



Hong Kong

## Test Equipment List

DESCRIPTION	Type No.	Serial No.	Calibrated until
Antenna	VULB9163	9163 330	2014.02.24
Antenna	3164-05	85724	2014.02.17
Loop Antenna	6512	29604	2013.09.24
Spectrum Analyzer	FSP 40	100378	2013.12.22
EMI Test Receiver	ESCI	100701	2013.08.03
Spectrum Analyzer	FSV40	100903	2014.01.26
Test Cable	SUCOFLEX 104	MY2320/4	2014.02.17
Amplifier	150A250	326446	2014.03.17
Temp. & Humid. Chamber	FACT5-2.0	4166	2013.11.21

## 7.1 Spurious radiated emissions

### Test Method

- 1 The EUT is placed on a turntable, which is 0.8m above ground plane.
- 2 The turntable shall be rotated for 360 degrees to determine the position of maximum emission level
- 3 EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- 4 Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 5 Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

### Limit

Frequency MHz	Field Strength uV/m	Field Strength dB $\mu$ V/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK



Hong Kong

**Spurious radiated emissions**Date of test : 31<sup>st</sup> January 2013

Test requirement : FCC Part 15

Test method : ANSI C63.4:2009

Operating mode : Transmit mode

Frequency : 2402MHz (GFSK)

Remark : The EUT has been tested under all modulation modes, only the worst case GFSK modulation test result are listed in the report.

Test Result

 Passed Not Passed

Frequency (MHz)	Polarity (H/V)	Read Level (dB $\mu$ V)	Corr. (dB)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
178.560	H	72.7	-38.9	33.8	43.5	-9.7	QP
179.580	H	75.1	-38.8	36.3	43.5	-7.2	QP
179.940	H	69.7	-38.8	30.9	43.5	-12.6	QP
180.300	H	66.4	-38.7	27.7	43.5	-15.8	QP
180.660	H	63.4	-38.7	24.7	43.5	-18.8	QP
181.320	H	71.6	-38.5	33.1	43.5	-10.4	QP
*1602.000	H	64.3	-13.8	50.5	74.0	-23.5	PK
*1602.000	H	55.5	-13.8	41.7	54.0	-12.3	AV
*2258.000	H	57.8	-9.0	48.8	74.0	-25.2	PK
*2258.000	H	43.3	-9.0	34.3	54.0	-19.7	AV
*2387.000	H	50.6	-8.0	42.6	74.0	-31.4	PK
*2387.000	H	39.4	-8.0	31.4	54.0	-22.6	AV
2402.000	H	102.9	-7.7	95.2	-	-	PK
2402.000	H	91.6	-7.7	83.9	-	-	AV
*2495.000	H	46.3	-6.5	39.8	74.0	-34.2	PK
*2495.000	H	39.7	-6.5	33.2	54.0	-20.8	AV
2651.000	H	49.2	-5.9	43.3	74.0	-30.7	PK
2651.000	H	43.1	-5.9	37.2	54.0	-16.8	AV
*4804.000	H	65.7	-1.9	63.8	74.0	-10.2	PK
*4804.000	H	52.9	-1.9	50.9	54.0	-3.1	AV

“\*” means the emission(s) appear within the restricted bands shall follow the requirement of section 15.205.





Hong Kong

**Spurious radiated emissions**Date of test : 31<sup>st</sup> January 2013

Test requirement : FCC Part 15

Test method : ANSI C63.4:2009

Operating mode : Transmit mode

Frequency : 2402MHz (GFSK)

Remark : The EUT has been tested under all modulation modes, only the worst case GFSK modulation test result are listed in the report.

Test Result

 Passed Not Passed

Frequency (MHz)	Polarity (H/V)	Read Level (dB $\mu$ V)	Corr. (dB)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
30.780	V	61.8	-37.5	24.3	40.0	-15.7	QP
36.720	V	60.7	-36.3	24.4	40.0	-15.6	QP
178.560	V	66.9	-38.8	28.1	43.5	-15.4	QP
180.660	V	70.5	-38.6	31.9	43.5	-11.6	QP
181.320	V	63.4	-38.5	24.9	43.5	-18.6	QP
182.760	V	62.0	-38.3	23.7	43.5	-19.8	QP
*1602.000	V	58.7	-14.9	43.8	74.0	-30.2	PK
*1602.000	V	51.7	-14.9	36.8	54.0	-17.2	AV
*2258.000	V	60.9	-9.5	51.4	74.0	-22.6	PK
*2258.000	V	48.1	-9.5	38.6	54.0	-15.4	AV
*2387.000	V	49.2	-8.3	40.9	74.0	-33.1	PK
*2387.000	V	39.6	-8.3	31.3	54.0	-22.7	AV
2402.000	V	99.8	-8.0	91.8	-	-	PK
2402.000	V	87.3	-8.0	79.3	-	-	AV
*2495.000	V	48.0	-7.8	40.2	74.0	-33.8	PK
*2495.000	V	44.4	-7.8	36.6	54.0	-17.4	AV
2651.000	V	49.7	-6.9	42.8	74.0	-31.2	PK
2651.000	V	41.5	-6.9	34.6	54.0	-19.4	AV
*4804.000	V	65.6	-1.6	64.0	74.0	-10.0	PK
*4804.000	V	52.6	-1.6	51.0	54.0	-3.0	AV

\*\* means the emission(s) appear within the restricted bands shall follow the requirement of section 15.205.

### Spurious radiated emissions

Date of test : 31<sup>st</sup> January 2013

Test requirement : FCC Part 15

Test method : ANSI C63.4:2009

Operating mode : Transmit mode

Frequency : 2441MHz (GFSK)

Remark : The EUT has been tested under all modulation modes, only the worst case GFSK modulation test result are listed in the report.

Test Result	
<input checked="" type="checkbox"/>	Passed
<input type="checkbox"/>	Not Passed

Frequency (MHz)	Polarity (H/V)	Read Level (dB $\mu$ V)	Corr. (dB)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
178.560	H	73.0	-38.9	33.8	43.5	-9.4	QP
179.580	H	75.4	-38.8	36.3	43.5	-6.9	QP
179.940	H	69.5	-38.8	30.9	43.5	-12.8	QP
180.300	H	66.4	-38.7	27.7	43.5	-15.8	QP
180.660	H	63.0	-38.7	24.7	43.5	-19.2	QP
181.320	H	71.4	-38.5	33.1	43.5	-10.6	QP
*1104.000	H	66.5	-18.8	47.7	74.0	-26.3	PK
*1104.000	H	49.1	-18.8	30.3	54.0	-23.7	AV
*1626.000	H	63.5	-13.7	49.8	74.0	-24.2	PK
*1626.000	H	57.2	-13.7	43.5	54.0	-10.5	AV
2160.000	H	56.7	-9.8	46.9	74.0	-27.1	PK
2160.000	H	42.0	-9.8	32.2	54.0	-21.8	AV
*2389.000	H	56.3	-8.0	48.3	74.0	-25.7	PK
*2389.000	H	40.6	-8.0	32.6	54.0	-21.4	AV
2441.000	H	101.9	-6.7	95.2	-	-	PK
2441.000	H	91.3	-6.7	84.6	-	-	AV
*2485.000	H	50.9	-6.6	44.3	74.0	-29.7	PK
*2485.000	H	39.8	-6.6	33.2	54.0	-20.8	AV
*4882.000	H	65.1	-2.2	62.9	74.0	-11.1	PK
*4882.000	H	53.2	-2.2	51.0	54.0	-3.0	AV

“\*” means the emission(s) appear within the restricted bands shall follow the requirement of section 15.205.



**Spurious radiated emissions**

Date of test : 31<sup>st</sup> January 2013

Test requirement : FCC Part 15

Test method : ANSI C63.4:2009

Operating mode : Transmit mode

Frequency : 2441MHz (GFSK)

Remark : The EUT has been tested under all modulation modes, only the worst case GFSK modulation test result are listed in the report.

Test Result	
<input checked="" type="checkbox"/>	Passed
<input type="checkbox"/>	Not Passed

Frequency (MHz)	Polarity (H/V)	Read Level (dBµV)	Corr. (dB)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
30.780	V	61.5	-37.5	24.3	40.0	-16.0	QP
36.720	V	60.5	-36.3	24.4	40.0	-15.8	QP
178.560	V	67.3	-38.8	28.1	43.5	-15.0	QP
180.660	V	70.1	-38.6	31.9	43.5	-12.0	QP
181.320	V	63.1	-38.5	24.9	43.5	-18.9	QP
182.760	V	61.6	-38.3	23.7	43.5	-20.2	QP
*1104.000	V	65.4	-19.6	45.8	74.0	-28.2	PK
*1104.000	V	48.2	-19.6	28.6	54.0	-25.4	AV
*1626.000	V	70.7	-14.9	55.8	74.0	-18.2	PK
*1626.000	V	52.8	-14.9	37.9	54.0	-16.1	AV
2160.000	V	54.6	-10.5	44.1	74.0	-29.9	PK
2160.000	V	43.2	-10.5	32.7	54.0	-21.3	AV
*2389.000	V	54.6	-8.3	46.3	74.0	-27.7	PK
*2389.000	V	39.8	-8.3	31.5	54.0	-22.5	AV
2441.000	V	98.0	-7.4	90.6	-	-	PK
2441.000	V	84.4	-7.4	77.0	-	-	AV
*2485.000	V	51.4	-7.8	43.6	74.0	-30.4	PK
*2485.000	V	39.0	-7.8	31.2	54.0	-22.8	AV
*4882.000	V	67.1	-1.9	65.2	74.0	-8.8	PK
*4882.000	V	52.7	-1.9	50.8	54.0	-3.2	AV

\*\*\* means the emission(s) appear within the restricted bands shall follow the requirement of section 15.205.

**Spurious radiated emissions**

Date of test : 31<sup>st</sup> January 2013

Test requirement : FCC Part 15

Test method : ANSI C63.4:2009

Operating mode : Transmit mode

Frequency : 2480MHz (GFSK)

Remark : The EUT has been tested under all modulation modes, only the worst case GFSK modulation test result are listed in the report.

Test Result	
<input checked="" type="checkbox"/>	Passed
<input type="checkbox"/>	Not Passed

Frequency (MHz)	Polarity (H/V)	Read Level (dBµV)	Corr. (dB)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
178.560	H	72.5	-38.9	33.8	43.5	-9.9	QP
179.580	H	75.3	-38.8	36.3	43.5	-7.0	QP
179.940	H	69.4	-38.8	30.9	43.5	-12.9	QP
180.300	H	66.5	-38.7	27.7	43.5	-15.7	QP
180.660	H	63.2	-38.7	24.7	43.5	-19.0	QP
181.320	H	71.9	-38.5	33.1	43.5	-10.1	QP
1652.000	H	63.1	-13.7	49.4	74.0	-24.6	PK
1652.000	H	55.7	-13.7	42.0	54.0	-12.0	AV
1865.000	H	54.4	-11.6	42.8	74.0	-31.2	PK
1865.000	H	43.1	-11.6	31.5	54.0	-22.5	AV
*2258.000	H	55.5	-9.0	46.5	74.0	-27.5	PK
*2258.000	H	41.9	-9.0	32.9	54.0	-21.1	AV
*2390.000	H	52.6	-7.9	44.7	74.0	-29.3	PK
*2390.000	H	39.0	-7.9	31.1	54.0	-22.9	AV
2480.000	H	99.7	-6.7	93.0	-	-	PK
2480.000	H	82.2	-6.7	75.5	-	-	AV
*2484.000	H	51.7	-6.6	45.1	74.0	-28.9	PK
*2484.000	H	39.9	-6.6	33.3	54.0	-20.7	AV
*4960.000	H	68.4	-6.7	61.7	74.0	-12.3	PK
*4960.000	H	54.1	-6.7	47.4	54.0	-6.6	AV

“\*” means the emission(s) appear within the restricted bands shall follow the requirement of section 15.205.



### Spurious radiated emissions

Date of test : 31<sup>st</sup> January 2013

Test requirement : FCC Part 15

Test method : ANSI C63.4:2009

Operating mode : Transmit mode

Frequency : 2480MHz (GFSK)

Remark : The EUT has been tested under all modulation modes, only the worst case GFSK modulation test result are listed in the report.

Test Result	
<input checked="" type="checkbox"/>	Passed
<input type="checkbox"/>	Not Passed

Frequency (MHz)	Polarity (H/V)	Read Level (dB $\mu$ V)	Corr. (dB)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector
30.780	V	61.7	-37.5	24.3	40.0	-15.8	QP
36.720	V	60.6	-36.3	24.4	40.0	-15.7	QP
178.560	V	67.0	-38.8	28.1	43.5	-15.3	QP
180.660	V	70.7	-38.6	31.9	43.5	-11.4	QP
181.320	V	63.1	-38.5	24.9	43.5	-18.9	QP
182.760	V	62.1	-38.3	23.7	43.5	-19.7	QP
1652.000	V	61.3	-14.8	46.5	74.0	-27.5	PK
1652.000	V	51.8	-14.8	37.0	54.0	-17.0	AV
1865.000	V	55.9	-12.3	43.6	74.0	-30.4	PK
1865.000	V	46.7	-12.3	34.4	54.0	-19.6	AV
*2258.000	V	53.7	-9.5	44.2	74.0	-29.8	PK
*2258.000	V	47.4	-9.5	37.9	54.0	-16.1	AV
*2390.000	V	53.6	-8.3	45.3	74.0	-28.7	PK
*2390.000	V	39.4	-8.3	31.1	54.0	-22.9	AV
2480.000	V	98.5	-7.7	90.8	-	-	PK
2480.000	V	85.9	-7.7	78.2	-	-	AV
*2484.000	V	51.9	-7.7	44.2	74.0	-29.8	PK
*2484.000	V	44.2	-7.7	36.5	54.0	-17.5	AV
*4960.000	V	61.8	-1.1	60.7	74.0	-13.3	PK
*4960.000	V	48.7	-1.1	47.6	54.0	-6.4	AV

\*\*\* means the emission(s) appear within the restricted bands shall follow the requirement of section 15.205.



**Test Equipment List**

DESCRIPTION	Type No.	Serial No.	Calibrated until
Antenna	VULB9163	9163 330	2014.02.24
Antenna	3164-05	85724	2014.02.17
Loop Antenna	6512	29604	2013.09.24
Spectrum Analyzer	FSP 40	100378	2013.12.22
EMI Test Receiver	ESCI	100701	2013.08.03
Spectrum Analyzer	FSV40	100903	2014.01.26
Test Cable	SUCOFLEX 104	MY2320/4	2014.02.17
Amplifier	150A250	323446	2014.03.17
Temp. & Humid. Chamber	FACT5-2.0	4166	2013.11.21

## 7.2 20 dB bandwidth

### Test Method

- 1 Place the EUT on the table and set it in the transmitting mode.
- 2 Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 3 Mark the peak frequency and  $-20\text{dB}$  (upper and lower) frequency.

### Limit

Limit [kHz]

---

N/A

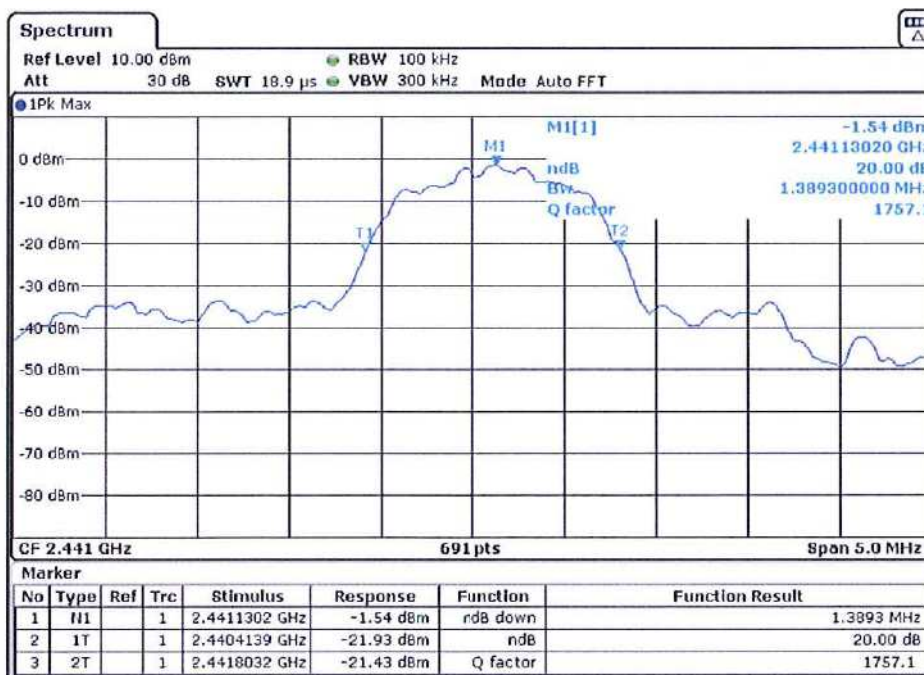


**20 dB bandwidth**

Test result  
(GFSK)

Bandwidth MHz	Result
1.389	Pass

Remark : The EUT has been tested under all modulation modes, only the worst case 2441MHz GFSK modulation test result are listed in the report.



## Test Equipment

### 20 dB bandwidth Test

DESCRIPTION	Type No.	Serial No.	Calibrated until
Antenna	VULB9163	9163 330	2014.02.24
Antenna	3164-05	85724	2014.02.17
Loop Antenna	6512	29604	2013.09.24
Spectrum Analyzer	FSP 40	100378	2013.12.22
EMI Test Receiver	ESCI	100701	2013.08.03
Spectrum Analyzer	FSV40	100903	2014.01.26
Test Cable	SUCOFLEX 104	MY2320/4	2014.02.17
Amplifier	150A250	326446	2014.03.17
Temp. & Humid. Chamber	FACT5-2.0	4166	2013.11.21



### 7.3 Carrier Frequency Separation

#### Test Method

1. Connect EUT antenna terminal to the spectrum analyzer with a low loss cable.  
Equipment mode: Spectrum analyzer  
RBW: 100KHz; VBW: 300KHz; SPAN:3MHz
2. By using the Max-Hold function record the separation of two adjacent channels.
3. Measure the frequency difference of these two adjacent channels by spectrum analyzer Marker function.
4. Repeat above procedures until all frequencies measured were complete.

#### Limit

Limit  
kHz

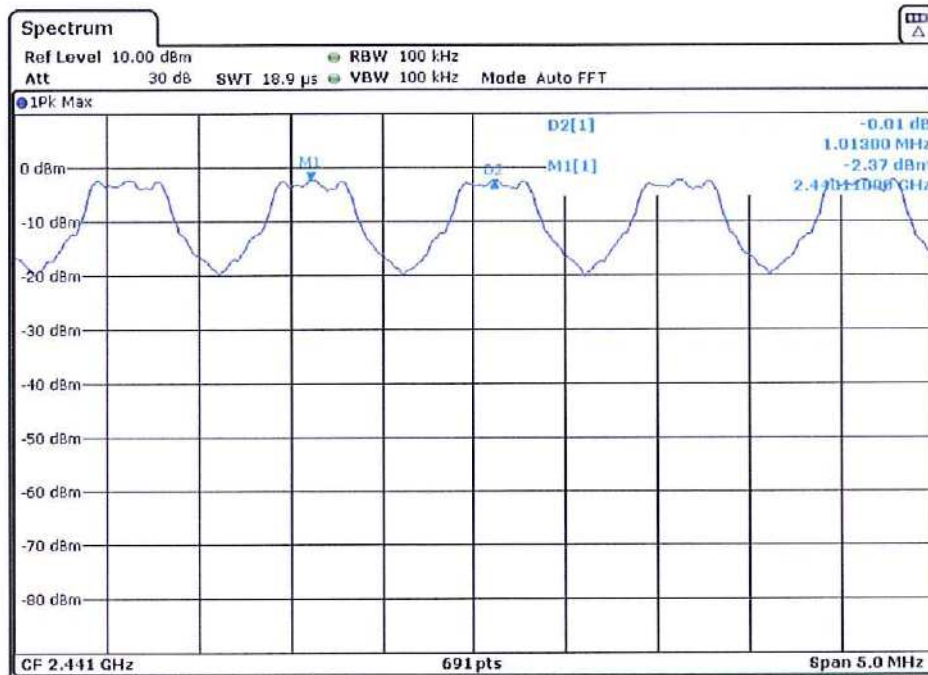
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≥25kHz or 2/3 of the 20 dB bandwidth which is greater

## Carrier Frequency Separation

Test result  
(GFSK)

Carrier Frequency Separation MHz	Result
1.013	Pass





## Test Equipment

### Carrier Frequency Separation Test

DESCRIPTION	Type No.	Serial No.	Calibrated until
Antenna	VULB9163	9163 330	2014.02.24
Antenna	3164-05	85724	2014.02.17
Loop Antenna	6512	29604	2013.09.24
Spectrum Analyzer	FSP 40	100378	2013.12.22
EMI Test Receiver	ESCI	100701	2013.08.03
Spectrum Analyzer	FSV40	100903	2014.01.26
Test Cable	SUCOFLEX 104	MY2320/4	2014.02.17
Amplifier	150A250	326446	2014.03.17
Temp. & Humid. Chamber	FACT5-2.0	4166	2013.11.21

## 7.4 Number of hopping frequencies

### Test Method

1. Connect EUT antenna terminal to the spectrum analyzer with a low loss cable.  
Equipment mode: Spectrum analyzer  
RBW: 300KHz; VBW: 1MHz
2. Set the spectrum analyzer on Max-Hold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
3. Repeat above procedures until all frequencies measured were complete.

### Limit

Limit  
number

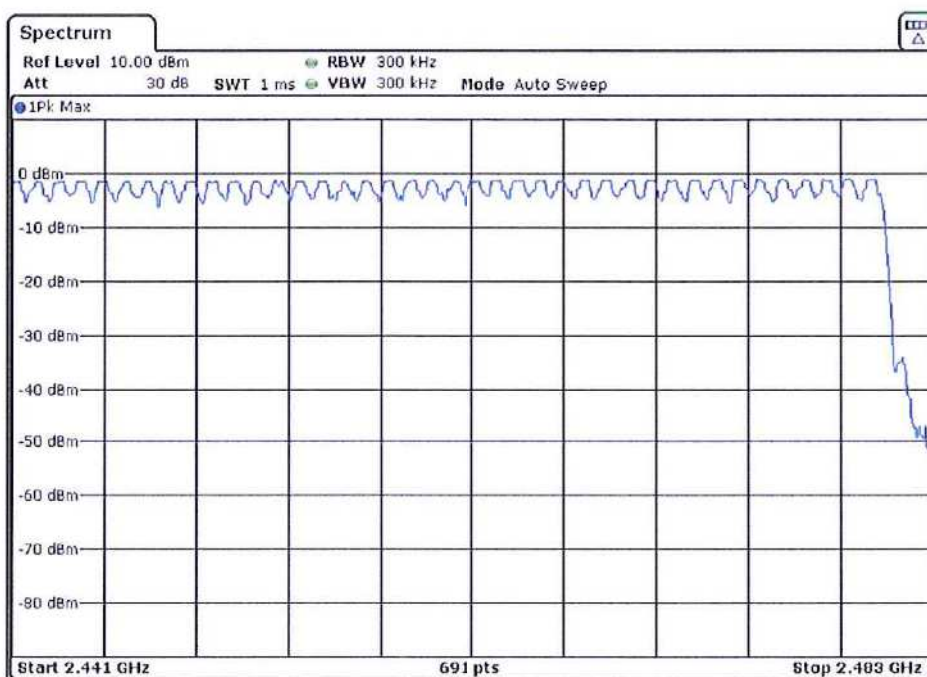
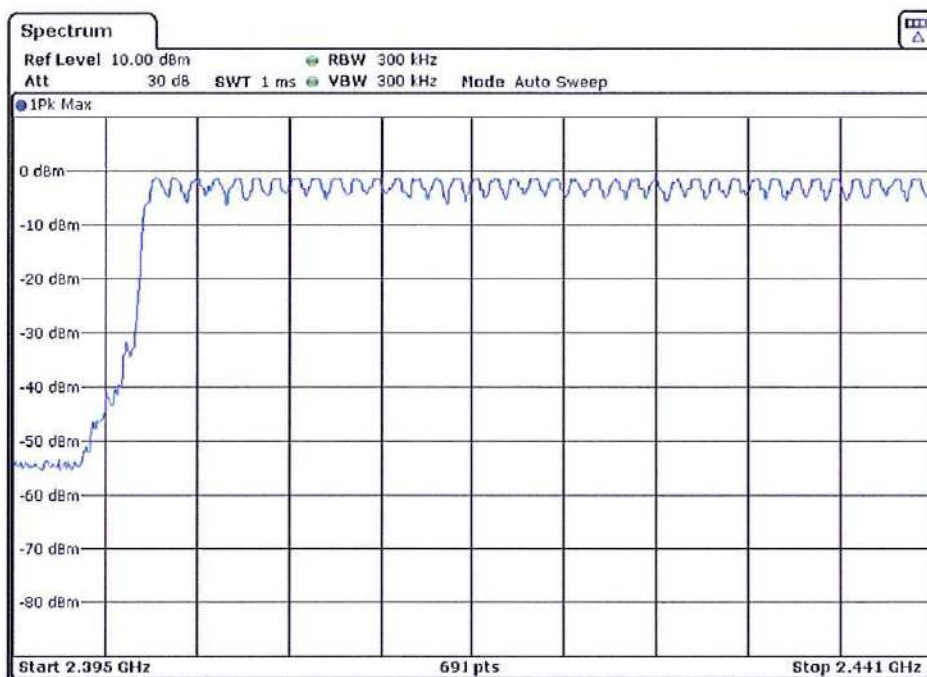
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$\geq 15$

## Number of hopping frequencies

Test result:

Number of hopping frequencies	Result
79	Pass





**Test Equipment****Number of hopping frequencies Test**

DESCRIPTION	Type No.	Serial No.	Calibrated until
Antenna	VULB9163	9163 330	2014.02.24
Antenna	3164-05	85724	2014.02.17
Loop Antenna	6512	29604	2013.09.24
Spectrum Analyzer	FSP 40	100378	2013.12.22
EMI Test Receiver	ESCI	100701	2013.08.03
Spectrum Analyzer	FSV40	100903	2014.01.26
Test Cable	SUCOFLEX 104	MY2320/4	2014.02.17
Amplifier	150A250	326446	2014.03.17
Temp. & Humid. Chamber	FACT5-2.0	4166	2013.11.21

## 7.9 Dwell Time

### Test Method

1. Connect EUT antenna terminal to the spectrum analyzer with a low loss cable.  
Equipment mode: Spectrum analyzer  
RBW: 100kHz; VBW: 100kHz; SPAN: Zero Span
2. Adjust the center frequency of spectrum analyzer on any frequency be measured.
3. Measure the Dwell Time by spectrum analyzer Marker function.
4. Repeat above procedures until all frequencies measured were complete.

### Limit

The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

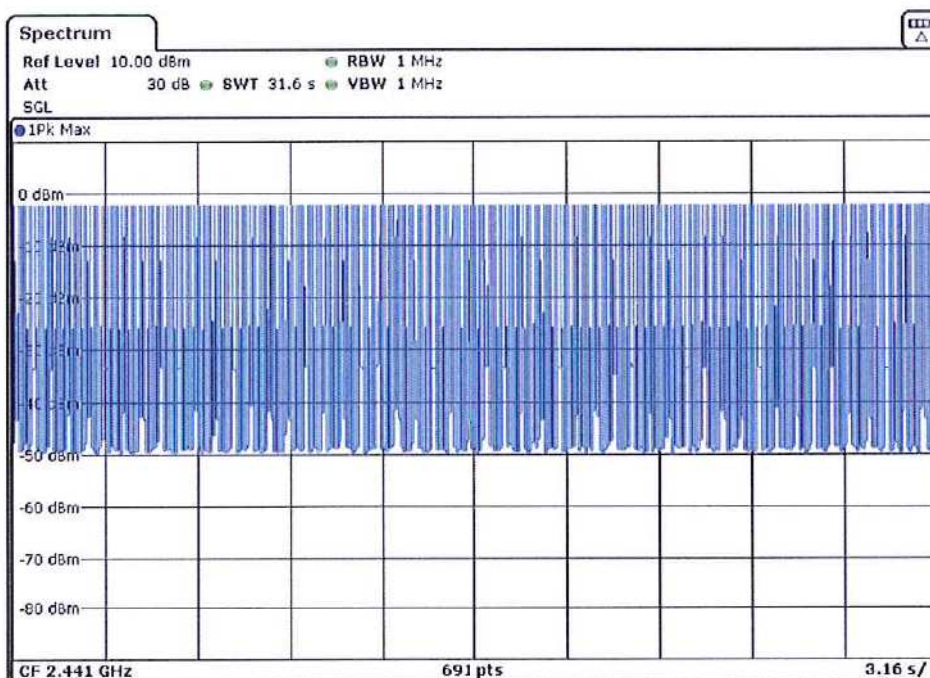
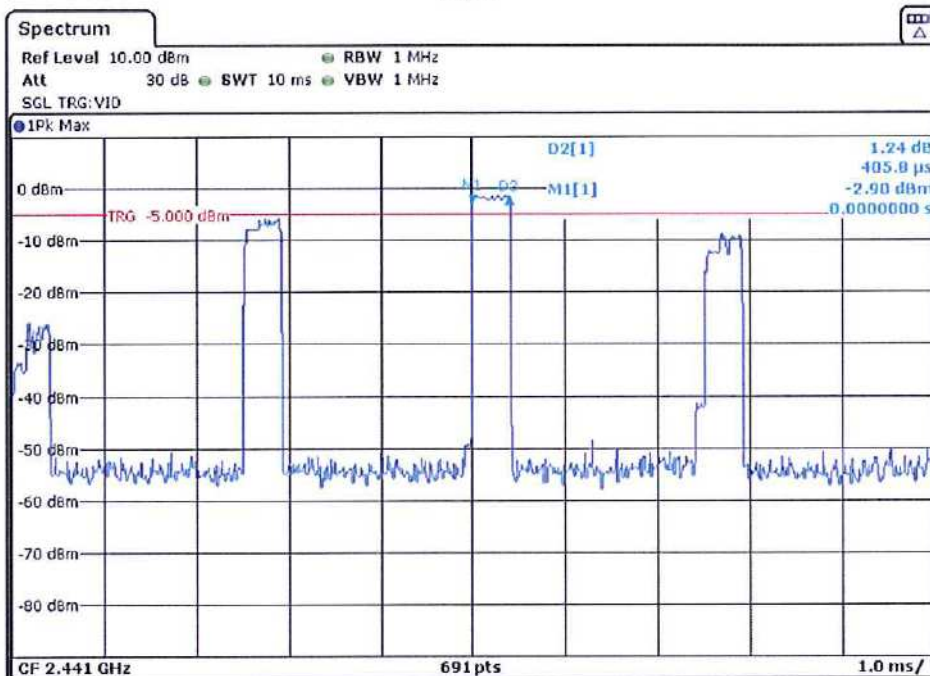
Test Result (GFSK)

Packet	Dwell Time (ms)	Test Result (ms)	Limit (ms)	Result
DH1	0.4058	134	< 400	Pass
DH3	1.6522	264	< 400	Pass
DH5	2.8986	307	< 400	Pass

Remark : The EUT has been tested under all modulation modes, only the worst case GFSK modulation test result are listed in the report.

Dwell Time

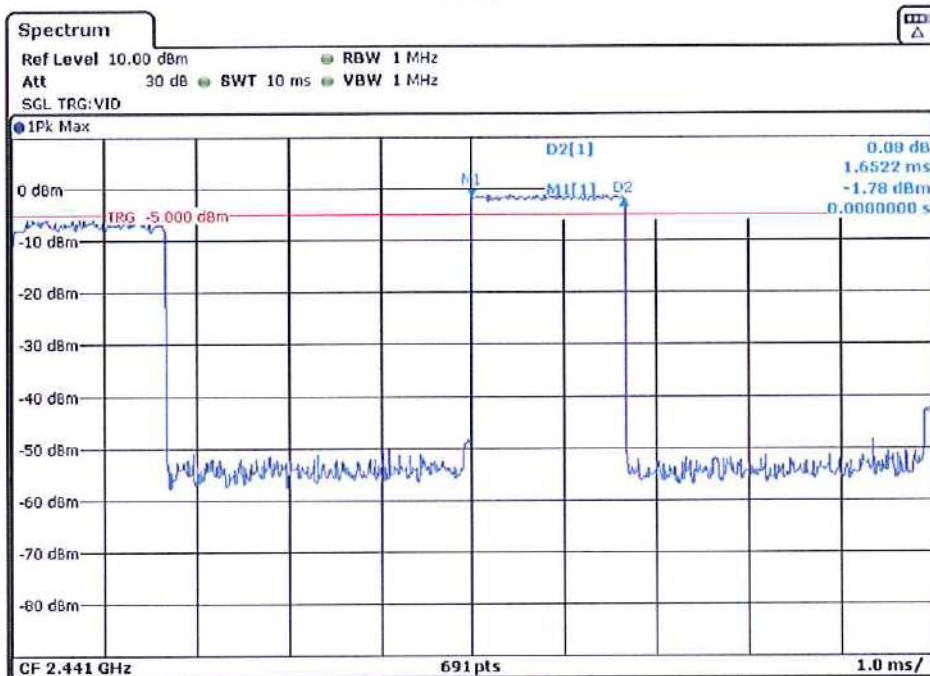
DH1





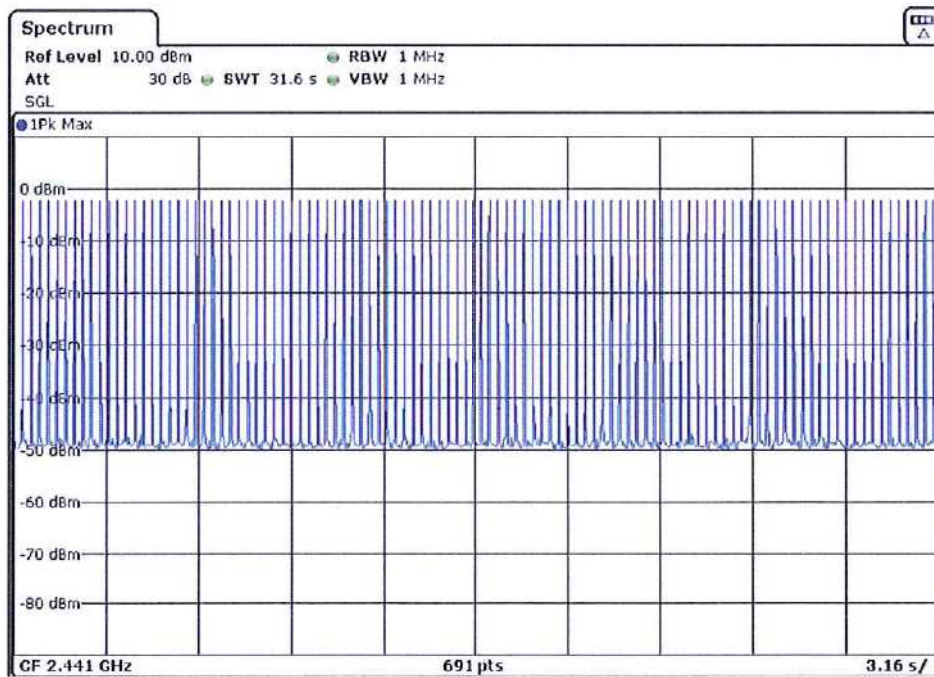
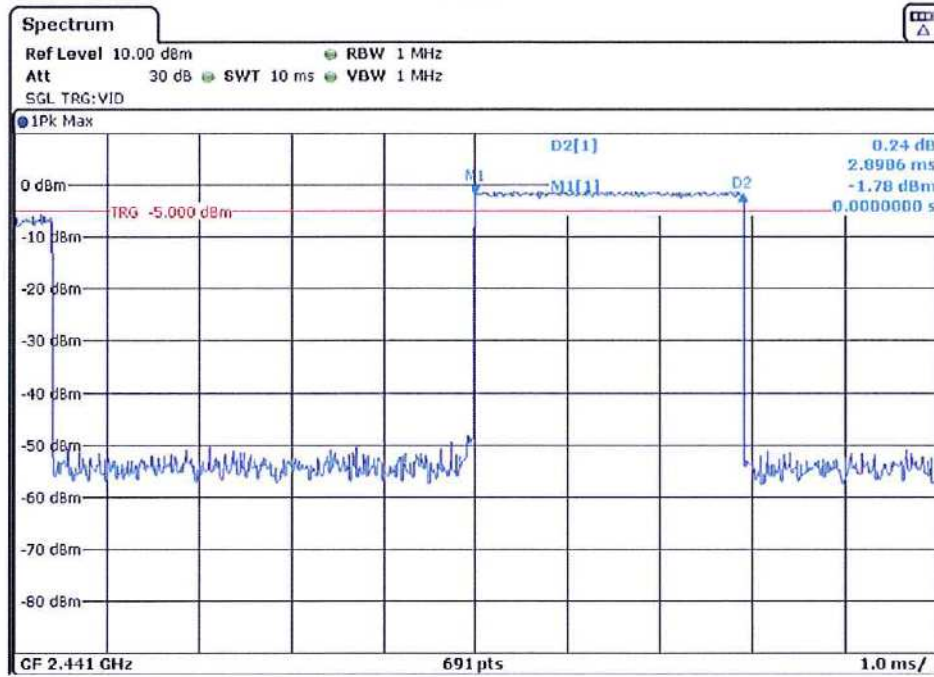
Dwell Time

DH3



Dwell Time

DH5





Hong Kong

## Test Equipment

### Dwell Time Test

DESCRIPTION	Type No.	Serial No.	Calibrated until
Antenna	VULB9163	9163 330	2014.02.24
Antenna	3164-05	85724	2014.02.17
Loop Antenna	6512	29604	2013.09.24
Spectrum Analyzer	FSP 40	100378	2013.12.22
EMI Test Receiver	ESCI	100701	2013.08.03
Spectrum Analyzer	FSV40	100903	2014.01.26
Test Cable	SUCOFLEX 104	MY2320/4	2014.02.17
Amplifier	150A250	326446	2014.03.17
Temp. & Humid. Chamber	FACT5-2.0	4166	2013.11.21



## 8. System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

### System Measurement Uncertainty

Items		Extended Uncertainty
RE	Field strength (dB $\mu$ V/m)	U=5.08dB (30MHz-1GHz) U=4.56dB (1GHz-6GHz)
CE	Disturbance Voltage (cB $\mu$ V)	U=2.7dB