Test Report

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

Report No	ES1769-2
Client	Fishman
Address	3 Riverside Dr. Andover MA 01810
Phone	978-253-5455
Items tested	ALM-A01-CSR8645.Bluetooth Module
FCC ID	RMU-PROLBX500
IC	10812A-PROLBX500
Equipment Type	Part 15 Spread Spectrum Transmitter
Equipment Code	DSS
FCC/IC Rule Parts	CFR Title 47 FCC Part 15.247, ISED Canada RSS-247 Issue 2
Test Dates	7/11/2018 – 7/17/2018
Results	As detailed within this report
Prepared by	Christopher Hamel – EMC Engineer
Authorized by	Yunus Faziloglu – Sr. Engineer
Issue Date	10/31/2018
Conditions of Issue	This Test Report is issued subject to the conditions stated in the '*Conditions of Testing*' section on page 21 of this report.

Contents

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 ALM-A01-CSR8645.Bluetooth Module. It is a frequency hopping spread spectrum transmitter that operates in the 2402 – 2480 MHz frequency range.

Antenna Type: Non-detachable PCB Trace
Gain: -3.76dBi

We found that the product met the above requirements without modification.

Test samples were received in good condition.

Issue No.	Reason for change	Date Issued
1	Original Release	October 31, 2018

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 FCC Part 15.247, RSS-247 Issue 2, RSS-Gen Issue 4 and ANSI C63.10-2013.

Radiated emissions were maximized by rotating the device around 3 orthogonal planes (X, Y and Z) as well as varying the test antenna's height and polarity.

EUT operating voltage is 9.0V DC

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:	S1769		
Company:	Fishman		
Company Address:	3 Riverside Drive		
	Andover, MA, 01810		
Contact:	Vlad Kratik		
	MN	**PN**	**SN**
EUT:	ALM-A01-CSR8645		
EUT Description:	Bluetooth module		

EUT Components	**MN**	**SN**
Bluetooth Module Radiated	ALM-A01-CSR8645	
Bluetooth Module Conducted	ALM-A01-CSR8645	

Software Operating Mode Description:
CMW controlled, or client supplied test mode.
Performance Criteria:
less then 10% PER with CMW

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 -3.76dBi 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	The unit complies with AC line conducted emissions requirements.

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)]

Radiated emissions were maximized by rotating the device around 3 orthogonal planes (X, Y and Z) and worst case emissions observed in Y orientation. All the results below are for the worst case orientation only.

MEASUREMENTS / RESULTS

EUT tested Bluetooth DH1 Channels 0, 39, 78

Curtis Straus - a Bureau Veritas Company	Work Order - S1769
Radiated Emissions Electric Field 3m Distance	EUT Power Input - 9V
Top Peaks Vertical 30-1000MHz	Test Site - CH2
Operator: Zachary Johnson	Conditions - 24.9°C; 4
Notes:	
EUT Mode: DH1 Channel 0	

Data Taken at July 11, 2018

Frequency (MHz)	Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Lim1: FCC_pt15_209 (dBµV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)
31.407	28.5	-1.2	27.3	40	-12.7	PASS	-12.7
295.998	38.4	-7.9	30.5	46	-15.5	PASS	
300	38.3	-7.7	30.6	46	-15.4	PASS	
304.001	38.1	-7.5	30.6	46	-15.4	PASS	
312.003	37.1	-7.2	29.9	46	-16.1	PASS	
923.346	27.6	3.8	31.4	46	-14.6	PASS	

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
Top Peaks Horizontal 30-1000MHz
Operator: Zachary Johnson
Notes:
EUT Mode: DH1 Channel 0

Work Order - S1769
EUT Power Input - 9V
Test Site - CH2
Conditions - 24.9°C; 4

Data Taken at July 11, 2018

Frequency (MHz)	Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Lim1: FCC_pt15_209 (dBµV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)
30.461	28.1	-0.5	27.6	40	-12.4	PASS	
295.974	44.8	-7.9	37	46	-9	PASS	-9
299.975	40.5	-7.7	32.8	46	-13.2	PASS	
304.001	40.7	-7.5	33.3	46	-12.7	PASS	
823.412	30.5	2	32.5	46	-13.5	PASS	
908.699	29.4	3.3	32.7	46	-13.3	PASS	

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
Top Peaks Vertical 30-1000MHz
Operator: Zachary Johnson
Notes:
EUT Mode: DH1 Channel 39

Work Order - S1769
EUT Power Input - 9V
Test Site - CH2
Conditions - 24.9°C; 4

Data Taken at July 11, 2018

Frequency (MHz)	Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Lim1: FCC_pt15_209 (dBµV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)
30.412	27.5	-0.5	27	40	-13	PASS	-13
295.998	38.7	-7.9	30.8	46	-15.2	PASS	
300.024	38.5	-7.7	30.8	46	-15.2	PASS	
308.002	38.8	-7.3	31.5	46	-14.5	PASS	
780.707	29.4	1.5	31	46	-15	PASS	
898.15	28.3	3.5	31.8	46	-14.2	PASS	

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
Top Peaks Horizontal 30-1000MHz
Operator: Zachary Johnson
Notes:
EUT Mode: DH1 Channel 39

Work Order - S1769
EUT Power Input - 9V
Test Site - CH2
Conditions - 24.9°C; 4

Data Taken at July 11, 2018

Frequency (MHz)	Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Lim1: FCC_pt15_209 (dBµV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)
30.582	28.4	-0.6	27.8	40	-12.2	PASS	
276.016	41.1	-7.8	33.3	46	-12.7	PASS	
296.022	41.7	-7.9	33.8	46	-12.2	PASS	
299.975	43.5	-7.7	35.8	46	-10.2	PASS	-10.2
303.976	42.3	-7.5	34.9	46	-11.1	PASS	
308.002	41.8	-7.3	34.5	46	-11.5	PASS	

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
Top Peaks Vertical 30-1000MHz
Operator: Zachary Johnson
Notes:
EUT Mode: DH1 Channel 78

Work Order - S1769
EUT Power Input - 9V
Test Site - CH2
Conditions - 24.9°C; 4
0
0

Data Taken at July 11, 2018

Frequency (MHz)	Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Lim1: FCC_pt15_209 (dBµV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)
30.024	27.7	-0.2	27.5	40	-12.5	PASS	-12.5
296.022	39.7	-7.9	31.8	46	-14.2	PASS	
300.024	38.6	-7.7	30.9	46	-15.1	PASS	
303.976	38.3	-7.5	30.9	46	-15.1	PASS	
308.002	39.5	-7.3	32.2	46	-13.8	PASS	
956.01	27.8	3.7	31.5	46	-14.5	PASS	

Curtis Straus - a Bureau Veritas Company	Work Order - S1769
Radiated Emissions Electric Field 3m Distance	EUT Power Input - 9V
Top Peaks Horizontal 30-1000MHz	Test Site - CH2
Operator: Zachary Johnson	Conditions - 24.9°C; 4
Notes:	0
EUT Mode: DH1 Channel 78	0

Data Taken at July 11, 2018

Frequency (MHz)	Peak Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Lim1: FCC_pt15_209 (dBµV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)
272.015	41	-8	33	46	-13	PASS	
280.017	41	-7.7	33.3	46	-12.7	PASS	
291.997	41.1	-7.9	33.2	46	-12.8	PASS	
295.998	41.9	-7.9	34	46	-12	PASS	
299.975	42.1	-7.7	34.4	46	-11.6	PASS	-11.6
304.001	40.7	-7.5	33.3	46	-12.7	PASS	

30-1000MHz

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
1-6GHz Vertical Data
Operator: Aristotelis Casternopoulos
Notes:
EUT Mode: DH1 Channel 0

Work Order - S1769
EUT Power Input - 9V Battery
Test Site - CH2
Conditions - 24.9°C; 46%RH; 1004mBar
0
0

Data Taken at July 11, 2018

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)
2168.5	35.2	25	12.3	47.5	74	-26.5	PASS	-26.5	37.3	54	-16.7	PASS	
2882.4	33.4	24.8	13.6	47	74	-27	PASS		38.4	54	-15.6	PASS	
5748.7	33	25.3	14.4	47.4	74	-26.6	PASS		39.7	54	-14.3	PASS	-14.3

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
1-6GHz Horizontal Data
Operator: Aristotelis Casternopoulos
Notes:
EUT Mode: DH1 Channel 0

Test Site - CH2
Conditions - 24.9°C; 46%RH; 1004mBar
0
0

Data Taken at July 11, 2018

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)
2168.3	33	25	12.3	45.4	74	-28.6	PASS		37.3	54	-16.7	PASS	
2934.9	35.2	24.9	13.5	48.8	74	-25.2	PASS		38.5	54	-15.5	PASS	
4804.3	32.9	25.8	12.7	45.6	74	-28.4	PASS		38.5	54	-15.5	PASS	
5902.2	35.2	25	14.7	49.9	74	-24.1	PASS	-24.1	39.7	54	-14.3	PASS	-14.3

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
1-6GHz Vertical Data
Operator: Aristotelis Casternopoulos
Notes:
EUT Mode: DH1 Channel 39

Work Order - S1769
EUT Power Input - 9V Battery
Test Site - CH2
Conditions - 24.9°C; 46%RH; 1004mBar
0
0

Data Taken at July 11, 2018

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)
1367.6	33.7	24.1	5.5	39.1	74	-34.9	PASS		29.6	54	-24.4	PASS	
3482.9	33.7	24.8	12.8	46.4	74	-27.6	PASS		37.6	54	-16.4	PASS	
4881.2	35.1	27.8	13.1	48.1	74	-25.9	PASS		40.8	54	-13.2	PASS	-13.2
5735.6	33.2	25.4	14.3	47.5	74	-26.5	PASS		39.7	54	-14.3	PASS	
5766.1	34.2	25.2	14.4	48.6	74	-25.4	PASS	-25.4	39.7	54	-14.3	PASS	

Curtis Straus - a Bureau Veritas Company	Work Order - S1769
Radiated Emissions Electric Field 3m Distance	EUT Power Input - 9V Battery
1-6GHz Horizontal Data	Test Site - CH2
Operator: Aristotelis Casternopoulos	Conditions - 24.9°C; 46%RH; 1004mBar
Notes:	0
EUT Mode: DH1 Channel 39	0

Data Taken at July 11, 2018

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Average Margin (dB)
2161	34.4	24.9	12.2	46.6	74	-27.4	PASS		37.2	54	-16.8	PASS	
3198.5	35.6	25.5	13.4	49	74	-25	PASS		38.9	54	-15.1	PASS	
4612	34.5	25.1	13.4	47.9	74	-26.1	PASS		38.4	54	-15.6	PASS	
5748.9	34.6	25.3	14.4	49	74	-25	PASS		39.7	54	-14.3	PASS	-14.3
5759.9	34.8	25.2	14.4	49.2	74	-24.8	PASS	-24.8	39.7	54	-14.3	PASS	

Curtis Straus - a Bureau Veritas Company	Work Order - S1769
Radiated Emissions Electric Field 3m Distance	EUT Power Input - 9V Battery
1-6GHz Vertical Data	Test Site - CH2
Operator: Aristotelis Casternopoulos	Conditions - 24.9°C; 46%RH; 1004mBar
Notes:	0
EUT Mode: DH1 Channel 78	0

Data Taken at July 11, 2018

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)
1270.4	32.9	24.4	5.3	38.2	74	-35.8	PASS		29.7	54	-24.3	PASS	
2172.8	33.2	24.9	12.4	45.5	74	-28.5	PASS		37.3	54	-16.7	PASS	
3325.7	32.9	25	12.9	45.8	74	-28.2	PASS		37.9	54	-16.1	PASS	
4960.1	34	27.2	13.4	47.3	74	-26.7	PASS		40.6	54	-13.4	PASS	-13.4
5757.3	33.5	25.3	14.4	48	74	-26	PASS	-26	39.7	54	-14.3	PASS	

Curtis Straus - a Bureau Veritas Company	Work Order - S1769
Radiated Emissions Electric Field 3m Distance	EUT Power Input - 9V Battery
1-6GHz Horizontal Data	Test Site - CH2
Operator: Aristotelis Casternopoulos	Conditions - 24.9°C; 46%RH; 1004mBar
Notes:	0
EUT Mode: DH1 Channel 78	0

Data Taken at July 11, 2018

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Average Margin (dB)
1382.7	33.3	24.3	5.5	38.7	74	-35.3	PASS		29.8	54	-24.2	PASS	
2168.4	33.1	24.9	12.3	45.4	74	-28.6	PASS		37.2	54	-16.8	PASS	
3117.2	35	25.3	13.3	48.3	74	-25.7	PASS	-25.7	38.6	54	-15.4	PASS	
5756	33.3	25.3	14.4	47.7	74	-26.3	PASS		39.7	54	-14.3	PASS	-14.3

1-6GHz

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 1m Distance
6-18GHz Vertical Data
Operator: Zachary Johnson
Notes:
EUT Mode: DH1 Channel 0

Work Order - S1769
EUT Power Input - 9V Battery
Test Site - CH2
Conditions - 24.9°C; 46%RH; 1004mBar

Data Taken at July 11, 2018

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)
17946.9	40	30.6	20.2	60.2	83.5	-23.3	PASS	-23.3	50.9	63.5	-12.6	PASS	-12.6

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 1m Distance
6-18GHz Horizontal Data
Operator: Zachary Johnson
Notes:
EUT Mode: DH1 Channel 0

Work Order - S1769
EUT Power Input - 9V Battery
Test Site - CH2
Conditions - 24.9°C; 46%RH; 1004mBar

Data Taken at July 11, 2018

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Test Results (Pass/Fail)	Worst Avg Margin (dB)
17992.6	39.2	30.3	20.8	60	83.5	-23.5	PASS	-23.5	51.2	63.5	-12.3	PASS	-12.3

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 1m Distance
6-18GHz Vertical Data
Operator: Zachary Johnson
Notes:
EUT Mode: DH1 Channel 39

Work Order - S1769
EUT Power Input - 9V Battery
Test Site - CH2
Conditions - 24.9°C; 46%RH; 1004mBar

Data Taken at July 11, 2018

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)
7323.5	38.4	30.7	7.5	45.8	83.5	-37.7	PASS		38.1	63.5	-25.4	PASS	
12687.7	38.2	29.9	15.3	53.5	83.5	-30	PASS	-30	45.2	63.5	-18.3	PASS	-18.3

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 1m Distance
6-18GHz Horizontal Data
Operator: Zachary Johnson
Notes:
EUT Mode: DH1 Channel 39

Work Order - S1769
EUT Power Input - 9V Battery
Test Site - CH2
Conditions - 24.9°C; 46%RH; 1004mBar

Data Taken at July 11, 2018

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Test Results (Pass/Fail)	Worst Avg Margin (dB)
7323.7	38.8	34.3	7.5	46.2	83.5	-37.3	PASS		41.8	63.5	-21.7	PASS	
12558.7	38.3	29.4	16.1	54.4	83.5	-29.1	PASS	-29.1	45.5	63.5	-18	PASS	-18

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 1m Distance
6-18GHz Vertical Data
Operator: Zachary Johnson
Notes:
EUT Mode: DH1 Channel 78

Work Order - S1769
EUT Power Input - 9V Battery
Test Site - CH2
Conditions - 24.9°C; 46%RH; 1004mBar

Data Taken at July 11, 2018

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)
7439.6	39.3	31.7	7.4	46.7	83.5	-36.8	PASS		39.1	63.5	-24.4	PASS	
12609.7	38.8	29.7	16	54.8	83.5	-28.7	PASS	-28.7	45.7	63.5	-17.8	PASS	-17.8

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 1m Distance
6-18GHz Horizontal Data
Operator: Zachary Johnson
Notes:
EUT Mode: DH1 Channel 78

Work Order - S1769
EUT Power Input - 9V Battery
Test Site - CH2
Conditions - 24.9°C; 46%RH; 1004mBar

Data Taken at July 11, 2018

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_209_Peak (dBµV/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_209_Average (dBµV/m)	Avg Margin (dB)	Avg Test Results (Pass/Fail)	Worst Avg Margin (dB)
7440.9	42	33.8	7.4	49.3	83.5	-34.2	PASS		41.2	63.5	-22.3	PASS	
12387.7	37	29.1	16.3	53.3	83.5	-30.2	PASS	-30.2	45.4	63.5	-18.1	PASS	-18.1

6-18GHz

Radiated Emissions Table

Date: 12-Jul-18 **Company:** Fishman **Work Order:** S1769
Engineer: Chris Hamel **EUT Desc:** CRS Bluetooth module **EUT Operating Voltage/Frequency:** 9V DC
Temp: 24.3°C **Humidity:** 47% **Pressure:** 1004
Frequency Range: 18-26.5GHz **Measurement Distance:** 0.1 m
Notes: Bluetooth Channels 0, 39, 78 DH1 **EUT Max Freq:** 2480
No Emissions Found

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 Limit (dBµV/m)	FCC Class B High Frequency - Peak Margin (dB)	FCC Class B High Frequency - Peak Result (Pass/Fail)	FCC Class B High Frequency - Average Limit (dBµV/m)	FCC Class B High Frequency - Average Margin (dB)	FCC Class B High Frequency - Average 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: 2093 **Preamp:** 18-26.5GHz **Antenna:** 18-26.5GHz Horn **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.203
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor

18-26.5GHz

Rev. 7/10/2018							
Spectrum Analyzers / Receivers /Preselectors	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**
2093 MXE EMI Receiver	20Hz-26.5GHz	N9038A	Agilent	MY51210181	2093	I	11/16/2018
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
Preamps /Couplers Attenuators / Filters	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**
2311 PA	1-1000MHz	PAM-103	COM-POWER	441174	2311	II	10/29/2018
2111 HF Preamp	0.5-18GHz	PAM-118A	COM-POWER	551063	2111	II	11/19/2018
HF (Yellow)	18-26.5GHz	AFS4-18002650-60-8P-4	CS	467559	1266	II	10/16/2018
2116 BRF	0.009-18000MHz	BRM50702	Micro-Tronics	G226	2116	II	11/8/2018
Antennas	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**
Red-White Bilog	30-2000MHz	JB1	Sunol	A091604-1	1105	I	8/21/2019
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	5/15/2020
TH A#2082		HTC-1	HDE		2082	II	3/22/2019
Cables	**Range**		**Mfr**			**Cat**	**Calibration Due**
Asset #2051	9kHz - 18GHz		Florida RF			II	3/7/2019
Asset #2459	9KHz-18GHz		MegaPhase			II	10/29/2018
Asset #2467	9KHz-18GHz		MegaPhase			II	10/29/2018
Asset #2323	1-26.5GHz	TM26-S1S1-120	MEGAPHASE	17139101 002	2323	II	8/19/2018
All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.							

TEU

Radiated Band Edge

Radiated Band Edge

Date: 11-Jul-18 **Company:** Fishman **Work Order:** S1769
Engineer: Aristotelis Casternopoulos **EUT Desc:** Bluetooth Module **EUT Operating Voltage/Frequency:** 9VDC
Temp: 24.9°C **Humidity:** 46% **Pressure:** 1004mBar
Frequency Range: 2.3-2.5 GHz **Measurement Distance:** 3 m
Notes: Bluetooth DH1 Y-Orientation Ch0 and Ch78 **EUT Max Freq:** 2483.5MHz

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)
Low Edge				---	---	---	---	---	---	---	---	---	---	---
H	2390.0	13.4	4.6	0.0	32.2	0.8	46.4	37.6	74.0	-27.6	Pass	54.0	-16.4	Pass
H	2370.0	16.8	4.9	0.0	32.1	0.7	49.6	37.7	74.0	-24.4	Pass	54.0	-16.3	Pass
				---	---	---	---	---	---	---	---	---	---	---
High Edge				---	---	---	---	---	---	---	---	---	---	---
H	2496.0	16.4	4.4	0.0	32.4	0.7	49.5	37.5	74.0	-24.5	Pass	54.0	-16.5	Pass
H	2483.5	14.1	4.5	0.0	32.4	0.7	47.2	37.6	74.0	-26.8	Pass	54.0	-16.4	Pass
				---	---	---	---	---	---	---	---	---	---	---

Table Result: Pass by -16.3 dB ***Worst Freq:*** 2370.0 MHz

Test Site: EMI Chamber 2 **Cable 1:** Asset #2051 **Cable 2:** Asset #2459 **Cable 3:** ---
Analyzer: 2093 **Preamp:** None **Antenna:** Blue Horn **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.203

Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
2093 MXE EMI Receiver	20Hz-26.5GHz	N9038A	Agilent	MY51210181	2093	I	11/16/2018
Radiated Emissions Sites	**FCC Code**	**IC Code**	**VCCI Code**	**Range**	**Asset**	**Cat**	**Calibration Due**
EMI Chamber 2	719150	2762A-7	A-0015	1-18GHz	1686	I	12/21/2018
Antennas	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**
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	5/15/2020
TH A#2082		HTC-1	HDE		2082	II	3/22/2019
Cables	**Range**		**Mfr**			**Cat**	**Calibration Due**
Asset #2051	9kHz - 18GHz		Florida RF			II	3/7/2019
Asset #2459	9KHz-18GHz		MegaPhase			II	10/29/2018

TEU

AC Line Conducted Emissions

LIMITS

Frequency of emission (MHz)	Quasi-peak limit (dBµV)	Average limit (dBµV)
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

Curtis Straus - a Bureau Veritas Company
Conducted Emissions per CISPR 16-2-1
Quick Average Detector Data
Notes:
EUT Line tested: 120VAC/60Hz; Neutral (line 0)
EUT Mode of Operation: Verification

Work Order # - S1769
EUT Power Input - 120VAC/ 60Hz
Test Site - CEMI-2
Conditions: - 22.8°C; 47%RH; 1044mBar
Test Engineer - PC
Witnessed by - None

Data Taken at 7/17/2018

Frequency (MHz)	Raw Avg Reading (dBµV)	Correction Factor (dB)	Adjusted Avg Amplitude (dBµV)	Av Lim: Mains_FCC&CISPR_Avg_Class_B (dBµV)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)
0.151	27.7	20.4	48	56	-8	PASS	
0.275	22.6	20.5	43.1	51	-7.9	PASS	-7.9
0.5	12.9	20.5	33.5	46	-12.5	PASS	
0.575	12.7	20.6	33.2	46	-12.8	PASS	
0.993	12.3	20.6	32.9	46	-13.1	PASS	
1.241	11.8	20.7	32.5	46	-13.5	PASS	

Curtis Straus - a Bureau Veritas Company
Conducted Emissions per CISPR 16-2-1
Peak Detector Data
Notes:
EUT Line tested: 120VAC/60Hz; Neutral (line 0)
EUT Mode of Operation: Verification

Work Order # - S1769
EUT Power Input - 120VAC/ 60Hz
Test Site - CEMI-2
Conditions: - 22.8°C; 47%RH; 1044mBar
Test Engineer - PC
Witnessed by - None

Data Taken at 7/17/2018

Frequency (MHz)	Raw Pk Reading (dBµV)	Correction Factor (dB)	Adjusted Pk Amplitude (dBµV)	QP Lim: Mains_FCC&CISPR_QP_Class_B (dBµV)	Margin to the QP Limit (dB)	Pk to QP Limit Results (Pass/Fail)	Worst Margin (QP Limit) (dB)
0.151	33.4	20.4	53.8	66	-12.2	PASS	
0.232	28.9	20.6	49.5	62.4	-12.9	PASS	
0.263	29.2	20.6	49.8	61.3	-11.5	PASS	
0.291	30	20.5	50.5	60.5	-10	PASS	-10
0.328	26	20.5	46.6	59.5	-12.9	PASS	
0.526	19.9	20.5	40.4	56	-15.6	PASS	

Curtis Straus - a Bureau Veritas Company
Conducted Emissions per CISPR 16-2-1
Quick Average Detector Data
Notes:
EUT Line tested: 120VAC/60Hz; Phase (line 1)
EUT Mode of Operation: Normal

Work Order # - S1769
EUT Power Input - 120VAC/ 60Hz
Test Site - CEMI-2
Conditions: - 22.8°C; 47%RH; 1044mBar
Test Engineer - PC
Witnessed by - None

Data Taken at 7/17/2018

Frequency (MHz)	Raw Avg Reading (dBµV)	Correction Factor (dB)	Adjusted Avg Amplitude (dBµV)	Av Lim: Mains_FCC&CISPR_Avg_Class_B (dBµV)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)
0.16	27.1	20.5	47.7	55.4	-7.7	PASS	-7.7
0.25	23.3	20.6	43.9	51.8	-7.9	PASS	
0.294	21.6	20.5	42.1	50.4	-8.3	PASS	
0.5	13.6	20.5	34.1	46	-11.9	PASS	
0.559	12.6	20.6	33.1	46	-12.9	PASS	
0.994	11.6	20.6	32.2	46	-13.8	PASS	

Curtis Straus - a Bureau Veritas Company
Conducted Emissions per CISPR 16-2-1
Peak Detector Data
Notes:
EUT Line tested: 120VAC/60Hz; Phase (line 1)
EUT Mode of Operation: Normal

Work Order # - S1769
EUT Power Input - 120VAC/ 60Hz
Test Site - CEMI-2
Conditions: - 22.8°C; 47%RH; 1044mBar
Test Engineer - PC
Witnessed by - None

Data Taken at 7/17/2018

Frequency (MHz)	Raw Pk Reading (dBµV)	Correction Factor (dB)	Adjusted Pk Amplitude (dBµV)	QP Lim: Mains_FCC&CISPR_QP_Class_B (dBµV)	Margin to the QP Limit (dB)	Pk to QP Limit Results (Pass/Fail)	Worst Margin (QP Limit) (dB)
0.154	35.7	20.4	56.1	65.8	-9.7	PASS	-9.7
0.207	28.7	20.6	49.3	63.3	-14	PASS	
0.251	29	20.6	49.5	61.7	-12.2	PASS	
0.293	27.3	20.5	47.8	60.5	-12.7	PASS	
0.507	20.3	20.5	40.8	56	-15.2	PASS	
0.533	19.6	20.5	40.2	56	-15.8	PASS	

Rev. 7/10/2018

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Rental MXE EMI Receiver(1168255)	20Hz-8.4GHz	N9038A	Agilent	MY53290009	1168255	I	8/15/2018	8/15/2017
LISNs/Measurement Probes	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
LISN Asset 2092	9KHz-30MHz	NNLK 8121	Schwarzbeck	NLK 8121-66	2092	I	7/25/2018	7/25/2017
Conducted Test Sites (Mains / Telco)	**FCC Code**		**VCCI Code**			**Cat**	**Calibration Due**	**Calibrated on**
CEMI 2	719150		A-0015			III	NA	N/A
Meteorological Meters/Chambers		**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
TH A#2077		HTC-1	HDE		2077	II	3/22/2019	3/22/2018
Barometric A#2160		5396-0321	Monarch Instrument	4000060	2160	I	4/13/2019	4/13/2017
Cables	**Range**		**Mfr**			**Cat**	**Calibration Due**	**Calibrated on**
CEMI-15	9kHz - 2GHz		C-S			II	10/2/2018	10/2/2017

Attenuators	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
20dB Attenuator-60	9kHz-2GHz			N/A		II	43366	43001

using standards traceable to NIST or other nationally recognized calibration standard.

TEU

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 CISPR	 5.6dB 4.6dB	 N/A 5.2dB (Ucispr)
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 CISPR	 3.9dB 3.6dB	 N/A 3.6dB (Ucispr)
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% 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 were 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 ISED Canada RSS-247 Issue 2

DUT Information

DUT Name:	ALM-A01-CSR8645 Bluetooth Module
Manufacturer:	Fishman
Serial Number:	01

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: -3.76dBi

Test Equipment Used:

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	7/30/2018	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	7/26/2018	6/26/2017
SMB100A Signal Generator	100kHz-40GHz	SMB100A	ROHDE & SCHWARZ	179846	2434	I	10/13/2018	10/13/2017
Power/Noise Meters		**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
OSP - open switch and control platform	30MHz-18GHz	OSP-B157W8	ROHDE & SCHWARZ	1527.1144.02-100955-Ck		I	2/1/2019	2/1/2018
Cables	**Range**		**Mfr**			**Cat**	**Calibration Due**	**Calibrated on**
DUT1	30MHz-26GHz		Micro-Coax			III	verify before use	
DUT2	30MHz-26GHz		Micro-Coax			III	verify before use	
DUT3	30MHz-26GHz		Micro-Coax			III	verify before use	
DUT4	30MHz-26GHz		Micro-Coax			III	verify before use	
Attenuators / Couplers	**Range**	**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
10dB Attenuator-01 Brown	30MHz-26GHz		Mini Curcuits			III	verify before use	
10dB Attenuator-02 Yellow	30MHz-26GHz		Mini Curcuits			III	verify before use	
10dB Attenuator-03 Red	30MHz-26GHz		Mini Curcuits			III	verify before use	
10dB Attenuator-04 orange	30MHz-26GHz		Mini Curcuits			III	verify before use	
API - 30dB 20W Attenuator	9KHz-40GHz	89-30-11	API Weinschel	703	2121	II	3/23/2019	3/23/2018
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**
CMW270 Wideband Radio Communication Tester	DC to 6GHz	CMW270	ROHDE & SCHWARZ	1201.0002K75-101066-MV		I	6/13/2019	6/13/2018
Meteorological Meters/Chambers		**MN**	**Mfr**	**SN**	**Asset**	**Cat**	**Calibration Due**	**Calibrated on**
Temp/Humidity Chamber #18		EPX-2H	Espec	137664	1645	I	1/5/2019	1/5/2018
All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.								

Summary

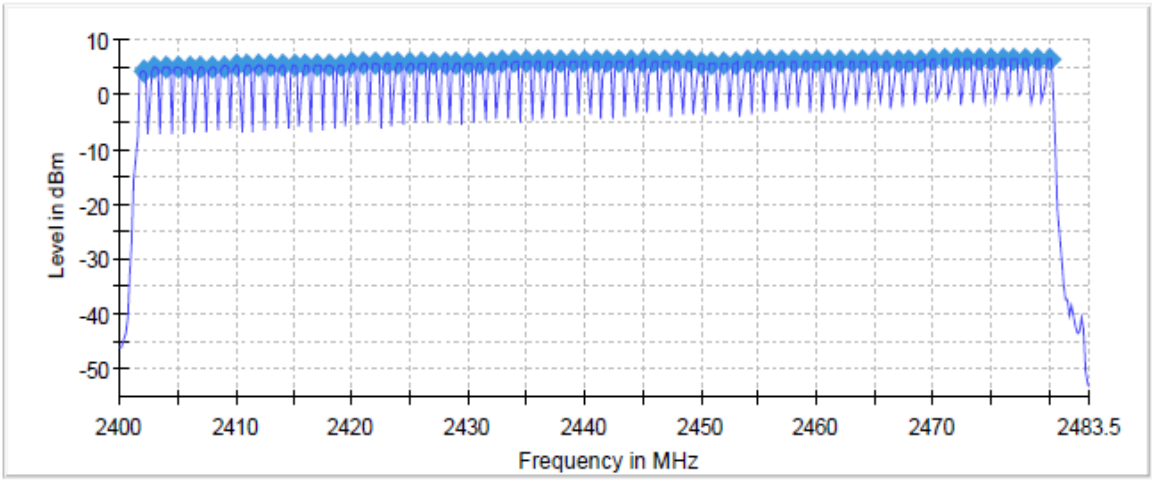
Test	Frequency (MHz)	DH1 Result	DH3 Result	DH5 Result	2-DH1 Result	2-DH3 Result	2-DH5 Result	3-DH1 Result	3-DH3 Result	3-DH5 Result
Hopping Frequencies	--- (hopping)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Band Edge (during hopping)	--- (hopping)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Carrier Frequency Separation	2402.000	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Carrier Frequency Separation	2480.000	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Time of Channel Occupancy	2402.000	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Time of Channel Occupancy	2441.000	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Time of Channel Occupancy	2480.000	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Emission Bandwidth 20 dB and 99% Occupied Bandwidth	2402.000	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Band Edge low	2402.000	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Peak output power	2402.000	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Conducted Spurious Emissions	2402.000	---	---	PASS	---	---	---	---	---	---
Emission Bandwidth 20 dB and 99% Occupied Bandwidth	2441.000	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Peak output power	2441.000	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Conducted Spurious Emissions	2441.000	---	---	PASS	---	---	---	---	---	---
Emission Bandwidth 20 dB and 99% Occupied Bandwidth	2480.000	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Band Edge high	2480.000	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Peak output power	2480.000	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Conducted Spurious Emissions	2480.000	---	---	PASS	---	---	---	---	---	---

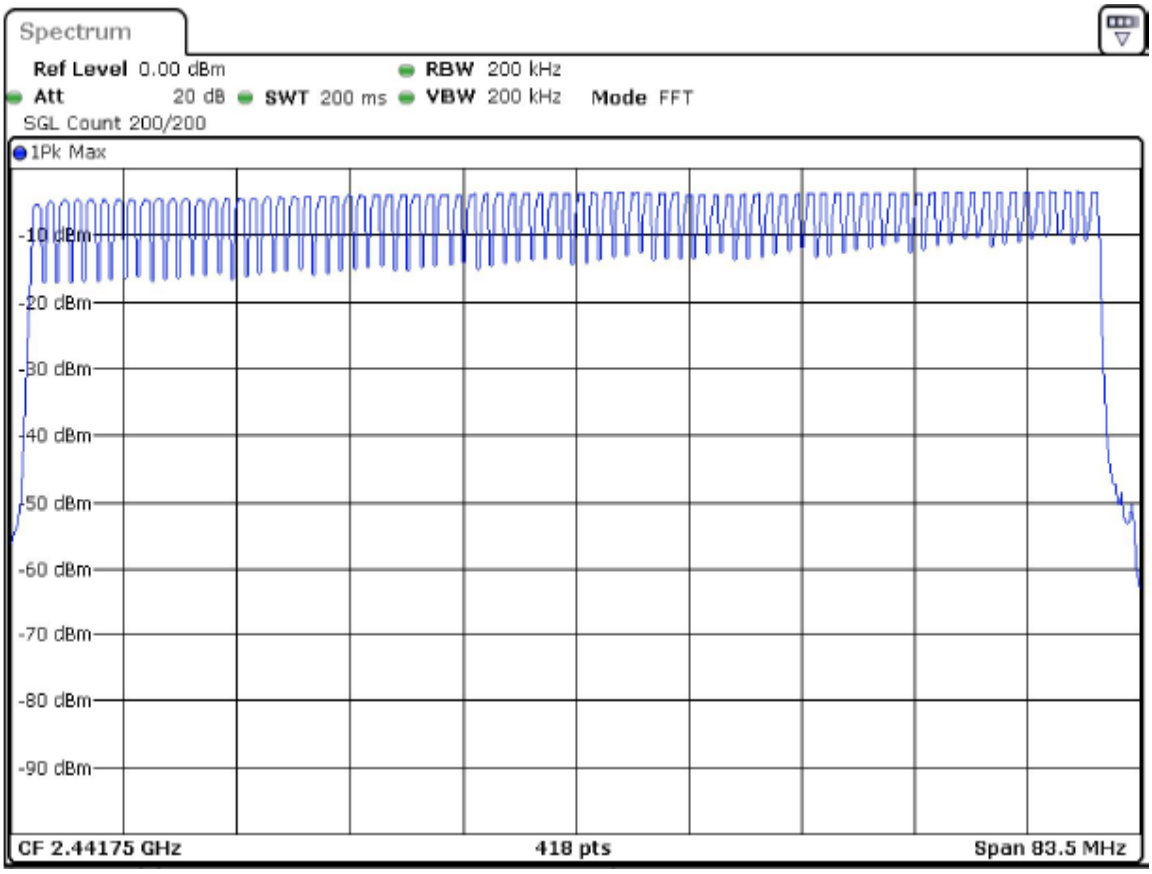
Number of Hopping Frequencies

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

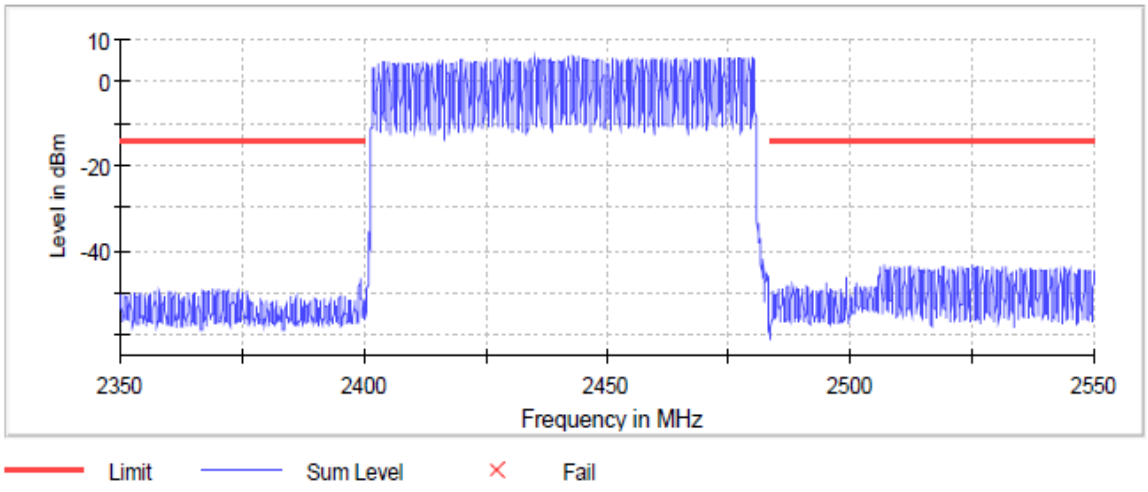
Inband Peak

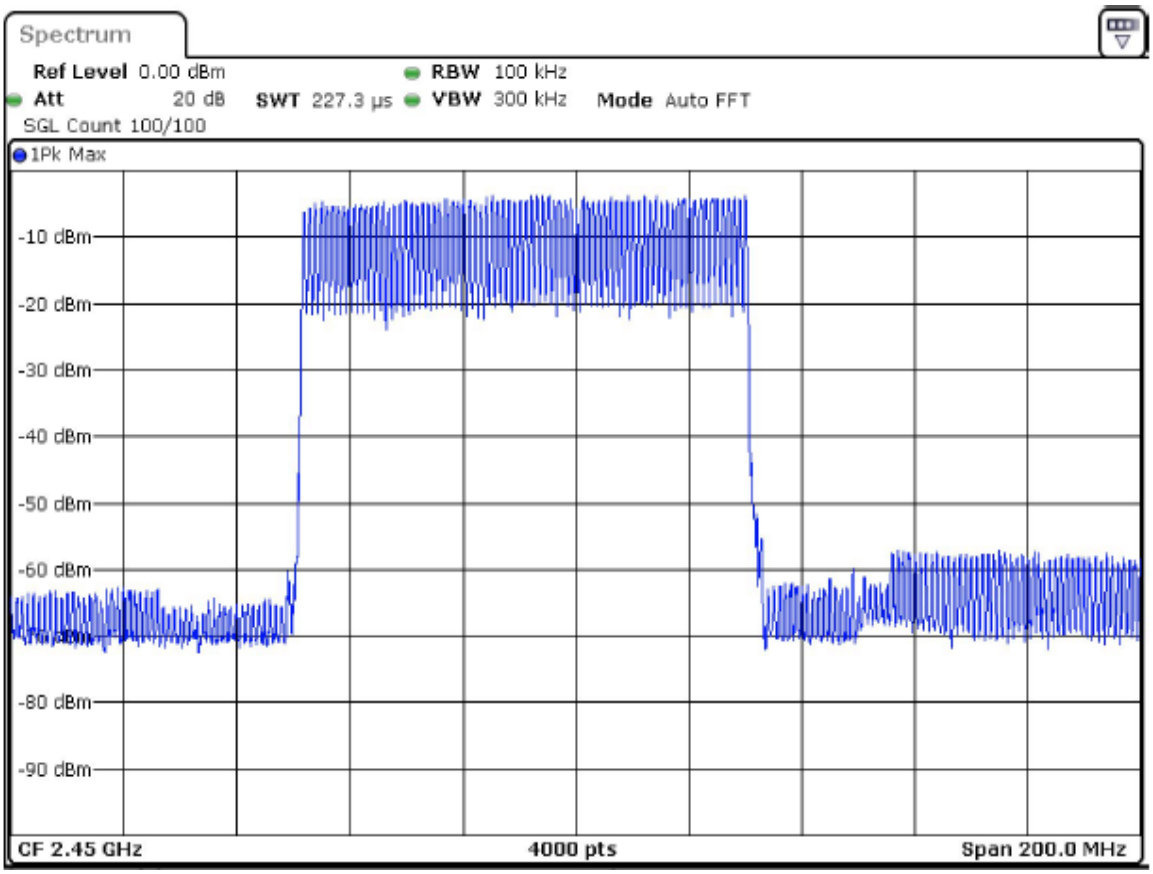
Data Rate	Frequency (MHz)	Level (dBm)
DH1	2479.97500	6.3
DH3	2478.97500	6.4
DH5	2443.97500	6.1
2-DH1	2444.97500	4.2
2-DH3	2448.97500	4.1
2-DH5	2442.97500	4.1
3-DH1	2478.97500	4.2
3-DH3	2473.02500	4.1
3-DH5	2445.97500	4.1

Plots for packet type DH5 shown below.

Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2524.925000	-43.4	29.6	-13.9	PASS
2506.975000	-43.6	29.7	-13.9	PASS
2507.025000	-43.7	29.8	-13.9	PASS
2507.975000	-43.7	29.9	-13.9	PASS
2513.875000	-43.7	29.9	-13.9	PASS
2531.175000	-43.8	29.9	-13.9	PASS
2524.875000	-43.8	30.0	-13.9	PASS
2525.925000	-43.8	30.0	-13.9	PASS
2510.975000	-43.9	30.0	-13.9	PASS
2508.825000	-43.9	30.0	-13.9	PASS
2512.025000	-43.9	30.0	-13.9	PASS
2531.125000	-43.9	30.1	-13.9	PASS
2543.975000	-44.0	30.1	-13.9	PASS
2531.975000	-44.0	30.1	-13.9	PASS
2506.025000	-44.0	30.1	-13.9	PASS




Spectrum
Ref Level 0.00 dBm
RBW 100 kHz
Att 20 dB
SWT 227.3 µs
VBW 300 kHz
Mode Auto FFT
SGL Count 100/100
1Pk Max
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-80 dBm
-90 dBm
CF 2.45 GHz
4000 pts
Span 200.0 MHz

Carrier Frequency Separation

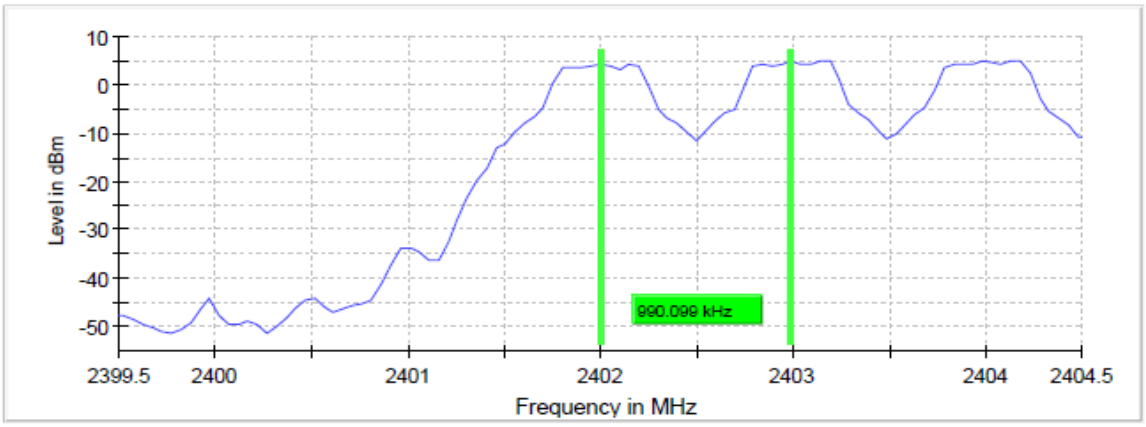
Test procedure in accordance with ANSI C63.10-2013
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty(k = 2) < 1%

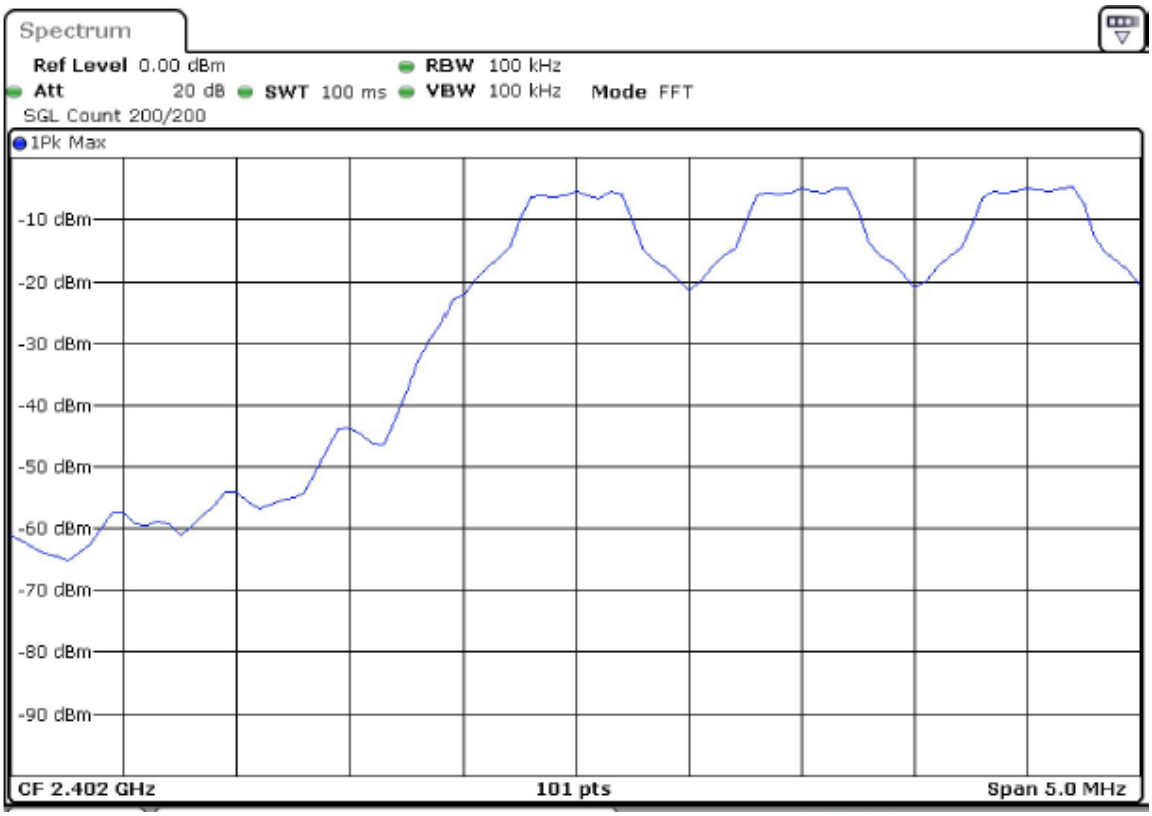
2402 MHz

Limit is 2/3 of the 20dB bandwidth of the corresponding packet type.

Packet Type	DUT Frequency (MHz)	Frequency Separation (MHz)	Minimum Limit (MHz)	Result
DH1	2402.000000	0.990099	0.633664	PASS
DH3	2402.000000	0.990099	0.673267	PASS
DH5	2402.000000	0.990099	0.673267	PASS
2-DH1	2402.000000	0.990099	0.851485	PASS
2-DH3	2402.000000	0.990099	0.871287	PASS
2-DH5	2402.000000	0.990099	0.871287	PASS
3-DH1	2402.000000	0.990099	0.851485	PASS
3-DH3	2402.000000	0.990099	0.891089	PASS
3-DH5	2402.000000	0.990099	0.891089	PASS

Plots for packet type DH5 shown below.



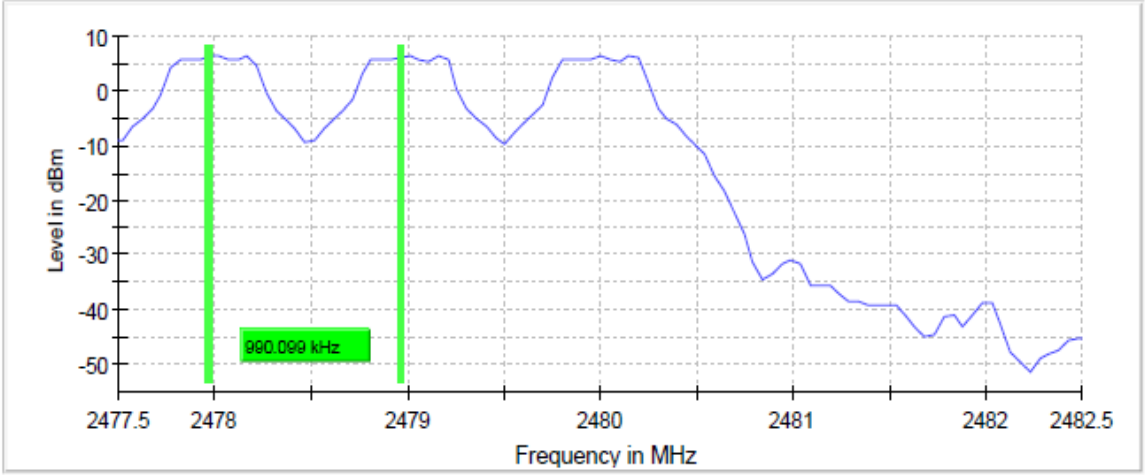


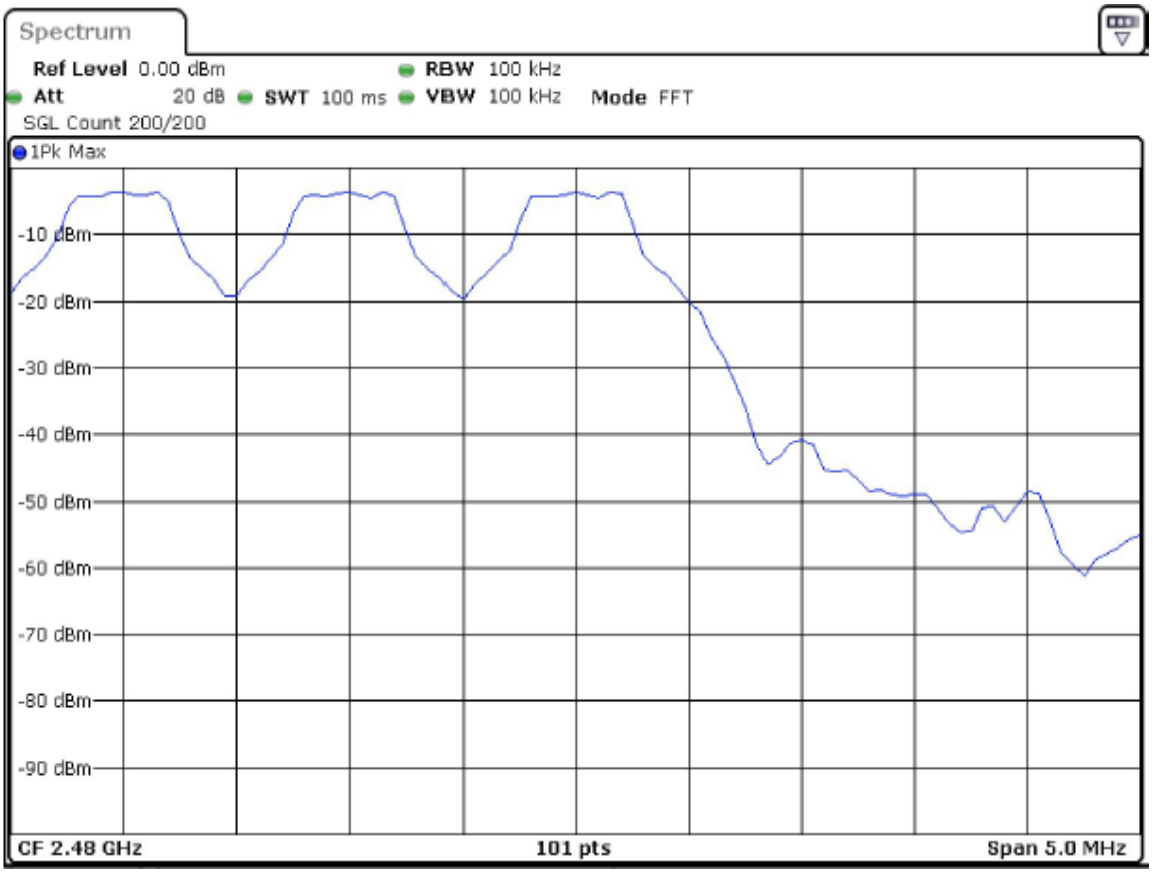
2480 MHz

Limit is 2/3 of the 20dB bandwidth of the corresponding packet type.

Packet Type	DUT Frequency (MHz)	Frequency Separation (MHz)	Minimum Limit (MHz)	Result
DH1	2480.000000	0.990099	0.633664	PASS
DH3	2480.000000	0.990099	0.673267	PASS
DH5	2480.000000	0.990099	0.673267	PASS
2-DH1	2480.000000	0.990099	0.851485	PASS
2-DH3	2480.000000	0.990099	0.871287	PASS
2-DH5	2480.000000	0.990099	0.871287	PASS
3-DH1	2480.000000	0.990099	0.851485	PASS
3-DH3	2480.000000	0.990099	0.891089	PASS
3-DH5	2480.000000	0.990099	0.891089	PASS

Plots for packet type DH5 shown below.


10
0
-10
-20
-30
-40
-50
Level in dBm
990.099 kHz
2477.5
2478
2479
2480
2481
2482
2482.5
Frequency in MHz


Spectrum
Ref Level 0.00 dBm
RBW 100 kHz
Att 20 dB SWT 100 ms VBW 100 kHz Mode FFT
SGL Count 200/200
1Pk Max
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
CF 2.48 GHz
101 pts
Span 5.0 MHz

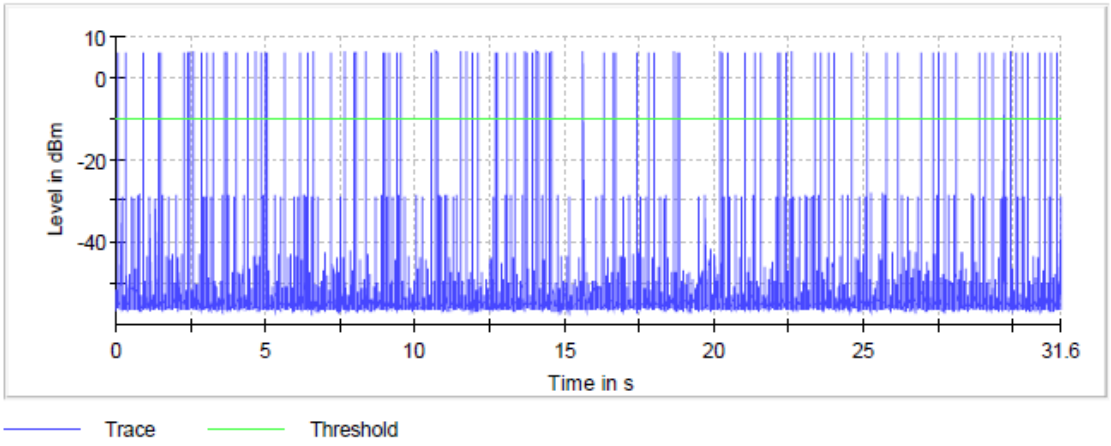
Time of Channel Occupancy (Dwell Time)

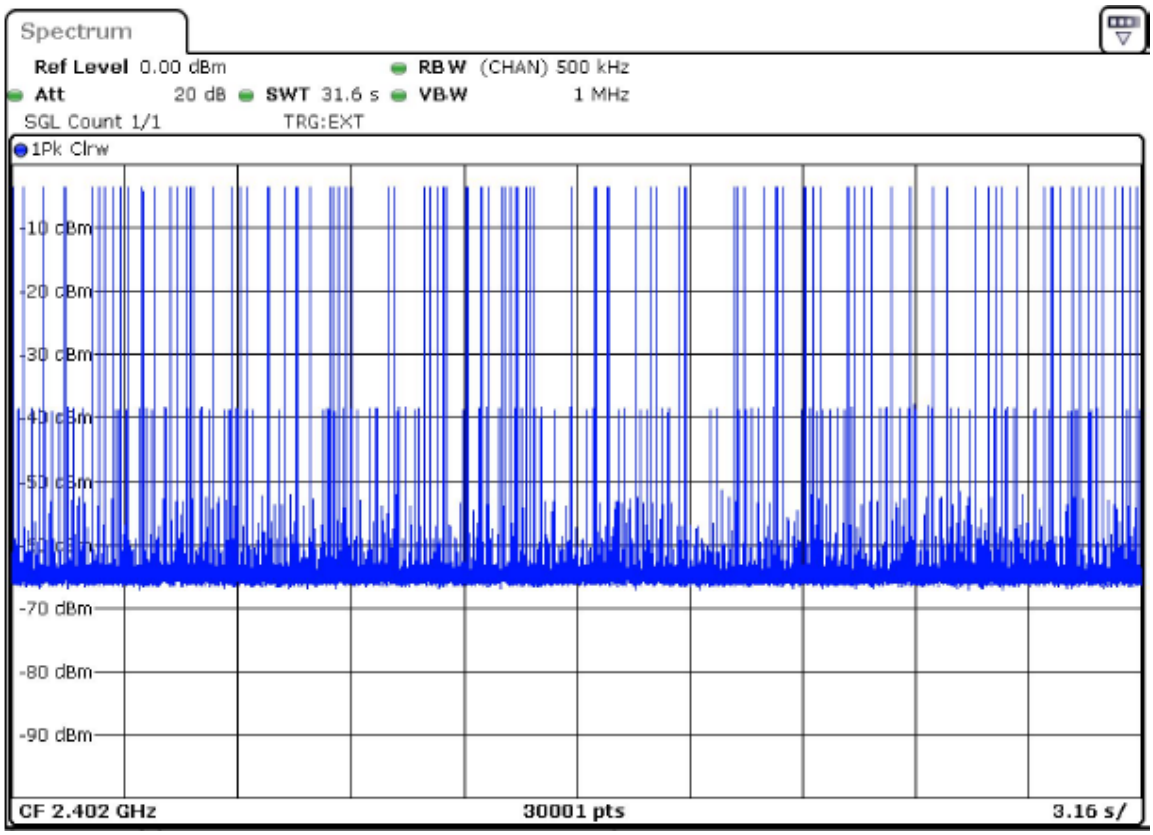
Test procedure in accordance with ANSI C63.10-2013
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 1%

2402 MHz

Data Rate	Time (ms)	Limit Max (ms)	Result
DH1	133.690	400.000	PASS
DH3	254.500	400.000	PASS
DH5	295.150	400.000	PASS
2-DH1	134.590	400.000	PASS
2-DH3	297.410	400.000	PASS
2-DH5	250.690	400.000	PASS
3-DH1	135.960	400.000	PASS
3-DH3	275.730	400.000	PASS
3-DH5	312.860	400.000	PASS

Plots for packet type DH5 shown below.



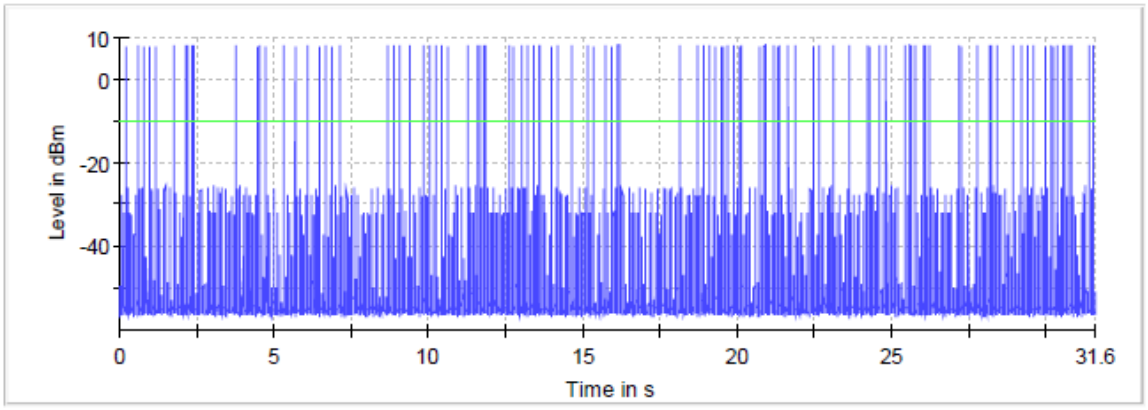


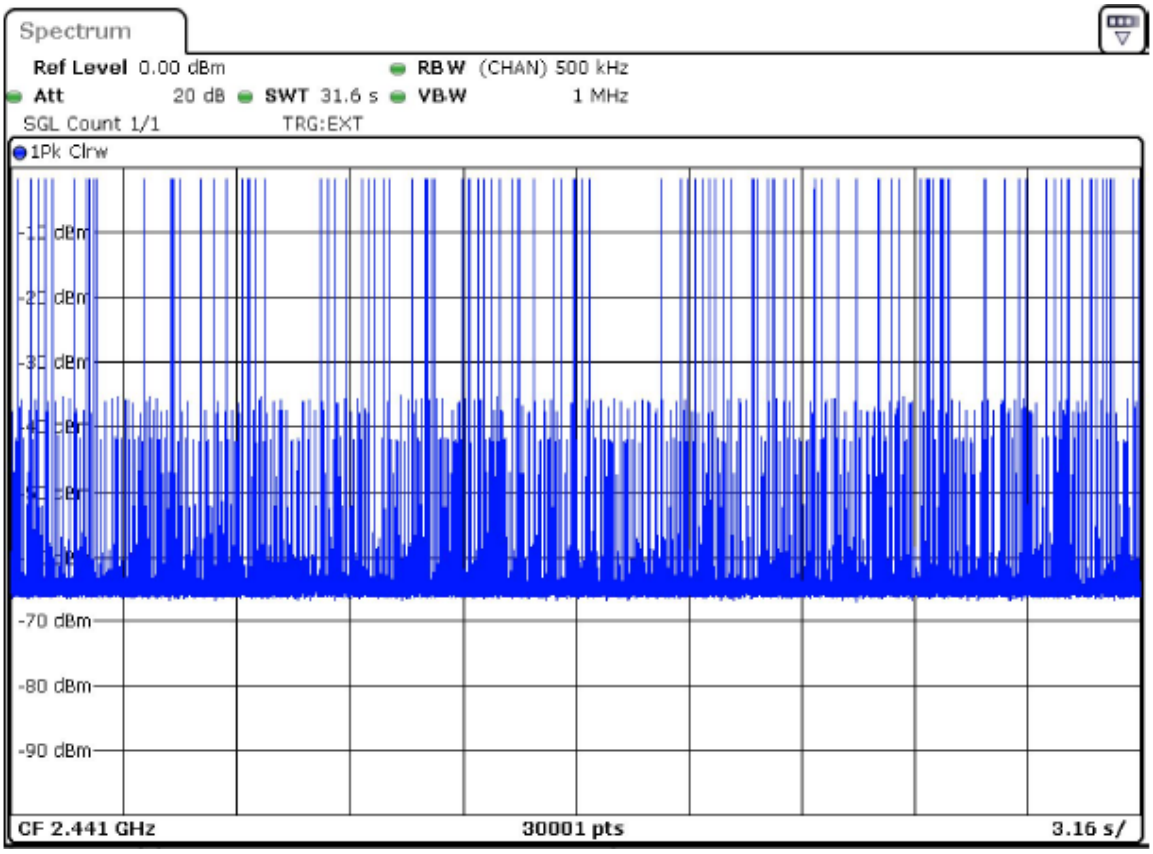
2441 MHz

Data Rate	Time (ms)	Limit Max (ms)	Result
DH1	134.550	400.000	PASS
DH3	276.590	400.000	PASS
DH5	315.819	400.000	PASS
2-DH1	136.600	400.000	PASS
2-DH3	280.740	400.000	PASS
2-DH5	305.600	400.000	PASS
3-DH1	137.540	400.000	PASS
3-DH3	283.420	400.000	PASS
3-DH5	327.760	400.000	PASS

Plots for packet type DH5 shown below.

Time of Channel Occupancy

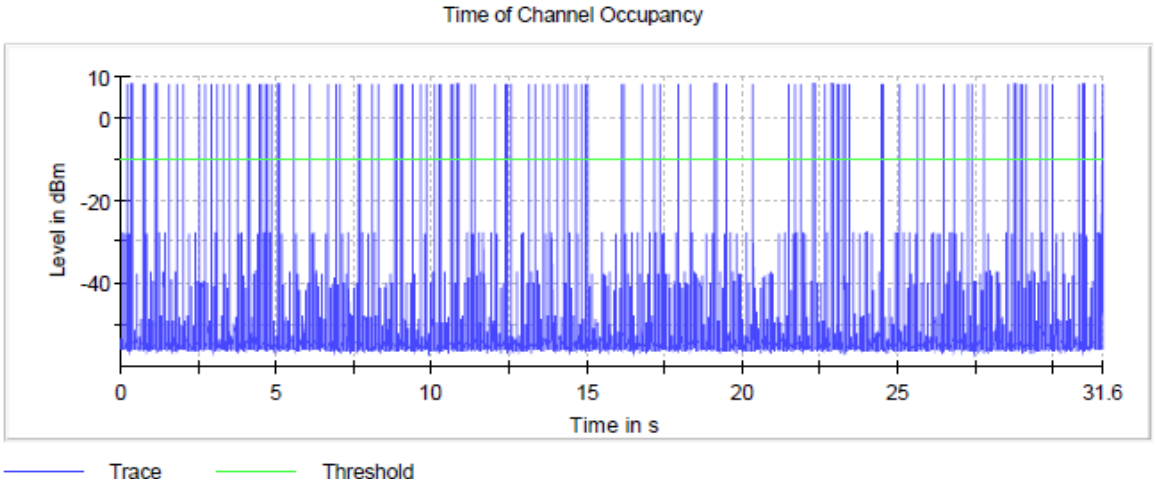


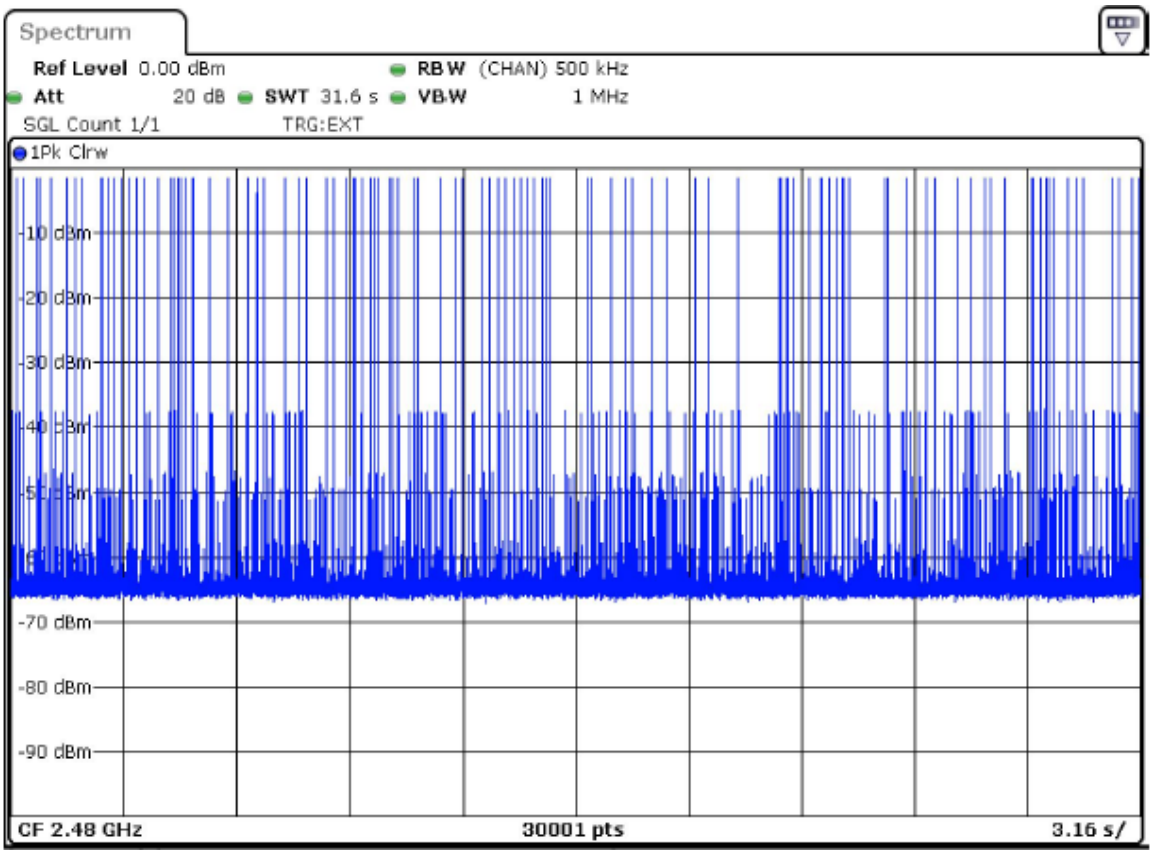


2480 MHz

Data Rate	Time (ms)	Limit Max (ms)	Result
DH1	134.510	400.000	PASS
DH3	291.680	400.000	PASS
DH5	330.450	400.000	PASS
2-DH1	136.080	400.000	PASS
2-DH3	265.630	400.000	PASS
2-DH5	316.990	400.000	PASS
3-DH1	137.980	400.000	PASS
3-DH3	280.030	400.000	PASS
3-DH5	301.330	400.000	PASS

Plots for packet type DH5 shown below.



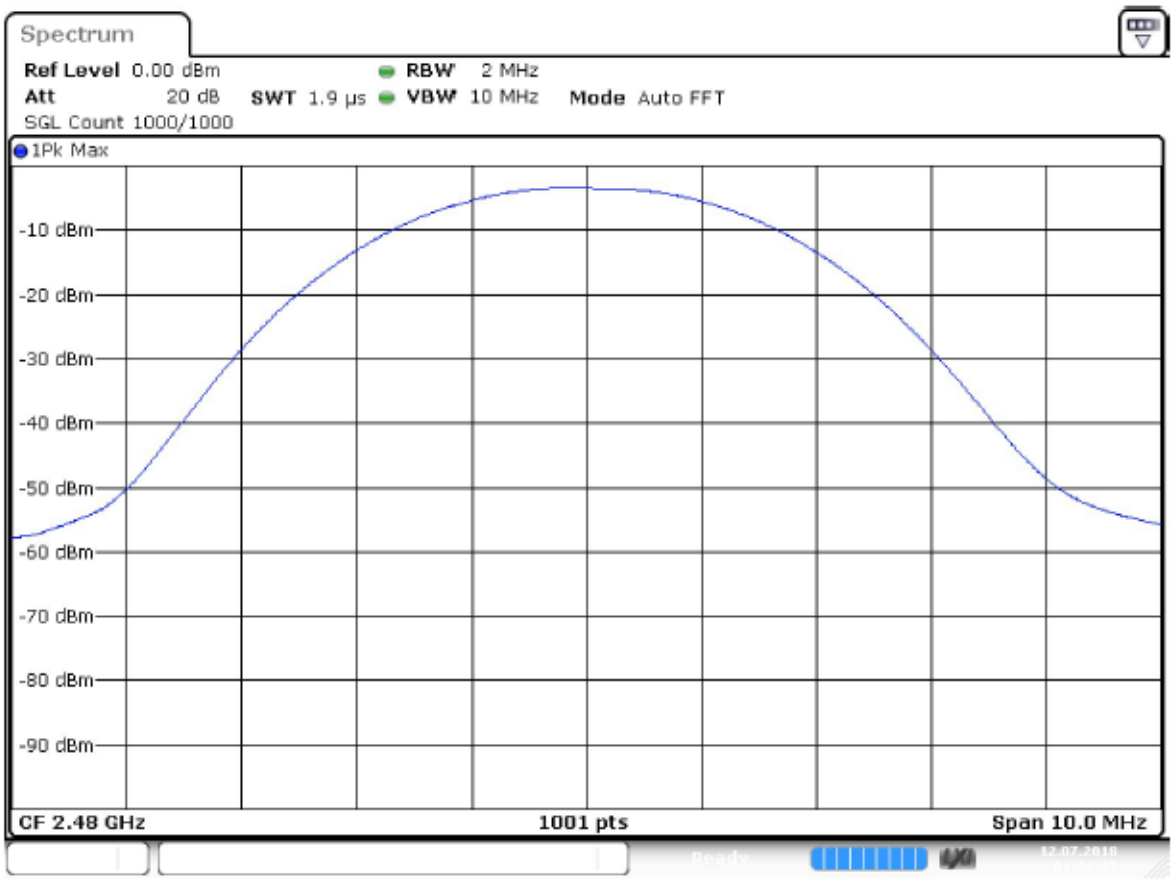

Spectrum
Ref Level 0.00 dBm
RBW (CHAN) 500 kHz
Att 20 dB SWT 31.6 s VBW 1 MHz
SGL Count 1/1 TRG:EXT
1Pk Clrw
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-70 dBm
-80 dBm
-90 dBm
CF 2.48 GHz
30001 pts
3.16 s/

Peak Output Power

Test procedure in accordance with ANSI C63.10-2013

Data Rate	2402MHz	2441MHz	2480MHz	Limit dBm
DH1	7.9	9.7	10	**30**
DH3	8.2	10	10.2	**30**
DH5	8.2	10	**10.2**	**30**
2-DH1	6	8.4	8.5	**30**
2-DH3	6.1	8.5	8.6	**30**
2-DH5	6.1	8.6	8.7	**30**
3-DH1	6	8.4	8.6	**30**
3-DH3	6.3	8.8	8.8	**30**
3-DH5	6.3	8.7	8.8	**30**

Plot for packet type DH5 shown below.



Date: 12.JUL.2018 01:29:36

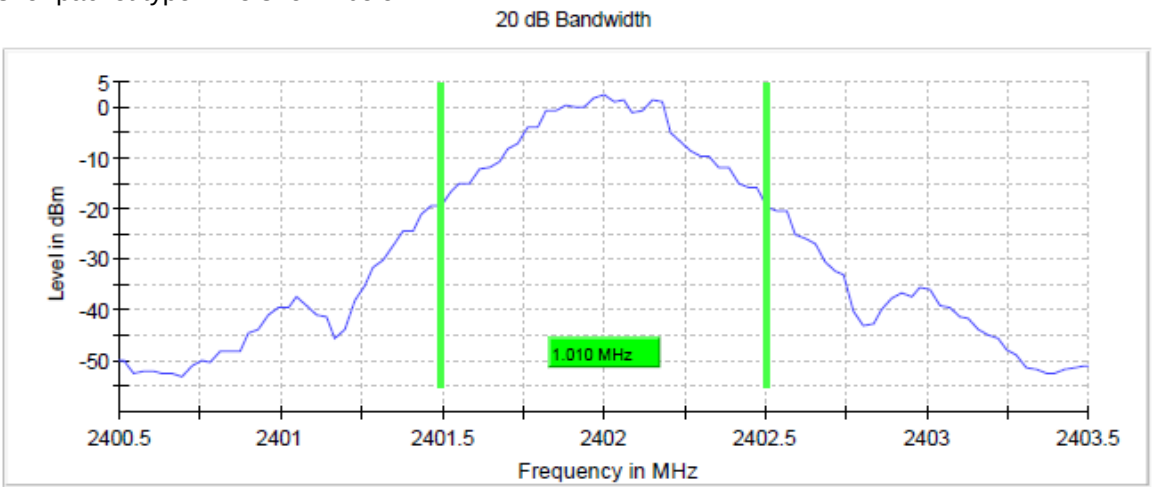
Emission Bandwidth 20 dB

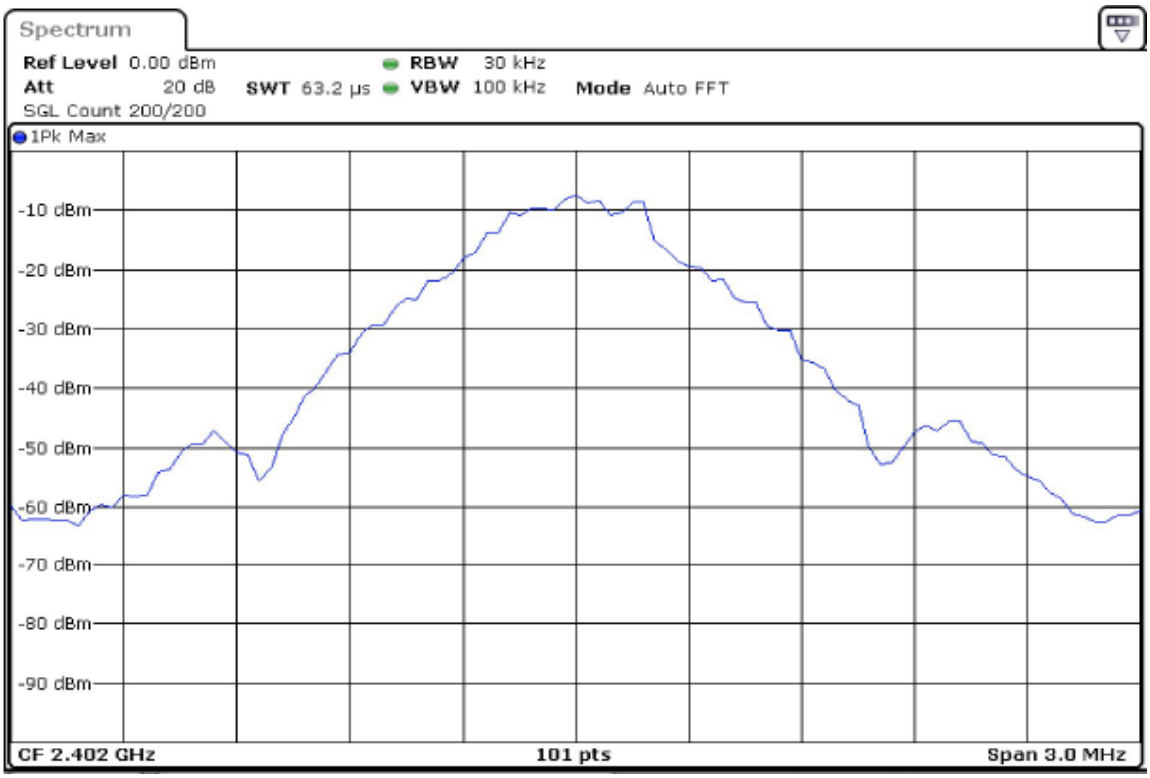
Test procedure in accordance with ANSI C63.10-2013
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 2%

2402 MHz

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	0.950496	2401.524752	2402.475248	PASS
DH3	1.009900	2401.495050	2402.504950	PASS
DH5	1.009900	2401.495050	2402.504950	PASS
2-DH1	1.277227	2401.346535	2402.623762	PASS
2-DH3	1.306930	2401.346535	2402.653465	PASS
2-DH5	1.306930	2401.346535	2402.653465	PASS
3-DH1	1.277227	2401.376238	2402.653465	PASS
3-DH3	1.336633	2401.316832	2402.653465	PASS
3-DH5	1.336633	2401.316832	2402.653465	PASS

Plots for packet type DH5 shown below.

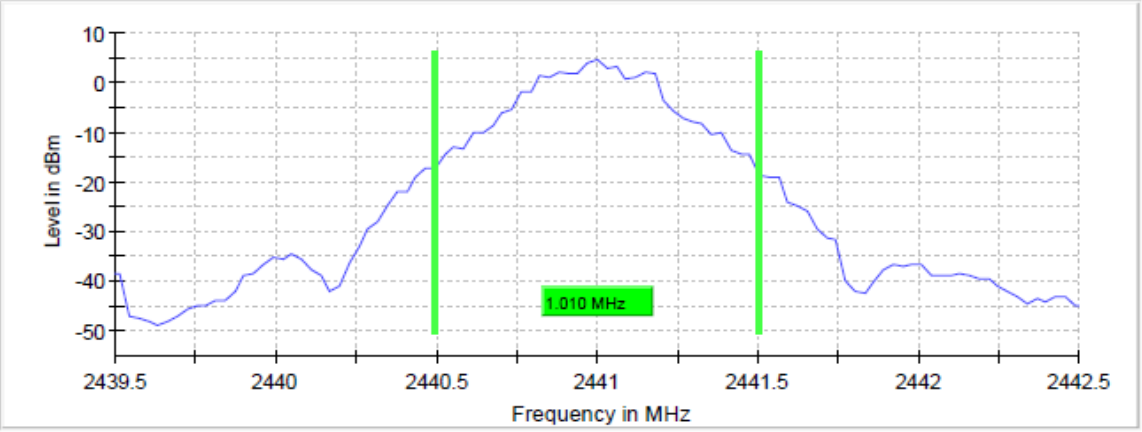


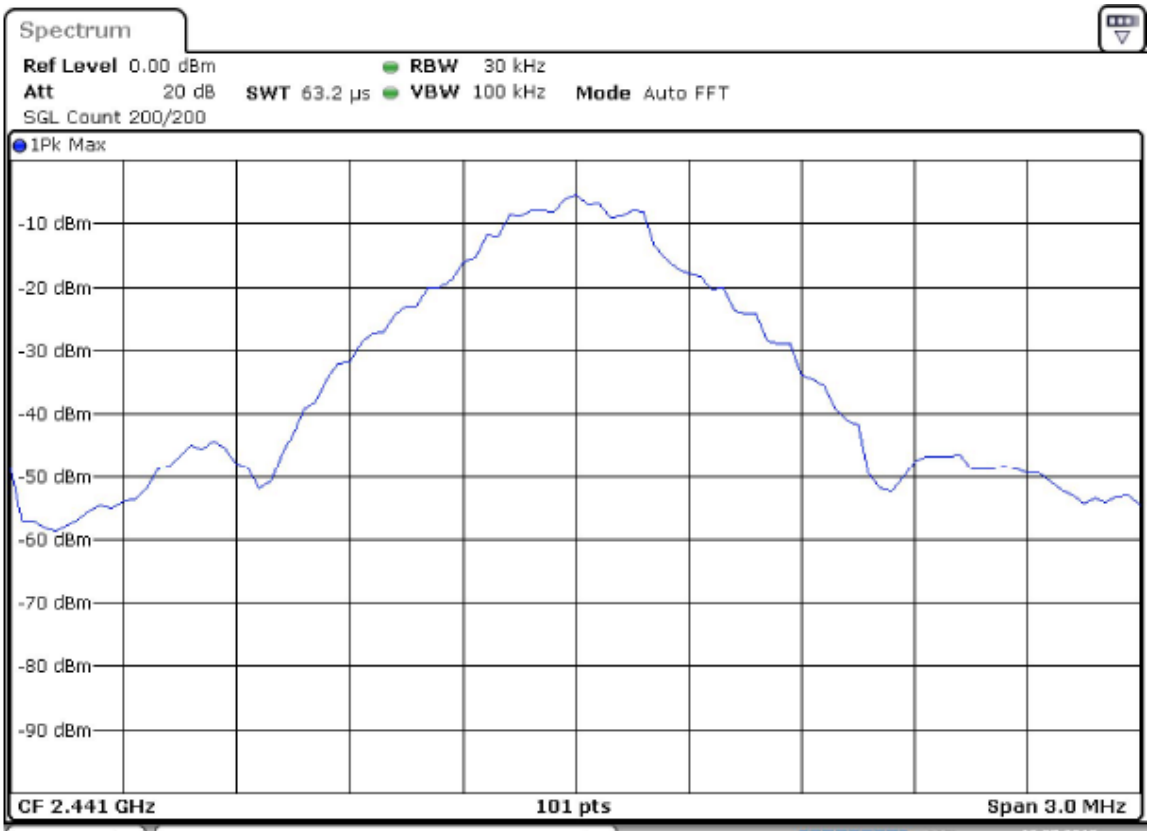


2441 MHz

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	0.950496	2440.524752	2441.475248	PASS
DH3	1.009900	2440.495050	2441.504950	PASS
DH5	1.009900	2440.495050	2441.504950	PASS
2-DH1	1.277227	2440.346535	2441.623762	PASS
2-DH3	1.306930	2440.346535	2441.653465	PASS
2-DH5	1.306930	2440.346535	2441.653465	PASS
3-DH1	1.277227	2440.376238	2441.653465	PASS
3-DH3	1.336633	2440.316832	2441.653465	PASS
3-DH5	1.336633	2440.316832	2441.653465	PASS

Plots for packet type DH5 shown below.

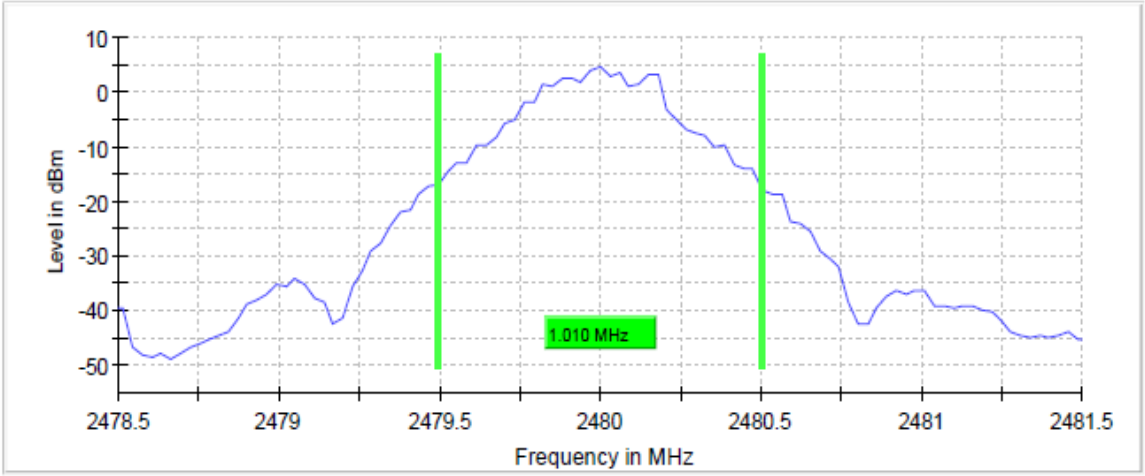

10
0
-10
-20
-30
-40
-50
Level in dBm
1.010 MHz
2439.5
2440
2440.5
2441
2441.5
2442
2442.5
Frequency in MHz


Spectrum
Ref Level 0.00 dBm
RBW 30 kHz
Att 20 dB
SWT 63.2 µs
VBW 100 kHz
Mode Auto FFT
SGL Count 200/200
1Pk Max
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
CF 2.441 GHz
101 pts
Span 3.0 MHz

2480 MHz

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	0.950496	2479.524752	2480.475248	PASS
DH3	1.009900	2479.495050	2480.504950	PASS
DH5	1.009900	2479.495050	2480.504950	PASS
2-DH1	1.277227	2479.346535	2480.623762	PASS
2-DH3	1.306930	2479.346535	2480.653465	PASS
2-DH5	1.306930	2479.346535	2480.653465	PASS
3-DH1	1.277227	2479.376238	2480.653465	PASS
3-DH3	1.336633	2479.316832	2480.653465	PASS
3-DH5	1.336633	2479.316832	2480.653465	PASS

Plots for packet type DH5 shown below.



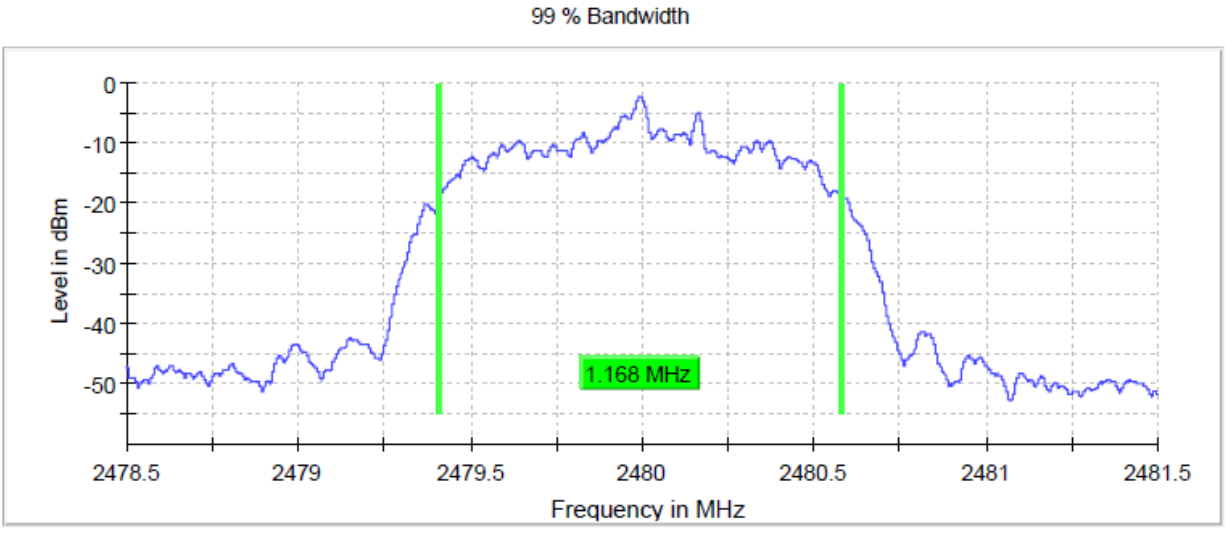

Spectrum
Ref Level 0.00 dBm
RBW 30 kHz
Att 20 dB
SWT 63.2 µs
VBW 100 kHz
Mode Auto FFT
SGL Count 200/200
1Pk Max
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
CF 2.48 GHz
101 pts
Span 3.0 MHz

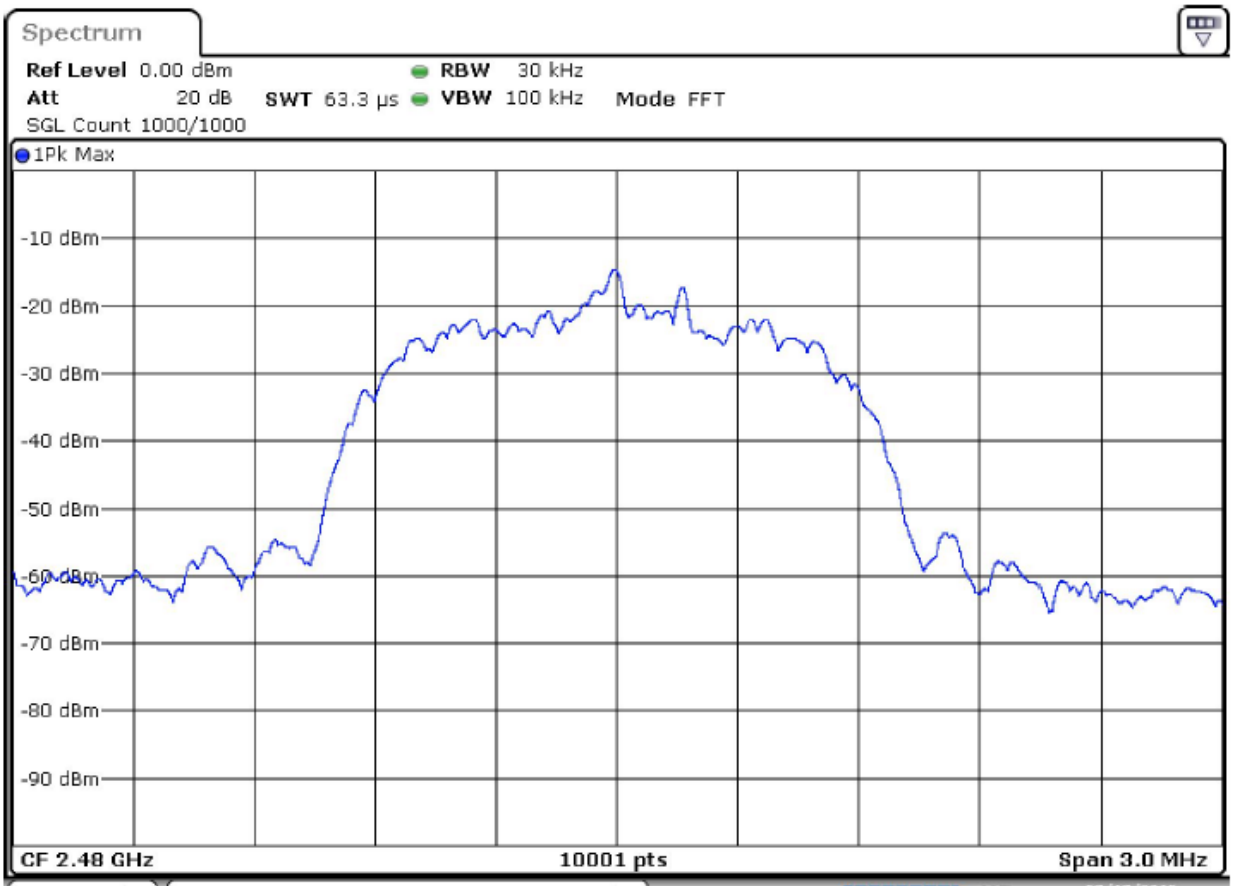
99% Occupied Bandwidth

Test procedure in accordance with RSS-Gen Issue 5 Section 6.7
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 2%

2402MHz		2441MHz		2480MHz	
Data Rate	99% Occupied Bandwidth (MHz)	Data Rate	99% Occupied Bandwidth (MHz)	Data Rate	99% Occupied Bandwidth (MHz)
DH1	0.844416	DH1	0.842916	DH1	0.844115
DH3	0.878613	DH3	0.875612	DH3	0.875312
DH5	0.880711	DH5	0.875312	DH5	0.879812
2-DH1	1.151585	2-DH1	1.151585	2-DH1	1.151885
2-DH3	1.166884	2-DH3	1.164784	2-DH3	1.165084
2-DH5	1.159684	2-DH5	1.159984	2-DH5	1.158784
3-DH1	1.135087	3-DH1	1.132987	3-DH1	1.133587
3-DH3	1.161784	3-DH3	1.160884	3-DH3	1.167783
3-DH5	1.162384	3-DH5	1.163284	3-DH5	1.160884

Plots for packet type 3-DH3 at 2480MHz shown below.




Spectrum
Ref Level 0.00 dBm
RBW 30 kHz
Att 20 dB
SWT 63.3 µs
VBW 100 kHz
Mode FFT
SGL Count 1000/1000
1Pk Max
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
CF 2.48 GHz
10001 pts
Span 3.0 MHz

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

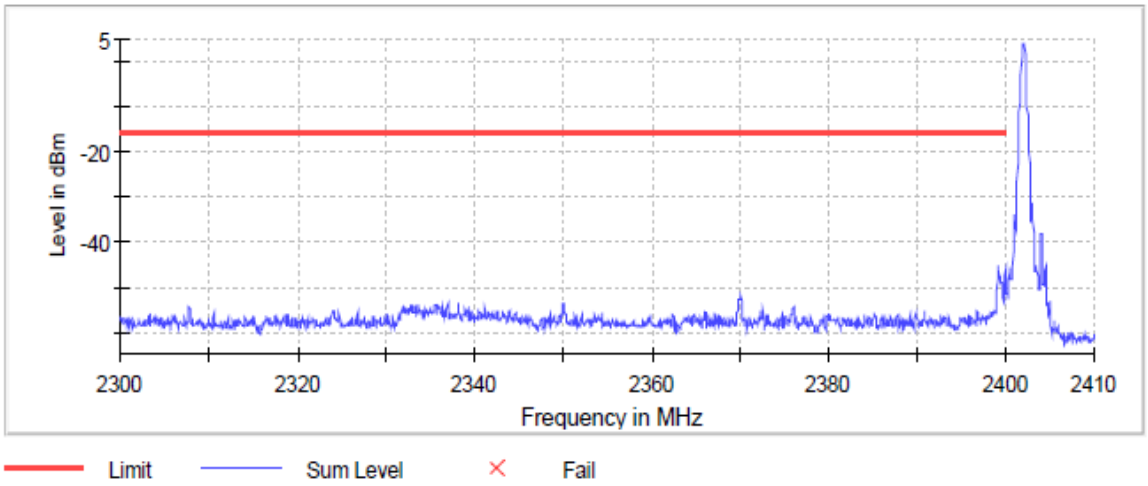
Inband Peak

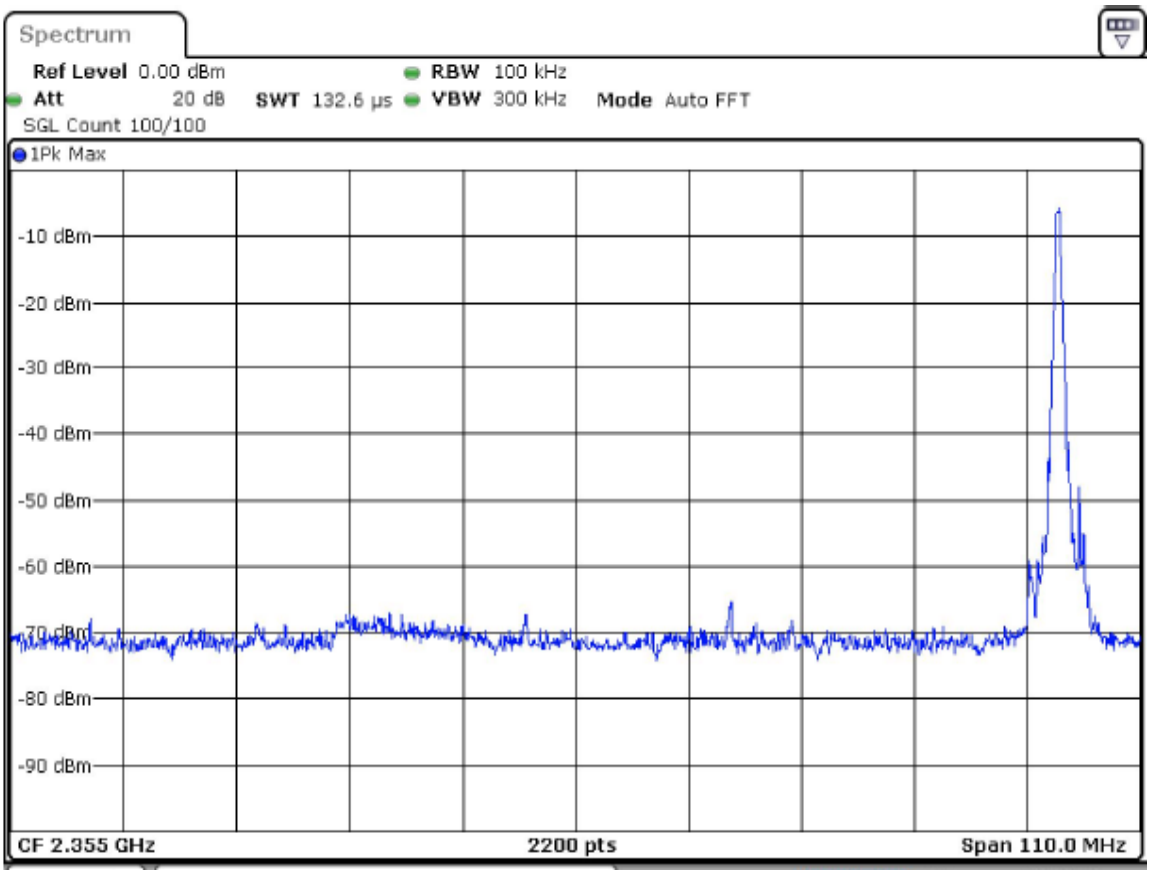
Data Rate	Frequency	Level (dBm)
DH1	2401.9750	4.4
DH3	2402.1750	4.3
DH5	2401.9750	4.3
2-DH1	2401.9750	1.4
2-DH3	2401.9750	1.4
2-DH5	2401.9750	1.4
3-DH1	2401.8250	1.5
3-DH3	2401.9750	1.4
3-DH5	2401.9750	1.4

Plots for packet type DH5 shown below.

Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2399.175000	-45.5	29.7	-15.7	PASS
2399.975000	-45.6	29.9	-15.7	PASS
2399.125000	-45.7	29.9	-15.7	PASS
2399.225000	-46.3	30.6	-15.7	PASS
2399.925000	-47.5	31.8	-15.7	PASS
2399.325000	-47.7	31.9	-15.7	PASS
2399.375000	-48.1	32.3	-15.7	PASS
2399.425000	-48.1	32.4	-15.7	PASS
2399.075000	-48.2	32.4	-15.7	PASS
2399.275000	-48.3	32.6	-15.7	PASS
2399.475000	-48.8	33.1	-15.7	PASS
2399.525000	-49.1	33.3	-15.7	PASS
2399.575000	-49.1	33.4	-15.7	PASS
2399.625000	-50.5	34.8	-15.7	PASS
2399.875000	-50.9	35.2	-15.7	PASS





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

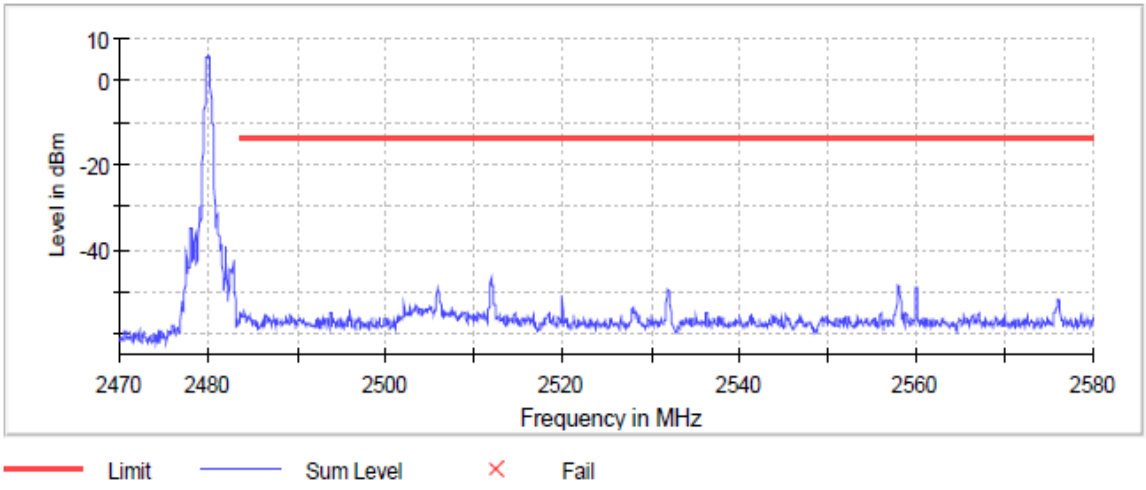
Inband Peak

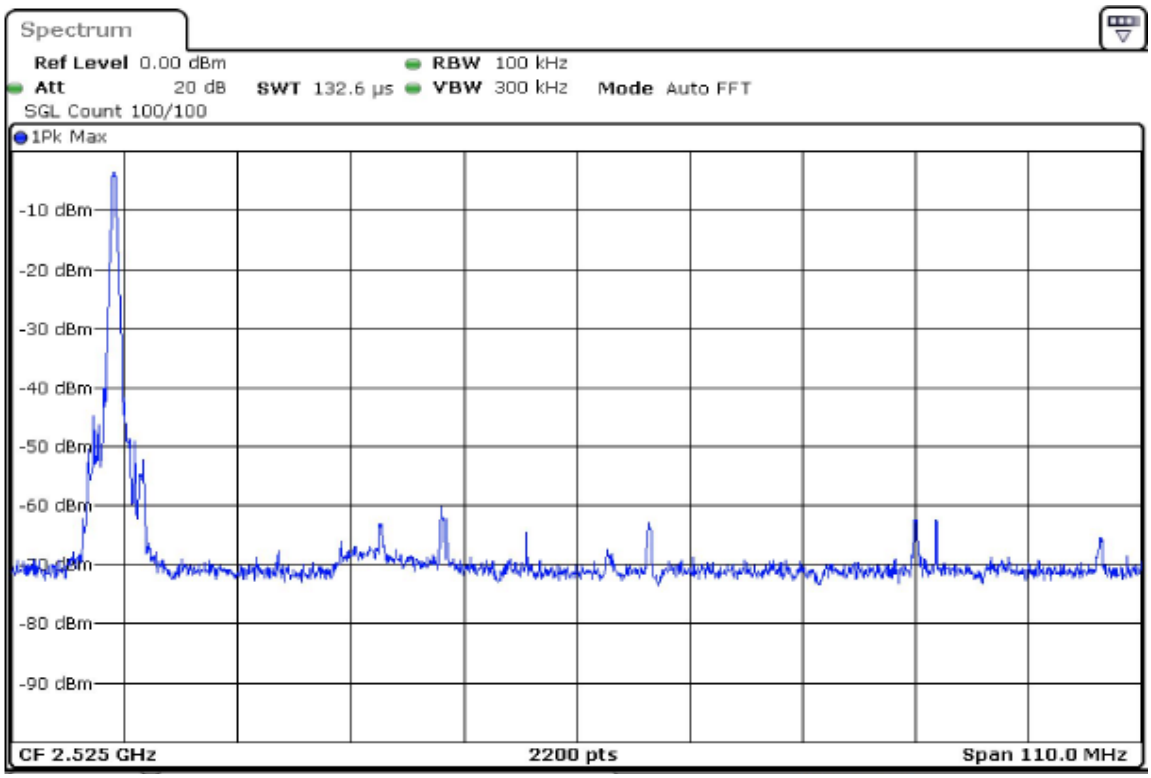
Data Rate	Frequency	Level (dBm)
DH1	2479.9750	6.4
DH3	2480.1750	6.3
DH5	2479.9750	6.4
2-DH1	2479.9750	4.2
2-DH3	2479.9750	4.2
2-DH5	2479.9750	4.2
3-DH1	2479.8250	4.3
3-DH3	2479.9750	4.2
3-DH5	2479.9750	4.1

Plots for packet type DH5 shown below.

Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2511.975000	-46.6	33.0	-13.6	PASS
2511.925000	-46.7	33.1	-13.6	PASS
2511.875000	-48.1	34.5	-13.6	PASS
2512.075000	-48.4	34.7	-13.6	PASS
2512.025000	-48.5	34.9	-13.6	PASS
2512.175000	-48.5	34.9	-13.6	PASS
2557.975000	-48.8	35.1	-13.6	PASS
2512.125000	-48.8	35.1	-13.6	PASS
2558.075000	-48.8	35.2	-13.6	PASS
2559.975000	-48.9	35.3	-13.6	PASS
2557.875000	-48.9	35.3	-13.6	PASS
2511.825000	-49.0	35.3	-13.6	PASS
2560.025000	-49.0	35.4	-13.6	PASS
2558.025000	-49.1	35.4	-13.6	PASS
2558.125000	-49.1	35.4	-13.6	PASS




Spectrum
Ref Level 0.00 dBm
RBW 100 kHz
Att 20 dB
SWT 132.6 µs
VBW 300 kHz
Mode Auto FFT
SGL Count 100/100
1Pk Max
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
CF 2.525 GHz
2200 pts
Span 110.0 MHz

Conducted Spurious Emissions

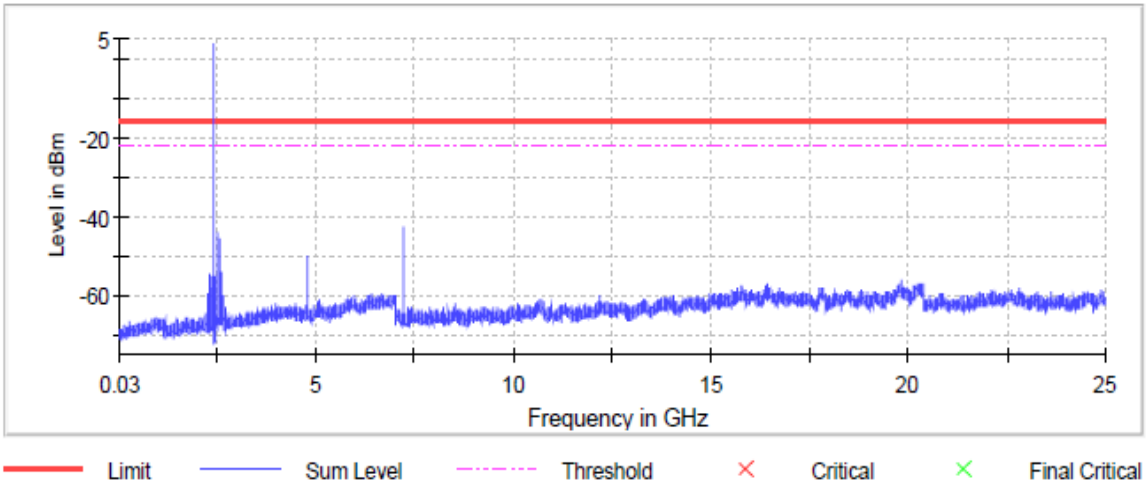
Test procedure in accordance with ANSI C63.10-2013
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 0.8 dB

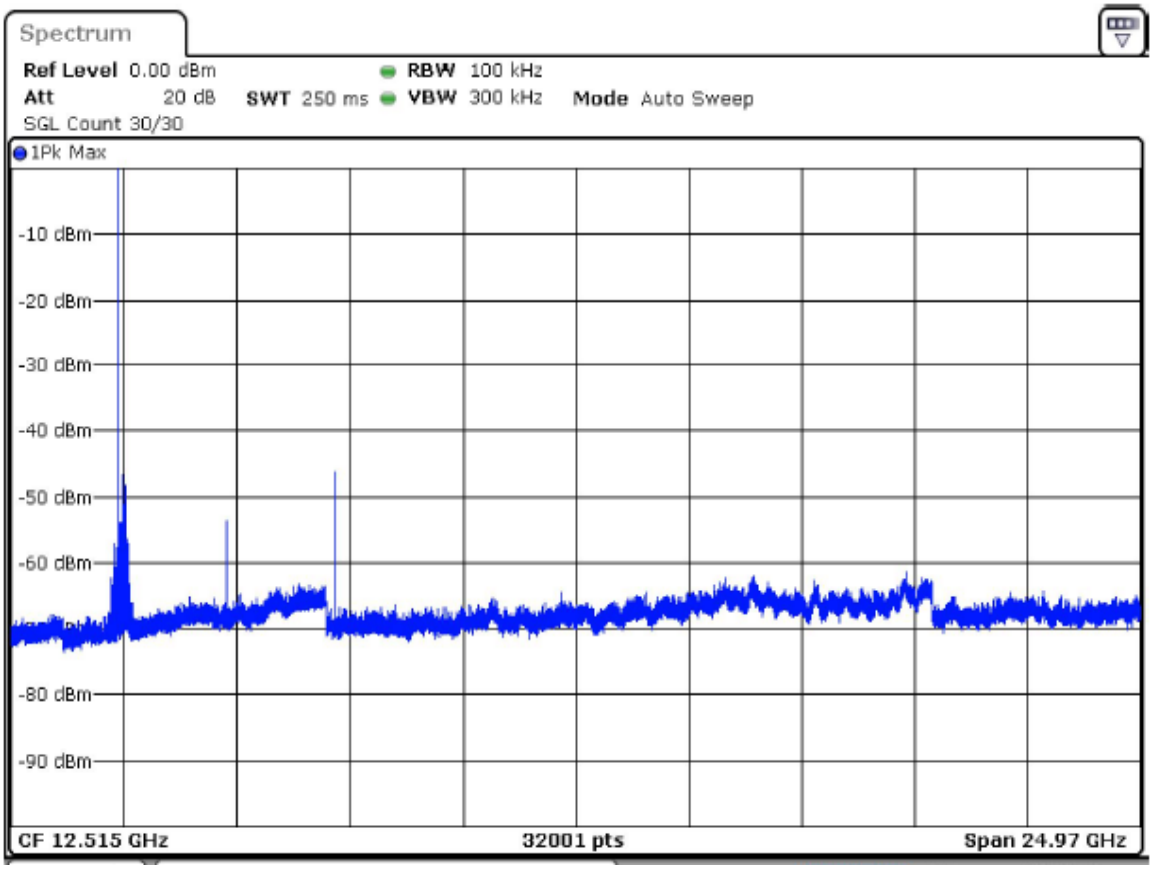
2402 MHz

Plots for packet type DH5 shown below.

Pre Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
7205.919659	-42.5	26.7	-15.8
7206.699947	-43.1	27.3	-15.8
2506.244336	-43.8	28.0	-15.8
2505.464048	-44.4	28.6	-15.8
2557.743352	-45.4	29.6	-15.8
7205.139371	-45.9	30.1	-15.8
2558.523640	-46.1	30.3	-15.8
2399.344864	-46.4	30.6	-15.8
2531.993844	-48.2	32.4	-15.8
4804.192838	-50.2	34.4	-15.8
4803.412550	-51.6	35.8	-15.8
2584.273148	-53.3	37.5	-15.8
2610.022656	-54.0	38.2	-15.8
2297.907409	-54.3	38.5	-15.8
2497.661167	-54.6	38.8	-15.8



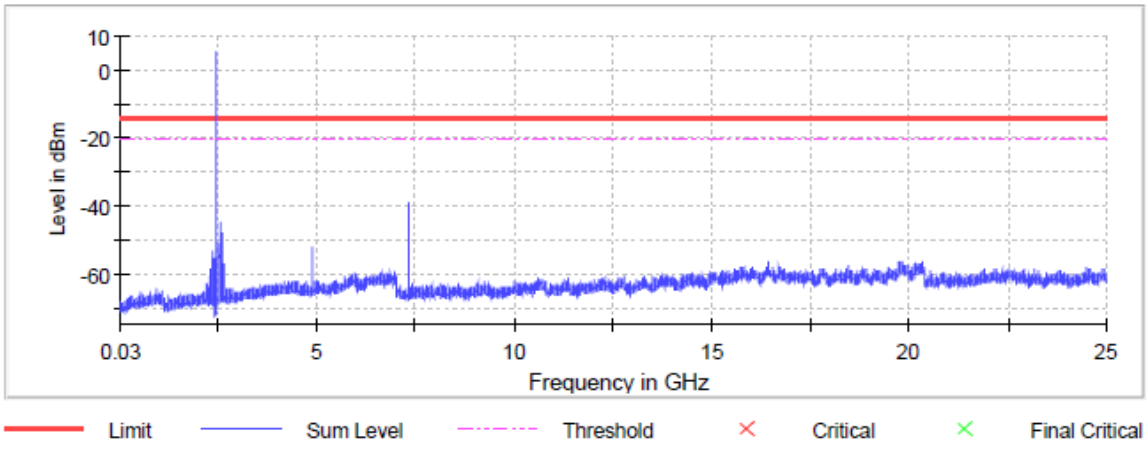

Spectrum
Ref Level 0.00 dBm
RBW 100 kHz
Att 20 dB
SWT 250 ms
VBW 300 kHz
Mode Auto Sweep
SGL Count 30/30
1Pk Max
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-80 dBm
-90 dBm
CF 12.515 GHz
32001 pts
Span 24.97 GHz

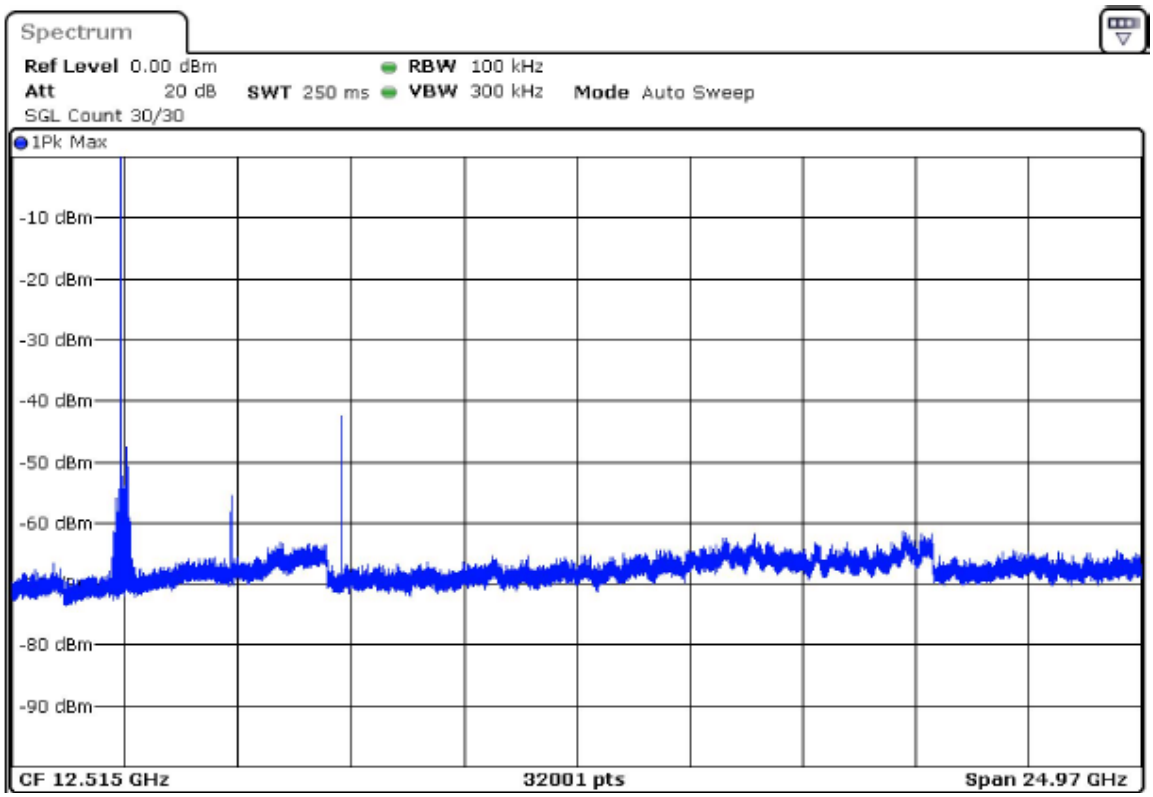
2441 MHz

Plots for packet type DH5 shown below.

Pre Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
7323.743164	-39.0	24.9	-14.1
7322.182588	-39.4	25.2	-14.1
7322.962876	-41.9	27.8	-14.1
2545.258742	-44.7	30.6	-14.1
2544.478454	-46.6	32.4	-14.1
2596.757758	-47.8	33.7	-14.1
2597.538046	-49.1	34.9	-14.1
2571.008250	-49.2	35.0	-14.1
2521.069810	-50.9	36.8	-14.1
2518.728946	-51.0	36.9	-14.1
2519.509234	-51.3	37.2	-14.1
2492.979438	-51.5	37.3	-14.1
4882.221649	-52.1	37.9	-14.1
2336.921815	-53.1	38.9	-14.1
2536.675573	-54.1	40.0	-14.1



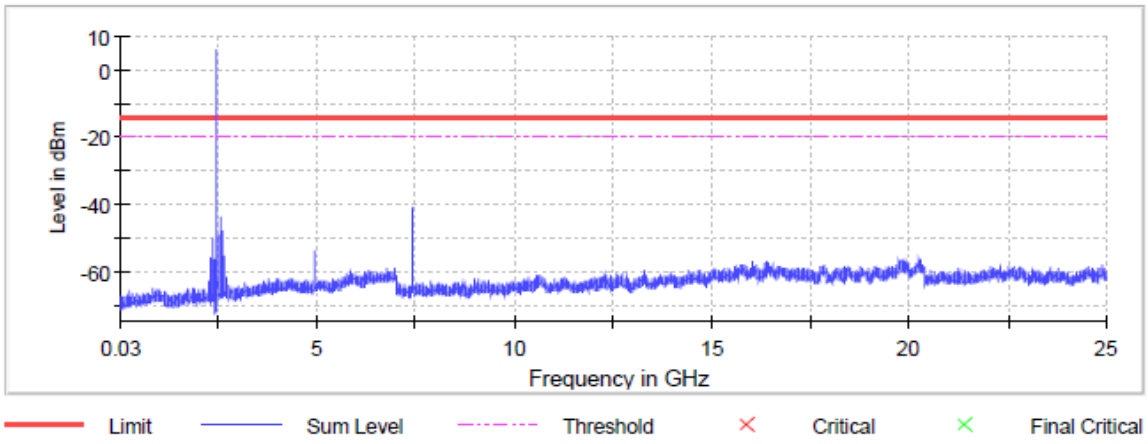

Spectrum
Ref Level 0.00 dBm
RBW 100 kHz
Att 20 dB
SWT 250 ms
VBW 300 kHz
Mode Auto Sweep
SGL Count 30/30
1Pk Max
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-80 dBm
-90 dBm
CF 12.515 GHz
32001 pts
Span 24.97 GHz

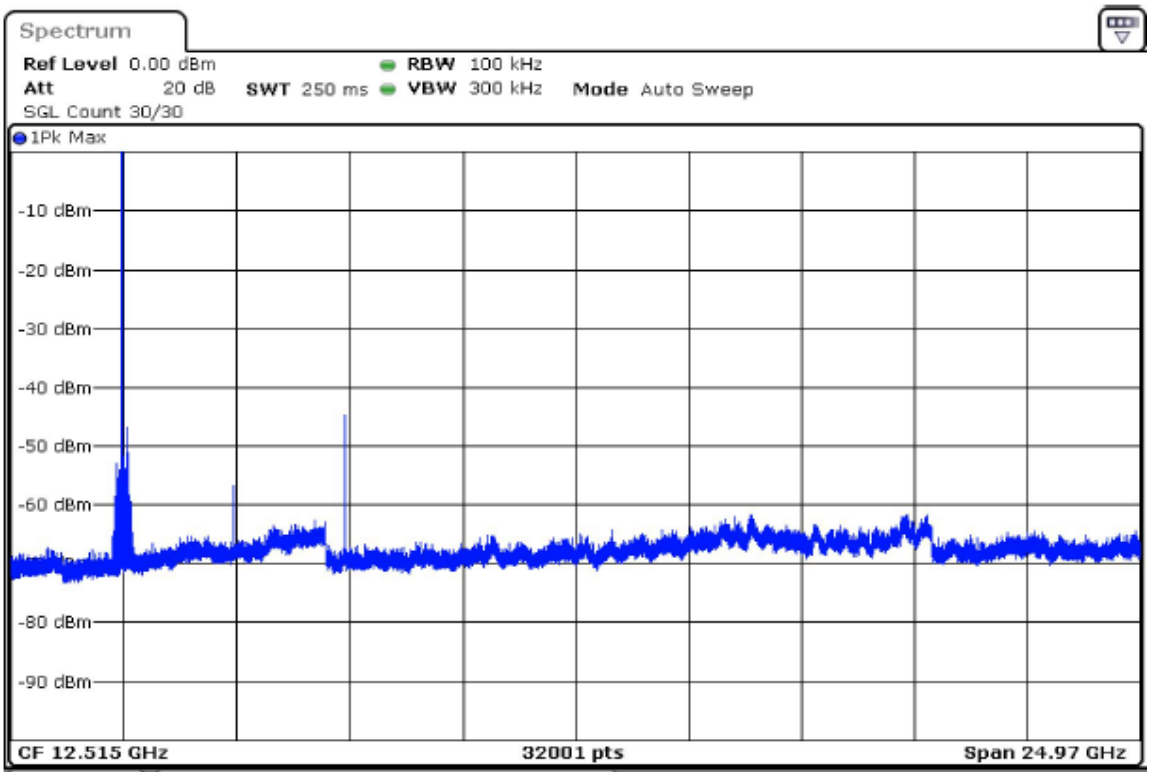
2480 MHz

Plots for packet type DH5 shown below.

Pre Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
7440.786382	-41.1	27.2	-13.9
7439.225805	-41.1	27.2	-13.9
7440.006094	-43.0	29.1	-13.9
2584.273148	-43.9	30.0	-13.9
2583.492860	-44.4	30.5	-13.9
2635.772163	-48.1	34.2	-13.9
2636.552451	-48.6	34.7	-13.9
2610.022656	-48.7	34.8	-13.9
2511.706353	-48.9	35.0	-13.9
2512.486641	-50.0	36.1	-13.9
2375.936221	-50.2	36.3	-13.9
2531.993844	-50.9	37.0	-13.9
2557.743352	-51.1	37.2	-13.9
2558.523640	-52.0	38.1	-13.9
2506.244336	-52.7	38.8	-13.9




Spectrum
Ref Level 0.00 dBm
RBW 100 kHz
Att 20 dB
SWT 250 ms
VBW 300 kHz
Mode Auto Sweep
SGL Count 30/30
1Pk Max
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-80 dBm
-90 dBm
CF 12.515 GHz
32001 pts
Span 24.97 GHz