Test Report

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

Report No	ES1636-3
Client	Harman International Industries Inc. Mark Bowman
Address	30001 Cabot Dr. Novi, MI 48377
Phone	1-248-254-7751
Items tested FCC ID IC	INFO3.5 CSM MY20 2AHPN-BE2843 6434C-BE2843
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	09/20/2018 to 11/21/2018
Results	As detailed within this report

Prepared by

Christopher Hamel – Test Engineer

Authorized by

Yunus Faziloglu – Sr. Engineer

Issue Date 11/30/2018

Conditions of Issue

This Test Report is issued subject to the conditions stated in the '*Conditions of Testing*' section on page 18 of this report.

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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, ISED Canada RSS-247 Issue 2

The product is the INFO3.5 CSM MY20. It is a frequency hopping spread spectrum transmitter that operates in the 2402 – 2480 MHz frequency range.

Antenna Type: Non-detachable PCB trace
Gain: 5.98dBi

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	November 30, 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 Title 47 FCC Part 15.247, ISED Canada RSS-247 Issue 2, ISED Canada RSS-Gen Issue 5 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 antenna is internal and cannot be maximized separately.

EUT operating voltage is 13.8V DC from a vehicle battery only, therefore AC line conducted emissions requirements are not applicable.

The following bandwidths were used during radiated spurious emissions testing.

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

Product Tested - Configuration Documentation

EUT Configuration			
Work Order:	S1636		
Company:	Harman International Inc.		
Company Address:	30001 Cabot Dr.		
	Novi MI 48377		
Contact:	Mark Bowman		
	MN	**PN**	**SN**
EUT:	INFO3.5 CSM MY20	--	--
EUT Description:	Automotive Infotainment Unit with Bluetooth/WLAN		
EUT Max Frequency:	5825 MHz		
EUT Min Frequency:	5825 MHz		

EUT Components	**MN**	**SN**
Head Unit	INFO3.5 CSM MY20	

Support Equipment	**MN**	**SN**
ADB Dev board		

Port Label	Port Type	# ports	# populated	cable type	shielded	ferrites	length (m)	in/out	under test	comment
USB Port	other	1	1	other	Yes	No	1.5	in	yes	
Power/Low speed signal	other	2	2	other	No	No	1	in	yes	
Display	other	1	1	other	Yes	No	1.5	in	yes	
Back up cam	other	1	1	other	Yes	No	2	in	yes	Orange Fackra
External 2.4G wifi	other	1	1	other	Yes	No		in	yes	Beige Fakra
GPS port	other	1	1	other	Yes	No	2	in	yes	Blue fakra Cable
AM/FM Antenna	other	2	2	other	Yes	No	2	in	yes	Black Fakra am and fm, Green FM only
Sdards	other	1	1	other	Yes	No	1.5	in	yes	Yellow Fakra Cable

Software Operating Mode Description:

EUT placed in required Bluetooth test modes via R&S CMW communication tester.

Statement of Conformity

RSS-GEN	RSP-100	RSS 247	Part 15	Comments
6.4			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.
	3.2		15.21	Information to the user is shown in the instruction manual exhibit.
			15.27	No special accessories are required for compliance.
3.2			15.31	The EUT was tested in accordance with the measurement standards in this section.
6.13.2			15.33	Frequency range was investigated according to this section, unless noted in specific rule section under which the equipment operates.
6.13.1			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.
6.8			15.203	EUT employs a non-detachable internal PCB trace antenna with 5.98dBi gain.
8.10			15.205 15.209	The fundamental is not in a Restricted band and the spurious and harmonic emissions in the Restricted bands comply with the general emission limits of 15.209 or RSS-Gen as applicable
8.8			15.207	N/A. EUT is vehicle battery powered only.

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

Test Results

Radiated Spurious Emissions

LIMITS

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

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

MEASUREMENTS / RESULTS

Worst case packet type was found to be DH1

3 Channels were tested: Low (0), Mid (39) and High (78)

Curtis Straus - a Bureau Veritas Company	Work Order - S1636
Radiated Emissions Electric Field 3m Distance	EUT Power Input - 13.8V DC
Top Peaks Vertical 30-1000MHz	Test Site - CH2
Operator: CCH	Conditions - 22.8°C; 46%RH; 1010mBar
Notes:	Witnessed by - N/A
Bluetooth DH1 CH0	EUT Maximum Frequency - 5825MHz

Data Taken at September 20, 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	33.7	-6.7	27	40	-13	PASS	-13
73.141	40.2	-20.1	20.1	40	-19.9	PASS	
104.52	39.6	-16.2	23.4	43.5	-20.1	PASS	
196.379	38.1	-14.8	23.2	43.5	-20.3	PASS	
466.354	36.4	-9.1	27.3	46	-18.7	PASS	
897.641	31.9	-1.8	30.2	46	-15.8	PASS	

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
Top Peaks Horizontal 30-1000MHz
Operator: CCH
Notes:
Bluetooth DH1 CH0

Work Order - S1636
EUT Power Input - 13.8V DC
Test Site - CH2
Conditions - 22.8°C; 46%RH; 1010mBar
Witnessed by - N/A
EUT Maximum Frequency - 5825MHz

Data Taken at September 20, 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)
30.121	32.9	-6.5	26.4	40	-13.6	PASS	
466.354	38.2	-9.1	29.1	46	-16.9	PASS	
552.394	35.6	-7.9	27.7	46	-18.3	PASS	
621.433	36.8	-6.6	30.2	46	-15.8	PASS	
828.601	35.4	-3.1	32.2	46	-13.8	PASS	
897.641	34.8	-1.8	33	46	-13	PASS	-13

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
Top Peaks Vertical 30-1000MHz
Operator: CCH
Notes:
Bluetooth DH1 CH39

Work Order - S1636
EUT Power Input - 13.8V DC
Test Site - CH2
Conditions - 22.8°C; 46%RH; 1010mBar
Witnessed by - N/A
EUT Maximum Frequency - 5825MHz

Data Taken at September 20, 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)
30.194	32.5	-6.5	26	40	-14	PASS	-14
104.496	40.1	-16.2	23.9	43.5	-19.6	PASS	
466.379	36.3	-9.1	27.3	46	-18.7	PASS	
483.354	34	-8.5	25.5	46	-20.5	PASS	
607.975	33.8	-7	26.8	46	-19.2	PASS	
897.665	33.6	-1.8	31.8	46	-14.2	PASS	

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
Top Peaks Horizontal 30-1000MHz
Operator: CCH
Notes:
Bluetooth DH1 CH39

Work Order - S1636
EUT Power Input - 13.8V DC
Test Site - CH2
Conditions - 22.8°C; 46%RH; 1010mBar
Witnessed by - N/A
EUT Maximum Frequency - 5825MHz

Data Taken at September 20, 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	32	-6.4	25.6	40	-14.4	PASS	
466.33	37.8	-9.1	28.7	46	-17.3	PASS	
621.457	37	-6.6	30.4	46	-15.6	PASS	
798.458	34.9	-3.3	31.6	46	-14.4	PASS	
828.601	34.4	-3.1	31.2	46	-14.8	PASS	
897.641	33.9	-1.8	32.2	46	-13.8	PASS	-13.8

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
Top Peaks Vertical 30-1000MHz
Operator: CCH
Notes:
Bluetooth DH1 CH78

Work Order - S1636
EUT Power Input - 13.8V DC
Test Site - CH2
Conditions - 22.8°C; 46%RH; 1010mBar
Witnessed by - N/A
EUT Maximum Frequency - 5825MHz

Data Taken at September 20, 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)
30.727	32.8	-6.9	25.9	40	-14.1	PASS	-14.1
57.233	39.9	-20.8	19.1	40	-20.9	PASS	
466.379	36.1	-9.1	27	46	-19	PASS	
601.184	34	-6.9	27.1	46	-18.9	PASS	
759.537	34.1	-3.8	30.3	46	-15.7	PASS	
959.066	32	-1.5	30.5	46	-15.5	PASS	

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
Top Peaks Horizontal 30-1000MHz
Operator: CCH
Notes:
Bluetooth DH1 CH78

Work Order - S1636
EUT Power Input - 13.8V DC
Test Site - CH2
Conditions - 22.8°C; 46%RH; 1010mBar
Witnessed by - N/A
EUT Maximum Frequency - 5825MHz

Data Taken at September 20, 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	32	-6.4	25.7	40	-14.3	PASS	
466.354	37.6	-9.1	28.6	46	-17.4	PASS	
580.839	35.9	-7.3	28.5	46	-17.5	PASS	
621.433	36.7	-6.6	30.1	46	-15.9	PASS	
828.625	34.3	-3.1	31.1	46	-14.9	PASS	
897.665	35	-1.8	33.2	46	-12.8	PASS	-12.8

30-1000MHz

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
1-6GHz Vertical Data
Operator: CCH
Notes:
Bluetooth DH1 CH0

Work Order - S1636
EUT Power Input - 13.8V DC
Test Site - CH2
Conditions - 22.8°C; 46%RH; 1010mBar
Witnessed by - N/A
EUT Maximum Frequency - 5825MHz

Data Taken at September 20, 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)
2086.5	42.2	32.5	0.7	42.9	74	-31.1	PASS		33.2	54	-20.8	PASS	
2902.9	41	32.7	2.6	43.6	74	-30.4	PASS		35.3	54	-18.7	PASS	
5962.8	39.4	31.1	6.1	45.5	74	-28.5	PASS	-28.5	37.1	54	-16.9	PASS	-16.9

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
1-6GHz Horizontal Data
Operator: CCH
Notes:
Bluetooth DH1 CH0

Work Order - S1636
EUT Power Input - 13.8V DC
Test Site - CH2
Conditions - 22.8°C; 46%RH; 1010mBar
Witnessed by - N/A
EUT Maximum Frequency - 5825MHz

Data Taken at September 20, 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)
2183.4	41.2	32.6	2	43.1	74	-30.9	PASS		34.6	54	-19.4	PASS	
3084.1	41	32.9	2.2	43.1	74	-30.9	PASS		35	54	-19	PASS	
5770.1	40.5	31	6.1	46.6	74	-27.4	PASS	-27.4	37.1	54	-16.9	PASS	-16.9

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
1-6GHz Vertical Data
Operator: CCH
Notes:
Bluetooth DH1 CH39

Work Order - S1636
EUT Power Input - 13.8V DC
Test Site - CH2
Conditions - 22.8°C; 46%RH; 1010mBar
Witnessed by - N/A
EUT Maximum Frequency - 5825MHz

Data Taken at September 20, 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)
1312.4	41.3	32.4	-3.3	38	74	-36	PASS		29.1	54	-24.9	PASS	
2163.3	42.5	32.6	1.8	44.2	74	-29.8	PASS		34.4	54	-19.6	PASS	
3252.2	42.2	32.8	2.1	44.3	74	-29.7	PASS		35	54	-19	PASS	
5856.2	41.6	30.9	6.1	47.7	74	-26.3	PASS	-26.3	37	54	-17	PASS	-17

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
1-6GHz Horizontal Data
Operator: CCH
Notes:
Bluetooth DH1 CH39

Work Order - S1636
EUT Power Input - 13.8V DC
Test Site - CH2
Conditions - 22.8°C; 46%RH; 1010mBar
Witnessed by - N/A
EUT Maximum Frequency - 5825MHz

Data Taken at September 20, 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)
2150.3	40.3	32.5	1.7	41.9	74	-32.1	PASS		34.2	54	-19.8	PASS	
3190.6	41.4	33	2.5	44	74	-30	PASS		35.5	54	-18.5	PASS	
4184.8	41.1	31.5	2.7	43.9	74	-30.1	PASS		34.3	54	-19.7	PASS	
4671.3	40.9	31.3	3.2	44.1	74	-29.9	PASS		34.5	54	-19.5	PASS	
5787.5	39.2	31	6.1	45.3	74	-28.7	PASS	-28.7	37.1	54	-16.9	PASS	-16.9

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
1-6GHz Vertical Data
Operator: CCH
Notes:
Bluetooth DH1 CH78

Work Order - S1636
EUT Power Input - 13.8V DC
Test Site - CH2
Conditions - 22.8°C; 46%RH; 1010mBar
Witnessed by - N/A
EUT Maximum Frequency - 5825MHz

Data Taken at September 20, 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)
1339.7	41	32.6	-3.5	37.5	74	-36.5	PASS		29.1	54	-24.9	PASS	
1503	40.7	32.4	-4.4	36.2	74	-37.8	PASS		28	54	-26	PASS	
2150.2	41.2	32.6	1.7	42.8	74	-31.2	PASS		34.2	54	-19.8	PASS	
3060.9	43.1	32.9	2.2	45.4	74	-28.6	PASS		35.1	54	-18.9	PASS	
4201.8	39.6	31.4	2.8	42.4	74	-31.6	PASS		34.2	54	-19.8	PASS	
5806.6	39.3	30.9	6.1	45.4	74	-28.6	PASS	-28.6	37.1	54	-16.9	PASS	-16.9

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 3m Distance
1-6GHz Horizontal Data
Operator: CCH
Notes:
Bluetooth DH1 CH78

Work Order - S1636
EUT Power Input - 13.8V DC
Test Site - CH2
Conditions - 22.8°C; 46%RH; 1010mBar
Witnessed by - N/A
EUT Maximum Frequency - 5825MHz

Data Taken at September 20, 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)
2129.8	41.8	32.7	1.5	43.2	74	-30.8	PASS		34.1	54	-19.9	PASS	
3215.4	40.8	32.9	2.4	43.2	74	-30.8	PASS		35.3	54	-18.7	PASS	
5825.4	39.6	30.9	6.1	45.7	74	-28.3	PASS	-28.3	37	54	-17	PASS	-17

1-6GHz

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 1m Distance
6-18GHz Vertical Data
Operator: CCH
Notes:
Bluetooth DH1 CH0

Work Order - S1636
EUT Power Input - 13.8V DC
Test Site - CH2
Conditions - 22.8°C; 46%RH; 1010mBar
Witnessed by - N/A
EUT Maximum Frequency - 5825MHz

Data Taken at September 20, 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)
17969.9	40.6	30.8	21.7	62.2	83.5	-21.3	PASS	-21.3	52.4	63.5	-11.1	PASS	-11.1

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 1m Distance
6-18GHz Horizontal Data
Operator: CCH
Notes:
Bluetooth DH1 CH0

Work Order - S1636
EUT Power Input - 13.8V DC
Test Site - CH2
Conditions - 22.8°C; 46%RH; 1010mBar
Witnessed by - N/A
EUT Maximum Frequency - 5825MHz

Data Taken at September 20, 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)
17980.2	41	30.6	21.8	62.8	83.5	-20.7	PASS	-20.7	52.4	63.5	-11.1	PASS	-11.1

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 1m Distance
6-18GHz Vertical Data
Operator: CCH
Notes:
Bluetooth DH1 CH39

Work Order - S1636
EUT Power Input - 13.8V DC
Test Site - CH2
Conditions - 22.8°C; 46%RH; 1010mBar
Witnessed by - N/A
EUT Maximum Frequency - 5825MHz

Data Taken at September 20, 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)
17989	39.6	30.6	21.9	61.5	83.5	-22	PASS	-22	52.5	63.5	-11	PASS	-11

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 1m Distance
6-18GHz Horizontal Data
Operator: CCH
Notes:
Bluetooth DH1 CH39

Work Order - S1636
EUT Power Input - 13.8V DC
Test Site - CH2
Conditions - 22.8°C; 46%RH; 1010mBar
Witnessed by - N/A
EUT Maximum Frequency - 5825MHz

Data Taken at September 20, 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)
16751.4	39.1	30.5	18.1	57.3	83.5	-26.2	PASS		48.6	63.5	-14.9	PASS	
17940.1	39.4	30.8	21.3	60.6	83.5	-22.9	PASS	-22.9	52.1	63.5	-11.4	PASS	-11.4

Curtis Straus - a Bureau Veritas Company
Radiated Emissions Electric Field 1m Distance
6-18GHz Vertical Data
Operator: CCH
Notes:
Bluetooth DH1 CH78

Work Order - S1636
EUT Power Input - 13.8V DC
Test Site - CH2
Conditions - 22.8°C; 46%RH; 1010mBar
Witnessed by - N/A
EUT Maximum Frequency - 5825MHz

Data Taken at September 20, 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)
10709.5	39.2	29.9	13	52.2	83.5	-31.3	PASS		42.9	63.5	-20.6	PASS	
17944.9	39.8	30.8	21.3	61.1	83.5	-22.4	PASS	-22.4	52.2	63.5	-11.3	PASS	-11.3

Curtis Straus - a Bureau Veritas Company	Work Order - S1636
Radiated Emissions Electric Field 1m Distance	EUT Power Input - 13.8V DC
6-18GHz Horizontal Data	Test Site - CH2
Operator: CCH	Conditions - 22.8°C; 46%RH; 1010mBar
Notes:	Witnessed by - N/A
Bluetooth DH1 CH78	EUT Maximum Frequency - 5825MHz

Data Taken at September 20, 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)
17997.6	40	30.3	22	62	83.5	-21.5	PASS	-21.5	52.4	63.5	-11.1	PASS	-11.1

6-18GHz

Radiated Emissions Table

Date: 20-Sep-18 **Company:** Harman International **Work Order:** S1636
Engineer: Chris Hamel **EUT Desc:** INFO3.5 CSM MY20 **EUT Operating Voltage/Frequency:** 13.8V DC
Temp: 22.8°C **Humidity:** 46% **Pressure:** 1010mBar
Frequency Range: 18-26.5GHz **Measurement Distance:** 0.1 m
Notes: No Emissions Found **EUT Max Freq:** 5825MHz
Bluetooth DH1 Channels 0 39 78

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: Gold **Preamp:** 18-26.5GHz **Antenna:** 18-26.5GHz Horn **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.208

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

18-26.5GHz

Rev. 10/8/2018

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
Gold	100Hz-26.5 GHz	E4407B	Agilent	MY45113816	1284	I	3/19/2019

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

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 #2054	9kHz - 18GHz		Florida RF			II	10/31/2018
Asset #2466	9KHz-18GHz		MegaPhase			II	10/29/2018
Asset #2323	1-26.5GHz	TM26-S1S1-120	MEGAPHASE	17139101 002	2323	II	8/9/2019

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

TEU

Radiated Band Edges

Radiated Band Edges

Date: 10-Oct-18 **Company:** Harman International **Work Order:** S1636
Engineer: Chris Hamel **EUT Desc:** INFO3.5 CSM MY20 **EUT Operating Voltage/Frequency:** 13.8V DC
Temp: 24.0°C **Humidity:** 51% **Pressure:** 1012mBar
Frequency Range: 2.3-2.5GHz **Measurement Distance:** 1 m
Notes: BT Band edges. Worst case antenna polarization is vertical.
DH1 - Worst case packet type

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)
Low				---	---	---	---	---	---	---	---	---	---	---
V	2390.0	16.1	16.1	0.0	32.6	4.2	52.9	52.9	83.5	-30.6	Pass	63.5	-10.6	Pass
High				---	---	---	---	---	---	---	---	---	---	---
V	2483.5	14.9	14.9	0.0	32.8	4.0	51.7	51.7	83.5	-31.8	Pass	63.5	-11.8	Pass
V	2485.3	15.5	15.5	0.0	32.8	4.0	52.3	52.3	83.5	-31.2	Pass	63.5	-11.2	Pass

Table Result: Pass by -10.6 dB ***Worst Freq:*** 2390.0 MHz

Test Site: EMI Chamber 2 **Cable 1:** Asset #2051 **Cable 2:** Asset #2054 **Cable 3:** ---
Analyzer: Rental SA#4 **Preamp:** None **Antenna:** Blue Horn **Preselector:** ---
CSsoft Radiated Emissions Calculator v 1.017.208

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 #2054	9kHz - 18GHz		Florida RF			II	10/31/2018

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

Not Applicable. EUT is vehicle battery powered only

Measurement Uncertainty

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

Measurement	Expanded Uncertainty k=2	Maximum allowable uncertainty
Radiated Emissions (30-1000MHz) NIST 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

ES1636-3 Appendix A

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

DUT Information

DUT Name:	INFO3.5 CSM MY20
Manufacturer:	Harman International Industries, Inc.
Serial Number:	02

79 channels are provided for BT mode:

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

Notes: The channels which were indicated in bold type of the above channel list were selected as representative test channels.

Antenna gain	5.98 dBi
Number of transmit chains	1
Equipment type	Frequency Hopping Spread Spectrum

Test Equipment Used

Rev. 10/03/2018								
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	10/1/2019	10/1/2018
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	10/1/2019	10/1/2018
SMB100A Signal Generator	100kHz-40GHz	SMB100A	ROHDE & SCHWARZ	179846	2557	I	10/1/2019	10/1/2018
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	2558	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	2434	III	verify before use	
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 (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
Occupied Channel Bandwidth 99%	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	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Emission Bandwidth 20 dB	2441.000 (single)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Occupied Channel Bandwidth 99%	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	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Emission Bandwidth 20 dB	2480.000 (single)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Occupied Channel Bandwidth 99%	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	------	------	------	------	------	------	------

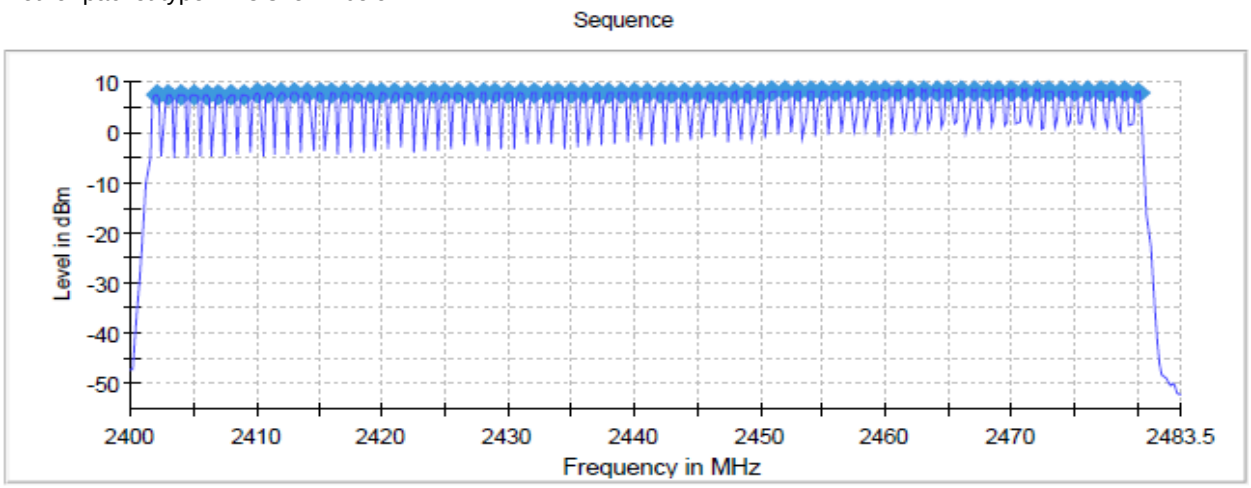
Number of Hopping Frequencies

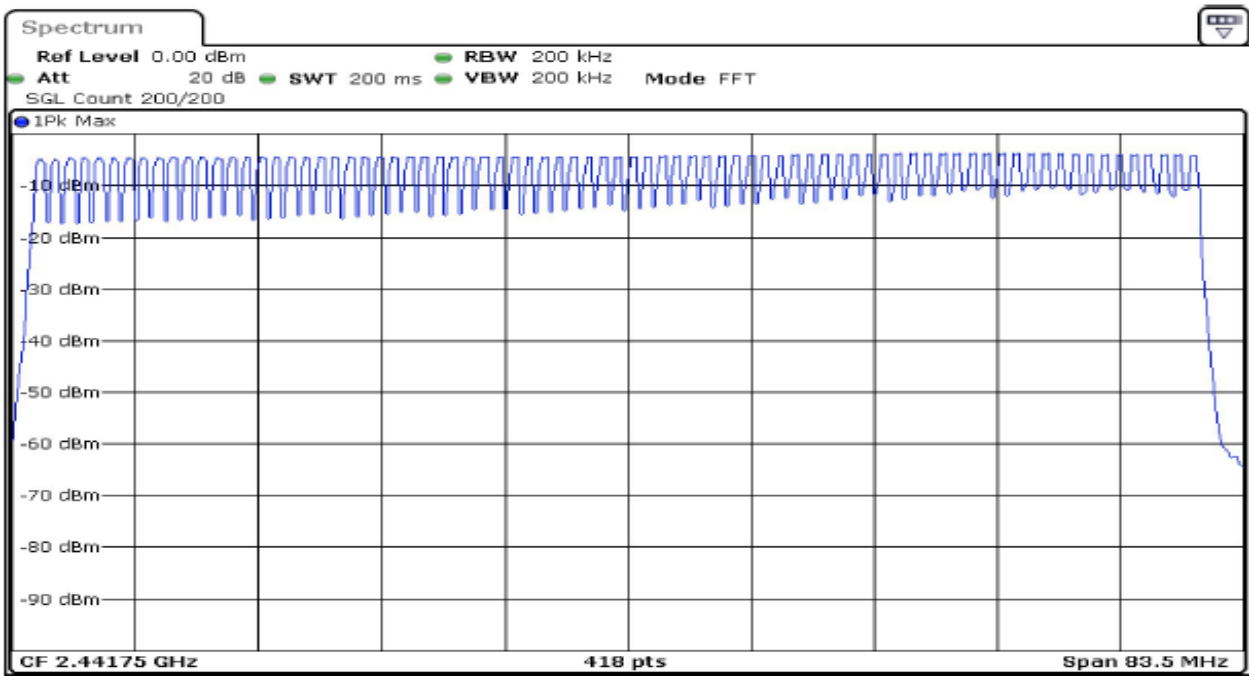
Test procedure in accordance with ANSI C63.10-2013

Channels

Channels	Limit Min	Result
79	15	PASS

Plot for packet type DH3 shown below.





Band Edge (during hopping)

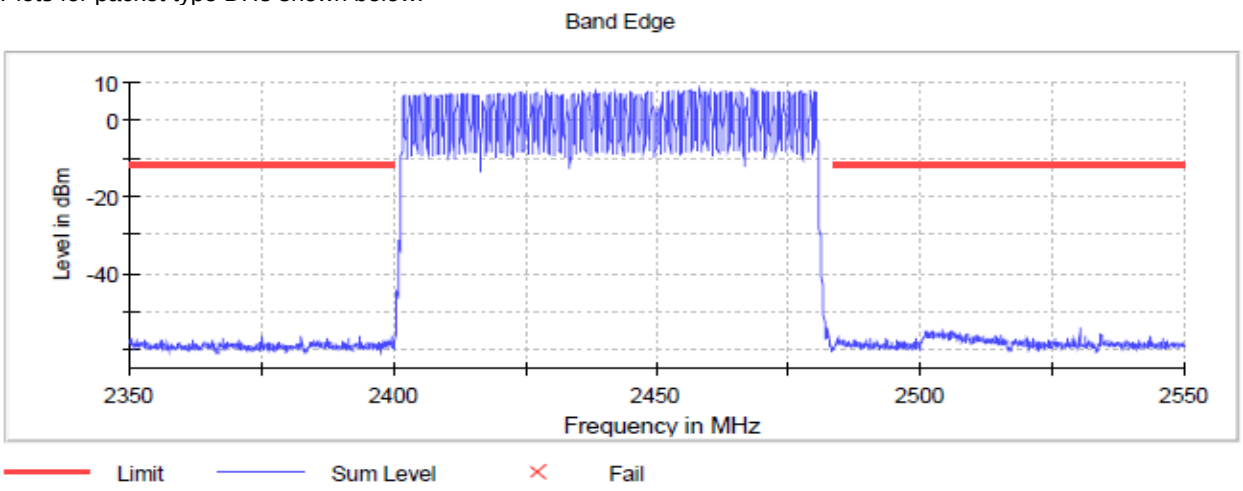
Test procedure in accordance with ANSI C63.10-2013

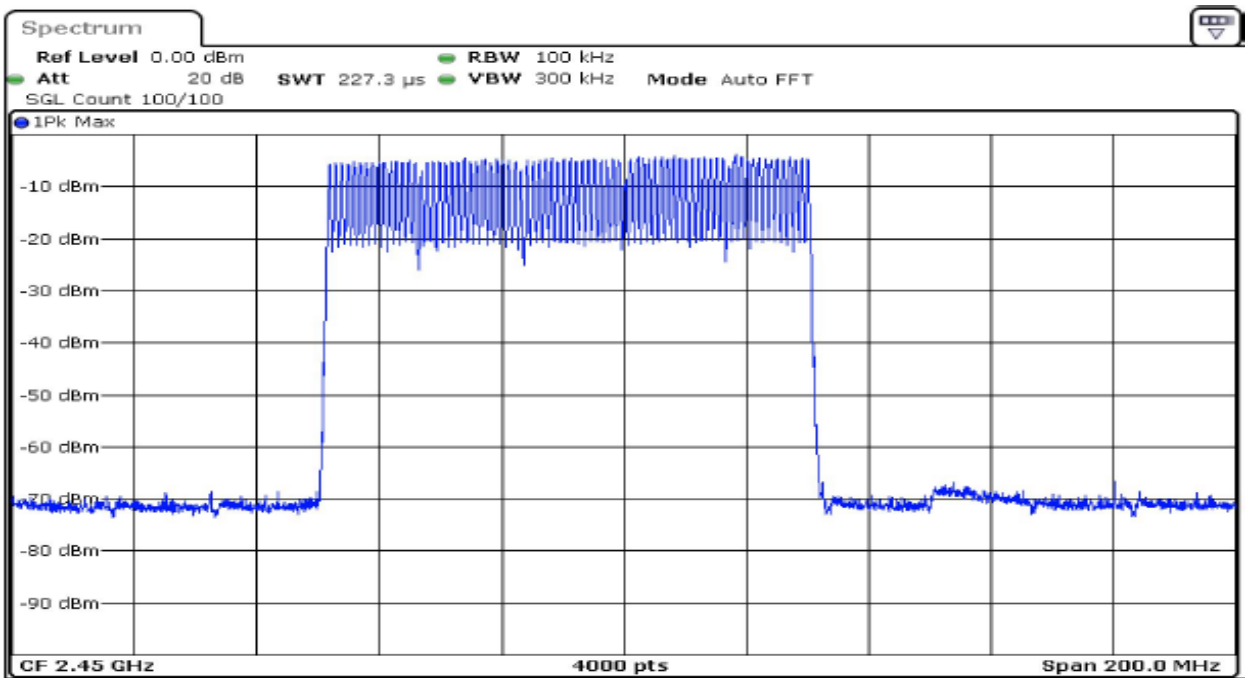
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 0.8 dB

Inband Peak

Data Rate	Frequency (MHz)	Level (dBm)
DH1	2464.8750	8.3
DH3	2468.1750	8.4
DH5	2462.0250	8.0
2-DH1	2453.8750	3.6
2-DH3	2469.0250	3.6
2-DH5	2465.1750	3.6
3-DH1	2460.8750	3.8
3-DH3	2459.1750	3.7
3-DH5	2470.1750	3.7

Plots for packet type DH3 shown below.




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
-70 dBm
-80 dBm
-90 dBm
CF 2.45 GHz
4000 pts
Span 200.0 MHz

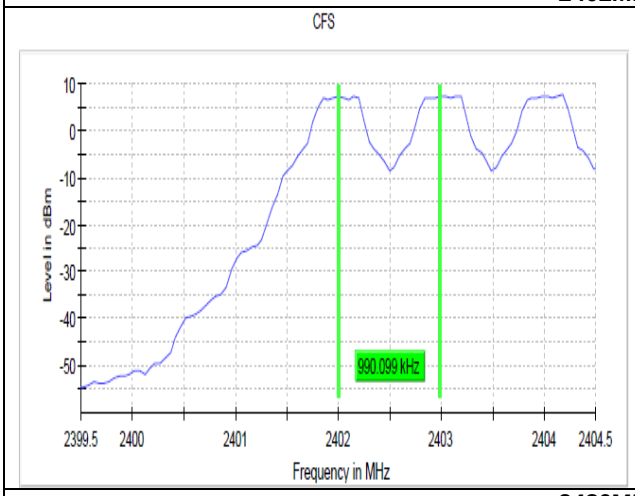
Carrier Frequency Separation

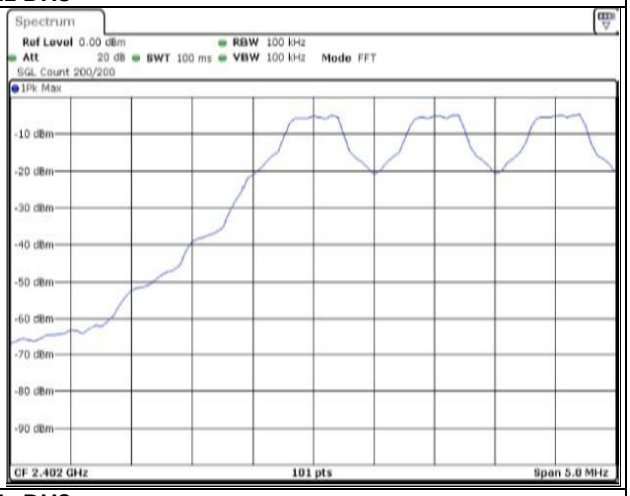
Test procedure in accordance with ANSI C63.10-2013
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty(k = 2) < 1%

Hopping Mode				
Packet Type	2402MHz		2480MHz	
	Frequency Separation (MHz)	Minimum Limit (MHz)	Frequency Separation (MHz)	Minimum Limit (MHz)
DH1	0.990099	0.693069	0.990099	0.693069
DH3	0.990099	0.693069	0.990099	0.693069
DH5	0.990099	0.693069	0.990099	0.712871
2-DH1	0.990099	0.950495	0.990099	0.930693
2-DH3	0.990099	0.950495	0.990099	0.930693
2-DH5	0.990099	0.950495	0.990099	0.930693
3-DH1	0.990099	0.910891	0.990099	0.891089
3-DH3	0.990099	0.930693	0.990099	0.930693
3-DH5	0.940594	0.930693	0.990099	0.930693

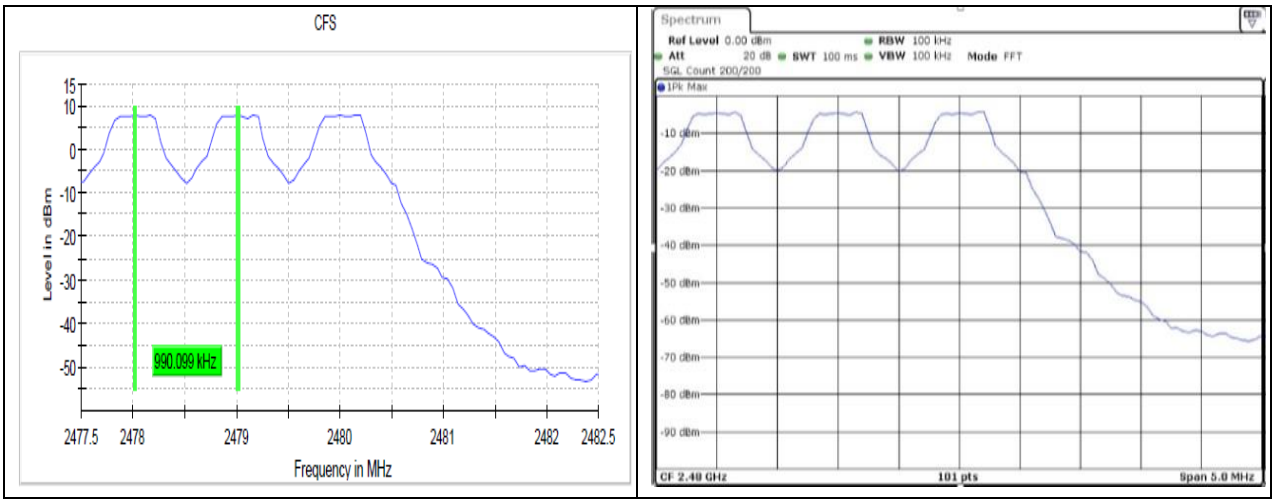
*Limit is 2/3 of the widest 20dB bandwidth of the corresponding packet type.

2402MHz DH3





2480MHz DH3


CFS
Level in dBm
15
10
0
-10
-20
-30
-40
-50
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 2.40 GHz
101 pts
Span 5.0 MHz

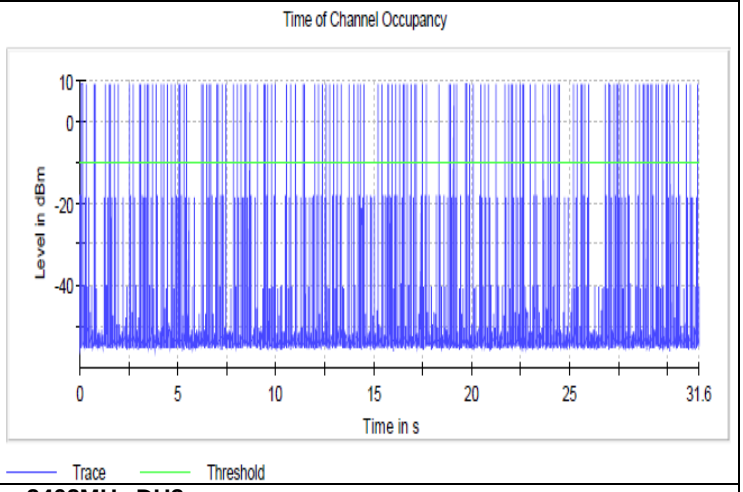
Time of Channel Occupancy (Dwell Time)

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%

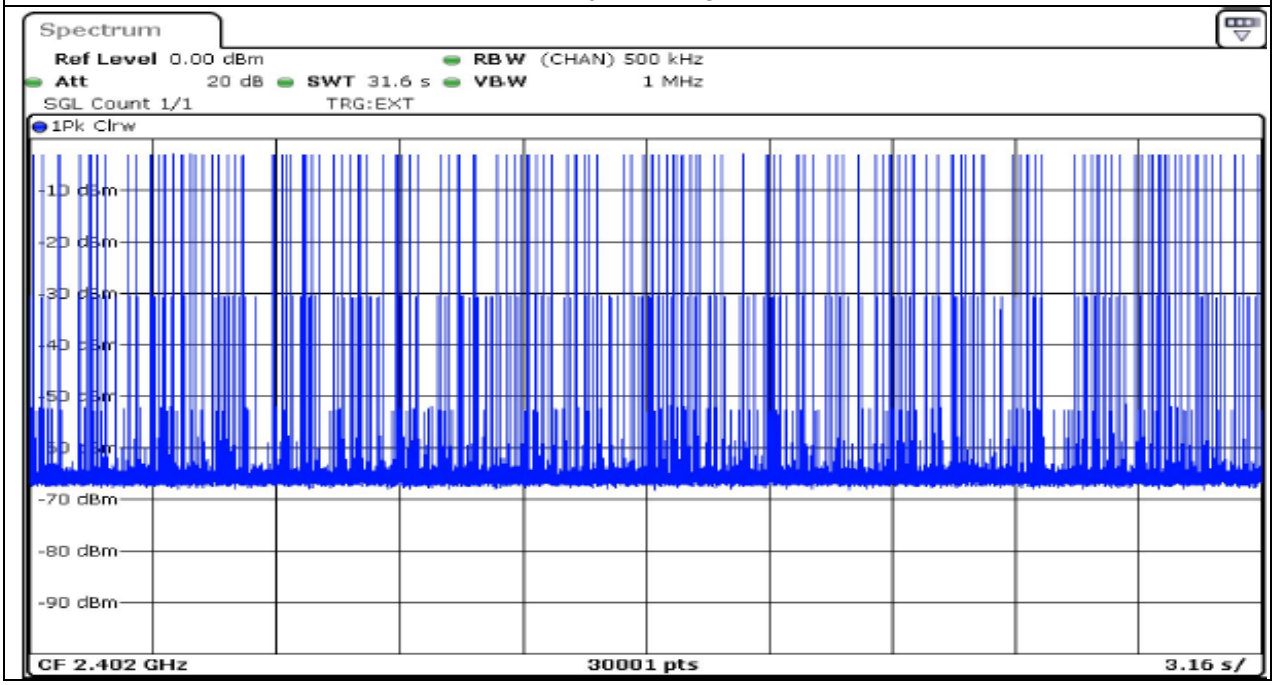
2402MHz

Data Rate	Time (ms)	Limit Max (ms)	Result
DH1	126.260	400.000	PASS
DH3	249.210	400.000	PASS
DH5	292.790	400.000	PASS
2-DH1	126.460	400.000	PASS
2-DH3	258.880	400.000	PASS
2-DH5	328.110	400.000	PASS
3-DH1	127.420	400.000	PASS
3-DH3	240.400	400.000	PASS
3-DH5	303.900	400.000	PASS

2402MHz DH3



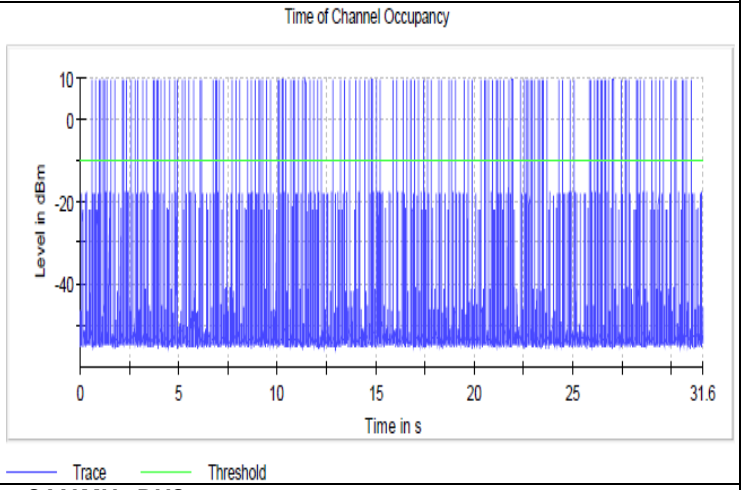
2402MHz DH3



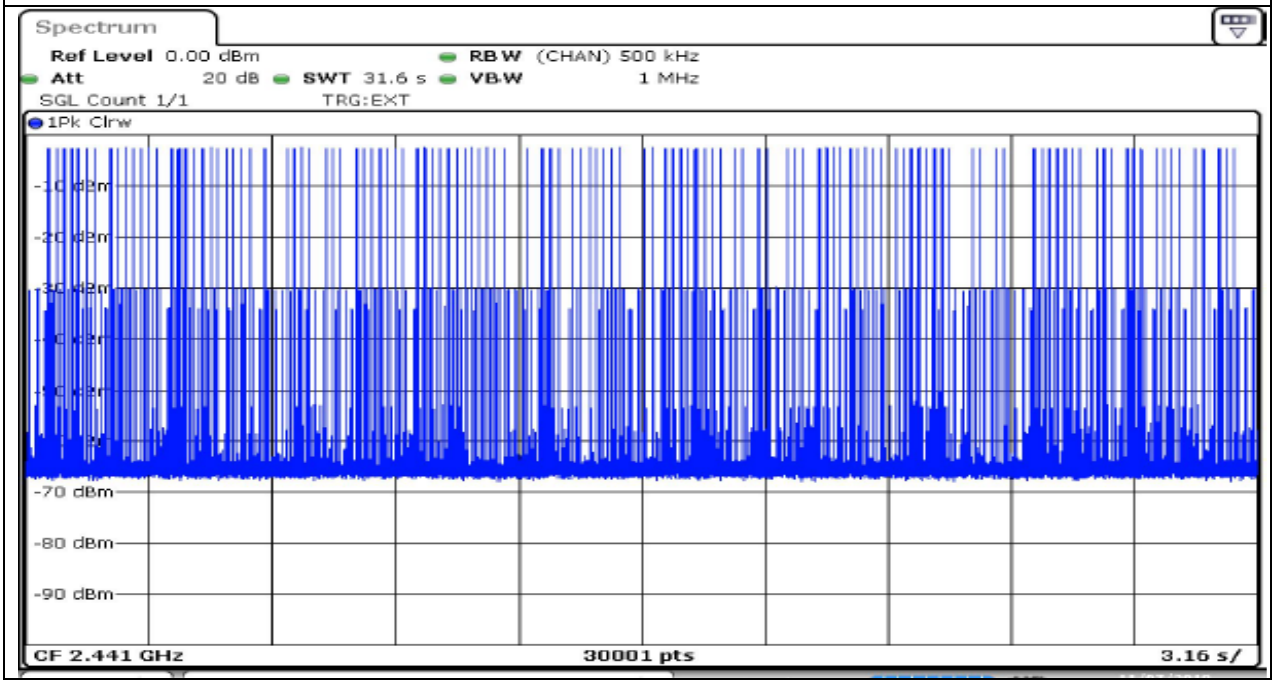
2441MHz

Data Rate	Time (ms)	Limit Max (ms)	Result
DH1	126.190	400.000	PASS
DH3	265.700	400.000	PASS
DH5	313.040	400.000	PASS
2-DH1	126.700	400.000	PASS
2-DH3	249.500	400.000	PASS
2-DH5	317.350	400.000	PASS
3-DH1	127.470	400.000	PASS
3-DH3	272.230	400.000	PASS
3-DH5	342.220	400.000	PASS

2441MHz DH3



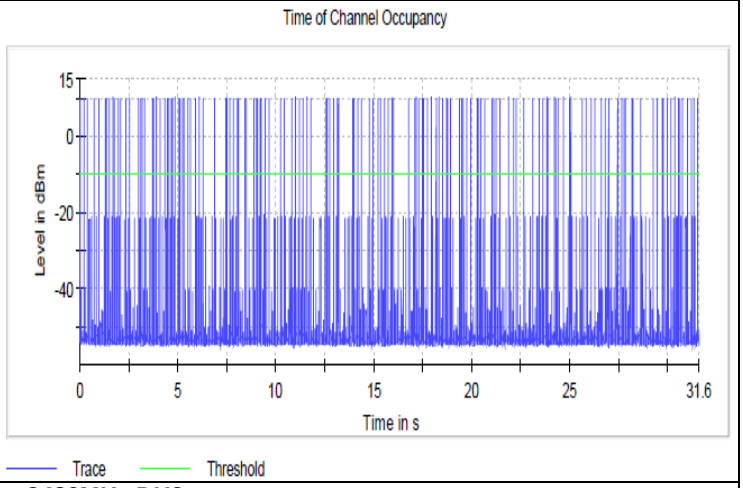
2441MHz DH3



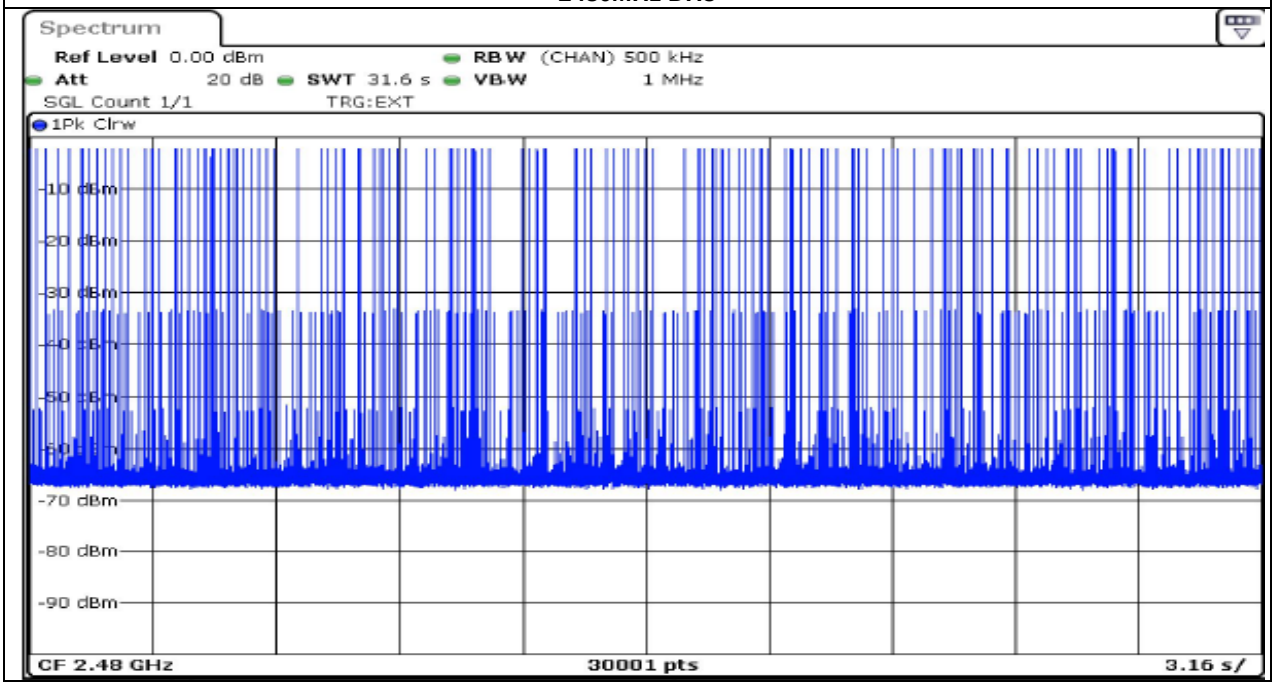
2480MHz

Data Rate	Time (ms)	Limit Max (ms)	Result
DH1	126.320	400.000	PASS
DH3	260.790	400.000	PASS
DH5	347.750	400.000	PASS
2-DH1	126.990	400.000	PASS
2-DH3	263.230	400.000	PASS
2-DH5	311.920	400.000	PASS
3-DH1	127.530	400.000	PASS
3-DH3	255.760	400.000	PASS
3-DH5	316.090	400.000	PASS

2480MHz DH3



2480MHz DH3

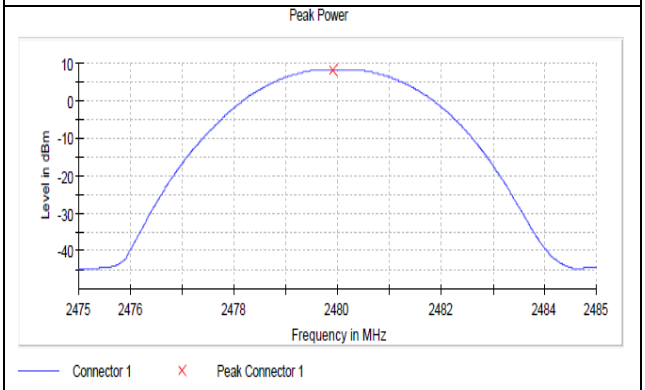


Peak Output Power

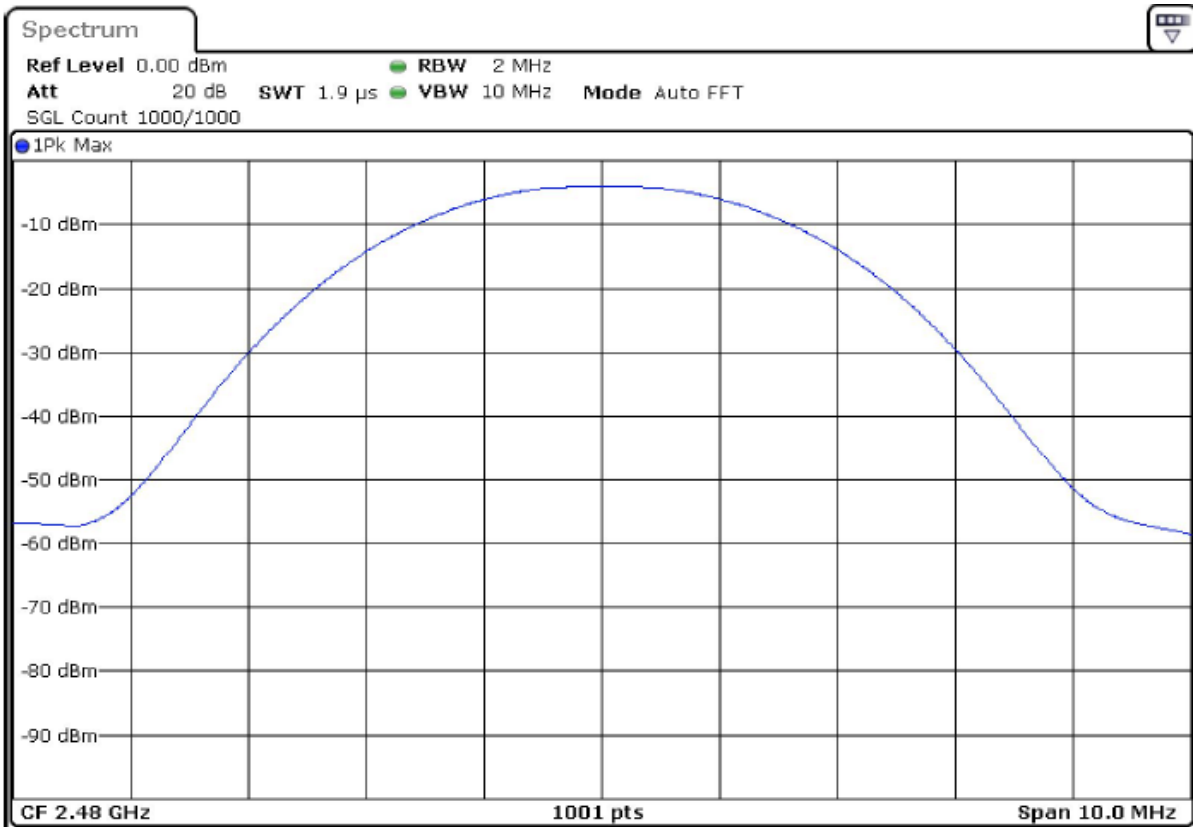
Test procedure in accordance with ANSI C63.10-2013

Data Rate	2402MHz	2441MHz	2480MHz	Limit dBm
DH1	7.302	7.818	8.091	20.96
DH3	7.512	7.997	8.294	20.96
DH5	7.503	8.007	8.265	20.96
2-DH1	4.885	5.418	5.532	20.96
2-DH3	4.945	5.436	5.737	20.96
2-DH5	4.692	5.703	5.646	20.96
3-DH1	5.084	5.653	5.876	20.96
3-DH3	5.154	5.628	5.875	20.96
3-DH5	5.324	6.163	6.112	20.96

2480MHz DH3



2480MHz DH3



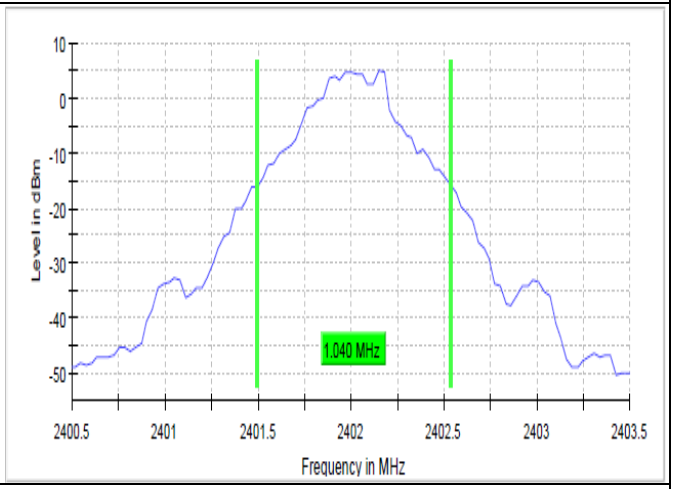
Emission Bandwidth 20 dB

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%

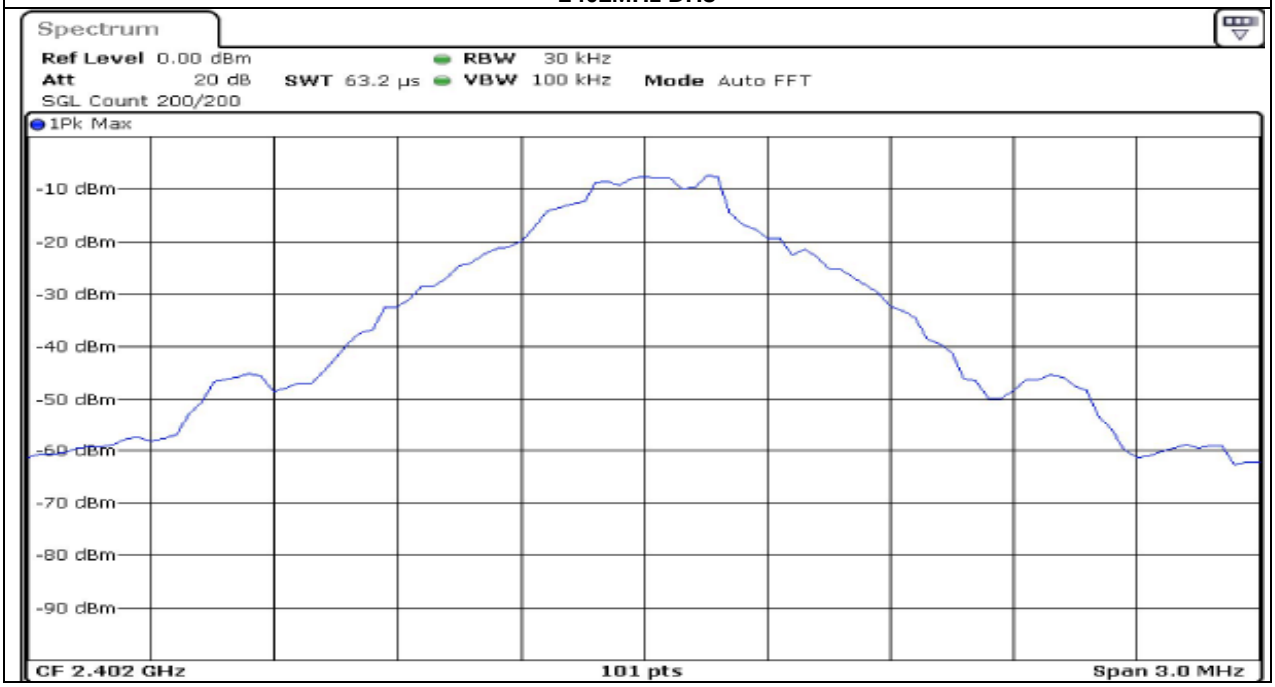
2402MHz

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	1.039603	2401.495050	2402.534653	PASS
DH3	1.039603	2401.495050	2402.534653	PASS
DH5	1.039603	2401.495050	2402.534653	PASS
2-DH1	1.425742	2401.287129	2402.712871	PASS
2-DH3	1.425742	2401.287129	2402.712871	PASS
2-DH5	1.425742	2401.287129	2402.712871	PASS
3-DH1	1.366336	2401.316832	2402.683168	PASS
3-DH3	1.396039	2401.287129	2402.683168	PASS
3-DH5	1.396039	2401.287129	2402.683168	PASS

2402MHz DH3



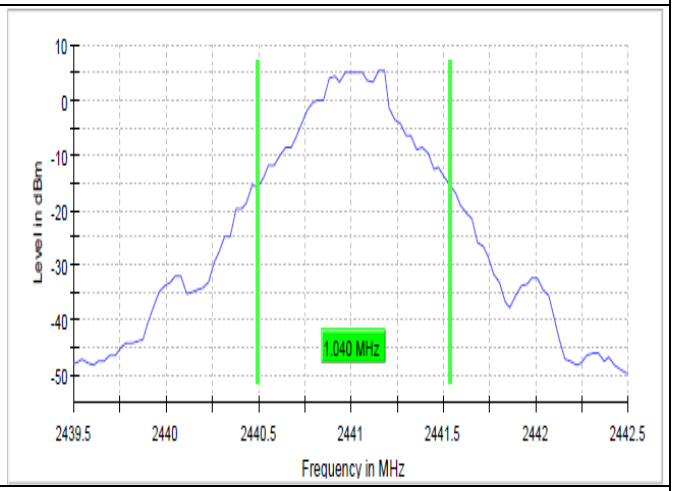
2402MHz DH3



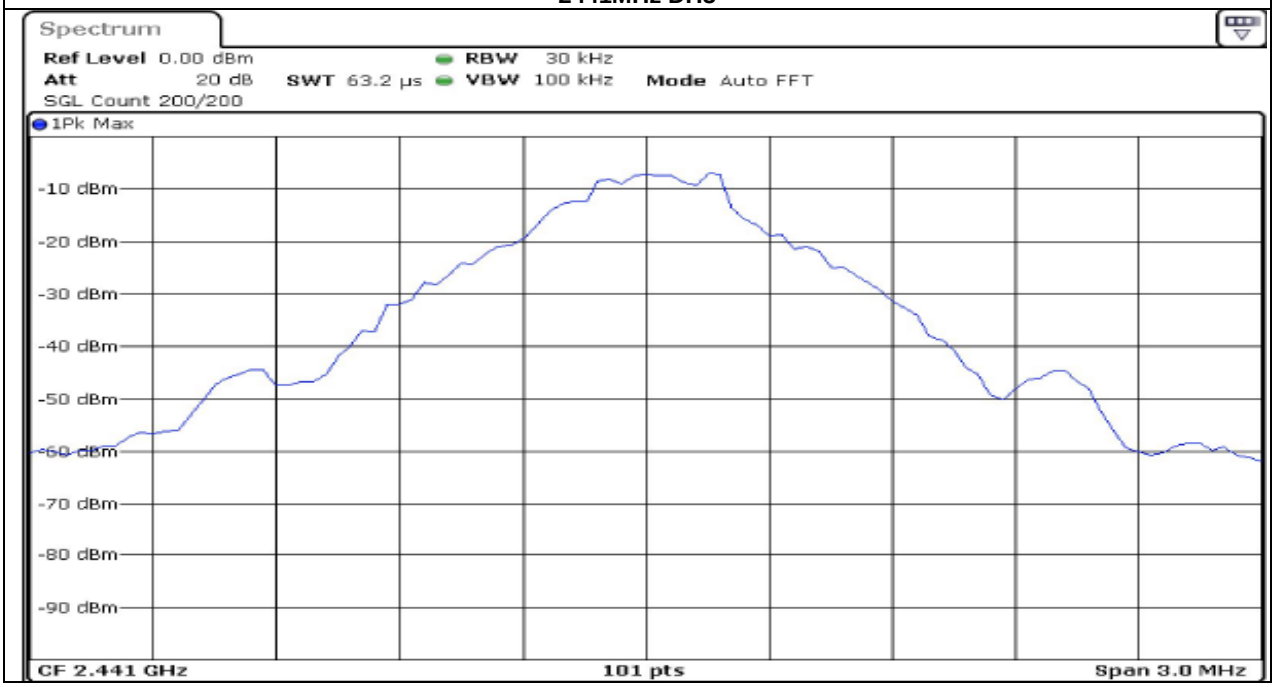
2441MHz

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	1.039603	2440.495050	2441.534653	PASS
DH3	1.039603	2440.495050	2441.534653	PASS
DH5	1.039603	2440.495050	2441.534653	PASS
2-DH1	1.396039	2440.316832	2441.712871	PASS
2-DH3	1.396039	2440.316832	2441.712871	PASS
2-DH5	1.396039	2440.316832	2441.712871	PASS
3-DH1	1.366336	2440.316832	2441.683168	PASS
3-DH3	1.366336	2440.316832	2441.683168	PASS
3-DH5	1.396039	2440.316832	2441.712871	PASS

2441MHz DH3



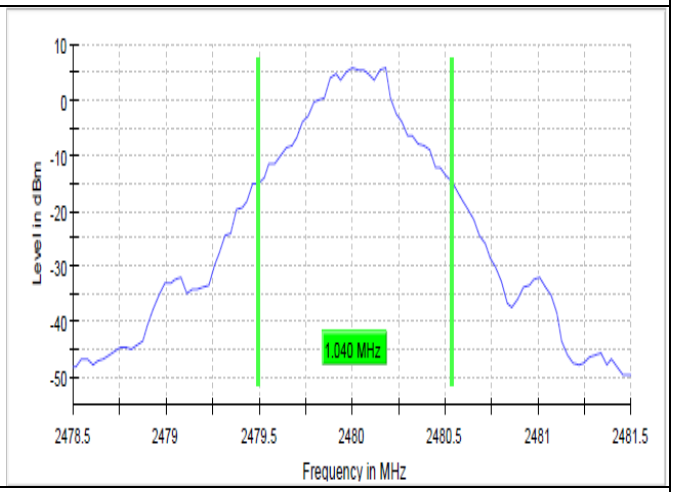
2441MHz DH3



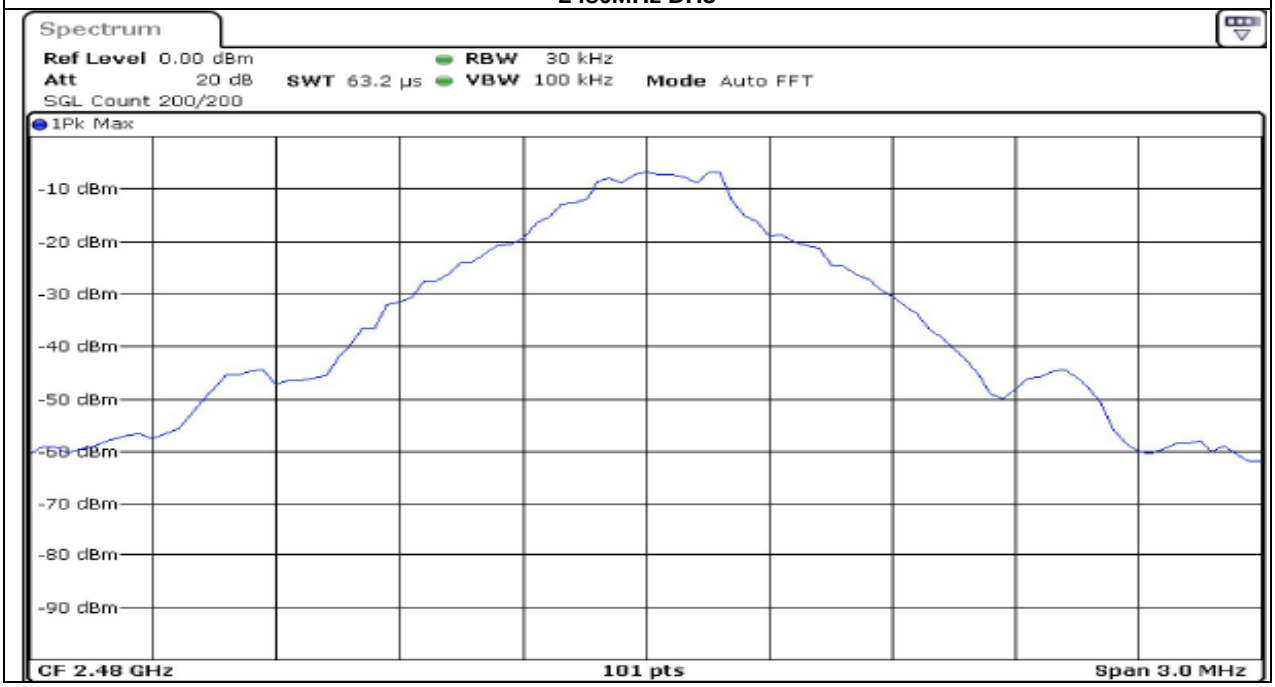
2480MHz

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	1.039603	2479.495050	2480.534653	PASS
DH3	1.039603	2479.495050	2480.534653	PASS
DH5	1.069306	2479.495050	2480.564356	PASS
2-DH1	1.396039	2479.316832	2480.712871	PASS
2-DH3	1.396039	2479.316832	2480.712871	PASS
2-DH5	1.396039	2479.316832	2480.712871	PASS
3-DH1	1.336633	2479.346535	2480.683168	PASS
3-DH3	1.396039	2479.316832	2480.712871	PASS
3-DH5	1.396039	2479.316832	2480.712871	PASS

2480MHz DH3



2480MHz DH3



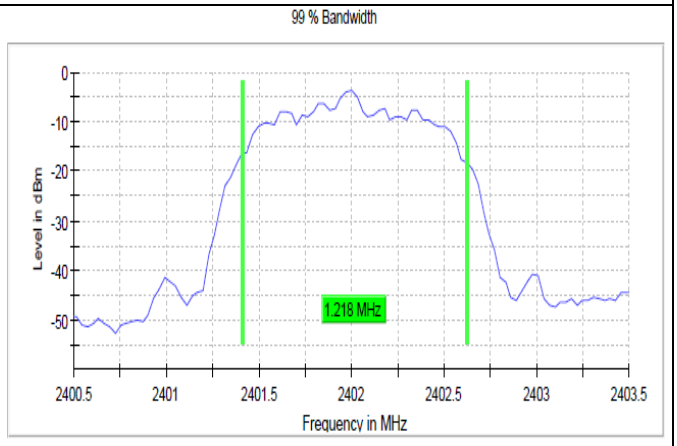
Occupied Channel Bandwidth 99%

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%

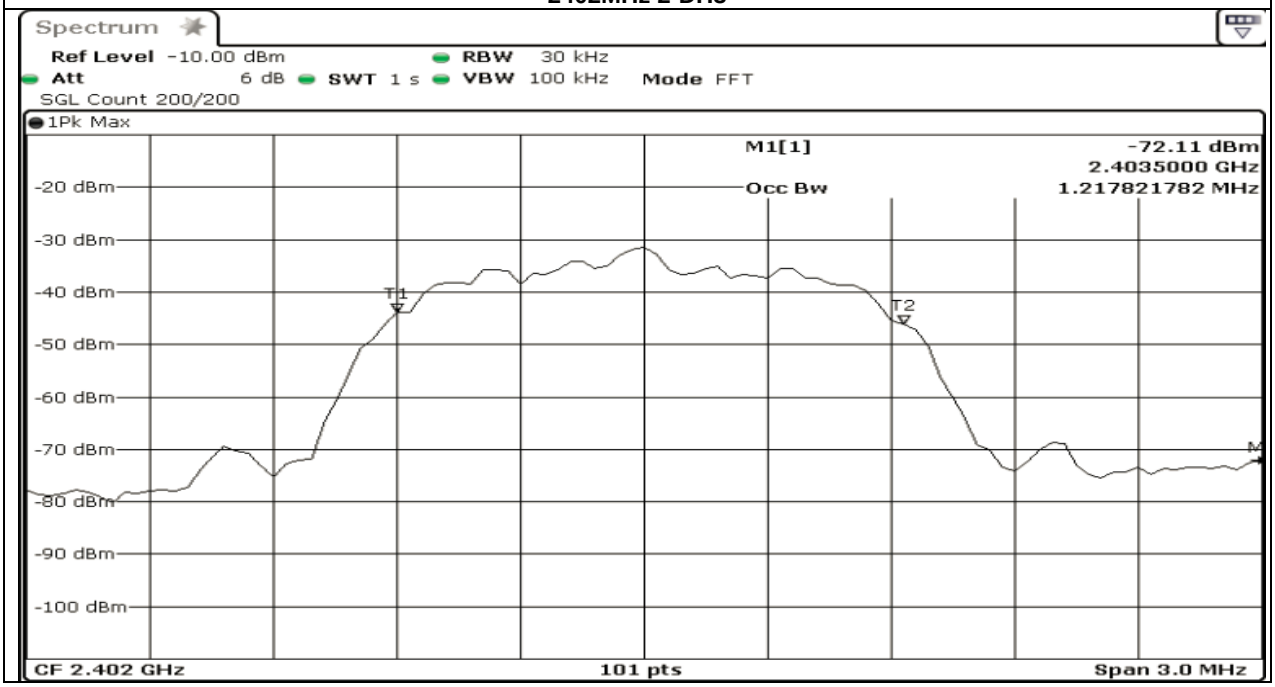
2402MHz

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	0.875622	2401.5720	2402.4480	PASS
DH3	0.895522	2401.5522	2402.4478	PASS
DH5	0.885721	2401.5620	2402.4480	PASS
2-DH1	1.203980	2401.3830	2402.5870	PASS
2-DH3	1.217821	2401.4059	2402.6237	PASS
2-DH5	1.214000	2401.3930	2402.6070	PASS
3-DH1	1.184080	2401.4130	2402.5970	PASS
3-DH3	1.213930	2401.3830	2402.5970	PASS
3-DH5	1.213930	2401.3830	2402.5970	PASS

2402MHz 2-DH3

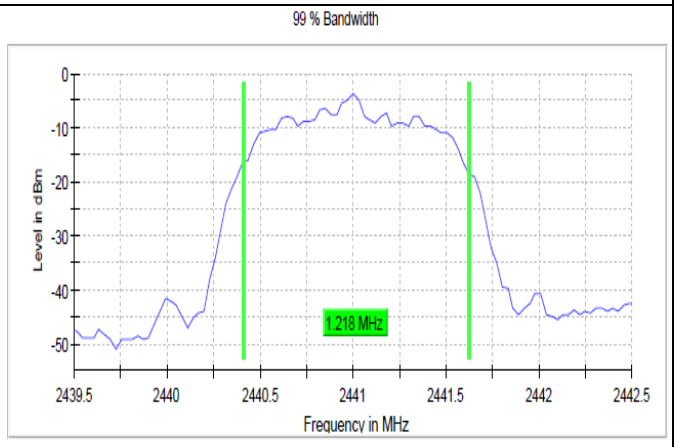


2402MHz 2-DH3

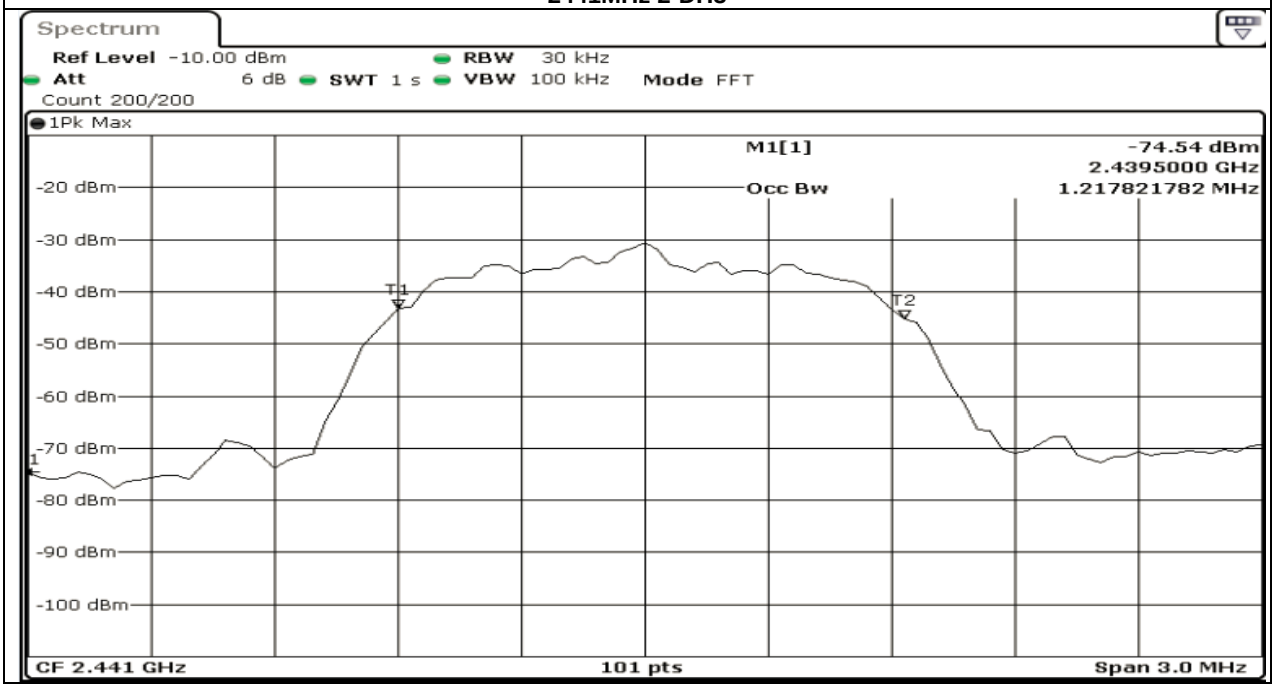


2441MHz				
Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	0.875622	2440.56200	2441.4380	PASS
DH3	0.895522	2440.5621	2441.4577	PASS
DH5	0.905473	2440.5520	2441.4480	PASS
2-DH1	1.184080	2440.4030	2441.5870	PASS
2-DH3	1.217821	2440.4059	2441.6237	PASS
2-DH5	1.203980	2440.3930	2441.5970	PASS
3-DH1	1.184080	2440.4230	2441.6070	PASS
3-DH3	1.213930	2440.3930	2441.6070	PASS
3-DH5	1.213930	2440.3930	2441.6070	PASS

2441MHz 2-DH3



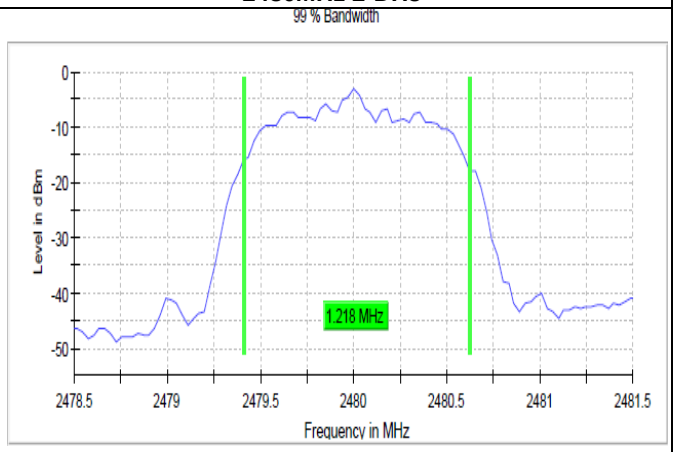
2441MHz 2-DH3



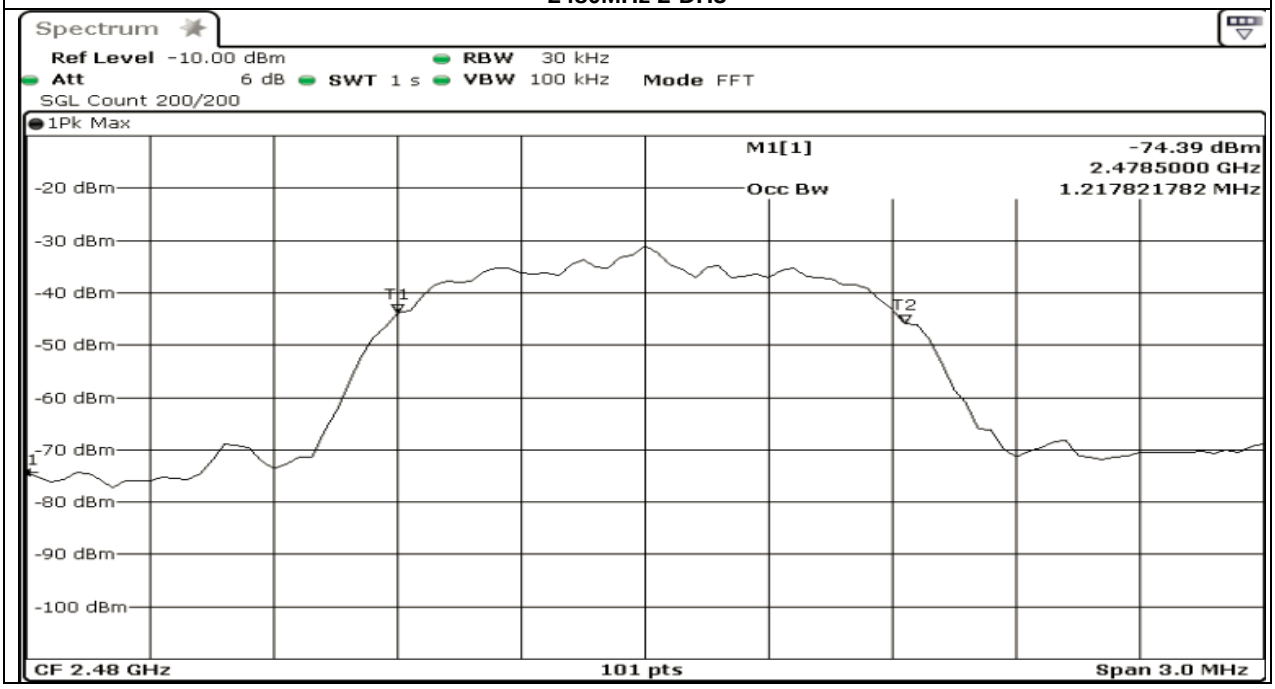
2480MHz

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	0.865672	2479.5820	2480.4480	PASS
DH3	0.875621	2479.5720	2480.4480	PASS
DH5	0.895522	2479.5620	2480.4580	PASS
2-DH1	1.174080	2479.4130	2480.5810	PASS
2-DH3	1.217821	2479.4059	2480.6237	PASS
2-DH5	1.203930	2479.4130	2480.6170	PASS
3-DH1	1.174129	2479.4330	2480.6070	PASS
3-DH3	1.213930	2479.4030	2480.6170	PASS
3-DH5	1.213930	2479.3930	2480.6070	PASS

2480MHz 2-DH3



2480MHz 2-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

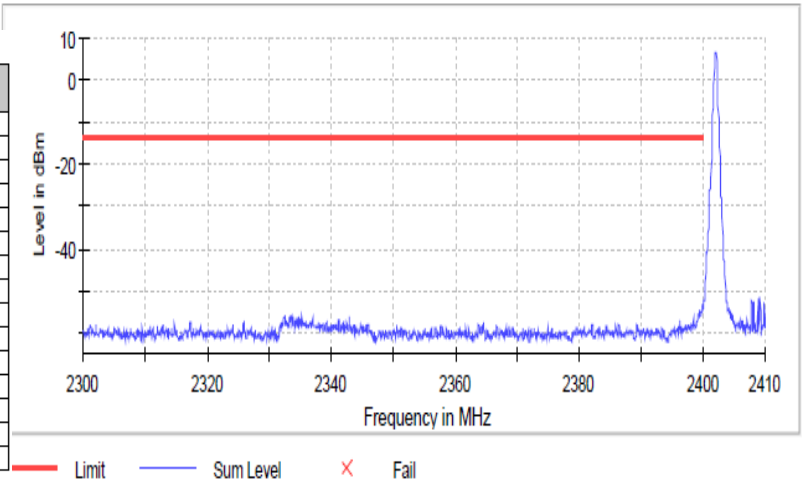
Inband Peak

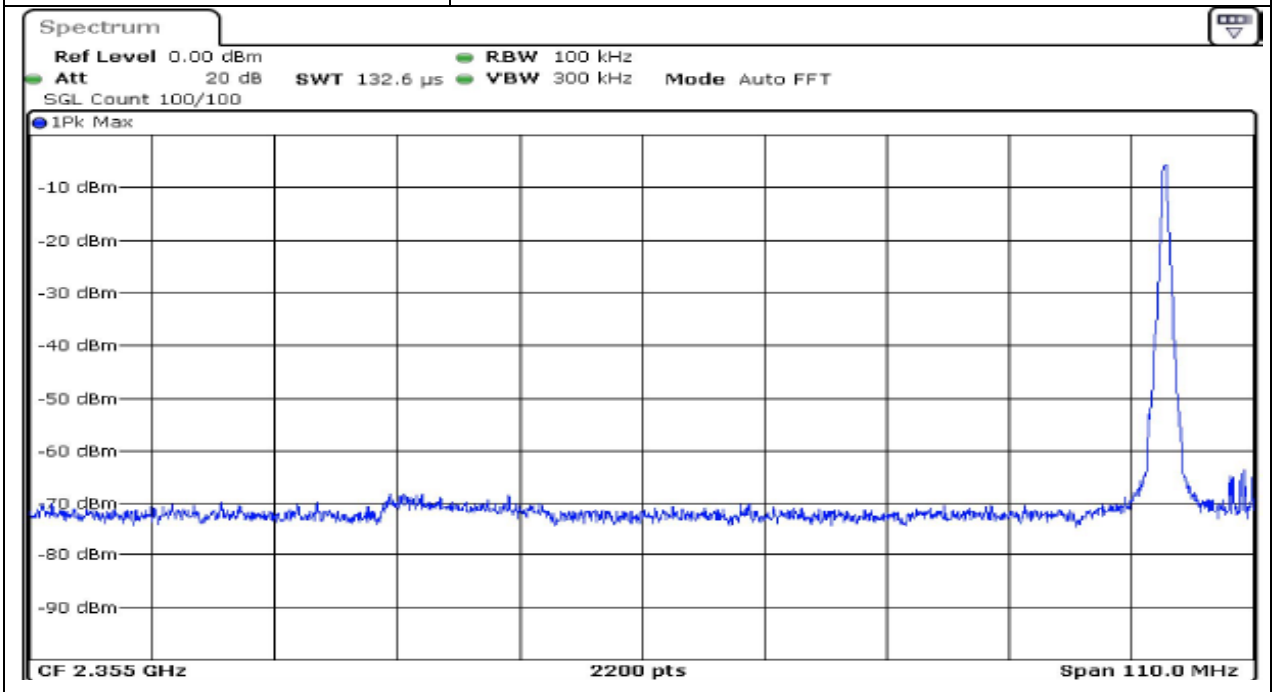
Data Rate	Frequency (MHz)	Level (dBm)
DH1	2402.175000	7.2
DH3	2402.025000	6.7
DH5	2402.175000	7.2
2-DH1	2401.825000	2.5
2-DH3	2402.025000	2.3
2-DH5	2401.825000	2.5
3-DH1	2401.825000	2.6
3-DH3	2402.175000	2.6
3-DH5	2402.175000	2.6

2402 MHz DH3

Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2399.875000	-53.3	40.0	-13.3	PASS
2399.825000	-53.6	40.3	-13.3	PASS
2399.975000	-54.1	40.8	-13.3	PASS
2399.925000	-54.5	41.2	-13.3	PASS
2399.725000	-54.7	41.4	-13.3	PASS
2399.475000	-54.9	41.6	-13.3	PASS
2399.575000	-55.1	41.8	-13.3	PASS
2399.525000	-55.2	41.9	-13.3	PASS
2399.775000	-55.3	42.0	-13.3	PASS
2399.675000	-55.5	42.2	-13.3	PASS
2399.275000	-55.6	42.3	-13.3	PASS
2399.225000	-55.7	42.4	-13.3	PASS
2335.325000	-55.9	42.6	-13.3	PASS
2333.575000	-56.0	42.7	-13.3	PASS
2332.425000	-56.0	42.7	-13.3	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

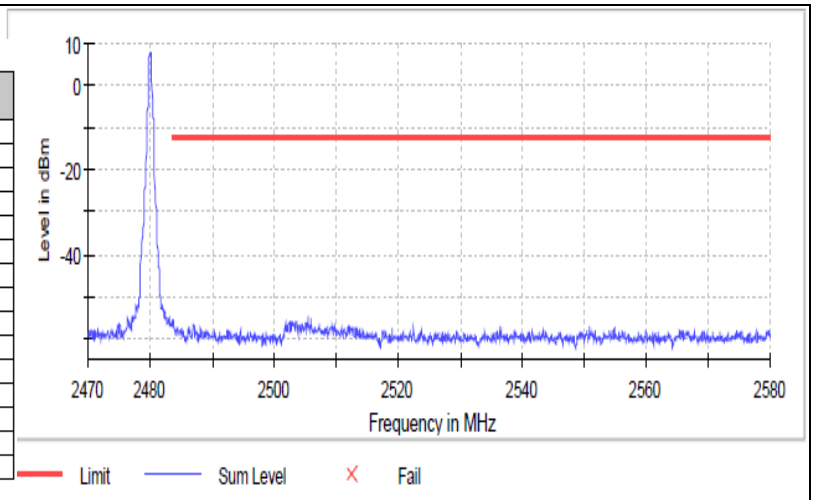
Inband Peak

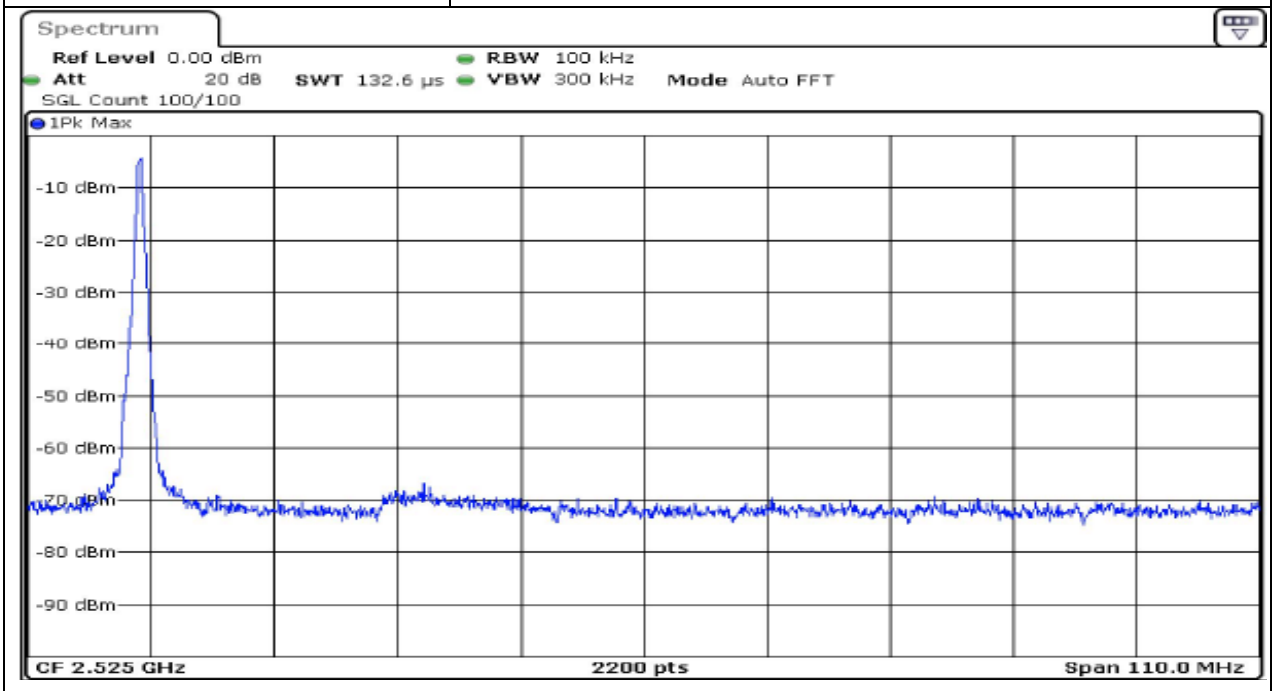
Data Rate	Frequency (MHz)	Level (dBm)
DH1	2479.875000	8.0
DH3	2480.175000	8.1
DH5	2480.025000	7.8
2-DH1	2479.875000	3.5
2-DH3	2480.025000	3.3
2-DH5	2479.875000	3.4
3-DH1	2480.025000	3.3
3-DH3	2480.175000	3.4
3-DH5	2480.175000	3.5

2480 MHz DH3

Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2505.425000	-54.5	42.6	-11.9	PASS
2505.475000	-54.5	42.6	-11.9	PASS
2505.925000	-55.1	43.2	-11.9	PASS
2505.975000	-55.1	43.2	-11.9	PASS
2483.675000	-55.5	43.7	-11.9	PASS
2483.625000	-55.6	43.7	-11.9	PASS
2503.525000	-55.9	44.1	-11.9	PASS
2502.825000	-55.9	44.1	-11.9	PASS
2505.025000	-56.0	44.1	-11.9	PASS
2505.875000	-56.1	44.2	-11.9	PASS
2502.875000	-56.1	44.2	-11.9	PASS
2504.975000	-56.1	44.3	-11.9	PASS
2503.675000	-56.2	44.3	-11.9	PASS
2505.175000	-56.2	44.3	-11.9	PASS
2503.575000	-56.2	44.4	-11.9	PASS





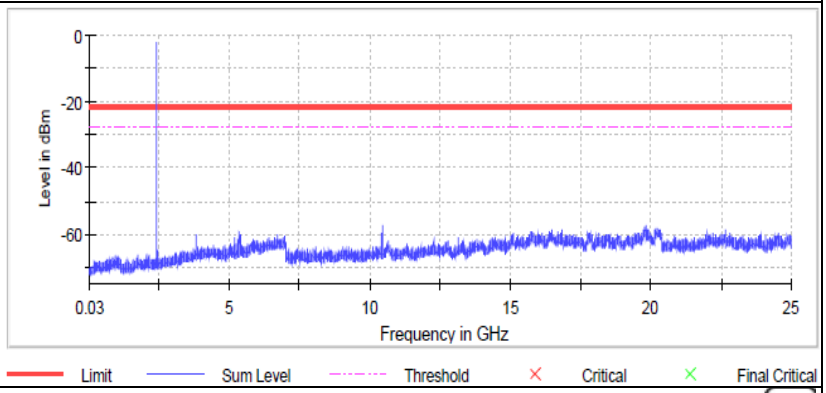
Conducted Spurious Emissions

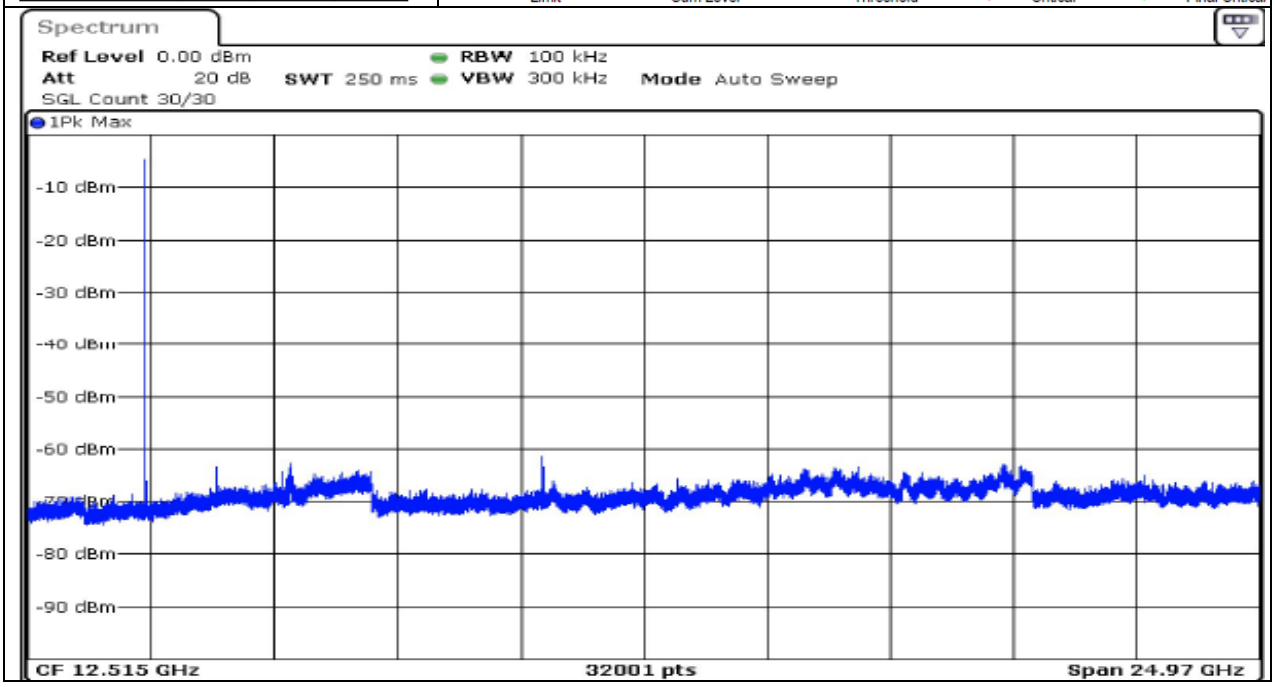
Test procedure in accordance with ANSI C63.10-2013
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 0.8 dB

2402 MHz DH3

Pre Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
10442.554764	-57.1	35.4	-21.7
19830.981376	-57.3	35.6	-21.7
19834.102528	-57.7	35.9	-21.7
19796.648698	-57.7	35.9	-21.7
10444.115340	-58.3	36.5	-21.7
20236.731196	-58.3	36.5	-21.7
19776.361207	-58.3	36.6	-21.7
20238.291772	-58.3	36.6	-21.7
20171.967282	-58.3	36.6	-21.7
20154.800944	-58.4	36.6	-21.7
19799.769851	-58.4	36.7	-21.7
16859.644230	-58.4	36.7	-21.7
19826.299647	-58.4	36.7	-21.7
19842.685697	-58.5	36.7	-21.7
20146.217774	-58.5	36.8	-21.7

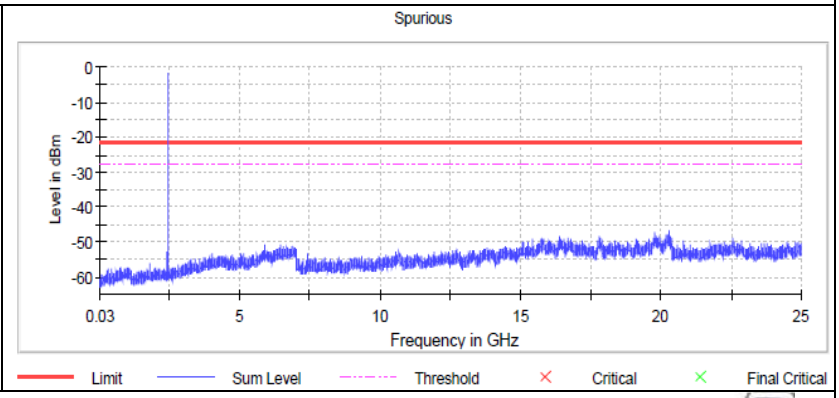


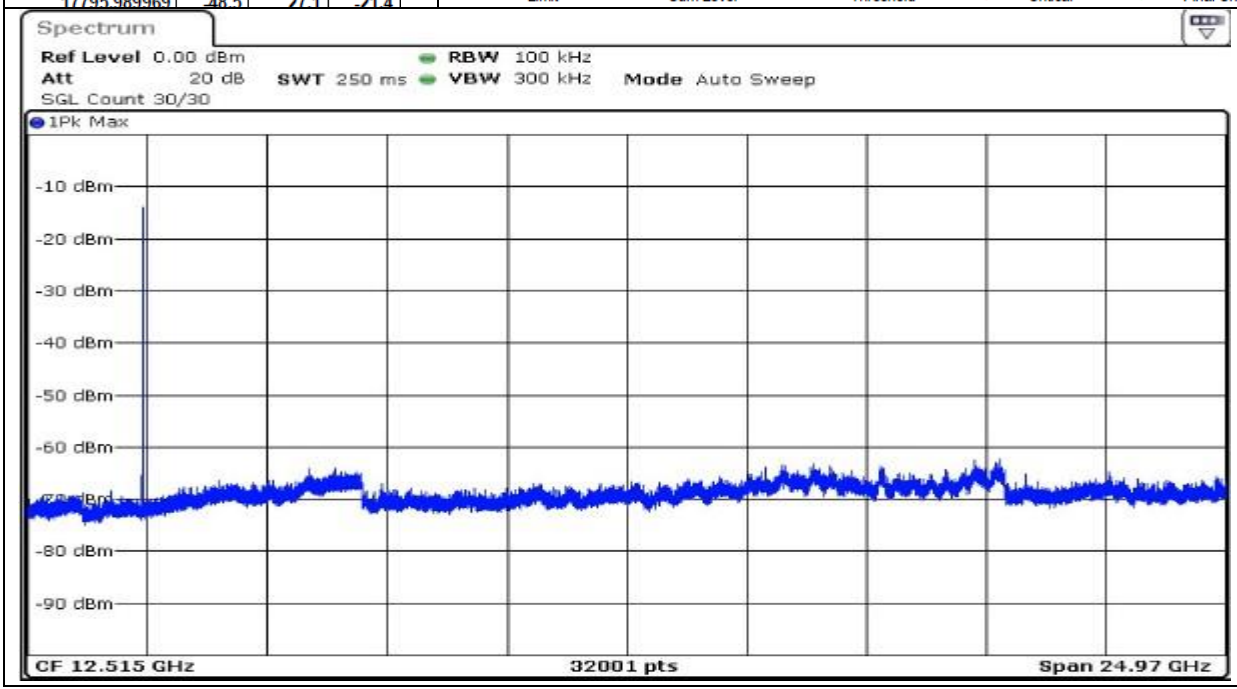


2441 MHz DH3

Pre Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
20301.495110	-46.7	25.3	-21.4
19760.755445	-47.3	25.9	-21.4
20203.959095	-47.8	26.4	-21.4
20280.427330	-47.8	26.4	-21.4
20214.883129	-47.9	26.5	-21.4
20217.223993	-48.0	26.6	-21.4
20182.891316	-48.1	26.6	-21.4
20281.987907	-48.2	26.8	-21.4
20225.026874	-48.3	26.9	-21.4
20331.926346	-48.3	26.9	-21.4
19844.246274	-48.3	26.9	-21.4
16407.077123	-48.5	27.0	-21.4
20279.647042	-48.5	27.1	-21.4
19774.800631	-48.5	27.1	-21.4
17795.989969	-48.5	27.1	-21.4





2480 MHz DH3

Pre Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
20239.072060	-47.6	26.4	-21.2
20195.375926	-47.7	26.5	-21.2
19779.482360	-47.9	26.7	-21.2
19786.504953	-47.9	26.7	-21.2
20293.692228	-48.0	26.8	-21.2
19841.905409	-48.1	26.9	-21.2
20294.472516	-48.1	26.9	-21.2
19784.944377	-48.2	27.0	-21.2
16499.931408	-48.2	27.0	-21.2
19759.194869	-48.2	27.0	-21.2
19762.316021	-48.2	27.0	-21.2
20257.798975	-48.3	27.1	-21.2
16448.432393	-48.3	27.1	-21.2
19827.079935	-48.3	27.1	-21.2
20234.390332	-48.3	27.1	-21.2