
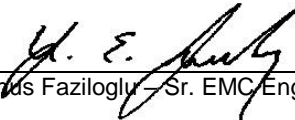




# Test Report



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS

Report No	ER2501-3
Client	Harman International Industries, Incorporated
Address	30001 Cabot Drive Novi, MI 48377
Phone	248-254-7751
Items tested FCC ID IC	GEN3.1 MID VA 2AHPN-BE2837 6434C-BE2837
Equipment Type Equipment Code	Part 15 Spread Spectrum Transmitter DSS
FCC/IC Rule Parts	CFR Title 47 FCC Part 15.247, ISED Canada RSS-247 Issue 2
Test Dates	October 20 <sup>th</sup> to November 10 <sup>th</sup> , 2017
Results	As detailed within this report
Prepared by	 Zachary Johnson, EMC Engineer
Authorized by	 Yurdas Faziloglu, Sr. EMC Engineer
Issue Date	11/30/2017
Conditions of Issue	This Test Report is issued subject to the conditions stated in the 'Conditions of Testing' section on page 14 of this report.

Curtis-Straus LLC is accredited by the American Association for Laboratory Accreditation for the specific scope of accreditation under Certificate Number 1627-01. This report may contain data which is not covered by the A2LA accreditation.



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS  
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8828



## Contents

Contents.....	2
Summary.....	3
Test Methodology.....	4
Product Tested - Configuration Documentation .....	5
Statement of Conformity .....	6
Test Results .....	7
Radiated Spurious Emissions .....	7
AC Line Conducted Emissions.....	12
Measurement Uncertainty.....	13
Conditions Of Testing.....	14
Appendix A:.....	16

Report REV Sep-08-2017 - YF



## Summary

This test report supports an application for certification of a transmitter operating pursuant to:  
CFR Title 47 FCC Part 15.247, ISED Canada RSS-247 Issue 2

The product is the GEN3.1 MID VA. It is a frequency hopping spread spectrum transmitter that operates in the 2402 – 2480 MHz frequency range.

Antenna Type: PCB Trace  
Gain: 0.38dBi maximum peak

We found that the product met the above requirements without modification.  
Modifications: None

Test samples were received in good condition.

Issue No.	Reason for change	Date Issued
1	Original Release	November 30, 2017

page 3 of 44



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS  
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8828



## Test Methodology

All testing was performed according to the following rules/procedures/documents;  
CFR 47 Part 15.247, RSS-247 Issue 2, RSS-Gen Issue 4 and ANSI C63.10-2013.

Radiated emissions were maximized by testing the device in the in-vehicle setup orientation and varying the test antenna's height and polarity.

EUT operating voltage is 13.5V DC

The following bandwidths were used during radiated spurious and AC line conducted emissions testing.

Frequency	RBW	VBW
0.15-30MHz	9kHz	30kHz
30-1000MHz	120kHz	1MHz
1-25GHz	1MHz	3MHz

## Product Tested - Configuration Documentation

EUT Configuration											
<b>Work Order:</b>	R2501										
<b>Company:</b>	Harman International Industries, Incorporated										
<b>Company Address:</b>	30001 Cabot Drive Novi, MI, 48377										
<b>Contact:</b>	Mark Bowman										
	MN			PN				SN			
<b>EUT:</b>	GEN3.1 MID VA										
<b>EUT Description:</b>	Car Stereo System										
<b>EUT Components</b>	MN			SN							
audio Harness											
Back up camera											
GPS antenna											
Power Harness											
USB diag port											
<b>Support Equipment</b>	MN			SN							
CS Supplied Laptop.											
<b>Port Label</b>	<b>Port Type</b>	<b># ports</b>	<b># populated</b>	<b>cable type</b>	<b>shielded</b>	<b>ferrites</b>	<b>length (m)</b>	<b>in/out</b>	<b>under test</b>	<b>comment</b>	
Audio	-	1	1	-	No	No	1	in	yes		
DC Power		1	1		No	No	1	in	yes		
Back up camera	-	1	1	-	No	No	0.1	in	yes		
Dab/XM	-	1	1	Coaxial	Yes	No	1	in	yes		
FM/AM antenna	-	1	1	Coaxial	Yes	No	0.1	in	yes		
Next gen port		1	0					in	no		
<b>Software Operating Mode Description:</b>											
EUT may be operating in 1 of 2 modes. For immunity, EUT will connect with a CMW and operate as normal with traffic while doing emissions scans eut will operate by transmitting a constant signal. For Bluetooth eut will still need to be connected to CMW.											
<b>Performance Criteria:</b>											
Eut will connect to CMW and preform less than 10% PER during test.											

**Statement of Conformity**

RSS-GEN	RSP-100	RSS 247	Part 15	Comments
6.3			15.15(b)	There are no controls accessible to the user that varies the output power to operate in violation of the regulatory requirements.
	3.1		15.19	The label is shown in the label exhibit.
	4		15.21	Information to the user is shown in the instruction manual exhibit.
			15.27	No special accessories are required for compliance.
3, 6.1			15.31	The EUT was tested in accordance with the measurement standards in this section.
6.13			15.33	Frequency range was investigated according to this section, unless noted in specific rule section under which the equipment operates.
8.1			15.35	The EUT emissions were measured using the measurement detector and bandwidth specified in this section, unless noted in specific rule section under which the equipment operates.
8.3			15.203	EUT employs PCB trace antenna with 0.38dBi maximum peak gain.
8.10			15.205 15.209	The fundamental is not in a Restricted band and the spurious and harmonic emissions in the Restricted bands comply with the general emission limits of 15.209 or RSS-Gen as applicable.
8.8			15.207	N/A, EUT is vehicle battery powered only.

Refer to Appendix A of this report for antenna port conducted measurements.



## Test Results

### Radiated Spurious Emissions

#### LIMITS

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).  
[15.247(d)]

All results below are for the in-vehicle setup orientation only.

#### MEASUREMENTS / RESULTS

Curtis Straus - a Bureau Veritas Company						Work Order - R2501							
Radiated Emissions Electric Field 3m Distance						EUT Power Input - 13.8V DC							
30-1000MHz Vertical Data						Test Site - CH 1							
Operator: CCH						Conditions - 25.2°C; 24%RH; 1006mBar							
Bluetooth mode TX Channel 39. Filtering 2300-2400MHz. 11/6/2017						Witnessed by - FCC B							
						EUT Maximum Frequency - Filtering 2300-2400MHz							
Frequency	Raw QP Reading	Correction Factor	Adjusted QP Amplitude	Lim1: FCC_pt15_1 09_Class_B	Margin to Lim1	Test Results Lim1	Worst Margin Lim1	Lim2: FCC_pt15_1 09_Class_B	Margin to Lim2	Test Results Lim2	Worst Margin Lim2	Antenna Height	EUT Azimuth
(MHz)	(dBµV)	(dB/m)	(dBµV/m)	(dBµV/m)	(dB)	(Pass/Fail)	(dB)	(dBµV/m)	(dB)	(Pass/Fail)	(dB)	(cm)	(degrees)
99.51	47.6	-25.3	22.2	43.5	-21.3	PASS		43.5	-21.3	PASS		100	295
104.529	50.3	-23.9	26.4	43.5	-17.2	PASS	-17.2	43.5	-17.2	PASS	-17.2	106	229
702.063	28.9	-10.5	18.4	46	-27.6	PASS		46	-27.6	PASS		105	52
710.758	30.2	-10.4	19.8	46	-26.2	PASS		46	-26.2	PASS		105	157
774.578	26.3	-8.6	17.6	46	-28.4	PASS		46	-28.4	PASS		133	316
798.199	34.7	-8.5	26.2	46	-19.8	PASS		46	-19.8	PASS		174	12

Curtis Straus - a Bureau Veritas Company						Work Order - R2501							
Radiated Emissions Electric Field 3m Distance						EUT Power Input - 13.8V DC							
30-1000MHz Horizontal Data						Test Site - CH 1							
Operator: CCH						Conditions - 25.2°C; 24%RH; 1006mBar							
Bluetooth mode TX Channel 39. Filtering 2300-2400MHz. 11/6/2017						Witnessed by - FCC B							
						EUT Maximum Frequency - Filtering 2300-2400MHz							
Frequency	Raw QP Reading	Correction Factor	Adjusted QP Amplitude	Lim1: FCC_pt15_1 09_Class_B	Margin to Lim1	Test Results Lim1	Worst Margin Lim1	Lim2: FCC_pt15_1 09_Class_B	Margin to Lim2	Test Results Lim2	Worst Margin Lim2	Antenna Height	EUT Azimuth
(MHz)	(dBµV)	(dB/m)	(dBµV/m)	(dBµV/m)	(dB)	(Pass/Fail)	(dB)	(dBµV/m)	(dB)	(Pass/Fail)	(dB)	(cm)	(degrees)
728.972	33.8	-10.4	23.4	46	-22.6	PASS		46	-22.6	PASS		125	327
761.586	26.6	-9.1	17.4	46	-28.6	PASS		46	-28.6	PASS		102	340
775.242	25.9	-8.6	17.3	46	-28.7	PASS		46	-28.7	PASS		125	340
797.695	33.5	-8.5	25	46	-21.1	PASS	-21.1	46	-21.1	PASS	-21.1	203	333
798.293	27	-8.5	18.5	46	-27.5	PASS		46	-27.5	PASS		217	328
821.951	25.7	-8.2	17.5	46	-28.5	PASS		46	-28.5	PASS		225	1

#### 30-1000MHz Center Channel



**Test Report for Harmon International Industries, Incorporated • GEN3.1 MID VA • Report No. ER2501-3 • November 30, 2017**

Curtis Straus - a Bureau Veritas Company										Work Order - R2501					
Radiated Emissions Electric Field 3m Distance										EUT Power Input - 13.8V DC					
1-6GHz Vertical Data										Test Site - CH 1					
Operator: CCH										Conditions - 25.2°C; 24%RH; 1006mBar					
Bluetooth mode TX Channel 0. Filtering 2300-2400MHz. 11/6/2017										Witnessed by - FCC B					
										EUT Maximum Frequency - Filtering 2300-2400MHz					
					Pk Lim:					Av Lim:					
Frequency	Raw Peak Reading	Raw Avg Reading	Correction Factor	Adjusted Peak Amplitude	FCC_pt15_109_ClassB_Peak	Peak Margin	Peak Results	Worst Peak Margin	Adjusted Avg Amplitude	FCC_pt15_109_ClassB_AVG	Avg Margin	Avg Results	Worst Avg Margin	Antenna Height	EUT Azimuth
(MHz)	(dBμV)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dB)	(cm)	(degrees)
2193.7	34	25.6	7.9	41.9	74	-32.1	PASS		33.5	54	-20.4	PASS		274	59
2802.3	37.5	25.6	11.3	48.8	74	-25.2	PASS	-25.2	36.9	54	-17.1	PASS		109	42
5821.3	33.1	24	15.1	48.2	74	-25.8	PASS		39.1	54	-14.9	PASS	-14.9	274	169

Curtis Straus - a Bureau Veritas Company										Work Order - R2501					
Radiated Emissions Electric Field 3m Distance										EUT Power Input - 13.8V DC					
1-6GHz Horizontal Data										Test Site - CH 1					
Operator: CCH										Conditions - 25.2°C; 24%RH; 1006mBar					
Bluetooth mode TX Channel 0. Filtering 2300-2400MHz. 11/6/2017										Witnessed by - FCC B					
										EUT Maximum Frequency - Filtering 2300-2400MHz					
					Pk Lim:					Av Lim:					
Frequency	Raw Peak Reading	Raw Avg Reading	Correction Factor	Adjusted Peak Amplitude	FCC_pt15_109_ClassB_Peak	Peak Margin	Peak Results	Worst Peak Margin	Adjusted Avg Amplitude	FCC_pt15_109_ClassB_AVG	Avg Margin	Avg Results	Worst Average Margin	Antenna Height	EUT Azimuth
(MHz)	(dBμV)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dB)	(cm)	(degrees)
2192.4	35.2	25.7	7.9	43.1	74	-30.9	PASS		33.5	54	-20.4	PASS		100	286
2819.6	34.6	25.5	10.5	45.1	74	-28.8	PASS		36.1	54	-17.9	PASS		297	217
5522.2	32.5	24.6	14.8	47.4	74	-26.6	PASS	-26.6	39.4	54	-14.6	PASS	-14.6	297	183

**1-6GHz Low Channel**

Curtis Straus - a Bureau Veritas Company										Work Order - R2501					
Radiated Emissions Electric Field 3m Distance										EUT Power Input - 13.8V DC					
1-6GHz Vertical Data										Test Site - CH 1					
Operator: CCH										Conditions - 25.2°C; 24%RH; 1006mBar					
Bluetooth mode TX Channel 39. Filtering 2300-2400MHz. 11/6/2017										Witnessed by - Etsi 300328					
										EUT Maximum Frequency - Filtering 2300-2400MHz					
					Pk Lim:					Av Lim:					
Frequency	Raw Peak Reading	Raw Avg Reading	Correction Factor	Adjusted Peak Amplitude	FCC_pt15_109_ClassB_Peak	Peak Margin	Peak Results	Worst Peak Margin	Adjusted Avg Amplitude	FCC_pt15_109_ClassB_AVG	Avg Margin	Avg Results	Worst Avg Margin	Antenna Height	EUT Azimuth
(MHz)	(dBμV)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dB)	(cm)	(degrees)
2169.9	35.7	25.7	7.7	43.4	74	-30.6	PASS		33.4	54	-20.6	PASS		298	87
2808.7	34.6	25.6	11	45.6	74	-28.4	PASS		36.6	54	-17.4	PASS		198	19
5710.7	32.8	24.5	15.1	47.9	74	-26.1	PASS	-26.1	39.6	54	-14.4	PASS	-14.4	225	256

Curtis Straus - a Bureau Veritas Company										Work Order - R2501					
Radiated Emissions Electric Field 3m Distance										EUT Power Input - 13.8V DC					
1-6GHz Horizontal Data										Test Site - CH 1					
Operator: CCH										Conditions - 25.2°C; 24%RH; 1006mBar					
Bluetooth mode TX Channel 39. Filtering 2300-2400MHz. 11/6/2017										Witnessed by - Etsi 300328					
										EUT Maximum Frequency - Filtering 2300-2400MHz					
					Pk Lim:					Av Lim:					
Frequency	Raw Peak Reading	Raw Avg Reading	Correction Factor	Adjusted Peak Amplitude	FCC_pt15_109_ClassB_Peak	Peak Margin	Peak Results	Worst Peak Margin	Adjusted Avg Amplitude	FCC_pt15_109_ClassB_AVG	Avg Margin	Avg Results	Worst Average Margin	Antenna Height	EUT Azimuth
(MHz)	(dBμV)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dB)	(cm)	(degrees)
2179.2	34.9	25.7	7.8	42.6	74	-31.3	PASS		33.5	54	-20.5	PASS		100	166
2802.1	33.9	25.6	11.3	45.1	74	-28.8	PASS		36.9	54	-17.1	PASS		125	26
5654.7	34.2	24.8	14.8	48.9	74	-25.1	PASS	-25.1	39.5	54	-14.4	PASS	-14.4	275	8

**1-6GHz Mid Channel**





**Test Report for Harmon International Industries, Incorporated • GEN3.1 MID VA • Report No. ER2501-3 • November 30, 2017**

Curtis Straus - a Bureau Veritas Company						Work Order - R2501										
Radiated Emissions Electric Field 3m Distance						EUT Power Input - 13.8V DC										
1-6GHz Vertical Data						Test Site - CH 1										
Operator: CCH						Conditions - 25.2°C; 24%RH; 1006mBar										
Bluetooth mode TX Channel 78. Filtering 2300-2400MHz. 11/6/2017						Witnessed by - FCC B										
						EUT Maximum Frequency - Filtering 2300-2400MHz										
					Pk Lim: FCC_pt15_1					Av Lim: FCC_pt15_1						
Frequency	Raw Peak Reading	Raw Avg Reading	Correction Factor	Adjusted Peak Amplitude	09_ClassB_Peak	Peak Margin	Peak Results	Worst Peak Margin	Adjusted Avg Amplitude	09_ClassB_AVG	Avg Margin	Avg Results	Worst Avg Margin	Antenna Height	EUT Azimuth	
(MHz)	(dBμV)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dB)	(cm)	(degrees)	
2136.9	34.7	25.7	7.4	42.1	74	-31.8	PASS		33.1	54	-20.9	PASS		275	168	
2807	33.5	25.6	11.1	44.5	74	-29.4	PASS		36.7	54	-17.3	PASS		100	112	
5737.1	34.2	24.3	15.1	49.3	74	-24.7	PASS	-24.7	39.4	54	-14.5	PASS	-14.5	125	270	

Curtis Straus - a Bureau Veritas Company						Work Order - R2501									
Radiated Emissions Electric Field 3m Distance						EUT Power Input - 13.8V DC									
1-6GHz Horizontal Data						Test Site - CH 1									
Operator: CCH						Conditions - 25.2°C; 24%RH; 1006mBar									
Bluetooth mode TX Channel 78. Filtering 2300-2400MHz. 11/6/2017						Witnessed by - FCC B									
						EUT Maximum Frequency - Filtering 2300-2400MHz									
					Pk Lim: FCC_pt15_1					Av Lim: FCC_pt15_1					
Frequency	Raw Peak Reading	Raw Avg Reading	Correction Factor	Adjusted Peak Amplitude	09_ClassB_Peak	Peak Margin	Peak Results	Worst Peak Margin	Adjusted Avg Amplitude	09_ClassB_AVG	Avg Margin	Avg Results	Worst Average Margin	Antenna Height	EUT Azimuth
(MHz)	(dBμV)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dB)	(cm)	(degrees)
2032.7	36.1	25.6	7	43.1	74	-30.9	PASS		32.6	54	-21.4	PASS		125	77
2802.8	36.9	25.6	11.2	48.1	74	-25.8	PASS	-25.8	36.9	54	-17.1	PASS		282	245
5762.8	32.9	24.2	15.2	48.1	74	-25.9	PASS		39.4	54	-14.6	PASS	-14.6	183	146

**1-6GHz High Channel**

Curtis Straus - a Bureau Veritas Company						Work Order - R2501									
Radiated Emissions Electric Field 1m Distance						EUT Power Input - 13.8V DC									
6-18GHz Vertical Data						Test Site - CH 1									
Operator: CCH						Conditions - 25.2°C; 24%RH; 1006mBar									
Bluetooth mode TX Channel 39. Filtering 2300-2400MHz. 11/6/2017						Witnessed by - Etsi 300328									
						EUT Maximum Frequency - Filtering 2300-2400MHz									
					Pk Lim: FCC_pt15_109_ClassB_Peak					Av Lim: FCC_pt15_109_ClassB_AVG					
Frequency	Raw Peak Reading	Raw Avg Reading	Correction Factor	Adjusted Peak Amplitude	109_ClassB_Peak	Peak Margin	Peak Results	Worst Peak Margin	Adjusted Avg Amplitude	109_ClassB_AVG	Avg Margin	Avg Results	Worst Avg Margin	Antenna Height	EUT Azimuth
(MHz)	(dBμV)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dB)	(cm)	(degrees)
13608.5	27.5	18	30.9	58.4	83.5	-25.1	PASS		48.9	63.5	-14.6	PASS		100	82
17748.1	29.9	19.1	37.8	67.7	83.5	-15.8	PASS	-15.8	57	63.5	-6.5	PASS	-6.5	100	47

Curtis Straus - a Bureau Veritas Company						Work Order - R2501									
Radiated Emissions Electric Field 1m Distance						EUT Power Input - 13.8V DC									
6-18GHz Horizontal Data						Test Site - CH 1									
Operator: CCH						Conditions - 25.2°C; 24%RH; 1006mBar									
Bluetooth mode TX Channel 39. Filtering 2300-2400MHz. 11/6/2017						Witnessed by - Etsi 300328									
						EUT Maximum Frequency - Filtering 2300-2400MHz									
					Pk Lim: FCC_pt15_109_ClassB_Peak					Av Lim: FCC_pt15_109_ClassB_AVG					
Frequency	Raw Peak Reading	Raw Avg Reading	Correction Factor	Adjusted Peak Amplitude	109_ClassB_Peak	Peak Margin	Peak Test Results	Worst Peak Margin	Adjusted Avg Amplitude	109_ClassB_AVG	Avg Margin	Avg Test Results	Worst Avg Margin	Antenna Height	EUT Azimuth
(MHz)	(dBμV)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dB)	(cm)	(degrees)
8349.4	26.2	17	21.3	47.5	83.5	-36	PASS		38.2	63.5	-25.3	PASS		125	0
13606.3	27.1	18	30.9	58.1	83.5	-25.4	PASS		48.9	63.5	-14.6	PASS		150	18
16915.8	30.4	20.6	32.2	62.6	83.5	-20.9	PASS		52.8	63.5	-10.7	PASS		186	204
17692.1	28.5	19.1	38.8	67.3	83.5	-16.2	PASS	-16.2	57.9	63.5	-5.6	PASS	-5.6	154	269

**6-18GHz Center Channel**



<b>Radiated Emissions Table</b>														
Date: 26-Oct-17			Company: Harman International						Work Order: R2501					
Engineer: Mike Leonard			EUT Desc: NA Mid S/N 089						EUT Operating Voltage/Frequency: 13.5VDC					
Temp: 24c			Humidity: 42%						Pressure: 998mbar					
Frequency Range: 18-26.5GHz										Measurement Distance: 0.1 m				
Notes: Bluetooth mode										EUT Max Freq: Not provided				
Antenna Polarization (H/V)	Frequency (MHz)	Peak Reading (dBµV)	Average Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Peak Reading (dBµV/m)	Adjusted Avg Reading (dBµV/m)	FCC Class B High Frequency - Peak			FCC Class B High Frequency - Average		
									Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
No emissions found above noise floor														
Test Site: EMI Chamber 2			Cable 1: Asset #2328			Cable 2: ---			Cable 3: ---					
Analyzer: Rental SA#1			Preamp: 18-26.5GHz			Antenna: 18-26.5GHz Horn			Preselector: ---					
CSsoft Radiated Emissions Calculator v 1.017.195 Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor														
Copyright Curtis-Straus LLC 2000														

### 18-26.5GHz Center Channel

Rev. 11/5/2017

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Gold	100Hz-26.5 GHz	E4407B	Agilent	MY45113816	1284	I	2/28/2018	2/28/2017
Rental MXE EMI Receiver(1170725)	20Hz-26.5GHz	N9038A	Agilent	MY51210151	1170725	I	12/22/2017	12/22/2016
Radiated Emissions Sites	FCC Code	IC Code	VCCI Code	Range	Asset	Cat	Calibration Due	Calibrated on
EMI Chamber 1	719150	2762A-6	A-0015	30-1000MHz	1685	I	12/21/2018	12/21/2016
EMI Chamber 1	719150	2762A-6	A-0015	1-18GHz	1685	I	12/21/2018	12/21/2016
Mixers/Diplexers	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Mixer / Horn	26.5-40 GHz	11970A	Agilent	3003A10230	2154	I	3/12/2019	3/12/2016
Preamps/Couplers Attenuators / Filters	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
2310 PA	1-1000MHz	PAM-103	COM-POWER	441175	2310	II	10/29/2018	10/29/2017
2463 HF PA	.5-18GHz	PAM-118A	COM-POWER	443005	2463	II	10/9/2018	10/9/2017
HF (Yellow)	18-26.5GHz	AFS4-18002650-60-8P-4	CS	467559	1266	II	10/16/2018	10/16/2017
Antennas	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Red-Brown Bilog	30-2000MHz	JB1	Sunol	A0032406	1218	I	1/13/2019	1/13/2017
Orange Horn	1-18GHz	3115	EMCO	0004-6123	390	I	10/13/2018	10/13/2016
HF (White) Horn	18-26.5GHz	801-WLM	Waveline	758	758	III	Verify before Use	date of test
Meteorological Meters/Chambers		MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	4/28/2018	4/28/2016
TH A#2084		HTC-1	HDE		2084	II	3/23/2018	3/23/2017
Cables	Range		Mfr			Cat	Calibration Due	Calibrated on
Asset #1509	9kHz - 18GHz		Florida RF			II	10/2/2018	10/2/2017
Asset #2456	9KHz-18GHz		MegaPhase			II	10/29/2018	10/29/2017
Asset #2457	9KHz-18GHz		MegaPhase			II	10/29/2018	10/29/2017
Asset #2323	1-26.5GHz	TM26-S1S1-120	MEGAPHASE	17139101 002	2323	II	8/19/2018	8/19/2017
Asset #2324	1-26.5GHz	TM26-S1S1-120	MEGAPHASE	17139101 001	2324	II	8/19/2018	8/19/2017

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

### 30MHz to 26.5GHz Test Equipment Used



**Curtis-Straus LLC, a wholly owned subsidiary of BV CPS**  
 One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8828



## Radiated Band Edge

Radiated Emissions Table														
Date: 06-Nov-17			Company: Harman			Work Order: R2501								
Engineer: Chris Hamel			EUT Desc: NA MID			EUT Operating Voltage/Frequency: 13.8V DC								
Temp: 24.6°C			Humidity: 25%			Pressure: 1010mBar								
Frequency Range:										Measurement Distance: 3 m				
Notes: BT Mode DH1 Packet Rate.										EUT Max Freq:				
Antenna Polarization (H/V)	Frequency (MHz)	Peak Reading (dBµV)	Average Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Peak Reading (dBµV/m)	Adjusted Avg Reading (dBµV/m)	FCC Class B High Frequency - Peak			FCC Class B High Frequency - Average		
									Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
Channel 0														
Max V	2401.9	61.9		0.0	28.0	3.1				74.0			54.0	
Max H	2401.9	61.2		0.0	28.0	3.1				74.0			54.0	
V	2390.0	16.1	4.5	0.0	28.0	3.1	47.2	35.6		74.0	-26.8	Pass	54.0	-18.4
V	2386.8	20.7	4.6	0.0	28.0	3.1	51.8	35.7		74.0	-22.2	Pass	54.0	-18.3
Channel 78														
Max V	2479.9	64.5		0.0	28.2	3.2				74.0			54.0	
Max H	2479.7	64.1		0.0	28.2	3.2				74.0			54.0	
H	2483.5	14.1	4.4	0.0	28.2	3.2	45.5	35.8		74.0	-28.5	Pass	54.0	-18.2
H	2491.8	20.5	4.5	0.0	28.3	3.3	52.1	36.1		74.0	-21.9	Pass	54.0	-17.9
<b>Table Result:</b> Pass by -17.9 dB										<b>Worst Freq:</b> 2491.8 MHz				
Test Site: EMI Chamber 1			Cable 1: Asset #2456			Cable 2: Asset #2457			Cable 3: ---					
Analyzer: Rental SA#3			Preamp: None			Antenna: Orange Horn			Preselector: ---					
CSsoft Radiated Emissions Calculator v 1.017.197														
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor														

Rev. 11/5/2017

Spectrum Analyzers / Receivers / Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Rental MXE EMI Receiver(1170725)	20Hz-26.5GHz	N9038A	Agilent	MY51210151	1170725	I	12/22/2017	12/22/2016
Radiated Emissions Sites	FCC Code	IC Code	VCCI Code	Range	Asset	Cat	Calibration Due	Calibrated on
EMI Chamber 1	719150	2762A-6	A-0015	1-18GHz	1685	I	12/21/2018	12/21/2016
Antennas	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Orange Horn	1-18GHz	3115	EMCO	0004-6123	390	I	10/13/2018	10/13/2016
Meteorological Meters/Chambers		MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
TH A#2084		HTC-1	HDE		2084	II	3/23/2018	3/23/2017
Cables	Range		Mfr			Cat	Calibration Due	Calibrated on
Asset #2456	9KHz-18GHz		MegaPhase			II	10/29/2018	10/29/2017
Asset #2457	9KHz-18GHz		MegaPhase			II	10/29/2018	10/29/2017

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

### Band Edge Test Equipment Used



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS  
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8828



## AC Line Conducted Emissions LIMITS

Frequency of emission (MHz)	Quasi-peak limit (dB $\mu$ V)	Average limit (dB $\mu$ V)
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\*Decreases with the logarithm of the frequency.

[47 CFR 15.207(a)]

## MEASUREMENTS / RESULTS

N/A. EUT is powered by a vehicle battery only.

### Measurement Uncertainty

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

Measurement	Expanded Uncertainty k=2	Maximum allowable uncertainty
Radiated Emissions (30-1000MHz)		
NIST	5.6dB	N/A
CISPR	4.6dB	5.2dB (Ucisp)
Radiated Emissions (1-26.5GHz)	4.6dB	N/A
Radiated Emissions (above 26.5GHz)	4.9dB	N/A
Magnetic Radiated Emissions	5.6dB	N/A
Conducted Emissions		
NIST	3.9dB	N/A
CISPR	3.6dB	3.6dB (Ucisp)
Telco Conducted Emissions (Current)	2.9dB	N/A
Telco Conducted Emissions (Voltage)	4.4dB	N/A
Electrostatic Discharge	11.5%	N/A
Radiated RF Immunity (Uniform Field)	1.6dB	N/A
Electrical Fast Transients	23.1%	N/A
Surge	23.1%	N/A
Conducted RF Immunity	3dB	N/A
Magnetic Immunity	12.8%	N/A
Dips and Interrupts	2.3V	N/A
Harmonics	3.5%	N/A
Flicker	3.5%	N/A
Radio frequency (@ 2.4GHz)	$3.23 \times 10^{-8}$	$1 \times 10^{-7}$
RF power, conducted	0.40dB	0.75dB
Maximum frequency deviation:		
• Within 300Hz and 6kHz of audio frequency / Within 6kHz and 25kHz of audio frequency	3.4% 0.3dB	5% 3dB
Adjacent channel power	1.9dB	3dB
Conducted spurious emission of transmitter, valid up to 12.75GHz	2.39dB	3dB
Conducted emission of receivers	1.3dB	3dB
Radiated emission of transmitter, valid up to 26.5GHz	3.9dB	6dB
Radiated emission of transmitter, valid up to 80GHz	3.3dB	6dB
Radiated emission of receiver, valid up to 26.5GHz	3.9dB	6dB
Radiated emission of receiver, valid up to 80GHz	3.3dB	6dB
Humidity	2.37%	5%
Temperature	0.7°C	1.0°C
Time	4.1%	10%
RF Power Density, Conducted	0.4dB	3dB
DC and low frequency voltages	1.3%	3%
Voltage (AC, <10kHz)	1.3%	2%
Voltage (DC)	0.62%	1%
The above reflects a 95% confidence level		



## Conditions Of Testing

[Bureau Veritas Consumer Products Services, Inc., a Massachusetts corporation], and/or its affiliates (collectively, the "Company") will conduct, at the request of the Submitter ("Client"), the tests specified on the submitted Test Request Form or equivalent in accordance with, and subject to, the following terms and conditions (collectively, "Conditions"):

1. All orders for tests are subject to acceptance by the Company, and no order will constitute a binding commitment of the Company unless and until such order is accepted by it, as evidenced by the issuance of a written report ("Test Report") by the Company. The Test Report is issued solely by the Company, is intended for the exclusive use of Client and shall not be published, used for advertising purposes, copied or replicated for distribution to any other person or entity or otherwise publicly disclosed without the prior written consent of the Company. By submitting a request for services to the Company, Client consents to the disclosure to accreditation bodies of those records of Client relevant to the accreditation body's assessment of the Company's competence and compliance with relevant accreditation criteria. The Company shall not be liable for any loss or damage whatsoever resulting from the failure of the Company to provide its services within any time period for completion estimated by the Company. If Client anticipates using the Test Report in any legal proceeding, arbitration, dispute resolution forum or other proceeding, it shall so notify the Company prior to submitting the Test Report in such proceeding. The Company has no obligation to provide a fact or expert witness at such proceeding unless the Company agrees in advance to do so for a separate and additional fee.
2. The Test Report will set forth the findings of the Company solely with respect to the test samples identified therein. Unless specifically and expressly indicated in the Test Report, the results set forth in such Test Report are not intended to be indicative or representative of the quality or characteristics of the lot from which a test sample is taken, and Client shall not rely upon the Test Report as being so indicative or representative of the lot or of the tested product in general. The Test Report will reflect the findings of the Company at the time of testing only, and the Company shall have no obligation to update the Test Report after its issuance. The Test Report will set forth the results of the tests performed by the Company based upon the written information provided to the Company. The Test Report will be based solely on the samples and written information submitted to the Company by Client, and the Company shall not be obligated to conduct any independent investigation or inquiry with respect thereto.
3. The Company may, in its sole discretion, destroy samples which have been furnished to the Company for testing and which have not been destroyed in the course of testing. The Company may delegate the performance of all or a portion of the services contemplated hereunder to an affiliate, agent or subcontractor of the Company, and Client consents to such delegation.
4. These Conditions and the Test Report represent the entire understanding of the parties hereto with respect to the subject matter hereof and of the Test Report, and no modification, variance or extrapolation with respect thereto shall be permitted without the prior written consent of the Company.
5. The names, service marks, trademarks and copyrights of the Company and its affiliates, including the names "**BUREAU VERITAS**," "**BUREAU VERITAS CONSUMER PRODUCTS SERVICES**," "**BVCPS**," "**MTL**," "**ACTS**," "**MTL-ACTS**" and "**CURTIS-STRAUS**" (collectively, the "Marks") are and shall remain the sole property of the Company or its affiliates and shall not be used by Client except solely to the extent that Client obtains the prior written approval of the Company and then only in the manner prescribed by the Company. Client shall not contest the validity of the Marks or take any action that might impair the value or goodwill associated with the Marks or the image or reputation of the Company or its affiliates.
6. Payment in full shall be due 30 days after the date of invoice. Interest shall be due on overdue amounts from the due date until paid at an interest rate of 1.5% per month or, if less, the maximum rate permitted by law. The Company reserves the right, at any time and from time to time, to revoke any credit extended to Client. Client shall reimburse the Company for any costs it incurs in collecting past due amounts, including court costs and fees and expenses of attorneys and collection agencies. The Test Report may not be used or relied upon by Client if and for so long as Client fails to pay when due any invoice issued by the Company or any affiliate of it to Client or any affiliate or subsidiary of Client together with interest and penalties, if any, accrued thereon.
7. The Company disclaims any and all responsibility or liability arising out of or in connection with e-mail transmissions of such information.
8. Client understands and agrees that the Company is neither an insurer nor a guarantor, that the Company does not take the place of Client or any designer, manufacturer, agent, buyer, distributor or transportation or shipping company, and that the Company disclaims all liability in such capacities. Client further understands that if it seeks assurance against loss or damage, it should obtain appropriate insurance.
9. Client agrees that the Company, by providing the services, does not take the place of Client nor any third party, nor does the Company release them from any of their obligations, nor does the Company otherwise assume, abridge, abrogate or undertake to discharge any duty of any third party to Client or any duty of Client or any third party to any other third party, and Client will not release any third party from its obligations and duties with respect to the tested goods.
10. Client shall, on a timely basis, (a) provide adequate instructions to the Company in order to enable the Company to perform properly its services, (b) provide, or cause Client's suppliers and contractors to provide, the Company with all documents necessary to enable the Company to perform its services, (c) furnish the Company with all relevant information regarding Client's intended use and purposes of the tested goods, (d) advise the Company of essential dates and deadlines relevant to the tested goods and (e) fully exercise all rights and remedies available to Client against third parties in respect of the tested goods.
11. The Company shall undertake due care and ordinary skill in the performance of its services to Client, and the Company shall accept responsibility only where such skill has not been exercised and, even in such event, only to the extent of the limitation of liability set forth herein.
12. If Client desires to assert a claim arising from or relating to (i) the performance, purported performance or non-performance of any services by the Company or (ii) the sale, resale, manufacture, distribution or use of any tested goods, it must submit that claim to the Company in a writing that sets forth with particularity the basis for such claim within 60 days from discovery of the potential claim and not more than six months after the date of issuance of the Test Report to Client. Client waives any and all such claims including, without limitation, claims that the Test Report is inaccurate, incomplete or misleading or that additional or different testing is required, unless and then only to the extent that Client submits a written claim to the Company within both such time periods.
13. CLIENT SHALL, EXCEPT TO THE EXTENT OF COMPANY'S LIABILITY TO CLIENT HEREUNDER (WHICH IN NO EVENT SHALL EXCEED THE LIMITATION OF LIABILITY HEREIN), HOLD HARMLESS AND INDEMNIFY THE COMPANY, ITS AFFILIATES AND THEIR RESPECTIVE DIRECTORS, OFFICERS, EMPLOYEES, AGENTS AND SUBCONTRACTORS AGAINST ALL ACTUAL OR ALLEGED THIRD PARTY CLAIMS FOR LOSS, DAMAGE OR EXPENSE OF WHATSOEVER NATURE AND HOWSOEVER ARISING FROM OR RELATING TO (i) THE PERFORMANCE, PURPORTED PERFORMANCE OR NON-PERFORMANCE OF ANY SERVICES BY THE COMPANY OR (ii) THE SALE, RESALE, MANUFACTURE, DISTRIBUTION OR USE OF ANY TESTED GOODS.
14. EXCEPT AS MAY OTHERWISE BE EXPRESSLY AGREED TO IN WRITING BY THE COMPANY AND NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN OR IN ANY TEST REPORT, NO WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, IS MADE.



15. (A) IN NO EVENT WHATSOEVER SHALL THE COMPANY BE LIABLE FOR ANY CONSEQUENTIAL, SPECIAL, INCIDENTAL, EXEMPLARY OR PUNITIVE DAMAGES IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE TEST REPORT OR THE SERVICES PROVIDED BY THE COMPANY HEREUNDER, INCLUDING WITHOUT LIMITATION LOSS OF OR DAMAGE TO PROPERTY; LOSS OF INCOME, PROFIT OR USE; OR ANY CLAIMS OR DEMANDS MADE AGAINST CLIENT OR ANY OTHER PERSON BY ANY THIRD PARTY IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE SERVICES PROVIDED BY THE COMPANY HEREUNDER.

(B) NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN, AND IN RECOGNITION OF THE RELATIVE RISKS AND BENEFITS TO CLIENT AND THE COMPANY ASSOCIATED WITH THE TESTING SERVICES CONTEMPLATED HEREBY, THE RISKS HAVE BEEN ALLOCATED SUCH THAT UNDER NO CIRCUMSTANCES WHATSOEVER SHALL THE LIABILITY OF THE COMPANY TO CLIENT OR ANY THIRD PARTY IN RESPECT OF ANY CLAIM FOR LOSS, DAMAGE OR EXPENSE, OF WHATSOEVER NATURE OR MAGNITUDE, AND HOWSOEVER ARISING, EXCEED AN AMOUNT EQUAL TO FIVE (5) TIMES THE AMOUNT OF THE FEES PAID TO THE COMPANY FOR THE SPECIFIC SERVICES WHICH GAVE RISE TO SUCH CLAIM OR U.S.\$10,000, WHICHEVER IS THE LESSER AMOUNT.

16. The Company shall not be liable for any loss or damage resulting from any delay or failure in performance of its obligations hereunder resulting directly or indirectly from any event of force majeure or any event outside the control of the Company. If any such event occurs, the Company may immediately cancel or suspend its performance hereunder without incurring any liability whatsoever to Client.

17. Company's services, including these Conditions, shall be governed by, and construed in accordance with, the local laws of the country where the Company performs the tests or, in the case of tests performed in the United States of America, the laws of Massachusetts without regard to conflicts of laws principles. If any aspect(s) of these Conditions is found to be illegal or unenforceable, the validity, legality and enforceability of all remaining aspects of these Conditions shall not in any way be affected or impaired thereby. Any proceeding related to the subject matter hereof shall be brought, if at all, in the courts of the country where the Company performs the tests or, in the case of tests performed in the United States of America, in the courts of Massachusetts. Client waives the right to interpose any counterclaim or setoffs of any nature in any litigation arising hereunder.

The complete list of the Approved Subcontractors Curtis-Straus may use to delegate the performance of work can be provided upon request.  
Rev.160009121(2)\_#684340 v14CS



## Appendix A:

### CFR Title 47 FCC Part §15.247 and ISSED Canada RSS-247 Issue 2

#### DUT Information

DUT Name: GEN3.1 MID VA  
Manufacturer: Harman International Industries, Inc.  
Serial Number: 096

#### Frequencies

BT CH 0 (2402 MHz)		
BT CH 1 (2403 MHz)	BT CH 2 (2404 MHz)	BT CH 3 (2405 MHz)
BT CH 4 (2406 MHz)	BT CH 5 (2407 MHz)	BT CH 6 (2408 MHz)
BT CH 7 (2409 MHz)	BT CH 8 (2410 MHz)	BT CH 9 (2411 MHz)
BT CH 10 (2412 MHz)	BT CH 11 (2413 MHz)	BT CH 12 (2414 MHz)
BT CH 13 (2415 MHz)	BT CH 14 (2416 MHz)	BT CH 15 (2417 MHz)
BT CH 16 (2418 MHz)	BT CH 17 (2419 MHz)	BT CH 18 (2420 MHz)
BT CH 19 (2421 MHz)	BT CH 20 (2422 MHz)	BT CH 21 (2423 MHz)
BT CH 22 (2424 MHz)	BT CH 23 (2425 MHz)	BT CH 24 (2426 MHz)
BT CH 25 (2427 MHz)	BT CH 26 (2428 MHz)	BT CH 27 (2429 MHz)
BT CH 28 (2430 MHz)	BT CH 29 (2431 MHz)	BT CH 30 (2432 MHz)
BT CH 31 (2433 MHz)	BT CH 32 (2434 MHz)	BT CH 33 (2435 MHz)
BT CH 34 (2436 MHz)	BT CH 35 (2437 MHz)	BT CH 36 (2438 MHz)
BT CH 37 (2439 MHz)	BT CH 38 (2440 MHz)	BT CH 39 (2441 MHz)
BT CH 40 (2442 MHz)	BT CH 41 (2443 MHz)	BT CH 42 (2444 MHz)
BT CH 43 (2445 MHz)	BT CH 44 (2446 MHz)	BT CH 45 (2447 MHz)
BT CH 46 (2448 MHz)	BT CH 47 (2449 MHz)	BT CH 48 (2450 MHz)
BT CH 49 (2451 MHz)	BT CH 50 (2452 MHz)	BT CH 51 (2453 MHz)
BT CH 52 (2454 MHz)	BT CH 53 (2455 MHz)	BT CH 54 (2456 MHz)
BT CH 55 (2457 MHz)	BT CH 56 (2458 MHz)	BT CH 57 (2459 MHz)
BT CH 58 (2460 MHz)	BT CH 59 (2461 MHz)	BT CH 60 (2462 MHz)
BT CH 61 (2463 MHz)	BT CH 62 (2464 MHz)	BT CH 63 (2465 MHz)
BT CH 64 (2466 MHz)	BT CH 65 (2467 MHz)	BT CH 66 (2468 MHz)
BT CH 67 (2469 MHz)	BT CH 68 (2470 MHz)	BT CH 69 (2471 MHz)
BT CH 70 (2472 MHz)	BT CH 71 (2473 MHz)	BT CH 72 (2474 MHz)
BT CH 73 (2475 MHz)	BT CH 74 (2476 MHz)	BT CH 75 (2477 MHz)
BT CH 76 (2478 MHz)	BT CH 77 (2479 MHz)	BT CH 78 (2480 MHz)

#### DUT Settings

No. of transmission chains 1  
Equipment Type Frequency Hopping Spread Spectrum



Antenna Gain

Frequency	Efficiency [%]	Peak Gain [dBi]	Efficiency [dB]
2400	27.5759	-0.346604	-5.594703045
2402	27.8658	-0.346006	-5.549284843
2405	27.8566	-0.171463	-5.550718919
2410	28.2118	-0.0276734	-5.495692036
2415	28.3198	0.0703329	-5.47909818
2420	28.4283	0.101875	-5.462491102
2425	28.7202	0.144621	-5.418125401
2430	29.0618	0.160079	-5.366774903
2435	29.1796	0.142808	-5.349206658
2440	29.2362	0.112557	-5.340790758
2441	29.2928	0.082306	-5.332391136
2445	29.1799	0.0388361	-5.349162008
2450	28.7984	-0.0614676	-5.406316404
2455	28.6374	-0.16971	-5.430664143
2460	28.8522	-0.228147	-5.39821066
2462	29.067	-0.286584	-5.365997894
2465	28.8558	-0.325766	-5.397668808
2470	28.7344	-0.448801	-5.415978669
2475	29.2672	-0.342111	-5.336188246
2480	29.8094	-0.21967	-5.256467653
2485	29.9644	-0.0947805	-5.233944141
2490	30.2587	0.0513981	-5.191497344
2495	31.19	0.216943	-5.059846252
2500	31.6833	0.378915	-4.991695904



**Test Equipment Used:**

Rev. 11/9/2017								
<b>Spectrum Analyzers / Receivers /Preselectors</b>	<b>Range</b>	<b>MN</b>	<b>Mfr</b>	<b>SN</b>	<b>Asset</b>	<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>
FSV40 Signal/Spectrum Analyzer	10Hz-40GHz	FSV40	ROHDE & SCHWARZ	101551	2200	I	6/30/2018	6/30/2017
<b>Signal Generators/Comparaison Noise Emitter</b>	<b>Range</b>	<b>MN</b>	<b>Mfr</b>	<b>SN</b>	<b>Asset</b>	<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>
SMBV100A Vector Signal Generator	9KHz-6GHz	SMBV100A	ROHDE & SCHWARZ	261919	2201	I	6/26/2018	6/26/2017
SMB100A Signal Generator	100kHz-40GHz	SMB100A	ROHDE & SCHWARZ	179846	2434	I	5/30/2018	5/30/2017
<b>Power/Noise Meters</b>	<b>Range</b>	<b>MN</b>	<b>Mfr</b>	<b>SN</b>	<b>Asset</b>	<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>
OSP - open switch and control platform	30MHz-18GHz	OSP120	ROHDE & SCHWARZ	101674		I	6/1/2018	6/1/2017
<b>Cables</b>	<b>Range</b>		<b>Mfr</b>			<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>
DUT1	30MHz-26GHz		Micro-Coax			II	6/21/2018	6/21/2017
DUT2	30MHz-26GHz		Micro-Coax			II	6/22/2018	6/22/2017
DUT3	30MHz-26GHz		Micro-Coax			II	6/23/2018	6/23/2017
DUT4	30MHz-26GHz		Micro-Coax			II	6/24/2018	6/24/2017
<b>Attenuators / Couplers</b>	<b>Range</b>	<b>MN</b>	<b>Mfr</b>	<b>SN</b>	<b>Asset</b>	<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>
10dB Attenuator-01 Brown	30MHz-26GHz		Mini Curcuits			II	7/13/2018	7/14/2017
10dB Attenuator-02 Yellow	30MHz-26GHz		Mini Curcuits			II	7/13/2018	7/14/2017
10dB Attenuator-03 Red	30MHz-26GHz		Mini Curcuits			II	7/13/2018	7/14/2017
10dB Attenuator-04 orange	30MHz-26GHz		Mini Curcuits			II	7/13/2018	7/14/2017
API - 30dB 20W Attenuator	9KHz-40GHz	89-30-11	API Weinschel	703	2121	I	3/22/2018	3/22/2217
Directional Coupler	0.5GHz-18GHz	UDC	AA MCS	001040		II	8/11/2018	8/11/2017
<b>Communication Tester</b>	<b>Range</b>	<b>MN</b>	<b>Mfr</b>	<b>SN</b>	<b>Asset</b>	<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>
CMW500 Wideband Radio Communication Tester	DC to 6GHz	CMW500	ROHDE & SCHWARZ	155905		I	6/2/2018	6/2/2017
<b>Meteorological Meters/Chambers</b>	<b>Range</b>	<b>MN</b>	<b>Mfr</b>	<b>SN</b>	<b>Asset</b>	<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>
Temp/Humidity Chamber #18		EPX-2H	Espec	137664	1645	I	4/21/2018	4/21/2017
All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.								



**Summary**

Test	Frequency (MHz)	DH1 Result	DH3 Result	DH5 Result	2-DH1 Result	2-DH3 Result	2-DH5 Result	3-DH1 Result	3-DH3 Result	3-DH5 Result
Hopping Frequencies	--- (hopping)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Band Edge (during hopping)	--- (hopping)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Carrier Frequency Separation	2402.000 (hopping)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Carrier Frequency Separation	2480.000 (hopping)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Time of Channel Occupancy	2402.000 (hopping)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Time of Channel Occupancy	2441.000 (hopping)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Time of Channel Occupancy	2480.000 (hopping)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Emission Bandwidth 20 dB	2402.000 (single)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Band Edge low	2402.000 (single)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Peak output power	2402.000 (single)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Conducted Spurious Emissions	2402.000 (single)	---	PASS	---	---	---	---	---	---	---
Emission Bandwidth 20 dB	2441.000 (single)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Peak output power	2441.000 (single)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Conducted Spurious Emissions	2441.000 (single)	---	PASS	---	---	---	---	---	---	---
Emission Bandwidth 20 dB	2480.000 (single)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Band Edge high	2480.000 (single)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Peak output power	2480.000 (single)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Conducted Spurious Emissions	2480.000 (single)	---	PASS	---	---	---	---	---	---	---



BUREAU VERITAS



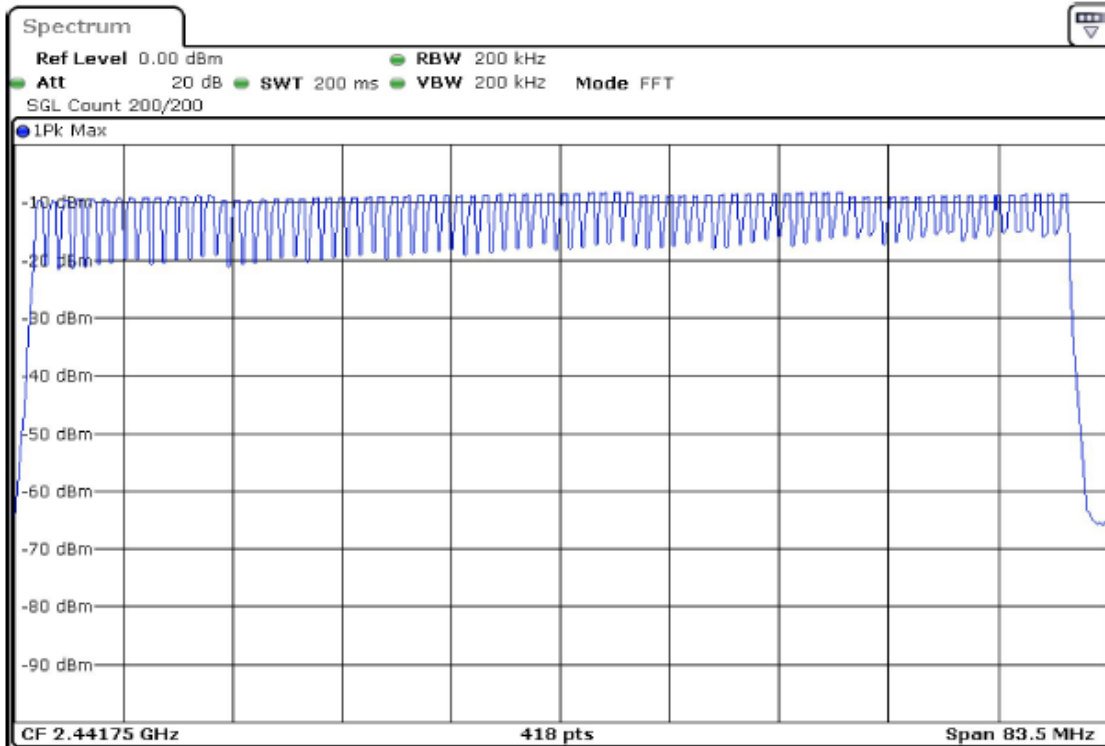
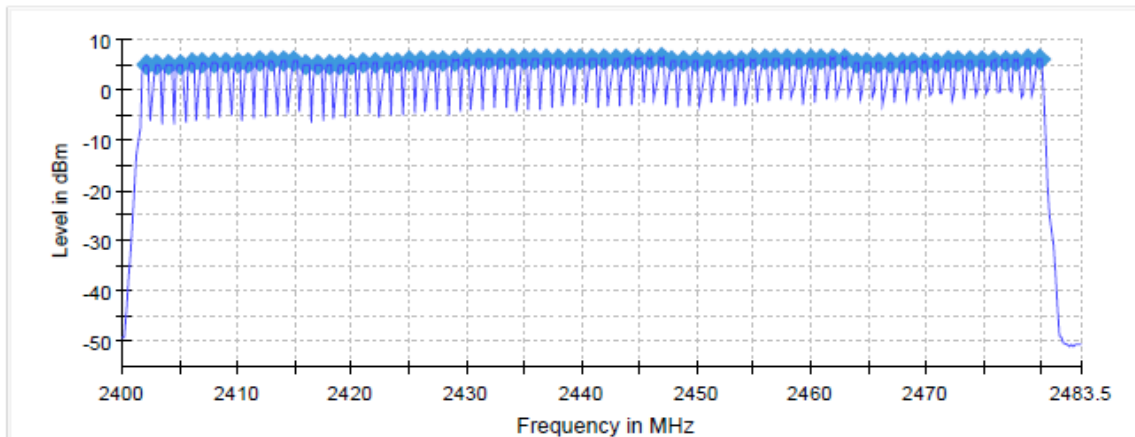
### Number of Hopping Frequencies

Test procedure in accordance with ANSI C63.10-2013

### Channels

Channels	Limit Min	Result
79	15	PASS

Sequence



## Band Edge (during hopping)

Test procedure in accordance with ANSI C63.10-2013

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 0.8 dB

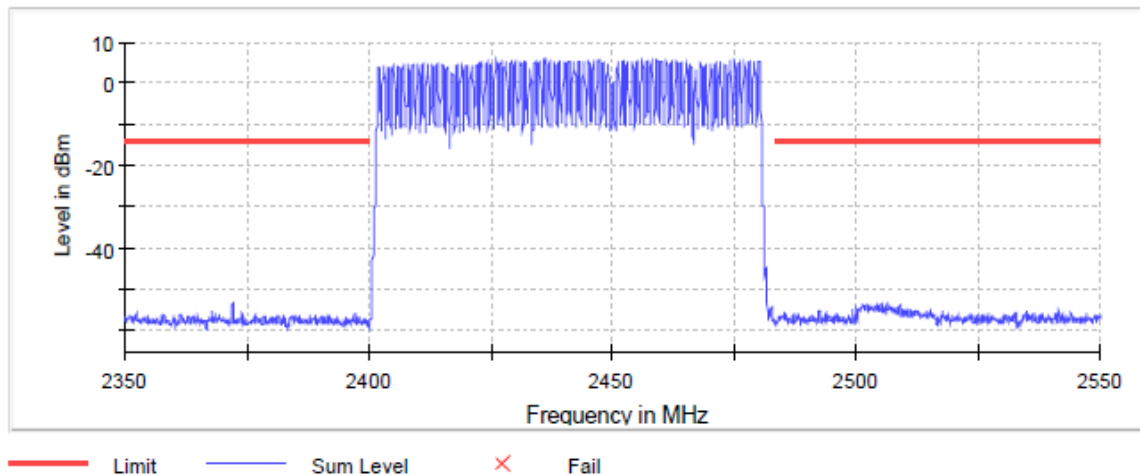
## Inband Peak

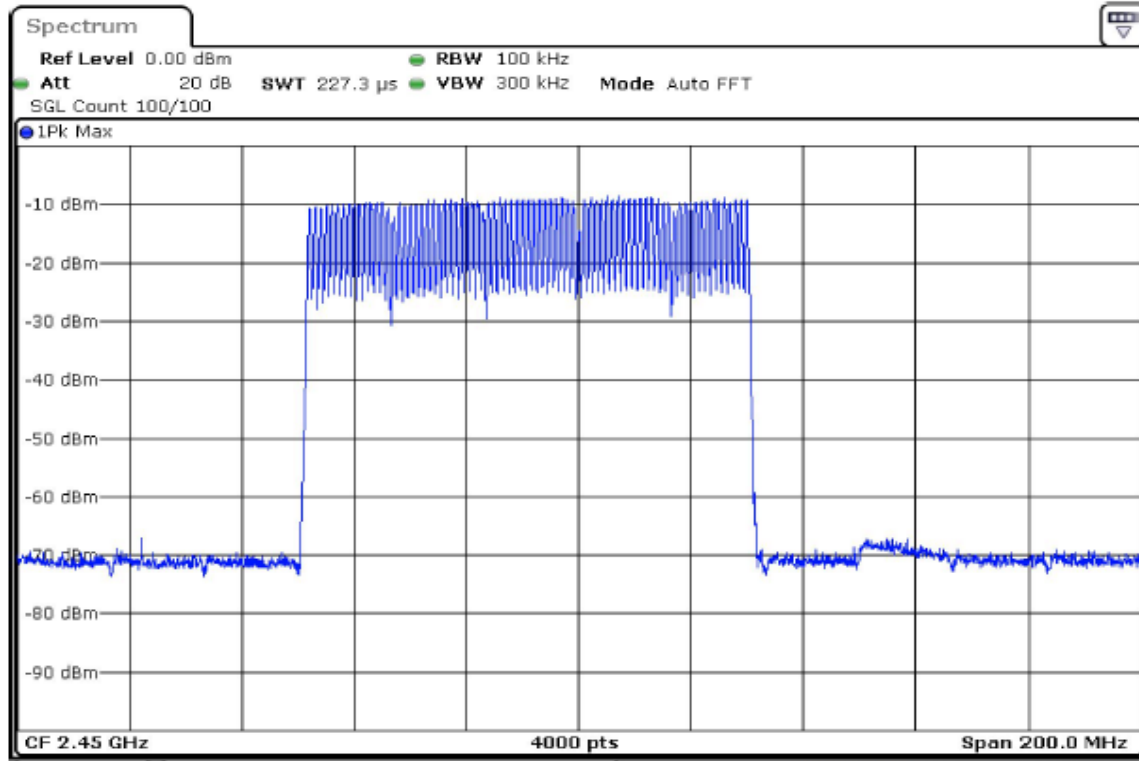
Data Rate	Frequency (MHz)	Level (dBm)
DH1	2462.796801	6.2
DH3	2436.153462	6.1
DH5	2459.147713	6.1
2-DH1	2429.005249	2.3
2-DH3	2429.005249	2.2
2-DH5	2447.000750	2.1
3-DH1	2428.855286	2.6
3-DH3	2430.154961	2.6
3-DH5	2429.155211	2.1

Plots for packet type DH3 shown below.

## Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2372.019495	-53.4	39.5	-13.9	PASS
2504.886278	-53.5	39.5	-13.9	PASS
2501.237191	-53.5	39.6	-13.9	PASS
2505.886028	-53.6	39.6	-13.9	PASS
2508.735316	-53.6	39.6	-13.9	PASS
2501.537116	-53.7	39.8	-13.9	PASS
2502.186953	-53.7	39.8	-13.9	PASS
2505.936016	-53.8	39.8	-13.9	PASS
2505.436141	-53.8	39.9	-13.9	PASS
2500.987253	-53.8	39.9	-13.9	PASS
2503.836541	-53.8	39.9	-13.9	PASS
2371.969508	-53.9	39.9	-13.9	PASS
2506.635841	-53.9	39.9	-13.9	PASS
2501.037241	-53.9	39.9	-13.9	PASS
2505.386153	-53.9	40.0	-13.9	PASS





### Carrier Frequency Separation

Test procedure in accordance with ANSI C63.10-2013

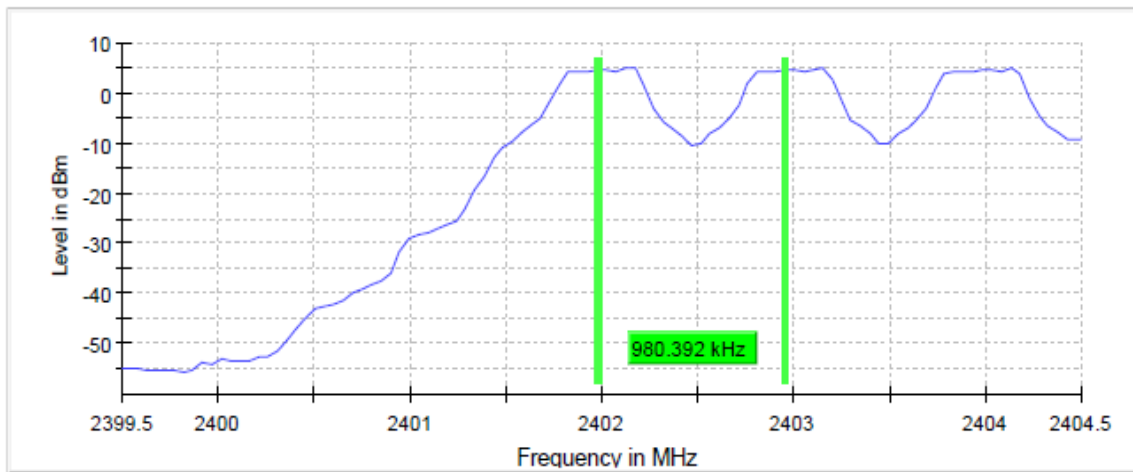
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty(k = 2) < 1%

#### 2402 MHz

Limit is 2/3 of the 20dB bandwidth measured for the corresponding mode.

Packet Type	DUT Frequency (MHz)	Frequency Separation (MHz)	Minimum Limit (MHz)	Result
DH1	2402.000000	0.980392	0.705883	PASS
DH3	2402.000000	0.980392	0.705883	PASS
DH5	2402.000000	0.980392	0.705883	PASS
2-DH1	2402.000000	0.980392	0.921568	PASS
2-DH3	2402.000000	0.980392	0.921568	PASS
2-DH5	2402.000000	0.980392	0.921568	PASS
3-DH1	2402.000000	0.980392	0.901961	PASS
3-DH3	2402.000000	0.931373	0.921568	PASS
3-DH5	2402.000000	0.980392	0.921568	PASS

Plots for packet type DH3 shown below.



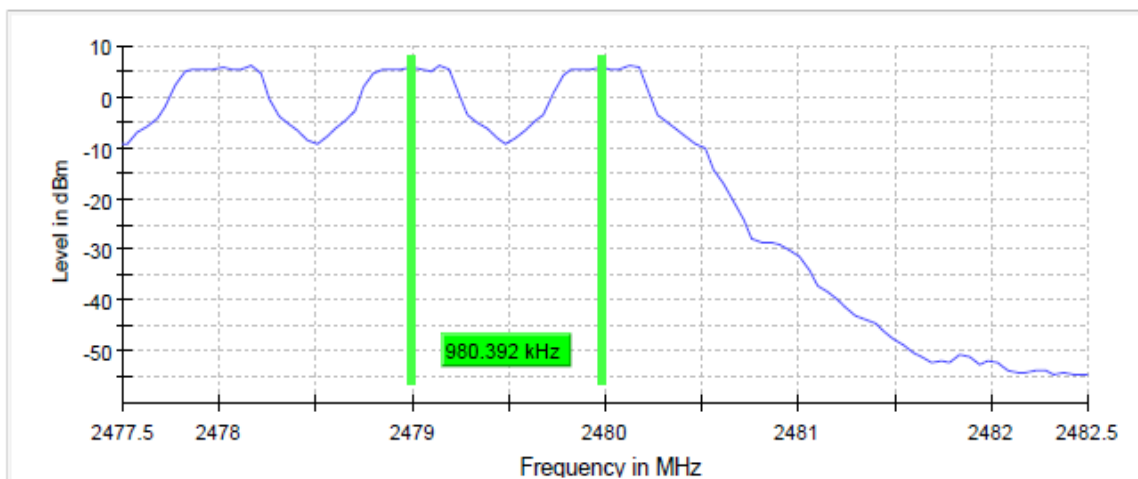


**2480 MHz**

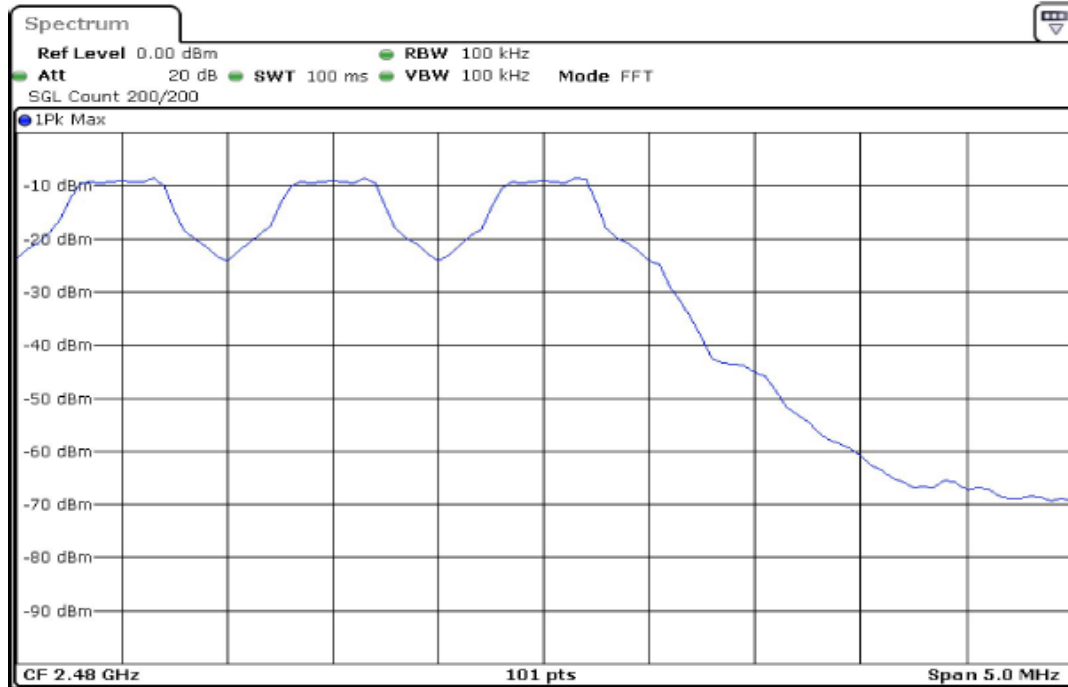
Limit is 2/3 of the 20dB bandwidth measured for the corresponding mode.

Packet Type	DUT Frequency (MHz)	Frequency Separation (MHz)	Minimum Limit (MHz)	Result
DH1	2480.000000	0.980392	0.705883	PASS
DH3	2480.000000	0.980392	0.686275	PASS
DH5	2480.000000	0.980392	0.745098	PASS
2-DH1	2480.000000	0.980392	0.941176	PASS
2-DH3	2480.000000	0.980392	0.941176	PASS
2-DH5	2480.000000	0.980392	0.941176	PASS
3-DH1	2480.000000	0.980392	0.901961	PASS
3-DH3	2480.000000	0.980392	0.901961	PASS
3-DH5	2480.000000	0.980392	0.921569	PASS

Plots for packet type DH3 shown below.







### Time of Channel Occupancy (Dwell Time)

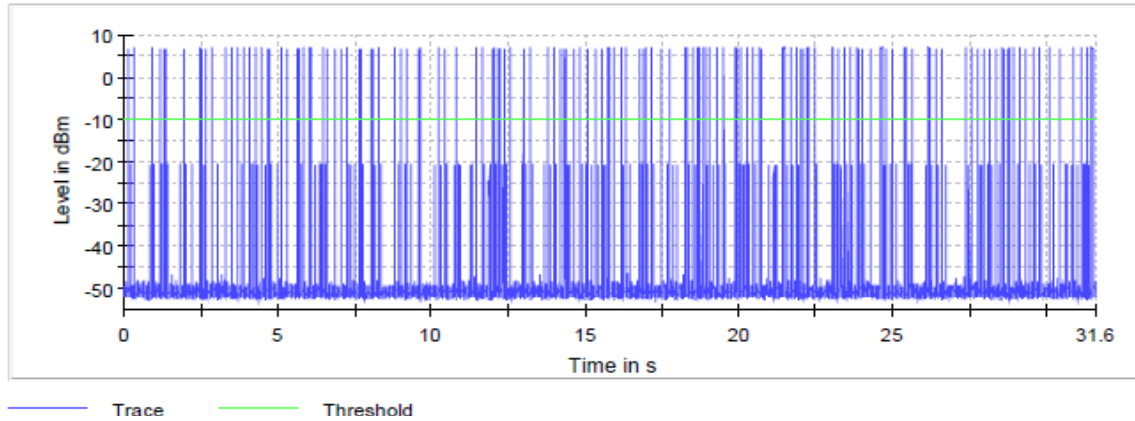
Test procedure in accordance with ANSI C63.10-2013

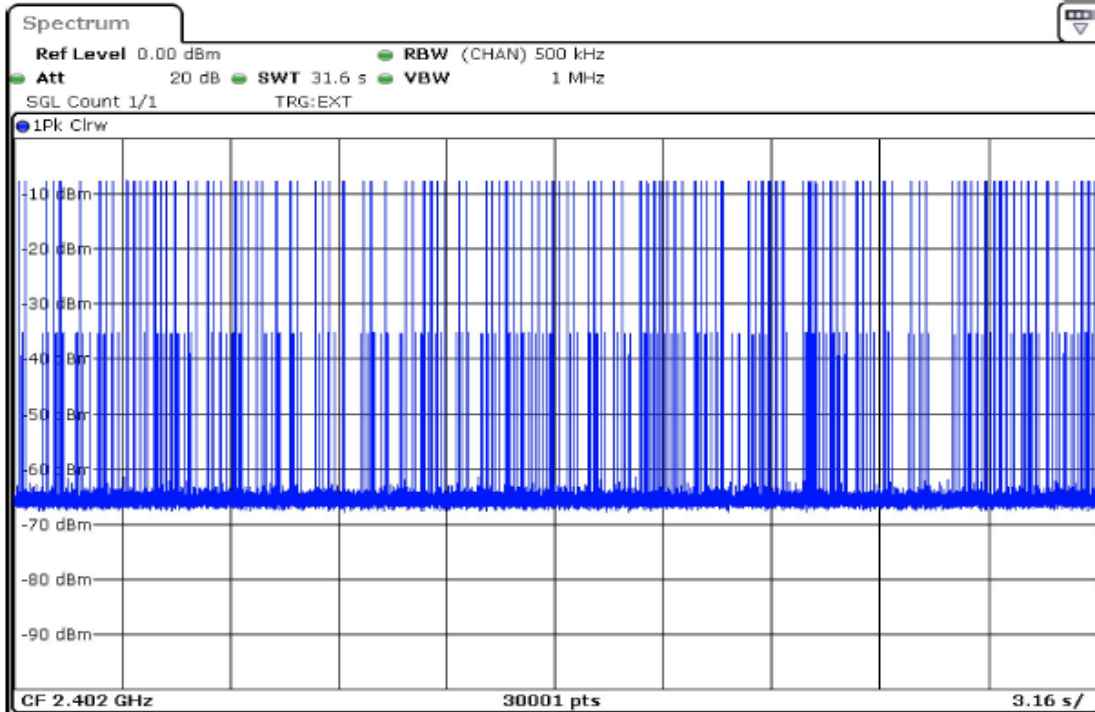
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 1%

#### 2402 MHz

Data Rate	Time (ms)	Limit Max (ms)	Result
DH1	122.940	400.000	PASS
DH3	254.230	400.000	PASS
DH5	288.790	400.000	PASS
2-DH1	113.880	400.000	PASS
2-DH3	250.130	400.000	PASS
2-DH5	280.830	400.000	PASS
3-DH1	117.370	400.000	PASS
3-DH3	241.750	400.000	PASS
3-DH5	279.620	400.000	PASS

Plots for packet type DH3 shown below.

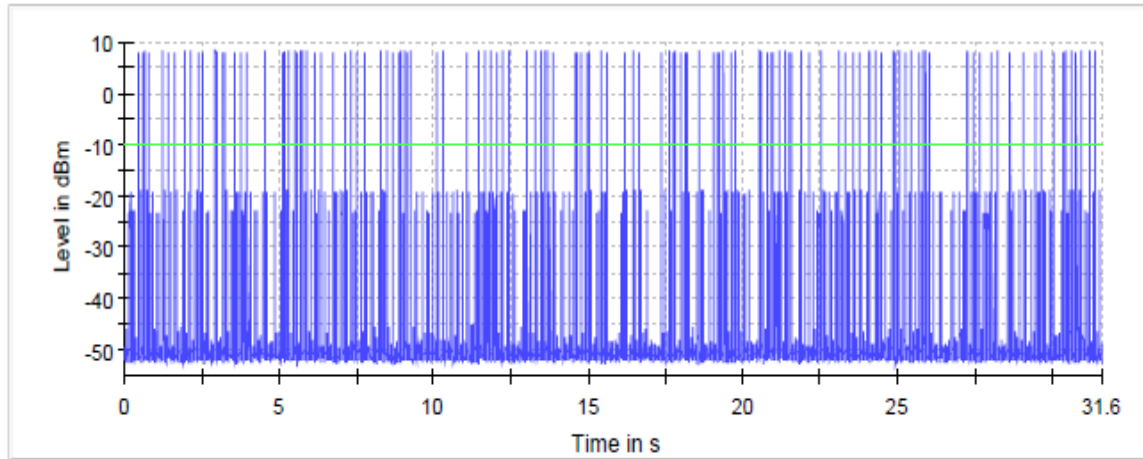




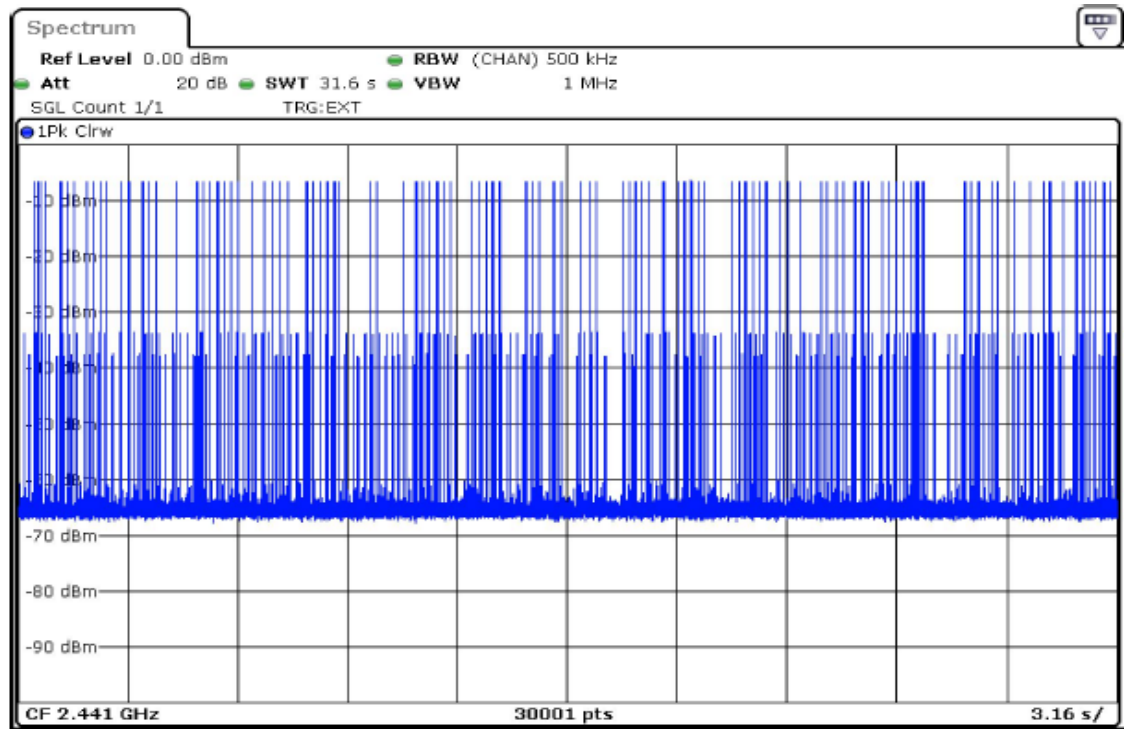
**2441 MHz**

Data Rate	Time (ms)	Limit Max (ms)	Result
DH1	122.610	400.000	PASS
DH3	234.590	400.000	PASS
DH5	332.190	400.000	PASS
2-DH1	115.310	400.000	PASS
2-DH3	247.930	400.000	PASS
2-DH5	270.050	400.000	PASS
3-DH1	118.320	400.000	PASS
3-DH3	265.840	400.000	PASS
3-DH5	296.450	400.000	PASS

Plots for packet type DH3 shown below.



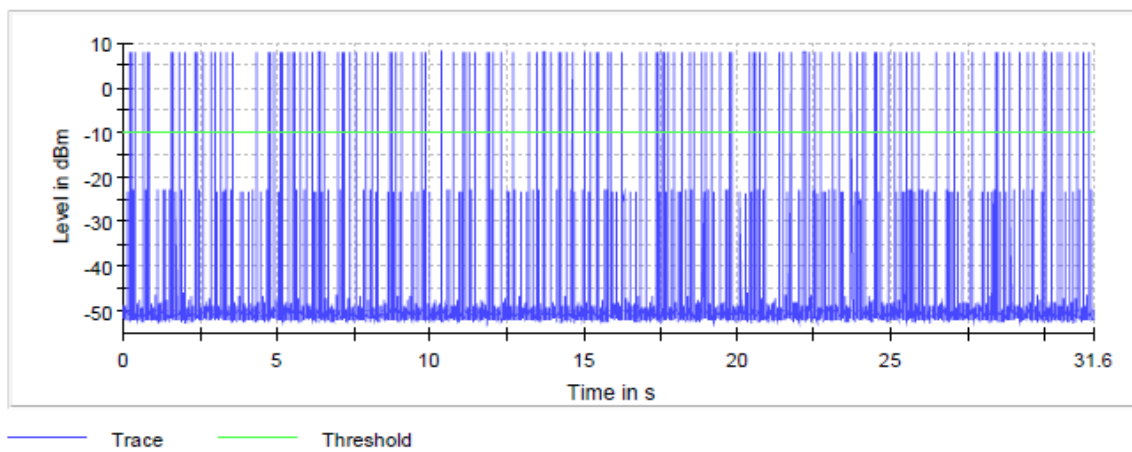
— Trace      — Threshold

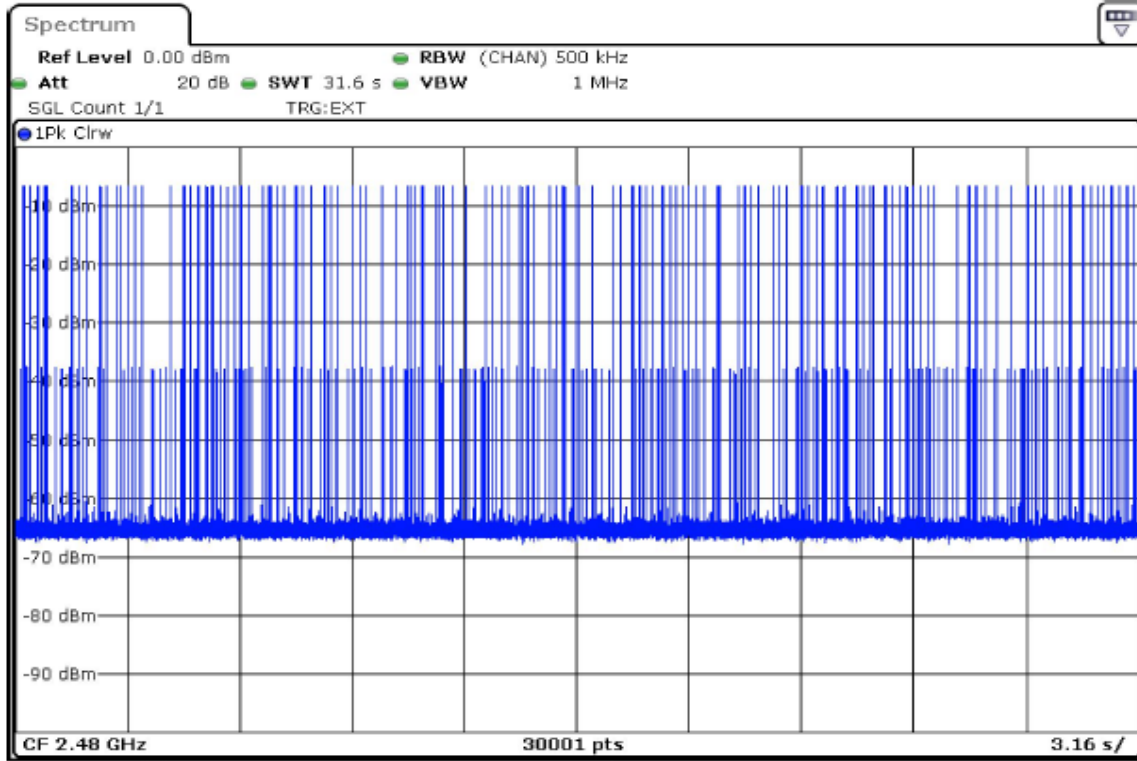


**2480 MHz**

Data Rate	Time (ms)	Limit Max (ms)	Result
DH1	122.990	400.000	PASS
DH3	249.320	400.000	PASS
DH5	314.830	400.000	PASS
2-DH1	115.080	400.000	PASS
2-DH3	226.930	400.000	PASS
2-DH5	305.150	400.000	PASS
3-DH1	118.980	400.000	PASS
3-DH3	238.740	400.000	PASS
3-DH5	289.460	400.000	PASS

Plots for packet type DH3 shown below.



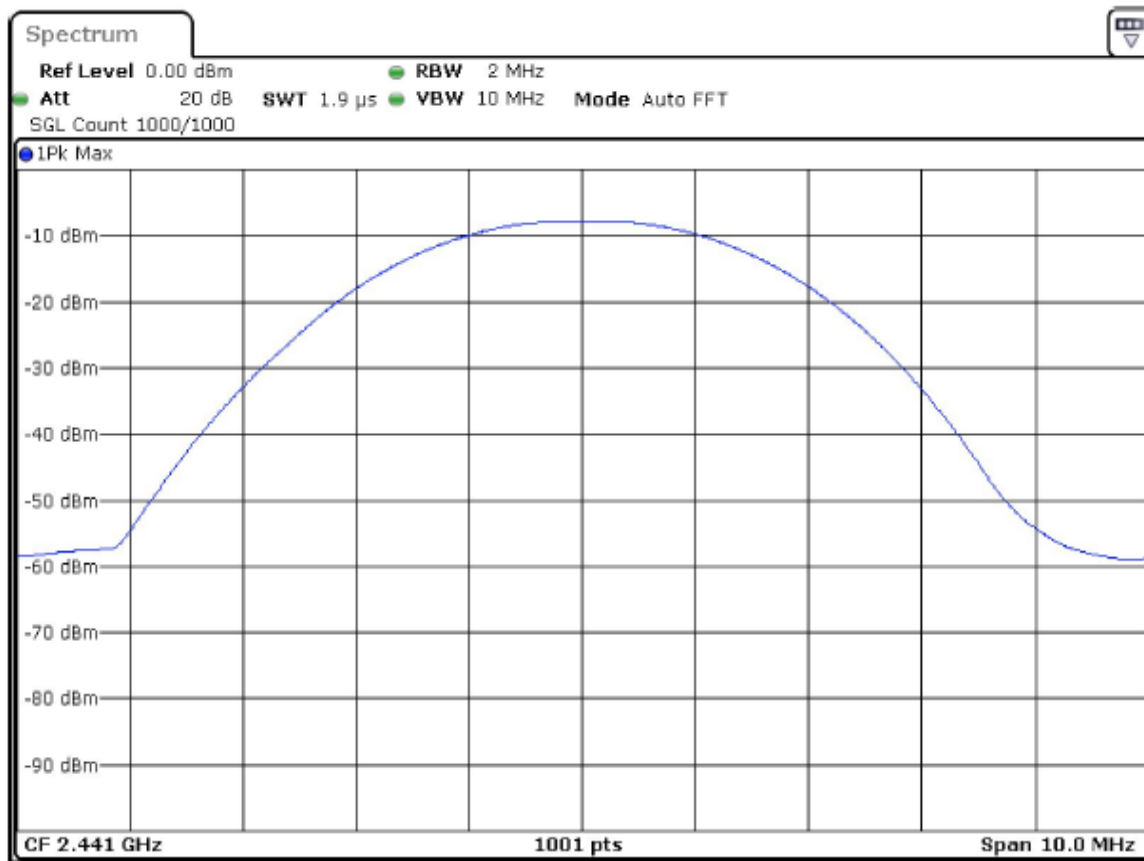


**Peak Output Power**

Test procedure in accordance with ANSI C63.10-2013

Data Rate	2402MHz	2441MHz	2480MHz	Limit dBm
DH1	4.425	5.839	5.731	30
DH3	4.959	5.936	5.84	30
DH5	4.684	5.675	5.595	30
2-DH1	2.835	3.711	3.669	30
2-DH3	2.875	3.732	3.568	30
2-DH5	2.708	3.704	3.735	30
3-DH1	2.883	3.877	3.745	30
3-DH3	2.975	3.932	4.033	30
3-DH5	3.153	4.323	3.951	30

Plot for packet type DH3 shown below.



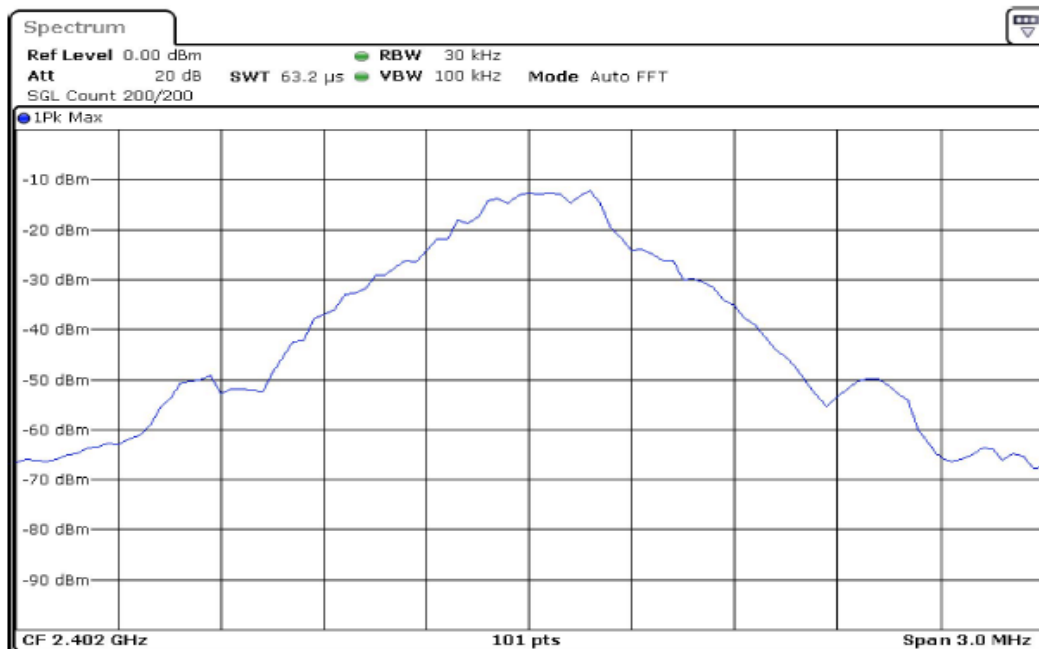
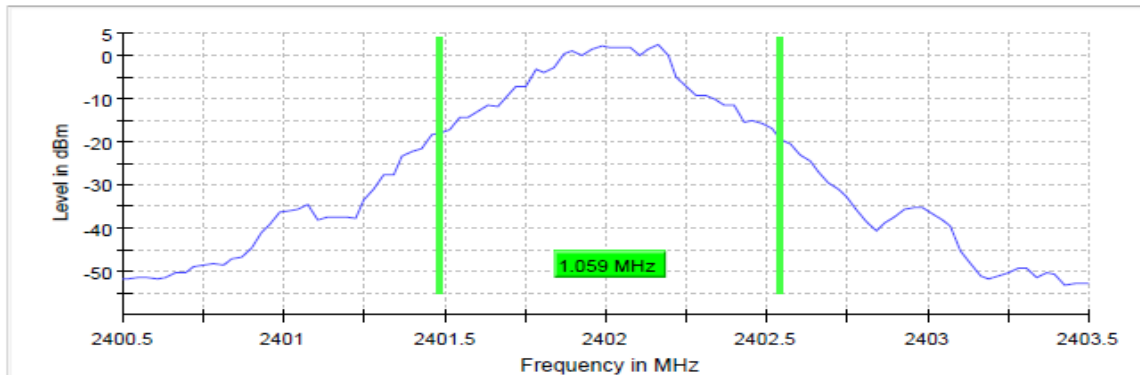
### Emission Bandwidth 20 dB

Test procedure in accordance with ANSI C63.10-2013  
 Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 2%

#### 2402 MHz

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	1.058824	2401.485294	2402.544118	PASS
DH3	1.058824	2401.485294	2402.544118	PASS
DH5	1.058824	2401.485294	2402.544118	PASS
2-DH1	1.382352	2401.308824	2402.691176	PASS
2-DH3	1.382352	2401.308824	2402.691176	PASS
2-DH5	1.382352	2401.308824	2402.691176	PASS
3-DH1	1.352941	2401.338235	2402.691176	PASS
3-DH3	1.382352	2401.308824	2402.691176	PASS
3-DH5	1.382352	2401.308824	2402.691176	PASS

Plots for packet type DH3 shown below.

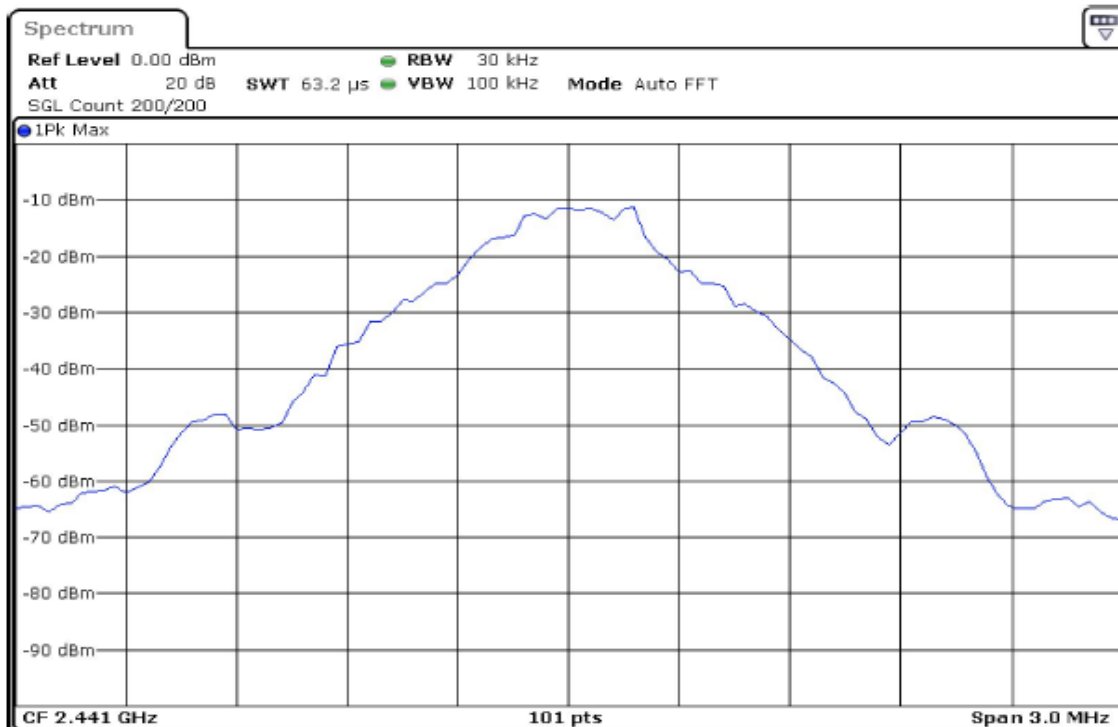
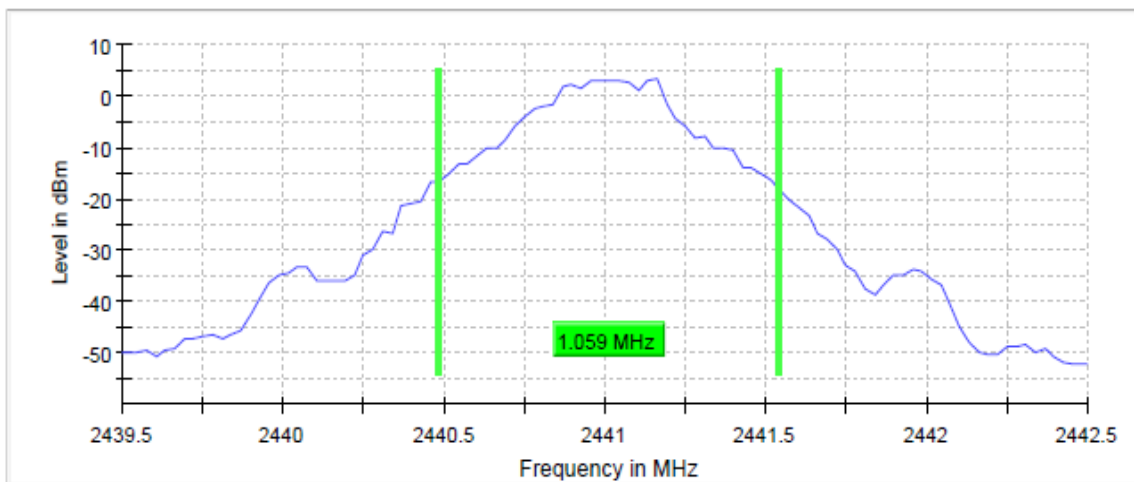




**2441 MHz**

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	1.058824	2440.485294	2441.544118	PASS
DH3	1.058824	2440.485294	2441.544118	PASS
DH5	1.088235	2440.426471	2441.514706	PASS
2-DH1	1.382352	2440.308824	2441.691176	PASS
2-DH3	1.382352	2440.308824	2441.691176	PASS
2-DH5	1.382352	2440.308824	2441.691176	PASS
3-DH1	1.323530	2440.338235	2441.661765	PASS
3-DH3	1.382352	2440.308824	2441.691176	PASS
3-DH5	1.382352	2440.308824	2441.691176	PASS

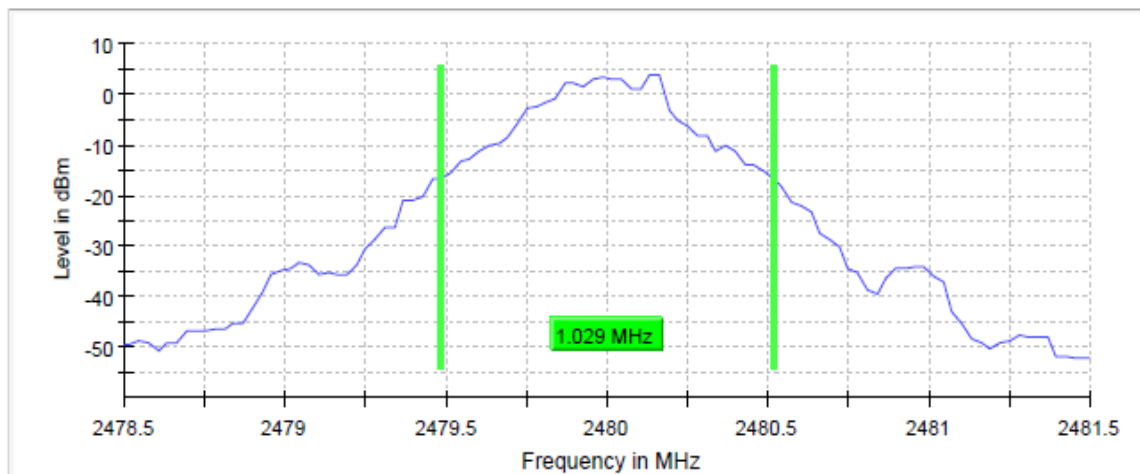
Plots for packet type DH3 shown below.

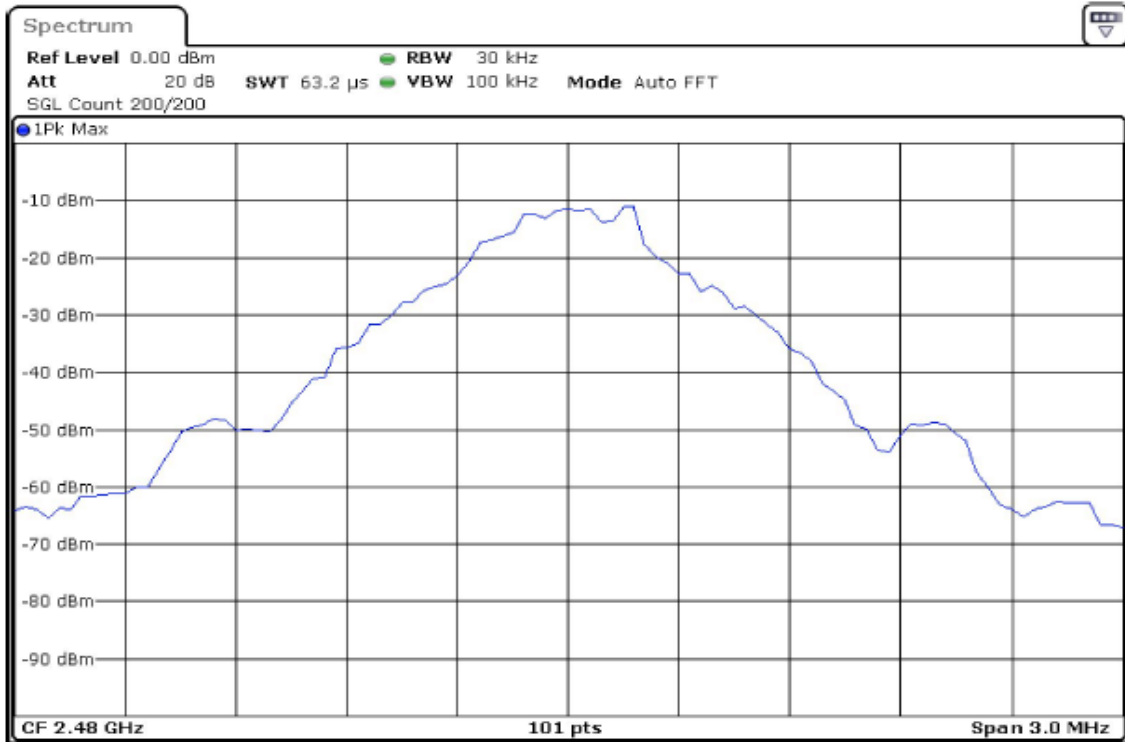


**2480 MHz**

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	1.058824	2479.485294	2480.544118	PASS
DH3	1.029412	2479.485294	2480.514706	PASS
DH5	1.117647	2479.426471	2480.544118	PASS
2-DH1	1.411764	2479.279412	2480.691176	PASS
2-DH3	1.411764	2479.279412	2480.691176	PASS
2-DH5	1.411764	2479.279412	2480.691176	PASS
3-DH1	1.352941	2479.308824	2480.661765	PASS
3-DH3	1.352941	2479.308824	2480.661765	PASS
3-DH5	1.382353	2479.279412	2480.661765	PASS

Plots for packet type DH3 shown below.





### Band Edge Low (2402 MHz)

Test procedure in accordance with ANSI C63.10-2013

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 0.8 dB

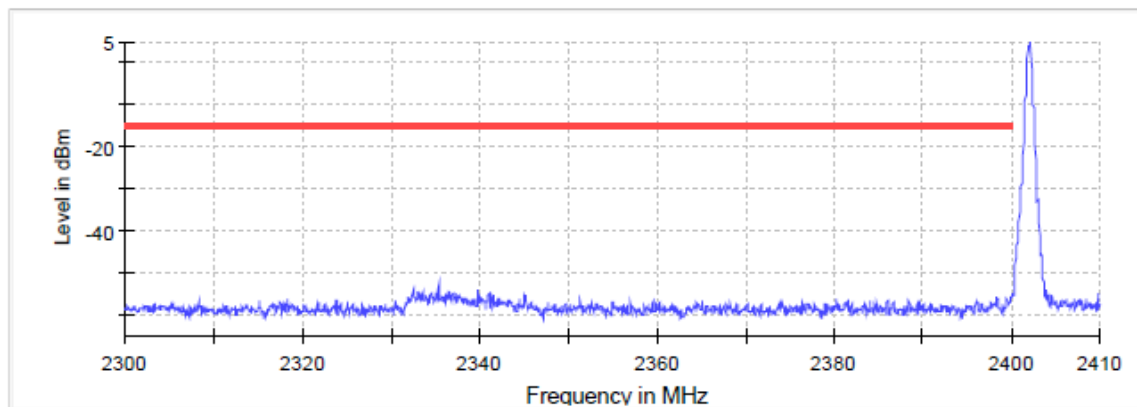
### Inband Peak

Data Rate	Frequency (MHz)	Level (dBm)
DH1	2401.828714	4.7
DH3	2402.128578	4.9
DH5	2402.128578	4.8
2-DH1	2401.828714	1.1
2-DH3	2401.978646	0.8
2-DH5	2402.128578	1.0
3-DH1	2401.828714	1.1
3-DH3	2402.128578	0.8
3-DH5	2402.128578	1.1

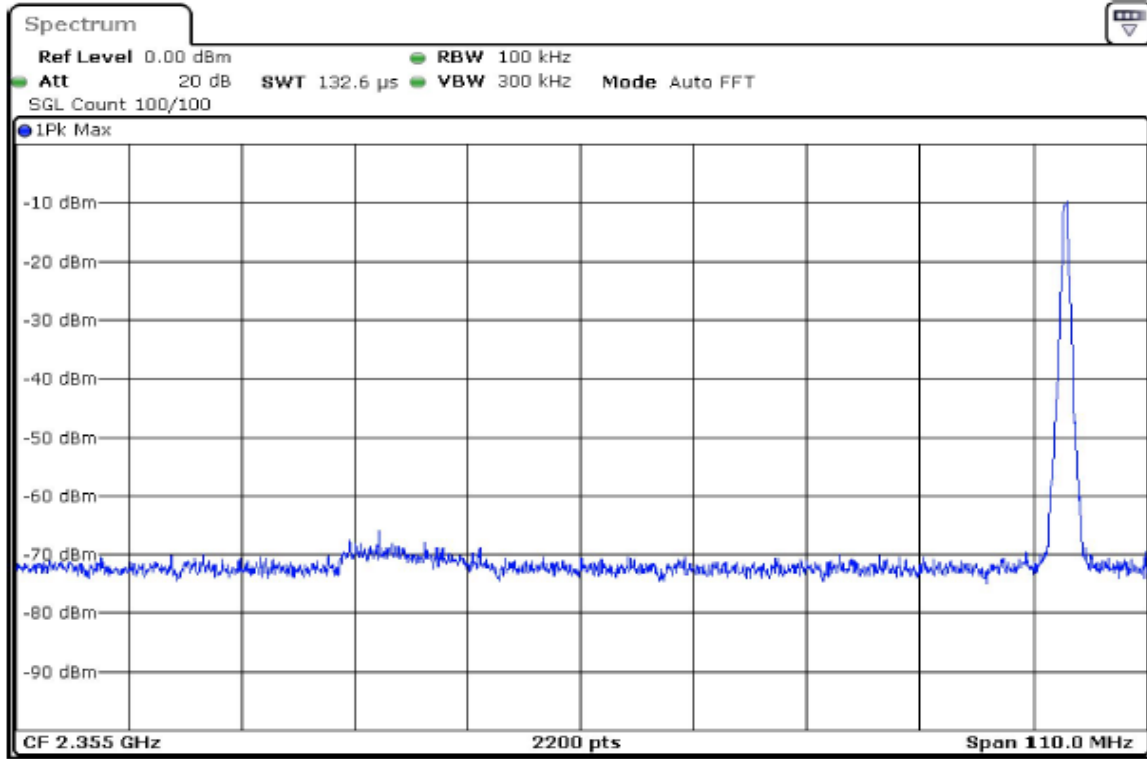
Plots for packet type DH3 shown below.

## Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2335.358928	-52.3	37.2	-15.1	PASS
2335.408905	-52.5	37.4	-15.1	PASS
2332.460245	-53.9	38.8	-15.1	PASS
2339.806906	-54.2	39.1	-15.1	PASS
2332.510223	-54.3	39.2	-15.1	PASS
2339.756929	-54.3	39.2	-15.1	PASS
2336.608360	-54.5	39.4	-15.1	PASS
2333.009995	-54.6	39.4	-15.1	PASS
2333.559746	-54.6	39.4	-15.1	PASS
2335.308950	-54.6	39.5	-15.1	PASS
2333.609723	-54.7	39.6	-15.1	PASS
2335.159019	-54.8	39.7	-15.1	PASS
2333.059973	-54.8	39.7	-15.1	PASS
2335.109041	-54.8	39.7	-15.1	PASS
2336.558383	-54.9	39.7	-15.1	PASS



— Limit      — Sum Level      × Fail



### Band Edge High (2480 MHz)

Test procedure in accordance with ANSI C63.10-2013  
 Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 0.8 dB

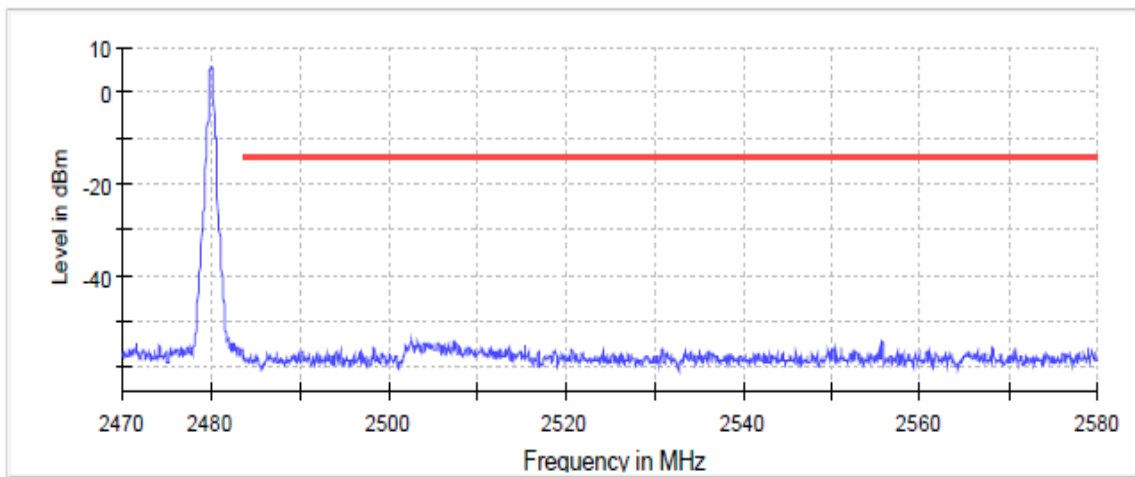
### Inband Peak

Data Rate	Frequency (MHz)	Level (dBm)
DH1	2480.170377	5.9
DH3	2480.170377	6.0
DH5	2480.020445	5.6
2-DH1	2479.820536	2.0
2-DH3	2480.020445	1.8
2-DH5	2480.170377	2.0
3-DH1	2479.820536	2.1
3-DH3	2480.170377	2.1
3-DH5	2480.020445	1.8

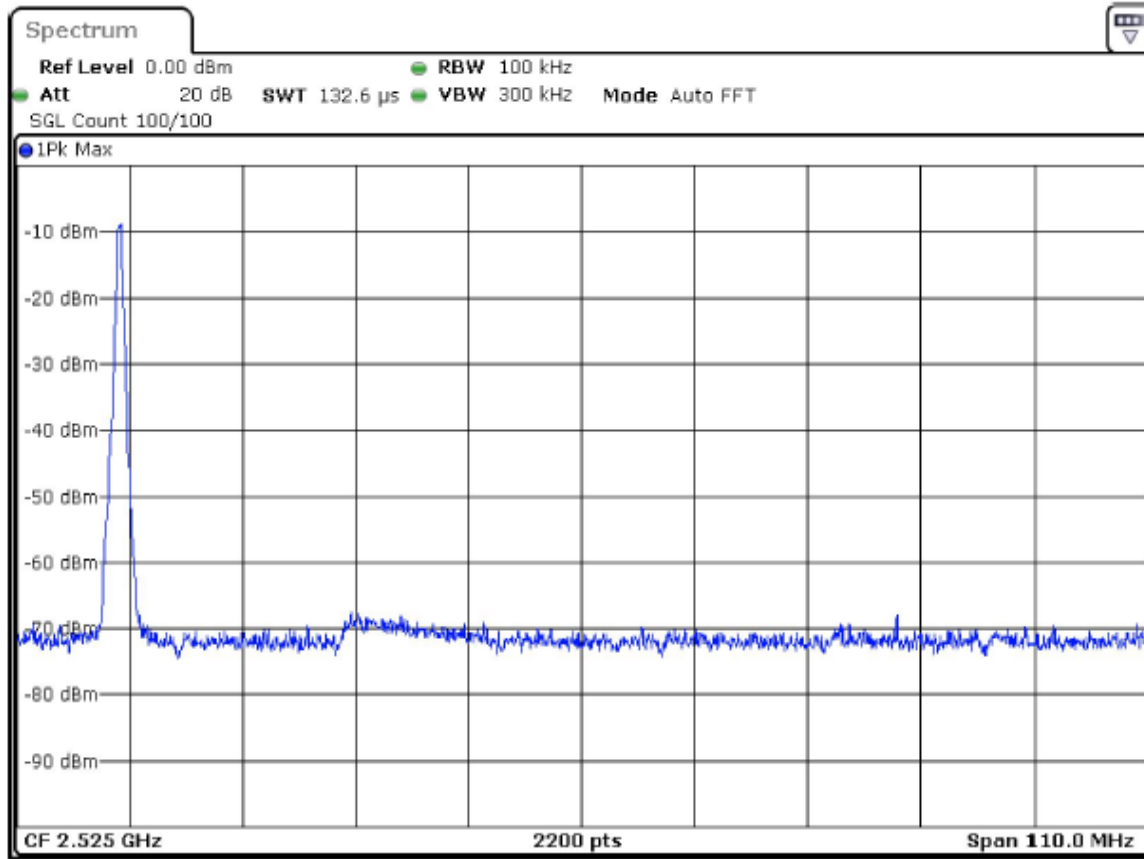
Plots for packet type DH3 shown below.

## Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2502.610177	-53.6	39.6	-14.0	PASS
2502.560200	-53.7	39.7	-14.0	PASS
2502.510223	-53.9	39.9	-14.0	PASS
2503.259882	-54.0	40.1	-14.0	PASS
2555.686052	-54.2	40.2	-14.0	PASS
2502.460245	-54.2	40.2	-14.0	PASS
2503.209905	-54.3	40.3	-14.0	PASS
2507.358019	-54.4	40.4	-14.0	PASS
2507.407996	-54.4	40.4	-14.0	PASS
2503.309859	-54.4	40.4	-14.0	PASS
2503.459791	-54.6	40.6	-14.0	PASS
2503.959564	-54.6	40.6	-14.0	PASS
2555.636075	-54.6	40.6	-14.0	PASS
2504.009541	-54.7	40.7	-14.0	PASS
2504.159473	-54.7	40.7	-14.0	PASS



— Limit      — Sum Level      × Fail



## Conducted Spurious Emissions

Test procedure in accordance with ANSI C63.10-2013

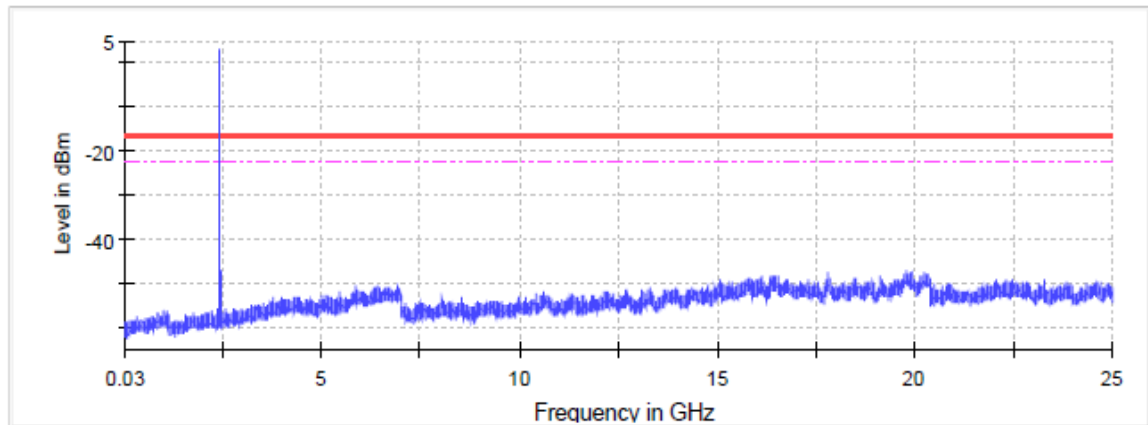
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 0.8 dB

### 2402 MHz

Plots for packet type DH3 shown below.

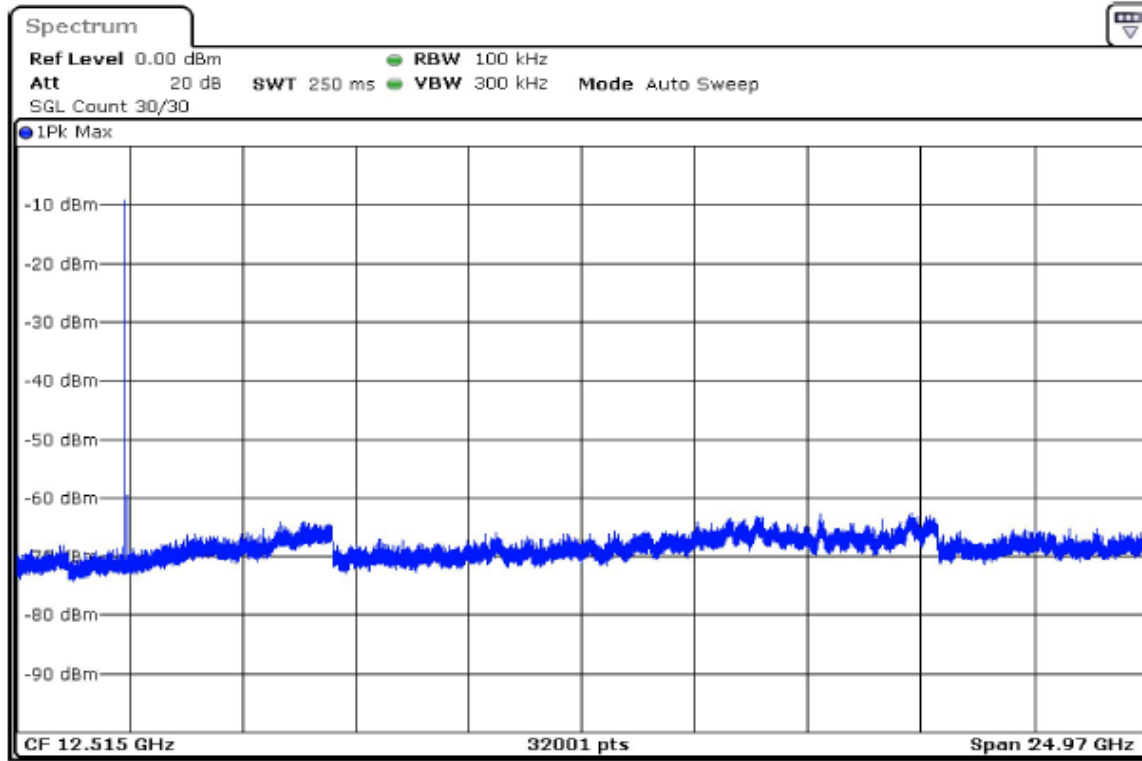
#### Pre Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
19802.273139	-47.1	30.5	-16.6
20220.494500	-47.5	30.9	-16.6
19949.742985	-47.6	30.9	-16.6
20231.418193	-47.6	31.0	-16.6
19868.595557	-47.7	31.1	-16.6
17804.797981	-47.7	31.1	-16.6
19927.115337	-47.7	31.1	-16.6
19841.286326	-47.8	31.2	-16.6
19756.237579	-47.8	31.2	-16.6
20302.422192	-47.8	31.2	-16.6
19870.156084	-48.0	31.4	-16.6
19766.381007	-48.0	31.4	-16.6
19800.712612	-48.0	31.4	-16.6
20325.049841	-48.1	31.5	-16.6
19781.206018	-48.1	31.5	-16.6



— Limit    — Sum Level    - - - Threshold    × Critical    × Final Critical





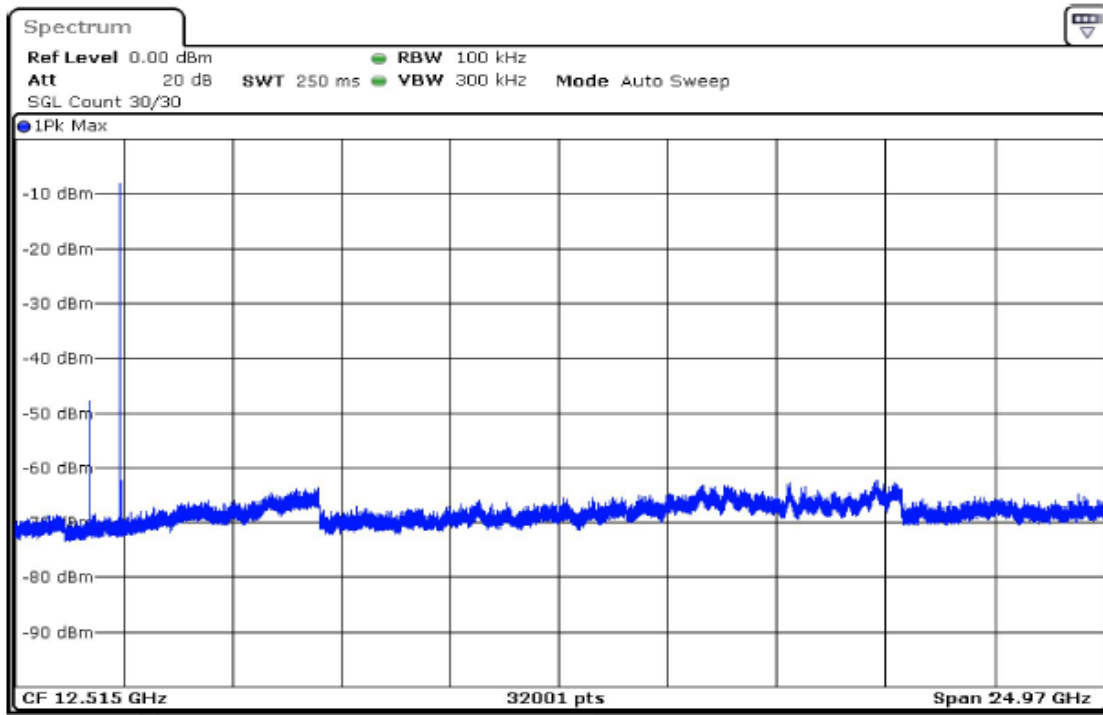
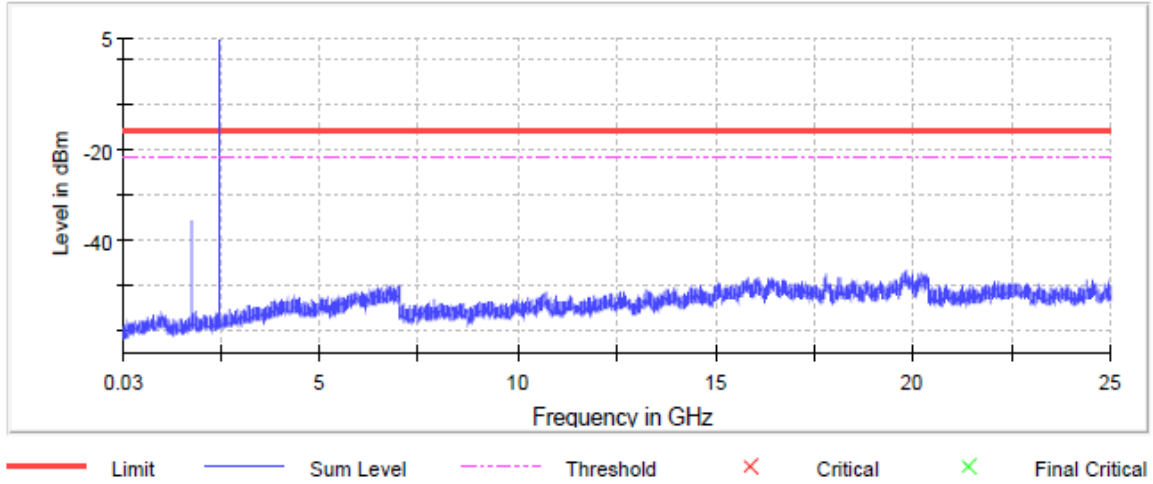
**2441 MHz**

Plots for packet type DH3 shown below.

**Pre Measurements**

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
1747.750609	-35.5	20.1	-15.5
1748.530873	-40.4	24.9	-15.5
19854.550809	-46.7	31.2	-15.5
19846.748172	-46.7	31.2	-15.5
19769.502062	-47.1	31.6	-15.5
19978.612743	-47.3	31.9	-15.5
19790.569183	-47.5	32.0	-15.5
20211.911599	-47.5	32.0	-15.5
19763.259953	-47.5	32.0	-15.5
20250.924786	-47.5	32.1	-15.5
19841.286326	-47.6	32.1	-15.5
20261.848478	-47.6	32.1	-15.5
19785.887601	-47.6	32.2	-15.5
19838.945535	-47.6	32.2	-15.5
19746.094150	-47.6	32.2	-15.5





**2480 MHz**

Plots for packet type DH3 shown below.

### Pre Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
19842.066590	-46.6	31.0	-15.6
19761.699425	-47.2	31.5	-15.6
19772.623117	-47.4	31.8	-15.6
19865.474502	-47.4	31.8	-15.6
19789.788919	-47.4	31.8	-15.6
19781.986282	-47.5	31.9	-15.6
20359.381445	-47.5	31.9	-15.6
20236.880039	-47.6	32.0	-15.6
19755.457315	-47.6	32.0	-15.6
20334.413005	-47.6	32.0	-15.6
20300.081401	-47.7	32.0	-15.6
19789.008656	-47.7	32.1	-15.6
19786.667865	-47.8	32.1	-15.6
19742.973095	-47.8	32.2	-15.6
20185.382632	-47.9	32.3	-15.6

