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# FCC TEST REPORT (BLUETOOTH)

**REPORT NO.:** RF990727C01

**MODEL NO.:** F-02C

**FCC ID:** VQK-F02C

**RECEIVED:** Jul. 27, 2010

**TESTED:** Jul. 28 ~ Aug. 23, 2010

**ISSUED:** Aug. 26, 2010

**APPLICANT:** FUJITSU LIMITED

**ADDRESS:** 1-1, Kamikodanaka 4-chome, Nakahara-ku,  
Kawasaki 211-8588, Japan

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

**LAB ADDRESS:** No. 47, 14th Ling, Chia Pau Tsuen, Lin Kou  
Hsiang, Taipei Hsien 244, Taiwan, R.O.C.

**TEST LOCATION:** No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei  
Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

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## 1. CERTIFICATION

**PRODUCT:** Mobile phone

**MODEL:** F-02C

**BRAND:** FOMA

**APPLICANT:** FUJITSU LIMITED

**TESTED:** Jul. 28 ~ Aug. 23, 2010

**TEST SAMPLE:** ENGINEERING SAMPLE

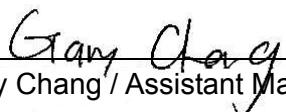
**STANDARDS:** FCC Part 15, Subpart C (Section 15.247),

ANSI C63.4-2003

The above equipment (Model: F-02C) 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 EMC characteristics under the conditions specified in this report.

**PREPARED BY** :  , DATE : Aug. 26, 2010  
Joanna Wang / Senior Specialist

**TECHNICAL  
ACCEPTANCE** :  , DATE : Aug. 26, 2010  
Responsible for RF Long Chen / Senior Engineer

**APPROVED BY** :  , DATE : Aug. 26, 2010  
Gary Chang / Assistant Manager



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## 2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -17.62dB at 2.758MHz.
15.247(d)	Transmitter Radiated Emissions Spec.: Table 15.209	PASS	Meet the requirement of limit. Minimum passing margin is -6.1dB at 2398.00MHz.

### 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	UNCERTAINTY
Conducted Emission	150kHz ~ 30MHz	2.44dB
Radiated emissions	30MHz ~ 200MHz	3.19dB
	200MHz ~ 1000MHz	3.21dB
	1GHz ~ 18GHz	2.26dB
	18GHz ~ 40GHz	1.94dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.



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### 3. GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

<b>EUT</b>	Mobile phone
<b>MODEL NO.</b>	F-02C
<b>FCC ID</b>	VQK-F02C
<b>POWER SUPPLY</b>	3.7Vdc (Li-ion Battery) 5.4Vdc (Adapter)
<b>MODULATION TYPE</b>	GFSK, $\pi/4$ -DQPSK, 8DPSK
<b>MODULATION TECHNOLOGY</b>	FHSS
<b>TRANSFER RATE</b>	1/2/3Mbps
<b>FREQUENCY RANGE</b>	2402 ~ 2480MHz
<b>NUMBER OF CHANNEL</b>	79
<b>CHANNEL SPACING</b>	1MHz
<b>ANTENNA TYPE</b>	Monopole antenna with -8dBi gain
<b>DATA CABLE</b>	NA
<b>I/O PORTS</b>	Refer to user's manual
<b>ACCESSORY DEVICES</b>	Battery

**NOTE:**

1. In this report, only included test items of radiated emission and AC power conducted emission per client's requests.
2. The EUT is a Mobile phone. The test data are separated into following test reports.

	<b>TEST STANDARD</b>	<b>REFERENCE REPORT</b>
<b>Bluetooth</b>	FCC Part 15, Subpart C (Section 15.247)	RF990727C01
<b>RFID</b>	FCC Part 15, Subpart C (Section 15.225)	RF990727C01-1
<b>WCDMA 850</b>	FCC Part 22	RF990727C01-2
<b>PCS 1900</b>	FCC Part 24	RF990727C01-3

3. The EUT uses the following Li-ion battery:

<b>BRAND</b>	Fujitsu Limited
<b>MODEL</b>	F19
<b>RATING</b>	3.7Vdc, 830mAh

4. The following accessories are for support units only.

<b>PRODUCT</b>	<b>BRAND</b>	<b>DESCRIPTION</b>
Adapter	SMK	I/P: 100-240Vac, 50-60Hz, 0.12A O/P: 5.4Vdc, 700mA
USB cable	NA	0.8m non-shielded cable without core

5. IMEI Code: 352147040005160.

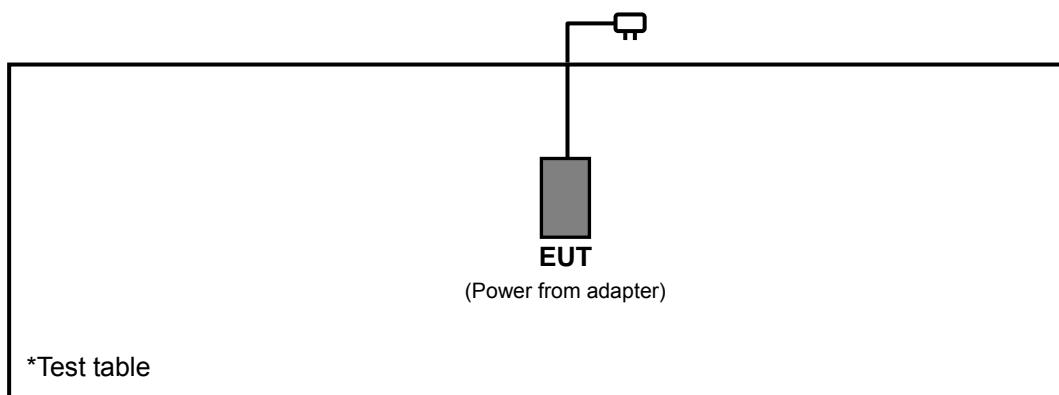
6. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

### 3.2 DESCRIPTION OF TEST MODES

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 CONFIGURATION OF SYSTEM UNDER TEST



### 3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO			DESCRIPTION
	RE $\geq$ 1G	RE $<$ 1G	PLC	
-	✓	✓	✓	-

Where RE $\geq$ 1G: Radiated Emission above 1GHz

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

PLC: Power Line Conducted Emission

#### RADIATED EMISSION TEST (ABOVE 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.
- 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	AXIS
-	0 to 78	0, 39, 78	FHSS	GFSK	DH5	X
-	0 to 78	0, 39, 78	FHSS	8DPSK	DH5	X

#### RADIATED EMISSION TEST (BELOW 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.
- 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	AXIS
-	0 to 78	39	FHSS	GFSK	DH5	X

#### 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	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
-	0 to 78	39	FHSS	GFSK	DH5



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**TEST CONDITION:**

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE≥1G	26deg. C, 67%RH, 1004 hPa	120Vac, 60Hz	Antony Lee
RE<1G	26deg. C, 67%RH, 1004 hPa	120Vac, 60Hz	Antony Lee
PLC	23deg. C, 62%RH, 1008 hPa	120Vac, 60Hz	Peter Lin

### 3.3 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)**

**ANSI C63.4-2003**

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

**NOTE:** The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.



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### 3.4 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	ADAPTER	SMK	NA	NA	NA

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA

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



## 4. TEST TYPES AND RESULTS

### 4.1 RADIATED EMISSION MEASUREMENT

#### 4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

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<sub>u</sub>V/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), 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.



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#### 4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESI7	838496/016	Dec. 29, 2009	Dec. 28, 2010
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jan. 11, 2010	Jan. 10, 2011
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Apr. 28, 2010	Apr. 27, 2011
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-408	Jan. 05, 2010	Jan. 04, 2011
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170242	Dec. 25, 2009	Dec. 24, 2010
Preamplifier Agilent	8449B	3008A01961	Nov. 04, 2009	Nov. 03, 2010
Preamplifier Agilent	8447D	2944A10738	Nov. 04, 2009	Nov. 03, 2010
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	274041/4	Aug. 21, 2010	Aug. 20, 2011
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	283397/4	Aug. 21, 2010	Aug. 20, 2011
Software ADT.	ADT_Radiated_V7.6.15.9.2	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller inn-co GmbH	CO2000	019303	NA	NA
Turn Table ADT.	TT100.	TT93021704	NA	NA
Turn Table Controller ADT.	SC100.	SC93021704	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 4.
3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site Registration No. is 988962.
5. The IC Site Registration No. is IC7450F-4.

#### 4.1.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. 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 antenna is a broadband antenna, and its height 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 Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

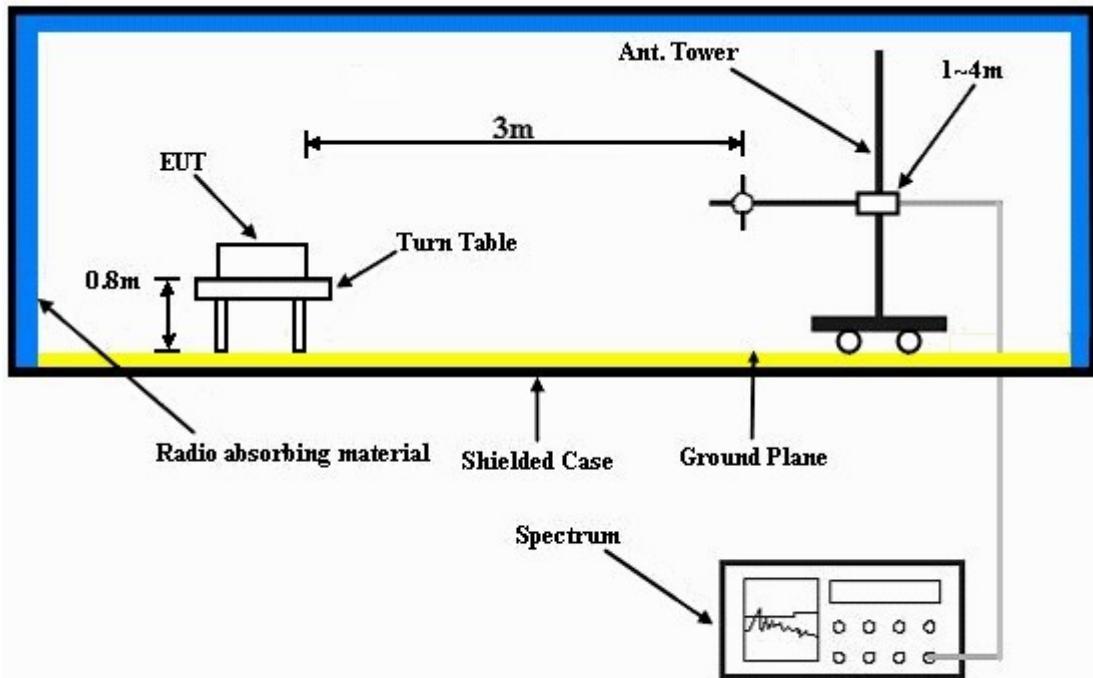
**NOTE:**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. 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 SETUP



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

#### 4.1.6 EUT OPERATING CONDITIONS

Set the EUT under transmitting condition.



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#### 4.1.7 TEST RESULTS

##### RADIATED WORST CASE DATA: ABOVE 1GHz: GFSK

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	26deg. C, 67%RH 1004 hPa	TESTED BY	Antony Lee

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	2390.00	38.8 PK	74.0	-35.2	1.05 H	248	5.30	33.50
2	2390.00	27.7 AV	54.0	-26.3	1.05 H	248	-5.80	33.50
3	#2398.00	45.7 PK	72.2	-26.5	1.05 H	169	12.20	33.50
4	#2398.00	35.1 AV	42.1	-7.0	1.05 H	169	1.60	33.50
5	#2400.00	56.3 PK	72.2	-15.9	1.07 H	173	22.80	33.50
6	#2400.00	26.2 AV	42.1	-15.9	1.07 H	173	-7.30	33.50
7	*2402.00	92.2 PK			1.07 H	173	58.70	33.50
8	*2402.00	62.1 AV			1.07 H	173	28.60	33.50
9	4804.00	49.3 PK	74.0	-24.7	1.00 H	266	9.40	39.90
10	4804.00	19.2 AV	54.0	-34.8	1.00 H	266	-20.70	39.90

**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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “\*”: Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 \* 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to:  $20\log(3.125 / 100) = -30.1$  dB.
7. Average value = peak reading +  $20\log(\text{duty cycle})$ .



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	26deg. C, 67%RH 1004 hPa	TESTED BY	Antony Lee

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	2390.00	39.4 PK	74.0	-34.6	1.00 V	263	5.90	33.50
2	2390.00	27.9 AV	54.0	-26.1	1.00 V	263	-5.60	33.50
3	#2398.00	41.5 PK	69.0	-27.5	1.00 V	322	8.00	33.50
4	#2398.00	30.9 AV	38.9	-8.0	1.00 V	322	-2.60	33.50
5	#2400.00	52.9 PK	69.0	-16.1	1.00 V	318	19.40	33.50
6	#2400.00	22.8 AV	38.9	-16.1	1.00 V	318	-10.70	33.50
7	*2402.00	89.0 PK			1.00 V	318	55.50	33.50
8	*2402.00	58.9 AV			1.00 V	318	25.40	33.50
9	4804.00	51.3 PK	74.0	-22.7	1.02 V	36	11.40	39.90
10	4804.00	21.2 AV	54.0	-32.8	1.02 V	36	-18.70	39.90

**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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “\*”: Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 \* 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to:  $20\log(3.125 / 100) = -30.1$  dB.
7. Average value = peak reading +  $20\log(\text{duty cycle})$ .
8. "#": The radiated frequency is out the restricted band.



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EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		FREQUENCY RANGE		1 ~ 25GHz
INPUT POWER (SYSTEM)		DETECTOR FUNCTION		Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS		TESTED BY		Antony Lee

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	*2441.00	93.2 PK			1.07 H	172	59.50	33.70
2	*2441.00	63.1 AV			1.07 H	172	29.40	33.70
3	4882.00	51.0 PK	74.0	-23.0	1.02 H	271	10.90	40.10
4	4882.00	20.9 AV	54.0	-33.1	1.02 H	271	-19.20	40.10
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	*2441.00	88.8 PK			1.00 V	299	55.10	33.70
2	*2441.00	58.7 AV			1.00 V	299	25.00	33.70
3	4882.00	49.5 PK	74.0	-24.5	1.01 V	45	9.40	40.10
4	4882.00	19.4 AV	54.0	-34.6	1.01 V	45	-20.70	40.10

**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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “\*”: Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 \* 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to:  $20\log(3.125 / 100) = -30.1$  dB.
7. Average value = peak reading +  $20\log(\text{duty cycle})$ .



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EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		FREQUENCY RANGE		1 ~ 25GHz
INPUT POWER (SYSTEM)		DETECTOR FUNCTION		Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS		TESTED BY		Antony Lee

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	*2480.00	91.9 PK			1.06 H	176	58.10	33.80
2	*2480.00	61.8 AV			1.06 H	176	28.00	33.80
3	2483.50	37.4 PK	74.0	-36.6	1.06 H	176	3.60	33.80
4	2483.50	7.3 AV	54.0	-46.7	1.06 H	176	-26.50	33.80
5	2485.50	42.5 PK	74.0	-31.5	1.05 H	174	8.60	33.90
6	2485.50	30.9 AV	54.0	-23.1	1.05 H	174	-3.00	33.90
7	4960.00	48.9 PK	74.0	-25.1	1.00 H	207	8.60	40.30
8	4960.00	18.8 AV	54.0	-35.2	1.00 H	207	-21.50	40.30
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	*2480.00	87.5 PK			1.00 V	318	53.70	33.80
2	*2480.00	57.4 AV			1.00 V	318	23.60	33.80
3	2483.50	34.5 PK	74.0	-39.5	1.00 V	318	0.70	33.80
4	2483.50	4.4 AV	54.0	-49.6	1.00 V	318	-29.40	33.80
5	2485.50	41.5 PK	74.0	-32.5	1.00 V	319	7.60	33.90
6	2485.50	29.7 AV	54.0	-24.3	1.00 V	319	-4.20	33.90
7	4960.00	48.7 PK	74.0	-25.3	1.00 V	273	8.40	40.30
8	4960.00	18.6 AV	54.0	-35.4	1.00 V	273	-21.70	40.30

**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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “\*”: Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 \* 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to:  $20\log(3.125 / 100) = -30.1$  dB.
7. Average value = peak reading +  $20\log(\text{duty cycle})$ .



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## 8DPSK

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	26deg. C, 67%RH 1004 hPa	TESTED BY	Antony Lee

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	2390.00	39.6 PK	74.0	-34.4	1.11 H	175	6.10	33.50
2	2390.00	28.7 AV	54.0	-25.3	1.11 H	175	-4.80	33.50
3	#2398.00	46.7 PK	72.9	-26.2	1.09 H	177	13.20	33.50
4	#2398.00	35.4 AV	42.8	-7.4	1.09 H	177	1.90	33.50
5	#2400.00	52.2 PK	72.9	-20.7	1.10 H	176	18.70	33.50
6	#2400.00	22.1 AV	42.8	-20.7	1.10 H	176	-11.40	33.50
7	*2402.00	92.9 PK			1.10 H	176	59.40	33.50
8	*2402.00	62.8 AV			1.10 H	176	29.30	33.50
9	4804.00	49.9 PK	74.0	-24.1	1.00 H	259	10.00	39.90
10	4804.00	19.8 AV	54.0	-34.2	1.00 H	259	-20.10	39.90

**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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “\*”: Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 \* 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to:  $20\log(3.125 / 100) = -30.1$  dB.
7. Average value = peak reading +  $20\log(\text{duty cycle})$ .



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	26deg. C, 67%RH 1004 hPa	TESTED BY	Antony Lee

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	2390.00	40.5 PK	74.0	-33.5	1.00 V	333	7.00	33.50
2	2390.00	29.6 AV	54.0	-24.4	1.00 V	333	-3.90	33.50
3	#2398.00	42.5 PK	67.7	-25.2	1.00 V	325	9.00	33.50
4	#2398.00	31.5 AV	37.6	-6.1	1.00 V	325	-2.00	33.50
5	#2400.00	47.5 PK	67.7	-20.2	1.00 V	325	14.00	33.50
6	#2400.00	17.4 AV	37.6	-20.2	1.00 V	325	-16.10	33.50
7	*2402.00	87.7 PK			1.00 V	325	54.20	33.50
8	*2402.00	57.6 AV			1.00 V	325	24.10	33.50
9	4804.00	50.7 PK	74.0	-23.3	1.01 V	41	10.80	39.90
10	4804.00	20.6 AV	54.0	-33.4	1.01 V	41	-19.30	39.90

**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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “\*”: Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 \* 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to:  $20\log(3.125 / 100) = -30.1$  dB.
7. Average value = peak reading +  $20\log(\text{duty cycle})$ .
8. "#": The radiated frequency is out the restricted band.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	26deg. C, 67%RH 1004 hPa	TESTED BY	Antony Lee

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	*2441.00	91.9 PK			1.05 H	169	58.20	33.70
2	*2441.00	61.8 AV			1.05 H	169	28.10	33.70
3	4882.00	49.3 PK	74.0	-24.7	1.01 H	269	9.20	40.10
4	4882.00	19.2 AV	54.0	-34.8	1.01 H	269	-20.90	40.10
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	*2441.00	88.7 PK			1.00 V	301	55.00	33.70
2	*2441.00	58.6 AV			1.00 V	301	24.90	33.70
3	4882.00	50.1 PK	74.0	-23.9	1.01 V	36	10.00	40.10
4	4882.00	20.0 AV	54.0	-34.0	1.01 V	36	-20.10	40.10

**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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “\*”: Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 \* 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to:  $20\log(3.125 / 100) = -30.1$  dB.
7. Average value = peak reading +  $20\log(\text{duty cycle})$ .



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	26deg. C, 67%RH 1004 hPa	TESTED BY	Antony Lee

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	*2480.00	90.4 PK			1.02 H	196	56.60	33.80
2	*2480.00	60.3 AV			1.02 H	196	26.50	33.80
3	2483.50	37.9 PK	74.0	-36.1	1.02 H	196	4.10	33.80
4	2483.50	7.8 AV	54.0	-46.2	1.02 H	196	-26.00	33.80
5	2485.50	40.9 PK	74.0	-33.1	1.00 H	195	7.00	33.90
6	2485.50	29.2 AV	54.0	-24.8	1.00 H	195	-4.70	33.90
7	4960.00	48.7 PK	74.0	-25.3	1.00 H	210	8.40	40.30
8	4960.00	18.6 AV	54.0	-35.4	1.00 H	210	-21.70	40.30
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	*2480.00	87.1 PK			1.00 V	299	53.30	33.80
2	*2480.00	57.0 AV			1.00 V	299	23.20	33.80
3	2483.50	34.5 PK	74.0	-39.5	1.00 V	299	0.70	33.80
4	2483.50	4.4 AV	54.0	-49.6	1.00 V	299	-29.40	33.80
5	2485.50	41.0 PK	74.0	-33.0	1.00 V	301	7.10	33.90
6	2485.50	30.1 AV	54.0	-23.9	1.00 V	301	-3.80	33.90
7	4960.00	49.7 PK	74.0	-24.3	1.00 V	281	9.40	40.30
8	4960.00	19.6 AV	54.0	-34.4	1.00 V	281	-20.70	40.30

**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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “\*”: Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 \* 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to:  $20\log(3.125 / 100) = -30.1$  dB.
7. Average value = peak reading +  $20\log(\text{duty cycle})$ .



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## BELOW 1GHz WORST-CASE DATA : GFSK

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		Channel 39		FREQUENCY RANGE
INPUT POWER (SYSTEM)		120Vac, 60 Hz		DETECTOR FUNCTION
ENVIRONMENTAL CONDITIONS		26deg. C, 67%RH 1004 hPa		TESTED BY
				Antony Lee

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	66.84	28.2 QP	40.0	-11.8	2.25 H	244	14.70	13.50
2	232.11	23.7 QP	46.0	-22.3	2.00 H	82	10.40	13.30
3	321.54	28.0 QP	46.0	-18.0	1.00 H	232	12.40	15.60
4	350.71	30.0 QP	46.0	-16.0	1.25 H	34	13.10	16.90
5	451.81	28.3 QP	46.0	-17.7	1.75 H	274	7.80	20.50
6	834.84	36.5 QP	46.0	-9.5	1.25 H	304	7.70	28.80
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	32.83	30.3 QP	40.0	-9.7	1.24 V	68	16.50	13.80
2	66.84	33.5 QP	40.0	-6.5	2.00 V	76	20.00	13.50
3	138.78	31.7 QP	43.5	-11.8	1.75 V	139	18.40	13.30
4	228.22	34.5 QP	46.0	-11.5	1.00 V	208	21.40	13.10
5	304.04	32.4 QP	46.0	-13.6	2.00 V	106	17.60	14.80
6	862.06	29.5 QP	46.0	-16.5	2.00 V	127	-0.10	29.60

**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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.



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## 4.2 CONDUCTED EMISSION MEASUREMENT

### 4.2.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB $\mu$ V)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56	56 to 46
0.5 ~ 5	56	46
5 ~ 30	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.
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

### 4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCS30	100288	Sep. 24, 2009	Sep. 23, 2010
RF signal cable Woken	5D-FB	Cable-HYCO2-01	Dec. 31, 2009	Dec. 30, 2010
LISN ROHDE & SCHWARZ	ESH2-Z5	100100	Dec. 25, 2009	Dec. 24, 2010
LISN ROHDE & SCHWARZ	ESH3-Z5	100311	Jul. 08, 2010	Jul. 07, 2011
Software ADT	ADT_Cond_V7.3.7	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 2.
3. The VCCI Site Registration No. is C-2047.



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#### 4.2.3 TEST PROCEDURES

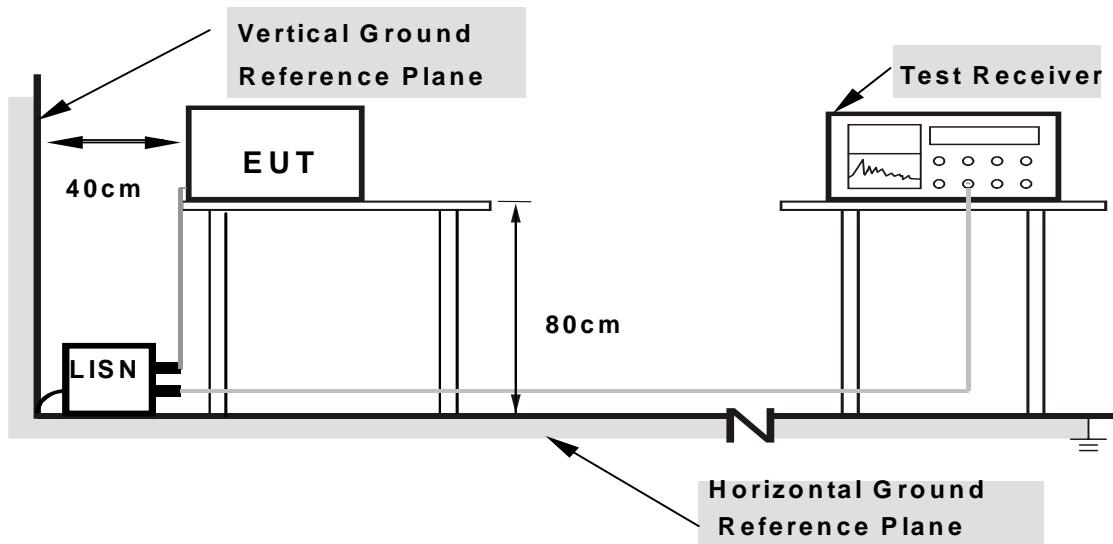
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling 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 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

**NOTE:** All modes of operation were investigated and the worst-case emissions are reported.

#### 4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.2.5 TEST SETUP



**Note:**

1. Support units were connected to second LISN.
2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

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

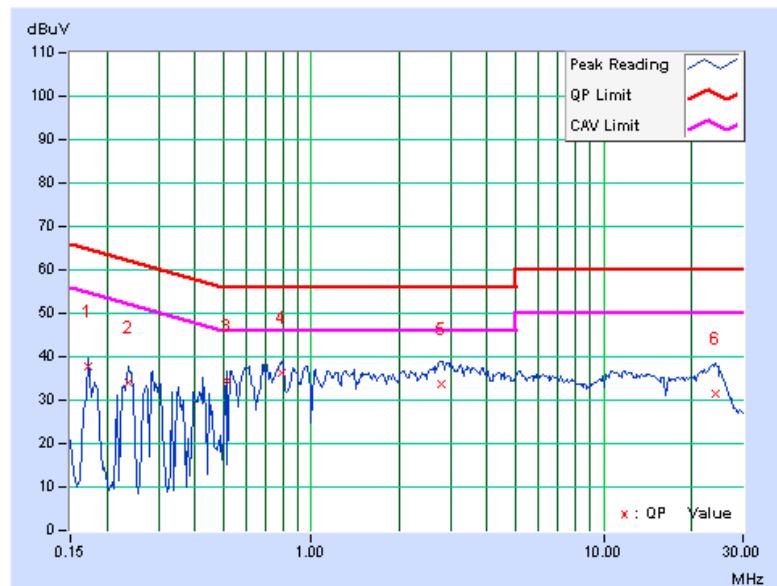
##### CONDUCTED WORST CASE DATA: GFSK

PHASE	Line 1	6dB BANDWIDTH	9kHz
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No	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
	Factor		[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.173	0.16	37.69	-	37.85	-	64.79	54.79	-26.95	-
2	0.236	0.16	34.09	-	34.25	-	62.24	52.24	-27.98	-
3	0.513	0.19	34.20	-	34.39	-	56.00	46.00	-21.61	-
4	0.795	0.21	36.26	-	36.47	-	56.00	46.00	-19.53	-
5	2.773	0.33	33.53	-	33.86	-	56.00	46.00	-22.14	-
6	24.230	0.61	30.76	-	31.37	-	60.00	50.00	-28.63	-

**REMARKS:** 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.

2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Correction factor = Insertion loss + Cable loss
6. Emission Level = Correction Factor + Reading Value.

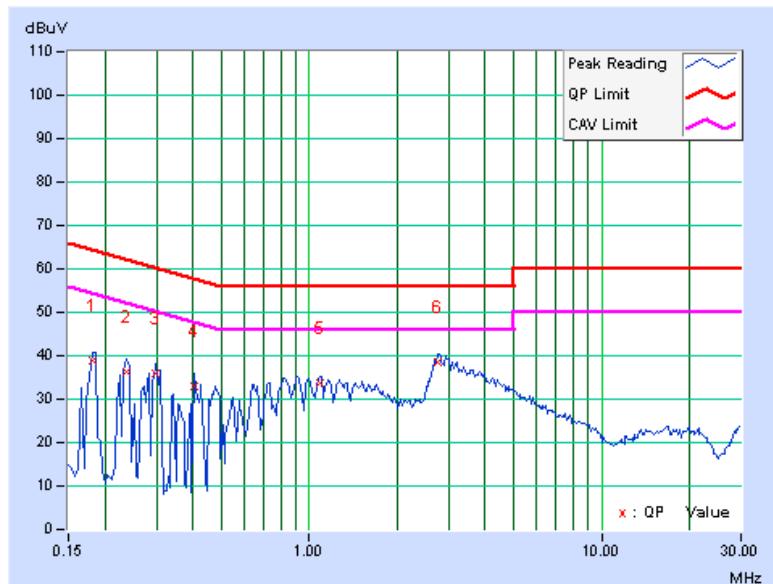


PHASE	Line 2	6dB BANDWIDTH	9kHz
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No	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
			Factor	[dB (uV)]	[dB (uV)]	[dB (uV)]	Q.P.	AV.	Q.P.	AV.
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.181	0.13	38.74	-	38.87	-	64.43	54.43	-25.56	-
2	0.236	0.14	36.33	-	36.47	-	62.24	52.24	-25.77	-
3	0.298	0.14	35.62	-	35.76	-	60.29	50.29	-24.52	-
4	0.404	0.16	32.85	-	33.01	-	57.77	47.77	-24.76	-
5	1.090	0.23	33.29	-	33.52	-	56.00	46.00	-22.48	-
6	2.758	0.32	38.06	-	38.38	-	56.00	46.00	-17.62	-

**REMARKS:** 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.

2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Correction factor = Insertion loss + Cable loss
6. Emission Level = Correction Factor + Reading Value.





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## 5. PHOTOGRAPHS OF THE TEST CONFIGURATION

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



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## 6. 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 accredited and approved according to ISO/IEC 17025.

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site:

[www.adt.com.tw/index.5/phtml](http://www.adt.com.tw/index.5/phtml). If you have any comments, please feel free to contact us at the following:

**Linko EMC/RF Lab:**

Tel: 886-2-26052180  
Fax: 886-2-26051924

**Hsin Chu EMC/RF Lab:**

Tel: 886-3-5935343  
Fax: 886-3-5935342

**Hwa Ya EMC/RF/Safety Telecom Lab:**

Tel: 886-3-3183232  
Fax: 886-3-3185050

**Web Site:** [www.adt.com.tw](http://www.adt.com.tw)

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



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## **7. APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB**

No any modifications are made to the EUT by the lab during the test.

**--- END ---**