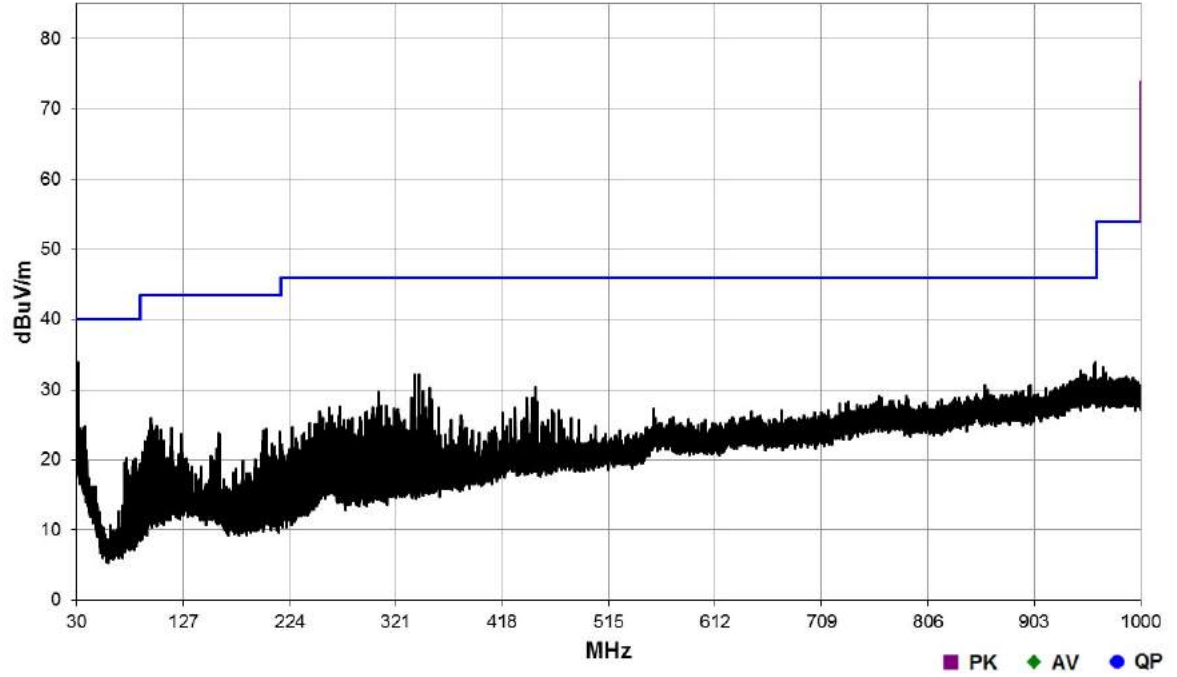
Band Edge



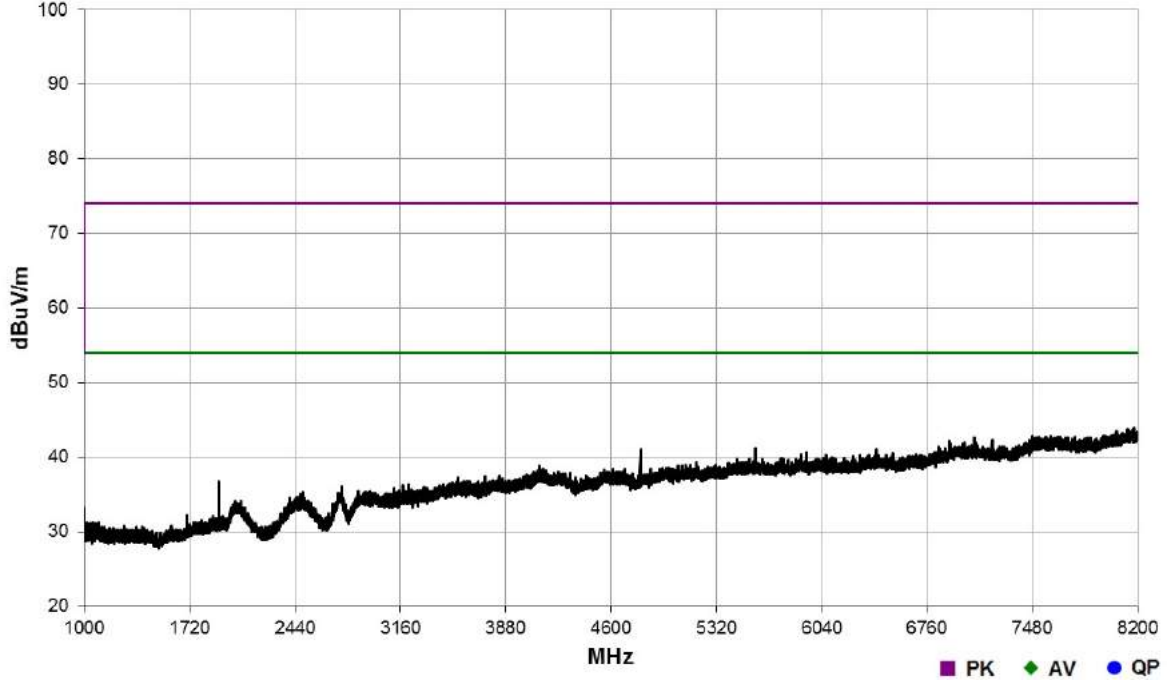
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Sample S24 CD04 SN:YU2-JP-FBA0057A; Power Setting: 5 dBm; Channel: 2402 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dBμV)	Factor (dB)	Field Strength (dBμV/m)	Field Strength (μV/m)	Limit (μV/m)
There were no emissions within 10 dB of the limit.						

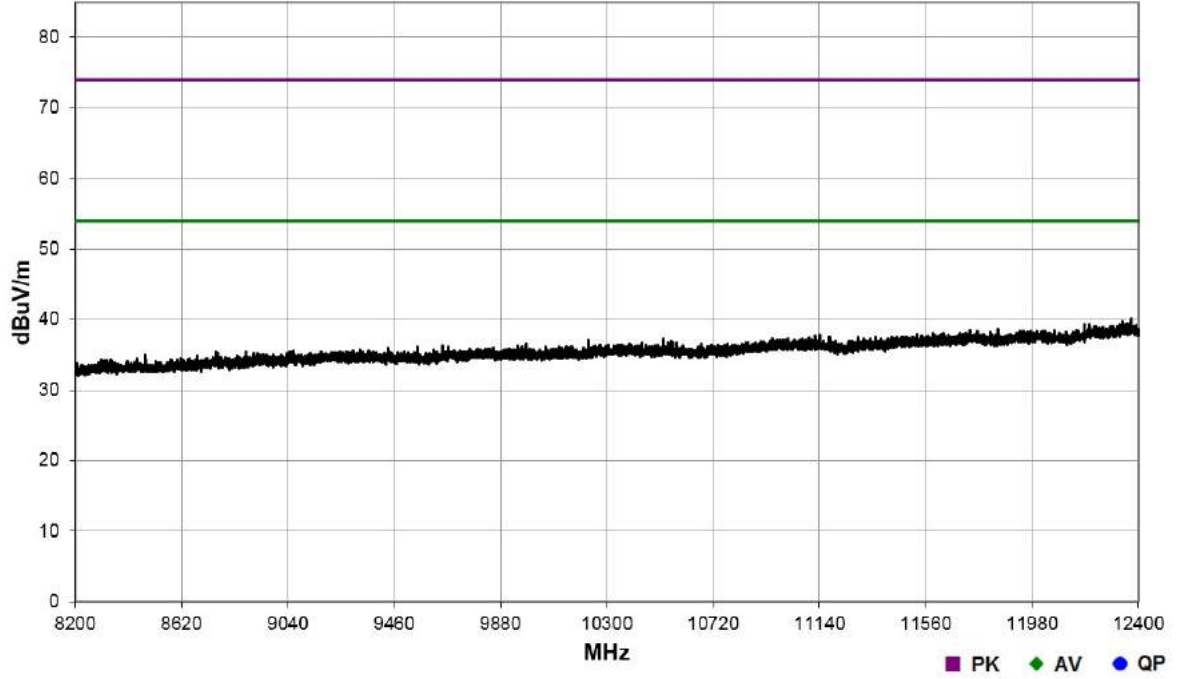
30 MHz to 1 GHz



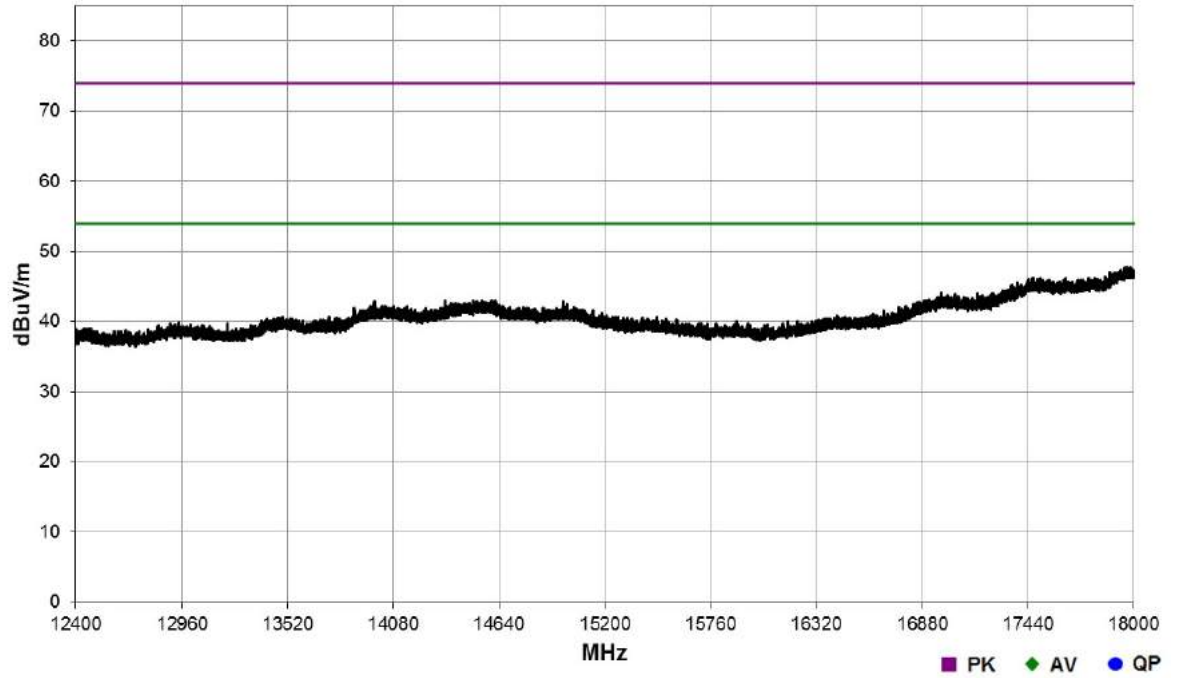
1 GHz to 8.2 GHz



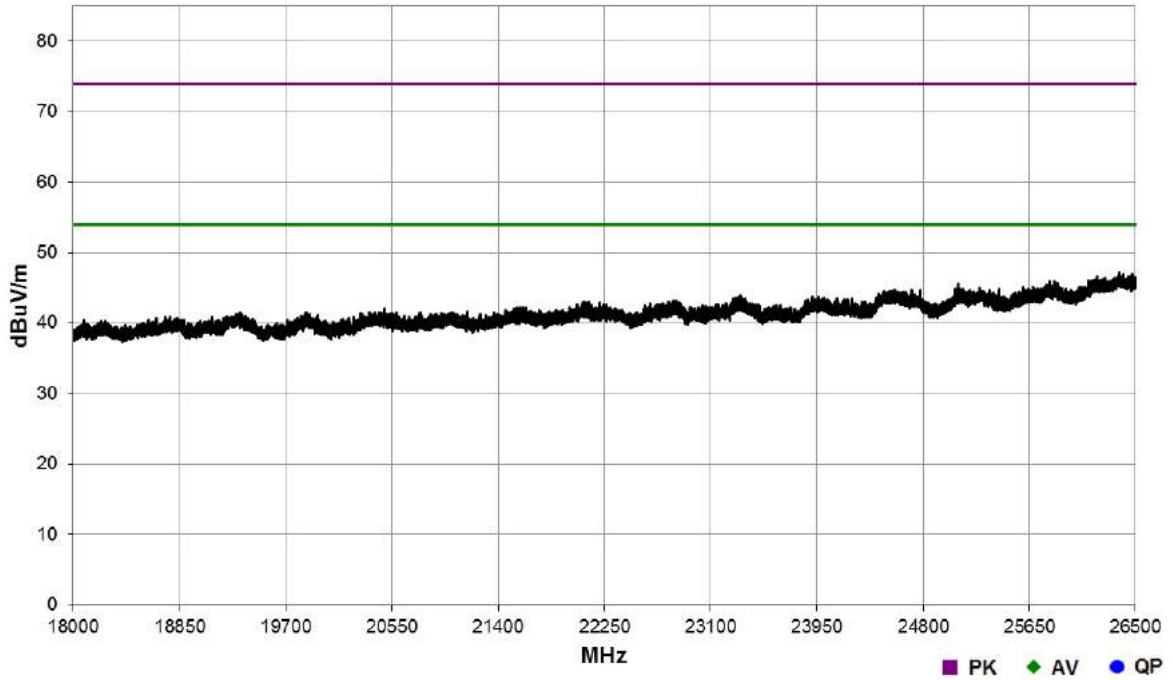
### 8.2 GHz to 12.4 GHz



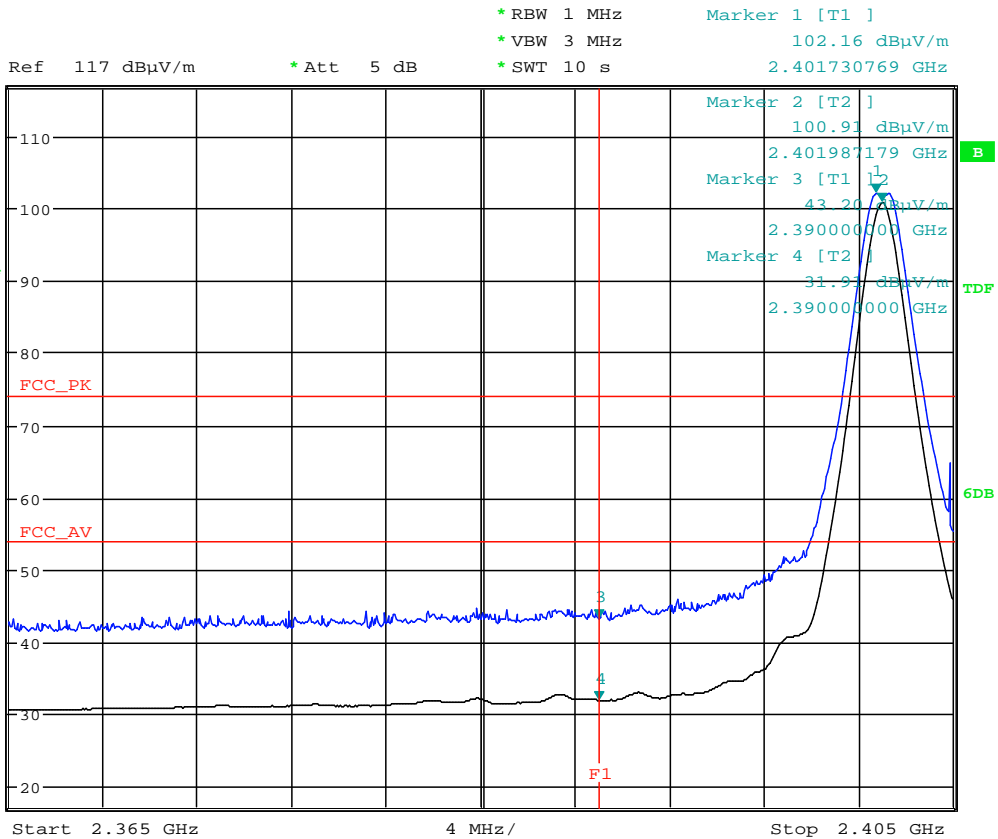
### 12.4 GHz to 18 GHz



18 GHz to 26.5 GHz



Band Edge

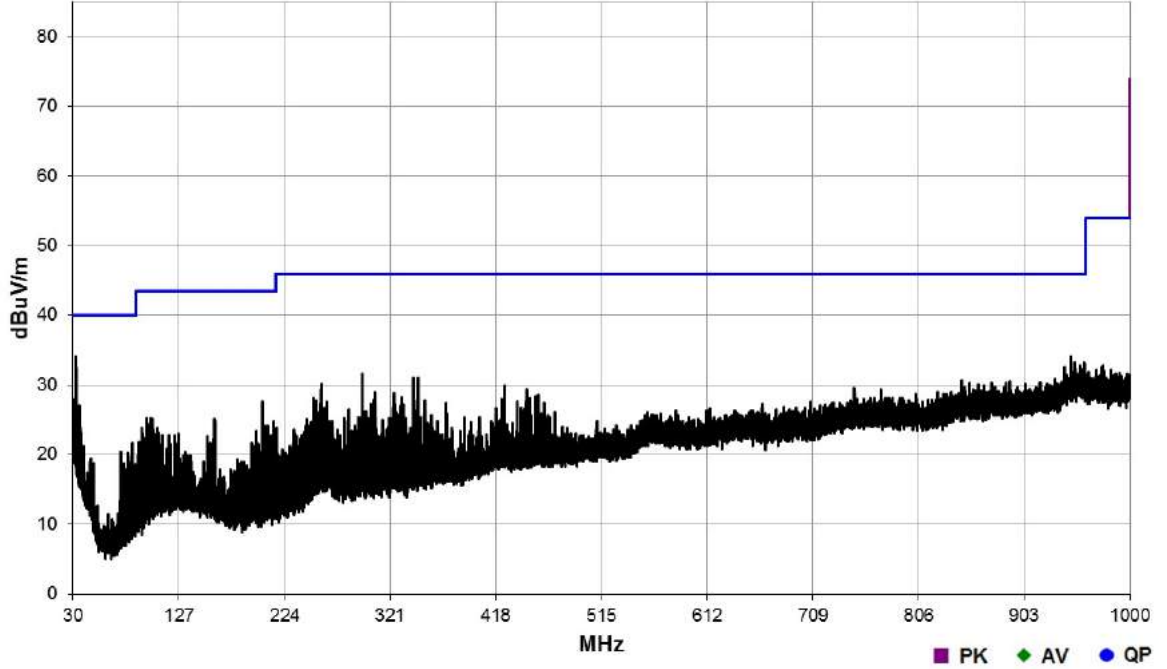


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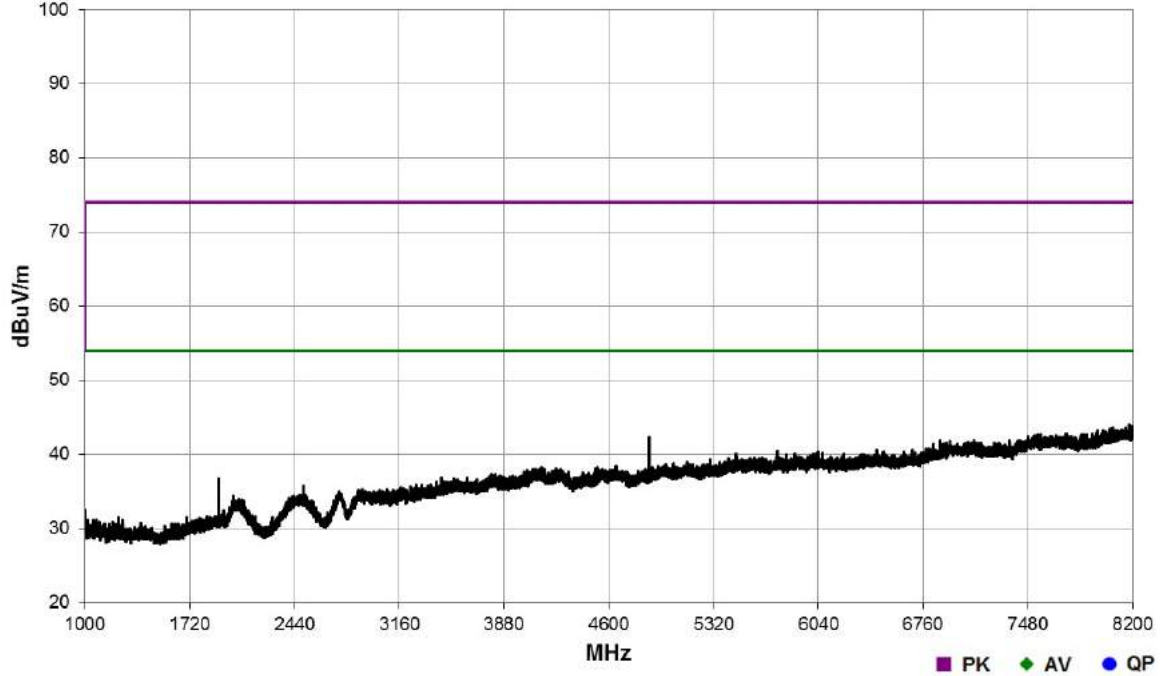


Sample S24 CD04 SN:YU2-JP-FBA0057A; Power Setting: 5 dBm; Channel: 2440 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dBμV)	Factor (dB)	Field Strength (dBμV/m)	Field Strength (μV/m)	Limit (μV/m)
There were no emissions within 10 dB of the limit.						

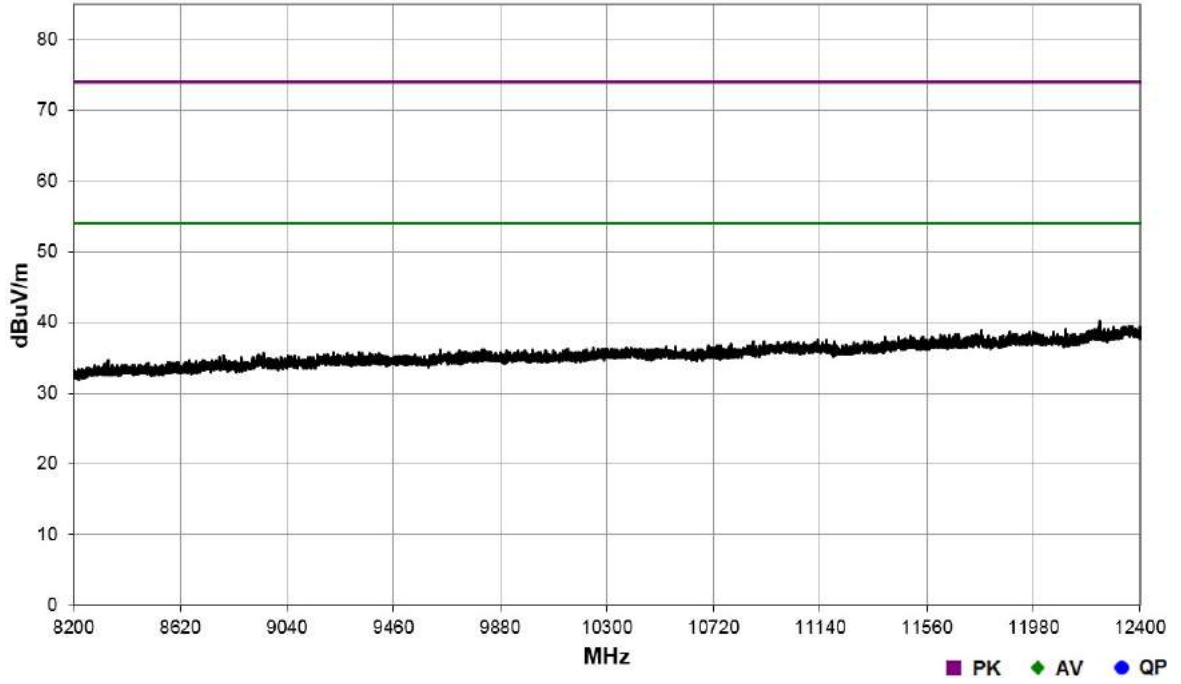
30 MHz to 1 GHz



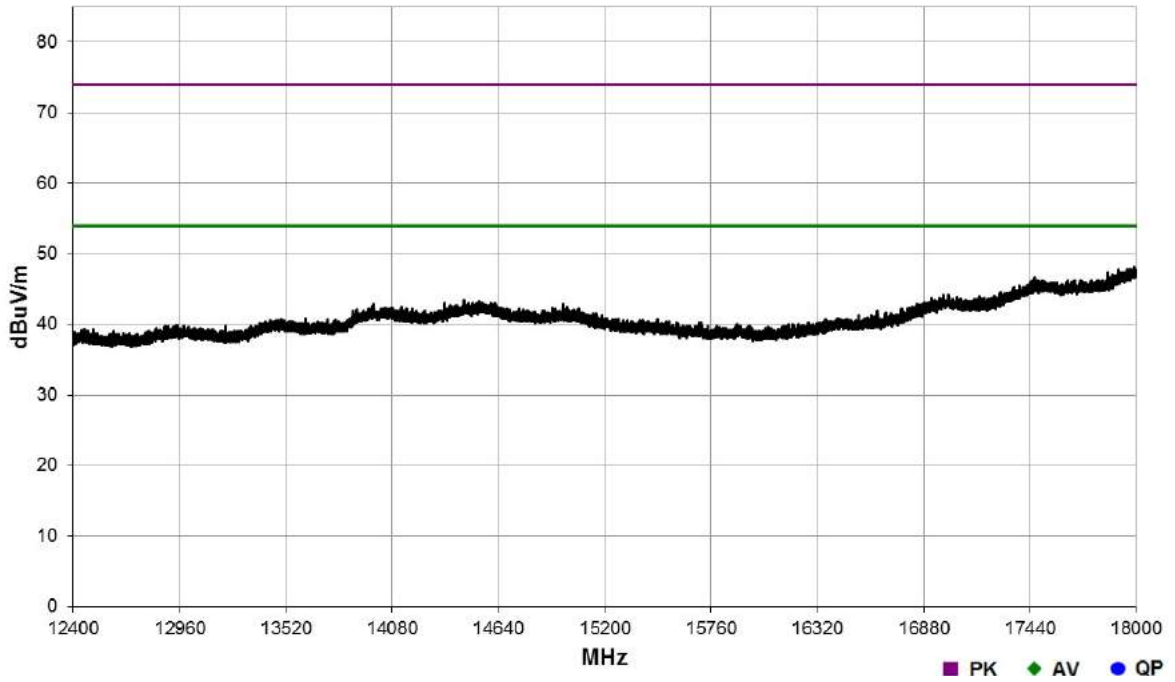
1 GHz to 8.2 GHz



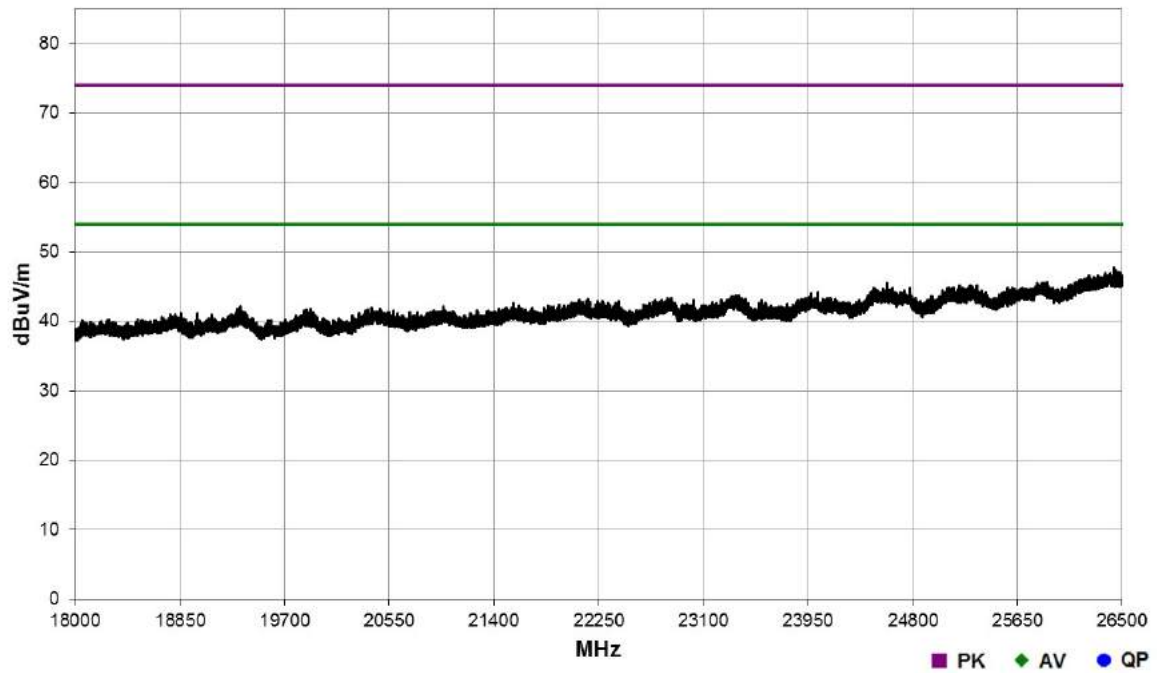
8.2 GHz to 12.4 GHz



12.4 GHz to 18 GHz

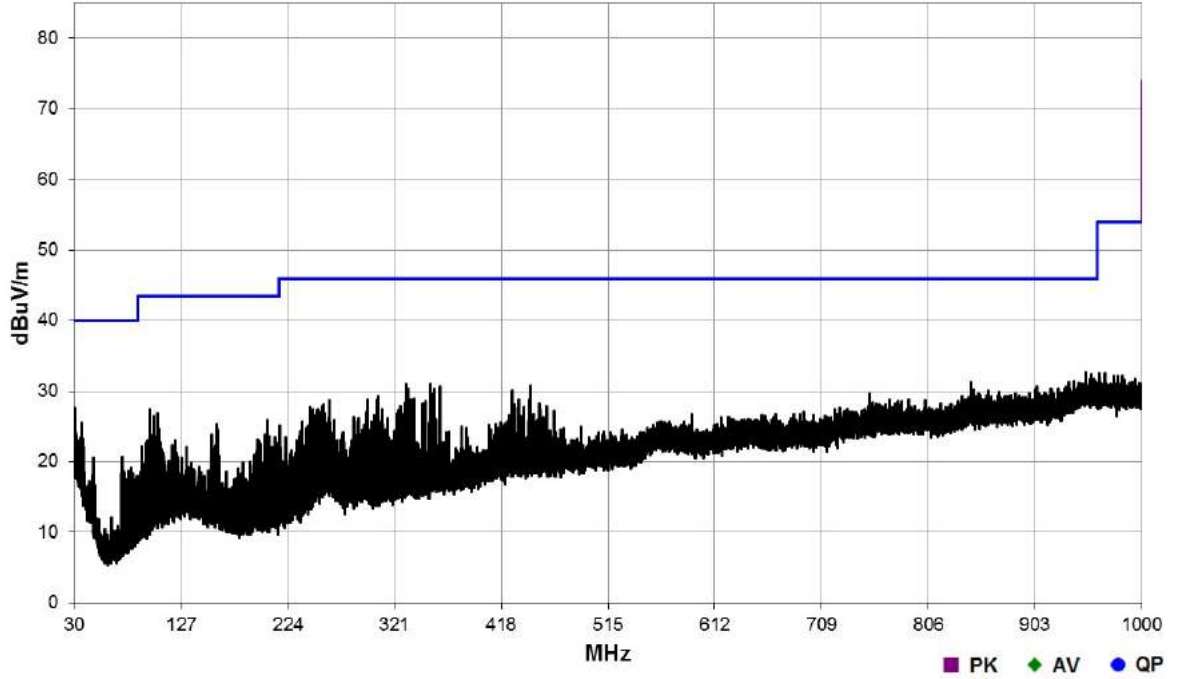


### 18 GHz to 26.5 GHz

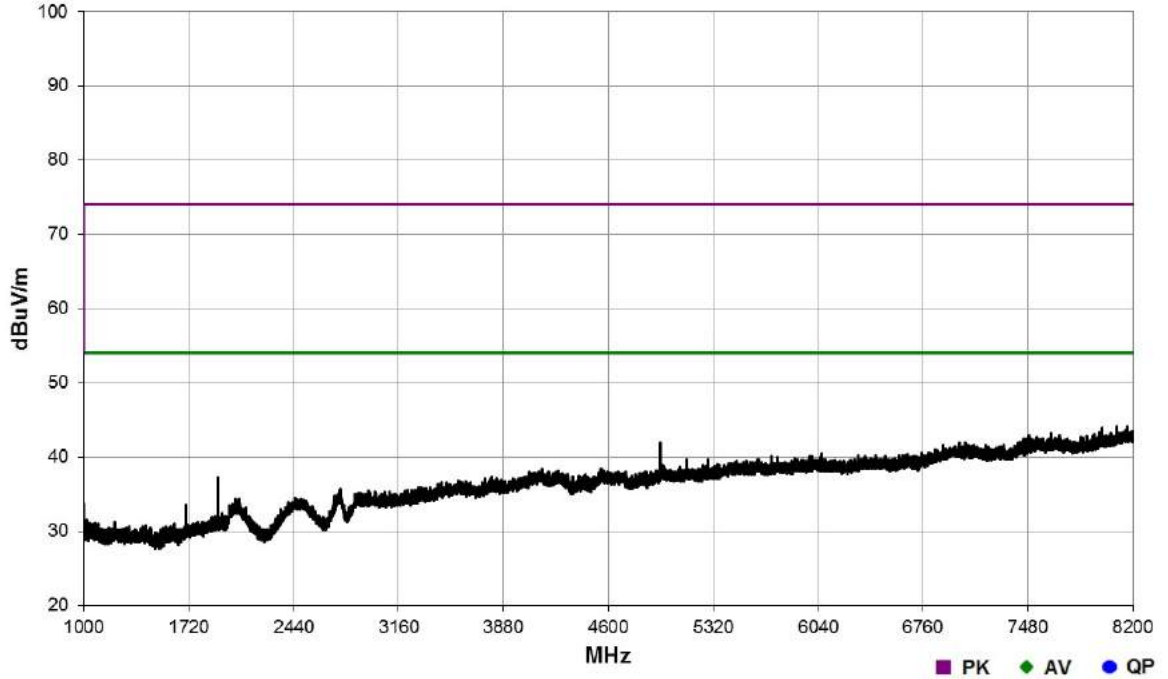


Sample S24 CD04 SN:YU2-JP-FBA0057A; Power Setting: 5 dBm; Channel: 2480 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dB $\mu$ V)	Factor (dB)	Field Strength (dB $\mu$ V/m)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
There were no emissions within 10 dB of the limit.						

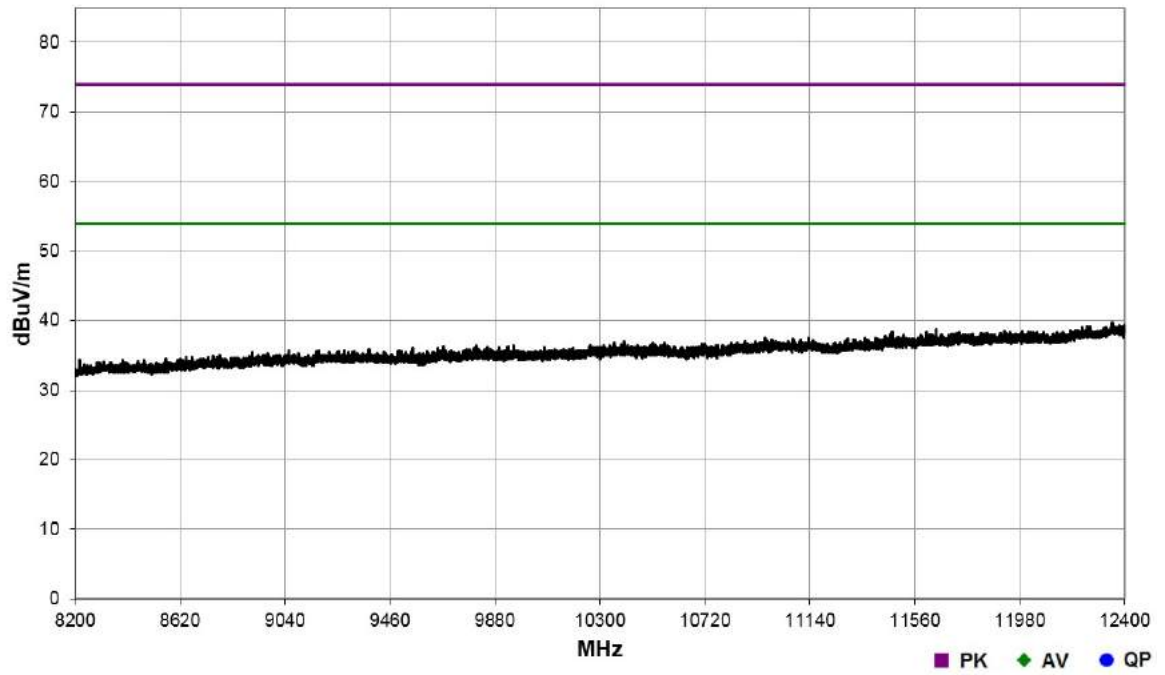
30 MHz to 1 GHz



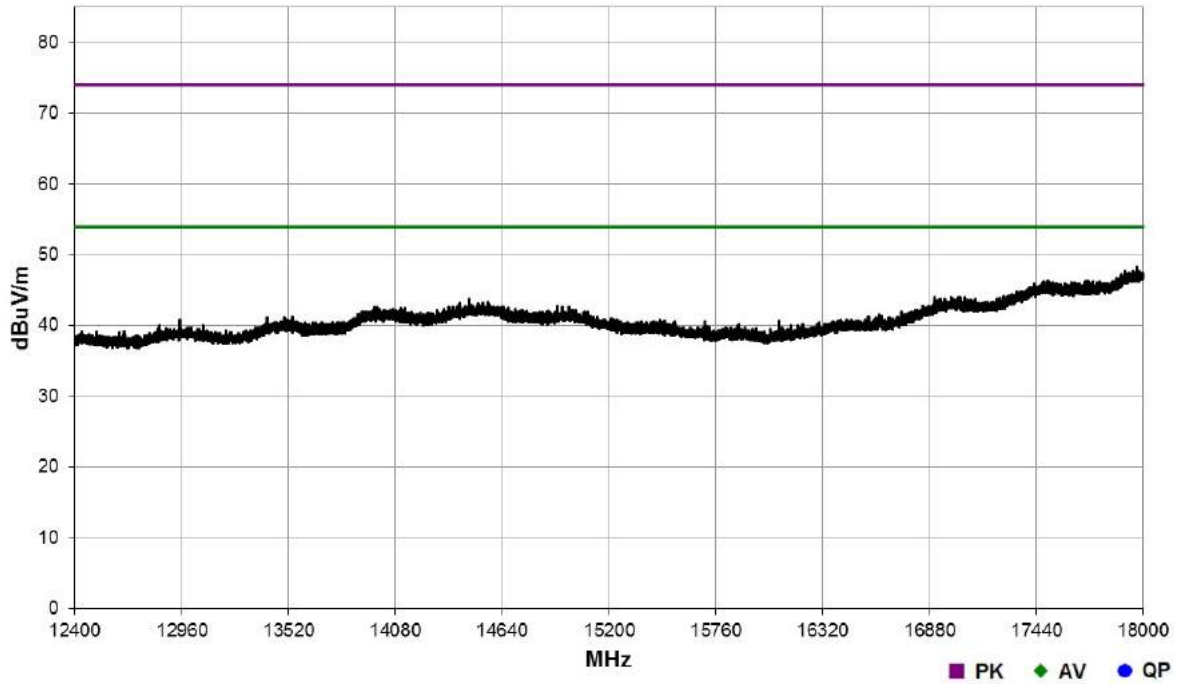
1 GHz to 8.2 GHz



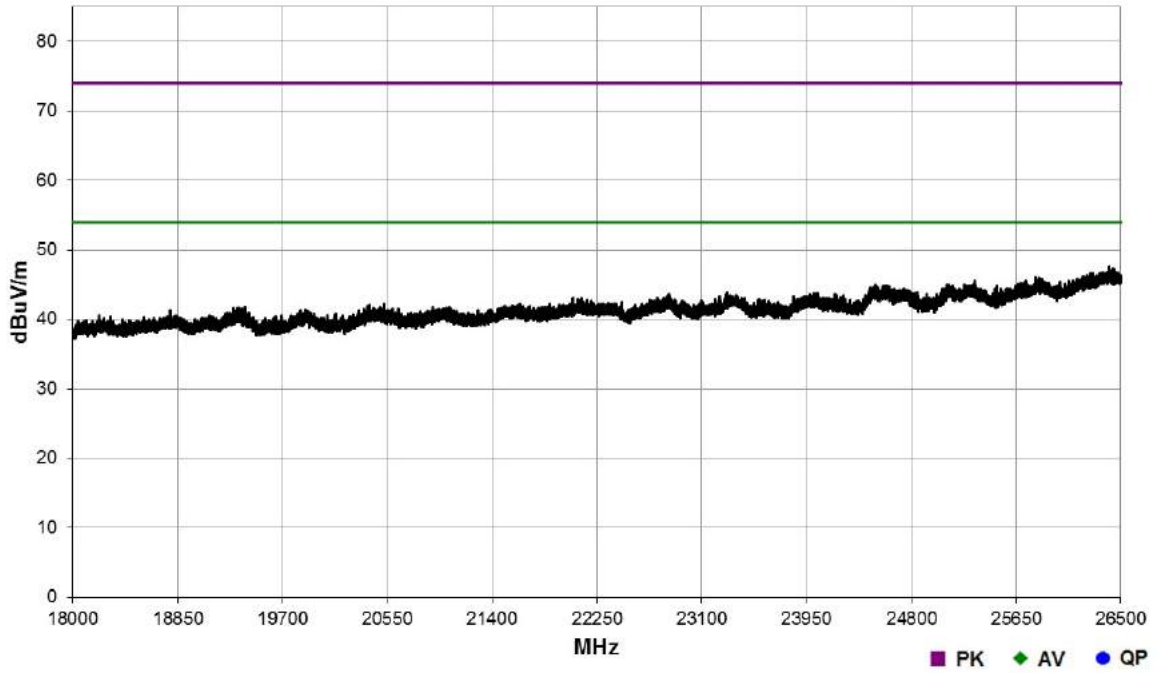
8.2 GHz to 12.4 GHz



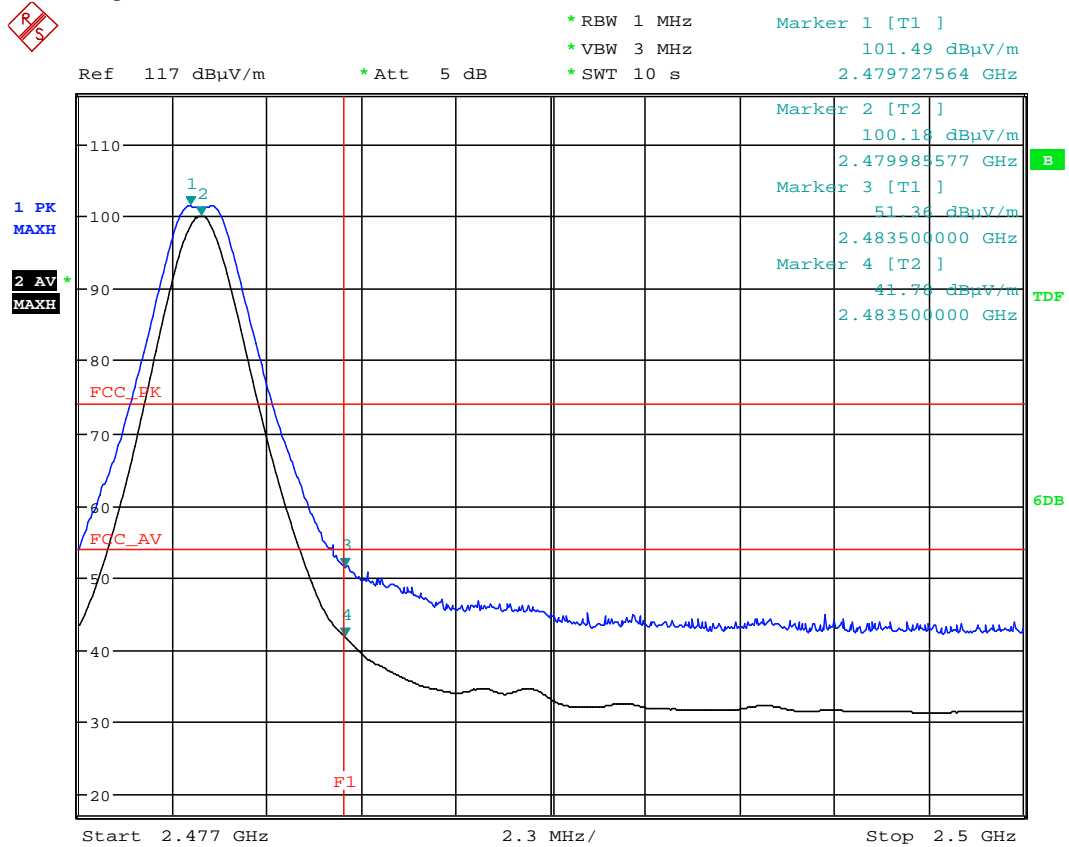
12.4 GHz to 18 GHz



18 GHz to 26.5 GHz



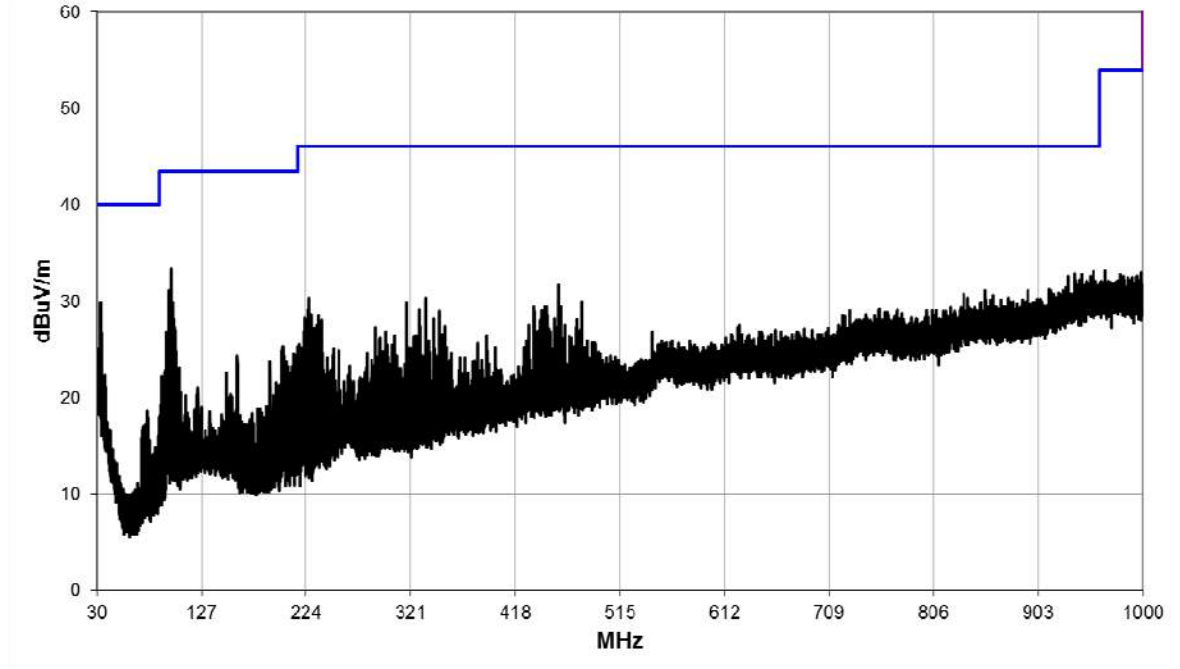
Band Edge



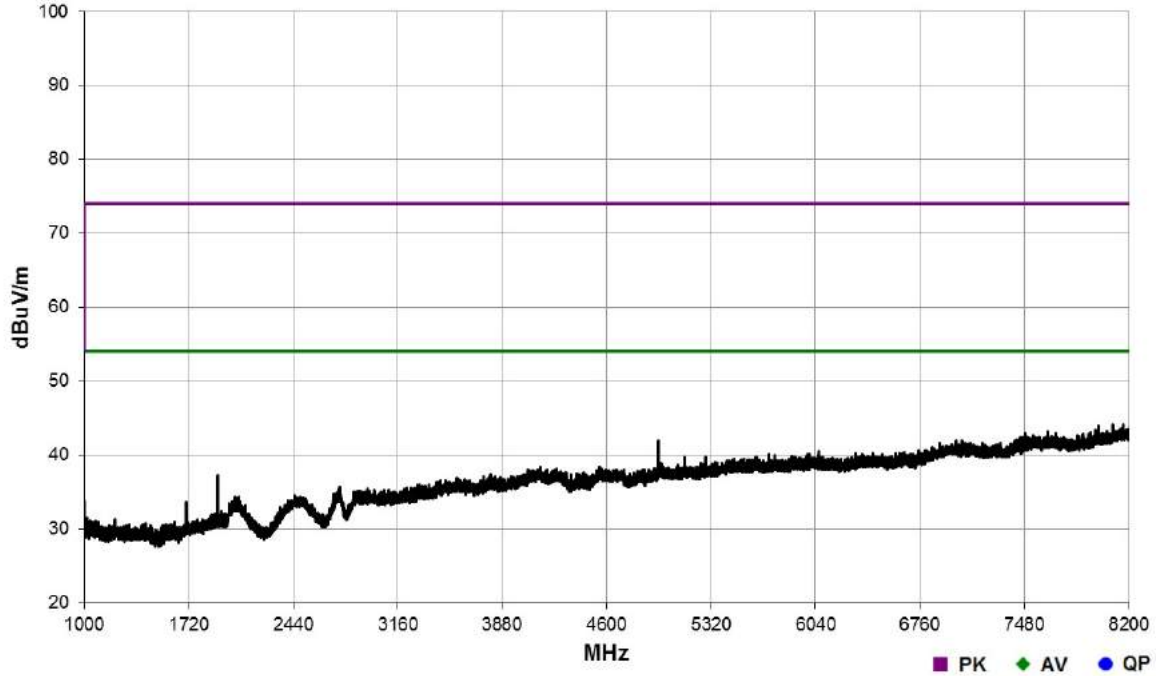
Date: 7.AUG.2018 10:26:51

Sample S26 CD05 SN: YR4-US-FBA0039A; Power Setting: 5 dBm; 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.						

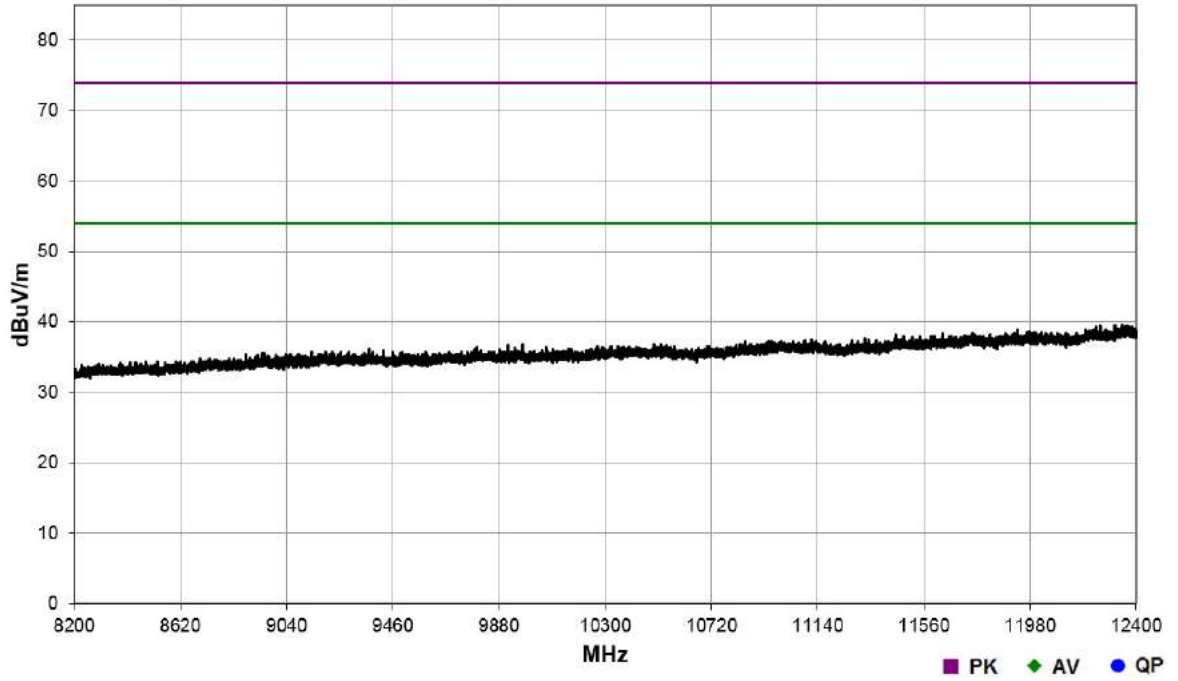
30 MHz to 1 GHz



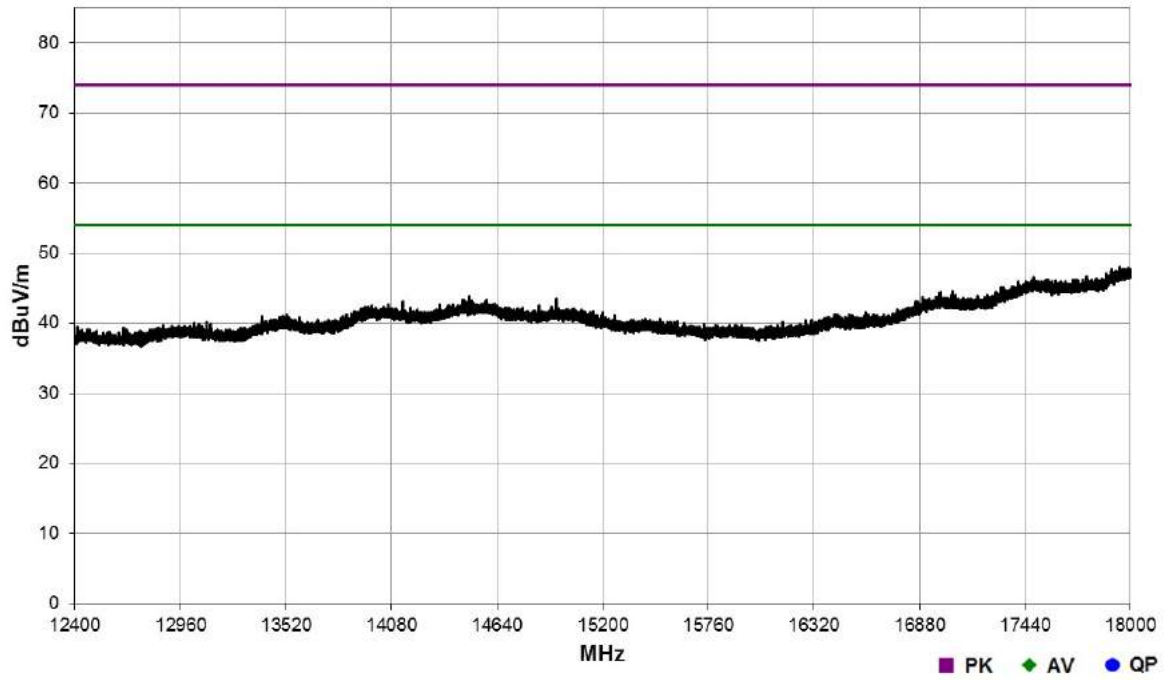
1 GHz to 8.2 GHz



### 8.2 GHz to 12.4 GHz

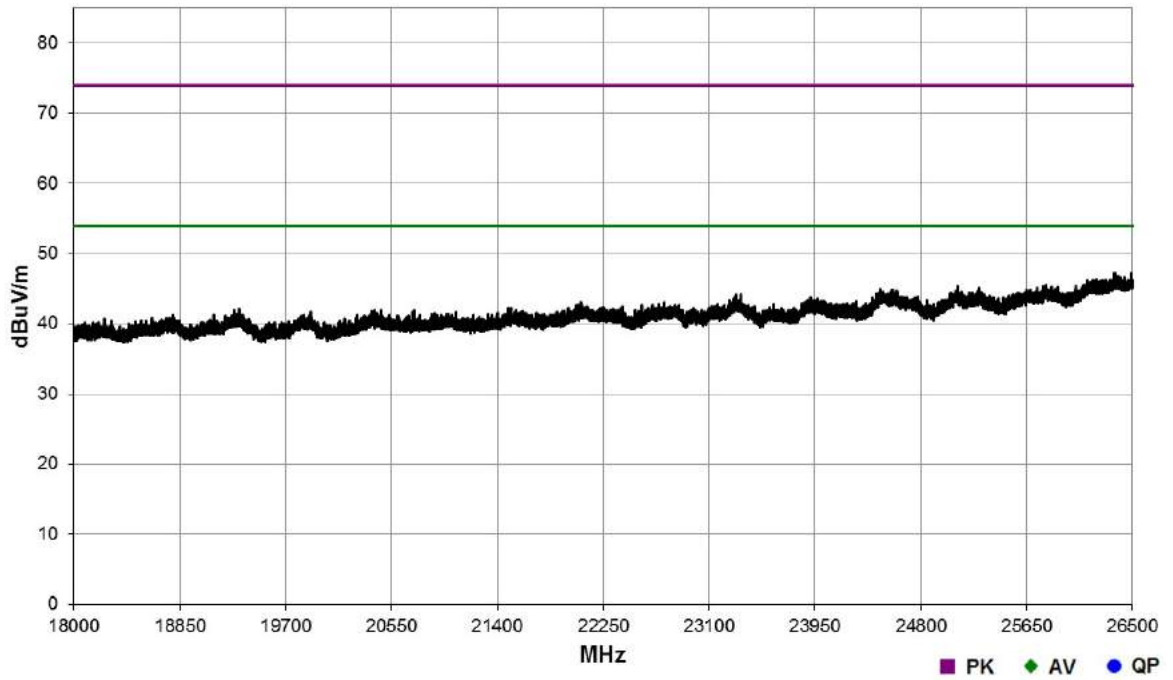


### 12.4 GHz to 18 GHz

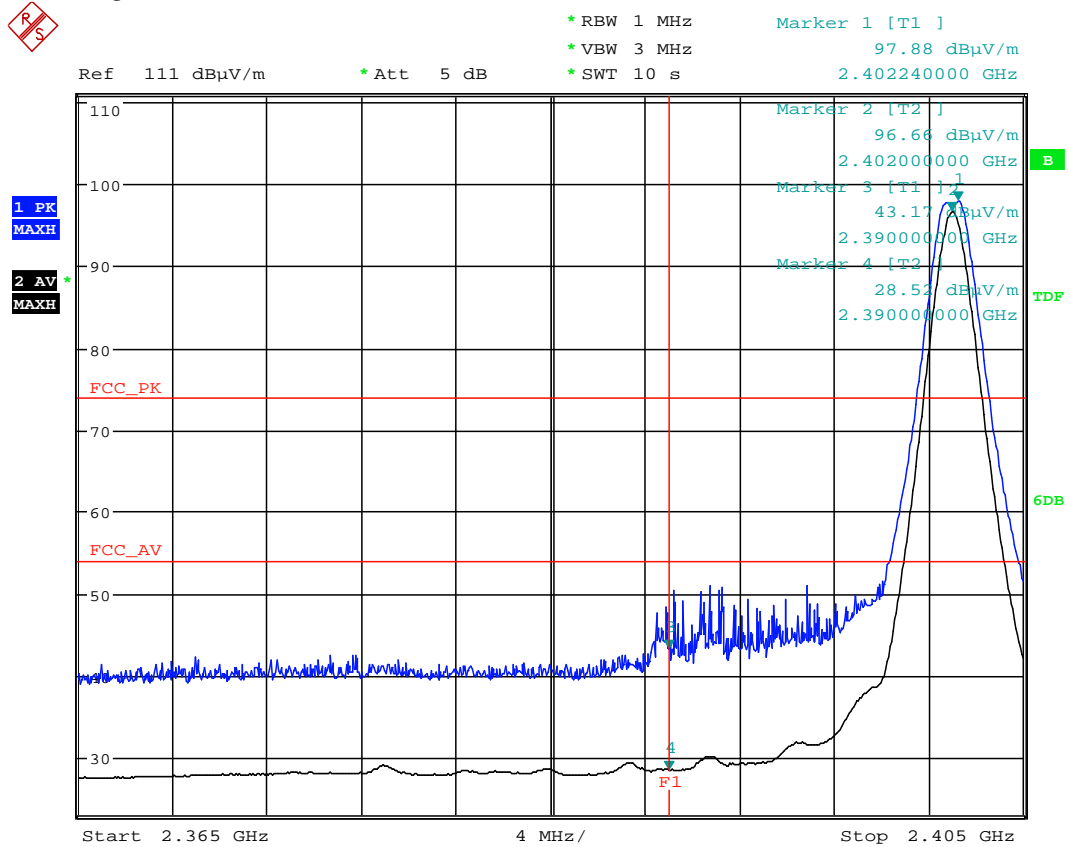




### 18 GHz to 26.5 GHz



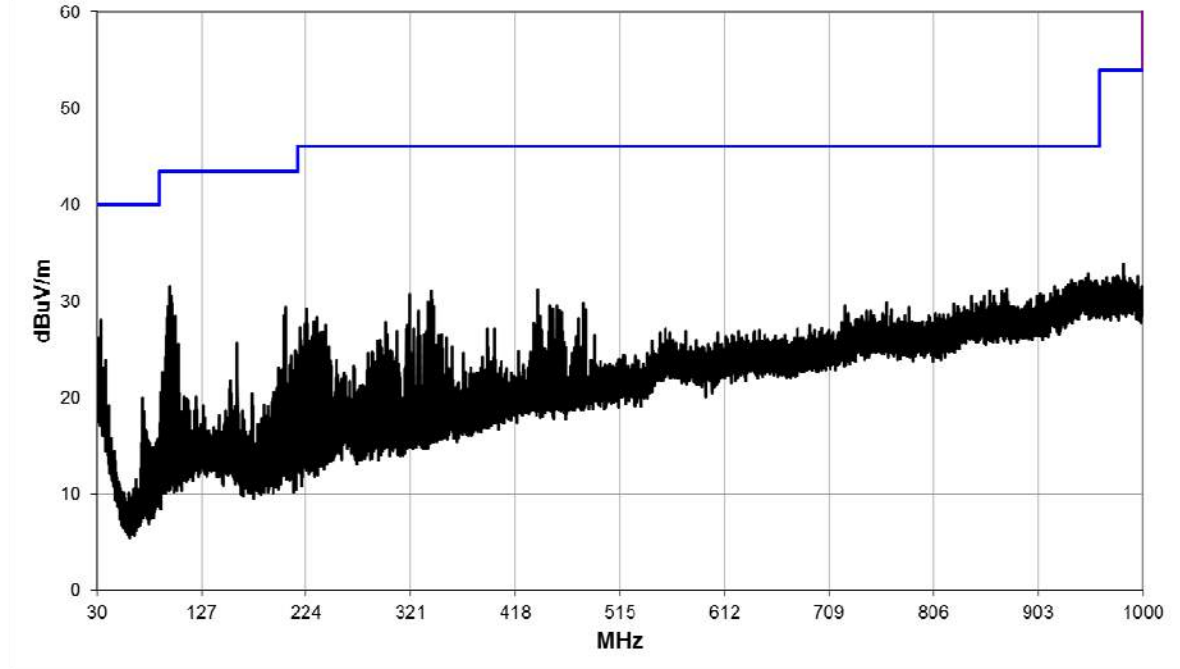
### Band Edge



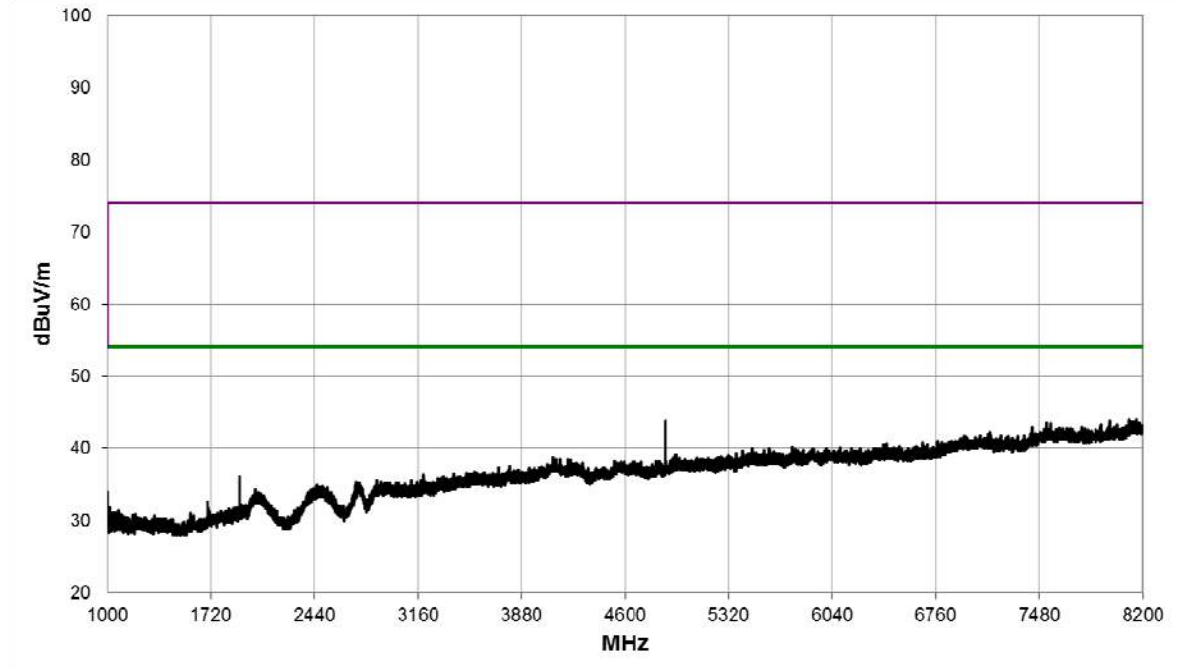
Date: 2.AUG.2018 08:10:15

Sample S26 CD05 SN: YR4-US-FBA0039A; Power Setting: 5 dBm; 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.						

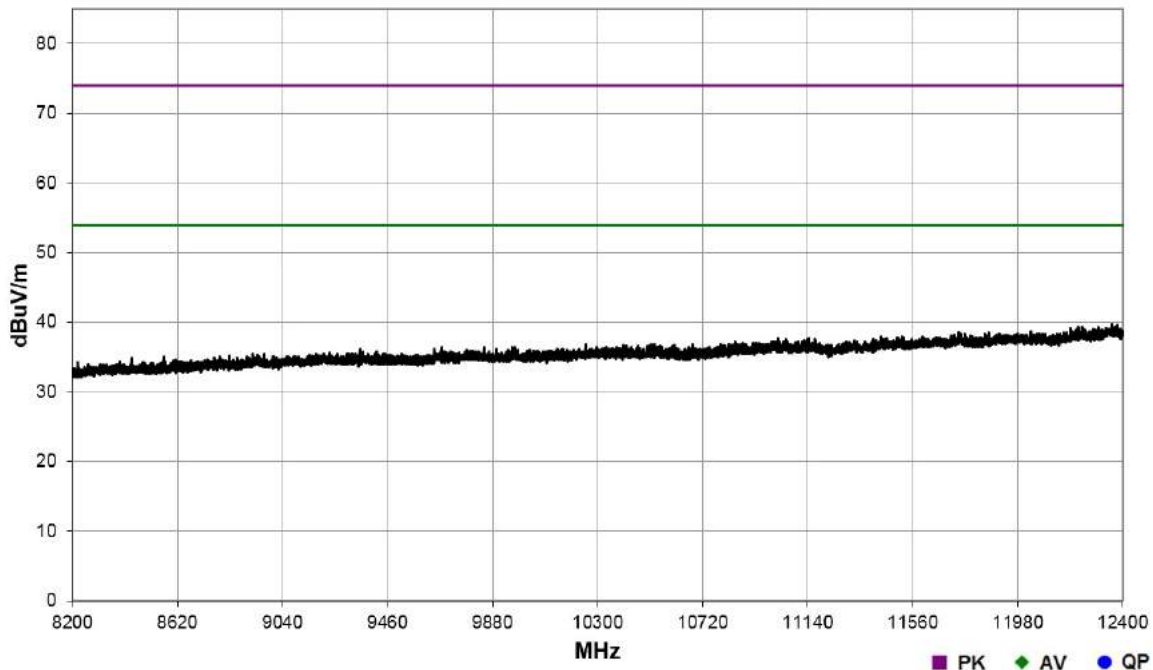
30 MHz to 1 GHz



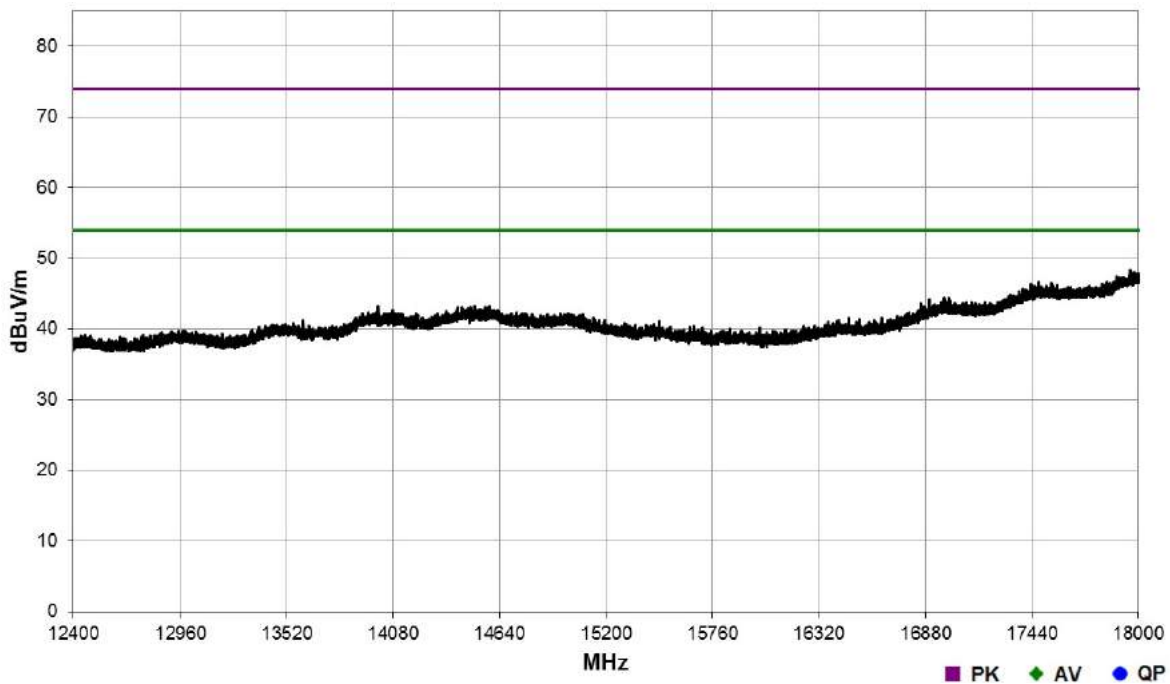
1 GHz to 8.2 GHz



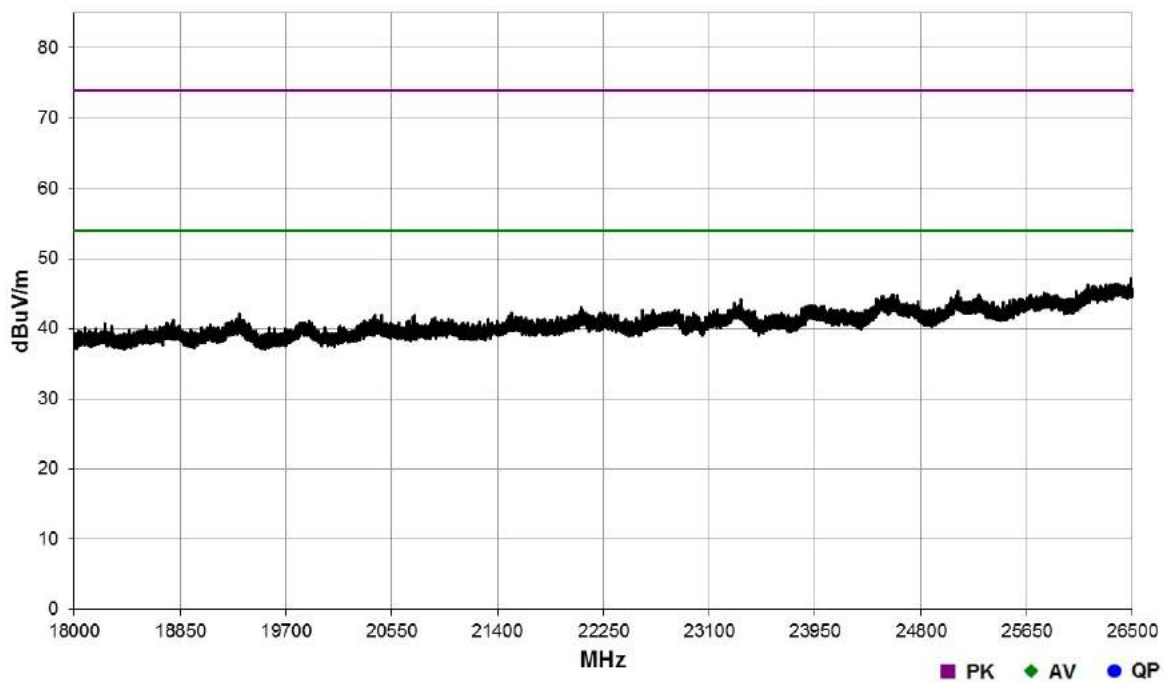
### 8.2 GHz to 12.4 GHz



### 12.4 GHz to 18 GHz

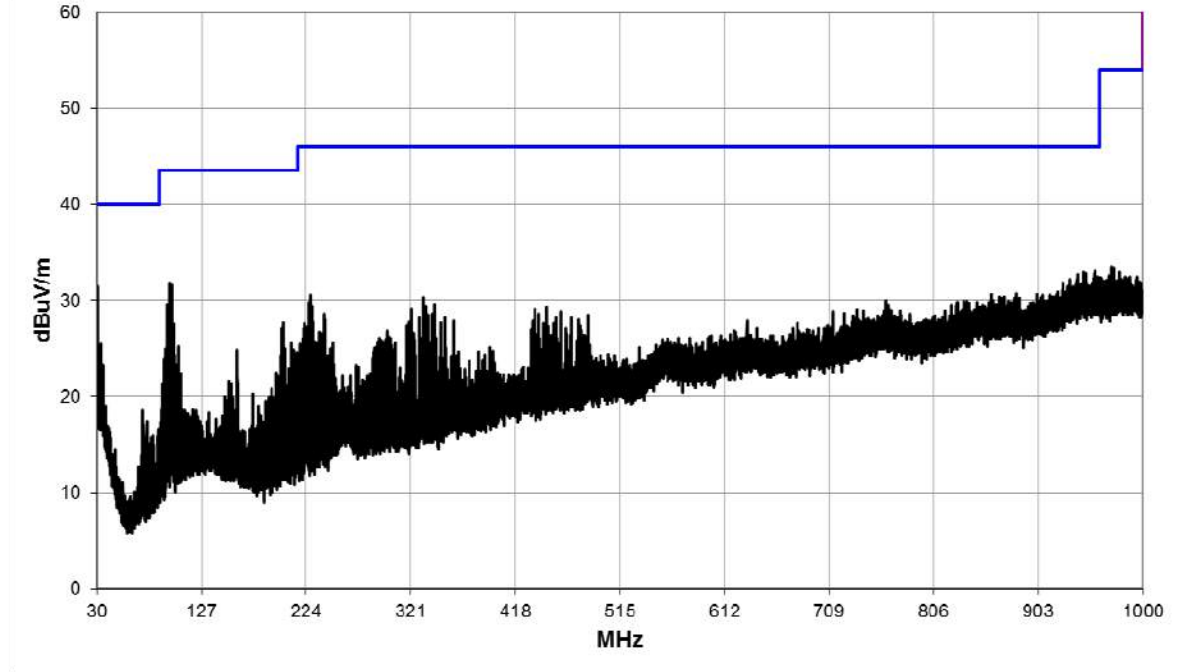


18 GHz to 26.5 GHz

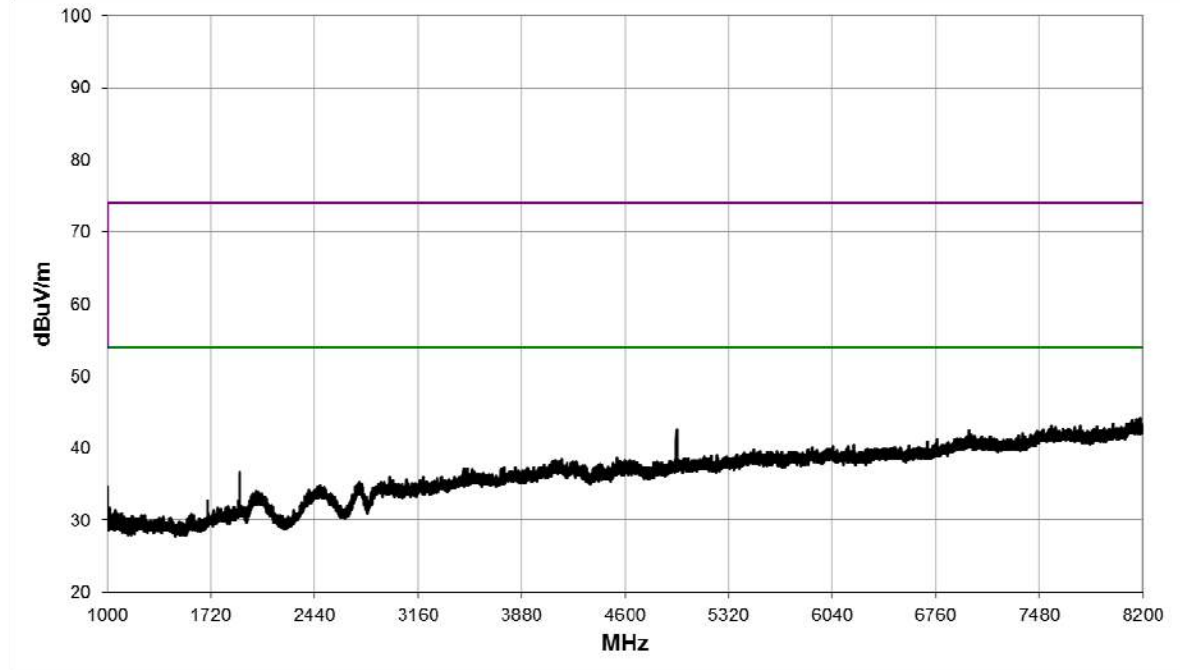


Sample S26 CD05 SN: YR4-US-FBA0039A; Power Setting: 5 dBm; Channel: 2480 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dB $\mu$ V)	Factor (dB)	Field Strength (dB $\mu$ V/m)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
There were no emissions within 10 dB of the limit.						

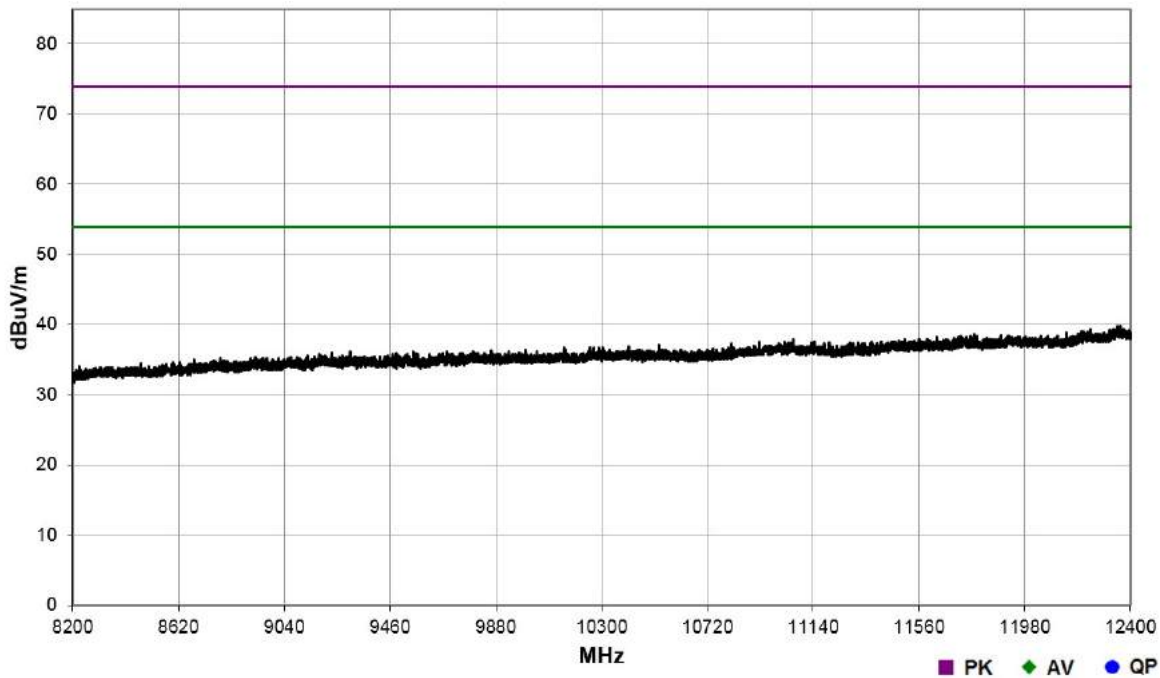
30 MHz to 1 GHz



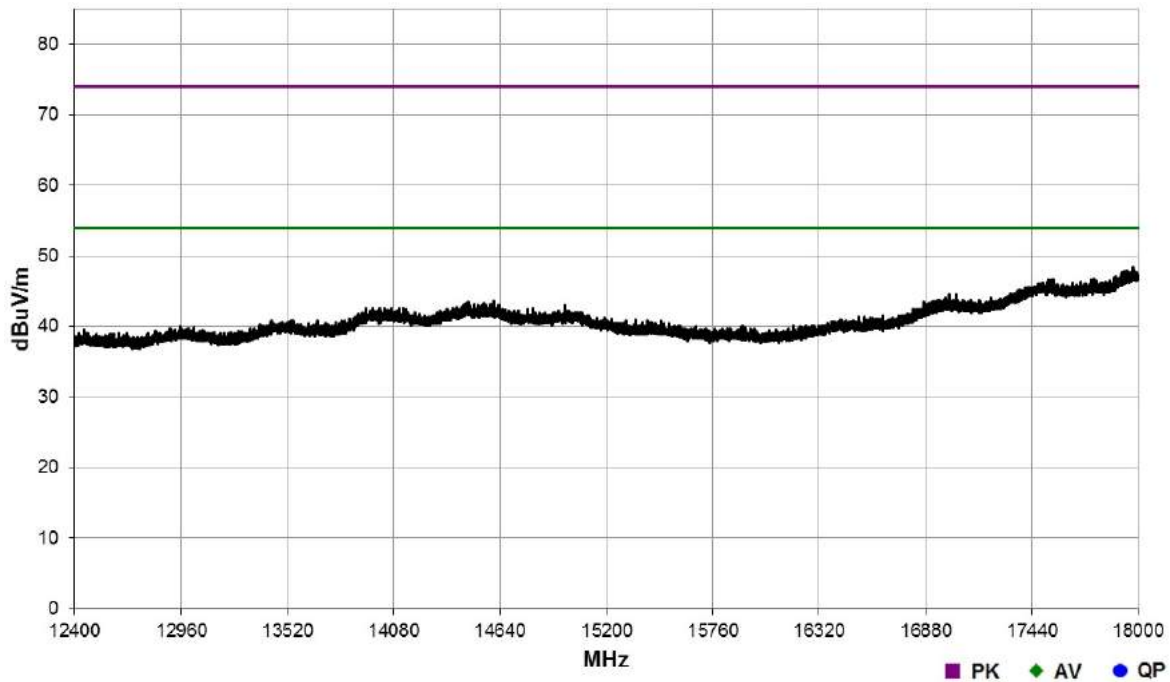
1 GHz to 8.2 GHz



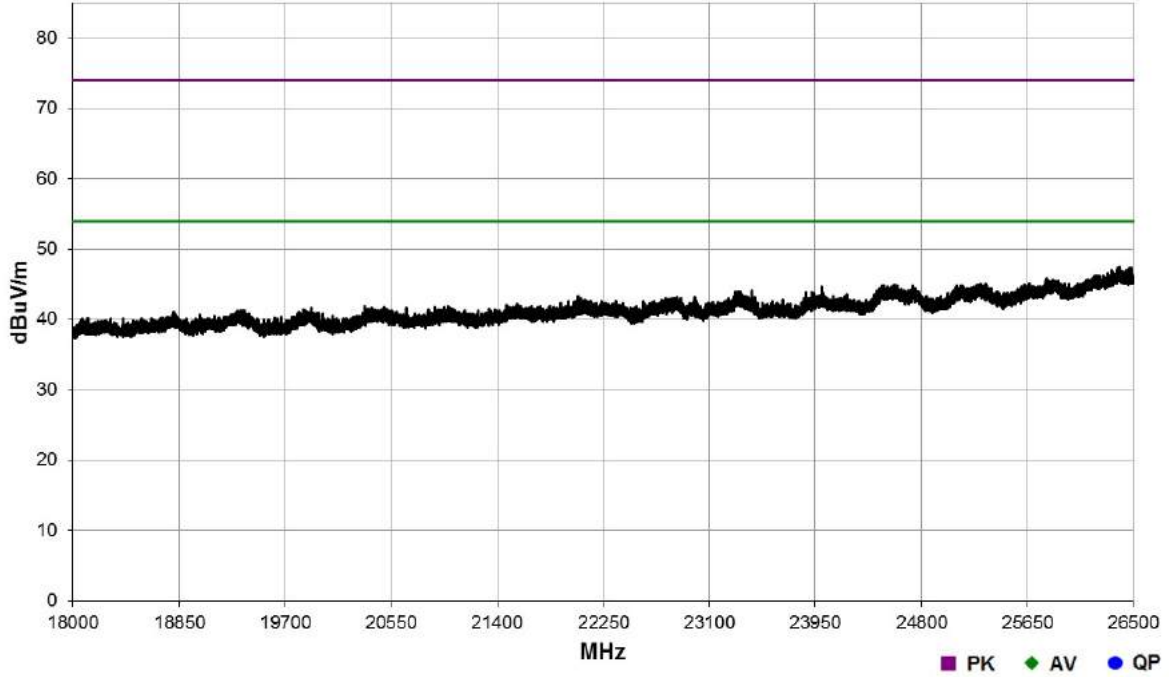
### 8.2 GHz to 12.4 GHz



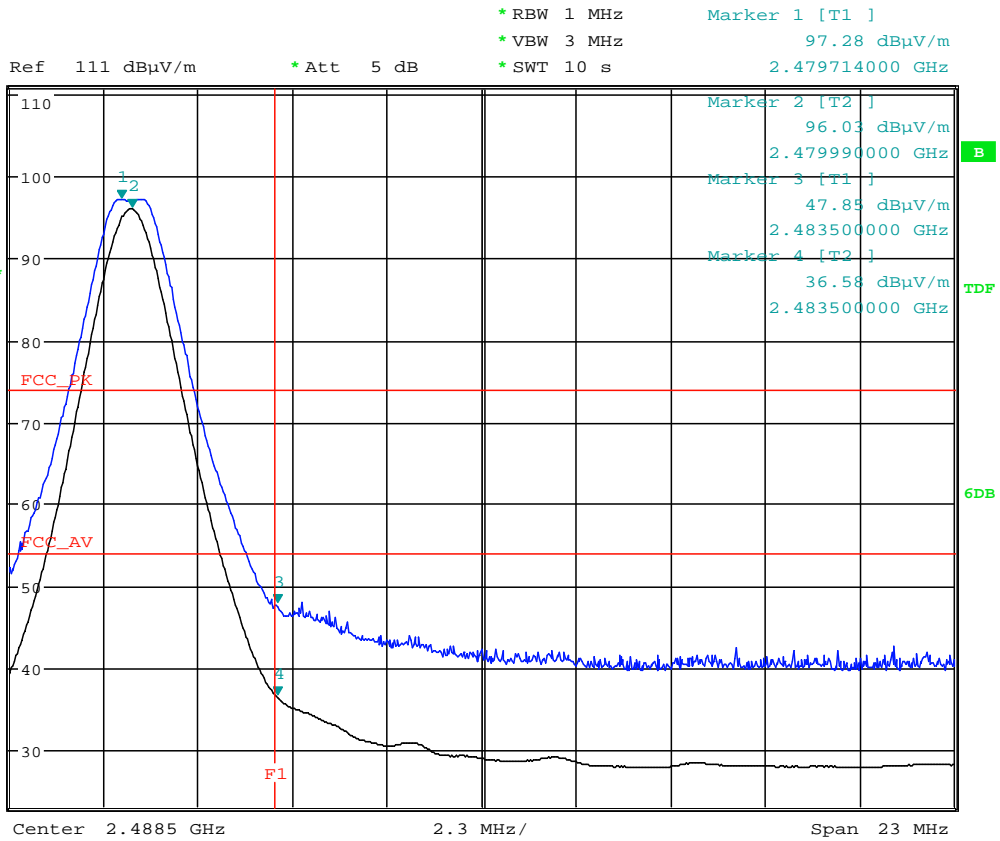
### 12.4 GHz to 18 GHz



18 GHz to 26.5 GHz



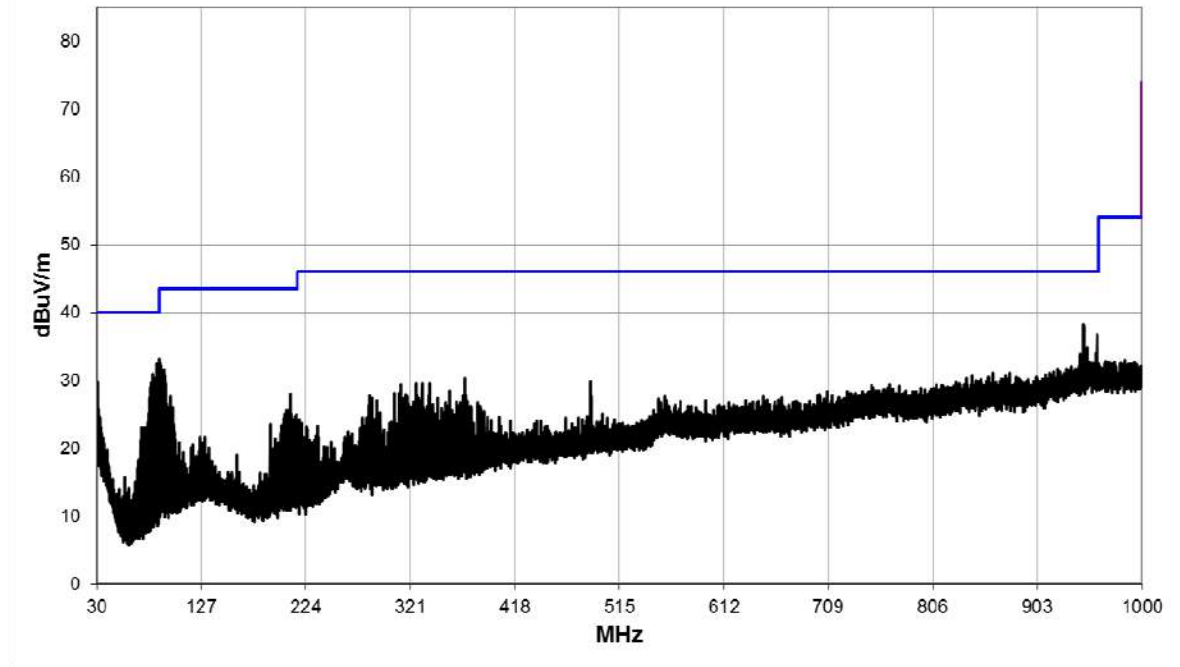
Band Edge



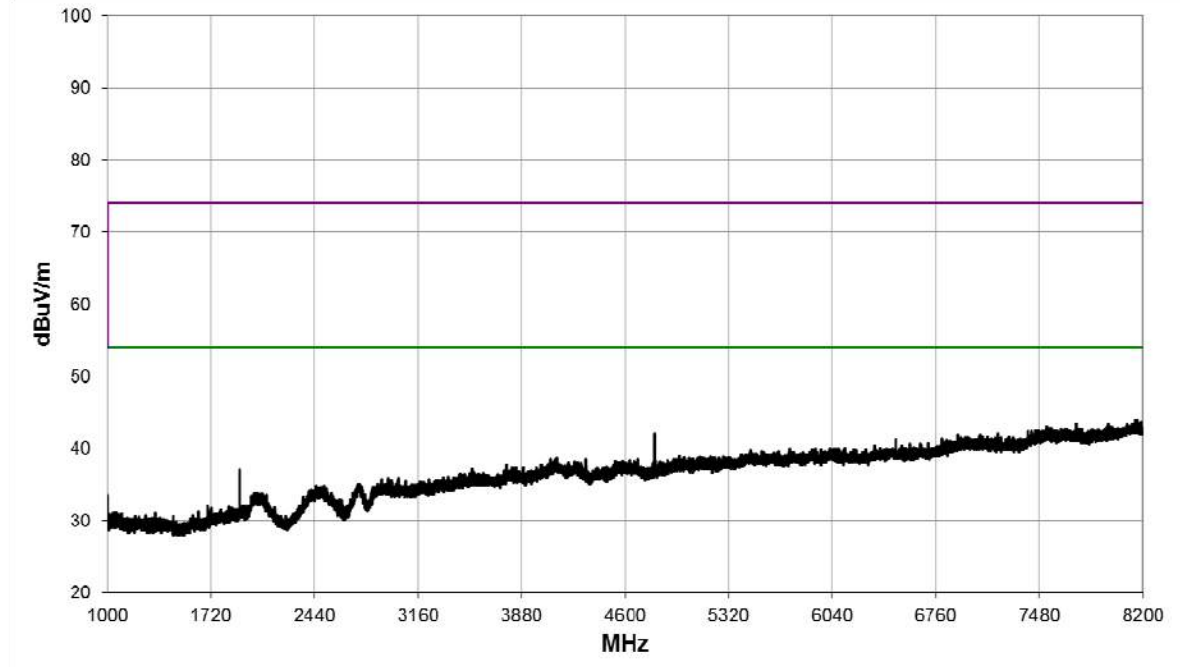
Date: 2.AUG.2018 08:42:48

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

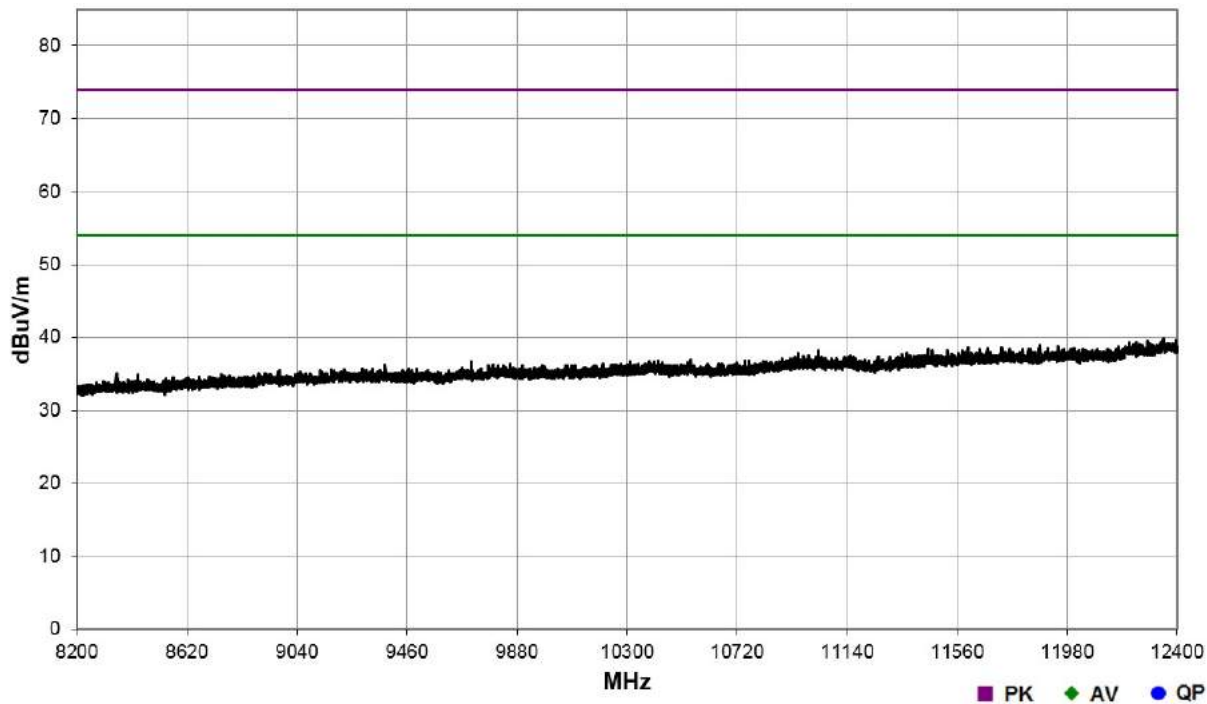


1 GHz to 8.2 GHz

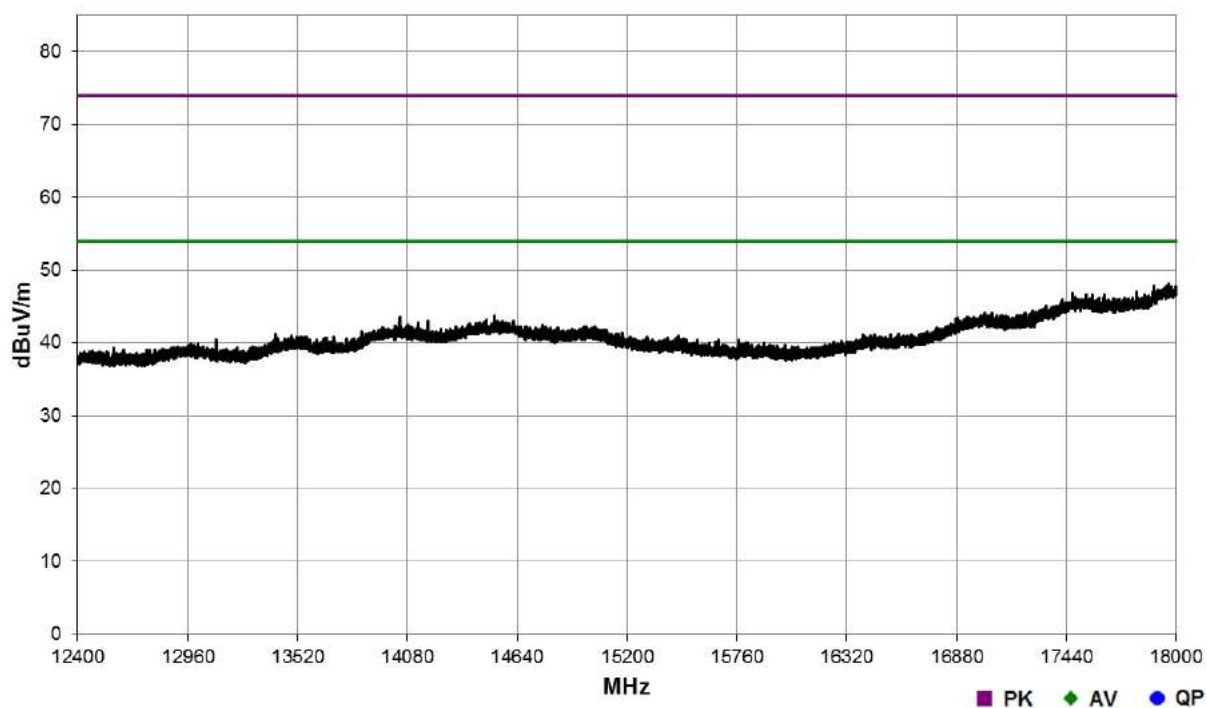




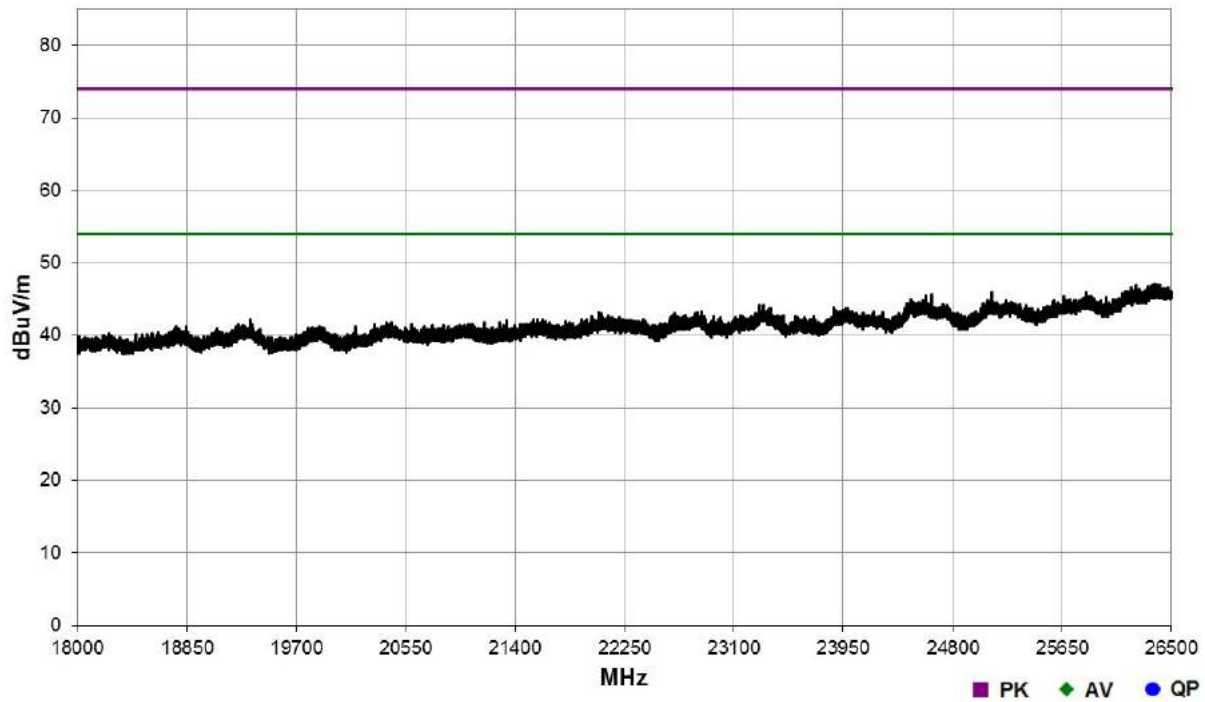
### 8.2 GHz to 12.4 GHz



### 12.4 GHz to 18 GHz

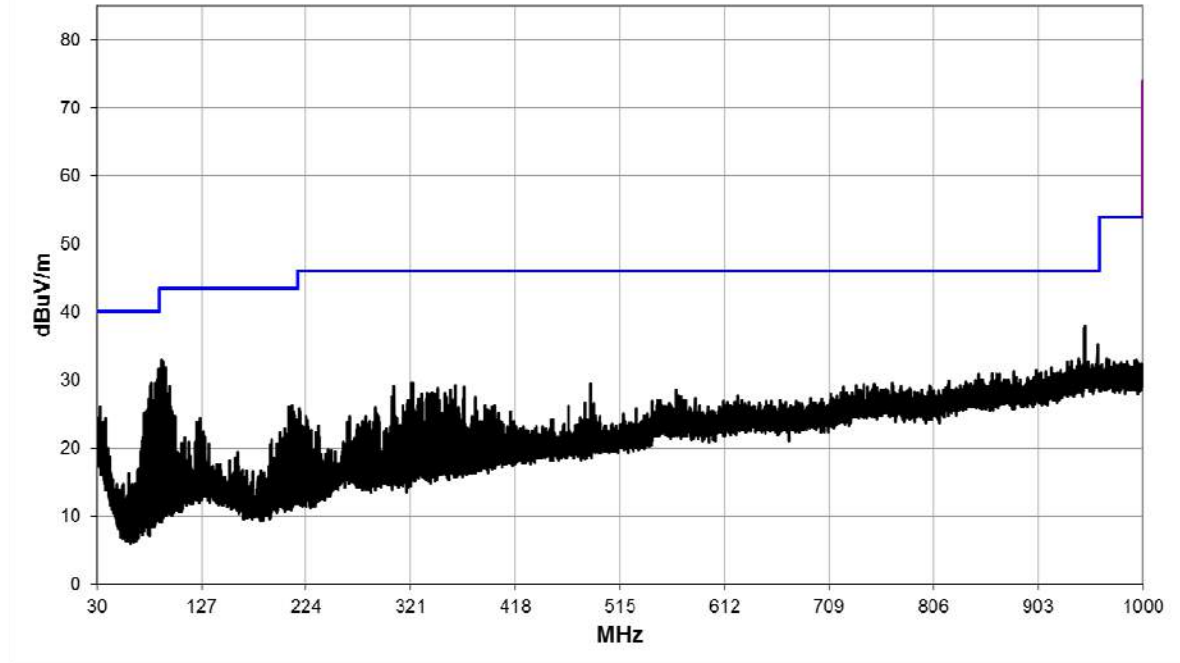


### 18 GHz to 26.5 GHz

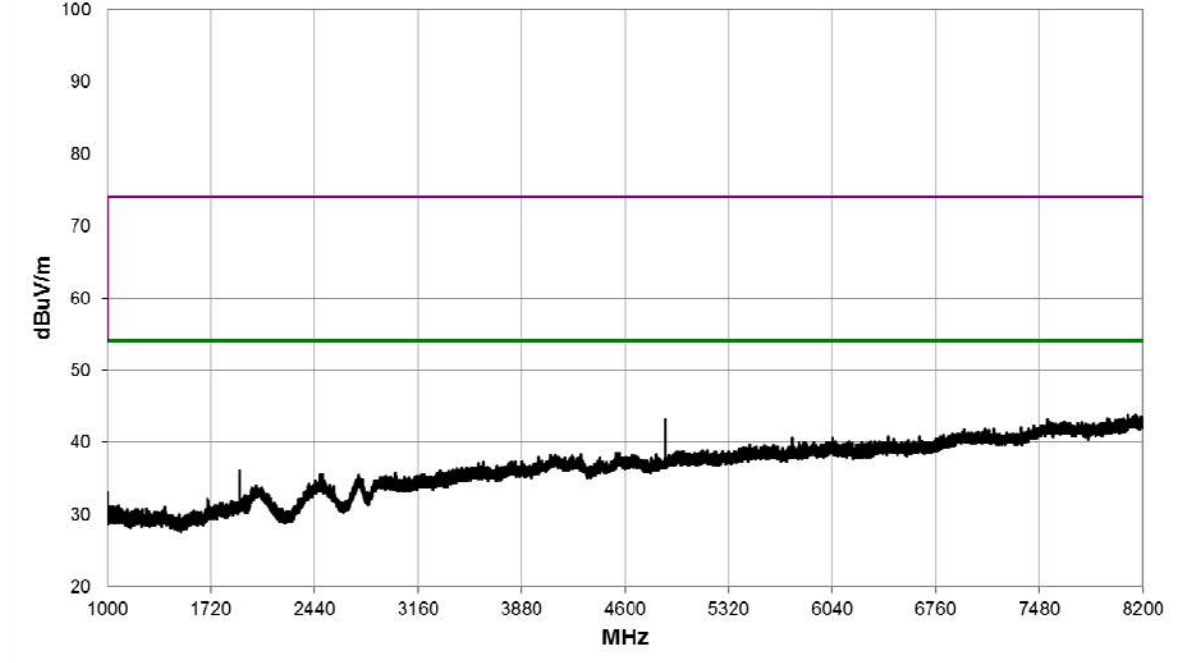


Sample S22 CF04 SN:YR5-US-FBA0037A; Channel: 2440 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dB $\mu$ V)	Factor (dB)	Field Strength (dB $\mu$ V/m)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
There were no emissions within 10 dB of the limit.						

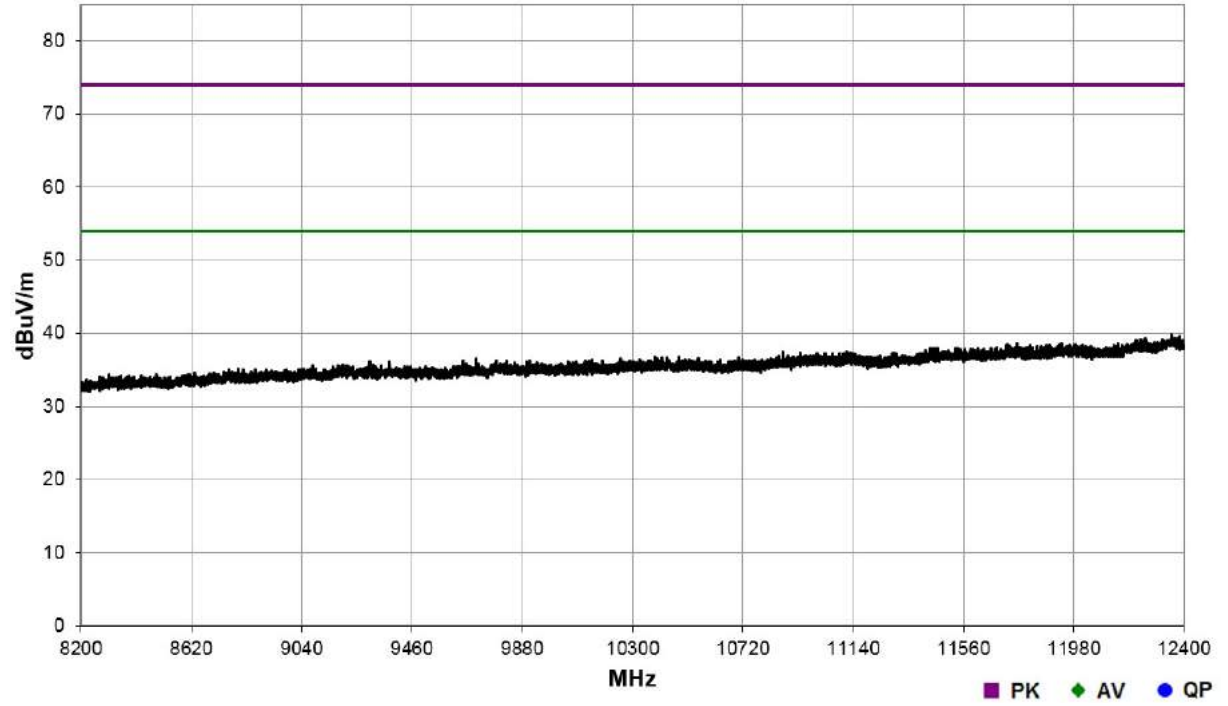
30 MHz to 1 GHz



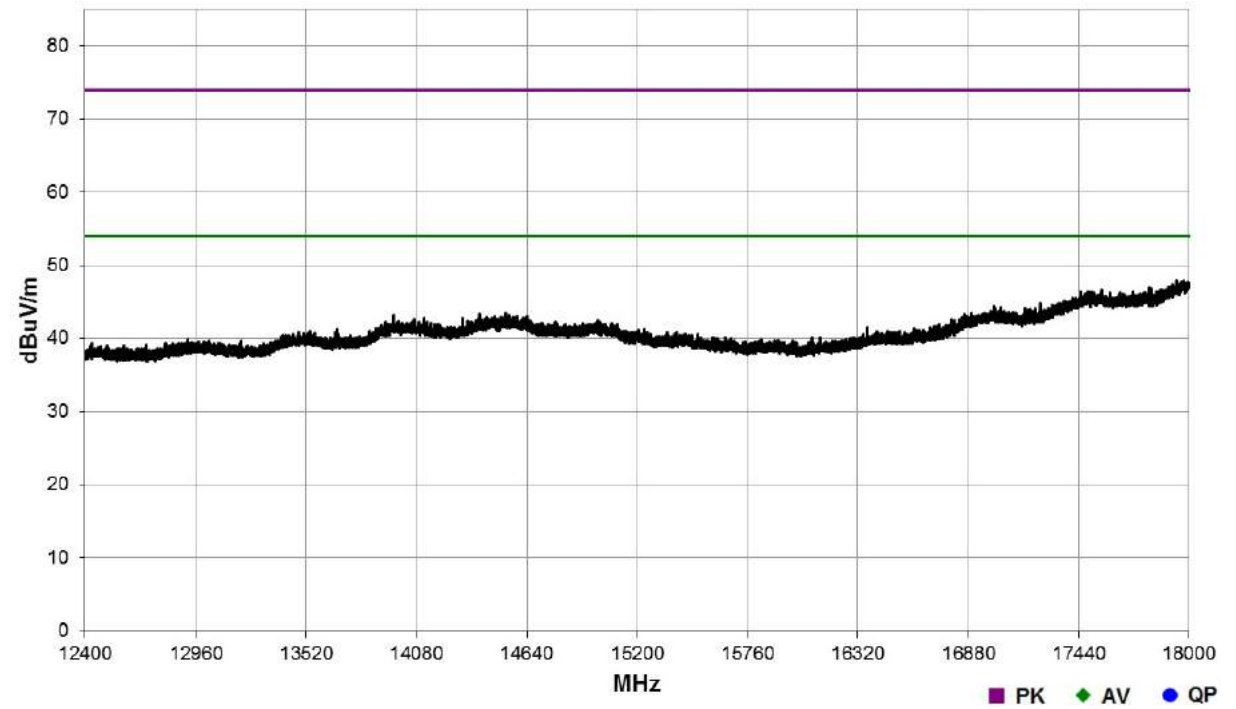
1 GHz to 8.2 GHz



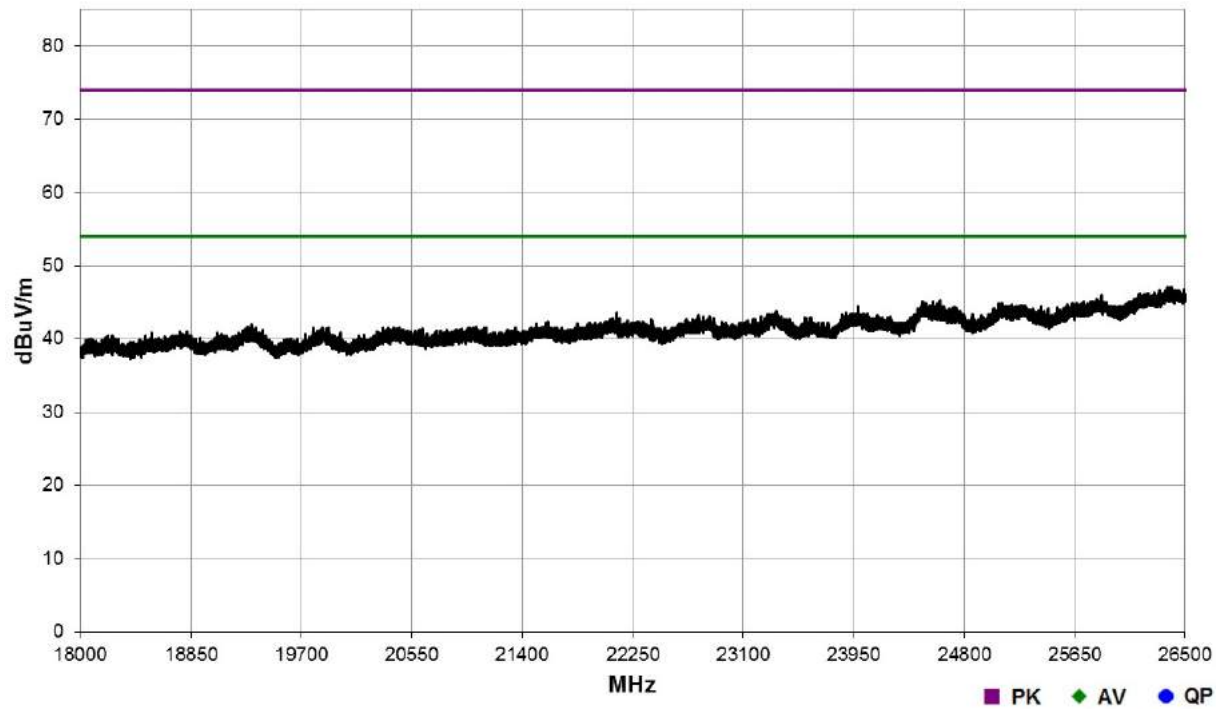
8.2 GHz to 12.4 GHz



12.4 GHz to 18 GHz

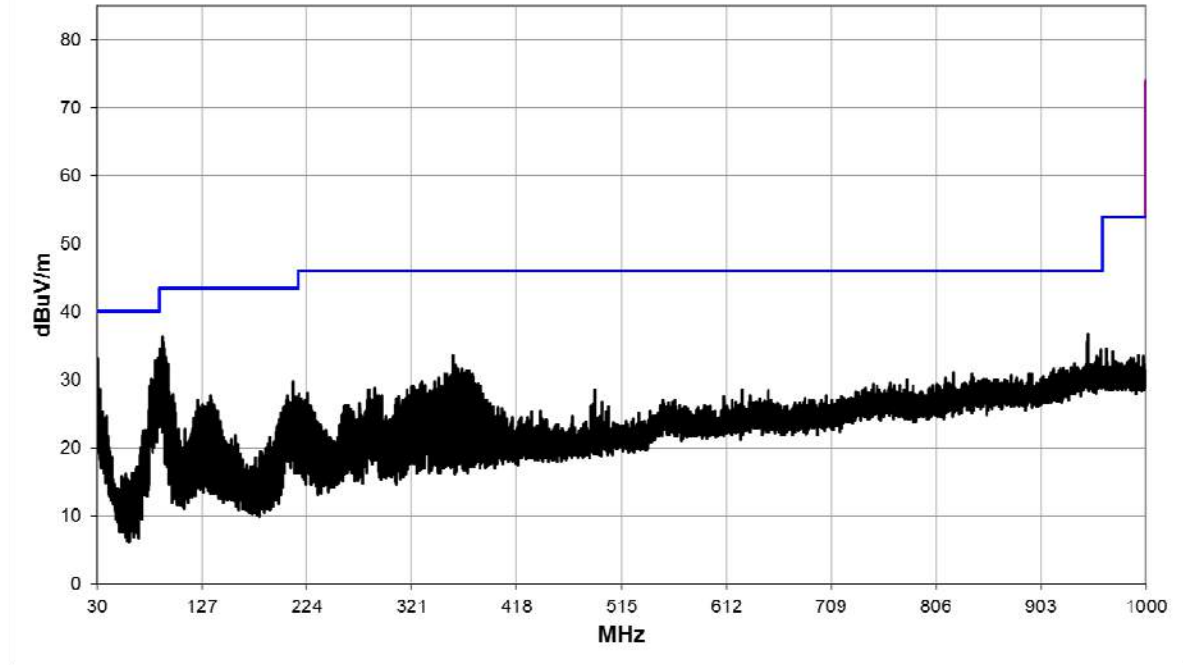


18 GHz to 26.5 GHz

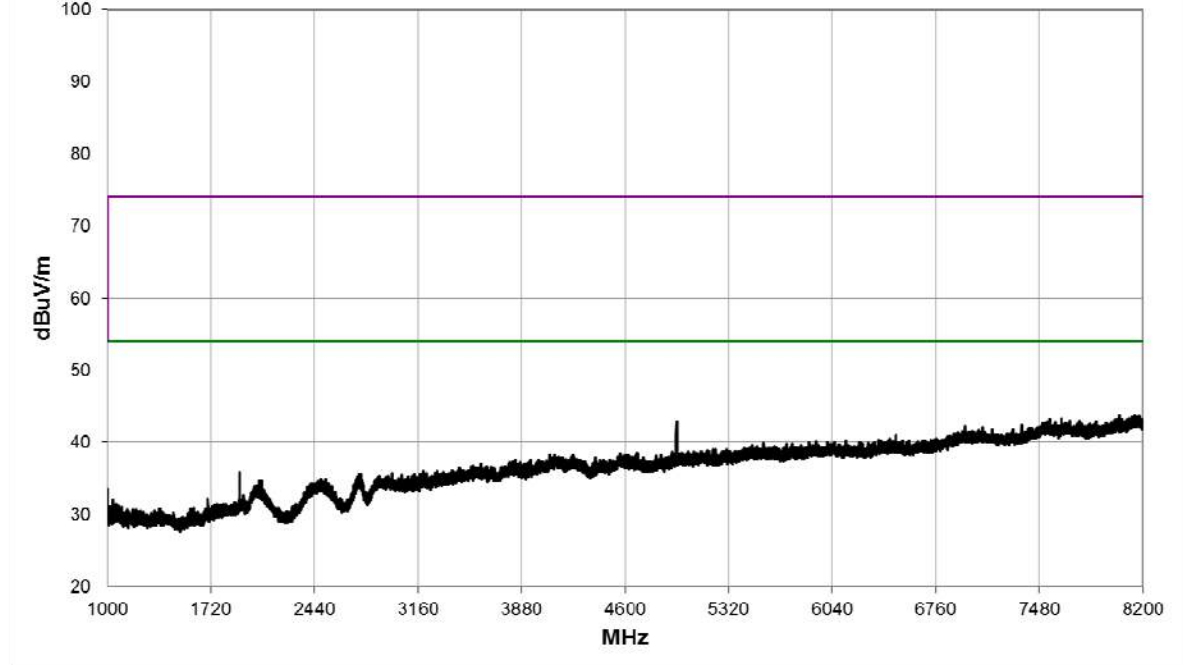


Sample S22 CF04 SN:YR5-US-FBA0037A; Channel: 2480 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dB $\mu$ V)	Factor (dB)	Field Strength (dB $\mu$ V/m)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
There were no emissions within 10 dB of the limit.						

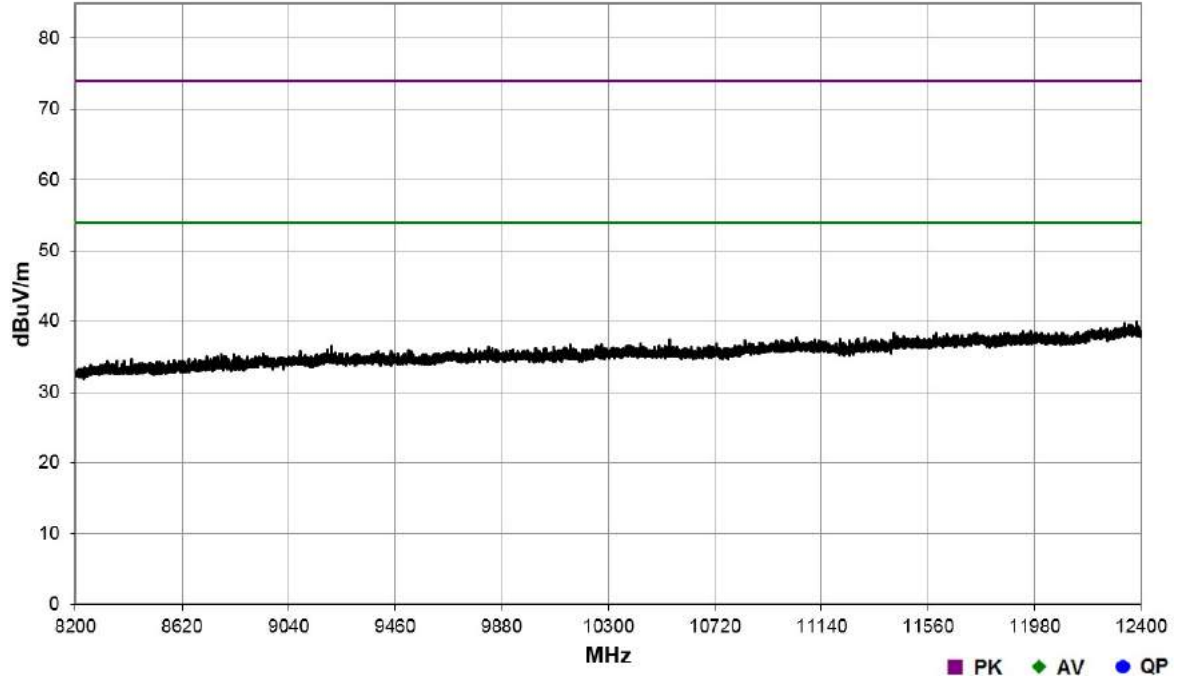
30 MHz to 1 GHz



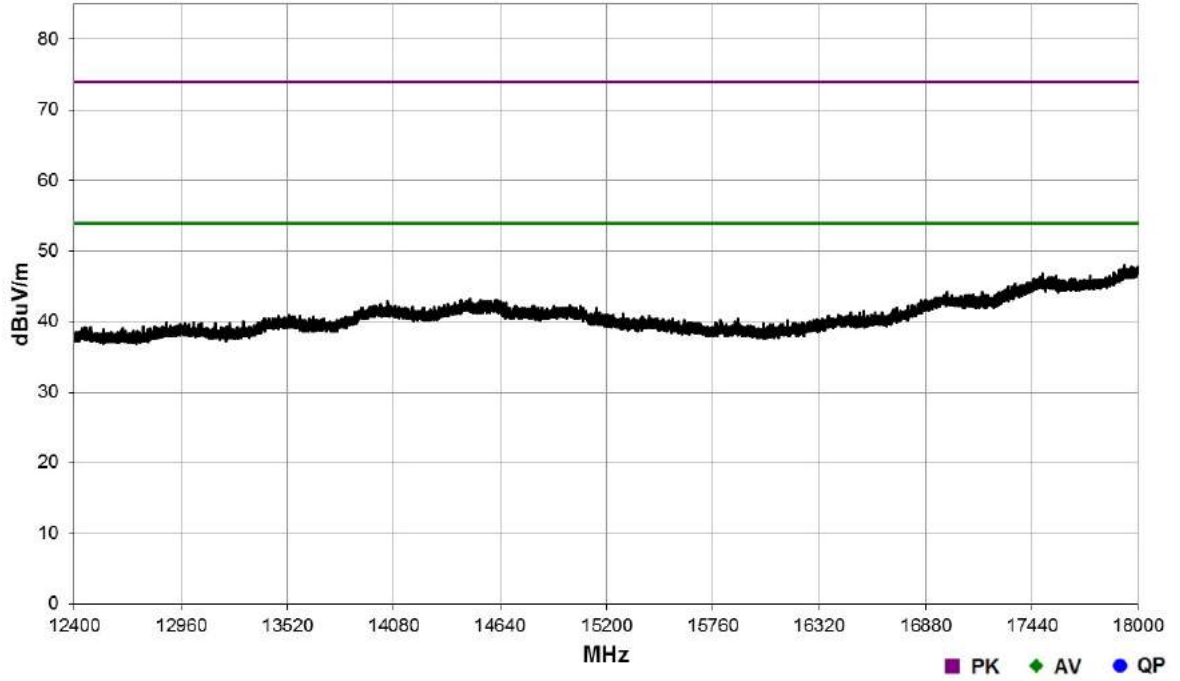
1 GHz to 8.2 GHz



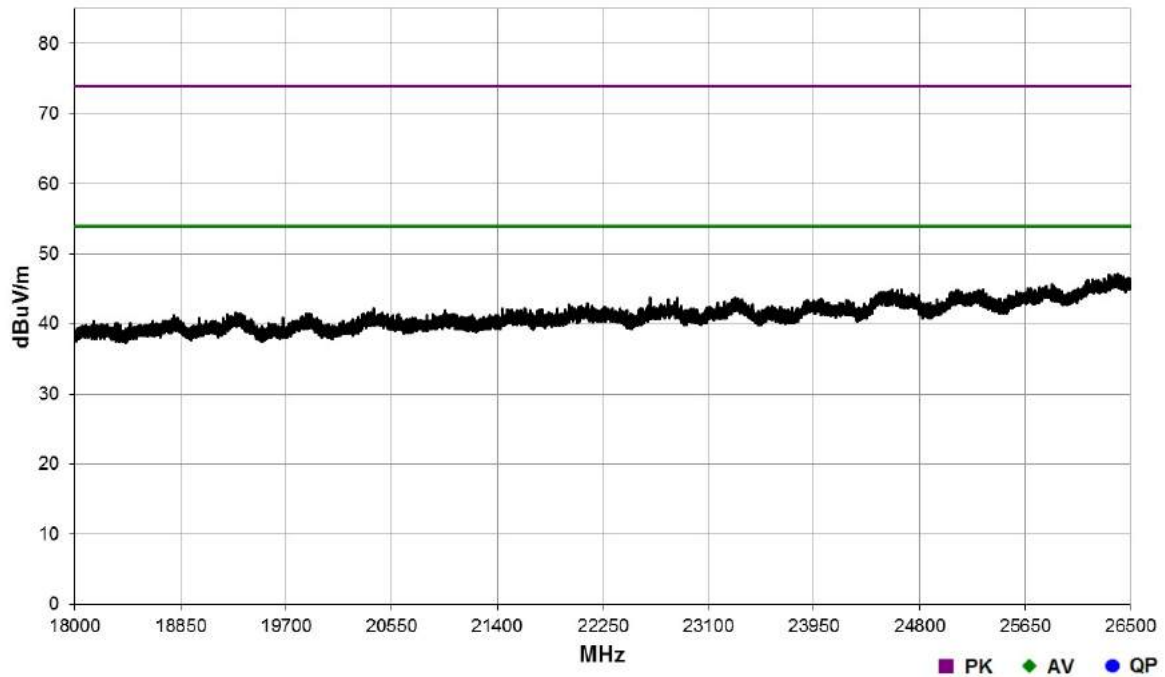
8.2 GHz to 12.4 GHz



12.4 GHz to 18 GHz



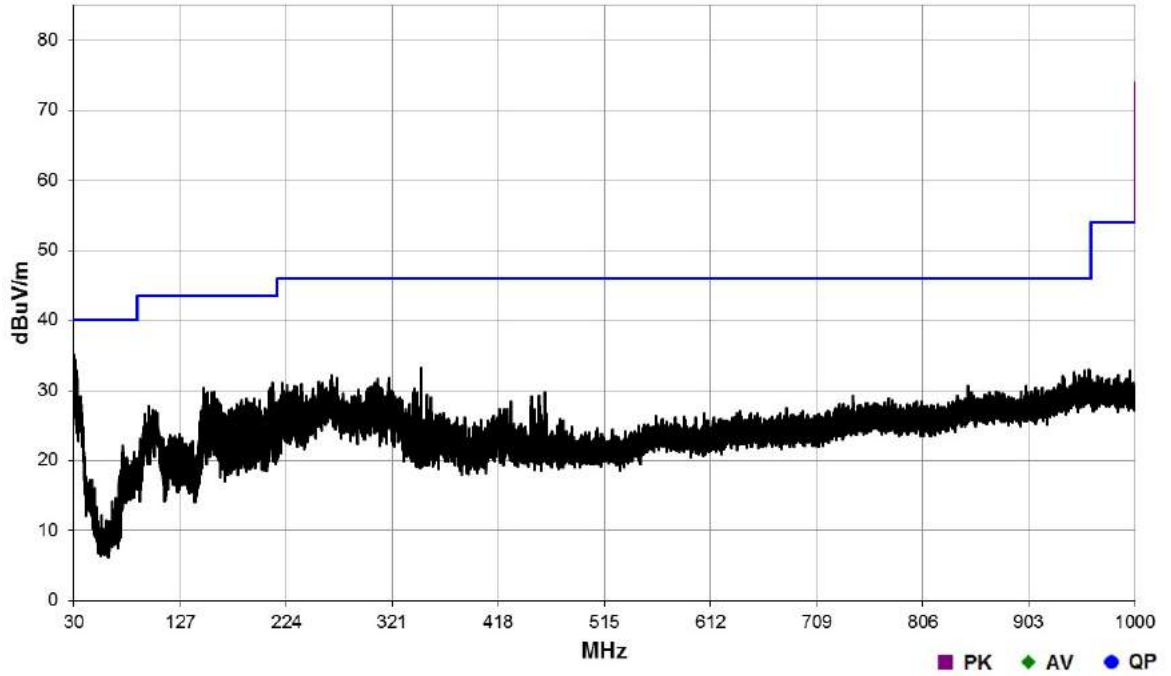
### 18 GHz to 26.5 GHz



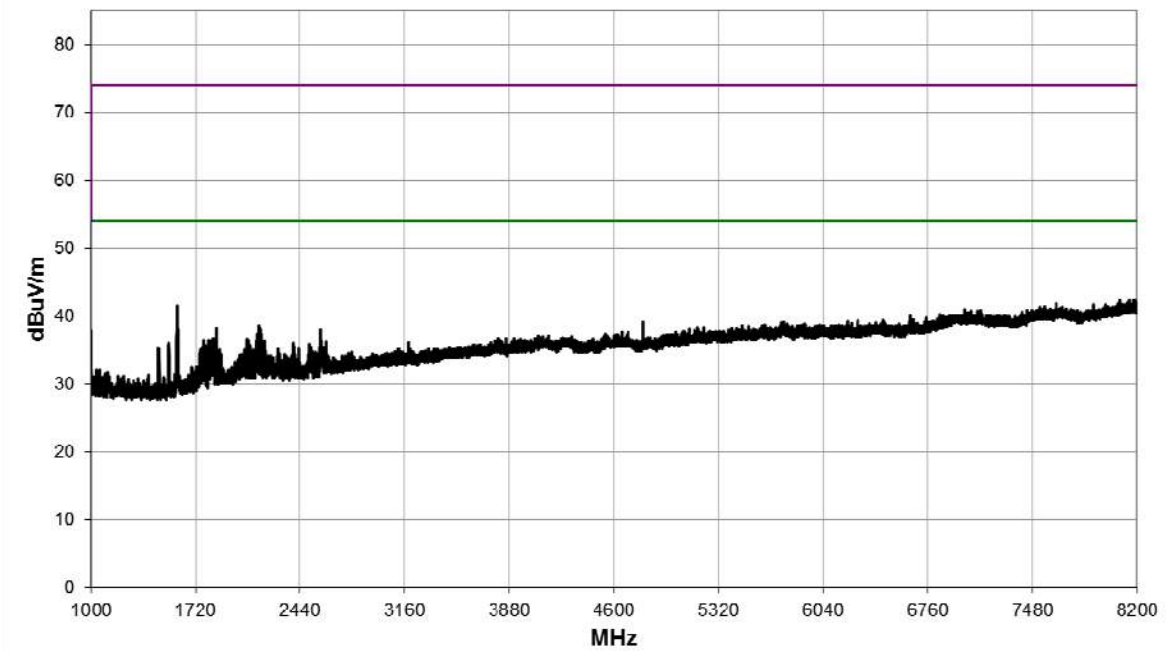


Sample S24 CD04 SN:YU2-JP-FBA0057A; Channel: 2402 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dB $\mu$ V)	Factor (dB)	Field Strength (dB $\mu$ V/m)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
There were no emissions within 10 dB of the limit.						

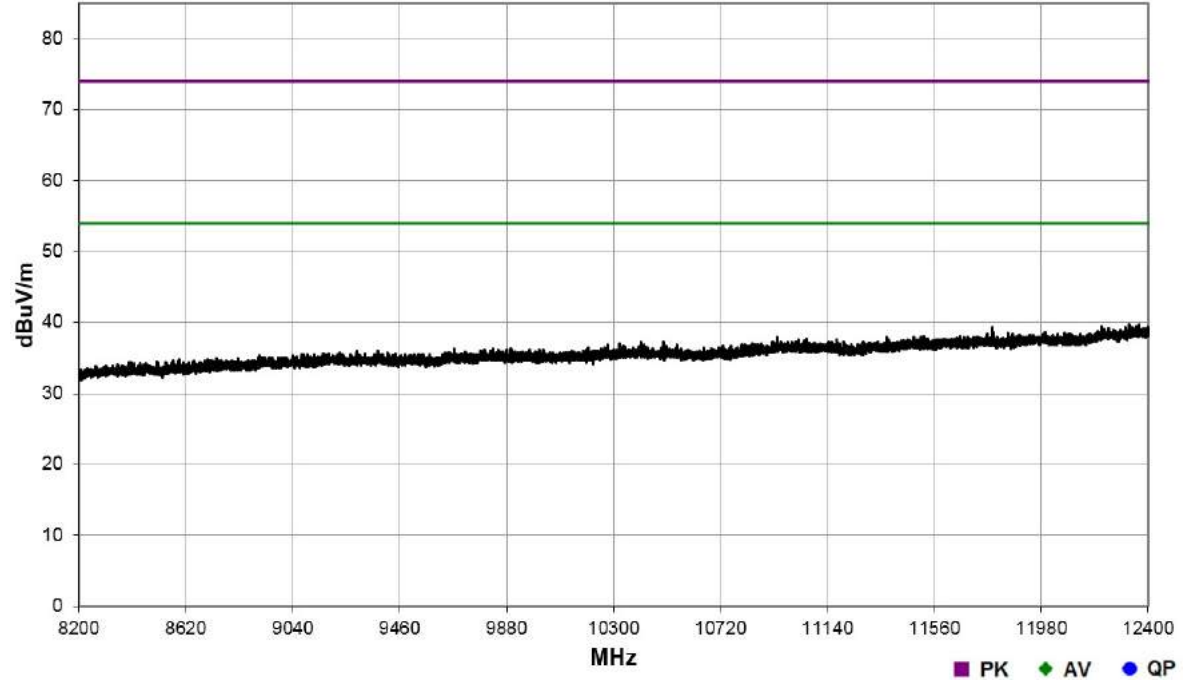
30 MHz to 1 GHz



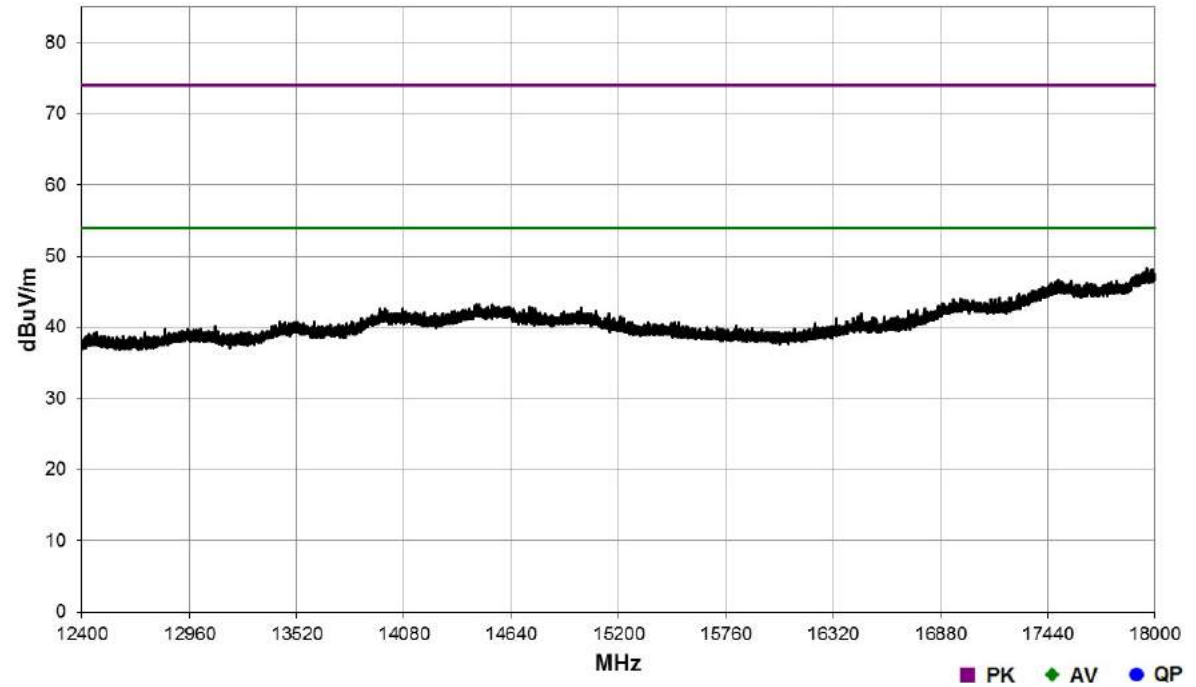
1 GHz to 8.2 GHz



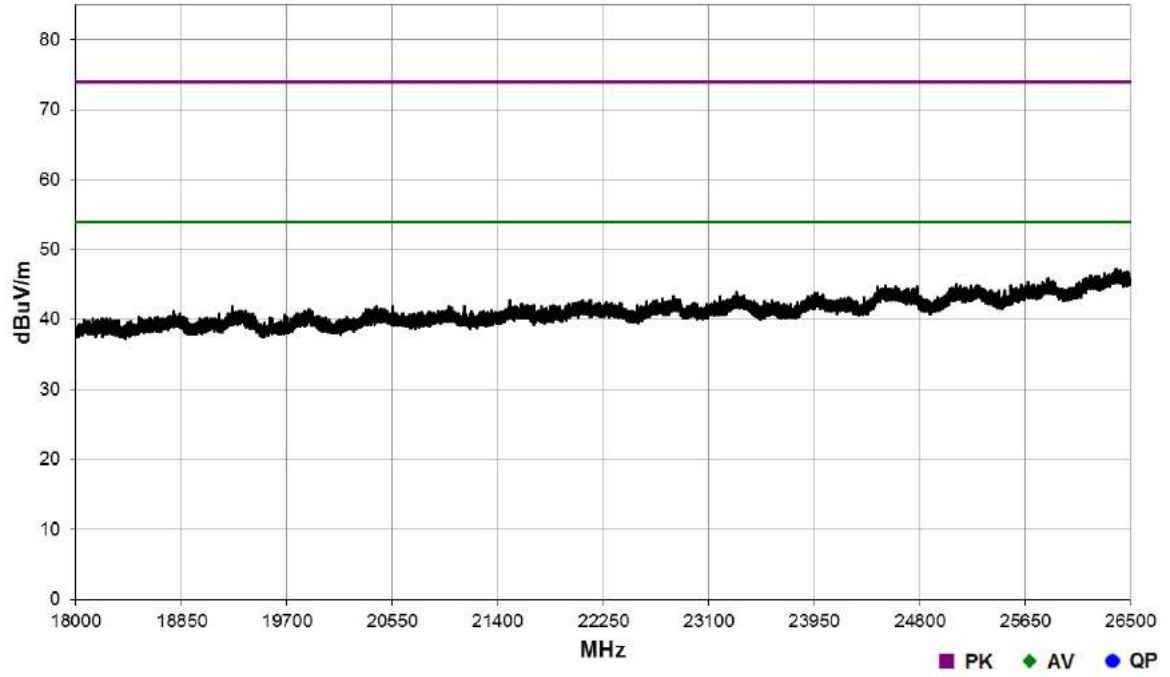
8.2 GHz to 12.4 GHz



12.4 GHz to 18 GHz

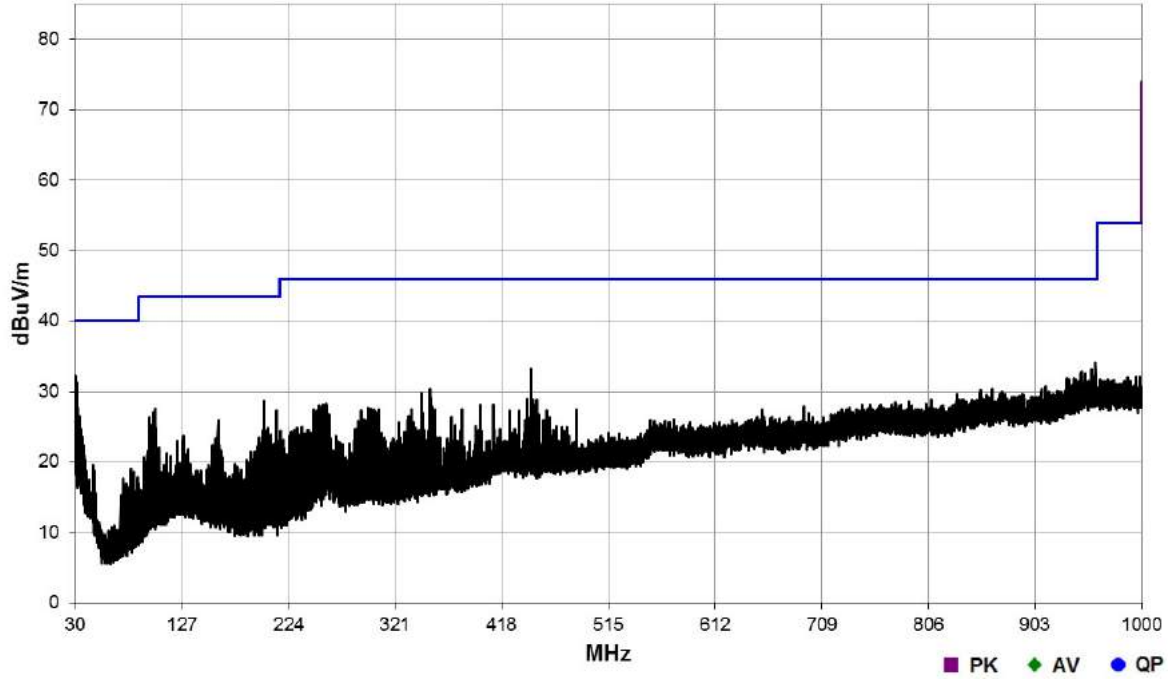


18 GHz to 26.5 GHz

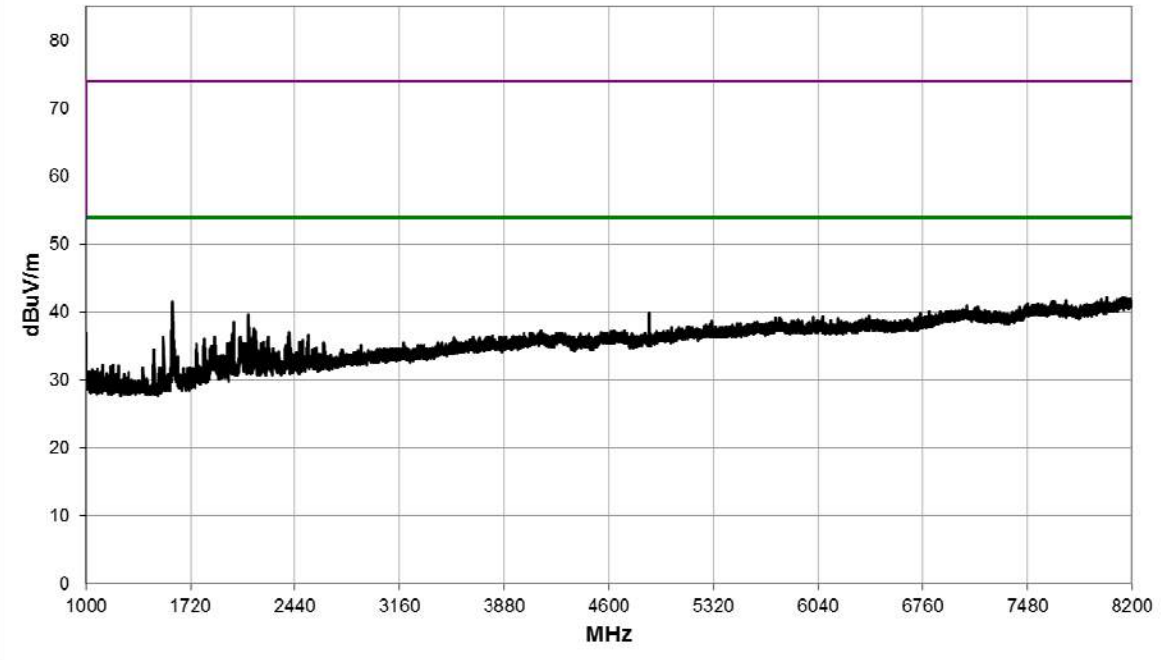


Sample S24 CD04 SN:YU2-JP-FBA0057A; Channel: 2440 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dB $\mu$ V)	Factor (dB)	Field Strength (dB $\mu$ V/m)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
There were no emissions within 10 dB of the limit.						

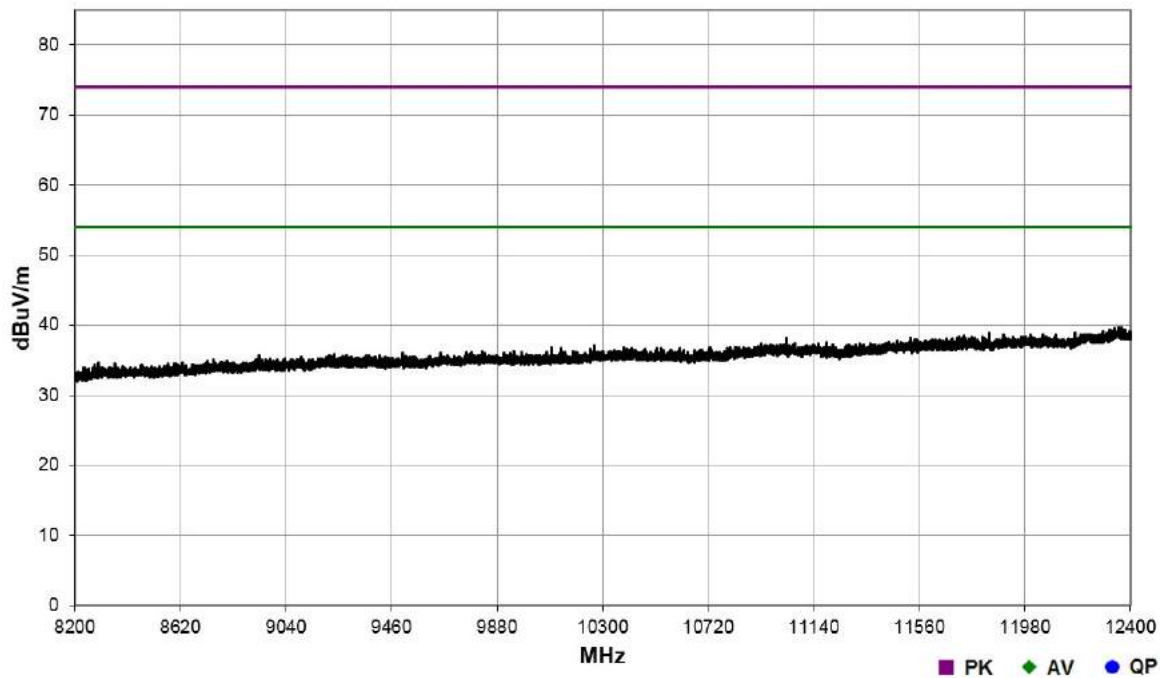
30 MHz to 1 GHz



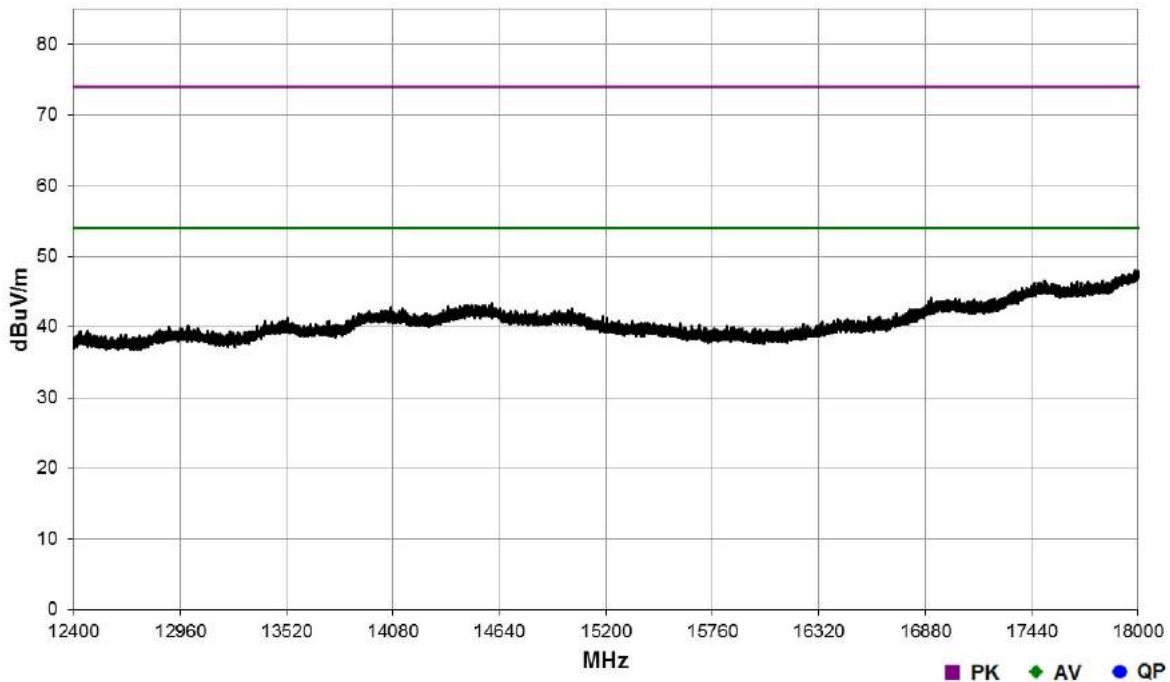
1 GHz to 8.2 GHz



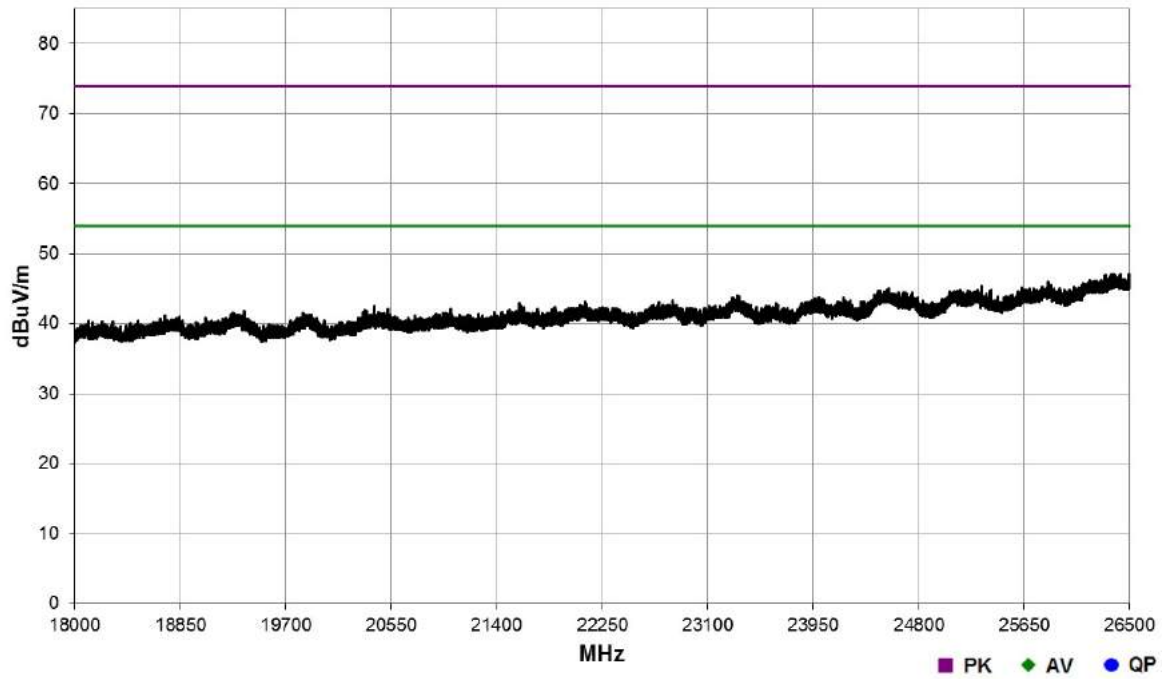
### 8.2 GHz to 12.4 GHz



### 12.4 GHz to 18 GHz

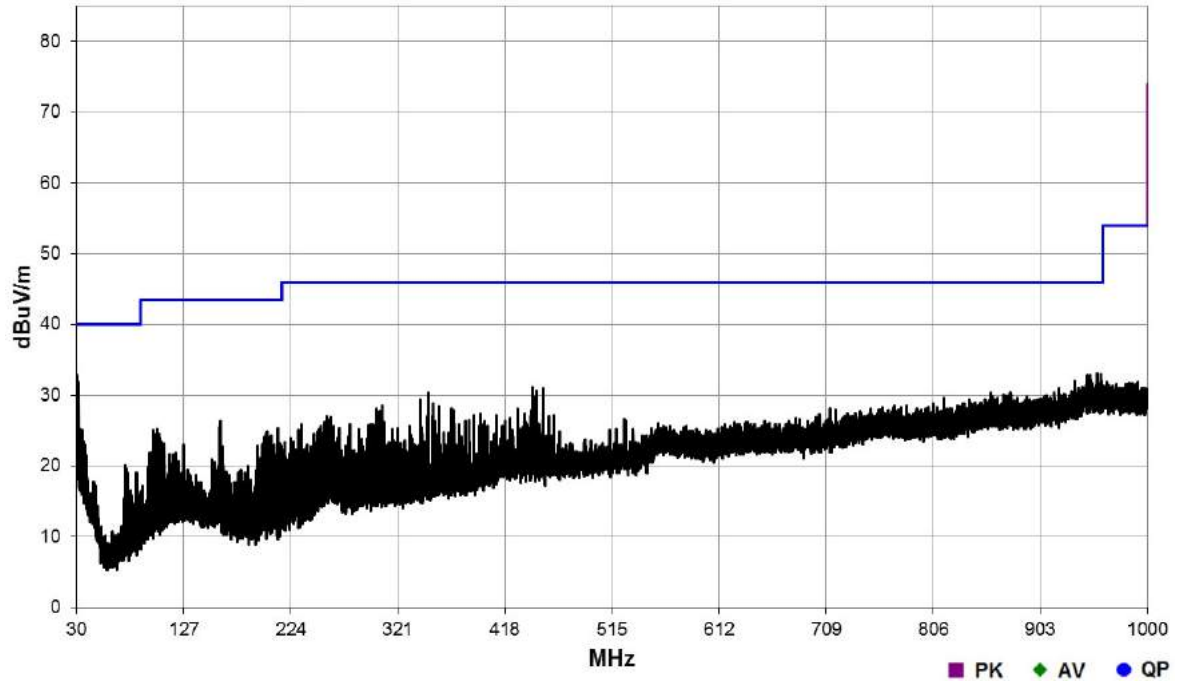


18 GHz to 26.5 GHz

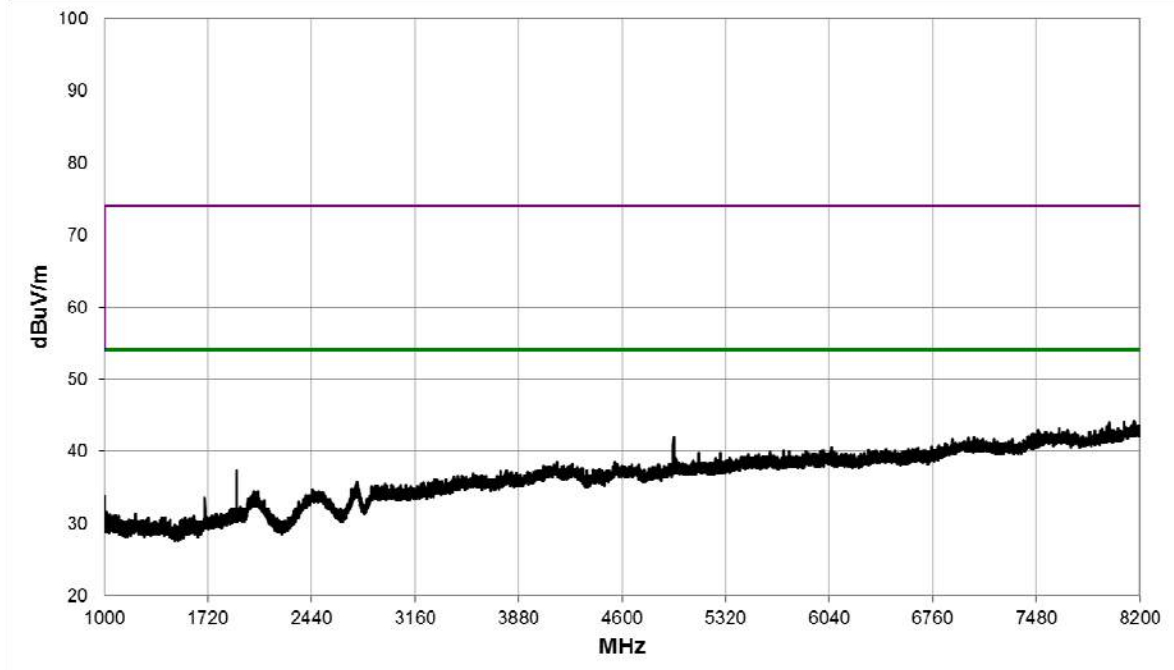


Sample S24 CD04 SN:YU2-JP-FBA0057A; Channel: 2480 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dBµV)	Factor (dB)	Field Strength (dBµV/m)	Field Strength (µV/m)	Limit (µV/m)
There were no emissions within 10 dB of the limit.						

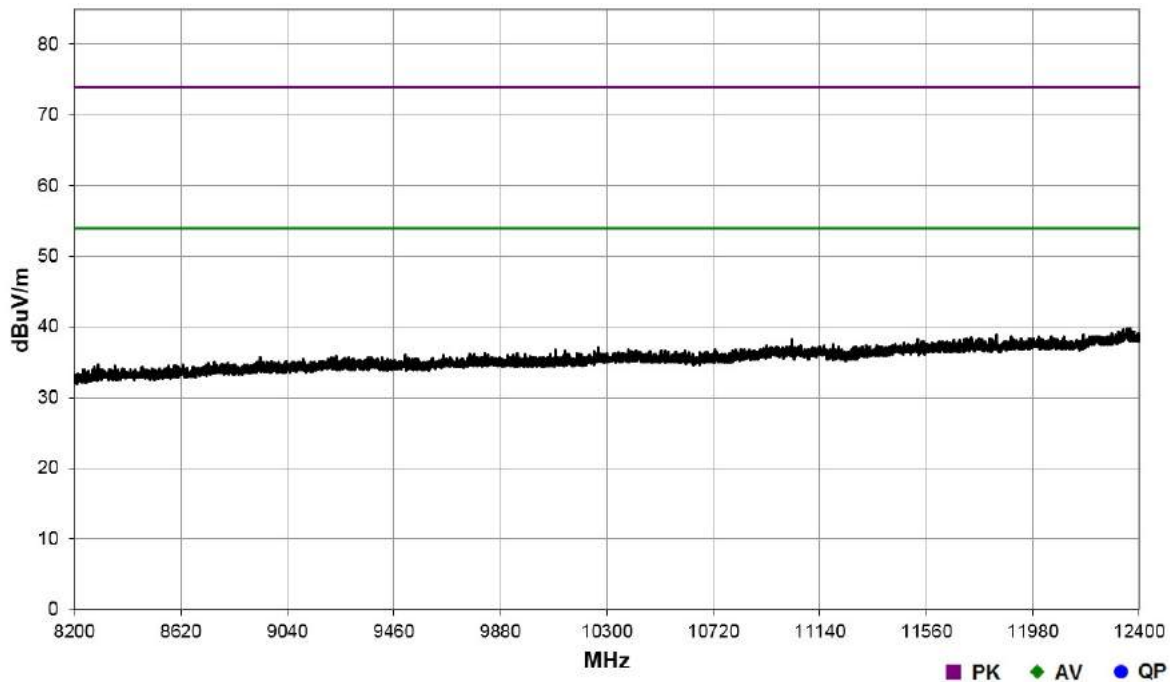
30 MHz to 1 GHz



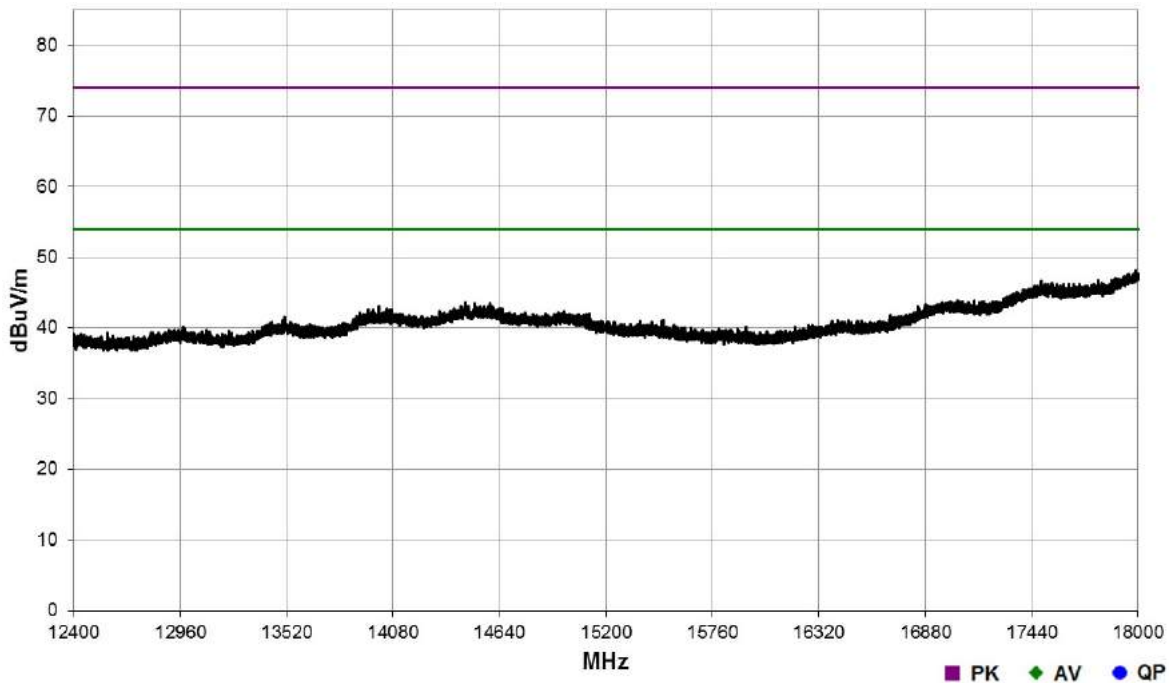
1 GHz to 8.2 GHz



### 8.2 GHz to 12.4 GHz

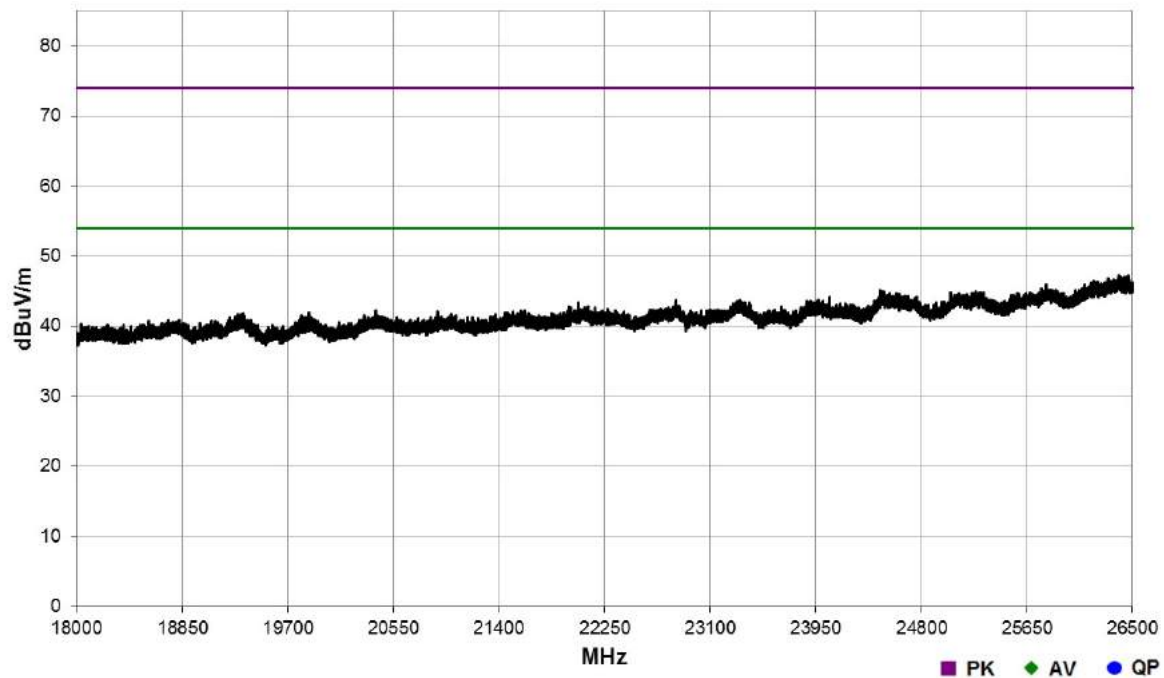


### 12.4 GHz to 18 GHz



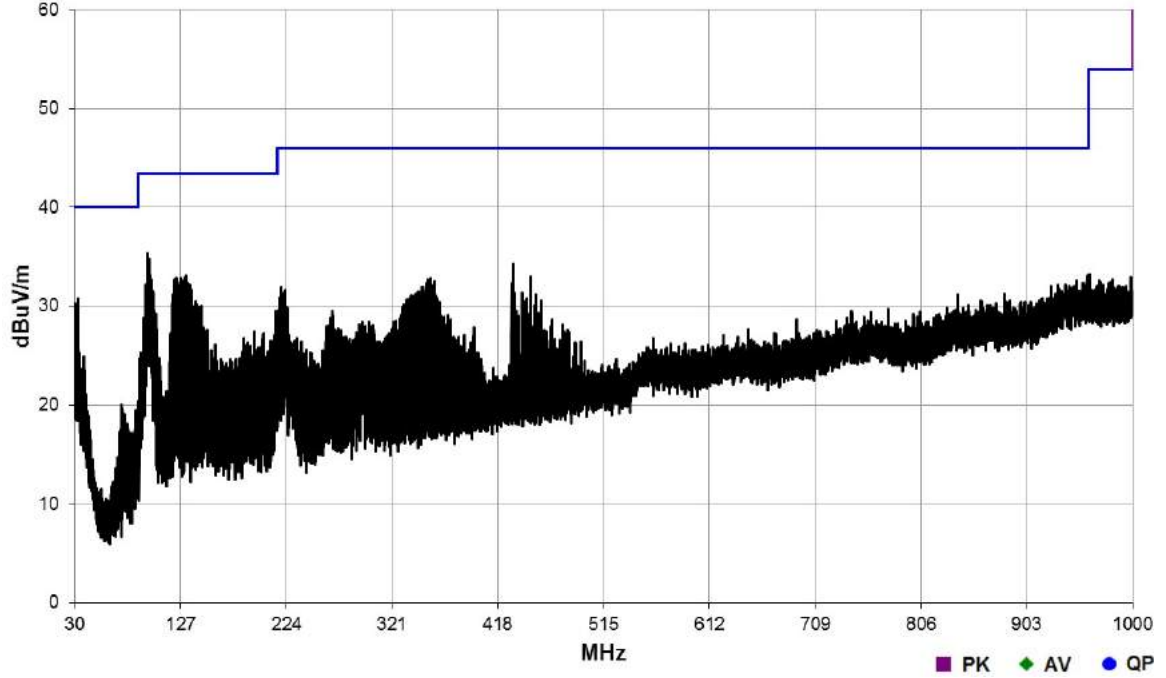


18 GHz to 26.5 GHz

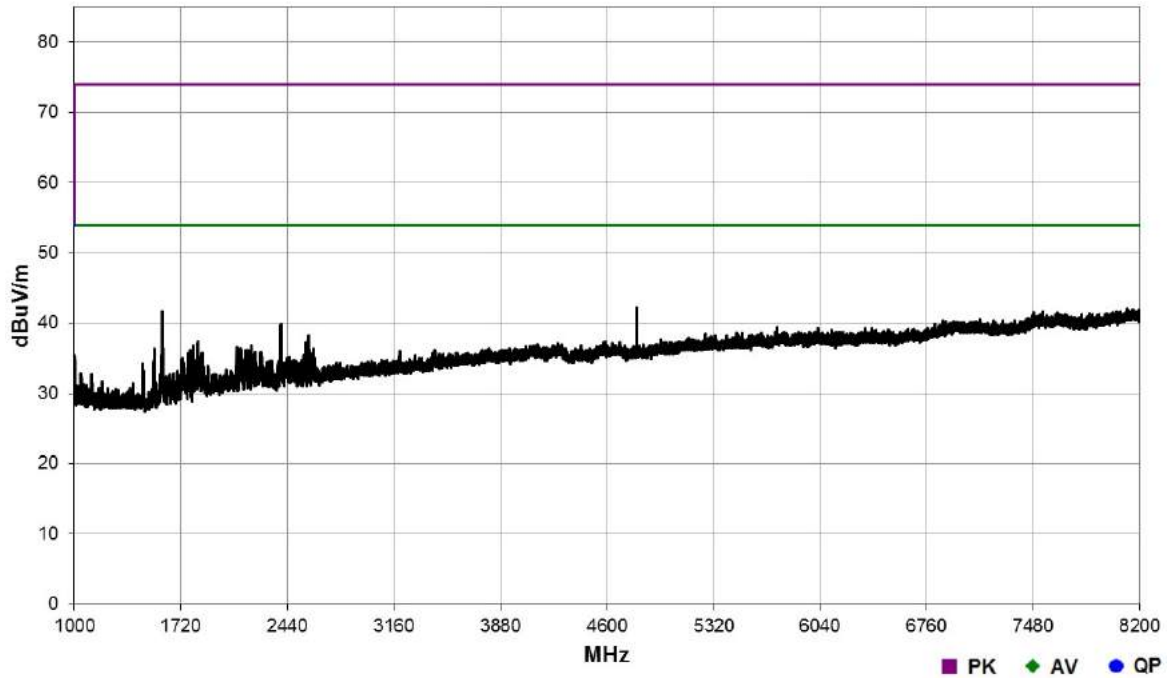


Sample S26 CD05 SN: YR4-US-FBA0039A; Channel: 2402 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dB $\mu$ V)	Factor (dB)	Field Strength (dB $\mu$ V/m)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
There were no emissions within 10 dB of the limit.						

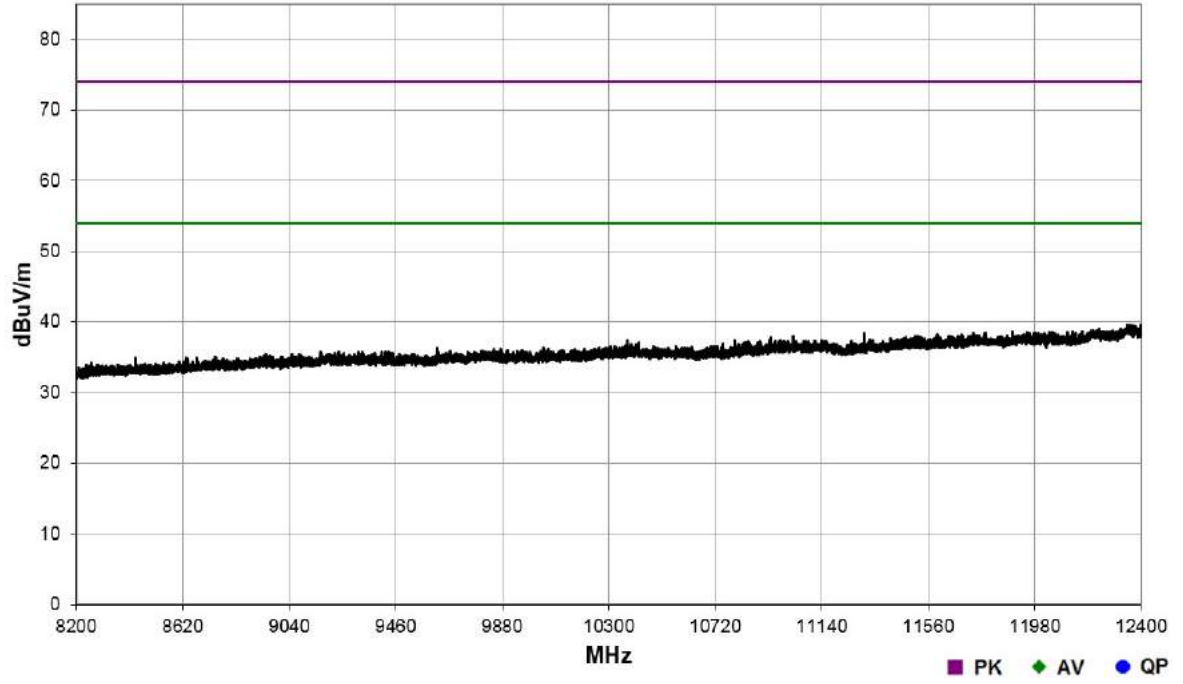
30 MHz to 1 GHz



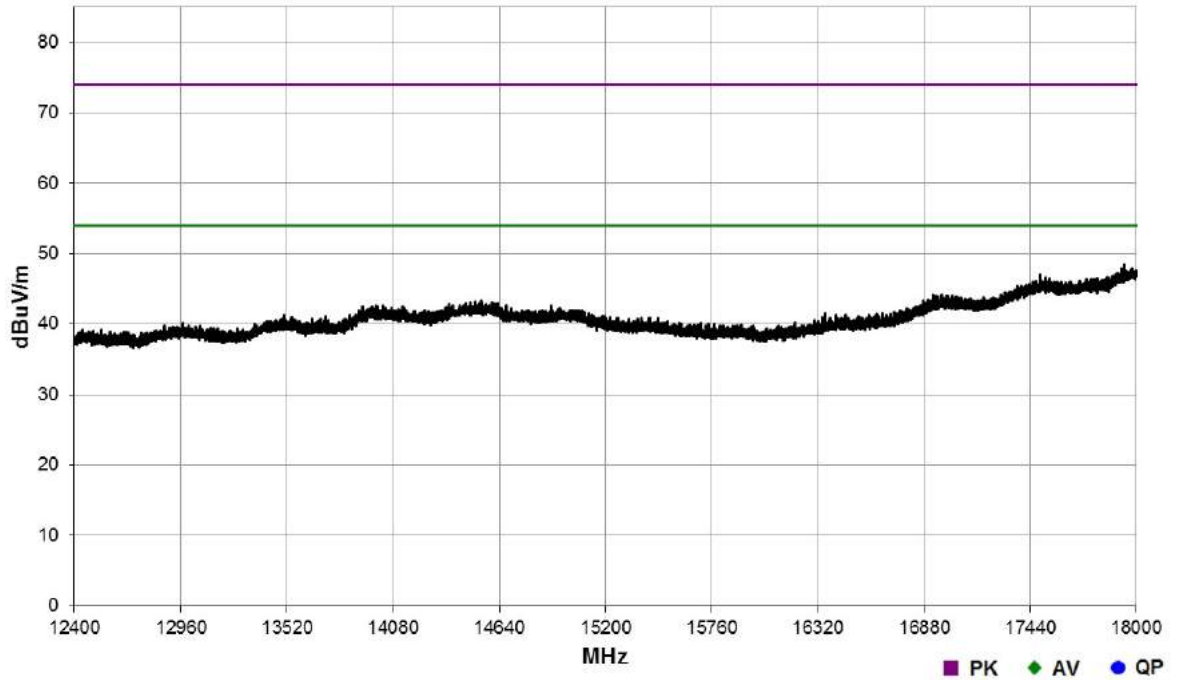
1 GHz to 8.2 GHz



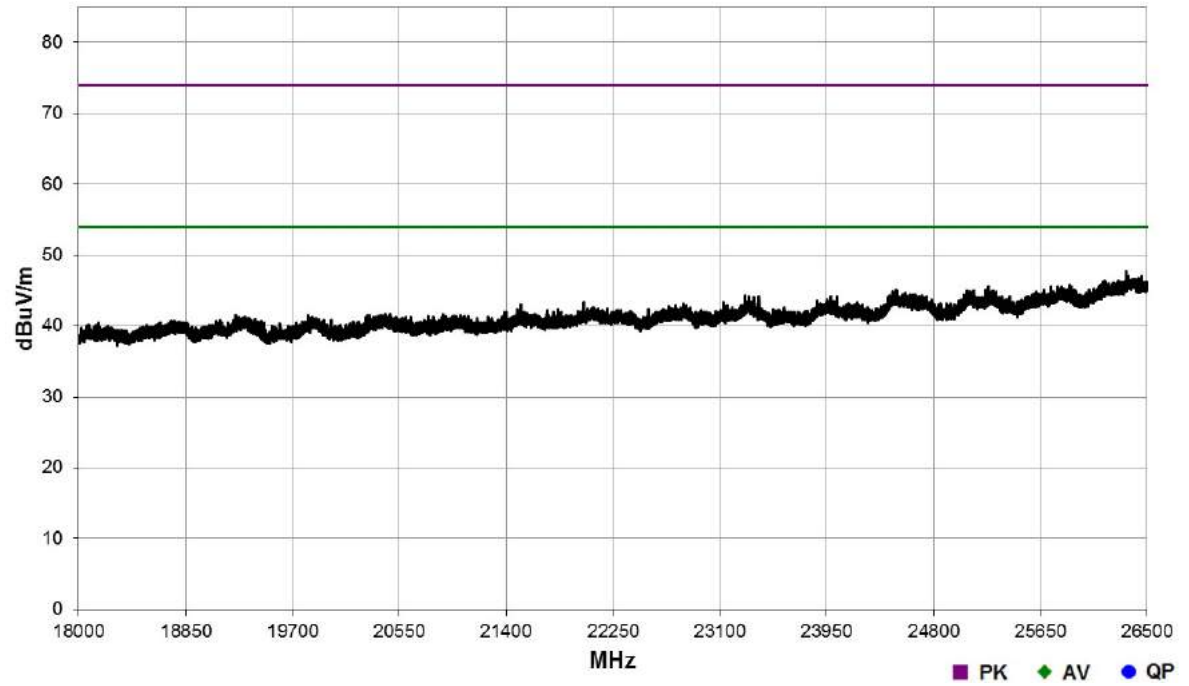
### 8.2 GHz to 12.4 GHz



### 12.4 GHz to 18 GHz

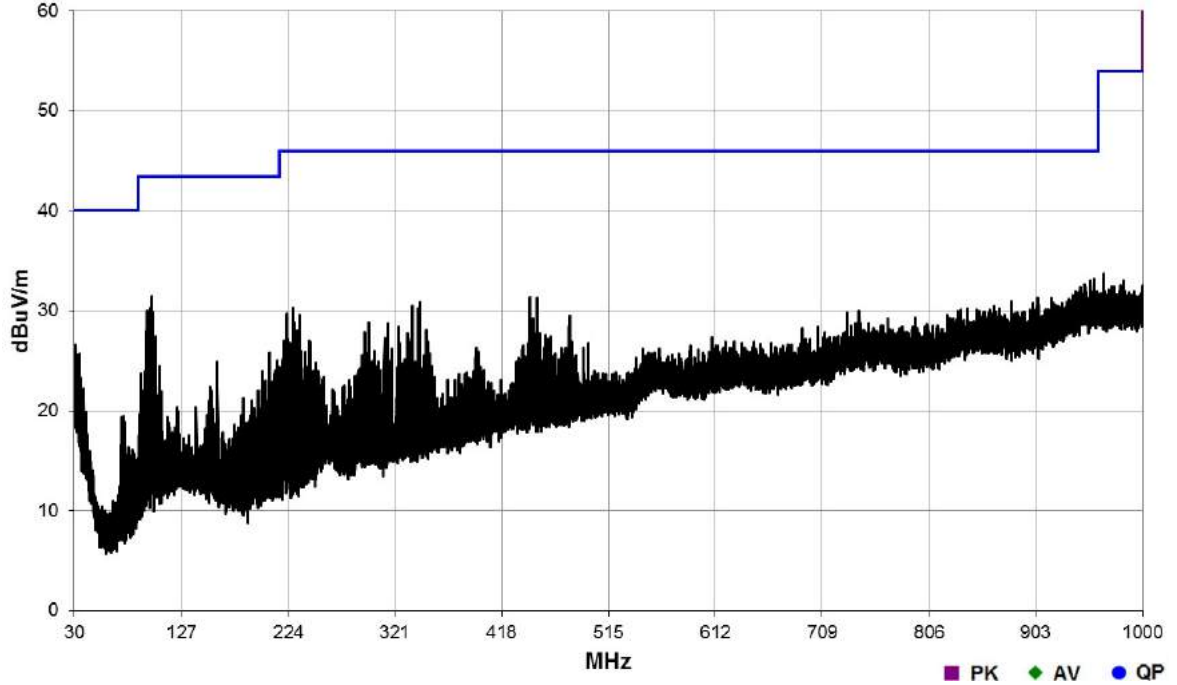


18 GHz to 26.5 GHz

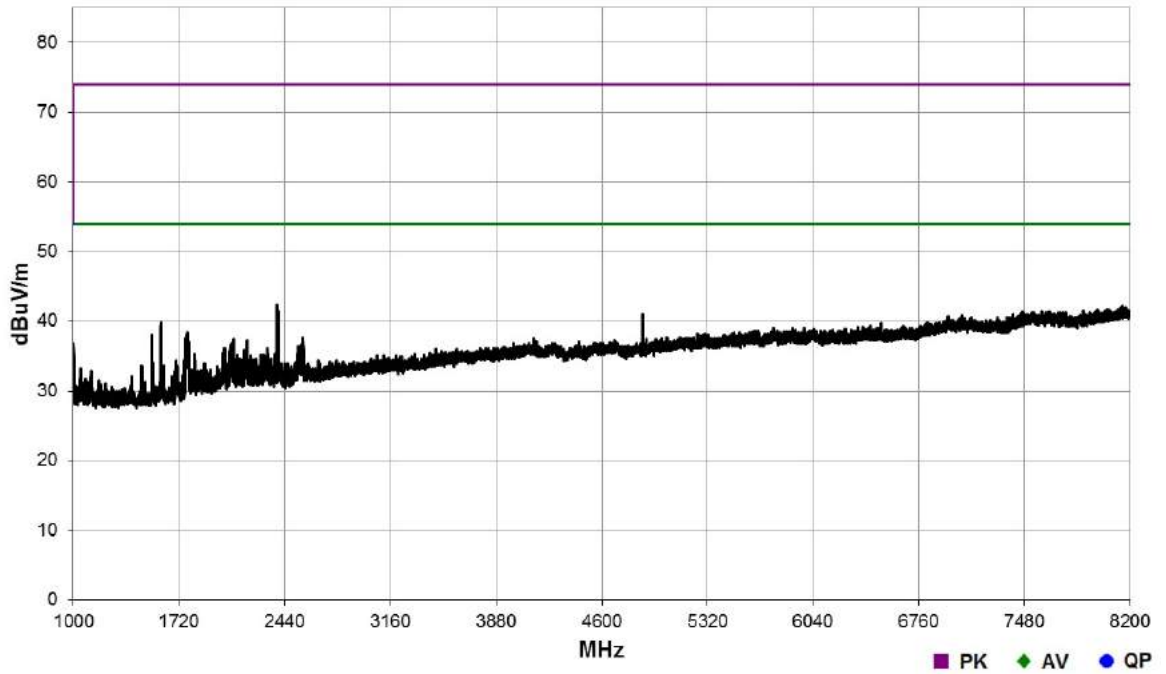


Sample S26 CD05 SN: YR4-US-FBA0039A; Channel: 2440 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dB $\mu$ V)	Factor (dB)	Field Strength (dB $\mu$ V/m)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
There were no emissions within 10 dB of the limit.						

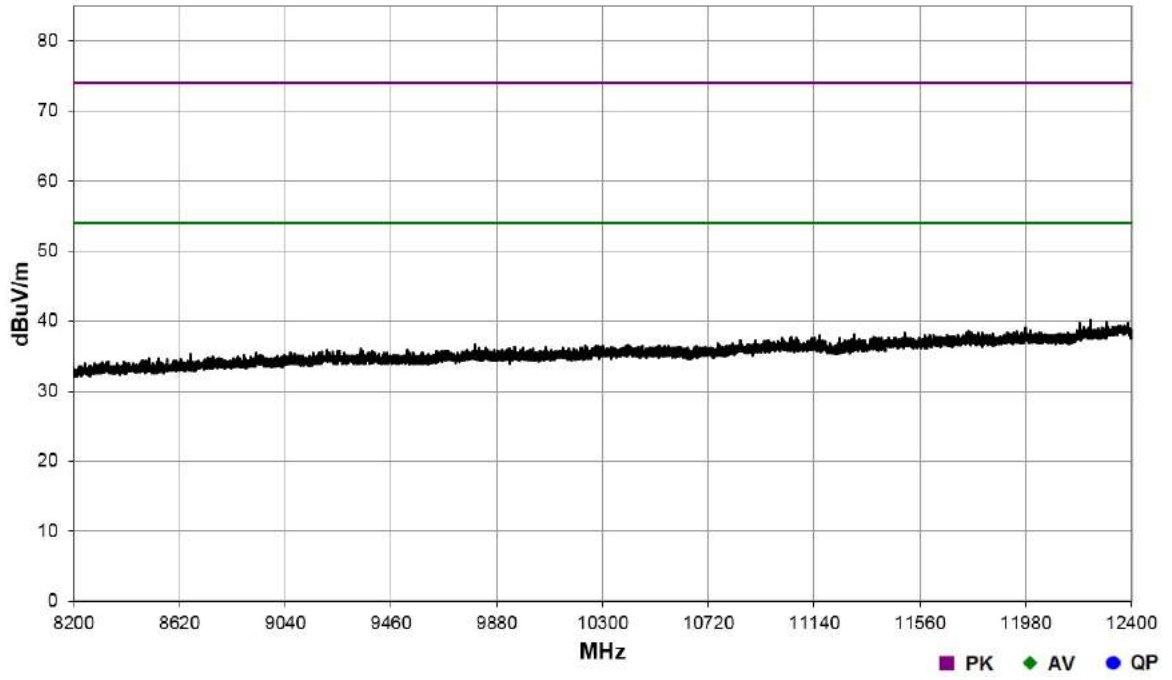
30 MHz to 1 GHz



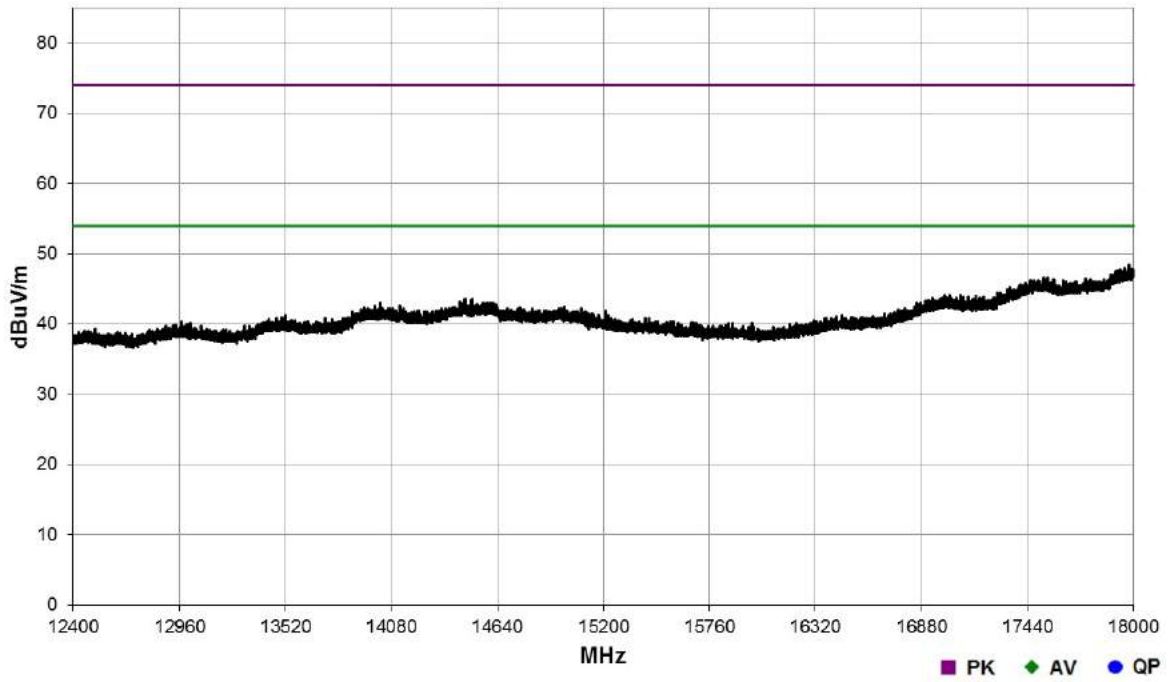
1 GHz to 8.2 GHz



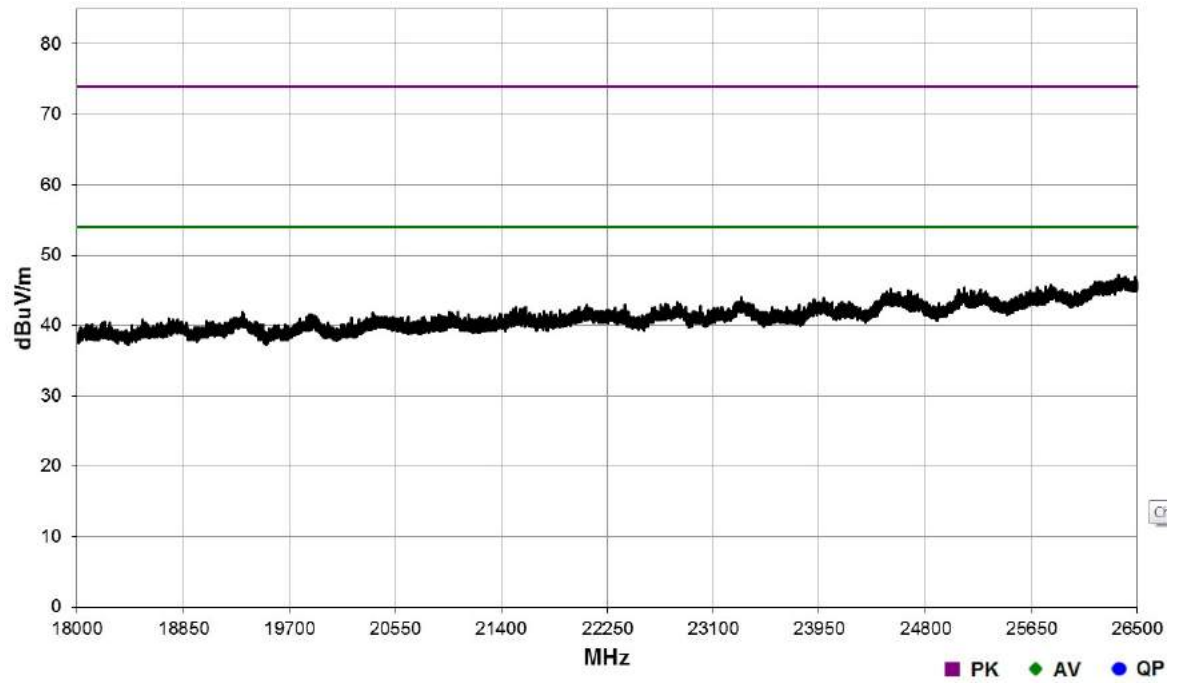
8.2 GHz to 12.4 GHz



12.4 GHz to 18 GHz

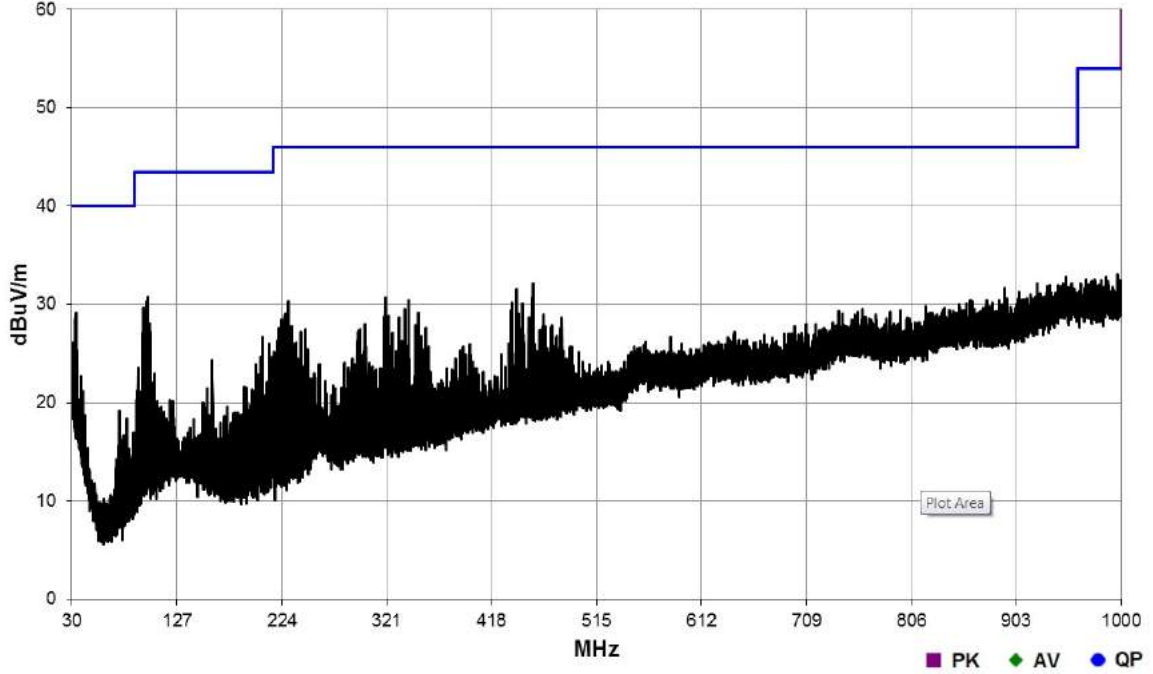


### 18 GHz to 26.5 GHz

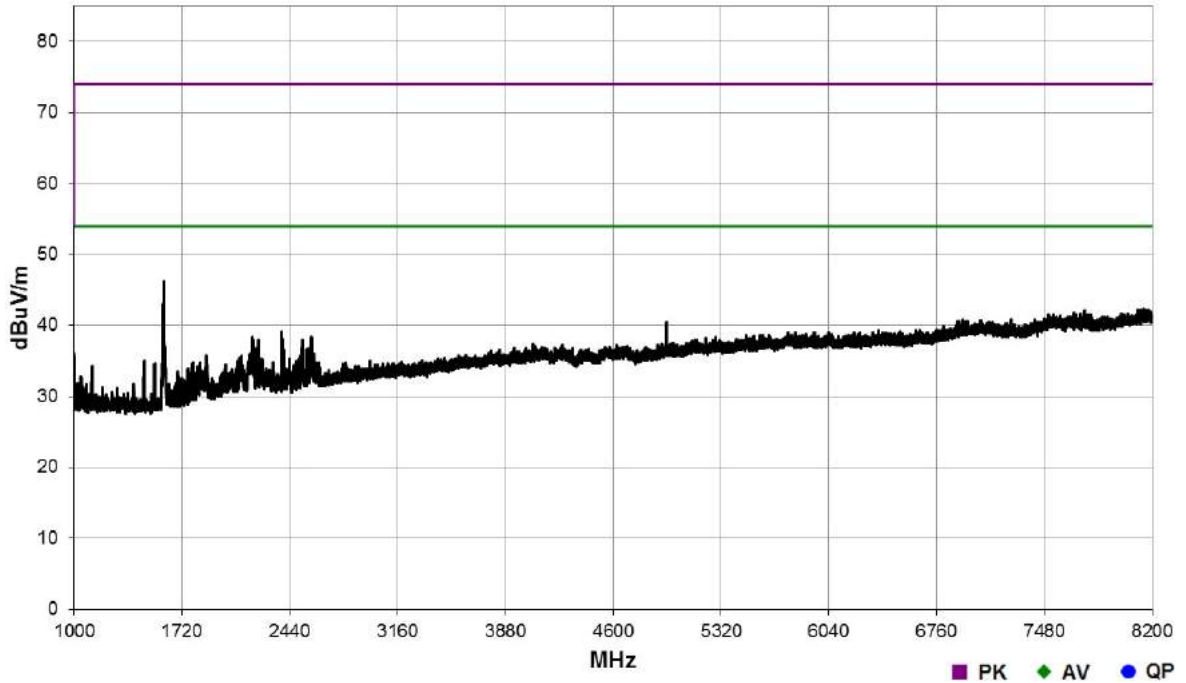


Sample S26 CD05 SN: YR4-US-FBA0039A; Channel: 2480 MHz; Modulation: GFSK; Data Rate: 1 Mbps						
Detector	Freq. (MHz)	Meas'd Emission (dB $\mu$ V)	Factor (dB)	Field Strength (dB $\mu$ V/m)	Field Strength ( $\mu$ V/m)	Limit ( $\mu$ V/m)
There were no emissions within 10 dB of the limit.						

30 MHz to 1 GHz

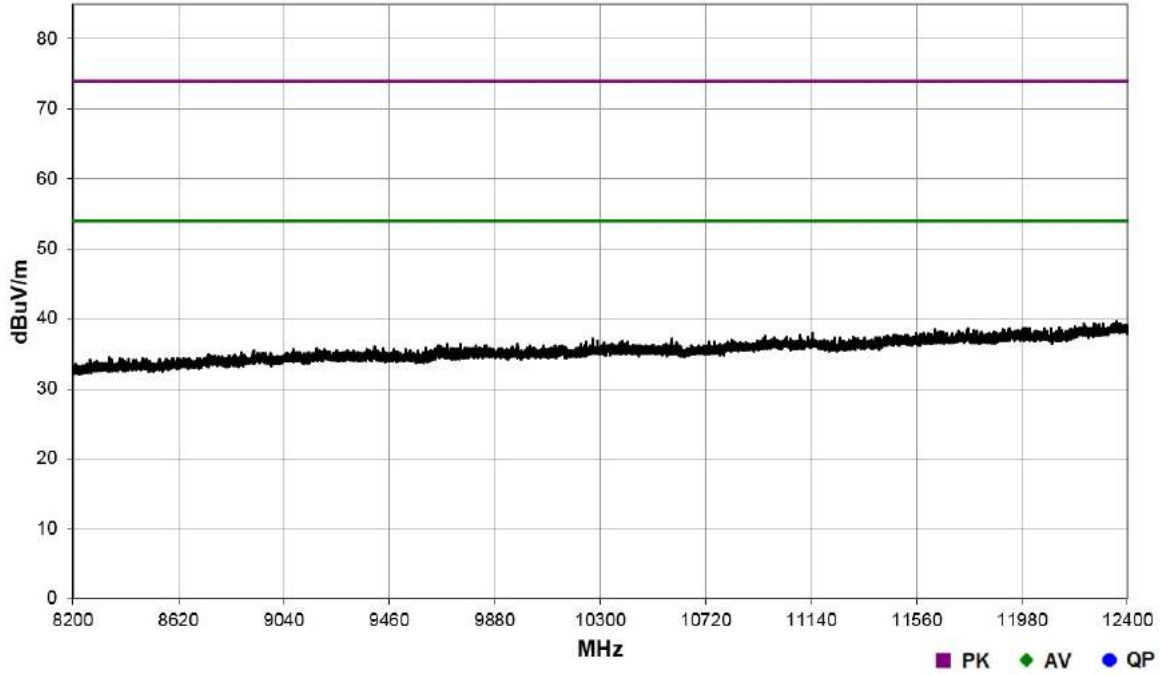


1 GHz to 8.2 GHz

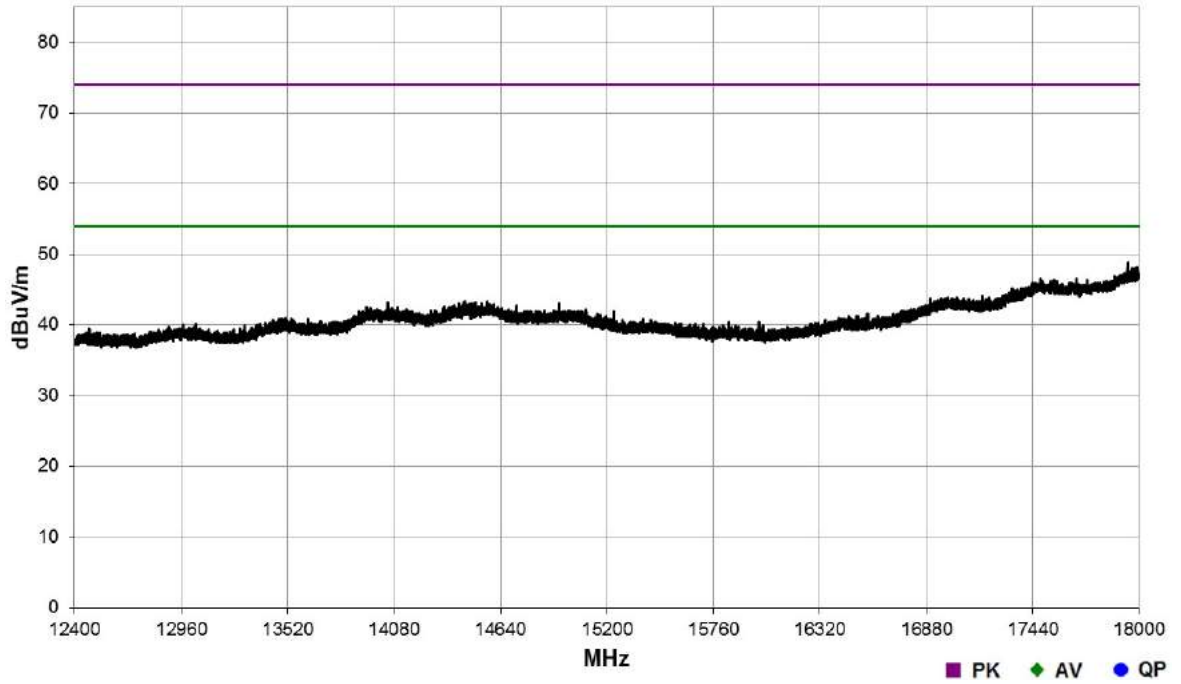




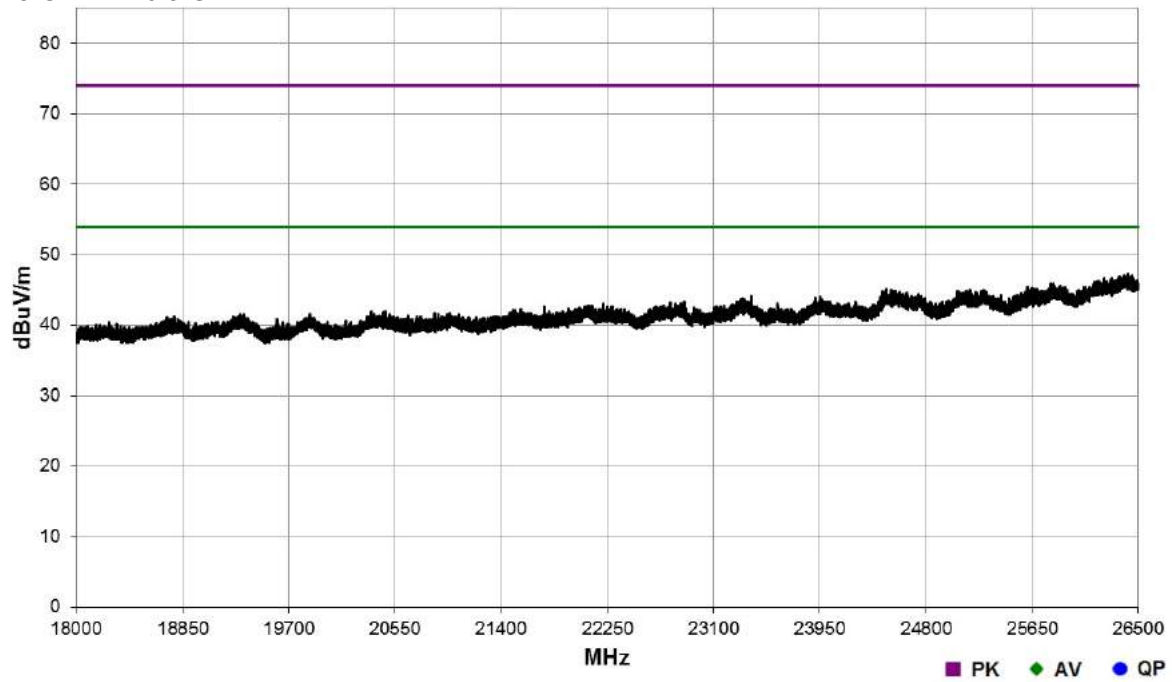
8.2 GHz to 12.4 GHz



12.4 GHz to 18 GHz



18 GHz to 26.5 GHz



## 12 AC power-line conducted emissions

### 12.1 Definition

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

### 12.2 Test Parameters

Test Location:	Element 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: 120 Vac	120 V ac $\pm$ 10 % (as declared)

### 12.3 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.

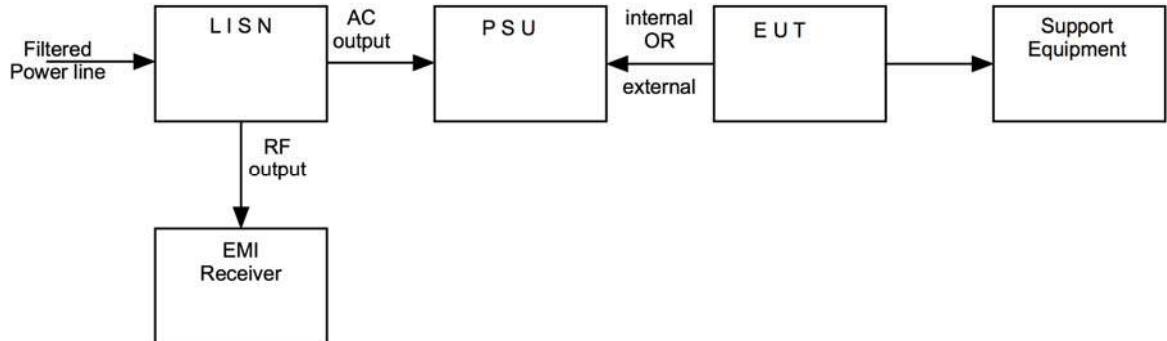
### 12.4 Test Method

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.

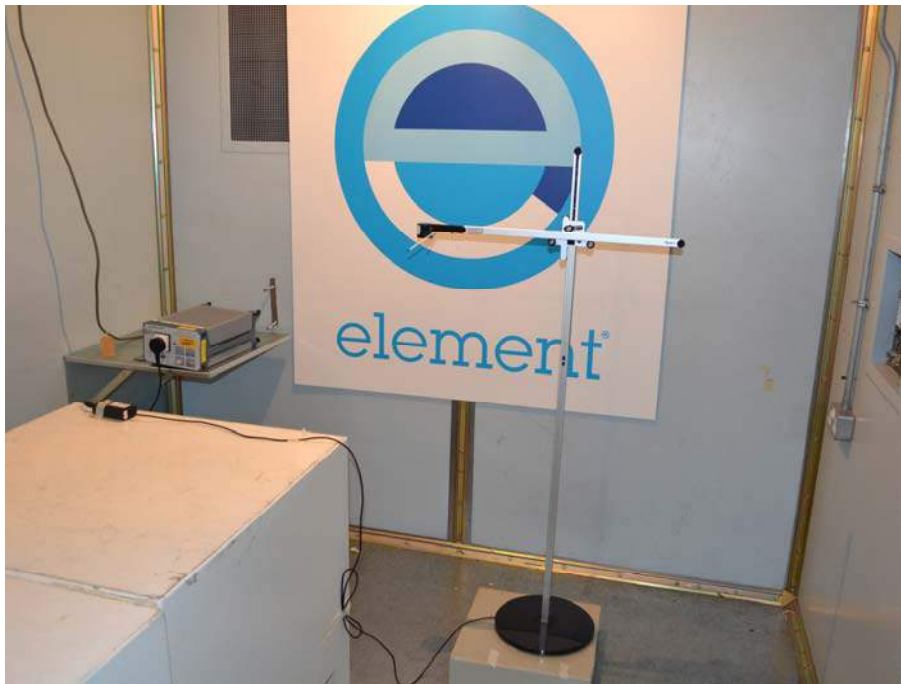
AC power line conducted emissions from the EUT are checked first by preview scans with peak and average detectors covering both live and neutral lines. A spectrum analyzer is used to determine if any periodic emissions are present.

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**



### 12.5 Test Set-up Photograph





**12.6 Test Equipment**

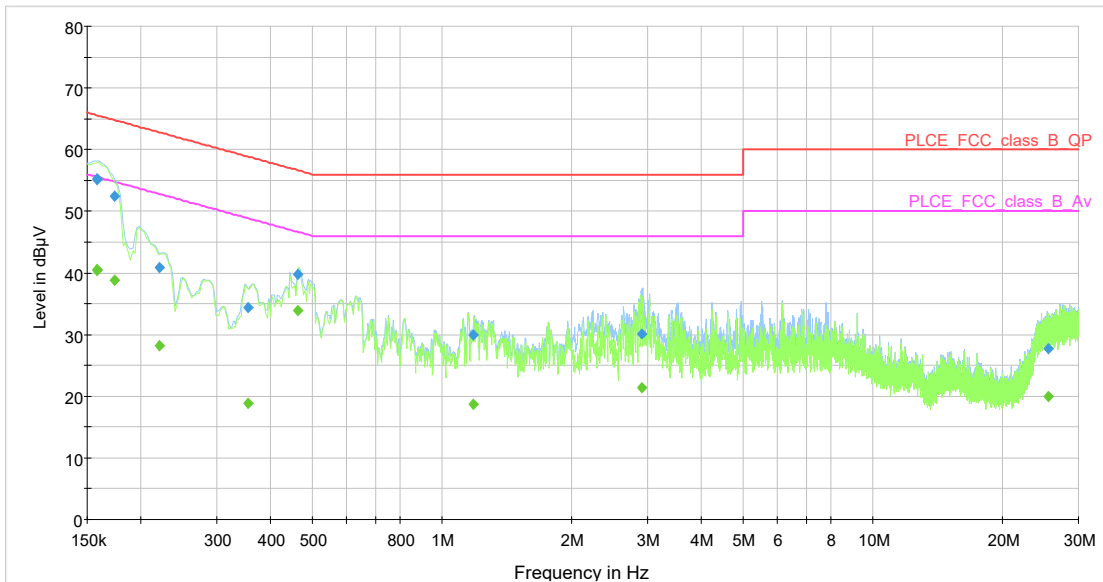
<i>Equipment Description</i>	<i>Manufacturer</i>	<i>Equipment Type</i>	<i>Element No</i>	<i>Due For Calibration</i>
ESC17	R&S	Measuring Receiver	RFG715	2018-11-03
ESH3-Z5	R&S	LISN	RFG732	2019-05-22

**12.7 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

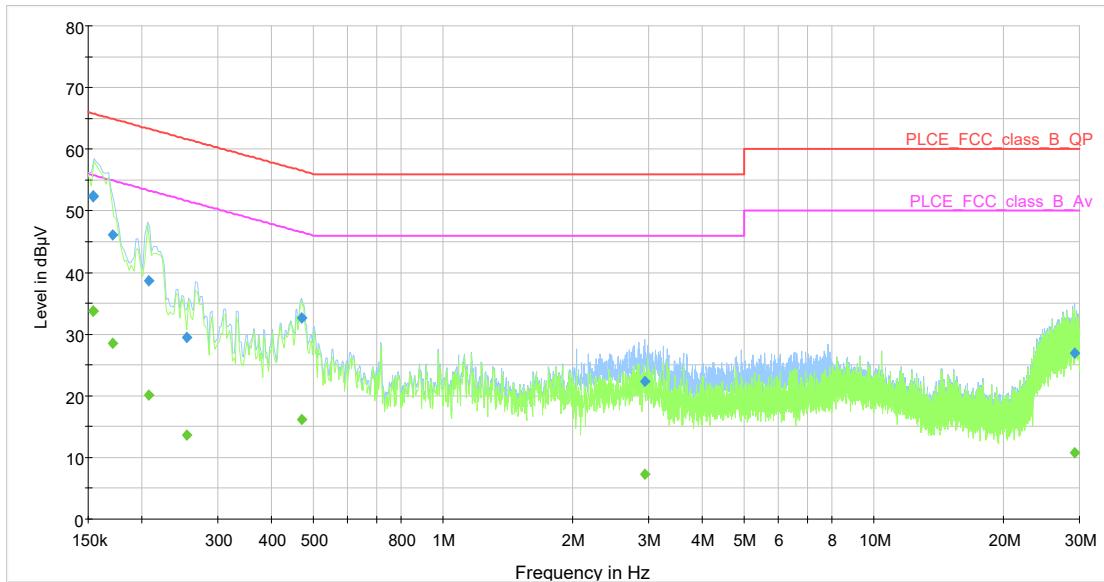
Frequency (MHz)	Average (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.158000	40.4	15000.0	9.000	GND	L1	10.1	15.1	55.6
0.158000	40.6	15000.0	9.000	GND	L1	10.1	15.0	55.6
0.173575	38.8	15000.0	9.000	GND	L1	10.1	16.0	54.8
0.221100	28.2	15000.0	9.000	GND	N	10.1	24.6	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

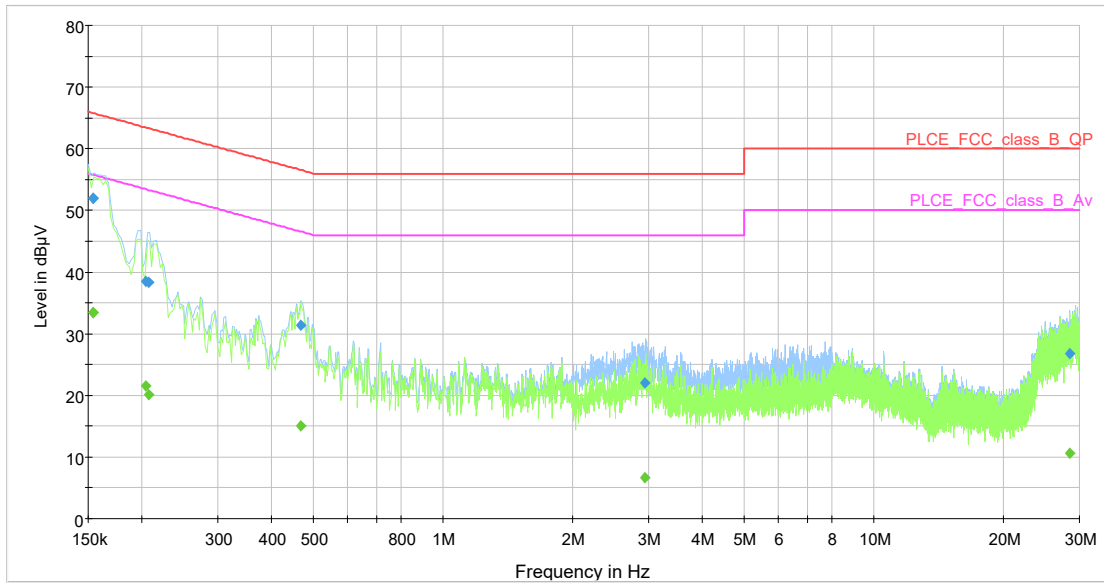
Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.154000	33.7	15000.0	9.000	GND	N	10.1	22.1	55.8
0.154000	33.7	15000.0	9.000	GND	N	10.1	22.0	55.8
0.171150	28.6	15000.0	9.000	GND	L1	10.1	26.3	54.9
0.207275	20.2	15000.0	9.000	GND	N	10.1	33.1	53.3
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





## 13 Occupied Bandwidth

### 13.1 Definition

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

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.

### 13.2 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)

### 13.3 Test Limit

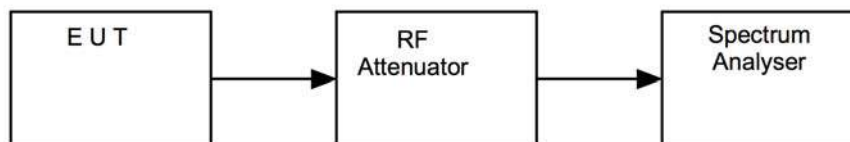
The minimum -6 dB bandwidth shall be at least 500 kHz.

### 13.4 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**

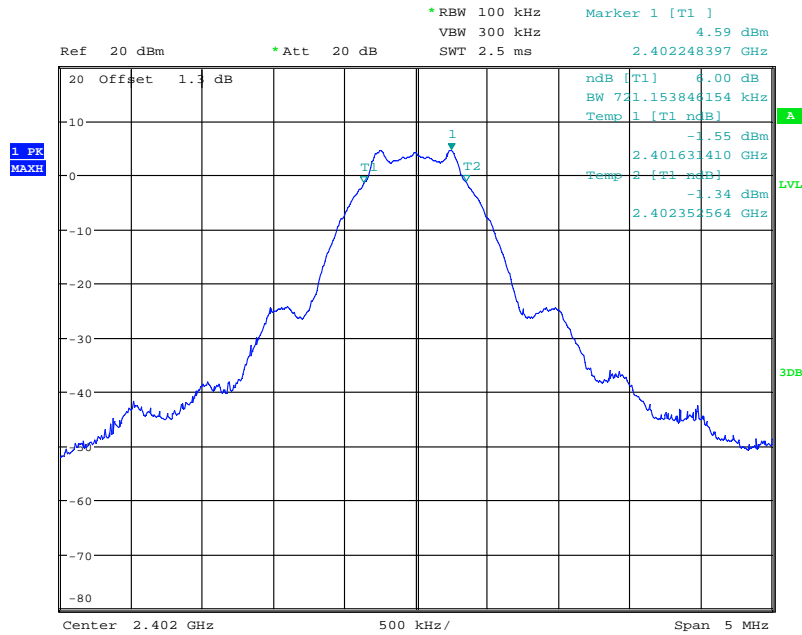


**13.5 Test Equipment**

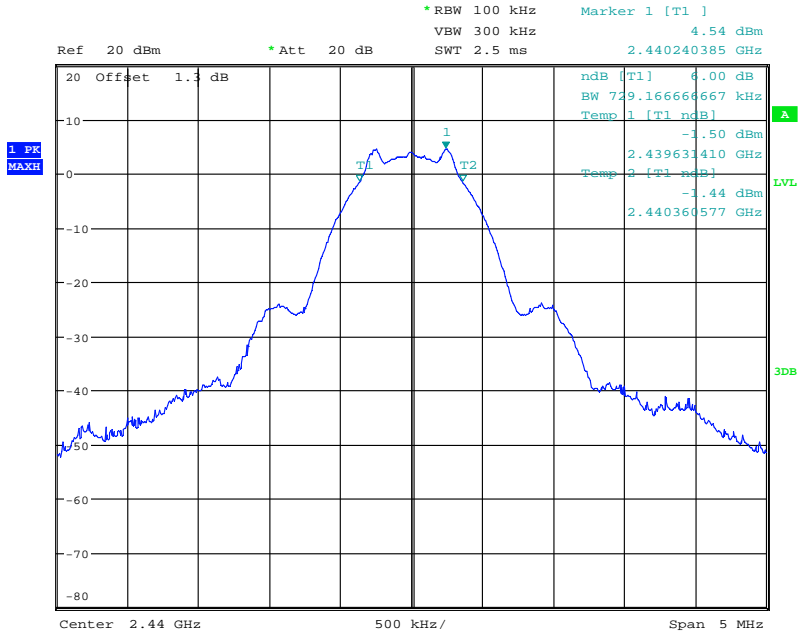
Equipment Description	Manufacturer	Equipment Type	Element No	Due For Calibration
Spectrum Analyser	R&S	FSU26	REF909	2019-06-15

**13.6 Test Results**

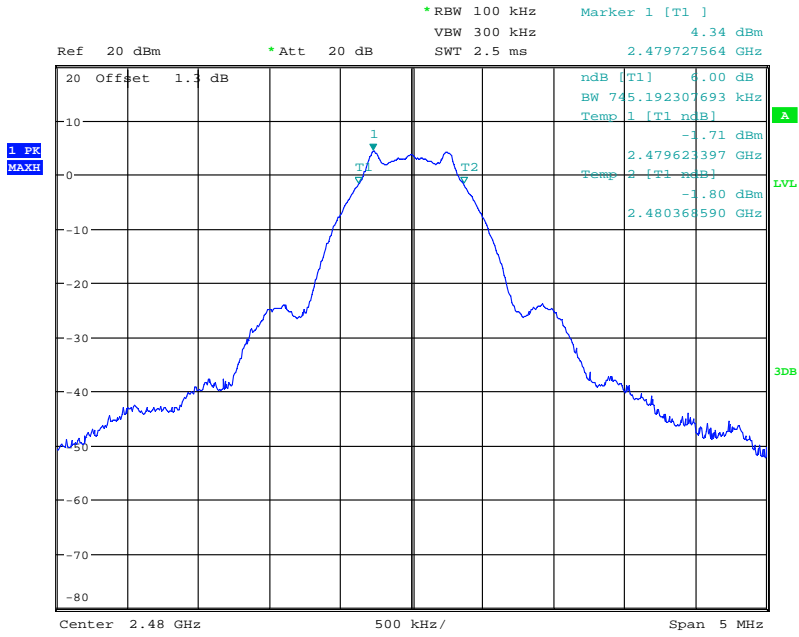
Test: 6 dB Bandwidth; Power Setting: 5 dBm				
Channel Frequency (MHz)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	6dB Bandwidth (kHz)	Result
2402	2401.631410	2402.352564	721.154	PASS
2440	2439.631410	2440.360577	729.167	PASS
2480	2479.623397	2480.368590	745.193	PASS



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

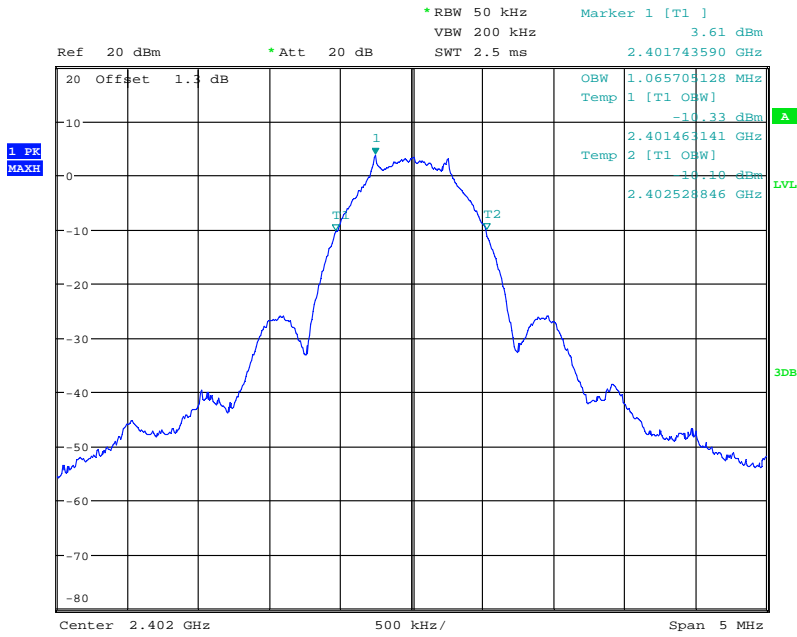


Date: 26.JUL.2018 16:41:07

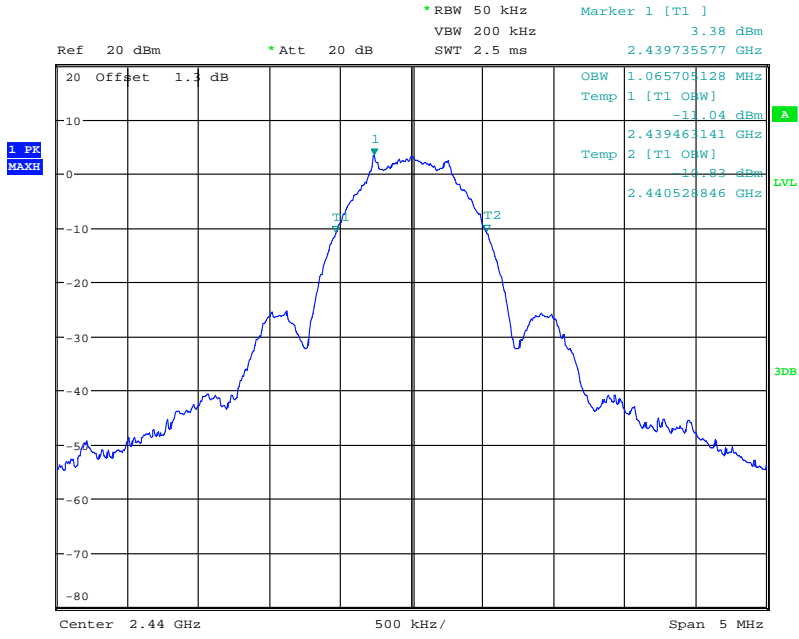


Date: 26.JUL.2018 16:39:37

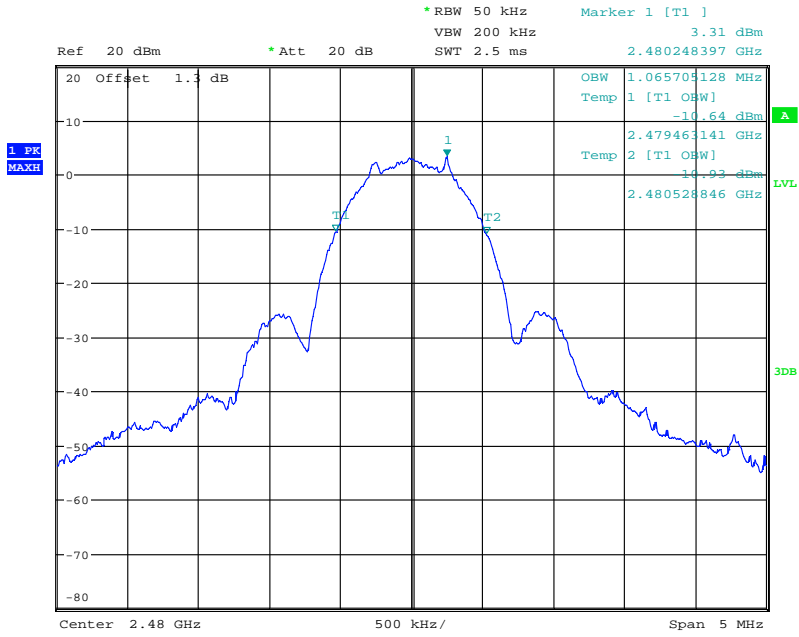
Test: 99% Bandwidth; Power Setting: 5 dBm				
Channel Frequency (MHz)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	99% Bandwidth (kHz)	Result
2402	2401.463141	2402.528846	1065.705	PASS
2440	2439.463141	2440.528846	1065.705	PASS
2480	2479.463141	2480.528846	1065.705	PASS



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



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



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

## 14 Maximum peak conducted output power

### 14.1 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.

### 14.2 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)

### 14.3 Test Limit

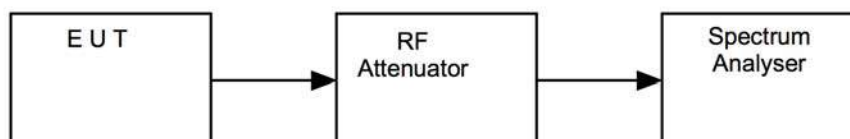
For systems employing digital modulation techniques operating in the bands 902 to 928 MHz, 2400 to 2483.5 MHz and 5725 to 5850 MHz, the maximum peak conducted output power shall not exceed 1 W.

### 14.4 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**

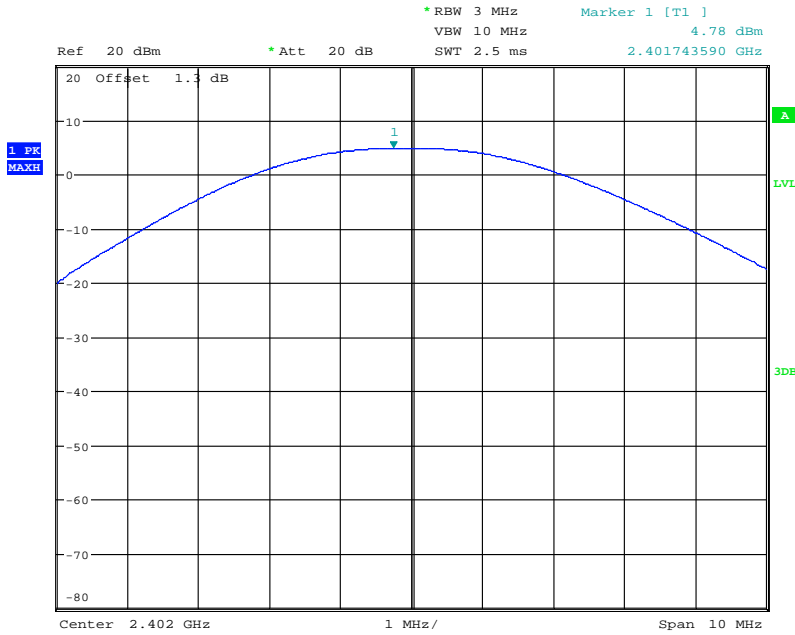


**14.5 Test Equipment**

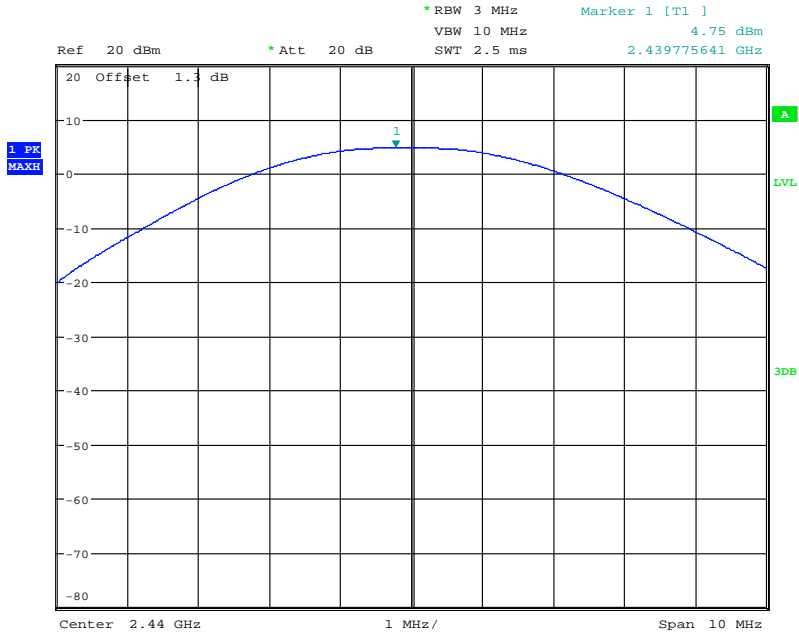
Equipment Description	Manufacturer	Equipment Type	Element No	Due For Calibration
Spectrum Analyser	R&S	FSU26	REF909	2019-06-15

**14.6 Test Results**

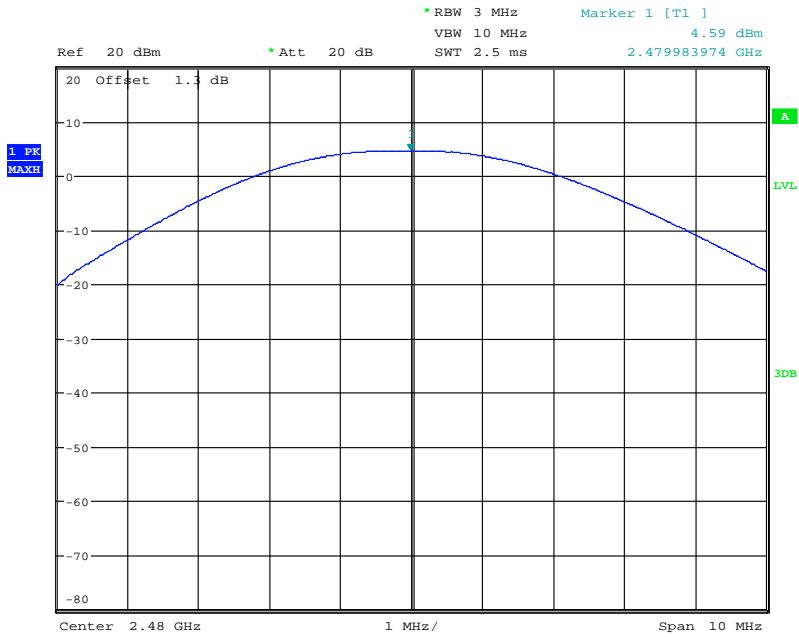
Power Setting: 5 dBm						
Channel Frequency (MHz)	Maximum peak conducted output power		Antenna gain (dBi)	E.I.R.P.		Result
	(dBm)	(W)		(dBm)	(W)	
2402	4.78	0.0030	4.39	9.17	0.0083	PASS
2440	4.75	0.0030	4.39	9.14	0.0082	PASS
2480	4.59	0.0029	4.39	8.98	0.0079	PASS



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



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



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



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

### 15.1 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.

### 15.2 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)

### 15.3 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.

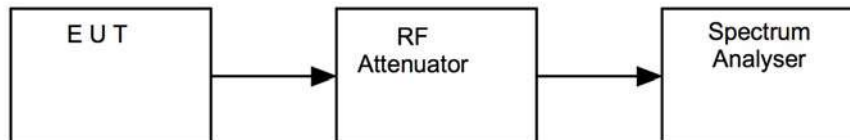
Attenuation below the general field strength limits specified in FCC 47CFR15.209 (a) / RSS-Gen is not required.

### 15.4 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.

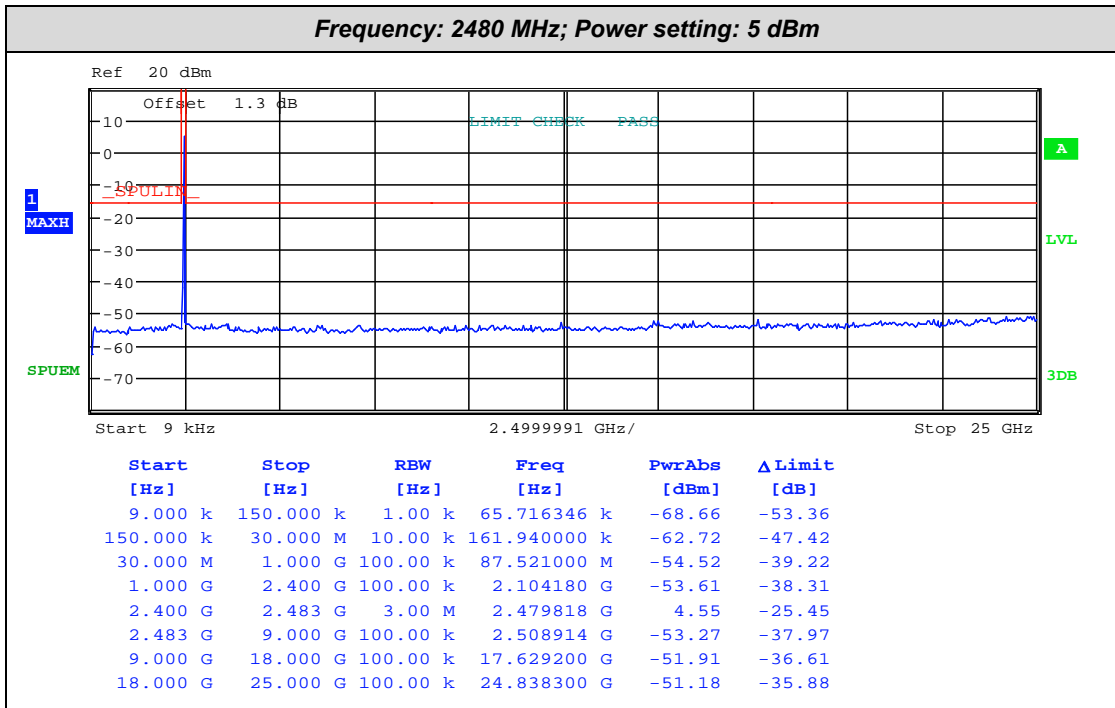
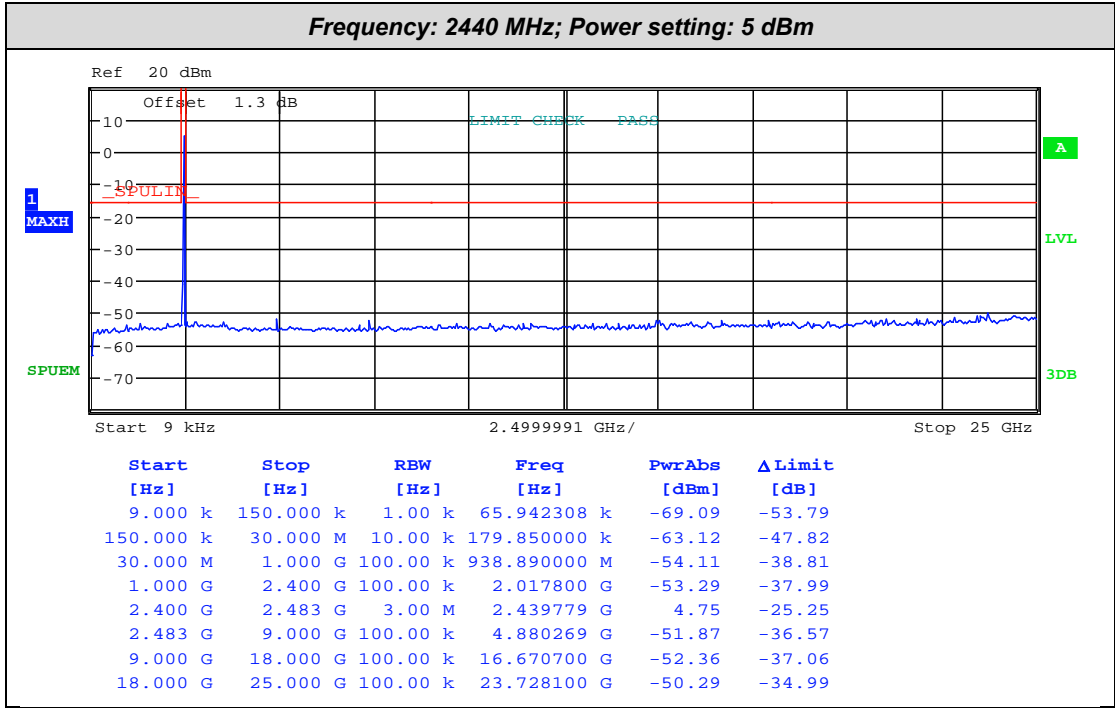
**Figure v Test Setup**



### 15.5 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





## 16 Power spectral density

### 16.1 Definition

The power per unit bandwidth.

### 16.2 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)

### 16.3 Test Limit

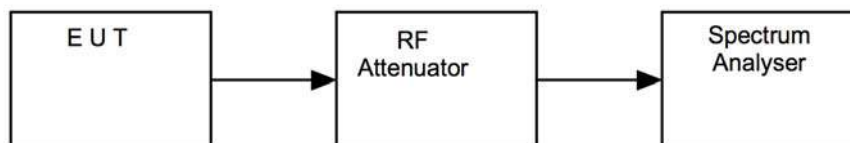
The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### 16.4 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**

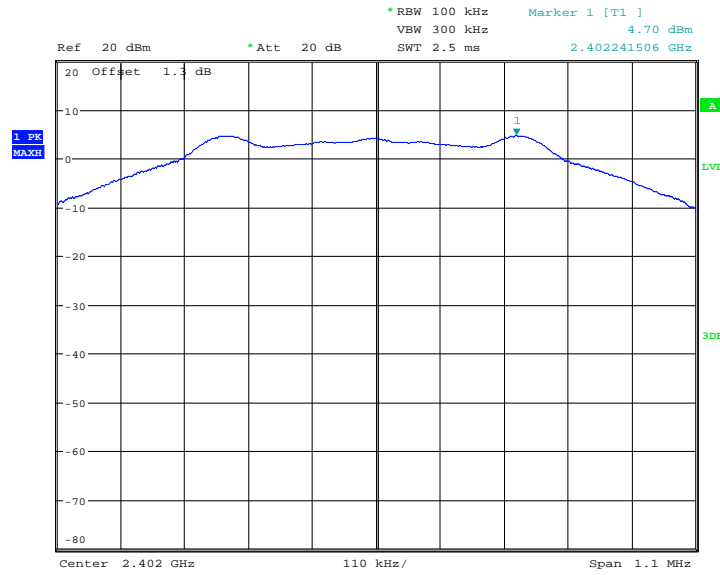


### 16.5 Test Equipment

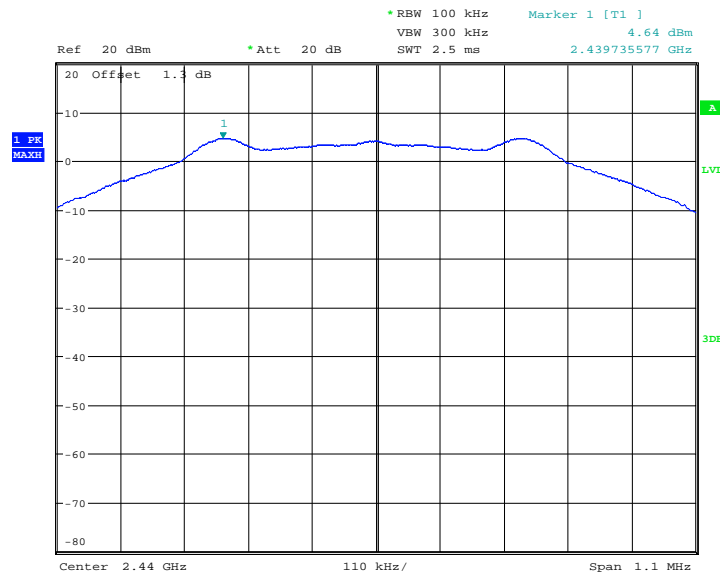
<i>Equipment Description</i>	<i>Manufacturer</i>	<i>Equipment Type</i>	<i>Element No</i>	<i>Due For Calibration</i>
Spectrum Analyser	R&S	FSU26	REF909	2019-06-15

### 16.6 Test Results

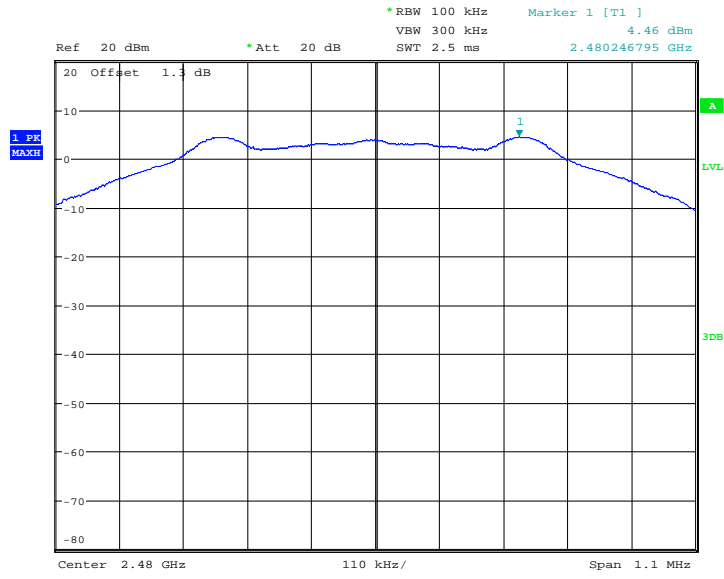
Power Setting: 5 dBm				
Channel Frequency (MHz)	Analyzer Level (dBm)	Cable loss (dB)	Power (dBm)	Result
2402	4.70	0.0	4.70	PASS
2440	4.64	0.0	4.64	PASS
2480	4.46	0.0	4.46	PASS



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



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



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

## 17 Measurement Uncertainty

### Calculated Measurement Uncertainties

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

#### [1] Radiated spurious emissions

Uncertainty in test result (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**



## 18 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.