

FCC Test Report

Report No.: RF190924C28-2

FCC ID: 2AQYP-3ABGPSW

Test Model: SNT3-ULTRA-V2-ABGPSW3(RCX)

Series Model: SNT3-ULTRA-V2-ABPSW3(RCX)
SNT3-ULTRA-V2-ABGPS3(RCX)
SNT3-ULTRA-V2-ABPS3(RCX)
SNT3-ULTRA-V2-ABGSW3(RCX)
SNT3-ULTRA-V2-ABSW3(RCX)
SNT3-ULTRA-V2-ABGS3(RCX)
SNT3-ULTRA-V2-ABS3(RCX) (Refer to section 3.1 for more details)

Received Date: Sep. 24, 2019

Test Date: Nov. 13, 2019

Issued Date: Nov. 20, 2019

Applicant: Sensolus NV

Address: Rijsenbergstraat 148D, 9000 Gent, Belgium

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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33383, Taiwan

FCC Registration /
Designation Number: 788550 / TW0003



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Release Control Record

Issue No.	Description	Date Issued
RF190924C28-2	Original Release	Nov. 20, 2019

1 Certificate of Conformity

Product: StickNTrack

Brand: Sensolus

Test Model: SNT3-ULTRA-V2-ABGPSW3(RCX)

Series Model: SNT3-ULTRA-V2-ABPSW3(RCX)
SNT3-ULTRA-V2-ABGPS3(RCX)
SNT3-ULTRA-V2-ABPS3(RCX)
SNT3-ULTRA-V2-ABGSW3(RCX)
SNT3-ULTRA-V2-ABSW3(RCX)
SNT3-ULTRA-V2-ABGS3(RCX)
SNT3-ULTRA-V2-ABS3(RCX) (Refer to section 3.1 for more details)

Sample Status: Mass Production

Applicant: Sensolus NV

Test Date: Nov. 13, 2019

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 : Gina Liu , **Date:** Nov. 20, 2019

Gina Liu / Specialist

Approved by : Dylan Chiou , **Date:** Nov. 20, 2019

Dylan Chiou / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.205 & 209	Radiated Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -0.79 dB at 5420.32 MHz

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 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	StickNTrack	
Brand	Sensolus	
Test Model	SNT3-ULTRA-V2-ABGPSW3(RCX)	
Series Model	SNT3-ULTRA-V2-ABPSW3(RCX) SNT3-ULTRA-V2-ABGPS3(RCX) SNT3-ULTRA-V2-ABPS3(RCX) SNT3-ULTRA-V2-ABGSW3(RCX) SNT3-ULTRA-V2-ABSW3(RCX) SNT3-ULTRA-V2-ABGS3(RCX) SNT3-ULTRA-V2-ABS3(RCX)	
Model Difference	Refer to note	
Status of EUT	Mass Production	
Power Supply Rating	3.6 Vdc (Battery)	
Modulation Type	BT LE	GFSK
	Sigfox	Uplink: DBPSK Downlink: GFSK
Operating Frequency	BT LE	2402 ~ 2480 MHz
	Sigfox	902.13 ~ 905.2 MHz
Antenna Type	BT LE	PCB track, meander PIFA antenna with 0.65 dBi gain
	Sigfox	Metal PIFA, SMD mount antenna with -0.87 dBi gain
Antenna Connector	N/A	
Accessory Device	N/A	
Data Cable Supplied	N/A	

Note:

1. The models of EUT are listed as below.

Model	Function list	Disable by SW or HW removed
Main	SNT3-ULTRA-V2-ABG PSW3(RCX)	Function: Bluetooth, GPS, Pressure sensor, Sigfox, Wifi All function
Variant-1	SNT3-ULTRA-V2-ABPS W3(RCX)	Function: Bluetooth, Pressure sensor, Sigfox, Wifi Disable by HW remove (chip and related components)
Variant-2	SNT3-ULTRA-V2-ABG PS3(RCX)	Function: Bluetooth, GPS, Pressure sensor, Sigfox Disable by HW remove (chip and related components)
Variant-3	SNT3-ULTRA-V2-ABPS 3(RCX)	Function: Bluetooth, Pressure sensor, Sigfox Disable by HW remove (chip and related components)
Variant-4	SNT3-ULTRA-V2-ABG SW3(RCX)	Function: Bluetooth, GPS, Sigfox, Wifi Disable by HW remove (chip and related components)
Variant-5	SNT3-ULTRA-V2-ABS W3(RCX)	Function: Bluetooth, Sigfox, Wifi Disable by HW remove (chip and related components)
Variant-6	SNT3-ULTRA-V2-ABG S3(RCX)	Function: Bluetooth, GPS, Sigfox Disable by HW remove (chip and related components)
Variant-7	SNT3-ULTRA-V2-ABS3 (RCX)	Function: Bluetooth, Sigfox Disable by HW remove (chip and related components)

* The model: SNT3-ULTRA-V2-ABGPSW3(RCX) was chosen for final test.

Explain the product feature codes:

A = Amplifier on sigfox RF frontend

B = Bluetooth

G = GPS

P = Pressure sensor

S = Sigfox

W = Wifi scanning (passive)

2. 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

40 channels are provided to this EUT:

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

54 channels are provided to this EUT:

CH	Freq. (MHz)										
0	902.1375	10	902.5375	20	903.0875	30	903.6375	40	904.0375	50	904.5875
1	902.1625	11	902.5625	21	903.1125	31	903.6625	41	904.0625	51	904.6125
2	902.1875	12	902.7375	22	903.1375	32	903.6875	42	904.2375	52	904.6375
3	902.2125	13	902.7625	23	903.1625	33	903.7125	43	904.2625	53	905.2
4	902.2375	14	902.7875	24	903.3375	34	903.7375	44	904.2875		
5	902.2625	15	902.8125	25	903.3625	35	903.7625	45	904.3125		
6	902.4375	16	902.8375	26	903.3875	36	903.9375	46	904.3375		
7	902.4625	17	902.8625	27	903.4125	37	903.9625	47	904.3625		
8	902.4875	18	903.0375	28	903.4375	38	903.9875	48	904.5375		
9	902.5125	19	903.0625	29	903.4625	39	904.0125	49	904.5625		

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

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

Note: "-"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 Config. Mode	Test Item	Function	Available Channel	Tested Channel	Modulation Type
-	Radiated Emission	BT LE	0 to 39	0 + 26	GFSK
		Sigfox	0 to 53		DBPSK

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 Config. Mode	Test Item	Function	Available Channel	Tested Channel	Modulation Type
-	Radiated Emission	BT LE	0 to 39	0 + 26	GFSK
		Sigfox	0 to 53		DBPSK

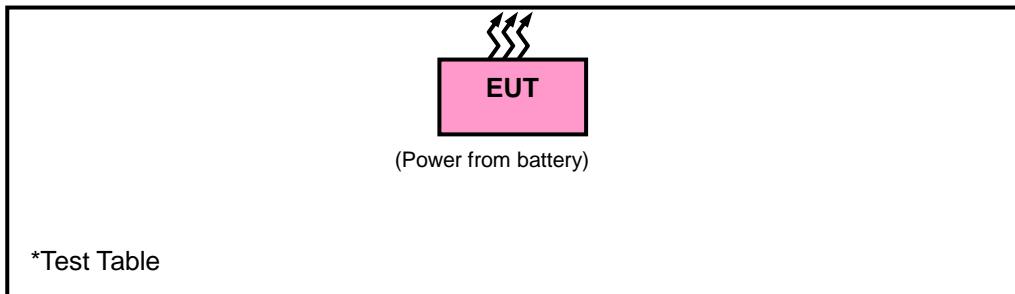
Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
Radiated Emission	25 deg. C, 65 % RH	3.6 Vdc	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.

3.3.1 Configuration of System under Test



3.4 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:

FCC Part 15, Subpart C (15.247)

KDB 558074 D01 15.247 Meas Guidance v05r02

ANSI C63.10-2013

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

4 Test Types and Results

4.1 Radiated Emission Measurement

4.1.1 Limits of Radiated Emission Measurement

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 (dB_uV/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.

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. 13, 2018	Dec. 12, 2019
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Apr. 15, 2019	Apr. 14, 2020
BILOG Antenna SCHWARZBECK	VULB 9168	9168-472	Nov. 23, 2018	Nov. 22, 2019
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 25, 2018	Nov. 24, 2019
Broadband Horn Antenna SCHWARZBECK	BBHA 9170	148	Nov. 25, 2018	Nov. 24, 2019
Fixed Attenuator WOKEN	MDCS18N-10	MDCS18N-10-01	Apr. 15, 2019	Apr. 14, 2020
Loop Antenna	HLA 6121	45745	Jul. 01, 2019	Jun. 30, 2020
Preamplifier EMCI	EMC001340	980201	Oct. 14, 2019	Oct. 13, 2020
Preamplifier EMCI	EMC 012645	980115	Oct. 08, 2019	Oct. 07, 2020
Preamplifier EMCI	EMC 184045	980116	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-800 0&3000	140811+170717	Oct. 08, 2019	Oct. 07, 2020
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM-1 000(140807)	Oct. 08, 2019	Oct. 07, 2020
RF Coaxial Cable WOKEN	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 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:

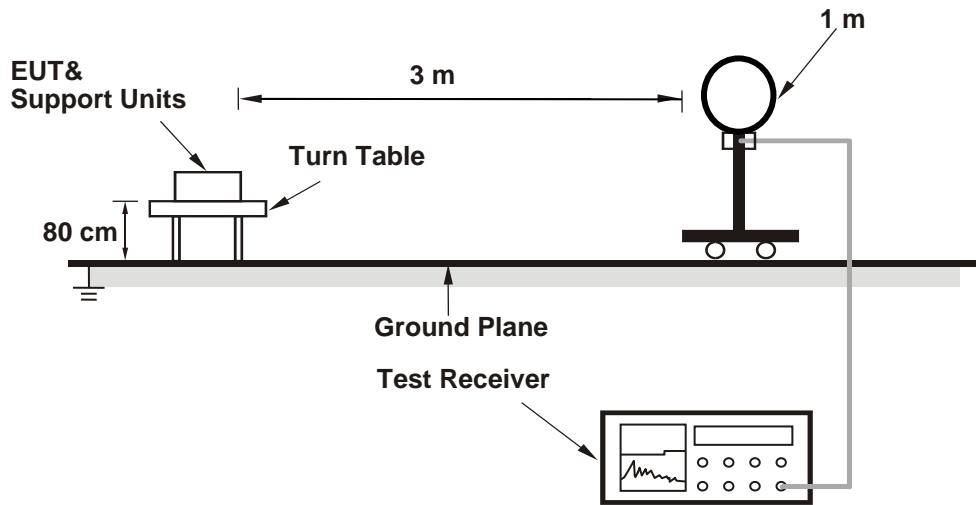
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK)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

4.1.4 Deviation from Test Standard

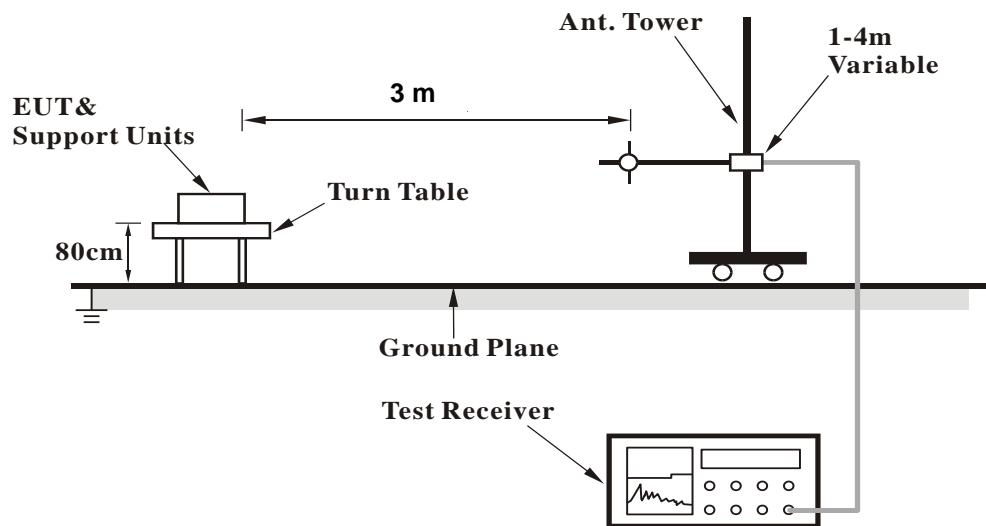
No deviation.

4.1.5 Test Set Up

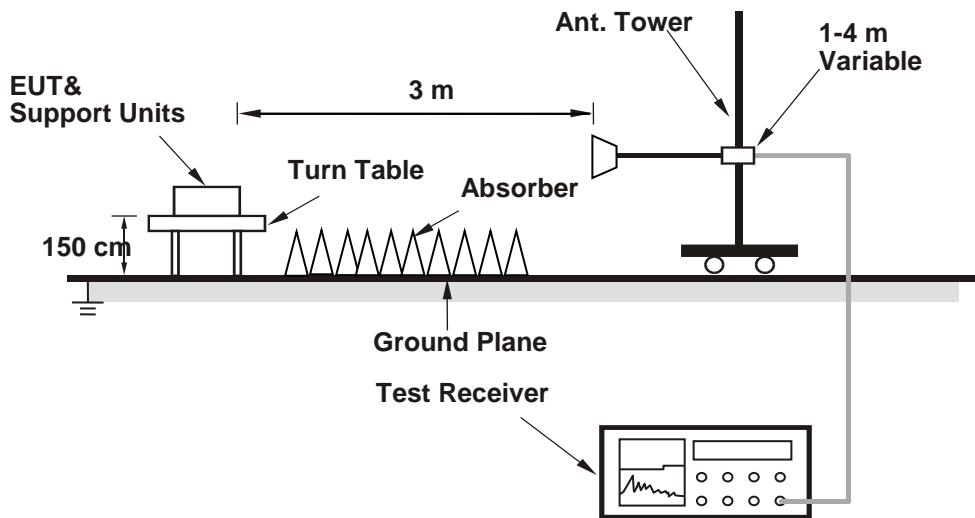
<Radiated Emission below 30 MHz>



<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

- Placed the EUT on a testing table.
- Use the software to control the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

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.

Above 1 GHz Data :

EUT Test Condition		Measurement Detail		
Channel		Channel 0+26		Frequency Range
Input Power		3.6 Vdc		Detector Function
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	37.63	42.63	-5	54	-16.37	124	218	Average
2390	50.23	55.23	-5	74	-23.77	124	218	Peak
2402	86.66	91.66	-5			124	218	Average
2402	88.73	93.73	-5			124	218	Peak
2710.165	49.78	69.96	-20.18	54	-4.22	110	300	Average
2710.165	51.38	71.56	-20.18	74	-22.62	110	300	Peak
4804	38.51	52.98	-14.47	54	-15.49	200	199	Average
4804	46.18	60.65	-14.47	74	-27.82	200	199	Peak

Antenna Polarity & Test Distance: Vertical at 3 m

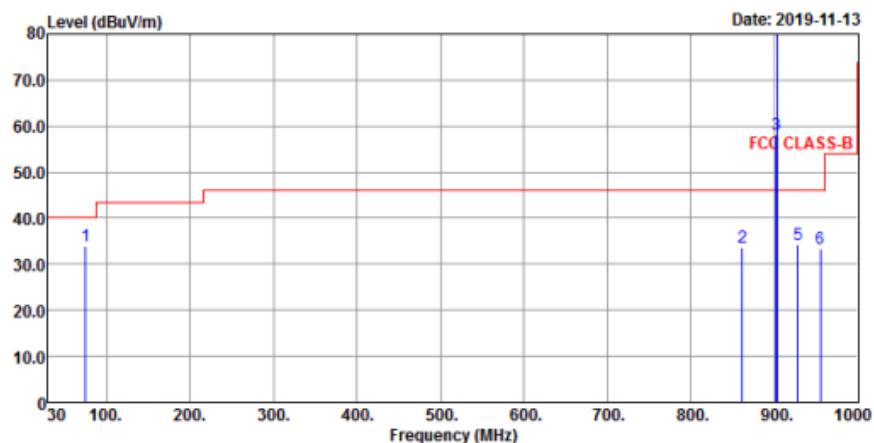
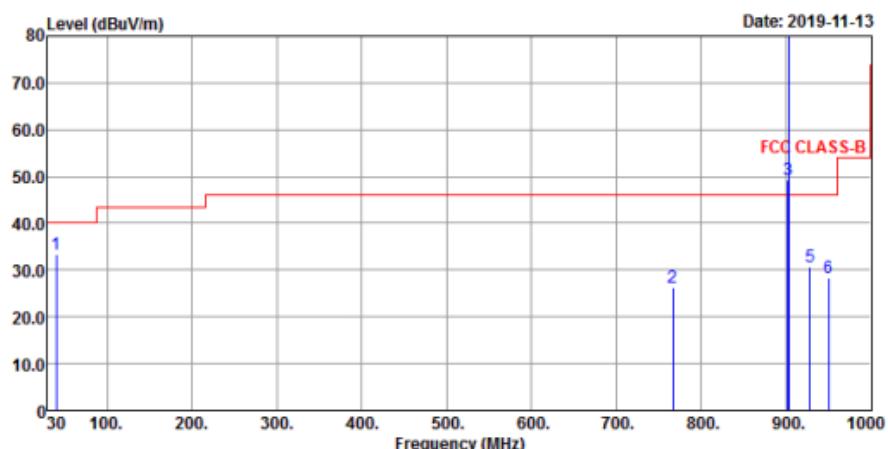
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	38.87	43.87	-5	54	-15.13	125	50	Average
2390	54.64	59.64	-5	74	-19.36	125	50	Peak
2402	95.98	100.98	-5			125	50	Average
2402	99.27	104.27	-5			125	50	Peak
4804	39.49	53.96	-14.47	54	-14.51	130	220	Average
4804	45.19	59.66	-14.47	74	-28.81	130	220	Peak
5420.32	53.21	66.27	-13.06	54	-0.79	111	299	Average
5420.32	56.96	70.02	-13.06	74	-17.04	111	299	Peak
*6323.713	51.37	62.14	-10.77	73.27	-21.9	137	308	Average
*6323.713	53.88	64.65	-10.77	93.27	-39.39	137	308	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.
4. " * ": Fundamental frequency.

30 MHz ~ 1 GHz Worst-Case Data:

EUT Test Condition		Measurement Detail	
Channel	Channel 0+26	Frequency Range	30 MHz ~ 1 GHz
Input Power	3.6 Vdc	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Tim Chen

Horizontal

Vertical


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
75.234	33.89	54.97	-21.08	40	-6.11	134	240	Peak
861.43	33.73	37.92	-4.19	46	-12.27	152	161	Peak
*902	58.02	62.48	-4.46	93.68	-35.66	149	193	QP
903.388	113.68	118.06	-4.38	46	67.68	149	193	QP
*928	34.16	37.11	-2.95	93.68	-59.52	149	193	QP
955.123	33.37	36.47	-3.1	46	-12.63	110	93	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
40.33	33.27	50.44	-17.17	40	-6.73	126	281	Peak
766.19	26.23	30.82	-4.59	46	-19.77	122	117	Peak
*902	49.31	53.77	-4.46	93.27	-43.96	161	71	QP
903.388	113.27	117.65	-4.38	46	67.27	161	71	QP
*928	30.62	33.57	-2.95	93.27	-62.65	161	71	QP
950.087	28.23	31.1	-2.87	46	-17.77	126	191	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.
3. " * ": Fundamental frequency.

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:

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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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