SHENZHEN 3NOD DIGITAL TECHNOLOGY CO., LTD

TEST REPORT

SCOPE OF WORK
FCC TESTING–100002634

REPORT NUMBER
191104028SZN-005

ISSUE DATE **[REVISED DATE]**

December 5, 2019 [----------]

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TEST REPORT

Intertek Report No.: 191104028SZN-005

SHENZHEN 3NOD DIGITAL TECHNOLOGY CO., LTD

Application
For
Certification

FCC ID: 2AA3H-S6064

Onn. 5.1.2 Atmos Soundbar, onn. 5.1.2 Atmos Soundbar

Model: 100002634

Brand Name: onn.

2.4GHz Transceiver

Report No.: 191104028SZN-005

We hereby certify that the sample of the above item is considered to comply with the requirements of FCC Part 15, Subpart C for Intentional Radiator, mention 47 CFR [10-1-18]

Prepared and Checked by:

Leo Li
Project Engineer

Approved by:

Kidd Yang
Technical Supervisor
Date: December 5, 2019

MEASUREMENT/TECHNICAL REPORT

This report concerns (check one) Original Grant ___X___ Class II Change _____

Equipment Type: DTS - Part 15 Digital Transmission Systems

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? Yes _____No ____X_____

If yes, defer until : _____
date

Company Name agrees to notify the Commission by: _____
date

of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37? Yes _____ No ____X___

If no, assumed Part 15, Subpart C for intentional radiator - the new 47 CFR [10-1-18] Edition] provision.

Report prepared by:

Leo Li
Intertek Testing Services Shenzhen Ltd. Longhua Branch
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1.0 Summary of Test results

Applicant: SHENZHEN 3NOD DIGITAL TECHNOLOGY CO., LTD
Applicant Address: No.15, Zhongfu road, Tangxiayong community, Yanluo street, Bao 'an district, Shenzhen city, Guangdong, China

Model: 100002634
FCC ID: 2AA3H-S6064

TEST ITEM	REFERENCE	RESULTS
Max. Output power	15.247(b)(3)	Pass
6 dB Bandwidth	15.247(a)(2)	Pass
Max. Power Density	15.247(e)	Pass
Out of Band Antenna Conducted Emission	15.247(d)	Pass
Radiated Emission in Restricted Bands	15.247(d), 15.209, FCC 15.205	Pass
AC Conducted Emission	15.207	Pass
Antenna Requirement	15.203	Pass (See Notes)

Notes: The EUT uses an Integral Antenna which in accordance to Section 15.203 is considered sufficient to comply with the provisions of this section.

2.0 General Description

2.1 Product Description

The equipment under test (EUT) is a Soundbar with Bluetooth, 2.4G SRD, and WiFi functions. The 2.4G SRD module carry with double antennas, but they can`t transmit at the same time. Bluetooth and Wi-Fi transmitters are share one antenna while they cannot transmit simultaneously. The EUT is powered by AC 120V/60Hz. For more detailed features description, please refer to the user's manual.

Type of Modulation: GFSK.
Antenna Type: Integral Antenna
Antenna Gain: 3.8dBi

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

2.2 Related Submittal(s) Grants

This is an application for certification of a transceiver for the Onn. 5.1.2 Atmos Soundbar/ onn. 5.1.2 Atmos Soundbar 2.4G SRD function.
For the BT 5.0 EDR mode was tested and demonstrated in report 191104028SZN-001.
For the BT 5.0 BLE mode was tested and demonstrated in report 191104028SZN-002.
For the 2.4GHz WIFI function was tested and demonstrated in report 191104028SZN-003.
For the 5GHz WIFI function was tested and demonstrated in report 191104028SZN-004.
For other functions were reported in the SDOC report: 191104030SZN-001.

2.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013) and KDB 558074 D01 v05r02. Radiated emission measurement was performed in semi-anechoic chamber and conducted emission measurement was performed in shield room. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

2.4 Test Facility

The Semi-anechoic chamber and shielded room used to collect the radiated data and conducted data are **Intertek Testing Services Shenzhen Ltd. Longhua Branch** and located at 101, 201, Building B, No. 308 Wuhe Avenue, Zhangkengjing Community, GuanHu Subdistrict, LongHua District, Shenzhen, P.R. China. This test facility and site measurement data have been fully placed on file with File Number: CN1188.

3.0 System Test Configuration

3.1 Justification

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, all cables were manipulated to produce worst case emissions. The EUT was powered by AC 120V/60Hz during the test, only the worst data was reported in this report.

For maximizing emissions, the EUT was rotated through 360°, the EUT was placed on the styrene turntable with 0.8m up to 1GHz and 1.5 m above 1GHz. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance.

All readings are extrapolated back to the equivalent three meters reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

The rear of unit was flushed with the rear of the table.

Radiated emission measurement was performed the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

3.2 EUT Exercising Software

The EUT exercise program (provided by client) used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The worst case configuration is used in all specified testing.

The parameters of test software setting:
During the test, Channel and power controlling software provided by the applicant was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the application and is going to be fixed on the firmware of the end product.

Test software: VMI Debug V1.1.6.48

3.3 Special Accessories

HDMI cable (Shielded, Length 6ft)

3.4 Equipment Modification

Any modifications installed previous to testing by SHENZHEN 3NOD DIGITAL TECHNOLOGY CO., LTD will be incorporated in each production model sold / leased in the United States.

No modifications were installed by Intertek Testing Services Shenzhen Ltd. Longhua Branch.

3.5 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

3.6 Support Equipment List and Description

Description	Manufacturer	Remark
LED TV (Provided by Intertek)	Sony	KDL-24EX520
iPod (Provided by Intertek)	Apple	A1367
USB flash disk (Provided by Intertek)	Kingston	DTSE9G2
Detachable AC Cord for Soundbar (Provided by applicant)	SHENZHEN 3NOD DIGITAL TECHNOLOGY CO., LTD	without core, Length 4.92ft
Optical cable (Provided by applicant)	SHENZHEN 3NOD DIGITAL TECHNOLOGY CO., LTD	Length 6ft
LAN cable (Provided by applicant)	SHENZHEN 3NOD DIGITAL TECHNOLOGY CO., LTD	unshielded, Length 6ft
3.5mm to 3.5mm stereo audio cable (Provided by applicant)	SHENZHEN 3NOD DIGITAL TECHNOLOGY CO., LTD	unshielded, Length 6ft
HDMI cable (Provided by applicant)	SHENZHEN 3NOD DIGITAL TECHNOLOGY CO., LTD	Shielded, without core, Length 6ft
HDMI cable*3 (Provided by Intertek)	UGREEN	Shielded, without core, Length 6ft
Remote control (Provided by applicant)	SHENZHEN 3NOD DIGITAL TECHNOLOGY CO., LTD	100002634
Dummy load 1 (Provided by Intertek)	N/A	100 Ω
Dummy load 2 (Provided by Intertek)	N/A	100 Ω

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4.0 Measurement Results

4.1 Maximum Conducted Output Power at Antenna Terminals, FCC Rules 15.247(b)(3):

The antenna power of the EUT was connected to the input of a broadband peak RF power meter. The power meter has a video bandwidth that is greater than DTS bandwidth and utilize a fast-responding diode detector. Power was read directly at the EUT antenna terminals with cable loss added.

For antennas with gains of 6 dBi or less, maximum allowed Transmitter output is 1 watt (+30 dBm).

ANT 0:

Frequency (MHz)	Output in dBm (Peak reading)	Output in mWatt
Low Channel: 2403.35	0.93	1.2
Middle Channel: 2439.35	0.54	1.1
High Channel: 2477.35	0.04	1.0

ANT 1:

Frequency (MHz)	Output in dBm (Peak reading)	Output in mWatt
Low Channel: 2403.35	0.46	1.1
Middle Channel: 2439.35	0.34	1.1
High Channel: 2477.35	-0.01	1.0

Cable loss: 1.5 dB External Attenuation: 0 dB

Cable loss, external attenuation has been included in OFFSET function

EUT max. output level = 0.93dBm

For RF Exposure, the information is saved with filename: RF exposure.pdf.

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Date of Test: December 4, 2019 Model: 100002634

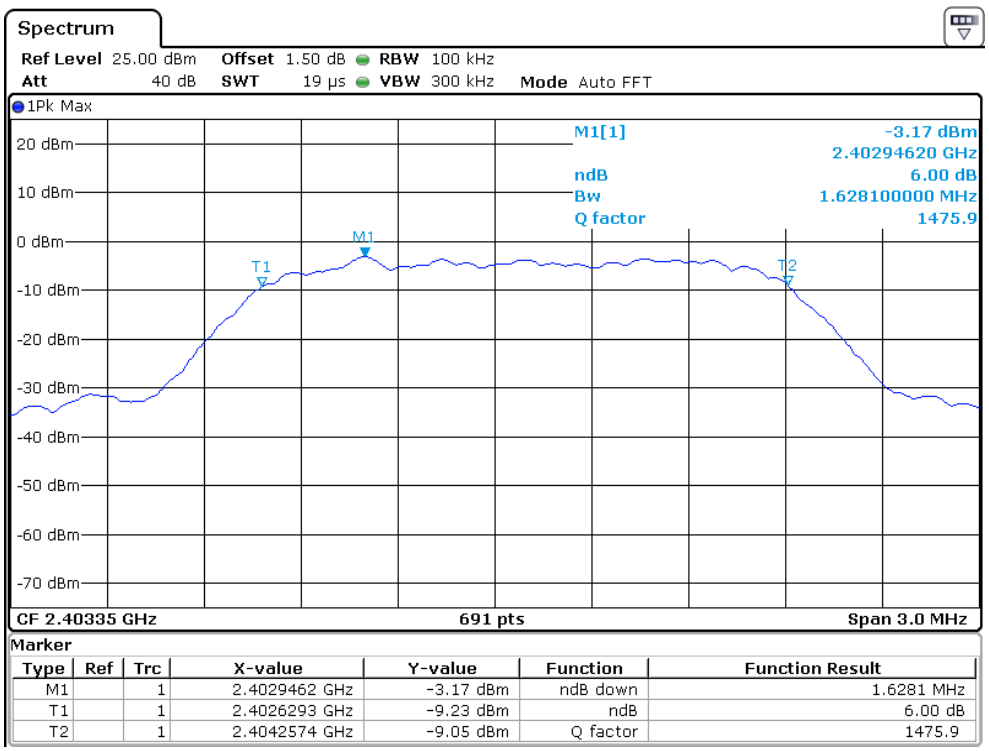
4.2 Minimum 6 dB RF Bandwidth, FCC Rule 15.247(a) (2):

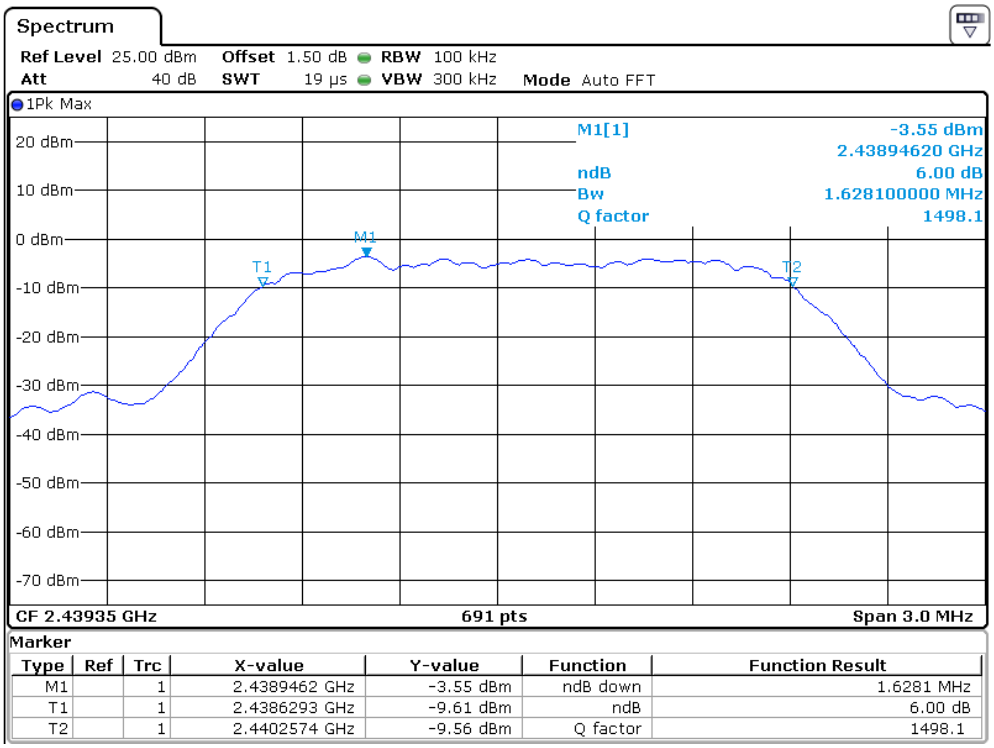
The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was set to 100 KHz according to FCC KDB 558074 D01 v05r02. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 6 dB lower than PEAK level. The 6dB bandwidth was determined from where the channel output spectrum intersected the display line.

Limit: The 6 dB Bandwidth is at least 500 kHz.

Frequency (MHz)	6 dB Bandwidth (KHz)
2403.35	1628.1
2439.35	1628.1
2477.35	1623.7

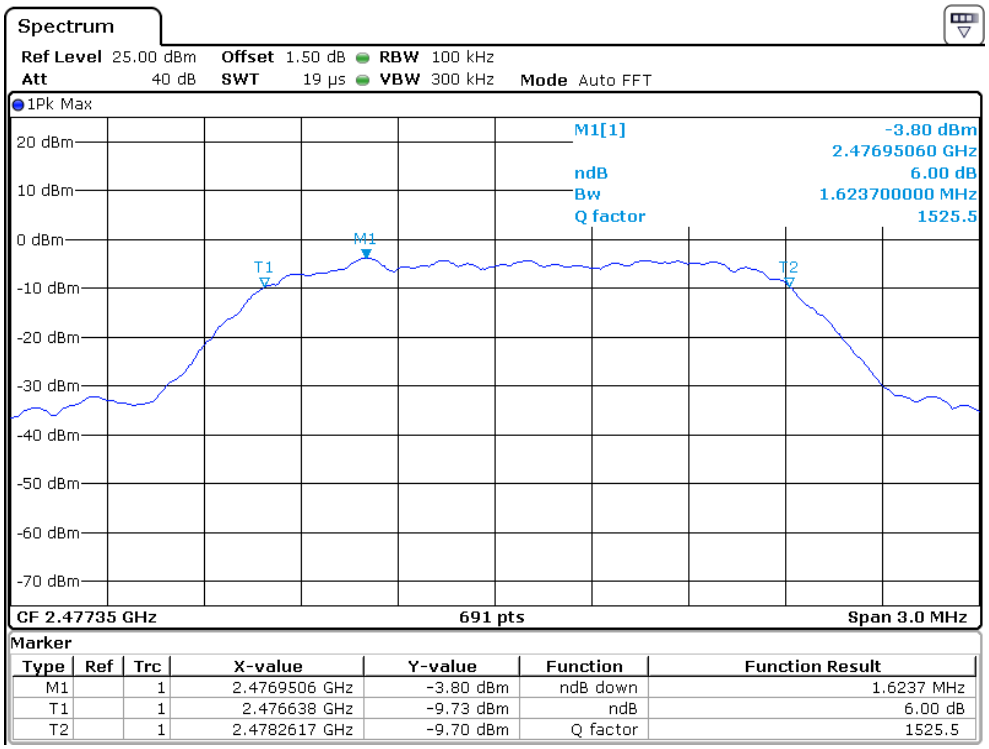
The test plots are attached as below.





Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4389462 GHz	-3.55 dBm	ndB down	1.6281 MHz
T1		1	2.4386293 GHz	-9.61 dBm	ndB	6.00 dB
T2		1	2.4402574 GHz	-9.56 dBm	Q factor	1498.1



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4769506 GHz	-3.80 dBm	ndB down	1.6237 MHz
T1		1	2.476638 GHz	-9.73 dBm	ndB	6.00 dB
T2		1	2.4782617 GHz	-9.70 dBm	Q factor	1525.5

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4.3 Maximum Power Density Reading, FCC Rule 15.247(e):

The Measurement Procedure PKPSD was set according to the FCC KDB 558074 D01 v05r02.

Antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.

For antennas with gains of 6 dBi or less, maximum allowed Power Density is 8dBm/3 kHz.

ANT 0:

Frequency (MHz)	Power Density with RBW 100KHz
2403.35	-3.25
2439.35	-3.56
2477.35	-3.95

ANT 1:

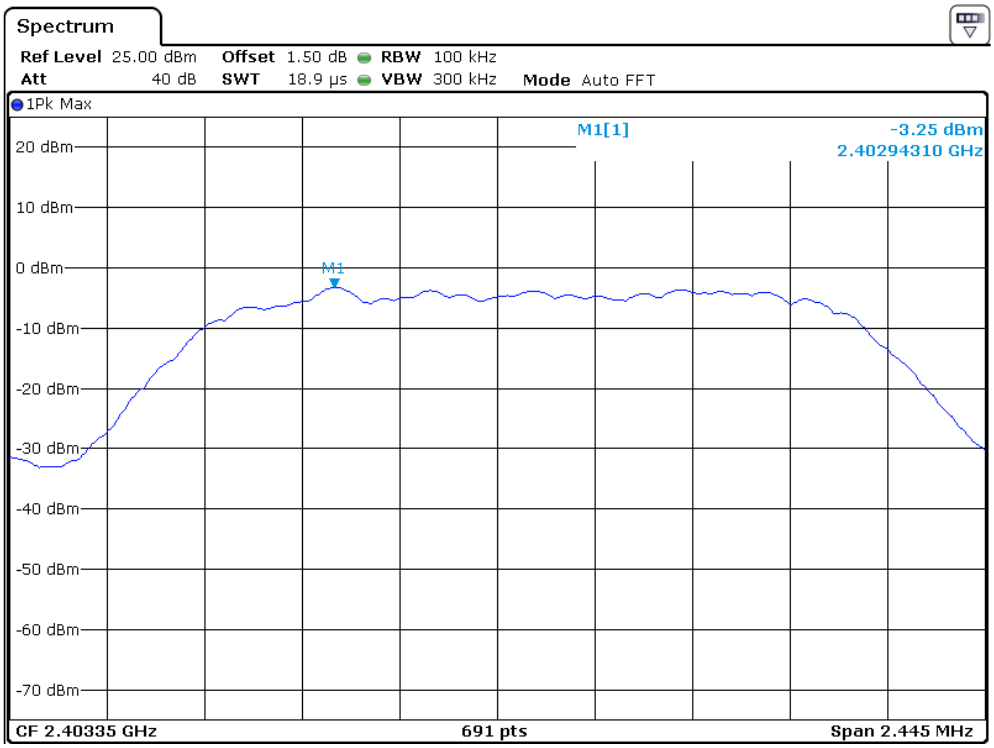
Frequency (MHz)	Power Density with RBW 100KHz
2403.35	-3.62
2439.35	-3.73
2477.35	-4.09

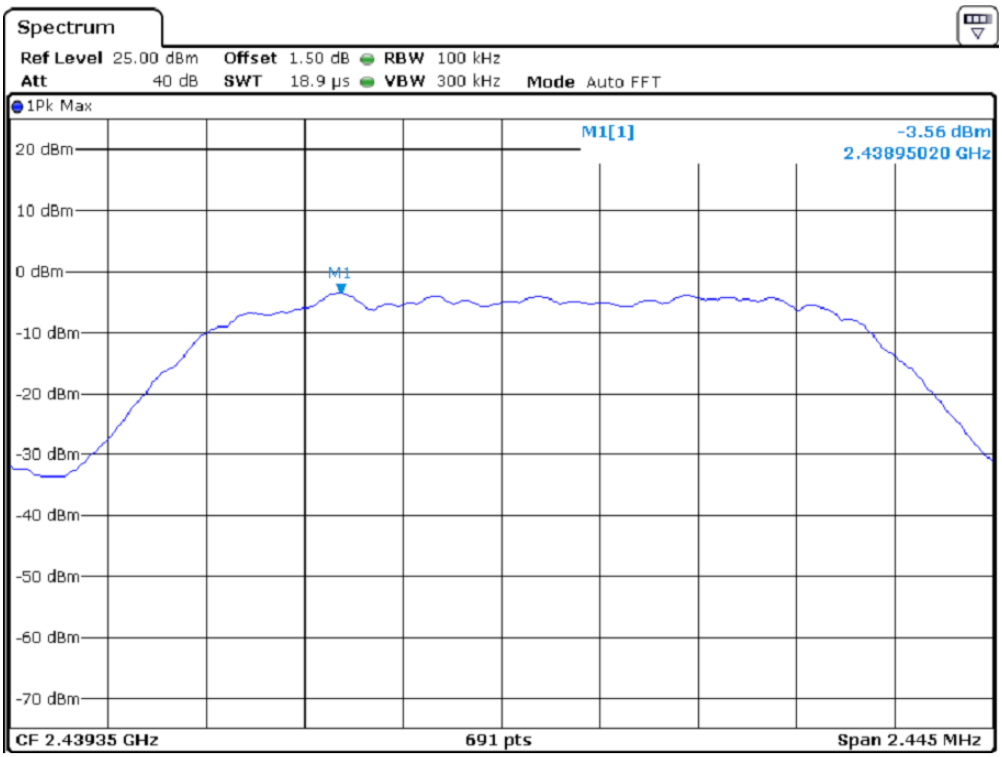
Cable loss: 1.5 dB External Attenuation: 0 dB

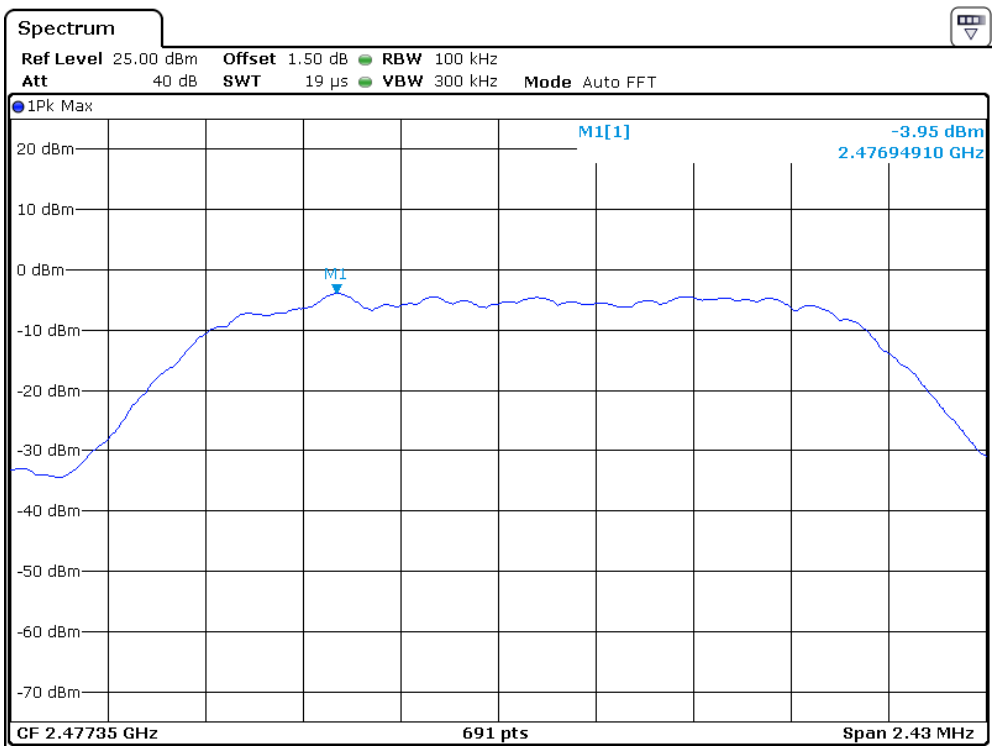
Cable loss, external attenuation has been included in OFFSET function

The test plots are attached as below.

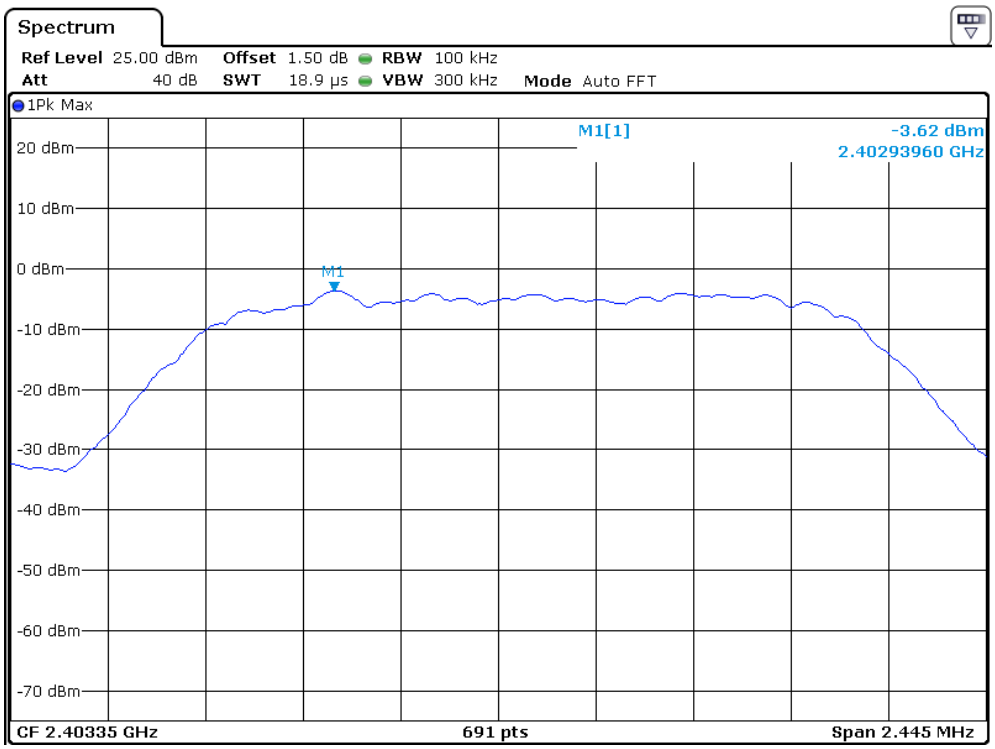
ANT 0:

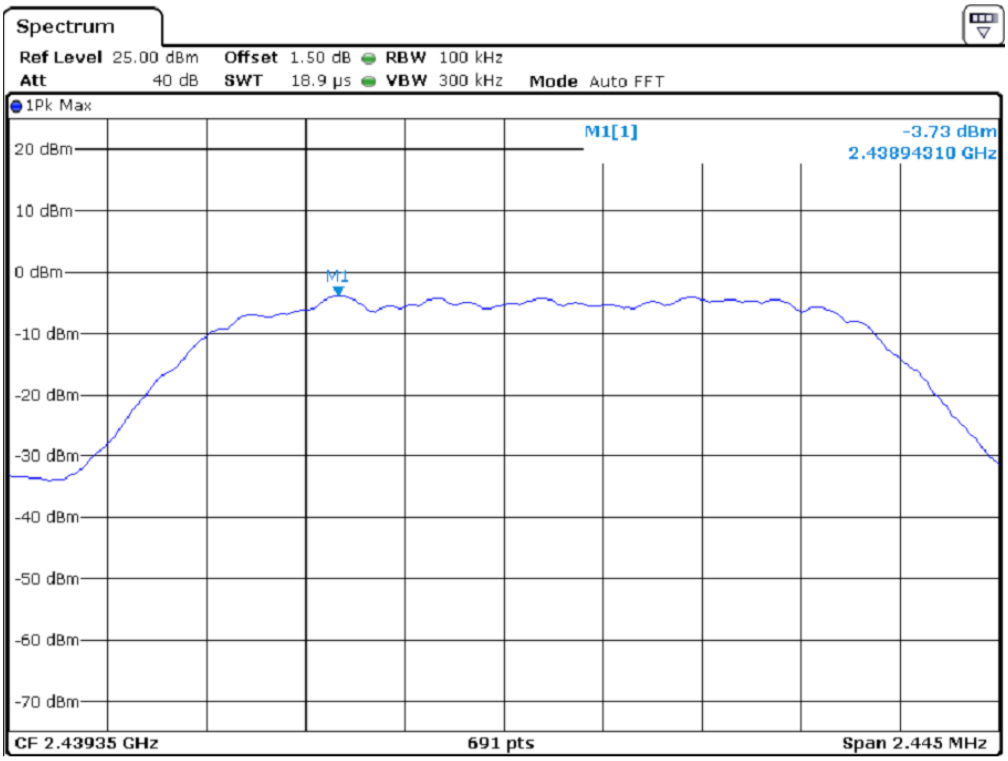


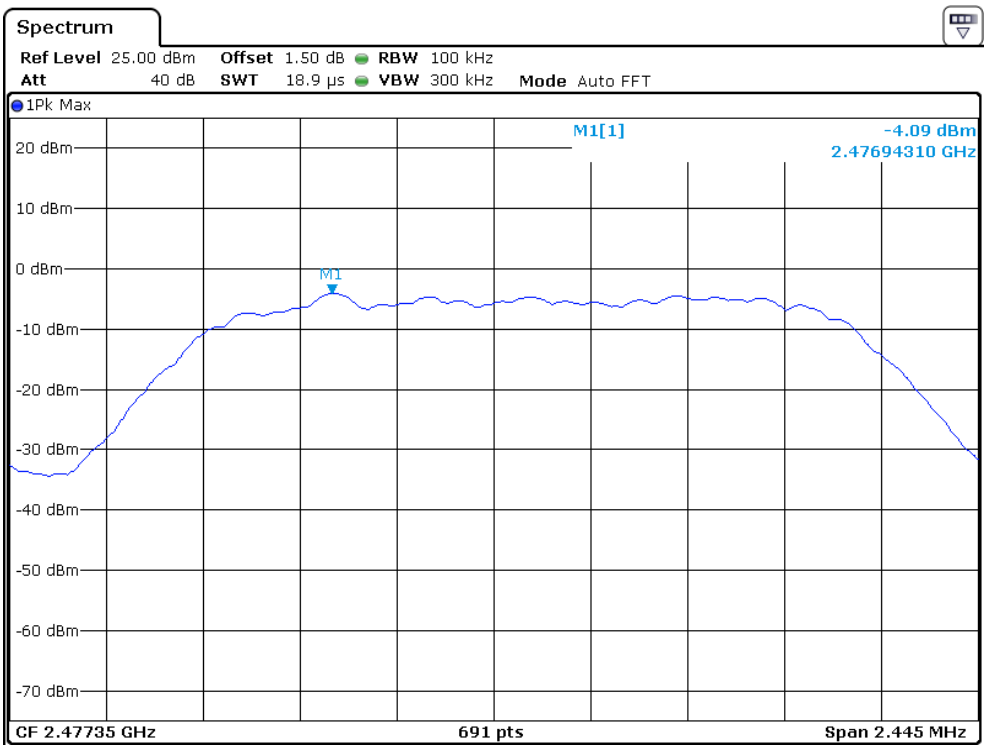



Spectrum
Ref Level 25.00 dBm Offset 1.50 dB RBW 100 kHz
Att 40 dB SWT 19 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] -3.95 dBm
2.47694910 GHz
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
CF 2.47735 GHz
691 pts
Span 2.43 MHz

ANT 1:


Spectrum
Ref Level 25.00 dBm Offset 1.50 dB RBW 100 kHz
Att 40 dB SWT 18.9 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] -3.62 dBm
2.40293960 GHz
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
CF 2.40335 GHz
691 pts
Span 2.445 MHz


Spectrum
Ref Level 25.00 dBm Offset 1.50 dB RBW 100 kHz
Att 40 dB SWT 18.9 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] -3.73 dBm
2.43894310 GHz
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
CF 2.43935 GHz
691 pts
Span 2.445 MHz


Spectrum
Ref Level 25.00 dBm Offset 1.50 dB RBW 100 kHz
Att 40 dB SWT 18.9 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] -4.09 dBm
2.47694310 GHz
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
CF 2.47735 GHz
691 pts
Span 2.445 MHz

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4.4 Out of Band Conducted Emissions, FCC Rule 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. The Measurement Procedure was set according to the FCC KDB 558074 D01 v05r02.

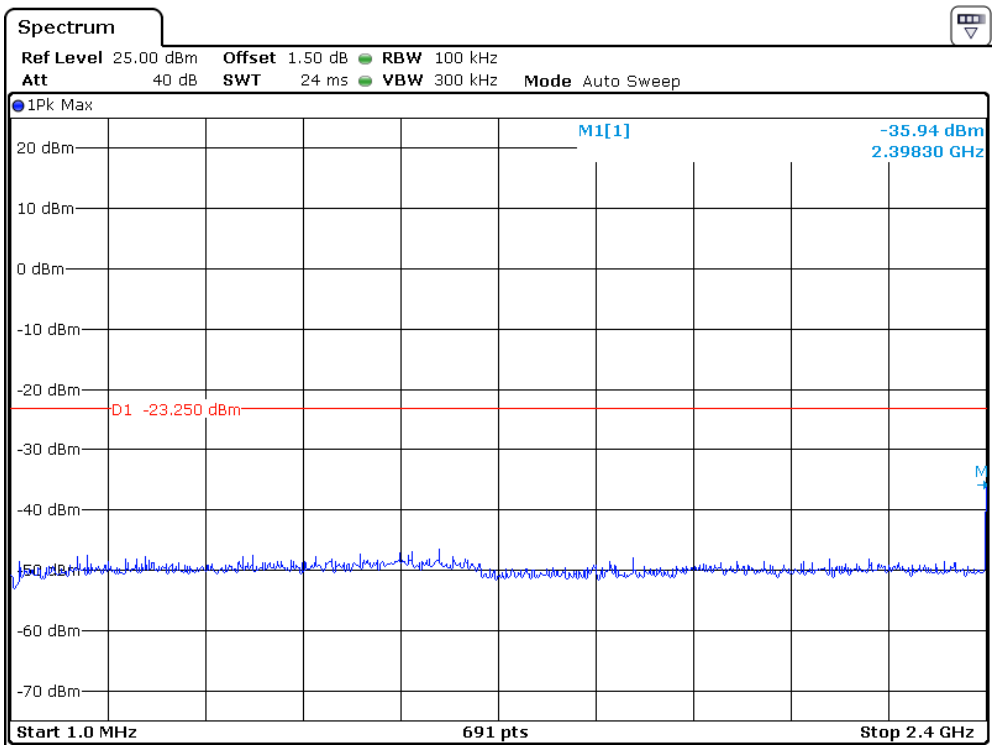
All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the passband.

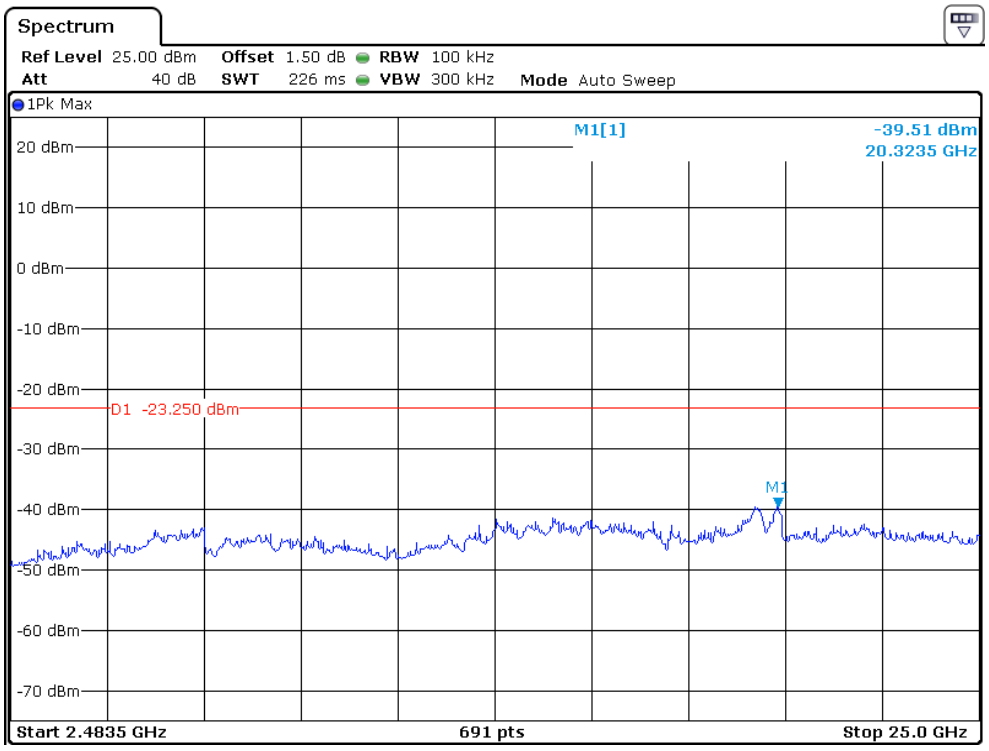
Refer to the attached test plots for out of band conducted emissions data.

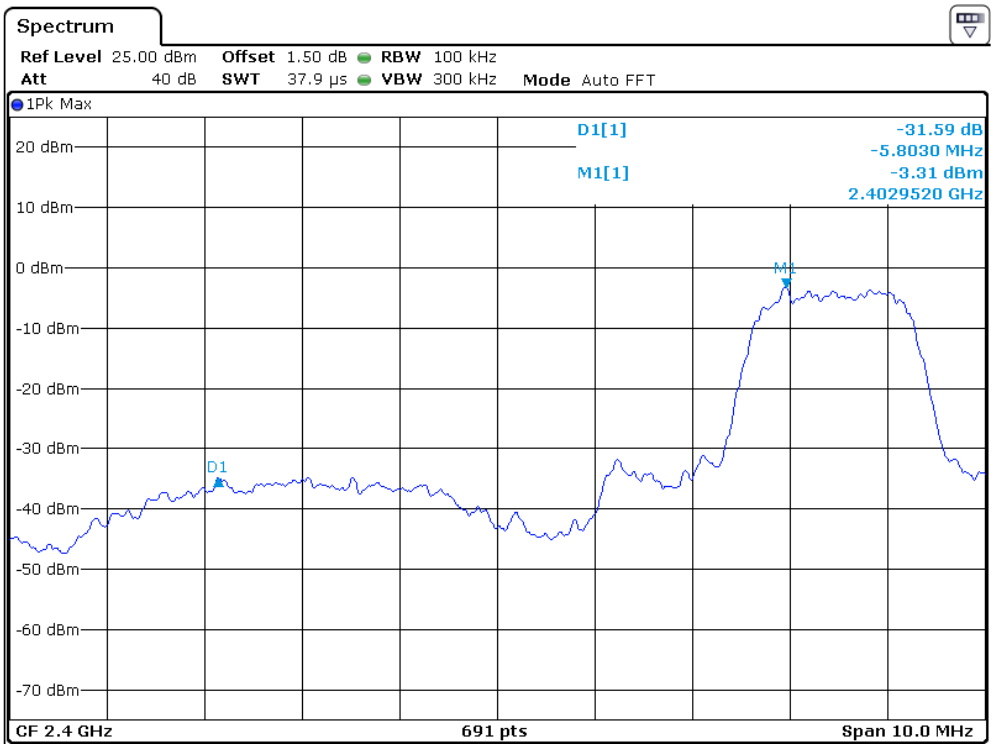
The test plots showed all spurious emission up to the tenth harmonic were measured and they were found to be at least 20 dB below the highest level of the desired power in the passband.

The test plots are attached as below.

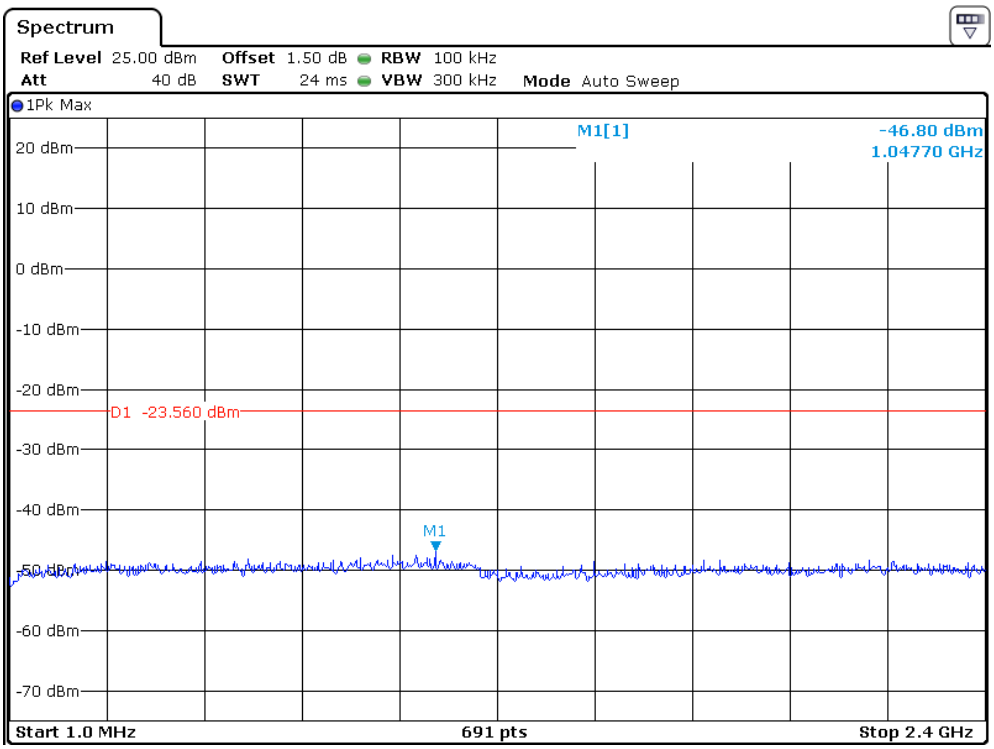
ANT 0:
Channel 1 (2403.35MHz) Reference Level: -3.25dBm

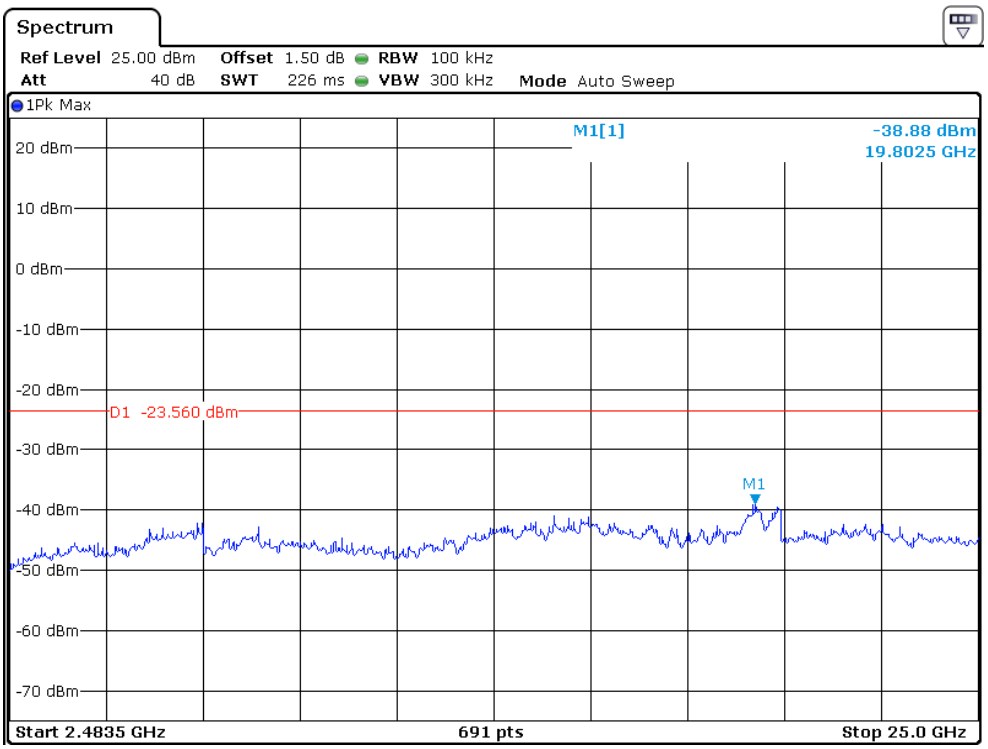




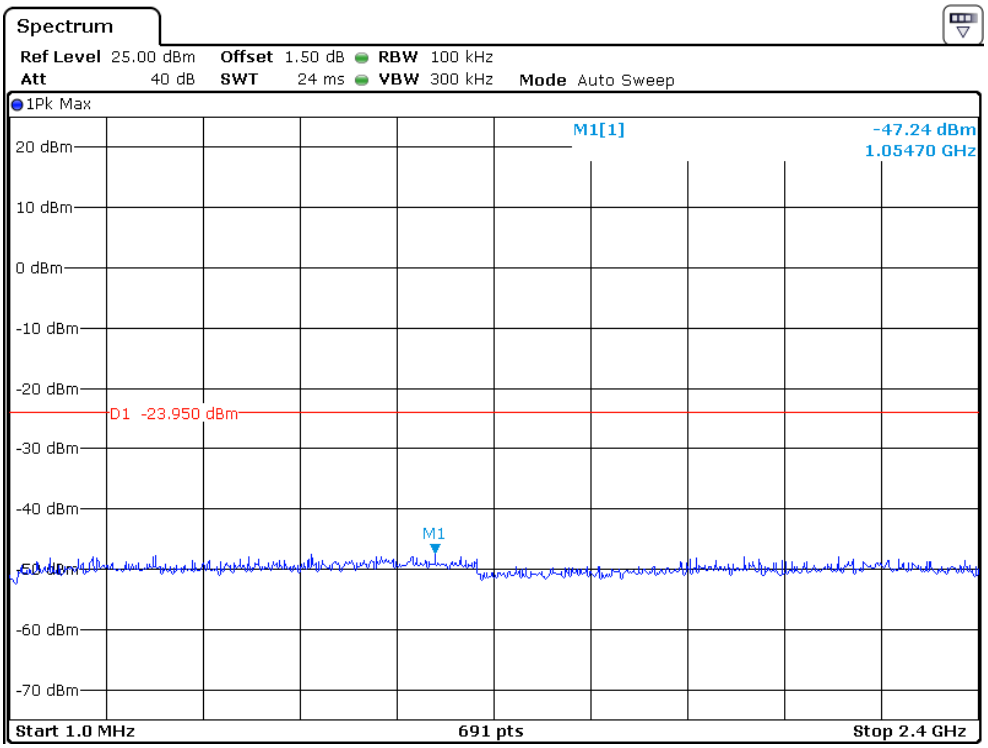


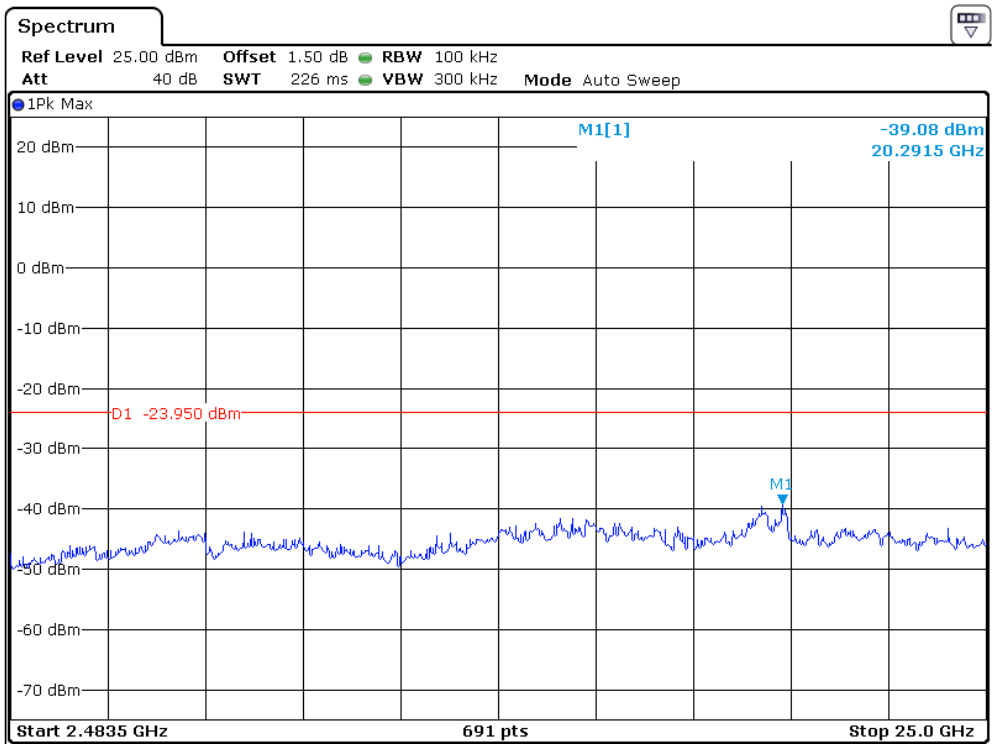
Channel 19 (2439.35MHz) Reference Level: -3.56dBm

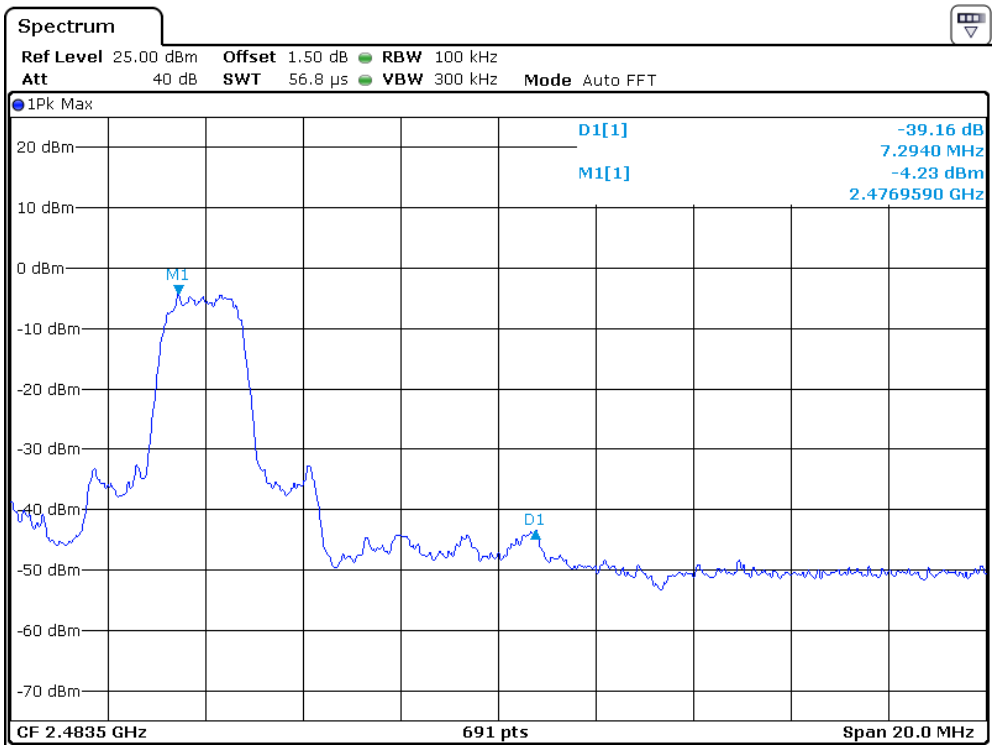




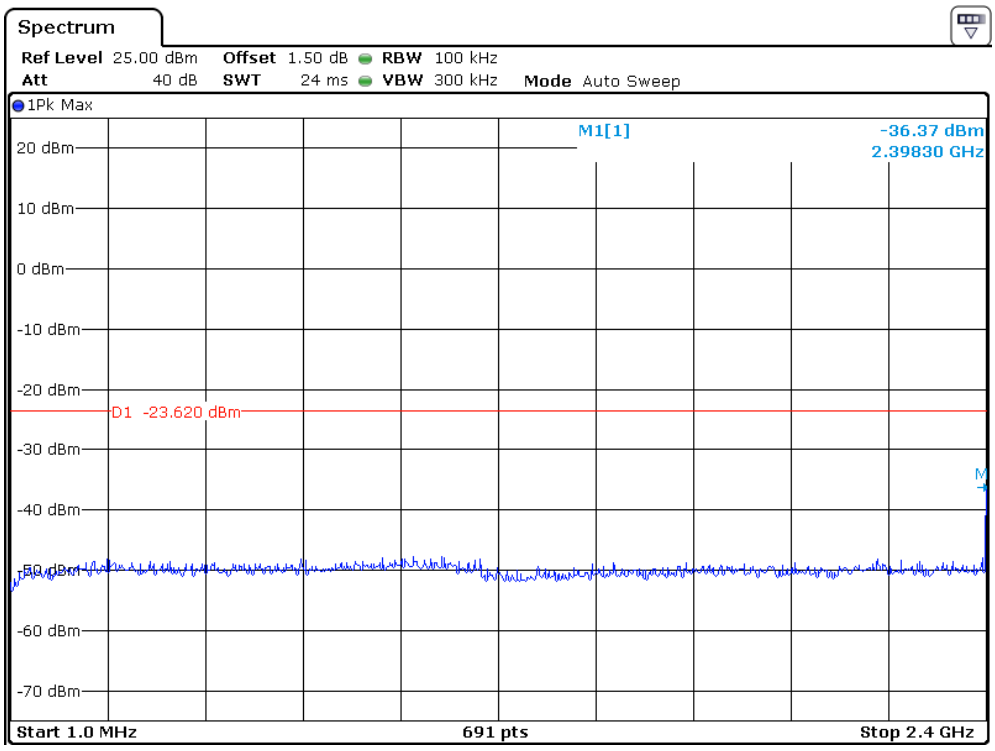
Channel 38 (2477.35MHz) Reference Level: -3.95dBm

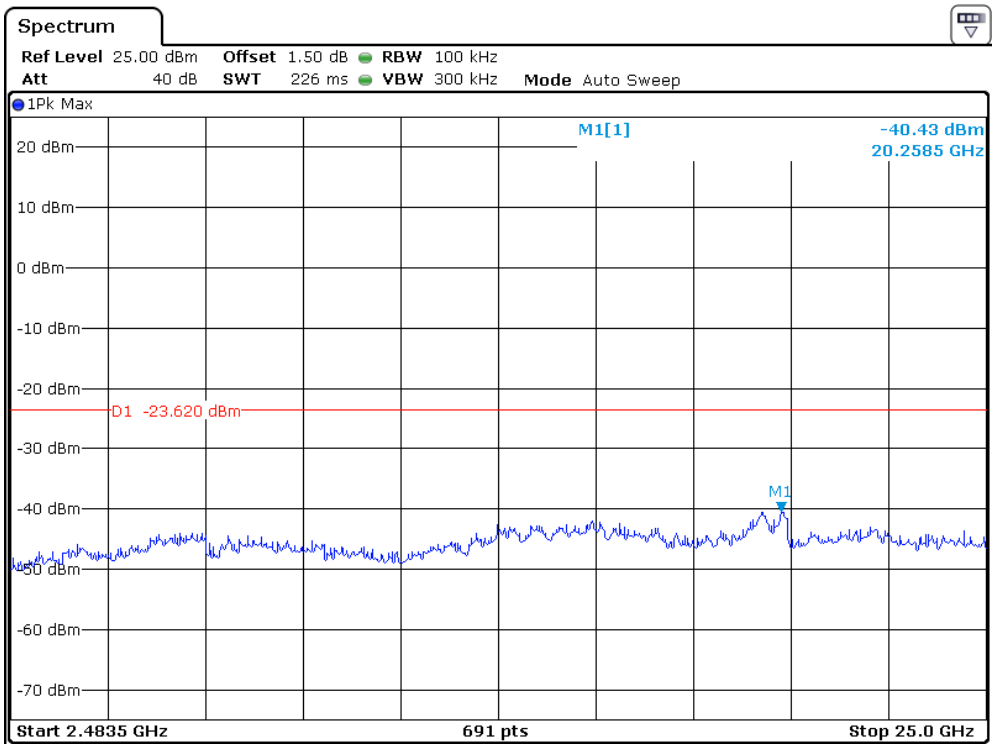


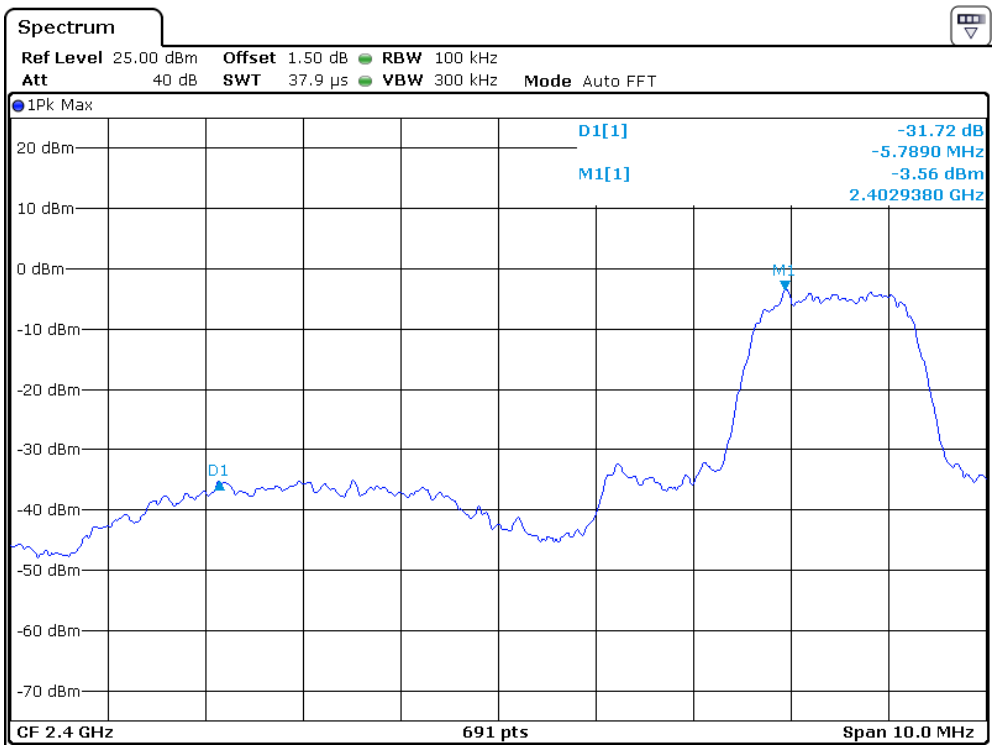

Spectrum
Ref Level 25.00 dBm Offset 1.50 dB RBW 100 kHz
Att 40 dB SWT 226 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
M1[1] -39.08 dBm
20.2915 GHz
D1 -23.950 dBm
M1
Start 2.4835 GHz 691 pts Stop 25.0 GHz


Spectrum
Ref Level 25.00 dBm Offset 1.50 dB RBW 100 kHz
Att 40 dB SWT 56.8 µs VBW 300 kHz Mode Auto FFT
1Pk Max
D1[1] -39.16 dB
7.2940 MHz
M1[1] -4.23 dBm
2.4769590 GHz
M1
D1
CF 2.4835 GHz 691 pts Span 20.0 MHz

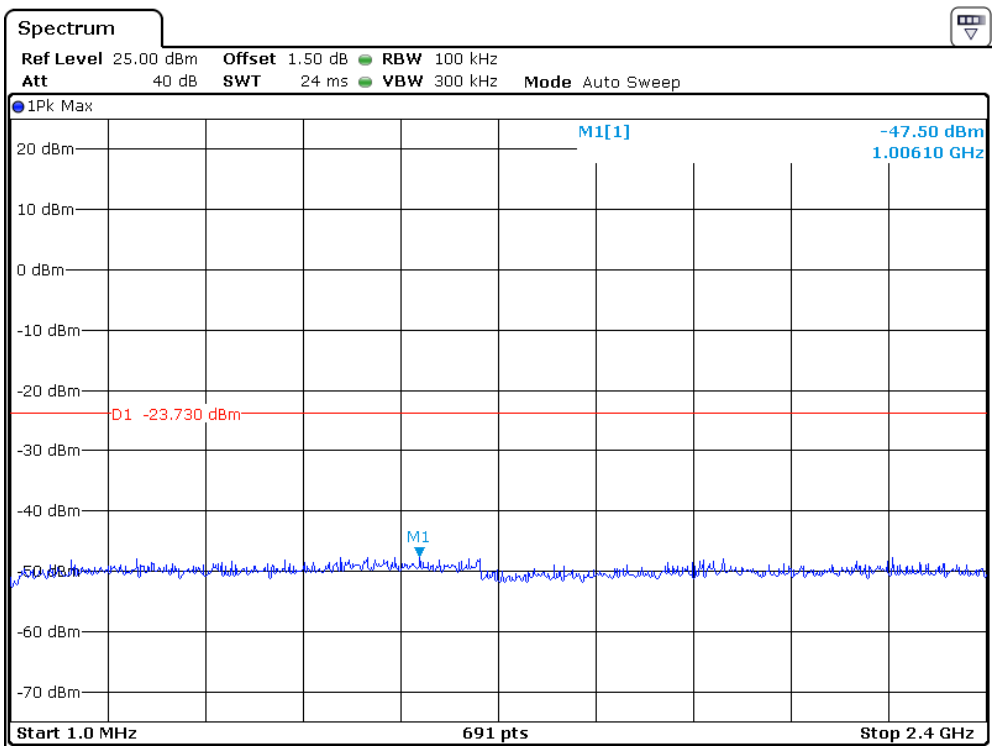
ANT 1:
Channel 1 (2403.35MHz) Reference Level: -3.62dBm

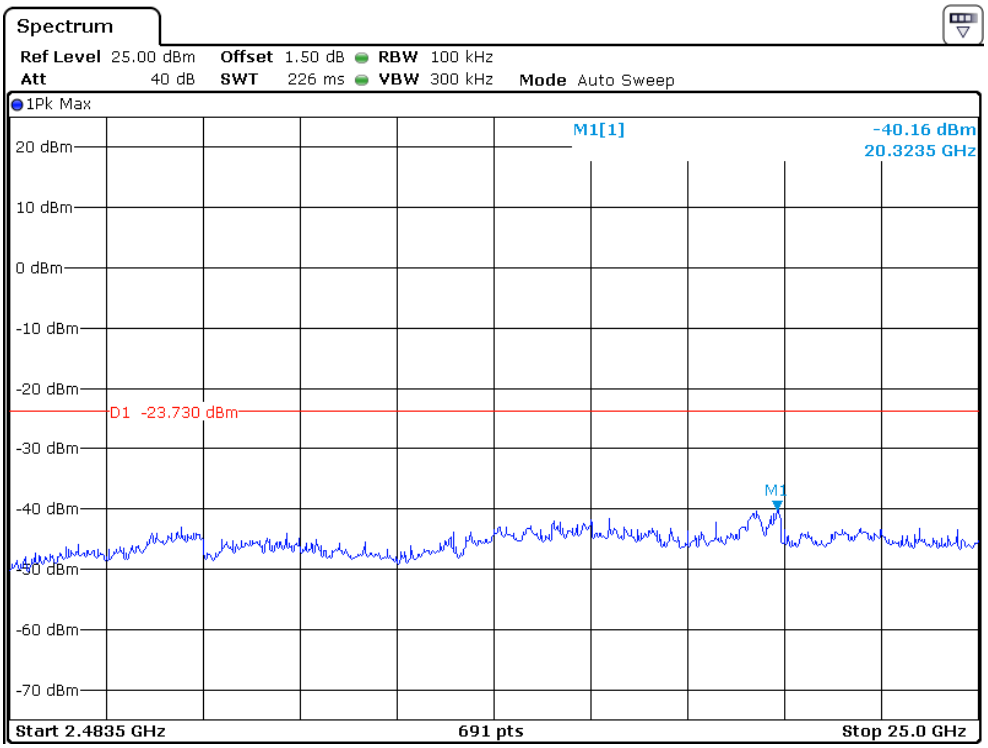




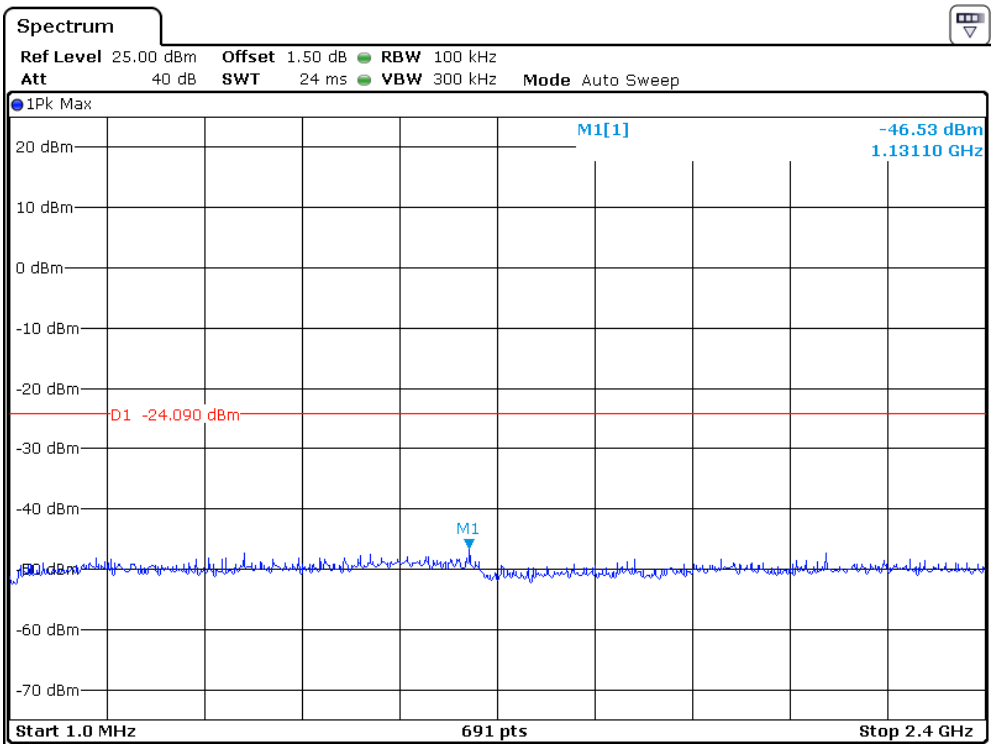


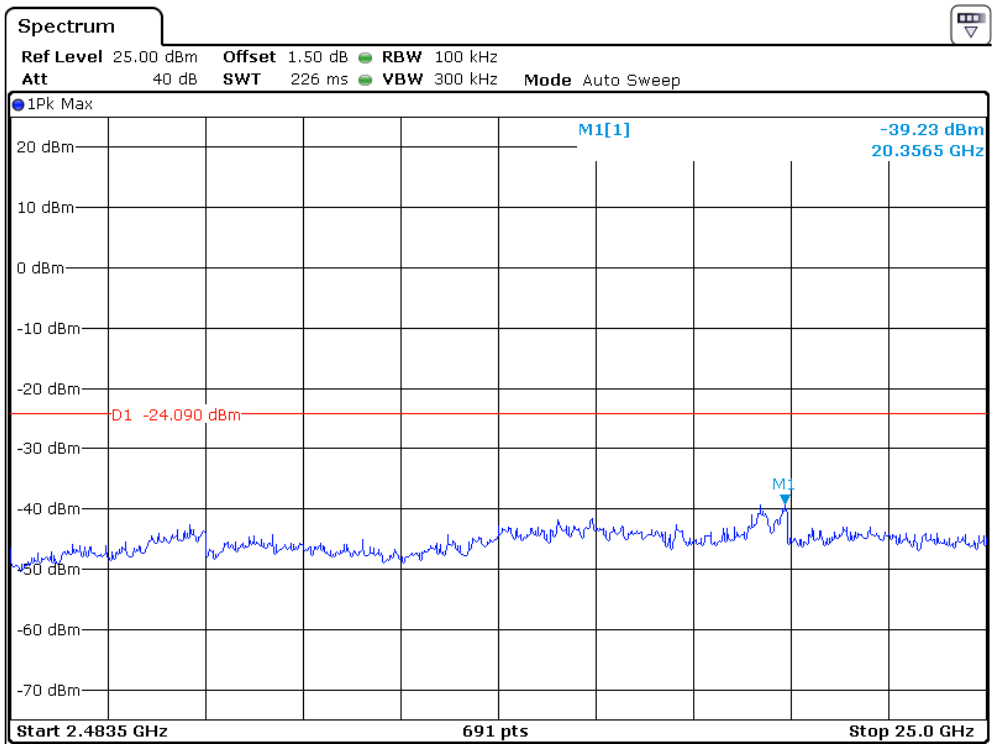
Channel 19 (2439.35MHz) Reference Level: -3.73dBm

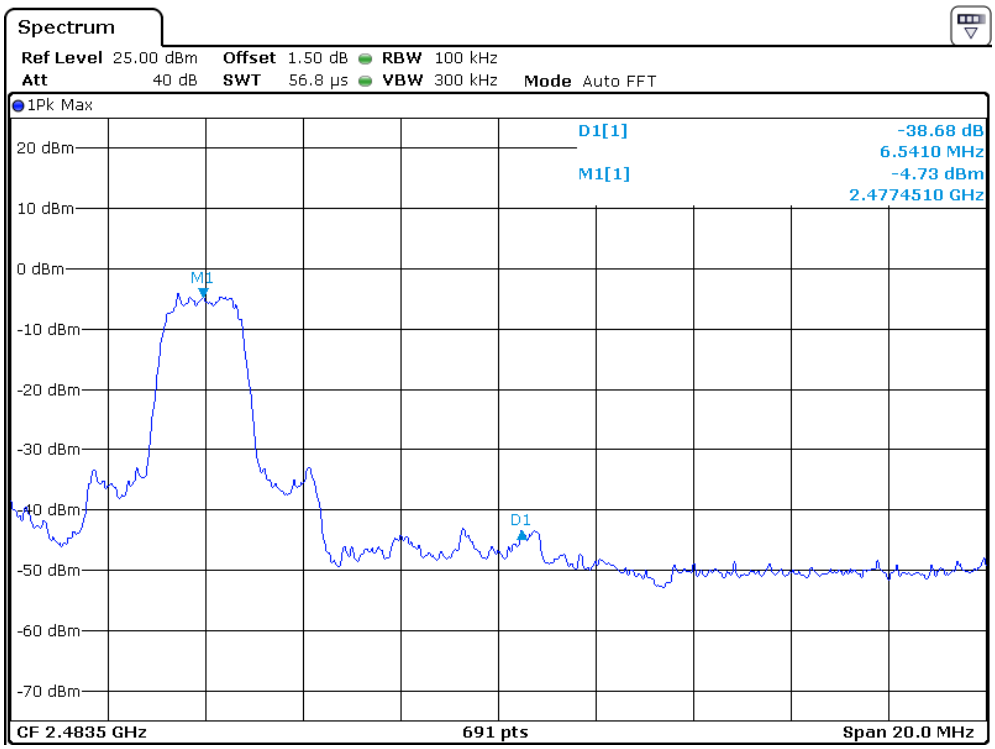




Channel 38 (2477.35MHz) Reference Level: -4.09dBm




Spectrum
Ref Level 25.00 dBm Offset 1.50 dB RBW 100 kHz
Att 40 dB SWT 226 ms VBW 300 kHz Mode Auto Sweep
1Pk Max
M1[1] -39.23 dBm
20.3565 GHz
D1 -24.090 dBm
Start 2.4835 GHz 691 pts Stop 25.0 GHz


Spectrum
Ref Level 25.00 dBm Offset 1.50 dB RBW 100 kHz
Att 40 dB SWT 56.8 µs VBW 300 kHz Mode Auto FFT
1Pk Max
D1[1] -38.68 dB
6.5410 MHz
M1[1] -4.73 dBm
2.4774510 GHz
CF 2.4835 GHz 691 pts Span 20.0 MHz

Applicant: SHENZHEN 3NOD DIGITAL TECHNOLOGY CO., LTD
Date of Test: November 30, 2019 Model: 100002634

4.5 Out of Band Radiated Emissions (for emissions in 4.4 above that are less than 20dB below carrier), FCC Rule 15.247(d):

For out of band emissions that are close to or that exceed the 20dB attenuation requirement described in the specification, radiated measurements were performed at a 3m separation distance to determine whether these emissions complied with the general radiated emission requirement.

[×] Not required, since all emissions are more than 20dB below fundamental
[ ] See attached data sheet

4.6 Transmitter Radiated Emissions in Restricted Bands, FCC Rule 15.35(b) (c):

Data is included of the worst-case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included. All measurements were performed with peak detection unless otherwise specified. Simultaneous transmission was considered during the test.

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

Applicant: SHENZHEN 3NOD DIGITAL TECHNOLOGY CO., LTD
Date of Test: November 30, 2019 Model: 100002634

4.7 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

FS = RA + AF + CF - AG + PD

Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
PD = Pulse Desensitization in dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

FS = RA + AF + CF - AG + PD

Example

Assume a receiver reading of 62.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB. The net field strength for comparison to the appropriate emission limit is 42 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 62.0 dBμV
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
PD = 0 dB
FS = 62 + 7.4 + 1.6 - 29 + 0 = 42 dBμV/m

Level in mV/m = Common Antilogarithm [(42 dBμV/m)/20] = 125.9 μV/m

Applicant: SHENZHEN 3NOD DIGITAL TECHNOLOGY CO., LTD
Date of Test: November 30, 2019 Model: 100002634

4.8 Radiated Spurious Emission

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit. Simultaneous transmission was considered during the test, but only worst-case is reported.

Worst Case Radiated Spurious Emission

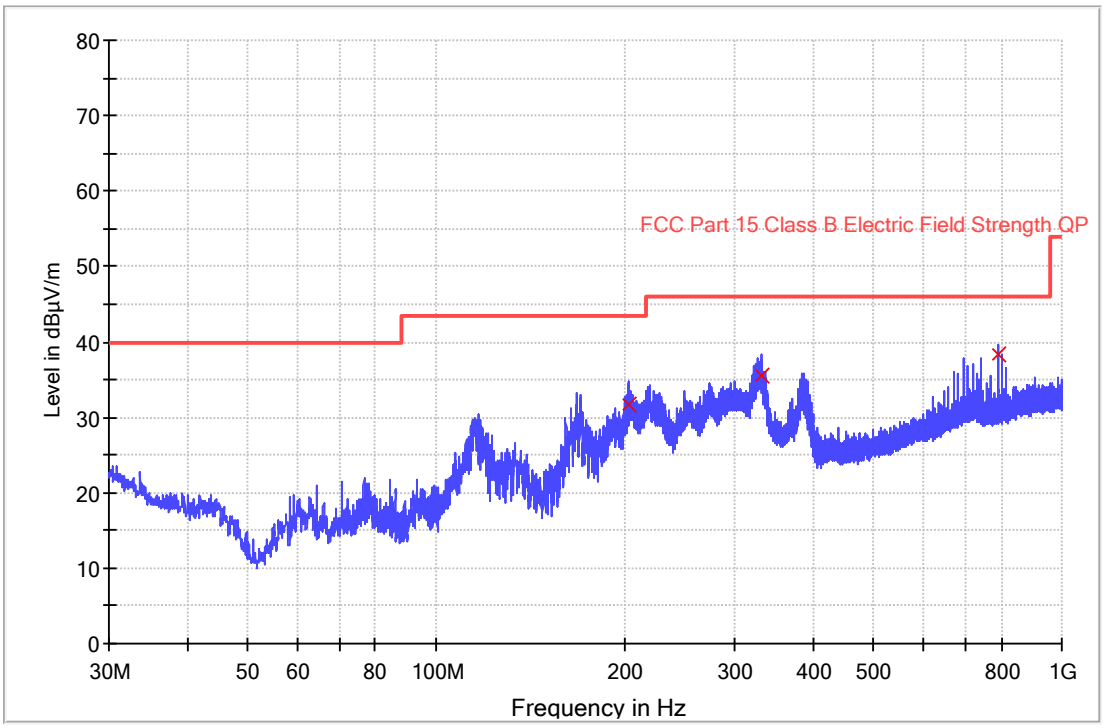
at 2484.780MHz

is passed by 3.6dB margin.

For the electronic filing, the worst case radiated emission configuration photographs are saved with filename: radiated photos.pdf.

Applicant: SHENZHEN 3NOD DIGITAL TECHNOLOGY CO., LTD
Date of Test: November 30, 2019 Model: 100002634
Worst Case Operating Mode: Simultaneous transmission (2.4G SRD & Bluetooth)

ANT Polarity: Horizontal

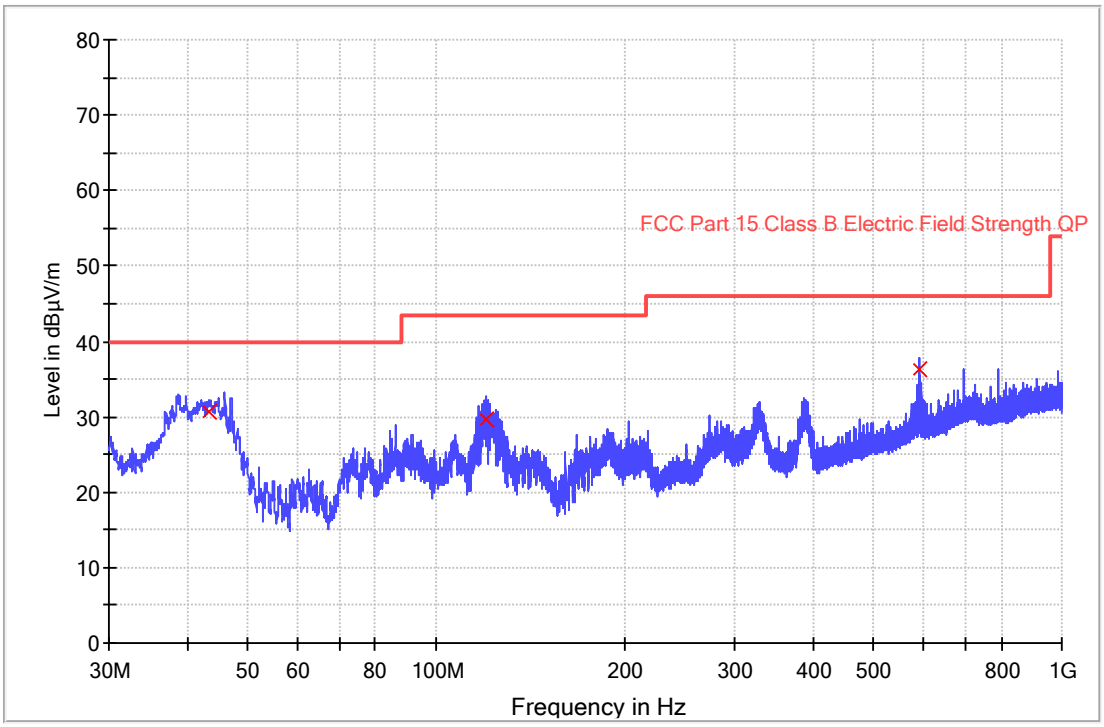


Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
202.563000	31.8	1000.0	120.000	H	12.8	11.7	43.5
330.344333	35.6	1000.0	120.000	H	17.5	10.4	46.0
791.999000	38.3	1000.0	120.000	H	26.3	7.7	46.0

Remark:
1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)
3. Margin (dB) = Limit Line(dBµV/m) – Level (dBµV/m)

Applicant: SHENZHEN 3NOD DIGITAL TECHNOLOGY CO., LTD
Date of Test: November 30, 2019 Model: 100002634
Worst Case Operating Mode: Simultaneous transmission (2.4G SRD & Bluetooth)

ANT Polarity: Vertical



Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
43.321333	30.8	1000.0	120.000	V	11.7	9.2	40.0
120.533333	29.6	1000.0	120.000	V	9.8	13.9	43.5
594.022667	36.3	1000.0	120.000	V	23.6	9.7	46.0

Remark:
1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)
3. Margin (dB) = Limit Line(dBµV/m) – Level (dBµV/m)

Applicant: SHENZHEN 3NOD DIGITAL TECHNOLOGY CO., LTD
Date of Test: November 30, 2019 Model: 100002634
Worst Case Operating Mode: Transmitting (2403.35MHz)
ANT 0:

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4806.700	51.3	36.3	33.4	48.4	74.0	-25.6
Horizontal	*2389.170	65.2	36.4	27.5	56.3	74.0	-17.7

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4806.700	43.0	36.3	33.4	40.1	54.0	-13.9
Horizontal	*2389.170	54.6	36.4	27.5	45.7	54.0	-8.3

NOTES:
1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value and RBW=1MHz/VBW=10Hz for average value.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: SHENZHEN 3NOD DIGITAL TECHNOLOGY CO., LTD
Date of Test: November 30, 2019 Model: 100002634
Worst Case Operating Mode: Transmitting (2439.35MHz)
ANT 0:

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4880.700	50.9	36.3	33.5	48.1	74.0	-25.9
Horizontal	*7321.050	52.0	36.3	37.7	53.4	74.0	-20.6

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4880.700	42.1	36.3	33.5	39.3	54.0	-14.7
Horizontal	*7321.050	43.5	36.3	37.7	44.9	54.0	-9.1

NOTES:

1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value and RBW=1MHz / VBW=10Hz for average value.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: SHENZHEN 3NOD DIGITAL TECHNOLOGY CO., LTD
Date of Test: November 30, 2019 Model: 100002634
Worst Case Operating Mode: Transmitting (2477.35MHz)
ANT 0:

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4954.700	50.2	36.3	33.5	47.4	74.0	-26.6
Horizontal	*7432.050	53.9	36.3	37.8	55.4	74.0	-18.6
Horizontal	*2484.830	69.6	36.4	27.5	60.7	74.0	-13.3

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4954.700	41.7	36.3	33.5	38.9	54.0	-15.1
Horizontal	*7432.050	43.4	36.3	37.8	44.9	54.0	-9.1
Horizontal	*2484.830	57.7	36.4	27.5	48.8	54.0	-5.2

NOTES:

1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value and RBW=1MHz / VBW=10Hz for average value.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: SHENZHEN 3NOD DIGITAL TECHNOLOGY CO., LTD
Date of Test: November 30, 2019 Model: 100002634
Worst Case Operating Mode: Transmitting (2403.35MHz)
ANT 1:

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4806.700	51.5	36.3	33.4	48.6	74.0	-25.4
Horizontal	*2389.240	65.4	36.4	27.5	56.5	74.0	-17.5

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4806.700	43.2	36.3	33.4	40.3	54.0	-13.7
Horizontal	*2389.240	54.8	36.4	27.5	45.9	54.0	-8.1

NOTES:
1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value and RBW=1MHz/VBW=10Hz for average value.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: SHENZHEN 3NOD DIGITAL TECHNOLOGY CO., LTD
Date of Test: November 30, 2019 Model: 100002634
Worst Case Operating Mode: Transmitting (2439.35MHz)
ANT 1:

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4880.700	49.9	36.3	33.5	47.1	74.0	-26.9
Horizontal	*7321.050	51.3	36.3	37.7	52.7	74.0	-21.3

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4880.700	41.7	36.3	33.5	38.9	54.0	-15.1
Horizontal	*7321.050	44.1	36.3	37.7	45.5	54.0	-8.5

NOTES:
1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value and RBW=1MHz / VBW=10Hz for average value.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: SHENZHEN 3NOD DIGITAL TECHNOLOGY CO., LTD
Date of Test: November 30, 2019 Model: 100002634
Worst Case Operating Mode: Transmitting (2477.35MHz)
ANT 1:

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4954.700	51.0	36.3	33.5	48.2	74.0	-25.8
Horizontal	*7432.050	53.6	36.3	37.8	55.1	74.0	-18.9
Horizontal	*2484.780	70.4	36.4	27.5	61.5	74.0	-12.5

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4954.700	41.7	36.3	33.5	38.9	54.0	-15.1
Horizontal	*7432.050	44.4	36.3	37.8	45.9	54.0	-8.1
Horizontal	*2484.780	59.3	36.4	27.5	50.4	54.0	-3.6

NOTES:
1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value and RBW=1MHz / VBW=10Hz for average value.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

4.9 Conducted Emission at Mains Terminal

4.9.1 Conducted Emissions Configuration Photograph

For electronic filing, the worst case conducted emission configuration photograph is saved with filename: conducted photos.pdf.

4.9.2 Conducted Emissions

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit. Simultaneous transmission was considered during the test, but only worst-case is reported.

Worst Case Neutral-Conducted Configuration
At

0.450 MHz

Judgement: Passed by 11.9 dB margin

TEST PERSONNEL:

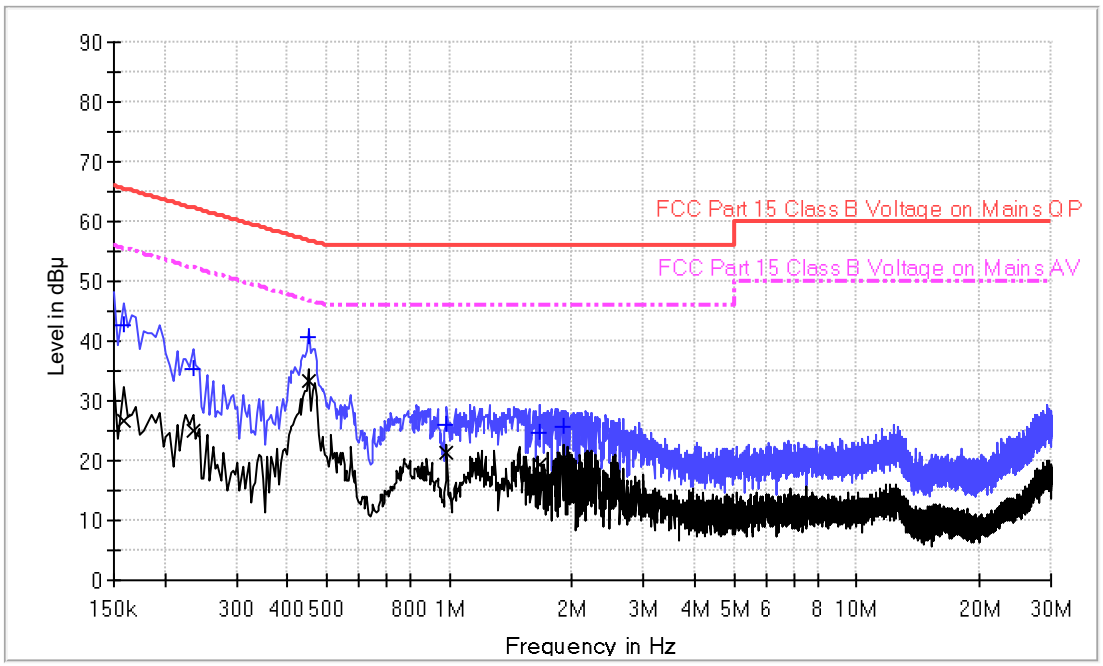
Sign on file

Leo Li, Project Engineer
Typed/Printed Name

Nevomber 30, 2019
Date

Applicant: SHENZHEN 3NOD DIGITAL TECHNOLOGY CO., LTD
Date of Test: November 30, 2019 Model: 100002634
Worst Case Operating Mode: Simultaneous transmission (2.4G SRD & Bluetooth)
Phase: Live

Conducted Emission Test - FCC



Limit and Margin QP

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.158000	42.8	9.000	L1	9.7	22.8	65.6
0.234000	35.2	9.000	L1	9.7	27.1	62.3
0.450000	40.5	9.000	L1	9.7	16.4	56.9
0.982000	25.9	9.000	L1	9.7	30.1	56.0
1.666000	24.5	9.000	L1	9.7	31.5	56.0
1.910000	25.7	9.000	L1	9.7	30.3	56.0

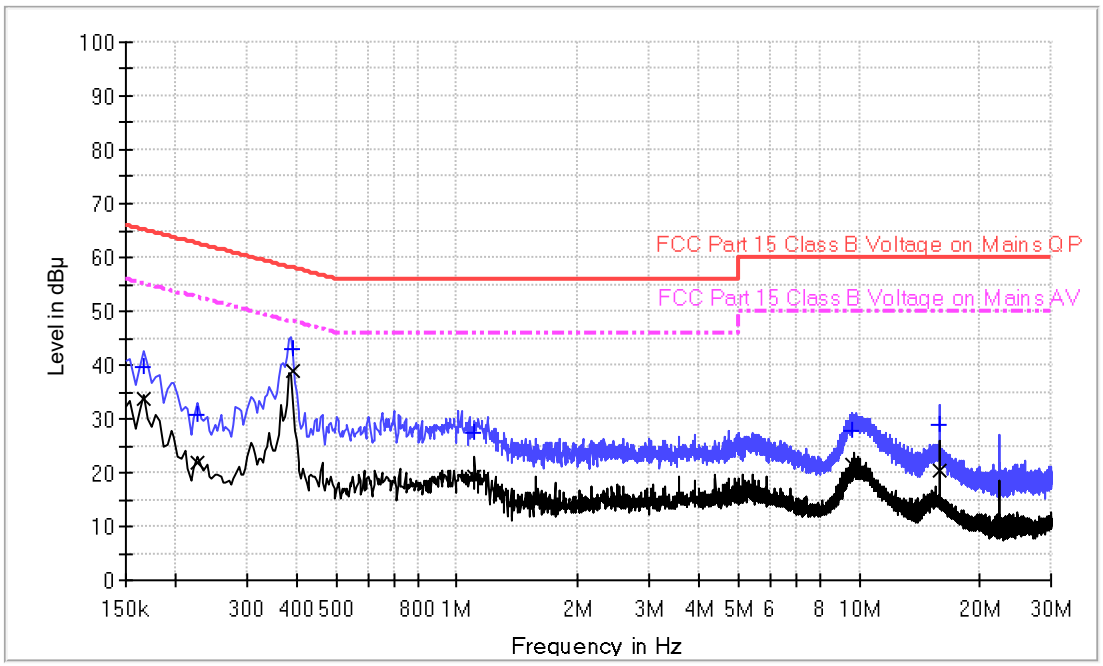
Limit and Margin AV

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.158000	26.8	9.000	L1	9.7	28.8	55.6
0.234000	25.0	9.000	L1	9.7	27.3	52.3
0.450000	33.5	9.000	L1	9.7	13.4	46.9
0.982000	21.4	9.000	L1	9.7	24.6	46.0
1.666000	19.2	9.000	L1	9.7	26.8	46.0
1.910000	20.3	9.000	L1	9.7	25.7	46.0

Remark:
1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Limit (dBuV) – Level (dBuV)

Applicant: SHENZHEN 3NOD DIGITAL TECHNOLOGY CO., LTD
Date of Test: November 30, 2019 Model: 100002634
Worst Case Operating Mode: Simultaneous transmission (2.4G SRD & Bluetooth)
Phase: Neutral

Conducted Emission Test - FCC



Limit and Margin QP

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.154000	43.3	9.000	N	9.7	22.5	65.8
0.166000	42.5	9.000	N	9.7	22.7	65.2
0.450000	42.4	9.000	N	9.7	14.5	56.9
0.890000	29.6	9.000	N	9.7	26.4	56.0
0.986000	27.8	9.000	N	9.7	28.2	56.0
12.006000	24.0	9.000	N	10.1	36.0	60.0

Limit and Margin AV

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.154000	30.0	9.000	N	9.7	25.8	55.8
0.166000	28.5	9.000	N	9.7	26.7	55.2
0.450000	35.0	9.000	N	9.7	11.9	46.9
0.890000	22.5	9.000	N	9.7	23.5	46.0
0.986000	21.6	9.000	N	9.7	24.4	46.0
12.006000	16.1	9.000	N	10.1	33.9	50.0

Remark:
1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Limit (dBuV) – Level (dBuV)

Applicant: SHENZHEN 3NOD DIGITAL TECHNOLOGY CO., LTD
Date of Test: November 30, 2019
Model: 100002634

4.10 Radiated Emissions from Digital Section of Transceiver, FCC Ref: 15.109

[ ] Not required - No digital part

[ ] Test results are attached

[x] Included in the separated report.

Applicant: SHENZHEN 3NOD DIGITAL TECHNOLOGY CO., LTD
Date of Test: November 30, 2019
Model: 100002634

4.11 Transmitter Duty Cycle Calculation and Measurements, FCC Rule 15.35(b), (c)

The EUT antenna output port was connected to the input of the spectrum analyzer. The analyzer center frequency was set to EUT RF channel carrier. The SWEP function on the analyzer was set to ZERO SPAN. The Transmitter ON time was determined from the resultant time-amplitude display:

	See attached spectrum analyzer chart (s) for Transmitter timing
	See Transmitter timing diagram provided by manufacturer
x	Not applicable, duty cycle was not used.

5.0 Equipment Photographs

For electronic filing, the photographs are saved with filename: external photos.pdf & internal photos.pdf.

6.0 Product Labeling

For electronic filing, the FCC ID label artwork and location is saved with filename: label.pdf.

7.0 Technical Specifications

For electronic filing, the block diagram and circuit diagram are saved with filename: block.pdf and circuit.pdf respectively.

8.0 Instruction Manual

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States.

9.0 Confidentiality Request

For electronic filing, the confidentiality request of the tested EUT is saved with filename: request.pdf.

10.0 Discussion of Pulse Desensitization

The determination of pulse desensitivity was made in accordance with Hewlett Packard Application Note 150-2, *Spectrum Analysis ... Pulsed RF.*

Pulse desensitivity is not applicable for this device since the transmitter transmits the RF signal continuously.

11.0 Test Equipment List

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ182-02	RF Power Meter	Anritsu	ML2496A	1302005	28-May-2019	28-May-2020
SZ182-02-01	Power Sensor	Anritsu	MA2411B	1207429	28-May-2019	28-May-2020
SZ061-04	Biconilog Antenna	ETS	3142C	00078828	14-Sep-2018	14-Sep-2020
SZ185-01	EMI Receiver	R & S	ESCI	100547	4-Jan-2019	4-Jan-2020
SZ061-08	Horn Antenna	ETS	3115	00092346	7-Sep-2019	7-Sep-2021
SZ061-07	Pyramidal Horn Antenna	ETS	3160-09	00083067	13-Aug-2019	13-Aug-2021
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	217	24-May-2019	24-May-2020
SZ056-03	Spectrum Analyzer	R&S	FSP 30	101148	28-May-2019	28-May-2020
SZ056-06	Signal Analyzer	R&S	FSV 40	101101	28-May-2019	28-May-2020
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	15-Jan-2019	15-Jan-2020
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	15-Dec-2018	15-Dec-2020
SZ062-02	RF Cable	RADIALL	RG 213U	--	19-Jun-2019	19-Dec-2019
SZ062-05	RF Cable	RADIALL	0.04-26.5GHz	--	14-Aug-2019	14-Aug-2020
SZ062-12	RF Cable	RADIALL	0.04-26.5GHz	--	14-Aug-2019	14-Aug-2020
SZ067-04	Notch Filter	Micro-Tronics	BRM50702-02	--	28-May-2019	28-May-2020
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	29-Oct-2019	29-Oct-2020
SZ187-01	Two-Line V-Network	R&S	ENV216	100072	29-Oct-2019	29-Oct-2020
SZ187-02	Two-Line V-Network	R&S	ENV216	100073	28-May-2019	28-May-2020
SZ188-03	Shielding Room	ETS	RFD-100	4100	16-Jan-2017	16-Jan-2020
SZ062-16	RF Cable	HUBER+SUHNER	CBL2-BN-1m	110127-2231000	30-Oct-2019	30-Oct-2020

********** End of Report**********