FCC TEST REPORT

(BLUETOOTH)

REPORT NO.:	RF120720E09-2 R1
MODEL NO.:	VC70N0
FCC ID:	UZ7VC70N0
RECEIVED:	July 20, 2012
TESTED:	Sep. 24 to Oct. 09, 2012
ISSUED:	Nov. 09, 2012

APPLICANT:	Motorola Solutions, Inc.
ADDRESS:	One Motorola Plaza Holtsville NY 11742-1300 USA

ISSUED BY:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
LAB ADDRESS:	No. 81-1, Lu Liao Keng, 9th Ling,Wu Lung Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan, R.O.C.
TEST LOCATION (1):	No. 81-1, Lu Liao Keng, 9th Ling,Wu Lung Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan, Taiwan, R.O.C.
TEST LOCATION (2):	No.49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan, Taiwan, R.O.C.

This report should not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

TABLE OF CONTENTS

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF120720E09-2	Original release	Nov. 08, 2012
RF120720E09-2 R1	Modified the description on section 3.1, section 3.5 & section 3.6	Nov. 09, 2012

1 CERTIFICATION

PRODUCT :	Vehicle Computer
BRAND NAME :	MOTOROLA
MODEL NO. :	VC70N0
TEST SAMPLE :	ENGINEERING SAMPLE
APPLICANT :	Motorola Solutions, Inc.
TESTED DATE :	Sep. 24 to Oct. 09, 2012
STANDARDS :	**FCC Part 15, Subpart C (Section 15.247)**
	ANSI C63.10-2009

The above equipment (Model: VC70N0) 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 : Phoenix Huang , **DATE:** Nov. 09, 2012
(Phoenix Huang, Specialist)

APPROVED BY : , **DATE:** Nov. 09, 2012
(May Chen, Deputy Manager)

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 -6.70dB at 11.94531MHz.
15.247(a)(1) (iii)	Number of Hopping Frequency Used	PASS	Meet the requirement of limit.
15.247(a)(1) (iii)	Dwell Time on Each Channel	PASS	Meet the requirement of limit.
15.247(a)(1)	1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	PASS	Meet the requirement of limit.
15.247(b)	Maximum Peak Output Power	PASS	Meet the requirement of limit.
15.247(d)	Transmitter Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -6.8dB at 320.00MHz.
15.247(d)	Conducted Out-Band Emission Measurement	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used.

NOTE:

1. Frequency Hopping System operating in 2.400 ~ 2.4835GHz band and the output power less than 125mW. The hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of hopping channel whichever is greater.

2.1 ME ASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

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

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	150kHz ~ 30MHz	2.98dB
Radiated emissions	30MHz ~1000MHz	4.89 dB
	1GHz ~ 18GHz	2.49 dB
	18GHz ~ 40GHz	2.70 dB

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT (Bluetooth)

PRODUCT	Vehicle Computer
MODEL NO.	VC70N0
POWER SUPPLY	DC 12V from power supply
MODULATION TYPE	GFSK,π/4-DQPSK, 8DPSK
MODULATION TECHNOLOGY	FHSS
DATE RATE	Up to 3Mbps
FREQUENCY RANGE	2402MHz ~ 2480MHz
NUMBER OF CHANNEL	79
MAX. OUTPUT POWER	1.774 mW
ANTENNA TYPE	Please see NOTE
DATA CABLE	NA
I/O PORTS	Refer to user's manual
ASSOCIATED DEVICES	NA

NOTE:

1. There are Bluetooth 2.1 + EDR technology and WLAN 802.11 a/b/g/n technology used for the EUT. and the report number corresponds with functions are listed as below:

Function	Report No.
WLAN	RF120720E09 R1 (15.247) RF120720E09-1 R1 (15.407)
Bluetooth	RF120720E09-2 R1

2. The associated devices(optional) of EUT information are as below:

Accessory	Model	Part No.	Description	Connector
Wired Scanner 1	LS 3408	LS 3408-ER20105R	LS 3408 serial/USB laser scanner	USB
Wired Scanner 2	DS3508	DS3508-ER20005R	DS3508 USB scanner	USB
Wired Scanner 3	DS457	DS457-SR20009	DS457 USB scanner	USB
Wireless Scanner 1	RS507	RS507-IM20000CTWR	RS507 BT Hands Free Imager (FCC ID: UZ7RS507)	NA (BT wireless connection)
Wireless Scanner 2	LS3578	LS3578-ER20005WR	LS3578 BT scanner (FCC ID: H9PLMX5452)	NA (BT wireless connection)
Wireless Scanner 3	DS3578	DS3578-ER2F005WR	DS3578 BT scanner (FCC ID: H9PDS3578)	NA (BT wireless connection)
External Speaker	HSN4040A	HSN4040A	Motorola HSN4040A 13 Watt water-resistant loudspeaker	special speaker connector
PTT mic	HMN1089B	HMN1089B	Motorola HMN1089B Water-resistant Palm Microphone or equivalent	special MIC connector
Keyboard 1	KYBD-QW-VC70-01R	59-160663-01	VC70_QWERTY keyboard	USB
Keyboard 2	KYBD-NU-VC70-01R	59-160661-01	VC70_21 keys_Functional/Numeric keyboard	USB
Keyboard 3	VC5090KYBD-00R	VC5090KYBD-02R	VC50_QWERTY keyboard	USB
Printer 1	RW420	R4D-0UBA000N-00	RW420 / Zebra, Printer.	RS232
Printer 2	MF2TE	200380-100	Microflash Series MF 2T, O'Neil, Easy Print	NA (BT wireless connection)
Power Supply 1	AA27410L	PWRS-9-60VDC-01R	Input Voltage: 9-60Vdc; Output Voltage: 12Vdc	DC input connector
Power Supply 2	50-14000-241R	PWRS-14000-241R	Input Voltage: 110-240Vac; Output Voltage: 12Vdc	DC input connector
Wired Scanner 1, Wireless Scanner 1 and Printer 1 were chosen for final test.				

3. The EUT has two variants, which are identical to each other in all aspects except for the following table:

Sample	Brand	Model	Difference
1	MOTOROLA	VC70N0	Heater
2	MOTOROLA	VC70N0	Non-heater

From the above samples, test **sample 1** was selected as representative model for the test and its data was recorded in this report.

4. The EUT could be supplied from a battery, the information are listed as below:

Brand:	Palladium
Part No.:	82-161178-01
Rating:	3.7V, 1880mAh

5. The antennas provided to the EUT, please refer to the following table:

No.	Brand	Model	ANT Type	Connecter Type (External only)	Freq. Range (MHz to MHz)	Gain (dBi) (Including cable loss)	Cable Loss (dB)	Cable Length
1	Aristotle	RFA-02-G78-1	PIFA	N/A	2400-2500	1.7 (for BT)	0.783	27cm
2	Aristotle	RFA-02-G78-1	PIFA	N/A	2400-2500	1.1 (for Main WLAN)	0.58	20cm
3	Aristotle	RFA-02-G78-1	PIFA	N/A	4900-5850	4.7 (for Main WLAN)	0.96 ~ 1.06	20cm
4	Aristotle	RFA-02-G78-1	PIFA	N/A	2400-2500	-0.5 (for Aux WLAN)	0.783	27cm
5	Aristotle	RFA-02-G78-1	PIFA	N/A	4900-5850	4.3 (for Aux WLAN)	1.296 ~ 1.431	27cm
6	PCTEL	GPSDBHF	Shark-shape	RRSMA	2400-2500	1.18 (for External WLAN)	2.28	12ft
7	PCTEL	GPSDBHF	Shark-shape	RRSMA	4900-5850	0.24 (for External WLAN)	3.36 ~ 3.84	12ft

6. The EUT incorporates a SISO function without beam forming.

MODULATION MODE	TX FUNCTION
802.11b	1Tx/1Rx
802.11g	1Tx/1Rx
802.11a	1Tx/1Rx
802.11n (HT20)	1Tx/1Rx

7. 2.4GHz and 5GHz technology cannot transmit at same time.

8. Radiated and Conducted emission of the simultaneous operation (Bluetooth and WLAN technology) has been evaluated and no non-compliance was found.

9. The EUT was pre-tested in chamber under following test modes :

Pre-test Mode	Description
Mode A	Power Supply 2 + Keyboard 1 (Sample: Non-heater)
Mode B	**Power Supply 2 + Keyboard 1 (Sample: Heater)**
Mode C	Power Supply 2 + Keyboard 2 (Sample: Heater)
Mode D	Power Supply 2 + Keyboard 3 (Sample: Heater)
Mode E	Power Supply 1 (Input: 12Vdc) + Keyboard 1 (Sample: Heater)
Mode F	Power Supply 1 (Input: 24Vdc) + Keyboard 1 (Sample: Heater)

The worse radiated emission was found in **Mode B**. Therefore only the test data of the modes were recorded in this report.

10. When the EUT operating in 802.11n, the software operation, which is defined by manufacturer, MCS (Modulation and Coding Schemes) from 0 to 7.

11. The above EUT information was declared by the 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 for Bluetooth.

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		

3.3 TEST MODE APPLICABLITY AND TESTED CHANNEL DETAIL:

EUT CONFIGURE MODE	APPLICABLE TO					DESCRIPTION
	PLC	RE < 1G	RE ³ 1G	APCM	OB	
1	√	√	√	√	√	Power Supply 2
2	√	-	-	-	-	Power Supply 1

Where **PLC:** Power Line Conducted Emission **RE < 1G:** Radiated Emission below 1GHz

RE ³ 1G: Radiated Emission above 1GHz **APCM:** Antenna Port Conducted Measurement

OB: Conducted Out-Band Emission Measurement

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.

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

RADIATED EMISSION TEST (BELOW 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

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

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.

Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
0 to 78	0, 39, 78	FHSS	GFSK	DH5
0 to 78	0, 39, 78	FHSS	8DPSK	DH5

ANTENNA PORT CONDUCTED MEASUREMENT:

☒ 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.

Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
0 to 78	0, 39, 78	FHSS	GFSK	DH5
0 to 78	0, 39, 78	FHSS	8DPSK	DH5

CONDUCTED OUT-BAND EMISSION MEASUREMENT:

☒ 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.

Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
0 to 78	0, 78	FHSS	GFSK	DH5
0 to 78	0, 78	FHSS	8DPSK	DH5

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
PLC	26deg. C, 61%RH	120Vac, 60Hz	Jyunchun Lin
	28deg. C,56%RH	120Vac, 60Hz	Gavin Peng
RE<1G	26deg. C, 81%RH	120Vac, 60Hz	Amos Chuang
RE≥1G	26deg. C, 77%RH	120Vac, 60Hz	Amos Chuang
APCM	25deg. C, 60%RH	120Vac, 60Hz	Amos Chuang
OB	25deg. C, 60%RH	120Vac, 60Hz	Amos Chuang

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)
ANSI C63.10-2009

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.

3.5 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.

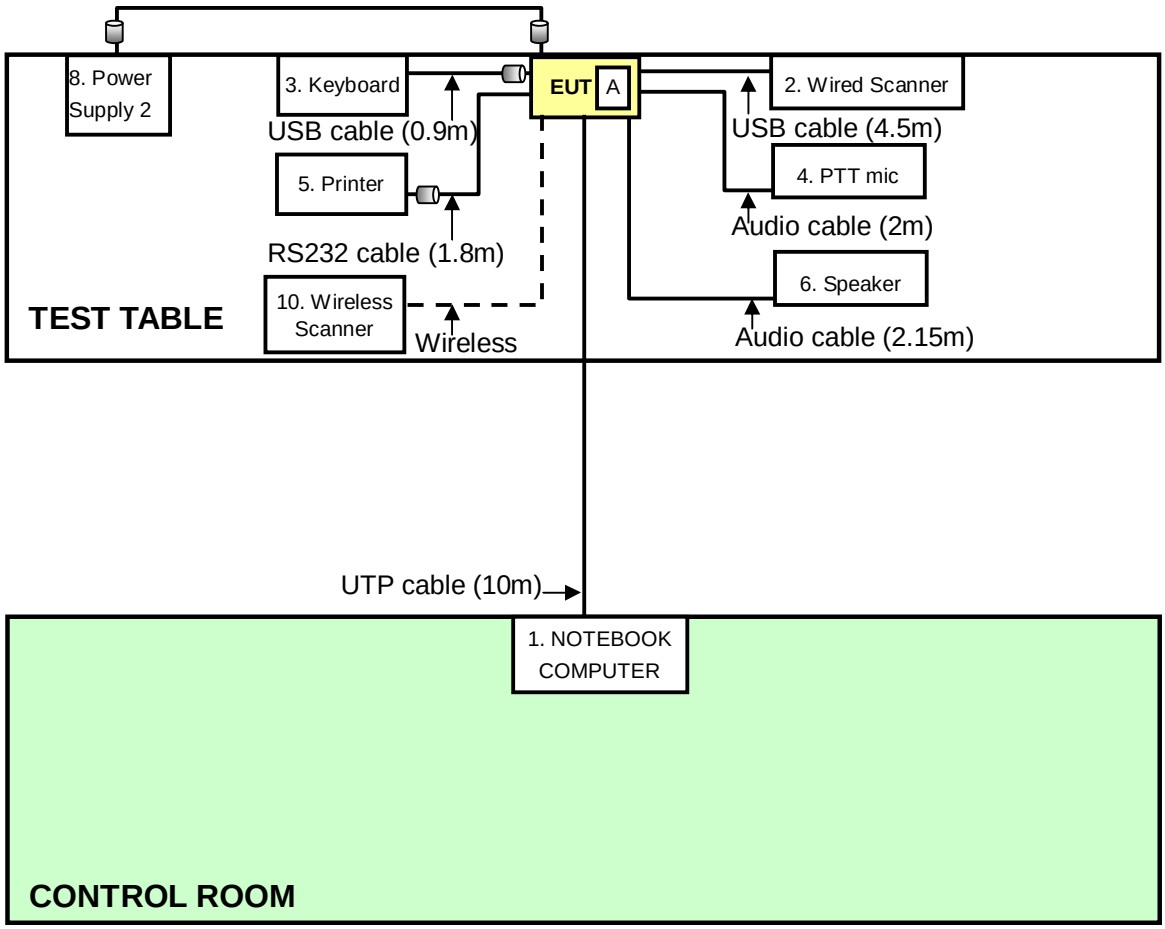
No.	Product	Brand	Model No.	Serial No.
1	NOTEBOOK COMPUTER	DELL	E6420	H62T3R1
2	Wired Scanner	NA	LS 3408	LS 3408-ER20105R
3	Keyboard	NA	KYBD-QW-VC70-01R	59-160663-01
4	PTT MIC	Motorola	HMN1089B	HMN1089B
5	Printer	NA	RW420	R4D-0UBA000N-00
6	Speaker	Motorola	HSN4040A	HSN4040A
7	Power Supply 1	Motorola	AA27410L	86-149830-01
8	Power Supply 2	Motorola	50-14000-241R	PWRS-14000-241R
9	DC Power Supply	GOOD WILL INSTRUMENT CO., LTD.	GPC-3030D	7700087
10	Wireless Scanner	RS507	RS507-IM20000CTWR	NA

No.	Signal cable description
1	UTP cable, 10m
2	USB cable, 4.5m
3	USB cable, 0.9m with one core
4	Audio cable, 2m
5	RS232 cable, 1.8m with one core
6	Audio cable, 2.15m
7	DC cable, 2m
8	DC cable, 1.8m with two cores
9	DC cable, 0.4m
10	NA

NOTE: All power cords of the above support units are non shielded (1.8m).

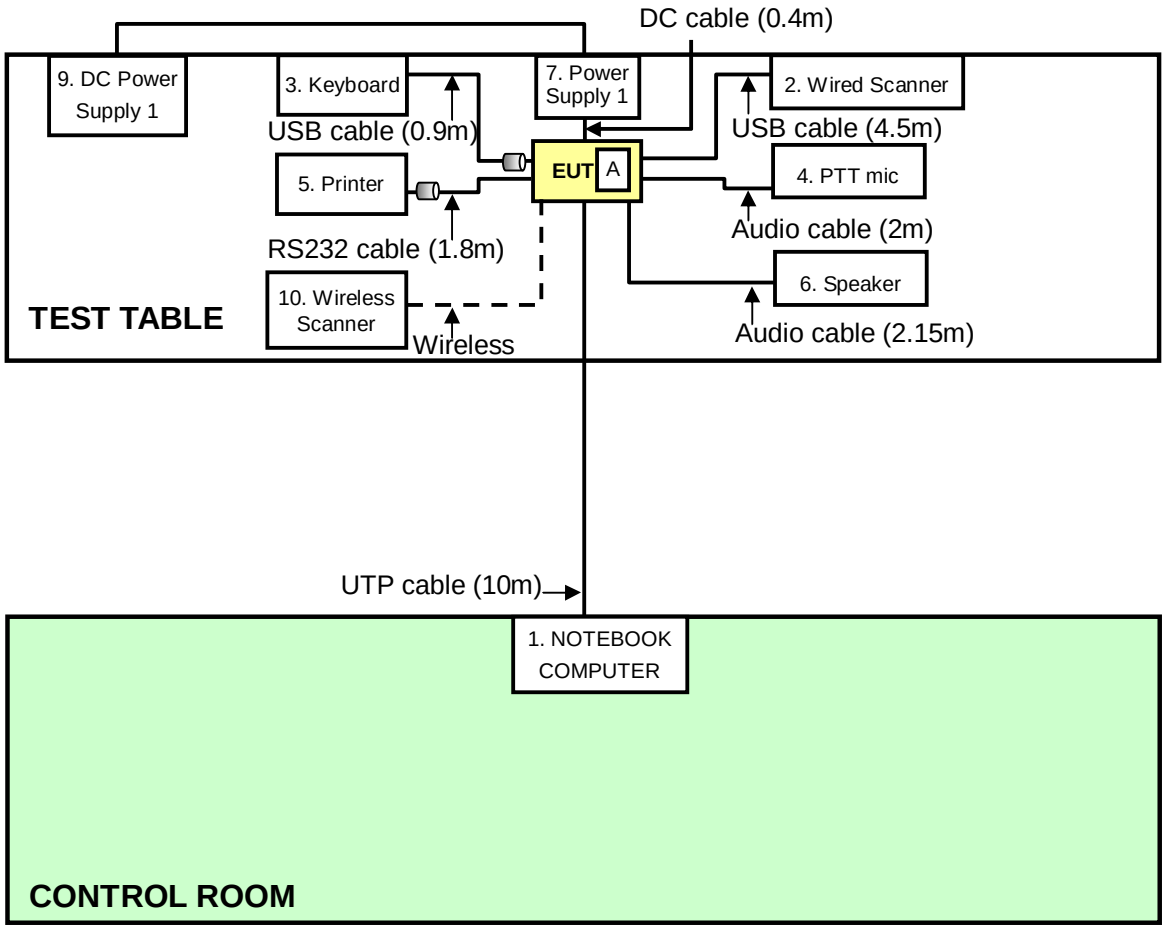
3.6 CONFIGURATION OF SYSTEM UNDER TEST

For Conducted emission (Mode 1) / Radiated emission (Mode 1~2) test:



NOTE: 1. Item A is the battery.

For Conducted emission (Mode 2) test:



NOTE: 1. Item A is the battery.

4 TEST PROCEDURES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBμV)	
	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 0.50MHz.

4.1.2 TEST INSTRUMENTS

For Mode 1:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver ROHDE & SCHWARZ	ESCS 30	100287	Feb. 29, 2012	Feb. 28, 2013
Line-Impedance Stabilization Network (for EUT) SCHWARZBECK	NSLK 8127	8127-523	Sep. 19, 2012	Sep. 20, 2013
Line-Impedance Stabilization Network (for Peripheral) ROHDE & SCHWARZ	ESH3-Z5	848773/004	Nov. 01, 2011	Oct. 31, 2012
RF Cable (JYEBAO)	5DFB	COACAB-002	Aug. 05, 2012	Aug. 04, 2013
50 ohms Terminator	50	4	Nov. 12, 2011	Nov. 11, 2012
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 Shielded Room No. A.
3 The VCCI Con A Registration No. is C-817.
4. Tested Date: Oct. 09, 2012

For Mode 2:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver ROHDE & SCHWARZ	ESCS 30	100287	Feb. 29, 2012	Feb. 28, 2013
Line-Impedance Stabilization Network (for EUT) SCHWARZBECK	NSLK 8127	8127-523	Sep. 20, 2011	Sep. 19, 2012
Line-Impedance Stabilization Network (for Peripheral) ROHDE & SCHWARZ	ESH3-Z5	848773/004	Nov. 01, 2011	Oct. 31, 2012
RF Cable (JYEBAO)	5DFB	COACAB-002	Aug. 05, 2012	Aug. 04, 2013
50 ohms Terminator	50	4	Nov. 12, 2011	Nov. 11, 2012
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 Shielded Room No. A.
3 The VCCI Con A Registration No. is C-817.
4. Tested Date: Sep. 10, 2012

4.1.3 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.

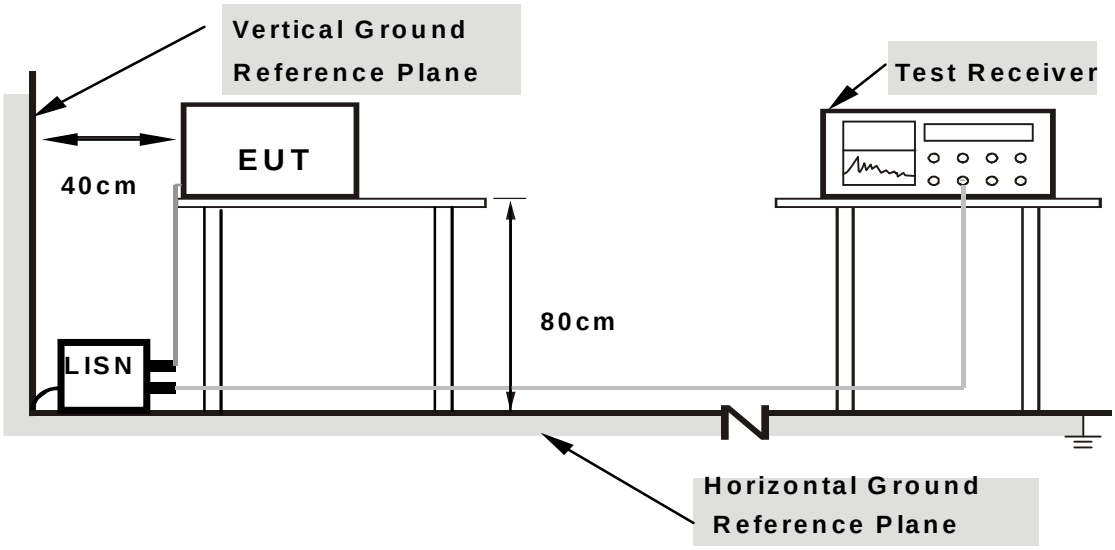
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 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 from other units and other metal planes

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

4.1.6 EUT OPERATING CONDITIONS

1. Turn on the power of EUT.
2. The communication partner run test program “BT Reg Test Ver 4.1.exe” to enable EUT under transmission/receiving condition continuously at specific channel frequency.

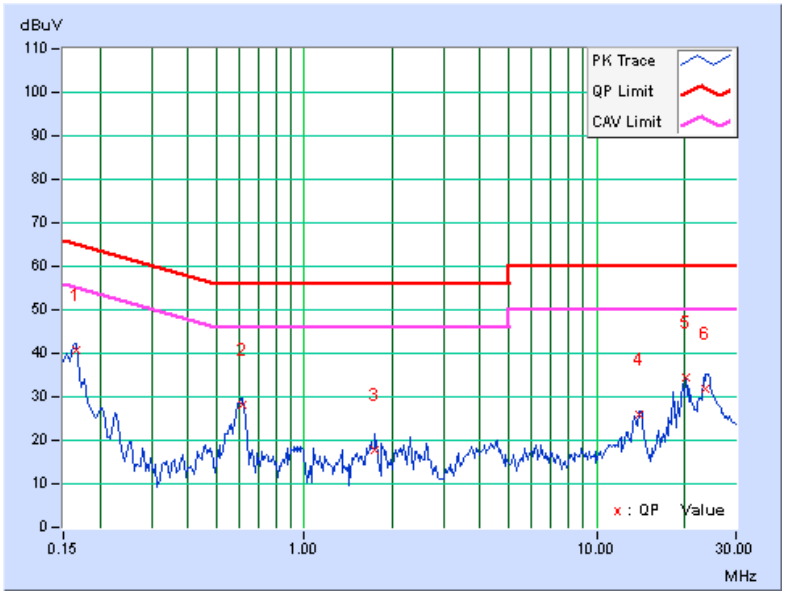
4.1.7 TEST RESULTS (MODE 1)

PHASE	Line (L)	6dB BANDWIDTH	9 kHz

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16562	0.09	40.52	39.81	40.61	39.90	65.18	55.18	-24.57	-15.28
2	0.61484	0.16	28.13	26.23	28.29	26.39	56.00	46.00	-27.71	-19.61
3	1.74219	0.23	17.62	12.51	17.85	12.74	56.00	46.00	-38.15	-33.26
4	14.03125	0.61	25.34	23.04	25.95	23.65	60.00	50.00	-34.05	-26.35
5	20.26022	0.72	33.63	30.73	34.35	31.45	60.00	50.00	-25.65	-18.55
6	23.71094	0.81	30.93	25.72	31.74	26.53	60.00	50.00	-28.26	-23.47

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.

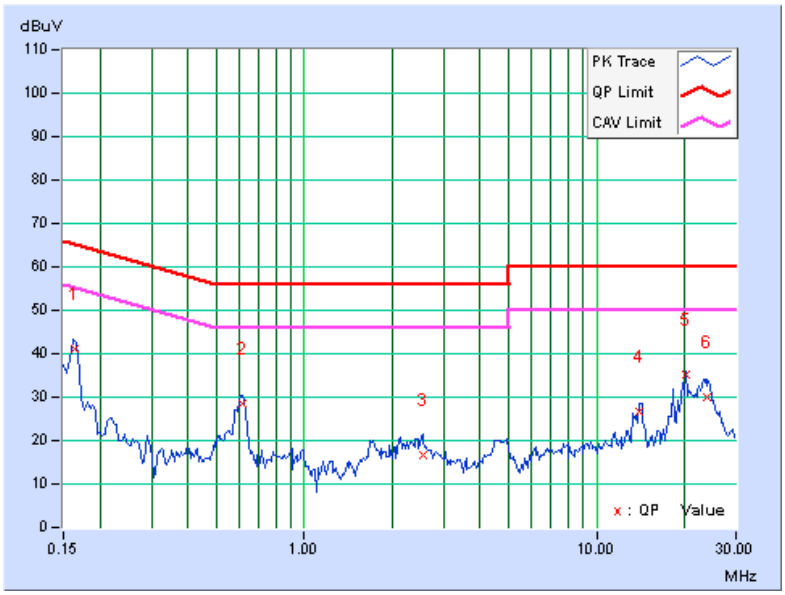


PHASE	Neutral (N)	6dB BANDWIDTH	9 kHz

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16497	0.10	41.05	40.20	41.15	40.30	65.21	55.21	-24.06	-14.91
2	0.61487	0.17	28.43	27.19	28.60	27.36	56.00	46.00	-27.40	-18.64
3	2.55078	0.26	16.30	9.76	16.56	10.02	56.00	46.00	-39.44	-35.98
4	14.03084	0.59	26.06	23.54	26.65	24.13	60.00	50.00	-33.35	-25.87
5	20.25781	0.70	34.41	31.43	35.11	32.13	60.00	50.00	-24.89	-17.87
6	24.01172	0.80	29.37	23.70	30.17	24.50	60.00	50.00	-29.83	-25.50

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.



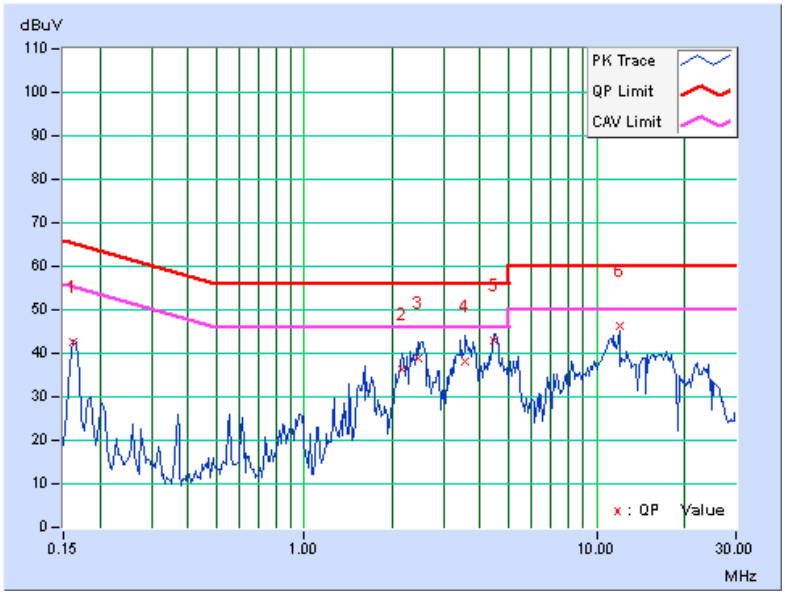
4.1.8 TEST RESULTS (MODE 2)

PHASE	Line (L)	6dB BANDWIDTH	9 kHz

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16172	0.09	42.45	41.63	42.54	41.72	65.38	55.38	-22.84	-13.66
2	2.15234	0.26	36.02	28.39	36.28	28.65	56.00	46.00	-19.72	-17.35
3	2.45313	0.27	38.65	32.03	38.92	32.30	56.00	46.00	-17.08	-13.70
4	3.57031	0.31	37.91	31.91	38.22	32.22	56.00	46.00	-17.78	-13.78
5	4.43750	0.34	42.47	38.23	42.81	38.57	56.00	46.00	-13.19	-7.43
6	11.94531	0.56	45.76	38.60	46.32	39.16	60.00	50.00	-13.68	-10.84

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.

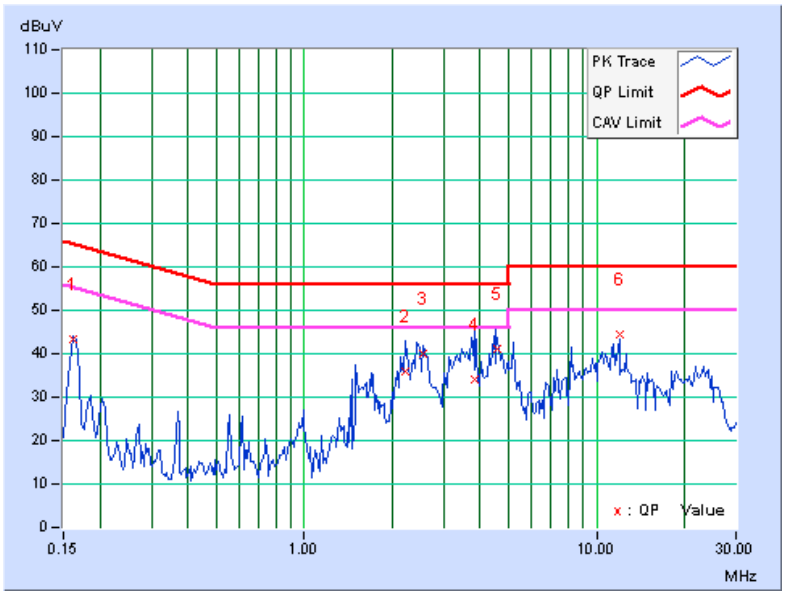


PHASE	Neutral (N)	6dB BANDWIDTH	9 kHz

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16172	0.10	43.28	42.48	43.38	42.58	65.38	55.38	-22.00	-12.80
2	2.23047	0.25	35.70	28.12	35.95	28.37	56.00	46.00	-20.05	-17.63
3	2.53516	0.26	39.68	33.03	39.94	33.29	56.00	46.00	-16.06	-12.71
4	3.85156	0.30	33.84	26.98	34.14	27.28	56.00	46.00	-21.86	-18.72
5	4.57591	0.33	40.63	36.25	40.96	36.58	56.00	46.00	-15.04	-9.42
6	**11.94531**	**0.54**	**43.75**	**42.76**	**44.29**	**43.30**	**60.00**	**50.00**	**-15.71**	**-6.70**

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.



4.2 RADIATED EMISSION MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

FREQUENCIES (MHz)	FIELD STRENGTH (microvolts/meter)	MEASUREMENT DISTANCE (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

NOTE:

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 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.

4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY51210202	Dec. 19, 2011	Dec. 18, 2012
Spectrum Analyzer Agilent PSA	E4446A	MY48250113	Nov. 30 , 2011	Nov. 29 , 2012
Pre_Amplifier HP	8449B	300801923	Oct. 31, 2011	Oct. 30, 2012
TRILOG Broadband Antenna SCHWARZBECK	VULB 9168	138	Apr. 02, 2012	Apr. 01, 2013
Horn_Antenna SCHWARZBECK	BBHA9120	D124	Dec. 16, 2011	Dec. 15, 2012
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170153	Jan. 17, 2012	Jan. 16, 2013
RF Cable (Chaintek)	Sucoflex 106	RF106-102	Jan. 19, 2012	Jan. 18, 2013
RF Cable	8DFB	STCCAB-30M -1GHz	Sep. 23, 2012	Sep. 22, 2013
Software	ADT_Radiated _V7.6.15.9.2	NA	NA	NA
Antenna Tower & Turn Table CT	NA	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 horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3 The test was performed in Open Site No. C.
4. The FCC Site Registration No. is 656396.
5 The VCCI Site Registration No. is R-1626.
6 The CANADA Site Registration No. is IC 7450G-3.
7 Tested Date: Sep. 24 to 26, 2012

4.2.3 TEST PROCEDURES

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meters open site 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 detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

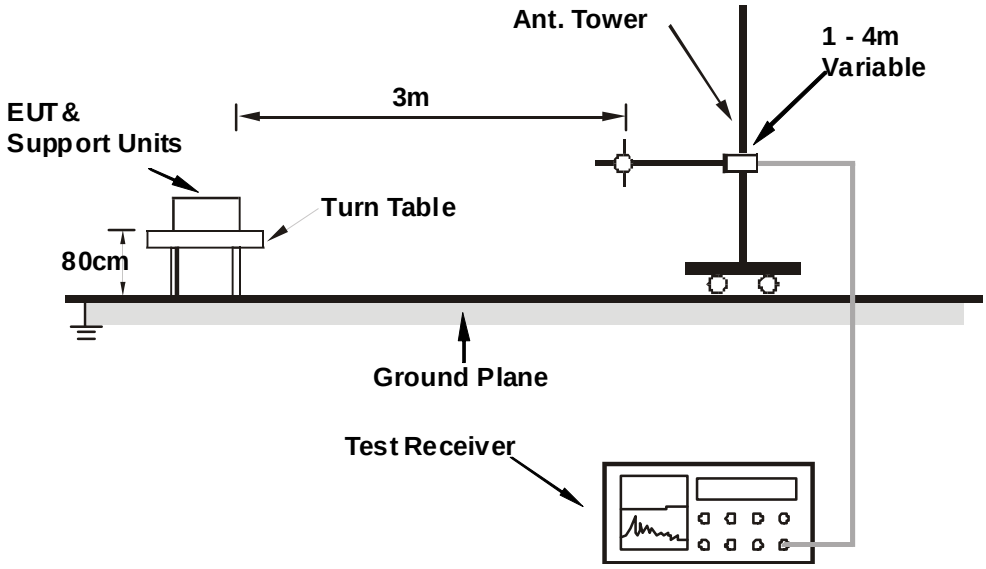
NOTE:

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

4.2.4 DEVIATION FROM TEST STANDARD

No deviation

4.2.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.2.6 EUT OPERATING CONDITIONS

Same as 4.1.6

4.2.7 TEST RESULTS

BELOW 1GHz WORST-CASE DATA

BT_GFSK

CHANNEL	TX Channel 78	**DETECTOR FUNCTION**	Quasi-Peak (QP)
FREQUENCY RANGE	Below 1GHz		

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	54.53	30.3 QP	40.0	-9.7	1.00 H	2	16.03	14.29
2	211.00	28.3 QP	43.5	-15.2	1.00 H	7	15.87	12.43
3	**320.00**	**39.2 QP**	**46.0**	**-6.8**	**1.08 H**	**40**	**22.36**	**16.87**
4	448.00	34.1 QP	46.0	-11.9	1.57 H	141	13.55	20.59
5	704.01	37.9 QP	46.0	-8.2	1.00 H	324	10.77	27.08
6	1000.00	32.3 QP	54.0	-21.7	1.34 H	141	1.87	30.45
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	120.00	22.6 QP	43.5	-20.9	1.00 V	330	9.88	12.75
2	172.00	29.6 QP	43.5	-13.9	1.13 V	203	15.29	14.32
3	320.00	32.6 QP	46.0	-13.4	1.14 V	192	15.69	16.87
4	448.00	36.9 QP	46.0	-9.1	1.36 V	55	16.27	20.59
5	576.00	34.6 QP	46.0	-11.4	1.13 V	239	9.85	24.73
6	704.00	31.1 QP	46.0	-14.9	1.25 V	335	4.06	27.08

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.

ABOVE 1GHz DATA

BT_GFSK

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	53.6 PK	74.0	-20.4	1.00 H	305	23.21	30.39
2	2390.00	23.5 AV	54.0	-30.5	1.00 H	305	-6.89	30.39
3	*2402.00	96.2 PK			1.02 H	306	65.76	30.44
4	*2402.00	66.1 AV			1.02 H	306	35.66	30.44
5	4804.00	46.1 PK	74.0	-27.9	1.00 H	81	10.21	35.89
6	4804.00	16.0 AV	54.0	-38.0	1.00 H	81	-19.89	35.89
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	53.3 PK	74.0	-20.7	1.02 V	261	22.91	30.39
2	2390.00	23.2 AV	54.0	-30.8	1.02 V	261	-7.19	30.39
3	*2402.00	97.5 PK			1.02 V	261	67.06	30.44
4	*2402.00	67.4 AV			1.02 V	261	36.96	30.44
5	4804.00	45.3 PK	74.0	-28.7	1.23 V	54	9.41	35.89
6	4804.00	15.2 AV	54.0	-38.8	1.23 V	54	-20.69	35.89

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: 20log(3.125 / 100)= -30.1 dB.
7. Average value = peak reading + 20log(duty cycle).

CHANNEL	TX Channel 39	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	98.9 PK			1.00 H	304	68.32	30.58
2	*2441.00	68.8 AV			1.00 H	304	38.22	30.58
3	4882.00	46.4 PK	74.0	-27.6	1.00 H	80	10.44	35.96
4	4882.00	16.3 AV	54.0	-37.7	1.00 H	80	-19.66	35.96
5	7323.00	47.7 PK	74.0	-26.3	1.00 H	89	5.50	42.20
6	7323.00	17.6 AV	54.0	-36.4	1.00 H	89	-24.60	42.20
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	99.7 PK			1.05 V	258	69.12	30.58
2	*2441.00	69.6 AV			1.05 V	258	39.02	30.58
3	4882.00	45.8 PK	74.0	-28.2	1.21 V	55	9.84	35.96
4	4882.00	15.7 AV	54.0	-38.3	1.21 V	55	-20.26	35.96
5	7323.00	47.1 PK	74.0	-26.9	1.15 V	192	4.90	42.20
6	7323.00	17.0 AV	54.0	-37.0	1.15 V	192	-25.20	42.20

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: 20log(3.125 / 100)= -30.1 dB.
7. Average value = peak reading + 20log(duty cycle).

CHANNEL	TX Channel 78	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	97.9 PK			1.00 H	309	67.17	30.73
2	*2480.00	67.8 AV			1.00 H	309	37.07	30.73
3	2483.50	54.8 PK	74.0	-19.2	1.00 H	309	24.06	30.74
4	2483.50	24.7 AV	54.0	-29.3	1.00 H	309	-6.04	30.74
5	4960.00	46.5 PK	74.0	-27.5	1.00 H	83	10.39	36.11
6	4960.00	16.4 AV	54.0	-37.6	1.00 H	83	-19.71	36.11
7	7440.00	47.8 PK	74.0	-26.2	1.00 H	90	5.26	42.54
8	7440.00	17.7 AV	54.0	-36.3	1.00 H	90	-24.84	42.54
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	100.0 PK			1.02 V	265	69.27	30.73
2	*2480.00	69.9 AV			1.02 V	265	39.17	30.73
3	2483.50	54.7 PK	74.0	-19.3	1.02 V	265	23.96	30.74
4	2483.50	24.6 AV	54.0	-29.4	1.02 V	265	-6.14	30.74
5	4960.00	45.6 PK	74.0	-28.4	1.20 V	51	9.49	36.11
6	4960.00	15.5 AV	54.0	-38.5	1.20 V	51	-20.61	36.11
7	7440.00	47.3 PK	74.0	-26.7	1.19 V	189	4.76	42.54
8	7440.00	17.2 AV	54.0	-36.8	1.19 V	189	-25.34	42.54

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: 20log(3.125 / 100)= -30.1 dB.
7. Average value = peak reading + 20log(duty cycle).

BT_8DPSK

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	58.1 PK	74.0	-15.9	1.00 H	304	27.71	30.39
2	2390.00	28.0 AV	54.0	-26.0	1.00 H	304	-2.39	30.39
3	*2402.00	95.6 PK			1.00 H	304	65.16	30.44
4	*2402.00	65.5 AV			1.00 H	304	35.06	30.44
5	4804.00	44.3 PK	74.0	-29.7	1.00 H	83	8.41	35.89
6	4804.00	14.2 AV	54.0	-39.8	1.00 H	83	-21.69	35.89
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	59.6 PK	74.0	-14.4	1.08 V	260	29.21	30.39
2	2390.00	29.5 AV	54.0	-24.5	1.08 V	260	-0.89	30.39
3	*2402.00	95.5 PK			1.08 V	260	65.06	30.44
4	*2402.00	65.4 AV			1.08 V	260	34.96	30.44
5	4804.00	44.1 PK	74.0	-29.9	1.21 V	53	8.21	35.89
6	4804.00	14.0 AV	54.0	-40.0	1.21 V	53	-21.89	35.89

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: 20log(3.125 / 100)= -30.1 dB.
7. Average value = peak reading + 20log(duty cycle).

CHANNEL	TX Channel 39	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	97.7 PK			1.00 H	306	67.12	30.58
2	*2441.00	67.6 AV			1.00 H	306	37.02	30.58
3	4882.00	44.1 PK	74.0	-29.9	1.00 H	81	8.14	35.96
4	4882.00	14.0 AV	54.0	-40.0	1.00 H	81	-21.96	35.96
5	7323.00	48.4 PK	74.0	-25.6	1.34 H	79	6.20	42.20
6	7323.00	18.3 AV	54.0	-35.7	1.34 H	79	-23.90	42.20
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	99.7 PK			1.08 V	266	69.12	30.58
2	*2441.00	69.6 AV			1.08 V	266	39.02	30.58
3	4882.00	43.9 PK	74.0	-30.1	1.21 V	53	7.94	35.96
4	4882.00	13.8 AV	54.0	-40.2	1.21 V	53	-22.16	35.96
5	7323.00	48.1 PK	74.0	-25.9	1.12 V	193	5.90	42.20
6	7323.00	18.0 AV	54.0	-36.0	1.12 V	193	-24.20	42.20

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: 20log(3.125 / 100)= -30.1 dB.
7. Average value = peak reading + 20log(duty cycle).

CHANNEL	TX Channel 78	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	97.3 PK			1.00 H	308	66.57	30.73
2	*2480.00	67.2 AV			1.00 H	308	36.47	30.73
3	2483.50	60.6 PK	74.0	-13.4	1.00 H	308	29.86	30.74
4	2483.50	30.5 AV	54.0	-23.5	1.00 H	308	-0.24	30.74
5	4960.00	44.0 PK	74.0	-30.0	1.00 H	81	7.89	36.11
6	4960.00	13.9 AV	54.0	-40.1	1.00 H	81	-22.21	36.11
7	7440.00	48.2 PK	74.0	-25.8	1.34 H	82	5.66	42.54
8	7440.00	18.1 AV	54.0	-35.9	1.34 H	82	-24.44	42.54
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	98.9 PK			1.02 V	266	68.17	30.73
2	*2480.00	68.8 AV			1.02 V	266	38.07	30.73
3	2483.50	62.8 PK	74.0	-11.2	1.02 V	266	32.06	30.74
4	2483.50	32.7 AV	54.0	-21.3	1.02 V	266	1.96	30.74
5	4960.00	43.3 PK	74.0	-30.7	1.25 V	50	7.19	36.11
6	4960.00	13.2 AV	54.0	-40.8	1.25 V	50	-22.91	36.11
7	7440.00	48.3 PK	74.0	-25.7	1.10 V	192	5.76	42.54
8	7440.00	18.2 AV	54.0	-35.8	1.10 V	192	-24.34	42.54

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: 20log(3.125 / 100)= -30.1 dB.
7. Average value = peak reading + 20log(duty cycle).

4.3 NUMBER OF HOPPING FREQUENCY USED

4.3.1 LIMIT OF HOPPING FREQUENCY USED

At least 15 hopping frequencies, and should be equally spaced.

4.3.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP 40	100036	Dec 14, 2011	Dec 13, 2012

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. Tested date: Oct. 02, 2012

4.3.3 TEST PROCEDURES

a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.

c. Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.

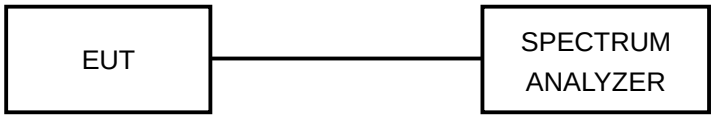
d. Set the SA on View mode and then plot the result on SA screen.

e. Repeat above procedures until all frequencies measured were complete.

4.3.4 DEVIATION FROM TEST STANDARD

No deviation

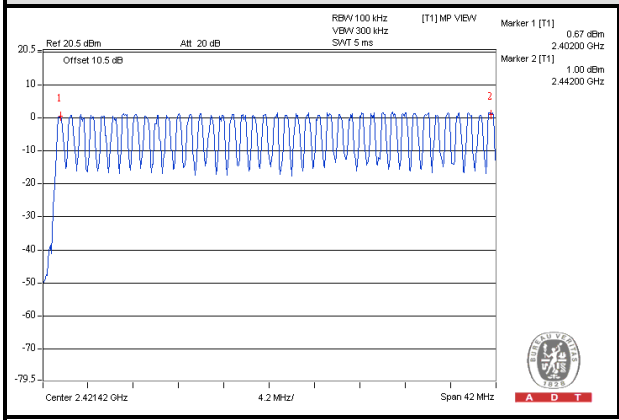
4.3.5 TEST SETUP

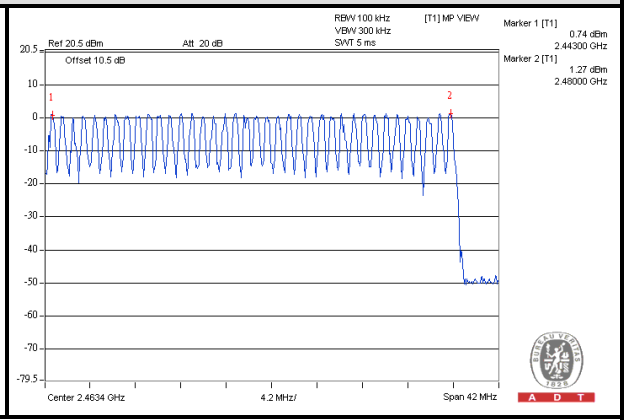


4.3.6 TEST RESULTS

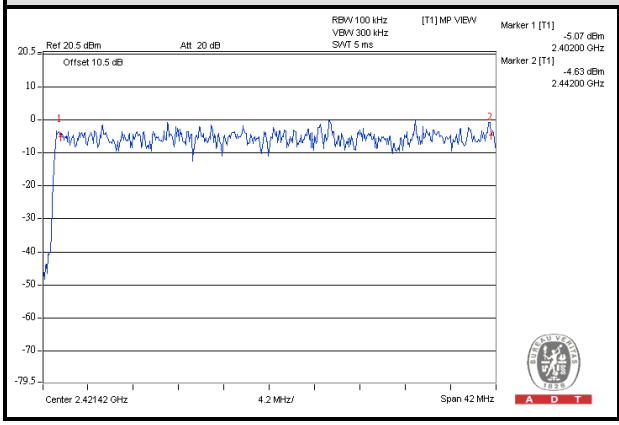
There are 79 hopping frequencies in the hopping mode. Please refer to next pages for the test result. On the plots, it shows that the hopping frequencies are equally spaced.

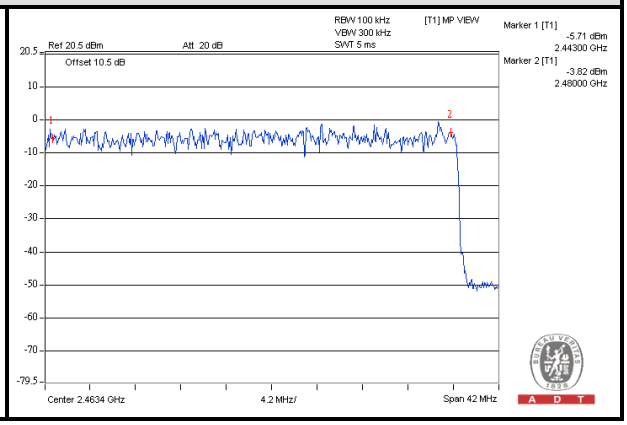
GFSK


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
Marker 1 [T1]
0.67 dBm
2.40200 GHz
Marker 2 [T1]
1.00 dBm
2.44200 GHz
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
Center 2.42142 GHz
4.2 MHz/
Span 42 MHz


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
Marker 1 [T1]
0.74 dBm
2.44300 GHz
Marker 2 [T1]
1.27 dBm
2.48000 GHz
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
Center 2.4634 GHz
4.2 MHz/
Span 42 MHz

8DPSK


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
Marker 1 [T1]
-5.07 dBm
2.40200 GHz
Marker 2 [T1]
-4.63 dBm
2.44200 GHz
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
Center 2.42142 GHz
4.2 MHz/
Span 42 MHz


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
Marker 1 [T1]
-5.71 dBm
2.44300 GHz
Marker 2 [T1]
-3.82 dBm
2.48000 GHz
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
Center 2.4634 GHz
4.2 MHz/
Span 42 MHz

4.4 DWELL TIME ON EACH CHANNEL

4.4.1 LIMIT OF DWELL TIME USED

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

4.4.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP 40	100036	Dec 14, 2011	Dec 13, 2012

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. Tested date: Oct. 02, 2012

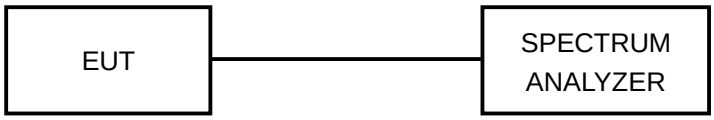
4.4.3 TEST PROCEDURES

a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
c. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
d. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
e. Repeat above procedures until all different time-slot modes have been completed.

4.4.4 DEVIATION FROM TEST STANDARD

No deviation

4.4.5 TEST SETUP



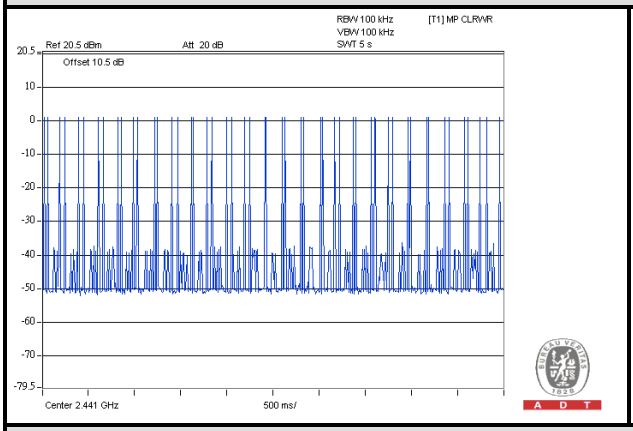
4.4.6 TEST RESULTS

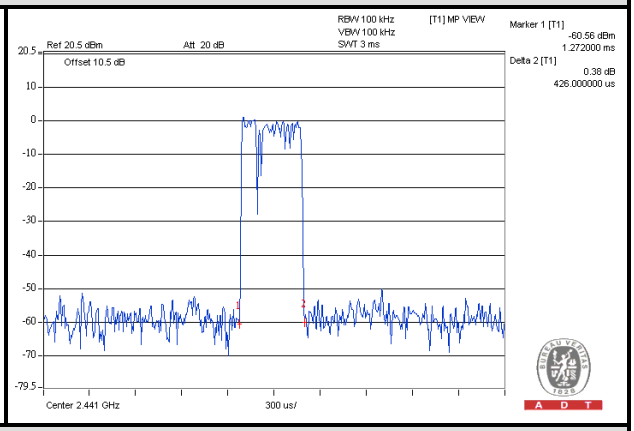
For GFSK:

Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
DH1	50 (times / 5 sec) *6.32=316 times	0.426	134.62	400
DH3	27 (times / 5 sec) *6.32=170.64 times	1.69	288.38	400
DH5	17 (times / 5 sec) *6.32=107.44 times	2.99	321.25	400

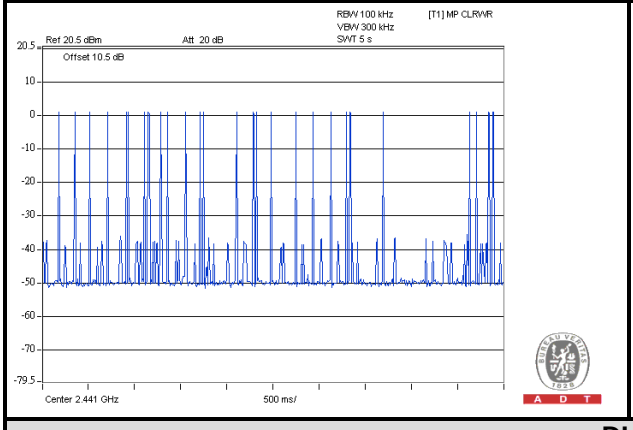
NOTE: Test plots of the transmitting time slot are shown on next page.

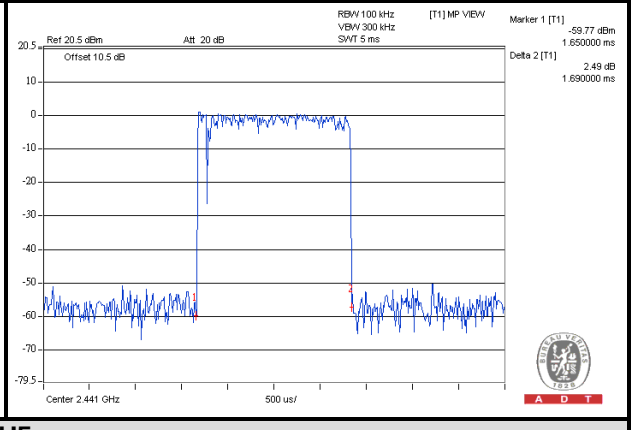
DH1


RBW 100 kHz
VBW 100 kHz
SWT 5 s
[T1] MP CLRWR
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
Center 2.441 GHz
500 ms/

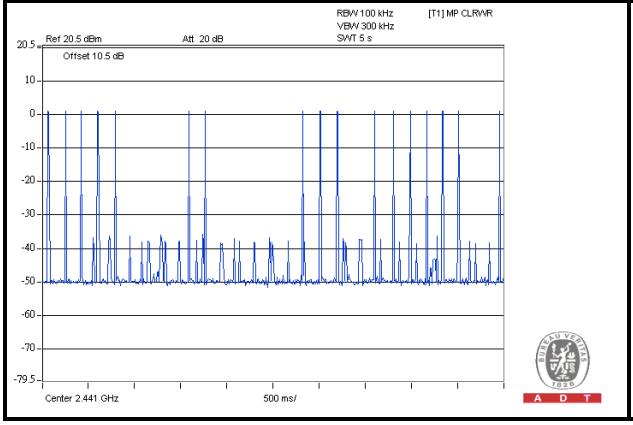

RBW 100 kHz
VBW 100 kHz
SWT 3 ms
[T1] MP VIEW
Marker 1 [T1]
-60.56 dBm
1.272000 ms
Delta 2 [T1]
0.38 dB
426.000000 us
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
Center 2.441 GHz
300 us/

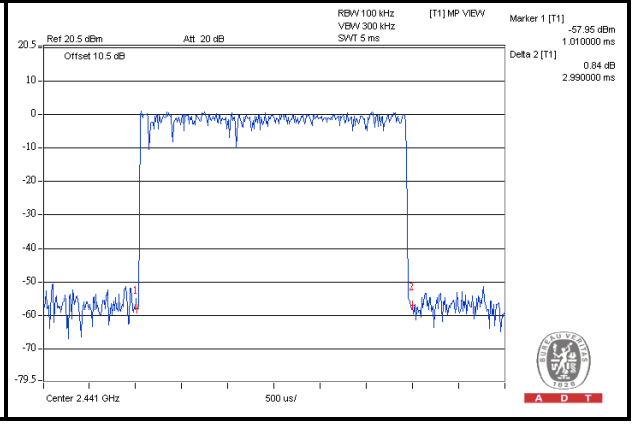
DH3


RBW 100 kHz
VBW 300 kHz
SWT 5 s
[T1] MP CLRWR
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
Center 2.441 GHz
500 ms/


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
Marker 1 [T1]
-59.77 dBm
1.650000 ms
Delta 2 [T1]
2.49 dB
1.690000 ms
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
Center 2.441 GHz
500 us/

DH5


RBW 100 kHz
VBW 300 kHz
SWT 5 s
[T1] MP CLRWR
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
Center 2.441 GHz
500 ms/

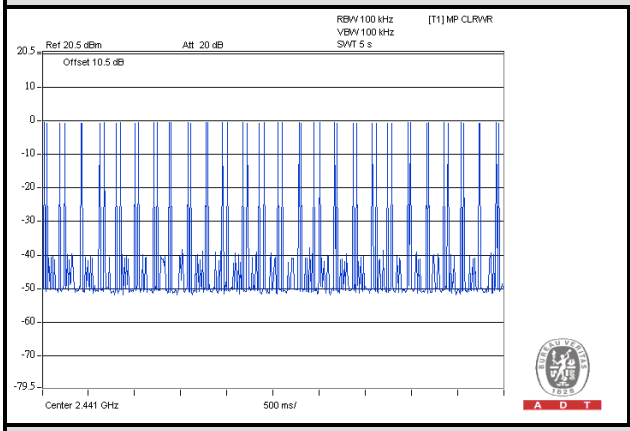

RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
Marker 1 [T1]
-57.95 dBm
1.010000 ms
Delta 2 [T1]
0.84 dB
2.990000 ms
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
Center 2.441 GHz
500 us/

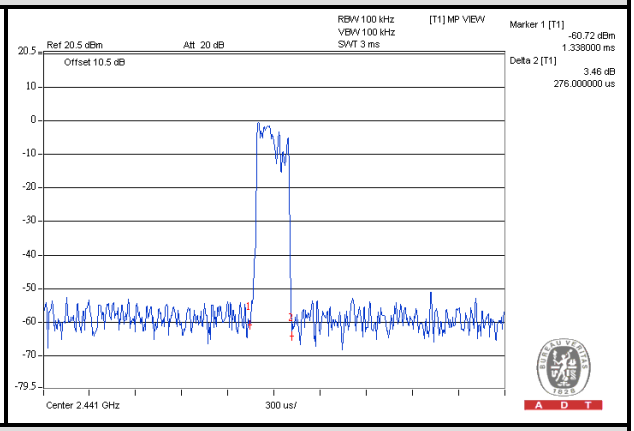
For 8DPSK:

Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
DH1	50 (times / 5 sec) *6.32=316 times	0.276	87.216	400
DH3	25 (times / 5 sec) *6.32=158 times	1.69	267.02	400
DH5	16 (times / 5 sec) *6.32=101.12 times	2.9	293.25	400

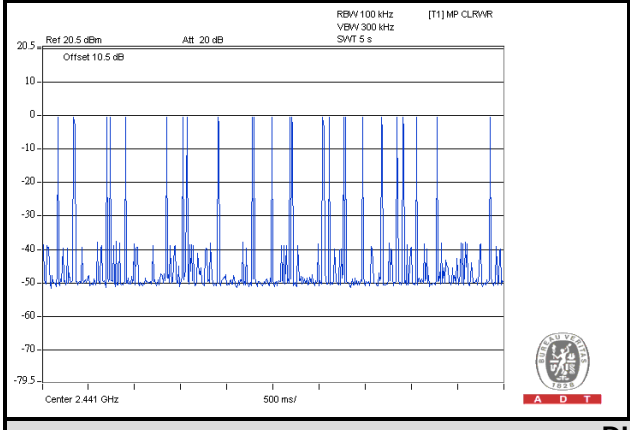
NOTE: Test plots of the transmitting time slot are shown on next page.

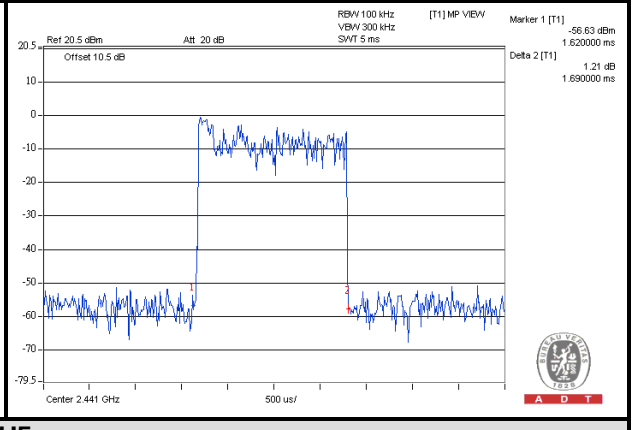
DH1


RBW 100 kHz
VBW 100 kHz
SWT 5 s
[T1] MP CLRWR
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
Center 2.441 GHz
500 ms/

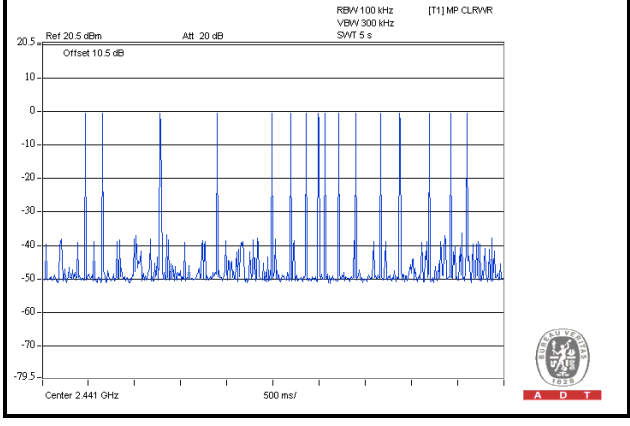

RBW 100 kHz
VBW 100 kHz
SWT 3 ms
[T1] MP VIEW
Marker 1 [T1]
-60.72 dBm
1.338000 ms
Delta 2 [T1]
3.46 dB
276.000000 us
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
Center 2.441 GHz
300 us/

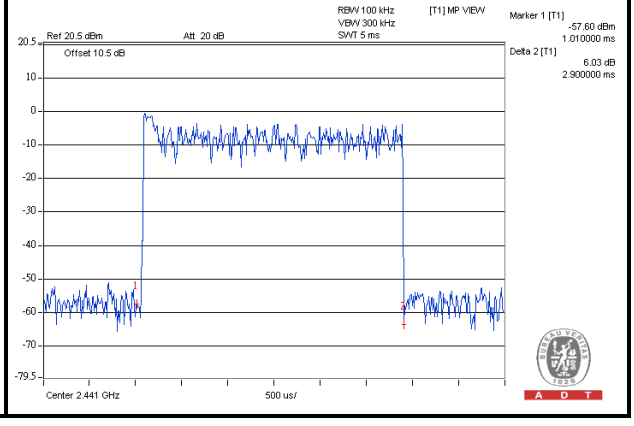
DH3


RBW 100 kHz
VBW 300 kHz
SWT 5 s
[T1] MP CLRWR
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
Center 2.441 GHz
500 ms/


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
Marker 1 [T1]
-56.63 dBm
1.620000 ms
Delta 2 [T1]
1.21 dB
1.690000 ms
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
Center 2.441 GHz
500 us/

DH5


RBW 100 kHz
VBW 300 kHz
SWT 5 s
[T1] MP CLRWR
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
Center 2.441 GHz
500 ms/


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
Marker 1 [T1]
-57.60 dBm
1.010000 ms
Delta 2 [T1]
6.03 dB
2.900000 ms
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
Center 2.441 GHz
500 us/

4.5 CHANNEL BANDWIDTH

4.5.1 LIMITS OF CHANNEL BANDWIDTH

For frequency hopping system operating in the 2400-2483.5MHz, If the 20dB bandwidth of hopping channel is greater than 25kHz, two-thirds 20dBbandwidth of hopping channel shell be a minimum limit for the hopping channel separation.

4.5.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP 40	100036	Dec. 14, 2011	Dec. 13, 2012

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. Tested: Oct. 02, 2012

4.5.3 TEST PROCEDURE

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.

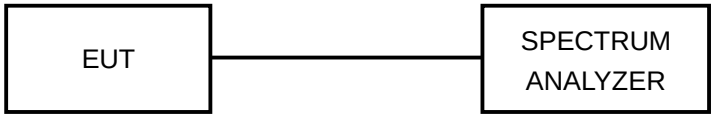
c. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.

d. Repeat above procedures until all frequencies measured were complete.

4.5.4 DEVIATION FROM TEST STANDARD

No deviation

4.5.5 TEST SETUP

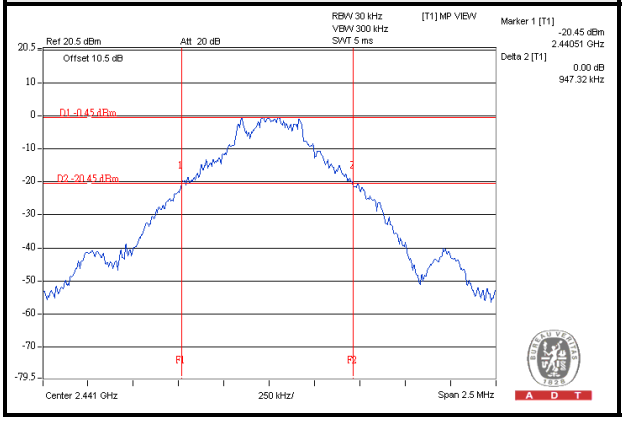
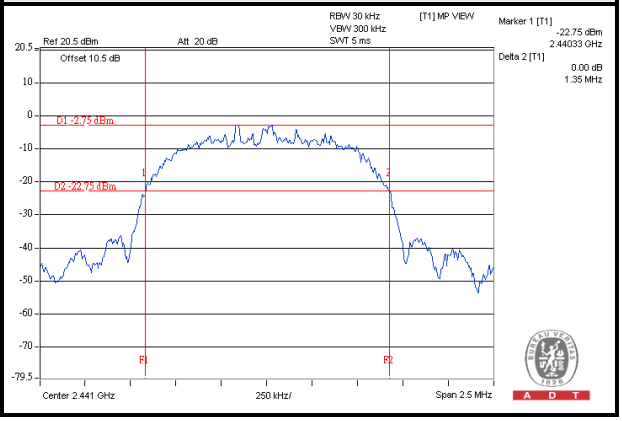


4.5.6 EUT OPERATING CONDITION

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.5.7 TEST RESULTS

CHANNEL	FREQUENCY (MHz)	20dB BANDWIDTH (MHz)	
		GFSK	8DPSK
0	2402	0.91	1.32
39	2441	0.94	1.35
78	2480	0.91	1.34

SPECTRUM PLOT OF WORST VALUE	
GFSK	8DPSK
	

4.6 HOPPING CHANNEL SEPARATION

4.6.1 LIMIT OF HOPPING CHANNEL SEPARATION

At least 25 kHz or two-thirds of 20dB hopping channel bandwidth (whichever is greater).

4.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP 40	100036	Dec. 14, 2011	Dec. 13, 2012

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. Tested date: Oct. 02, 2012

4.6.3 TEST PROCEDURES

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.

c. By using the MaxHold function record the separation of two adjacent channels.

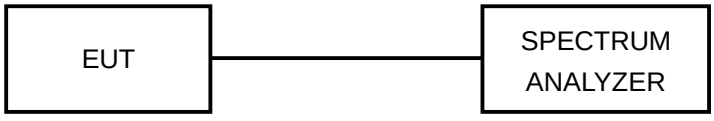
d. Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.

e. Repeat above procedures until all frequencies measured were complete.

4.6.4 DEVIATION FROM TEST STANDARD

No deviation

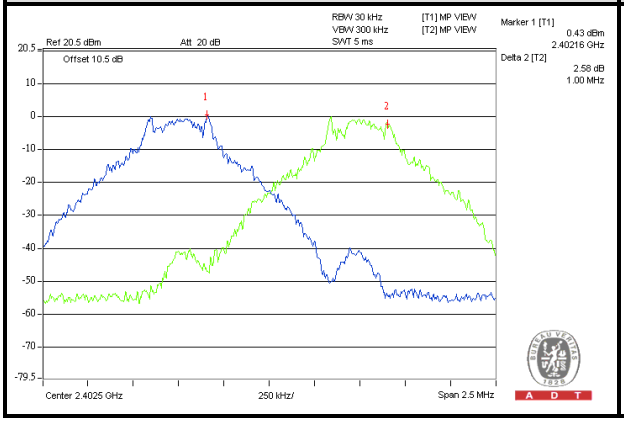
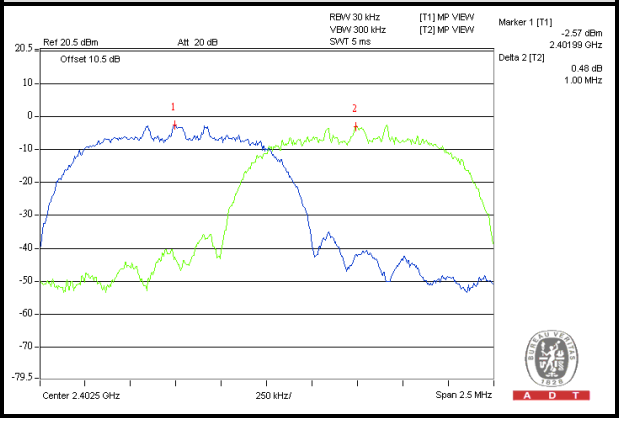
4.6.5 TEST SETUP



4.6.6 TEST RESULTS

CHANNEL	FREQUENCY (MHz)	ADJACENT CHANNEL SEPARATION (MHz)		20dB BANDWIDTH (MHz)		MINIMUM LIMIT (MHz)		PASS / FAIL
		GFSK	8DPSK	GFSK	8DPSK	GFSK	8DPSK	
0	2402	1.00	1.00	0.91	1.32	0.61	0.88	PASS
39	2441	1.00	1.00	0.94	1.35	0.63	0.9	PASS
78	2480	1.00	1.00	0.91	1.34	0.61	0.89	PASS

NOTE: The minimum limit is two-third 20dB bandwidth.

SPECTRUM PLOT OF WORST VALUE	
GFSK	8DPSK
	

4.7 MAXIMUM PEAK OUTPUT POWER

4.7.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The Maximum Peak Output Power Limit is 125mW.

4.7.2 INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP 40	100036	Dec. 14, 2011	Dec. 13, 2012

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. Tested date: Oct. 02, 2012

4.7.3 TEST PROCEDURES

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.

c. The center frequency of the spectrum analyzer is set to the fundamental frequency and using 3MHz RBW and 10 MHz VBW.

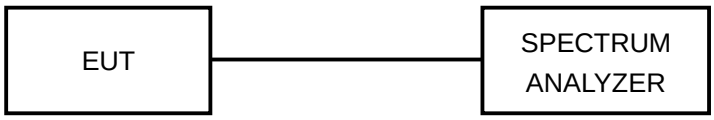
d. Measure the captured power within the band and recording the plot.

e. Repeat above procedures until all frequencies required were complete.

4.7.4 DEVIATION FROM TEST STANDARD

No deviation

4.7.5 TEST SETUP



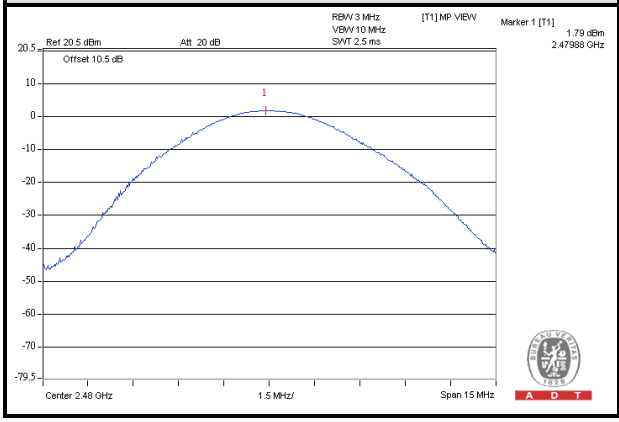
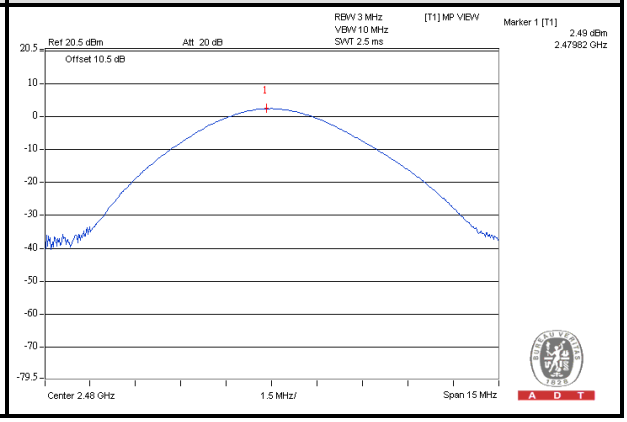
For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

4.7.6 EUT OPERATING CONDITION

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.7.7 TEST RESULTS

CHANNEL	FREQUENCY (MHz)	OUTPUT POWER (mW)		OUTPUT POWER (dBm)		POWER LIMIT (mW)	PASS / FAIL
		GFSK	8DPSK	GFSK	8DPSK		
0	2402	1.340	1.600	1.27	2.04	125	PASS
39	2441	1.449	1.690	1.61	2.28	125	PASS
78	2480	1.510	1.774	1.79	2.49	125	PASS

SPECTRUM PLOT OF WORST VALUE	
GFSK	8DPSK
	

4.8 CONDUCTED OUT-BAND EMISSION MEASUREMENT

4.8.1 LIMITS OF CONDUCTED OUT-BAND EMISSION MEASUREMENT

Below 20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

4.8.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP 40	100036	Dec. 14, 2011	Dec. 13, 2012

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. Tested date: Oct. 02, 2012

4.8.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set RBW a of spectrum analyzer to 100 kHz and VBW of spectrum analyzer to 300 kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

4.8.4 DEVIATION FROM TEST STANDARD

No deviation

4.8.5 EUT OPERATING CONDITION

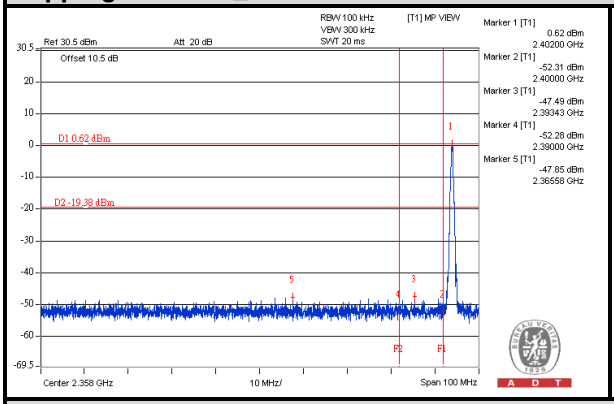
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

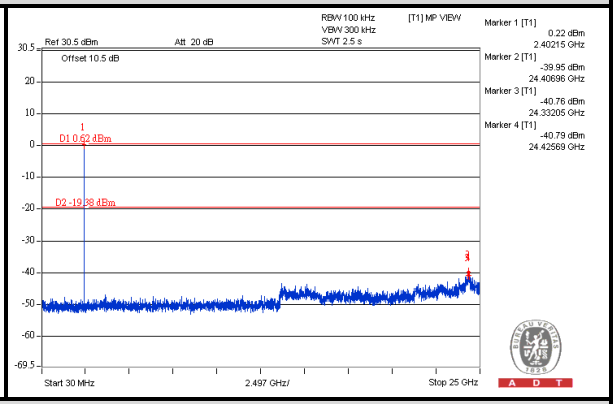
4.8.6 TEST RESULTS

The spectrum plots are attached on the following images. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

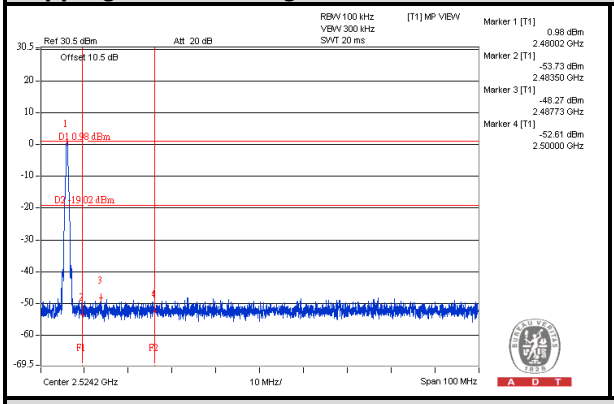
GFSK

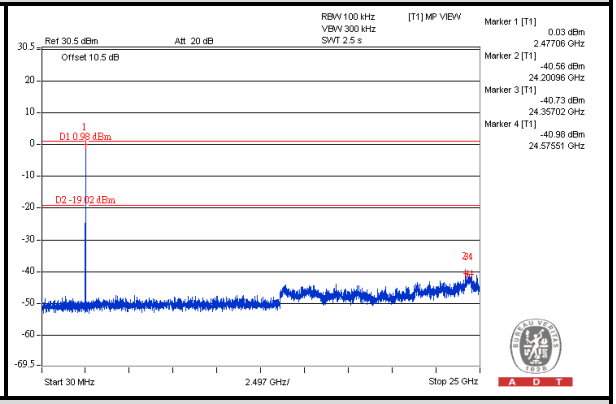
Hopping disabled_ Low Channel



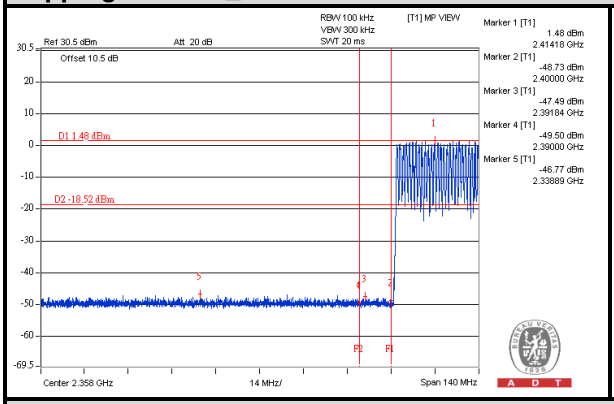


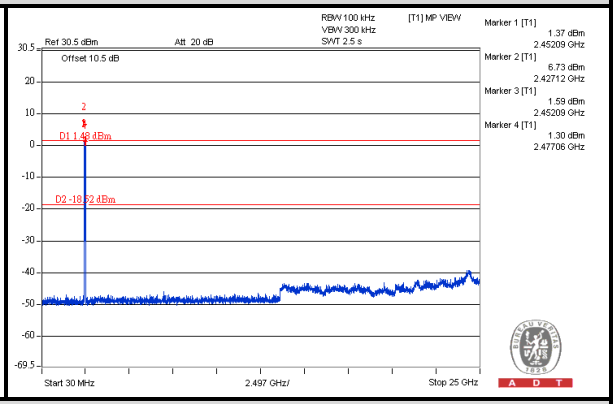
Hopping disabled_ High Channel



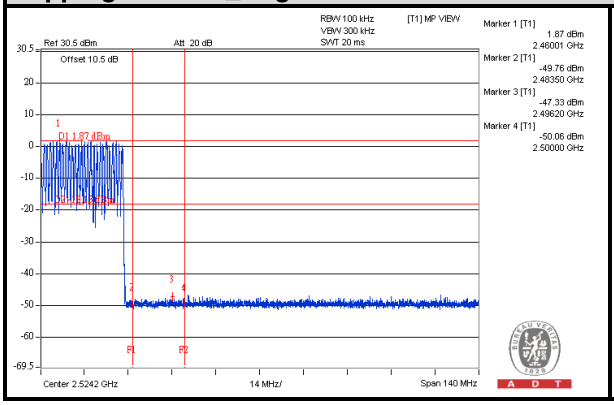


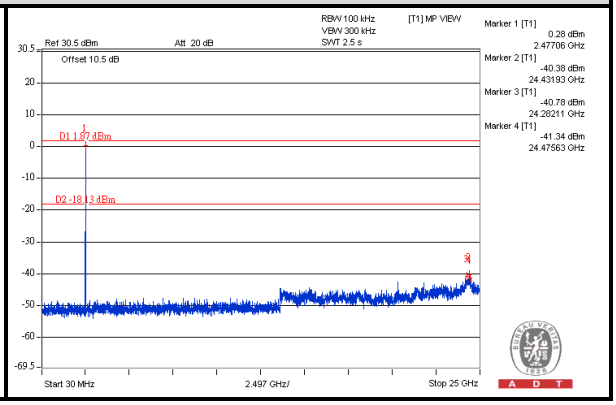
Hopping enabled_ Low Channel





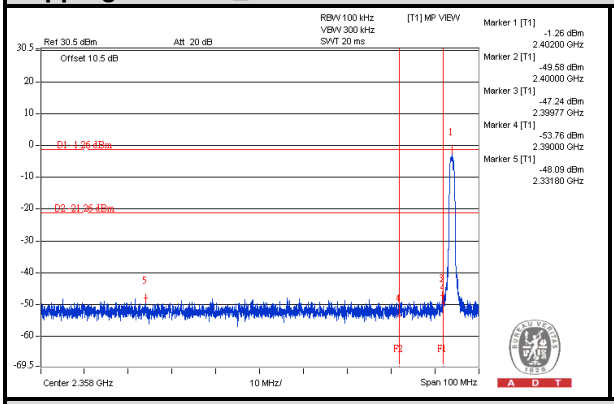
Hopping enabled_ High Channel

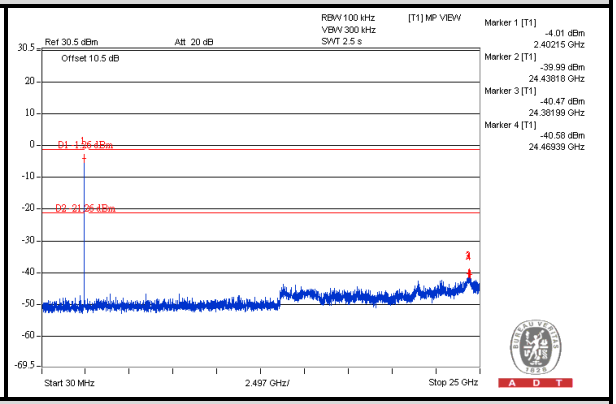




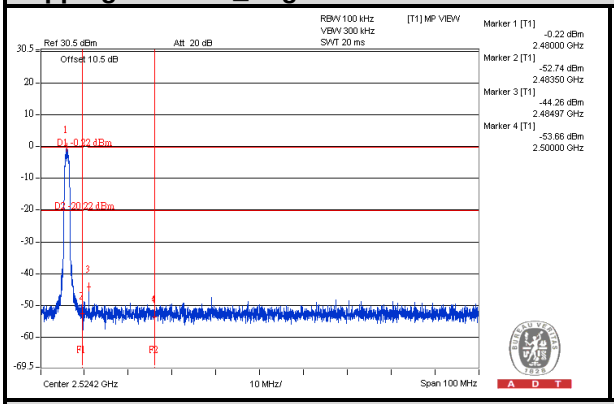
8DPSK

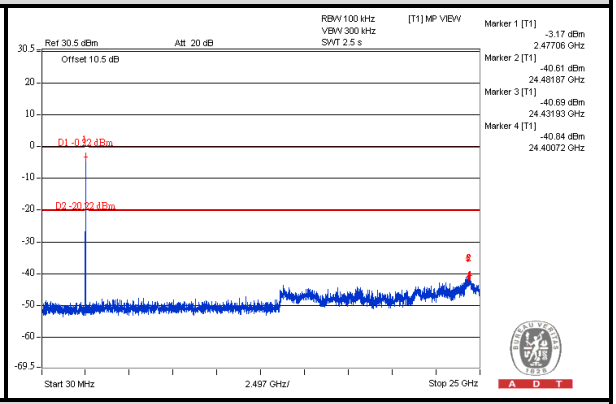
Hopping disabled_ Low Channel



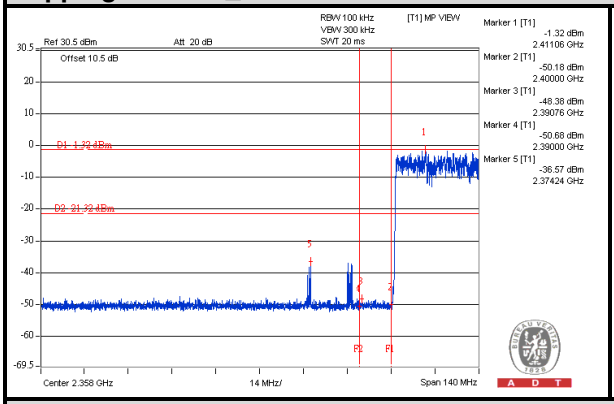


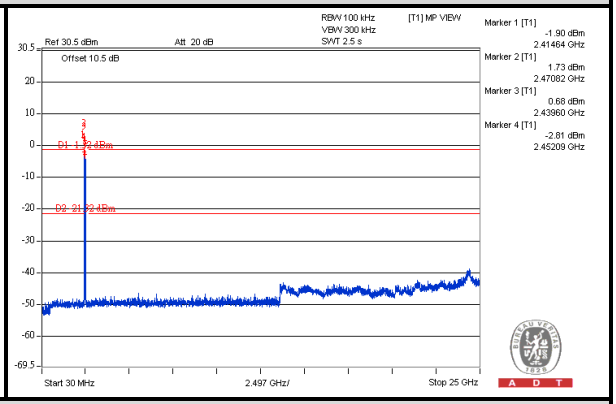
Hopping disabled_ High Channel



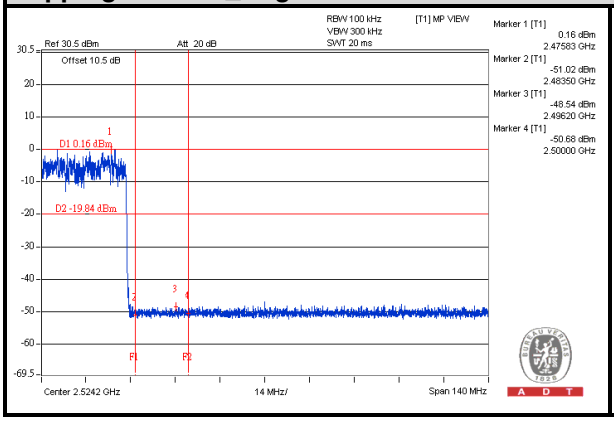


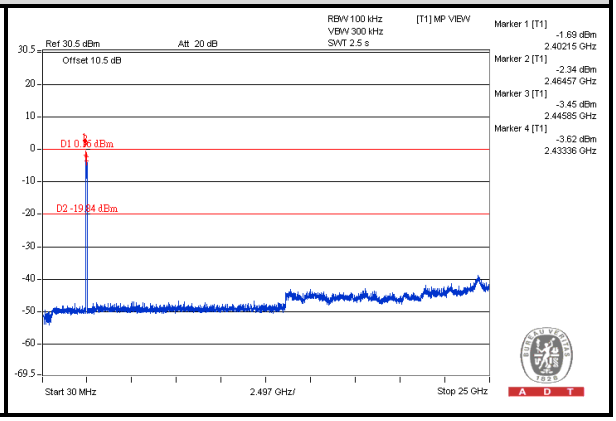
Hopping enabled_ Low Channel





Hopping enabled_ High Channel





5 PHOTOGRAPHS OF THE TEST CONFIGURATION

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

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.

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

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Web Site: www.bureauveritas-adt.com

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

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

No modifications were made to the EUT by the lab during the test.

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