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FCC TEST REPORT (BLUETOOTH/DTS)

REPORT NO.: RF140313E05C-2

MODEL NO.: QCNFA34AC

FCC ID: PPD-QCNFA34AC

RECEIVED: Aug. 07, 2014

TESTED: Aug. 18 to 27, 2014

ISSUED: Sep. 12, 2014

APPLICANT: Qualcomm Atheros, Inc.

ADDRESS: 1700 Technology Drive, San Jose, CA 95110

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, R.O.C.

TEST LOCATION (2): No. 49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan, R.O.C.

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TABLE OF CONTENTS

RELEASE CONTROL RECORD	4
1 CERTIFICATION	5
2 SUMMARY OF TEST RESULTS	6
2.1 MEASUREMENT UNCERTAINTY	7
3 GENERAL INFORMATION	8
3.1 GENERAL DESCRIPTION OF EUT (BLUETOOTH/DTS)	8
3.2 DESCRIPTION OF ANTENNA	10
3.3 DESCRIPTION OF TEST MODES	11
3.4 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL:	12
3.5 DUTY CYCLE OF TEST SIGNAL	16
3.6 GENERAL DESCRIPTION OF APPLIED STANDARDS	17
3.7 DESCRIPTION OF SUPPORT UNITS	18
3.8 CONFIGURATION OF SYSTEM UNDER TEST	18
4 TEST PROCEDURES AND RESULTS (BT-EDR)	19
4.1 MAXIMUM PEAK OUTPUT POWER	19
4.1.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT	19
4.1.2 INSTRUMENTS	19
4.1.3 TEST PROCEDURES	19
4.1.4 DEVIATION FROM TEST STANDARD	19
4.1.5 TEST SETUP	20
4.1.6 EUT OPERATING CONDITION	20
4.1.7 TEST RESULTS	21
4.2 RADIATED EMISSION AND BANDEdge MEASUREMENT	23
4.2.1 LIMITS OF RADIATED EMISSION AND BANDEdge MEASUREMENT	23
4.2.2 TEST INSTRUMENTS	24
4.2.3 TEST PROCEDURES	26
4.2.4 DEVIATION FROM TEST STANDARD	26
4.2.5 TEST SETUP	27
4.2.6 EUT OPERATING CONDITIONS	28
4.2.7 TEST RESULTS	29
5 TEST TYPES AND RESULTS (BT-LE)	36
5.1 CONDUCTED OUTPUT POWER MEASUREMENT	36
5.1.1 LIMITS OF MAXIMUM OUTPUT POWER MEASUREMENT	36
5.1.2 INSTRUMENTS	36
5.1.3 TEST PROCEDURES	36
5.1.4 DEVIATION FROM TEST STANDARD	36
5.1.5 TEST SETUP	37
5.1.6 EUT OPERATING CONDITIONS	37
5.1.7 TEST RESULTS	38
5.2 UNWANTED EMISSION MEASUREMENT (RADIATED VERSUS CONDUCTED)	39
5.2.1 LIMITS OF UNWANTED EMISSION MEASUREMENT	39
5.2.2 TEST INSTRUMENTS	40
5.2.3 TEST PROCEDURES	42



A D T

5.2.4	DEVIATION FROM TEST STANDARD	42
5.2.5	TEST SETUP	43
5.2.6	EUT OPERATING CONDITIONS.....	44
5.2.7	TEST RESULTS	45
6	PHOTOGRAPHS OF THE TEST CONFIGURATION.....	50
7	INFORMATION ON THE TESTING LABORATORIES	51
8	APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB.....	52



A D T

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF140313E05C-2	Original release	Sep. 12, 2014



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1 CERTIFICATION

PRODUCT : 802.11 a/b/g/n/ac+ BT 4.1 M.2 Type Card
BRAND NAME : Qualcomm Atheros
MODEL NO. : QCNFA34AC
TEST SAMPLE : R&D SAMPLE
APPLICANT : Qualcomm Atheros, Inc.
TESTED DATE : Aug. 18 to 27, 2014
STANDARDS : FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10-2009

The above equipment (Model: QCNFA34AC) 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 : L. Chung, DATE: Sep. 12, 2014
(Lori Chung, Specialist)

APPROVED BY : M. Chen, DATE: Sep. 12, 2014
(May Chen, Manager)



2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

For BT-EDR mode:

APPLIED STANDARD: FCC Part 15, Subpart C			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
15.247(b)	Maximum Peak Output Power	PASS	Meet the requirement of limit.
15.247(d)	Radiated Emissions & Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -5.5dB at 906.64MHz.
15.203	Antenna Requirement	PASS	Antenna connector is IPEX not a standard connector.

NOTE: Frequency Hopping System operating in 2400-2483.5MHz 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.

For BT-LE mode:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.247)			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
15.247(d)	Radiated Emissions & Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -5.5dB at 906.62MHz
15.209			
15.247(b)	Conducted Output power	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	Antenna connector is IPEX not a standard connector.

NOTE: This report is prepared for FCC class II permissive change. Only radiated emission and Transmit Power were presented in this test report.



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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:

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

Measurement	Value
Radiated emissions (30MHz-1GHz)	5.37 dB
Radiated emissions (1GHz -6GHz)	3.72 dB
Radiated emissions (6GHz -18GHz)	4.00 dB
Radiated emissions (18GHz -40GHz)	4.11 dB



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3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT (BLUETOOTH/DTS)

PRODUCT	802.11 a/b/g/n/ac+ BT 4.1 M.2 Type Card
MODEL NO.	QCNFA34AC
POWER SUPPLY	DC 3.3V from host equipment
MODULATION TYPE	GFSK, π/4-DQPSK, 8DPSK for FHSS 16QAM, QPSK, BPSK for OFDM GFSK for DTS
MODULATION TECHNOLOGY	FHSS, OFDM, DTS
DATE RATE	Up to 3Mbps for BT-EDR mode Up to 24Mbps for BT-HS mode Up to 1Mbps for BT-LE mode
FREQUENCY RANGE	BT-EDR, BT-LE mode: 2402MHz ~ 2480MHz BT-HS mode: 2412MHz ~ 2462MHz
NUMBER OF CHANNEL	BT-EDR mode: 79 BT-HS mode: 11 BT-LE mode: 40
MAX. OUTPUT POWER	BT-EDR mode: 14.388 mW BT-LE mode: 2.018 mW
ANTENNA TYPE	See item 3.2
ANTENNA CONNECTOR	See item 3.2
DATA CABLE	NA
I/O PORTS	NA
ASSOCIATED DEVICES	NA



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NOTE:

1. This report is prepared for FCC class II permissive change. The difference compared with the Report No.: RF140313E05-2 design is as the following:
 - ◆ Change Diplexer (this component will impact all the WLAN/BT Tx patch).
2. According to above conditions, only radiated emission / conducted output power need to be performed. And all data was verified to meet the requirements.
3. There are Bluetooth technology and WLAN technology used for the EUT.
4. The Bluetooth supports version 4.1.
5. The EUT is a combo module, therefore the WLAN OFDM will be cover BT OFDM (low power) scenario.
6. The modular has two variant designs as following table:

Variant No.	Description
SKU #1	NFA344: This SKU supports 2T2R MIMO.
SKU #2	NFA345: This SKU supports 1T2R.

7. WLAN/BT coexistence mode:

◆ **NFA344:**

2TX 5GHz WLAN (Main + Aux) + BT (Main) concurrent.
2TX 2.4GHz WLAN+ BT timely shared at Main antenna.

◆ **NFA345:**

1TX 2.4GHz WLAN+ BT timely shared at Main antenna.
1TX 5GHz WLAN+ BT concurrent

8. The emission of the simultaneous operation (WiFi <5GHz> & Bluetooth) have been evaluated and no non-compliance found. The detail combinations of transmitters / frequencies / modes as below table

Mode	Available Channel	Tested Channel	Modulation Technology
5 GHz (802.11ac(VHT20))	149 to 165	157	OFDM
+ Bluetooth (GFSK)	0 to 78	78	FHSS

9. 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.



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3.2 DESCRIPTION OF ANTENNA

The antenna provided to the EUT, please refer to the following table:

Brand	Model	Antenna Type	2.4G Gain with cable loss (dBi)	5G Gain with cable loss (dBi)	2.4G Cable Loss (dBi)	5G Cable Loss (dBi)	Connector Type	Cable Length (mm)
WNC	81.EBJ15.005	PIFA	3.62	Band 1&2: 3.08 Band 3: 4.76 Band 4: 4.76	1.15	Band1&2: 1.70 Band 3: 1.74 Band 4: 1.79	IPEX	300

Note: 1. Above antenna gains of antenna are Total (H+V).
2. All of antenna can be application for WLAN and Bluetooth.



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3.3 DESCRIPTION OF TEST MODES

79 channels are provided for BT-EDR mode

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		

40 channels are provided for BT-LE mode:

CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480



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3.4 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL:

For BT-EDR mode:

EUT CONFIGURE MODE	APPLICABLE TO			DESCRIPTION
	RE < 1G	RE ≥ 1G	APCM	
1	√	√	√	SKU #1(NFA344)

Where **RE < 1G**: Radiated Emission below 1GHz **RE ≥ 1G**: Radiated Emission above 1GHz

APCM: Antenna Port Conducted Measurement

Note 1. In original, the EUT's antenna had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.

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	3DH5



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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	3DH5

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE<1G	23deg. C, 69%RH	120Vac, 60Hz	Gary Cheng
RE≥1G	25deg. C, 70%RH	120Vac, 60Hz	Tim Ho
APCM	25deg. C, 60%RH	120Vac, 60Hz	James Chan



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For BT-LE mode:

EUT CONFIGURE MODE	APPLICABLE TO			DESCRIPTION
	UE < 1G	UE ≥ 1G	APCM	
1	√	√	√	SKU #1(NFA344)

Where **RE < 1G**: Radiated Emission below 1GHz **RE ≥ 1G**: Radiated Emission above 1GHz**APCM**: Antenna Port Conducted MeasurementNote 1. The EUT's antenna had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.**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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
BT-LE	0 to 39	39	GFSK	1

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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
BT-LE	0 to 39	0, 19, 39	GFSK	1

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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
BT-LE	0 to 39	0, 19, 39	GFSK	1



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TEST CONDITION:

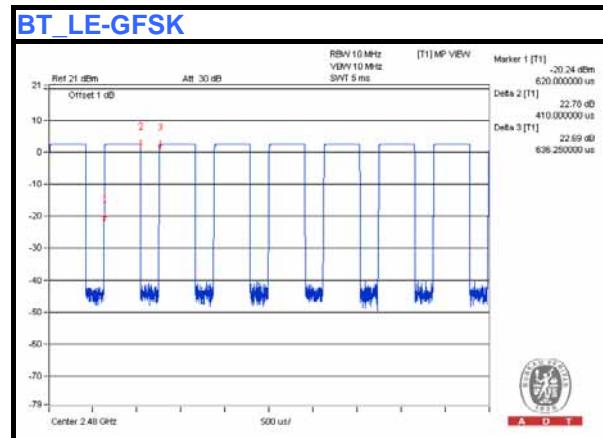
APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE<1G	23deg. C, 69%RH	120Vac, 60Hz	Gary Cheng
RE≥1G	25deg. C, 70%RH	120Vac, 60Hz	Tim Ho
APCM	25deg. C, 60%RH	120Vac, 60Hz	James Chan

3.5 DUTY CYCLE OF TEST SIGNAL

For BT_LE-GFSK

Duty cycle of test signal is < 98%.

Duty cycle = 0.41 ms/0.63625 ms = 0.644





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3.6 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)

558074 D01 DTS Meas Guidance v03r02

ANSI C63.10-2009

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



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3.7 DESCRIPTION OF SUPPORT UNITS

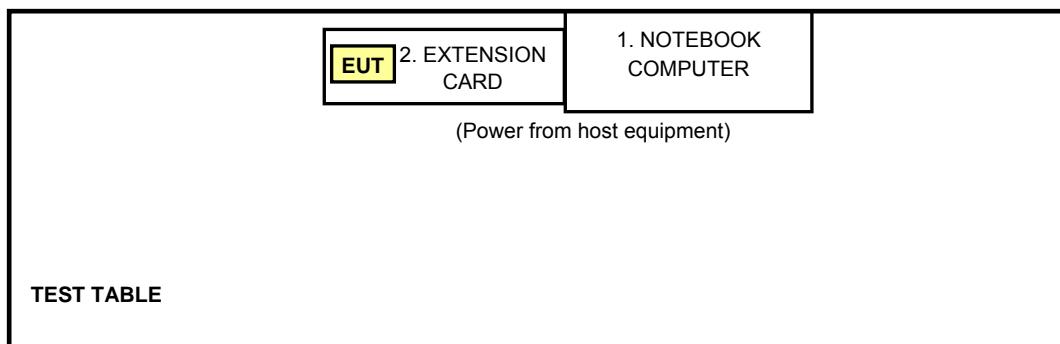
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Product	Brand	Model No.	Serial No.	FCC ID
1	NOTEBOOK COMPUTER	DELL	E6420	H62T3R1	FCC DoC
2	EXTENSION CARD	Qualcomm Atheros	HPCBM194-0	NA	NA

No.	Signal cable description
1	NA
2	NA

Note: The power cords of the above support units were unshielded (1.8m).

3.8 CONFIGURATION OF SYSTEM UNDER TEST





4 TEST PROCEDURES AND RESULTS (BT-EDR)

4.1 MAXIMUM PEAK OUTPUT POWER

4.1.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The Maximum Peak Output Power Limit is 125mW.

4.1.2 INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
SPECTRUM ANALYZER R&S	FSV 40	100964	July 05, 2014	July 04, 2015

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 : Aug. 25, 2014

4.1.3 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.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 TEST SETUP



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

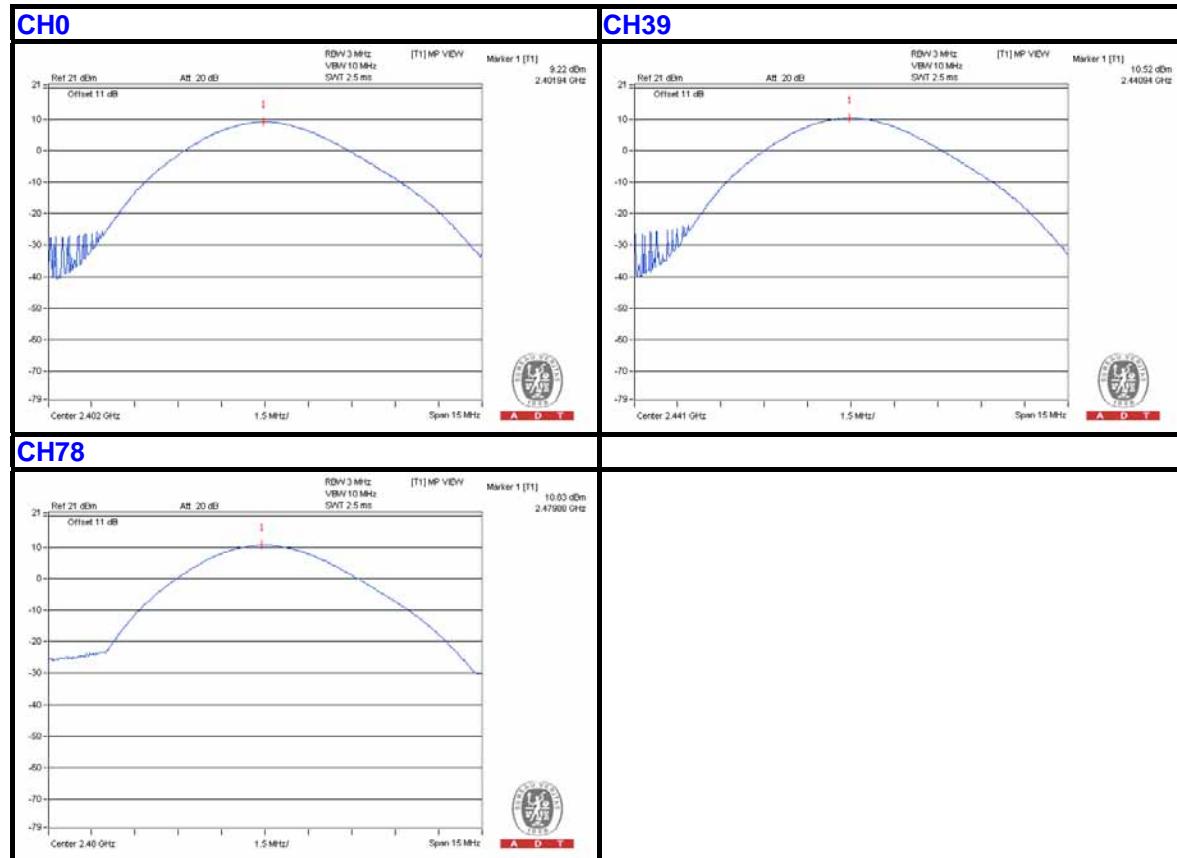
4.1.6 EUT OPERATING CONDITION

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

4.1.7 TEST RESULTS

CHANNEL	FREQUENCY (MHz)	OUTPUT POWER (mW)		OUTPUT POWER (dBm)		POWER LIMIT (mW)	PASS / FAIL
		GFSK	8DPSK	GFSK	8DPSK		
0	2402	8.356	12.274	9.22	10.89	125	PASS
39	2441	11.272	13.274	10.52	11.23	125	PASS
78	2480	12.106	14.388	10.83	11.58	125	PASS

For GFSK

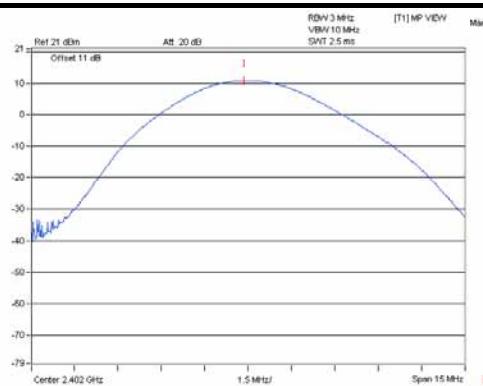




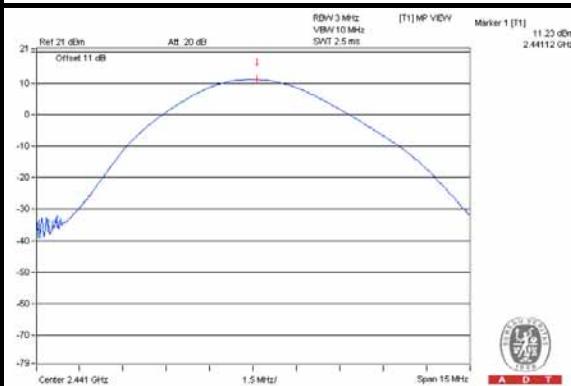
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For 8DPSK

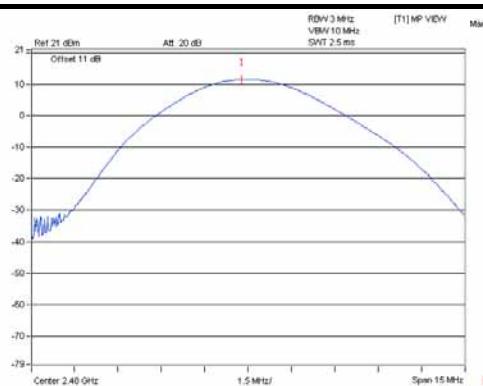
CH0



CH39



CH78



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4.2 RADIATED EMISSION AND BANDEDGE MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION AND BANDEDGE 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 (dB_{uV}/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.



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4.2.2 TEST INSTRUMENTS

For Below 1GHz test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
MXE EMI Receiver Agilent	N9038A	MY51210105	July 21, 2014	July 20, 2015
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-03	Nov. 13, 2013	Nov. 12, 2014
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-360	Feb. 26, 2014	Feb. 25, 2015
RF Cable	NA	CHGCAB_001	Oct. 05, 2013	Oct. 04, 2014
Spectrum Analyzer R&S	FSV40	100964	July 05, 2014	July 04, 2015
Horn_Antenna AISI	AIH.8018	0000320091110	Nov. 18, 2013	Nov. 17, 2014
Pre-Amplifier Agilent	8449B	3008A02578	June 24, 2014	June 23, 2015
RF Cable	NA	RF104-201 RF104-203 RF104-204	Dec. 12, 2013	Dec. 11, 2014
Spectrum Analyzer Agilent	E4446A	MY48250253	Aug. 28, 2013	Aug. 27, 2014
Pre-Amplifier SPACEK LABS	SLKKa-48-6	9K16	Nov. 13, 2013	Nov. 12, 2014
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Oct. 08, 2013	Oct. 07, 2014
Software	ADT_Radiated _V8.7.07	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 966 Chamber No. G.
4. The FCC Site Registration No. is 966073.
5. The VCCI Site Registration No. is G-137.
6. The CANADA Site Registration No. is IC 7450H-2.
7. Tested Date: Aug. 19, 2014

**For Above 1GHz test:**

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
MXE EMI Receiver Agilent	N9038A	MY50010156	Aug. 11, 2014	Aug. 10, 2015
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-04	Nov. 13, 2013	Nov. 12, 2014
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Feb. 27, 2014	Feb. 26, 2015
RF Cable	NA	CHHCAB_001	Oct. 06, 2013	Oct. 05, 2014
Spectrum Analyzer R&S	FSV40	100964	July 05, 2014	July 04, 2015
Horn_Antenna AISI	AIH.8018	0000220091110	Dec. 06, 2013	Dec. 05, 2014
Pre-Amplifier Agilent	8449B	3008A01923	Oct. 29, 2013	Oct. 28, 2014
RF Cable	NA	RF104-205 RF104-207 RF104-202	Dec. 12, 2013	Dec. 11, 2014
Spectrum Analyzer Agilent	E4446A	MY48250253	Aug. 28, 2013	Aug. 27, 2014
Pre-Amplifier SPACEK LABS	SLKKa-48-6	9K16	Nov. 13, 2013	Nov. 12, 2014
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Oct. 08, 2013	Oct. 07, 2014
Software	ADT_Radiated_V8.7.07	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 966 Chamber No. H.
4. The FCC Site Registration No. is 797305.
5. The CANADA Site Registration No. is IC 7450H-3.
6. Tested Date: Aug. 18, 2014



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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 3 meters chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. 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:

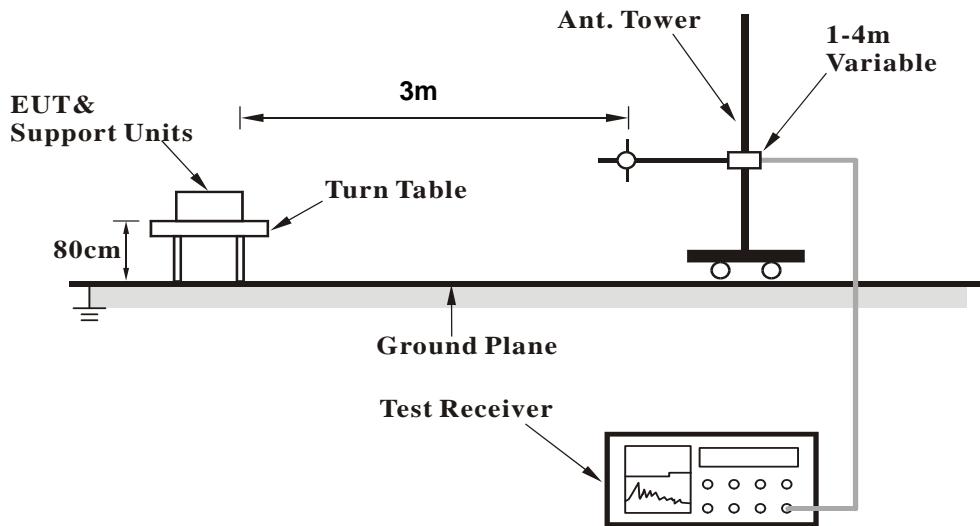
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 1MHz for Peak detection at frequency above 1GHz.
3. All modes of operation were investigated and the worst-case emissions are reported.

4.2.4 DEVIATION FROM TEST STANDARD

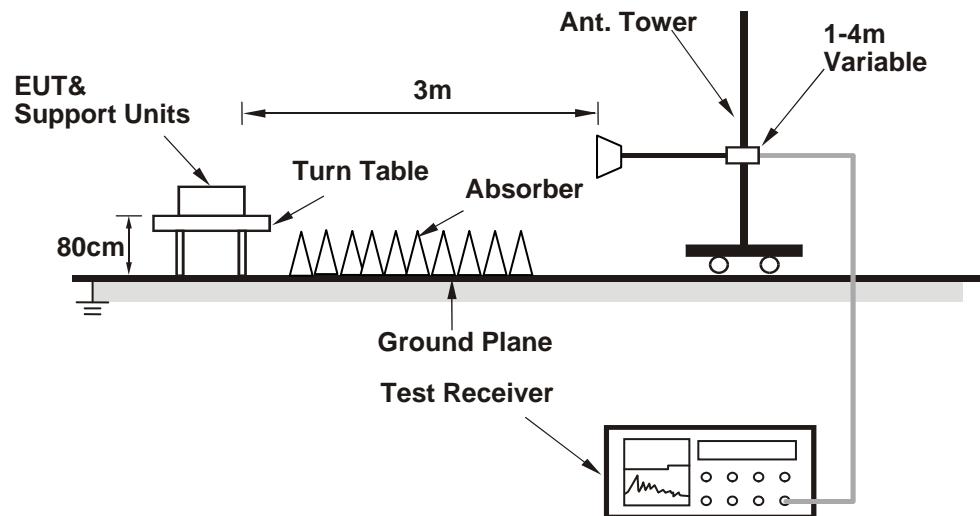
No deviation

4.2.5 TEST SETUP

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



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



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4.2.6 EUT OPERATING CONDITIONS

1. Connect the EUT with the support unit 1 (Notebook Computer) which is placed on a testing table.
2. The communication partner run test program “QCRT Version3.0.29.0” to enable EUT under transmission/receiving condition continuously at specific channel frequency.



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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	54.12	25.5 QP	40.0	-14.5	2.00 H	93	39.07	-13.55
2	166.06	35.2 QP	43.5	-8.3	2.00 H	118	48.71	-13.49
3	233.20	38.3 QP	46.0	-7.7	1.00 H	11	53.76	-15.46
4	428.38	33.6 QP	46.0	-12.5	2.00 H	66	42.30	-8.75
5	666.45	31.7 QP	46.0	-14.3	1.00 H	42	35.69	-3.99
6	770.72	33.6 QP	46.0	-12.4	2.00 H	107	35.25	-1.63

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	49.50	22.9 QP	40.0	-17.1	1.00 V	32	36.44	-13.52
2	166.58	24.4 QP	43.5	-19.1	2.00 V	202	37.92	-13.52
3	311.74	26.4 QP	46.0	-19.6	1.50 V	181	38.40	-11.98
4	428.32	26.7 QP	46.0	-19.3	2.00 V	133	35.46	-8.75
5	663.85	32.2 QP	46.0	-13.8	1.50 V	130	36.25	-4.03
6	906.64	40.5 QP	46.0	-5.5	1.50 V	116	40.31	0.23

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value



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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	46.1 PK	74.0	-27.9	1.58 H	227	51.70	-5.60
2	2390.00	16.0 AV	54.0	-38.0	1.58 H	227	21.60	-5.60
3	*2402.00	97.8 PK			1.58 H	227	103.39	-5.59
4	*2402.00	67.7 AV			1.58 H	227	73.29	-5.59
5	4804.00	48.3 PK	74.0	-25.7	1.04 H	156	44.41	3.89
6	4804.00	18.2 AV	54.0	-35.8	1.04 H	156	14.31	3.89
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	46.3 PK	74.0	-27.7	1.08 V	278	51.90	-5.60
2	2390.00	16.2 AV	54.0	-37.8	1.08 V	278	21.80	-5.60
3	*2402.00	104.7 PK			1.08 V	278	110.29	-5.59
4	*2402.00	74.6 AV			1.08 V	278	80.19	-5.59
5	4804.00	49.1 PK	74.0	-24.9	1.14 V	178	45.21	3.89
6	4804.00	19.0 AV	54.0	-35.0	1.14 V	178	15.11	3.89

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) – Pre-Amplifier 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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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	97.8 PK			1.61 H	231	103.20	-5.40
2	*2441.00	67.7 AV			1.61 H	231	73.10	-5.40
3	4882.00	48.5 PK	74.0	-25.5	1.03 H	166	44.70	3.80
4	4882.00	18.4 AV	54.0	-35.6	1.03 H	166	14.60	3.80
5	7323.00	53.4 PK	74.0	-20.6	1.02 H	327	45.12	8.28
6	7323.00	23.3 AV	54.0	-30.7	1.02 H	327	15.02	8.28
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	104.8 PK			1.12 V	274	110.20	-5.40
2	*2441.00	74.7 AV			1.12 V	274	80.10	-5.40
3	4882.00	48.7 PK	74.0	-25.3	1.09 V	180	44.90	3.80
4	4882.00	18.6 AV	54.0	-35.4	1.09 V	180	14.80	3.80
5	7323.00	51.9 PK	74.0	-22.1	1.01 V	160	43.62	8.28
6	7323.00	21.8 AV	54.0	-32.2	1.01 V	160	13.52	8.28

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) – Pre-Amplifier 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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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	97.8 PK			1.15 H	66	103.03	-5.23
2	*2480.00	67.7 AV			1.15 H	66	72.93	-5.23
3	2483.50	49.9 PK	74.0	-24.1	1.15 H	66	55.10	-5.20
4	2483.50	19.8 AV	54.0	-34.2	1.15 H	66	25.00	-5.20
5	4960.00	48.1 PK	74.0	-25.9	1.00 H	161	44.27	3.83
6	4960.00	18.0 AV	54.0	-36.0	1.00 H	161	14.17	3.83
7	7440.00	53.4 PK	74.0	-20.6	1.00 H	319	44.72	8.68
8	7440.00	23.3 AV	54.0	-30.7	1.00 H	319	14.62	8.68
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	104.2 PK			1.06 V	306	109.43	-5.23
2	*2480.00	74.1 AV			1.06 V	306	79.33	-5.23
3	2483.50	52.3 PK	74.0	-21.7	1.06 V	306	57.50	-5.20
4	2483.50	22.2 AV	54.0	-31.8	1.06 V	306	27.40	-5.20
5	4960.00	49.2 PK	74.0	-24.8	1.10 V	193	45.37	3.83
6	4960.00	19.1 AV	54.0	-34.9	1.10 V	193	15.27	3.83
7	7440.00	52.3 PK	74.0	-21.7	1.00 V	171	43.62	8.68
8	7440.00	22.2 AV	54.0	-31.8	1.00 V	171	13.52	8.68

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) – Pre-Amplifier 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: $20\log(3.125 / 100) = -30.1 \text{ dB}$
7. Average value = peak reading + $20\log(\text{duty cycle})$.



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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	46.6 PK	74.0	-27.4	1.19 H	76	52.20	-5.60
2	2390.00	16.5 AV	54.0	-37.5	1.19 H	76	22.10	-5.60
3	*2402.00	98.2 PK			1.19 H	76	103.79	-5.59
4	*2402.00	68.1 AV			1.19 H	76	73.69	-5.59
5	4804.00	47.8 PK	74.0	-26.2	1.01 H	159	43.91	3.89
6	4804.00	17.7 AV	54.0	-36.3	1.01 H	159	13.81	3.89
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	47.1 PK	74.0	-26.9	1.09 V	316	52.70	-5.60
2	2390.00	17.0 AV	54.0	-37.0	1.09 V	316	22.60	-5.60
3	*2402.00	104.6 PK			1.09 V	316	110.19	-5.59
4	*2402.00	74.5 AV			1.09 V	316	80.09	-5.59
5	4804.00	48.9 PK	74.0	-25.1	1.05 V	198	45.01	3.89
6	4804.00	18.8 AV	54.0	-35.2	1.05 V	198	14.91	3.89

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) – Pre-Amplifier 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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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	97.2 PK			1.18 H	72	102.60	-5.40
2	*2441.00	67.1 AV			1.18 H	72	72.50	-5.40
3	4882.00	48.5 PK	74.0	-25.5	1.05 H	156	44.70	3.80
4	4882.00	18.4 AV	54.0	-35.6	1.05 H	156	14.60	3.80
5	7323.00	53.0 PK	74.0	-21.0	1.00 H	314	44.72	8.28
6	7323.00	22.9 AV	54.0	-31.1	1.00 H	314	14.62	8.28
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	104.5 PK			1.04 V	294	109.90	-5.40
2	*2441.00	74.4 AV			1.04 V	294	79.80	-5.40
3	4882.00	49.1 PK	74.0	-24.9	1.09 V	183	45.30	3.80
4	4882.00	19.0 AV	54.0	-35.0	1.09 V	183	15.20	3.80
5	7323.00	52.2 PK	74.0	-21.8	1.07 V	187	43.92	8.28
6	7323.00	22.1 AV	54.0	-31.9	1.07 V	187	13.82	8.28

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) – Pre-Amplifier 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 + 20log(duty cycle).



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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	97.6 PK			1.14 H	66	102.83	-5.23
2	*2480.00	67.5 AV			1.14 H	66	72.73	-5.23
3	2483.50	49.1 PK	74.0	-24.9	1.14 H	66	54.30	-5.20
4	2483.50	19.0 AV	54.0	-35.0	1.14 H	66	24.20	-5.20
5	4960.00	48.4 PK	74.0	-25.6	1.01 H	164	44.57	3.83
6	4960.00	18.3 AV	54.0	-35.7	1.01 H	164	14.47	3.83
7	7440.00	53.0 PK	74.0	-21.0	1.05 H	319	44.32	8.68
8	7440.00	22.9 AV	54.0	-31.1	1.05 H	319	14.22	8.68
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	104.9 PK			1.05 V	304	110.13	-5.23
2	*2480.00	74.8 AV			1.05 V	304	80.03	-5.23
3	2483.50	55.9 PK	74.0	-18.1	1.05 V	304	61.10	-5.20
4	2483.50	25.8 AV	54.0	-28.2	1.05 V	304	31.00	-5.20
5	4960.00	49.1 PK	74.0	-24.9	1.09 V	180	45.27	3.83
6	4960.00	19.0 AV	54.0	-35.0	1.09 V	180	15.17	3.83
7	7440.00	51.9 PK	74.0	-22.1	1.00 V	163	43.22	8.68
8	7440.00	21.8 AV	54.0	-32.2	1.00 V	163	13.12	8.68

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) – Pre-Amplifier 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: $20\log(3.125 / 100) = -30.1 \text{ dB}$
7. Average value = peak reading + $20\log(\text{duty cycle})$.



5 TEST TYPES AND RESULTS (BT-LE)

5.1 CONDUCTED OUTPUT POWER MEASUREMENT

5.1.1 LIMITS OF MAXIMUM OUTPUT POWER MEASUREMENT

For systems using digital modulation in the 2400–2483.5 MHz band: 1 Watt (30dBm)

5.1.2 INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Power Meter Anritsu	ML2495A	1014008	Apr. 30, 2014	Apr. 29, 2015
Power Sensor Anritsu	MA2411B	0917122	Apr. 30, 2014	Apr. 29, 2015

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 :Aug. 27, 2014

5.1.3 TEST PROCEDURES

The peak / average power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak / average power sensor. Record the peak power level.

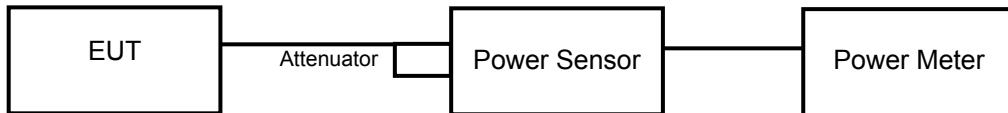
5.1.4 DEVIATION FROM TEST STANDARD

No deviation



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5.1.5 TEST SETUP



5.1.6 EUT OPERATING CONDITIONS

The software (QCRT Version:3.0.29.0) provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.



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5.1.7 TEST RESULTS

FOR PEAK POWER

BT_LE-GFSK

CHANNEL	FREQUENCY (MHz)	PEAK POWER (mW)	PEAK POWER (dBm)	LIMIT (dBm)	PASS/FAIL
0	2402	1.663	2.21	30	PASS
19	2440	1.901	2.79	30	PASS
39	2480	2.018	3.05	30	PASS

FOR AVERAGE POWER

BT_LE-GFSK

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (mW)	AVERAGE POWER (dBm)
0	2402	1.390	1.43
19	2440	1.626	2.11
39	2480	1.750	2.43



5.2 UNWANTED EMISSION MEASUREMENT (RADIATED VERSUS CONDUCTED)

5.2.1 LIMITS OF UNWANTED 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 (dB_uV/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.



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5.2.2 TEST INSTRUMENTS

For Below 1GHz test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
MXE EMI Receiver Agilent	N9038A	MY51210105	July 21, 2014	July 20, 2015
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-03	Nov. 13, 2013	Nov. 12, 2014
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-360	Feb. 26, 2014	Feb. 25, 2015
RF Cable	NA	CHGCAB_001	Oct. 05, 2013	Oct. 04, 2014
Spectrum Analyzer R&S	FSV40	100964	July 05, 2014	July 04, 2015
Horn_Antenna AISI	AIH.8018	0000320091110	Nov. 18, 2013	Nov. 17, 2014
Pre-Amplifier Agilent	8449B	3008A02578	June 24, 2014	June 23, 2015
RF Cable	NA	RF104-201 RF104-203 RF104-204	Dec. 12, 2013	Dec. 11, 2014
Spectrum Analyzer Agilent	E4446A	MY48250253	Aug. 28, 2013	Aug. 27, 2014
Pre-Amplifier SPACEK LABS	SLKKa-48-6	9K16	Nov. 13, 2013	Nov. 12, 2014
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Oct. 08, 2013	Oct. 07, 2014
Software	ADT_Radiated_V8.7.07	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 966 Chamber No. G.
4. The FCC Site Registration No. is 966073.
5. The VCCI Site Registration No. is G-137.
6. The CANADA Site Registration No. is IC 7450H-2.
7. Tested Date: Aug. 19, 2014

**For Above 1GHz test:**

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
MXE EMI Receiver Agilent	N9038A	MY50010156	Aug. 11, 2014	Aug. 10, 2015
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-04	Nov. 13, 2013	Nov. 12, 2014
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Feb. 27, 2014	Feb. 26, 2015
RF Cable	NA	CHHCAB_001	Oct. 06, 2013	Oct. 05, 2014
Spectrum Analyzer R&S	FSV40	100964	July 05, 2014	July 04, 2015
Horn_Antenna AISI	AIH.8018	0000220091110	Dec. 06, 2013	Dec. 05, 2014
Pre-Amplifier Agilent	8449B	3008A01923	Oct. 29, 2013	Oct. 28, 2014
RF Cable	NA	RF104-205 RF104-207 RF104-202	Dec. 12, 2013	Dec. 11, 2014
Spectrum Analyzer Agilent	E4446A	MY48250253	Aug. 28, 2013	Aug. 27, 2014
Pre-Amplifier SPACEK LABS	SLKKa-48-6	9K16	Nov. 13, 2013	Nov. 12, 2014
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Oct. 08, 2013	Oct. 07, 2014
Software	ADT_Radiated_V8.7.07	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 966 Chamber No. H.
4. The FCC Site Registration No. is 797305.
5. The CANADA Site Registration No. is IC 7450H-3.
6. Tested Date: Aug. 18, 2014



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5.2.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. 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:

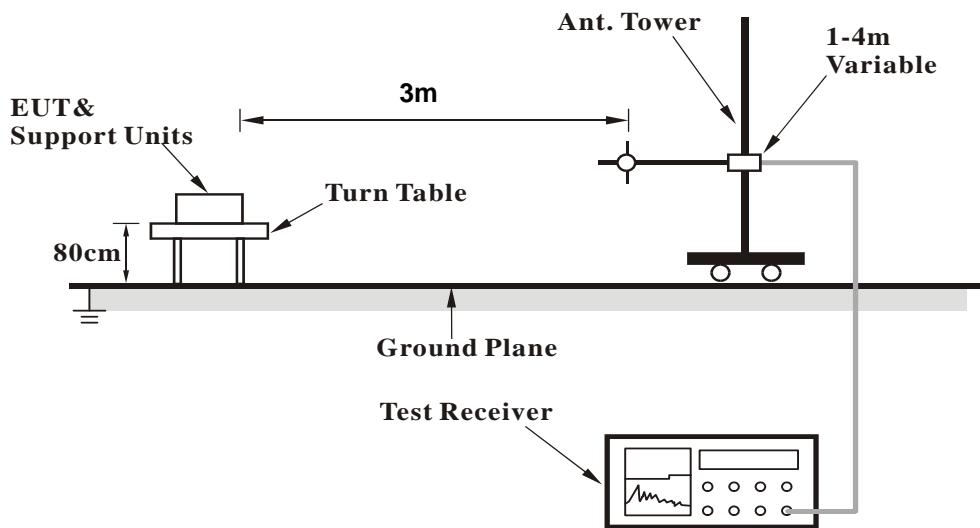
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 1MHz for Peak detection at frequency above 1GHz.
3. All modes of operation were investigated and the worst-case emissions are reported.

5.2.4 DEVIATION FROM TEST STANDARD

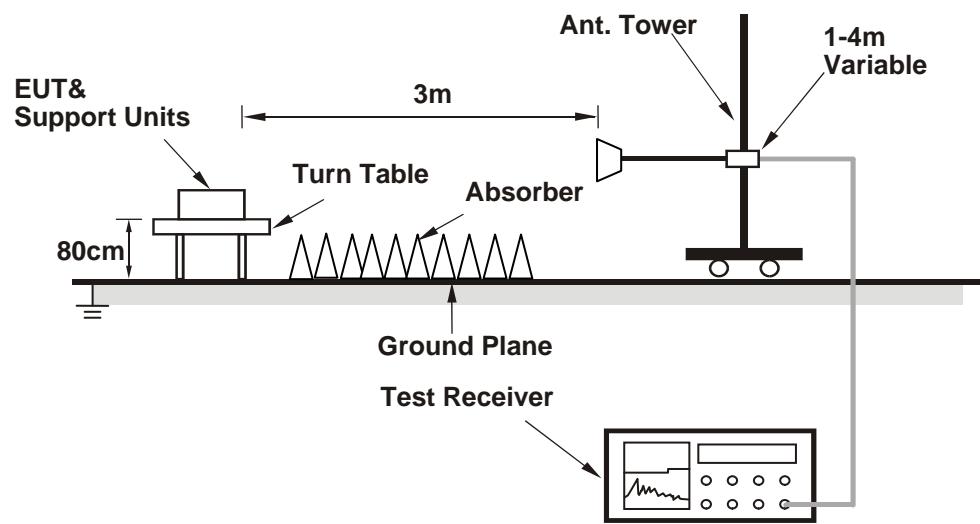
No deviation

5.2.5 TEST SETUP

For radiated configuration:
<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



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



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5.2.6 EUT OPERATING CONDITIONS

1. Connect the EUT with the support unit 1 (Notebook Computer) which is placed on a testing table.
2. The communication partner run test program “QCRT Version:3.0.29.0” to enable EUT under transmission/receiving condition continuously at specific channel frequency.



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5.2.7 TEST RESULTS

Radiated versus Conducted Measurement	
<input type="checkbox"/> Conducted measurement	<input checked="" type="checkbox"/> Radiated measurement
<u>For Radiated measurement:</u>	
The level of unwanted emissions was measured when radiated by the cabinet or structure of the equipment with the antenna connector(s) terminated by a specified load (cabinet radiation)	
<u>For Conducted measurement:</u>	
The level of unwanted emissions was measured as their power in a specified load (conducted spurious emissions).	



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BELOW 1GHZ WORST-CASE DATA**BT_LE-GFSK**

CHANNEL	TX Channel 0	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	54.10	25.6 QP	40.0	-14.4	2.00 H	93	39.17	-13.55
2	166.06	35.0 QP	43.5	-8.5	2.00 H	118	48.51	-13.49
3	233.21	38.3 QP	46.0	-7.7	1.00 H	11	53.78	-15.46
4	428.38	33.7 QP	46.0	-12.3	2.00 H	66	42.41	-8.75
5	666.48	31.9 QP	46.0	-14.2	1.00 H	42	35.84	-3.99
6	770.72	33.6 QP	46.0	-12.4	2.00 H	107	35.25	-1.63
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	49.56	22.9 QP	40.0	-17.1	1.00 V	32	36.43	-13.53
2	166.58	24.4 QP	43.5	-19.1	2.00 V	202	37.92	-13.52
3	311.75	26.5 QP	46.0	-19.5	1.50 V	181	38.45	-11.98
4	428.32	26.7 QP	46.0	-19.3	2.00 V	133	35.46	-8.75
5	663.85	32.3 QP	46.0	-13.7	1.50 V	130	36.35	-4.03
6	906.62	40.5 QP	46.0	-5.5	1.50 V	116	40.23	0.23

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value



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Radiated test was done with antenna**ABOVE 1GHz DATA****BT_LE-GFSK**

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

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	46.8 PK	74.0	-27.2	1.05 H	315	52.40	-5.60
2	2390.00	32.3 AV	54.0	-21.7	1.05 H	315	37.90	-5.60
3	*2402.00	91.0 PK			1.05 H	315	96.59	-5.59
4	*2402.00	80.5 AV			1.05 H	315	86.09	-5.59
5	4804.00	48.7 PK	74.0	-25.3	1.00 H	234	44.81	3.89
6	4804.00	35.6 AV	54.0	-18.4	1.00 H	234	31.71	3.89

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	48.6 PK	74.0	-25.4	1.06 V	269	54.20	-5.60
2	2390.00	33.1 AV	54.0	-20.9	1.06 V	269	38.70	-5.60
3	*2402.00	95.8 PK			1.06 V	269	101.39	-5.59
4	*2402.00	84.5 AV			1.06 V	269	90.09	-5.59
5	4804.00	47.6 PK	74.0	-26.4	1.55 V	197	43.71	3.89
6	4804.00	36.7 AV	54.0	-17.3	1.55 V	197	32.81	3.89

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.



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CHANNEL	TX Channel 19	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	*2440.00	90.1 PK			1.05 H	300	95.51	-5.41
2	*2440.00	79.7 AV			1.05 H	300	85.11	-5.41
3	4880.00	49.4 PK	74.0	-24.6	1.03 H	254	45.60	3.80
4	4880.00	35.9 AV	54.0	-18.1	1.03 H	254	32.10	3.80
5	7320.00	52.9 PK	74.0	-21.1	1.10 H	233	44.63	8.27
6	7320.00	40.0 AV	54.0	-14.0	1.10 H	233	31.73	8.27
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	*2440.00	95.9 PK			1.02 V	262	101.31	-5.41
2	*2440.00	84.3 AV			1.02 V	262	89.71	-5.41
3	4880.00	47.6 PK	74.0	-26.4	1.48 V	221	43.80	3.80
4	4880.00	36.5 AV	54.0	-17.5	1.48 V	221	32.70	3.80
5	7320.00	51.5 PK	74.0	-22.5	1.00 V	345	43.23	8.27
6	7320.00	38.7 AV	54.0	-15.3	1.00 V	345	30.43	8.27

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.



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

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	90.6 PK			1.04 H	315	95.83	-5.23
2	*2480.00	80.2 AV			1.04 H	315	85.43	-5.23
3	2483.50	47.2 PK	74.0	-26.8	1.04 H	315	52.40	-5.20
4	2483.50	33.0 AV	54.0	-21.0	1.04 H	315	38.20	-5.20
5	4960.00	49.3 PK	74.0	-24.7	1.03 H	241	45.47	3.83
6	4960.00	36.0 AV	54.0	-18.0	1.03 H	241	32.17	3.83
7	7440.00	53.0 PK	74.0	-21.0	1.04 H	239	44.32	8.68
8	7440.00	39.9 AV	54.0	-14.1	1.04 H	239	31.22	8.68
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	96.1 PK			1.06 V	272	101.33	-5.23
2	*2480.00	84.5 AV			1.06 V	272	89.73	-5.23
3	2483.50	49.9 PK	74.0	-24.1	1.06 V	272	55.10	-5.20
4	2483.50	34.0 AV	54.0	-20.0	1.06 V	272	39.20	-5.20
5	4960.00	47.8 PK	74.0	-26.2	1.54 V	206	43.97	3.83
6	4960.00	36.8 AV	54.0	-17.2	1.54 V	206	32.97	3.83
7	7440.00	52.0 PK	74.0	-22.0	1.02 V	343	43.32	8.68
8	7440.00	39.2 AV	54.0	-14.8	1.02 V	343	30.52	8.68

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.



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6 PHOTOGRAPHS OF THE TEST CONFIGURATION

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



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7 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:

Linko EMC/RF Lab:

Tel: 886-2-26052180
Fax: 886-2-26052943

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: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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



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8 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.

--- END ---