RF Test Report

Report No.:	FCC_IC_RF_SL21102901-SMT-001_2.4G Rev.2
Product:	Outpost
Test Model no.:	81043
Series Model:	N/A
Product Description:	Outpost
HVIN/Model no.:	81043
FCC ID:	2A4D081043
IC ID:	28183-81043
Received Date:	11/04/221
Test Date:	11/04/2021-12/16/2021 & 03/21/2022 – 03/22/2022 & 04/05/2022
Issued Date:	04/08/2022
Applicant:	SportsMEDIA Technology Corporation, d/b/a SMT
Address:	3511 University Drive, Durham, NC 27707, USA
Manufacturer:	BriteLab Inc
Address:	6341 San Ignacio Ave. San Jose, CA 95119
Issued By:	Bureau Veritas Consumer Products Services, Inc.
Lab Address:	775 Montague Expressway, Milpitas, CA 95035
Test Location:	775 Montague Expressway, Milpitas, CA 95035
FCC Registration / Designation Number:	540430
ISED# / CAB identifier:	4842D

TESTING CERT # 2742-01

Table of Contents

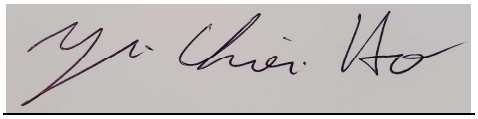
Release Control Record

Issue No.	Description	Date Issued
FCC_IC_RF_SL21102901-SMT-001_ 2.4G	Orignal Release	01/03/2022
FCC_IC_RF_SL21102901-SMT-001_ 2.4G Rev.1	Updated Product information operating frequency	02/16/2022
FCC_IC_RF_SL21102901-SMT-001_ 2.4G Rev.2	Updated RF Conducted measurements.	04/08/2022

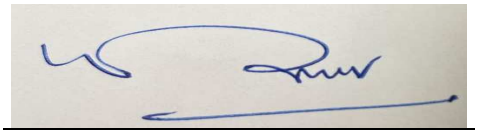
1 Certificate of Conformity

Product:	Outpost
Brand:	SMT
Test Model no.:	81043
Series Model:	N/A
Sample Status:	Production
Applicant:	SportsMEDIA Technology Corporation, d/b/a SMT
Test Date:	11/04/2021-12/16/2021 & 03/21/2022 – 03/22/2022 & 04/05/2022
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.247) RSS 247 Issue 2, February 2017 ANSI C63.10: 2013 RSS Gen Issue 5, April 2018 KDB 558074 D01 15.247 Meas Guidance v05r02

The above equipment has been tested by **Bureau Veritas Consumer Products Services, Inc., Milpitas Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by :  , **Date:** 04/08/2022

Yu-Chien Ho / Test Engineer

Approved by :  , **Date:** 04/08/2022

Suresh Kondapalli / Engineer Reviewer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247) RSS 247 Issue2, RSS Gen Issue5			
Standard	Test Item	Result	Remarks
15.207 RSS Gen 8.8	AC Power Conducted Emission	Pass	Meet the requirement of limit.
15.205 &15.209 & 15.247(d) RSS 247 5.5	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit.
15.247(a)(2) RSS 247 5.2 RSS Gen 6.7	6dB bandwidth & 99% bandwidth	Pass	Meet the requirement of limit.
15.247(b) / RSS 247 5.4.d	Maximum Peak Output Power	Pass	Meet the requirement of limit.
15.247(e) / RSS 247 5.2.b	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	The antenna is installed professionally installed.

Note: N/A: EUT worked with battery.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	3.51dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	3.73dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	4.64dB
	6GHz ~ 18GHz	4.82dB
	18GHz ~ 40GHz	4.91dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Outpost
Brand	SMT
Test Model no.	81043
Identification No. of EUT	1
Series Model	N/A
Status of EUT	Production
Power Supply Rating	120V/60Hz
Modulation Type	OQPSK
Modulation Technology	DSSS
Transfer Rate	0.25
Operating Frequency	2.405 ~ 2.480GHz
Number of Channel	16 Channels
Antenna Type	Patch
Antenna Gain (dBi)	8
Antenna Connector	Internal to device.

Note:

1. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

16 channels are provided for 2.4 GHz zigbee Channels:

Channel	Frequency	Channel	Frequency
11	2405 MHz	19	2445MHz
12	2410 MHz	20	2450MHz
13	2415 MHz	21	2455MHz
14	2420 MHz	22	2460MHz
15	2425 MHz	23	2465MHz
zigbee 16	2430 MHz	zigbee 24	2470 MHz
17	2435 MHz	25	2475 MHz
18	2440 MHz	26	2480 MHz

Power setting is as below:

Channel	Power Setting (dBm)	Channel	Power Setting (dBm)
11	20	19	20
12	20	20	20
13	20	21	20
14	20	22	20
15	20	23	20
zigbee 16	20	zigbee 24	20
17	20	25	20
18	20	26	20

3.2.1 EUT Operation Mode

Normal operation for this EUT is

3.2.2 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

Where RE≥1G: Radiated Emission above 1GHz & Bandedge Measurement

RE<1G: Radiated Emission below 1GHz

PLC: Power Line Conducted Emission

APCM: Antenna Port Conducted Measurement

NOTE: As the manufacturer stated the antenna is install on the ceiling of an ice hocky rink only in one orientation, antenna element facing down on the ice hocky rink. The worst-case position is how the antenna will be installed.

NOTE: "-" means no effect.

Radiated Emission Test (Above 1GHz):

☐ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	2.4 GHz zigbee	11 to 26	11, 18, 26	DSSS	OQPSK	0.25

Radiated Emission Test (Below 1GHz):

☐ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	2.4 GHz zigbee	11 to 26	18	DSSS	OQPSK	0.25

Power Line Conducted Emission Test:

☐ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	2.4 GHz zigbee	11 to 26	11, 18, 26	DSSS	OQPSK	0.25

Antenna Port Conducted Measurement:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

☐ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	2.4 GHz zigbee	11 to 26	11, 18, 26	DSSS	OQPSK	0.25

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	25° C, 65%RH	120V/60Hz	Yu-Chien Ho
RE<1G	25° C, 65%RH	120V/60Hz	Yu-Chien Ho
PLC	25° C, 68%RH	120V/60Hz	Yu-Chien Ho
APCM	25° C, 60%RH	120V/60Hz	Yu-Chien Ho

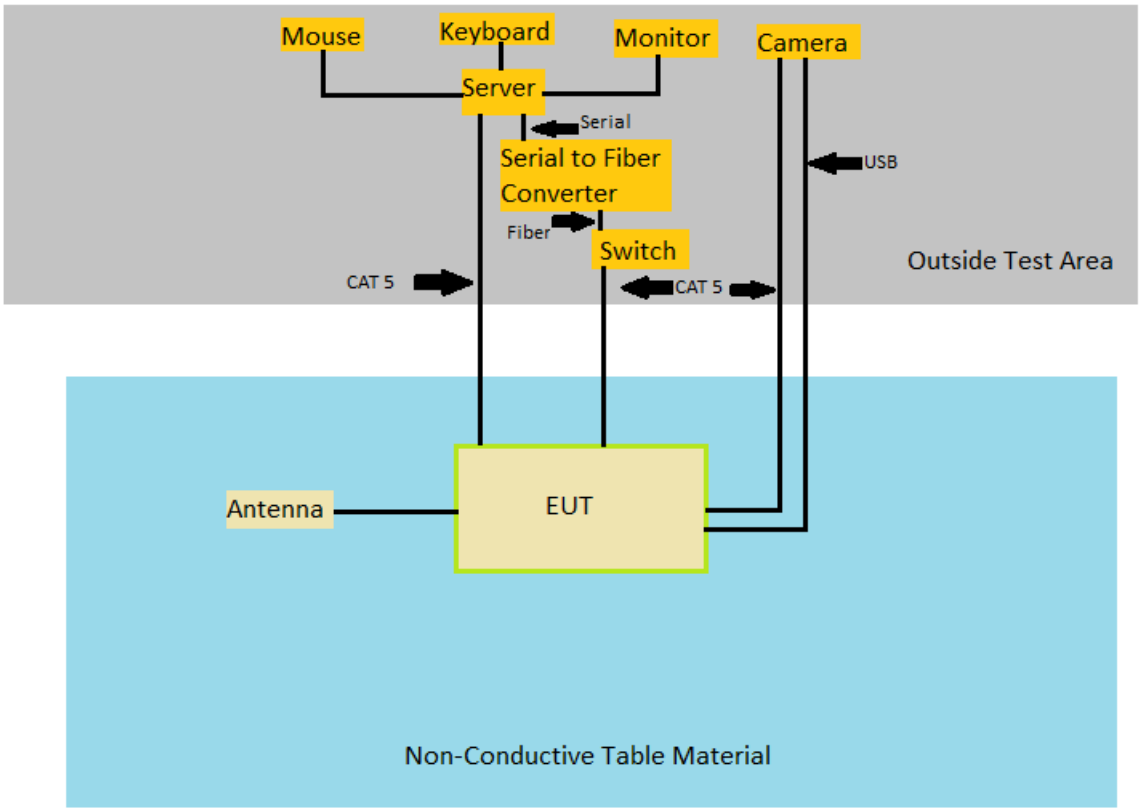
3.3 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	EUT	SMT	Outpost	F002148	N/A	
B.	Server	Supermicro	815-5	S263776X0107881	N/A	
C.	Switch	N/A	N/A	N/A	N/A	
D.	Serial to Fiber Converter	SerialComm	SER-FIBER-SM-ST	YA1126000220	N/A	
E.	Antenna	-	-	-		
F.	Camera	Mako	G-030B	-	N/A	
G.	Monitor	Dell	U2415b	CN-0CFV9N-QDC00-986-2FR3-A13	N/A	
H.	Keyboard	Logitech	K120	15Z4SC501EP8	N/A	
I.	Mouse	Logitech	M-B296C		N/A	

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	CAT 5	3	15	No	0	
2.	USB	1	15	Yes	0	
3.	Serial	1	1	No	0	
4.	Fiber	1	1	No	0	

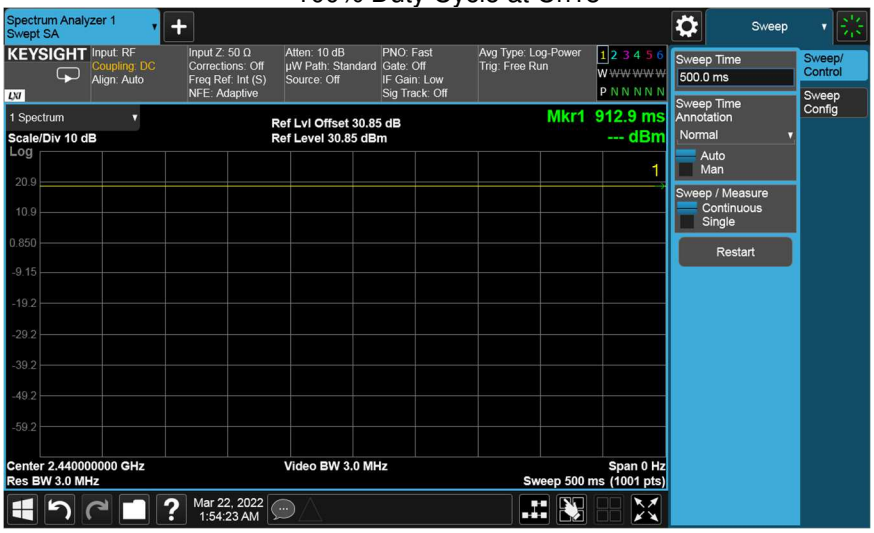
3.3.1 EUT Setup Diagram



3.3.2 Duty Cycle of Test Signal

Duty cycle of test signal is ⩾ 98 %, duty factor is not required.

100% Duty Cycle at Ch18



3.4 EUT Operating Condition

For RF Condcuted Measurements and for Radiated Emissions:
a. Connected the EUT with the laptop vis USB dongle.
b. Controlling software has been activated to set the EUT on specific status.

3.4.1 Description of EUT Normal Operation

EUT normal operation is IrTrackCentral program active on the server and antenna transmitting. Camera is actively attempting to track the puck movement. (For testing purpose, tracking a puck was not possible.)

3.5 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

47 CFR FCC Part 15, Subpart C (Section 15.247)
RSS-247 Issue 2, February 2017
ANSI C63.10: 2013
RSS-Gen Issue 5, February 2021
558074 D01 15.247 Meas Guidance v05r02

All test items have been performed and recorded as per the above standards.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Spectrum Analyzer KEYSIGHT	N9030B	MY57140374	09/22/2021	09/22/2022
Horn Antenna ETS-Lindgren	3117	214309	04/21/2021	04/21/2023
Pre-Amplifier RF-Lambda	RAMP00M50GA	18040300055	05/07/2021	05/07/2022
EMI Test Receiver Rohde & Schwarz	ESIB 40	100179	1/29/2021	1/29/2022
Transient Limiter Electro-Metrics	EM-7600-5	106	12/31/2020	12/31/2021
LISN ETS-Lindgren	3816/2NM	214372	1/29/2021	1/29/2022
Loop Antenna	N/A	00049120	11/25/2020	11/25/2021
Biconilog Antenna Sunol	JB6	A111717	9/4/2020	9/4/2022
SMA Fixed Attenuator (50ohm, 2w, 30dB, DC-6GHz)	VAT-03W2+	n/a	07/21/2021	07/21/2022
FSB Antenna Cable, 0.5m (Microwave Town)	FSB360PK-KMKM-00.50M	201906110002	10/1/2021	10/1/2022
FSB Antenna Cable, 4m (Microwave Town)	FSB360PK-KMKM-400M	202103270001	10/1/2021	10/1/2022
10m Semi-Anechoic Chamber (ETS-Lindgren)	S2010BL8X8	1462	07/21/2020	07/21/2022

4.1.3 Test Procedures

For Radiated emission below 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz at frequency below 30MHz.

For Radiated emission above 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

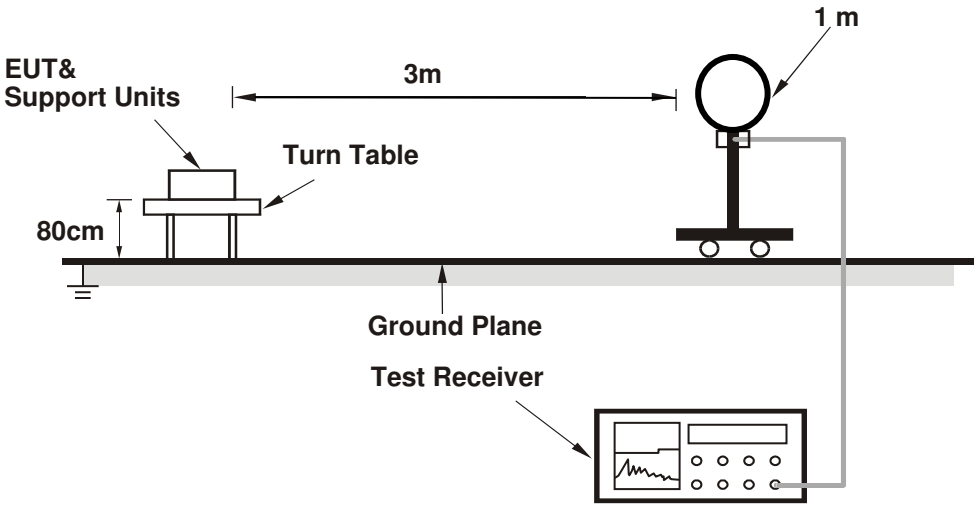
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

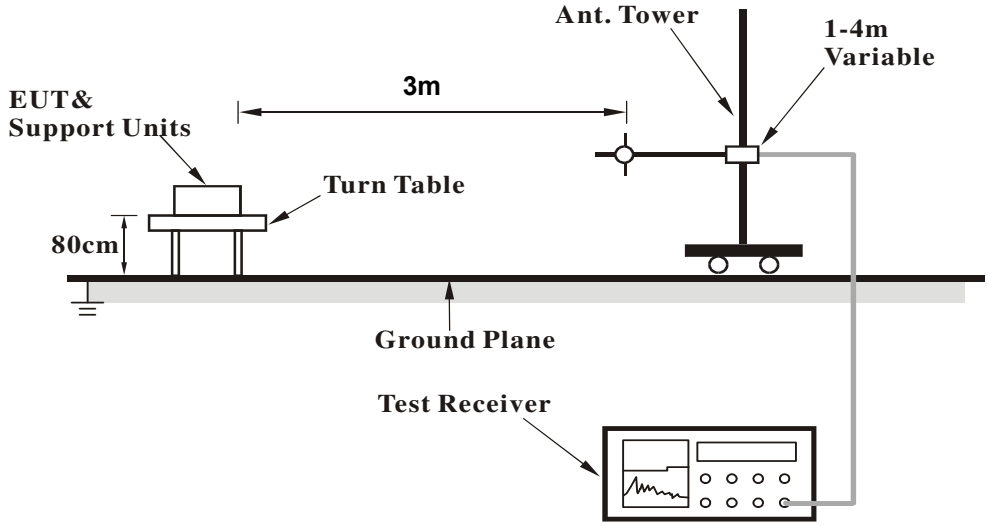
No deviation.

4.1.5 Test Setup

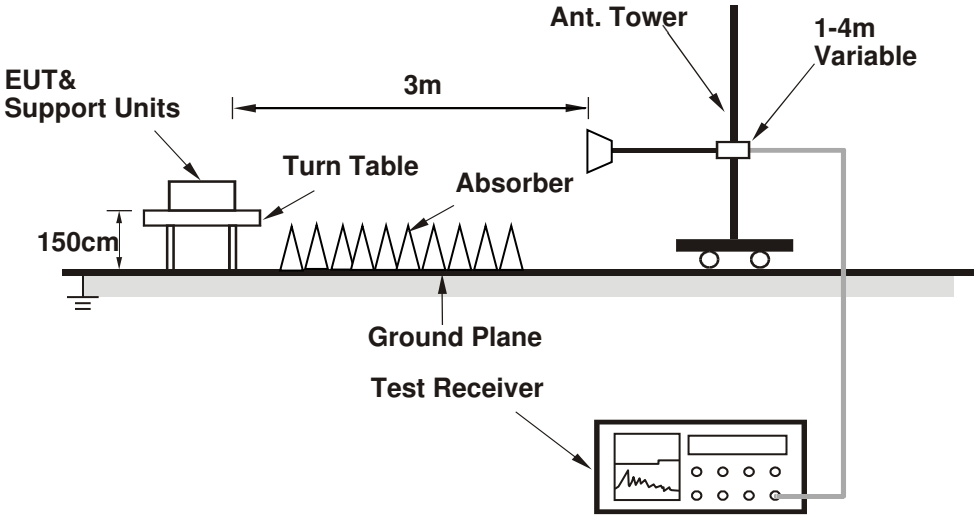
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Conditions

a. Connected the EUT with the Notebook Computer which is placed on remote site.
b. Controlling software has been activated to set the EUT on specific status.

4.1.7 Test Results

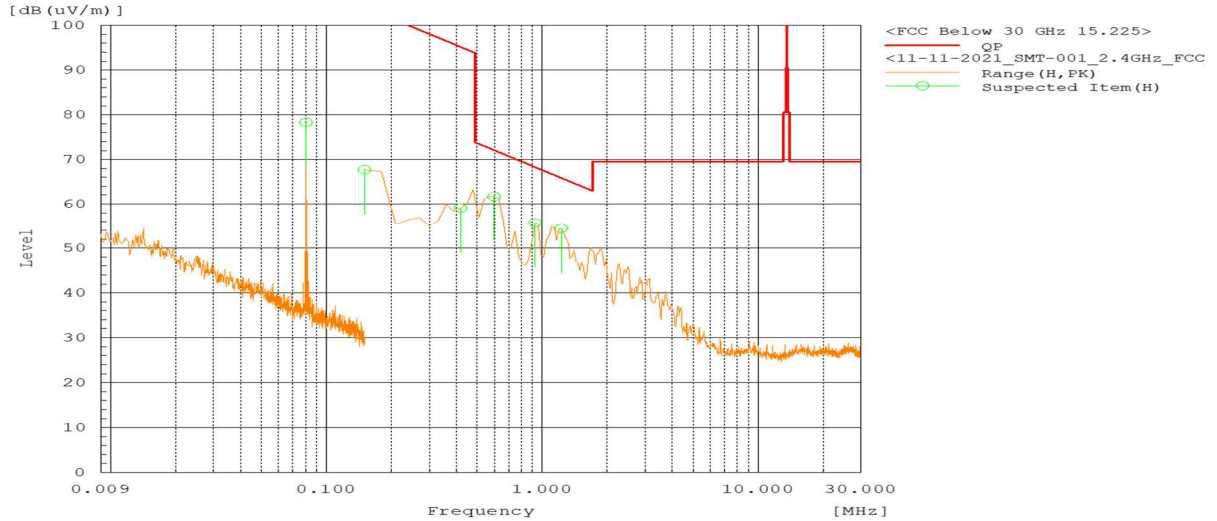
Below 30MHz Data:

CHANNEL	2.4 GHz zigbee Ch 18	**DETECTOR FUNCTION**	Quasi Peak
FREQUENCY RANGE	9KHz-30MHz		
Test Mode	Normal Operation, all accessories exercised and tracking puck.		

Antenna Polarity & Test Distance: 0 Degree at 3m										
No.	Frequency (MHz)	Degree (0/90)	Reading QP [dB(uV)]	Factor [dB(1/m)]	Level QP [dB(uV/m)]	Limit\QP dB(uV/m)	Margin QP [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	15.075	0	-22	35.3	13.3	69.5	-56.2	100	139	Pass
2	0.15	0	-5.4	61.3	55.9	104.1	-48.2	100	92	Pass
3	0.419	0	-2.1	53.2	51.1	95.2	-44.1	100	85.9	Pass
4	0.598	0	5.4	50.2	55.6	72.1	-16.5	100	61.3	Pass
5	0.926	0	-3.7	46.8	43.1	68.3	-25.2	100	101.4	Pass
6	1.225	0	5.4	44.8	50.2	65.8	-15.6	100	112.5	Pass

REMARKS:

1. Emission level (dBuV/m) = Reading Value (dBuV) + Factor (dB)
2. AF (dB/m) = Antenna Factor (dB/m) – Preamplifier Gain (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.

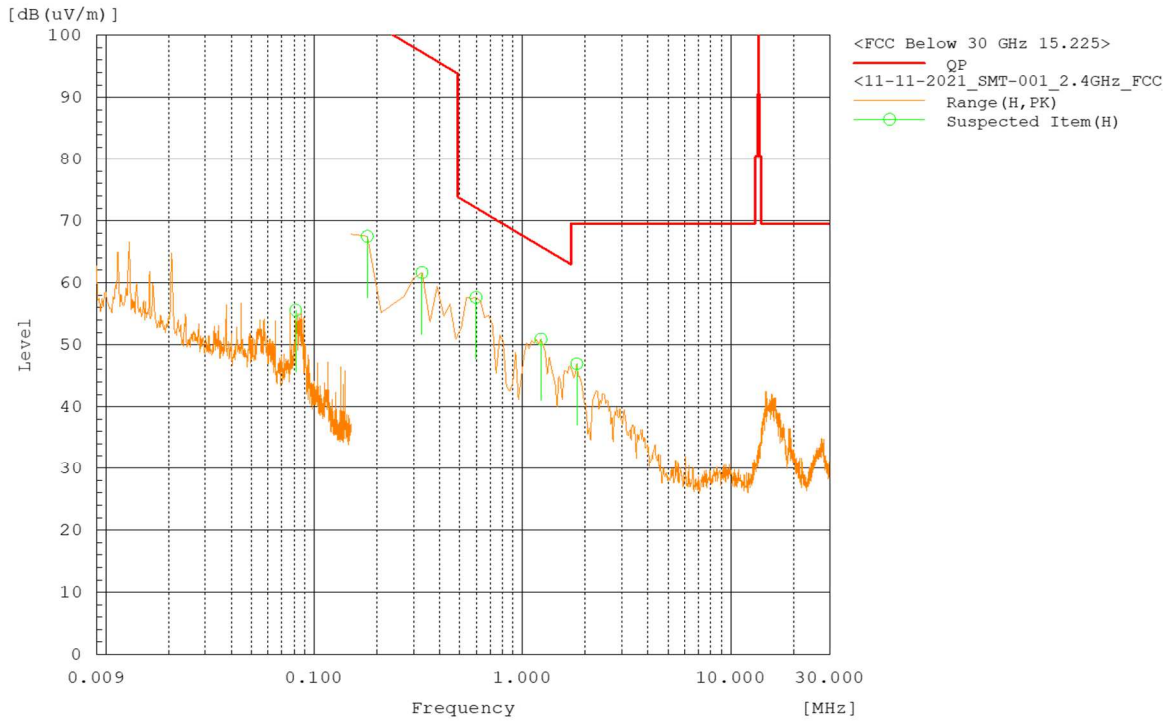


CHANNEL	2.4 GHz zigbee Ch 18	**DETECTOR FUNCTION**	Quasi Peak
FREQUENCY RANGE	9KHz-30MHz		
Test Mode	Normal Operation, all accessories exercised and tracking puck.		

Antenna Polarity & Test Distance: 90 Degree at 3m										
No.	Frequency (MHz)	Degree (0/90)	Reading QP [dB(uV)]	Factor [dB(1/m)]	Level QP [dB(uV/m)]	Limit\QP dB(uV/m)	Margin QP [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	15.075	90	-0.3	35.3	35	69.5	-34.5	100	92.3	Pass
2	0.18	90	4	60.1	64.1	102.5	-38.4	100	102.9	Pass
3	0.329	90	-7.3	55.1	47.8	97.3	-49.5	100	0	Pass
4	0.598	90	0.3	50.2	50.5	72.1	-21.6	100	0	Pass
5	1.225	90	2.4	44.8	47.2	65.8	-18.6	100	8.3	Pass
6	1.822	90	-0.5	42	41.5	69.5	-28	100	337.2	Pass

REMARKS:

1. Emission level (dBuV/m) = Reading Value (dBuV) + Factor (dB)
2. AF (dB/m) = Antenna Factor (dB/m) – Preamplifier Gain (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.



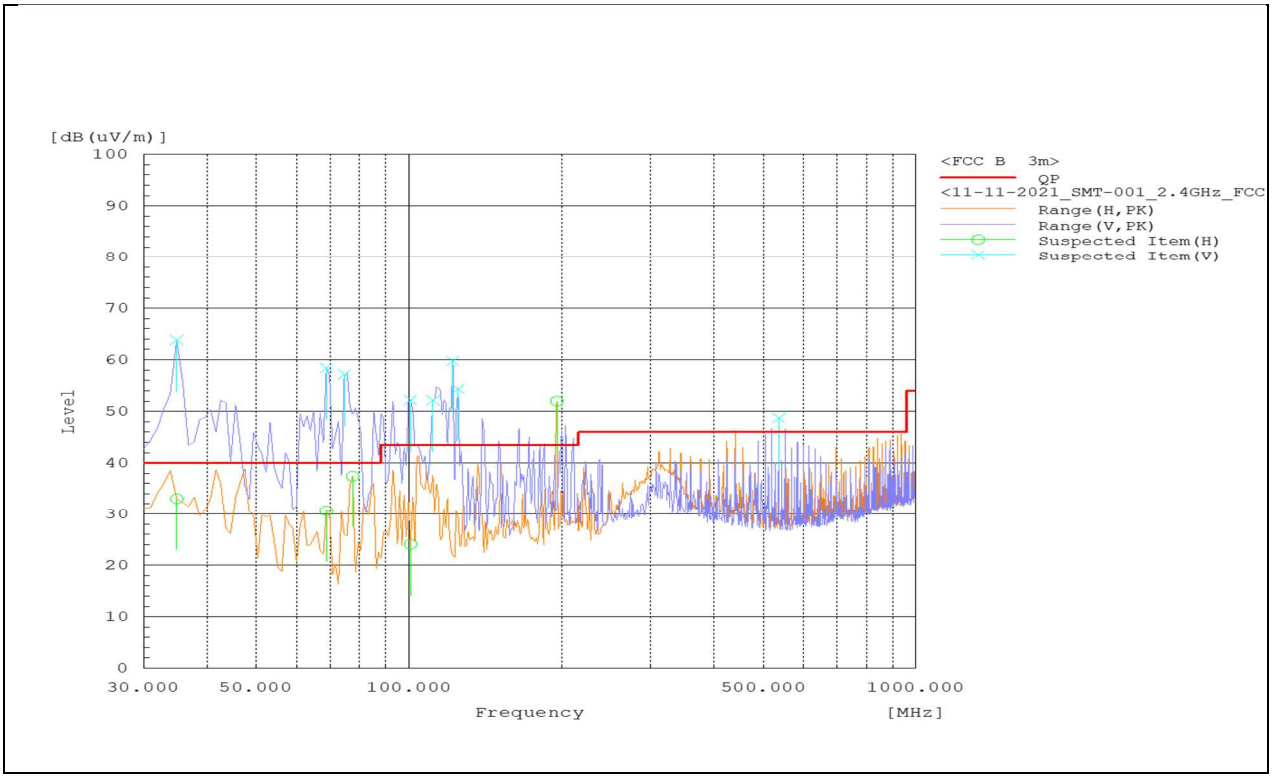
Below 1GHz Data:

CHANNEL	2.4 GHz zigbee Ch 11	**DETECTOR FUNCTION**	Quasi Peak
FREQUENCY RANGE	30MHz – 1GHz		
Test Mode	Normal Operation, all accessories exercised and tracking puck.		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m										
No.	Frequency (MHz)	Polarization (H/V)	Reading QP [dB(uV)]	Factor [dB(1/m)]	Level QP [dB(uV/m)]	Limit\QP dB(uV/m)	Margin QP [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	34.429	V	6.5	22.4	28.9	40	-11.1	247	14.7	Pass
2	34.448	V	6.2	22.3	28.5	40	-11.5	323	0.1	Pass
3	34.477	V	-3.9	22.3	18.4	40	-21.6	324	3.4	Pass
4	34.844	V	-2.4	22	19.6	40	-20.4	172	276.8	Pass
5	34.943	H	2.2	23.4	25.6	40	-14.4	374	183.3	Pass
6	68.893	V	-4.1	13.1	9	40	-31	248	57.4	Pass
7	69.26	H	-4.4	13.4	9	40	-31	280	46.6	Pass
8	74.122	V	1.7	12.8	14.5	40	-25.5	391	65	Pass
9	78.03	H	3.5	13.3	16.8	40	-23.2	333	44	Pass
10	122.215	V	0.2	19.5	19.7	43.5	-23.8	248	75	Pass
11	124.686	V	-4.2	19.6	15.4	43.5	-28.1	399	106	Pass
12	535.987	V	7.3	25.4	32.7	46	-13.3	229	132.8	Pass

REMARKS:

1. Emission level (dBuV/m) = Reading Value (dBuV) + Factor (dB)
2. AF (dB/m) = Antenna Factor (dB/m) – Preamplifier Gain (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.

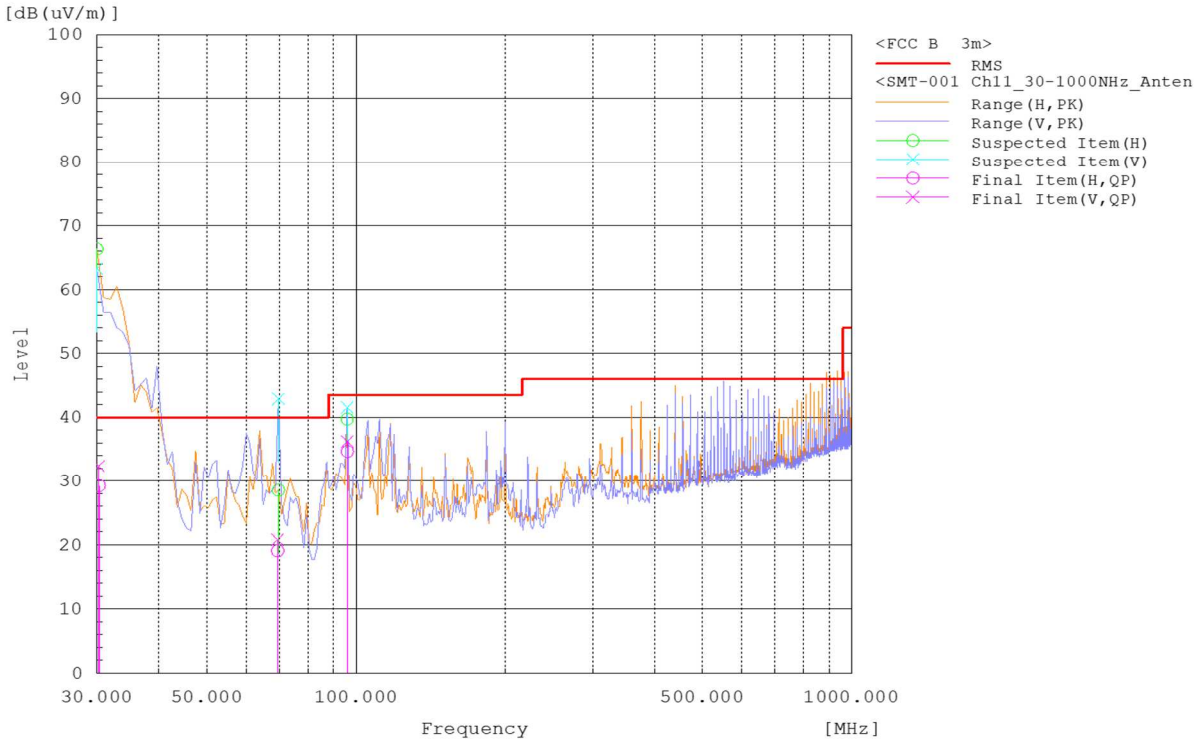

[dB(uV/m)]
100
90
80
70
60
50
40
30
20
10
0
Level
30.000
50.000
100.000
500.000
1000.000
Frequency
[MHz]
<FCC B 3m>
QP
<11-11-2021_SMT-001_2.4GHz_FCC
Range(H,PK)
Range(V,PK)
Suspected Item(H)
Suspected Item(V)

CHANNEL	2.4 GHz zigbee Ch 11	**DETECTOR FUNCTION**	Quasi Peak
FREQUENCY RANGE	30MHz – 1GHz		
Test Mode	Normal Operation, all accessories exercised and tracking puck.		
EUT antenna facing forward.			

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m										
No.	Frequency (MHz)	Polarization (H/V)	Reading QP [dB(uV)]	Factor [dB(1/m)]	Level QP [dB(uV/m)]	Limit\QP dB(uV/m)	Margin QP [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	30.263	V	7.1	25.3	32.4	40	-7.6	162	93.8	Pass
2	30.342	H	2.7	26.6	29.3	40	-10.7	205.3	74.5	Pass
3	69.343	V	7.7	13.1	20.8	40	-19.2	265.4	354	Pass
4	69.47	H	5.7	13.4	19.1	40	-20.9	388.6	120.7	Pass
5	95.996	V	20.6	15.6	36.2	43.5	-7.3	260.2	38.8	Pass
6	96.003	H	20	14.7	34.7	43.5	-8.8	259.3	39	Pass

REMARKS:

1. Emission level (dBuV/m) = Reading Value (dBuV) + Factor (dB)
2. AF (dB/m) = Antenna Factor (dB/m) – Preamplifier Gain (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.



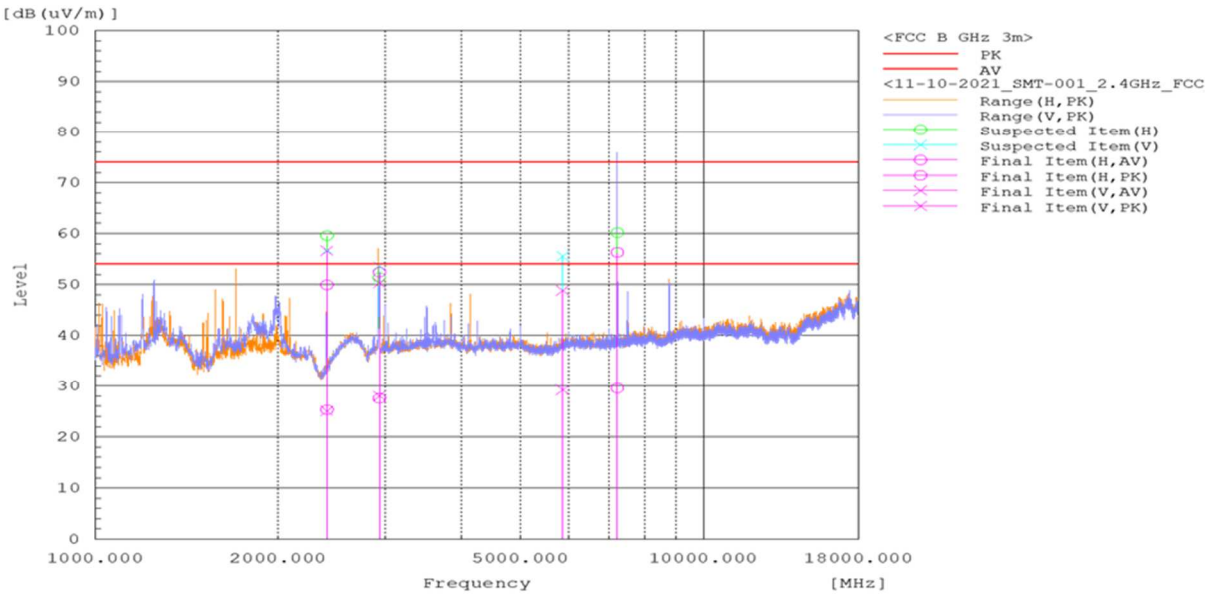
Above 1GHz Test Data:

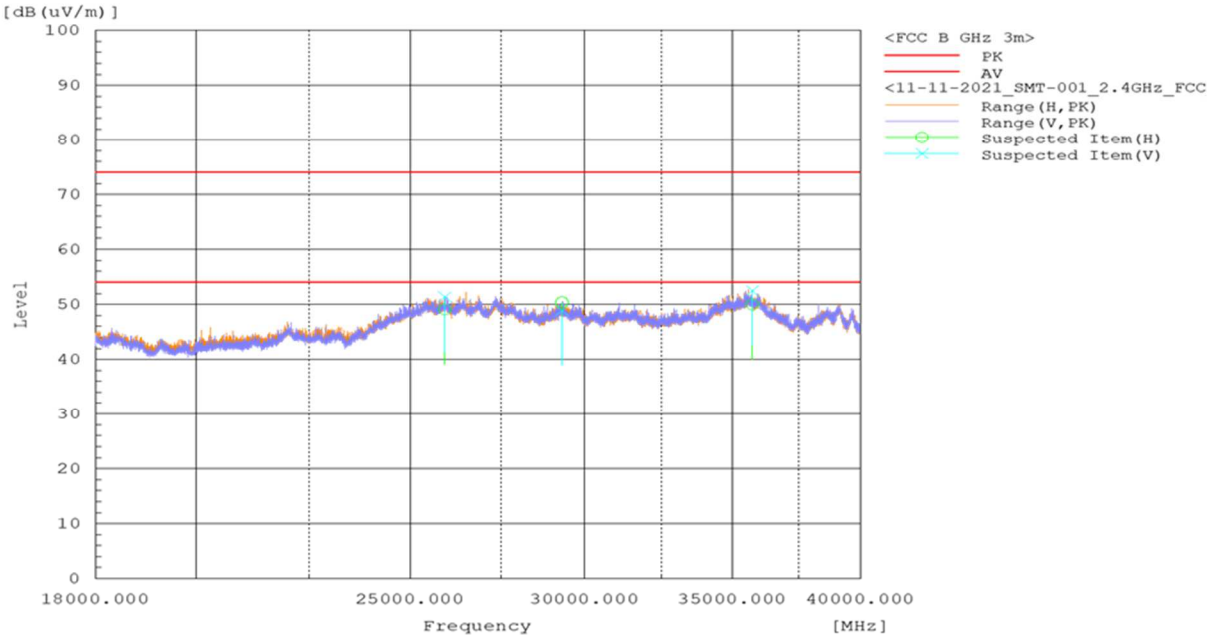
CHANNEL	2.4 GHz zigbee Ch 11	**DETECTOR FUNCTION**	Peak / Average
FREQUENCY RANGE	1 GHz – 40 GHz		
Test Mode	Normal Operation, all accessories exercised and tracking puck.		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	**Frequency (MHz)**	**Polarization (H/V)**	**Reading AV [dB(uV)]**	**Reading PK [dB(uV)]**	**Factor [dB(1/m)]**	**Level AV [dB(uV/m)]**	**Level PK dB(uV/m)**	**Limit AV dB(uV/m)**	**Limit PK [dB(uV/m)**	**Margin AV [dB]**	**Margin PK [dB]**	**Height (cm)**	**Angle (Deg)**	**Pass / Fail**
1	2404.701	H	36.9	61.5	-11.6	25.3	49.9	54	74	-28.7	24.1	399	255.9	Pass
2	2404.833	V	36.7	68.2	-11.6	25.1	56.6	54	74	-28.9	17.4	132	12	Pass
3	2932.12	V	38.3	60.6	-10.3	28	50.3	54	74	-26	23.7	283	280.5	Pass
4	2932.504	H	37.9	62.7	-10.3	27.6	52.4	54	74	-26.4	21.6	352	0	Pass
5	5866.397	V	33	52.6	-3.8	29.2	48.8	54	74	-24.8	25.2	100	251	Pass
6	7213.518	H	30.3	57.1	-0.8	29.5	56.3	54	74	-24.5	17.7	268	86	Pass
7	25924.826	V	21.6	32.9	18.6	40.2	51.5	54	74	-13.8	22.5	139	102.3	Pass
8	25924.432	H	21.3	32.8	18.6	39.9	51.4	54	74	-14.1	22.6	253	197.1	Pass
9	29297.638	H	18.9	32	19.6	38.5	51.6	54	74	-15.5	22.4	284	348	Pass
10	29296.418	V	20.6	31.3	19.6	40.2	50.9	54	74	-13.8	23.1	103	358.4	Pass
11	35739.752	V	22.4	34.3	17.6	40	51.9	54	74	-14	22.1	284	72.5	Pass
12	35737.616	H	22.9	34.6	17.6	40.5	52.2	54	74	-13.5	21.8	360	344	Pass

REMARKS:

1. Emission level (dBuV/m) = Reading Value (dBuV) + Factor (dB)
2. AF (dB/m) = Antenna Factor (dB/m) – Preamplifier Gain (dB).
3. Margin value = Emission level – Limit value.

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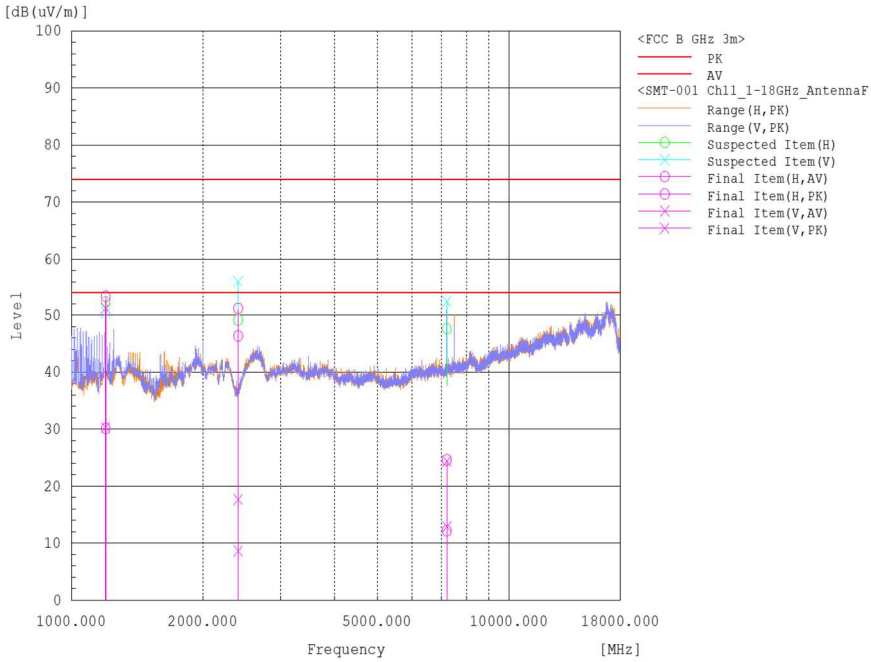
Range(V,PK)
Suspected Item(H)
Suspected Item(V)

CHANNEL	2.4 GHz zigbee Ch 11	**DETECTOR FUNCTION**	Peak / Average
FREQUENCY RANGE	1GHz – 40GHz		
Test Mode	Normal Operation, all accessories exercised and tracking puck.		
EUT antenna facing forward.			

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	**Frequency (MHz)**	**Polarization (H/V)**	**Reading AV [dB(uV)]**	**Reading PK [dB(uV)]**	**Factor [dB(1/m)]**	**Level AV [dB(uV/m)]**	**Level PK dB(uV/m)**	**Limit AV dB(uV/m)**	**Limit PK [dB(uV/m)**	**Margin AV [dB]**	**Margin PK [dB]**	**Height (cm)**	**Angle (Deg)**	**Pass/ Fail**
1	1196.702	V	47.8	68.7	-17.5	30.3	51.2	54	74	-23.7	-22.8	400	116.8	Pass
2	1197.968	H	47.6	70.8	-17.5	30.1	53.3	54	74	-23.9	2-0.7	242.7	263.4	Pass
3	2404.7	H	59.6	64.4	-13.2	46.4	51.2	54	74	-7.6	-22.8	396.1	243.8	Pass
4	2404.964	V	21.9	30.9	-13.2	8.7	17.7	54	74	-45.3	5-6.3	297.2	1.5	Pass
5	7214.252	V	19.3	30.8	-6.4	12.9	24.4	54	74	-41.1	4-9.6	114.9	307.8	Pass
6	7214.687	H	18.6	31	-6.4	12.2	24.6	54	74	-41.8	-49.4	100	202.3	Pass
7	19043.01	H	31.4	42.5	3.9	35.3	46.4	54	74	-18.7	-27.6	159.1	0.8	Pass
8	19042.37	V	30.1	43.1	3.9	34	47	54	74	-20	-27	329.8	356.8	Pass
9	30996.95	V	31.7	42.9	-4.9	26.8	38	54	74	-27.2	-36	246.7	208	Pass
10	30996.24	H	31.3	42.6	-4.9	26.4	37.7	54	74	-27.6	-36.3	245.3	33.7	Pass
11	35987.26	H	30	41.9	-7.6	22.4	34.3	54	74	-31.6	-39.7	203.1	274.7	Pass
12	35988.42	V	29.9	42.1	-7.6	22.3	34.5	54	74	-31.7	-39.5	212.9	65.1	Pass

REMARKS:

1. Emission level (dBuV/m) = Reading Value (dBuV) + Factor (dB)
2. AF (dB/m) = Antenna Factor (dB/m) – Preamplifier Gain (dB).
3. Margin value = Emission level – Limit value.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Range(V,PK)
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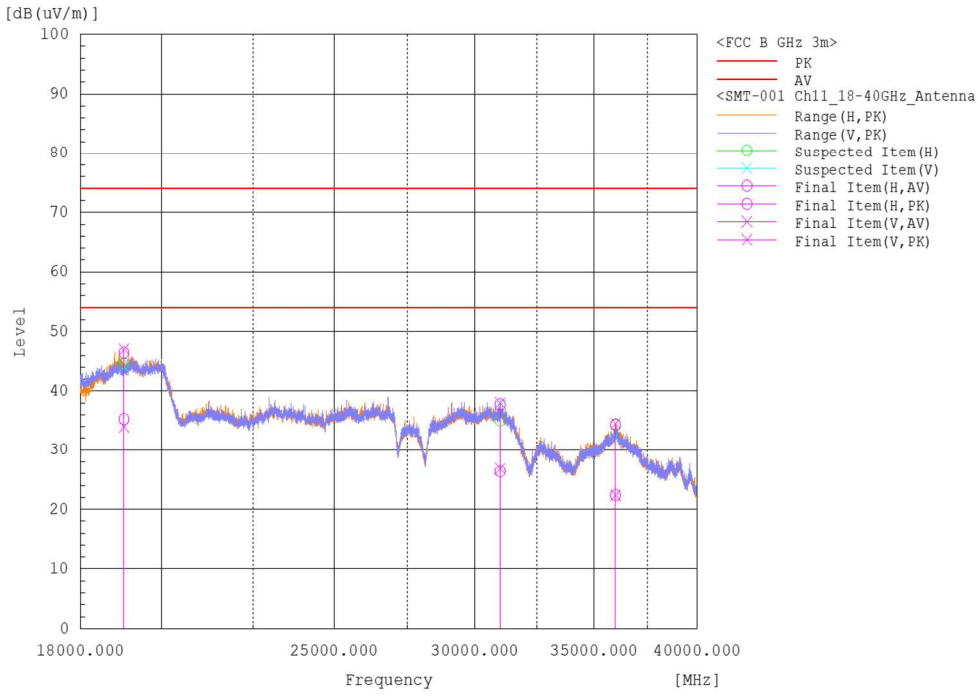
Final Item(V,AV)
Final Item(V,PK)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Suspected Item(V)
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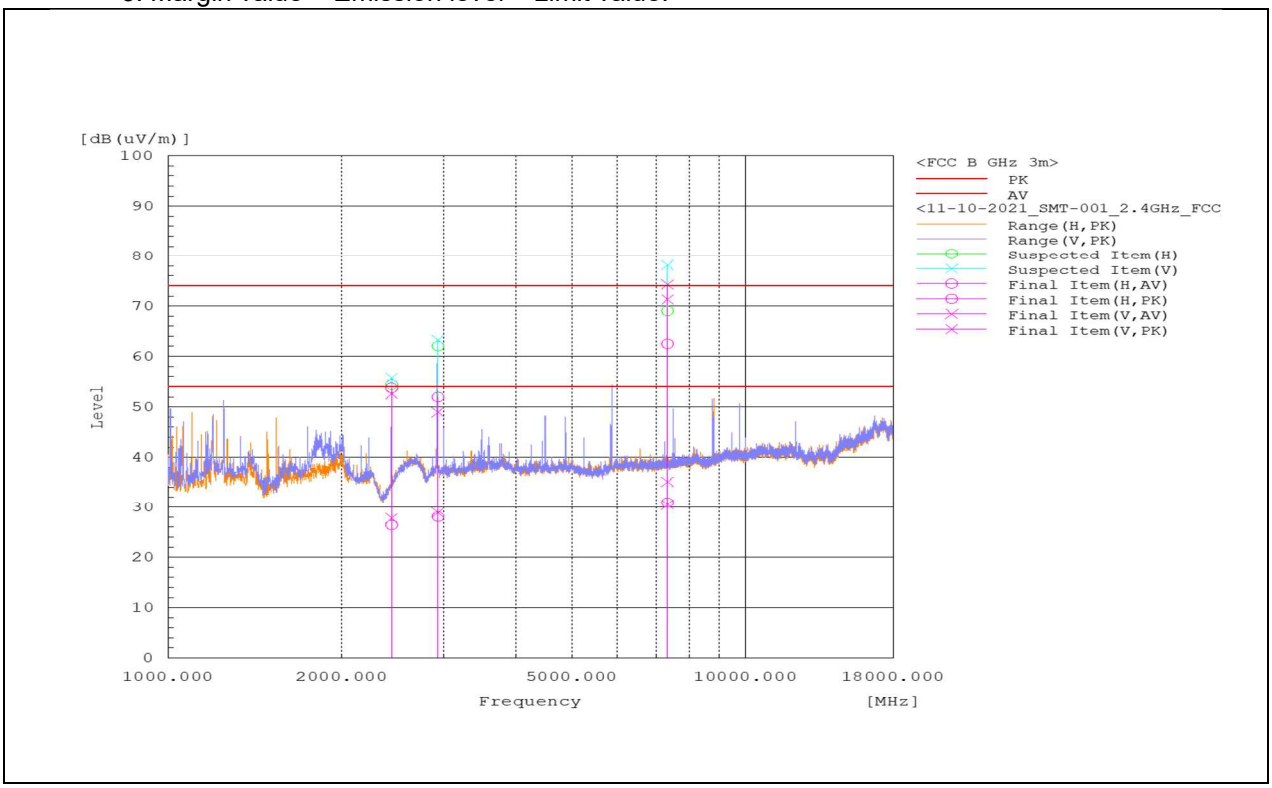
Final Item(H,PK)
Final Item(V,AV)
Final Item(V,PK)

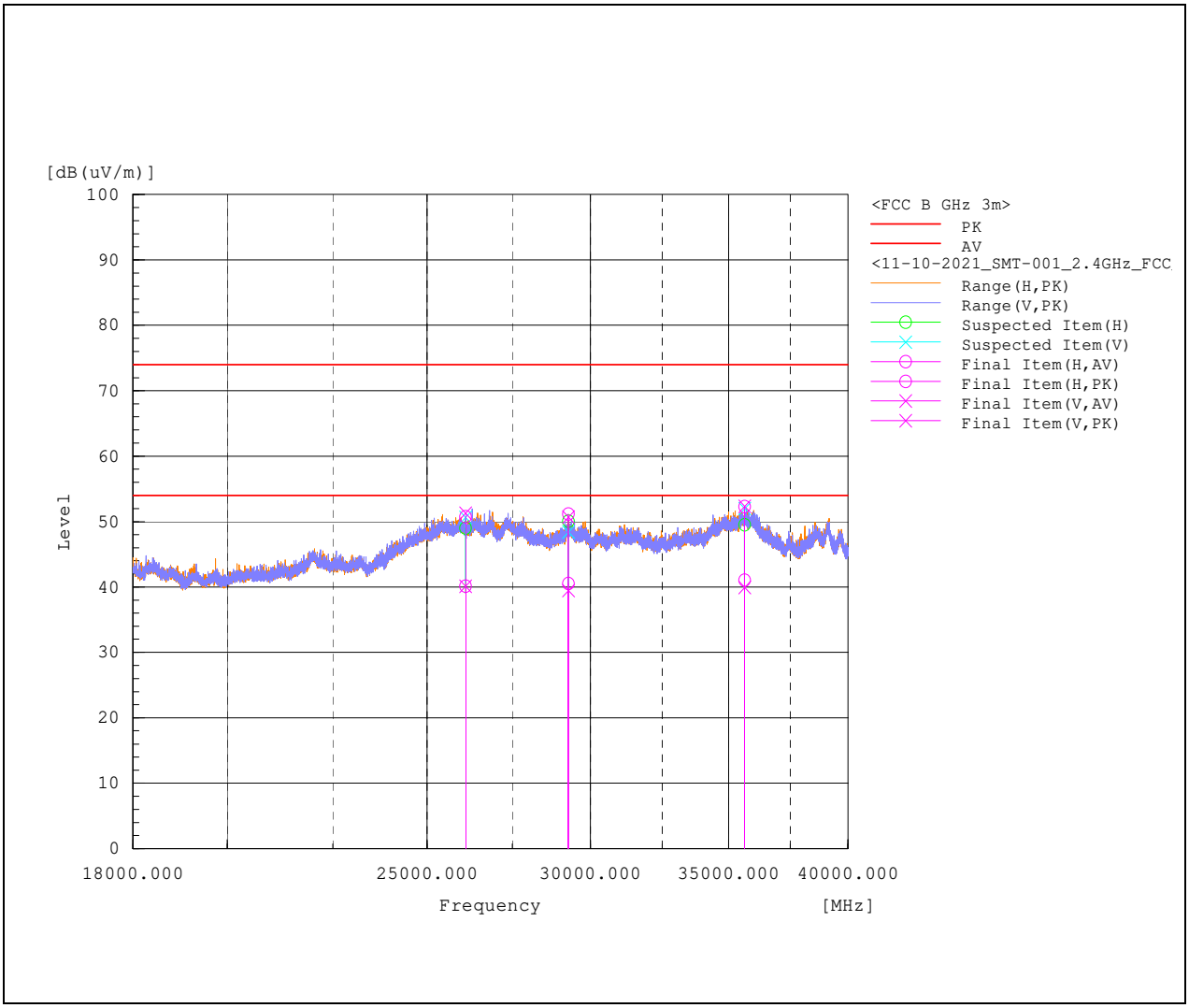
CHANNEL	2.4 GHz zigbee Ch 18	**DETECTOR FUNCTION**	Peak / Average
FREQUENCY RANGE	1 GHz – 40 GHz		
Test Mode	Normal Operation, all accessories exercised and tracking puck.		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	**Frequency (MHz)**	**Polarization (H/V)**	**Reading AV [dB(uV)]**	**Reading PK [dB(uV)]**	**Factor [dB(1/m)]**	**Level AV [dB(uV/m)]**	**Level PK dB(uV/m)**	**Limit AV dB(uV/m)**	**Limit PK [dB(uV/m)**	**Margin AV [dB]**	**Margin PK [dB]**	**Height (cm)**	**Angle (Deg)**	**Pass / Fail**
1	2439.662	V	39.2	64	-11.4	27.8	52.6	54	74	-26.2	-21.4	208	318.8	Pass
2	2440.354	H	37.8	65.2	-11.4	26.4	53.8	54	74	-27.6	-20.2	200	85.2	Pass
3	2932.441	V	39.2	59.2	-10.3	28.9	48.9	54	74	-25.1	-25.1	223	315.5	Pass
4	2934.796	H	38.4	62.3	-10.3	28.1	52	54	74	-25.9	-22	103	310.9	Pass
5	7321.196	V	31	71.8	-0.5	30.5	71.3	54	74	-23.5	-2.7	299	88	Pass
6	7321.381	H	31.4	63	-0.5	30.9	62.5	54	74	-23.1	-11.5	269	311.1	Pass
7	26094.59	V	21.5	32.7	18.6	40.1	51.3	54	74	-13.9	-22.7	367	229	Pass
8	26093.508	H	21.5	32.1	18.6	40.1	50.7	54	74	-13.9	-23.3	200	69.8	Pass
9	29268.994	H	20.9	31.6	19.6	40.5	51.2	54	74	-13.5	-22.8	400	49.3	Pass
10	29269.426	V	19.9	31.1	19.6	39.5	50.7	54	74	-14.5	-23.3	246	92.7	Pass
11	35640.092	V	22.1	34.5	17.8	39.9	52.3	54	74	-14.1	-21.7	162	3.7	Pass
12	35639.42	H	23.2	34.5	17.8	41	52.3	54	74	-13	-21.7	117	189.2	Pass

REMARKS:

1. Emission level (dBuV/m) = Reading Value (dBuV) + Factor (dB)
2. AF (dB/m) = Antenna Factor (dB/m) – Preamplifier Gain (dB).
3. Margin value = Emission level – Limit value.

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[MHz]
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AV
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Range(V,PK)
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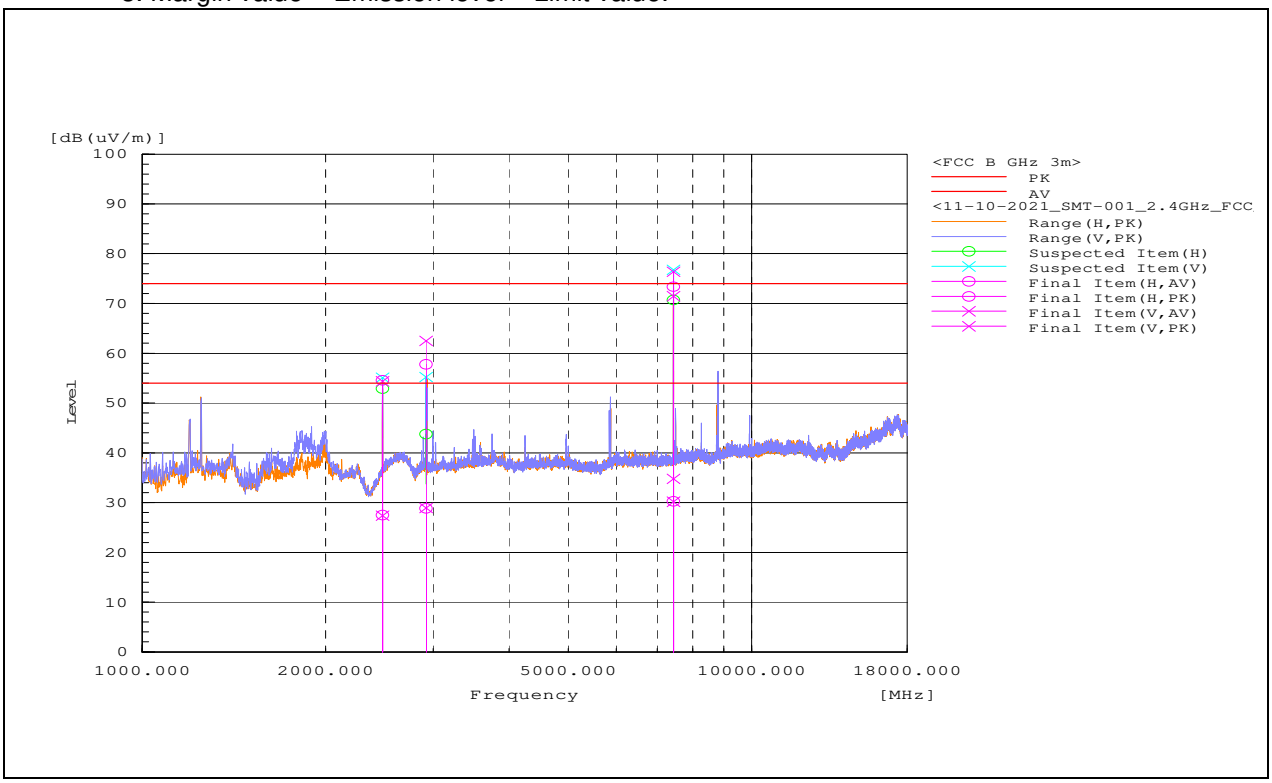
Suspected Item(V)
Final Item(H,AV)
Final Item(H,PK)
Final Item(V,AV)
Final Item(V,PK)

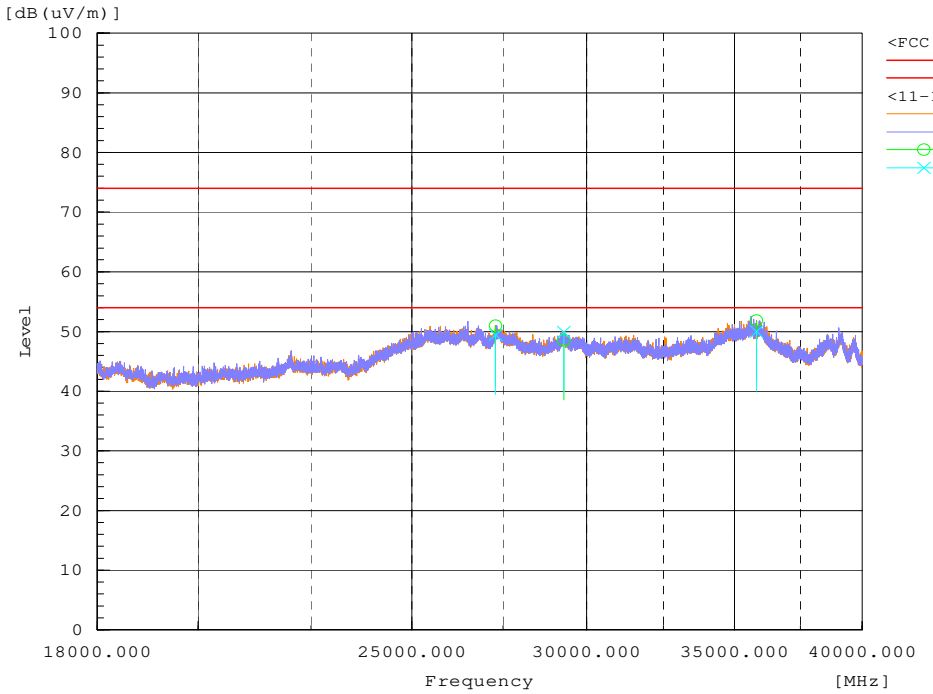
CHANNEL	2.4 GHz zigbee Ch 26	DETECTOR FUNCTION	Peak / Average
FREQUENCY RANGE	1 GHz – 40 GHz		
Test Mode	Normal Operation, all accessories exercised and tracking puck.		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK dB(uV/m)	Limit AV dB(uV/m)	Limit PK [dB(uV/m)	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass / Fail
1	2479.521	V	38.6	65.6	-11.2	27.4	54.4	54	74	-26.6	-19.6	147	341.3	Pass
2	2479.852	H	38.7	65.8	-11.2	27.5	54.6	54	74	-26.5	-19.4	177	69	Pass
3	2920.809	H	39.2	68.2	-10.4	28.8	57.8	54	74	-25.2	-16.2	261	352.9	Pass
4	2921.122	V	39.3	72.9	-10.4	28.9	62.5	54	74	-25.1	-11.5	132	53.4	Pass
5	7438.574	H	30.4	73.5	-0.1	30.3	73.4	54	74	-23.7	-0.6	132	68.3	Pass
6	7438.625	V	30.3	71.6	-0.1	30.2	71.5	54	74	-23.8	-2.5	254	181.3	Pass
7	27278.716	H	19.4	32.5	19.4	38.8	51.9	54	74	-15.2	-22.1	109	116.2	Pass
8	27277.26	V	19.9	32.4	19.4	39.3	51.8	54	74	-14.7	-22.2	291	162.6	Pass
9	29299.342	V	18.9	31.8	19.6	38.5	51.4	54	74	-15.5	-22.6	245	88.6	Pass
10	29299.318	H	19.6	31.3	19.6	39.2	50.9	54	74	-14.8	-23.1	336	356.7	Pass
11	35817.416	H	22.7	34.5	17.3	40	51.8	54	74	14	--22.2	223	91.4	Pass
12	35817.336	V	22.5	34.9	17.3	39.8	52.2	54	74	-14.2	-21.8	382	110.9	Pass

REMARKS:

1. Emission level (dBuV/m) = Reading Value (dBuV) + Factor (dB)
2. AF (dB/m) = Antenna Factor (dB/m) – Preamplifier Gain (dB).
3. Margin value = Emission level – Limit value.




[dB(uV/m)]
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AV
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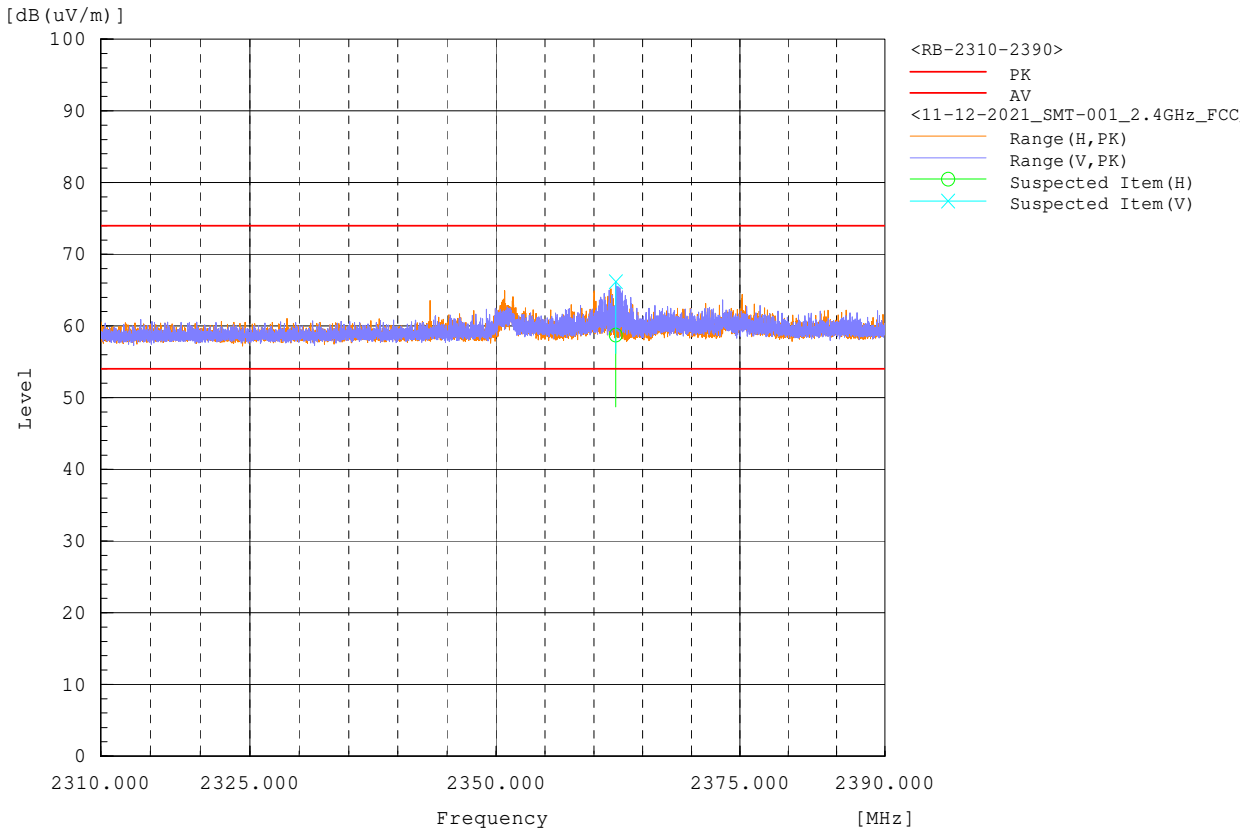
Range(H,PK)
Range(V,PK)
Suspected Item(H)
Suspected Item(V)

Restricted Band Data:

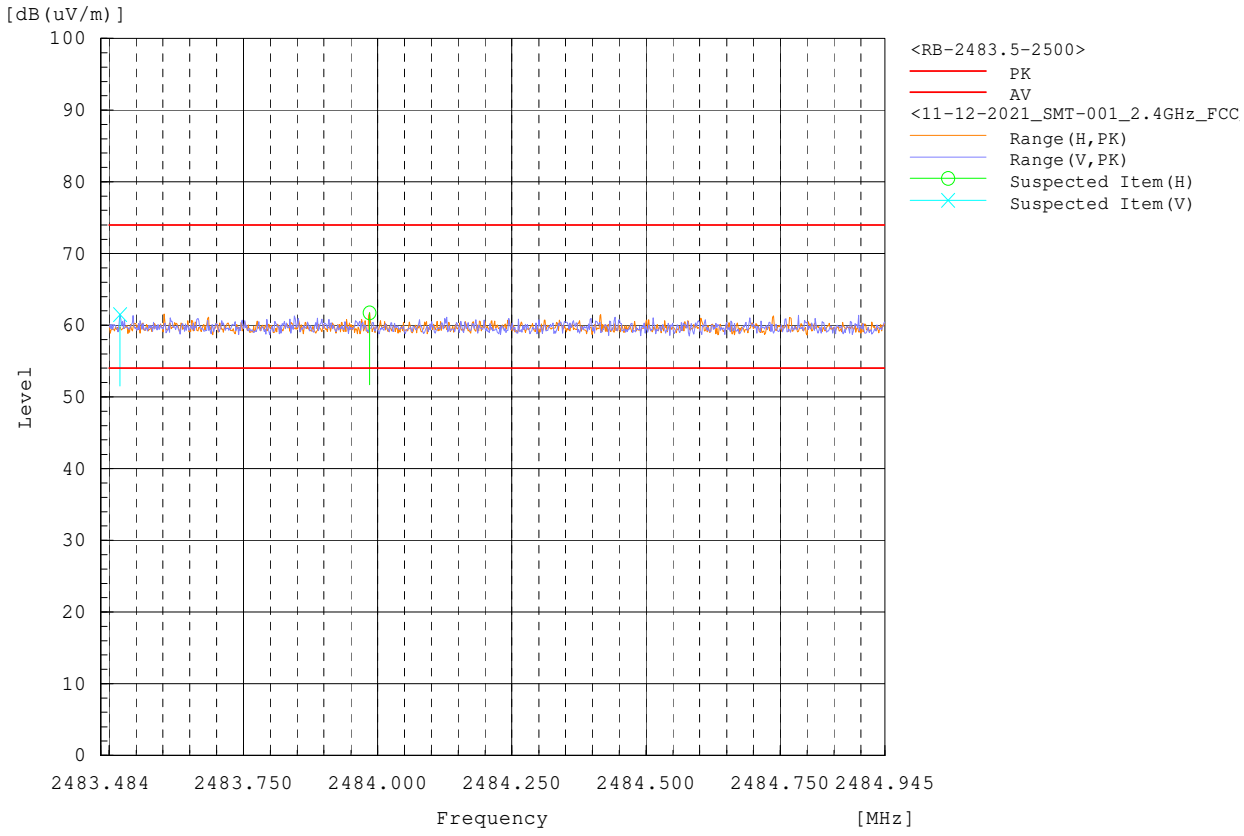
CHANNEL	2.4 GHz zigbee Ch 11	DETECTOR FUNCTION	Peak / Average
FREQUENCY RANGE	2310 – 2390 MHz		
Test Mode	Normal Operation, all accessories exercised and tracking puck.		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (0°/90°)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK dB(uV/m)	Limit AV dB(uV/m)	Limit PK [dB(uV/m)	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/ Fail
1	2362.232	0°	8.5	31.9	34.9	43.4	66.8	54	74	1-0.6	-7.2	100	278	Pass
2	2362.232	0°	8.3	30.9	34.9	43.2	65.8	54	74	-10.8	-8.2	106	52.9	Pass



CHANNEL	2.4 GHz zigbee Ch 26	DETECTOR FUNCTION	Peak / Average
FREQUENCY RANGE	2483 – 2485 MHz		
Test Mode	Normal Operation, all accessories exercised and tracking puck.		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (0°/90°)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK dB(uV/m)	Limit AV dB(uV/m)	Limit PK [dB(uV/m)	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/ Fail
1	2483.52	90°	7.6	22.4	35.4	43	57.8	54	74	-11	-16.2	Pass	33.1	Pass
2	2483.985	90°	7.7	23.3	35.4	43.1	58.7	54	74	-10.9	-15.3	Pass	244	Pass



4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration	Due Date Of Calibration
EMI Test Receiver ROHDE & SCHWARZ	ESIB 40	100179	1/29/2021	1/29/2022
Transient Limiter ELECTRO-METRICS	EM-7600-5	106	12/31/2019	12/31/2021
LISN EMCO	3816/2NM	214372	03/10/2021	03/10/2022

4.2.3 Test Procedures

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

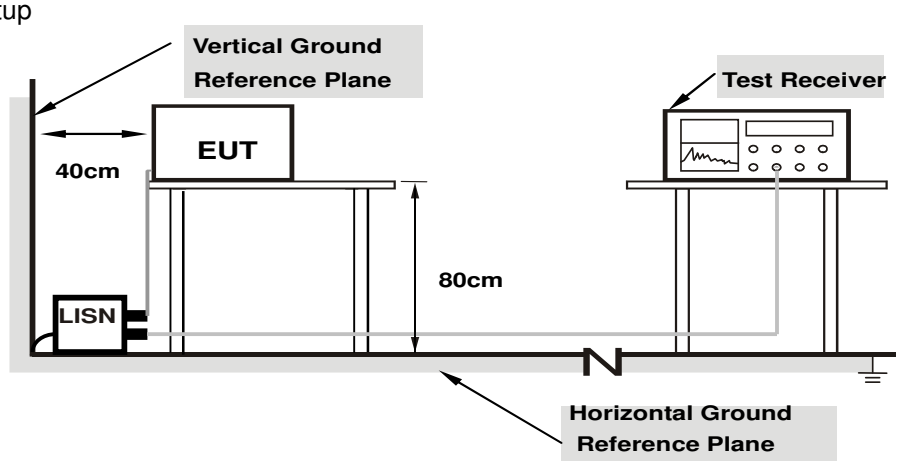
c. The frequency range from 150 kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT Operating Conditions

Same as 4.1.6.

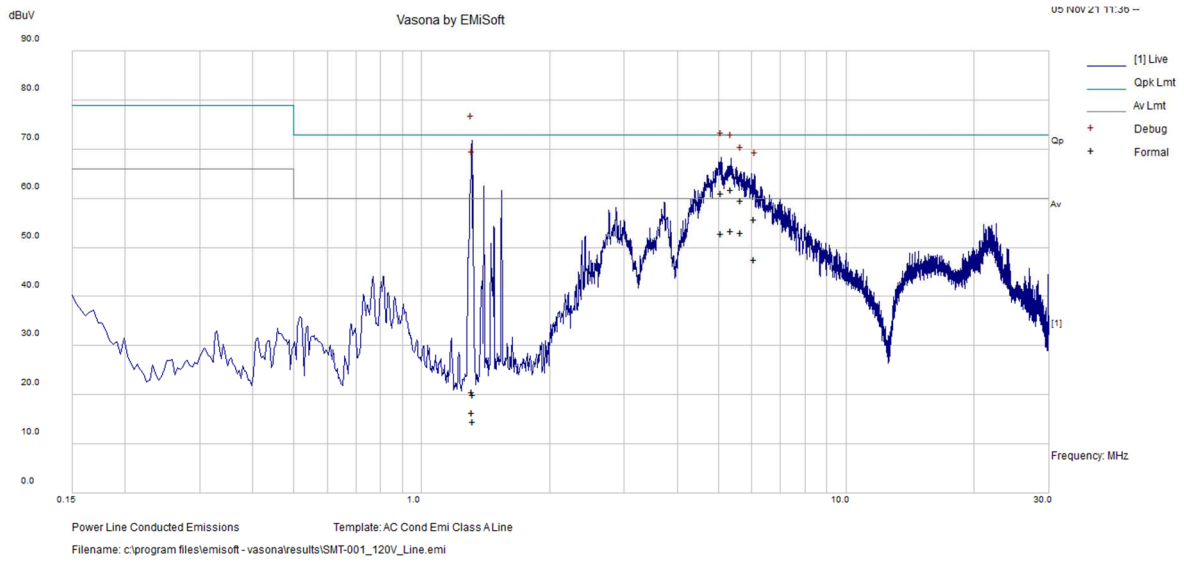
4.2.7 Test Results:

Frequency Range	0.15-30 MHz	Phase	Line
Input Power	120 Vac, 60 Hz	Environmental Conditions	22 °C, 55% RH
Tested by	Yu-Chien Ho	Test Date	11/5/2021
Test Mode	Normal Operation, all accessories exercised and tracking puck.		

No	Frequency (MHz)	Reading Value (dBuV)	Cable Loss (dB)	Insertion Loss (dB)	Emission Level Corrected (dBuV)	Measurement Type	Line/ Neutral	Limit (dBuV)	Margin (dB)	Pass/ Fail
1	1.321311	10.54	9.48	0.04	20.06	Quasi Peak	Line	73	-52.94	Pass
2	5.087397	51.48	9.56	0.08	61.12	Quasi Peak	Line	73	-11.88	Pass
3	5.374856	52.25	9.57	0.09	61.91	Quasi Peak	Line	73	-11.09	Pass
4	5.670635	49.97	9.58	0.09	59.64	Quasi Peak	Line	73	-13.36	Pass
5	1.315659	11.06	9.48	0.04	20.58	Quasi Peak	Line	73	-52.42	Pass
6	6.10112	46.11	9.59	0.1	55.8	Quasi Peak	Line	73	-17.2	Pass
7	1.321311	5.04	9.48	0.04	14.56	Average	Line	60	-45.44	Pass
8	5.087397	43.37	9.56	0.08	53.02	Average	Line	60	-6.98	Pass
9	5.374856	43.88	9.57	0.09	53.54	Average	Line	60	-6.46	Pass
10	5.670635	43.37	9.58	0.09	53.04	Average	Line	60	-6.96	Pass
11	1.315659	6.88	9.48	0.04	16.4	Average	Line	60	-43.6	Pass
12	6.10112	37.96	9.59	0.1	47.66	Average	Line	60	-12.34	Pass

Remarks:

1. The emission levels of other frequencies were very low against the limit.
2. Margin value = Emission level – Limit value
3. Correction factor = Insertion loss + Cable loss
4. Emission Level = Correction Factor + Reading Value

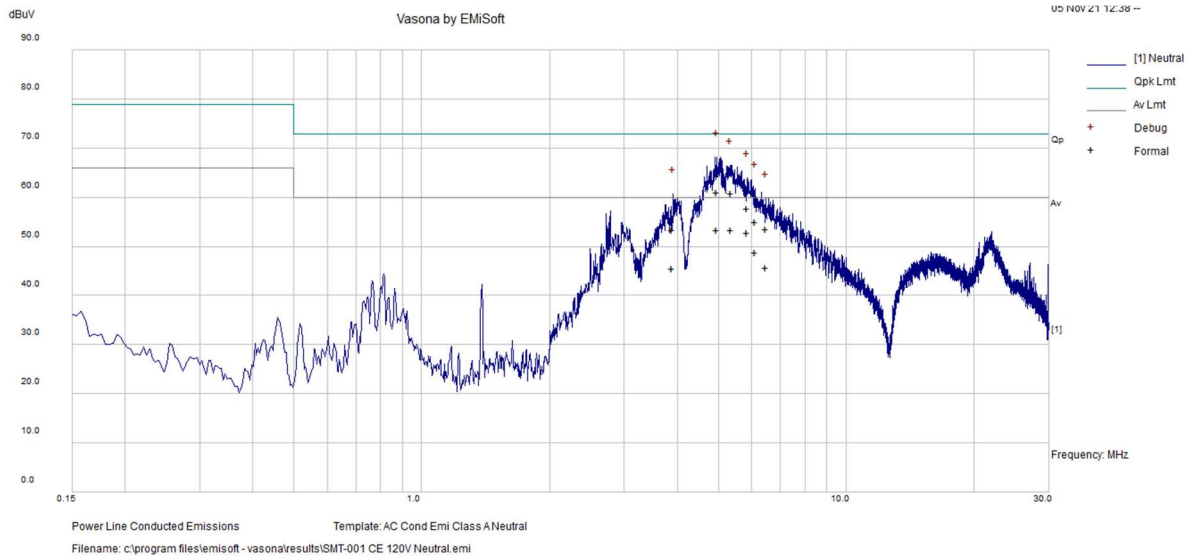


Frequency Range	0.15-30 MHz	Phase	Neutral
Input Power	120 Vac, 60 Hz	Environmental Conditions	22 °C, 55% RH
Tested by	Yu-Chien Ho	Test Date	11/5/2021
Test Mode	Normal Operation, all accessories exercised and tracking puck.		

No	Frequency (MHz)	Reading Value (dBuV)	Cable Loss (dB)	Insertion Loss (dB)	Emission Level Corrected (dBuV)	Measurement Type	Line/ Neutral	Limit (dBuV)	Margin (dB)	Pass/ Fail
1	4.967673	51.56	9.56	0.09	61.21	Quasi Peak	Neutral	73	-11.79	Pass
2	5.359164	51.25	9.57	0.1	60.92	Quasi Peak	Neutral	73	-12.08	Pass
3	5.858571	48.2	9.59	0.11	57.89	Quasi Peak	Neutral	73	-15.11	Pass
4	6.118615	45.34	9.59	0.11	55.04	Quasi Peak	Neutral	73	-17.96	Pass
5	3.905733	43.94	9.55	0.07	53.56	Quasi Peak	Neutral	73	-19.44	Pass
6	6.471701	43.94	9.59	0.12	53.65	Quasi Peak	Neutral	73	-19.35	Pass
7	4.967673	43.86	9.56	0.09	53.51	Average	Neutral	60	-6.49	Pass
8	5.359164	43.83	9.57	0.1	53.5	Average	Neutral	60	-6.5	Pass
9	5.858571	43.18	9.59	0.11	52.88	Average	Neutral	60	-7.12	Pass
10	6.118615	39.18	9.59	0.11	48.89	Average	Neutral	60	-11.11	Pass
11	3.905733	36	9.55	0.07	45.61	Average	Neutral	60	-14.39	Pass
12	6.471701	36.15	9.59	0.12	45.85	Average	Neutral	60	-14.15	Pass

Remarks:

1. The emission levels of other frequencies were very low against the limit.
2. Margin value = Emission level – Limit value
3. Correction factor = Insertion loss + Cable loss
4. Emission Level = Correction Factor + Reading Value

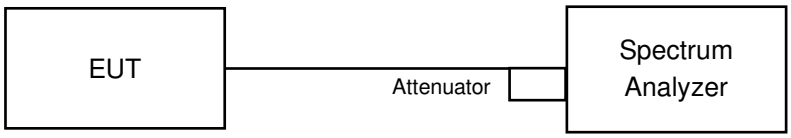


4.3 Conducted Ouput Power Measurement

4.3.1 Limits of Conducted Output Power Measurement

For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

4.3.2 Test Setup



4.3.1 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.2 Test Procedures

a. RBW ≥ DTS Bandwidth.
b. VBW ≥ [3 x RBW].
c. Span ≥ [3x x RBW].
d. Sweep time = auto couple
e. Detector = Peak
f. Trace mode = max hold.
g. Allow trace to fully stabilize.
h. Use peak marker function to determine the peak amplitude level.

4.3.3 Deviation from Test Standard

No deviation.

4.3.4 EUT Operating Conditions

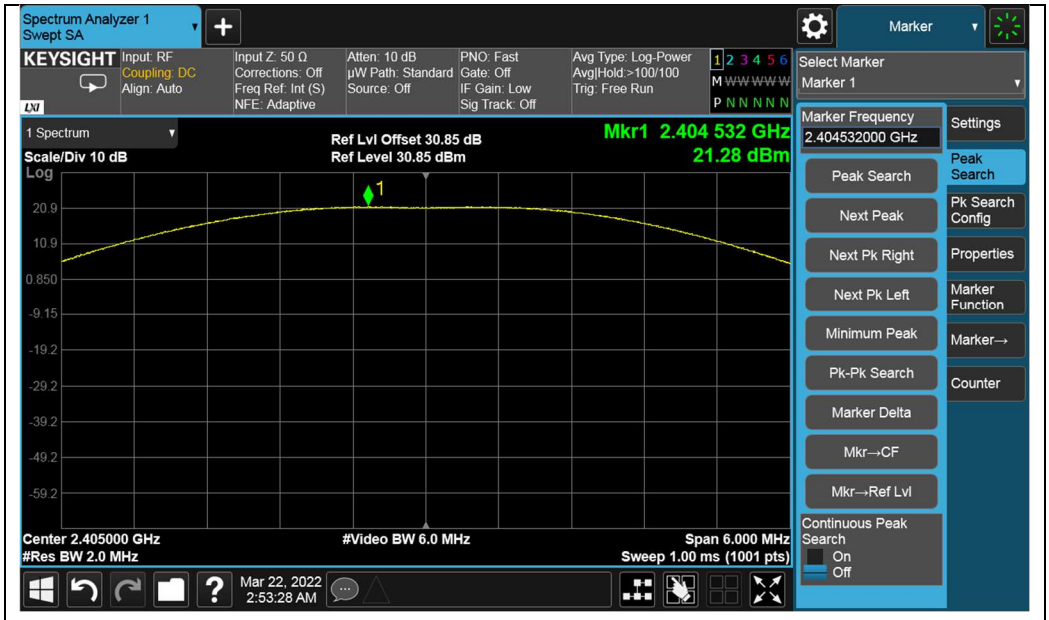
Same as Item 4.3.6.

4.3.5 Test Result

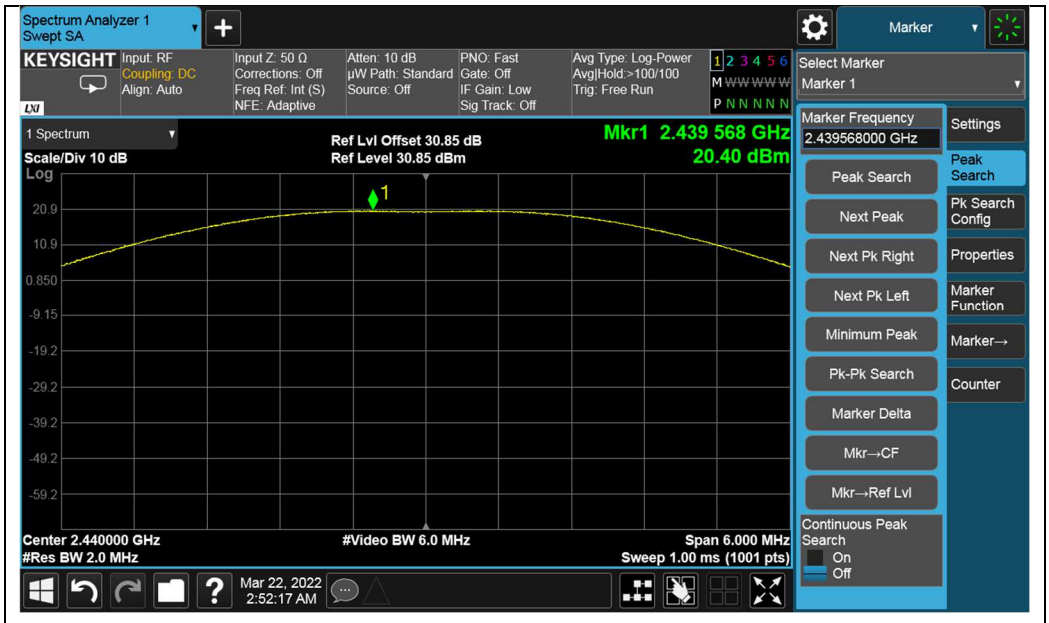
2.4 GHz zigbee Channels

Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Pass/Fail
11	2405	21.28	30	Pass
18	2440	20.4	30	Pass
26	2480	19.81	30	Pass

Test Plots:



Conducted Output Power Ch. 11



Conducted Output Power Ch. 18

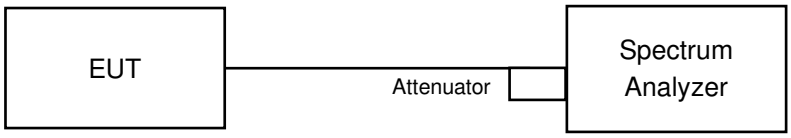
Conducted Output Power Ch. 26

4.4 6dB & 99% Bandwidth

4.4.1 Limits of 6dB & 99% Bandwidth

6dB BW ≥ 500 KHz

4.5.2 Test Setup



4.4.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.3 Test Procedures

RSS Gen 6.7

The following conditions shall be observed for measuring the occupied bandwidth and x dB bandwidth:

• The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

• The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.

• The detector of the spectrum analyzer shall be set to “Sample”. However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or “Max Hold”) may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.

• The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

558074 D01 DTS Meas Guidance v04, 8.1 DTS bandwidth

6dB Emission bandwidth measurement procedure:
a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
c. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
d. RBW = 100 KHz.
g. VBW ≥ 3 x RBW.
h. Detector = Peak.
i. Sweep time = Auto coupled.
j. Trace mode = max hold
k. Allow sweep to continue until the trace stabilizes.
l. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the mazimum level measured in the fundamental emissions.

4.4.4 Deviation from Test Standard

No deviation.

4.4.5 EUT Operating Conditions

Same as Item 4.3.6.

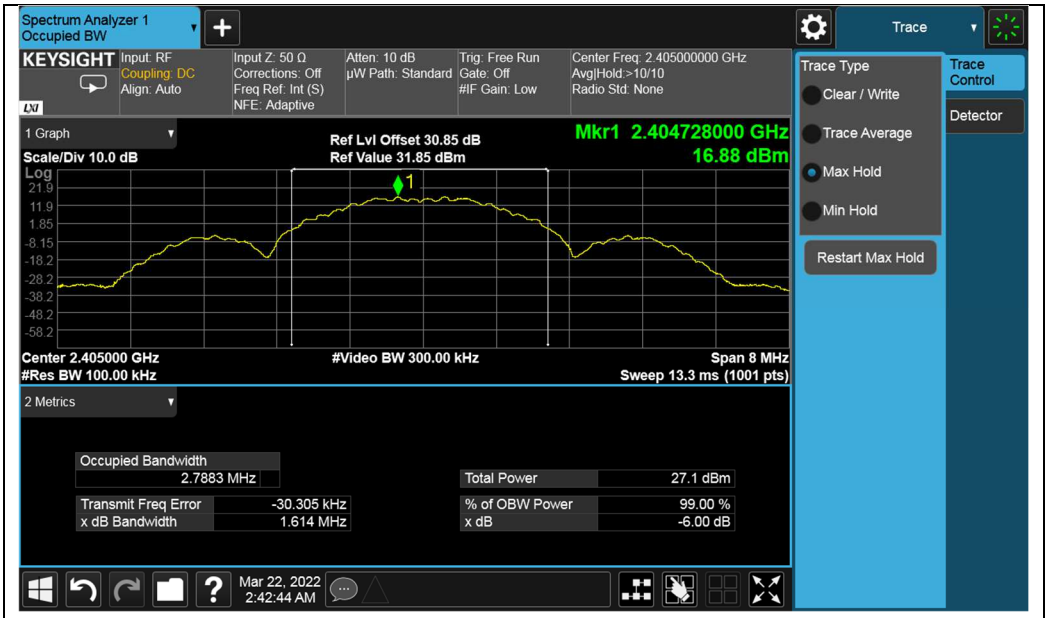
4.4.6 Test Results

2.4 GHz zigbee Channels

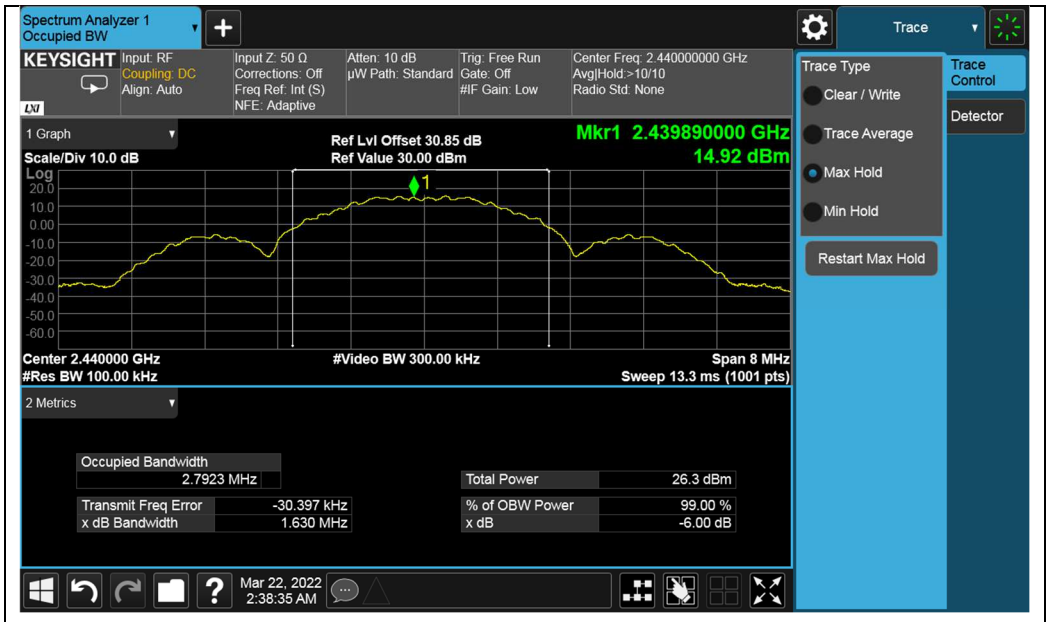
	Channel	Frequency (MHz)	Result (MHz)	Limit ≥ (KHz)	Pass/Fail
6dB BW	11	2405	1.61	500	Pass
	18	2440	1.63	500	Pass
	26	2480	1.63	500	Pass

	Channel	Frequency (MHz)	Result (MHz)
99% OBW	11	2405	2.78
	18	2440	2.79
	26	2480	2.78

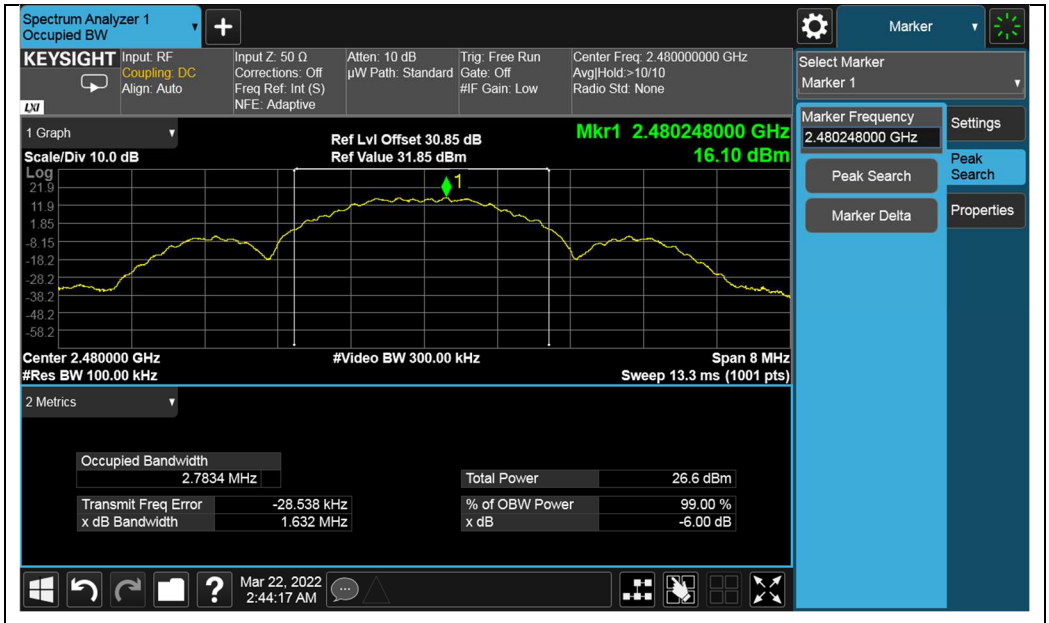
Test Plots:



6dB & 99% Bandwidth Ch. 11



6dB & 99% Bandwidth Ch. 18



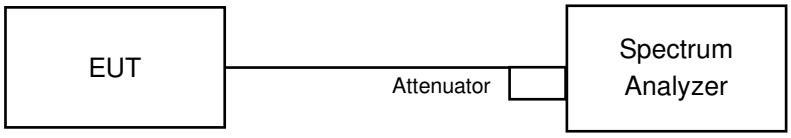
6dB & 99% Bandwidth Ch. 26

4.5 Conducted Spurious Emissions Measurement

4.5.1 Limits of Conducted Spurious Emission Measurement

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedures

Connect the primary antenna port through an attenuator to the spectrum analyzer input; in the results, account for all losses between the unlicensed wireless device output and the spectrum analyzer. The instrument shall span 30 MHz to 10 times the operating frequency in GHz, with a resolution bandwidth of 100 kHz, video bandwidth of 300 kHz, and a coupled sweep time with a peak detector. The band 30 MHz to the highest frequency may be split into smaller spans, as long as the entire spectrum is covered.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Conditions

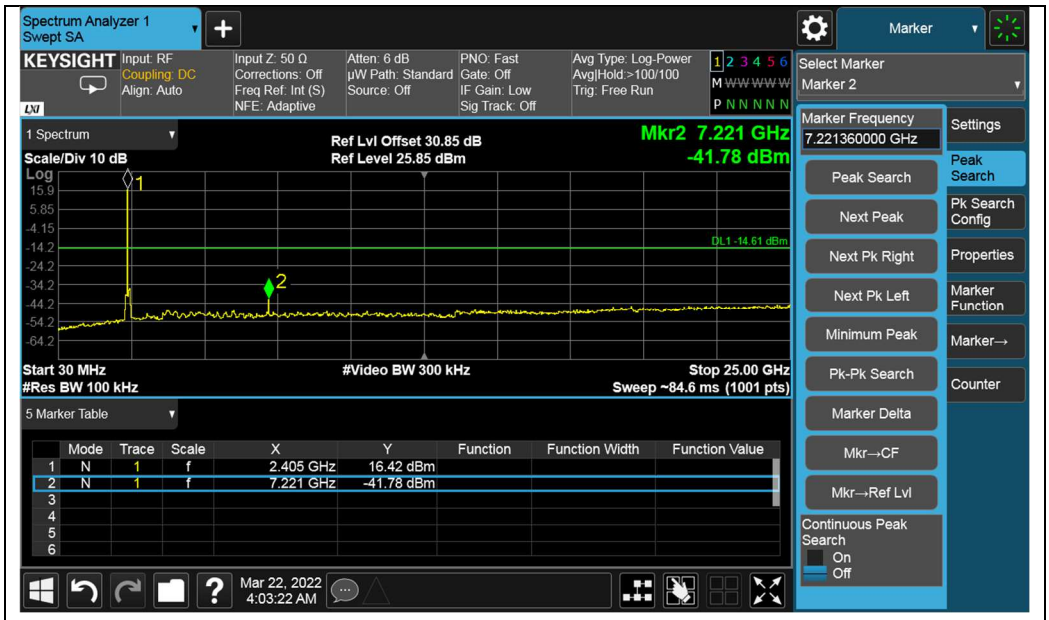
4.5.7 Test Results

2.4 GHz zigbee Channels

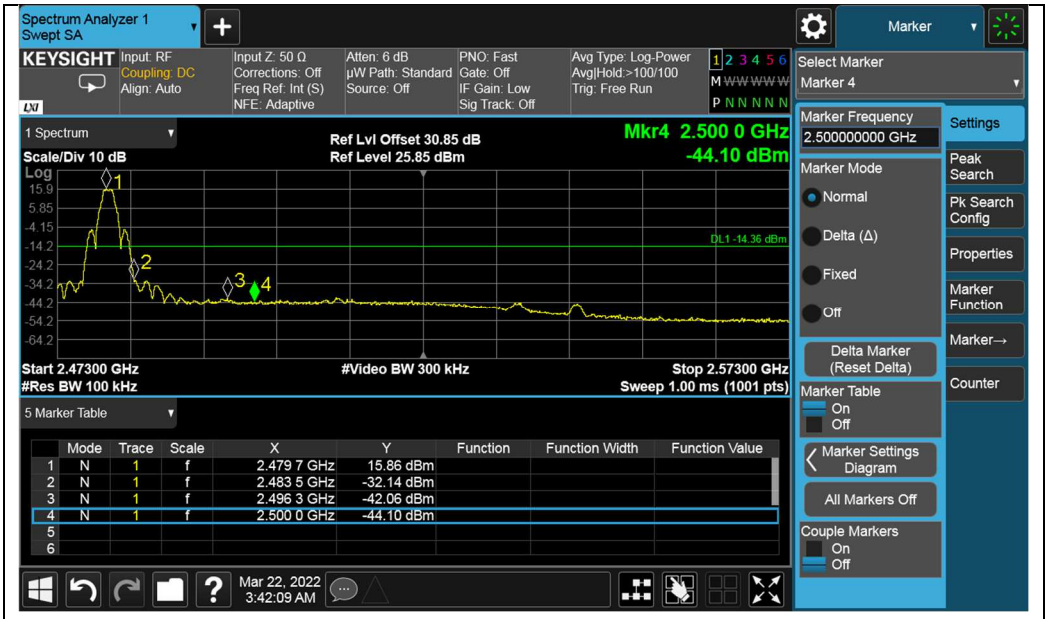
Channel	Frequency (MHz)	Pass/Fail
11	2405	Pass
18	2440	Pass
26	2480	Pass

Test Plots:

Conducted Spurious Emissions Ch. Low



Conducted Spurious Emissions Ch. Mid



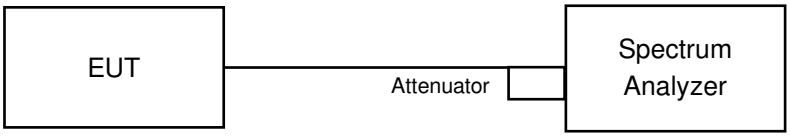
Conducted Spurious Emissions Ch. High

4.6 Peak Spectral Density

4.6.1 Limits

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 KHz band during any time interval of continuous transmission. This power spectral density shall be determinted in accordance with the provision of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedures

The measurement is made according to ANSI C63.10 clause 11.10.2 (Peak PSD)

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
c. Turn on the EUT and connect it to measurement instrument. Then set analyzer center frequency to DTS channel center frequency. Set a reference level on the measuring instrument equal to the highest peak value.
d. Span = 1.5x the DTS bandwidth.
e. RBW = 3 KHz ≤ RBW ≤ 100 KHz.
f. VBW ≥ [3 x RBW].
g. Detector = Peak.
h. Sweep time = Auto coupled.
i. Trace mode = max hold
j. Allow trace to fully stabilizes.
k. Use the peak marker function to determine the maximum amplitude level within the RBW.
l. If measured value exceeds limit, reduce RBW (no less than 3 KHz) and repeat.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Conditions

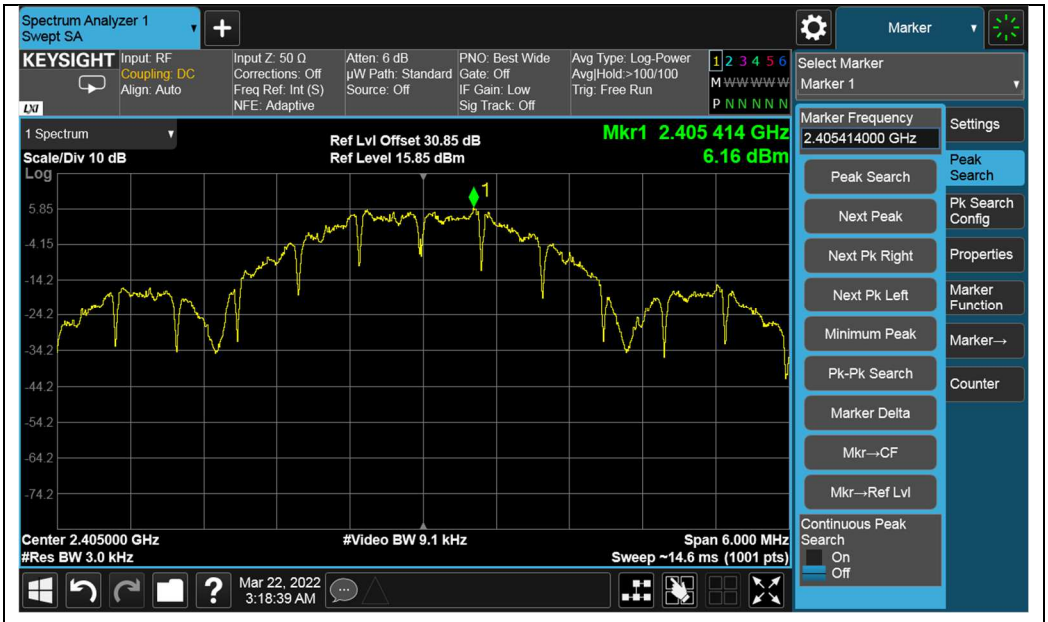
Same as Item 4.3.6.

4.6.7 Test Results

2.4 GHz zigbee Channels

Channel	Frequency (MHz)	Conducted PSD (dBm/3KHz)	Limit (dBm/3KHz)	Pass/Fail
11	2405	6.16	≤ 8	Pass
18	2440	5.43	≤ 8	Pass
26	2480	5.1	≤ 8	Pass

4.6.8 Test Plots



PSD Ch. 11

PSD Ch. 18

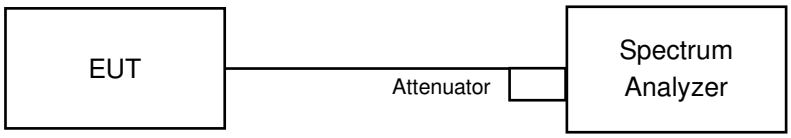
PSD Ch. 26

4.7 Band Edge Measurement

4.7.1 Limits of Band Edge Measurement

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

4.7.2 Test Setup



4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.7.4 Test Procedures

a. Set the EUT to maximum power setting and enable the EUT transmit continuously.
b. Band edge emsissions must be at least 20 dB down from the highest emission level within the authorized band as a measured.
c. Change modulation and channel bandwidth then repeat step 1 to 2.
d. Measure and record the result in the tewt report

4.7.5 Deviation from Test Standard

No deviation.

4.7.6 EUT Operating Conditions

Same as Item 4.3.6.

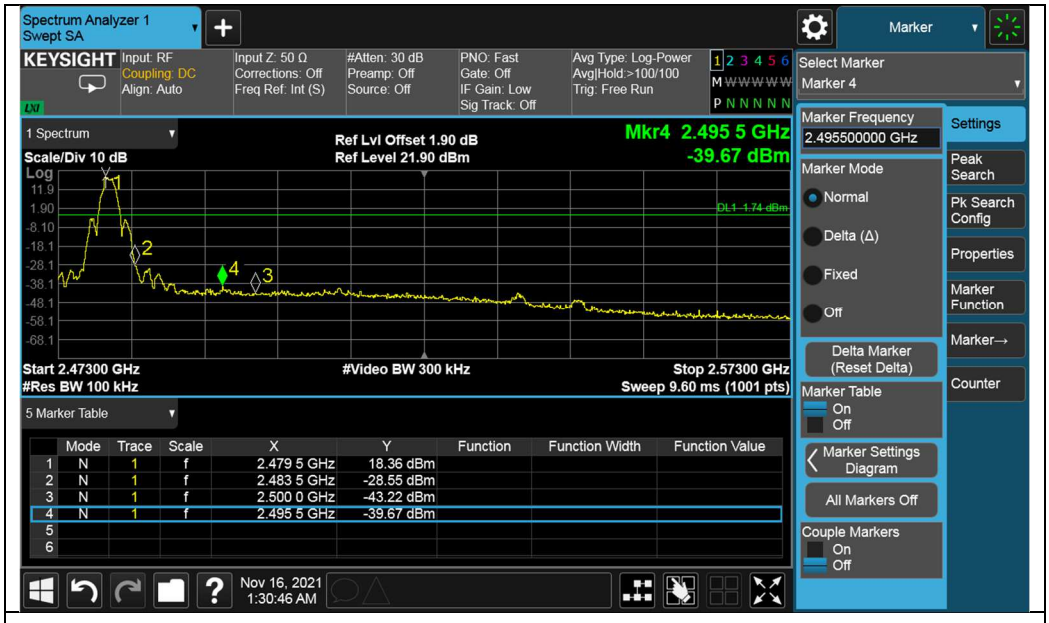
4.7.7 Test Results

2.4 GHz zigbee Channels

Channel	Frequency (MHz)	Pass/Fail
11	2405	Pass
18	2440	Pass
26	2480	Pass

Test Plots:

Band EdgeLow Channel



Band Edge High Channel

5 Pictures of Test Arrangements

Please see setup photo file.

Appendix – Information on the Testing Laboratories

Bureau Veritas is a global leader in testing, inspection and certification (TIC) services. We help businesses improve safety, sustainability and productivity; and our clients include the majority of leading brands in retail, manufacturing and other industries. With a presence in every major country around the world, our quality assurance and compliance solutions are vital in helping our customers enhance product quality and concept-to-consumer journeys. We also assist with increasing speed to market, profitability and brand equity throughout the supply chain. Bureau Veritas is a leading wireless/IoT testing, inspection, audit and certification provider, with a global network of test laboratories to support the IoT industry in areas of connectivity, security, interoperability as well as quality, health & safety, and environmental/chemical requirements.

If you have any comments, please feel free to contact us at the following:

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Web Site: www.cps.bureauveritas.com

The address and road map of all our labs can be found in our web site also.

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