

## FCC Test Report

**Report No.:** RF170822C09-5

**FCC ID:** JEH-5555-01XX

**Marketing name:** NCR Orderman5 / NCR Orderman5+

**Test Model:** 5555-01XX

**Received Date:** Aug. 22, 2017

**Test Date:** Dec. 28, 2017 ~ Mar. 21, 2018

**Issued Date:** Mar. 22, 2018

**Applicant:** NCR

**Address:** 864 Spring Street NW Atlanta, GA 30308

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

**Lab Address:** No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan  
( R.O.C )

**Test Location:** No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City  
33383, Taiwan, R.O.C.

**FCC Registration /  
Designation Number:** 788550 / TW0003



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### Release Control Record

Issue No.	Description	Date Issued
RF170822C09-5	Original Release	Mar. 22, 2018

## 1 Certificate of Conformity

**Product:** 5555-01XX

**Brand:** NCR

**Marketing name:** NCR Orderman5 / NCR Orderman5+

**Test Model:** 5555-01XX


**Sample Status:** Production Unit


**Applicant:** NCR

**Test Date:** Dec. 28, 2017 ~ Mar. 21, 2018

**Standards:** 47 CFR FCC Part 15, Subpart C (Section 15.249)  
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 :** , **Date:** Mar. 22, 2018  
Gina Liu / Specialist

**Approved by :** , **Date:** Mar. 22, 2018  
Dylan Chiou / Project Engineer

## 2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.249)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -16.11 dB at 0.35953 MHz.
15.209 15.249 15.249 (d)	Radiated Emission Test Band Edge Measurement Limit: 50 dB less than the peak value of fundamental frequency or meet radiated emission limit in section 15.209	PASS	Meet the requirement of limit. Minimum passing margin is -13.92 dB at 927.525 MHz.

### 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	150 kHz ~ 30 MHz	2.44 dB
Radiated Emissions up to 1 GHz	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

<b>Product</b>	5555-01XX
<b>Brand</b>	NCR
<b>Marketing name</b>	NCR Orderman5 / NCR Orderman5+
<b>Test Model</b>	5555-01XX
<b>Status of EUT</b>	Production Unit
<b>Power Supply Rating</b>	3.7 Vdc (Li-ion battery)
<b>Modulation Type</b>	2-GFSK 4-GFSK
<b>Transfer Rate</b>	2-GFSK: 9.6 kbps 4-GFSK: 64 kbps
<b>Operating Frequency</b>	2-GFSK: 902.300 ~ 905.200 MHz 4-GFSK: 902.400 ~ 927.525 MHz
<b>Number of Channel</b>	3
<b>Antenna Type</b>	PIFA antenna with -5.38 dBi gain
<b>Antenna Connector</b>	N/A
<b>Accessory Device</b>	Refer to Note as below
<b>Data Cable Supplied</b>	Refer to Note as below

Note:

- The EUT contains following accessory devices.

Product	Brand	Model	Description
Battery	NCR	5555-0105-8801	3.7 Vdc, 3150 mAh
BT/WLAN Module	USI	WM-BAN-BM-07_S	--
OSR Module	TI	CC1125	--
NFC Module	NXP	NPC100	--
LCD Panel	Holitech	QDF8504-5.0	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

3 channels are provided to this EUT:

#### <2-GFSK>

Channel	Freq. (MHz)
1	902.3
2	903.7
3	905.2

#### <4-GFSK>

Channel	Freq. (MHz)
1	902.4
2	915.0
3	927.525

#### 3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE $\geq$ 1G	RE $<$ 1G	PLC	EB	
-	√	√	√	√	-

Where **RE $\geq$ 1G**: Radiated Emission above 1 GHz & Bandedge Measurement  
**RE $<$ 1G**: Radiated Emission below 1 GHz  
**PLC**: Power Line Conducted Emission  
**EB**: 20 dB Bandwidth measurement

**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 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	Tested Channel	Operating Frequency (MHz)	Modulation Type
-	1	902.3	2-GFSK
		902.4	4-GFSK
-	2	903.7	2-GFSK
		915.0	4-GFSK
-	3	905.2	2-GFSK
		927.525	4-GFSK

**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	Tested Channel	Operating Frequency (MHz)	Modulation Type
-	1	902.3	2-GFSK
		902.4	4-GFSK
-	2	903.7	2-GFSK
		915.0	4-GFSK
-	3	905.2	2-GFSK
		927.525	4-GFSK

**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	Tested Channel	Operating Frequency (MHz)	Modulation Type
-	3	927.525	4-GFSK

**20 dB Bandwidth:**

- 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	Tested Channel	Operating Frequency (MHz)	Modulation Type
-	1	902.3	2-GFSK
		902.4	4-GFSK
-	2	903.7	2-GFSK
		915.0	4-GFSK
-	3	905.2	2-GFSK
		927.525	4-GFSK

**Test Condition:**

Applicable To	Environmental Conditions	Input Power	Tested By
RE≥1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Getaz Yang
RE<1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Getaz Yang
PLC	25 deg. C, 68 % RH	120 Vac, 60 Hz	Getaz Yang
EB	25 deg. C, 68 % RH	120 Vac, 60 Hz	Getaz Yang



### 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.

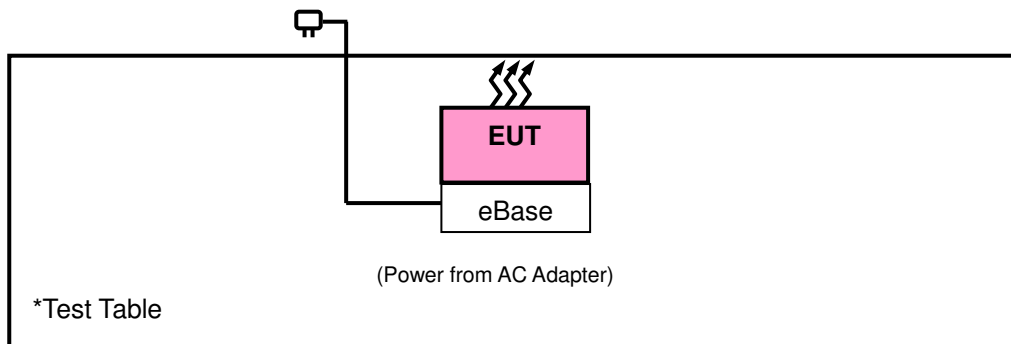
No.	Product	Brand	Model No.	Serial No.	FCC ID
1	NCR Orderman5 eBase	NCR	5555-02XX	N/A	N/A
2	Adapter	UMEC	UP0181M-05PE	N/A	N/A

No.	Signal Cable Description Of The Above Support Units
1.	N/A
2.	N/A

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item 1, 2 was provided by client.

#### 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 (15.249)

ANSI C63.10-2013

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

**NOTE:** The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

## 4 Test Types and Results

### 4.1 Radiated Emission and Bandedge Measurement

#### 4.1.1 Limits of Radiated Emission and Bandedge Measurement

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following

Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
902 ~ 928 MHz	50	500
2400 ~ 2483.5 MHz	50	500
5725 ~ 5875 MHz	50	500
24 ~ 24.25 GHz	250	2500

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits as below table, whichever is the lesser attenuation

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 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 20dB 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	Feb. 17, 2017	Feb. 16, 2018
	N9038A	MY52260177	Jul. 05, 2017	Jul. 04, 2018
Spectrum Analyzer Agilent	N9010A	MY52220314	Nov. 24, 2017	Nov. 23, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	100115	Nov. 23, 2017	Nov. 22, 2018
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Dec. 06, 2017	Dec. 05, 2018
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-969	Dec. 12, 2017	Dec. 11, 2018
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Dec. 01, 2017	Nov. 30, 2018
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 17, 2017	Apr. 16, 2018
Loop Antenna	HLA 6121	45745	May 19, 2017	May 18, 2018
Preamplifier EMCI	EMC001340	980201	Nov. 01, 2017	Oct. 30, 2018
Bluetooth Tester	CBT	100946	Jul. 29, 2016	Jul. 28, 2018
Preamplifier EMCI	EMC 012645	980115	Oct. 20, 2017	Oct. 19, 2018
Preamplifier EMCI	EMC 184045	980116	Oct. 20, 2017	Oct. 19, 2018
Preamplifier EMCI	EMC 330H	980112	Oct. 13, 2017	Oct. 12, 2018
Power Meter Anritsu	ML2495A	1012010	Aug. 15, 2017	Aug. 14, 2018
Power Sensor Anritsu	MA2411B	1315050	Aug. 15, 2017	Aug. 14, 2018
RF signal cable HUBER+SUHNNER	EMC104-SM-SM-800 0&3000	140811+170717	Oct. 20, 2017	Oct. 19, 2018
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM-1 000(140807)	Oct. 20, 2017	Oct. 19, 2018
RF Coaxial Cable Worken	8D-FB	Cable-Ch10-01	Oct. 20, 2017	Oct. 19, 2018
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.
3. The horn antenna and preamplifier (model: EMC 184045) are used only for the measurement of emission frequency above 1GHz if tested.
4. The IC Site Registration No. is IC7450F-10.

#### 4.1.3 Test Procedures

- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 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 detect 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:**

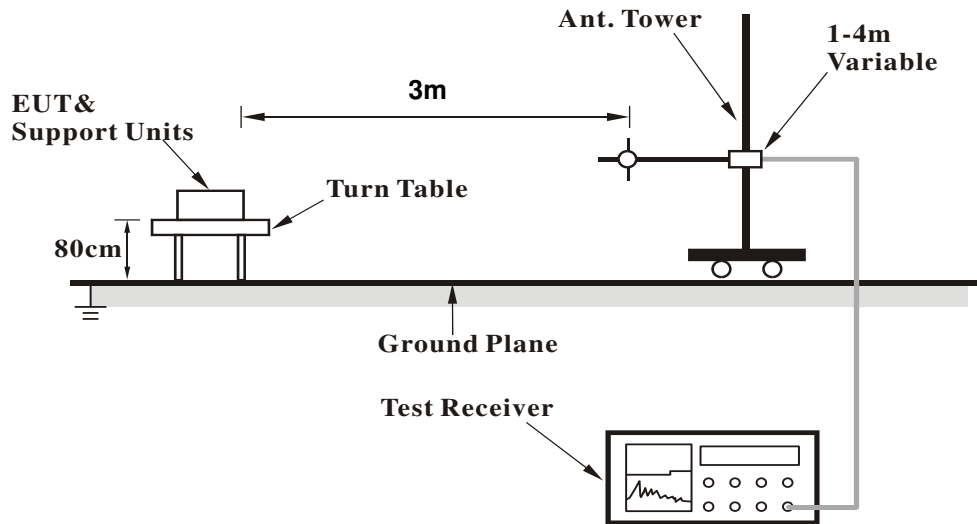
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz & 360 KHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1/T for Average (Duty cycle < 98 %) at frequency above 1 GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10 Hz (Duty cycle ≥ 98 %) for Average detection (AV) at frequency above 1 GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.1.4 Deviation from Test Standard

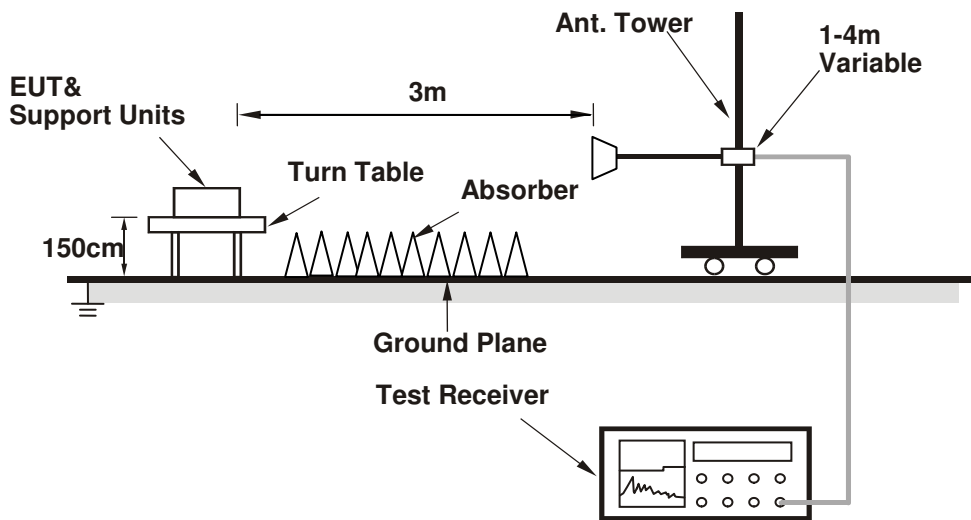
No deviation.

#### 4.1.5 Test Set Up

##### <Frequency Range below 1 GHz>



##### <Frequency Range 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

2-GFSK

EUT Test Condition		Measurement Detail	
Channel	Channel 1 (902.3MHz)	Frequency Range	30 MHz ~ 13 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Getaz Yang

Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
42.61	15.3	32.3	40	-24.7	13.58	0.5	31.08	105	5	QP
137.67	13.62	32.18	43.5	-29.88	12.21	0.92	31.69	121	285	QP
266.68	13.79	32.28	46	-32.21	11.97	1.52	31.98	119	283	QP
361.74	17.13	32.73	46	-28.87	14.43	1.93	31.96	117	149	QP
471.35	20.47	33.23	46	-25.53	16.75	2.38	31.89	110	204	QP
604.24	22.8	32.4	46	-23.2	19.66	2.92	32.18	127	271	QP
902.3	67.04	71.49	114	-46.96	23.52	4.05	32.02	128	342	Peak
902.3	66.88	71.33	94	-27.12	23.52	4.05	32.02	128	342	QP
1804.6	22.97	47.29	54	-31.03	25.4	4.22	53.94	110	204	Average
1804.6	34.07	58.39	74	-39.93	25.4	4.22	53.94	110	204	Peak

Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
41.64	15.29	32.28	40	-24.71	13.56	0.5	31.05	135	64	QP
144.46	13.59	31.76	43.5	-29.91	12.51	0.95	31.63	103	289	QP
257.95	13.67	32.34	46	-32.33	11.71	1.49	31.87	126	173	QP
354.95	16.76	32.5	46	-29.24	14.26	1.9	31.9	114	15	QP
478.14	20.73	33.3	46	-25.27	16.89	2.4	31.86	116	141	QP
654.68	23.69	32.28	46	-22.31	20.27	3.13	31.99	102	320	QP
902.3	74.58	79.03	114	-39.42	23.52	4.05	32.02	104	75	Peak
902.3	74.45	78.9	94	-19.55	23.52	4.05	32.02	104	75	QP
1804.6	23.01	47.33	54	-30.99	25.4	4.22	53.94	116	85	Average
1804.6	34.77	59.09	74	-39.23	25.4	4.22	53.94	116	85	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value

EUT Test Condition		Measurement Detail	
Channel	Channel 2 (903.7MHz)	Frequency Range	30 MHz ~ 13 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Getaz Yang

Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
43.58	14.96	31.98	40	-25.04	13.59	0.5	31.11	118	295	QP
139.61	14.23	32.6	43.5	-29.27	12.34	0.93	31.64	105	159	QP
256.01	14.69	33.45	46	-31.31	11.65	1.48	31.89	113	139	QP
353.01	17.03	32.8	46	-28.97	14.22	1.89	31.88	134	20	QP
480.08	18.99	31.5	46	-27.01	16.93	2.41	31.85	119	256	QP
601.33	22.36	32.06	46	-23.64	19.62	2.91	32.23	104	191	QP
903.7	68.51	72.96	114	-45.49	23.53	4.05	32.03	128	340	Peak
903.7	68.36	72.81	94	-25.64	23.53	4.05	32.03	128	340	QP
1807.4	22.97	47.29	54	-31.03	25.4	4.22	53.94	128	324	Average
1807.4	34.37	58.69	74	-39.63	25.4	4.22	53.94	128	324	Peak

Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
41.64	15.5	32.49	40	-24.5	13.56	0.5	31.05	117	217	QP
127.97	12.84	32.29	43.5	-30.66	11.55	0.88	31.88	111	47	QP
252.13	14.13	33.04	46	-31.87	11.54	1.47	31.92	127	104	QP
360.77	16.79	32.43	46	-29.21	14.4	1.93	31.97	116	91	QP
478.14	20.42	32.99	46	-25.58	16.89	2.4	31.86	138	331	QP
603.27	23.02	32.65	46	-22.98	19.65	2.92	32.2	132	323	QP
903.7	76.27	80.72	114	-37.73	23.53	4.05	32.03	104	72	Peak
903.7	76.12	80.57	94	-17.88	23.53	4.05	32.03	104	72	QP
1807.4	23.02	47.34	54	-30.98	25.4	4.22	53.94	116	229	Average
1807.4	34.09	58.41	74	-39.91	25.4	4.22	53.94	116	229	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value

EUT Test Condition		Measurement Detail	
Channel	Channel 3 (905.2MHz)	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	Getaz Yang

Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
49.4	15.36	33.03	40	-24.64	13.08	0.53	31.28	102	315	QP
134.76	12.75	31.59	43.5	-30.75	12.01	0.91	31.76	106	93	QP
221.09	13.2	33.32	46	-32.8	10.26	1.34	31.72	114	334	QP
345.25	16.84	32.78	46	-29.16	14.03	1.86	31.83	103	170	QP
482.99	19.79	32.22	46	-26.21	16.98	2.42	31.83	126	62	QP
604.24	23.43	33.03	46	-22.57	19.66	2.92	32.18	125	257	QP
905.2	65.16	69.59	114	-48.84	23.54	4.06	32.03	129	340	Peak
905.2	64.98	69.41	94	-29.02	23.54	4.06	32.03	129	340	QP
1810.4	22.96	47.27	54	-31.04	25.41	4.22	53.94	109	82	Average
1810.4	34.54	58.85	74	-39.46	25.41	4.22	53.94	109	82	Peak

Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
42.61	15.18	32.18	40	-24.82	13.58	0.5	31.08	126	132	QP
142.52	13.36	31.61	43.5	-30.14	12.44	0.94	31.63	110	258	QP
261.83	13.41	31.98	46	-32.59	11.82	1.5	31.89	136	7	QP
350.1	17.6	33.41	46	-28.4	14.15	1.88	31.84	120	274	QP
438.37	18.96	32.64	46	-27.04	16.1	2.22	32	139	71	QP
575.14	22.57	32.84	46	-23.43	19.03	2.8	32.1	121	14	QP
905.2	73.42	77.85	114	-40.58	23.54	4.06	32.03	102	72	Peak
905.2	73.28	77.71	94	-20.72	23.54	4.06	32.03	102	72	QP
1810.4	23.04	47.35	54	-30.96	25.41	4.22	53.94	116	336	Average
1810.4	36.56	60.87	74	-37.44	25.41	4.22	53.94	116	336	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value



#### 4-GFSK

EUT Test Condition		Measurement Detail	
Channel	Channel 1 (902.4MHz)	Frequency Range	30 MHz ~ 13 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Getaz Yang

#### Antenna Polarity & Test Distance: Horizontal at 3 m

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
43.58	16.1	33.12	40	-23.9	13.59	0.5	31.11	109	18	QP
138.64	14.94	33.4	43.5	-28.56	12.27	0.93	31.66	101	241	QP
254.07	13.86	32.69	46	-32.14	11.59	1.48	31.9	102	90	QP
343.31	16.43	32.43	46	-29.57	13.98	1.85	31.83	107	235	QP
484.93	20.33	32.69	46	-25.67	17.02	2.43	31.81	115	120	QP
653.71	23.65	32.25	46	-22.35	20.26	3.13	31.99	136	292	QP
902.4	66.87	71.32	114	-47.13	23.52	4.05	32.02	127	349	Peak
902.4	66.69	71.14	94	-27.31	23.52	4.05	32.02	127	349	QP
1804.8	25.98	50.3	54	-28.02	25.4	4.22	53.94	105	159	Average
1804.8	35.21	59.53	74	-38.79	25.4	4.22	53.94	105	159	Peak

#### Antenna Polarity & Test Distance: Vertical at 3 m

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
39.7	15.38	32.34	40	-24.62	13.54	0.49	30.99	111	305	QP
136.7	13.86	32.51	43.5	-29.64	12.14	0.92	31.71	100	209	QP
265.71	14.28	32.79	46	-31.72	11.94	1.51	31.96	106	100	QP
383.08	18.12	33.15	46	-27.88	14.94	2.01	31.98	121	244	QP
485.9	19.44	31.77	46	-26.56	17.04	2.43	31.8	129	283	QP
653.71	23.72	32.32	46	-22.28	20.26	3.13	31.99	119	194	QP
902.4	74.83	79.28	114	-39.17	23.52	4.05	32.02	104	68	Peak
902.4	74.64	79.09	94	-19.36	23.52	4.05	32.02	104	68	QP
1804.8	33.53	57.85	54	-20.47	25.4	4.22	53.94	105	236	Average
1804.8	36.58	60.9	74	-37.42	25.4	4.22	53.94	105	236	Peak

Remarks:

2. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor

Margin value = Emission level – Limit value

EUT Test Condition		Measurement Detail	
Channel	Channel 2 (915MHz)	Frequency Range	30 MHz ~ 13 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Getaz Yang

Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
39.7	15.69	32.65	40	-24.31	13.54	0.49	30.99	109	82	QP
140.58	13.41	31.75	43.5	-30.09	12.37	0.93	31.64	113	217	QP
167.74	13.61	32.35	43.5	-29.89	11.96	1.06	31.76	123	94	QP
292.87	15.32	32.67	46	-30.68	12.74	1.63	31.72	109	35	QP
442.25	19.61	33.19	46	-26.39	16.18	2.24	32	102	79	QP
610.06	22.86	32.27	46	-23.14	19.73	2.94	32.08	132	57	QP
915	69.41	73.74	114	-44.59	23.59	4.11	32.03	129	344	Peak
915	69.23	73.56	94	-24.77	23.59	4.11	32.03	129	344	QP
1830	33.99	58.27	54	-20.01	25.41	4.25	53.94	116	141	Average
1830	37.23	61.51	74	-36.77	25.41	4.25	53.94	116	141	Peak

Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
40.67	16.26	33.24	40	-23.74	13.55	0.49	31.02	116	336	QP
121.18	13.15	33.11	43.5	-30.35	11.09	0.85	31.9	101	175	QP
258.92	14.76	33.39	46	-31.24	11.74	1.49	31.86	135	234	QP
393.75	18.51	33.33	46	-27.49	15.19	2.07	32.08	122	294	QP
518.88	20.79	32.02	46	-25.21	17.75	2.59	31.57	109	17	QP
648.86	23.66	32.38	46	-22.34	20.2	3.11	32.03	103	187	QP
915	77.21	81.54	114	-36.79	23.59	4.11	32.03	105	77	Peak
915	77.01	81.34	94	-16.99	23.59	4.11	32.03	105	77	QP
1830	34.3	58.58	54	-19.7	25.41	4.25	53.94	102	158	Average
1830	38.27	62.55	74	-35.73	25.41	4.25	53.94	102	158	Peak

Remarks:

2. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor

Margin value = Emission level – Limit value

EUT Test Condition		Measurement Detail	
Channel	Channel 3 (927.525MHz)	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	Getaz Yang

Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
42.61	15.19	32.19	40	-24.81	13.58	0.5	31.08	129	256	QP
142.52	13.35	31.6	43.5	-30.15	12.44	0.94	31.63	110	257	QP
165.8	13.38	31.97	43.5	-30.12	12.15	1.05	31.79	107	187	QP
291.9	14.61	31.97	46	-31.39	12.71	1.63	31.7	138	62	QP
389.87	18.75	33.64	46	-27.25	15.1	2.05	32.04	136	81	QP
569.32	21.84	32.25	46	-24.16	18.9	2.77	32.08	119	122	QP
927.525	71.82	75.99	114	-42.18	23.66	4.16	31.99	125	341	Peak
927.525	71.04	75.21	94	-22.96	23.66	4.16	31.99	125	341	QP
1855.05	37.6	61.86	54	-16.4	25.41	4.28	53.95	125	79	Average
1855.05	37.3	61.56	74	-36.7	25.41	4.28	53.95	125	79	Peak

Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
39.7	14.52	31.48	40	-25.48	13.54	0.49	30.99	129	256	QP
161.92	13.04	31.32	43.5	-30.46	12.54	1.03	31.85	110	257	QP
252.13	13.41	32.32	46	-32.59	11.54	1.47	31.92	107	187	QP
341.37	15.99	32.03	46	-30.01	13.94	1.84	31.82	138	62	QP
442.25	18.57	32.15	46	-27.43	16.18	2.24	32	136	81	QP
564.47	22.41	32.93	46	-23.59	18.79	2.76	32.07	119	122	QP
927.525	80.26	84.43	114	-33.74	23.66	4.16	31.99	103	76	Peak
927.525	80.08	84.25	94	-13.92	23.66	4.16	31.99	103	76	QP
1855.05	38.17	62.43	54	-15.83	25.41	4.28	53.95	113	85	Average
1855.05	39.71	63.97	74	-34.29	25.41	4.28	53.95	113	85	Peak

Remarks:

2. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor

Margin value = Emission level – Limit value

## 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 0.50 MHz.

### 4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration	Due Date Of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 23, 2017	Nov. 22, 2018
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Sep. 05, 2017	Sep. 04, 2018
LISN/AMN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Mar. 10, 2017	Mar. 09, 2018
LISN/AMN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 15, 2017	Aug. 14, 2018
Software ADT	BV ADT_Cond_ V7.3.7.3	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 Shielded Room 1.
  3. The VCCI Site Registration No. is C-2040.

### 4.2.3 Test Procedures

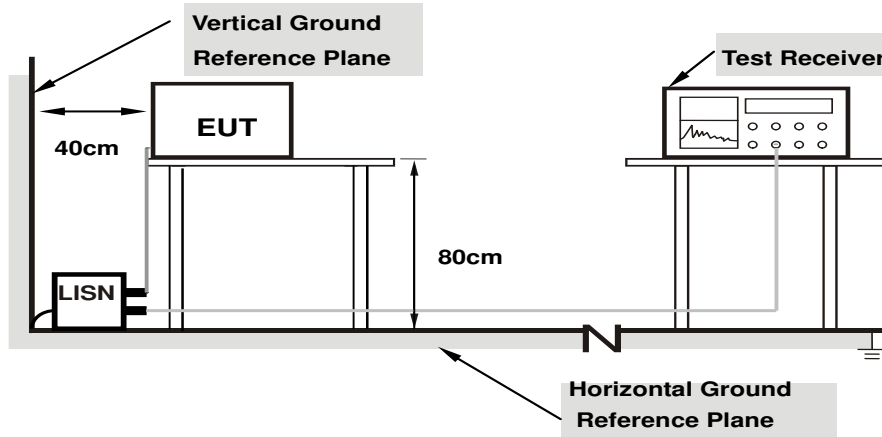
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50 uH of coupling 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 30 MHz was searched. Emission levels under (Limit – 20 dB) 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 0.15 MHz - 30 MHz.

#### 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.

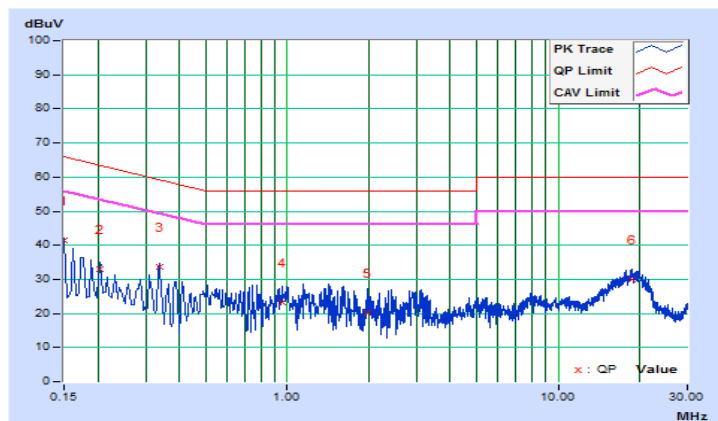
#### 4.2.7 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Getaz Yang	Test Date	2017/12/28

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.39	30.86	18.56	41.25	28.95	66.00	56.00	-24.75	-27.05
2	0.20474	10.39	22.76	10.68	33.15	21.07	63.42	53.42	-30.27	-32.35
3	0.33750	10.40	23.24	21.62	33.64	32.02	59.26	49.26	-25.62	-17.24
4	0.95561	10.42	12.84	6.32	23.26	16.74	56.00	46.00	-32.74	-29.26
5	1.97988	10.46	9.69	3.59	20.15	14.05	56.00	46.00	-35.85	-31.95
6	18.65994	11.29	18.57	9.68	29.86	20.97	60.00	50.00	-30.14	-29.03

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

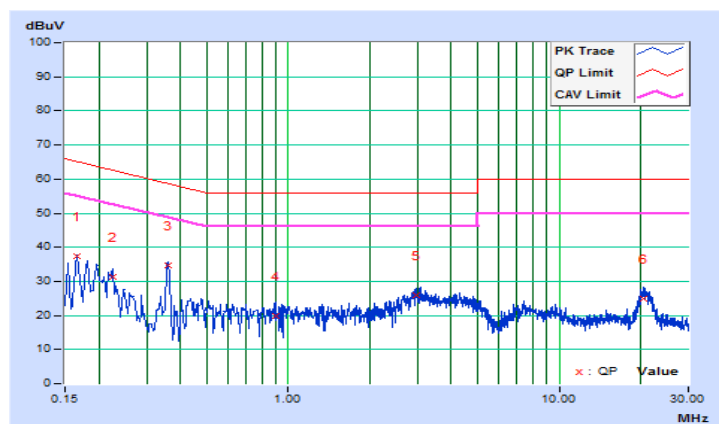


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Getaz Yang	Test Date	2017/12/28

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16569	10.16	27.31	18.16	37.47	28.32	65.17	55.17	-27.70	-26.85
2	0.22429	10.16	21.06	14.16	31.22	24.32	62.66	52.66	-31.44	-28.34
<b>3</b>	<b>0.35953</b>	<b>10.17</b>	<b>24.47</b>	<b>22.46</b>	<b>34.64</b>	<b>32.63</b>	<b>58.74</b>	<b>48.74</b>	<b>-24.10</b>	<b>-16.11</b>
4	0.89681	10.19	9.77	5.84	19.96	16.03	56.00	46.00	-36.04	-29.97
5	2.96911	10.28	15.57	7.91	25.85	18.19	56.00	46.00	-30.15	-27.81
6	20.47418	10.97	14.03	5.41	25.00	16.38	60.00	50.00	-35.00	-33.62

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



### 4.3 20 dB Bandwidth

#### 4.3.1 Limits of 20 dB Bandwidth Measurement

The 20 dB bandwidth shall be specified in operating frequency band.

#### 4.3.2 Test Setup

Refer to section 4.1.5.

#### 4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

#### 4.3.4 Test Procedures

The bandwidth of the fundamental frequency was measured by spectrum analyzer with 1 kHz RBW and 3 kHz VBW. The 20 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20 dB.

#### 4.3.5 Deviation from Test Standard

No deviation.

#### 4.3.6 EUT Operating Conditions

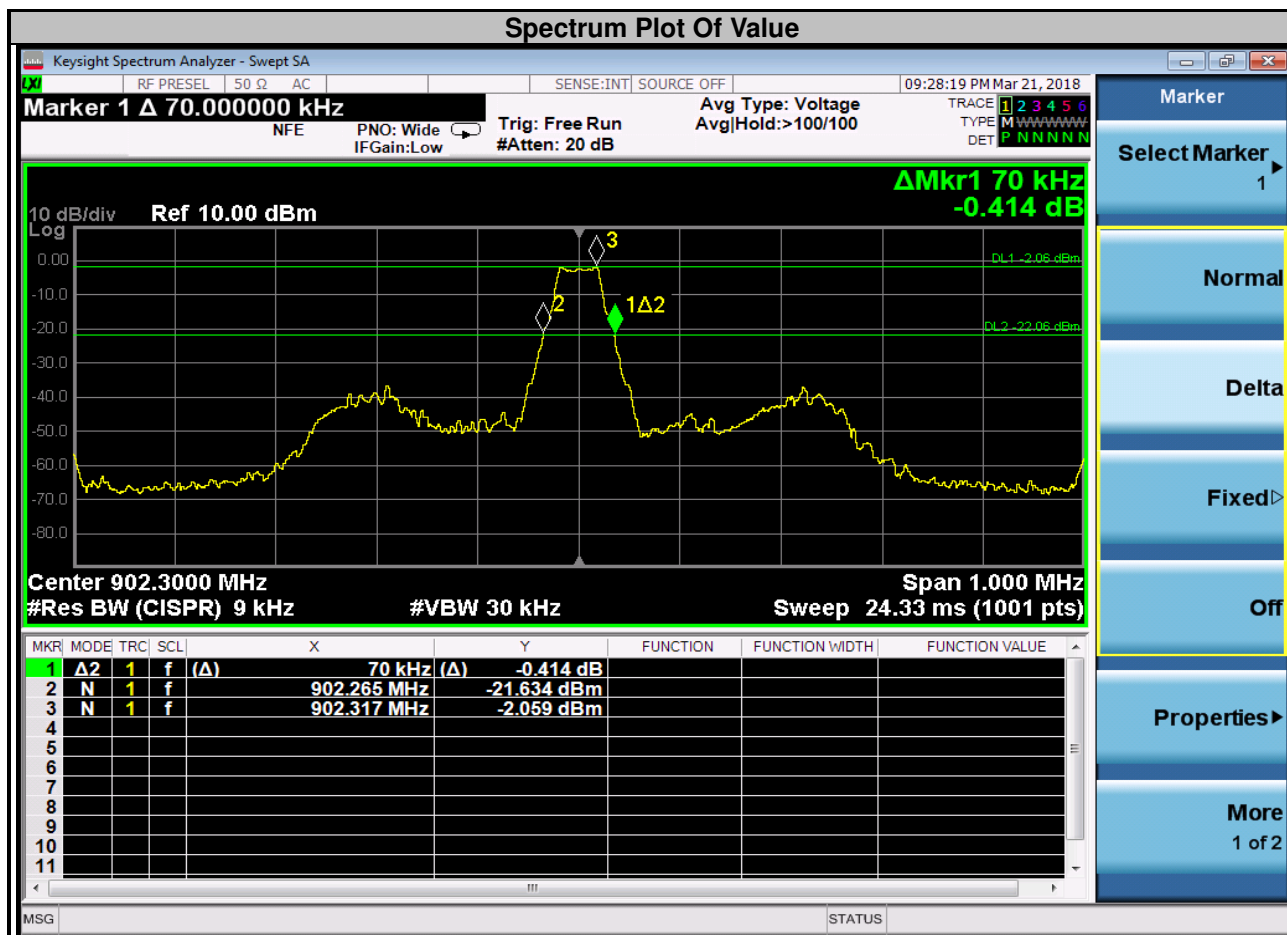
- a. Placed the EUT on the testing table.
- b. Set the EUT under transmission condition continuously at specific channel frequency.



4.3.7 Test Results

2-GFSK

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
1	902.3	0.07

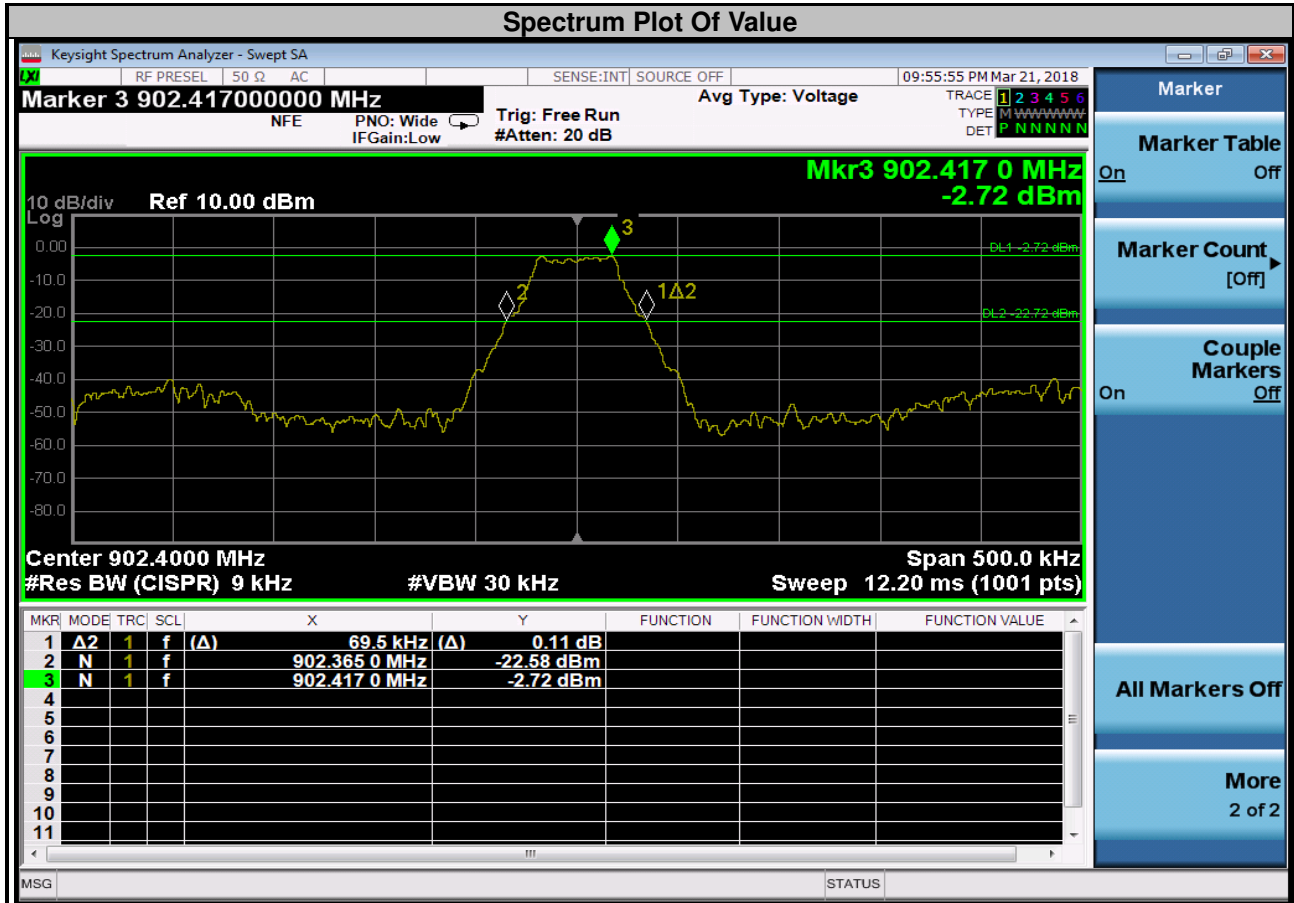






4-GFSK

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
1	902.4	0.07







## 5 Pictures of Test Arrangements

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

## Appendix – Information on 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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**Web Site:** [www.bureauveritas-adt.com](http://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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