Test Type: Emissions [X] Immunity []

Product Type: Wireless Headphones

Product Name/Number: *Model Numbers: BMD0003 and BMD0004*
FCC ID: A94429638
IC: 3232A-429638

Prepared For: *Design Assurance Engineering Department, Bose Corporation*

Test Results: Pass [**X**] Fail []

Applicable Standards: FCC CFR 47 Part 15 Subpart C
Industry Canada RSS-247 Issue 2
Industry Canada RSS-GEN Issue 5

Report Number: *EMC.429638.18.282.1*

General Comments/Special Test Conditions:
This report relates only to the items tested. This report covers EMC marking requirements for models BMD0003 and BMD0004.

	Print Name	Signature	Date
Prepared By:	Karl Klemm		16 OCT 2018
Electrical Engineer Review* By:	Nathan Cross		16 OCT 2018

* Since every test result is separately reviewed after its completion, the electrical engineer review indicated above represents a higher level review to ensure this report lists and contains all applicable and appropriate requirements.

If the report carries the “accredited” logo, the reviewer must verify all the tests in this report are covered under the current ISO17025 accreditation. The A2LA-accredited logo must be removed if any of the tests in the report are not performed under the current scope of accreditation. It is the responsibility or the reviewer to ensure the A2LA advertising policy is followed.

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Test Report Summary

Product Information:

Description

The EUT is a wireless headphone that contains DSS/DTS transceivers, manufactured by Cambridge Silicon Radio, CSR8675. The EUT uses Adaptive Frequency Hopping (AFH) mode, using a reduced hop set if interference is detected in band, however a minimum of 20 channels is always maintained.

The two models use identical electronics and are differentiated only by cosmetic differences in the enclosure. The differences in the enclosures have no impact on the transmitter function or characteristics. Model BMD003 was used for testing.

Setup (Cables and Accessories)

For radio tests the radio was configured with CSR Blue Suite software (details provided in SOFTWARE AND FIRMWARE section).

EUT Antenna Description

The antenna is an internal PIF variant with antenna gain of 5.65 dBi formed by printed circuit board etch.

SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was version 0.6.3
The test utility software used during testing was Polycomm, version 0.2.1.0 and CSR Blue Suite version 2.6.2.

Scope:

This report covers EMC requirements. FCC CFR 47 PART 15 SUBPART C, Industry Canada RSS-247 Issue 2, and Industry Canada RSS-GEN Issue 5.

All measurements in this report were made with a direct connection to the antenna terminal, with the antenna disconnected.

Test Objective:

Verify product meets all applicable EMC requirements.

Measurement Method:

ANSI C63.10 (2013).

Results:

Product complies with all applicable EMC requirements. All final results represent worst-case emissions and/or immunity.

Conclusions:

The device under test (D.U.T.):
[**X**] meets all test standards selected in section 2 of this report.
[ ] does not meet all test standards selected in section 2 of this report.

Affirmation of Test Results:

	Print Name	Signature	Date
Testing Engineer/Technician	Brent Dewitt		12 OCT 2018

Test Standards

Emissions:

	Standard
[X]	FCC Part 15C
[X]	Canada RSS-247
[X]	Canada RSS-GEN

Environmental Conditions

Ambient:

Temperature:	22±4 °C
Humidity:	30-60 %RH
Mains Voltage:	[X] 5 Vdc

FCC Test Site Accreditation.

Firm Name	Location	Accreditation	MRA	Designation Number	Expiration Date	Contact	Contact Title
Bose Corporation	1 New York Avenue, Framingham, MA	American Association for Laboratory Accreditation	N/A	US1088	07/31/2020	Carole Park	Quality Manager

Canadian Test Site Registration.

Radiated emissions below 1GHz were performed in Test Site 3232A-1. Radiated emissions above 1GHz were performed in Test Site 3232A-2.

Scope of Accreditation for: Bose Corporation

Test Site	OATS 3m	OATS 10m	OATS 30m	Chamber 3m	Chamber 10m	Expiry Date
3232A-2	No	No	No	Yes	No	2020-06-27
3232A-1	No	No	No	Yes	No	2020-04-25

MEASUREMENT METHODS

Duty Cycle: KDB 558074 D01 Section 6.0
6 dB BW: KDB 558074 D01, Section 8.1.
99% Occupied Bandwidth: ANSI C63.10-2013, Section 6.9.3
Output Power: KDB 558074 D01 Section 9.1.2
Power Spectral Density: KDB 558074 D01 Section 10.2.
Out-of-band emissions in non-restricted bands: KDB 558074 D01 Section 11.0.
Out-of-band emissions in restricted bands: KDB 558074 D01 Section 12.2.5.2

20dB and 99% Bandwidth

Requirement:

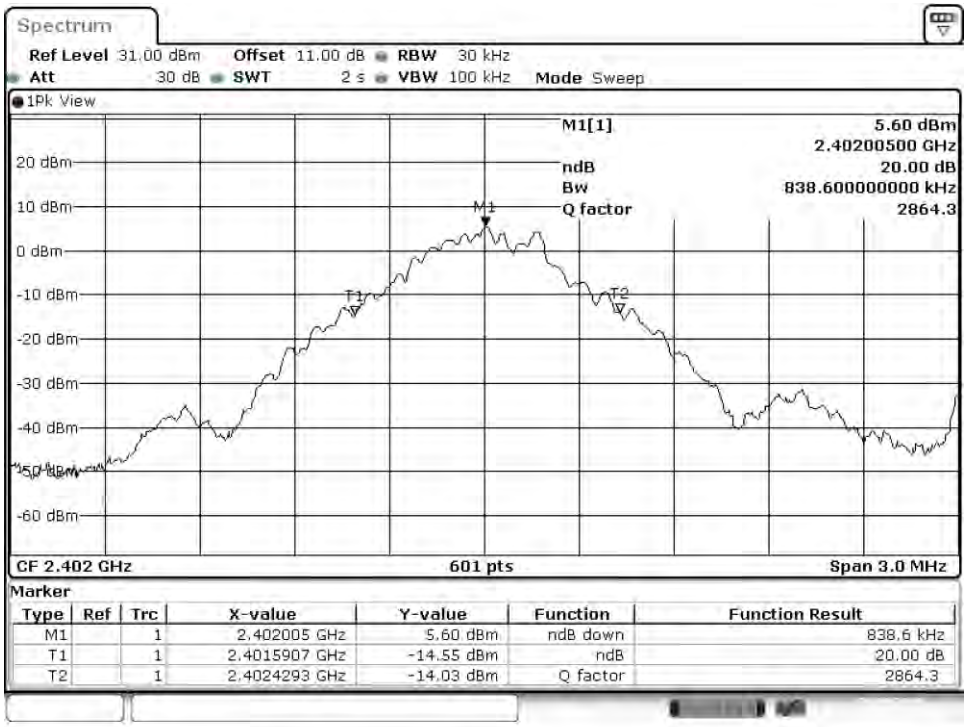
None; for reporting purposes only. Test per FCC 15.247(a)(1); IC RSS-247 5.1 (1), RSS-Gen 6.6.

Test Procedure:

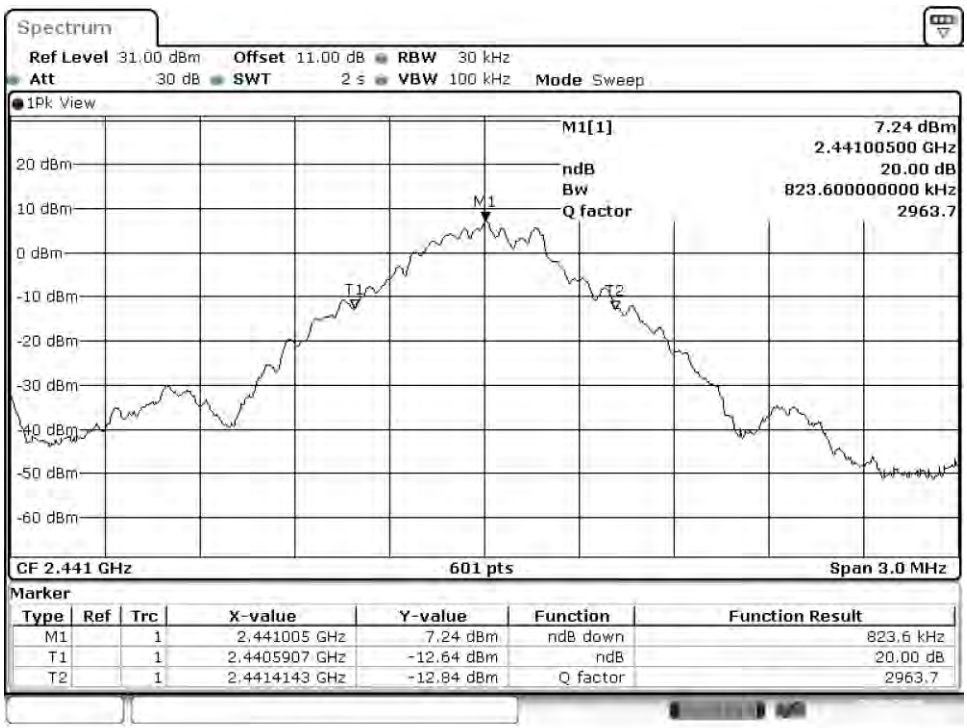
The transmitter output is connected to a spectrum analyzer. The RBW is set to 1-5% of the 20 dB bandwidth and 99% Occupied Bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

20dB Occupied Bandwidth

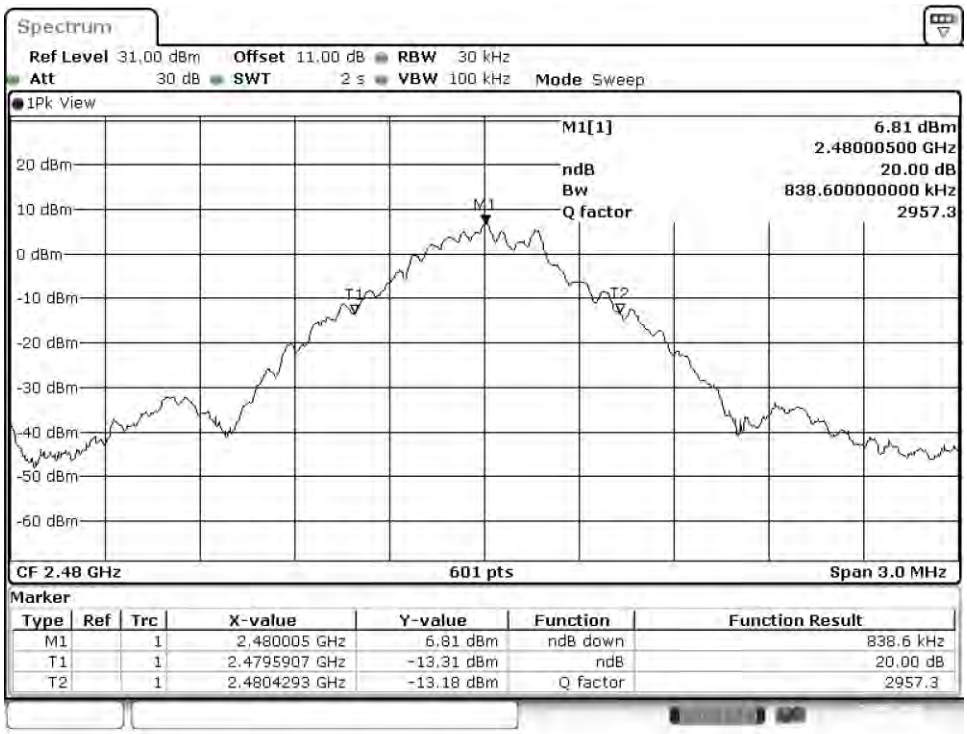
20 dB OBW Summary Table (Basic Rate: 1 Mbps)				
Channel	Frequency (MHz)	Mode	20 dB OBW (MHz)	Limit NA
Low	2402	DH5	0.839	-
Middle	2441	DH5	0.824	-
High	2480	DH5	0.839	-



Plot1 20dB OBW DH5 2402 MHz

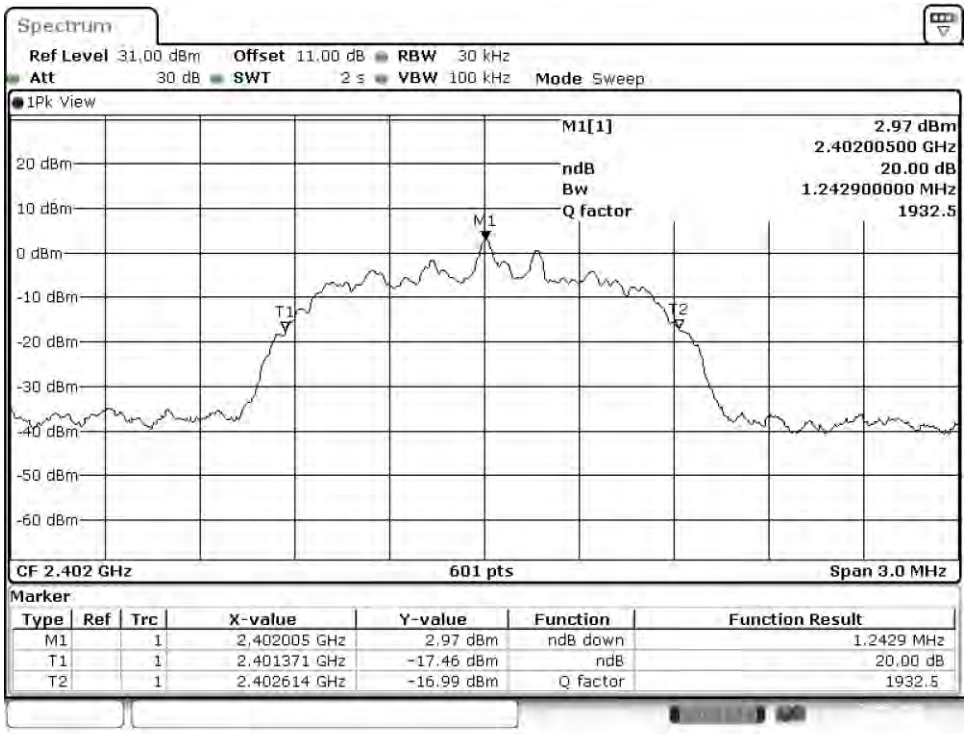


Plot2 20dB OBW DH5 2441 MHz

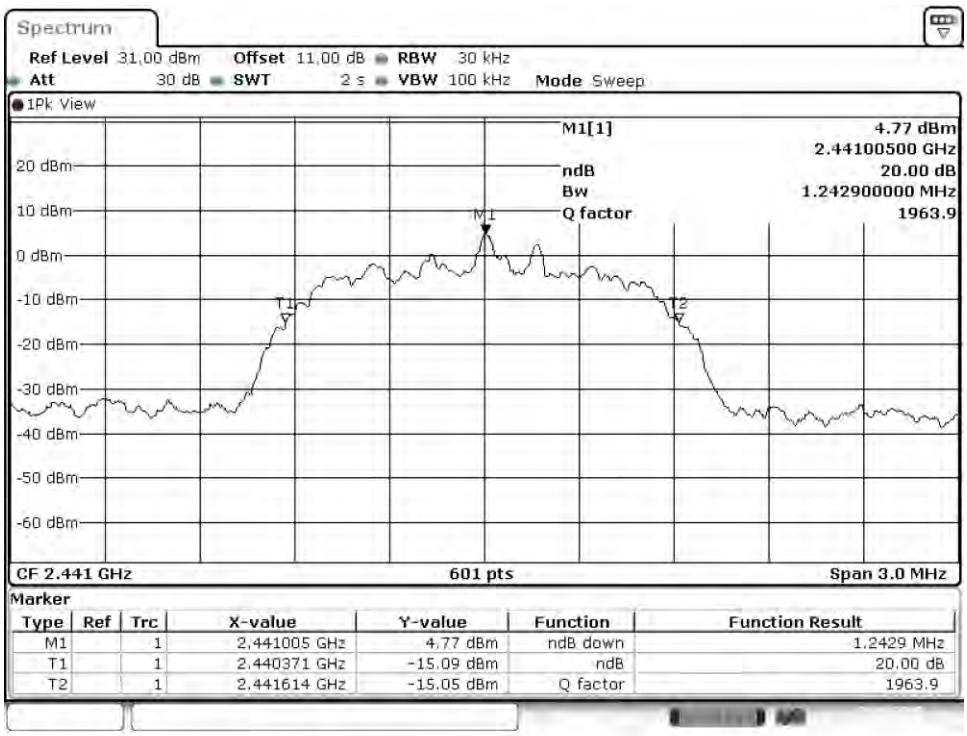


Plot3 20dB OBW DH5 2480 MHz

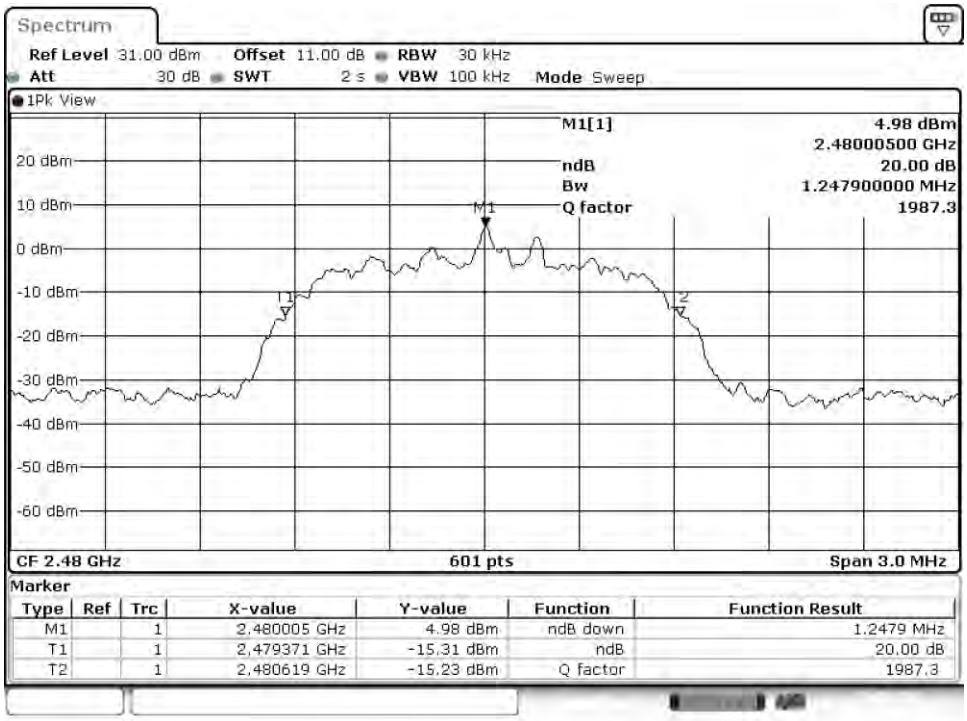
20 dB OBW Summary Table (Enhanced Rate: 2 Mbps)				
Channel	Frequency (MHz)	Mode	20 dB OBW (MHz)	Limit NA
Low	2402	2-DH5	1.243	-
Middle	2441	2-DH5	1.243	-
High	2480	2-DH5	1.248	-



Plot4 20dB OBW 2DH5 2402 MHz

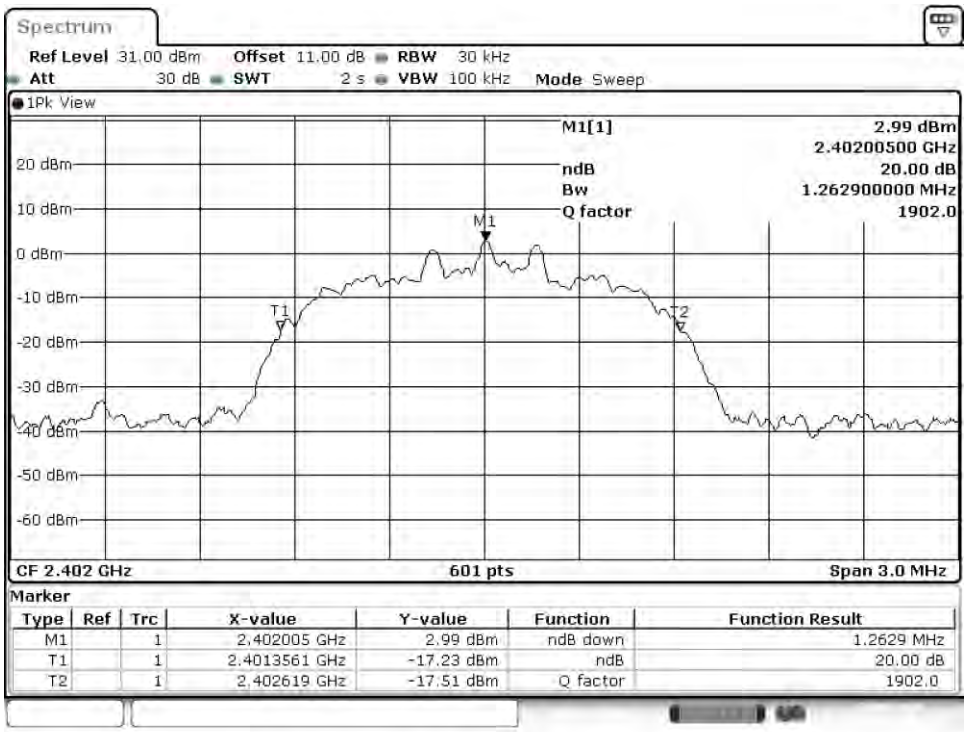


Plot5 20dB OBW 2DH5 2441 MHz

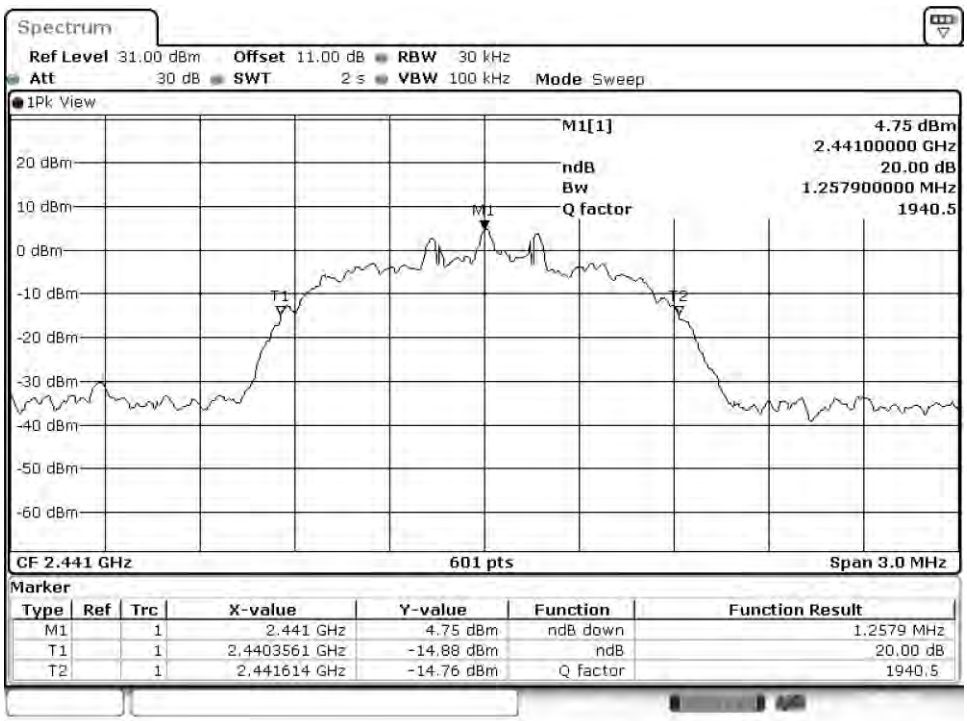


Plot6 20dB OBW 2DH5 2480 MHz

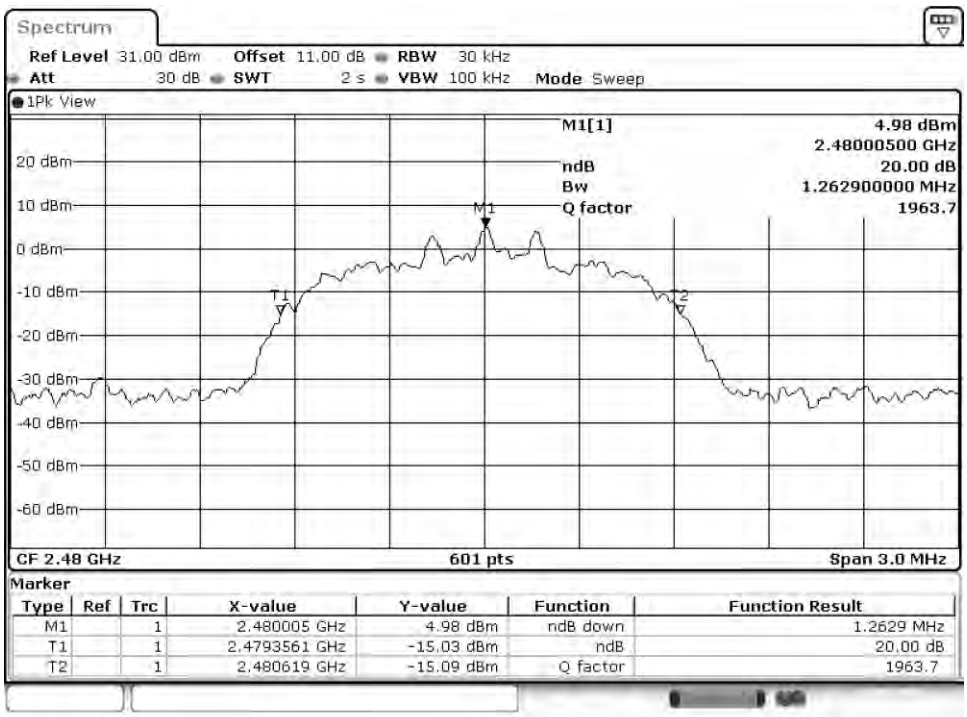
20 dB OBW Summary Table (Enhanced Rate: 3 Mbps)				
Channel	Frequency (MHz)	Mode	20 dB OBW (MHz)	Limit NA
Low	2402	3-DH5	1.263	-
Middle	2441	3-DH5	1.258	-
High	2480	3-DH5	1.263	-



Plot7 20dB OBW 3DH5 2402 MHz



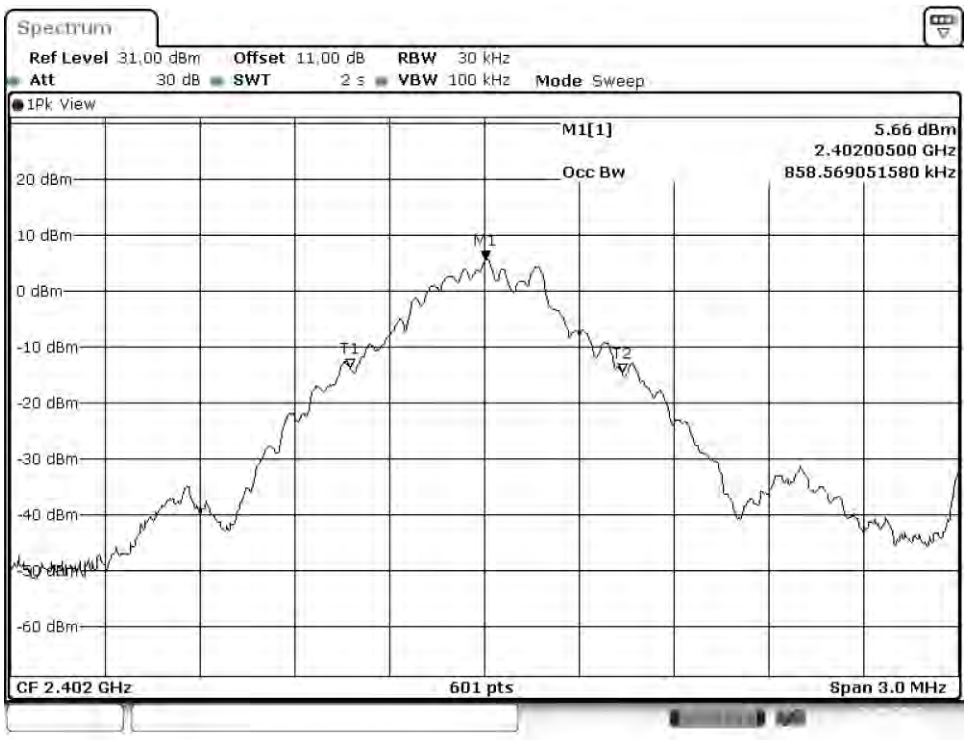
Plot8 20dB OBW 3DH5 2441 MHz



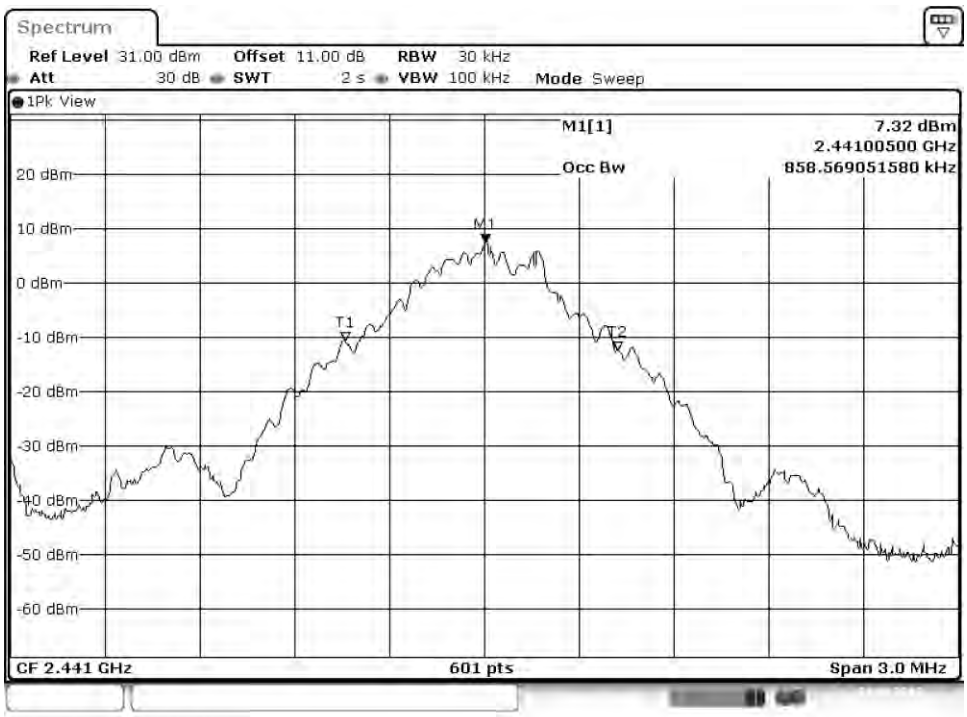
Plot9 20dB OBW 3DH5 2480 MHz

99% Occupied Bandwidth

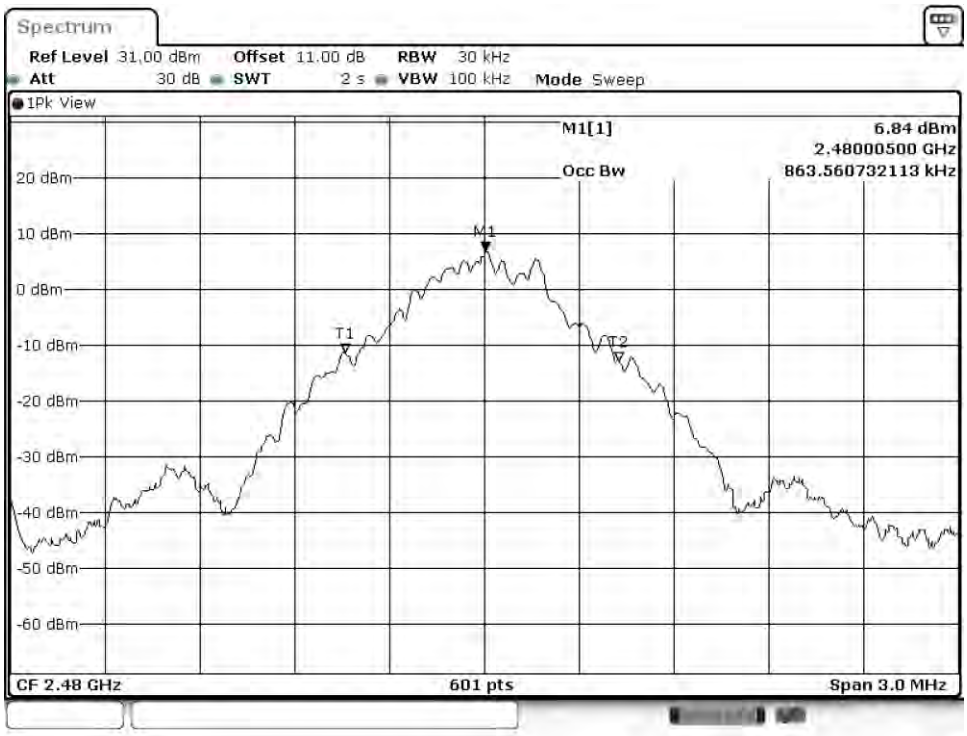
99% OBW Summary Table (Basic Rate: 1 Mbps)				
Channel	Frequency (MHz)	Mode	99% OBW (MHz)	Limit NA
Low	2402	DH5	0.859	-
Middle	2441	DH5	0.859	-
High	2480	DH5	0.864	-



Plot1 99P OBW DH5 2402 MHz

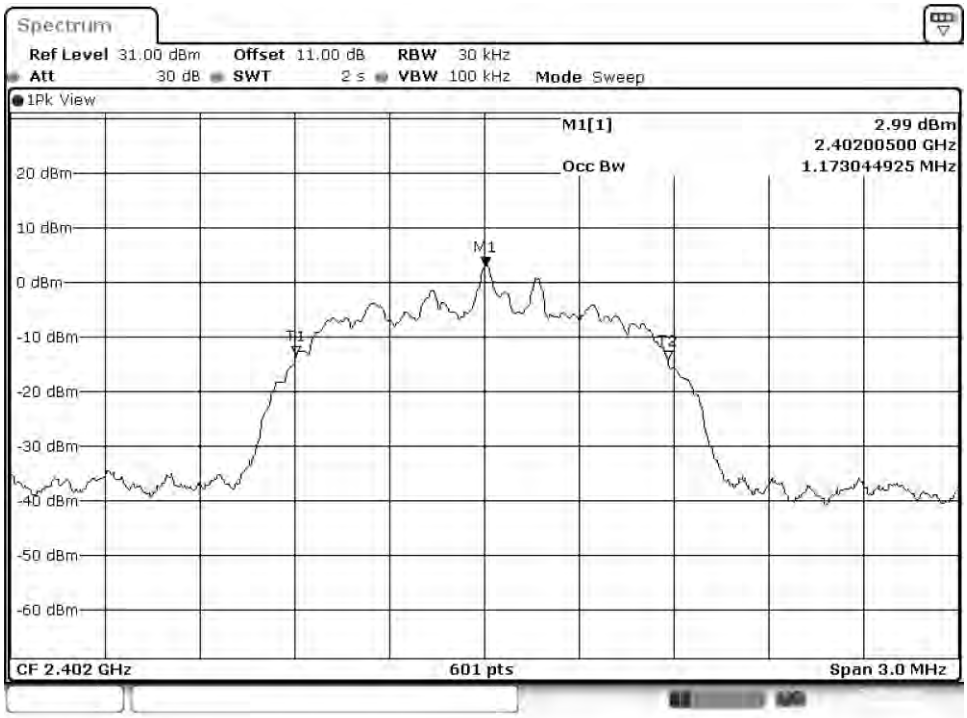


Plot2 99P OBW DH5 2441 MHz

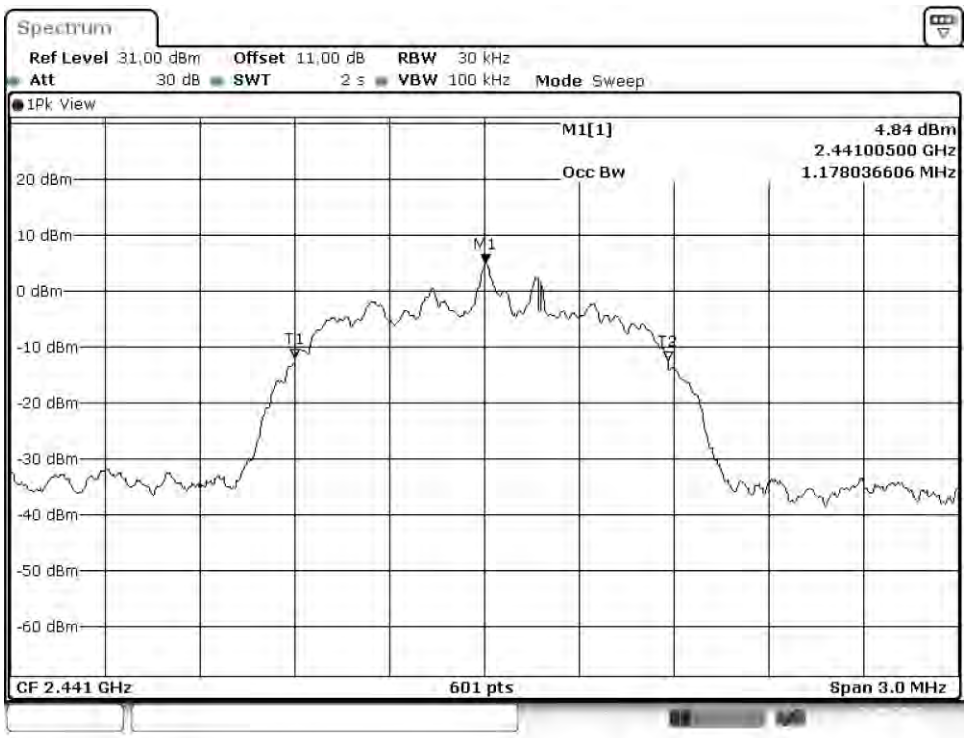


Plot3 99P OBW DH5 2480 MHz

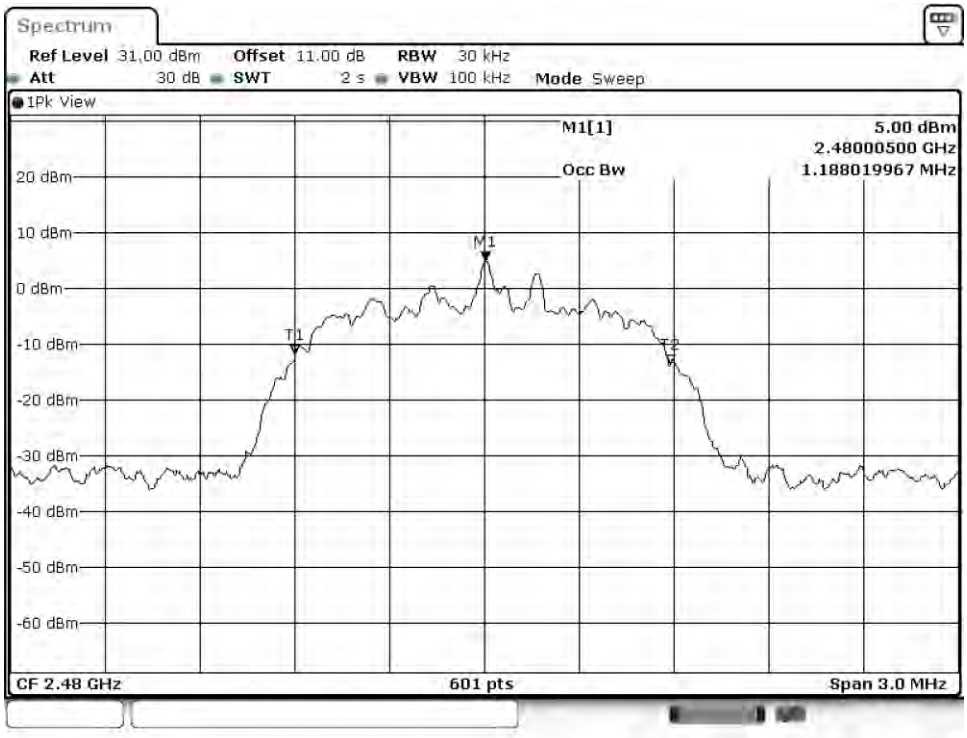
99% OBW Summary Table (Enhanced Rate: 2 Mbps)				
Channel	Frequency (MHz)	Mode	99% OBW (MHz)	Limit NA
Low	2402	2-DH5	1.173	-
Middle	2441	2-DH5	1.178	-
High	2480	2-DH5	1.188	-



Plot4 99P OBW 2DH5 2402 MHz

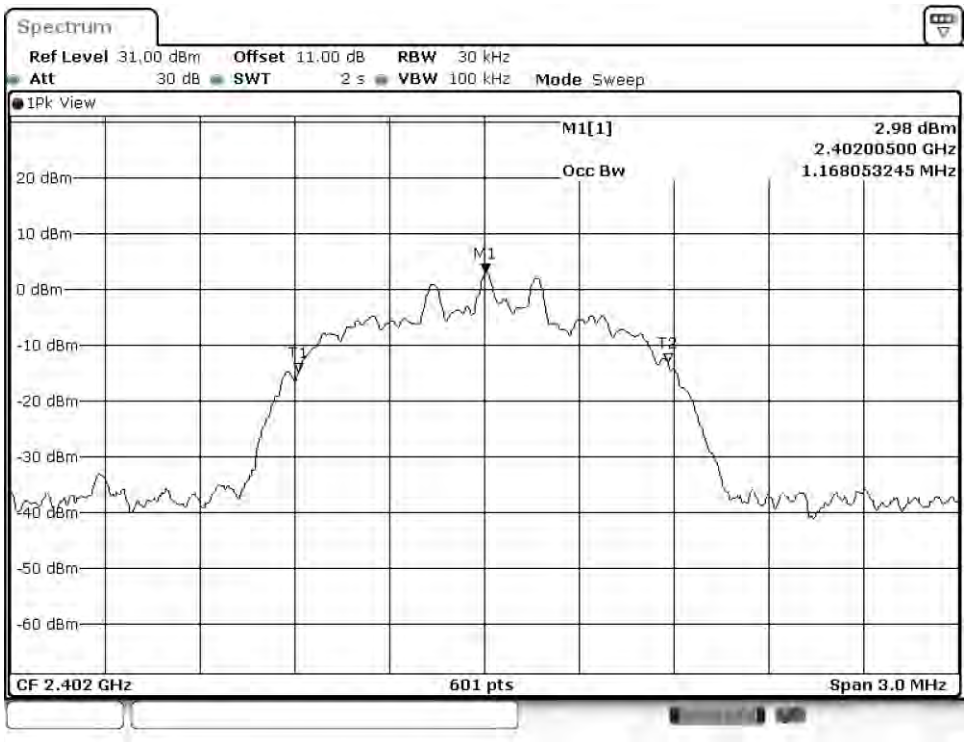


Plot5 99P OBW 2DH5 2441 MHz

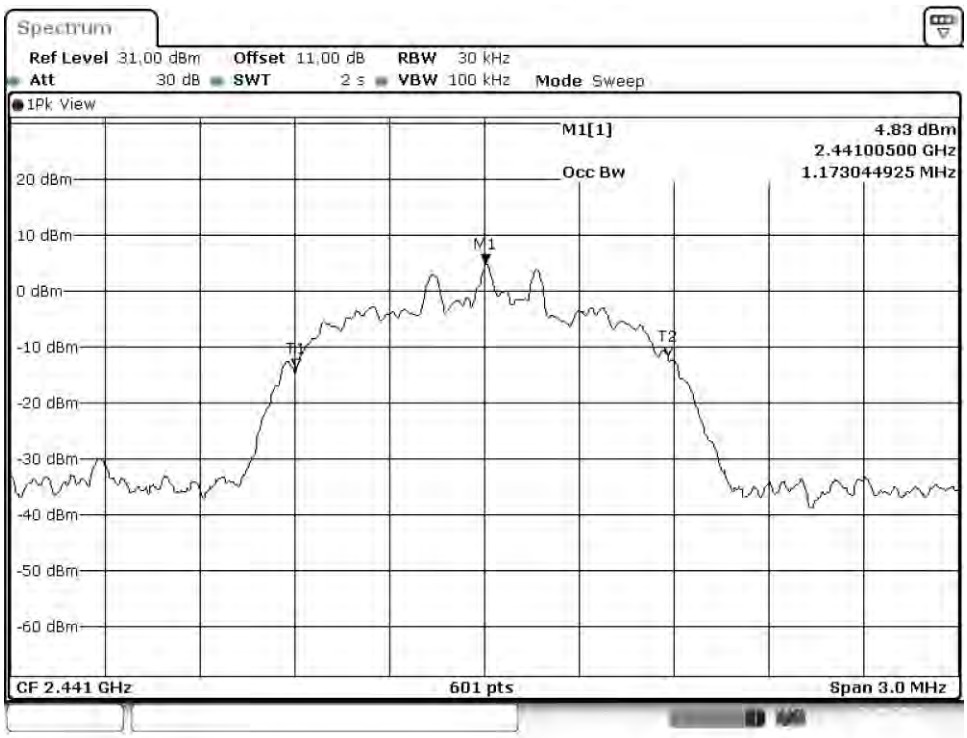


Plot6 99P OBW 2DH5 2480 MHz

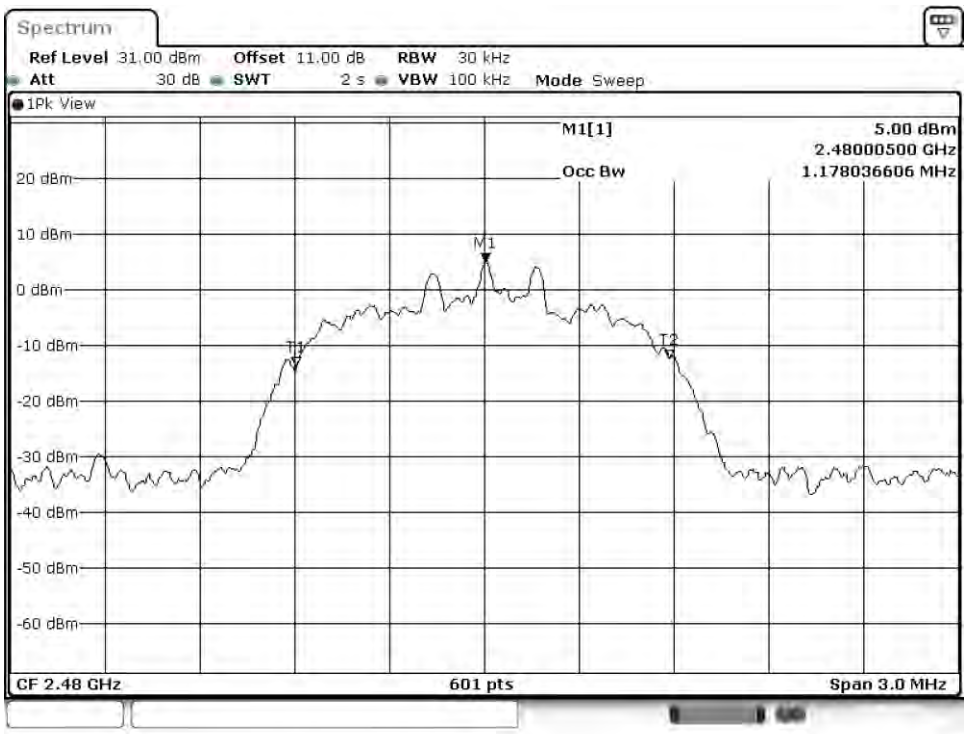
99% OBW Summary Table (Enhanced Rate: 3 Mbps)				
Channel	Frequency (MHz)	Mode	99% OBW (MHz)	Limit NA
Low	2402	3-DH5	1.168	-
Middle	2441	3-DH5	1.173	-
High	2480	3-DH5	1.178	-



Plot7 99P OBW 3DH5 2402 MHz



Plot8 99P OBW 3DH5 2441 MHz



Plot9 99P OBW 3DH5 2480 MHz

Conducted Output Power

Requirements:

FCC 15.247 (b) (1)
For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

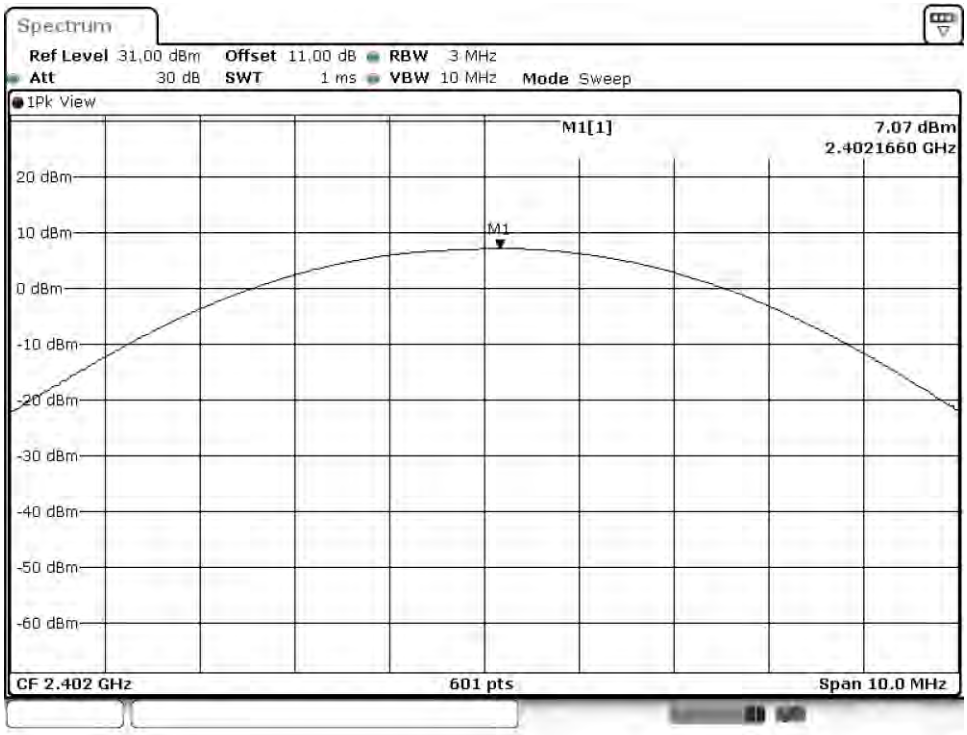
RSS-247 5.4 (2)
For frequency hopping systems operating in the band 2400-2483.5 MHz and employing at least 75 hopping channels, the maximum peak conducted output power shall not exceed 1 W; for all other frequency hopping systems in the band, the maximum peak conducted output power shall not exceed 0.125 W.

Test setup details:

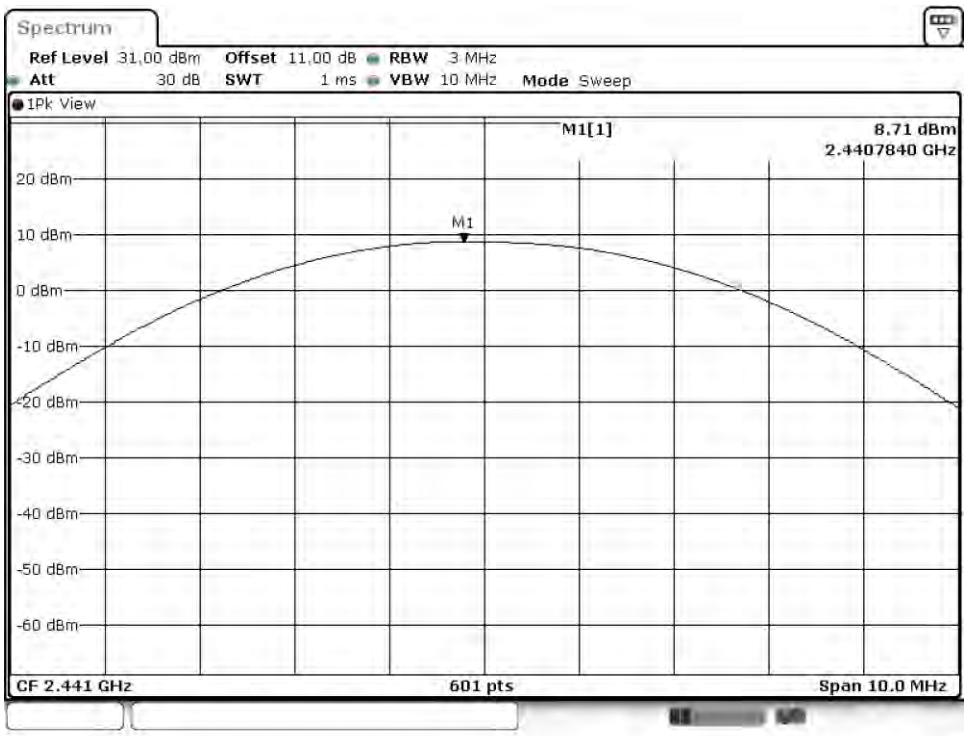
The EUT is controlled via the USB port with CSR's Blue Suite software which is used to set the test modes of the Bluetooth device. The EUT antenna is disconnected. A temporary test connector is mounted to the PCB. An 8 inch u.FL to SMA adapter cable with 1 dB loss was used for all conducted measurements. To compensate for the cable loss, the reference level offset feature of the spectrum analyzer was used. The EUT is programmed to operate on fixed frequencies at the low, middle, and high end of the authorized frequency band. The spectrum analyzer resolution bandwidth is set to 3 MHz (higher than the occupied bandwidth), peak detector and max hold. The maximum output power is recorded for each of the three frequencies in both basic and enhanced data rates.

Test Results:

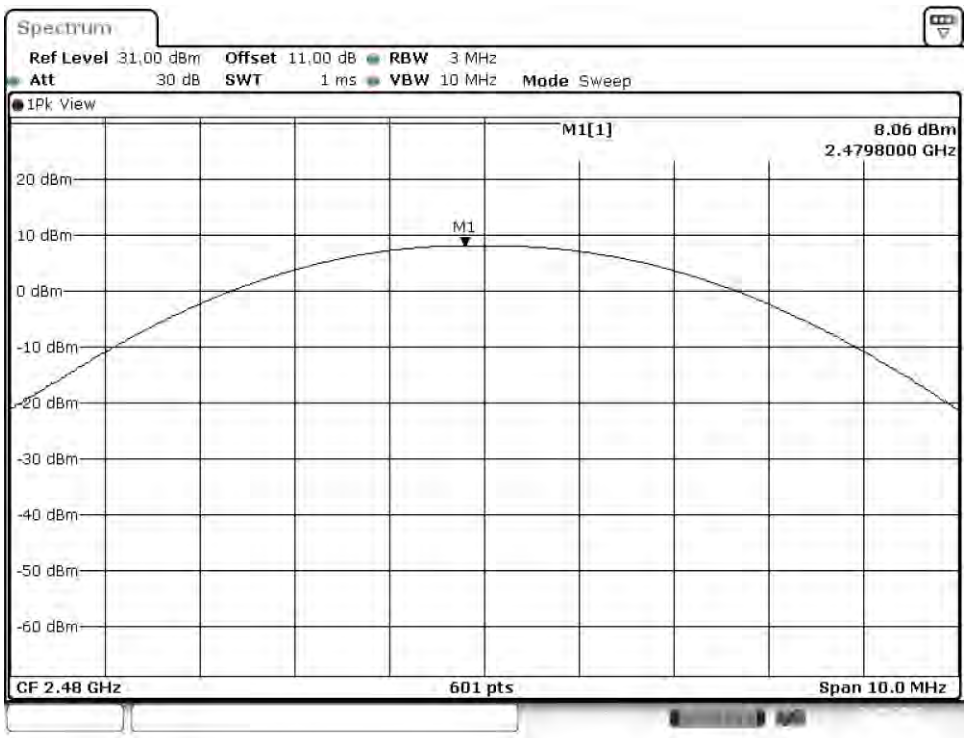
Output Power Summary Table (Basic Rate: 1 Mbps)							
Channel	Frequency (MHz)	Mode	Output Power (dBm)	Directional Gain (dBi)	Limit (dB)	Margin (dB)	Result
Low	2402	DH5	7.07	0	30	22.93	Pass
Middle	2441	DH5	8.71	0	30	21.29	Pass
High	2480	DH5	8.06	0	30	21.94	Pass



Plot1 Power DH5 2402 MHz

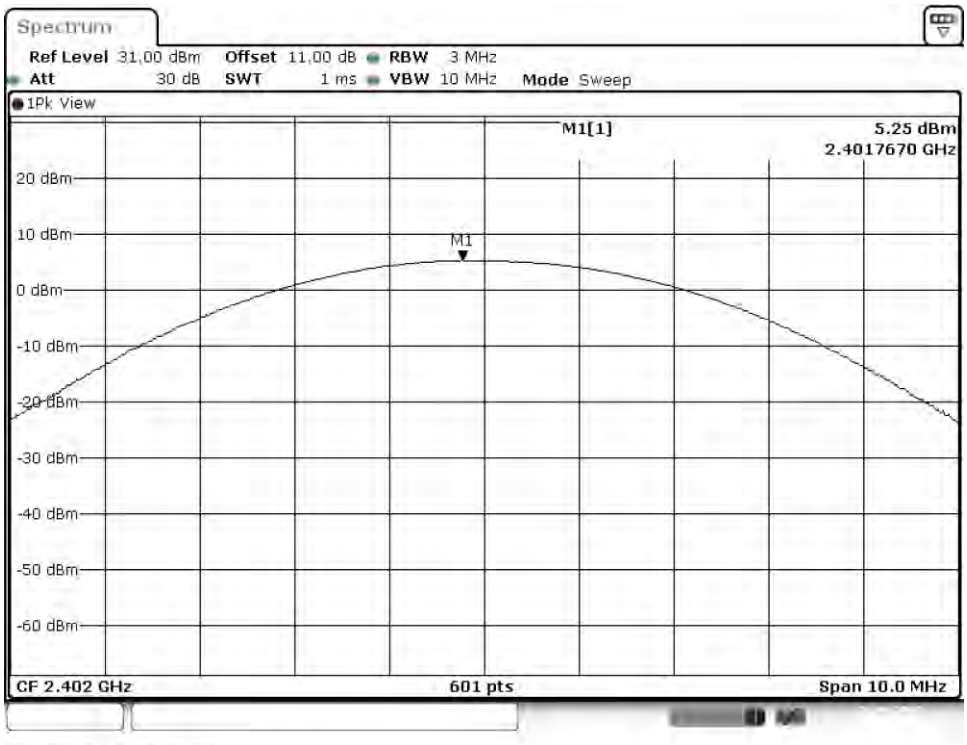


Plot2 Power DH5 2441 MHz

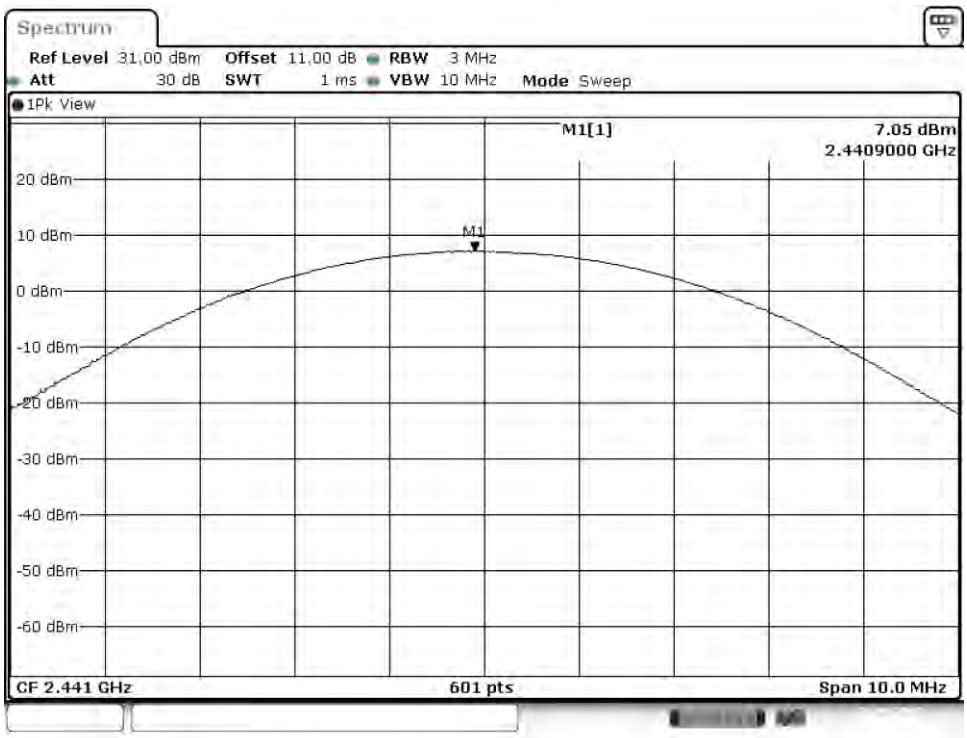


Plot3 Power DH5 2480 MHz

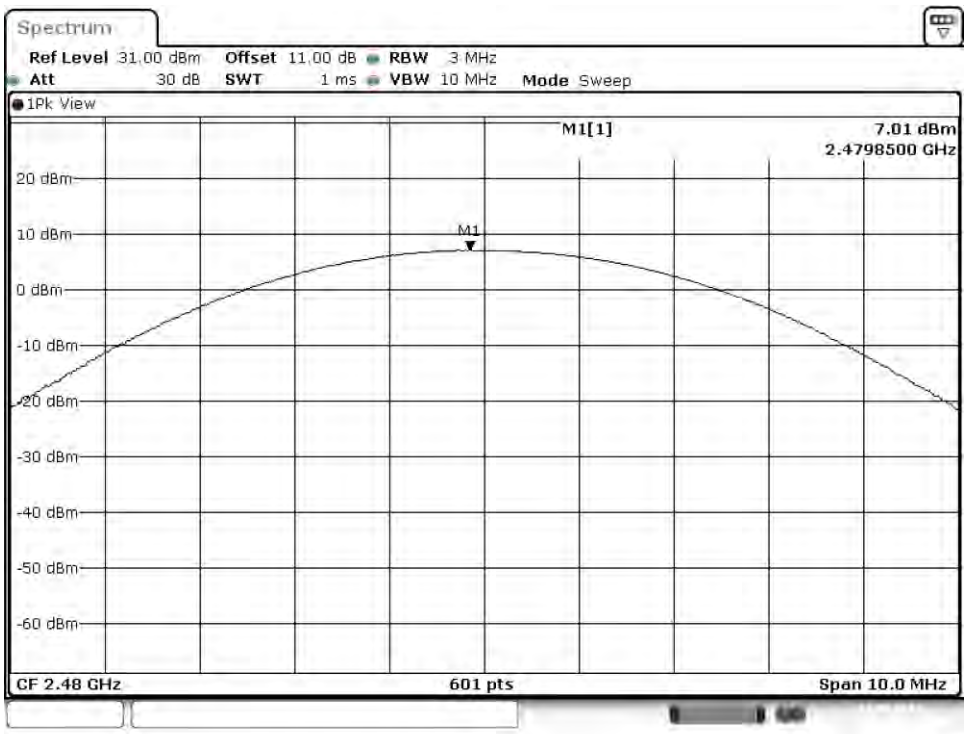
Output Power Summary Table (Enhanced Rate: 2 Mbps)							
Channel	Frequency (MHz)	Mode	Output Power (dBm)	Directional Gain (dBi)	Limit (dB)	Margin (dB)	Result
Low	2402	2-DH5	5.25	0	21	15.75	Pass
Middle	2441	2-DH5	7.05	0	21	13.95	Pass
High	2480	2-DH5	7.01	0	21	13.99	Pass



Plot4 Power 2DH5 2402 MHz

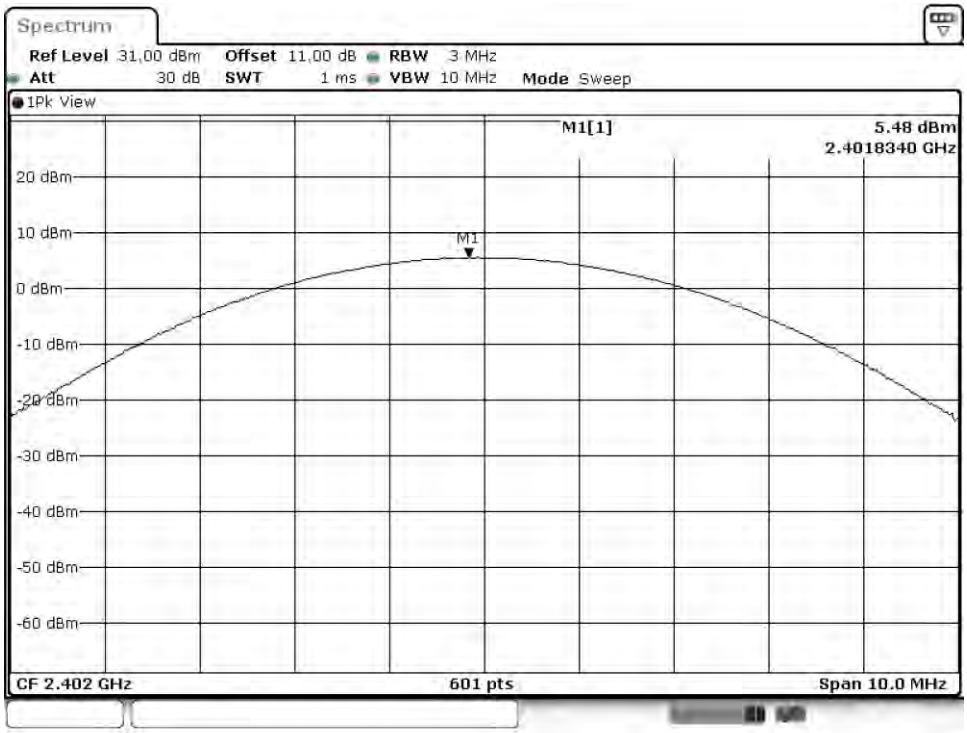


Plot5 Power 2DH5 2441 MHz

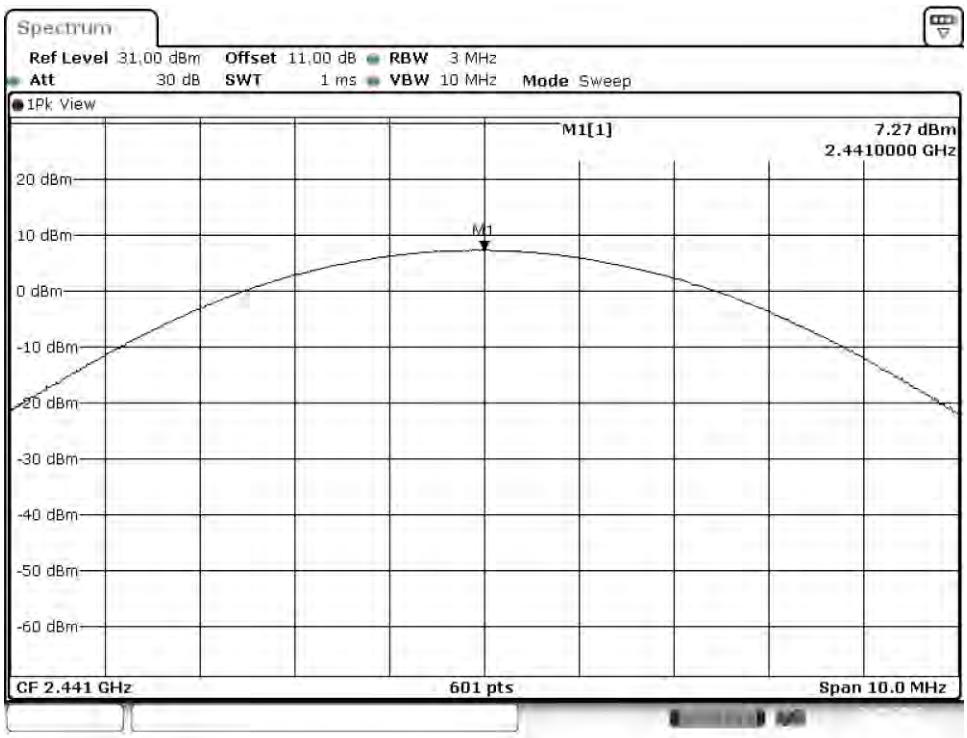


Plot6 Power 2DH5 2480 MHz

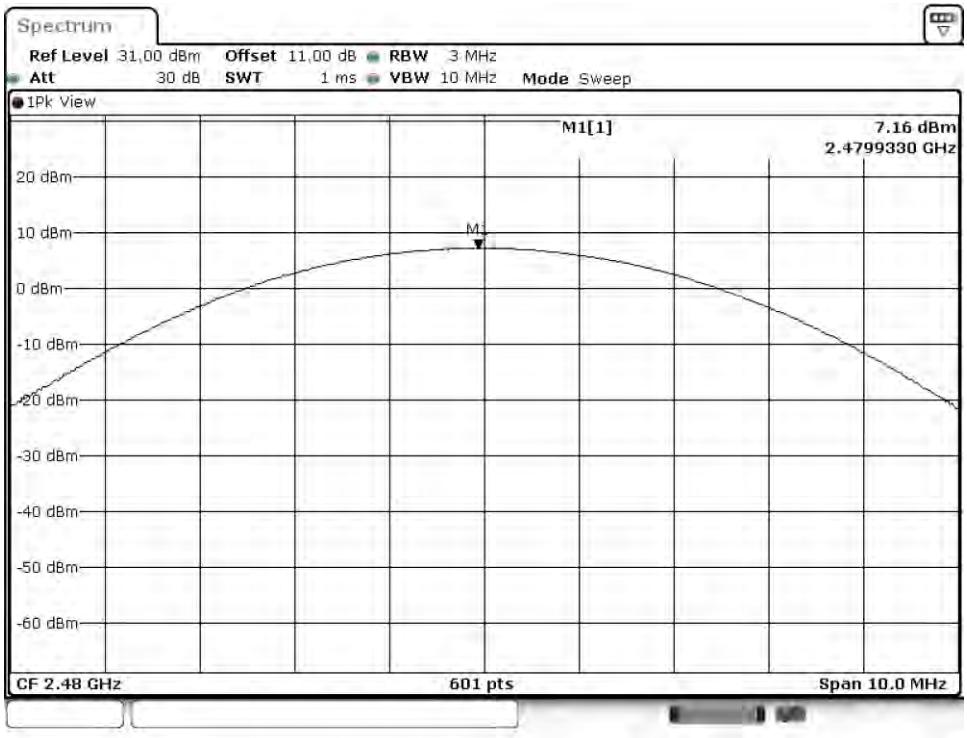
Output Power Summary Table (Enhanced Rate: 3 Mbps)							
Channel	Frequency (MHz)	Mode	Output Power (dBm)	Directional Gain (dBi)	Limit (dB)	Margin (dB)	Result
Low	2402	3-DH5	5.48	0	21	15.52	Pass
Middle	2441	3-DH5	7.27	0	21	13.73	Pass
High	2480	3-DH5	7.16	0	21	13.84	Pass



Plot7 Power 3DH5 2402 MHz



Plot8 Power 3DH5 2441 MHz



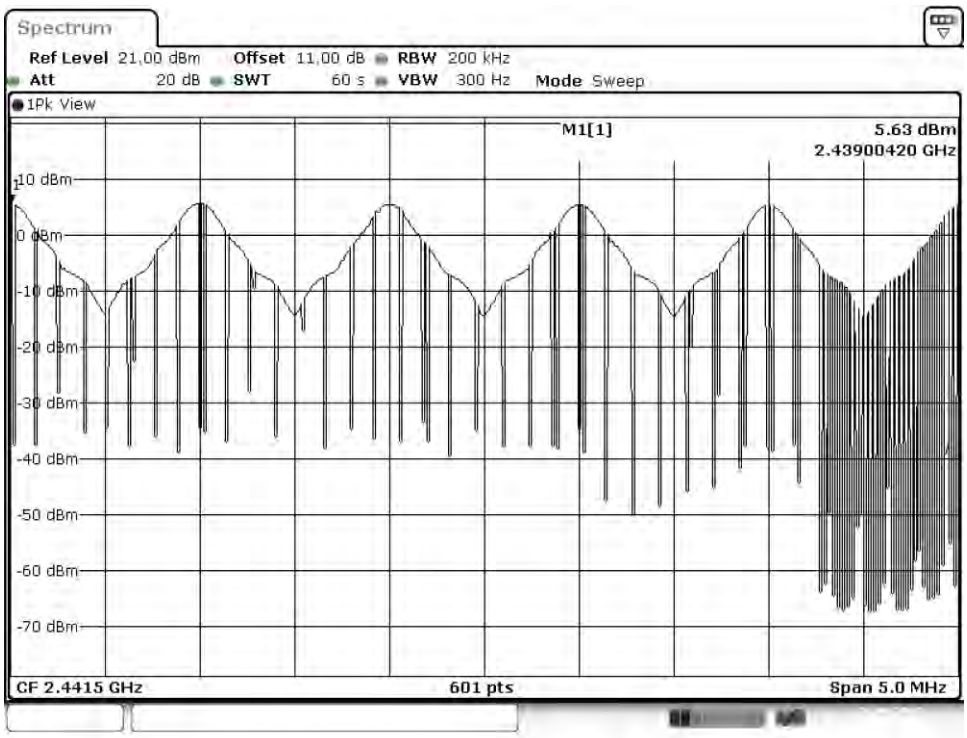
Plot9 Power 3DH5 2480 MHz

Hopping Frequency Separation

Requirements:

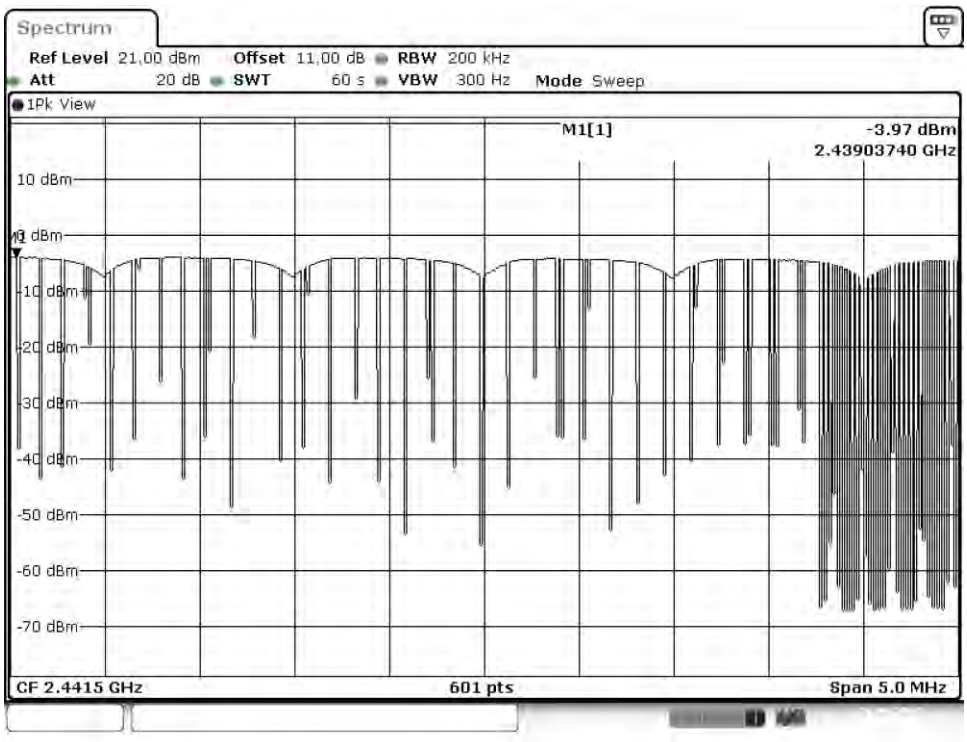
FCC 15.247 (a) (1), IC RSS-247 5.1 (2)
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Test Results:



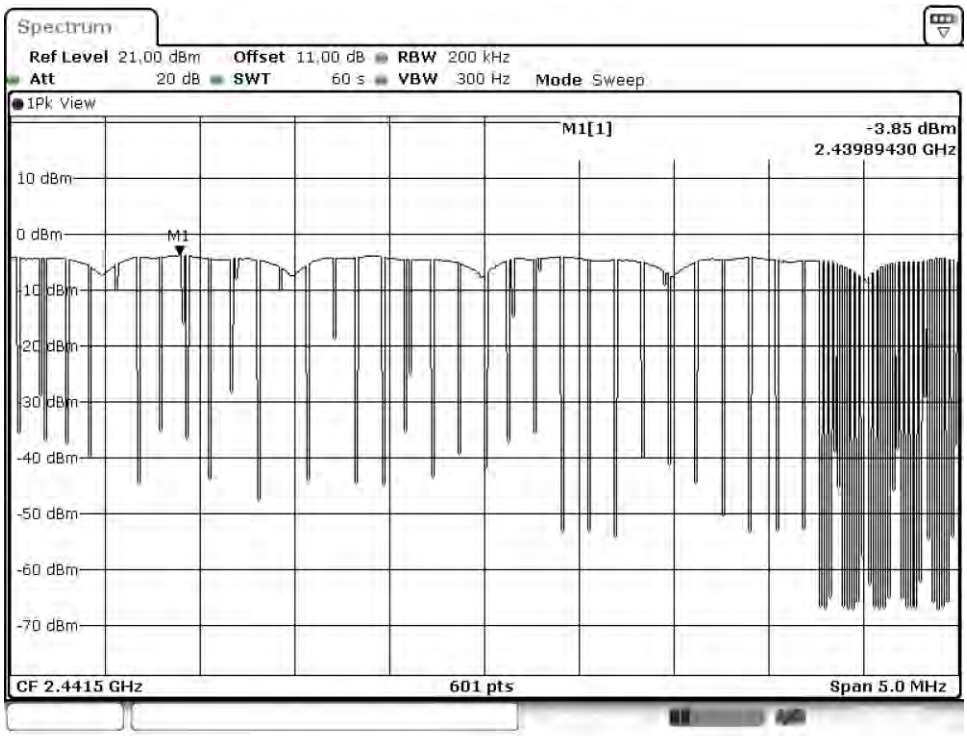
Plot1 Frequency Separation DH5 Hopping

Hopping frequencies are separated by 1 MHz, which is greater than the required minimum of the 20 dB bandwidth; 839 kHz for DH5.



Plot2 Frequency Separation 2DH5 Hopping

Hopping frequencies are separated by 1 MHz which is greater than the required minimum of 2/3 of the 20 dB bandwidth of the hopping channel, which would be 832 kHz for 2-DH5; the output power in 2-DH5 mode is less than 125 mW



Plot3 Frequency Separation 3DH5 Hopping

Hopping frequencies are separated by 1 MHz which is greater than the required minimum of 2/3 of the 20 dB bandwidth of the hopping channel, which would be 842 kHz for 3-DH5; the output power in 3-DH5 mode is less than 125 mW

Conducted Spurious Emissions

Requirements:

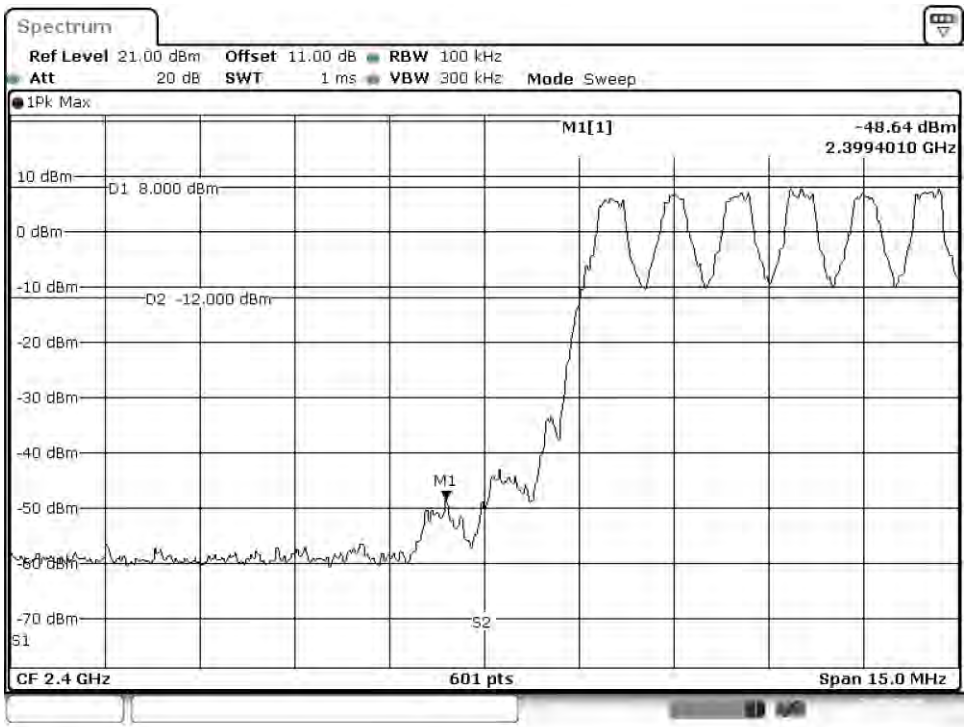
FCC 15.247 (d)
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see 15.205(c)).

IC RSS-247 5.5
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section A8.4 (4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

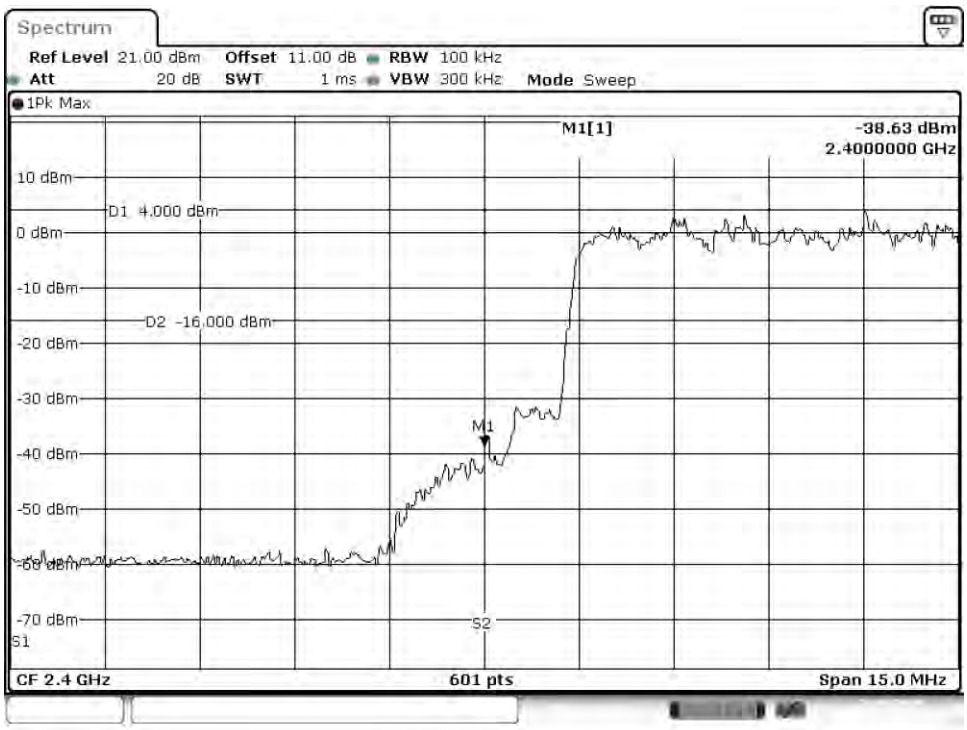
Note: Antenna gain outside of the wanted band was assumed to be zero. The conducted spurious readings are for additional information as the radiated readings take precedence.

Spurious Band-edge Emissions

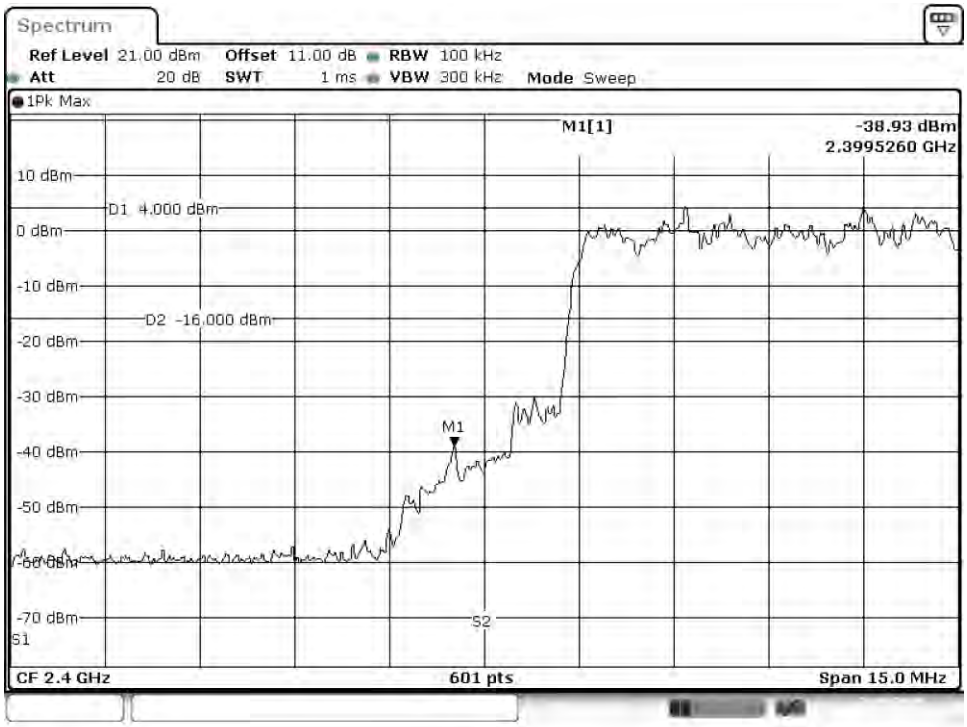
Lower Band Edge (Hopping Mode)						
Mode	Frequency (MHz)	Mode	Worst Case (dBc)	Limit (dBc)	Margin (dB)	Result
Hopping	All	DH5	56.64	20	36.64	Pass
Hopping	All	3-DH5	42.93	20	22.93	Pass
Hopping	All	2-DH5	42.63	20	22.63	Pass



Plot1 Lower Band Edge DH5 Hopping

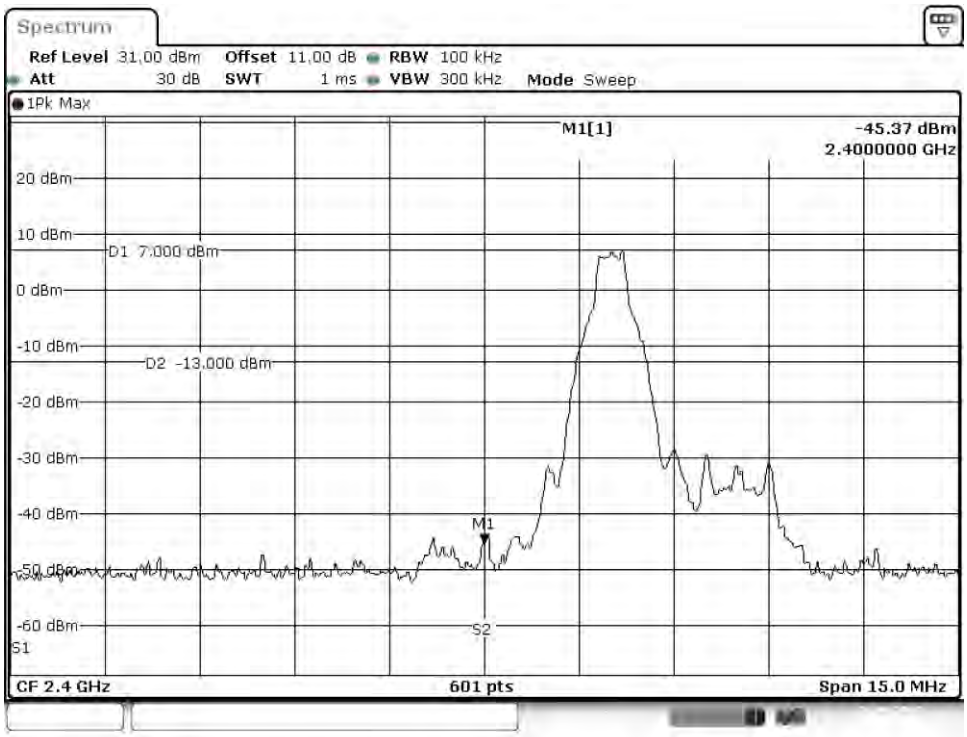


Plot2 Lower Band Edge 2DH5 Hopping

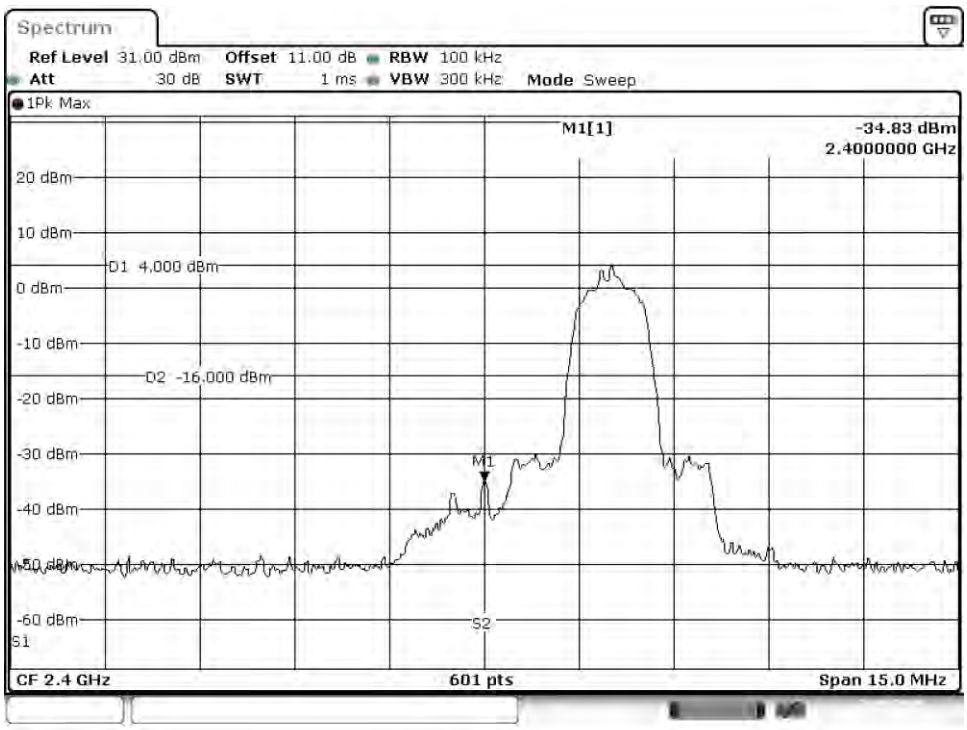


Plot3 Lower Band Edge 3DH5 Hopping

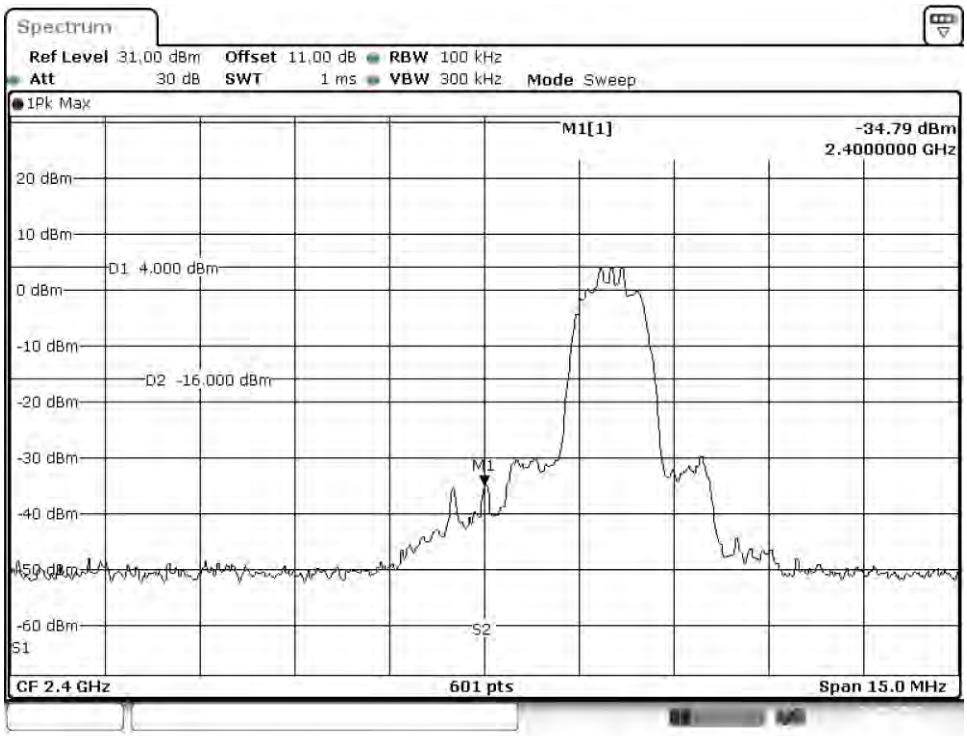
Lower Band Edge (Non-Hopping Mode)						
Channel	Frequency (MHz)	Mode	Worst Case (dBc)	Limit (dBc)	Margin (dB)	Result
Low	2402	DH5	52.37	20	32.37	Pass
Low	2402	2-DH5	38.83	20	18.83	Pass
Low	2402	3-DH5	38.79	20	18.79	Pass



Plot1 Lower Band Edge DH5 2402 MHz

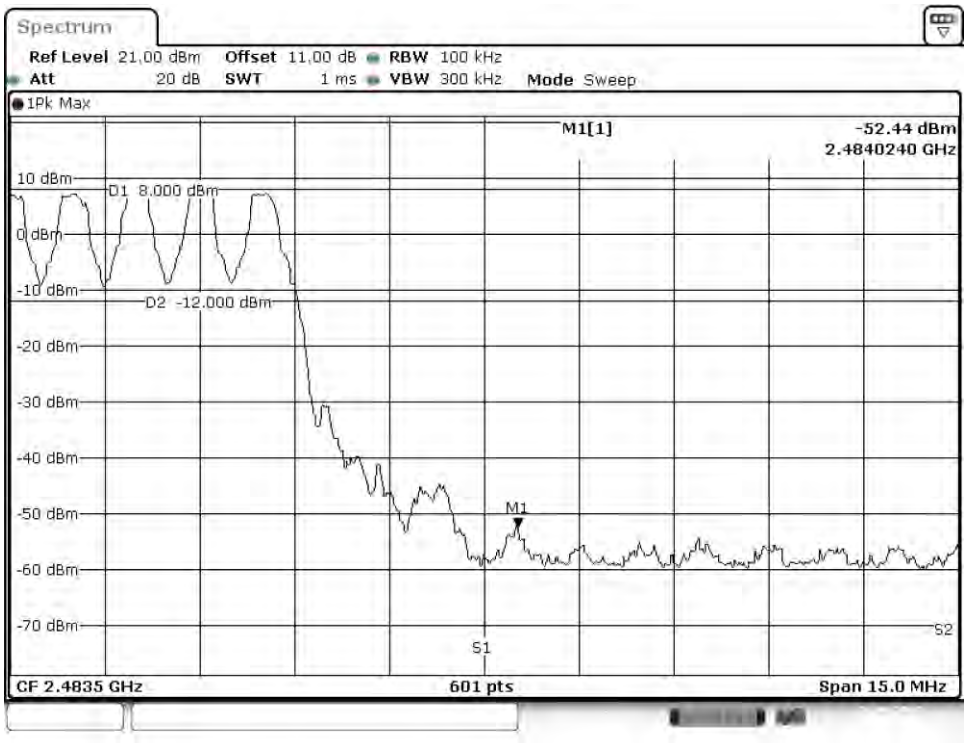


Plot2 Lower Band Edge 2DH5 2402 MHz



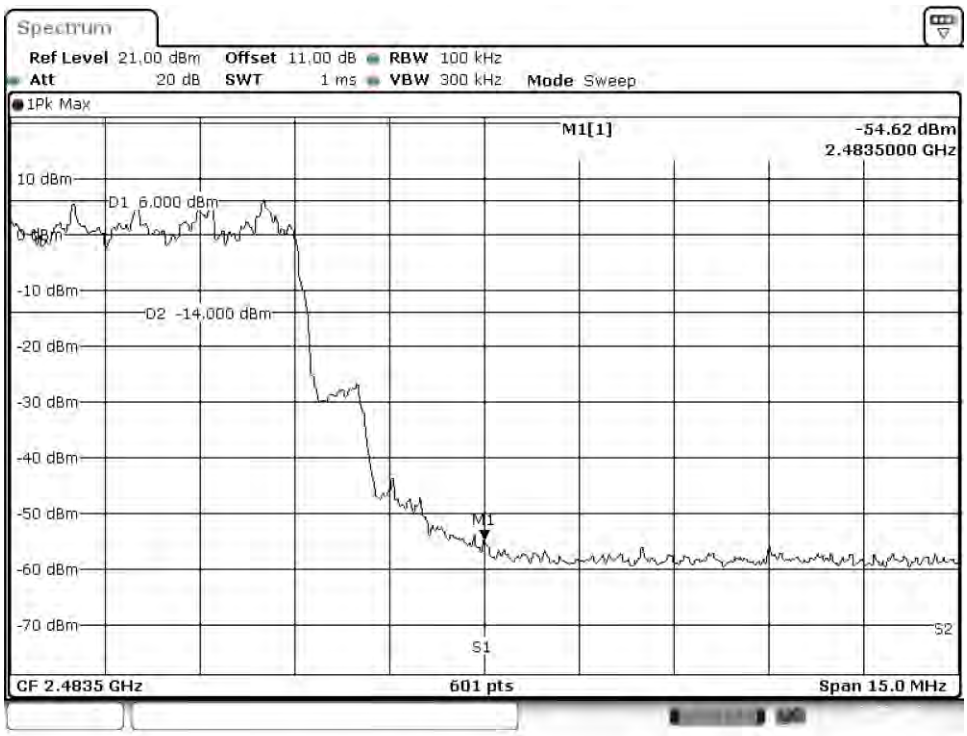
Plot3 Lower Band Edge 3DH5 2402 MHz

Upper Band Edge (Hopping Mode)						
Mode	Frequency (MHz)	Mode	Worst Case (dBc)	Limit (dBc)	Margin (dB)	Result
Hopping	All	DH5	60.44	20	40.44	Pass
Hopping	All	2-DH5	61.54	20	41.54	Pass
Hopping	All	3-DH5	60.62	20	40.62	Pass



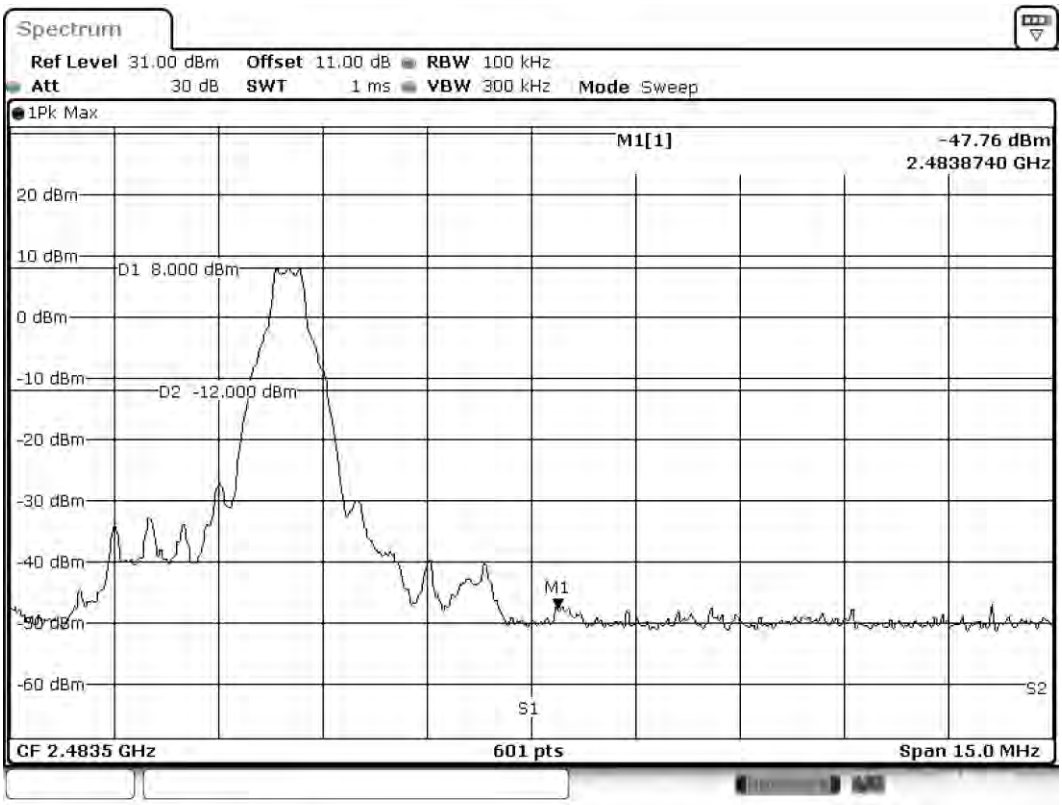
Plot1 Upper Band Edge DH5 Hopping

Plot2 Upper Band Edge 2DH5 Hopping

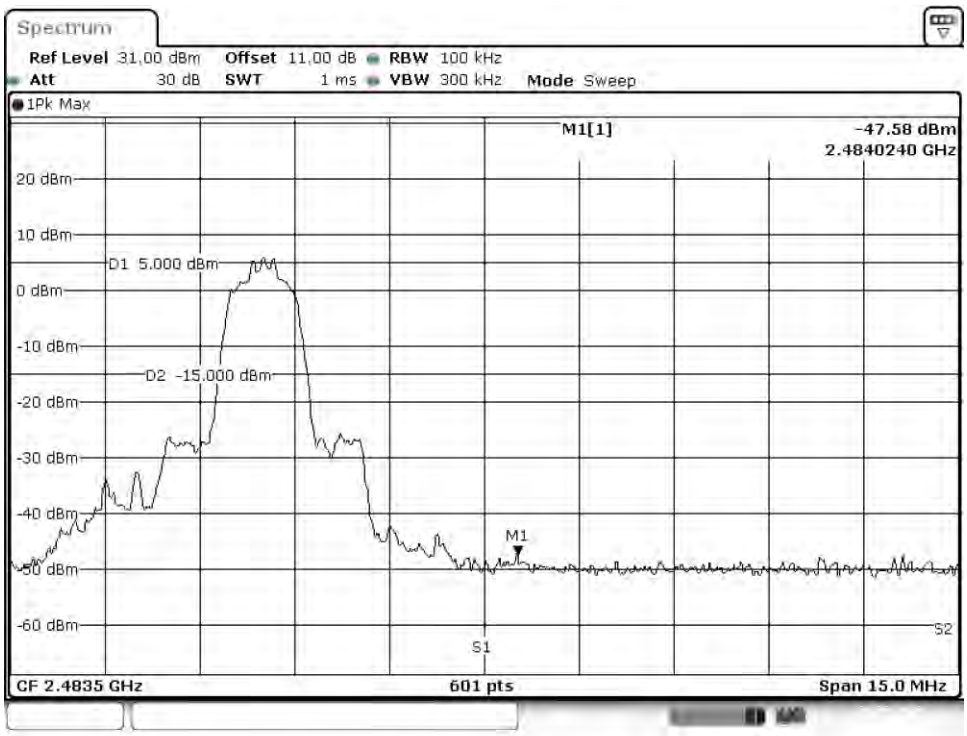


Plot3 Upper Band Edge 3DH5 Hopping

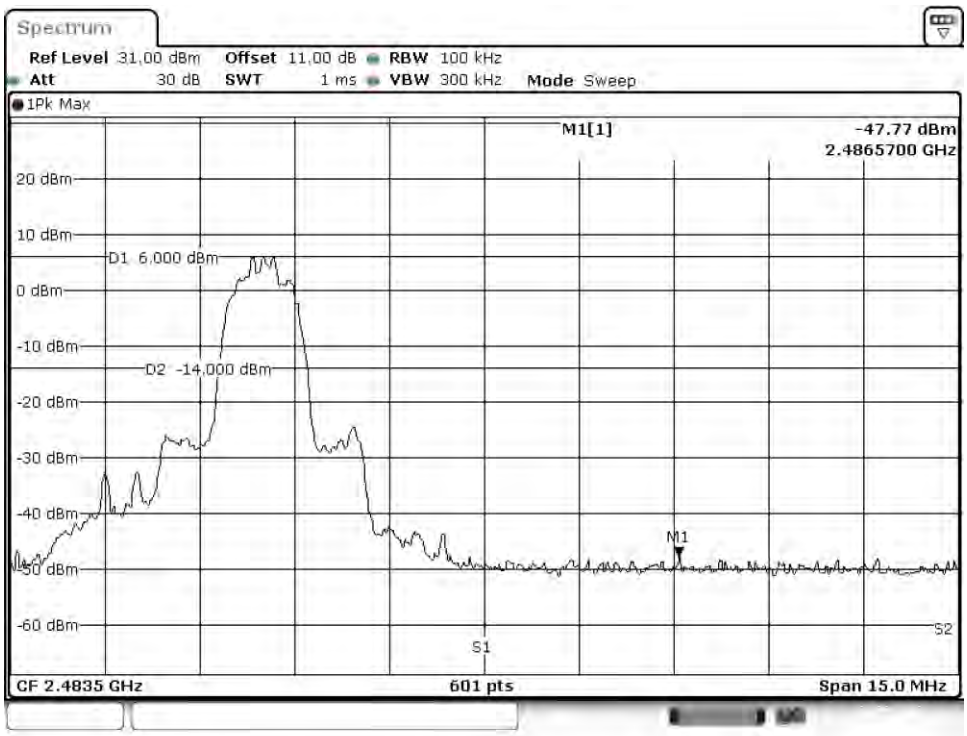
Upper Band Edge (Non-Hopping Mode)						
Channel	Frequency (MHz)	Mode	Worst Case (dBc)	Limit (dBc)	Margin (dB)	Result
High	2480	DH5	56.26	20	36.26	Pass
High	2480	2-DH5	52.58	20	32.58	Pass
High	2480	3-DH5	53.77	20	33.77	Pass



Plot1 Upper Band Edge DH5 2480 MHz



Plot2 Upper Band Edge 2DH5 2480 MHz



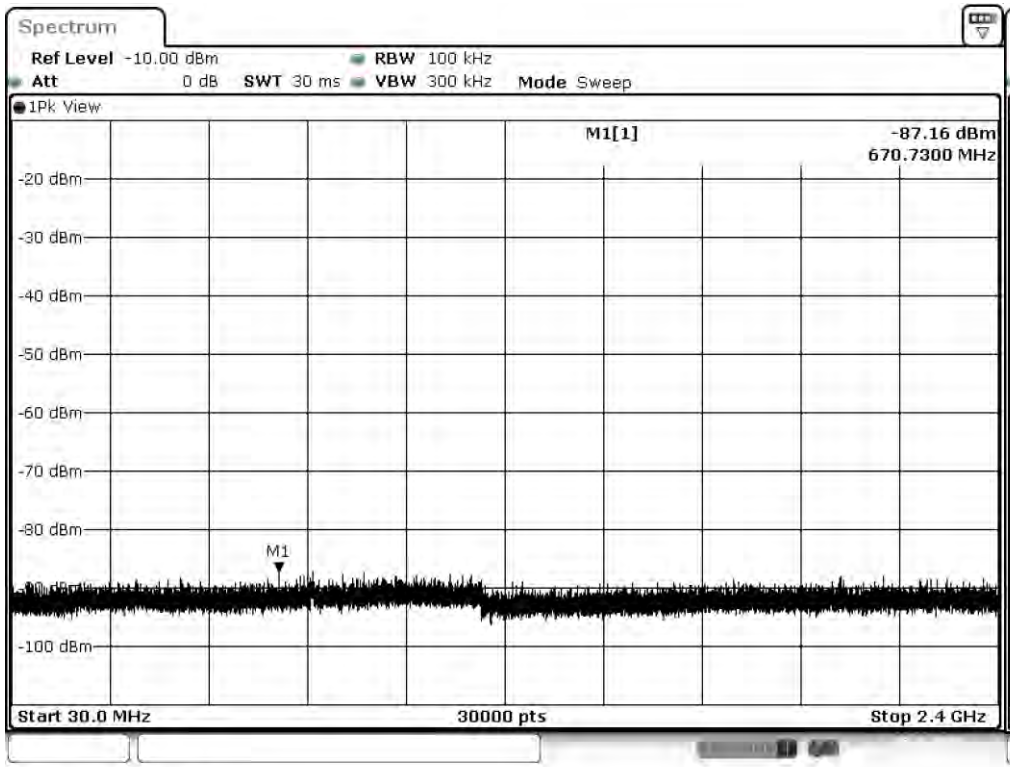
Plot3 Upper Band Edge 3DH5 2480 MHz

Spurious Emissions

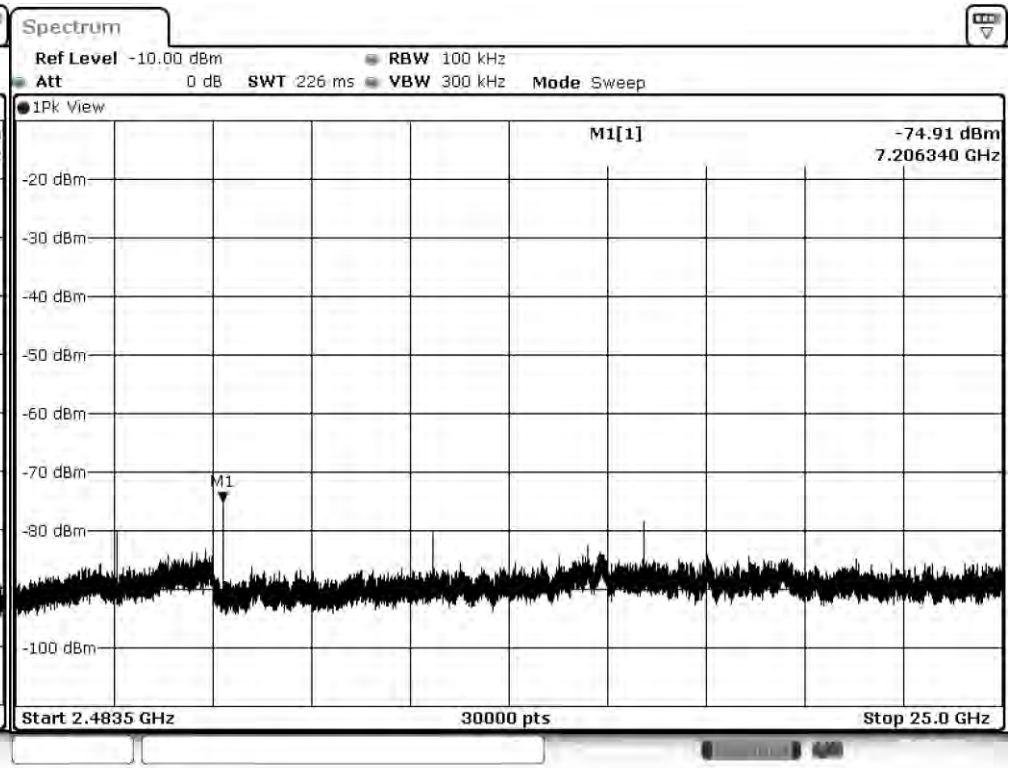
For these readings, a notch filter was used to protect the EMI receiver from overload. A correction factor was applied to account for the effect of the notch filter.

Spurious Summary Table (Basic Rate: 1 Mbps)											
Channel	Band Range (MHz)	Mode	Raw Measurement (dBm)	Test Cable Loss (dB)	Pad ATTN (dB)	EUT Antenna Gain At Harmonic Frequency (dBi)	Corrected Reading (dBm)	Convert to E-Field at 3 meters (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	Result
Low	30 To 1000	DH5	-87.2	1.0	10.0	0.0	-76.2	19.07	74	54.93	Pass
Low	2483.5 To 25000	DH5	-74.9	1.0	10.0	0.0	-63.9	31.32	74	42.68	Pass
Mid	30 To 1000	DH5	-57.9	1.0	10.0	0.0	-46.9	48.36	74	25.64	Pass
Mid	2483.5 To 25000	DH5	-74.6	1.0	10.0	0.0	-63.6	31.66	74	42.34	Pass
High	30 To 1000	DH5	-87.7	1.0	10.0	0.0	-76.7	18.51	74	55.49	Pass
High	2483.5 To 25000	DH5	-73.0	1.0	10.0	0.0	-62.0	33.23	74	40.77	Pass
Hopping	30 To 1000	DH5	-67.8	1.0	10.0	0.0	-56.8	38.41	74	35.59	Pass
Hopping	2483.5 To 25000	DH5	-69.1	1.0	10.0	0.0	-58.1	37.10	74	36.90	Pass

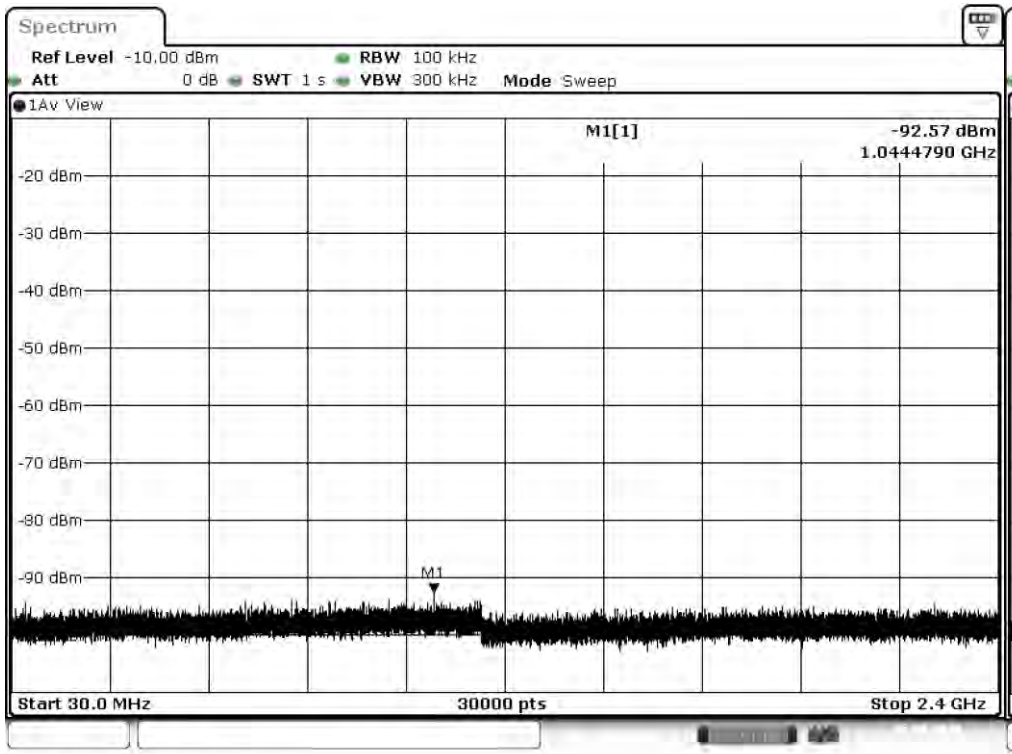
Spurious Summary Table (Basic Rate: 1 Mbps)											
Channel	Band Range (MHz)	Mode	Raw Measurement (dBm)	Test Cable Loss (dB)	Pad ATTN (dB)	EUT Antenna Gain At Harmonic Frequency (dBi)	Corrected Reading (dBm)	Convert to E-Field at 3 meters (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Result
Low	30 To 1000	DH5	-92.6	1.0	10.0	0.0	-81.6	13.66	54	40.34	Pass
Low	2483.5 To 25000	DH5	-81.8	1.0	10.0	0.0	-70.8	24.43	54	29.57	Pass
Mid	30 To 1000	DH5	-93.9	1.0	10.0	0.0	-82.9	12.28	54	41.72	Pass
Mid	2483.5 To 25000	DH5	-82.9	1.0	10.0	0.0	-71.9	23.37	54	30.63	Pass
High	30 To 1000	DH5	-93.6	1.0	10.0	0.0	-82.6	12.64	54	41.36	Pass
High	2483.5 To 25000	DH5	-81.6	1.0	10.0	0.0	-70.6	24.63	54	29.37	Pass
Hopping	30 To 1000	DH5	-93.2	1.0	10.0	0.0	-82.2	13.07	54	40.93	Pass
Hopping	2483.5 To 25000	DH5	-80.0	1.0	10.0	0.0	-69.0	26.18	54	27.82	Pass



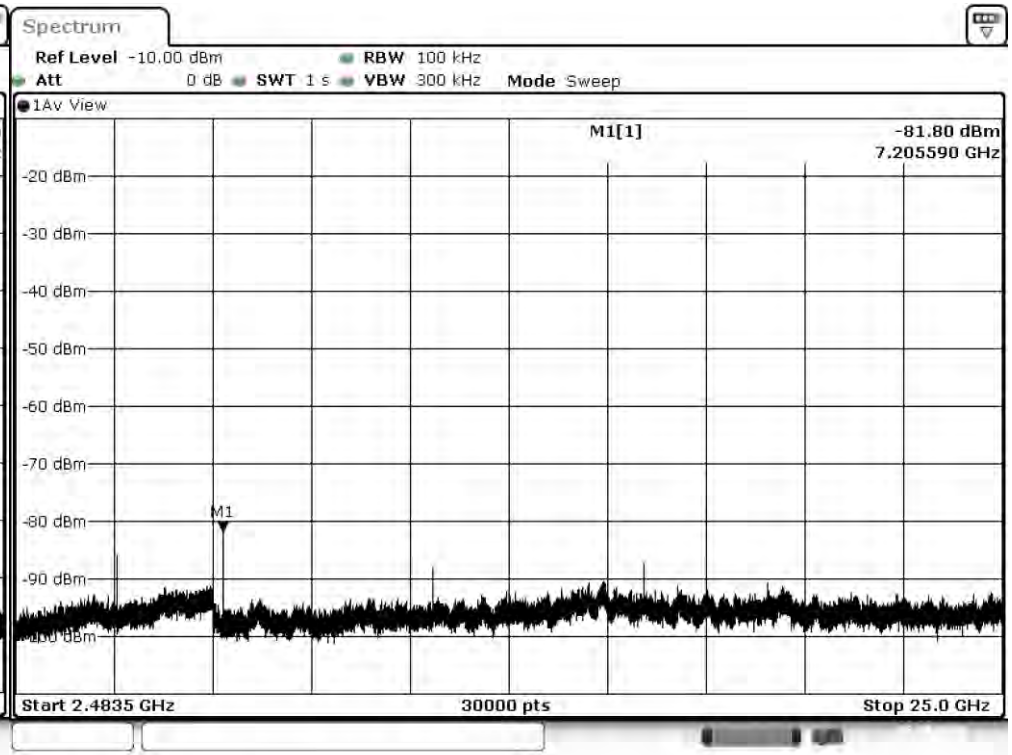
Plot1 DH5 2402 MHz Peak Band 1



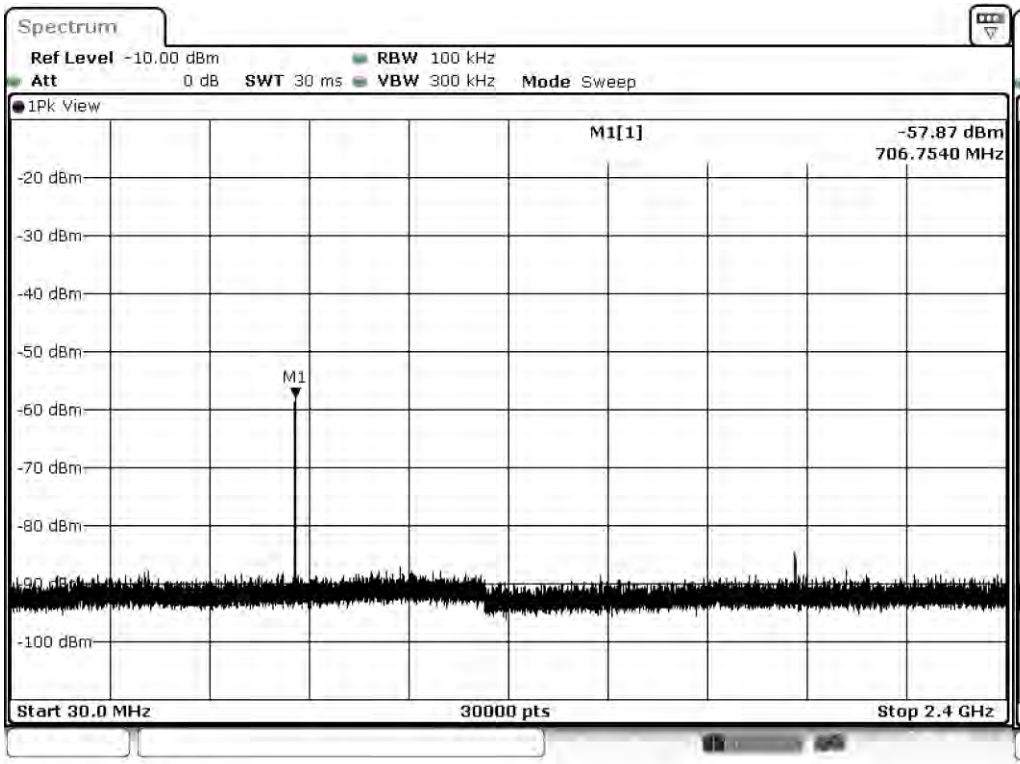
Plot2 DH5 2402 MHz Peak Band 2



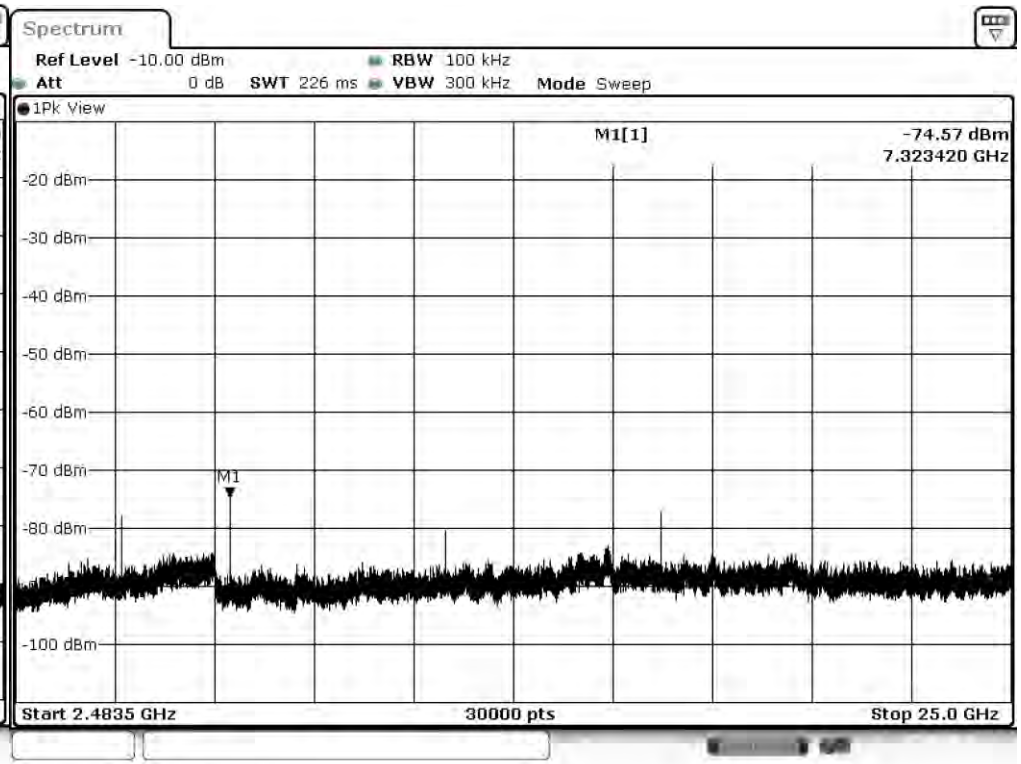
Plot1 DH5 2402 MHz Average Band 1



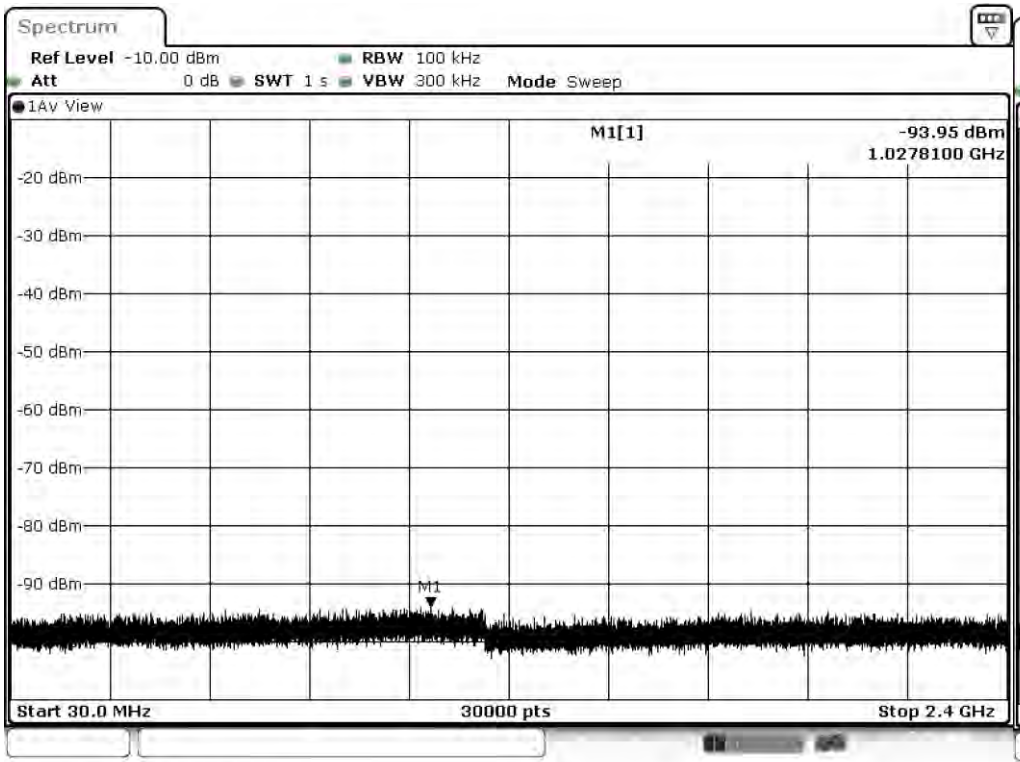
Plot2 DH5 2402 MHz Average Band 2



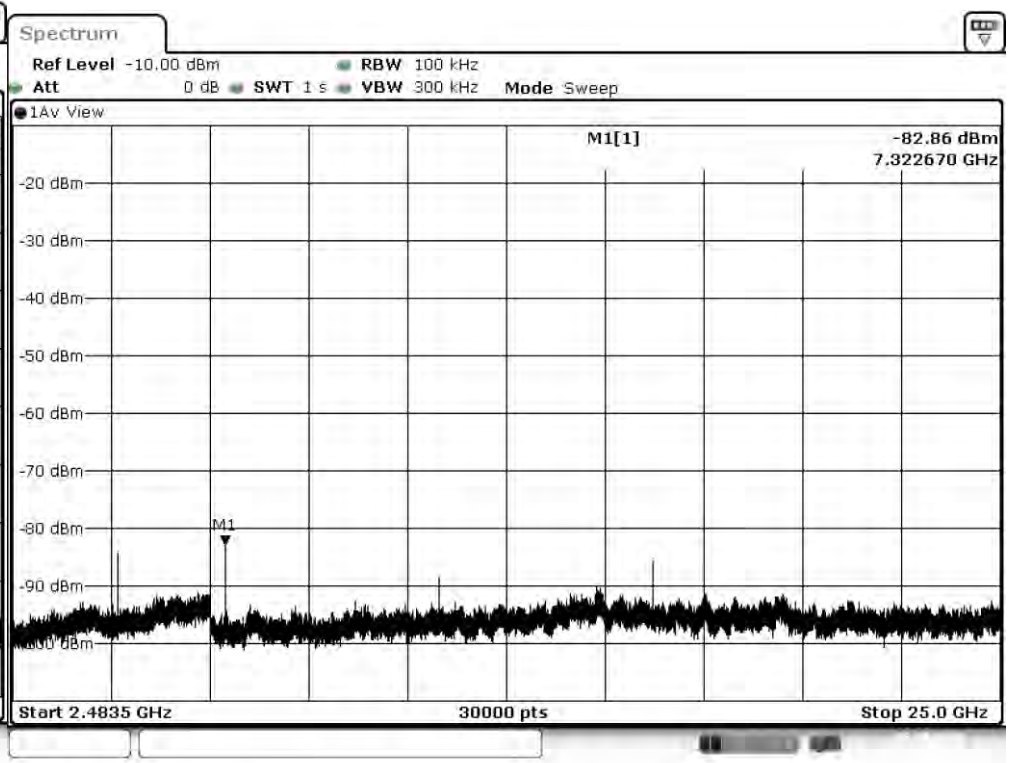
Plot1 DH5 2441 MHz Peak Band 1



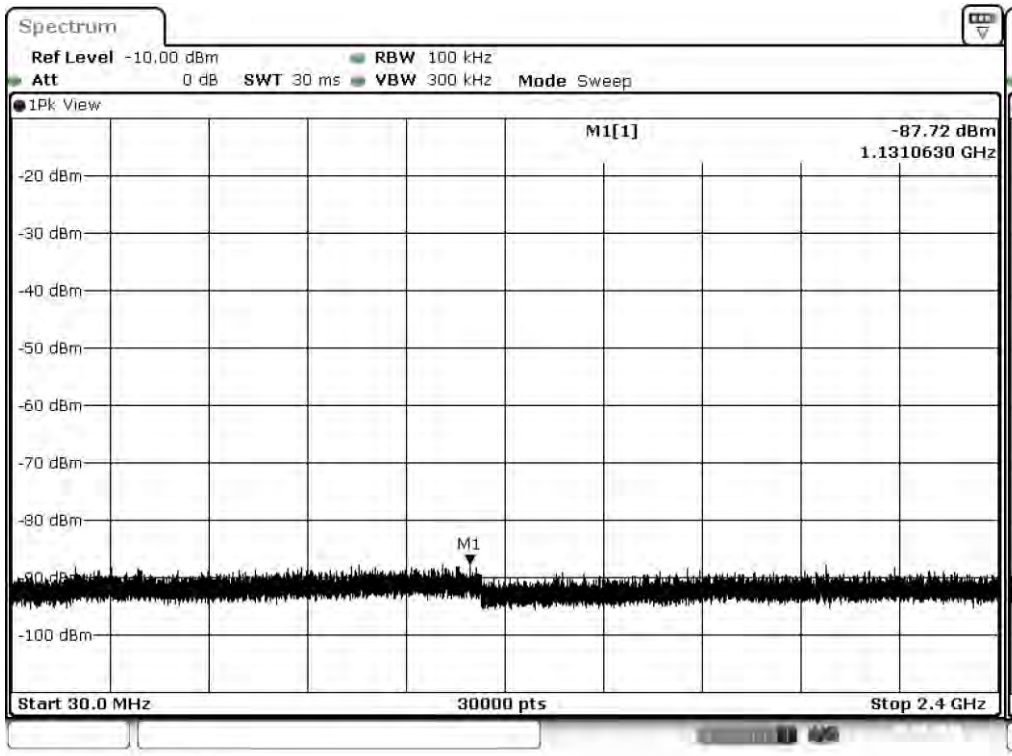
Plot2 DH5 2441 MHz Peak Band 2



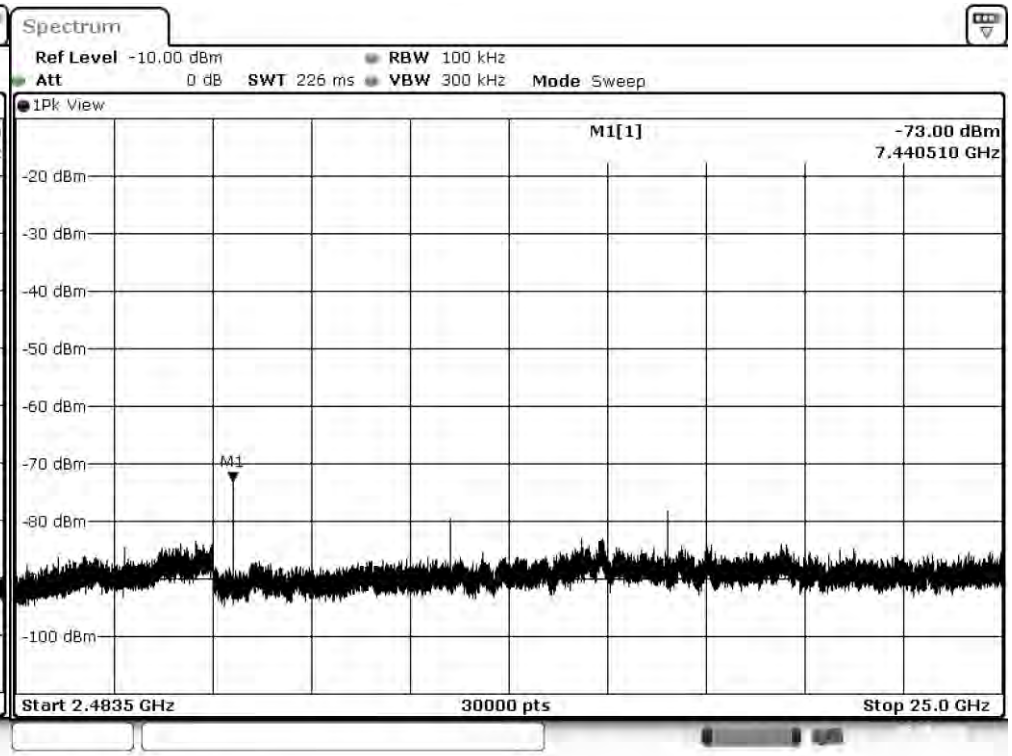
Plot1 DH5 2441 MHz Average Band 1



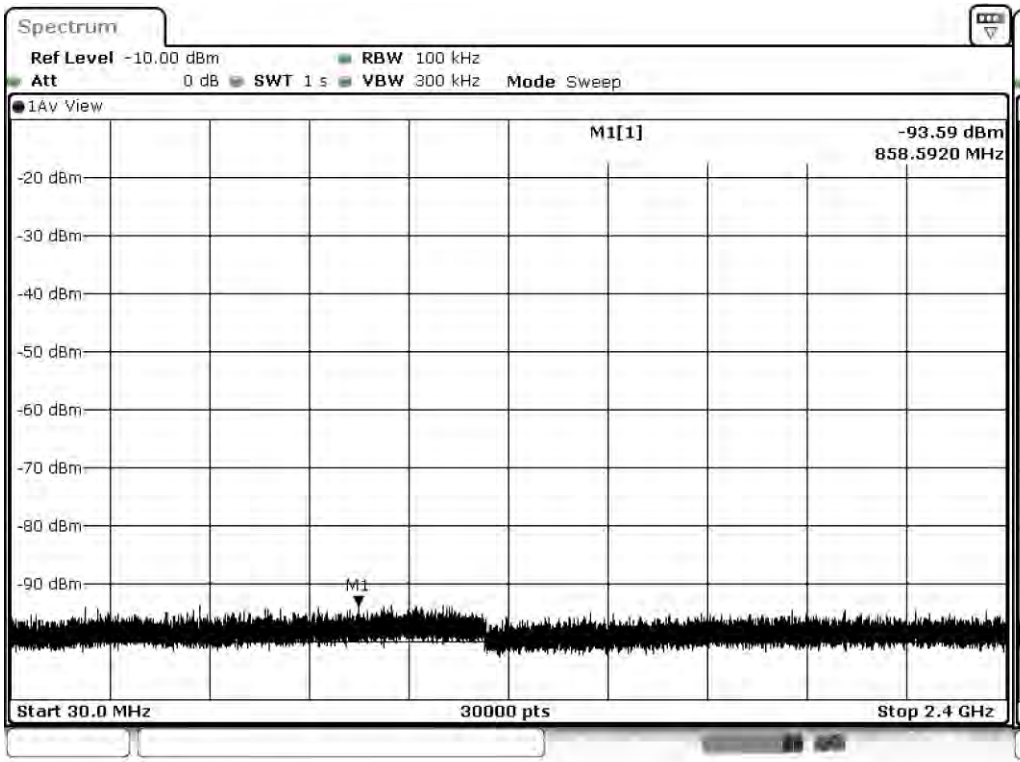
Plot2 DH5 2441 MHz Average Band 2



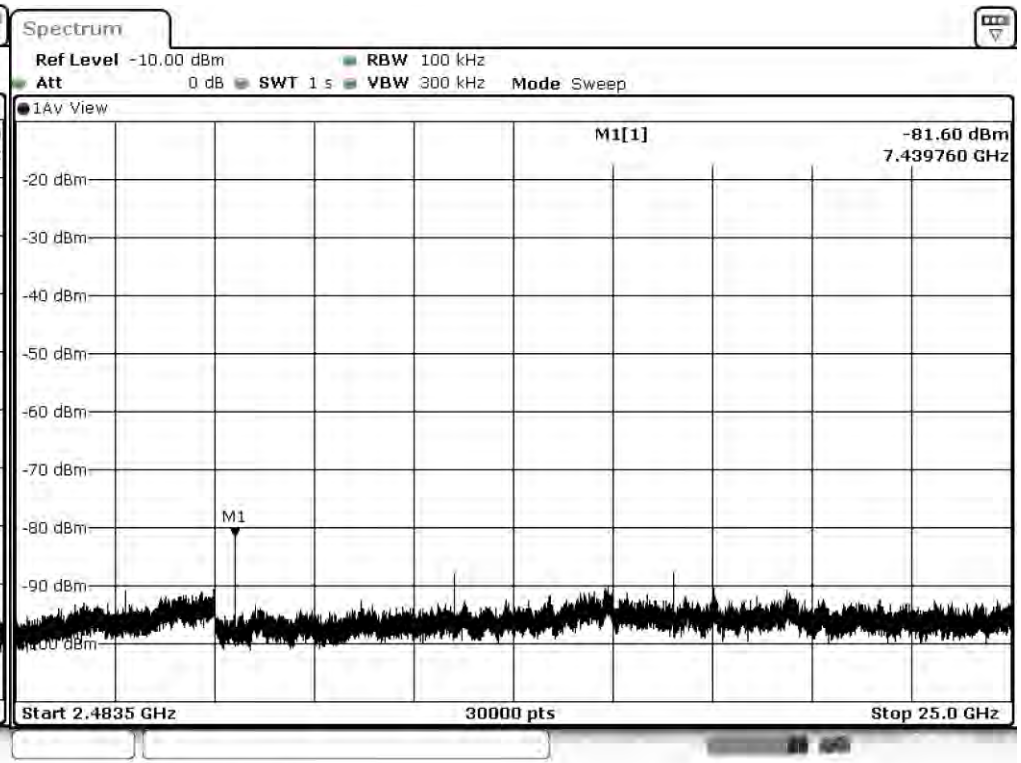
Plot1 DH5 2480 MHz Peak Band 1



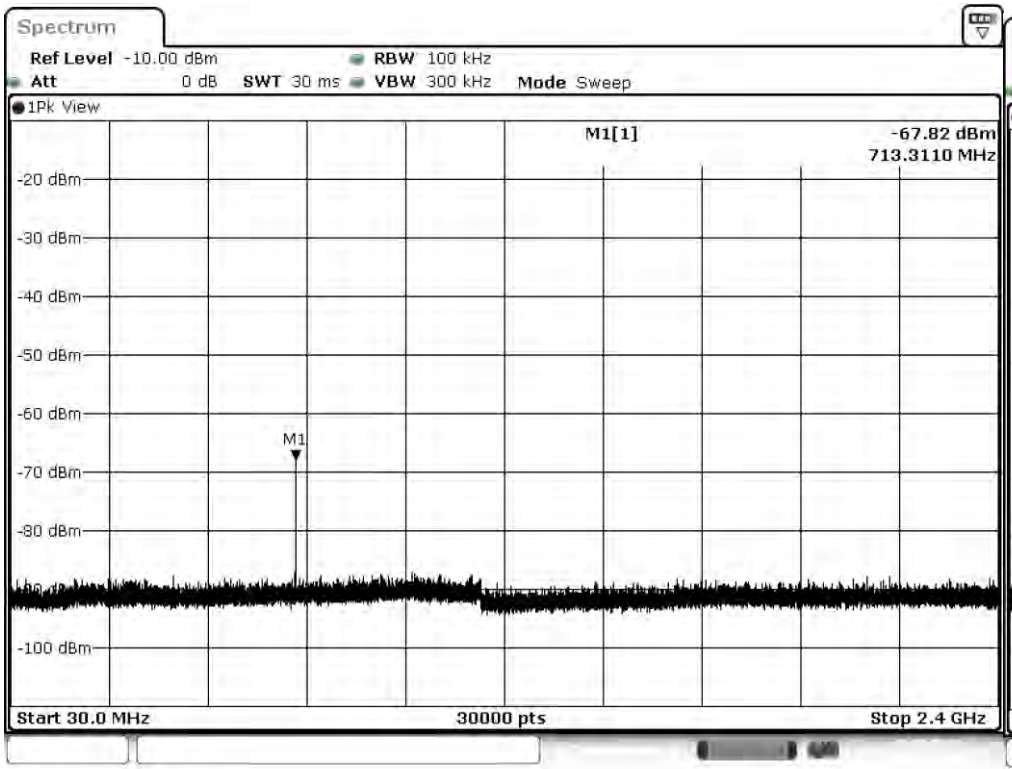
Plot2 DH5 2480 MHz Peak Band 2



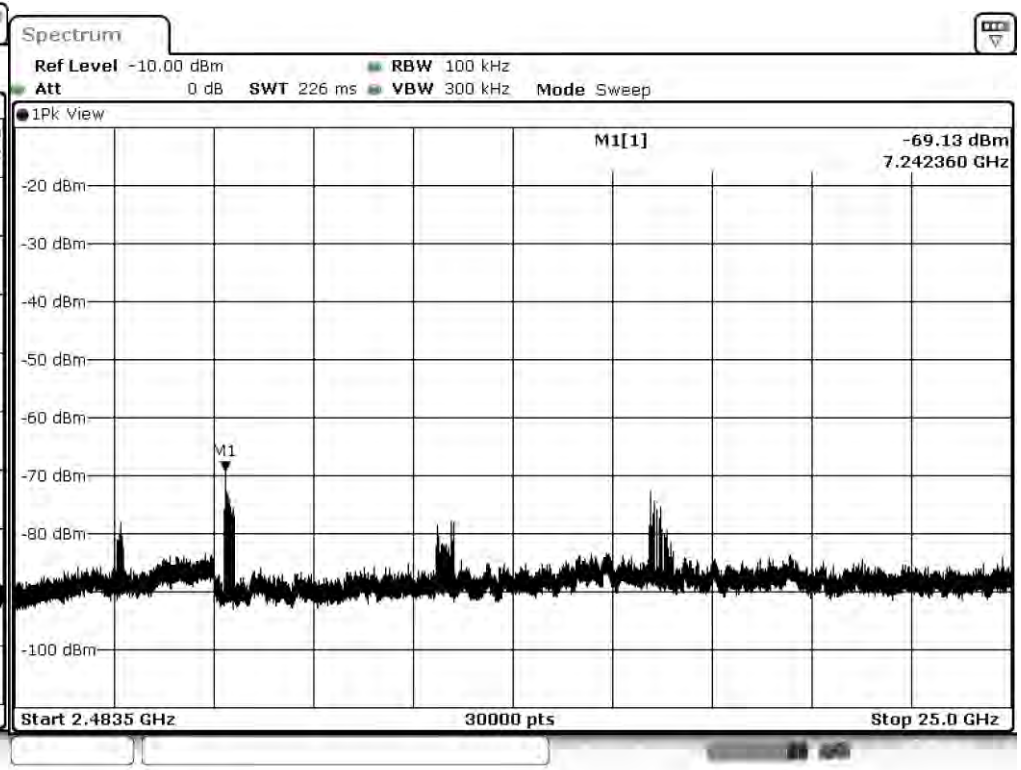
Plot1 DH5 2480 MHz Average Band 1



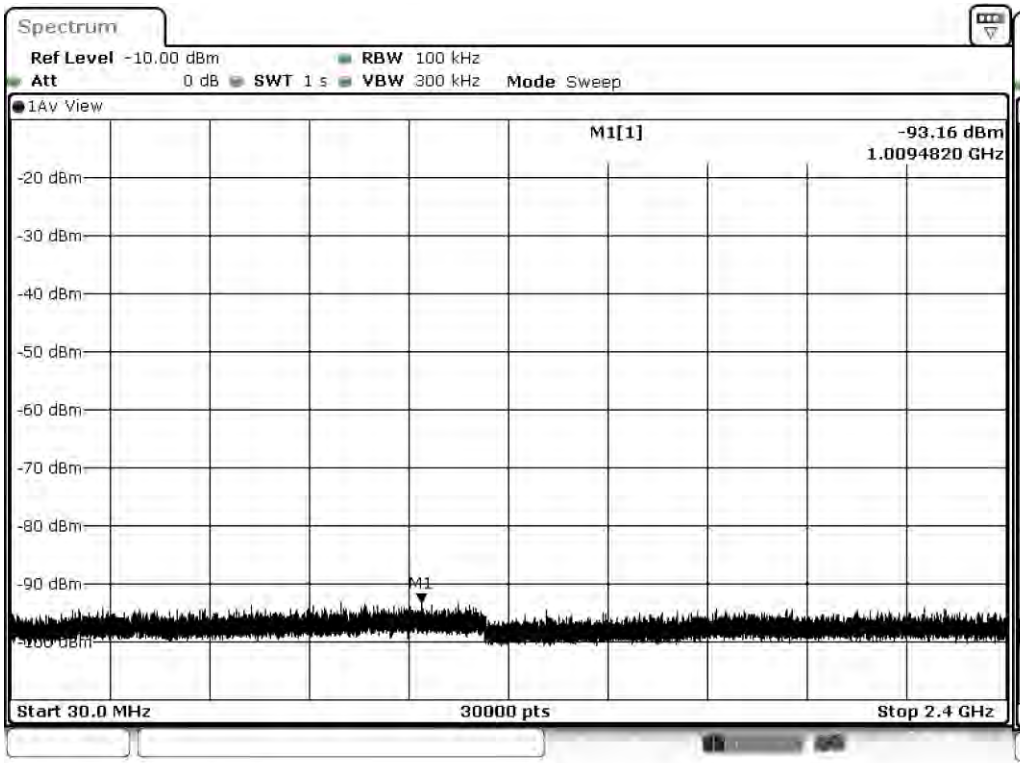
Plot2 DH5 2480 MHz Average Band 2



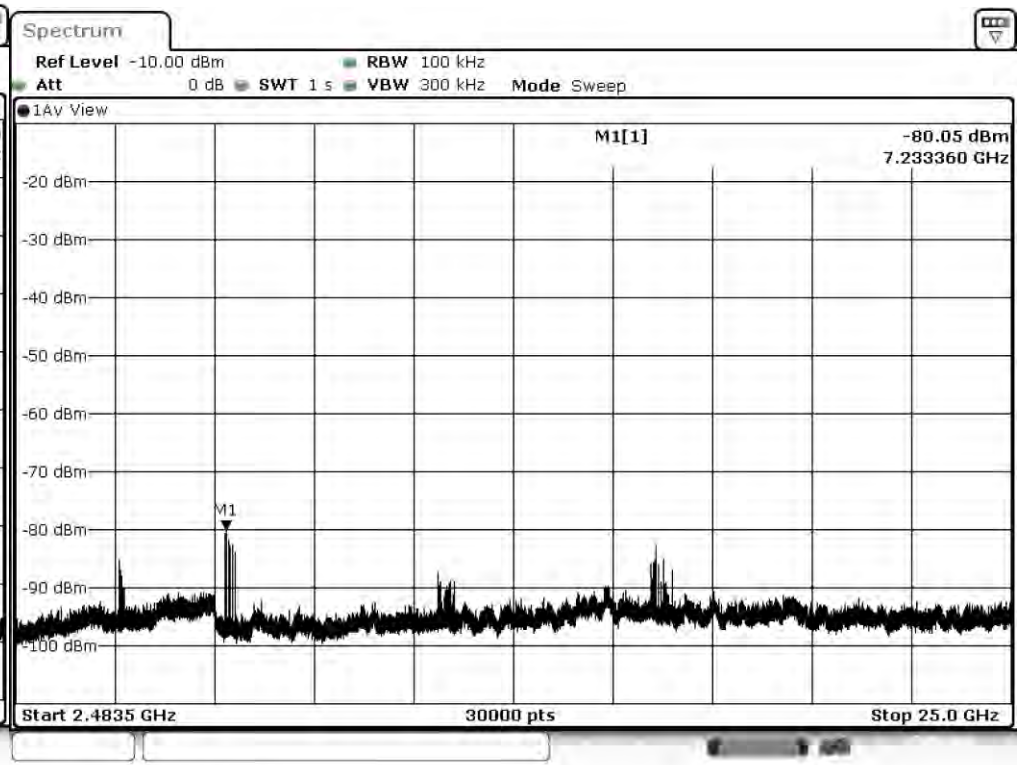
Plot1 DH5 Hopping Peak Band 1



Plot2 DH5 Hopping Peak Band 2



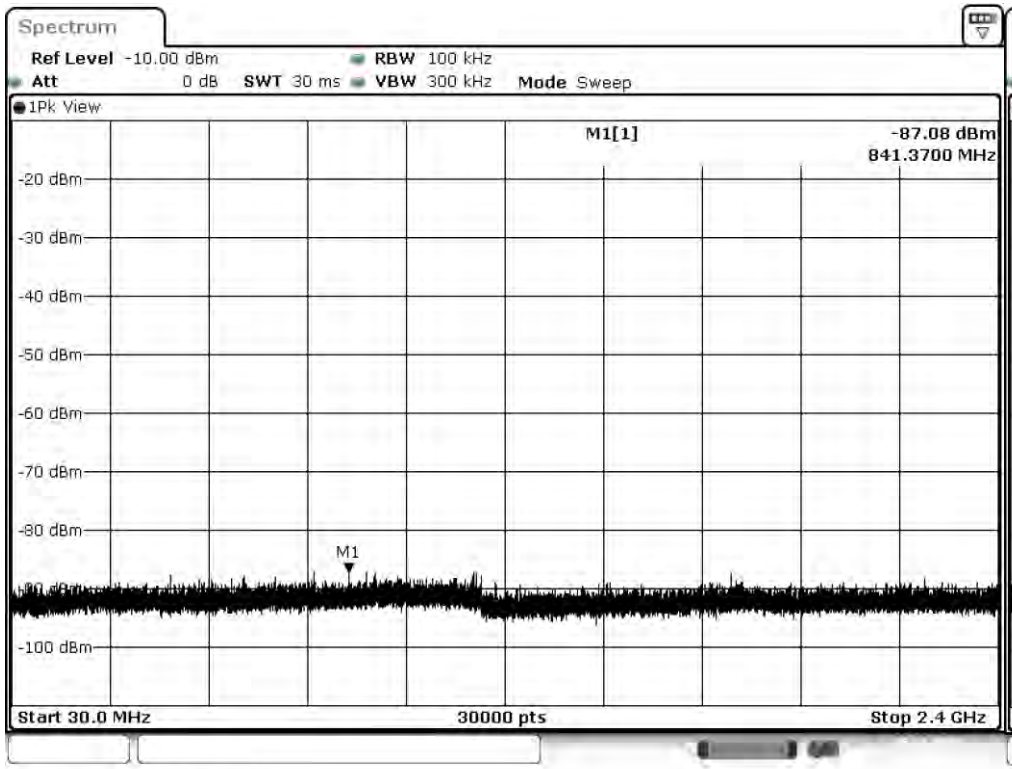
Plot1 DH5 Hopping Average Band 1



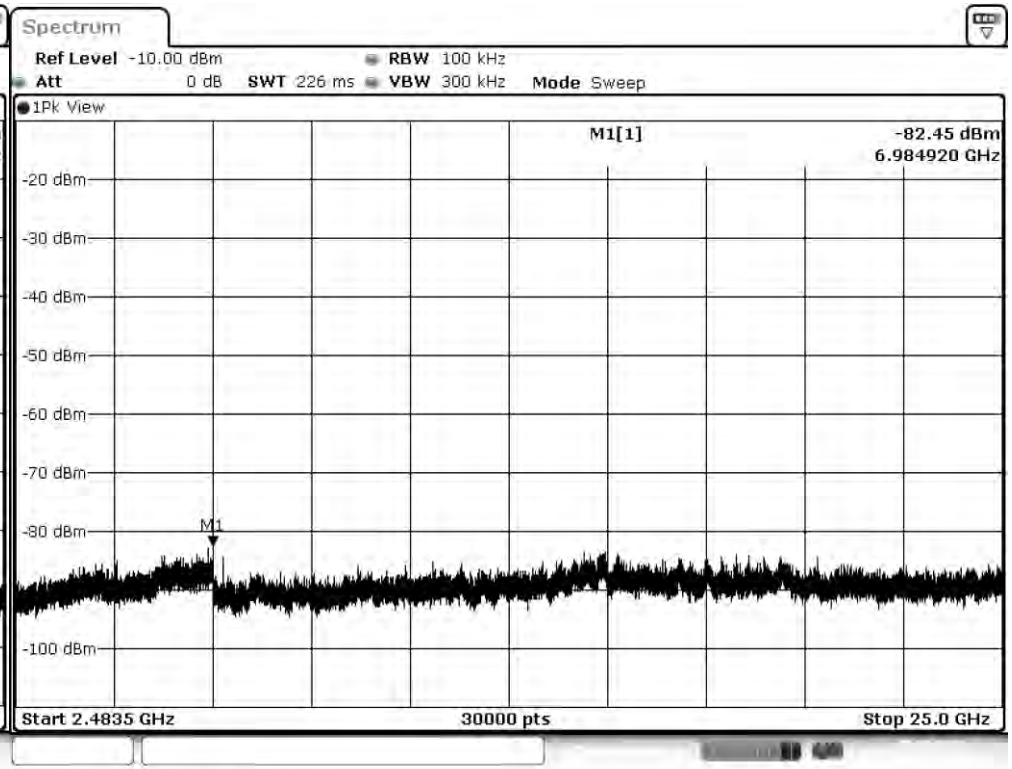
Plot2 DH5 Hopping Average Band 2

Spurious Summary Table (Enhanced Rate: 2 Mbps)											
Channel	Band Range (MHz)	Mode	Raw Measurement (dBm)	Test Cable Loss (dB)	Pad ATTN (dB)	EUT Antenna Gain At Harmonic Frequency (dBi)	Corrected Reading (dBm)	Convert to E-Field at 3 meters (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	Result
Low	30 To 1000	2DH5	-87.1	1.0	10.0	0.0	-76.1	19.15	74	54.85	Pass
Low	2483.5 To 25000	2DH5	-82.4	1.0	10.0	0.0	-71.4	23.78	74	50.22	Pass
Mid	30 To 1000	2DH5	-87.5	1.0	10.0	0.0	-76.5	18.70	74	55.30	Pass
Mid	2483.5 To 25000	2DH5	-81.0	1.0	10.0	0.0	-70.0	25.19	74	48.81	Pass
High	30 To 1000	2DH5	-87.2	1.0	10.0	0.0	-76.2	19.06	74	54.94	Pass
High	2483.5 To 25000	2DH5	-83.4	1.0	10.0	0.0	-72.4	22.82	74	51.18	Pass
Hopping	30 To 1000	2DH5	-87.3	1.0	10.0	0.0	-76.3	18.93	74	55.07	Pass
Hopping	2483.5 To 25000	2DH5	-79.0	1.0	10.0	0.0	-68.0	27.19	74	46.81	Pass

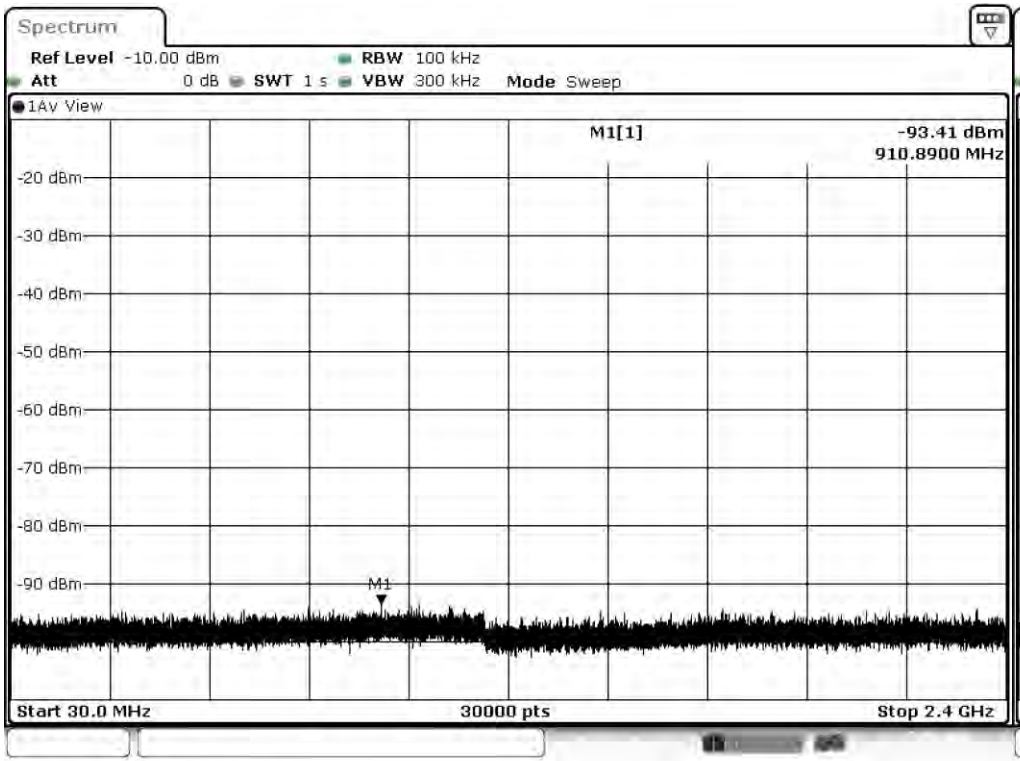
Spurious Summary Table (Enhanced Rate: 2 Mbps)											
Channel	Band Range (MHz)	Mode	Raw Measurement (dBm)	Test Cable Loss (dB)	Pad ATTN (dB)	EUT Antenna Gain At Harmonic Frequency (dBi)	Corrected Reading (dBm)	Convert to E-Field at 3 meters (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Result
Low	30 To 1000	2DH5	-93.4	1.0	10.0	0.0	-82.4	12.82	54	41.18	Pass
Low	2483.5 To 25000	2DH5	-89.8	1.0	10.0	0.0	-78.8	16.39	54	37.61	Pass
Mid	30 To 1000	2DH5	-93.6	1.0	10.0	0.0	-82.6	12.64	54	41.36	Pass
Mid	2483.5 To 25000	2DH5	-86.4	1.0	10.0	0.0	-75.4	19.83	54	34.17	Pass
High	30 To 1000	2DH5	-93.9	1.0	10.0	0.0	-82.9	12.38	54	41.62	Pass
High	2483.5 To 25000	2DH5	-90.3	1.0	10.0	0.0	-79.3	15.93	54	38.07	Pass
Hopping	30 To 1000	2DH5	-93.3	1.0	10.0	0.0	-82.3	12.89	54	41.11	Pass
Hopping	2483.5 To 25000	2DH5	-88.2	1.0	10.0	0.0	-77.2	18.00	54	36.00	Pass



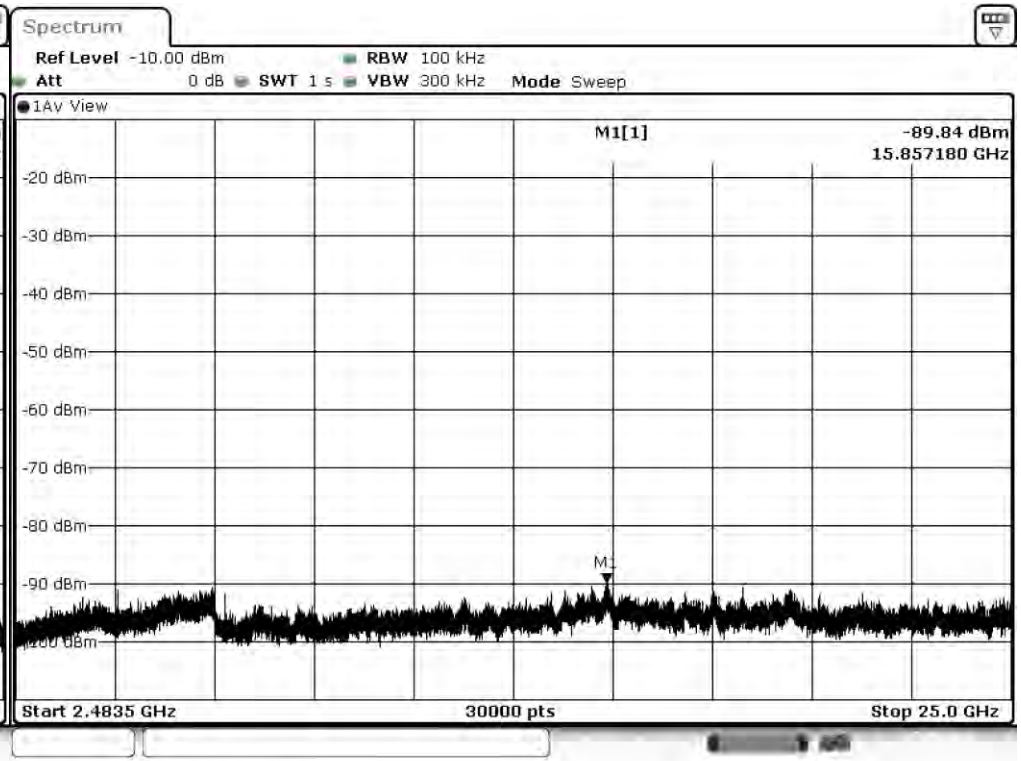
Plot1 2DH5 2402 MHz Peak Band 1



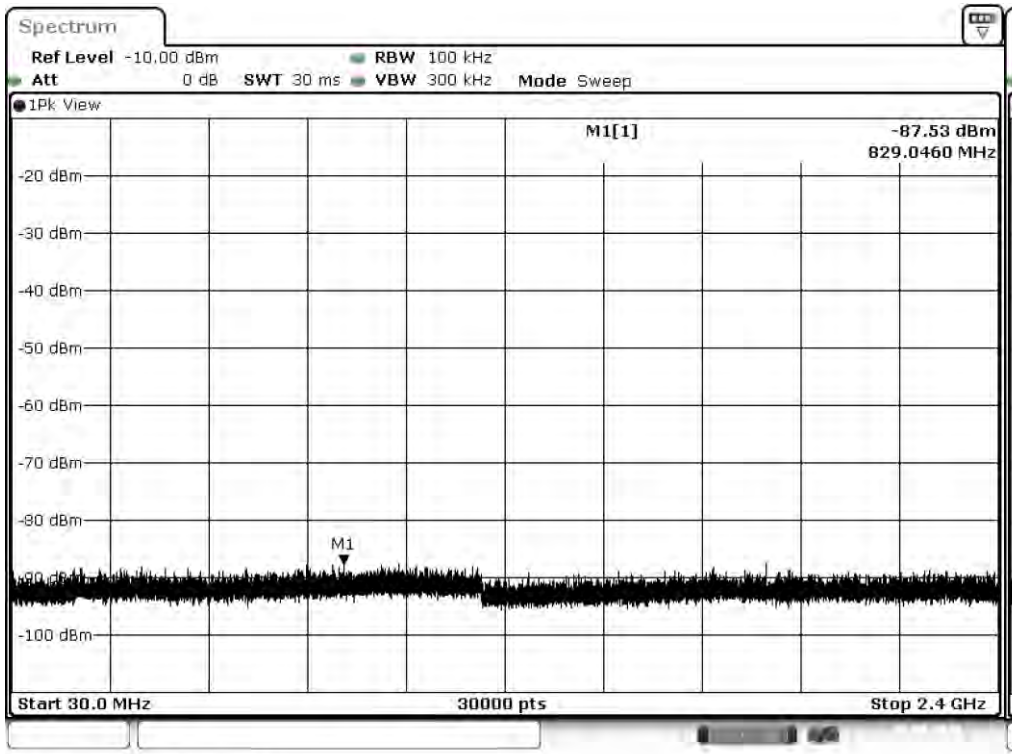
Plot2 2DH5 2402 MHz Peak Band 2



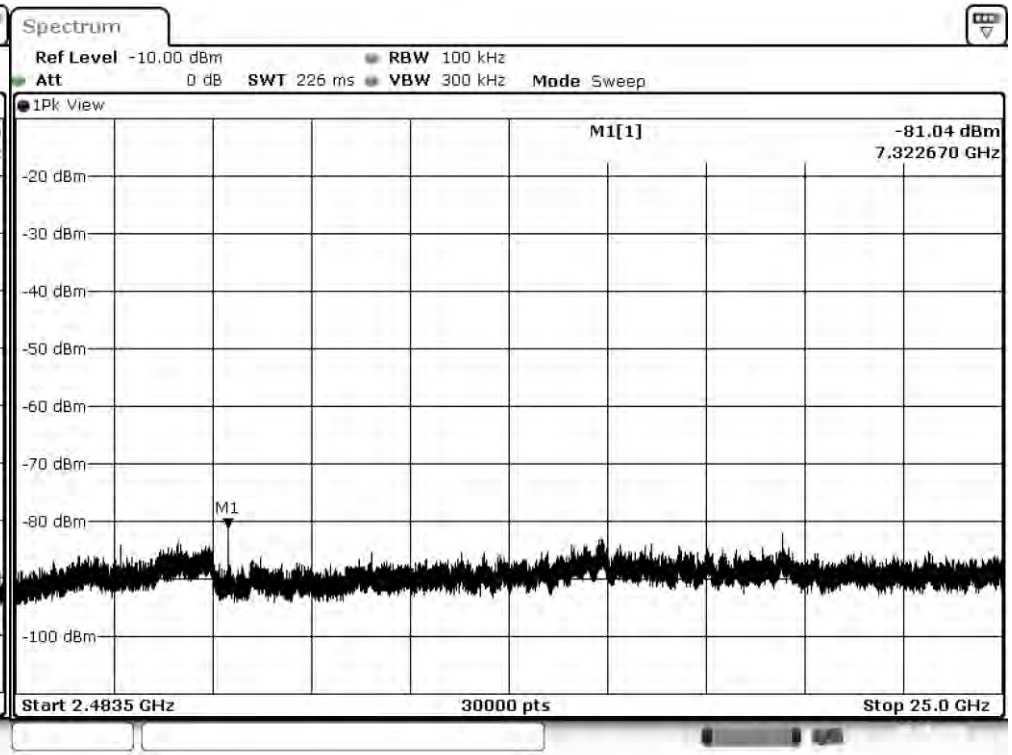
Plot1 2DH5 2402 MHz Average Band 1



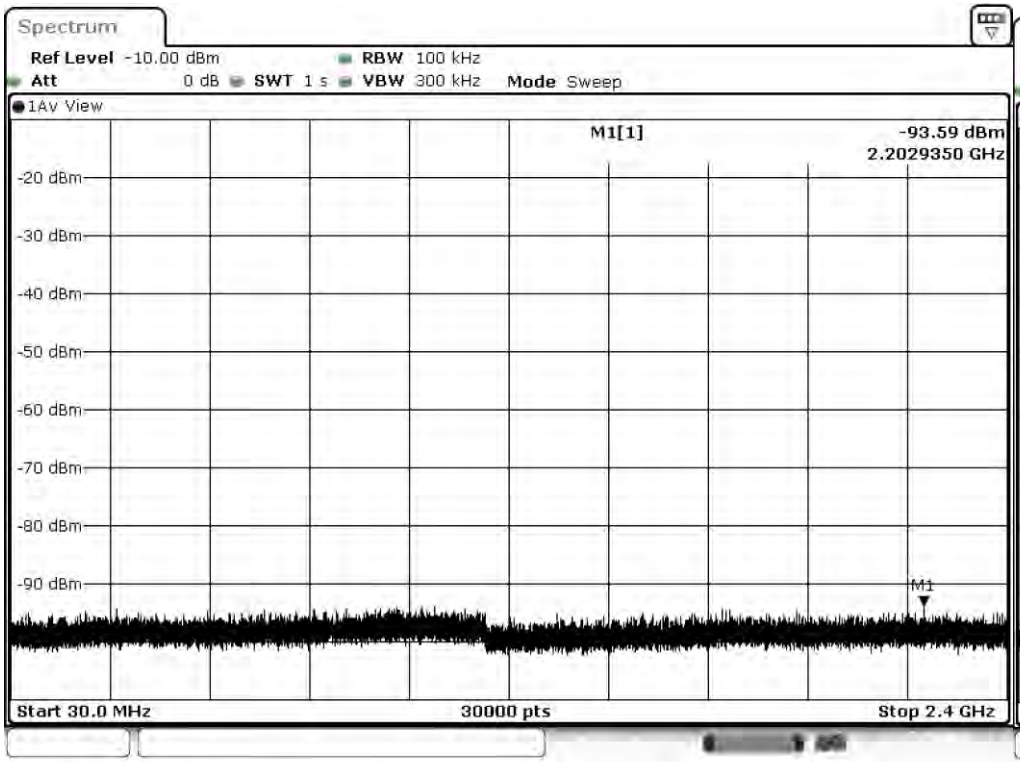
Plot2 2DH5 2402 MHz Average Band 2



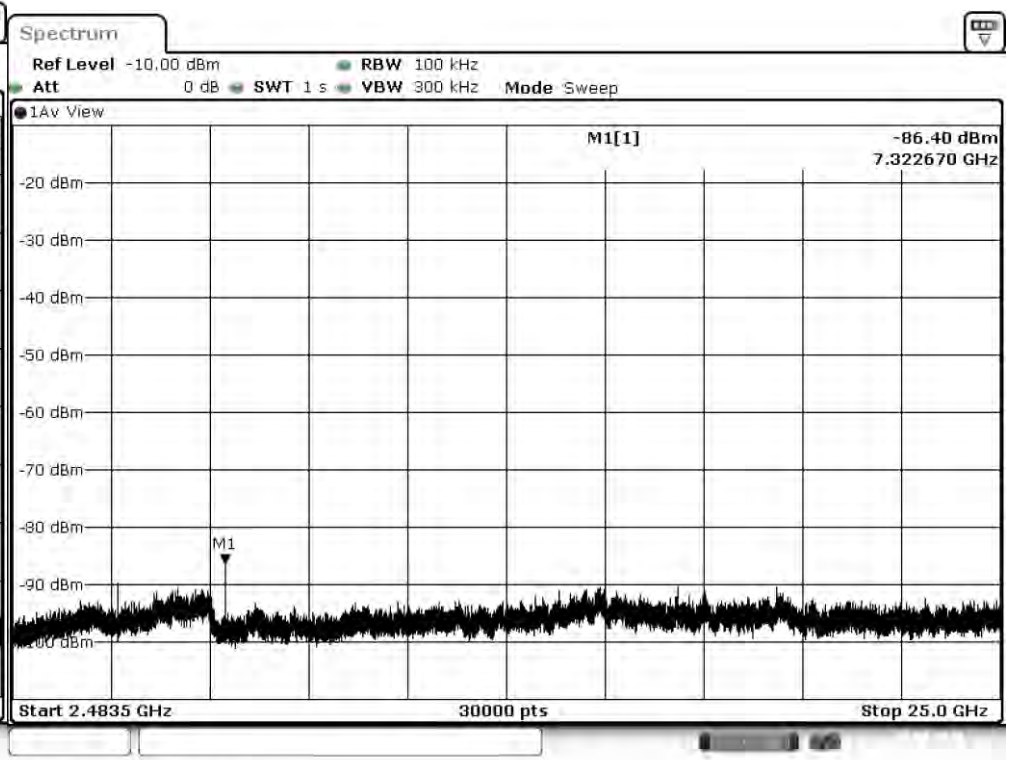
Plot1 2DH5 2441 MHz Peak Band 1



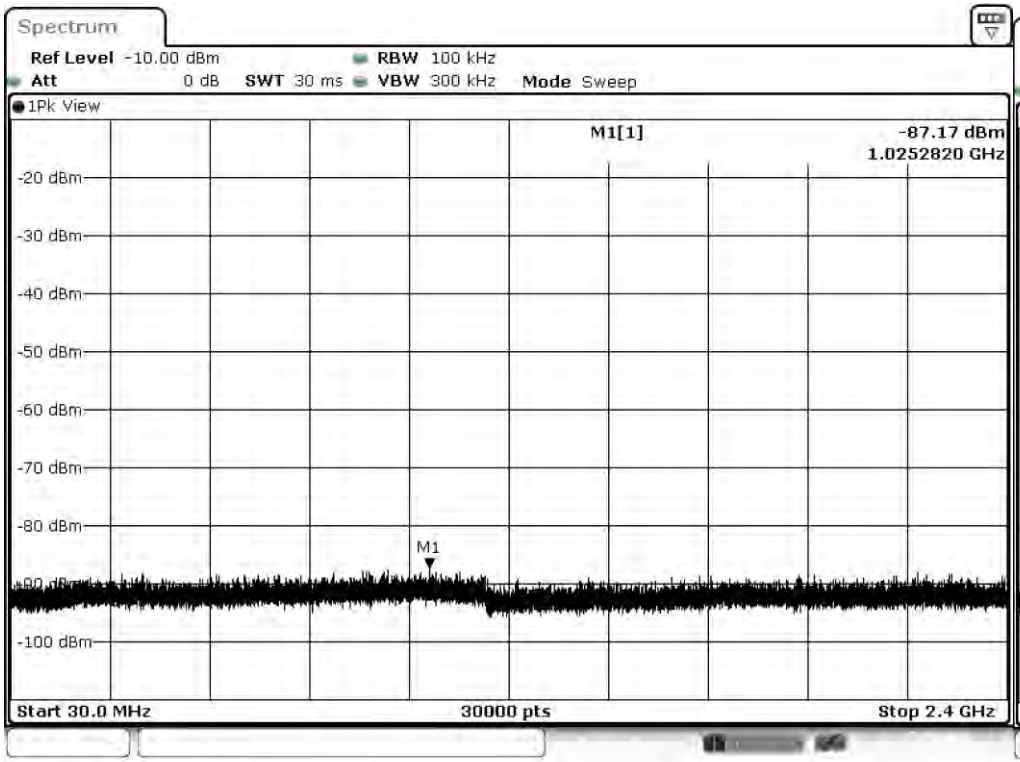
Plot2 2DH5 2441 MHz Peak Band 2



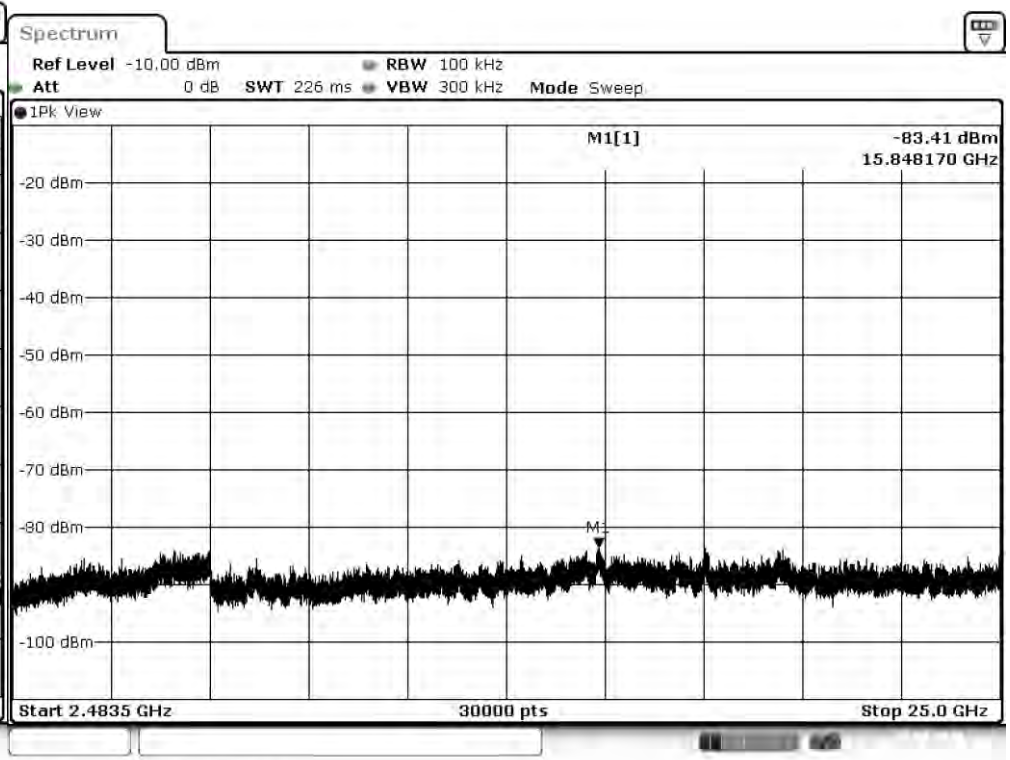
Plot1 2DH5 2441 MHz Average Band 1



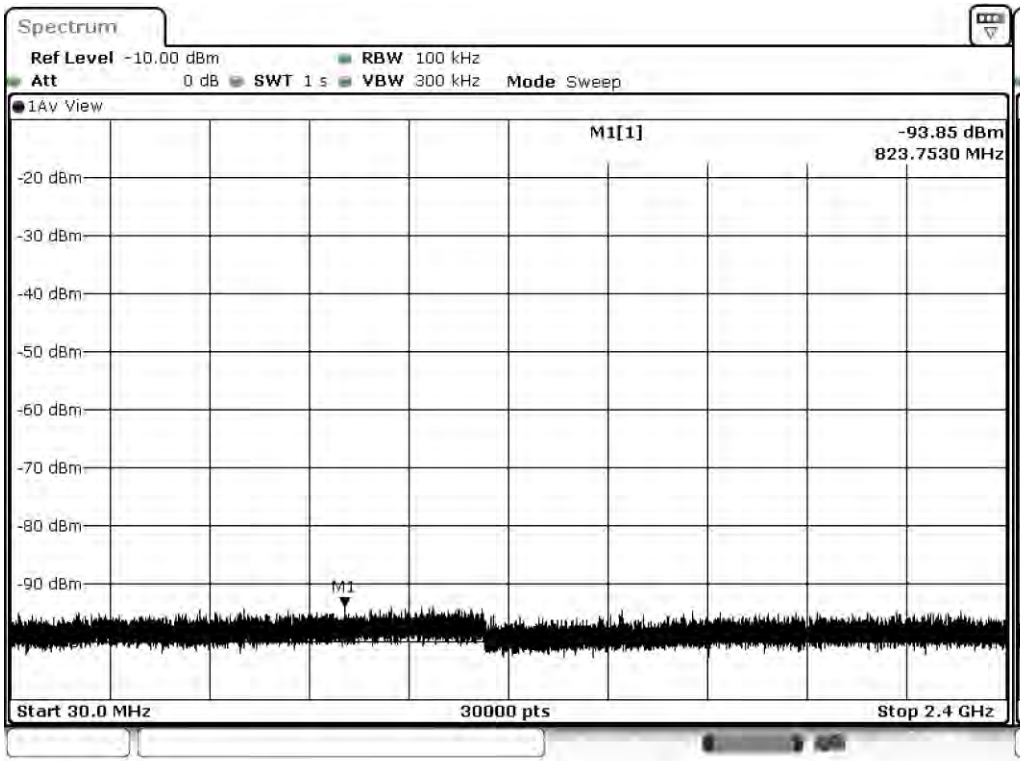
Plot2 2DH5 2441 MHz Average Band 2



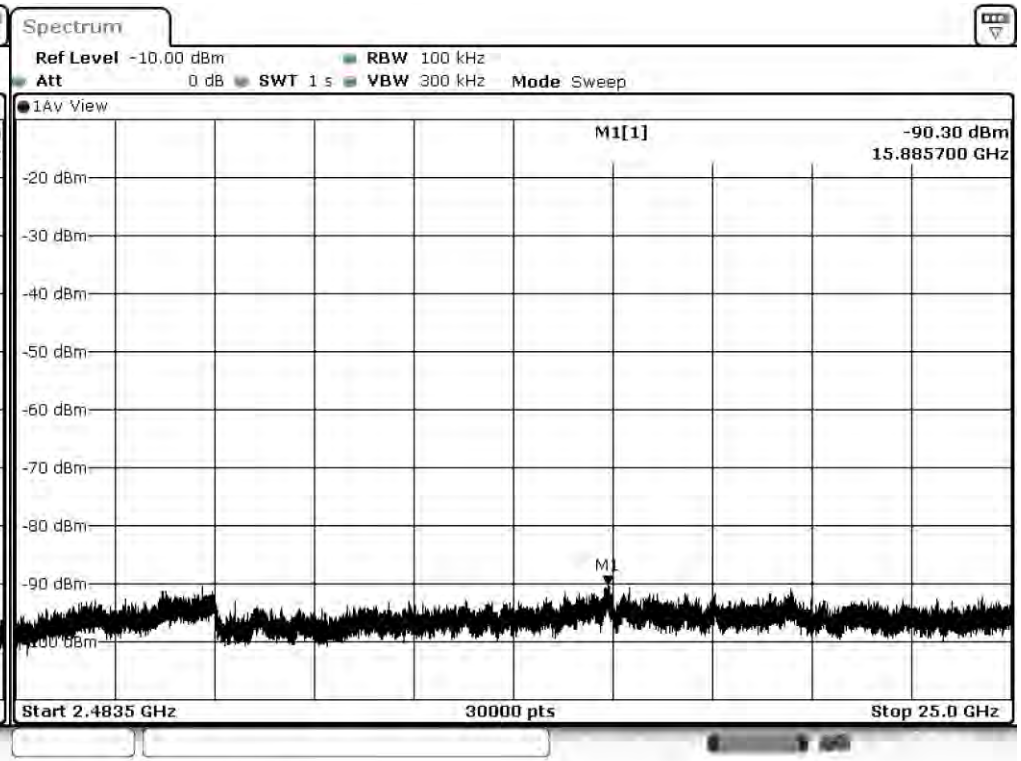
Plot1 2DH5 2480 MHz Peak Band 1



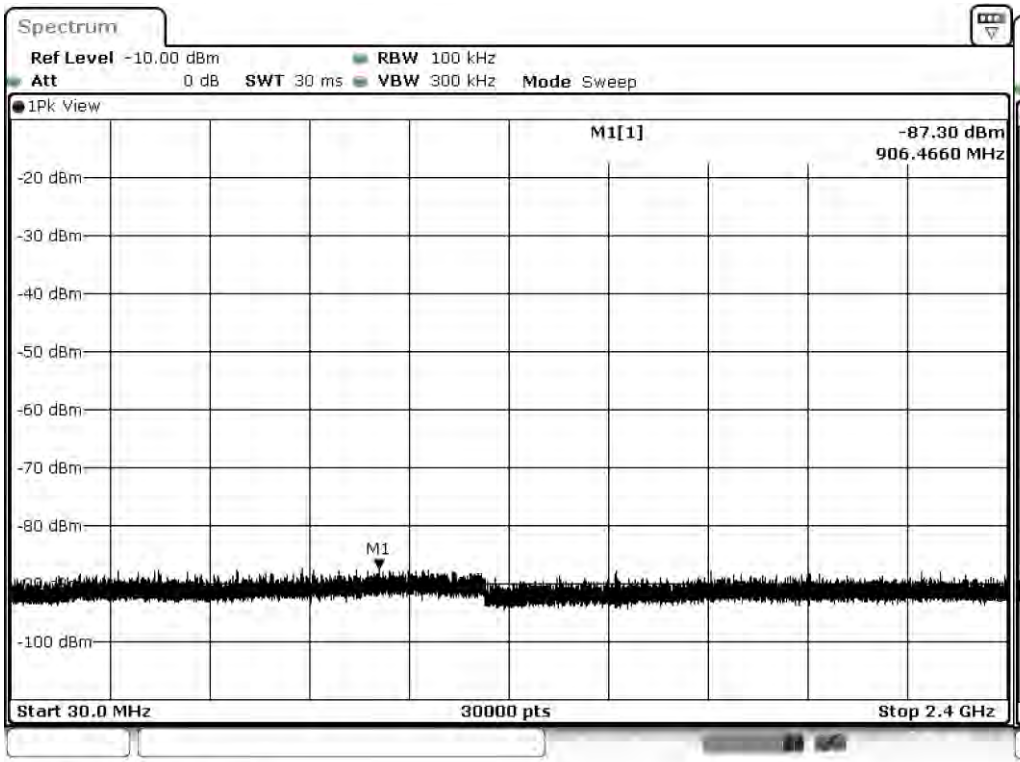
Plot2 2DH5 2480 MHz Peak Band 2



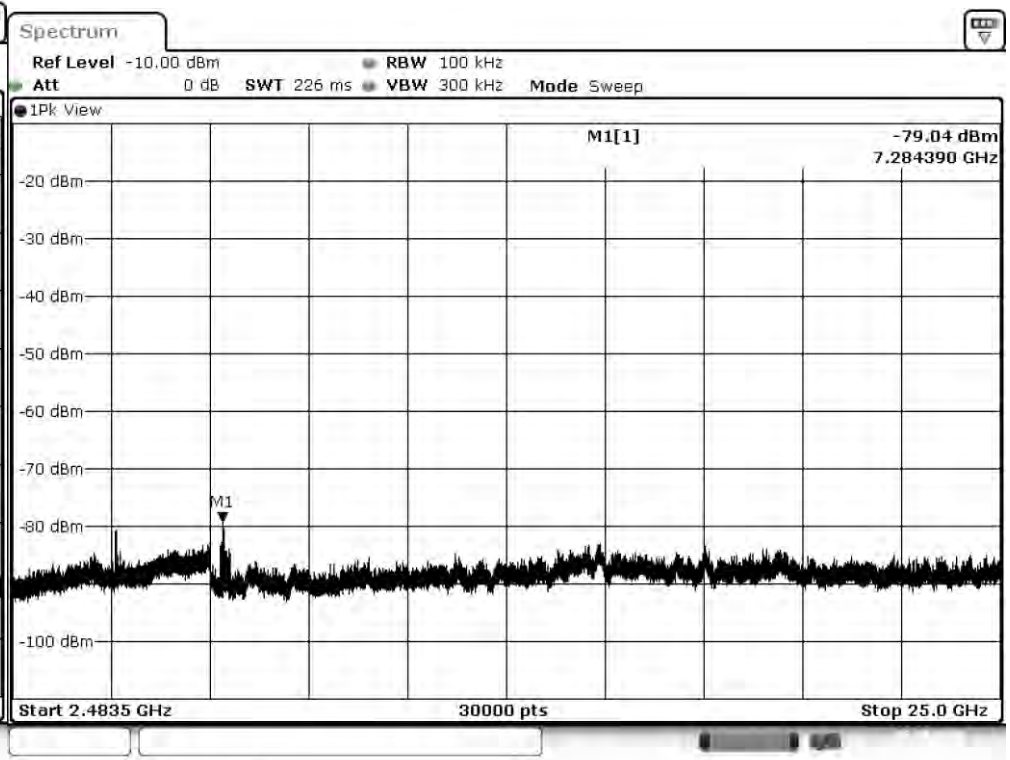
Plot1 2DH5 2480 MHz Average Band 1



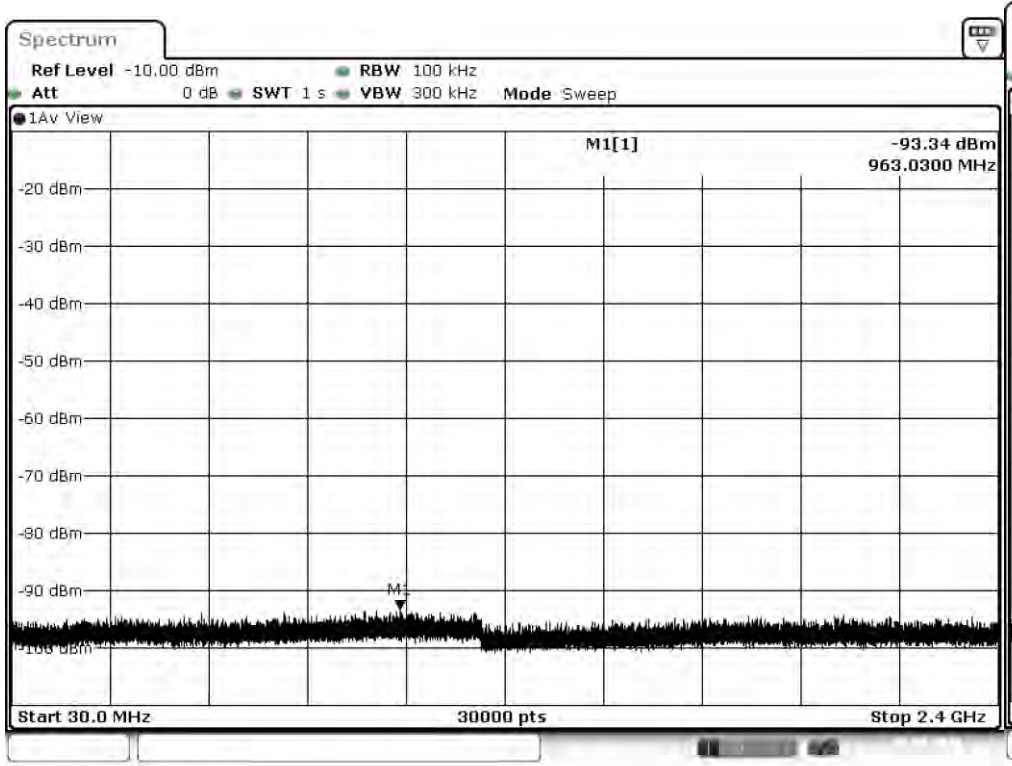
Plot2 2DH5 2480 MHz Average Band 2



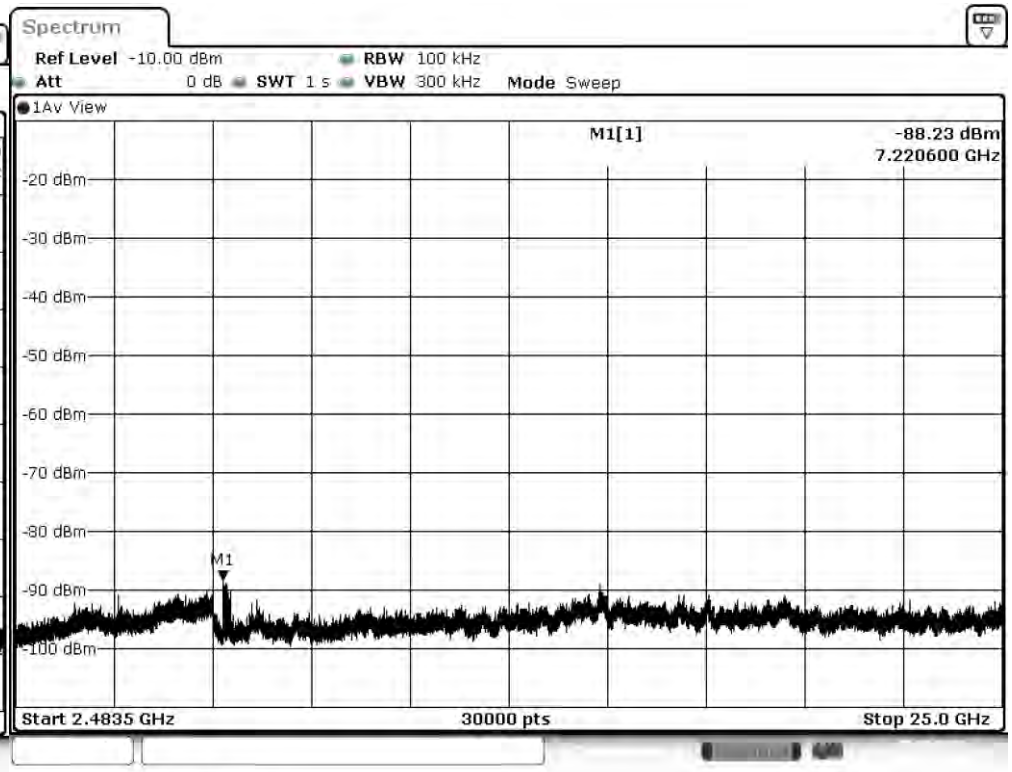
Plot1 2DH5 Hopping Peak Band 1



Plot2 2DH5 Hopping Peak Band 2



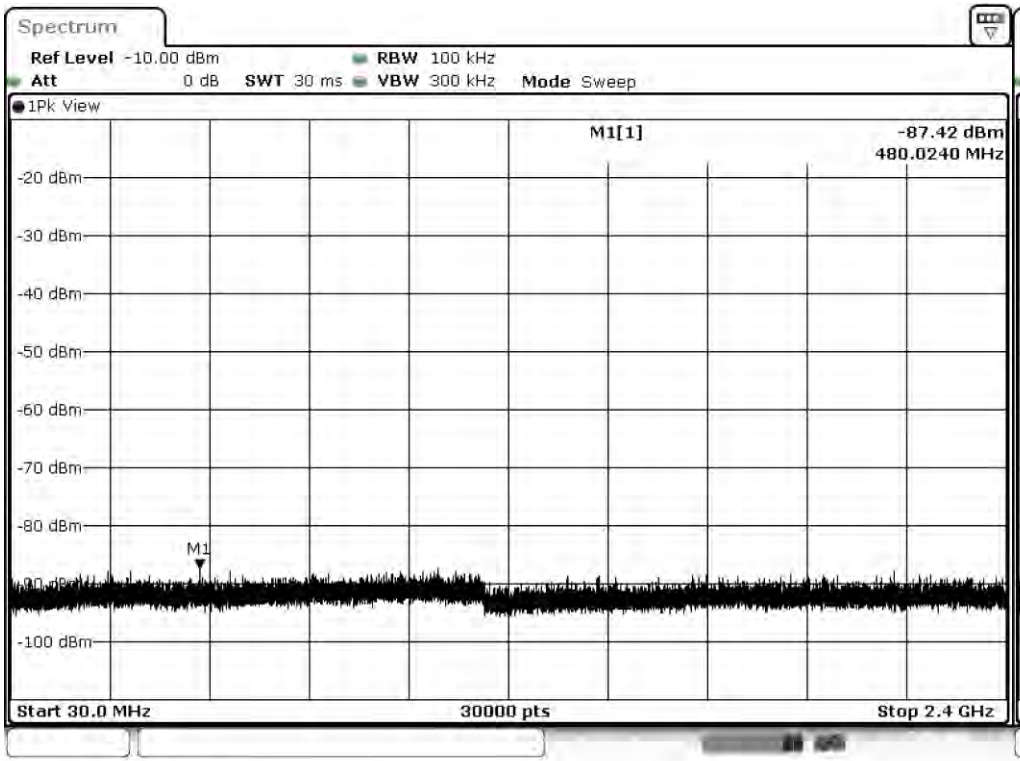
Plot1 2DH5 Hopping Average Band 1



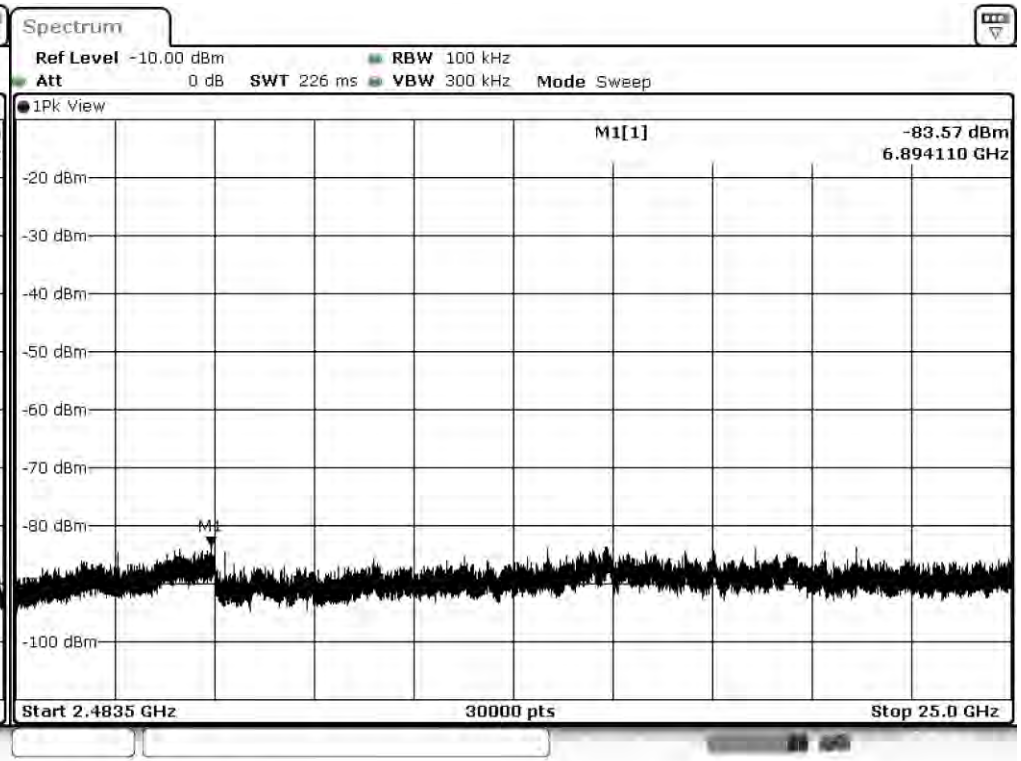
Plot2 2DH5 Hopping Average Band 2

Spurious Summary Table (Enhanced Rate: 3 Mbps)											
Channel	Band Range (MHz)	Mode	Raw Measurement (dBm)	Test Cable Loss (dB)	Pad ATTN (dB)	EUT Antenna Gain At Harmonic Frequency (dBi)	Corrected Reading (dBm)	Convert to E-Field at 3 meters (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	Result
Low	30 To 1000	3DH5	-87.4	1.0	10.0	0.0	-76.4	18.81	74	55.19	Pass
Low	2483.5 To 25000	3DH5	-83.6	1.0	10.0	0.0	-72.6	22.66	74	51.34	Pass
Mid	30 To 1000	3DH5	-87.4	1.0	10.0	0.0	-76.4	18.85	74	55.15	Pass
Mid	2483.5 To 25000	3DH5	-81.8	1.0	10.0	0.0	-70.8	24.47	74	49.53	Pass
High	30 To 1000	3DH5	-87.3	1.0	10.0	0.0	-76.3	18.90	74	55.10	Pass
High	2483.5 To 25000	3DH5	-82.0	1.0	10.0	0.0	-71.0	24.28	74	49.72	Pass
Hopping	30 To 1000	3DH5	-87.0	1.0	10.0	0.0	-76.0	19.20	74	54.80	Pass
Hopping	2483.5 To 25000	3DH5	-79.6	1.0	10.0	0.0	-68.6	26.58	74	47.42	Pass

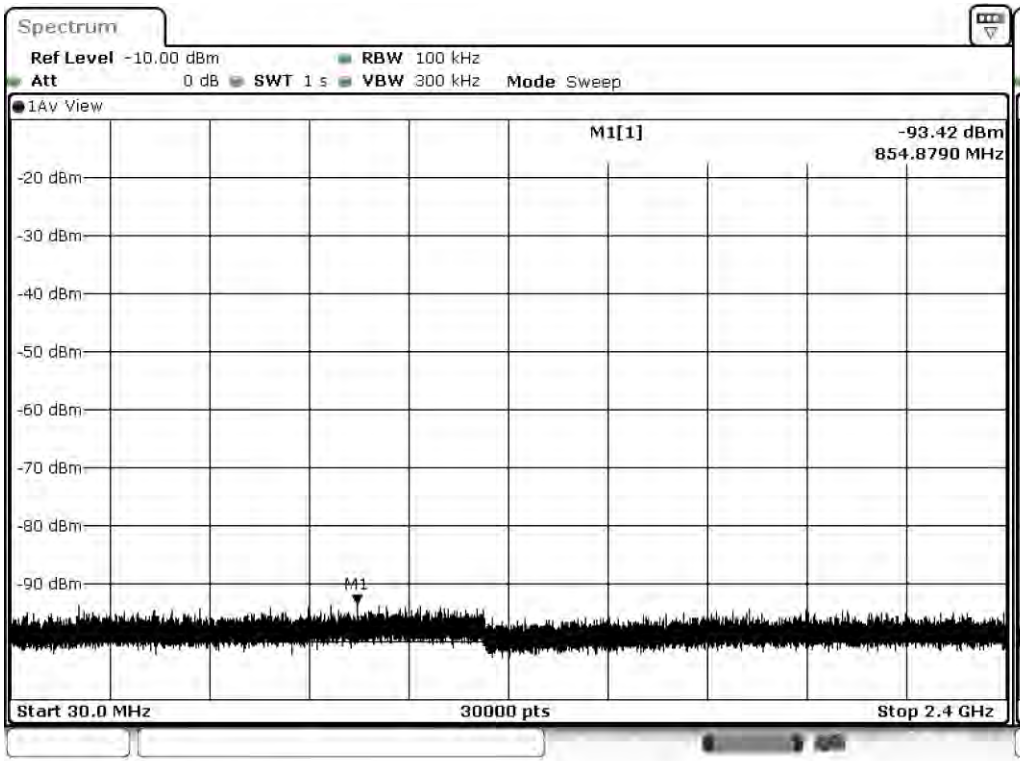
Spurious Summary Table (Enhanced Rate: 3 Mbps)											
Channel	Band Range (MHz)	Mode	Raw Measurement (dBm)	Test Cable Loss (dB)	Pad ATTN (dB)	EUT Antenna Gain At Harmonic Frequency (dBi)	Corrected Reading (dBm)	Convert to E-Field at 3 meters (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Result
Low	30 To 1000	3DH5	-93.4	1.0	10.0	0.0	-82.4	12.81	54	41.19	Pass
Low	2483.5 To 25000	3DH5	-89.8	1.0	10.0	0.0	-78.8	16.46	54	37.54	Pass
Mid	30 To 1000	3DH5	-93.4	1.0	10.0	0.0	-82.4	12.85	54	41.15	Pass
Mid	2483.5 To 25000	3DH5	-87.7	1.0	10.0	0.0	-76.7	18.55	54	35.45	Pass
High	30 To 1000	3DH5	-93.4	1.0	10.0	0.0	-82.4	12.81	54	41.19	Pass
High	2483.5 To 25000	3DH5	-90.4	1.0	10.0	0.0	-79.4	15.86	54	38.14	Pass
Hopping	30 To 1000	3DH5	-93.2	1.0	10.0	0.0	-82.2	12.99	54	41.01	Pass
Hopping	2483.5 To 25000	3DH5	-86.0	1.0	10.0	0.0	-75.0	20.27	54	33.73	Pass



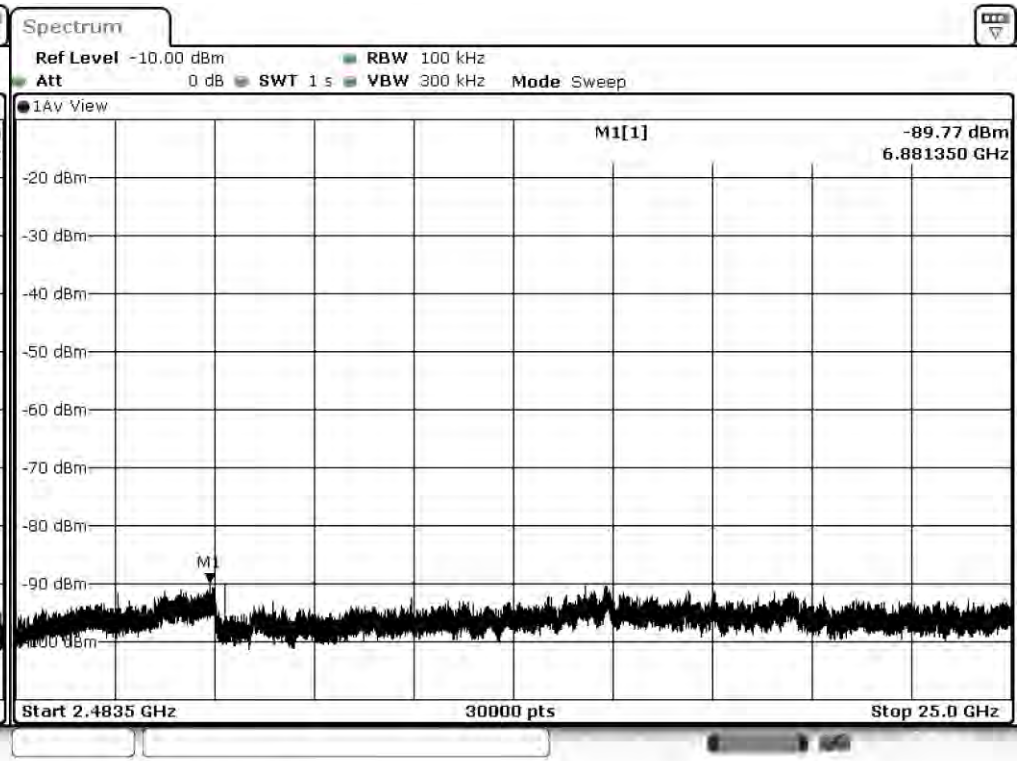
Plot1 3DH5 2402 MHz Peak Band 1



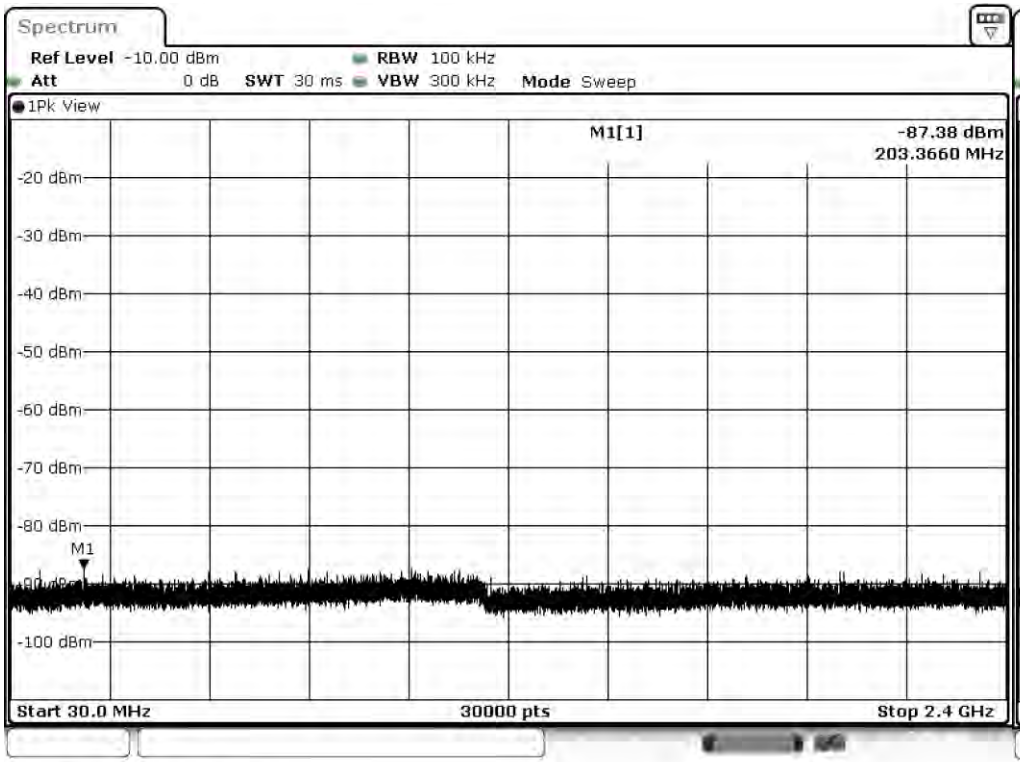
Plot2 3DH5 2402 MHz Peak Band 2



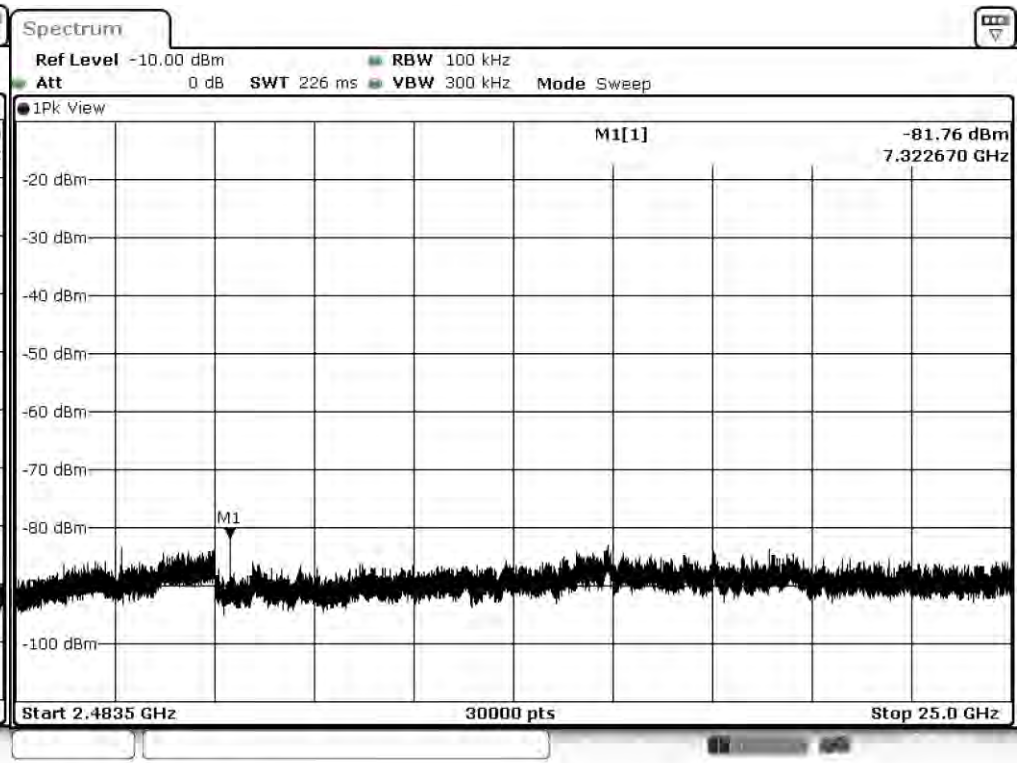
Plot1 3DH5 2402 MHz Average Band 1



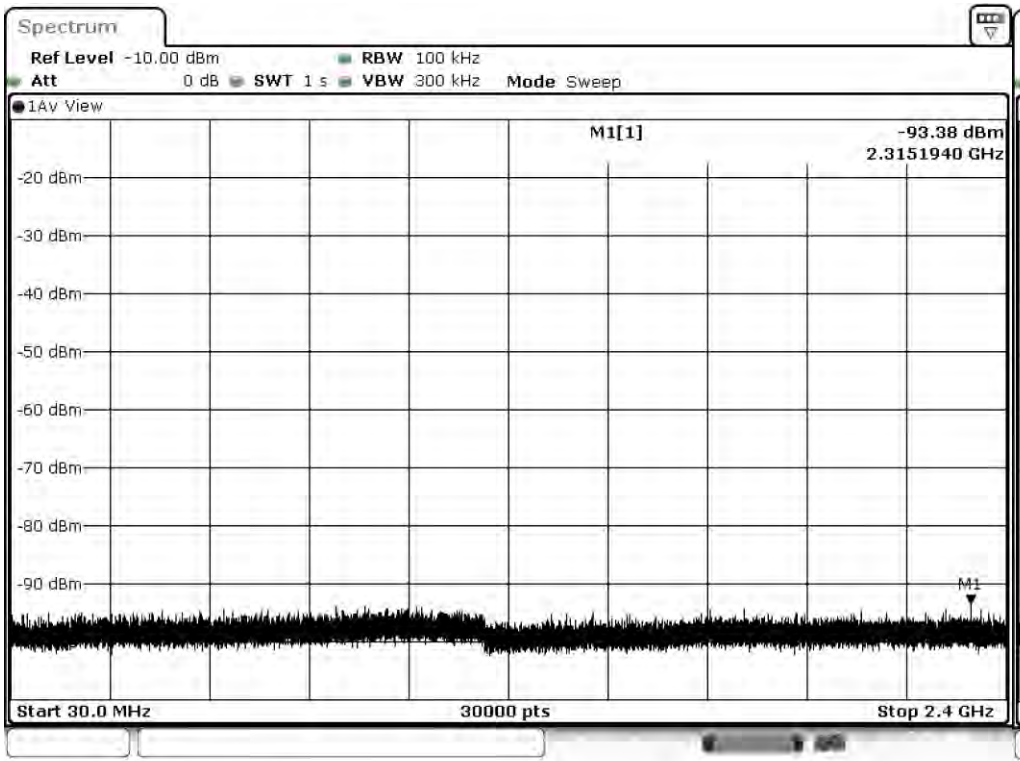
Plot2 3DH5 2402 MHz Average Band 2



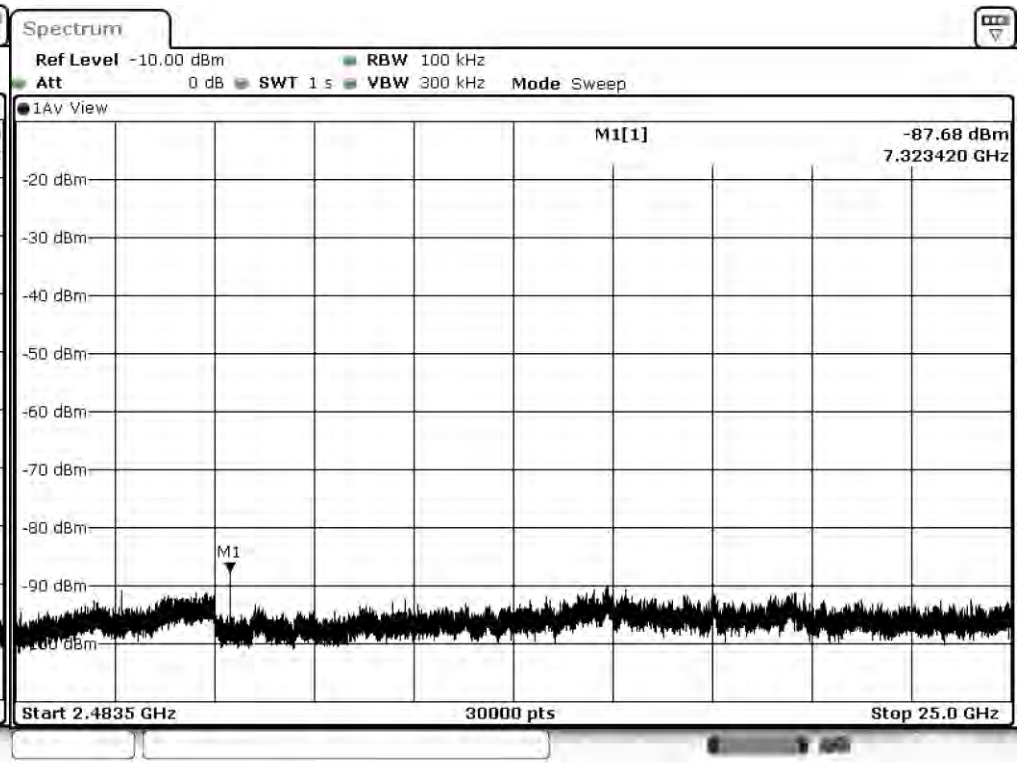
Plot1 3DH5 2441 MHz Peak Band 1



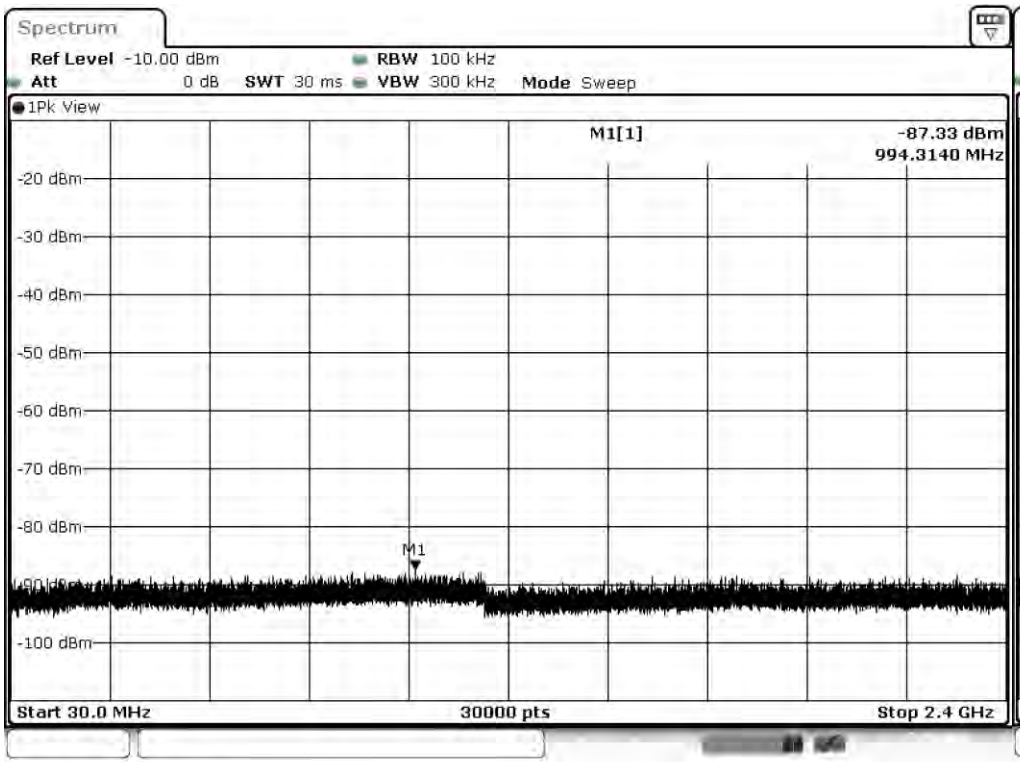
Plot2 3DH5 2441 MHz Peak Band 2



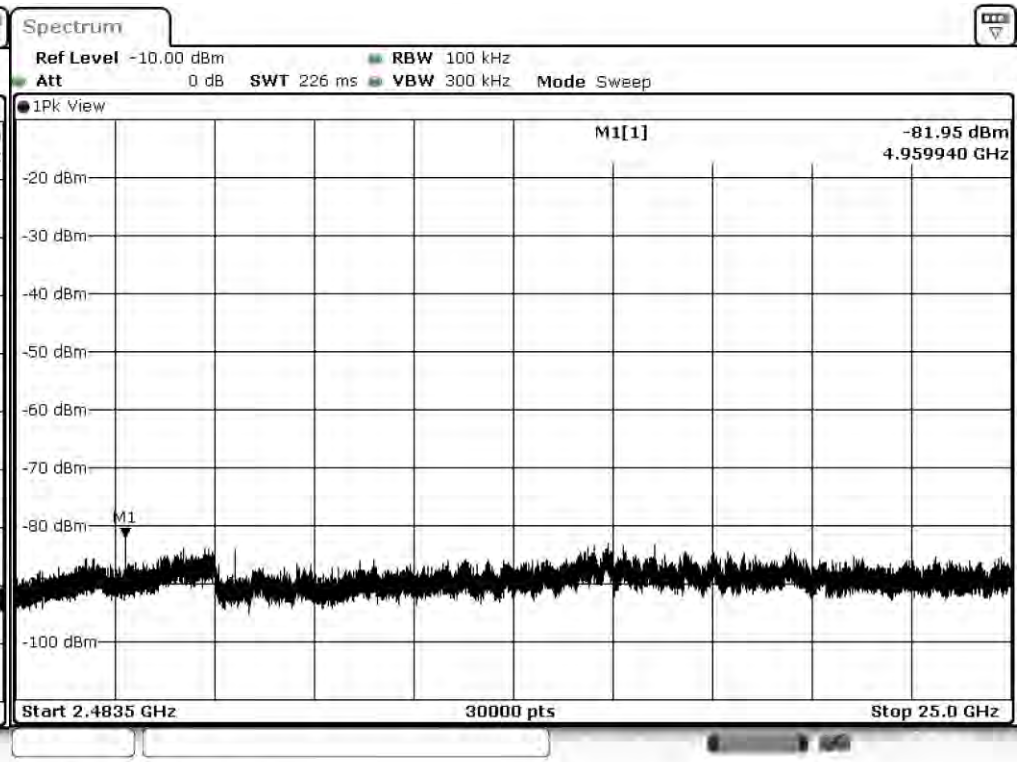
Plot1 3DH5 2441 MHz Average Band 1



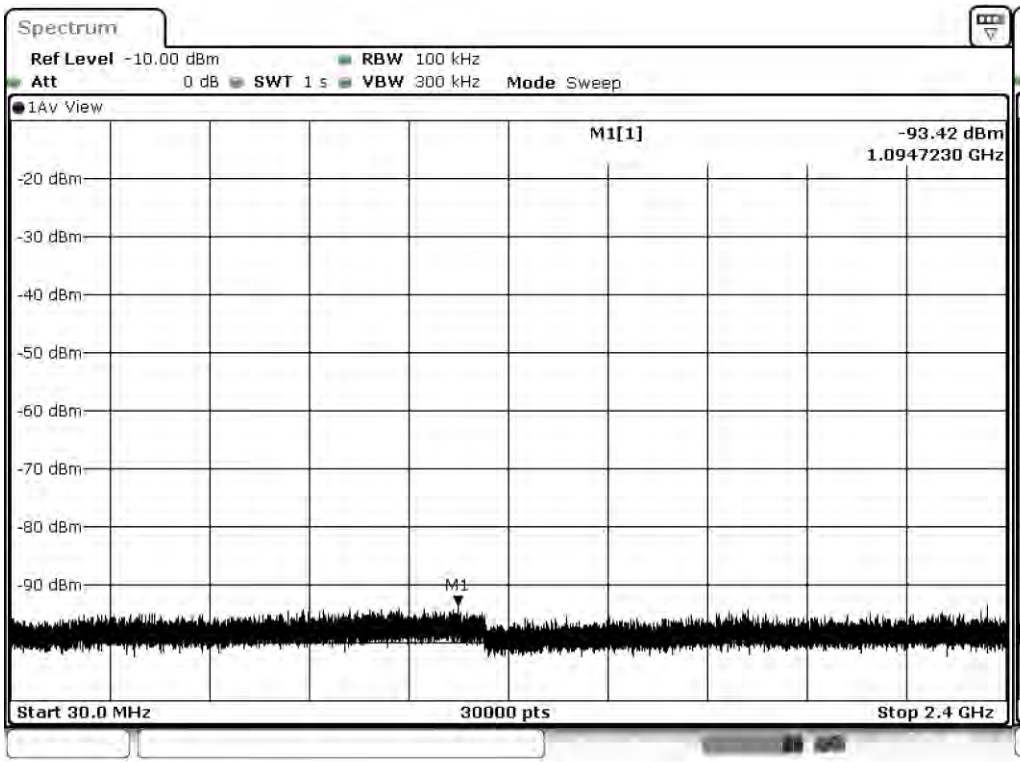
Plot2 3DH5 2441 MHz Average Band 2



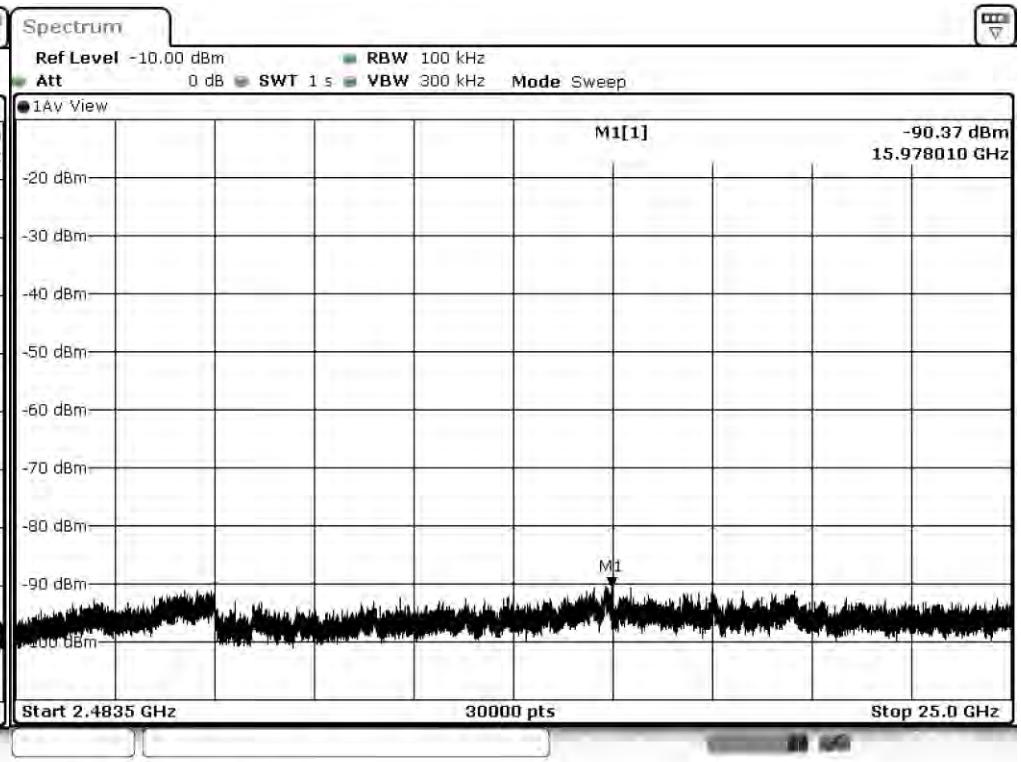
Plot1 3DH5 2480 MHz Peak Band 1



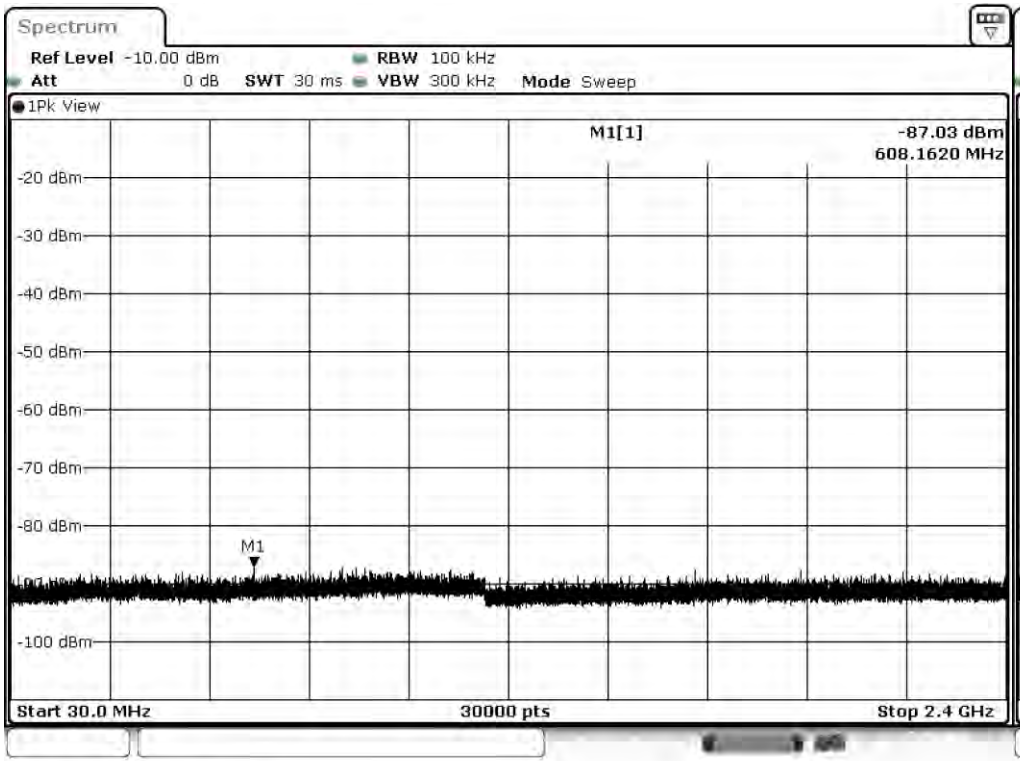
Plot2 3DH5 2480 MHz Peak Band 2



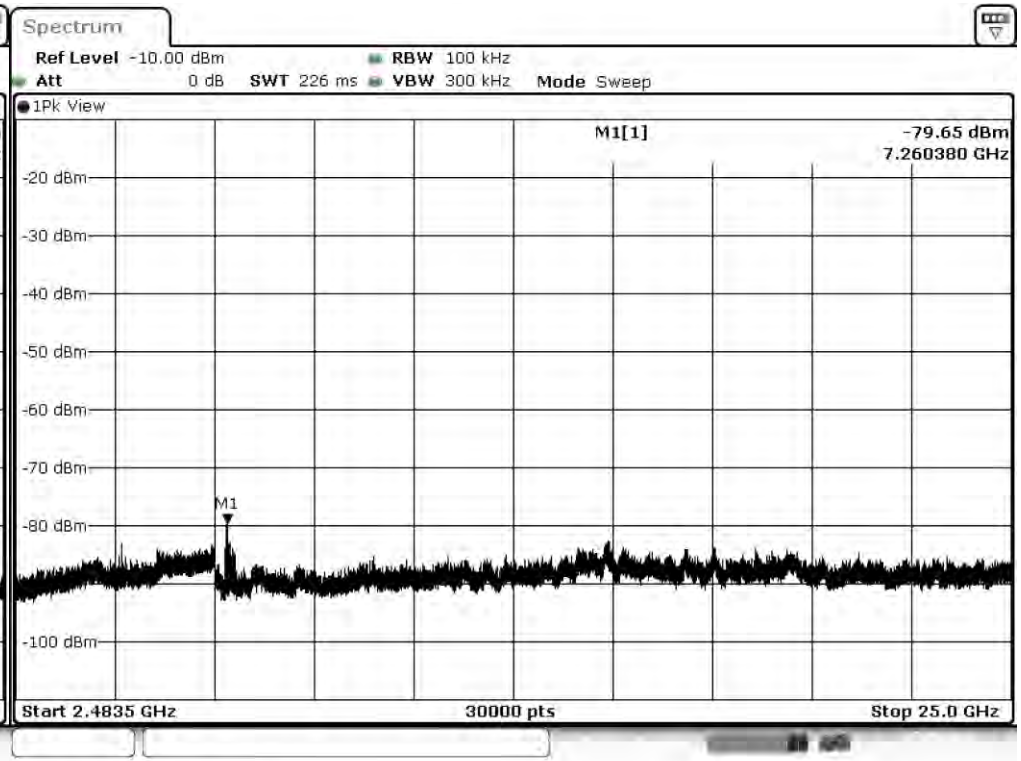
Plot1 3DH5 2480 MHz Average Band 1



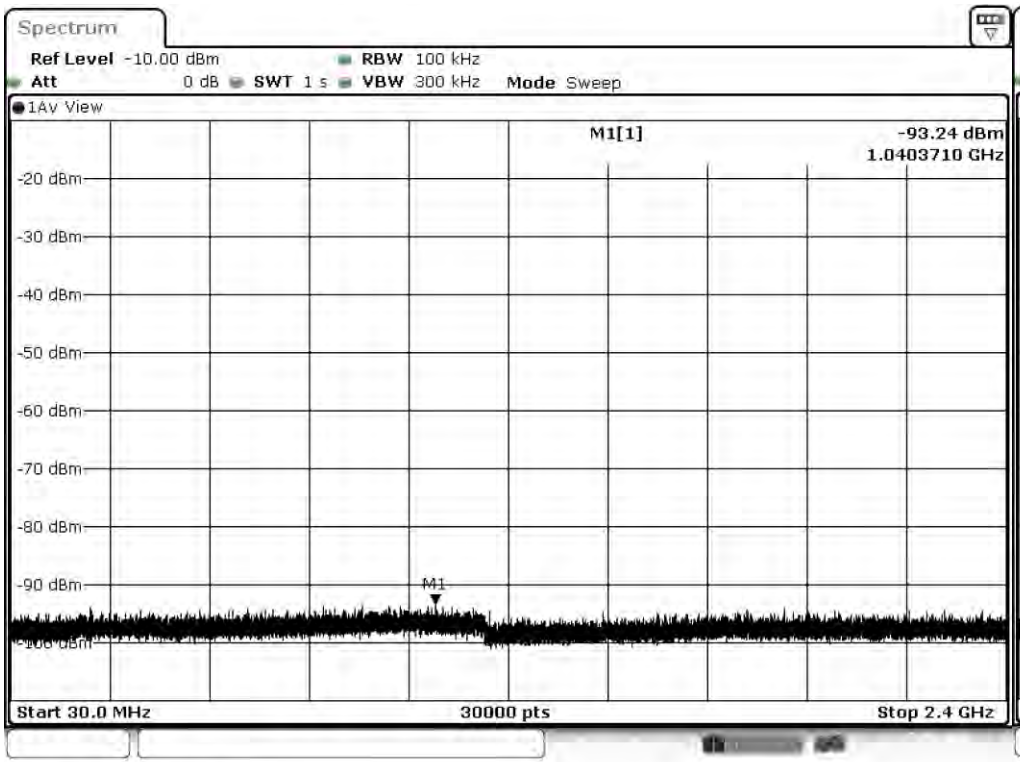
Plot2 3DH5 2480 MHz Average Band 2



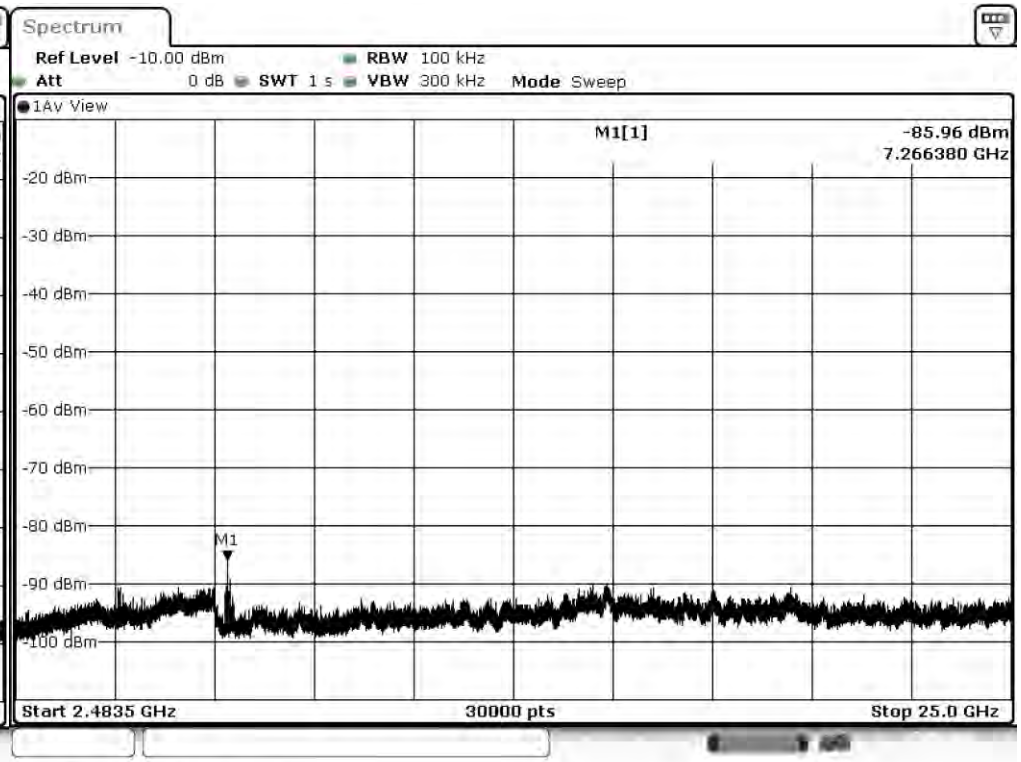
Plot1 3DH5 Hopping Peak Band 1



Plot2 3DH5 Hopping Peak Band 2



Plot1 3DH5 Hopping Average Band 1



Plot2 3DH5 Hopping Average Band 2

Average Time of Occupancy

Requirements:

FCC 15.247 (a) (1) (iii), IC RSS-247 5.1 (4)
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Test setup details

The EUT is controlled via the USB cable with CSR's Blue Suite software which is used to set the test modes of EUT. The EUT is programmed to operate at fixed frequencies at the low, middle, and high end of the authorized frequency band.

Using zero span mode on the channel center frequency the transmit pulse width was measured for each of the following modes, DH1, DH3 & DH5 with the maximum payload size for basic and enhanced data rates.

Dwell Time = (TX Pulse Width) * (Hop Rate) / (# of Channels) / (# of slots) * 31.6
= (TX Pulse Width) * 1600 / 79 / (# of Slots) * 31.6
= (TX Pulse Width) * 640 / (# Slots)

Hop Rate = 1600 hops / S
# of channels = 79
# of slots = number of slots used per packet in a given mode: DH1 = 2, DH3 = 4, DH5 = 6

31.6 Seconds = (79 channels) * 0.4 Seconds

8 Seconds = (20 channels) * 0.4 Seconds

Test Results:

TX Pulse Width (xDH1)									
Channel	Frequency (MHz)	Mode	Pulse Width (mS)	Number of pulses in 3.16 S	Number of pulses in 31.6 S	Time of occupancy (mS)	Limit (mS)	Margin (mS)	Result
Middle	2441	DH1	0.410	32	320	131.3	400	268.70	Pass
Middle	2441	2-DH1	0.423	32	320	135.5	400	264.55	Pass
Middle	2441	3-DH1	0.423	32	320	135.5	400	264.55	Pass

Number of pulses in 31.6 s = Number of pulses in 3.16 s * 10

Time of occupancy = Pulse Width * Number of pulses

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TX Pulse Width (xDH3)									
Channel	Frequency (MHz)	Mode	Pulse Width (mS)	Number of pulses in 3.16 S	Number of pulses in 31.6 S	Time of occupancy (mS)	Limit (mS)	Margin (mS)	Result
Middle	2441	DH3	1.669	17	170	283.7	400	116.35	Pass
Middle	2441	2-DH3	1.676	17	170	285.0	400	115.04	Pass
Middle	2441	3-DH3	1.676	16	160	268.2	400	131.81	Pass

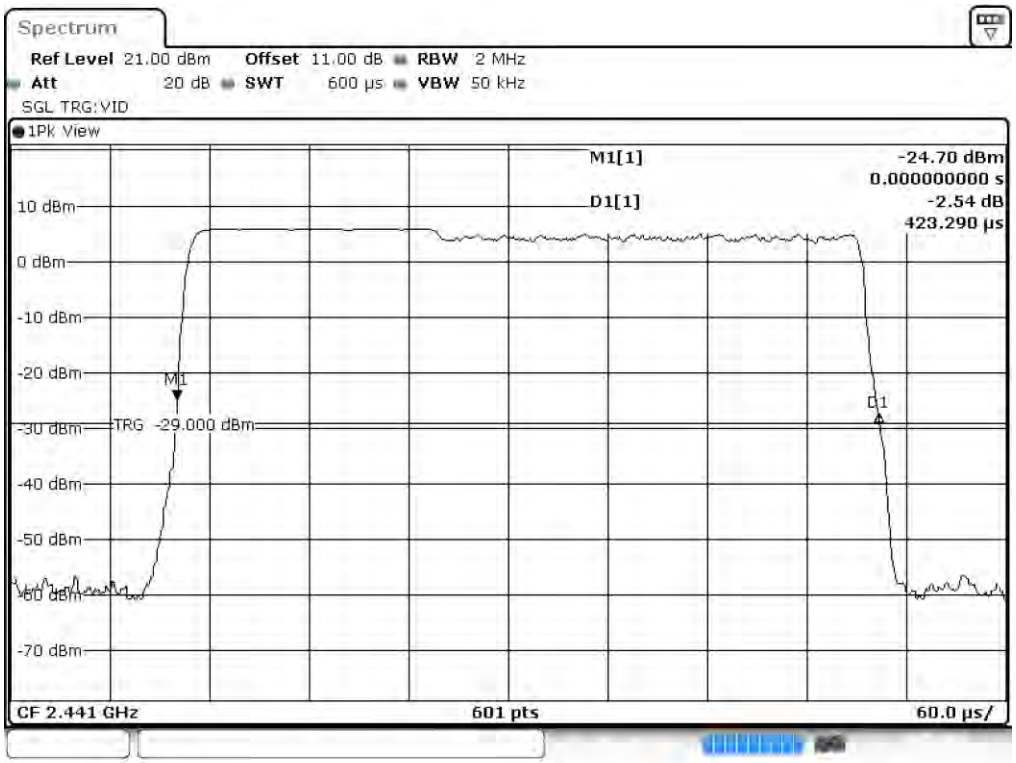
Number of pulses in 31.6 s = Number of pulses in 3.16 s * 10

Time of occupancy = Pulse Width * Number of pulses

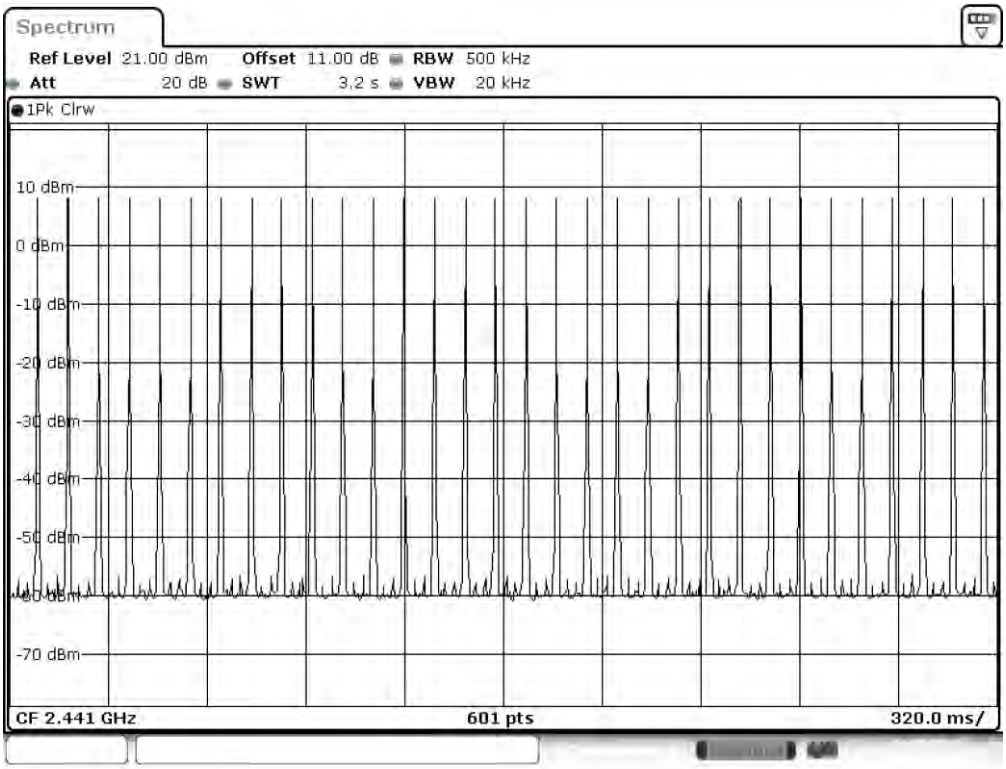
TX Pulse Width (xDH5)									
Channel	Frequency (MHz)	Mode	Pulse Width (mS)	Number of pulses in 3.16 S	Number of pulses in 31.6 S	Time of occupancy (mS)	Limit (mS)	Margin (mS)	Result
Middle	2441	DH5	2.915	10	100	291.5	400	108.49	Pass
Middle	2441	2-DH5	2.915	10	100	291.5	400	108.49	Pass
Middle	2441	3-DH5	2.922	11	110	321.4	400	78.60	Pass

Number of pulses in 31.6 s = Number of pulses in 3.16 s * 10

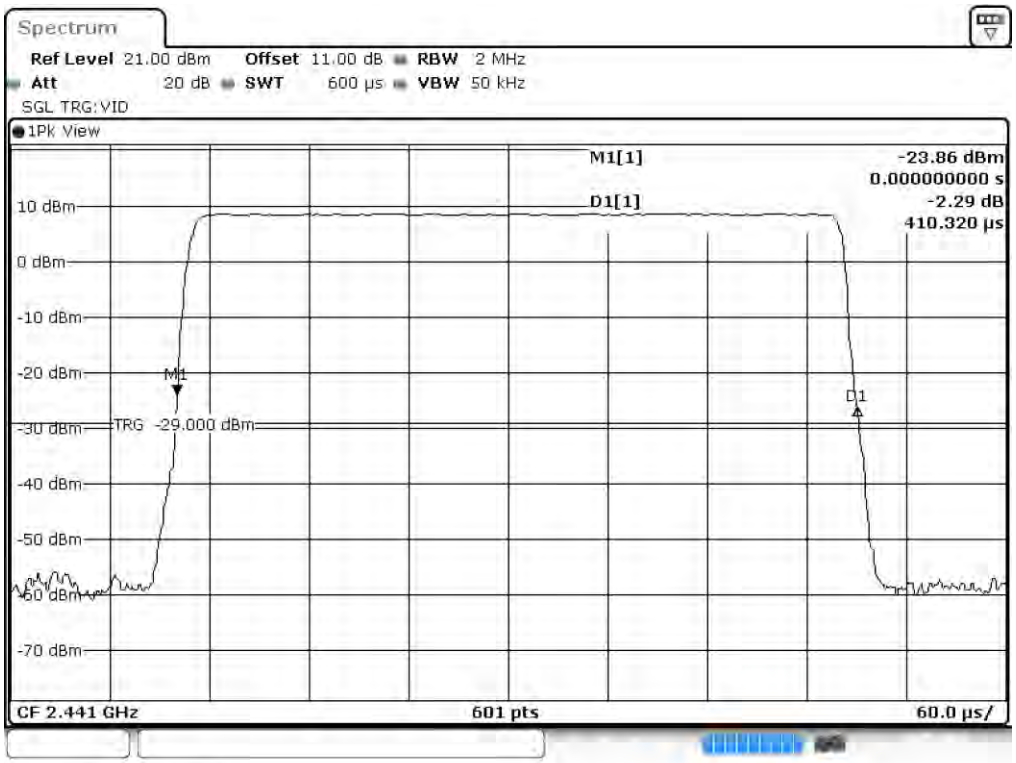
Time of occupancy = Pulse Width * Number of pulses



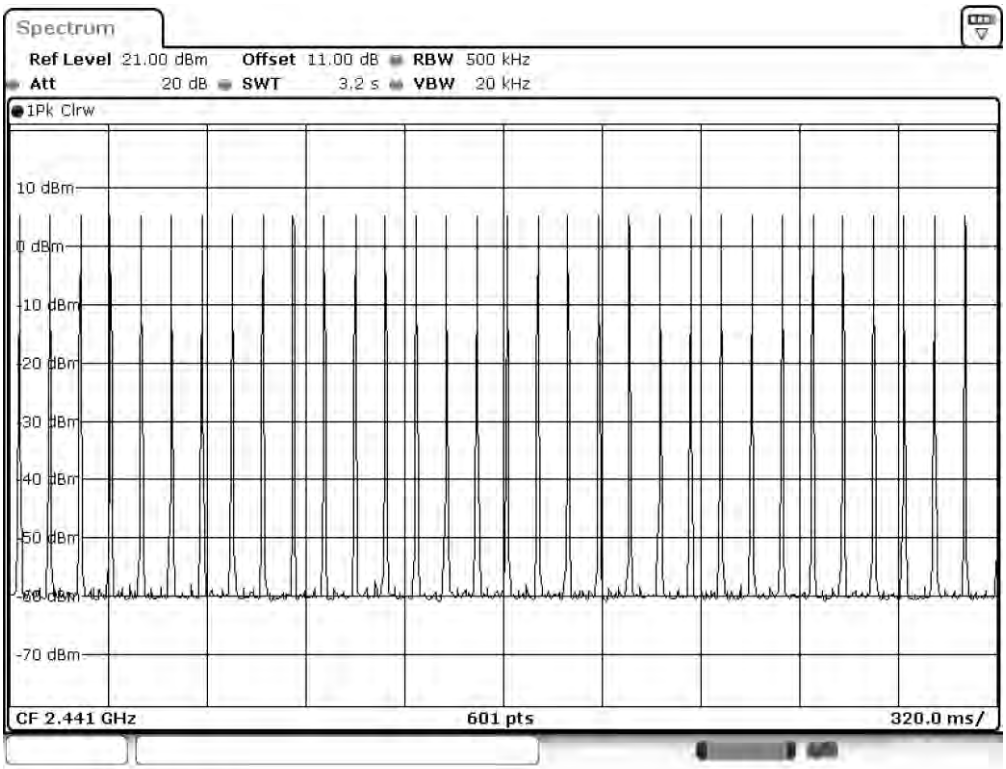
Plot2 2441 TX pulse width 2DH1



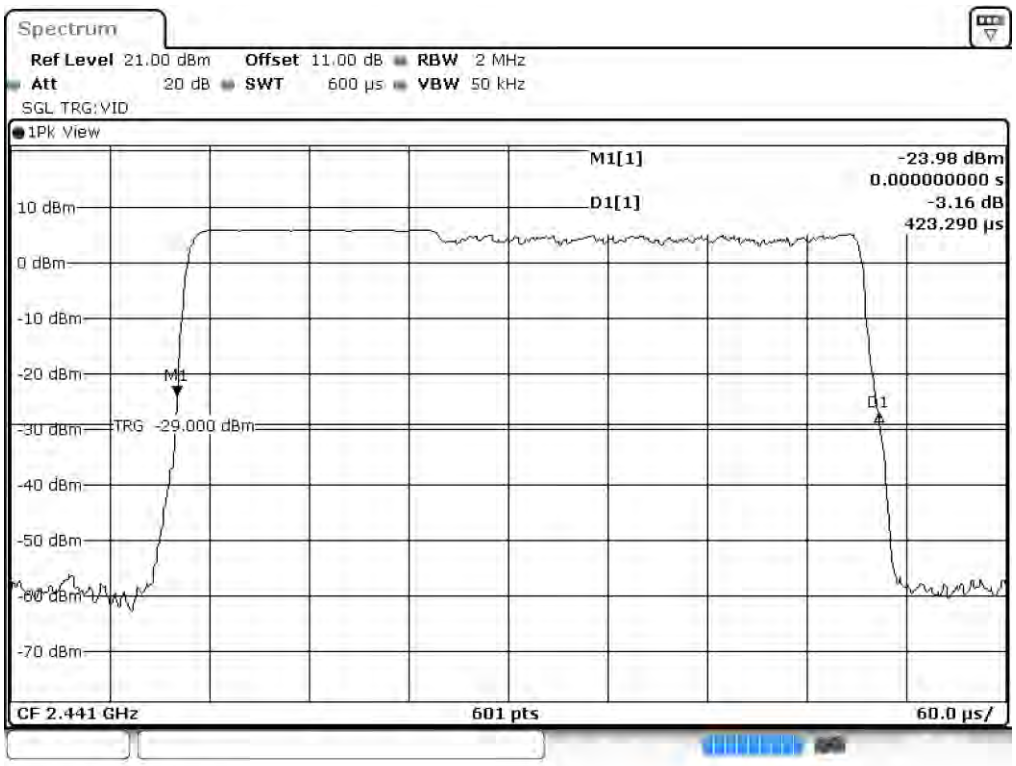
Plot10 2441 TX pulse count DH1



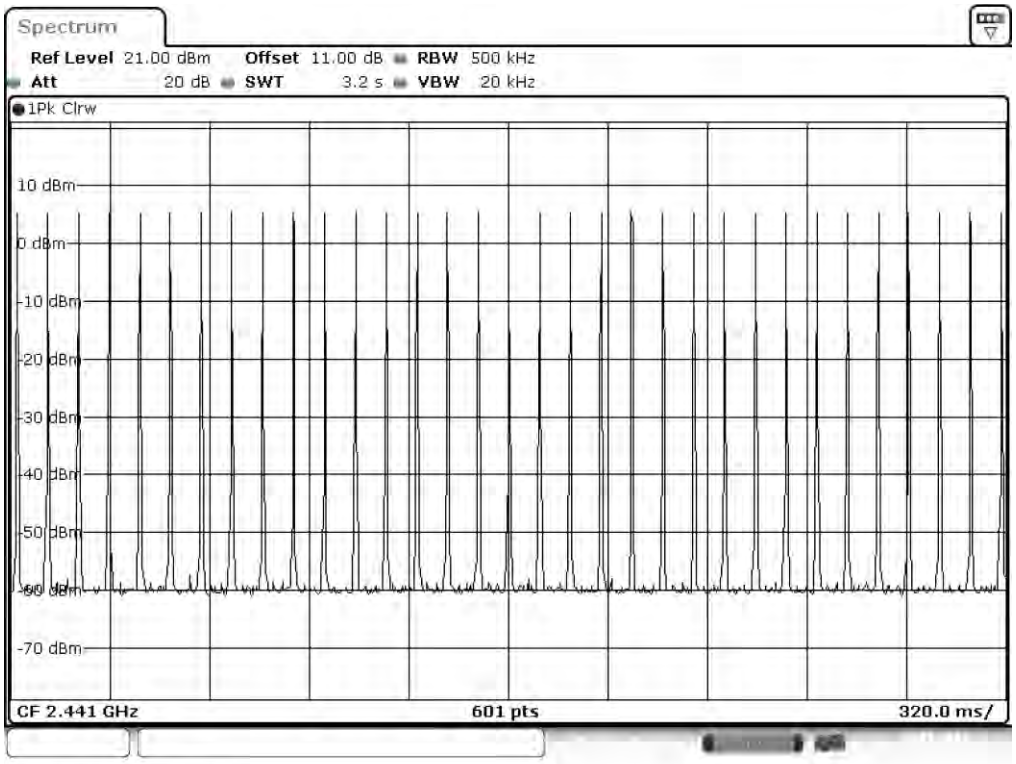
Plot1 2441 TX pulse width DH1



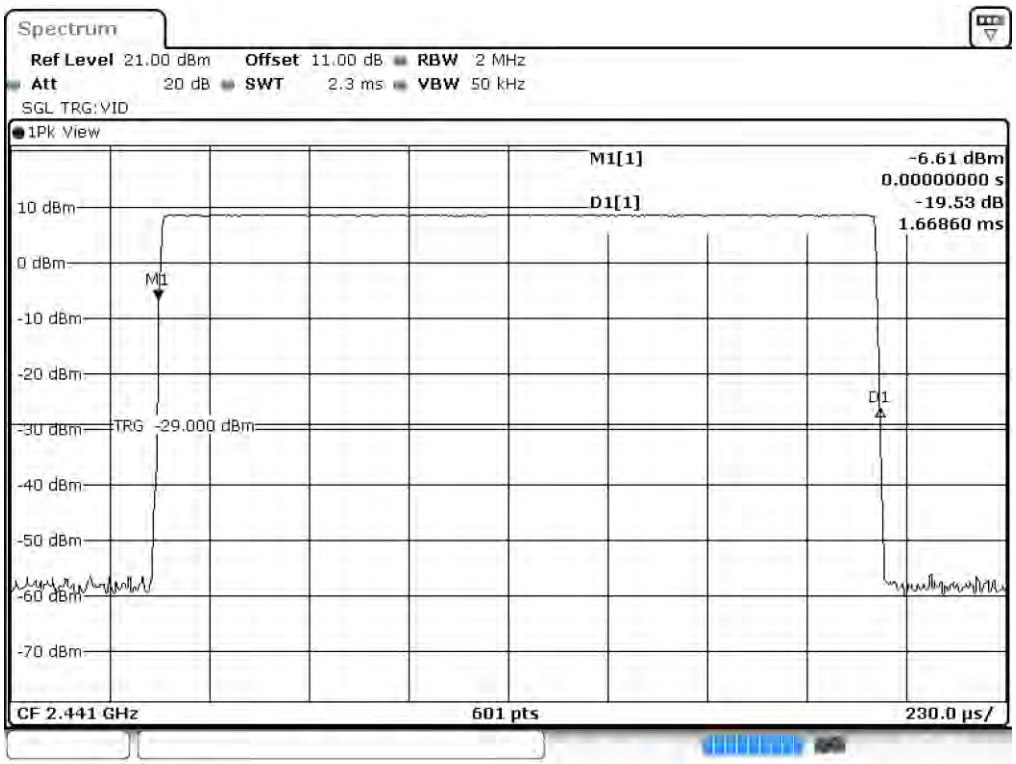
Plot11 2441 TX pulse count 2DH1



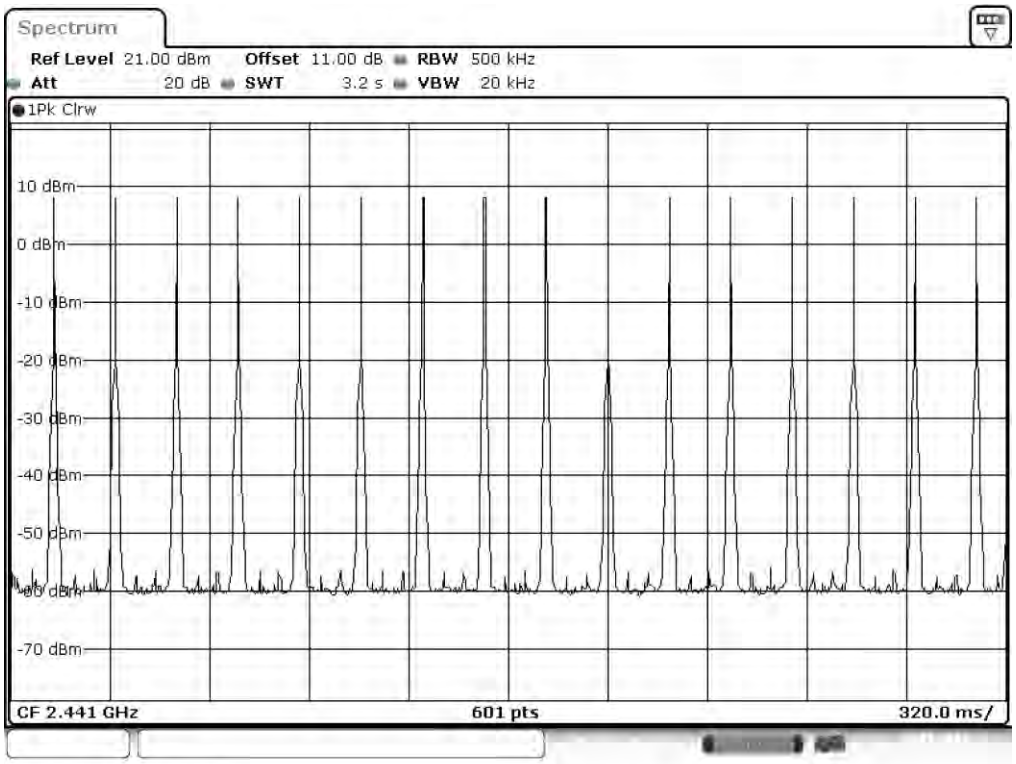
Plot3 2441 TX pulse width 3DH1



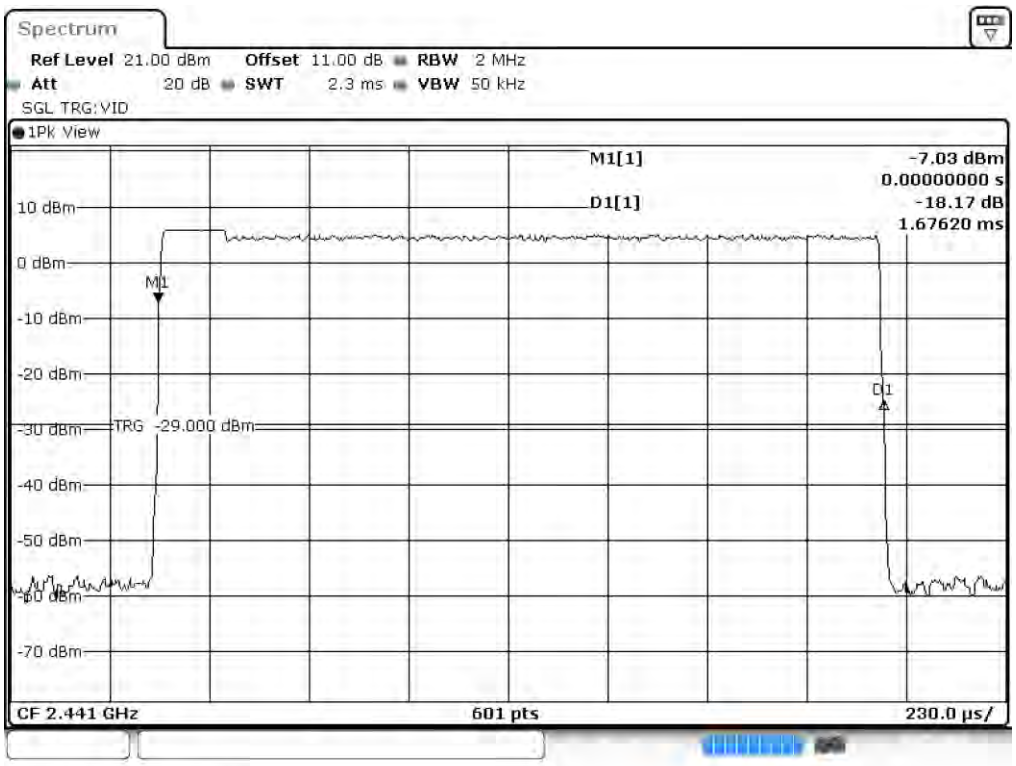
Plot12 2441 TX pulse count 3DH1



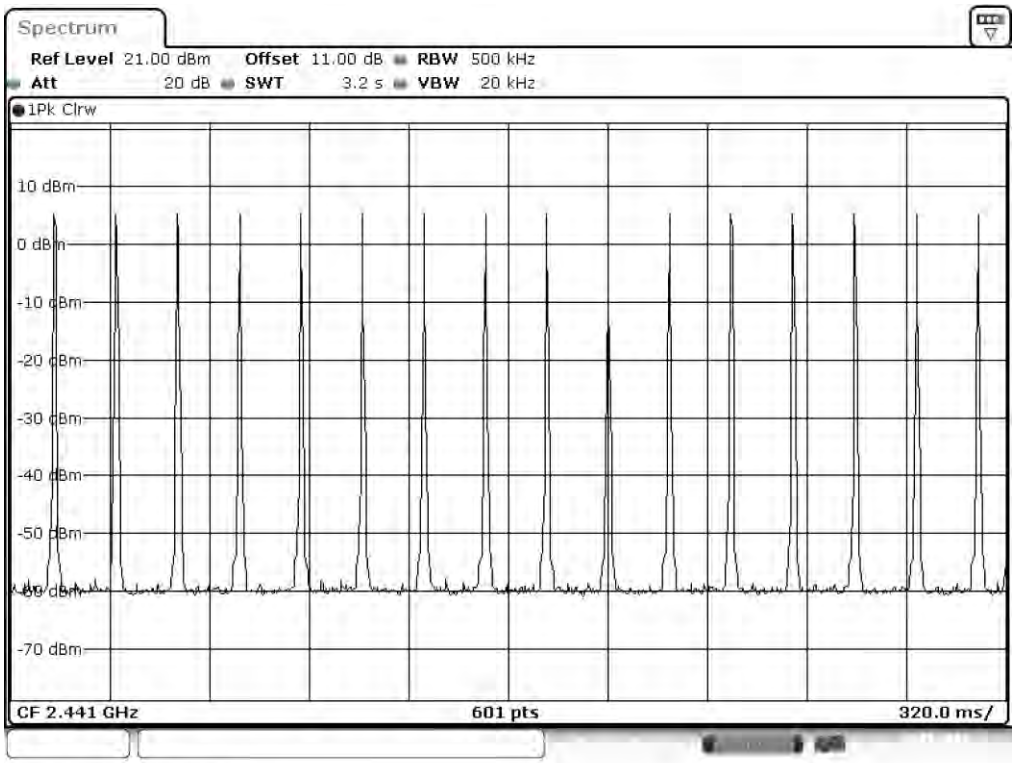
Plot4 2441 TX pulse width DH3



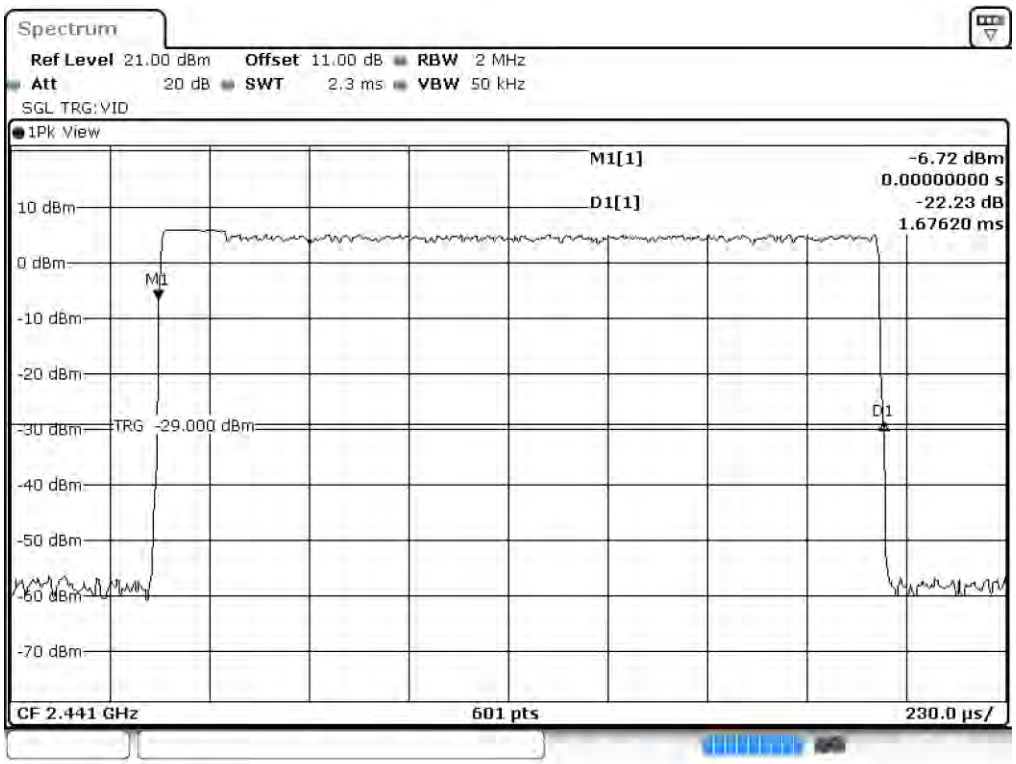
Plot13 2441 TX pulse count DH3



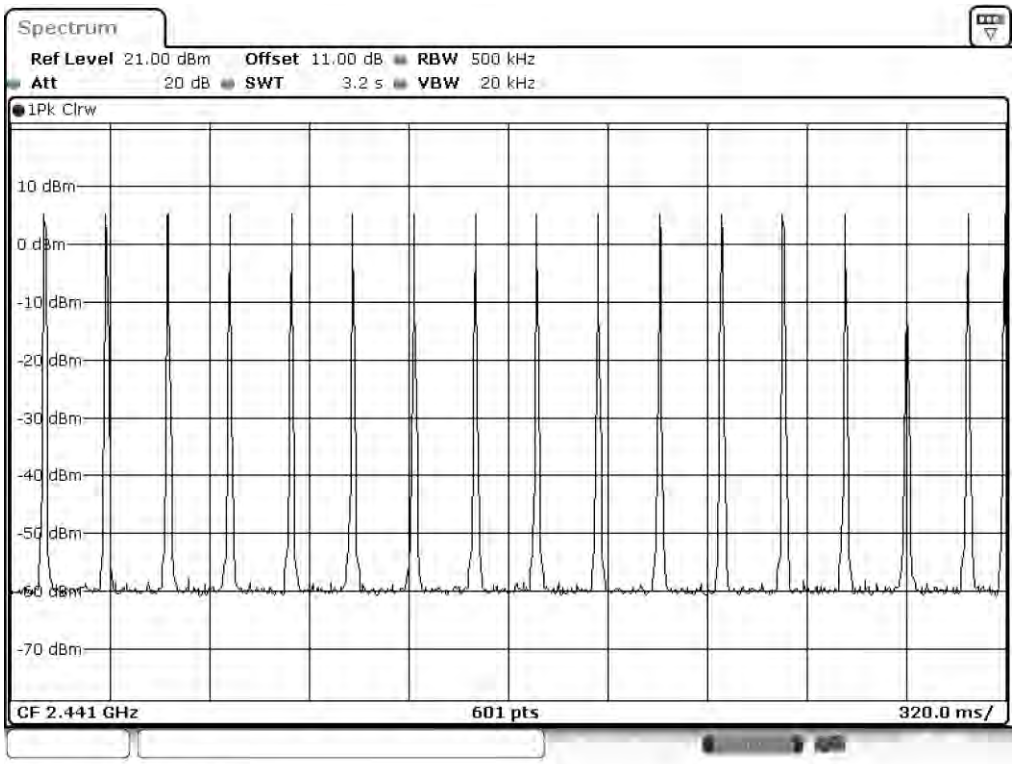
Plot5 2441 TX pulse width 2DH3



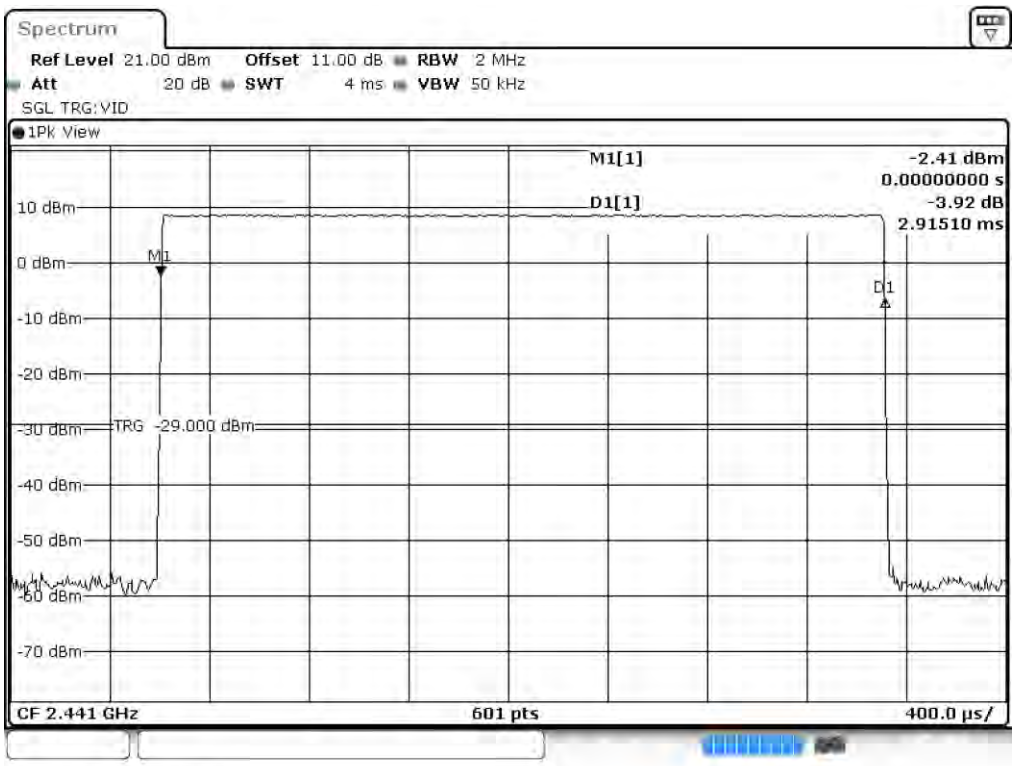
Plot14 2441 TX pulse count 2DH3



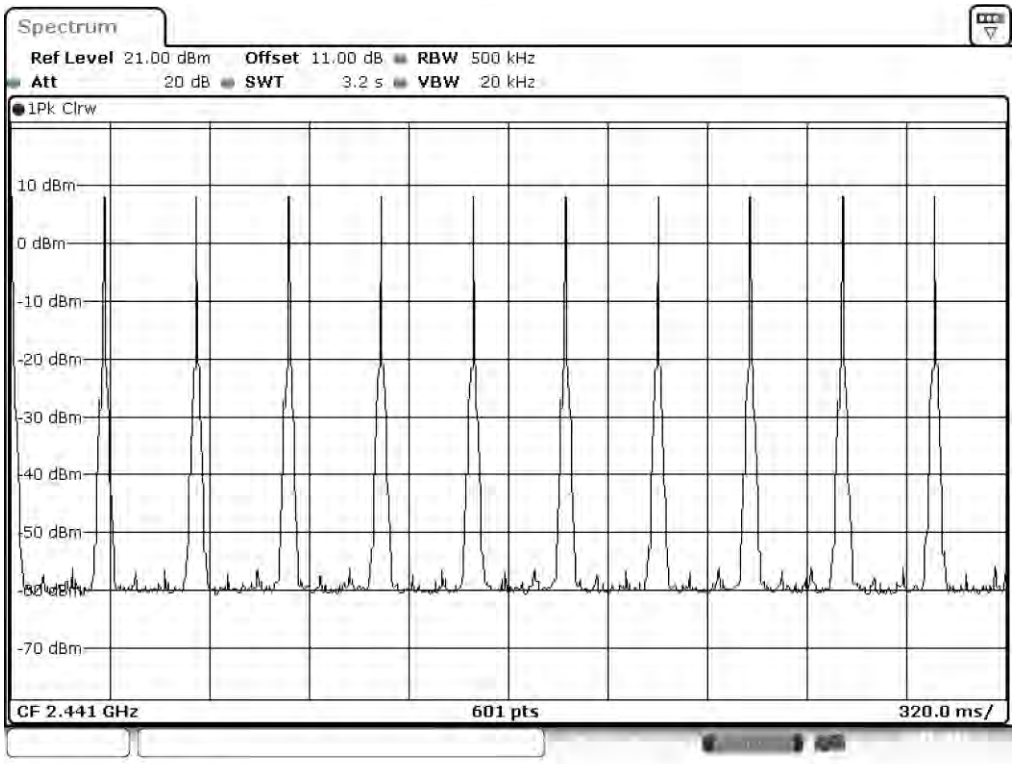
Plot6 2441 TX pulse width 3DH3



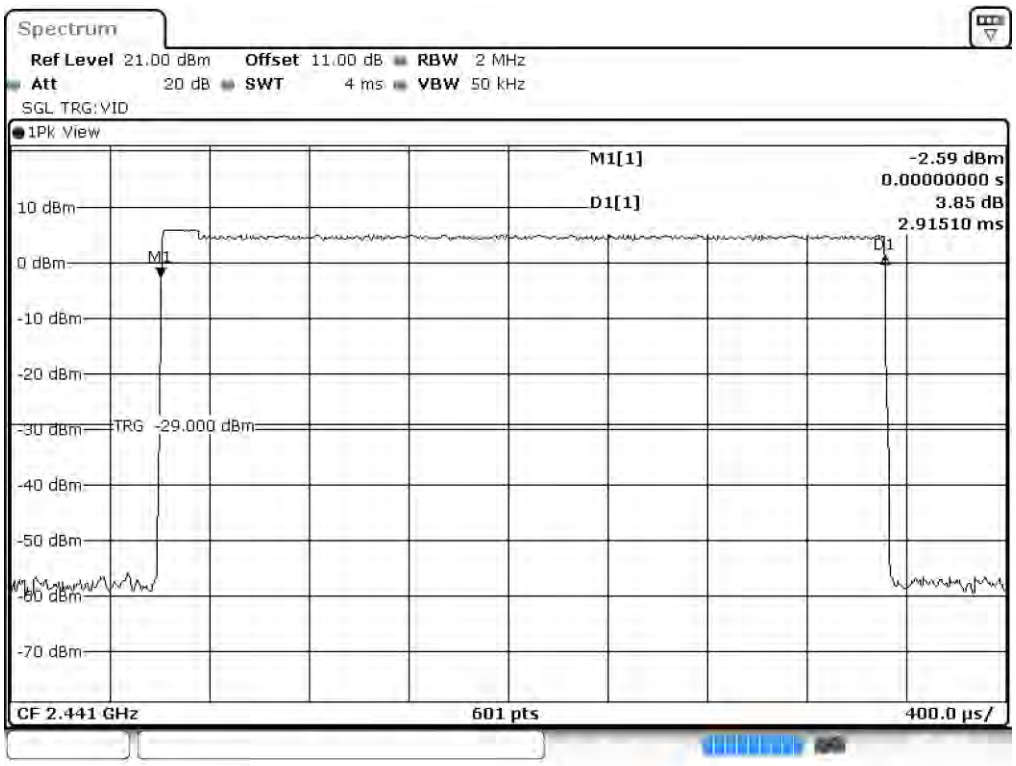
Plot15 2441 TX pulse count 3DH3



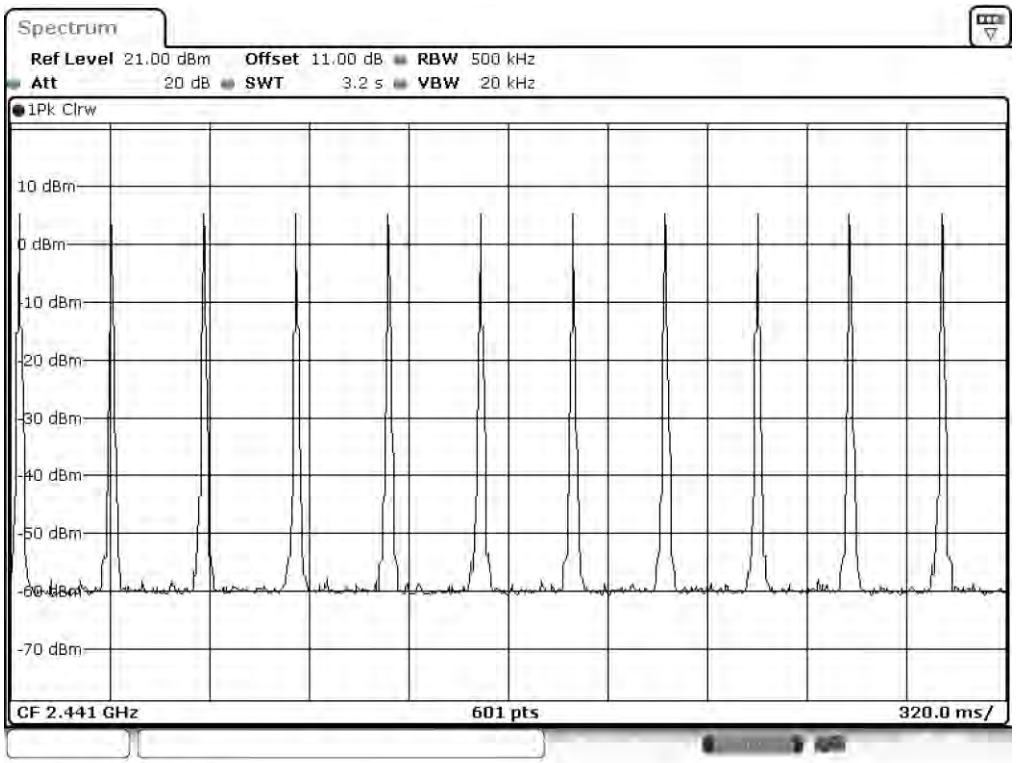
Plot7 2441 TX pulse width DH5



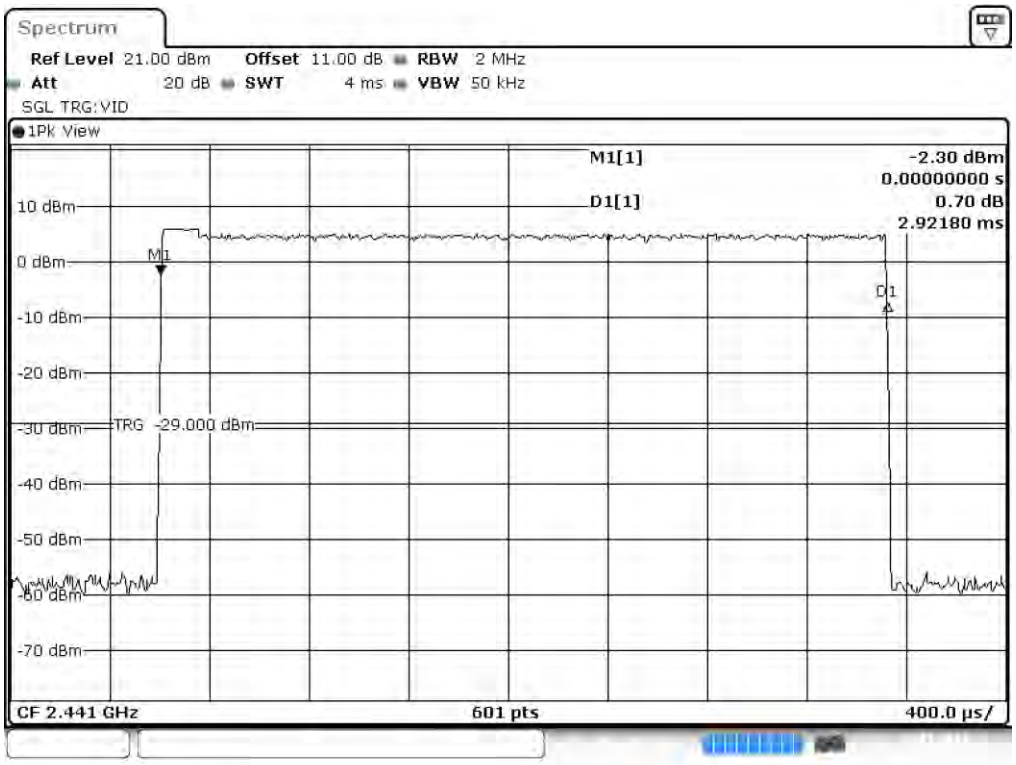
Plot16 2441 TX pulse count DH5



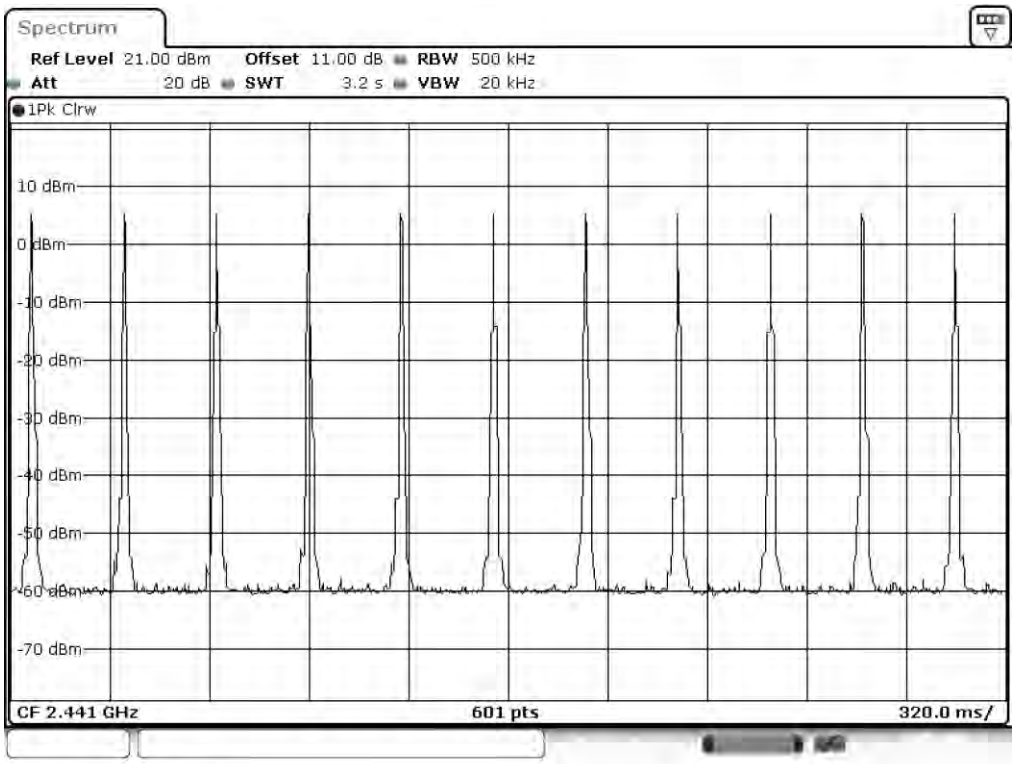
Plot8 2441 TX pulse width 2DH5



Plot17 2441 TX pulse count 2DH5



Plot9 2441 TX pulse width 3DH5



Plot18 2441 TX pulse count 3DH5

Number of Hopping Channels

Requirements:

FCC 15.247 (a) (1) (iii), IC RSS-247 5.1 (4)

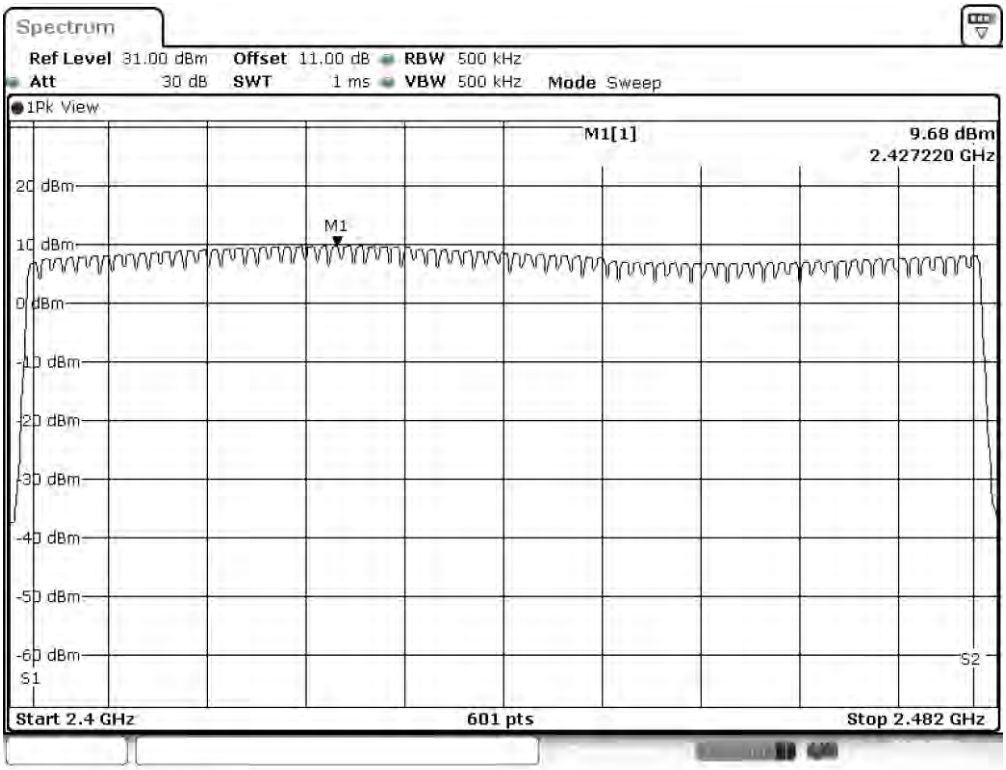
Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

Test Setup:

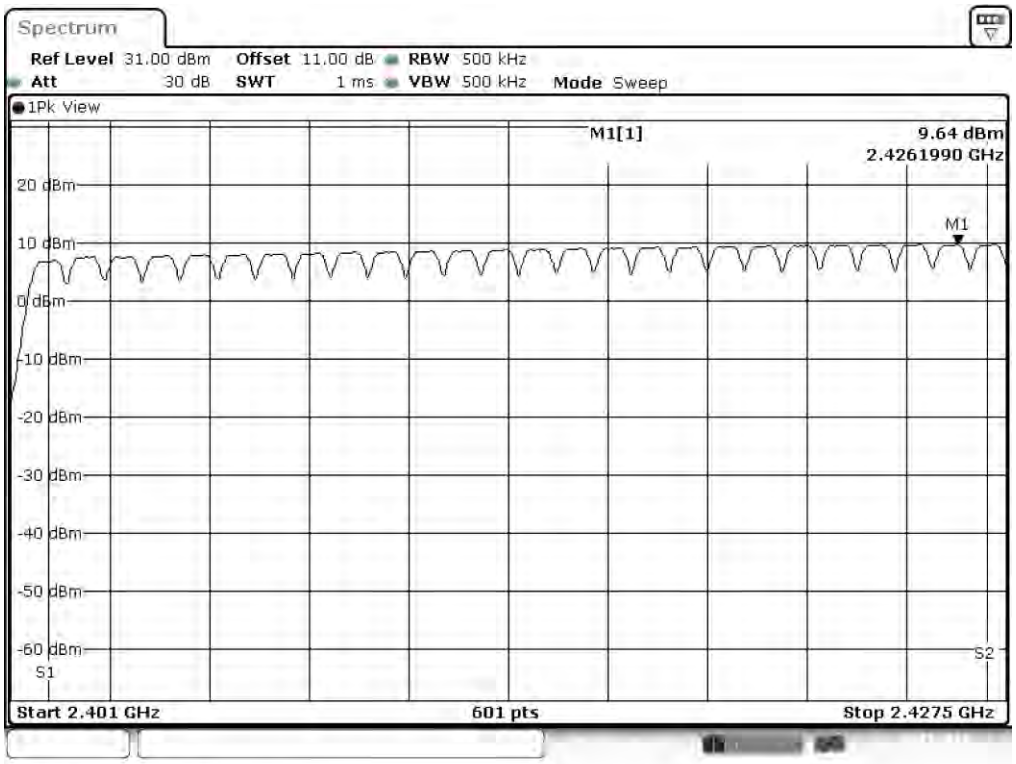
EUT is controlled by CSR's Blue Suite software to enable testing of the spurious output in specific operational modes.

Measurements are made with the EUT in normal operation (hopping through all available channels) in basic and enhanced data rate modes.

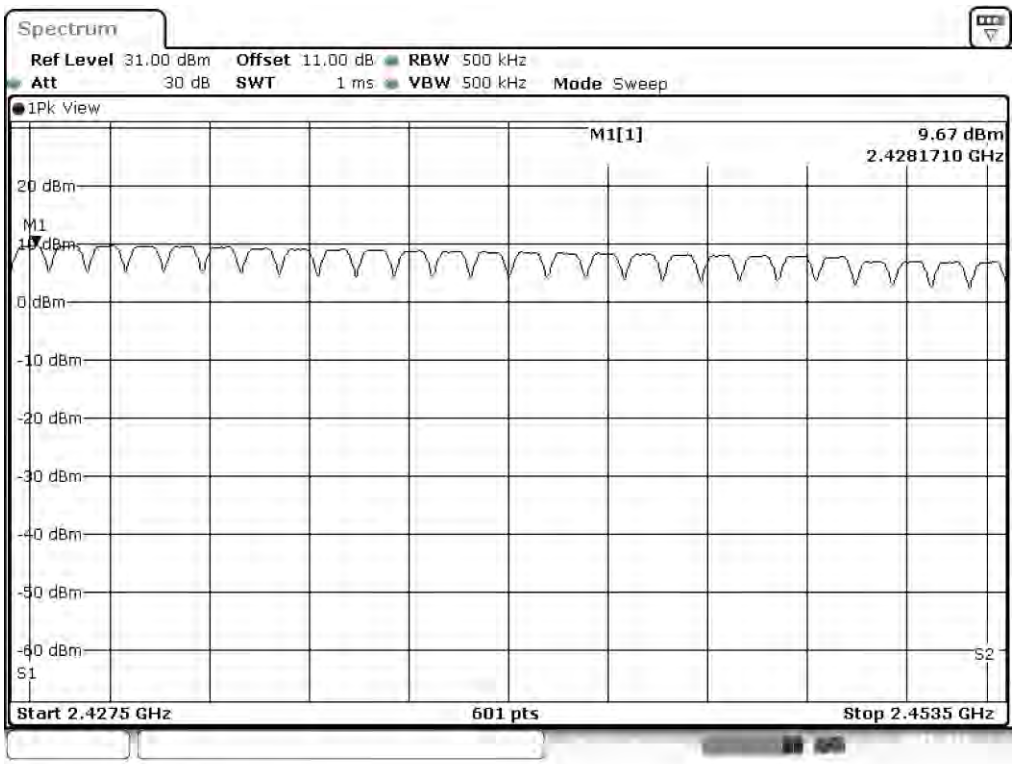
Test Results:



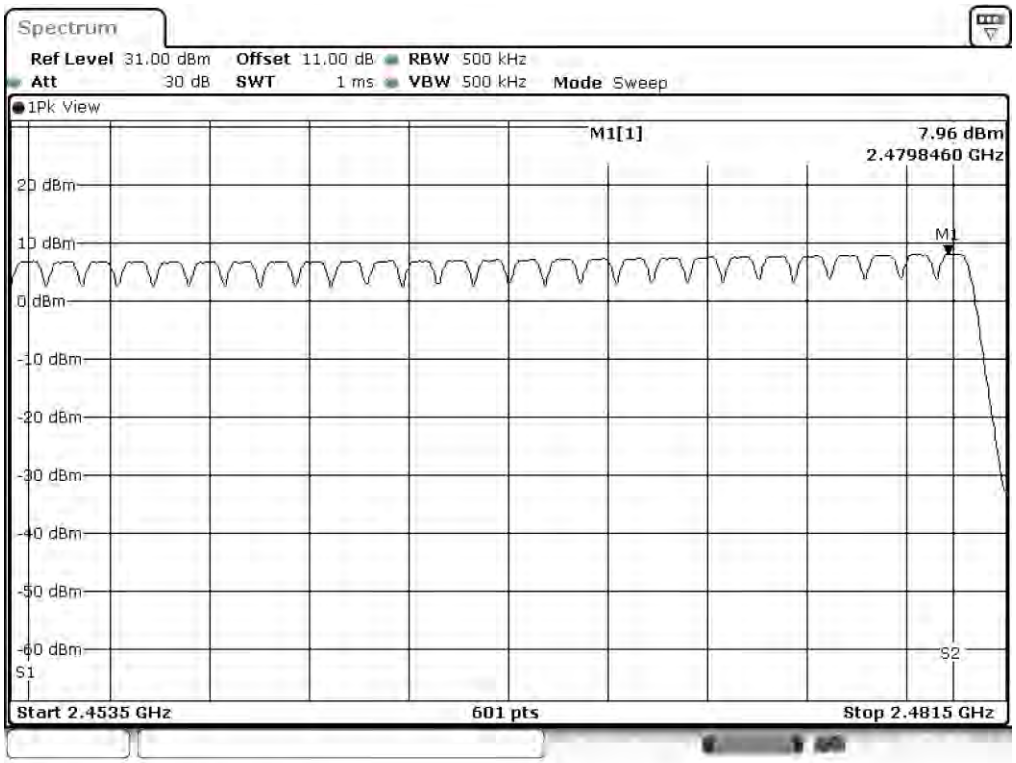
Plot1 79 Hopping Frequency DH5



Plot2 1st segment DH5 (26 Frequencies)



Plot3 2nd segment DH5 (26 Frequencies)



Plot4 3rd segment DH5 (27 Frequencies)

Conducted Measurements Resources Used

TN	Description	Model	S/N	Manufacturer	Most Recent Service	Service Due Date
2408	Spectrum Analyzer	FSV40	101414	Rohde & Schwarz	04-Apr-2018	04-Apr-2019
2342	Band Reject Filter	BRM50702-07	001	Micro-Tronics	07-Mar-2018	07-Mar-2019

End of Report