FCC Test Report

(Spot Check)

Report No.:	RF200219C04
FCC ID:	TX2-RTL8822CE
Test Model:	RTL8822CE
Received Date:	Feb. 19, 2020
Test Date:	Feb. 26, 2020
Issued Date:	Mar. 02, 2020
Applicant:	Realtek Semiconductor Corp.
Address:	No. 2, Innovation Road II, Hsinchu Science Park, Hsinchu 300, 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:	No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, Taiwan
FCC Registration / Designation Number:	788550 / TW0003

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Release Control Record

Issue No.	Description	Date Issued
RF200219C04	Original Release	Mar. 02, 2020

1 Certificate of Conformity

Product:	802.11a/b/g/n/ac RTL8822CE Combo Module
Brand:	REALTEK
Test Model:	RTL8822CE
Sample Status:	Engineering Sample
Applicant:	Realtek Semiconductor Corp.
Test Date:	Feb. 26, 2020
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.247) ANSI C63.10:2013

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 : Lena Wang , **Date:** Mar. 02, 2020

Lena Wang / Specialist

Approved by : , **Date:** Mar. 02, 2020

Dylan Chiou / Senior Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	**Test Item**	**Result**	**Remarks**
15.207	AC Power Conducted Emission	N/A	Refer to Note
15.247(a)(1)(iii)	Number of Hopping Frequency Used	N/A	Refer to Note
15.247(a)(1)(iii)	Dwell Time on Each Channel	N/A	Refer to Note
15.247(a)(1)	1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	N/A	Refer to Note
15.247(a)(1)	Maximum Peak Output Power	N/A	Refer to Note
15.205 & 209	Radiated Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -8.4 dB at 2390 MHz.
15.247(d)	Band Edge Measurement	N/A	Refer to Note
15.247(d)	Antenna Port Emission	N/A	Refer to Note
15.203	Antenna Requirement	N/A	Refer to Note

Note:

1. This report is a partial report, only spot check test items such as Radiated Spurious Emissions was were performed for this report. Other testing data please refer to BV CPS report no.: RE180816E04-2 for module (Brand: Realtek, RTL8822CE).
2. 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 up to 1 GHz	9 kHz ~ 30 MHz	3.04 dB
	30 MHz ~ 200 MHz	2.93 dB
	200 MHz ~ 1000 MHz	2.95 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	802.11a/b/g/n/ac RTL8822CE Combo Module
Brand	REALTEK
Test Model	RTL8822CE
Status of EUT	Engineering Sample
Power Supply Rating	3.3 Vdc (host equipment)
Modulation Type	GFSK, π/4-DQPSK, 8DPSK
Transfer Rate	1/2/3 Mbps
Operating Frequency	2402 ~ 2480 MHz
Number of Channel	79
Antenna Type	Refer to Note as below
Antenna Connector	N/A
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

3. This report is a partial report, only spot check test items such as Radiated Spurious Emissions was were performed for this report. Other testing data please refer to BV CPS report no.: RE180816E04-2 for module (Brand: Realtek, RTL8822CE).
4. The EUT is authorized for use in specific End-product. Please refer to below for more details.

Product	Brand	Model
Notebook Computer	HP	TPN-I137

5. The antenna information is listed as below.

Antenna Type	Manufacturer	Parts Number	Antenna Gain (dBi)			
			BT /WLAN 2.4 GHz	WLAN 5.15~5.35 GHz	WLAN 5.47~5.725 GHz	WLAN 5.725~5.85 GHz
Laptop Mode						
PIFA	INPAQ	Tx1/Rx1 Antenna: 6036B0263501 (WA-P-LB-02-733) Tx2/Rx2. Antenna: 6036B0263701 (WA-P-LB-02-734)	Tx1: 0.12 Tx2: 0.68	Tx1: -1.26 Tx2: 0.29	Tx1: -0.47 Tx2: -0.83	Tx1: -0.56 Tx2: -1.34
	AWAN	Tx1/Rx1 Antenna: 6036B0263601 (AUP5Y-100000) Tx2/Rx2. Antenna: 6036B0263401 (AUP5Y-100001)	Tx1: 1.80 Tx2: 1.36	Tx1: 1.34 Tx2: 0.38	Tx1: 2.86 Tx2: -1.84	Tx1: -0.56 Tx2: -3.28
Table Mode						
PIFA	INPAQ	Tx1/Rx1 Antenna: 6036B0263501 (WA-P-LB-02-733) Tx2/Rx2. Antenna: 6036B0263701 (WA-P-LB-02-734)	Tx1: -2.35 Tx2: -1.71	Tx1: -2.51 Tx2: -1.07	Tx1: -1.62 Tx2: -2.13	Tx1: -1.62 Tx2: -2.49
	AWAN	Tx1/Rx1 Antenna: 6036B0263601 (AUP5Y-100000) Tx2/Rx2. Antenna: 6036B0263401 (AUP5Y-100001)	Tx1: -1.47 Tx2: -1.96	Tx1: -0.01 Tx2: -2.01	Tx1: -1.44 Tx2: -4.7	Tx1: -0.76 Tx2: -5.47

6. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or User's Manual.

3.2 Description of Test Modes

79 channels are provided to this EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

3.2.1 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 1 GHz **RE<1G:** Radiated Emission below 1 GHz

Note:

1. The EUT had been pre-tested on the positioned of each 3 axis of tablet mode and NB mode. The worst case was found when positioned on **NB mode.**
2. "-" means no effect.

Radiated Emission Test (Above 1 GHz):

☒ 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	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	0	FHSS	GFSK	DH5

Radiated Emission Test (Below 1 GHz):

☒ 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	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	0	FHSS	GFSK	DH5

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE≥1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Tim Chen
RE<1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Tim Chen

3.3 Description of Support Units

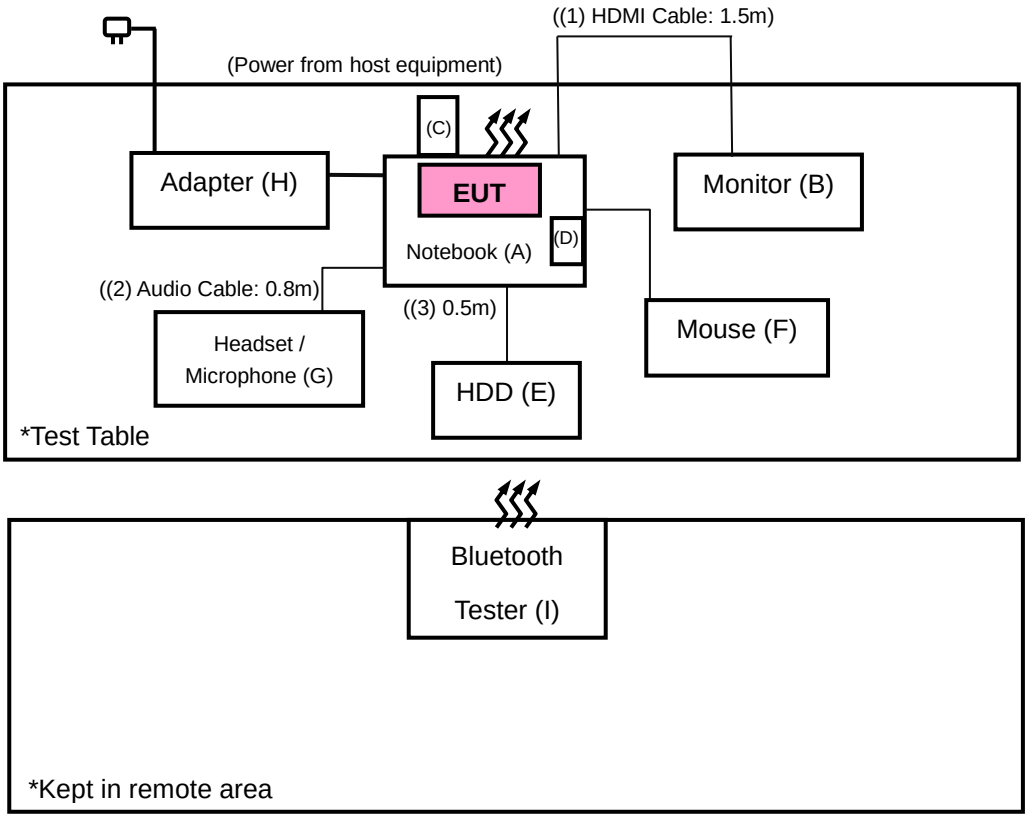
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Product	Brand	Model No.	Serial No.	FCC ID
A	Notebook Computer	HP	TPN-I137	N/A	N/A
B	Monitor	ViewSonic	VX2457-MHD	UG0182942333	N/A
C	USB 2.0 FLASH	HP	v250W	09	N/A
D	SD Card	SanDisk	N/A	N/A	N/A
E	HDD	G-Technology	0G04843	03	N/A
F	MOUSE	Dell	N/A	N/A	N/A
G	Headset / Microphone	HTC	N/A	N/A	N/A
H	Adapter	HP	TPN-AA05	N/A	N/A
I	Bluetooth Tester	R&S	CBT	100980	N/A

No.	Signal Cable Description Of The Above Support Units
1.	HDMI Cable: 1.5m
2.	Audio Cable: 0.8m
3.	HDD Cable: 0.5m

Note:
1. All power cords of the above support units are non-shielded (1.8m).
2. Items A was provided by client.

3.3.1 Configuration of System under Test



3.4 General Description of Applied Standards and References

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

Test Standard:

FCC Part 15, Subpart C (15.247)
ANSI C63.10-2013

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

References Test Guidance:

KDB 558074 D01 15.247 Meas Guidance v05r02

All test items have been performed as a reference to the above KDB test guidance.

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 20 dB 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:

a. The lower limit shall apply at the transition frequencies.

b. Emission level (dBuV/m) = 20 log Emission level (uV/m).

c. 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.

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY51210203	Mar. 18, 2019	Mar. 17, 2020
Spectrum Analyzer Agilent	N9010A	MY52220314	Dec. 12, 2019	Dec. 11, 2020
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 24, 2019	Nov. 23, 2020
BILOG Antenna SCHWARZBECK	VULB 9168	9168-472	Nov. 08, 2019	Nov. 07, 2020
Fixed Attenuator WORKEN	MDCS18N-10	MDCS18N-10-01	Apr. 15, 2019	Apr. 14, 2020
Loop Antenna	EM-6879	269	Sep. 16, 2019	Sep. 15, 2020
Preamplifier EMCI	EMC001340	980201	Oct. 14, 2019	Oct. 13, 2020
Bluetooth Tester	CBT	100946	Aug. 09, 2018	Aug. 08, 2020
Preamplifier EMCI	EMC 012645	980115	Oct. 08, 2019	Oct. 07, 2020
Preamplifier EMCI	EMC 330H	980112	Oct. 08, 2019	Oct. 07, 2020
RF Coaxial Cable HUBER+SUHNNER	EMC104-SM-SM-8000&3000	140811+170717	Oct. 08, 2019	Oct. 07, 2020
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM-1000(140807)	Oct. 08, 2019	Oct. 07, 2020
RF Coaxial Cable Worken	8D-FB	Cable-Ch10-01	Oct. 08, 2019	Oct. 07, 2020
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower &Turn Table Controller MF	MF-7802	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 / 24 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in HwaYa Chamber 10.

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 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 30 MHz.

For Radiated Emission above 30 MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 1 GHz) / 1.5 meters (for above 1 GHz) 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 detected 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:

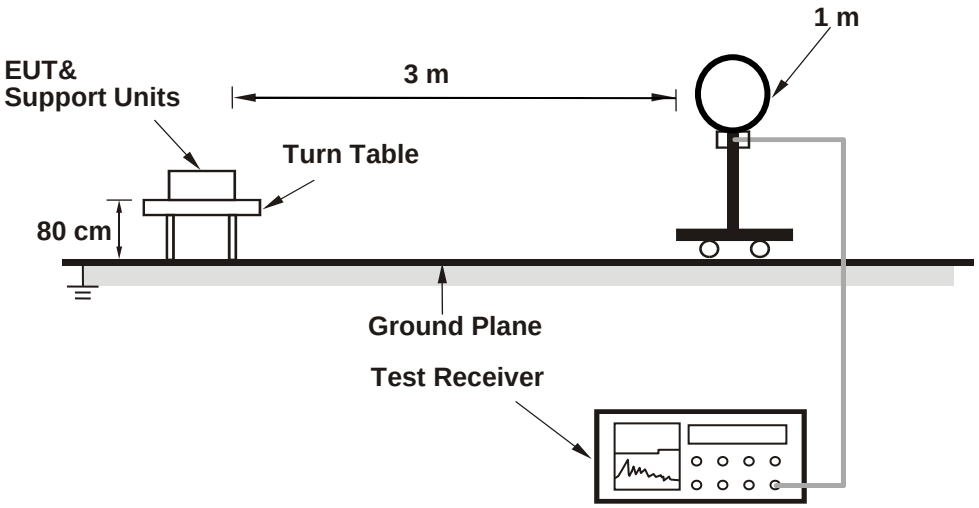
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK)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

4.1.4 Deviation from Test Standard

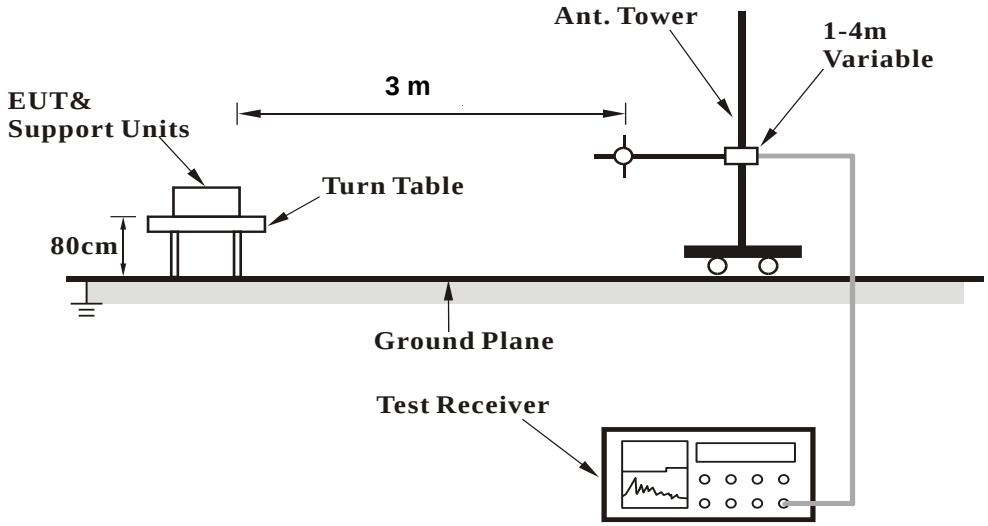
No deviation.

4.1.5 Test Set Up

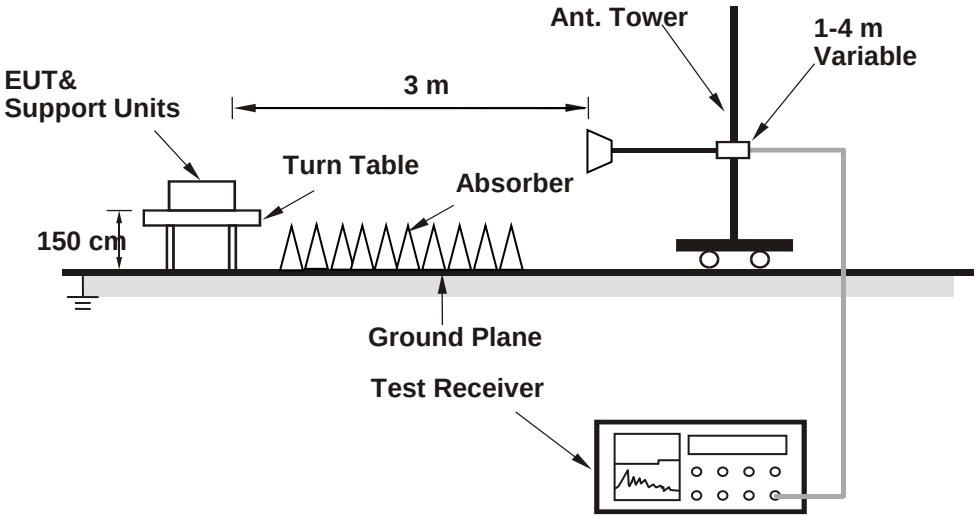
<Radiated Emission below 30 MHz>



<Radiated Emission 30 MHz to 1 GHz>



<Radiated Emission above 1 GHz>



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

4.1.6 EUT Operating Conditions

Set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1 GHz Data:

GFSK

EUT Test Condition		Measurement Detail	
Channel	Channel 0	**Frequency Range**	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	**Tested By**	Tim Chen

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	**Emission Level (dBuV/m)**	**Read Level (dBuV)**	**Factor (dB/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (cm)**	**Table Angle (Degree)**	**Remark**
2390	44.7	12.71	31.99	54	-9.3	177	214	Average
2390	46.18	51.71	-5.53	74	-27.82	177	214	Peak
2402	93.87	99.44	-5.57	------	------	177	214	Average
2402	94.72	100.29	-5.57	------	------	177	214	Peak
4804	32.09	47.11	-15.02	54	-21.91	162	341	Average
4804	42.85	57.87	-15.02	74	-31.15	162	341	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	**Emission Level (dBuV/m)**	**Read Level (dBuV)**	**Factor (dB/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (cm)**	**Table Angle (Degree)**	**Remark**
2390	**45.6**	**13.61**	**31.99**	**54**	**-8.4**	**344**	**255**	**Average**
2390	46.81	52.34	-5.53	74	-27.19	344	255	Peak
2402	95.23	100.8	-5.57	------	------	344	255	Average
2402	95.81	101.38	-5.57	------	------	344	255	Peak
4804	33.51	48.53	-15.02	54	-20.49	105	22	Average
4804	43.46	58.48	-15.02	74	-30.54	105	22	Peak

Remarks:

1. Emission Level = Read Level + Factor
   Margin value = Emission level – Limit value
2. 2402 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.

9 kHz ~ 30 MHz Data:

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

30 MHz ~ 1 GHz Worst-Case Data:

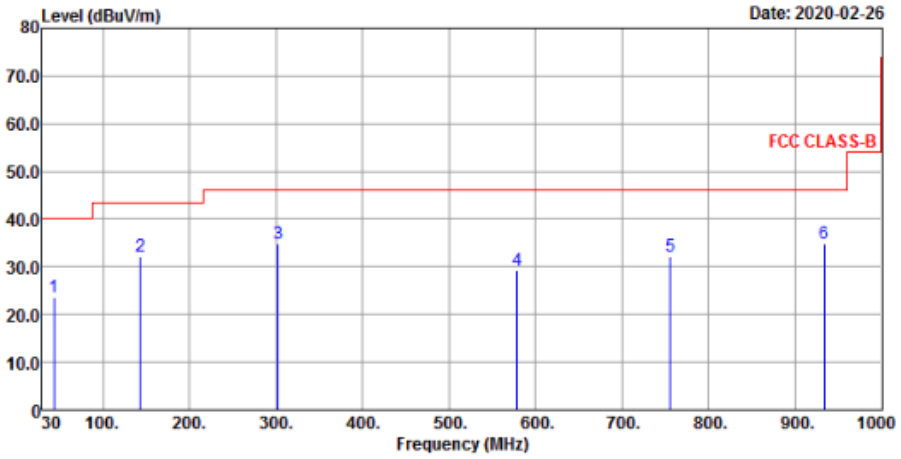
EUT Test Condition		Measurement Detail	
Channel	Channel 0	**Frequency Range**	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	**Tested By**	Tim Chen

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	**Emission Level (dBuV/m)**	**Read Level (dBuV)**	**Factor (dB/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (cm)**	**Table Angle (Degree)**	**Remark**
43.58	23.67	35.59	-11.92	40	-16.33	171	264	Peak
143.49	32.08	43.99	-11.91	43.5	-11.42	131	214	Peak
302.57	34.98	46.06	-11.08	46	-11.02	104	155	Peak
579.02	29.36	32.8	-3.44	46	-16.64	177	209	Peak
755.56	32.18	31.16	1.02	46	-13.82	176	89	Peak
934.04	34.95	31.52	3.43	46	-11.05	119	266	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	**Emission Level (dBuV/m)**	**Read Level (dBuV)**	**Factor (dB/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (cm)**	**Table Angle (Degree)**	**Remark**
45.52	29.08	40.86	-11.78	40	-10.92	222	344	Peak
157.07	25.53	37.13	-11.6	43.5	-17.97	157	104	Peak
293.84	30.12	41.48	-11.36	46	-15.88	124	109	Peak
575.14	28.02	31.59	-3.57	46	-17.98	133	266	Peak
783.69	33.67	32.12	1.55	46	-12.33	116	310	Peak
931.13	34.58	31.15	3.43	46	-11.42	142	65	Peak

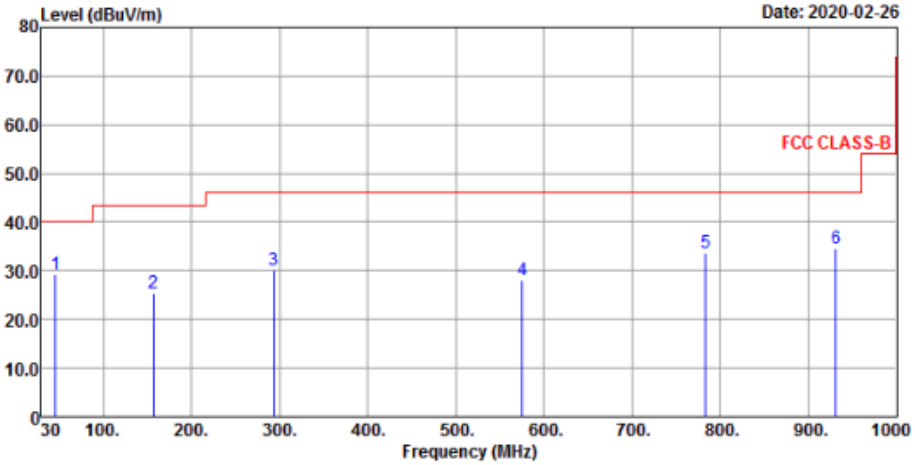
Remarks:

1. Emission Level = Read Level + Factor
   Margin value = Emission level – Limit value
2. The emission levels of other frequencies were very low against the limit.

Horizontal



Vertical



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 according to ISO/IEC 17025.

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

Lin Kou EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

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

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