S&O ELECTRONICS (MALAYSIA) SDN. BHD.

Application
For
Certification

FCC ID: 2AB3N-SA189AW

Bluetooth Remote Control Module

Model: SA189AW

2.4GHz Transceiver

Report No.: 151210011SZN-001

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 [10-1-14]

Prepared and Checked by:

Sign on file

Hardy Suo
Project Engineer

Approved by:

Digitally signed by Andy Yan
Location: Intertek Testing Services

Andy Yan
Technical Supervisor
Date: April 10, 2016

- The test results reported in this test report shall refer only to the sample actually tested and shall not refer or be deemed to refer to bulk from which such a sample may be said to have been obtained.
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- The evaluation data of the report will be kept for 3 years from the date of issuance.

TRF no.: FCC 15C_Tx_c

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MEASUREMENT/TECHNICAL REPORT

S&O ELECTRONICS (MALAYSIA) SDN. BHD.

Model: SA189AW

FCC ID: 2AB3N-SA189AW

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 [10-01-14 Edition] provision

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Report prepared by:

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List of attached file

Exhibit Type	File Description	Filename
Test Report	Test Report	report.pdf
Test Setup Photo	Radiated Emission	radiated photos.pdf
Test Setup Photo	Conducted Emission	conducted photos.pdf
External Photo	External Photo	external photos.pdf
Internal Photo	Internal Photo	internal photos.pdf
Block Diagram	Block Diagram	block.pdf
Schematics	Circuit Diagram	circuit.pdf
Operation Description	Technical Description	descri.pdf
ID Label/Location	Label Artwork and Location	label.pdf
Cover Letter	Confidentiality Letter	request.pdf
Cover Letter	Letter of Agency	agency.pdf
User Manual	User Manual	manual.pdf

EXHIBIT 1

SUMMARY OF TEST RESULTS

1.0 Summary of Test results

S&O ELECTRONICS (MALAYSIA) SDN. BHD.

Model: SA189AW

FCC ID: 2AB3N-SA189AW

TEST	REFERENCE	RESULTS
Max. Output power	15.247(b)	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)	Pass
Antenna Requirement	15.203	Pass (See Notes)

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

EXHIBIT 2

GENERAL DESCRIPTION

2.0 General Description

2.1 Product Description

The Equipment Under Test (EUT) is a Bluetooth Remote Control Module, Model: SA189AW with Bluetooth version 4.0 function operating in 2402-2480MHz. The EUT is powered by DC 3.0V (2 x 1.5V 'UM-3/R6/AA' batteries) or USB operated DC 5.0V. For more detailed features description, please refer to the user's manual.

Antenna Type: Integral antenna
Bluetooth Version: 4.0 Single Mode
Modulation Type: GFSK

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 Bluetooth Remote Control Module which has Bluetooth function, and there is no corresponding unit for certification.

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 v03r05. 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. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

2.4 Test Facility

The Semi-Anechoic chamber and shield room used to collect the radiated data and conducted data are **Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch** and located at 6F, Block D, Huahan Building, Langshan Road, Nanshan District, Shenzhen, P. R. China. This test facility and site measurement data have been fully placed on file with the FCC (Registration Number: 242492).

EXHIBIT 3

SYSTEM TEST CONFIGURATION

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. It was powered by DC 3.0V (2 x 1.5V 'UM-3/R6/AA' batteries) or USB operated DC 5.0V (via AC/DC adaptor which was powered by AC 120V, 60Hz) during the test. Only the worst case data was reported.

The signal is maximized through rotation and placement in the three orthogonal axes. 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.

The rear of unit shall be flushed with the rear of the table up to 1GHz and placed in the centre of turntable above 1GHz when powered by 5V USB Port. And placed in the centre of the turntable when powered by batteries.

All readings are extrapolated back to the equivalent three meter 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.

Radiated emission measurement were 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.

3.3 Special Accessories

N/A.

3.4 Measurement Uncertainty

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

Uncertainty and Compliance – Unless the standard specifically states that measured values are to be extended by the measurement uncertainty in determining compliance, all compliance determinations are based on the actual measured value.

3.5 Equipment Modification

Any modifications installed previous to testing by S&O ELECTRONICS (MALAYSIA) SDN. BHD. will be incorporated in each production model sold / leased in the United States.

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

3.6 Support Equipment List and Description

Description	Manufacturer	Model No.
AC/DC Adaptor with 1.5 m unshielded USB Cable	BlackBerry	PSM04R-050CHW1(M) Input: AC 100-240V, 50/60Hz, 150mA Output: DC 5.0V, 700mA

EXHIBIT 4

MEASUREMENT RESULTS

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 have 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).

Bluetooth 4.0 (Antenna Gain=3.3dBi)		
Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 2402	-0.7	0.9
Middle Channel: 2440	-2.0	0.6
High Channel: 2480	-2.5	0.6

Cable loss: 0.5 dB External Attenuation: 0 dB

Cable loss, external attenuation has been included in OFFSET function

EUT max output level = -0.7dBm

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

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

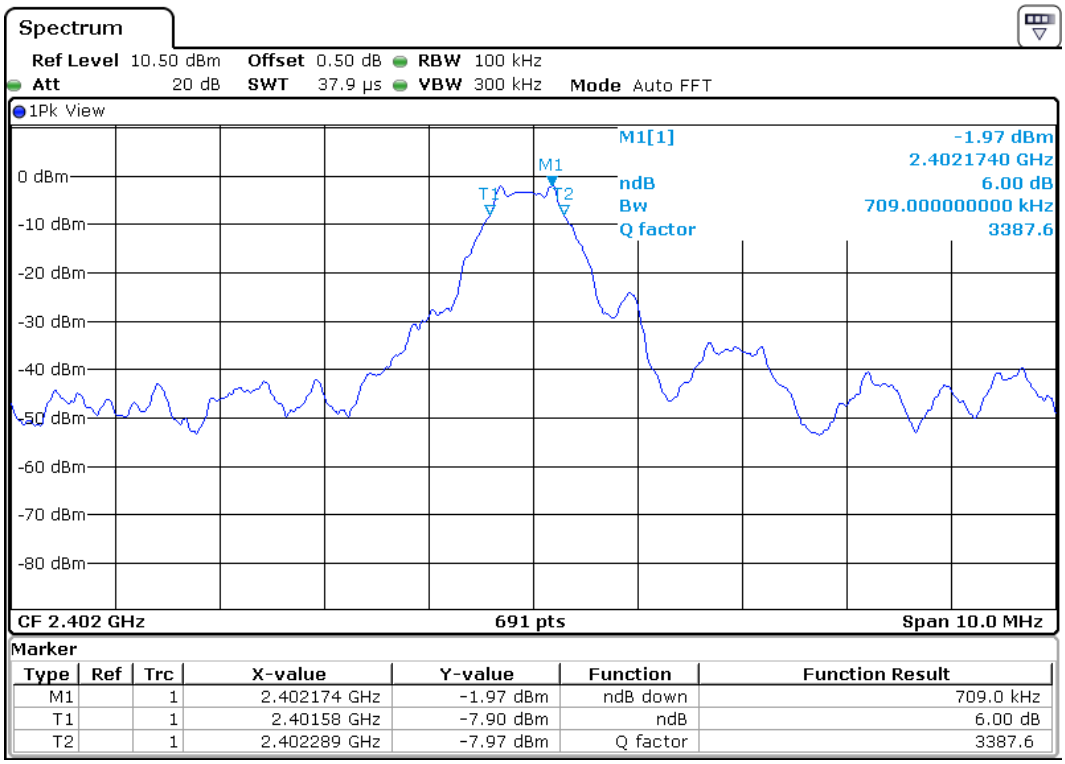
The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was set to 100 KHz according to FCC KDB 558074 D01. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY 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.

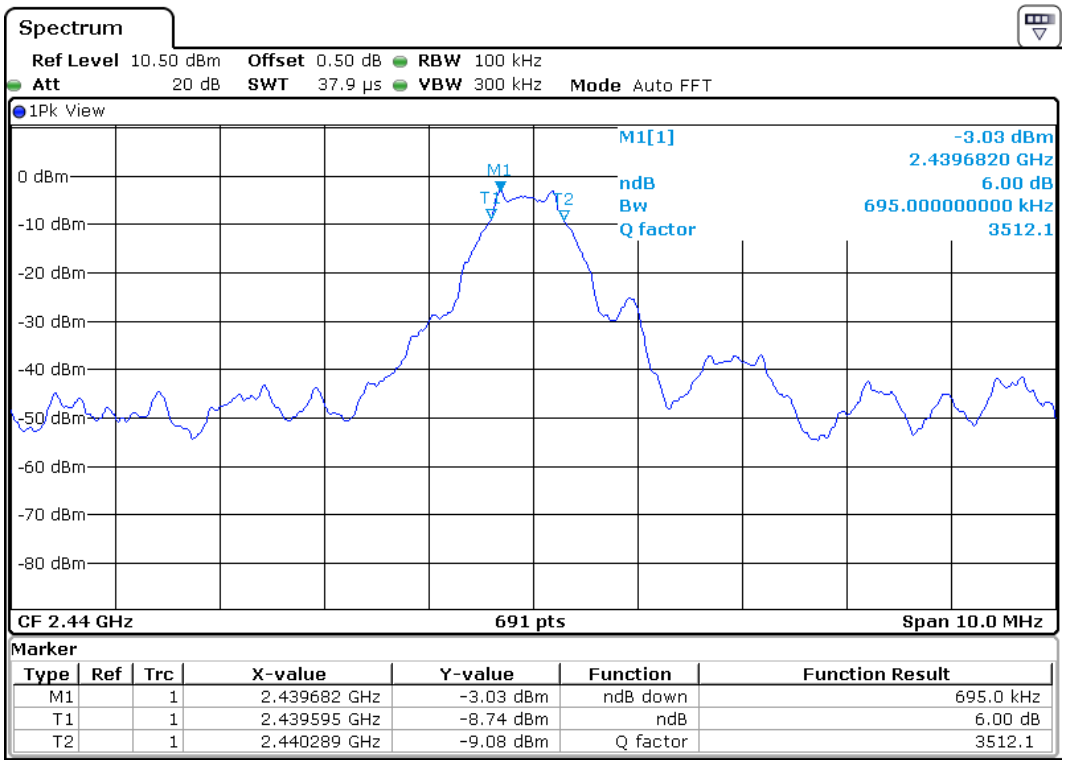
Bluetooth 4.0	
Frequency (MHz)	6 dB Bandwidth (MHz)
2402	0.709
2440	0.695
2480	0.680

The test plots are attached as below.

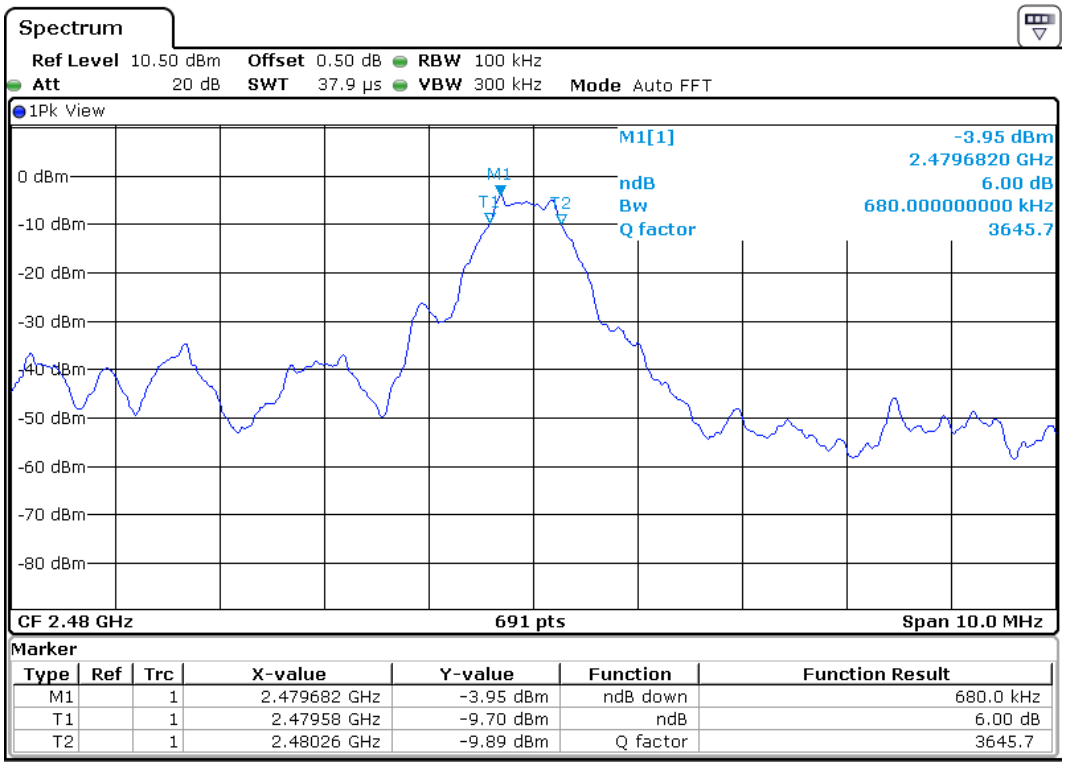
Low CH


Spectrum
Ref Level 10.50 dBm Offset 0.50 dB RBW 100 kHz
Att 20 dB SWT 37.9 µs VBW 300 kHz Mode Auto FFT
1Pk View
M1[1] -1.97 dBm
2.4021740 GHz
ndB 6.00 dB
Bw 709.000000000 kHz
Q factor 3387.6
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.402 GHz
691 pts
Span 10.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.402174 GHz -1.97 dBm ndB down 709.0 kHz
T1 1 2.40158 GHz -7.90 dBm ndB 6.00 dB
T2 1 2.402289 GHz -7.97 dBm Q factor 3387.6

Mid CH


Spectrum
Ref Level 10.50 dBm Offset 0.50 dB RBW 100 kHz
Att 20 dB SWT 37.9 µs VBW 300 kHz Mode Auto FFT
1Pk View
M1[1] -3.03 dBm
2.4396820 GHz
ndB 6.00 dB
Bw 695.000000000 kHz
Q factor 3512.1
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.44 GHz
691 pts
Span 10.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.439682 GHz -3.03 dBm ndB down 695.0 kHz
T1 1 2.439595 GHz -8.74 dBm ndB 6.00 dB
T2 1 2.440289 GHz -9.08 dBm Q factor 3512.1

High CH


Spectrum
Ref Level 10.50 dBm Offset 0.50 dB RBW 100 kHz
Att 20 dB SWT 37.9 µs VBW 300 kHz Mode Auto FFT
1Pk View
M1[1] -3.95 dBm
2.4796820 GHz
ndB 6.00 dB
Bw 680.000000000 kHz
Q factor 3645.7
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
M1
T1
T2
CF 2.48 GHz
691 pts
Span 10.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.479682 GHz -3.95 dBm ndB down 680.0 kHz
T1 1 2.47958 GHz -9.70 dBm ndB 6.00 dB
T2 1 2.48026 GHz -9.89 dBm Q factor 3645.7

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

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

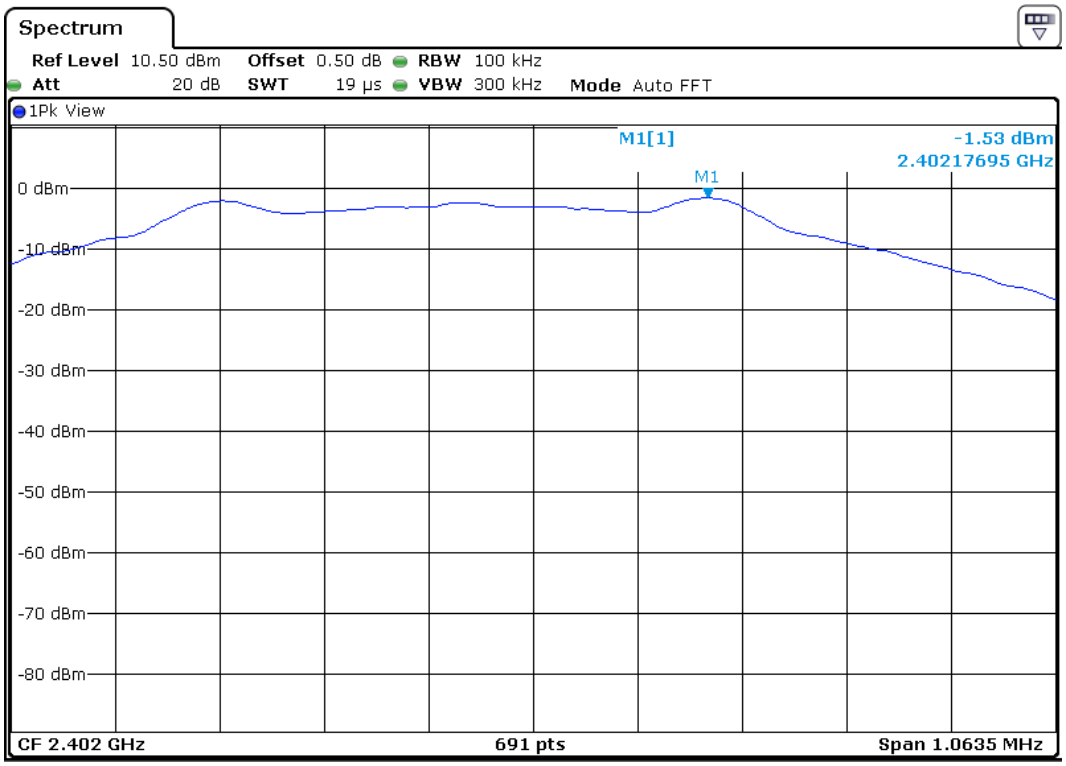
Antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.

Limit: The Power Density does not exceed 8dBm/ 3 kHz.

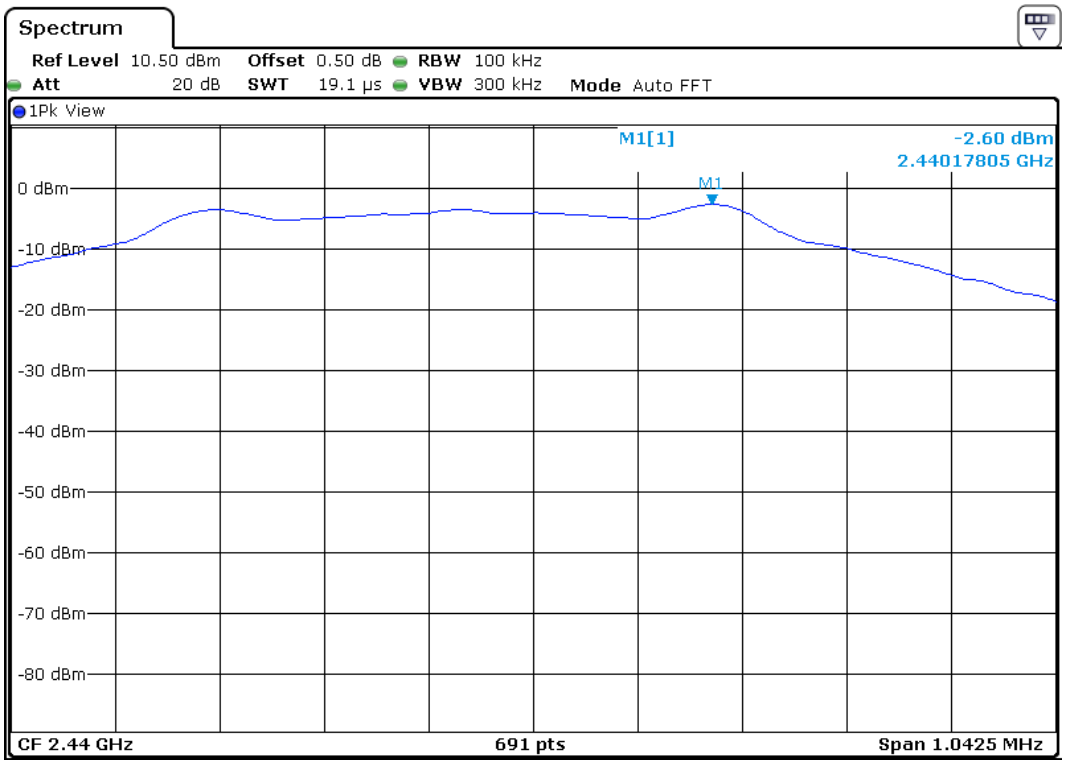
Bluetooth 4.0	
Frequency (MHz)	Power Density with RBW 100KHz (dBm)
2402	-1.53
2440	-2.60
2480	-3.84

The test plots are attached as below.

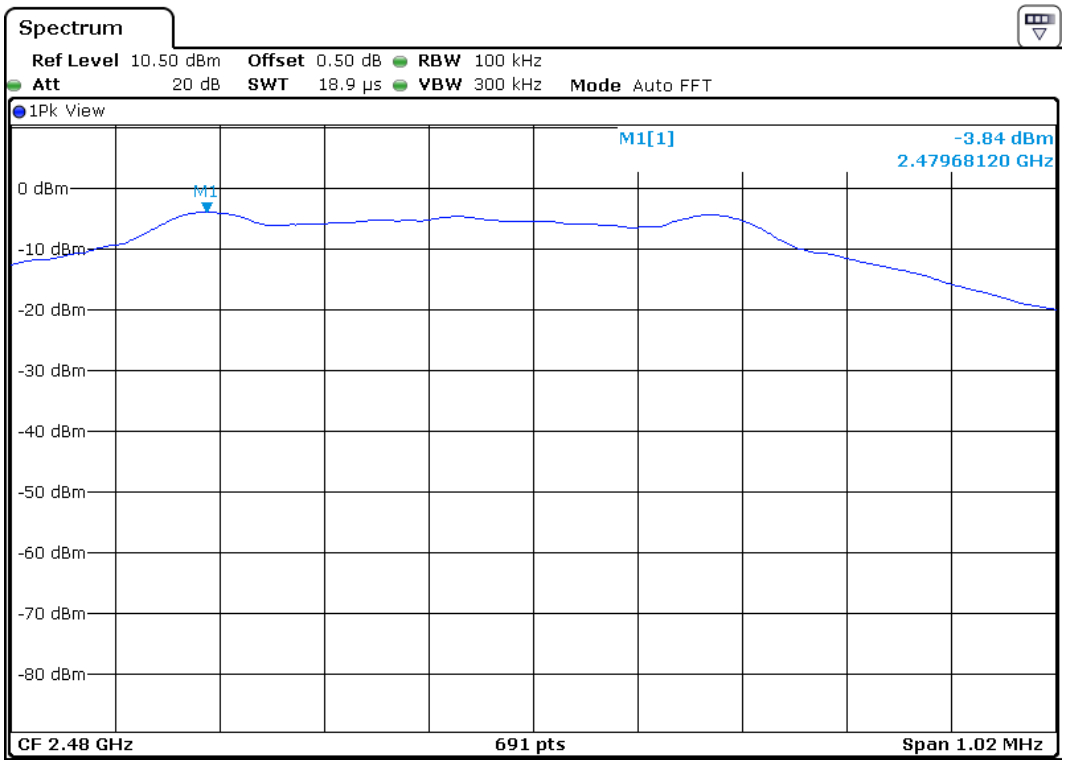
Low CH


Spectrum
Ref Level 10.50 dBm Offset 0.50 dB RBW 100 kHz
Att 20 dB SWT 19 µs VBW 300 kHz Mode Auto FFT
1Pk View
M1[1] -1.53 dBm
2.40217695 GHz
M1
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.402 GHz
691 pts
Span 1.0635 MHz

Mid CH


Spectrum
Ref Level 10.50 dBm Offset 0.50 dB RBW 100 kHz
Att 20 dB SWT 19.1 µs VBW 300 kHz Mode Auto FFT
1Pk View
M1[1] -2.60 dBm
2.44017805 GHz
M1
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.44 GHz
691 pts
Span 1.0425 MHz

High CH


Spectrum
Ref Level 10.50 dBm Offset 0.50 dB RBW 100 kHz
Att 20 dB SWT 18.9 µs VBW 300 kHz Mode Auto FFT
1Pk View
M1[1]
-3.84 dBm
2.47968120 GHz
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
M1
CF 2.48 GHz
691 pts
Span 1.02 MHz

4.4 Out of Band Conducted Emissions, FCC Rule 15.247(d)

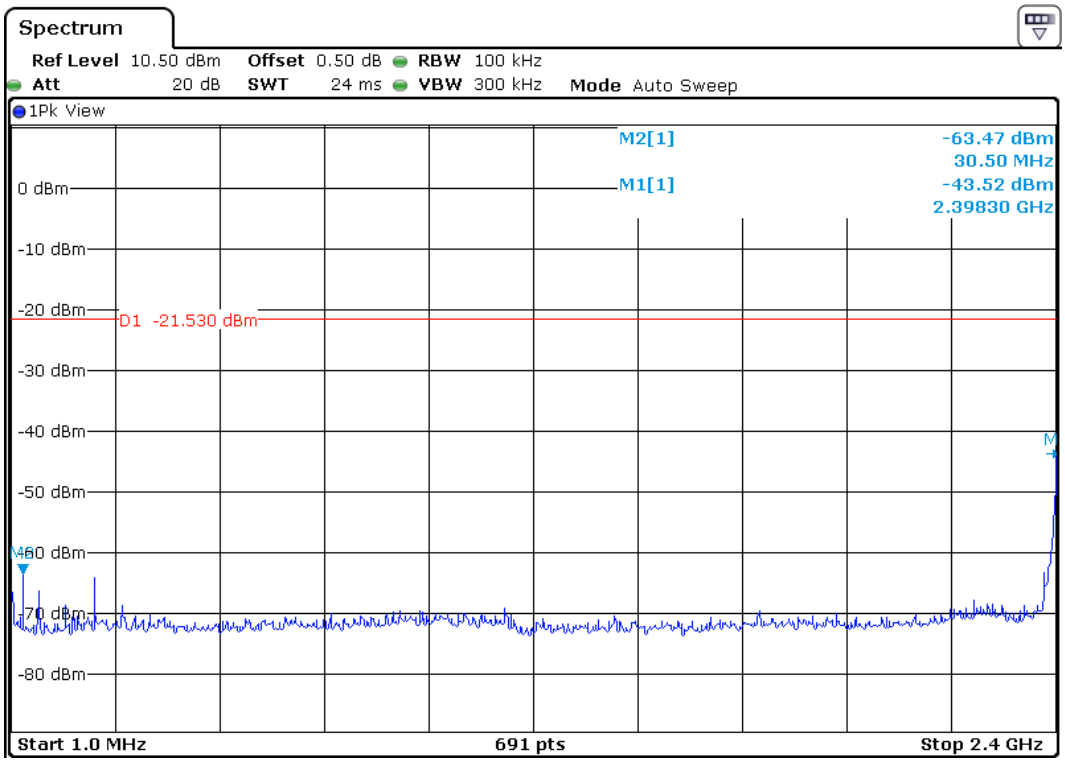
In any 100 kHz bandwidth outside the EUT passband, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20dB below that of the maximum in-band 100 kHz emission, or else shall meet the general limits for radiated emissions at frequencies outside the passband, whichever results in lower attenuation. The Measurement Procedure was set according to the FCC KDB 558074.

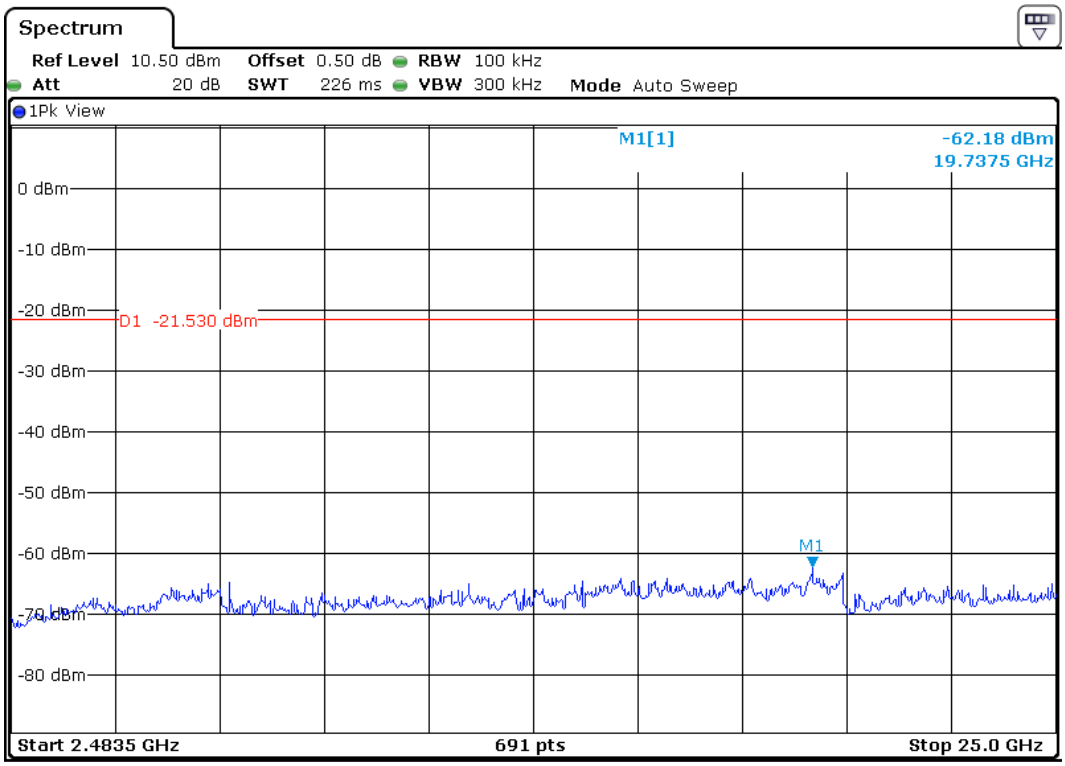
All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the passband.

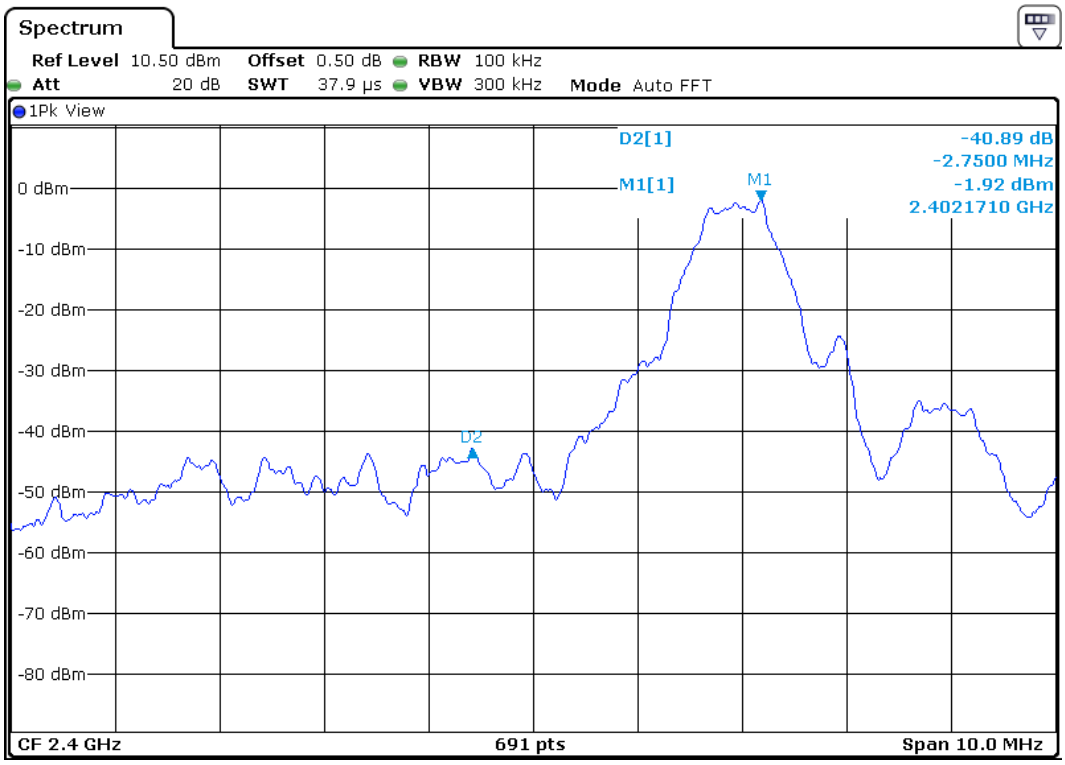
The test plots showed all spurious emission and up to the tenth harmonic were measured and they were found to be at least 20 dB below the highest level of the desired power in the passband.

The test plots are attached as below.

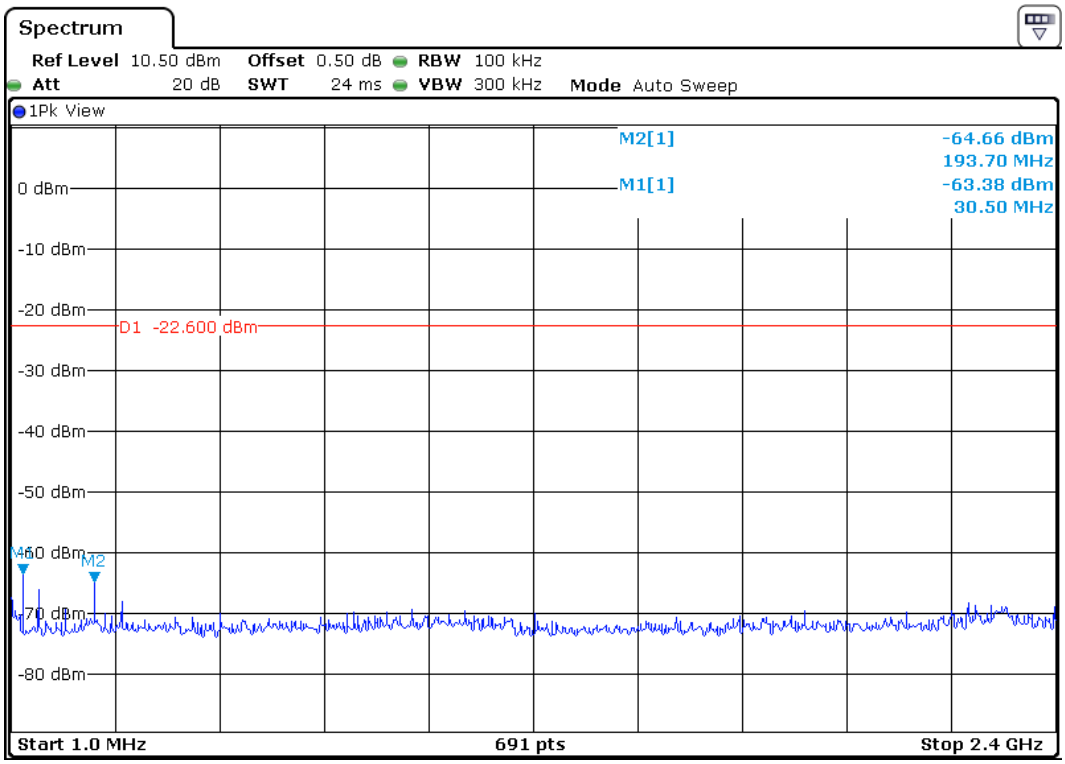
Low CH

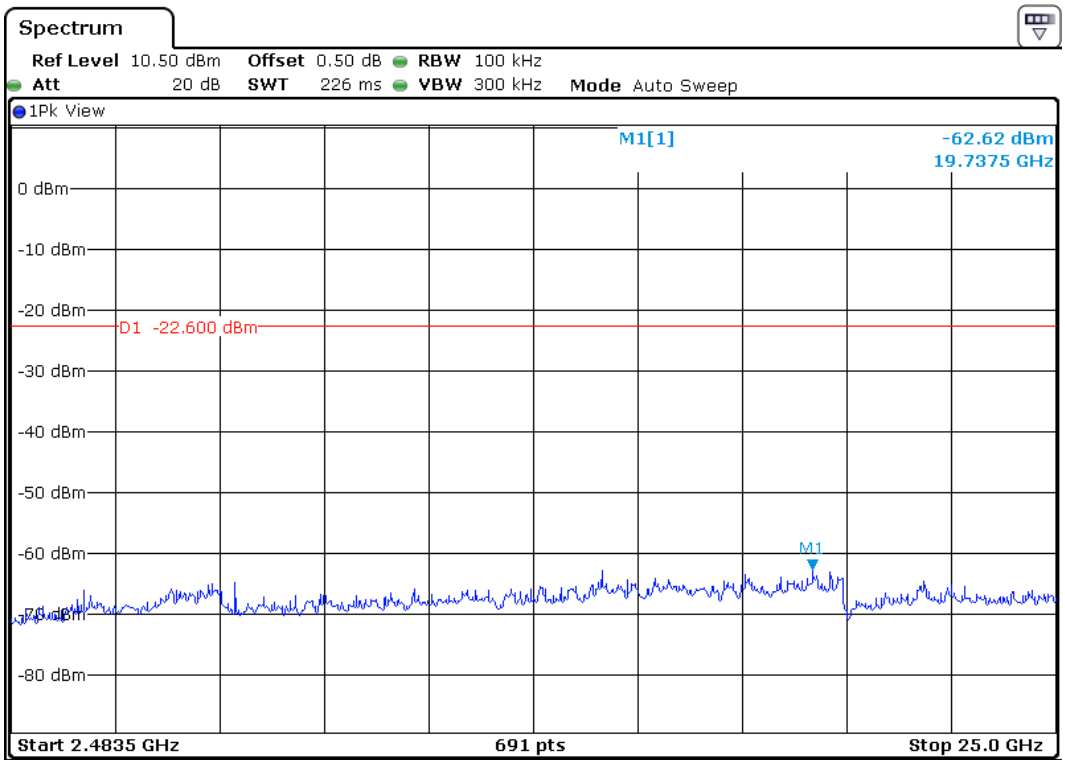

Spectrum
Ref Level 10.50 dBm Offset 0.50 dB RBW 100 kHz
Att 20 dB SWT 24 ms VBW 300 kHz Mode Auto Sweep
1Pk View
M2[1] -63.47 dBm
30.50 MHz
M1[1] -43.52 dBm
2.39830 GHz
D1 -21.530 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
Start 1.0 MHz
691 pts
Stop 2.4 GHz


Spectrum
Ref Level 10.50 dBm Offset 0.50 dB RBW 100 kHz
Att 20 dB SWT 226 ms VBW 300 kHz Mode Auto Sweep
1Pk View
M1[1] -62.18 dBm
19.7375 GHz
D1 -21.530 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
M1
Start 2.4835 GHz
691 pts
Stop 25.0 GHz

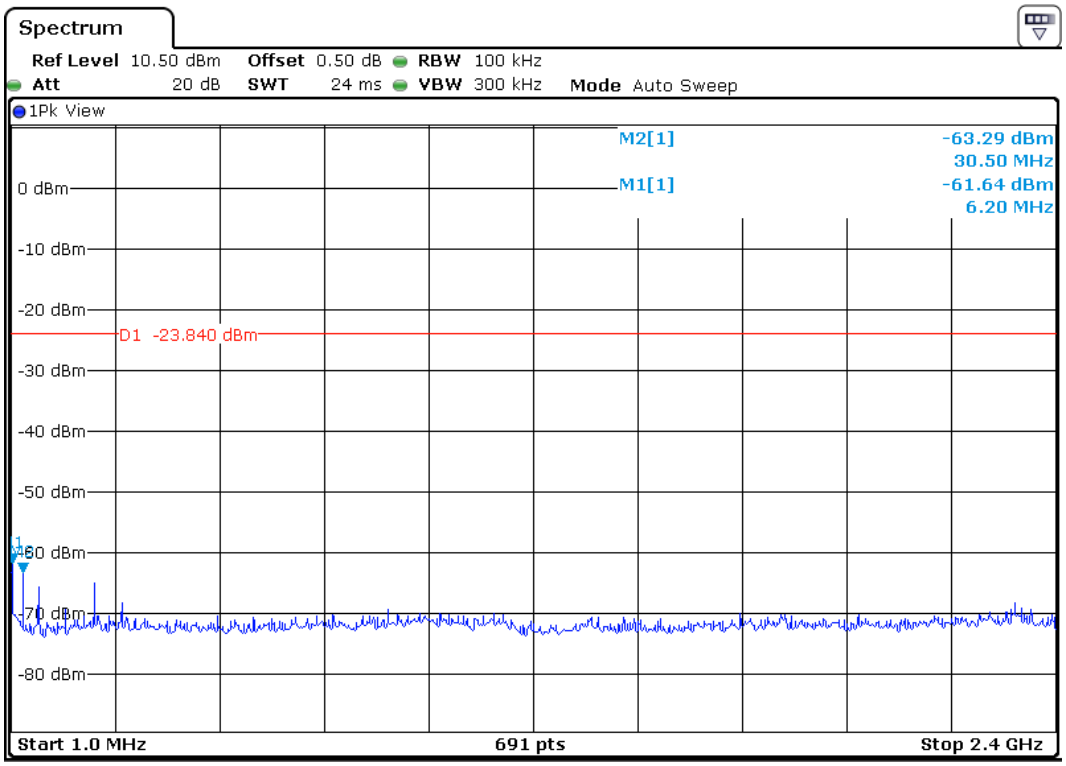

Spectrum
Ref Level 10.50 dBm Offset 0.50 dB RBW 100 kHz
Att 20 dB SWT 37.9 µs VBW 300 kHz Mode Auto FFT
1Pk View
D2[1] -40.89 dB
-2.7500 MHz
M1[1] -1.92 dBm
2.4021710 GHz
M1
D2
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.4 GHz
691 pts
Span 10.0 MHz

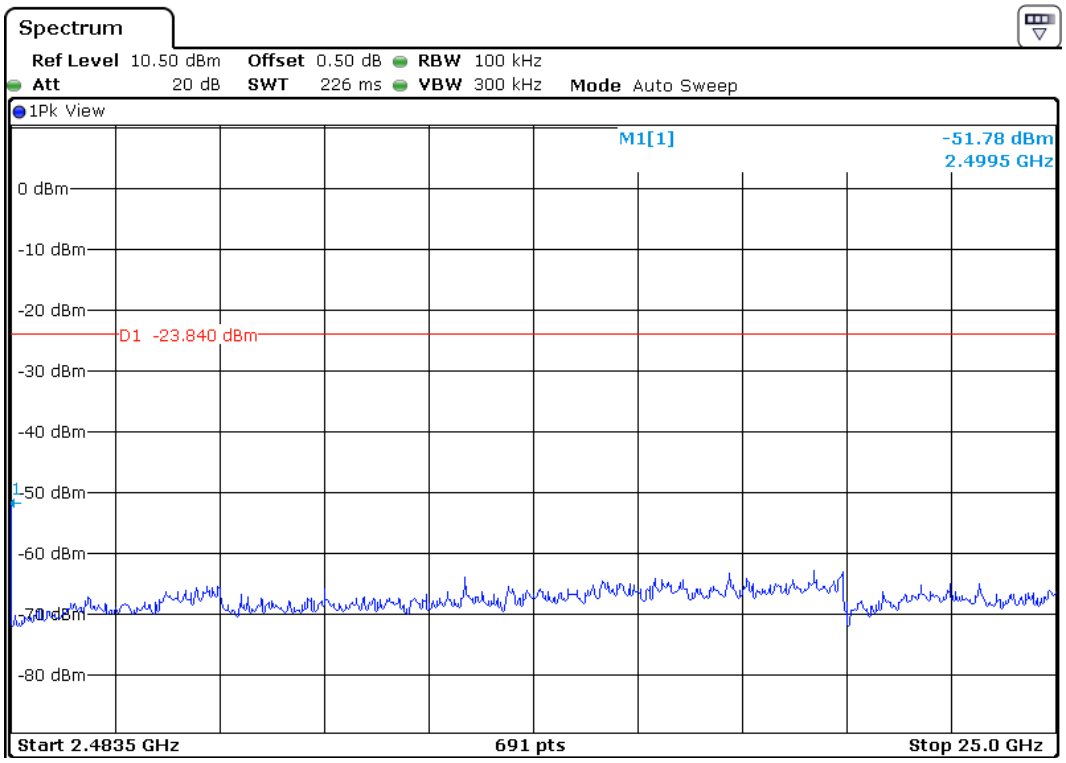
Mid CH

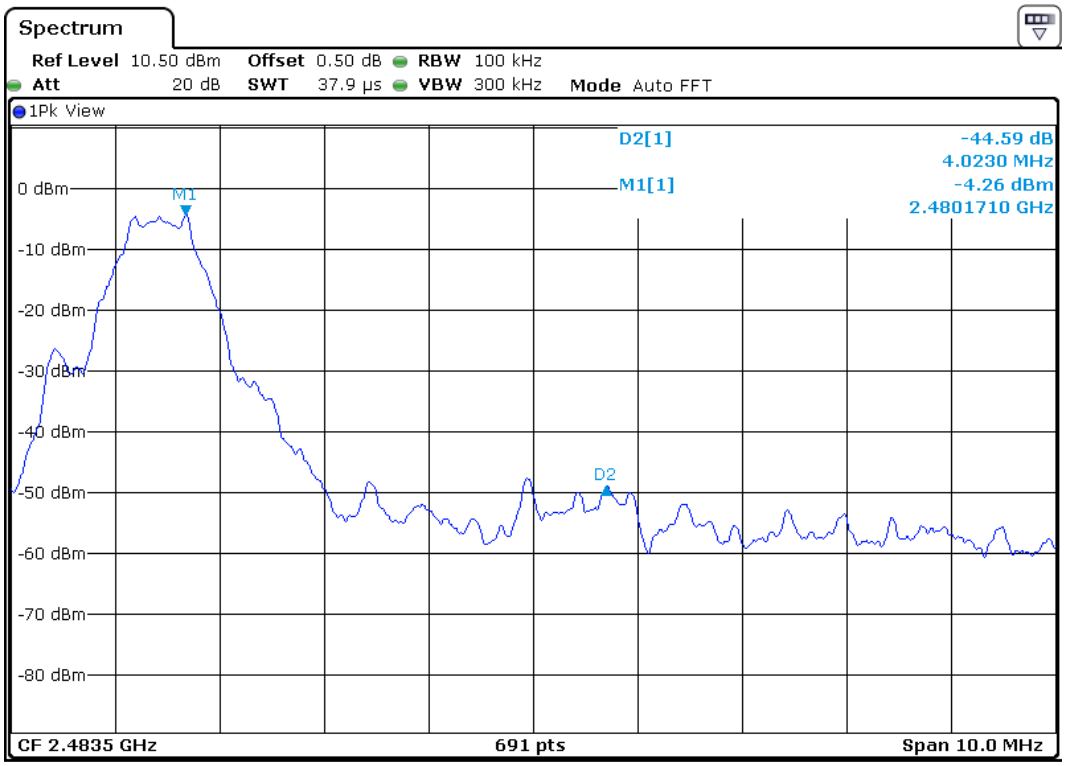

Spectrum
Ref Level 10.50 dBm Offset 0.50 dB RBW 100 kHz
Att 20 dB SWT 24 ms VBW 300 kHz Mode Auto Sweep
1Pk View
M2[1] -64.66 dBm
193.70 MHz
M1[1] -63.38 dBm
30.50 MHz
D1 -22.600 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
M1
M2
Start 1.0 MHz
691 pts
Stop 2.4 GHz


Spectrum
Ref Level 10.50 dBm Offset 0.50 dB RBW 100 kHz
Att 20 dB SWT 226 ms VBW 300 kHz Mode Auto Sweep
1Pk View
M1[1] -62.62 dBm
19.7375 GHz
D1 -22.600 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
M1
Start 2.4835 GHz
691 pts
Stop 25.0 GHz

High CH


Spectrum
Ref Level 10.50 dBm Offset 0.50 dB RBW 100 kHz
Att 20 dB SWT 24 ms VBW 300 kHz Mode Auto Sweep
1Pk View
M2[1] -63.29 dBm
30.50 MHz
M1[1] -61.64 dBm
6.20 MHz
D1 -23.840 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
Start 1.0 MHz
691 pts
Stop 2.4 GHz


Spectrum
Ref Level 10.50 dBm Offset 0.50 dB RBW 100 kHz
Att 20 dB SWT 226 ms VBW 300 kHz Mode Auto Sweep
1Pk View
M1[1] -51.78 dBm
2.4995 GHz
D1 -23.840 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
Start 2.4835 GHz
691 pts
Stop 25.0 GHz


Spectrum
Ref Level 10.50 dBm Offset 0.50 dB RBW 100 kHz
Att 20 dB SWT 37.9 µs VBW 300 kHz Mode Auto FFT
1Pk View
D2[1] -44.59 dB
4.0230 MHz
M1[1] -4.26 dBm
2.4801710 GHz
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
M1
D2
CF 2.4835 GHz
691 pts
Span 10.0 MHz

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.

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

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 32 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

4.8 Radiated Spurious Emission

Worst Case Radiated Spurious Emission

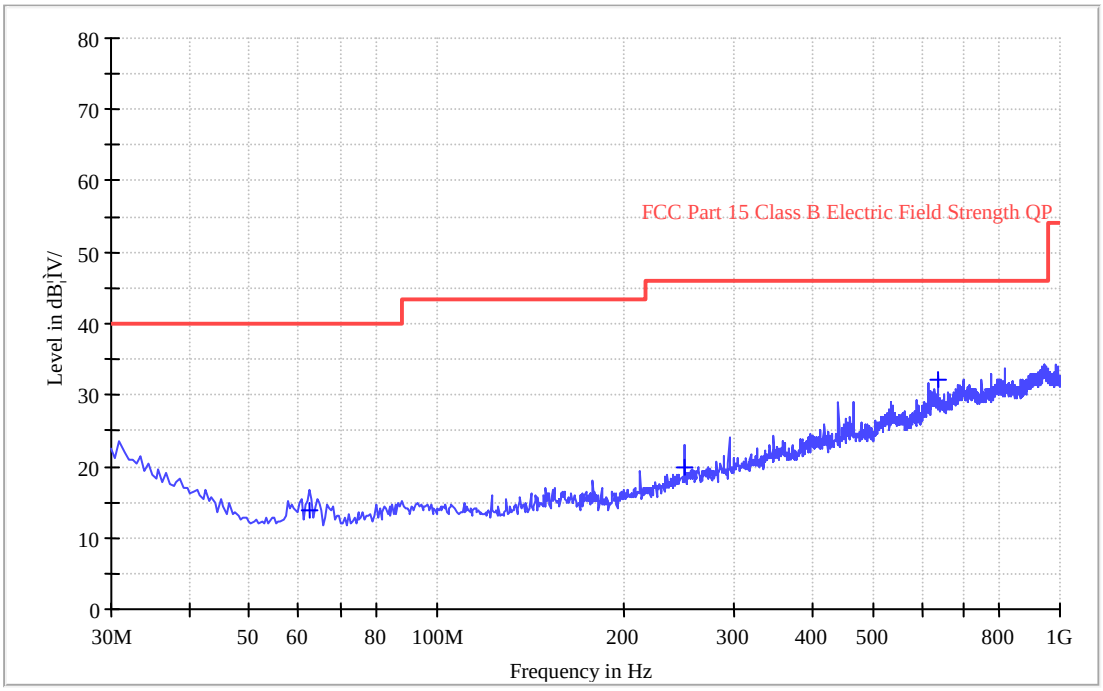
at 4804.000MHz

is passed by 6.0dB margin

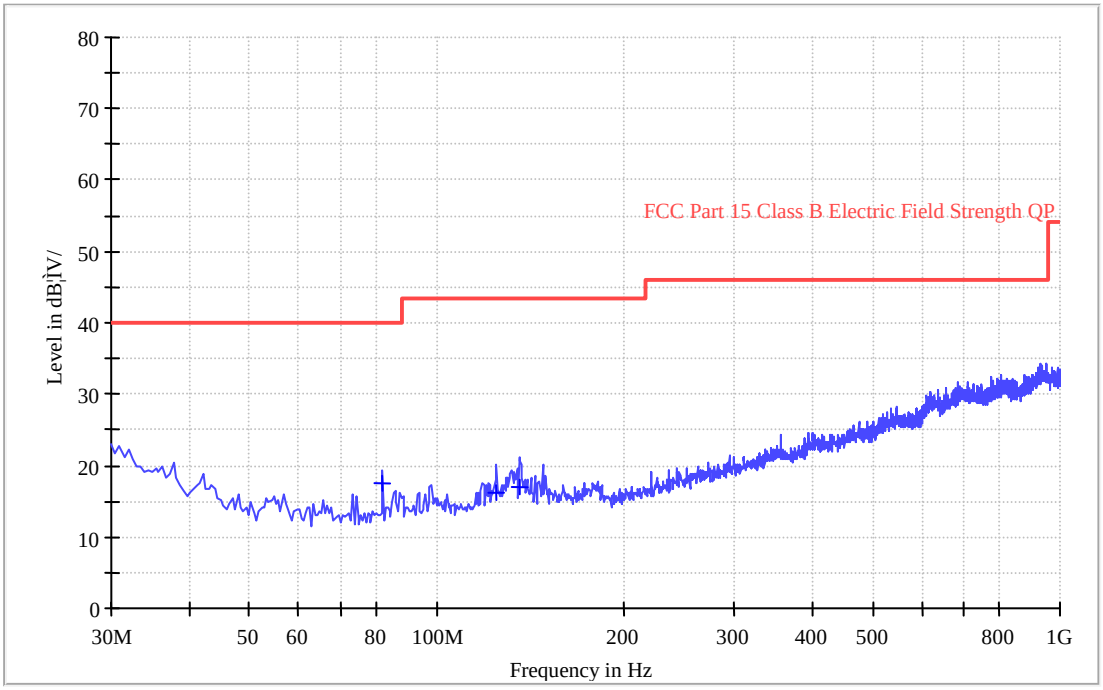
For the electronic filing, the worst case radiated emission configuration photographs are saved with filename: radiated photos.pdf.

Applicant: S&O ELECTRONICS (MALAYSIA) SDN. BHD. Date of Test: April 9, 2016
Model: SA189AW
Worst Case Operating Mode: Transmitting

ANT Polarity: Horizontal



ANT Polarity: Vertical



Applicant: S&O ELECTRONICS (MALAYSIA) SDN. BHD. Date of Test: April 9, 2016
Model: SA189AW
Worst Case Operating Mode: Transmitting with AC/DC Adapter (2402MHz)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	62.495	26.5	20.0	7.4	13.9	40.0	-26.1
Horizontal	249.705	25.8	20.0	14.2	20.0	46.0	-26.0
Horizontal	638.190	28.3	20.0	23.9	32.2	46.0	-13.8
Vertical	81.895	29.0	20.0	8.6	17.6	40.0	-22.4
Vertical	124.575	26.9	20.0	9.3	16.2	43.5	-27.3
Vertical	135.730	27.3	20.0	9.7	17.0	43.5	-26.5

NOTES: 1. Quasi-Peak detector is used except for others stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances 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 harmonic 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. All emissions are below the QP limit.

Applicant: S&O ELECTRONICS (MALAYSIA) SDN. BHD. Date of Test: April 9, 2016
Model: SA189AW
Mode: Transmitting with AC/DC Adapter

Radiated Emissions

(2402MHz)

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)
Vertical	*4804.000	56.1	36.1	35.5	55.5	74.0	-18.5
Vertical	*2389.074	57.2	36.7	28.1	48.6	74.0	-25.4

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)
Vertical	*4804.000	48.7	36.1	35.5	48.1	54.0	-6.0
Vertical	*2389.074	46.2	36.7	28.1	37.6	54.0	-16.4

NOTES: 1. Peak detector is used for the emission measurement (RBW=1MHz, VBW=3MHz for Peak data; RBW=1MHz, VBW=10Hz for Average data).

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: S&O ELECTRONICS (MALAYSIA) SDN. BHD. Date of Test: April 9, 2016
Model: SA189AW
Mode: Transmitting with AC/DC Adapter

Radiated Emissions

(2440MHz)

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)
Vertical	*4880.000	54.9	36.1	35.5	54.3	74.0	-19.7
Vertical	*7320.000	56.4	36.2	36.5	56.7	74.0	-17.3

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)
Vertical	*4880.000	47.0	36.1	35.5	46.4	54.0	-7.6
Vertical	*7320.000	42.8	36.2	36.5	43.1	54.0	-10.9

NOTES: 1. Peak detector is used for the emission measurement (RBW=1MHz, VBW=3MHz for Peak data; RBW=1MHz, VBW=10Hz for Average data).

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: S&O ELECTRONICS (MALAYSIA) SDN. BHD. Date of Test: April 9, 2016
Model: SA189AW
Mode: Transmitting with AC/DC Adapter

Radiated Emissions

(2480MHz)

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)
Vertical	*4960.000	54.7	36.1	35.5	54.1	74.0	-19.9
Vertical	*2484.194	57.5	36.7	28.1	48.9	74.0	-25.1

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)
Vertical	*4960.000	46.9	36.1	35.5	46.3	54.0	-7.7
Vertical	*2484.194	41.5	36.7	28.1	32.9	54.0	-21.1

NOTES: 1. Peak detector is used for the emission measurement (RBW=1MHz, VBW=3MHz for Peak data; RBW=1MHz, VBW=10Hz for Average data).

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.

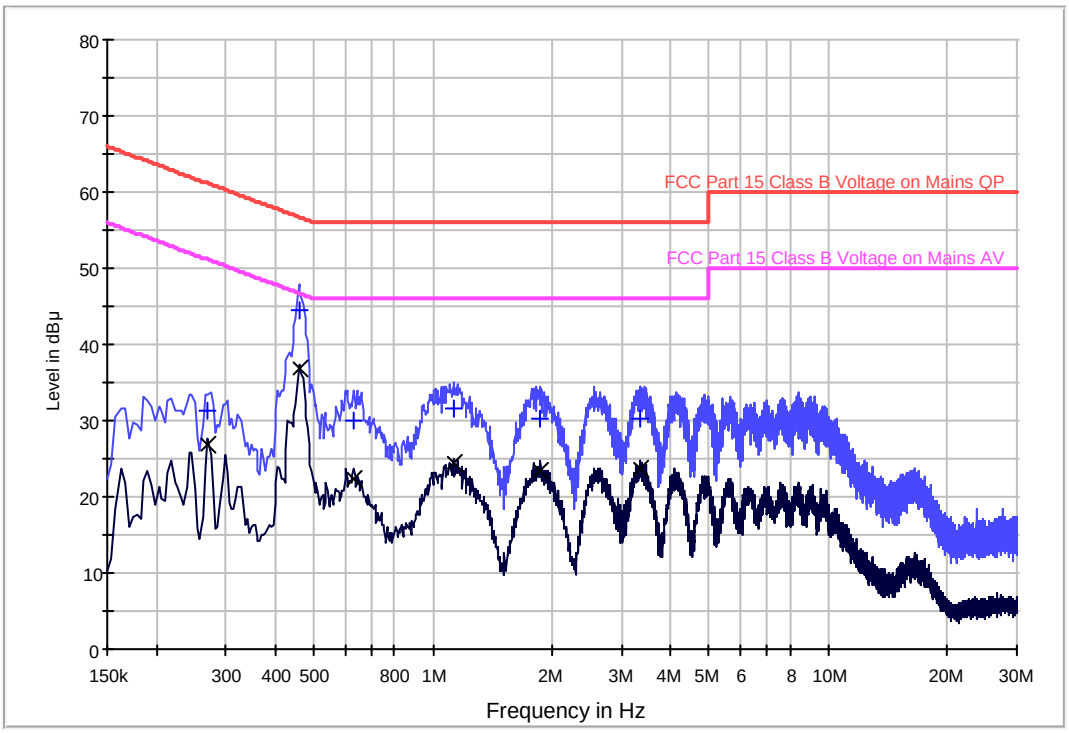
4.9 Conducted Emission

Worst Case Conducted emission at 0.458MHz is Passed by 9.7 dB margin

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

Applicant: S&O ELECTRONICS (MALAYSIA) SDN. BHD. Date of Test: April 9, 2016
Model: SA189AW
Mode: Transmitting with AC/DC Adapter

Conducted Emission Test - FCC



Result Table QP

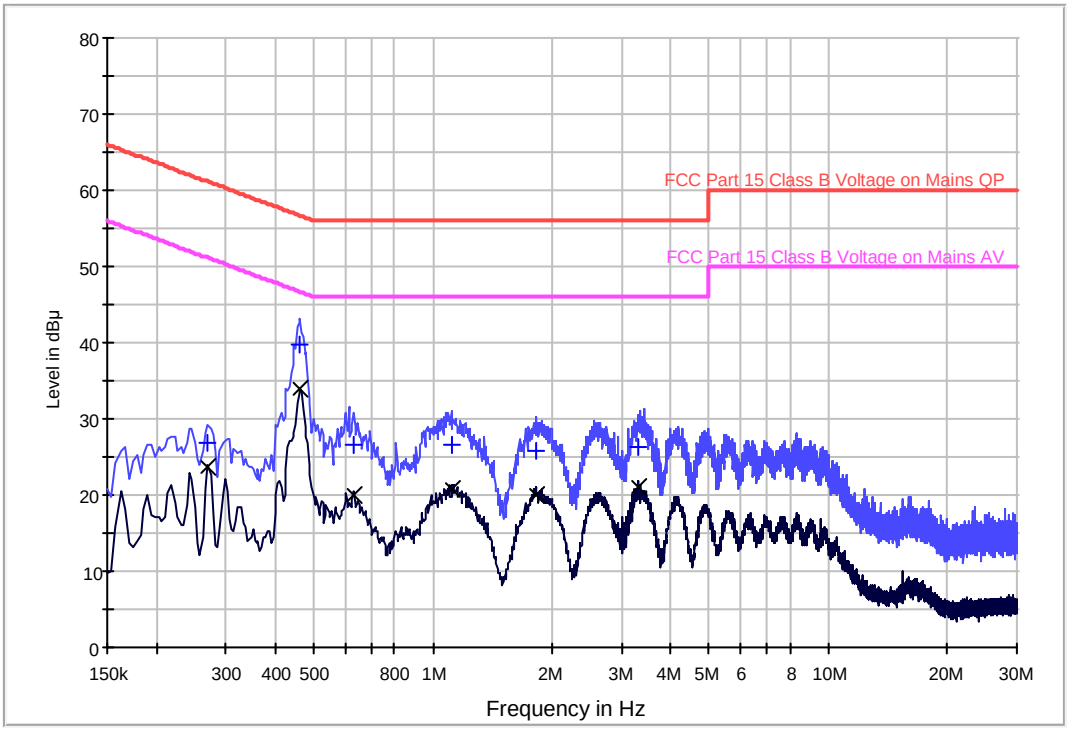
Frequency (MHz)	QuasiPeak (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.270	31.4	L1	9.9	29.7	61.1
0.458	44.4	L1	9.9	12.3	56.7
0.630	29.9	L1	10.0	26.1	56.0
1.126	31.6	L1	9.9	24.4	56.0
1.874	30.4	L1	9.9	25.6	56.0
3.338	30.3	L1	10.0	25.7	56.0

Result Table AV

Frequency (MHz)	Average (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.270	26.8	L1	9.9	24.3	51.1
0.458	37.0	L1	9.9	9.7	46.7
0.630	22.5	L1	10.0	23.5	46.0
1.126	24.4	L1	9.9	21.6	46.0
1.874	23.3	L1	9.9	22.7	46.0
3.338	23.6	L1	10.0	22.4	46.0

Applicant: S&O ELECTRONICS (MALAYSIA) SDN. BHD. Date of Test: April 9, 2016
Model: SA189AW
Mode: Transmitting with AC/DC Adapter

Conducted Emission Test - FCC



Result Table QP

Frequency (MHz)	QuasiPeak (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.270	26.8	N	10.2	34.3	61.1
0.462	39.7	N	10.2	17.0	56.7
0.630	26.6	N	10.3	29.4	56.0
1.110	26.5	N	10.3	29.5	56.0
1.818	25.7	N	10.3	30.3	56.0
3.306	26.3	N	10.3	29.7	56.0

Result Table AV

Frequency (MHz)	Average (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.270	23.6	N	10.2	27.5	51.1
0.462	34.1	N	10.2	12.6	46.7
0.630	20.0	N	10.3	26.0	46.0
1.110	20.7	N	10.3	25.3	46.0
1.818	20.1	N	10.3	26.0	46.0
3.306	21.0	N	10.3	25.0	46.0

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

[x] Not required - No digital part

[ ] Test results are attached

[ ] Included in the separated report.

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.

EXHIBIT 5

EQUIPMENT PHOTOGRAPHS

5.0 Equipment Photographs

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

EXHIBIT 6

PRODUCT LABELLING

6.0 **Product Labelling**

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

EXHIBIT 7

TECHNICAL SPECIFICATIONS

7.0 Technical Specifications

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

EXHIBIT 8

INSTRUCTION MANUAL

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.

EXHIBIT 9

CONFIDENTIALITY REQUEST

9.0 Confidentiality Request

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

EXHIBIT 10

MISCELLANEOUS INFORMATION

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.

EXHIBIT 11

TEST EQUIPMENT LIST

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	20-May-2015	20-May-2016
SZ182-02-01	Power Sensor	Anritsu	MA2411B	1207429	20-May-2015	20-May-2016
SZ061-12	BiConiLog Antenna	ETS	3142E	00166158	15-Sep-2015	15-Sep-2016
SZ185-01	EMI Receiver	R&S	ESCI	100547	23-Jan-2016	23-Jan-2017
SZ061-08	Horn Antenna	ETS	3115	00092346	17-Oct-2015	17-Oct-2016
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	217	29-Apr-2015	29-Apr-2016
SZ056-03	Spectrum Analyzer	R&S	FSP 30	101148	8-Jun-2015	8-Jun-2016
EM031-03	Spectrum Analyzer	R&S	FSV 40	101506	6-Jun-2015	6-Jun-2016
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	23-Jan-2016	23-Jan-2017
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	19-Apr-2014	19-Apr-2016
SZ062-02	RF Cable	RADIALL	RG 213U	--	30-Dec-2015	30-Jun-2016
SZ062-05	RF Cable	RADIALL	0.04-26.5GHz	--	6-Apr-2016	6-Oct-2016
SZ062-12	RF Cable	RADIALL	0.04-26.5GHz	--	6-Apr-2016	6-Oct-2016
SZ067-04	Notch Filter	Micro-Tronics	BRM50702-02	--	20-May-2015	20-May-2016
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	3-Nov-2015	3-Nov-2016
SZ187-01	Two-Line V-Network	R&S	ENV216	100072	3-Nov-2015	3-Nov-2016
SZ187-02	Two-Line V-Network	R&S	ENV216	100073	24-Jun-2015	24-Jun-2016
SZ188-03	Shielding Room	ETS	RFD-100	4100	23-Aug-2014	23-Aug-2016