FCC Test Report

(Co-Located)

Report No.:	RFBWHO-WTW-P24040364-1
FCC ID:	2AY6FSTKT60
Test Model:	T60
Received Date:	2024/2/28
Test Date:	2024/5/3 ~ 2024/5/17
Issued Date:	2024/6/14
Applicant:	STREAMTECK SCIENTIFIC INC.
Address:	No. 174, Huamei St., West Dist., Taichung City 403024, Taiwan
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location:	(1) No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, Taiwan (2) No. 70, Wenming Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)
FCC Registration / Designation Number:	(1) 788550 / TW0003 (2) 281270 / TW0032

Testing Laboratory
2021

Table of Contents

Release Control Record

Issue No.	Description	Date Issued
RFBWHO-WTW-P24040364-1	Original release	2024/6/14

1 Certificate of Conformity

Product:	SmartCaring
Brand:	STREAMTECK
Test Model:	T60
Sample Status:	Engineering sample
Applicant:	STREAMTECK SCIENTIFIC INC.
Test Date:	2024/5/3 ~ 2024/5/17
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.247) 47 CFR FCC Part 15, Subpart E (Section 15.407) 47 CFR FCC Part 15, Subpart C (Section 15.255)

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan 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 RF characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** 2024/6/14
Polly Chien / Specialist

Approved by : _____ , **Date:** 2024/6/14
Jeremy Lin / Project Engineer

2 Summary of Test Results

Applied Standard	47 CFR FCC Part 15, Subpart C (Section 15.247) 47 CFR FCC Part 15, Subpart E (Section 15.407) 47 CFR FCC Part 15, Subpart C (Section 15.255) ANSI C63.10-2020		
FCC Clause	Test Item	Result	Remarks
15.255 (d) 15.205 / 15.209 / 15.247(d) 15.407(b)(9) 15.407(b) (1/10) 15.407(b) (4(i)/10)	Radiated Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -0.4dB at 5725.00MHz.

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

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) (±)
Radiated Emissions	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	3.59 dB
	200MHz ~1000MHz	3.60 dB
	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB
	40GHz ~ 66GHz	4.59 dB
	66GHz ~ 100GHz	5.37 dB
	Above 100GHz	5.40 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	SmartCaring	
Brand	STREAMTECK	
Test Model	T60	
Sample Status	Engineering sample	
Power Supply Rating	5Vdc	
Modulation Type	WLAN	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
	mmWave	FMCW
	Bluetooth	GFSK
Operating Frequency	WLAN	2.4GHz: 2412 ~ 2462 MHz 5GHz: 5180 ~ 5240 MHz, 5260 ~ 5320 MHz, 5500 ~ 5720 MHz, 5745 ~ 5825 MHz
	mmWave	60~64GHz
	Bluetooth	2402 ~ 2480 MHz
Number of Channel	WLAN	2.4GHz: 802.11b, 802.11g, 802.11n (HT20):11 5GHz: 802.11a, 802.11n (HT20):25
	mmWave	1
	Bluetooth	40
Transfer Rate	WLAN	802.11b: 11.0/ 5.5/ 2.0/ 1.0Mbps 802.11a/g: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0Mbps 802.11n: up to 72.2 Mbps
	Bluetooth	Up to 2 Mbps
Antenna Type	Refer to Note	
Antenna Connector	Refer to Note	
Accessory Device	Refer to Note	

Note:

1. The EUT contains certified WLAN/Bluetooth modular which FCC ID: COF-AS01.
2. The EUT uses following accessories.

Adapter		
Brand	Model	Specification
ADAPTER TECH.	ATM012T-W050U	AC Input : 100-240V, 50-60Hz, 0.32-0.19A DC Output : 5V, 2.0A, 10.0W DC Output Cable (unshielded, 1.5m)

3. Simultaneously transmission condition.

Condition	Technology		
1	WLAN (2.4 GHz)	Bluetooth	mmWave (60GHz)
2	WLAN (5 GHz)	Bluetooth	mmWave (60GHz)
Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.			

4. The antenna information is listed as below.

Antenna No.	Frequency range	Gain (dBi)	Antenna Type	Connector Type
Radio 1 (WIFI 2.4G)	2.4~2.4835GHz	0.19	PCB	N/A
Radio 1 (WIFI 5G)	5.15~5.85GHz	3.27	PCB	N/A
Radio 1 (BT)	2.4~2.4835GHz	3	PIFA	ipex(MHF)
Radio 2 (60G Radar)	60~64GHz	15.8	PCB	N/A

*Detail antenna specification please refer to antenna datasheet and/or antenna measurement report.

5. 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

Bluetooth:

40 channels are provided to this EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

WLAN 2.4G:

11 channels are provided for 802.11b, 802.11g, 802.11n (HT20):

Channel	Frequency	Channel	Frequency
1	2412 MHz	7	2442 MHz
2	2417 MHz	8	2447 MHz
3	2422 MHz	9	2452 MHz
4	2427 MHz	10	2457 MHz
5	2432 MHz	11	2462 MHz
6	2437 MHz		

WLAN 5G:

FOR 5180 ~ 5320 MHz

8 channels are provided for 802.11a, 802.11n (HT20):

Channel	Frequency	Channel	Frequency
36	5180 MHz	52	5260 MHz
40	5200 MHz	56	5280 MHz
44	5220 MHz	60	5300 MHz
48	5240 MHz	64	5320 MHz

FOR 5500 ~ 5720 MHz

12 channels are provided for 802.11a, 802.11n (HT20):

Channel	Frequency	Channel	Frequency
100	5500 MHz	124	5620 MHz
104	5520 MHz	128	5640 MHz
108	5540 MHz	132	5660 MHz
112	5560 MHz	136	5680 MHz
116	5580 MHz	140	5700 MHz
120	5600 MHz	144	5720 MHz

FOR 5745 ~ 5825 MHz:

5 channels are provided for 802.11a, 802.11n (HT20):

Channel	Frequency	Channel	Frequency
149	5745 MHz	161	5805 MHz
153	5765 MHz	165	5825 MHz
157	5785 MHz		

mmWave:

1 channel is provided for EUT.

Channel	Frequency
1	61.96 GHz

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to		Description
	RE≥1G	RE<1G	
-	√	√	-

Where RE≥1G: Radiated Emission above 1GHz
RE<1G: Radiated Emission below 1GHz

Note: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on Z-plane.

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	Frequency Band	Available Channel	Tested Channel	Modulation Technology
-	802.11g + Bluetooth + mmWave	2412-2462 MHz	1 to 11	6 + 39 + 1	BPSK
		2402-2480 MHz	0 to 39		GFSK
		60~64GHz	1		-
-	802.11n (HT20) + Bluetooth + mmWave	5500 ~ 5720 MHz	100 to 144	140 + 39 + 1	OFDM
		2402-2480 MHz	0 to 39		GFSK
		60~64GHz	1		-

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	Frequency Band	Available Channel	Tested Channel	Modulation Technology
-	802.11g + Bluetooth + mmWave	2412-2462 MHz	1 to 11	6 + 39 + 1	BPSK
		2402-2480 MHz	0 to 39		GFSK
		60~64GHz	1		-
-	802.11n (HT20) + Bluetooth + mmWave	5500 ~ 5720 MHz	100 to 144	140 + 39 + 1	OFDM
		2402-2480 MHz	0 to 39		GFSK
		60~64GHz	1		-

Test Condition:

Applicable to	Environmental Conditions	Input Power (System)	Tested by
RE≥1G	23 deg. C, 67% RH	120 Vac, 60 Hz	Wade Huang
RE<1G	23 deg. C, 67% RH	120 Vac, 60 Hz	Wade Huang

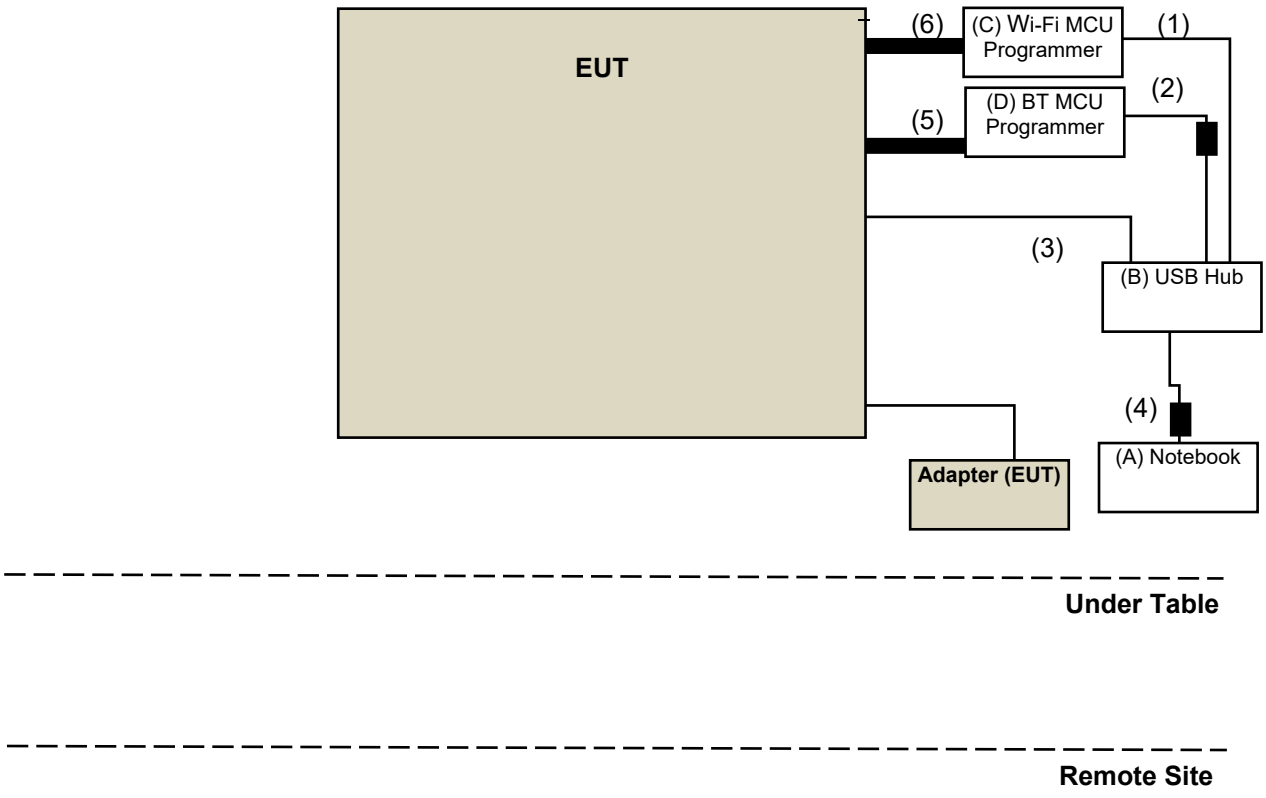
3.3 Description of Support Units

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.	Notebook	DELL	P24G	N/A	N/A	Supplied by applicant
B.	USB Hub (4-Port USB 2.0 Hub)	D-Link	DUB-H4	N/A	N/A	Supplied by applicant
C.	Wi-Fi MCU Programmer	Streamteck	STK-AZ-WIFI-PG01	N/A	N/A	Supplied by applicant
D.	BT MCU Programmer	Streamteck	STK-MCU-ISP01	N/A	N/A	Supplied by applicant

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	USB micro cable	1	3	No	0	Provided by Lab
2.	USB mini cable	1	1.5	No	1	Provided by Lab
3.	USB cable	1	1.2	No	0	Supplied by applicant
4.	USB Hub cable	1	0.5	Yes	1	Supplied by applicant
5.	14-Pin Shielded Ribbon Cable	1	0.1	Yes	0	Supplied by applicant
6.	3-Pin Shielded Ribbon Cable	1	0.05	Yes	0	Supplied by applicant

3.3.1 Configuration of System under Test



3.4 General Description of Applied Standards

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

47 CFR FCC Part 15, Subpart C (Section 15.247)
47 CFR FCC Part 15, Subpart E (Section 15.407)
47 CFR FCC Part 15, Subpart C (Section 15.255)

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

For mmWave:

Spurious Emission	
Frequency Range	Limitation
Radiated emissions below 40GHz	Part 15.209
Between 40GHz and 200GHz	90pW/cm^2 (at 3 meter)
Note: The levels of the spurious emissions shall not exceed the level of the fundamental emission.	

For WLAN, BT:

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table.

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.

Radiated emissions above 1 GHz which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20 dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
Above 960	500	3

Notes:

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 1000 MHz, 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 20 dB under any condition of modulation.

Limits of unwanted emission out of the restricted bands

Applicable To	Limit	
789033 D02 General UNII Test Procedure New Rules v02r01	Field Strength at 3 m	
	PK: 74 (dBμV/m)	AV: 54 (dBμV/m)

For transmitters operating in the 5.15-5.25 GHz band:

Applicable To	EIRP Limit	Equivalent Field Strength at 3 m
15.407(b)(1)	PK: -27 (dBm/MHz)	PK: 68.2 (dBμV/m)

For transmitters operating in the 5.725-5.850 GHz band:

Applicable To	EIRP Limit	Equivalent Field Strength at 3 m
15.407(b)(4)(i)	PK: -27 (dBm/MHz) [*1] PK: 10 (dBm/MHz) [*2] PK: 15.6 (dBm/MHz) [*3] PK: 27 (dBm/MHz) [*4]	PK: 68.2 (dBμV/m) [*1] PK: 105.2 (dBμV/m) [*2] PK: 110.8 (dBμV/m) [*3] PK: 122.2 (dBμV/m) [*4]
[*1] beyond 75 MHz or more above of the band edge. [*2] below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above. [*3] below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above. [*4] from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.		

Note: The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3}$$ μV/m, where P is the eirp (Watts).

4.1.2 Test Instruments

For Below 40GHz

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver Rohde & Schwarz	ESR3	102579	Jul. 04, 2023	Jul. 03, 2024
Spectrum Analyzer KEYSIGHT	N9020B	MY60110462	Apr. 22, 2024	Apr. 21, 2025
BILOG Antenna SCHWARZBECK	VULB9168	9168-995	Oct. 16, 2023	Oct. 15, 2024
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-404	Nov. 12, 2023	Nov. 11, 2024
HORN Antenna SCHWARZBECK	BBHA 9170	995	Nov. 12, 2023	Nov. 11, 2024
Loop Antenna EMCI	EM-6879	269	Sep. 23, 2023	Sep. 22, 2024
Preamplifier EMCI	EMC330N	980783	Jan. 15, 2024	Jan. 14, 2025
Preamplifier EMCI	EMC118A45SE	980810	Dec. 28, 2023	Dec. 27, 2024
Preamplifier EMCI	EMC184045SE	980787	Jan. 15, 2024	Jan. 14, 2025
RF signal cable EMCI	EMC104-SM-SM-(9000+2000+1000)	201230+ 201242+ 210101	Jan. 15, 2024	Jan. 14, 2025
RF signal cable EMCI	EMCCFD400-NM-NM-(9000+300+500)	201252+ 201250+ 201245	Jan. 15, 2024	Jan. 14, 2025
RF signal cable EMCI	EMC101G-KM-KM-(5000+3000+2000)	201261+201258+ 201249	Jan. 15, 2024	Jan. 14, 2025
Software BV CPS	ADT_Radiated_V7.6.15.9.5	NA	NA	NA
Turn Table Max-Full	MFT-151SS-0.5T	NA	NA	NA
Turn Table Controller Max-Full	MF-7802BS	MF780208675	NA	NA
Antenna Tower KaiTuo	NA	NA	NA	NA
Antenna Tower Controller KaiTuo	KT-2000	NA	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Temperature & Humidity Chamber Terchy	MHU-225AU	920842	Jun. 17, 2023	Jun. 16, 2024
Digital Storage Oscilloscope Keysight	DSO-X 6004A	MY55190202	Jun. 20, 2023	Jun. 19, 2024

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in WM Chamber 7.
3. Test date: May 15 ~ May 17, 2024

For Above 40GHz:

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer Keysight	N9042B	US60360159	Apr. 16, 2024	Apr. 15, 2025
*OXE89 Horn Antenna (33~55GHz) QuinStar	QWH-QPRR00	QWH-QPRR00-1	Apr. 09, 2024	Apr. 08, 2025
*Conical Horn Antenna (50~75GHz) Keysight	WR15CH-Conical	RCHO15RL-1	Apr. 09, 2024	Apr. 08, 2025
*Conical Horn Antenna (75~110GHz) Keysight	WR10CH-Conical	RCHO10RL-1	Apr. 09, 2024	Apr. 08, 2025
*Conical Horn Antenna (110~170GHz) Keysight	WR6.5CH-Conical	RCHO6RL-1	Apr. 09, 2024	Apr. 08, 2025
*Conical Horn Antenna (140~220GHz) Keysight	WR5.1CH-Conical	RCHO5RL-1	Apr. 09, 2024	Apr. 08, 2025
Extension Module_down converter (50-75GHz) 9VDC supply Keysight	N9029AV15	SAX 381	Apr. 16, 2024	Apr. 15, 2025
Extension Module_down converter (75-110GHz) 9VDC supply Keysight	N9029AV10	SAX 378	Apr. 16, 2024	Apr. 15, 2025
Extension Module_down converter (110-170GHz) 9VDC supply Keysight	N9029AV06	SAX723	Apr. 16, 2024	Apr. 15, 2025
Extension Module_down converter (140-220GHz) 9VDC supply Keysight	N9029AV05	SAX722	Apr. 16, 2024	Apr. 15, 2025
PSG analog signal generator Keysight	E8257D	MY60020399	Jan. 16, 2024	Jan. 15, 2025
*Power Meter VDI (110-325GHz)	PM5B	571V	Apr. 16, 2024	Apr. 15, 2025
*Power Meter Keysight (50-110GHz)	U8489A	US59290810	Mar. 08, 2024	Mar. 07, 2025
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	NA	NA

Note:
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in WM Chamber 7.
3. Test date: May 03, 2024

4.1.3 Test Procedures

For Radiated emission below 30 MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meters 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. 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, except for the frequency band (9 kHz to 90 kHz and 110 kHz to 490 kHz) set to average detect function and peak detect function.

Notes:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 200 Hz at frequency below 150 kHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz or 10 kHz at frequency (150 kHz to 30 MHz).
3. All modes of operation were investigated and the worst-case emissions are reported.

For Radiated emission 30MHz to 40GHz

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 120kHz 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) and Average detection (AV) at frequency above 1GHz.
3. All modes of operation were investigated and the worst-case emissions are reported.

For Radiated emission above 40GHz

a. Connect the test antenna covering the appropriate frequency range to a spectrum analyzer via an external mixer to the spectrum analyzer.

b. Set spectrum analyzer RBW = 1 MHz, VBW = 3 MHz, average detector.

c. Calculate the distance to the far field boundary and determine the maximum measurement distance.

d. Perform an exploratory search for emissions and determine the approximate direction at which each observed emission emanates from the EUT.

e. Exploratory measurements be made at a closer distance than the validated maximum measurement distance.

f. Perform a final measurement; begin with the test antenna at the approximate position where the maximum level occurred during the exploratory scan.

g. Slowly scan the test antenna around this position, slowly vary the test antenna polarization by rotating through at least 0° to 180°, and slowly vary the orientation of the test antenna to find the final position, polarization, and orientation at which the maximum level of the emission is observed.

h. Record the measured reading with the test antenna fixed at this maximized position, polarization, and orientation. Record the measurement distance.

i. Calculate the maximum field strength of the emission at the measurement distance and the adjusted/corrected power at the output of the test antenna.

j. Calculate the EIRP from the measured field strength and then convert to the linear.

k. Calculate the power density at the distance specified by the limit from the field strength at the distance specified by the limit.

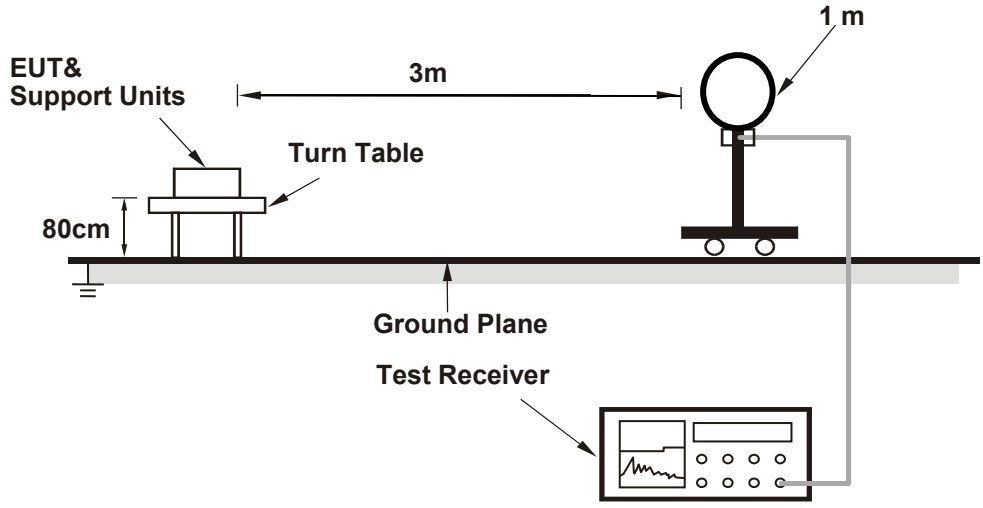
l. Repeat the preceding sequence for every emission observed in the frequency band under investigation.

4.1.4 Deviation from Test Standard

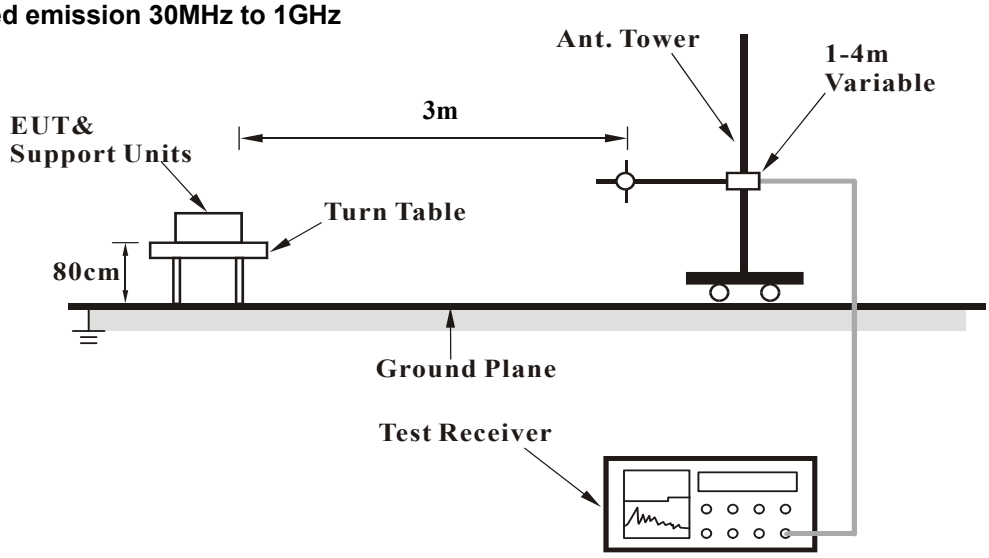
No deviation.

4.1.5 Test Setup

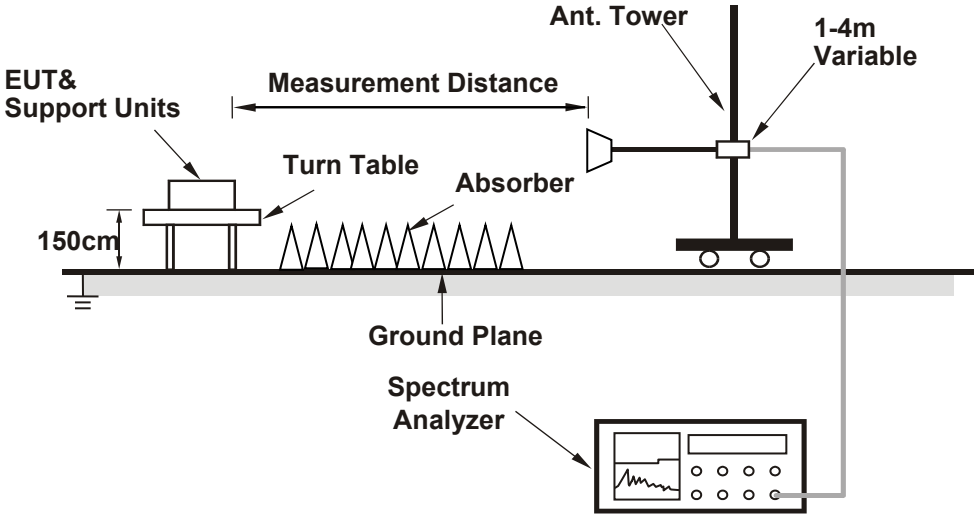
For Radiated emission below 30MHz



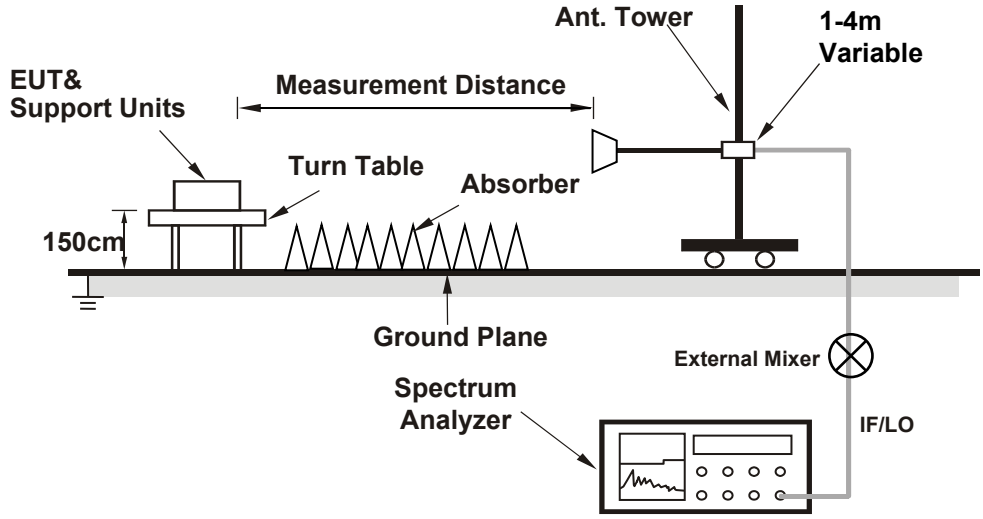
For Radiated emission 30MHz to 1GHz



For Radiated emission 1GHz to 40GHz



For Radiated emission above 40GHz



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

4.1.6 EUT Operating Conditions

a. Placed the EUT on the testing table.
b. Set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1GHz Data:

802.11g + Bluetooth + mmWave

For 1GHz ~ 25GHz

Channel	CH 6 + CH 39		
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	62.2 PK	74.0	-11.8	1.53 H	228	33.6	28.6
2	2390.00	47.4 AV	54.0	-6.6	1.53 H	228	18.8	28.6
3	*2412.00	102.9 PK			1.53 H	228	74.4	28.5
4	*2412.00	95.5 AV			1.53 H	228	67.0	28.5
5	*2480.00	93.7 PK			1.38 H	239	65.3	28.4
6	*2480.00	92.9 AV			1.38 H	239	64.5	28.4
7	2483.50	63.8 PK	74.0	-10.2	1.38 H	239	35.4	28.4
8	2483.50	52.3 AV	54.0	-1.7	1.38 H	239	23.9	28.4
9	4824.00	49.9 PK	74.0	-24.1	2.34 H	343	52.1	-2.2
10	4824.00	40.4 AV	54.0	-13.6	2.34 H	343	42.6	-2.2
11	4960.00	55.4 PK	74.0	-18.6	2.16 H	352	57.3	-1.9
12	4960.00	49.2 AV	54.0	-4.8	2.16 H	352	51.1	-1.9
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2336.88	62.4 PK	74.0	-11.6	1.42 V	298	33.9	28.5
2	2336.88	50.1 AV	54.0	-3.9	1.42 V	298	21.6	28.5
3	*2412.00	103.0 PK			1.42 V	298	74.5	28.5
4	*2412.00	95.7 AV			1.42 V	298	67.2	28.5
5	*2480.00	94.7 PK			1.10 V	177	66.3	28.4
6	*2480.00	94.1 AV			1.10 V	177	65.7	28.4
7	2483.50	64.0 PK	74.0	-10.0	1.10 V	177	35.6	28.4
8	2483.50	53.4 AV	54.0	-0.6	1.10 V	177	25.0	28.4
9	4824.00	48.9 PK	74.0	-25.1	1.31 V	81	51.1	-2.2
10	4824.00	38.6 AV	54.0	-15.4	1.31 V	81	40.8	-2.2
11	4960.00	56.6 PK	74.0	-17.4	1.62 V	172	58.5	-1.9
12	4960.00	50.8 AV	54.0	-3.2	1.62 V	172	52.7	-1.9

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

For above 40 GHz

Channel	CH 1 : 61.96 GHz		
Frequency Range	40GHz ~ 200GHz	Detector Function	Average (AV)

Antenna Polarity: Horizontal									
No.	Frequency (GHz)	Power (dBm)	Gain of test Antenna (dBi)	EMeas (dBμV/m)	EIRP Level (dBm/ MHz)	Power Density (pW/cm^2)	Power Density Limit (pW/cm^2)	Margin (pW/cm^2)	PASS/ FAIL
1	49.82	-72.25	22.50	76.46	-28.24	1.32	90.00	-88.68	PASS
2	52.51	-88.57	21.50	61.59	-43.11	0.04	90.00	-89.96	PASS
3	72.00	-90.42	21.50	62.48	-42.22	0.05	90.00	-89.95	PASS
4	86.40	-93.47	21.60	60.92	-43.78	0.04	90.00	-89.96	PASS
5	110.94	-105.96	22.00	50.20	-54.50	0.00	90.00	-90.00	PASS
6	170.02	-89.60	21.30	70.97	-33.73	0.37	90.00	-89.63	PASS
Antenna Polarity : Vertical									
No.	Frequency (GHz)	Power (dBm)	Gain of test Antenna (dBi)	EMeas (dBμV/m)	EIRP Level (dBm/ MHz)	Power Density (pW/cm^2)	Power Density Limit (pW/cm^2)	Margin (pW/cm^2)	PASS/ FAIL
1	49.83	-72.30	22.50	76.41	-28.29	1.31	90.00	-88.69	PASS
2	50.99	-90.47	21.50	59.44	-45.26	0.03	90.00	-89.97	PASS
3	64.08	-90.92	21.50	60.97	-43.73	0.04	90.00	-89.96	PASS
4	86.40	-87.98	21.60	66.41	-38.29	0.13	90.00	-89.87	PASS
5	115.20	-100.24	22.00	56.25	-48.45	0.01	90.00	-89.99	PASS
6	170.05	-89.61	21.30	70.96	-33.74	0.37	90.00	-89.63	PASS

Remarks:

1. The measured power level is converted to EIRP using the equation:

Follow ANSI 63.10 section 9.4 Equations to calculate and extrapolate field strength

E_{Meas} (dBμV/m) = 126.8 − 20log(λ) + P −G

where:

E_{Meas} is the field strength of the emission at the measurement distance, in dBμV/m

P is the power measured at the output of the test antenna, in dBm

λ is the wavelength of the emission under investigation [300/fMHz], in m

G is the gain of the test antenna, in dBi

Follow ANSI 63.10 section 9.5 Equations to calculate EIRP

EIRP Level (dBm/MHz) = E_{Meas} (dBμV/m)+20*log(d_{Meas})-104.7

E_{Meas} is the field strength of the emission at the measurement distance, in dBμV/m

d_{Meas} is the measurement distance, in m

Measurements made at 1 meter distance.

2. Power density formula as follows

Follow ANSI 63.10 section 9.6 Equations to calculate power density

$PD=EIRP_{Linear}/4\ \pi\ d^2$

PD is is the power density at the distance specified by the limit, in W/m^2

$EIRP_{Linear}$ is the equivalent isotropically radiated power, in watts

d is the 3m distance.

3. The far-field boundary is given in ANSI 63.10 as:

R far field = (2 * L^2) / λ

L is the Largest Antenna Dimension of measurement antenna, including the reflector

λ is the wavelength

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
40	0.03	0.0075	0.240
50	0.03	0.0060	0.300

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
50	0.025	0.0060	0.208
75	0.025	0.0040	0.313

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
75	0.018	0.0040	0.162
110	0.018	0.0027	0.238

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
110	0.012	0.0027	0.106
170	0.012	0.0018	0.163

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
170	0.008	0.0018	0.073
260	0.008	0.0012	0.111

802.11n (HT20) + Bluetooth + mmWave

For 1GHz ~ 40GHz

Channel	CH 39		
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	93.4 PK			1.35 H	240	65.0	28.4
2	*2480.00	92.7 AV			1.35 H	240	64.3	28.4
3	2483.50	56.1 PK	74.0	-17.9	1.35 H	240	27.7	28.4
4	2483.50	39.8 AV	54.0	-14.2	1.35 H	240	11.4	28.4
5	4960.00	55.1 PK	74.0	-18.9	2.15 H	350	57.0	-1.9
6	4960.00	48.9 AV	54.0	-5.1	2.15 H	350	50.8	-1.9
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	94.4 PK			1.11 V	175	66.0	28.4
2	*2480.00	93.9 AV			1.11 V	175	65.5	28.4
3	2483.50	57.7 PK	74.0	-16.3	1.11 V	175	29.3	28.4
4	2483.50	41.7 AV	54.0	-12.3	1.11 V	175	13.3	28.4
5	4960.00	56.4 PK	74.0	-17.6	1.61 V	170	58.3	-1.9
6	4960.00	50.5 AV	54.0	-3.5	1.61 V	170	52.4	-1.9

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

Channel	CH 140		
Frequency Range	1GHz ~ 40GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5700.00	108.1 PK			3.34 H	50	72.0	36.1
2	*5700.00	101.2 AV			3.34 H	50	65.1	36.1
3	**#5725.00**	**67.8 PK**	**68.2**	**-0.4**	**3.34 H**	**50**	**69.3**	**-1.5**
4	11400.00	51.2 PK	74.0	-22.8	2.00 H	137	49.8	1.4
5	11400.00	42.5 AV	54.0	-11.5	2.00 H	137	41.1	1.4
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*5700.00	106.6 PK			1.35 V	94	70.5	36.1
2	*5700.00	99.9 AV			1.35 V	94	63.8	36.1
3	#5725.00	66.7 PK	68.2	-1.5	1.35 V	94	68.2	-1.5
4	11400.00	52.3 PK	74.0	-21.7	1.65 V	216	50.9	1.4
5	11400.00	42.5 AV	54.0	-11.5	1.65 V	216	41.1	1.4

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

For above 40 GHz

Channel	CH 1 : 61.96 GHz		
Frequency Range	40GHz ~ 200GHz	Detector Function	Average (AV)

Antenna Polarity: Horizontal									
No.	Frequency (GHz)	Power (dBm)	Gain of test Antenna (dBi)	EMeas (dBμV/m)	EIRP Level (dBm/ MHz)	Power Density (pW/cm^2)	Power Density Limit (pW/cm^2)	Margin (pW/cm^2)	PASS/ FAIL
1	49.82	-72.20	22.50	76.51	-28.19	1.34	90.00	-88.66	PASS
2	52.51	-88.63	21.50	61.53	-43.17	0.04	90.00	-89.96	PASS
3	72.00	-90.26	21.50	62.64	-42.06	0.06	90.00	-89.94	PASS
4	86.40	-93.37	21.60	61.02	-43.68	0.04	90.00	-89.96	PASS
5	110.94	-105.94	22.00	50.22	-54.48	0.00	90.00	-90.00	PASS
6	170.02	-89.56	21.30	71.01	-33.69	0.38	90.00	-89.62	PASS
Antenna Polarity : Vertical									
No.	Frequency (GHz)	Power (dBm)	Gain of test Antenna (dBi)	EMeas (dBμV/m)	EIRP Level (dBm/ MHz)	Power Density (pW/cm^2)	Power Density Limit (pW/cm^2)	Margin (pW/cm^2)	PASS/ FAIL
1	49.83	-72.36	22.50	76.35	-28.35	1.29	90.00	-88.71	PASS
2	50.99	-90.37	21.50	59.54	-45.16	0.03	90.00	-89.97	PASS
3	64.08	-90.93	21.50	60.96	-43.74	0.04	90.00	-89.96	PASS
4	86.40	-87.92	21.60	66.47	-38.23	0.13	90.00	-89.87	PASS
5	115.20	-100.18	22.00	56.31	-48.39	0.01	90.00	-89.99	PASS
6	170.05	-89.67	21.30	70.90	-33.80	0.37	90.00	-89.63	PASS

Remarks:

1. The measured power level is converted to EIRP using the equation:

Follow ANSI 63.10 section 9.4 Equations to calculate and extrapolate field strength

E_{Meas} (dBμV/m) = 126.8 − 20log(λ) + P −G

where:

E_{Meas} is the field strength of the emission at the measurement distance, in dBμV/m

P is the power measured at the output of the test antenna, in dBm

λ is the wavelength of the emission under investigation [300/fMHz], in m

G is the gain of the test antenna, in dBi

Follow ANSI 63.10 section 9.5 Equations to calculate EIRP

EIRP Level (dBm/MHz) = E_{Meas} (dBμV/m)+20*log(d_{Meas})-104.7

E_{Meas} is the field strength of the emission at the measurement distance, in dBμV/m

d_{Meas} is the measurement distance, in m

Measurements made at 1 meter distance.

2. Power density formula as follows

Follow ANSI 63.10 section 9.6 Equations to calculate power density

$PD=EIRP_{Linear}/4\ \pi\ d^2$

PD is is the power density at the distance specified by the limit, in W/m^2

$EIRP_{Linear}$ is the equivalent isotropically radiated power, in watts

d is the 3m distance.

3. The far-field boundary is given in ANSI 63.10 as:

R far field = (2 * L^2) / λ

L is the Largest Antenna Dimension of measurement antenna, including the reflector

λ is the wavelength

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
40	0.03	0.0075	0.240
50	0.03	0.0060	0.300

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
50	0.025	0.0060	0.208
75	0.025	0.0040	0.313

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
75	0.018	0.0040	0.162
110	0.018	0.0027	0.238

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
110	0.012	0.0027	0.106
170	0.012	0.0018	0.163

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
170	0.008	0.0018	0.073
260	0.008	0.0012	0.111

Below 1GHz data

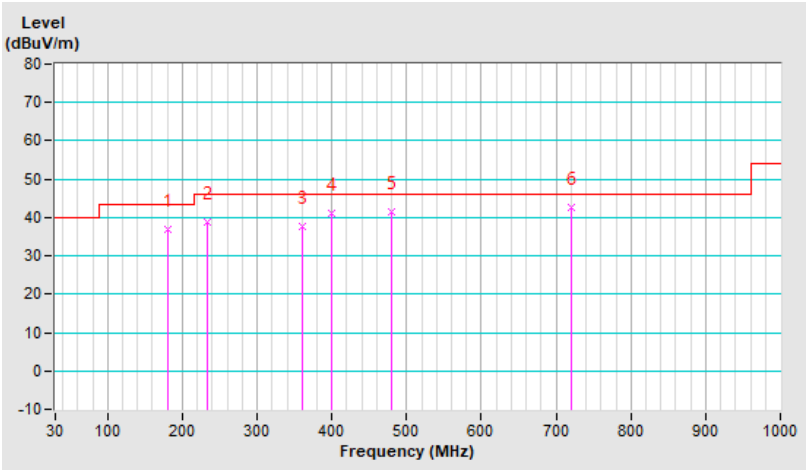
802.11g + Bluetooth + mmWave

CHANNEL	CH 6 + CH 39 + CH 1	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 m								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	180.35	36.8 QP	43.5	-6.7	1.49 H	248	51.2	-14.4
2	232.73	38.8 QP	46.0	-7.2	1.00 H	278	54.0	-15.2
3	359.80	37.7 QP	46.0	-8.3	1.00 H	122	48.8	-11.1
4	399.57	41.0 QP	46.0	-5.0	1.99 H	151	51.0	-10.0
5	480.08	41.6 QP	46.0	-4.4	1.00 H	230	49.6	-8.0
6	719.67	42.5 QP	46.0	-3.5	1.00 H	260	45.9	-3.4

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.

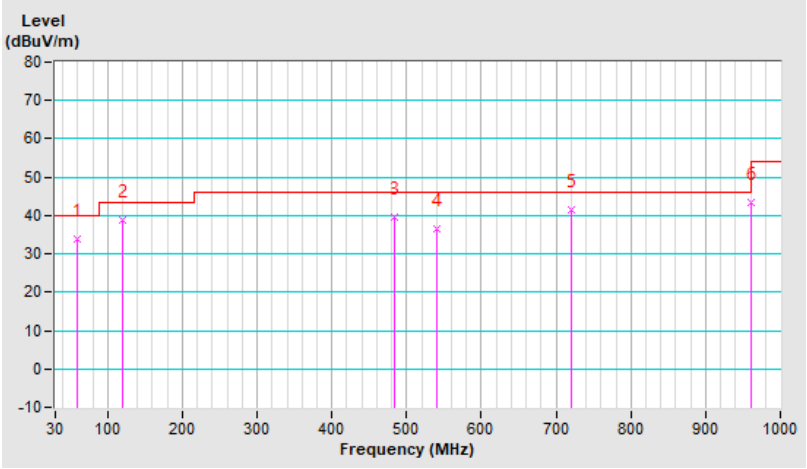


CHANNEL	CH 6 + CH 39 + CH 1	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 m								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	60.07	33.7 QP	40.0	-6.3	1.50 V	262	47.1	-13.4
2	120.21	38.9 QP	43.5	-4.6	1.01 V	288	54.0	-15.1
3	482.99	39.7 QP	46.0	-6.3	1.01 V	274	47.6	-7.9
4	540.22	36.7 QP	46.0	-9.3	2.00 V	147	43.5	-6.8
5	719.67	41.5 QP	46.0	-4.5	1.01 V	64	44.9	-3.4
6	960.23	43.2 QP	54.0	-10.8	1.01 V	157	43.7	-0.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.



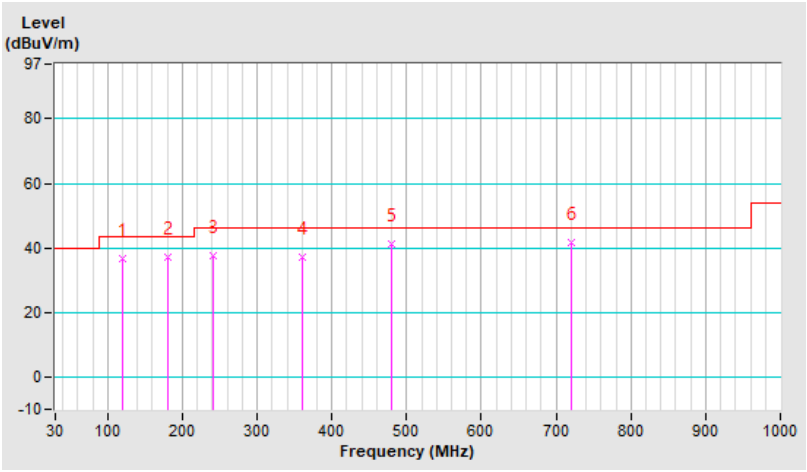
802.11n (HT20) + Bluetooth + mmWave

CHANNEL	CH 140 + CH 39 + CH 1	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 m								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	120.21	36.7 QP	43.5	-6.8	1.51 H	2	51.8	-15.1
2	180.35	37.3 QP	43.5	-6.2	1.51 H	253	51.7	-14.4
3	240.49	37.7 QP	46.0	-8.3	1.51 H	220	52.3	-14.6
4	359.80	37.0 QP	46.0	-9.0	2.00 H	102	48.1	-11.1
5	480.08	41.3 QP	46.0	-4.7	1.01 H	215	49.3	-8.0
6	719.67	41.8 QP	46.0	-4.2	1.01 H	254	45.2	-3.4

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.

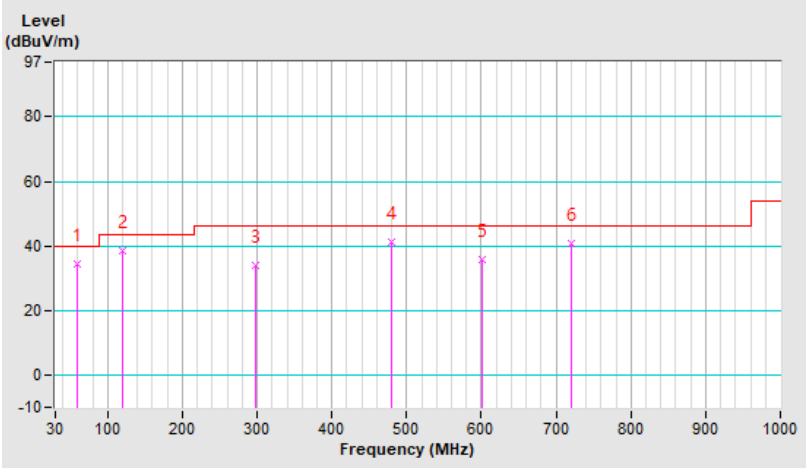


CHANNEL	CH 140 + CH 39 + CH 1	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 m								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	60.07	34.3 QP	40.0	-5.7	1.00 V	296	47.7	-13.4
2	120.21	38.7 QP	43.5	-4.8	1.00 V	310	53.8	-15.1
3	298.69	34.0 QP	46.0	-12.0	1.49 V	334	46.6	-12.6
4	480.08	41.1 QP	46.0	-4.9	1.00 V	147	49.1	-8.0
5	600.36	36.0 QP	46.0	-10.0	2.00 V	306	41.4	-5.4
6	719.67	40.9 QP	46.0	-5.1	1.00 V	71	44.3	-3.4

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.



5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

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

Linko EMC/RF Lab
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Web Site: http://ee.bureauveritas.com.tw

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

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