
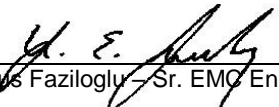




Test Report

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

Report No	ER2501-2
Client	Harman International Industries, Incorporated
Address	30001 Cabot Drive Novi, MI 48377
Phone	248-254-7751
Items tested FCC ID IC	GEN3.1 BASE+ VA 2AHPN-BE2836 6434C-BE2836
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 24 th to November 11 th , 2017
Results	As detailed within this report
Prepared by	 Zachary Johnson, EMC Engineer
Authorized by	 Yunus Faziloglu, Sr. EMC Engineer
Issue Date	11/22/2017
Conditions of Issue	This Test Report is issued subject to the conditions stated in the 'Conditions of Testing' section on page 15 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.



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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, ISSED Canada RSS-247 Issue 2

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

Antenna Type: PCB trace

Gain: Maximum -0.74dBi peak gain

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 22, 2017

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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											
Work Order:	R2501										
Company:	Harman International Industries, Incorporated										
Company Address:	30001 Cabot Drive										
	Novi, MI, 48377										
Contact:	Mark Bowman										
	MN			PN			SN				
EUT:	GEN3.1 BASE+ VA			--			Sample 1				
EUT Description:	Car Stereo System										
EUT Components	MN			SN							
Back up camera											
FM/AM antenna											
GPS antenna											
Support Equipment	MN			SN							
13.5Vdc Power Supply											
CS Supplied Laptop.											
USB to Ethernet Converter											
Port Label	Port Type	# ports	# populated	cable type	shielded	ferrites	length (m)	in/out	under test	comment	
Audio		1	1	-	No	No	1.2	in	yes		
Back up camera		1	1		Yes	No	0.3	in	yes		
DC main	Power DC	2	2	Power DC	No	No	1.2	in	yes		
FM/AM antenna	-	1	1		Yes	No	0.4	in	yes		
GPS antenna		1	1	Coaxial	Yes	No	1.3	in	yes		
USB		3	1	USB	Yes	No	3	in	yes	Redundant	
Software Operating Mode Description:											
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.											
Performance Criteria:											
Eut will connect to CMW and preform less than 10% PER during test.BT- EUT will connect to tablet or CMW over bluetooth and stay connected at appropriate distance											

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 maximum -0.74dBi 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 powered by a vehicle battery 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 Horizontal Data					Test Site - CH 1									
Operator: CCH					Conditions - 20.2°C; 22%RH; 1010mBar									
Spurious TX mode BT CH 39. Filtering 2300-2500MHz					Witnessed by - FCC B									
					EUT Maximum Frequency - Filtering 2300-2500MHz									
				Lim1:				Lim2:						
	Raw QP	Correction	Adjusted	FCC_pt15_	Margin to	Test	Worst	FCC_pt15_	Margin to	Test	Worst	Antenna	EUT	
Frequency	Reading	Factor	QP	109_Class_	Lim1	Results	Margin	109_Class_	Lim2	Results	Margin	Height	Azimuth	
			Amplitude	B		Lim1	Lim1	B		Lim2	Lim2			
(MHz)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dB)	(dBμV/m)	(dB)	(Pass/Fail)	(dB)	(cm)	(degrees)	
75.975	49.1	-27.2	21.9	40	-18.1	PASS		40	-18.1	PASS		225	9	
85.55	44.8	-28.1	16.7	40	-23.3	PASS		40	-23.3	PASS		189	183	
139.072	47.3	-21.9	25.4	43.5	-18.1	PASS		43.5	-18.1	PASS		158	57	
282.676	54.6	-21.7	32.9	46	-13.1	PASS		46	-13.1	PASS		124	70	
376	44.7	-19.1	25.5	46	-20.5	PASS		46	-20.5	PASS		100	96	
378.018	54.1	-19.1	35	46	-11	PASS	-11	46	-11	PASS	-11	103	111	

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 - 20.2°C; 22%RH; 1010mBar									
Spurious TX mode BT CH 39. Filtering 2300-2500MHz					Witnessed by - FCC B									
					EUT Maximum Frequency - Filtering 2300-2500MHz									

30-1000MHz Center Channel



**Test Report for Harmon International Industries, Incorporated • GEN3.1 BASE+ VA • Report No. ER2501-2 •
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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 - 20.2°C; 22%RH; 1010mBar											
Spurious TX mode BT CH 0. Filtering 2300-2500MHz					Witnessed by - FCC B											
					EUT Maximum Frequency - Filtering 2300-2500MHz											

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 - 20.2°C; 22%RH; 1010mBar											
Spurious TX mode BT CH 0. Filtering 2300-2500MHz					Witnessed by - FCC B											
					EUT Maximum Frequency - Filtering 2300-2500MHz											
					Pk Lim:					Av Lim:						
					FCC_pt15_109_ClassB_Peak			Worst Peak Margin	Adjusted Avg Amplitude	FCC_pt15_109_ClassB_AVG				Worst Average Margin	Antenna Height	EUT Azimuth
Frequency	Raw Peak Reading	Raw Avg Reading	Correction Factor	Adjusted Peak Amplitude		Peak Margin	Peak Results					Avg Margin	Avg Results			
(MHz)	(dBμV)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dB)	(cm)	(degrees)	
1595.2	48.6	38.7	-11.6	37	74	-37	PASS		27.1	54	-26.8	PASS		114	125	
2159.3	43.4	34.2	-7.9	35.5	74	-38.5	PASS		26.3	54	-27.7	PASS		282	142	
2466.1	43.6	37	-110.1	-66.5	74	-140.4	PASS		-73.1	54	-127.1	PASS		100	89	
2813.5	44	34.9	-4	39.9	74	-34	PASS		30.8	54	-23.1	PASS		112	167	
4017.8	42.4	34.1	-4.5	37.9	74	-36	PASS		29.6	54	-24.4	PASS		275	166	
5716.6	42.1	33.2	-0.4	41.7	74	-32.3	PASS	-32.3	32.7	54	-21.2	PASS	-21.2	275	230	

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 - 20.2°C; 22%RH; 1010mBar										
Spurious TX mode BT CH 39. Filtering 2300-2500MHz					Witnessed by - FCC B										
					EUT Maximum Frequency - Filtering 2300-2500MHz										
					Pk Lim:					Av Lim:					
					FCC_pt15_109_ClassB					FCC_pt15_109_ClassB					
Frequency	Raw Peak Reading	Raw Avg Reading	Correction Factor	Adjusted Peak Amplitude	Peak Margin	Peak Results	Worst Peak Margin	Adjusted Avg Amplitude	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)
2091.2	44	34.4	-8.5	35.5	74	-38.5 PASS		25.9	54	-28.1 PASS			193	336	
2414.8	42.4	36	-110.3	-67.9	74	-141.9 PASS		-74.3	54	-128.3 PASS			222	20	
2433.3	43.7	37.3	-110.2	-66.5	74	-140.5 PASS		-72.9	54	-126.8 PASS			300	309	
2467.9	42.8	37.4	-110.1	-67.3	74	-141.2 PASS		-72.7	54	-126.6 PASS			193	147	
2811.2	44.6	34.9	-3.9	40.6	74	-33.4 PASS		30.9	54	-23 PASS			288	9	
5173.4	42.7	33.1	-0.8	41.9	74	-32.1 PASS	-32.1	32.3	54	-21.7 PASS	-21.7		124	256	



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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 - 20.2°C; 22%RH; 1010mBar										
Spurious TX mode BT CH 39. Filtering 2300-2500MHz					Witnessed by - FCC B										
					EUT Maximum Frequency - Filtering 2300-2500MHz										
					Pk Lim:					Av Lim:					
				Adjusted	FCC_pt15_				Adjusted	FCC_pt15_					
				Peak	109_ClassB	Peak			Peak	109_ClassB					
				Amplitude	_Peak	Margin			Margin	_AVG				Worst	
Frequency	Raw Peak	Raw Avg	Correction												
	Reading	Reading	Factor	Amplitude											

1-6GHz Mid 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 - 20.2°C; 22%RH; 1010mBar										
Spurious TX mode BT CH 78. Filtering 2300-2500MHz					Witnessed by - FCC B										
					EUT Maximum Frequency - Filtering 2300-2500MHz										
					Pk Lim: FCC_pt15_109_ClassB			Worst	Adjusted	Av Lim: FCC_pt15_109_ClassB					
Frequency	Raw Peak Reading	Raw Avg Reading	Correction Factor	Adjusted Peak Amplitude	Peak Margin	Peak Results	Peak Margin	Avg Amplitude	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)
2145.9	43.2	34.3	-8	35.2	74	-38.8 PASS		26.3	54	-27.7 PASS		275	336		
2414.6	43	34.1	-110.3	-67.3	74	-141.3 PASS		-76.2	54	-130.1 PASS		107	9		
2467	43.9	35.8	-110.1	-66.2	74	-140.1 PASS		-74.2	54	-128.2 PASS		124	107		
2800.6	44.4	34.9	-3.5	40.9	74	-33.1 PASS		31.4	54	-22.6 PASS		275	176		
4119.1	43.1	34.5	-4.4	38.7	74	-35.3 PASS		30.1	54	-23.9 PASS		284	139		
5784.2	41.9	33.2	-0.3	41.6	74	-32.3 PASS		-32.3	32.9	54	-21.1 PASS	-21.1	275	91	

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 - 20.2°C; 22%RH; 1010mBar										
Spurious TX mode BT CH 78. Filtering 2300-2500MHz					Witnessed by - FCC B										
					EUT Maximum Frequency - Filtering 2300-2500MHz										
					Pk Lim: FCC_pt15_1					Av Lim: FCC_pt15_1					
					09_ClassB_Peak					09_ClassB_AVG					
Frequency	Raw Peak Reading	Raw Avg Reading	Correction Factor	Adjusted Peak Amplitude	Peak Margin	Peak Results	Worst Peak Margin	Adjusted Avg Amplitude	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)
1597.3	48.1	36.7	-11.6	36.5	74	-37.5 PASS		25.1	54	-28.8 PASS		124	114		
2076.3	43	34.3	-8.6	34.4	74	-39.6 PASS		25.7	54	-28.3 PASS		191	311		
2405.2	42.7	33.3	-110.3	-67.6	74	-141.6 PASS		-77	54	-131 PASS		275	15		
2806	45.6	34.9	-3.7	41.9	74	-32.1 PASS		31.2	54	-22.8 PASS		275	57		
4660.9	41.9	33.4	-2.8	39	74	-35 PASS		30.6	54	-23.4 PASS		175	70		
5882.3	42.4	32.9	-0.4	42	74	-31.9 PASS	-31.9	32.5	54	-21.5 PASS	-21.5	275	10		

1-6GHz High Channel



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**Test Report for Harmon International Industries, Incorporated • GEN3.1 BASE+ VA • Report No. ER2501-2 •
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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 - 20.2°C; 22%RH; 1010mBar										
Spurious TX mode BT CH 39. Filtering 2300-2500MHz					Witnessed by - FCC B										
					EUT Maximum Frequency - Filtering 2300-2500MHz										
					Pk Lim:					Av Lim:					
				Adjusted	FCC_pt15_1				Adjusted	FCC_pt15_1					
				Peak	09_ClassB_	Peak			Avg	09_ClassB_					
Frequency	Raw Peak	Raw Avg	Correction	Amplitude	Peak	Margin	Peak	Worst Peak	Amplitude	AVG	Avg Margin	Avg Results	Worst Avg	Antenna	EUT
	Reading	Reading	Factor				Results	Margin					Margin	Height	Azimuth
(MHz)	(dBμV)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dB)	(cm)	(degrees)
9477.6	43.8	34.6	4.5	48.3	83.5	-35.2	PASS		39.1	63.5	-24.4	PASS		100	33
10116.6	41.9	33.8	5.6	47.5	83.5	-36	PASS		39.4	63.5	-24.1	PASS		181	168
10587.6	40.4	31.8	4.6	45	83.5	-38.5	PASS		36.4	63.5	-27.1	PASS		148	98
11530.4	39.8	32.1	8.2	48	83.5	-35.5	PASS		40.3	63.5	-23.2	PASS		195	168
13908.8	41.8	32.9	12.4	54.2	83.5	-29.3	PASS		45.3	63.5	-18.2	PASS		100	59
17735.2	40.8	31.7	20	60.8	83.5	-22.7	PASS	-22.7	51.8	63.5	-11.7	PASS	-11.7	200	290

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: CH					Conditions - 20.2°C; 22%RH; 1010mBar											
Spurious TX mode BT CH 39. Filtering 2300-2500MHz					Witnessed by - FCC B											
					EUT Maximum Frequency - Filtering 2300-2500MHz											
					Pk Lim: FCC_pt15_1					Av Lim: FCC_pt15_1						
					09_ClassB_Peak		Peak Test Results	Worst Peak Margin	Adjusted Avg Amplitude	09_ClassB_AVG		Avg Margin	Avg Test Results	Worst Avg Margin	Antenna Height	EUT Azimuth
Frequency	Raw Peak Reading	Raw Avg Reading	Correction Factor	Adjusted Peak Amplitude	09_ClassB_Peak	Peak Margin	Peak Test Results	Worst Peak Margin	Adjusted Avg Amplitude	09_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)	
8859	44.5	33.8		5.8	50.3	83.5	-33.2 PASS		39.6	63.5	-23.9 PASS			175	205	
10531.5	46.5	32.1	5.4	51.8	83.5	-31.7 PASS			37.5	63.5	-26 PASS			175	59	
11563.4	40.2	32.5	8.1	48.4	83.5	-35.1 PASS			40.6	63.5	-22.9 PASS			100	28	
13304	42	33.1	12.7	54.7	83.5	-28.8 PASS			45.7	63.5	-17.8 PASS			189	19	
13800.5	44.3	33.9	12.1	56.3	83.5	-27.2 PASS			45.9	63.5	-17.6 PASS			180	256	
17997.7	40.2	31.7	20	60.3	83.5	-23.2 PASS		-23.2	51.8	63.5	-11.7 PASS		-11.7	144	217	

6-18GHz Center Channel

Radiated Emissions Table															
Date: 11-Nov-17				Company: Harman						Work Order: R2501					
Engineer: Chris Hamel				EUT Desc: GEN3.1 BASE+ VA						EUT Operating Voltage/Frequency: 13.8V DC					
Temp: 20.2°C				Humidity: 22%						Pressure: 1010mBar					
Frequency Range: 18-40GHz (combined)										Measurement Distance: 0.1 m					
Notes: EUT connected to CMW Center Channel No Emissions Found										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)	
Table Result:				Pass	by	N/A	dB			Worst Freq:			N/A MHz		
Test Site: EMI Chamber 2				Cable 1: Asset #2323						Cable 2: ---			Cable 3: ---		
Analyzer: Gold				Preamp: 18-26.5GHz						Antenna: 18-26.5GHz Horn			Preselector: ---		
CSsoft Radiated Emissions Calculator				v 1.017.197									Copyright Curtis-Straus LLC 2000		
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor															
Test Site: EMI Chamber 2				Cable 1: Asset #2323						Cable 2: Asset #2324			Cable 3: ---		
Analyzer: Gold				Preamp: 40GHz Mixer						Antenna: 40GHz Mixer			Preselector: ---		
CSsoft Radiated Emissions Calculator				v 1.017.197									Copyright Curtis-Straus LLC 2000		
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor															

18-40GHz Center Channel



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**Test Report for Harmon International Industries, Incorporated • GEN3.1 BASE+ VA • Report No. ER2501-2 •
November 22, 2017**

Rev.10/22/2017							
Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Gold	100Hz-26.5 GHz	E4407B	Agilent	MY45113816	1284	I	2/28/2018
Rental MXE EMI Receiver(1170725)	20Hz-26.5GHz	N9038A	Agilent	MY51210151	1170725	I	12/22/2017
Radiated Emissions Sites	FCC Code	IC Code	VCCI Code	Range	Asset	Cat	Calibration Due
EMI Chamber 2	719150	2762A-7	A-0015	30-1000MHz	1686	I	12/21/2018
EMI Chamber 2	719150	2762A-7	A-0015	1-18GHz	1686	I	12/21/2018
Mixers/Duplexers	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Mixer / Horn	26.5-40 GHz	11970A	Agilent	3003A10230	2154	I	3/12/2019
Preamps/Couplers Attenuators / Filters	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Blue	0.009-2000MHz	ZFL-1000-LN	CS	N/A	759	II	5/9/2018
2463 HF PA	.5-18GHz	PAM-118A	COM-POWER	443005	2463	II	10/9/2018
HF (Yellow)	18-26.5GHz	AFS4-18002650-60-8P-4	CS	467559	1266	II	10/16/2018
Antennas	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Red-Black Bilog	30-2000MHz	JB1	Sunol	A091604-2	1106	I	2/28/2019
HF (White) Horn	18-26.5GHz	801-WLM	Waveline	758	758	III	Verify before Use
Blue Horn	1-18Ghz	3117	ETS	157647	1861	I	2/14/2019
Meteorological Meters/Chambers		MN	Mfr	SN	Asset	Cat	Calibration Due
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	4/28/2018
TH A#2081		HTC-1	HDE		2081	II	3/23/2018
Cables	Range		Mfr			Cat	Calibration Due
Asset #1509	9kHz - 18GHz		Florida RF			II	10/2/2018
Asset #2052	9kHz - 18GHz		Florida RF			II	3/5/2018
Asset #2053	9kHz - 18GHz		Florida RF			II	10/31/2018
Asset #2323	1-26.5GHz	TM26-S1S1-120	MEGAPHASE	17139101 002	2323	II	8/19/2018
Asset #2324	1-26.5GHz	TM26-S1S1-120	MEGAPHASE	17139101 001	2324	II	8/19/2018
All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.							

TEU – Radiated Emissions 0.03-40GHz



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Radiated Band Edge

Radiated Emissions Table																			
Date: 17-Nov-17					Company: Harman					Work Order: R2501									
Engineer: Chris Hamel					EUT Desc: GEN3.1 BASE+ VA					EUT Operating Voltage/Frequency: 13.8V DC									
Temp: 22.1°C					Humidity: 25%					Pressure: 1007mBar									
Frequency Range:										Measurement Distance: 3 m									
Notes: Bluetooth mode DH1										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)					
DH 1				---	---	---	---	---	---	---	---	---	---	---					
Low				---	---	---	---	---	---	---	---	---	---	---					
H MAX	2402.0	47.7		0.0	28.0	3.2	---	---	74.0	---	---	54.0	---	---					
V MAX	2401.9	50.7		0.0	28.0	3.2	---	---	74.0	---	---	54.0	---	---					
V	2310.0	11.08	11.1	0.0	27.9	3.2	42.2	42.2	74.0	-31.8	Pass	54.0	-11.8	Pass					
V	2331.7	14.4	14.4	0.0	27.9	3.2	45.5	45.5	74.0	-28.5	Pass	54.0	-8.5	Pass					
High				---	---	---	---	---	---	---	---	---	---	---					
H Max	2480.1	44.4		0.0	28.2	3.2	---	---	74.0	---	---	54.0	---	---					
V MAX	2479.94	47.2		0.0	28.2	3.2	---	---	74.0	---	---	54.0	---	---					
V	2483.5	11.3	11.3	0.0	28.2	3.2	42.7	42.7	74.0	-31.3	Pass	54.0	-11.3	Pass					
V avg	2483.6	18.4	7.1	0.0	28.2	3.2	49.8	38.5	74.0	-24.2	Pass	54.0	-15.5	Pass					
				---	---	---	---	---	---	---	---	---	---	---					
Table Result:					Pass by -8.3 dB					Worst Freq: 2356.3 MHz									
Test Site: EMI Chamber 2					Cable 1: Asset #2458					Cable 2: Asset #2459					Cable 3: ---				
Analyzer: 1168255					Preamp: None					Antenna: Orange Horn					Preselector: ---				
CSsoft Radiated Emissions Calculator v 1.017.197																			
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor																			
Copyright Curtis-Strauss LLC 2000																			

Rev. 11/9/2017							
Spectrum Analyzers/ Receivers/Preselectors				Range	MN	Mfr	SN
Rental MXE EMI Receiver(1168255)				20Hz-8.4GHz	N9038A	Agilent	MY53290009
Radiated Emissions Sites				FCC Code	IC Code	VCCI Code	Range
EMI Chamber 2				719150	2762A-7	A-0015	1-18GHz
Antennas				Range	MN	Mfr	SN
Orange Horn				1-18GHz	3115	EMCO	0004-6123
Meteorological Meters/Chambers					MN	Mfr	SN
Weather Clock (Pressure Only)					BA928	Oregon Scientific	C3166-1
TH A#2085					HTC-1	HDE	2085
Cables				Range		Mfr	
Asset #2458				9KHz-18GHz		MegaPhase	
Asset #2459				9KHz-18GHz		MegaPhase	
All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.							

TEU – Band Edge 1-18GHz



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AC Line Conducted Emissions LIMITS

Frequency of emission (MHz)	Quasi-peak limit (dB μ V)	Average limit (dB μ 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)	5.6dB	N/A
NIST	4.6dB	5.2dB (Ucisp)
CISPR		
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)	3.23×10^{-8}	1×10^{-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%	5%
	0.3dB	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:

ER2501-2 Appendix A CFR Title 47 FCC Part §15.247 and ISCED Canada RSS-247 Issue 2

DUT Information

DUT Name: GEN3.1 BASE+ VA
Manufacturer: Harman International Industries, Inc.
Serial Number: 041

Frequencies

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

DUT Settings

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

Antenna Gain

Frequency	Efficiency [%]	Peak Gain [dBi]	Efficiency [dB]
2400	14.9857	-1.83298	-8.243229658
2402	14.8508	-1.76791	-8.282501506
2405	14.8688	-1.73645	-8.277240802
2410	14.8137	-1.65263	-8.293364547
2415	14.6733	-1.59516	-8.334722031
2420	14.6263	-1.52311	-8.34865523
2425	14.7158	-1.41172	-8.322161232
2430	14.8871	-1.25753	-8.271898944
2435	14.9185	-1.17556	-8.262748414
2440	14.9373	-1.0927	-8.257278966
2441	14.9561	-1.00984	-8.251816397
2445	14.8941	-1.00854	-8.269857346
2450	14.649	-1.0327	-8.34192021
2455	14.5232	-0.975972	-8.379376819
2460	14.548	-0.879392	-8.371967076
2462	14.5728	-0.782812	-8.364569954
2465	14.4263	-0.829499	-8.408450407
2470	14.214	-0.881457	-8.472836889
2475	14.3097	-0.802065	-8.44369471
2480	14.419	-0.744064	-8.410648582
2485	14.3104	-0.824097	-8.443482268
2490	14.3132	-0.876954	-8.442632602
2495	14.6987	-0.776703	-8.327210739
2500	14.9469	-0.774557	-8.254488711

Test Equipment Used:

Rev. 11/9/2017								
Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
FSV40 Signal/Spectrum Analyzer	10Hz-40GHz	FSV40	ROHDE & SCHWARZ	101551	2200	I	6/30/2018	6/30/2017
Signal Generators/Comparaison Noise Emitter	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
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
Power/Noise Meters		MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
OSP - open switch and control platform	30MHz-18GHz	OSP120	ROHDE & SCHWARZ	101674		I	6/1/2018	6/1/2017
Cables	Range		Mfr			Cat	Calibration Due	Calibrated on
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
Attenuators / Couplers	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
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
Communication Tester	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
CMW500 Wideband Radio Communication Tester	DC to 6GHz	CMW500	ROHDE & SCHWARZ	155905		I	6/2/2018	6/2/2017
Meteorological Meters/Chambers		MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
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

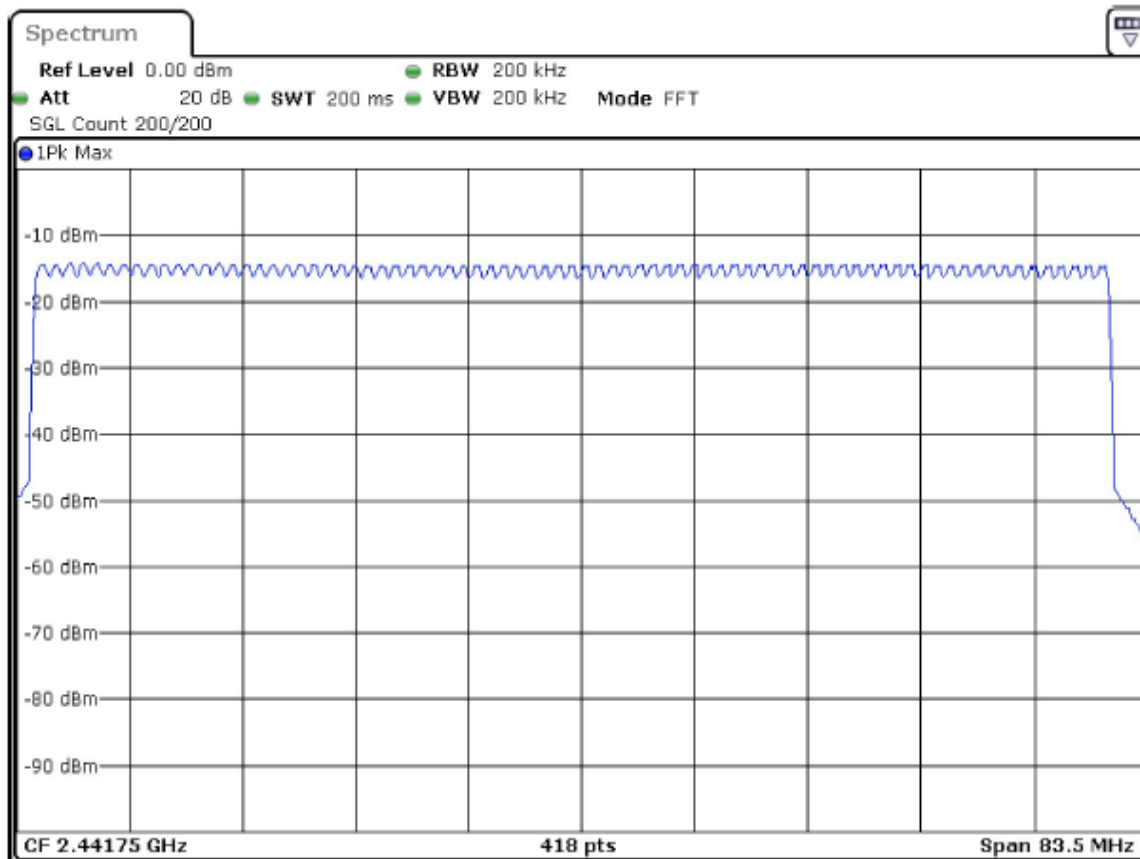
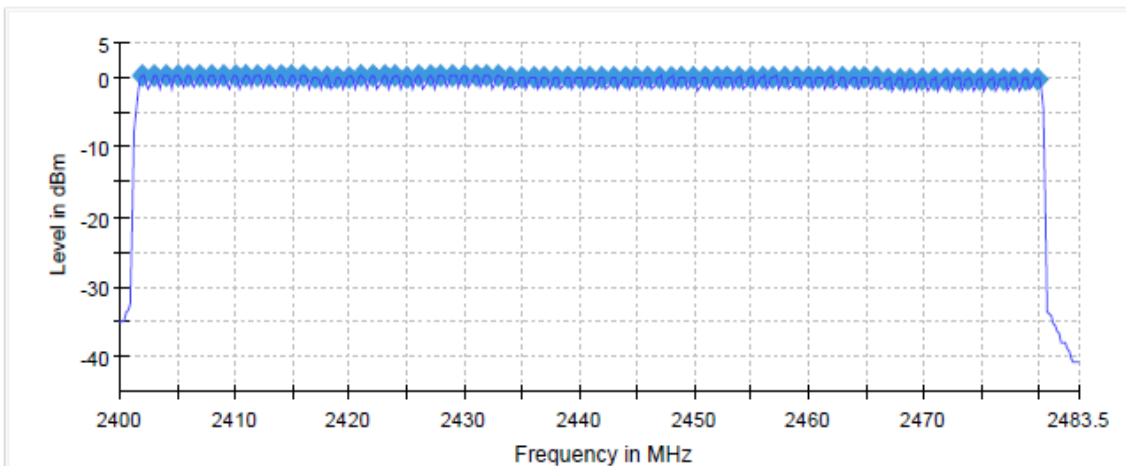
Test	Frequency (MHz)	DH1 Result	DH3 Result	DH5 Result	2-DH1 Result	2-DH3 Result	2-DH5 Result	3-DH1 Result	3-DH3 Result	3-DH5 Result
Hopping Frequencies	--- (hopping)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Band Edge (during hopping)	--- (hopping)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Carrier 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	---

Number of Hopping Frequencies

Test procedure in accordance with ANSI C63.10-2013

Channels

Channels	Limit Min	Result
79	15	PASS



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

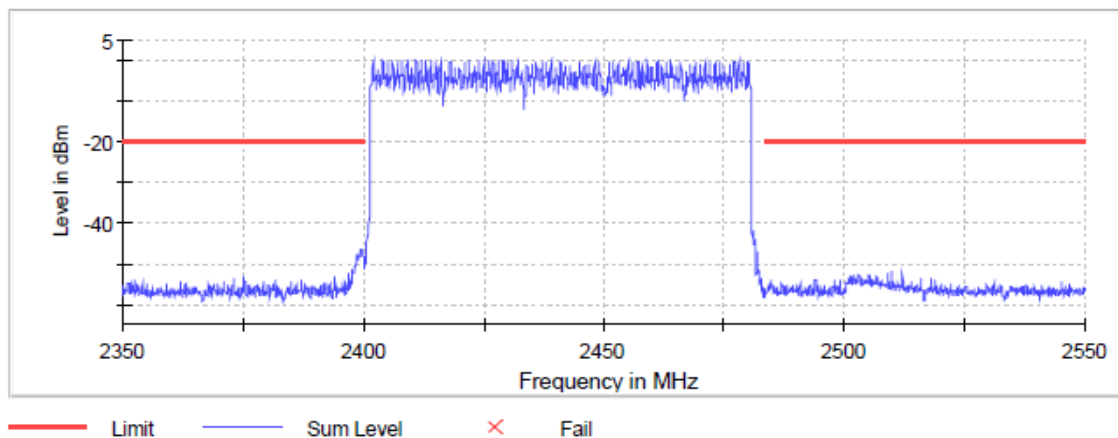
Data Rate	Frequency (MHz)	Level (dBm)
DH1	2430.804799	0.3
DH3	2429.805049	0.3
DH5	2429.805049	0.2
2-DH1	2405.811047	0.2
2-DH3	2403.961510	0.1
2-DH5	2430.104974	0.1
3-DH1	2415.808548	0.3
3-DH3	2414.108973	0.2
3-DH5	2404.961260	0.1

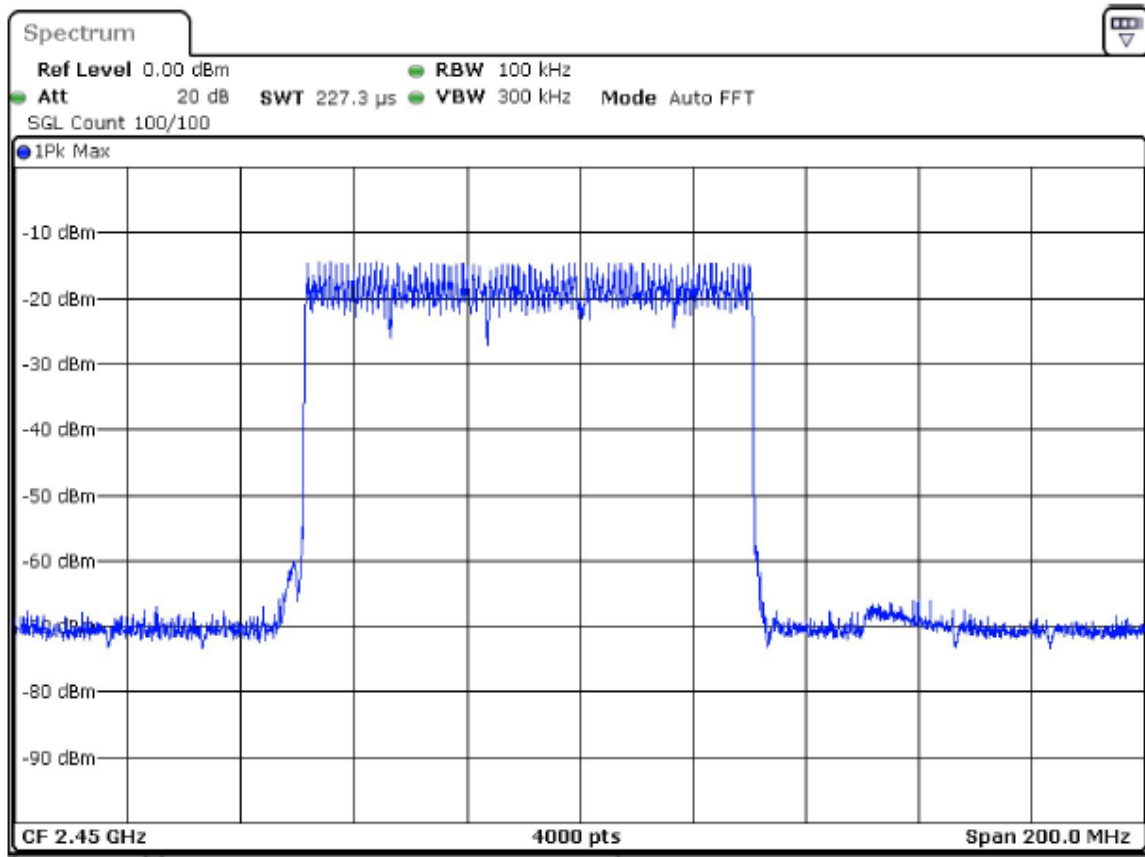
Plots for packet type 3-DH3 shown below.

Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2399.312672	-46.4	26.6	-19.8	PASS
2399.262684	-46.4	26.6	-19.8	PASS
2399.512622	-46.7	26.9	-19.8	PASS
2399.462634	-46.7	26.9	-19.8	PASS
2399.562609	-46.9	27.1	-19.8	PASS
2399.612597	-47.0	27.2	-19.8	PASS
2399.362659	-47.0	27.2	-19.8	PASS
2399.662584	-47.0	27.3	-19.8	PASS
2399.212697	-47.3	27.5	-19.8	PASS
2399.412647	-47.3	27.5	-19.8	PASS
2399.712572	-47.4	27.6	-19.8	PASS
2398.912772	-47.7	27.9	-19.8	PASS
2398.962759	-47.7	27.9	-19.8	PASS
2399.762559	-47.8	28.0	-19.8	PASS
2398.562859	-48.0	28.2	-19.8	PASS

Band Edge





Carrier Frequency Separation

Test procedure in accordance with ANSI C63.10-2013

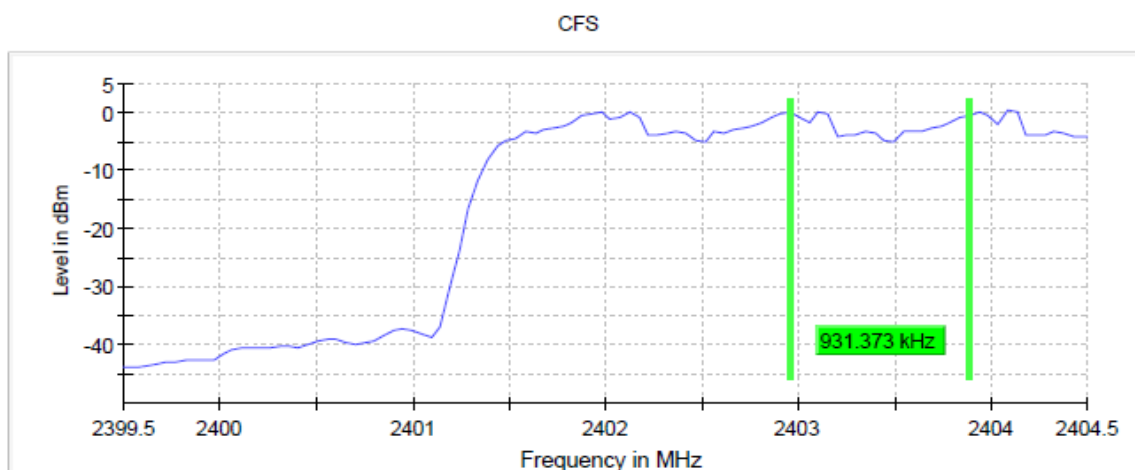
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty(k = 2) < 1%

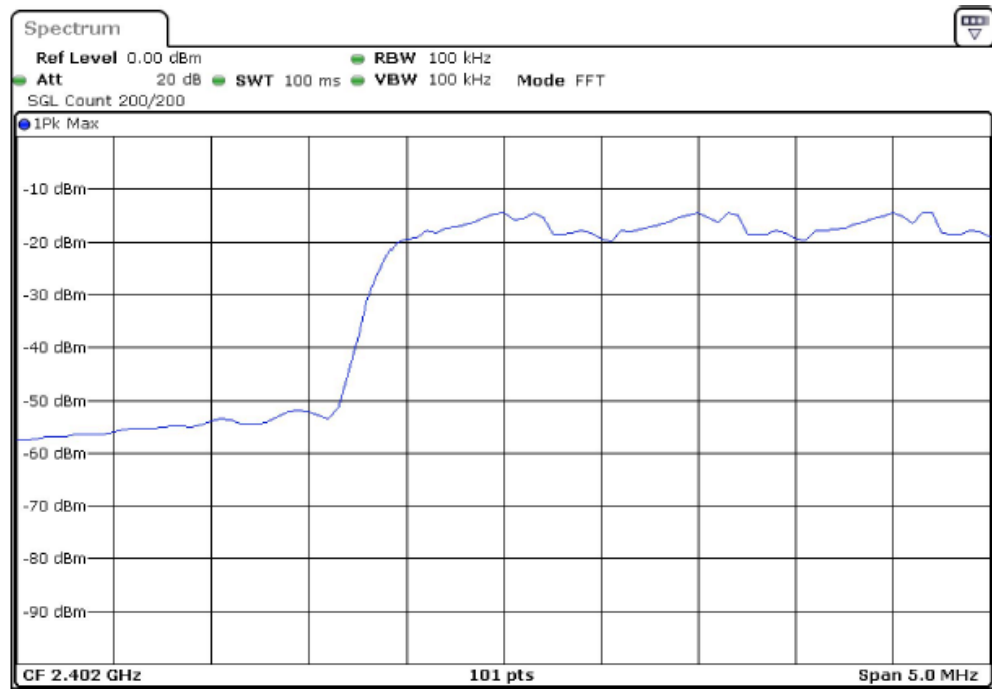
2402 MHz

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	0.568627	PASS
DH3	2402.000000	0.980393	0.607843	PASS
DH5	2402.000000	0.980393	0.607843	PASS
2-DH1	2402.000000	0.980392	0.823529	PASS
2-DH3	2402.000000	0.980392	0.862745	PASS
2-DH5	2402.000000	0.980392	0.843137	PASS
3-DH1	2402.000000	0.980392	0.823529	PASS
3-DH3	2402.000000	0.931373	0.862745	PASS
3-DH5	2402.000000	0.931373	0.862745	PASS

Plots for packet type 3-DH3 shown below.



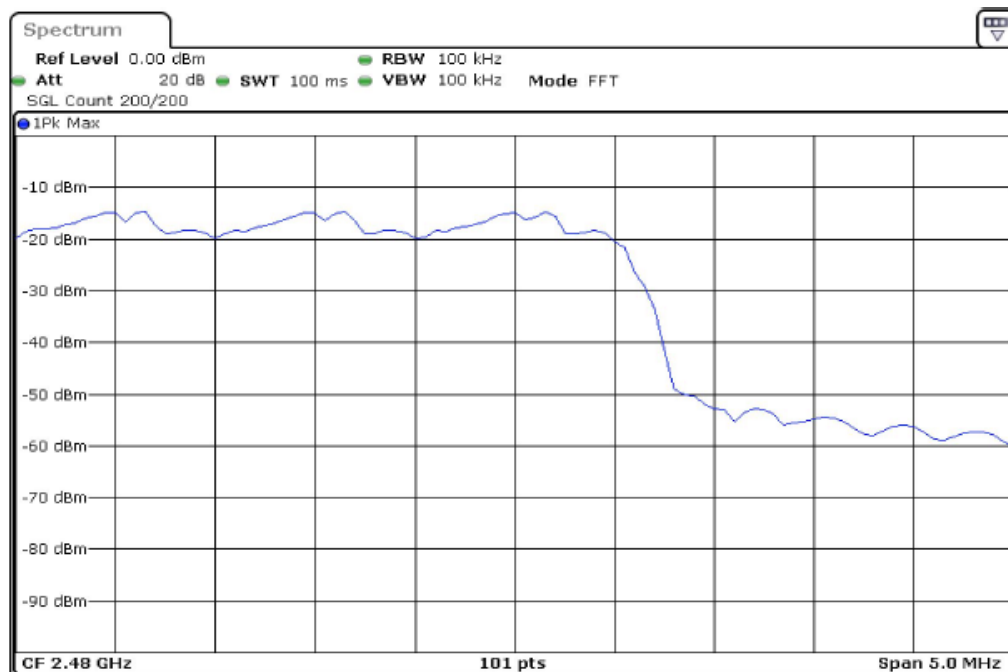
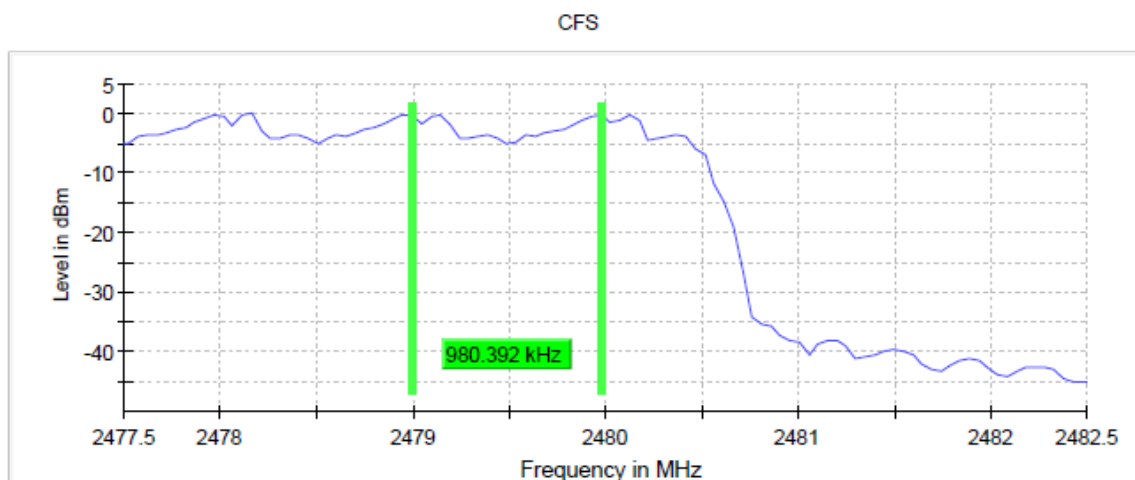


2480 MHz

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	0.568627	PASS
DH3	2480.000000	0.980392	0.647059	PASS
DH5	2480.000000	0.980392	0.607843	PASS
2-DH1	2480.000000	0.980392	0.823529	PASS
2-DH3	2480.000000	0.980392	0.862745	PASS
2-DH5	2480.000000	0.980392	0.843137	PASS
3-DH1	2480.000000	0.980392	0.823529	PASS
3-DH3	2480.000000	0.980392	0.862745	PASS
3-DH5	2480.000000	0.980392	0.862745	PASS

Plots for packet type 3-DH3 shown below.



Time of Channel Occupancy (Dwell Time)

Test procedure in accordance with ANSI C63.10-2013

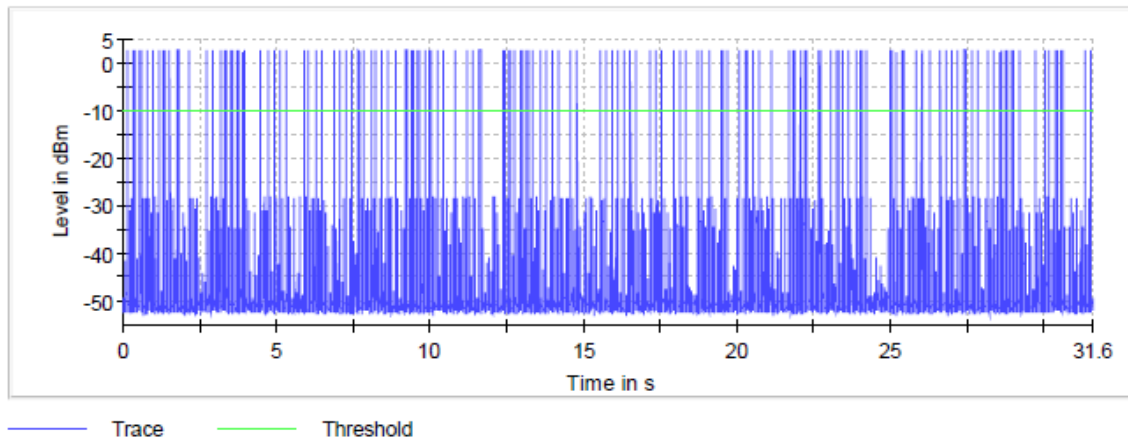
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 1%

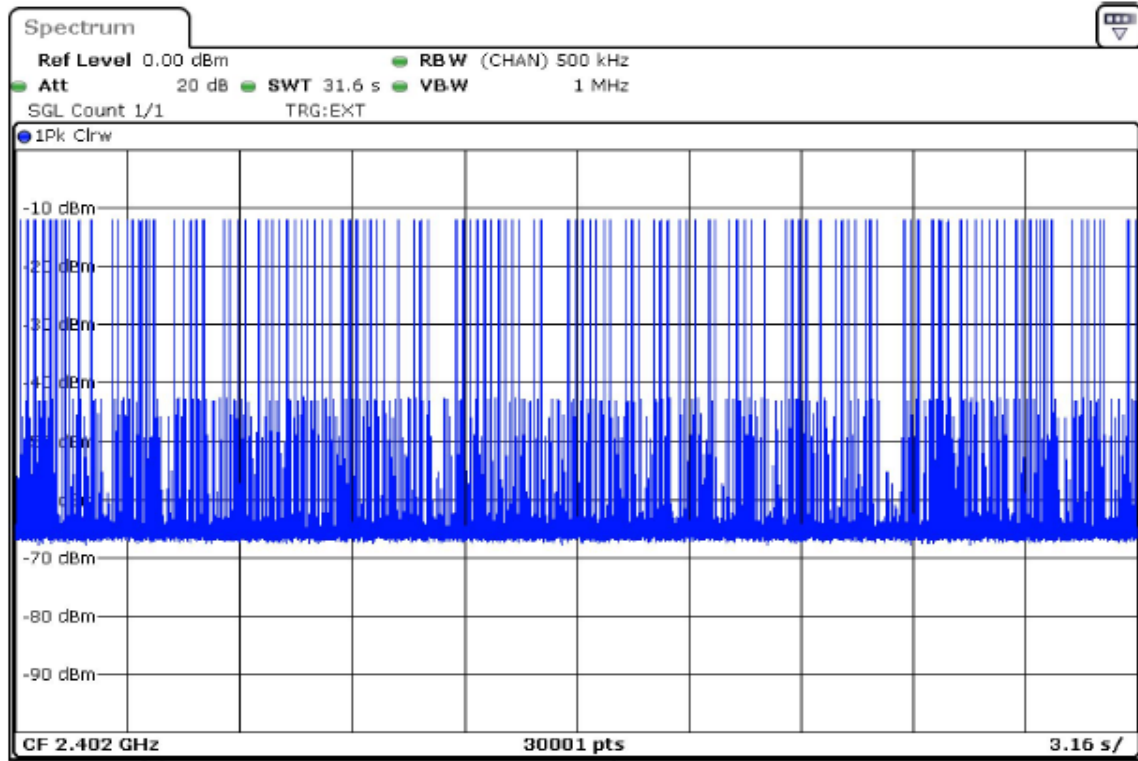
2402 MHz

Data Rate	Time (ms)	Limit Max (ms)	Result
DH1	144.480	400.000	PASS
DH3	285.140	400.000	PASS
DH5	283.760	400.000	PASS
2-DH1	131.440	400.000	PASS
2-DH3	231.620	400.000	PASS
2-DH5	294.710	400.000	PASS
3-DH1	132.960	400.000	PASS
3-DH3	253.520	400.000	PASS
3-DH5	297.860	400.000	PASS

Plots for packet type 3-DH3 shown below.

Time of Channel Occupancy

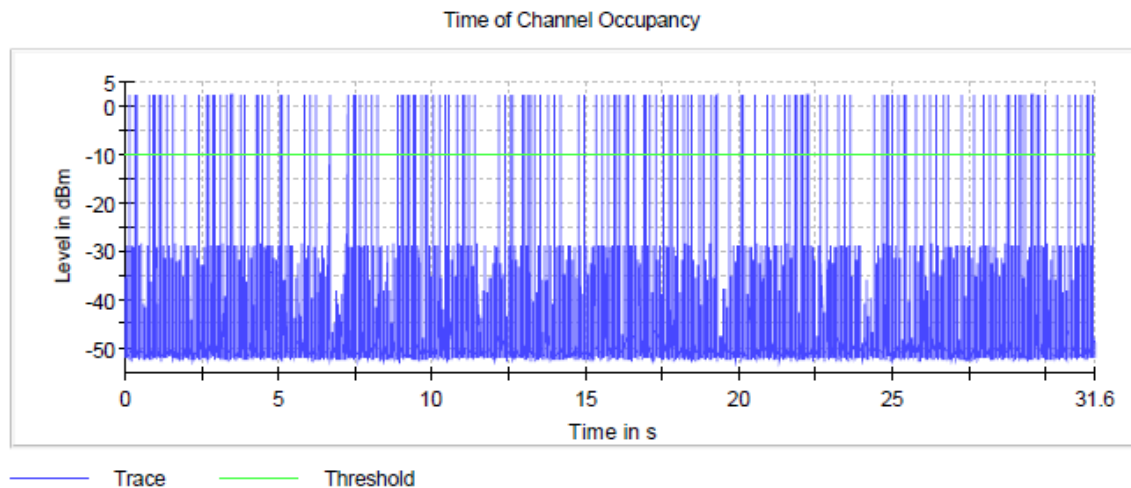


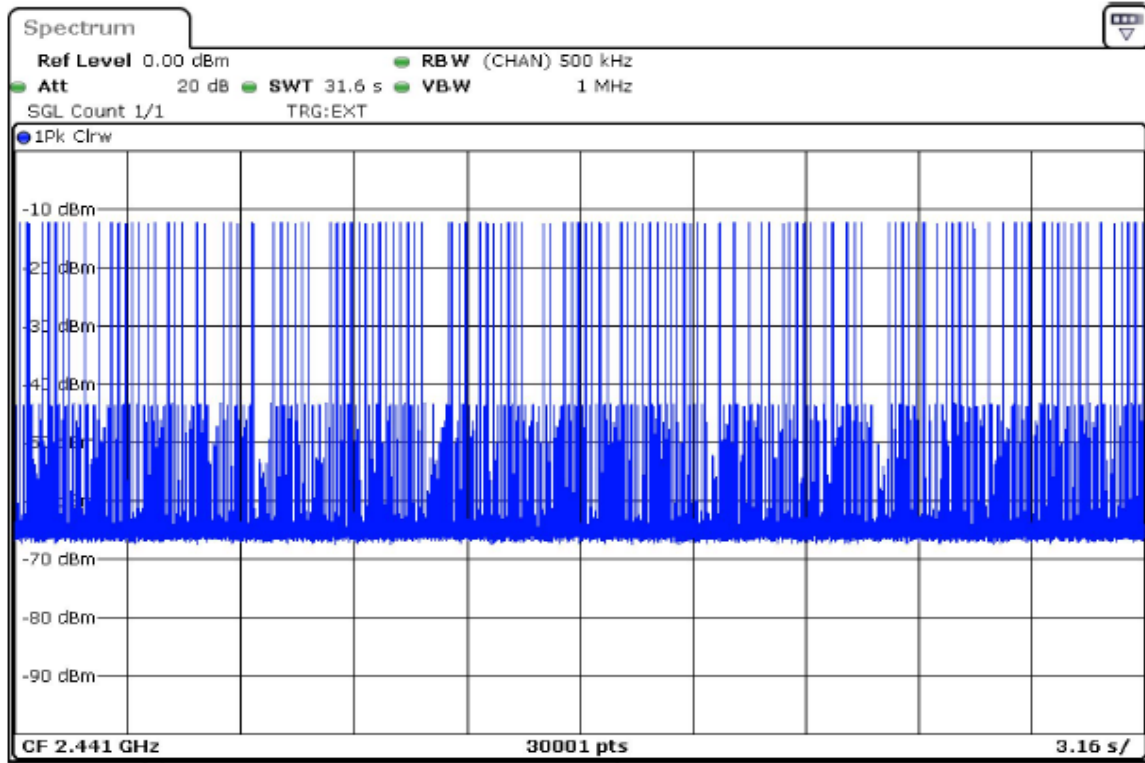


2441 MHz

Data Rate	Time (ms)	Limit Max (ms)	Result
DH1	144.380	400.000	PASS
DH3	288.510	400.000	PASS
DH5	310.360	400.000	PASS
2-DH1	131.440	400.000	PASS
2-DH3	220.390	400.000	PASS
2-DH5	287.520	400.000	PASS
3-DH1	132.200	400.000	PASS
3-DH3	248.720	400.000	PASS
3-DH5	284.380	400.000	PASS

Plots for packet type 3-DH3 shown below.

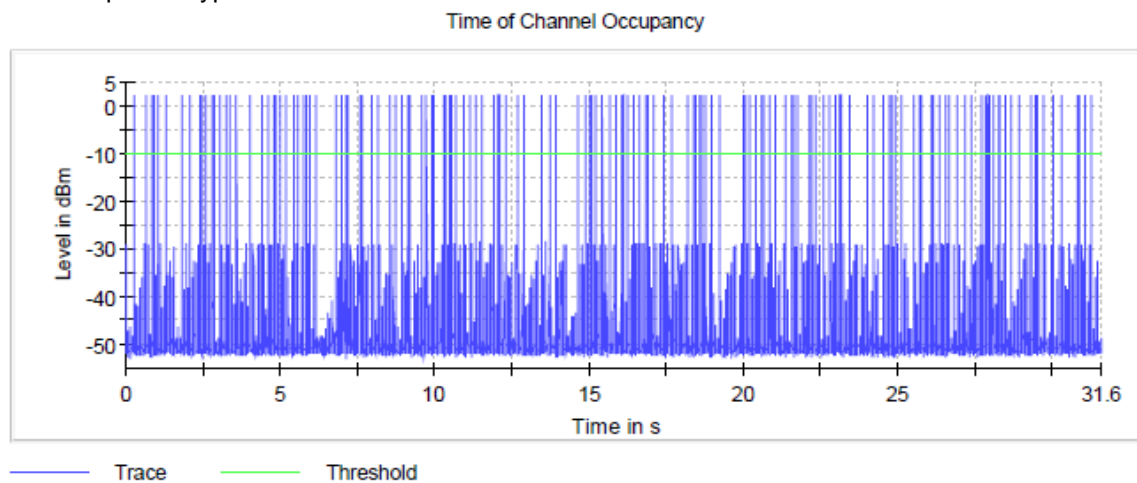


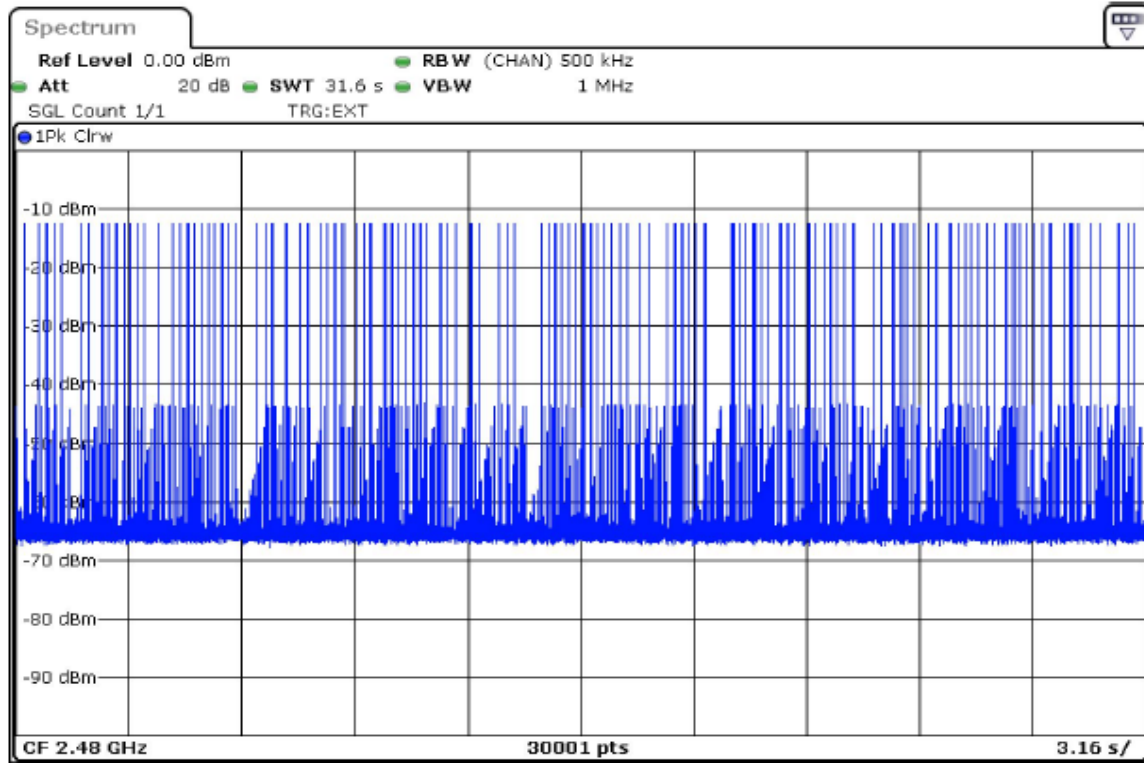


2480 MHz

Data Rate	Time (ms)	Limit Max (ms)	Result
DH1	144.390	400.000	PASS
DH3	288.450	400.000	PASS
DH5	304.350	400.000	PASS
2-DH1	130.630	400.000	PASS
2-DH3	244.740	400.000	PASS
2-DH5	272.720	400.000	PASS
3-DH1	132.340	400.000	PASS
3-DH3	234.830	400.000	PASS
3-DH5	275.950	400.000	PASS

Plots for packet type 3-DH3 shown below.





Peak Output Power

Test procedure in accordance with ANSI C63.10-2013

Data Rate	2402MHz	2441MHz	2480MHz	Limit dBm
DH1	-0.516	-0.809	-0.887	30
DH3	-0.517	-0.8	-0.861	30
DH5	-0.548	-0.831	-0.88	30
2-DH1	0.865	0.629	0.575	30
2-DH3	0.917	0.779	0.718	30
2-DH5	0.993	0.797	0.666	30
3-DH1	1.24	1.01	0.885	30
3-DH3	1.436	1.048	1.054	30
3-DH5	1.279	1.074	1.1	30

Plot for packet type 3-DH3 shown below.



Emission Bandwidth 20 dB

Test procedure in accordance with ANSI C63.10-2013

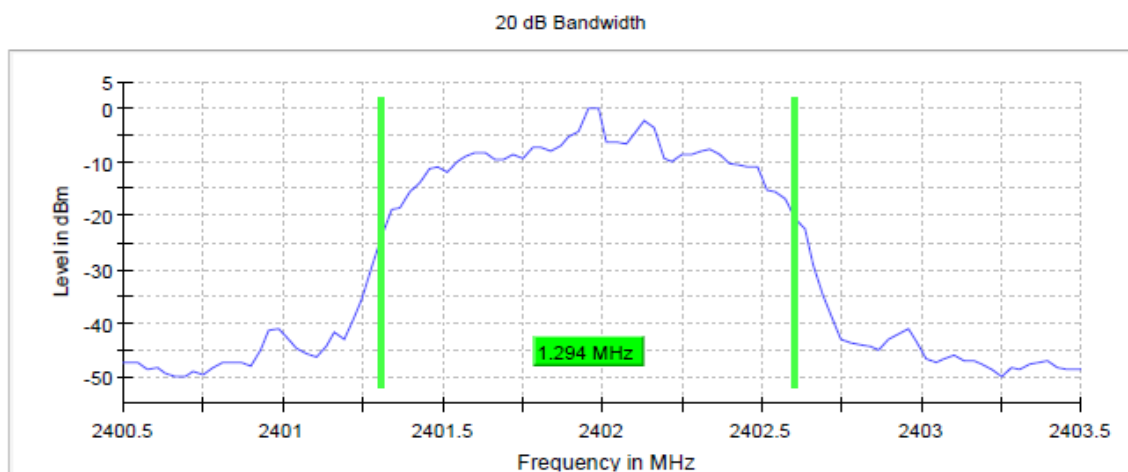
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 2%

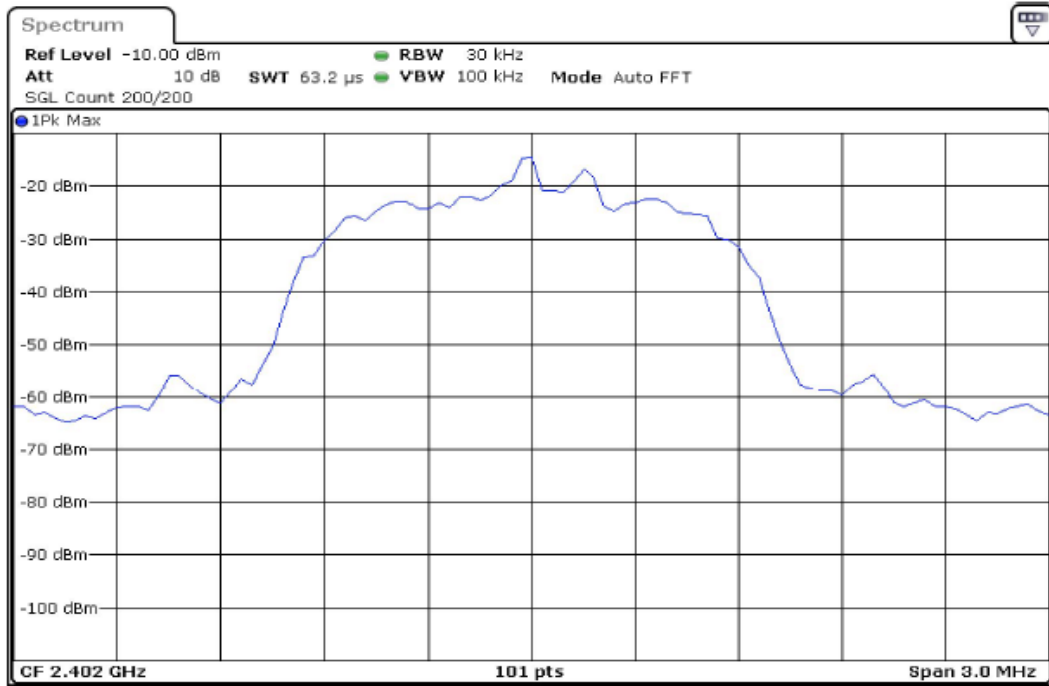
2402 MHz

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	0.852941	2401.514706	2402.367647	PASS
DH3	0.911769	2401.48529	2402.397059	PASS
DH5	0.911769	2401.48529	2402.397059	PASS
2-DH1	1.235299	2401.33823	2402.573529	PASS
2-DH3	1.294123	2401.33823	2402.632353	PASS
2-DH5	1.264711	2401.33823	2402.602941	PASS
3-DH1	1.235301	2401.36764	2402.602941	PASS
3-DH3	1.294121	2401.30882	2402.602941	PASS
3-DH5	1.294121	2401.30882	2402.602941	PASS

Plots for packet type 3-DH3

shown below.



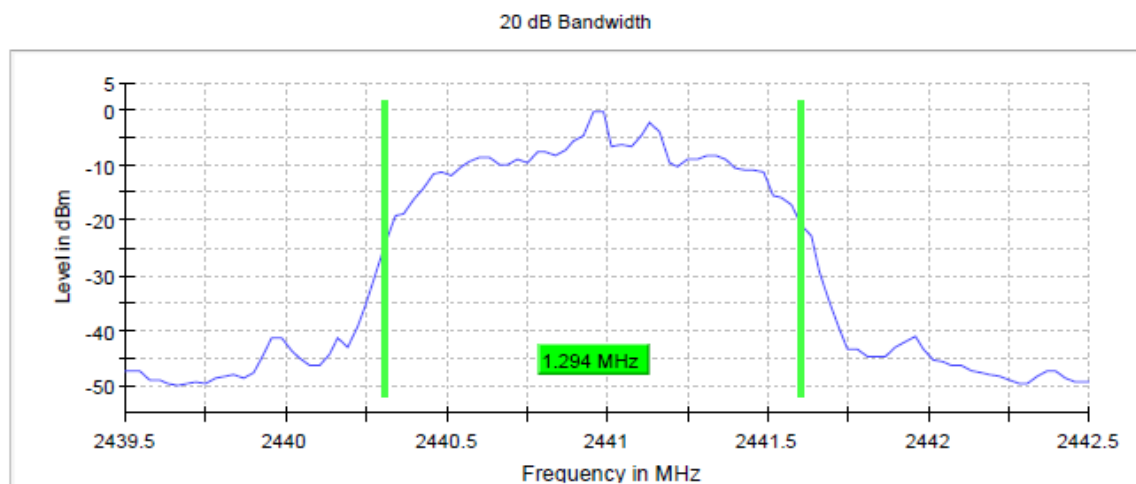


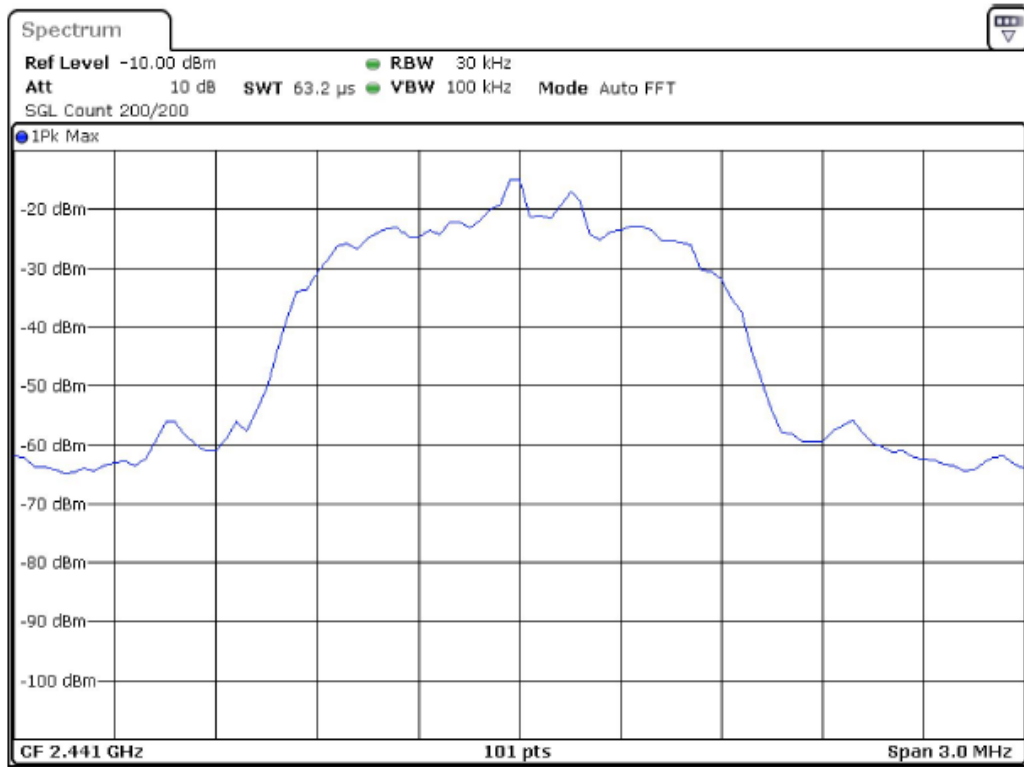
2441 MHz

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	0.852941	2440.514706	2441.367647	PASS
DH3	0.911765	2440.485294	2441.397059	PASS
DH5	0.911765	2440.485294	2441.397059	PASS
2-DH1	1.235294	2440.338235	2441.573529	PASS
2-DH3	1.294118	2440.338235	2441.632353	PASS
2-DH5	1.264706	2440.338235	2441.602941	PASS
3-DH1	1.235294	2440.367647	2441.602941	PASS
3-DH3	1.294117	2440.308824	2441.602941	PASS
3-DH5	1.294117	2440.308824	2441.602941	PASS

Plots for packet type 3-DH3

shown below.



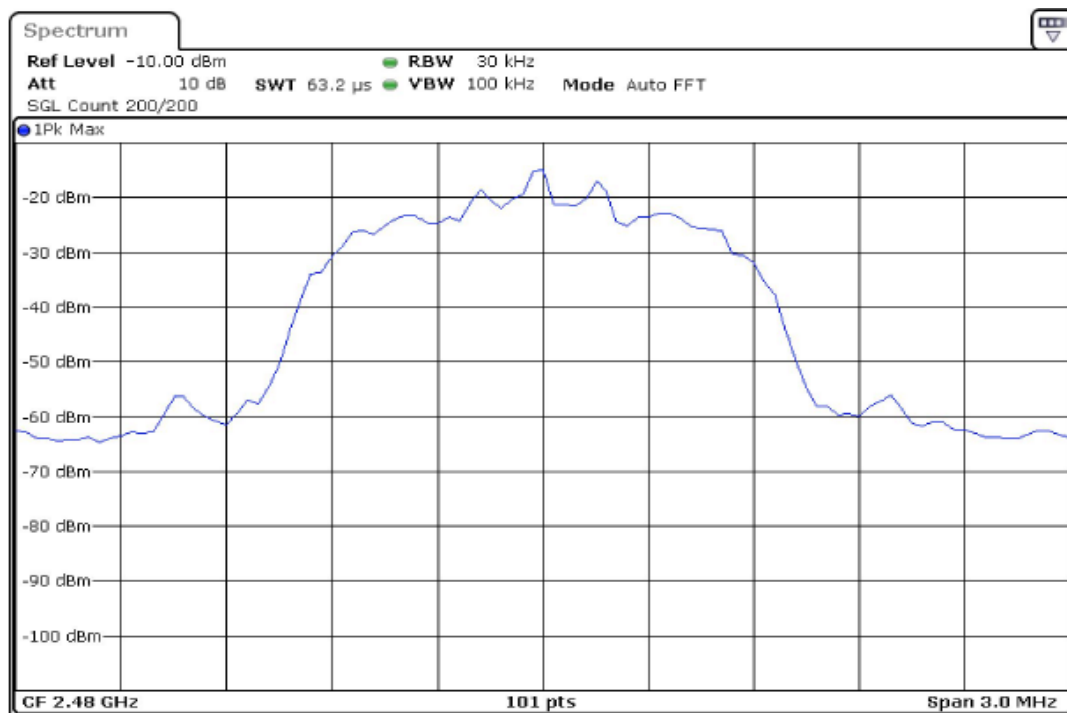
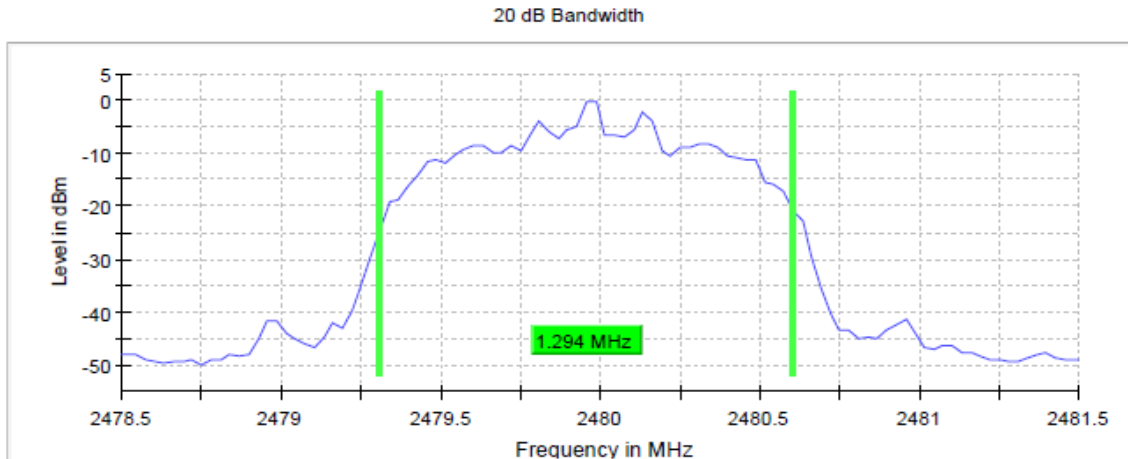


2480 MHz

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	0.852941	2479.514706	2480.367647	PASS
DH3	0.970588	2479.485294	2480.455882	PASS
DH5	0.911765	2479.485294	2480.397059	PASS
2-DH1	1.235294	2479.338235	2480.573529	PASS
2-DH3	1.294118	2479.338235	2480.632353	PASS
2-DH5	1.264706	2479.338235	2480.602941	PASS
3-DH1	1.235294	2479.367647	2480.602941	PASS
3-DH3	1.294117	2479.308824	2480.602941	PASS
3-DH5	1.294117	2479.308824	2480.602941	PASS

shown below.

Plots for packet type 3-DH3



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

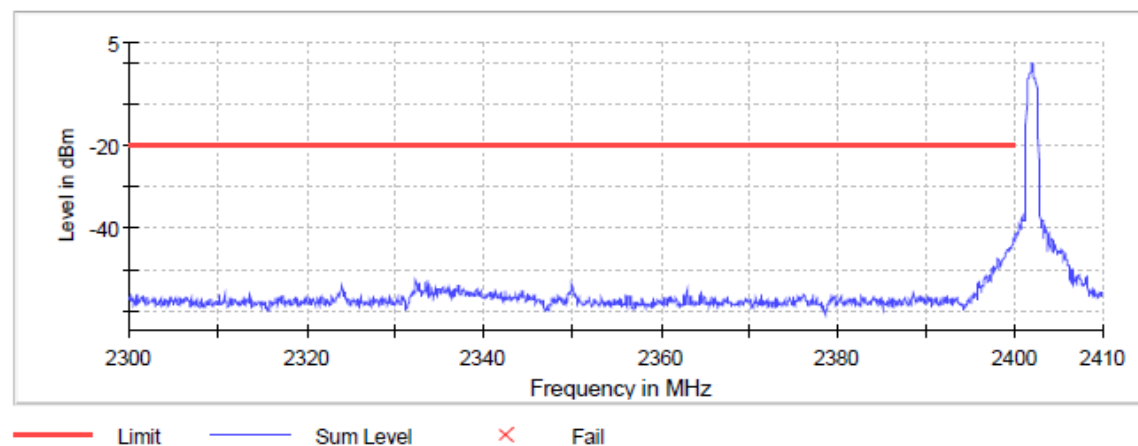
Data Rate	Frequency (MHz)	Level (dBm)
DH1	2401.778737	0.3
DH3	2401.778737	0.2
DH5	2401.778737	0.2
2-DH1	2401.778737	0.2
2-DH3	2401.928669	0.1
2-DH5	2401.928669	0.1
3-DH1	2401.778737	0.3
3-DH3	2401.928669	0.1
3-DH5	2402.078601	0.1

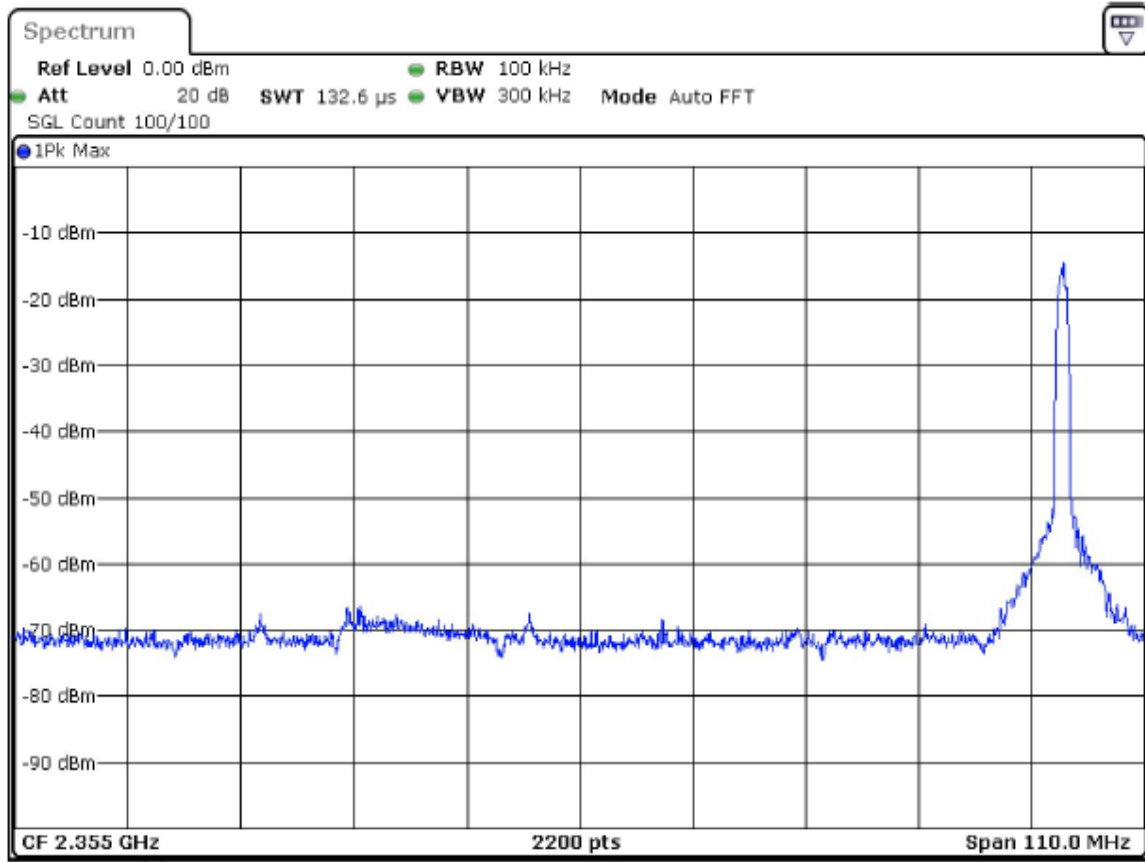
Plots for packet type 3-DH3 shown below.

Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2399.879600	-42.6	22.7	-19.9	PASS
2399.829623	-42.7	22.8	-19.9	PASS
2399.929577	-42.8	23.0	-19.9	PASS
2399.979555	-43.3	23.4	-19.9	PASS
2399.779646	-43.3	23.4	-19.9	PASS
2399.729668	-44.0	24.1	-19.9	PASS
2399.679691	-44.4	24.6	-19.9	PASS
2399.479782	-44.9	25.0	-19.9	PASS
2399.529759	-44.9	25.0	-19.9	PASS
2399.629714	-45.0	25.2	-19.9	PASS
2399.429805	-45.0	25.2	-19.9	PASS
2399.279873	-45.2	25.3	-19.9	PASS
2399.229896	-45.2	25.3	-19.9	PASS
2399.579736	-45.3	25.4	-19.9	PASS
2399.329850	-45.5	25.6	-19.9	PASS

Band Edge





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

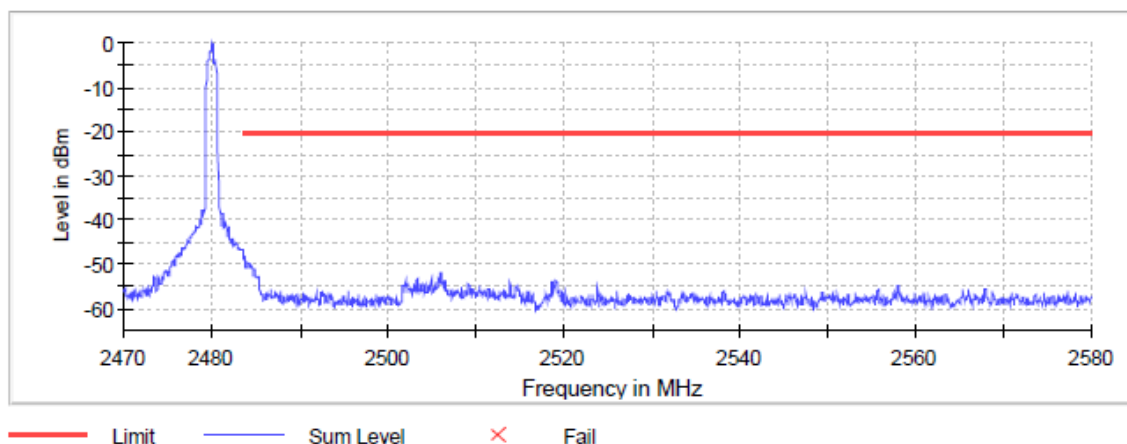
Data Rate	Frequency (MHz)	Level (dBm)
DH1	2479.820536	-0.1
DH3	2479.820536	-0.2
DH5	2479.820536	-0.2
2-DH1	2479.970468	-0.2
2-DH3	2479.970468	-0.3
2-DH5	2479.820536	-0.2
3-DH1	2479.820536	0.0
3-DH3	2480.120400	-0.1
3-DH5	2479.970468	-0.2

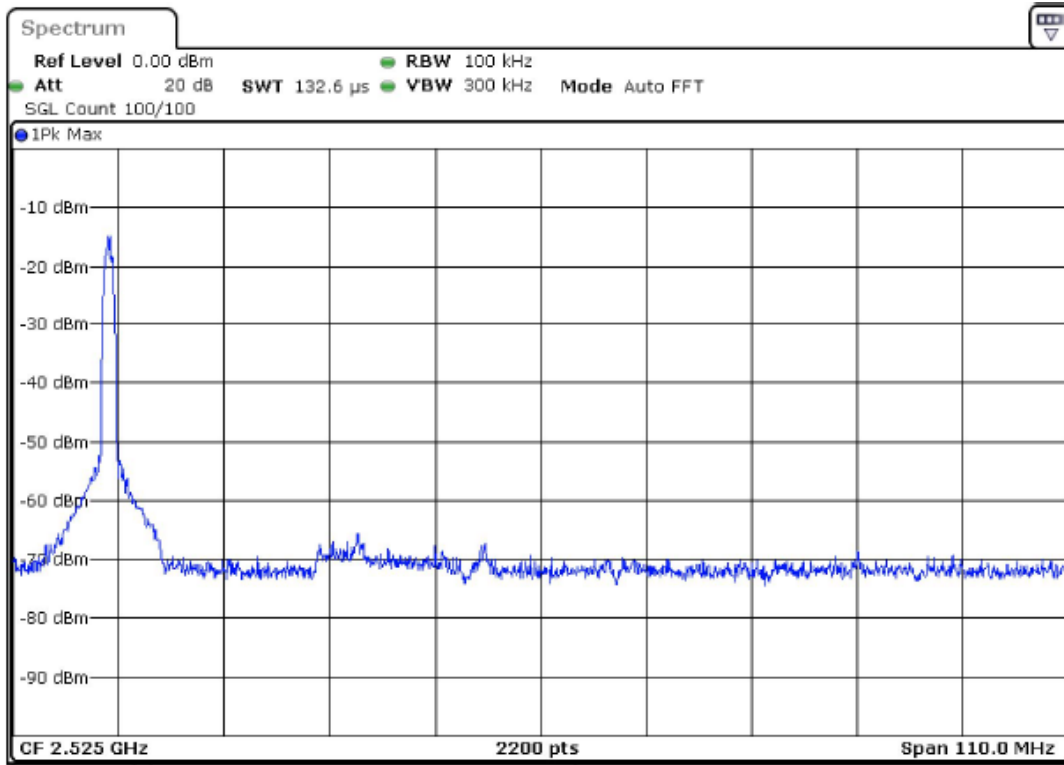
Plots for packet type 3-DH3 shown below.

Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2483.518855	-48.1	28.0	-20.1	PASS
2483.668787	-48.5	28.4	-20.1	PASS
2483.618810	-48.5	28.4	-20.1	PASS
2483.568832	-48.6	28.5	-20.1	PASS
2483.718764	-48.7	28.5	-20.1	PASS
2483.768741	-49.2	29.1	-20.1	PASS
2484.068605	-49.4	29.2	-20.1	PASS
2484.018628	-49.6	29.5	-20.1	PASS
2483.818719	-50.0	29.9	-20.1	PASS
2484.118582	-50.1	29.9	-20.1	PASS
2484.168560	-50.1	30.0	-20.1	PASS
2484.518401	-50.2	30.1	-20.1	PASS
2484.218537	-50.2	30.1	-20.1	PASS
2484.268514	-50.3	30.1	-20.1	PASS
2484.468423	-50.4	30.2	-20.1	PASS

Band Edge





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

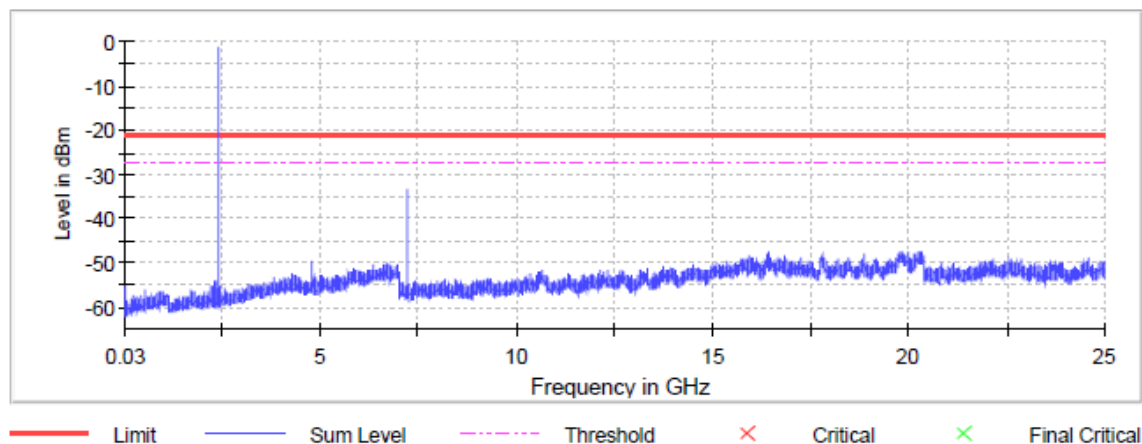
2402 MHz

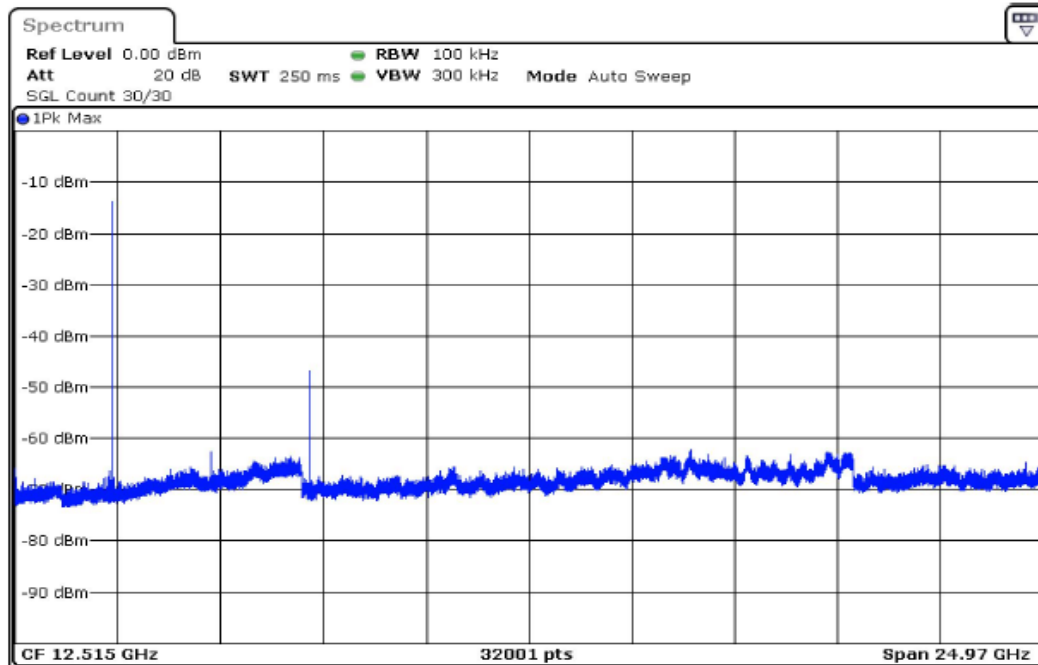
Plots for packet type 3-DH3 shown below.

Pre Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
7205.695425	-33.3	12.0	-21.3
7206.475689	-37.2	15.9	-21.3
7204.915162	-39.2	17.9	-21.3
16418.269327	-47.4	26.1	-21.3
19842.846853	-47.5	26.2	-21.3
19765.600744	-47.5	26.2	-21.3
20290.718236	-47.5	26.3	-21.3
19813.196831	-47.5	26.3	-21.3
20319.587995	-47.6	26.3	-21.3
20256.386632	-47.6	26.3	-21.3
19991.877226	-47.6	26.3	-21.3
19767.161271	-47.6	26.4	-21.3
19789.008656	-47.6	26.4	-21.3
20360.941972	-47.6	26.4	-21.3
20326.610368	-47.7	26.5	-21.3

Spurious



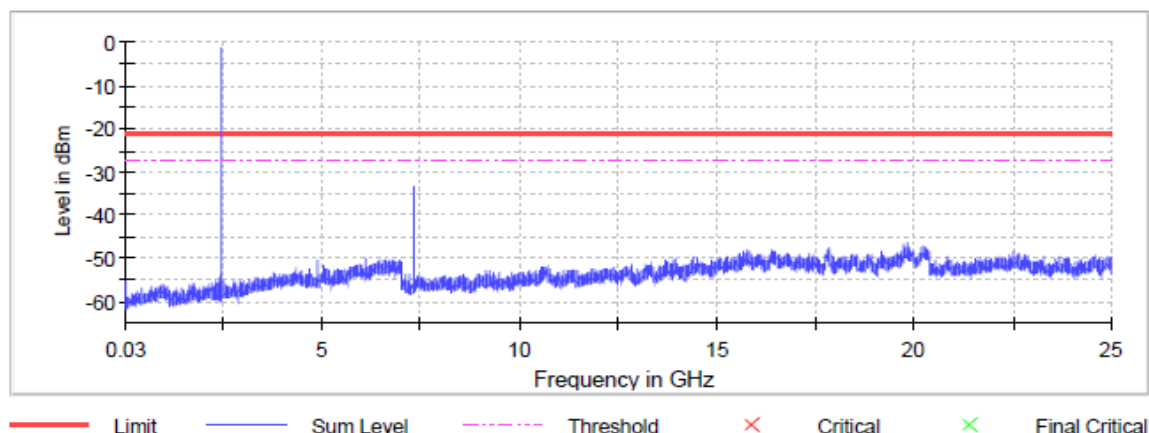


2441 MHz

Plots for packet type 3-DH3 shown below.

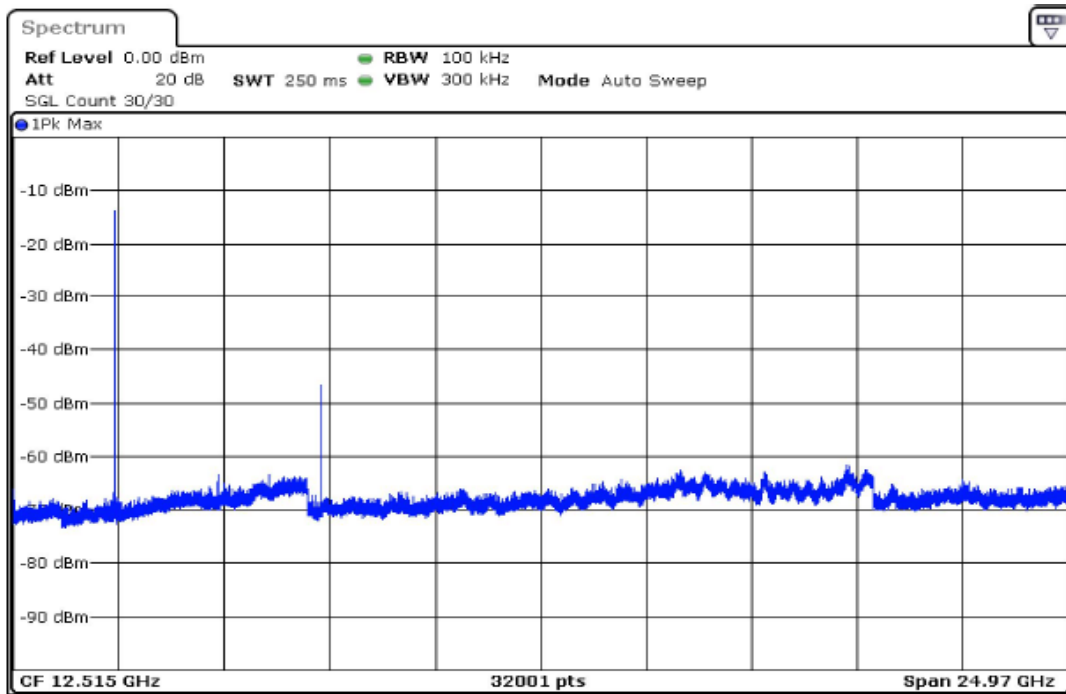
Pre Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
7322.734985	-33.4	12.4	-21.1
7321.954722	-36.5	15.5	-21.1
7323.515249	-38.1	17.0	-21.1
19828.021842	-46.3	25.2	-21.1
19745.313887	-46.5	25.4	-21.1
20236.099775	-47.0	26.0	-21.1
20212.691863	-47.3	26.3	-21.1
19777.304700	-47.4	26.3	-21.1
20191.624742	-47.4	26.4	-21.1
19900.586370	-47.5	26.4	-21.1
19863.913974	-47.5	26.4	-21.1
20238.440566	-47.5	26.4	-21.1
19780.425755	-47.5	26.4	-21.1
19781.986282	-47.5	26.4	-21.1
19799.932348	-47.6	26.5	-21.1



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2480 MHz

Plots for packet type 3-DH3 shown below.

Pre Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
7439.774545	-34.0	12.8	-21.2
7438.994282	-37.2	16.0	-21.2
7440.554809	-39.1	17.9	-21.2
20249.364258	-47.2	25.9	-21.2
19789.008656	-47.2	25.9	-21.2
19758.578370	-47.4	26.2	-21.2
19785.107337	-47.4	26.2	-21.2
19799.932348	-47.4	26.2	-21.2
20384.349884	-47.5	26.3	-21.2
19771.062590	-47.5	26.3	-21.2
19813.977095	-47.5	26.3	-21.2
19931.796919	-47.6	26.3	-21.2
19762.479689	-47.6	26.3	-21.2
19831.142897	-47.6	26.3	-21.2
19864.694238	-47.7	26.4	-21.2

