

FCC Test Report

Report No.: RF151007E09

FCC ID: HV4-HSTNN-W02P

Test Model: HSTNN-W02P

Received Date: Oct. 07, 2015

Test Date: Oct. 14 to 20, 2015

Issued Date: Oct. 29, 2015

Applicant: WACOM CO., LTD.

Address: 2-510-1, Toyondai, Kazo-Shi Saitama 349-1148 Japan

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.

Test Location (3): E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.



This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification. The report must 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	4
1 Certificate of Conformity	5
2 Summary of Test Results	6
2.1 Measurement Uncertainty	6
2.2 Modification Record	6
3 General Information	7
3.1 General Description of EUT	7
3.2 Description of Test Modes	8
3.2.1 Test Mode Applicability and Tested Channel Detail	9
3.3 Description of Support Units	10
3.3.1 Configuration of System under Test	10
3.4 Duty Cycle of Test Signal	11
3.5 General Description of Applied Standards	12
4 Test Types and Results	13
4.1 Radiated Emission and Bandedge Measurement	13
4.1.1 Limits of Radiated Emission and Bandedge Measurement	13
4.1.2 Test Instruments	14
4.1.3 Test Procedures	15
4.1.4 Deviation from Test Standard	15
4.1.5 Test Setup	16
4.1.6 EUT Operating Conditions	16
4.1.7 Test Results	17
4.2 6dB Bandwidth Measurement	21
4.2.1 Limits of 6dB Bandwidth Measurement	21
4.2.2 Test Setup	21
4.2.3 Test Instruments	21
4.2.4 Test Procedure	21
4.2.5 Deviation from Test Standard	21
4.2.6 EUT Operating Conditions	21
4.2.7 Test Result	22
4.3 Conducted Output Power Measurement	23
4.3.1 Limits OF Conducted Output Power Measurement	23
4.3.2 Test Setup	23
4.3.3 Test Instruments	23
4.3.4 Test Procedures	23
4.3.5 Deviation from Test Standard	23
4.3.6 EUT Operating Conditions	23
4.3.7 Test Results	24
4.4 Power Spectral Density Measurement	25
4.4.1 Limits of Power Spectral Density Measurement	25
4.4.2 Test Setup	25
4.4.3 Test Instruments	25
4.4.4 Test Procedure	25
4.4.5 Deviation from Test Standard	25
4.4.6 EUT Operating Condition	25
4.4.7 Test Results	26
4.5 Conducted Out of Band Emission Measurement	27
4.5.1 Limits of Conducted Out of Band Emission Measurement	27
4.5.2 Test Setup	27
4.5.3 Test Instruments	27
4.5.4 Test Procedure	27
4.5.5 Deviation from Test Standard	27
4.5.6 EUT Operating Condition	27



4.5.7 TEST RESULTS 28

5 Pictures of Test Arrangements 29

Appendix – Information on the Testing Laboratories 30



A D T

Release Control Record

Issue No.	Description	Date Issued
RF151007E09	Original release.	Oct. 29, 2015



A D T

1 Certificate of Conformity

Product: HP Active Pen

Brand: hp

Test Model: HSTNN-W02P

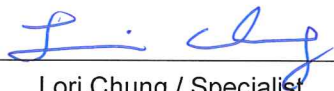
Sample Status: ENGINEERING SAMPLE

Applicant: WACOM CO., LTD.

Test Date: Oct. 14 to 20, 2015

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10: 2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : , **Date:** Oct. 29, 2015
Lori Chung / Specialist

Approved by : , **Date:** Oct. 29, 2015
May Chen / Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (SECTION 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	NA	Without AC power port of the EUT.
15.205 15.209 15.247(d)	Radiated Emissions & Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -15.9dB at 108.04MHz.
15.247(d)	Antenna Port Emission	PASS	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted power	PASS	Meet the requirement of limit.
15.247(e)	Power Spectral Density	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used.

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expended Uncertainty (k=2) ($\pm$)
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.19 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	3.43 dB
	6GHz ~ 18GHz	3.49 dB
	18GHz ~ 40GHz	4.11 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	HP Active Pen
Brand	hp
Test Model	HSTNN-W02P
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	1.5Vdc from battery for EUT 3.1Vdc from batteries for Bluetooth module
Modulation Type	GFSK
Modulation Technology	DTS
Transfer Rate	Up to 1Mbps
Operating Frequency	2402MHz ~ 2480MHz
Number of Channel	40
Output Power	1.941mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Battery x 1 (AAAA) Battery x 2 (Brand: HITACHI MAXELL, LTD / Model No.: SR527SW)
Data Cable Supplied	NA

Note:

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

Antenna Gain (dBi)	Frequency range (MHz to MHz)	Antenna Type
2.93	2400-2500	Chip

2. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

40 channels are provided to this EUT:

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	-	√	-

Where **RE≥1G**: Radiated Emission above 1GHz **RE<1G**: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **APCM**: Antenna Port Conducted Measurement

NOTE: 1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.
2. "-" means no effect.

Radiated Emission Test (Above 1GHz):

- ☒ 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 TYPE	DATA RATE (Mbps)
0 to 39	0, 19, 39	GFSK	1

Radiated Emission Test (Below 1GHz):

- ☒ 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 TYPE	DATA RATE (Mbps)
0 to 39	0	GFSK	1

Antenna Port Conducted Measurement:

- ☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- ☒ 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 TYPE	DATA RATE (Mbps)
0 to 39	0, 19, 39	GFSK	1

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	25deg. C, 65%RH	3Vdc from battery	Tim Ho
RE<1G	25deg. C, 65%RH	3Vdc from battery	Alex Ku
APCM	25deg. C, 60%RH	3Vdc from battery	Anderson Chen

3.3 Description of Support Units

The EUT has been tested as an independent unit.

3.3.1 Configuration of System under Test

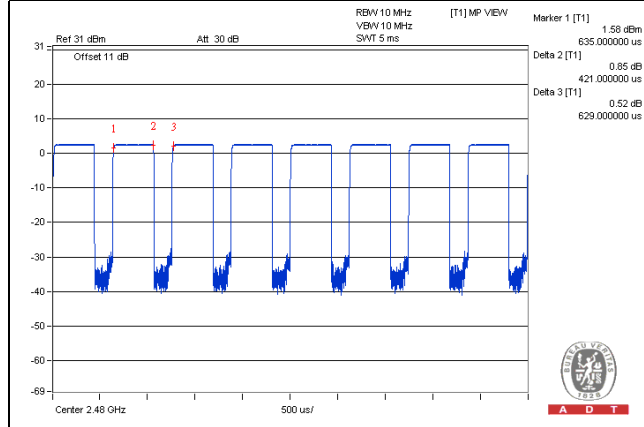


3.4 Duty Cycle of Test Signal

If duty cycle of test signal is < 98%, duty factor shall be considered.

Duty cycle = $0.421/0.629 = 0.669$, Duty factor = $10 * \log(1/0.669) = 1.7$

BT-LE



3.5 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 v03r03
ANSI C63.10-2013

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

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

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.

4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY54450088	July 24, 2015	July 23, 2016
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-06	Nov. 12, 2014	Nov. 11, 2015
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-406	Feb. 03, 2015	Feb. 02, 2016
RF Cable	8D	966-4-1 966-4-2 966-4-3	Apr. 03, 2015	Apr. 02, 2016
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Feb. 06, 2015	Feb. 05, 2016
Pre-Amplifier Agilent	8449B	3008A01922	Sep. 19, 2015	Sep. 18, 2016
RF Cable	EMC104-SM- SM-2000 EMC104-SM- SM-5000 EMC104-SM- SM-5000	150318 150323 150324	Mar. 31, 2015	Mar. 30, 2016
Spectrum Analyzer R&S	FSV40	100964	June 26, 2015	June 25, 2016
Pre-Amplifier EMCI	EMC184045	980143	Jan. 16, 2015	Jan. 15, 2016
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170608	Feb. 05, 2015	Feb. 04, 2016
RF Cable	SUCOFLEX 104	329751/4 RF104-204	Dec. 11, 2014	Dec. 10, 2015
Software	ADT_Radiated _V8.7.07	NA	NA	NA
Antenna Tower & Turn Table CT	NA	NA	NA	NA
Power Meter Anritsu	ML2495A	1014008	Apr. 28, 2015	Apr. 27, 2016
Power Sensor Anritsu	MA2411B	0917122	Apr. 28, 2015	Apr. 27, 2016
Spectrum Analyzer R&S	FSP40	100060	May 08, 2015	May 07, 2016

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 966 Chamber No. 4.
3. The FCC Site Registration No. is 292998
4. The CANADA Site Registration No. is 20331-2
5. Tested Date: Oct. 14 to 20, 2015

4.1.3 Test Procedures

- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

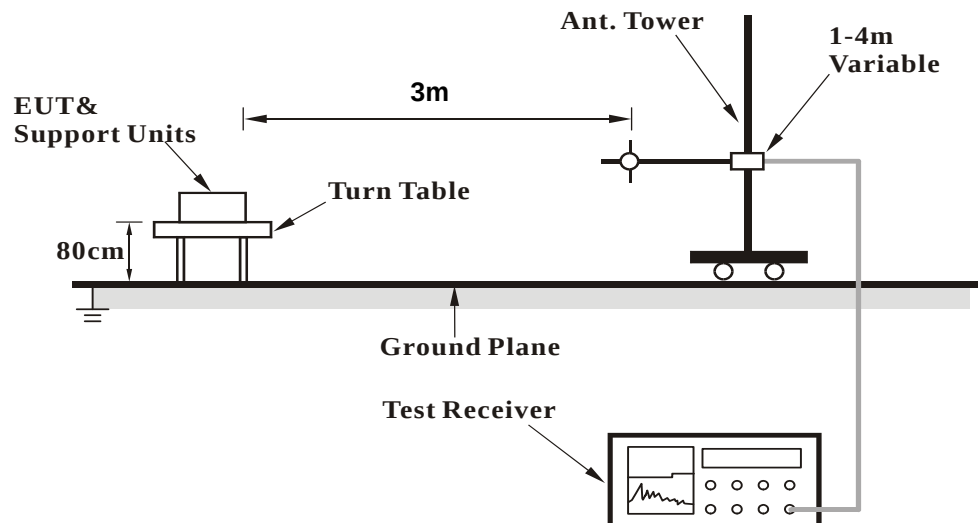
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

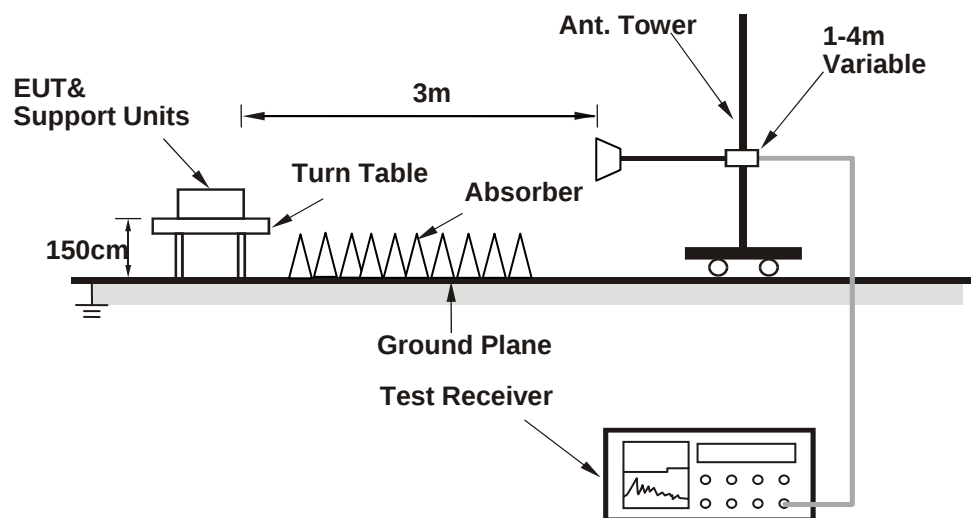
No deviation.

4.1.5 Test Setup

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



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

4.1.6 EUT Operating Conditions

1. Placed the EUT on testing table.
2. Controlling software (nRFgo Studio V1.21.0.2) has been activated to set the EUT under transmission/receiving condition continuously.

4.1.7 Test Results

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	52.6 PK	74.0	-21.4	1.53 H	76	58.79	-6.19
2	2390.00	34.3 AV	54.0	-19.7	1.53 H	76	40.49	-6.19
3	*2402.00	88.1 PK			1.53 H	76	94.24	-6.14
4	*2402.00	85.7 AV			1.53 H	76	91.84	-6.14
5	4804.00	42.7 PK	74.0	-31.3	1.55 H	6	42.96	-0.26
6	4804.00	29.2 AV	54.0	-24.8	1.55 H	6	29.46	-0.26
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	52.6 PK	74.0	-21.4	1.02 V	153	58.79	-6.19
2	2390.00	34.5 AV	54.0	-19.5	1.02 V	153	40.69	-6.19
3	*2402.00	83.3 PK			1.02 V	153	89.44	-6.14
4	*2402.00	79.4 AV			1.02 V	153	85.54	-6.14
5	4804.00	43.6 PK	74.0	-30.4	1.09 V	102	43.86	-0.26
6	4804.00	29.7 AV	54.0	-24.3	1.09 V	102	29.96	-0.26

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.

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	88.5 PK			1.51 H	66	94.50	-6.00
2	*2440.00	85.9 AV			1.51 H	66	91.90	-6.00
3	4880.00	43.1 PK	74.0	-30.9	1.48 H	4	43.06	0.04
4	4880.00	29.7 AV	54.0	-24.3	1.48 H	4	29.66	0.04
5	7320.00	46.4 PK	74.0	-27.6	2.60 H	134	40.06	6.34
6	7320.00	35.5 AV	54.0	-18.5	2.60 H	134	29.16	6.34
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	82.9 PK			1.02 V	157	88.90	-6.00
2	*2440.00	78.9 AV			1.02 V	157	84.90	-6.00
3	4880.00	43.3 PK	74.0	-30.7	1.19 V	117	43.26	0.04
4	4880.00	29.7 AV	54.0	-24.3	1.19 V	117	29.66	0.04
5	7320.00	46.6 PK	74.0	-27.4	1.95 V	52	40.26	6.34
6	7320.00	35.3 AV	54.0	-18.7	1.95 V	52	28.96	6.34

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.

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	88.0 PK			1.53 H	68	93.85	-5.85
2	*2480.00	85.8 AV			1.53 H	68	91.65	-5.85
3	2483.50	52.3 PK	74.0	-21.7	1.53 H	68	58.12	-5.82
4	2483.50	34.3 AV	54.0	-19.7	1.53 H	68	40.12	-5.82
5	4960.00	42.9 PK	74.0	-31.1	1.50 H	9	42.71	0.19
6	4960.00	29.4 AV	54.0	-24.6	1.50 H	9	29.21	0.19
7	7440.00	46.3 PK	74.0	-27.7	2.56 H	125	39.75	6.55
8	7440.00	35.2 AV	54.0	-18.8	2.56 H	125	28.65	6.55
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	83.0 PK			1.01 V	159	88.85	-5.85
2	*2480.00	79.0 AV			1.01 V	159	84.85	-5.85
3	2483.50	52.2 PK	74.0	-21.8	1.01 V	159	58.02	-5.82
4	2483.50	34.1 AV	54.0	-19.9	1.01 V	159	39.92	-5.82
5	4960.00	43.2 PK	74.0	-30.8	1.14 V	117	43.01	0.19
6	4960.00	29.5 AV	54.0	-24.5	1.14 V	117	29.31	0.19
7	7440.00	46.3 PK	74.0	-27.7	1.89 V	36	39.75	6.55
8	7440.00	35.2 AV	54.0	-18.8	1.89 V	36	28.65	6.55

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.

Below 1GHz 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	30.61	16.1 QP	40.0	-23.9	1.00 H	189	37.78	-21.66
2	108.47	24.1 QP	43.5	-19.4	1.50 H	360	47.29	-23.18
3	169.32	15.2 QP	43.5	-28.3	1.00 H	185	35.93	-20.70
4	286.40	15.3 QP	46.0	-30.8	1.50 H	201	34.82	-19.57
5	902.13	24.3 QP	46.0	-21.7	2.00 H	197	31.42	-7.15
6	930.74	24.4 QP	46.0	-21.6	2.00 H	125	31.05	-6.66
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	84.37	19.5 QP	40.0	-20.5	1.00 V	172	45.19	-25.71
2	108.04	27.6 QP	43.5	-15.9	2.00 V	360	50.85	-23.24
3	172.76	13.7 QP	43.5	-29.8	1.50 V	132	34.73	-21.05
4	400.88	17.0 QP	46.0	-29.0	1.50 V	260	33.79	-16.78
5	501.20	18.4 QP	46.0	-27.6	2.00 V	360	32.60	-14.20
6	902.13	25.1 QP	46.0	-20.9	1.00 V	306	32.23	-7.15

REMARKS:

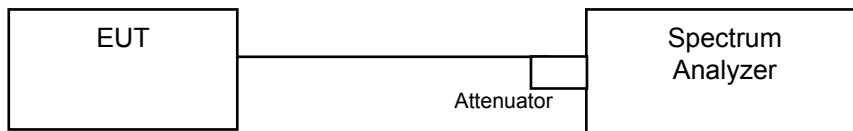
1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

4.2 6dB Bandwidth Measurement

4.2.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.2.2 Test Setup



4.2.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.2.4 Test Procedure

- Set resolution bandwidth (RBW) = 100kHz
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

4.2.5 Deviation from Test Standard

No deviation.

4.2.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	0.70	0.5	PASS
19	2440	0.70	0.5	PASS
39	2480	0.69	0.5	PASS

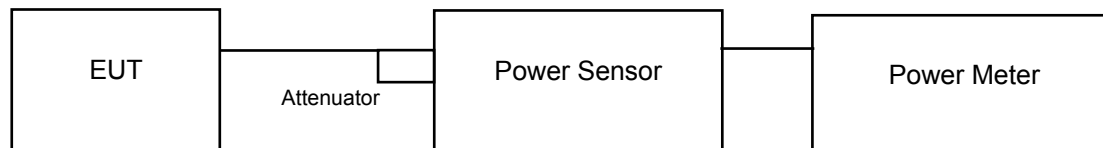


4.3 Conducted Output Power Measurement

4.3.1 Limits OF Conducted Output Power Measurement

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

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedures

A 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 power level.

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

Same as Item 4.2.6.

4.3.7 Test Results

For Peak Power

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
0	2402	1.941	2.88	30	Pass
19	2440	1.905	2.80	30	Pass
39	2480	1.866	2.71	30	Pass

For Average Power

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	1.910	2.81
19	2440	1.871	2.72
39	2480	1.837	2.64

4.4 Power Spectral Density Measurement

4.4.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8dBm.

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedure

- Set analyzer center frequency to DTS channel center frequency.
- Set the span to 1.5 times the DTS bandwidth.
- Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set the VBW $\geq 3 \times \text{RBW}$.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level within the RBW.

4.4.5 Deviation from Test Standard

No deviation.

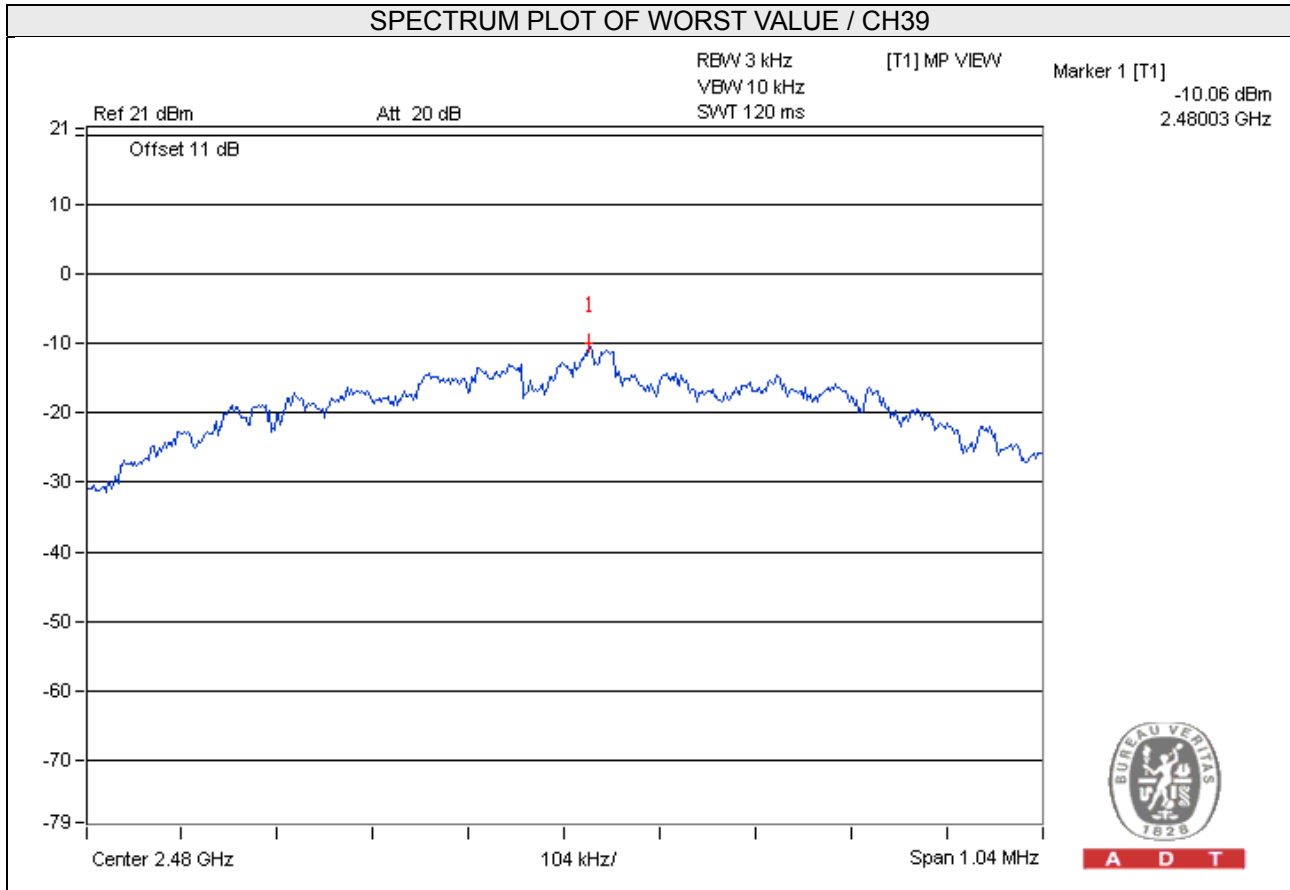
4.4.6 EUT Operating Condition

Same as Item 4.2.6

4.4.7 Test Results

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
0	2402	-10.43	8	PASS
19	2440	-10.26	8	PASS
39	2480	-10.06	8	PASS

SPECTRUM PLOT OF WORST VALUE / CH39

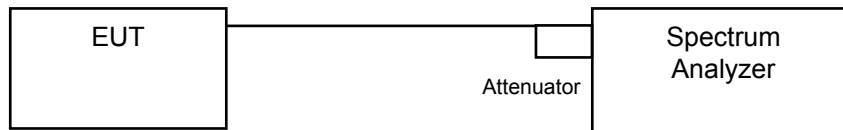


4.5 Conducted Out of Band Emission Measurement

4.5.1 Limits of Conducted Out of Band Emission Measurement

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

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW $\geq$ 300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOB

1. Set RBW = 100 kHz.
2. Set VBW $\geq$ 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

4.5.5 Deviation from Test Standard

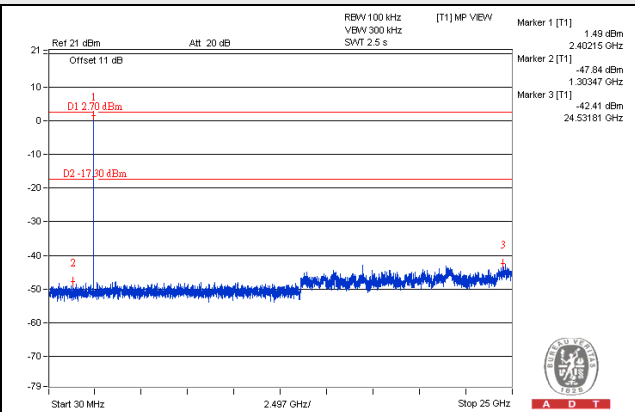
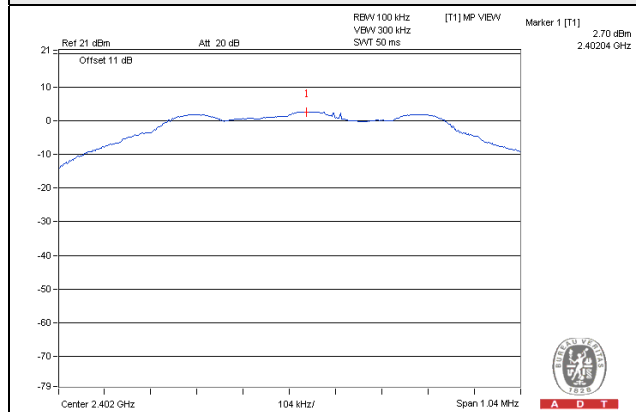
No deviation.

4.5.6 EUT Operating Condition

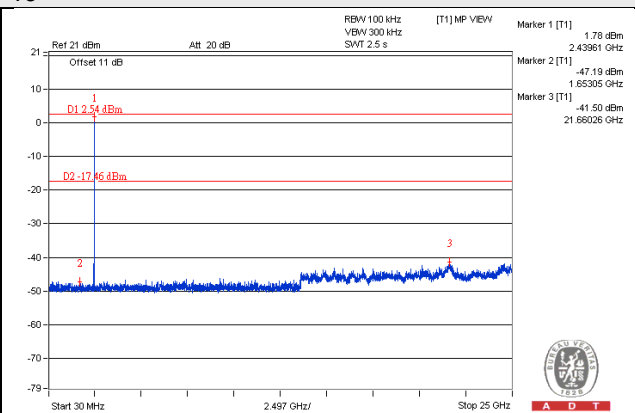
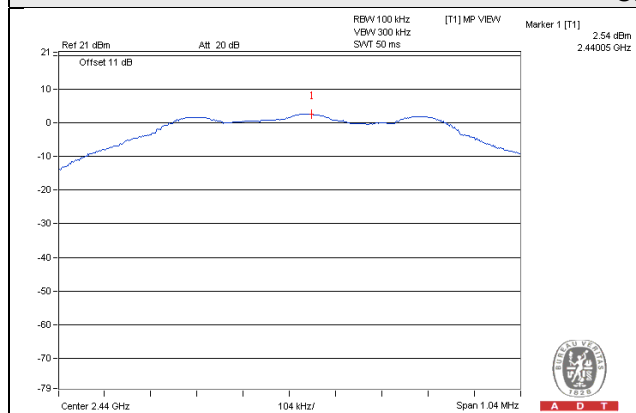
Same as Item 4.2.6

4.5.7 TEST RESULTS

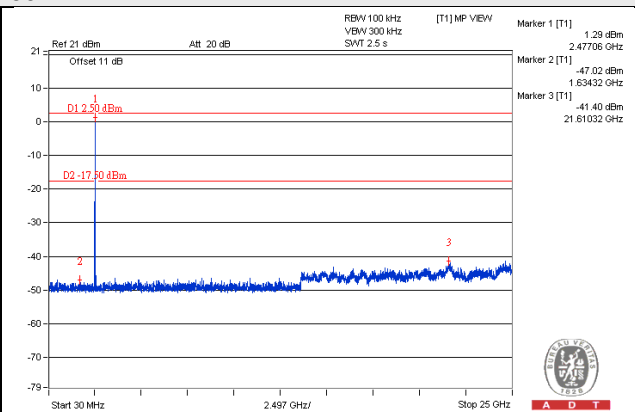
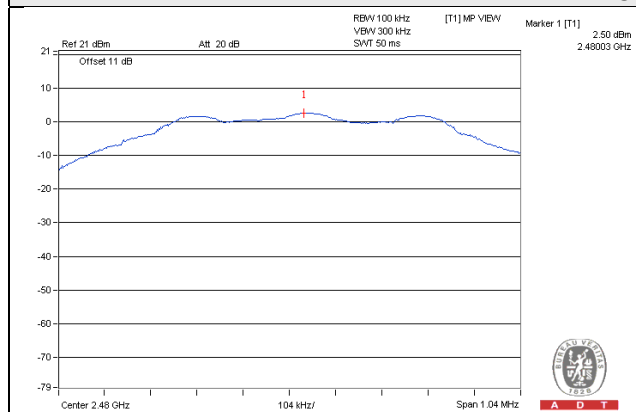
CH 0



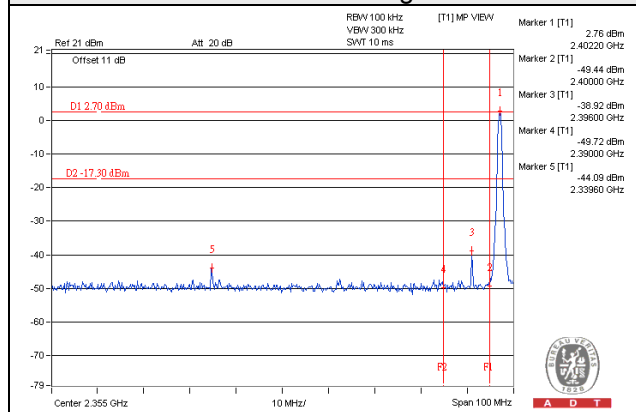
CH 19



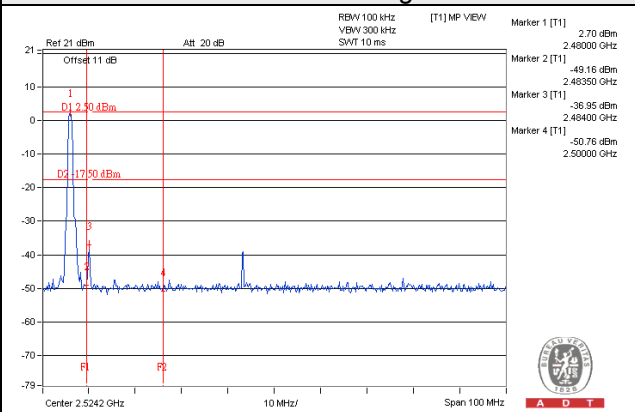
CH 39



CH 0 Band edge



CH 39 Band edge



5 Pictures of Test Arrangements

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

Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are 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: 886-2-26051924

Hsin Chu EMC/RF Lab/Telecom Lab

Tel: 886-3-5935343

Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety

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.

--- END ---