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Test report

449630-1TRFWL

Date of issue: September 27, 2021

Applicant:
The Genie Company, a Division of Overhead Door Corporation

Product:
Universal 4 Button Transmitter (U4Tx2)

Model:	Variant(s):
OU4TR2	GU4TG2, GU4RT2

FCC ID:	IC ID:
B8QUNI4B2	2133A-UNI4B2

Specifications:

- FCC 47 CFR Part 15, Subpart C – §15.231
- Industry Canada RSS-210 Issue 10 – Annex A

Lab and test locations

Company name	Nemko USA Inc.
Address	2210 Faraday Ave, Suite 150
City	Carlsbad
State	California
Postal code	92008
Country	USA
Telephone	+1 760 444 3500
Website	www.nemko.com
FCC Site Number	Test Firm Registration Number: 392943 Designation Number: US5058
ISED Test Site	2040B-3

Tested by	Martha Espinoza, Wireless Test Engineer
	James Cunningham, EMC/MIL/WL Supervisor
Reviewed by	Juan M Gonzalez, EMC & Wireless Divisions Manager
Review date	September 27, 2021
Reviewer signature	

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.
This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko USA's ISO/IEC 17025 accreditation.
This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

Copyright notification

Table of Contents

Section 1 Report summary

1.1 Applicant

Company name	The Genie Company a Division of Overhead Door Corporation
Address	2170 French Settlement Road
City	Dallas
Province/State	TX
Postal/Zip code	75212
Country	United States of America

1.2 Manufacturer

Company name	The Genie Company a Division of Overhead Door Corporation
Address	2170 French Settlement Road
City	Dallas
Province/State	TX
Postal/Zip code	75212
Country	United States of America

1.3 Test specifications

FCC 47 CFR Part 15, Subpart C – §15.231 IC RSS-210, Issue 10; Annex A	Periodic operation in the band 40.66-40.70 MHz and above 70 MHz Licence-Exempt Radio Apparatus: Category I Equipment: Momentarily operated and remote-control devices

1.4 Test methods

ANSI C63.10-2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

1.5 Exclusions

None.

1.6 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was performed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See "Summary of test results" for full details.

1.7 Test report revision history

Table 1.7-1: *Test report revision history*

Revision #	Details of changes made to test report
449630-1TRFWL	Original report issued

Notes:

Section 2 Summary of test results

2.1 FCC Part 15 Subpart C, general requirements test results

Part	Test description	Verdict
§15.207(a)	Conducted limits	Not applicable [1]
§15.31(e)	Variation of power source	Pass
§15.203	Antenna requirement	Pass [2]

Notes: [1] The EUT is battery operated. Charging via AC adaptor is not possible.
[2] The EUT uses a trace antenna on PCB.

2.2 FCC Part 15 Subpart C, intentional radiators test results

Part	Test description	Verdict
§15.231(a)(1)	Manually operated transmitter	Pass
§15.231(a)(2)	Cessation of transmission	Not applicable [1]
§15.231(a)(3)	Periodic transmissions	Pass [2]
§15.231(a)(4)	Setup information for security systems	Not applicable [3]
§15.231(b)	Field strength of emissions	Pass
§15.231(c)	Bandwidth of emissions	Pass
§15.231(d)	Band edge and frequency tolerance	Not applicable [4]
§15.231(e)	Periodic operation	Not applicable [5]

Notes: [1] The EUT does not support automatic activation.
[2] The EUT does not support periodic, polling or supervision transmissions.
[3] The EUT is not a security system and does not transmit set-up information.
[4] The EUT does not operate in the 40.66 – 40.70 MHz band to which these requirements apply.
[5] The EUT complies with the requirements of section 15.231(a) therefore these requirements do not apply.

2.4 IC RSS-GEN, Issue 5 test results

Part	Test description	Verdict
6.7	Occupied bandwidth	Pass
7.3	Receiver radiated emission limits	Not applicable [1]
7.4	Receiver conducted emission limits	Not applicable
8.8	Power Line Conducted Emissions Limits for License-Exempt Radio Apparatus	Not applicable

Notes: [1] The EUT is neither a scanning receiver nor a stand-alone receiver.
[2] The EUT is battery operated. Charging via AC adaptor is not possible.

2.4 IC RSS-231, Issue 10, Annex A test results

Part	Test description	Verdict
A.1.1(a)	Manually operated transmitter	Pass
A.1.1(b)	Cessation of transmission	Not applicable [1]
A.1.1(c)	Periodic transmissions	Pass [2]
A.1.1(d)	Setup information for security systems	Not applicable [3]
A.1.2	Field strength of emissions	Pass
A.1.3	Bandwidth of momentary signals	Pass
A.1.4	Reduced field strengths	Not applicable [4]

Notes: [1] The EUT does not support automatic activation.
[2] The EUT does not support periodic, polling or supervision transmissions.
[3] The EUT is not a security system and does not transmit set-up information.
[4] The EUT complies with the requirements of section A.1.1 therefore these requirements do not apply.

Section 3 Equipment under test (EUT) details

3.1 Sample information

Receipt date	September 22, 2021
Nemko sample ID number	NEx: 449630

3.2 EUT information

Product name	Universal 4 Button Transmitter (U4Tx2)
Model	OU4TR2
Variant(s)	GU4TR2, GU4TG2 (Variant are identical to OU4TR2 with respect to PCB and electronic components.
Serial number	None
Part number	N/A

3.3 EUT technical information

Operating frequency(-ies)	Various operating modes are supported as follows: Genie, 9 switch/ 3 position dipswitch, 360Mhz Genie, 9 switch/ 3 position dipswitch, 380Mhz Genie, 9 switch/ 3 position dipswitch, 412Mhz
Power requirements	$3V_{DC}$ battery
Antenna information	The EUT uses a unique antenna coupling/ non-detachable antenna to the intentional radiator.

3.4 Product description and theory of operation

The EUT is a programmable hand-held remote garage door opener activated via manual push-button.

3.5 EUT exercise and monitoring details

For radiated emissions, the EUT was programmed to operate in a given mode (Coding, and operating frequency) with continuous transmission. For bench testing, samples were programmed to operate in a given mode in the normal operating state. That is, the transmitter is manually activated by pushing the appropriate button on the sample. For radiated testing, a bench-top DC power supply was used in place of the battery.

Table 3.5-1: *EUT sub-assemblies*

Description	Brand name	Model/Part number	Serial number	Rev.
The EUT has no sub-assemblies	--	--	--	--

Table 3.5-2: *EUT interface ports*

Description	Qty.
None	--

Table 3.5-3: *Support equipment*

Description	Brand name	Model/Part number	Serial number	Rev.
None				

Table 3.5-4: *Inter-connection cables*

Cable description	From	To	Length (ft)
None	--	--	--

3.6 EUT setup diagram

Figure 3.6-1: *Test setup*

Section 4 Engineering considerations

4.1 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

4.2 Technical judgment

None

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures

Section 5 Test conditions

5.1 Atmospheric conditions

Temperature	15-30 °C
Relative humidity	20-75 %
Air pressure	86–106 kPa

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

5.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages ±5 %, for which the equipment was designed.

Section 6 Measurement uncertainty

6.1 Uncertainty of measurement

Measurement uncertainty budgets for the tests are detailed below. Measurement uncertainty calculations assume a coverage factor of K = 2 with 95% certainty.

Test name	Measurement uncertainty, dB
Radiated spurious emissions	3.78
Powerline conducted emissions	1.38
All antenna port measurements	0.55
Conducted spurious emissions	1.13

Section 7 Test equipment

Table 6.1-1: *Equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
EMI Test Receiver	Rohde & Schwarz	ESU40	E1121	19 May 2021	19 May 2022
System Controller	Sunol Sciences	SC104V	E1191	NCR	NCR
Bilog Antenna (30-1000MHz)	Schaffner	CBL6111D	1763	18 Feb 2020	18 Feb 2022
DRG Horn (1-18GHz)	ETS-Lindgren	3117-PA	E1160	02 Dec 2020	02 Dec 2021
Signal & Spectrum Analyzer	Rohde & Schwarz	FSV40	E1120	19 Nov 2019	19 Nov 2021
Close Field Probe (30 MHz – 1 GHz)	Agilent	11940A	920	NCR	NCR

Notes: NCR – no calibration required

Section 8 Testing data

8.1 Duty cycle

8.1.1 Definitions and limits

To correctly report average values of the fundamental and spurious harmonic emissions, it is necessary to measure the duty cycle of the transmitter.

8.1.2 Test summary

Test date	September 22, 2021	Temperature	24 °C
Test engineer	James Cunningham, EMC/MIL/WL Supervisor	Air pressure	1007 mbar
Test location	Wireless bench	Relative humidity	55 %

8.1.3 Observations, settings, and special notes

Measurements were performed in accordance with Section 7.5 of ANSI C63.10 using a spectrum analyzer tuned to the transmitter fundamental frequency in a zero-span mode.

Duty cycle was measured for each of the 3 added supported frequencies by the EUT.

8.1.4 Test data

Table 8.1-1: *Duty cycle test data*

Brand Name	Coding	Carrier Frequency (MHz)	Number of pulses t1 in 100 ms	t1 pulse width (µs)	Number of pulses t2 in 100 ms	t2 pulse width	Duty Cycle Correction (dB) Note 2	% Duty cycle
OHD	Genie, 9 switch/ 3 position dipswitch	360	9	See note 2	1	See note 2	-7.01	44.6
OHD	Genie, 9 switch/ 3 position dipswitch	380	9	See note 2	1	See note 2	-7.02	44.6
OHD	Genie, 9 switch/ 3 position dipswitch	412	9	See note 2	1	See note 2	-7.03	44.5

Note 1:
Duty cycle correction factor calculated using the following equation (from ANSI C63.10 Section 7.5):

$$\delta(dB) = 20\log_{10}\left[\sum(nt_1 + mt_2 + \cdots + \varepsilon t_x)/T\right]$$

Note 2:
The spectrum analyzer trace was exported to a spreadsheet and the duty cycle was calculated from the raw data. The duty cycle correction factor was calculated using the following equation (from ANSI C63.10 Section 7.5):

$$\delta(dB) = 20\log_{10}\langle\Delta\rangle$$

Where: Δ is the duty cycle calculated as (transmit on time during 100 ms interval) / 100 ms.

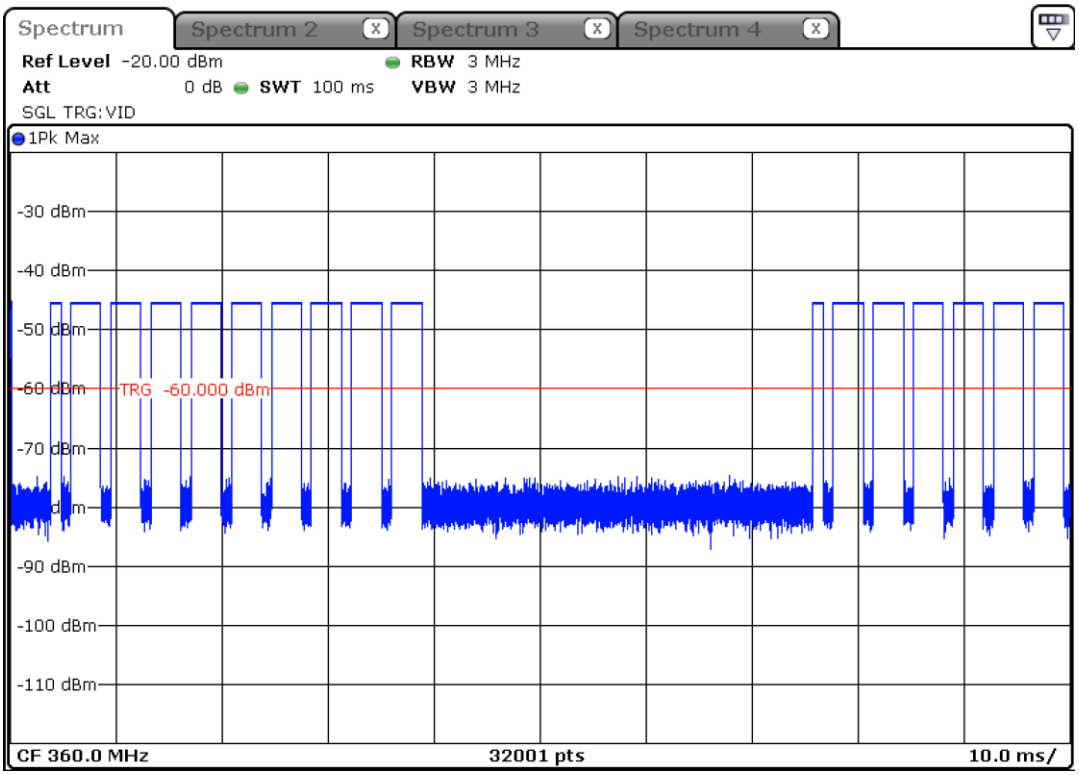

Figure 8.1-1: *Duty cycle, Genie, 9 switch/ 3 position dipswitch, 360MHz: 100 ms burst.*

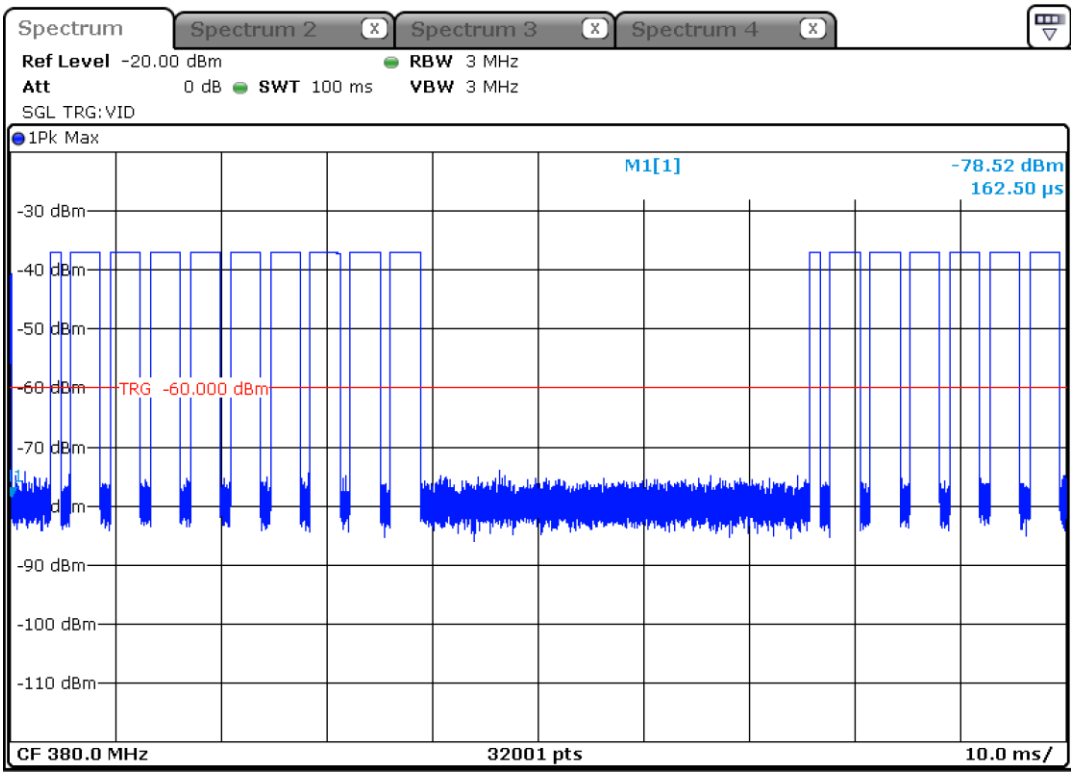

Figure 8.1-2: *Duty cycle, Genie, 9 switch/ 3 position dipswitch, 380MHz: 100 ms burst.*

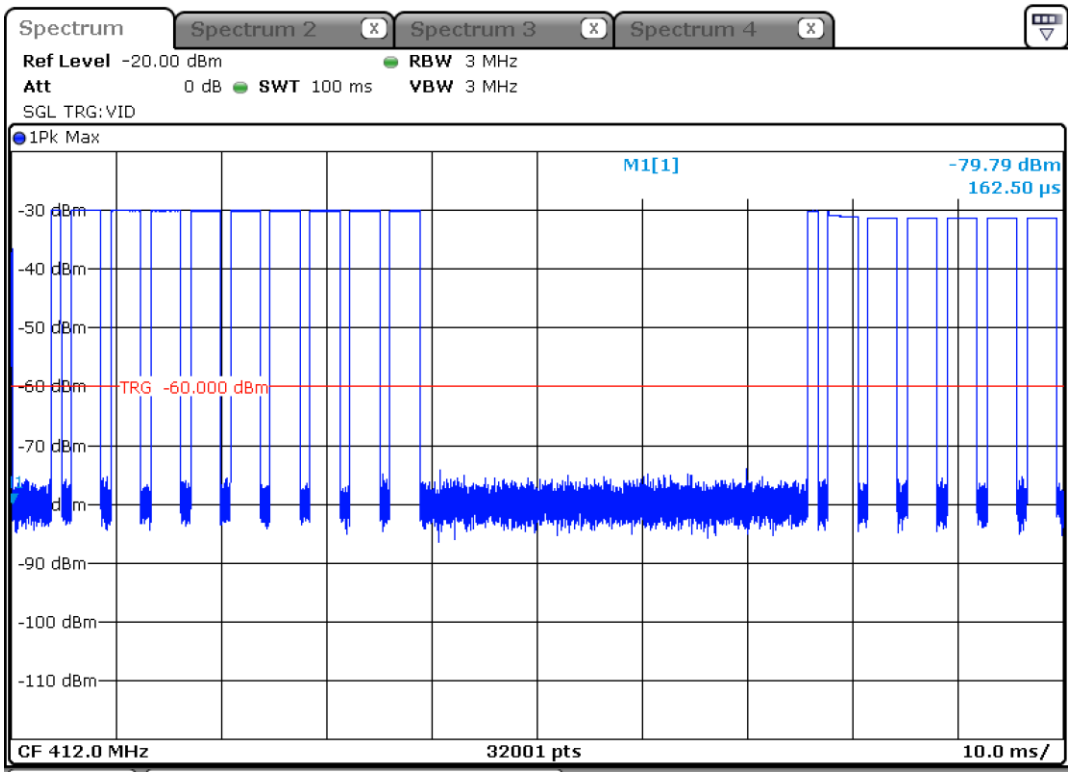

Figure 8.1-3: *Duty cycle, Genie, 9 switch/ 3 position dipswitch, 412 MHz: 100 ms burst.*

8.2 FCC 15.231(a)(1) / RSS-210 A.1.1(a) Manually operated transmitter

8.2.1 Definitions and limits

FCC 15.231(a)(1) and RSS-210 A.1.1(a):
A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

8.2.2 Test summary

Verdict	Pass		
Test date	September 22, 2021	Temperature	24 °C
Test engineer	James Cunningham, EMC/MIL/WL Supervisor	Air pressure	1007 mbar
Test location	Wireless bench	Relative humidity	55 %

8.2.3 Observations, settings, and special notes

Tests were performed based on the methodology of Section 7.4 of ANSI C63.10.

The spectrum analyzer was tuned to the operating frequency of the EUT in zero span mode. A 5 second sweep time was used with video triggering to capture the transmission from the EUT when the transmitter activation button was pressed. Markers were used to measure the transmission deactivation time.

8.2.4 Test data

Table 8.2-1: *Test data – deactivation time*

Brand	Coding	Operating Frequency (MHz)	Deactivation Time (s)
OHD	Genie, 9 switch/ 3 position dipswitch	360	1.1159
OHD	Genie, 9 switch/ 3 position dipswitch	380	1.1556
OHD	Genie, 9 switch/ 3 position dipswitch	412	1.1895

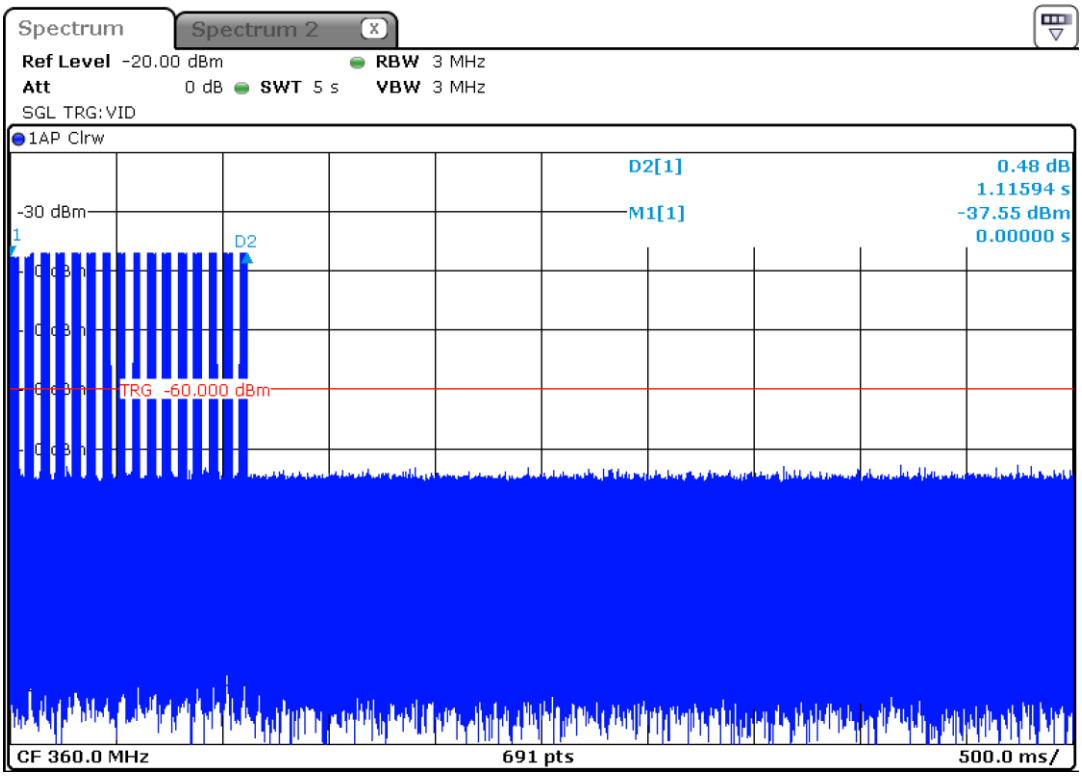

Figure 8.2-1: *Deactivation time, Genie, 9 switch/ 3 position dipswitch, 360MHz*

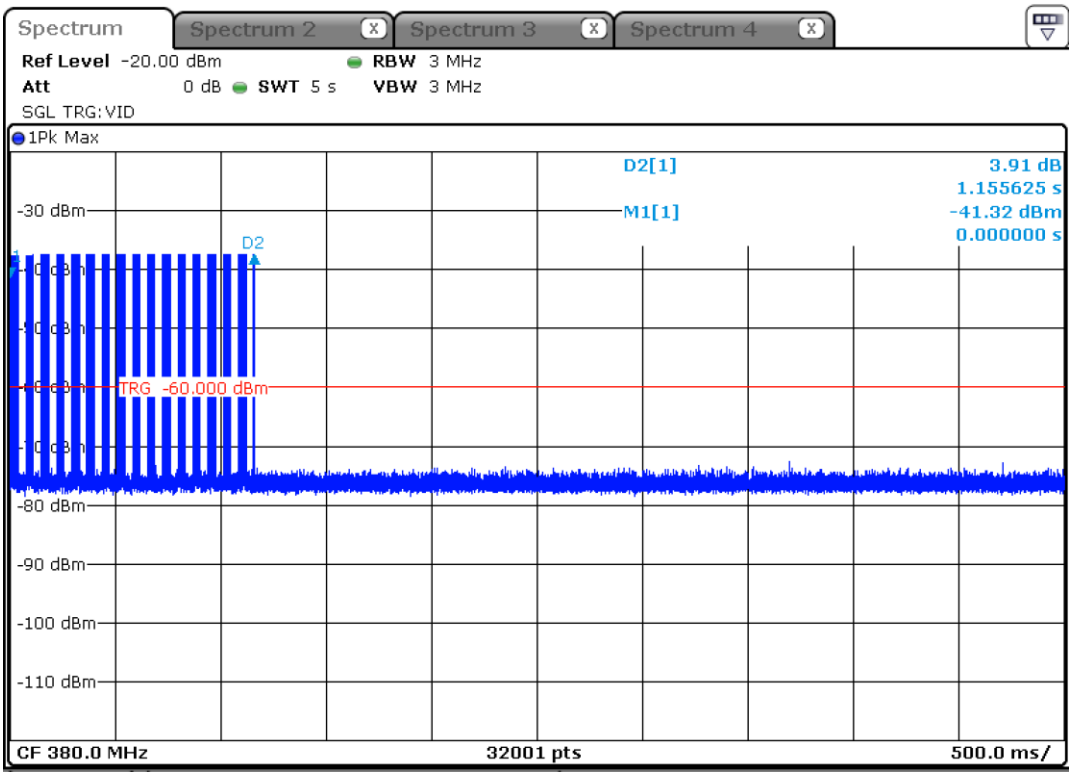

Figure 8.2-2: *Deactivation time, Genie, 9 switch/ 3 position dipswitch, 380MHz*

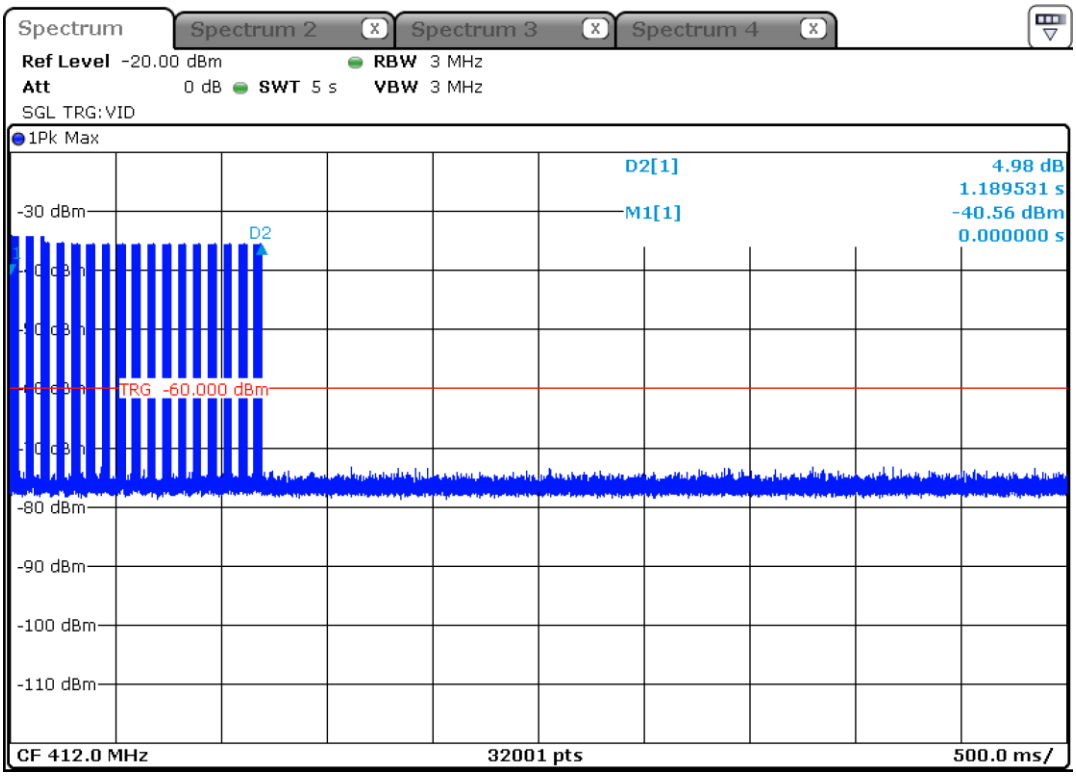

Figure 8.2-3: *Deactivation time, Genie, 9 switch/ 3 position dipswitch, 412 MHz*

8.3 FCC 15.231(b) / RSS-210 A.1.2 Field strength of emissions

8.3.1 Definitions and limits

FCC 15.231(b)):

In addition to provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66 – 40.70	2250	225
70 – 130	1250	125
130 – 174	1250 to 3750 [1]	125 – 375 [1]
174 – 260	3750	375
260 – 470	3750 – 12500 [1]	375 – 1250 [1]
Above 470	12500	1250

Notes: [1] Linear interpolation.

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at band edges.

(2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits of field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in § 15.209, whichever limit permits a higher field strength.

RSS-210 A.1.2:

Following are the requirements for field strength of emissions:

a. The field strength of emissions from momentarily operated intentional radiators shall not exceed the limits in the table below, based on the average value of the measured emissions. The requirements of the "Pulsed operation" section of RSS-Gen apply for averaging pulsed emissions and limiting peak emissions. Alternatively, compliance with the limits in the table below may be demonstrated using an International Special Committee on Radio Interference (CISPR) quasi-peak detector.

b. Unwanted emissions shall be 10 times below the fundamental emissions field strength limits in table below or comply with the limits specified in RSS-GEN, whichever is less stringent.

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)
40.66 – 40.70	2250
70 – 130	1250
130 – 174	1250 to 3750 *
174 – 260	3750
260 – 470	3750 – 12500 *
Above 470	12500

*Linear interpolation with frequency, f, in MHz:
For 130-174 MHz: Field Strength (μV/m) = (56.82 x f)-6136
For 260-470 MHz: Field Strength (μV/m) = (41.67 x f)-7083
** Frequency bands 225-328.6 MHz and 335.4-399.9 MHz are designated for the exclusive use of the Government of Canada. Manufacturers should be aware of possible harmful interference and degradation of their licence-exempt radio equipment in these frequency bands.

8.3.2 Test summary

Verdict	Pass		
Test date	September 22, 2021	Temperature	24 °C
Test engineer	Martha Espinoza, Wireless Test Engineer	Air pressure	1007 mbar
Test location	3m semi anechoic chamber	Relative humidity	55 %

8.3.3 Observations, settings, and special notes

Tests were performed using the methodology of Sections 6.3, 7.5 and 7.6 of ANSI C63.10.
The frequency range from 30 MHz to > 10 x the fundamental frequency was examined. The EUT was configured to continuously transmit at the desired mode (coding, and operating frequency). Measurements were made with a peak detector. Fundamental and harmonic emissions were adjusted using the appropriate duty cycle correction factor for comparison against the average emission limits. All measurements were performed at a 3 m measurement distance.
EUT was verified in 3 axis (X/Y/Z) to determine the maximum emissions. The worst-case scenario was identified to be having the EUT flat on the turntable and was used during all testing.

The table below outlines the operating modes tested:

Brand Name	Coding	Operating Frequency (MHz)	Comments
OHD	Genie, 9 switch/ 3 position dipswitch	360	Calculated
OHD	Genie, 9 switch/ 3 position dipswitch	380	Calculated
OHD	Genie, 9 switch/ 3 position dipswitch	412	Calculated

8.3.4 Test data

Field strength of fundamental:

Table 8.3-1: *Test data – field strength of fundamental*

Brand	Coding	Operating Frequency (MHz)	Peak Emission (dBµV/m)	Duty Cycle Correction Factor (dB)	Average Emission (dBµV/m)	Limit (dBµV/m)
OHD	Genie, 9 switch/ 3 position dipswitch	360	81.89	-7.01	74.88	77.97
OHD	Genie, 9 switch/ 3 position dipswitch	380	81.94	-7.02	74.92	78.84
OHD	Genie, 9 switch/ 3 position dipswitch	412	82.60	-7.03	75.57	80.07

Average Emission = Peak Emission + Duty Cycle Correction Factor. Example: 81.89 dBµV/m + (-7.01) dB = 74.88 dBµV/m average emission.

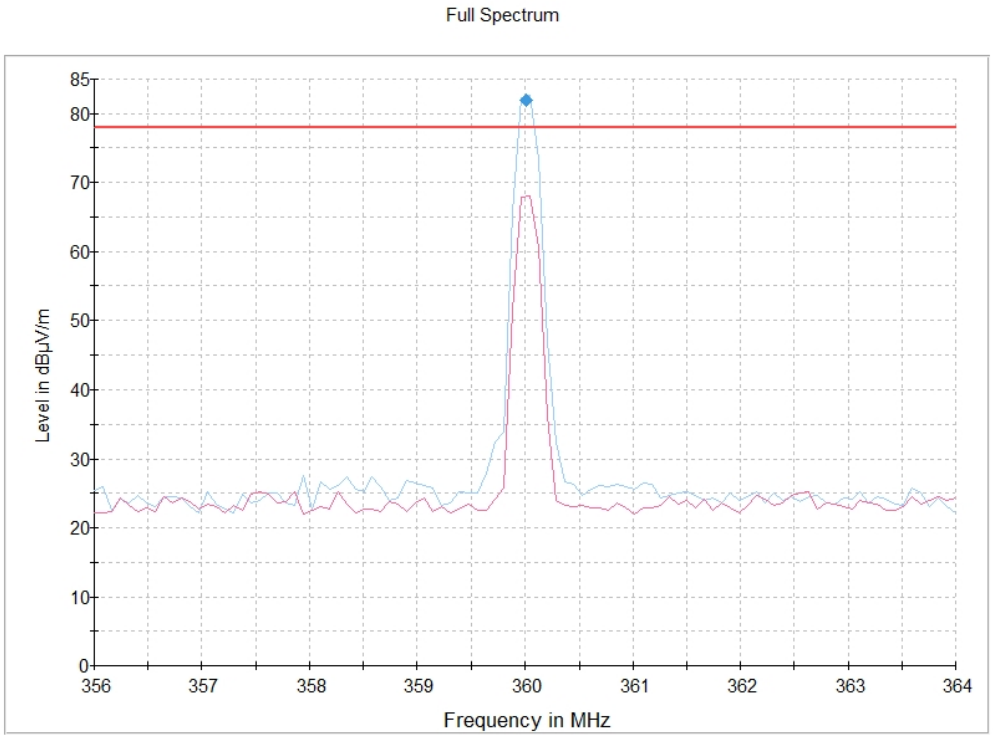

Figure 8.3-1: *Fundamental emission, OHD Genie, 9 switch/ 3 position dipswitch, 360 MHz*

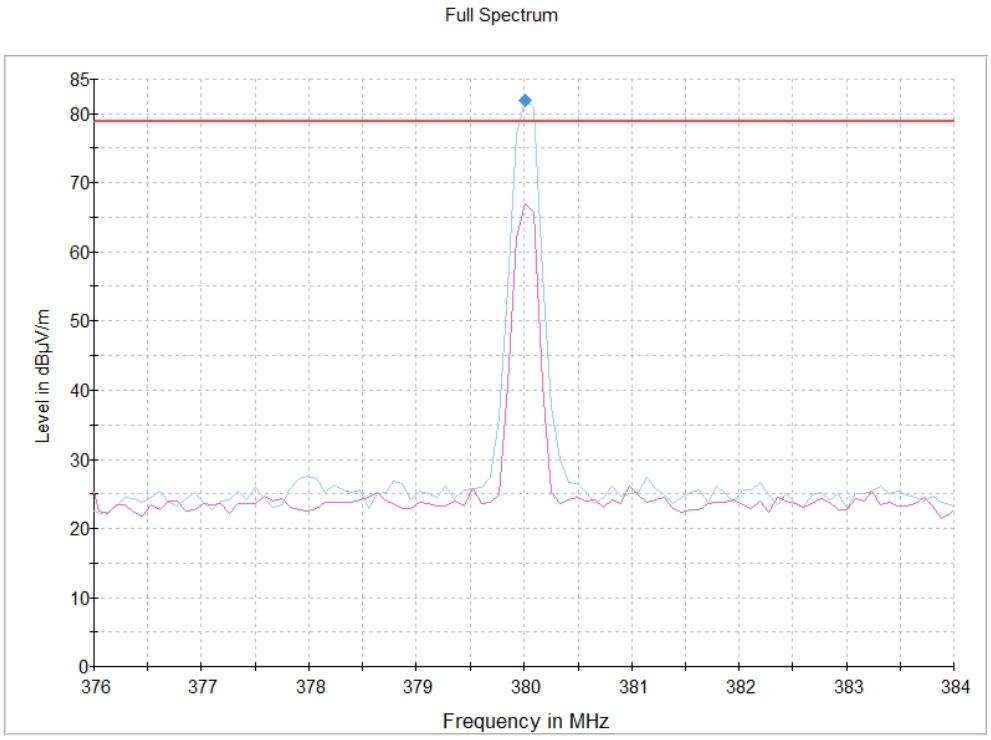

Figure 8.3-2: *Fundamental emission, OHD Genie, 9 switch/ 3 position dipswitch, 380 MHz*

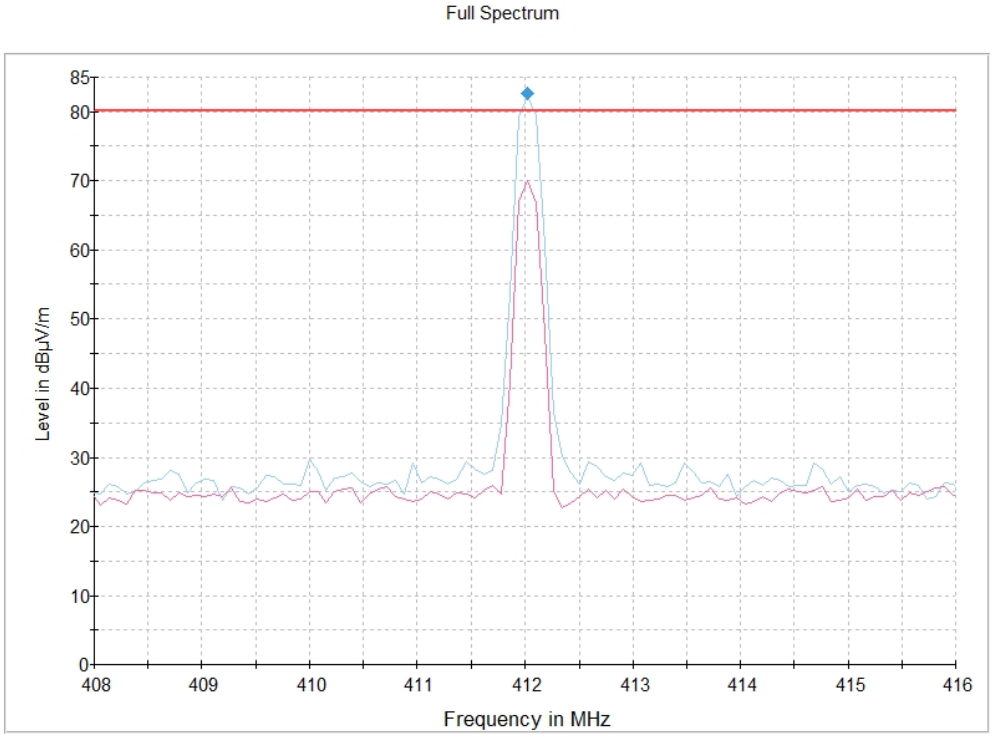

Figure 8.3-3: *Fundamental emission, OHD Genie, 9 switch/ 3 position dipswitch, 412 MHz*

Harmonic and spurious emissions:

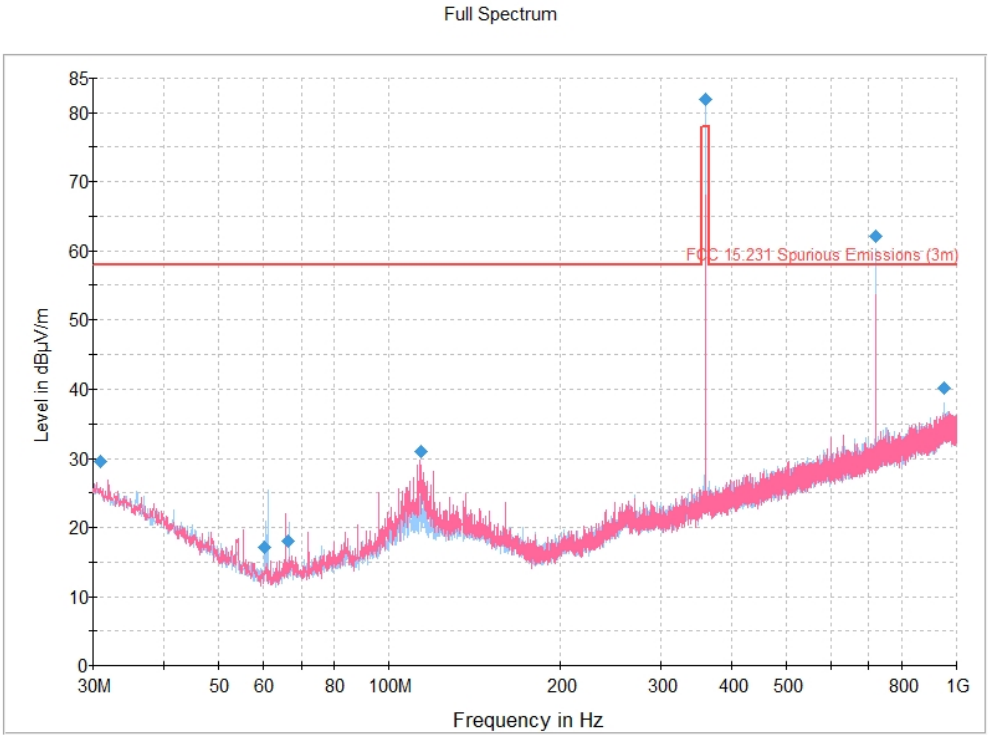

Figure 8.3-4: *Harmonic and spurious emissions, 30 – 1000 MHz, OHD Genie, 9 switch/ 3 position dipswitch, 360 MHz*

Table 8.3-2*: Harmonic and spurious emissions test data, OHD Genie, 9 switch/ 3 position dipswitch, 360 MHz*

Frequency (MHz)	MaxPeak (dBµV/m)	Duty cycle correction (dB)	Average (dBµV/m	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.940000	29.65	N/A	N/A	57.97	28.32	5000.0	120.000	205.0	V	38.0	26.0
60.120000	17.17	N/A	N/A	57.97	40.80	5000.0	120.000	410.0	H	343.0	12.7
66.327500	18.01	N/A	N/A	57.97	39.96	5000.0	120.000	402.0	V	281.0	13.1
113.661667	31.03	N/A	N/A	57.97	26.94	5000.0	120.000	402.0	V	0.0	19.1
360.002500	Fundamental					5000.0	120.000	146.0	H	212.0	24.2
720.034167	62.10	-7.01	55.09	57.97	2.88	5000.0	120.000	178.0	H	112.0	30.8
949.877500	40.33	N/A	N/A	57.97	17.64	5000.0	120.000	317.0	H	11.0	34.6

Notes:
[1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factors = antenna factor ACF (dB) + cable loss (dB) − amplifier gain (dB)
[3] The maximum measured value observed over a period of 5 seconds was recorded.
[4] Peak emissions at harmonic frequencies are adjusted by the duty cycle correction factor and compared against the average limit. For non-harmonic emissions, the peak is compared directly against the average limit.
[5] The limit is calculated based on the nominal carrier frequency.

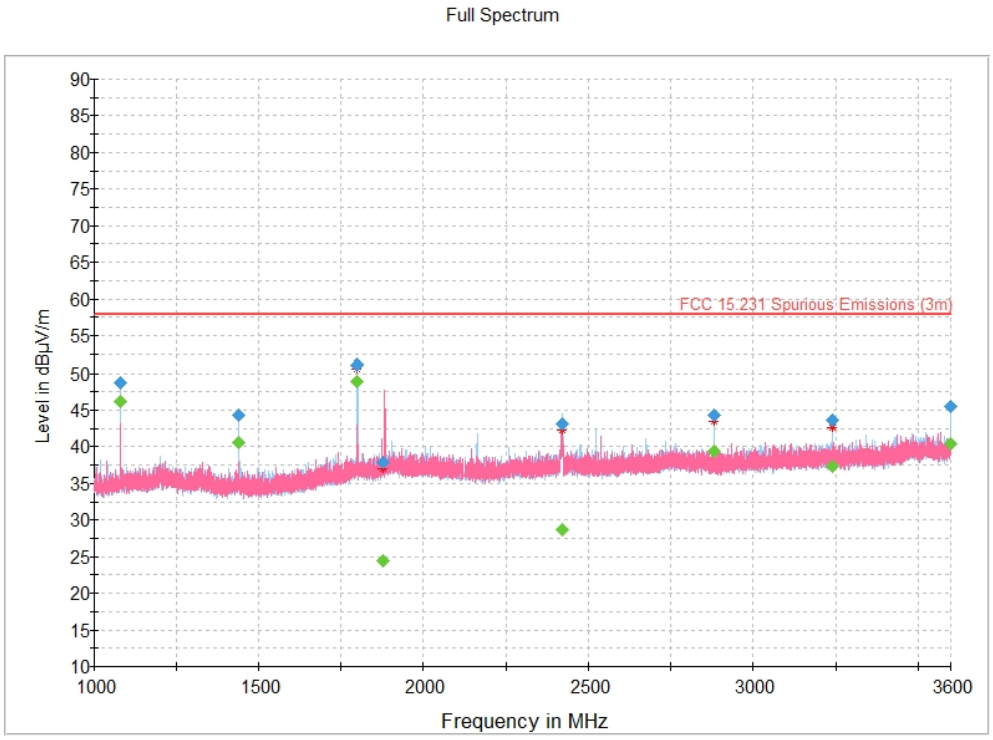

Figure 8.3-5: *Harmonic and spurious emissions, 30 – 1000 MHz, OHD Genie, 9 switch/ 3 position dipswitch, 360 MHz*

Table 8.3-3: *Harmonic and spurious emissions test data, OHD Genie, 9 switch/ 3 position dipswitch, 360 MHz*

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1080.028000	48.64	57.97	9.33	5000.0	1000.000	145.0	H	205.0	-14.0
1440.164000	44.24	57.97	13.73	5000.0	1000.000	155.0	H	213.0	-13.7
1799.968000	51.16	57.97	6.81	5000.0	1000.000	108.0	H	42.0	-10.7
1879.828000	37.93	57.97	20.04	5000.0	1000.000	213.0	V	210.0	-10.1
2419.980000	43.17	57.97	14.80	5000.0	1000.000	285.0	H	323.0	-8.9
2879.956000	44.33	57.97	13.64	5000.0	1000.000	154.0	H	36.0	-7.5
3240.160000	43.69	57.97	14.28	5000.0	1000.000	145.0	H	37.0	-6.1
3599.896000	45.52	57.97	12.45	5000.0	1000.000	154.0	H	37.0	-4.7

Notes:
[1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factors = antenna factor ACF (dB) + cable loss (dB) − amplifier gain (dB)
[3] The maximum measured value observed over a period of 5 seconds was recorded.
[4] Peak emissions at harmonic frequencies are adjusted by the duty cycle correction factor and compared against the average limit. For non-harmonic emissions, the peak is compared directly against the average limit.
[5] The limit is calculated based on the nominal carrier frequency.

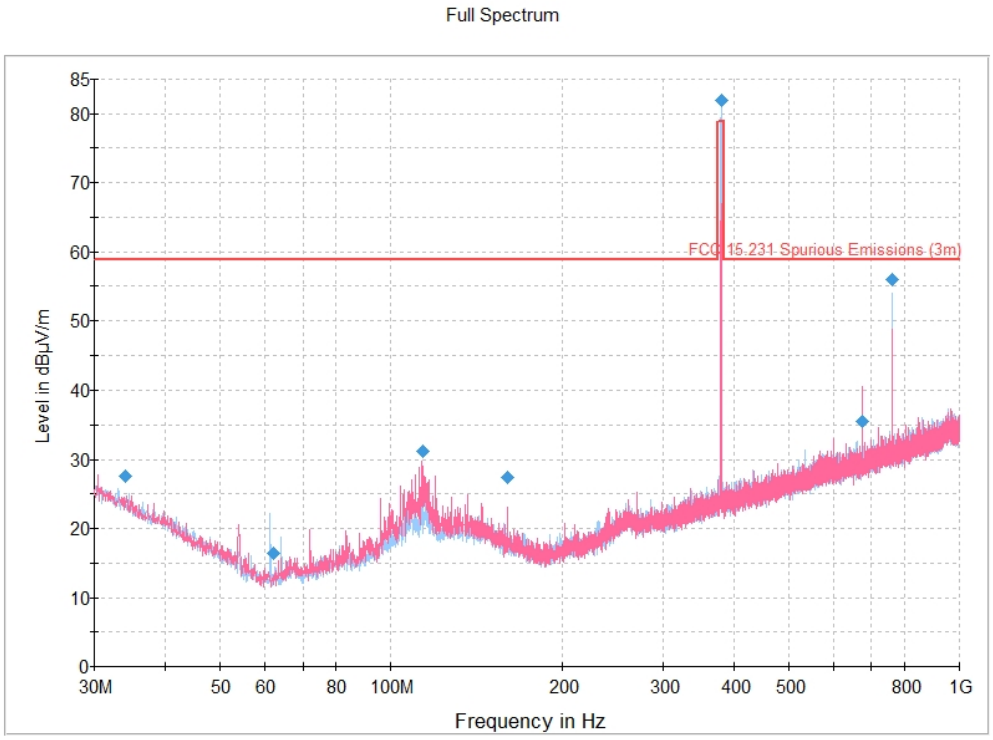

Figure 8.3-6: *Harmonic and spurious emissions, 30 – 1000 MHz, 9 switch/ 3 position dipswitch, 380 MHz*

Table 8.3-4: *Harmonic and spurious emissions test data, OHD Genie, 9 switch/ 3 position dipswitch, 380 MHz*

Frequency (MHz)	MaxPeak (dBµV/m)	Duty cycle correction (dB)	Average (dBµV/m	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
34.086667	27.53	N/A	N/A	58.84	31.31	5000.0	120.000	264.0	H	22.0	24.3
62.042500	16.49	N/A	N/A	58.84	42.35	5000.0	120.000	345.0	H	302.0	12.7
113.621667	31.18	N/A	N/A	58.84	27.66	5000.0	120.000	402.0	V	22.0	19.1
160.020000	27.44	N/A	N/A	58.84	31.40	5000.0	120.000	384.0	V	253.0	18.7
380.008333	Fundamental					5000.0	120.000	146.0	H	222.0	24.5
673.317500	35.51	N/A	N/A	58.84	23.33	5000.0	120.000	147.0	V	85.0	29.8
760.046667	56.01	-7.02	48.99	58.84	9.85	5000.0	120.000	116.0	H	84.0	31.5

Notes:
[1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factors = antenna factor ACF (dB) + cable loss (dB) − amplifier gain (dB)
[3] The maximum measured value observed over a period of 5 seconds was recorded.
[4] Peak emissions at harmonic frequencies are adjusted by the duty cycle correction factor and compared against the average limit. For non-harmonic emissions, the peak is compared directly against the average limit.
[5] The limit is calculated based on the nominal carrier frequency.

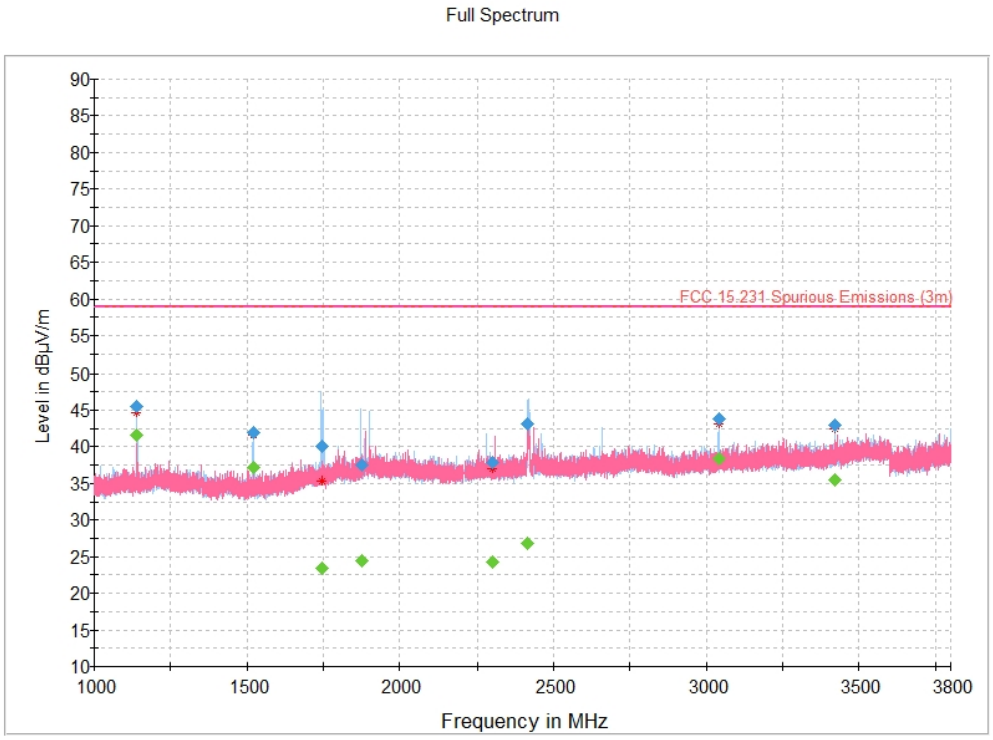

Figure 8.3-7: *Harmonic and spurious emissions, 30 – 1000 MHz, OHD Genie, 9 switch/ 3 position dipswitch, 380 MHz*

Table 8.3-5: *Harmonic and spurious emissions test data, OHD Genie, 9 switch/ 3 position dipswitch, 380 MHz*

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1139.932000	45.47	58.84	13.37	5000.0	1000.000	126.0	H	201.0	-13.4
1520.192000	41.92	58.84	16.92	5000.0	1000.000	145.0	H	291.0	-13.6
1747.000000	40.13	58.84	18.71	5000.0	1000.000	110.0	H	0.0	-11.4
1875.444000	37.54	58.84	21.30	5000.0	1000.000	230.0	H	0.0	-10.2
2301.612000	37.82	58.84	21.02	5000.0	1000.000	402.0	V	220.0	-9.5
2415.748000	43.21	58.84	15.64	5000.0	1000.000	125.0	H	11.0	-8.9
3040.168000	43.88	58.84	14.96	5000.0	1000.000	135.0	H	37.0	-7.0
3420.184000	42.97	58.84	15.87	5000.0	1000.000	135.0	H	36.0	-5.7

Notes:
[1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factors = antenna factor ACF (dB) + cable loss (dB) − amplifier gain (dB)
[3] The maximum measured value observed over a period of 5 seconds was recorded.
[4] Peak emissions at harmonic frequencies are adjusted by the duty cycle correction factor and compared against the average limit. For non-harmonic emissions, the peak is compared directly against the average limit.
[5] The limit is calculated based on the nominal carrier frequency.

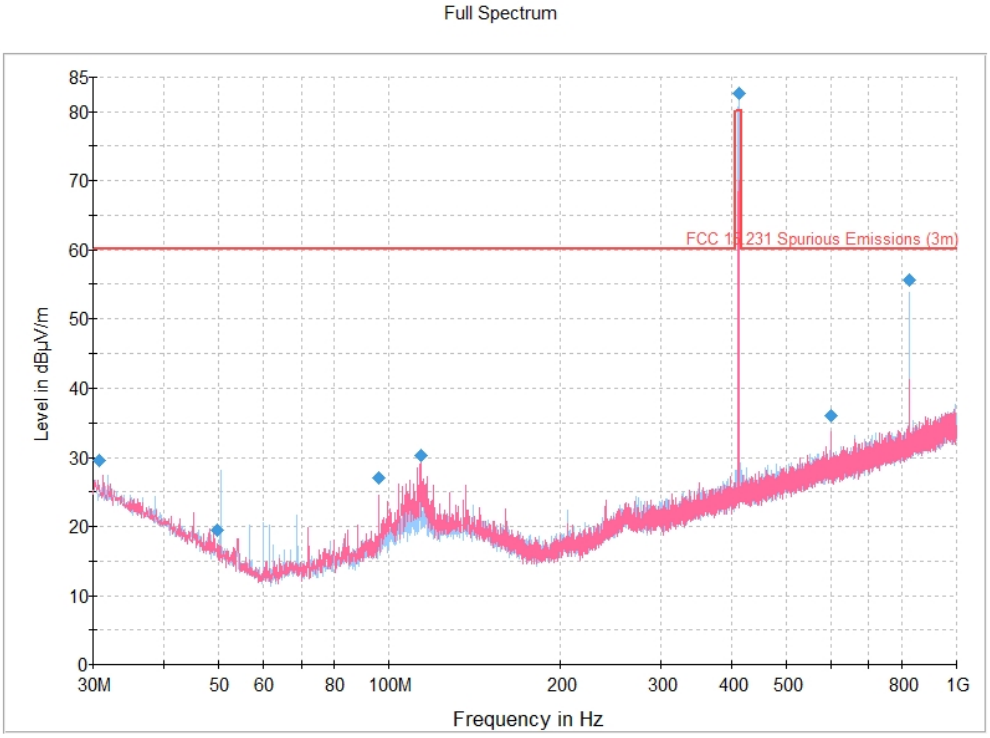

Figure 8.3-8: *Harmonic and spurious emissions, 30 – 1000 MHz, 9 switch/ 3 position dipswitch, 412 MHz*

Table 8.3-6: *Harmonic and spurious emissions test data, OHD Genie, 9 switch/ 3 position dipswitch, 412 MHz*

Frequency (MHz)	MaxPeak (dBµV/m)	Duty cycle correction (dB)	Average (dBµV/m	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.733333	29.51	N/A	N/A	60.07	30.56	5000.0	120.000	402.0	V	0.0	26.1
49.690833	19.50	N/A	N/A	60.07	40.57	5000.0	120.000	236.0	H	318.0	16.1
96.000833	27.00	N/A	N/A	60.07	33.07	5000.0	120.000	315.0	V	38.0	17.1
113.622500	30.35	N/A	N/A	60.07	29.72	5000.0	120.000	395.0	V	98.0	19.1
412.018333	Fundamental					5000.0	120.000	127.0	H	212.0	25.4
600.036667	36.15	N/A	N/A	60.07	23.92	5000.0	120.000	335.0	V	291.0	28.9
824.026667	55.67	-7.03	48.64	60.07	11.43	5000.0	120.000	208.0	H	207.0	32.5

Notes:
[1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factors = antenna factor ACF (dB) + cable loss (dB) − amplifier gain (dB)
[3] The maximum measured value observed over a period of 5 seconds was recorded.
[4] Peak emissions at harmonic frequencies are adjusted by the duty cycle correction factor and compared against the average limit. For non-harmonic emissions, the peak is compared directly against the average limit.
[5] The limit is calculated based on the nominal carrier frequency.

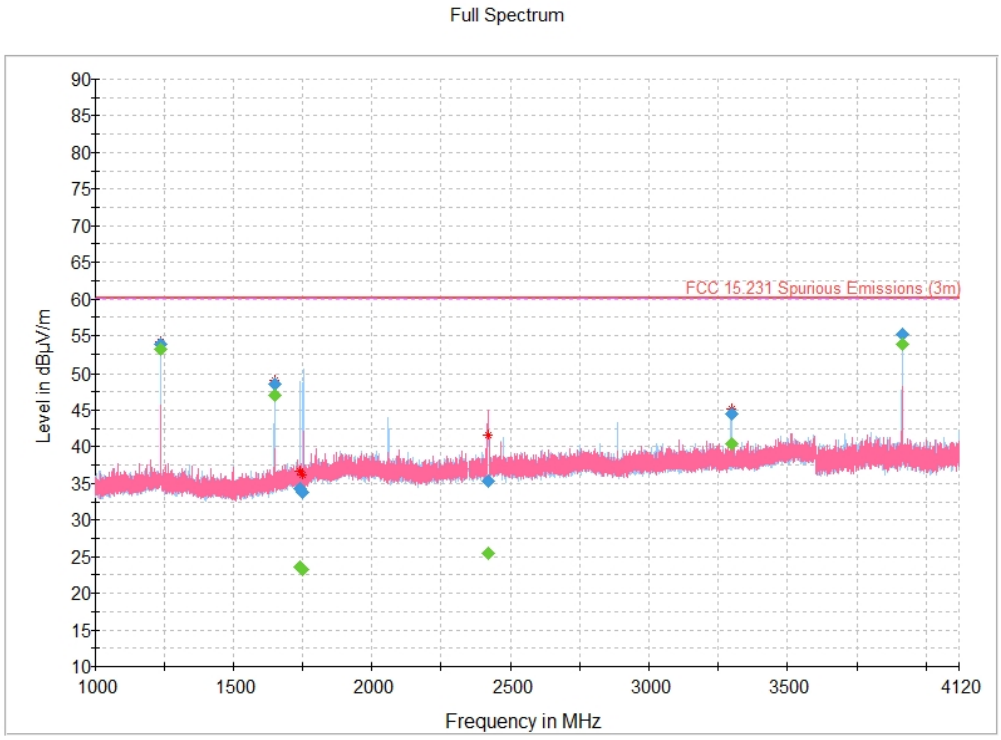

Figure 8.3-9: *Harmonic and spurious emissions, 30 – 1000 MHz, OHD Genie, 9 switch/ 3 position dipswitch, 412 MHz*

Table 8.3-7: *Harmonic and spurious emissions test data, OHD Genie, 9 switch/ 3 position dipswitch, 412 MHz*

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1236.184000	53.85	60.07	6.22	5000.0	1000.000	155.0	H	214.0	-13.0
1648.024000	48.56	60.07	11.51	5000.0	1000.000	145.0	H	290.0	-12.7
1740.356000	34.26	60.07	25.81	5000.0	1000.000	108.0	H	111.0	-11.5
1749.520000	33.70	60.07	26.37	5000.0	1000.000	410.0	H	0.0	-11.4
2415.524000	35.34	60.07	24.73	5000.0	1000.000	232.0	V	340.0	-8.9
3296.320000	44.44	60.07	15.63	5000.0	1000.000	116.0	H	260.0	-6.0
3914.236000	55.24	60.07	4.83	5000.0	1000.000	153.0	H	36.0	-3.4

Notes:
[1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factors = antenna factor ACF (dB) + cable loss (dB) − amplifier gain (dB)
[3] The maximum measured value observed over a period of 5 seconds was recorded.
[4] Peak emissions at harmonic frequencies are adjusted by the duty cycle correction factor and compared against the average limit. For non-harmonic emissions, the peak is compared directly against the average limit.
[5] The limit is calculated based on the nominal carrier frequency.

8.4 FCC 15.231(c) / RSS-210 A.1.3 Bandwidth of emissions

8.4.1 Definitions and limits

FCC 15.231(c) and RSS-210 A.1.1(a):
The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

8.4.2 Test summary

Verdict	Pass		
Test date	September 22, 2021	Temperature	24 °C
Test engineer	James Cunningham, EMC/MIL/WL Supervisor	Air pressure	1007 mbar
Test location	Wireless bench	Relative humidity	55 %

8.4.3 Observations, settings, and special notes

Tests were performed based on the methodology of Section 6.9.2 of ANSI C63.10.

8.4.4 Test data

Table 8.4-1: *Test data – 20 dB bandwidth*

Brand	Coding	Operating Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)
OHD	Genie, 9 switch/ 3 position dipswitch	360	10.560	900
OHD	Genie, 9 switch/ 3 position dipswitch	380	10.492	950
OHD	Genie, 9 switch/ 3 position dipswitch	412	9.262	1030

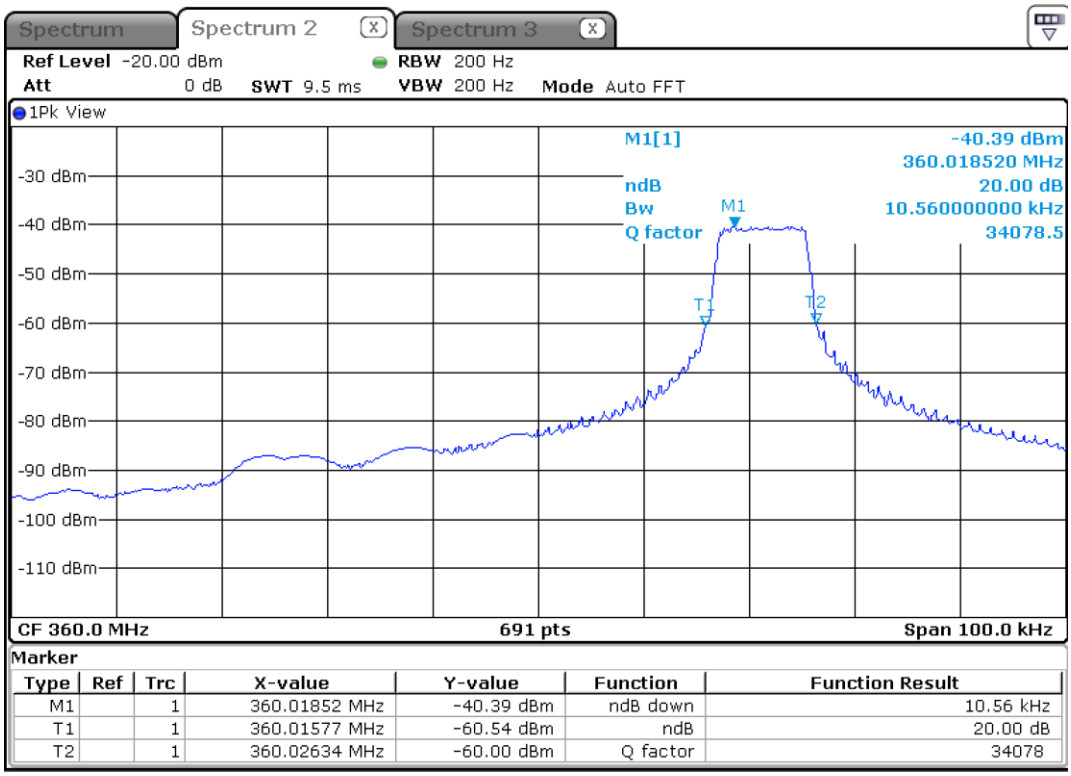

Figure 8.4-1: *20 dB bandwidth, OHD Genie, 9 switch/ 3 position dipswitch, 360 MHz.*

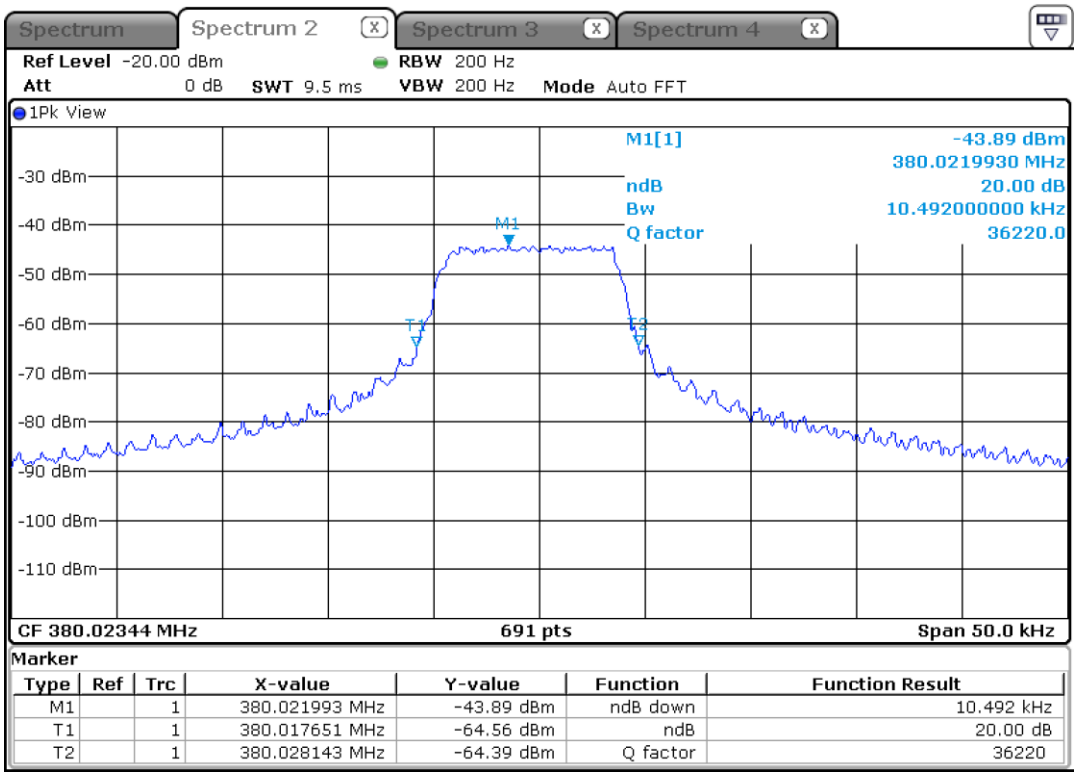

Figure 8.4-2: *20 dB bandwidth, OHD Genie, 9 switch/ 3 position dipswitch, 380 MHz.*

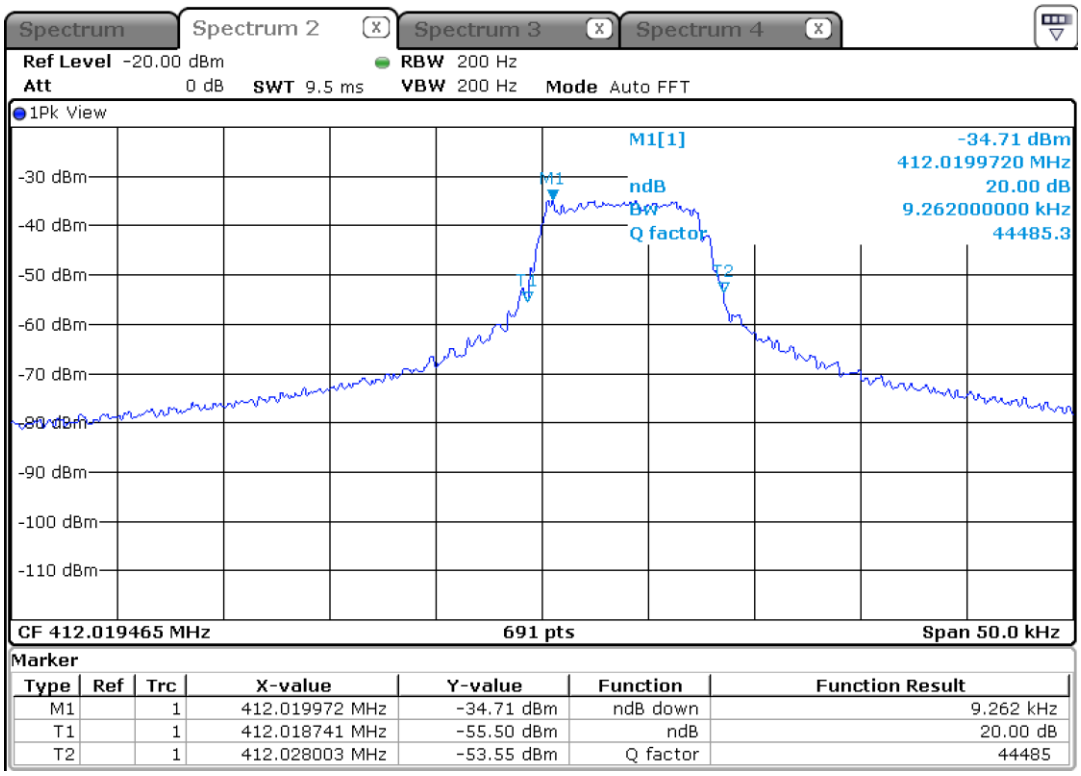

Figure 8.4-3: *20 dB bandwidth, OHD Genie, 9 switch/ 3 position dipswitch, 412 MHz.*

8.5 RSS-GEN 6.7 – Occupied bandwidth

8.5.1 Definitions and limits

RSS-GEN 6.7:
The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

8.5.2 Test summary

Verdict	Pass		
Test date	September 22, 2021	Temperature	24 °C
Test engineer	James Cunningham, EMC/MIL/WL Supervisor	Air pressure	1007 mbar
Test location	Wireless bench	Relative humidity	55 %

8.5.3 Observations, settings, and special notes

Tests were performed based on the methodology of Section 6.9.3 of ANSI C63.10.

8.5.4 Test data

Table 8.5-1: *Test data – 99% occupied bandwidth*

Brand	Coding	Operating Frequency (MHz)	99% Occupied Bandwidth (kHz)
OHD	Genie, 9 switch/ 3 position dipswitch	360	10.593
OHD	Genie, 9 switch/ 3 position dipswitch	380	10.781
OHD	Genie, 9 switch/ 3 position dipswitch	412	10.492

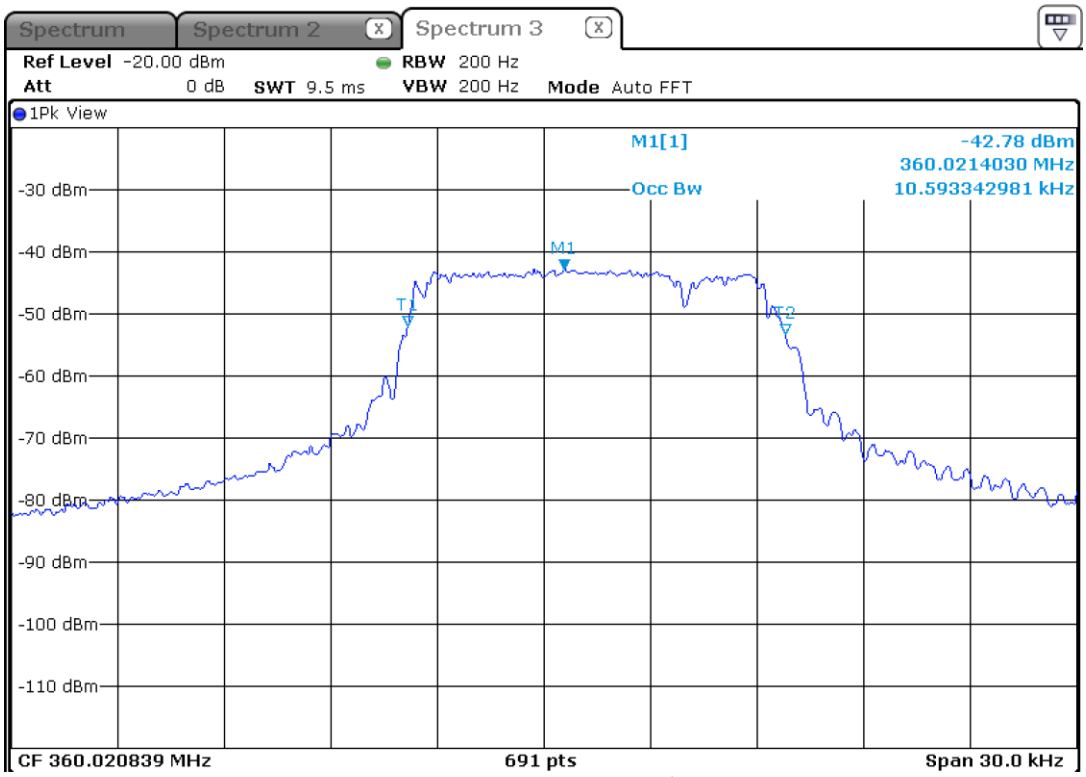

Figure 8.5-1: *99% occupied bandwidth, OHD Genie, 9 switch/ 3 position dipswitch, 360 MHz.*

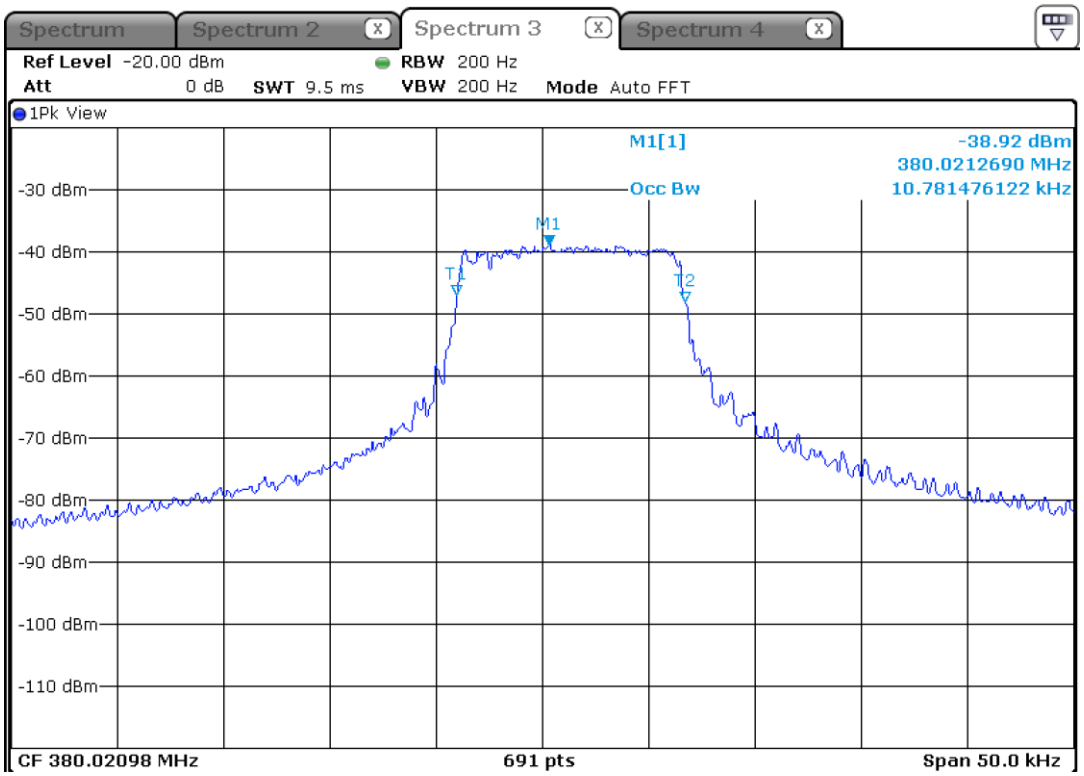

Figure 8.5-2: *99% occupied bandwidth, OHD Genie, 9 switch/ 3 position dipswitch, 380 MHz.*

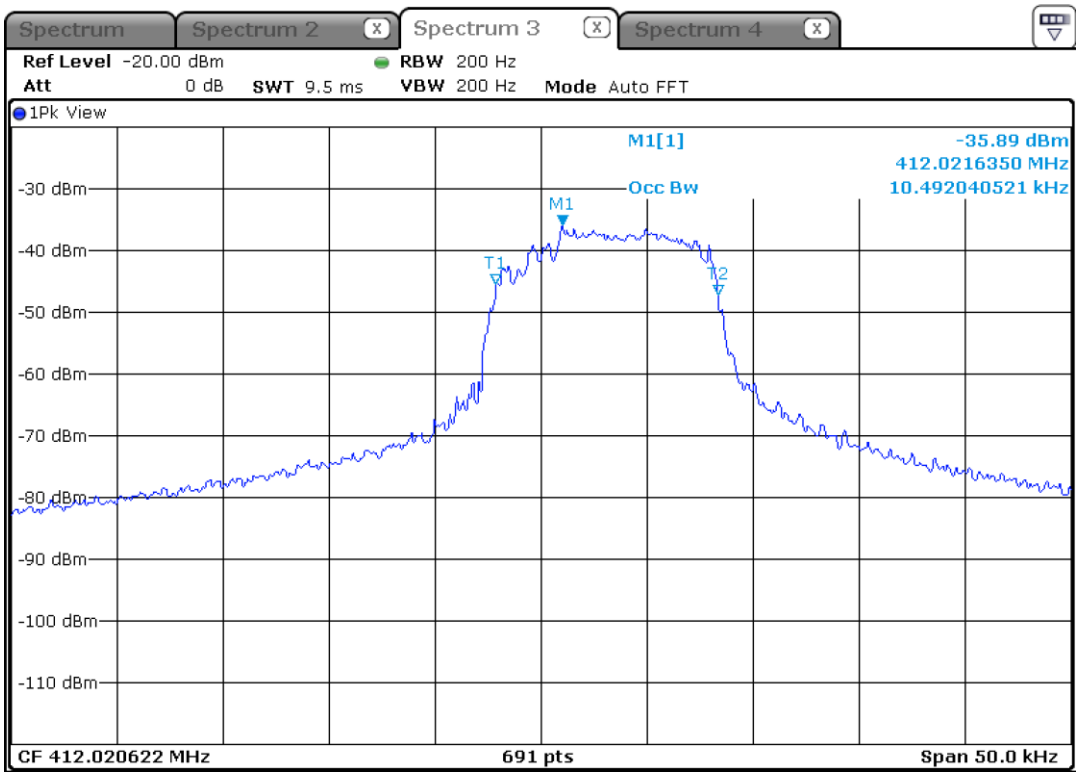

Figure 8.5-3: *99% occupied bandwidth, OHD Genie, 9 switch/ 3 position dipswitch, 412 MHz.*