



FCC TEST REPORT

REPORT NO.: RF130301C21
MODEL NO.: SP922FH
FCC ID: U2M-SP922FH
RECEIVED: Mar. 01, 2013
TESTED: Mar. 05 ~ Mar. 15, 2013
ISSUED: Mar. 20, 2013

APPLICANT: Senao Networks, Inc.

ADDRESS: 3F, No. 529, Chung Cheng Rd., Hsintien, Taipei,
Taiwan, R.O.C.

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

LAB ADDRESS: No. 47, 14th Ling, Chia Pau Vil., Lin Kou Dist.,
New Taipei City, Taiwan, R.O.C.

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

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF130301C21	Original release	Mar. 20, 2013



1. CERTIFICATION

PRODUCT: Long Range Cordless Handset
MODEL NO.: SP922FH
BRAND: EnGenius
APPLICANT: Senao Networks, Inc.
TESTED: Mar. 05 ~ Mar. 15, 2013
TEST SAMPLE: ENGINEERING SAMPLE
STANDARDS: **FCC Part 15, Subpart C (Section 15.247)**
ANSI C63.10-2009

The above equipment (model: SP922FH) 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 :** Mar. 20, 2013
Pettie Chen / Senior Specialist

APPROVED BY :  , **DATE :** Mar. 20, 2013
Ken Liu / Senior Manager



2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.247)			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -6.89dB at 0.15000MHz.
15.247(a)(1)(i)	Number of Hopping Frequency Used Spec.: At least 50 channels	PASS	Meet the requirement of limit.
15.247(a)(1)(i)	Dwell Time on Each Channel Spec.: Max. 0.4 second within 20 second	PASS	Meet the requirement of limit.
15.247(a)(1)(i)	1. Hopping Channel Separation Spec.: Min. 25 kHz or 20 dB bandwidth, whichever is greater 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	PASS	Meet the requirement of limit.
15.247(b)(2)	Maximum Peak Output Power Spec.: max. 30dBm	PASS	Meet the requirement of limit.
15.247(d)	Transmitter Radiated Emissions Spec.: Table 15.209	PASS	Meet the requirement of limit. Minimum passing margin is -4.8dB at 794.01MHz.
15.247(d)	Band Edge Measurement	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	Antenna connector is R-SMA not a standard connector.

2.1 MEASUREMENT UNCERTAINTY

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

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

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



3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

EUT	Long Range Cordless Handset
MODEL NO.	SP922FH
POWER SUPPLY	3.7Vdc (Battery) 5.0Vdc (Charger)
MODULATION TYPE	Differentially Encoded MSK
TRANSFER RATE	170.667 kbps
OPERATING FREQUENCY	902.3840 ~ 927.4656MHz
CHANNEL SPACING	404.543KHz
NUMBER OF CHANNEL	50
OUTPUT POWER	781.628mW
ANTENNA TYPE	Dipole Antenna with 2.0dBi gain (long antenna) Dipole Antenna with 1.5dBi gain (short antenna)
ANTENNA CONNECTOR	R-SMA
DATA CABLE	NA
I/O PORTS	Refer to user's manual
ACCESSORY DEVICES	Adapter, Charger, Battery

NOTE:

1. The EUT is on standby mode when charging.
2. The EUT with long antenna was for the final test.
3. The EUT uses following adapters, battery & Charger adapter.

BATTERY	
BRAND	EnGenius
INPUT POWER	1100mAh
OUTPUT POWER	3.7Vdc

CHARGER	
BRAND	EnGenius
MODEL	NA

ADAPTER (for Charger used)	
BRAND	DVE
MODEL	DSA-6E-05 US 050100
INPUT POWER	100-240Vac, 50/60Hz, 0.3A
OUTPUT POWER	5.0Vdc, 1.0A
POEWR LINE	1.5m non-shielded cable without core

4. 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

50 channels are provided to this EUT:

CH.	FREQ. (MHz)	CH.	FREQ. (MHz)	CH.	FREQ. (MHz)	CH.	FREQ. (MHz)	CH.	FREQ. (MHz)
1	902.3840	11	907.6430	21	912.4975	31	918.1611	41	923.0157
2	902.7885	12	908.0476	22	912.9021	32	918.9702	42	923.8247
3	903.1930	13	908.4521	23	913.3066	33	919.3748	43	924.2293
4	903.5976	14	909.2612	24	914.1157	34	919.7793	44	924.6338
5	904.4067	15	909.6657	25	914.9248	35	920.1839	45	925.0384
6	904.8112	16	910.0703	26	915.3293	36	920.5884	46	925.4429
7	905.2158	17	910.4748	27	915.7339	37	921.3975	47	926.2520
8	905.6203	18	910.8797	28	916.5430	38	921.8020	48	926.6566
9	906.0248	19	911.6885	29	917.3521	39	922.2066	49	927.0611
10	906.8339	20	912.0930	30	917.7566	40	922.6111	50	927.4656

3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE \geq 1G	RE<1G	PLC	APCM	
A	√	√	NOTE 2	√	Battery mode
B	NOTE 3	NOTE 3	√	NOTE 3	Charger mode

Where **RE \geq 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 **Y-plane**.
2. No need to concern of Conducted Emission due to the EUT is powered by battery.
3. The EUT is on standby mode when charging.

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.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
A	1 to 50	1, 25, 50	Differentially Encoded MSK

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.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
A	1 to 50	1, 25, 50	Differentially Encoded MSK

POWER LINE CONDUCTED EMISSION TEST:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
B	1 to 50	1, 25, 50	Differentially Encoded MSK



BANDEDGE 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.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
A	1 to 50	1, 50	Differentially Encoded MSK

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.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
A	1 to 50	1, 25, 50	Differentially Encoded MSK

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	25deg. C, 65%RH	3.7Vdc	Sun Lin
RE<1G	25deg. C, 65%RH	3.7Vdc	Sun Lin
PLC	24deg. C, 64%RH	120Vac, 60Hz	Match Tsui
APCM	20deg. C, 70%RH	3.7Vdc	Jun Wu



3.3 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.

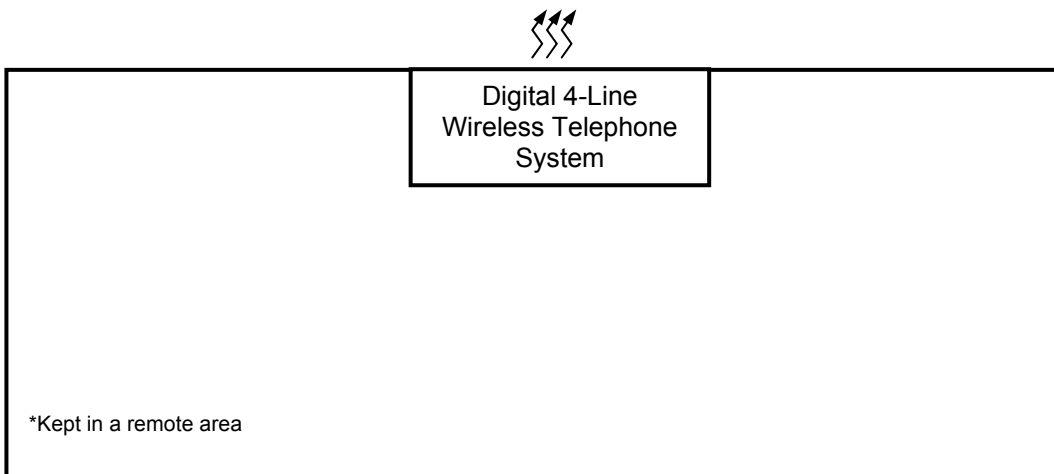
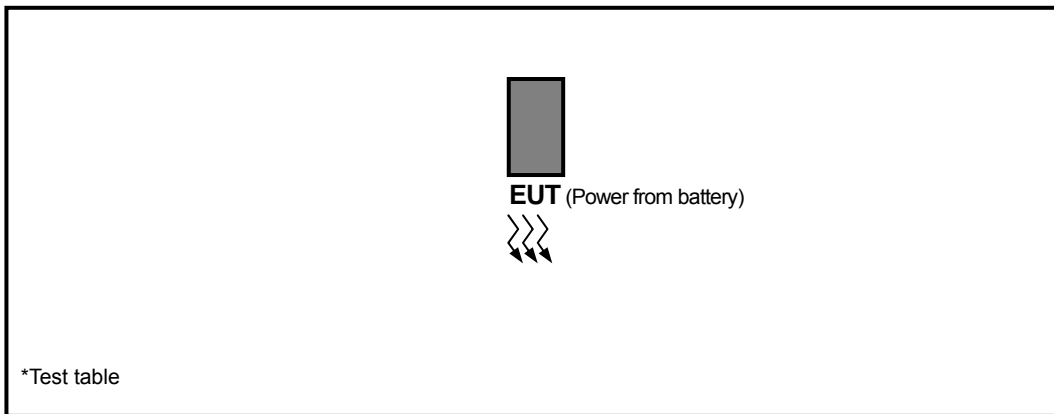
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	Digital 4-Line Wireless Telephone System	EnGenius	DuraFon PRO	NA	NA

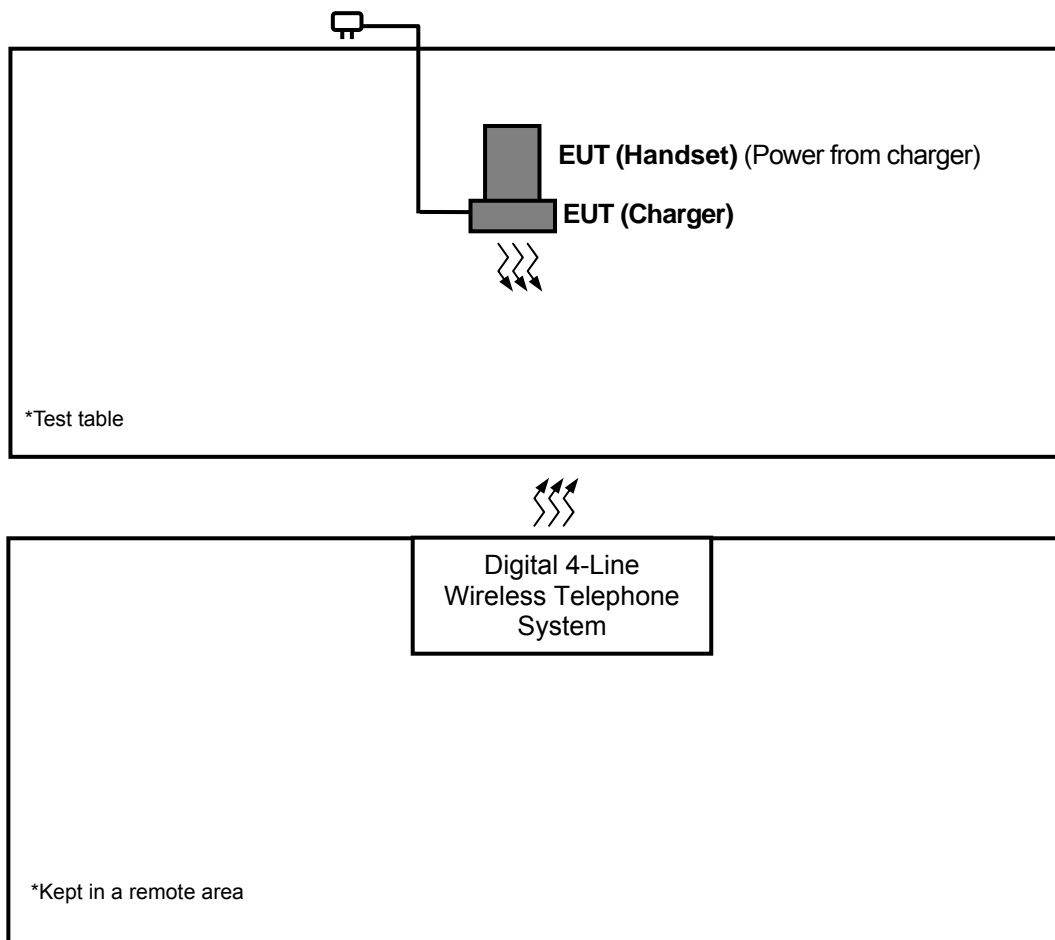
NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA

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

3.3.1 CONFIGURATION OF SYSTEM UNDER TEST

TEST MODE A



TEST MODE B**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.

4. TEST TYPES AND RESULTS

4.1 RADIATED EMISSION AND BANDEDGE MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT

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

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

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (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.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESIB7	100212	Aug. 06, 2012	Aug. 05, 2013
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jan. 31, 2013	Jan. 30, 2014
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Apr. 06, 2012	Apr. 05, 2013
HORN Antenna SCHWARZBECK	9120D	209	Sep. 03, 2012	Sep. 02, 2013
HORN Antenna SCHWARZBECK	BBHA 9170	148	Jul. 11, 2012	Jul. 10, 2013
Loop Antenna	HFH2-Z2	100070	Jan. 31, 2012	Jan. 30, 2014
Preamplifier Agilent	8447D	2944A10633	Oct. 25, 2012	Oct. 24, 2013
Preamplifier Agilent	8449B	3008A01964	Oct. 25, 2012	Oct. 24, 2013
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	250723/4	Aug. 28, 2012	Aug. 27, 2013
RF signal cable HUBER+SUHNNER	SUCOFLEX 106	12738/6+30922 4/4	Aug. 28, 2012	Aug. 27, 2013
Software ADT.	ADT_Radiated_ V7.6.15.9.2	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller inn-co GmbH	CO2000	017303	NA	NA
Turn Table ADT.	TT100	TT93021703	NA	NA
Turn Table Controller ADT.	SC100	SC93021703	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 calibration interval of the loop antenna is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. The test was performed in HwaYa Chamber 3.
 4. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
 5. The FCC Site Registration No. is 988962.
 6. The IC Site Registration No. is IC 7450F-3.

4.1.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Height of receiving 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 Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

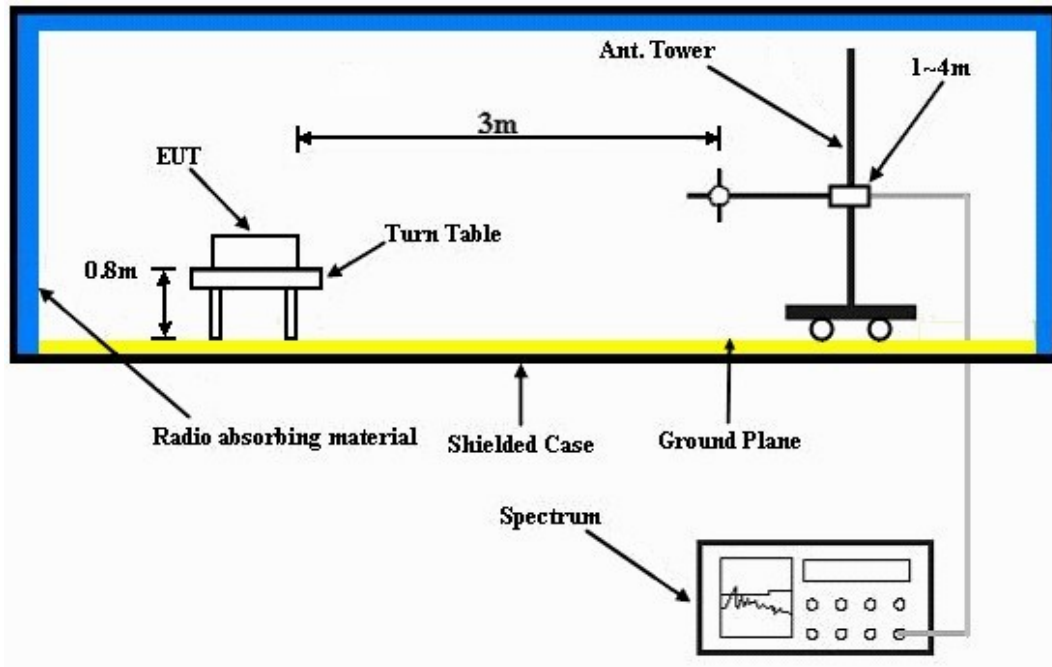
NOTE:

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



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

4.1.6 EUT OPERATING CONDITIONS

- a. Placed the EUT on a testing table.
- b. Set the EUT under transmission condition continuously at specific channel frequency.
- c. The necessary accessories enable the system in full functions.



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4.1.7 TEST RESULTS

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Sun Lin

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	#654.05	57.1 PK	110.8	-53.7	1.28 H	141	34.00	23.10
2	#654.05	37.8 AV	92.7	-54.9	1.28 H	141	14.70	23.10
3	#864.22	55.8 PK	110.8	-55.0	1.02 H	51	29.30	26.50
4	#864.22	34.1 AV	92.7	-58.6	1.02 H	51	7.60	26.50
5	#902.00	42.2 PK	110.8	-68.6	1.28 H	22	15.20	27.00
6	#902.00	30.5 AV	92.7	-62.2	1.28 H	22	3.50	27.00
7	*902.38	130.8 PK			1.59 H	321	103.80	27.00
8	*902.38	112.7 AV			1.59 H	321	85.70	27.00
9	#940.12	57.1 PK	110.8	-53.7	1.35 H	18	29.70	27.40
10	#940.12	38.5 AV	92.7	-54.2	1.35 H	18	11.10	27.40

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 radiated frequency is out the restricted band.
7. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:

$$20 \log (\text{Duty cycle}) = 20 \log (12.5\text{ms} / 100 \text{ ms}) = -18.1 \text{ dB}$$
 Please see page 23 for plotted duty.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Sun Lin

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	#653.62	45.2 PK	100.9	-55.7	1.41 V	22	22.10	23.10
2	#653.62	30.8 AV	82.8	-52.0	1.41 V	22	7.70	23.10
3	#865.48	50.8 PK	100.9	-50.1	1.35 V	225	24.30	26.50
4	#865.48	39.4 AV	82.8	-43.4	1.35 V	225	12.90	26.50
5	#902.00	42.4 PK	100.9	-58.5	1.26 V	246	15.40	27.00
6	#902.00	31.6 AV	82.8	-51.2	1.26 V	246	4.60	27.00
7	*902.38	120.9 PK			1.55 V	231	93.90	27.00
8	*902.38	102.8 AV			1.55 V	231	75.80	27.00
9	#941.67	43.8 PK	100.9	-57.1	1.22 V	212	16.40	27.40
10	#941.67	32.6 AV	82.8	-50.2	1.22 V	212	5.20	27.40

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 radiated frequency is out the restricted band.
7. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:
 $20 \log (\text{Duty cycle}) = 20 \log (12.5\text{ms} / 100 \text{ms}) = -18.1 \text{ dB}$
 Please see page 23 for plotted duty.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 25	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Sun Lin

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	#653.92	56.4 PK	110.0	-53.6	1.30 H	153	33.30	23.10
2	#653.92	37.6 AV	91.9	-54.3	1.30 H	153	14.50	23.10
3	#864.30	56.3 PK	110.0	-53.7	1.00 H	14	29.80	26.50
4	#864.30	33.9 AV	91.9	-58.0	1.00 H	14	7.40	26.50
5	#902.00	41.7 PK	110.0	-68.3	1.41 H	14	14.70	27.00
6	#902.00	30.2 AV	91.9	-61.7	1.41 H	14	3.20	27.00
7	*914.92	130.0 PK			1.53 H	148	102.90	27.10
8	*914.92	111.9 AV			1.53 H	148	84.80	27.10
9	#940.20	57.4 PK	110.0	-52.6	1.44 H	12	30.00	27.40
10	#940.20	39.1 AV	91.9	-52.8	1.44 H	12	11.70	27.40

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 radiated frequency is out the restricted band.
7. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:

$$20 \log (\text{Duty cycle}) = 20 \log (12.5\text{ms} / 100 \text{ms}) = -18.1 \text{ dB}$$
 Please see page 23 for plotted duty.



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 25	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Sun Lin

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	#653.41	44.8 PK	100.1	-55.3	1.50 V	19	21.70	23.10
2	#653.41	30.3 AV	82.0	-51.7	1.50 V	19	7.20	23.10
3	#864.38	50.4 PK	100.1	-49.7	1.41 V	263	23.90	26.50
4	#864.38	38.9 AV	82.0	-43.1	1.41 V	263	12.40	26.50
5	#902.00	41.9 PK	100.1	-58.2	1.32 V	228	14.90	27.00
6	#902.00	30.1 AV	82.0	-51.9	1.32 V	228	3.10	27.00
7	*914.92	120.1 PK			1.39 V	202	93.00	27.10
8	*914.92	102.0 AV			1.39 V	202	74.90	27.10
9	#941.45	43.5 PK	100.1	-56.6	1.38 V	205	16.10	27.40
10	#941.45	32.2 AV	82.0	-49.8	1.38 V	205	4.80	27.40

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 radiated frequency is out the restricted band.
7. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:
 $20 \log (\text{Duty cycle}) = 20 \log (12.5\text{ms} / 100 \text{ ms}) = -18.1 \text{ dB}$
 Please see page 23 for plotted duty.



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 50	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Sun Lin

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	#654.43	56.8 PK	109.2	-52.4	1.25 H	147	33.70	23.10
2	#654.43	38.2 AV	91.1	-52.9	1.25 H	147	15.10	23.10
3	#864.27	56.7 PK	109.2	-52.5	1.05 H	19	30.20	26.50
4	#864.27	34.5 AV	91.1	-56.6	1.05 H	19	8.00	26.50
5	#902.00	42.4 PK	109.2	-66.8	1.32 H	51	15.40	27.00
6	#902.00	30.6 AV	91.1	-60.5	1.32 H	51	3.60	27.00
7	*927.47	129.2 PK			1.45 H	158	101.90	27.30
8	*927.47	111.1 AV			1.45 H	158	83.80	27.30
9	#928.00	47.2 PK	109.2	-62.0	1.59 H	347	19.90	27.30
10	#928.00	25.6 AV	91.1	-65.5	1.59 H	347	-1.70	27.30
11	#940.20	58.2 PK	109.2	-51.0	1.39 H	8	30.80	27.40
12	#940.20	39.2 AV	91.1	-51.9	1.39 H	8	11.80	27.40

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 radiated frequency is out the restricted band.
7. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:

$$20 \log (\text{Duty cycle}) = 20 \log (12.5\text{ms} / 100 \text{ms}) = -18.1 \text{ dB}$$
 Please see page 23 for plotted duty.



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 50	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Sun Lin

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	#654.39	45.6 PK	99.8	-54.2	1.47 V	25	22.50	23.10
2	#654.39	30.7 AV	81.7	-51.0	1.47 V	25	7.60	23.10
3	#865.48	50.9 PK	99.8	-48.9	1.32 V	251	24.40	26.50
4	#865.48	39.4 AV	81.7	-42.3	1.32 V	251	12.90	26.50
5	#902.00	42.4 PK	99.8	-57.4	1.47 V	265	15.40	27.00
6	#902.00	30.8 AV	81.7	-50.9	1.47 V	265	3.80	27.00
7	*927.47	119.8 PK			1.45 V	296	92.50	27.30
8	*927.47	101.7 AV			1.45 V	296	74.40	27.30
9	#928.00	32.1 PK	99.8	-67.7	1.24 V	18	4.80	27.30
10	#928.00	15.8 AV	81.7	-65.9	1.24 V	18	-11.50	27.30
11	#941.65	44.8 PK	99.8	-55.0	1.42 V	212	17.40	27.40
12	#941.65	32.8 AV	81.7	-48.9	1.42 V	212	5.40	27.40

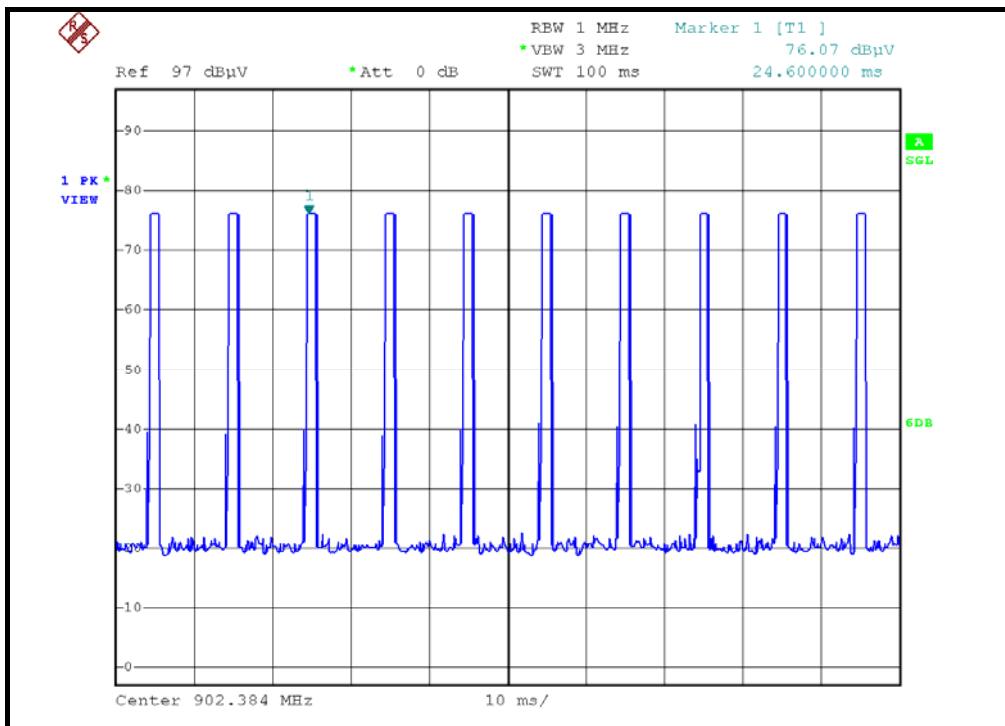
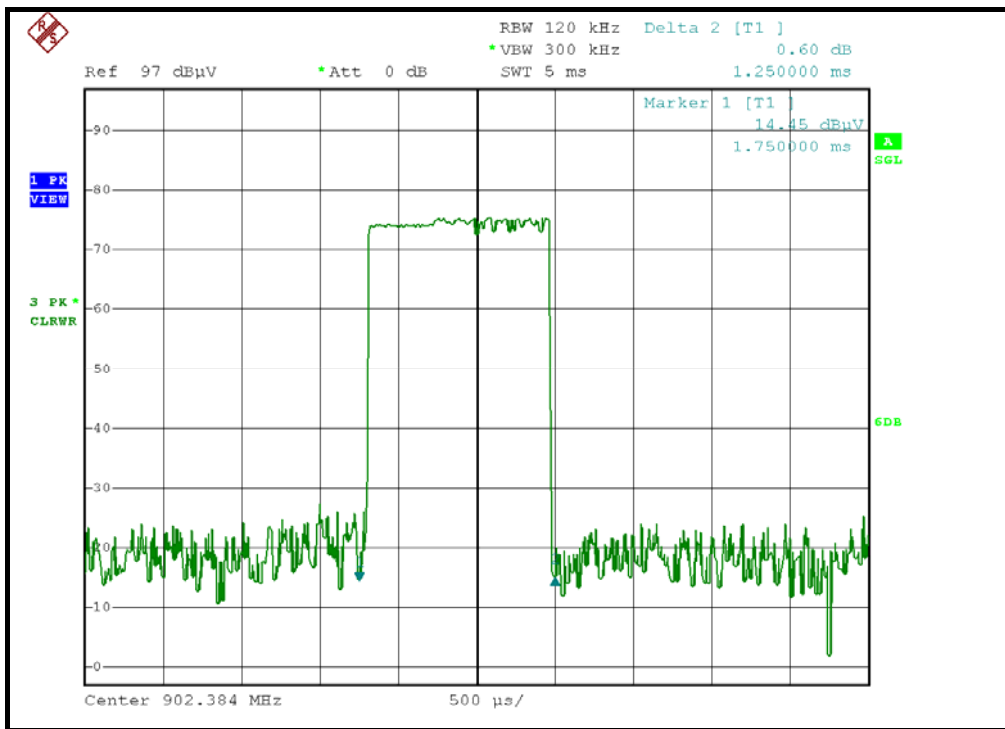
REMARKS:

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 radiated frequency is out the restricted band.
7. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:

$$20 \log (\text{Duty cycle}) = 20 \log (12.5\text{ms} / 100 \text{ms}) = -18.1 \text{ dB}$$
 Please see page 23 for plotted duty.



A D T



$$20 \log (\text{Duty cycle}) = 20 \log (10 \times 1.25 \text{ms} / 100 \text{ms}) = -18.1 \text{ dB}$$



A D T

ABOVE 1GHz DATA

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	FREQUENCY RANGE	1 ~ 10GHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Sun Lin

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	1804.77	45.6 PK	74.0	-28.4	1.47 H	190	16.70	28.90
2	1804.77	27.5 AV	54.0	-26.5	1.47 H	190	-1.40	28.90
3	2707.15	50.7 PK	74.0	-23.3	1.00 H	197	18.80	31.90
4	2707.15	32.6 AV	54.0	-21.4	1.00 H	197	0.70	31.90
5	3609.54	46.8 PK	74.0	-27.2	1.44 H	228	13.20	33.60
6	3609.54	28.7 AV	54.0	-25.3	1.44 H	228	-4.90	33.60

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	1804.77	47.3 PK	74.0	-26.7	1.45 V	98	18.40	28.90
2	1804.77	29.2 AV	54.0	-24.8	1.45 V	98	0.30	28.90
3	2707.15	48.1 PK	74.0	-25.9	1.26 V	103	16.20	31.90
4	2707.15	30.0 AV	54.0	-24.0	1.26 V	103	-1.90	31.90
5	3609.54	48.4 PK	74.0	-25.6	1.23 V	254	14.80	33.60
6	3609.54	30.3 AV	54.0	-23.7	1.23 V	254	-3.30	33.60

REMARKS:

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



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 25	FREQUENCY RANGE	1 ~ 10GHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Sun Lin

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	1829.85	44.7 PK	74.0	-29.3	1.00 H	228	15.70	29.00
2	1829.85	26.6 AV	54.0	-27.4	1.00 H	228	-2.40	29.00
3	2744.77	54.4 PK	74.0	-19.6	1.17 H	205	22.40	32.00
4	2744.77	36.3 AV	54.0	-17.7	1.17 H	205	4.30	32.00
5	3659.70	47.7 PK	74.0	-26.3	1.40 H	223	14.00	33.70
6	3659.70	29.6 AV	54.0	-24.4	1.40 H	223	-4.10	33.70
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	1829.85	47.8 PK	74.0	-26.2	1.03 V	73	18.80	29.00
2	1829.85	29.7 AV	54.0	-24.3	1.03 V	73	0.70	29.00
3	2744.77	46.0 PK	74.0	-28.0	1.25 V	102	14.00	32.00
4	2744.77	27.9 AV	54.0	-26.1	1.25 V	102	-4.10	32.00
5	3659.70	47.7 PK	74.0	-26.3	1.55 V	75	14.00	33.70
6	3659.70	29.6 AV	54.0	-24.4	1.55 V	75	-4.10	33.70

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.



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 50	FREQUENCY RANGE	1 ~ 10GHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Sun Lin

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	1854.93	43.2 PK	74.0	-30.8	1.76 H	226	14.20	29.00
2	1854.93	25.1 AV	54.0	-28.9	1.76 H	226	-3.90	29.00
3	2782.40	54.2 PK	74.0	-19.8	1.70 H	206	22.10	32.10
4	2782.40	36.1 AV	54.0	-17.9	1.70 H	206	4.00	32.10
5	3709.86	46.8 PK	74.0	-27.2	1.42 H	64	12.90	33.90
6	3709.86	28.7 AV	54.0	-25.3	1.42 H	64	-5.20	33.90

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	1854.93	46.5 PK	74.0	-27.5	1.68 V	287	17.50	29.00
2	1854.93	28.4 AV	54.0	-25.6	1.68 V	287	-0.60	29.00
3	2782.40	49.4 PK	74.0	-24.6	1.00 V	98	17.30	32.10
4	2782.40	31.3 AV	54.0	-22.7	1.00 V	98	-0.80	32.10
5	3709.86	48.2 PK	74.0	-25.8	1.53 V	83	14.30	33.90
6	3709.86	30.1 AV	54.0	-23.9	1.53 V	83	-3.80	33.90

REMARKS:

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



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BELOW 1GHz WORST-CASE DATA

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Sun Lin

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	76.56	30.2 QP	40.0	-9.8	1.24 H	218	19.60	10.60
2	152.39	30.1 QP	43.5	-13.4	1.00 H	222	16.20	13.90
3	302.10	32.0 QP	46.0	-14.0	1.00 H	218	16.80	15.20
4	387.65	29.6 QP	46.0	-16.4	2.00 H	94	12.40	17.20
5	550.97	38.1 QP	46.0	-7.9	1.24 H	89	16.80	21.30
6	731.79	38.1 QP	46.0	-7.9	1.24 H	15	13.80	24.30
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	33.79	31.7 QP	40.0	-8.3	1.00 V	46	19.20	12.50
2	144.61	30.4 QP	43.5	-13.1	1.25 V	221	16.80	13.60
3	286.55	32.0 QP	46.0	-14.0	1.00 V	203	17.40	14.60
4	321.54	29.9 QP	46.0	-16.1	1.00 V	207	14.30	15.60
5	385.70	27.0 QP	46.0	-19.0	1.50 V	89	9.80	17.20
6	792.06	32.4 QP	46.0	-13.6	2.00 V	101	7.00	25.40

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.



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 25	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Sun Lin

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	57.12	30.6 QP	40.0	-9.4	1.99 H	166	17.00	13.60
2	162.11	29.1 QP	43.5	-14.4	1.50 H	216	15.20	13.90
3	564.58	31.1 QP	46.0	-14.9	1.00 H	91	9.40	21.70
4	727.90	39.6 QP	46.0	-6.4	1.00 H	11	15.40	24.20
5	794.01	41.2 QP	46.0	-4.8	1.99 H	15	15.70	25.50
6	829.00	40.4 QP	46.0	-5.6	1.00 H	13	14.40	26.00

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	259.33	29.0 QP	46.0	-17.0	1.24 V	205	15.50	13.50
2	339.04	31.4 QP	46.0	-14.6	1.24 V	236	15.40	16.00
3	383.76	27.5 QP	46.0	-18.5	1.99 V	89	10.40	17.10
4	508.20	34.9 QP	46.0	-11.1	1.00 V	203	14.60	20.30
5	727.90	30.3 QP	46.0	-15.7	1.24 V	106	6.10	24.20
6	797.89	34.2 QP	46.0	-11.8	1.00 V	101	8.70	25.50

REMARKS:

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



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 50	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Sun Lin

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	57.12	30.1 QP	40.0	-9.9	2.00 H	146	16.50	13.60
2	257.38	25.6 QP	46.0	-20.4	1.00 H	220	12.10	13.50
3	333.21	30.4 QP	46.0	-15.6	1.00 H	233	14.50	15.90
4	405.15	26.6 QP	46.0	-19.4	1.00 H	233	8.90	17.70
5	430.42	31.9 QP	46.0	-14.1	1.00 H	233	13.60	18.30
6	533.47	29.5 QP	46.0	-16.5	1.50 H	176	8.60	20.90

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	183.50	24.9 QP	43.5	-18.6	1.24 V	221	12.50	12.40
2	202.94	26.0 QP	43.5	-17.5	2.00 V	205	14.80	11.20
3	261.27	27.1 QP	46.0	-18.9	1.24 V	215	13.50	13.60
4	329.32	26.2 QP	46.0	-19.8	1.24 V	80	10.40	15.80
5	564.58	25.4 QP	46.0	-20.6	2.00 V	84	3.70	21.70
6	788.17	32.8 QP	46.0	-13.2	1.00 V	105	7.50	25.30

REMARKS:

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

4.2 CONDUCTED EMISSION MEASUREMENT

4.2.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB μ V)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56	56 to 46
0.5 ~ 5	56	46
5 ~ 30	60	50

- NOTE:**
1. The lower limit shall apply at the transition frequencies.
 2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.
 3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCS30	100288	Nov. 09, 2012	Nov. 08, 2013
RF signal cable Woken	5D-FB	Cable-HYCO2-01	Dec. 28, 2012	Dec. 27, 2013
LISN ROHDE & SCHWARZ (EUT)	ESH2-Z5	100100	Dec. 21, 2012	Dec. 20, 2013
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 06, 2012	Jul. 05, 2013
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 HwaYa Shielded Room 2.
 3. The VCCI Site Registration No. is C-2047.

4.2.3 TEST PROCEDURES

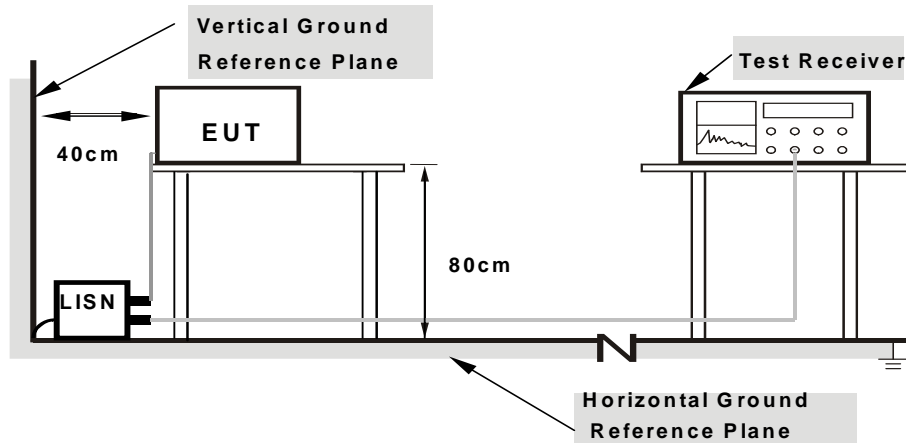
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling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

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

4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

4.2.5 TEST SETUP



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

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

4.2.6 EUT OPERATING CONDITIONS

Same as 4.1.6.

4.2.7 TEST RESULTS

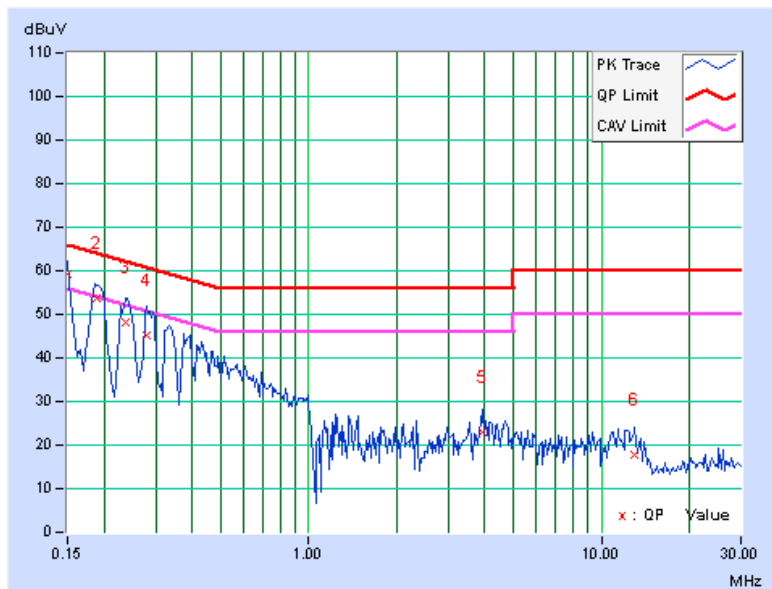
CONDUCTED WORST-CASE DATA :

PHASE	Line 1	6dB BANDWIDTH	9kHz
CHANNEL	Channel 1		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.15000	0.13	58.98	44.00	59.11	44.13	66.00
2	0.18897	0.12	53.65	41.46	53.77	41.58	64.08	54.08	-10.31	-12.50
3	0.23594	0.13	48.06	34.98	48.19	35.11	62.24	52.24	-14.05	-17.13
4	0.27891	0.13	45.00	30.68	45.13	30.81	60.85	50.85	-15.72	-20.04
5	3.93359	0.35	22.79	6.59	23.14	6.94	56.00	46.00	-32.86	-39.06
6	13.02344	0.83	17.06	1.79	17.89	2.62	60.00	50.00	-42.11	-47.38

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.

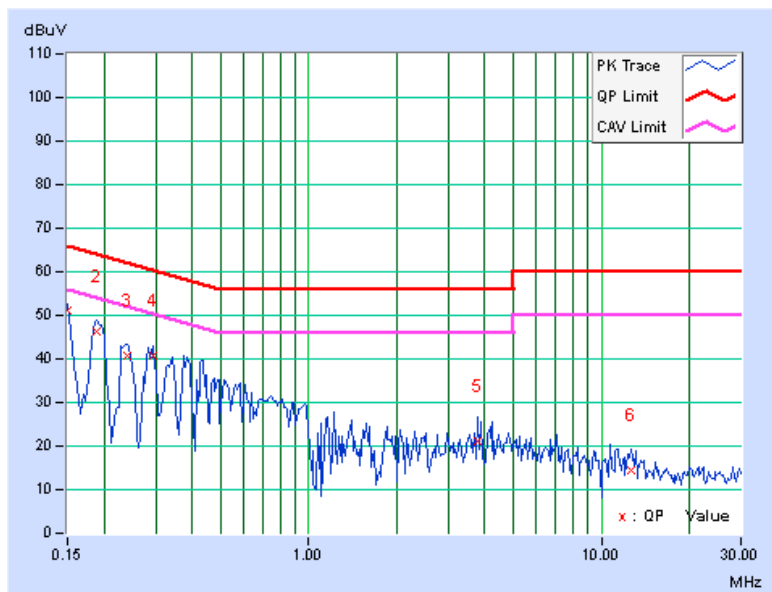


PHASE	Line 2	6dB BANDWIDTH	9kHz
CHANNEL	Channel 1		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.18	50.97	35.75	51.15	35.93	66.00	56.00	-14.85	-20.07
2	0.18906	0.17	46.06	34.09	46.23	34.26	64.08	54.08	-17.85	-19.82
3	0.23984	0.18	40.47	27.41	40.65	27.59	62.10	52.10	-21.45	-24.51
4	0.29453	0.19	40.54	25.58	40.73	25.77	60.40	50.40	-19.67	-24.63
5	3.77344	0.37	20.68	3.82	21.05	4.19	56.00	46.00	-34.95	-41.81
6	12.58203	0.68	13.75	-0.26	14.43	0.42	60.00	50.00	-45.57	-49.58

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.

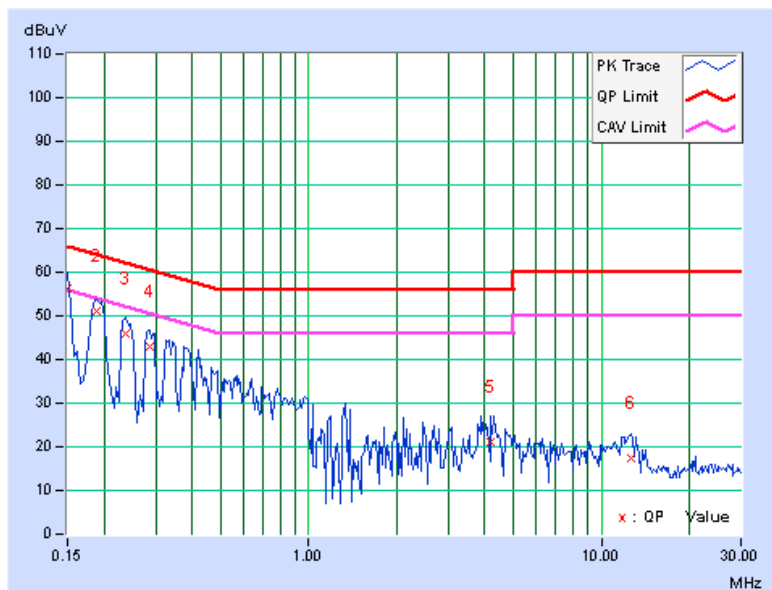


PHASE	Line 1	6dB BANDWIDTH	9kHz
CHANNEL	Channel 25		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.13	56.18	40.99	56.31	41.12	66.00	56.00	-9.69	-14.88
2	0.18906	0.12	51.17	39.07	51.29	39.19	64.08	54.08	-12.79	-14.89
3	0.23594	0.13	45.84	32.89	45.97	33.02	62.24	52.24	-16.27	-19.22
4	0.28672	0.13	42.68	30.57	42.81	30.70	60.62	50.62	-17.81	-19.92
5	4.19531	0.36	20.88	4.89	21.24	5.25	56.00	46.00	-34.76	-40.75
6	12.58203	0.80	16.45	1.57	17.25	2.37	60.00	50.00	-42.75	-47.63

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.

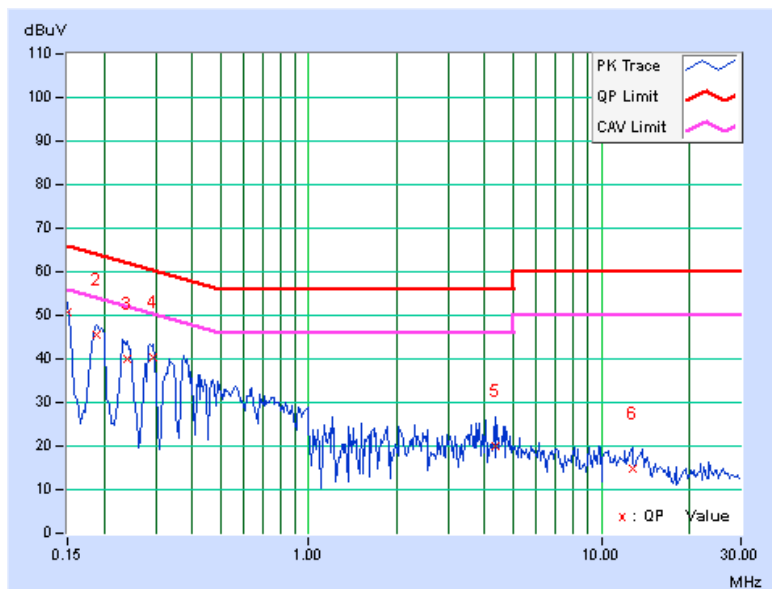


PHASE	Line 2	6dB BANDWIDTH	9kHz
CHANNEL	Channel 25		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.18	50.39	35.17	50.57	35.35	66.00	56.00	-15.43	-20.65
2	0.18906	0.17	45.53	33.60	45.70	33.77	64.08	54.08	-18.38	-20.31
3	0.23984	0.18	39.95	26.96	40.13	27.14	62.10	52.10	-21.97	-24.96
4	0.29453	0.19	40.26	25.48	40.45	25.67	60.40	50.40	-19.95	-24.73
5	4.32813	0.39	19.67	4.56	20.06	4.95	56.00	46.00	-35.94	-41.05
6	12.80469	0.69	14.06	-0.33	14.75	0.36	60.00	50.00	-45.25	-49.64

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.

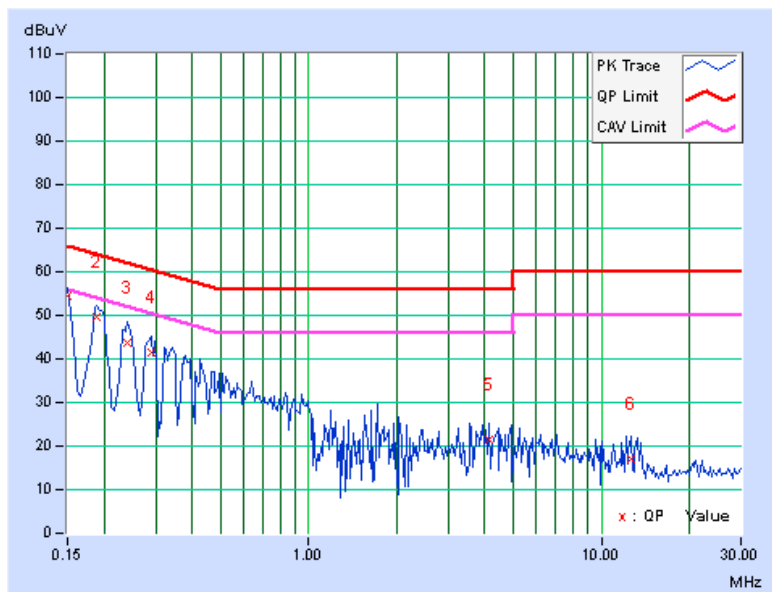


PHASE	Line 1	6dB BANDWIDTH	9kHz
CHANNEL	Channel 50		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.13	54.47	39.50	54.60	39.63	66.00	56.00	-11.40	-16.37
2	0.18906	0.12	49.57	37.64	49.69	37.76	64.08	54.08	-14.39	-16.32
3	0.23984	0.13	43.62	31.01	43.75	31.14	62.10	52.10	-18.36	-20.97
4	0.29063	0.13	41.43	28.90	41.56	29.03	60.51	50.51	-18.94	-21.47
5	4.13281	0.36	21.27	3.97	21.63	4.33	56.00	46.00	-34.37	-41.67
6	12.62109	0.80	16.26	1.50	17.06	2.30	60.00	50.00	-42.94	-47.70

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.

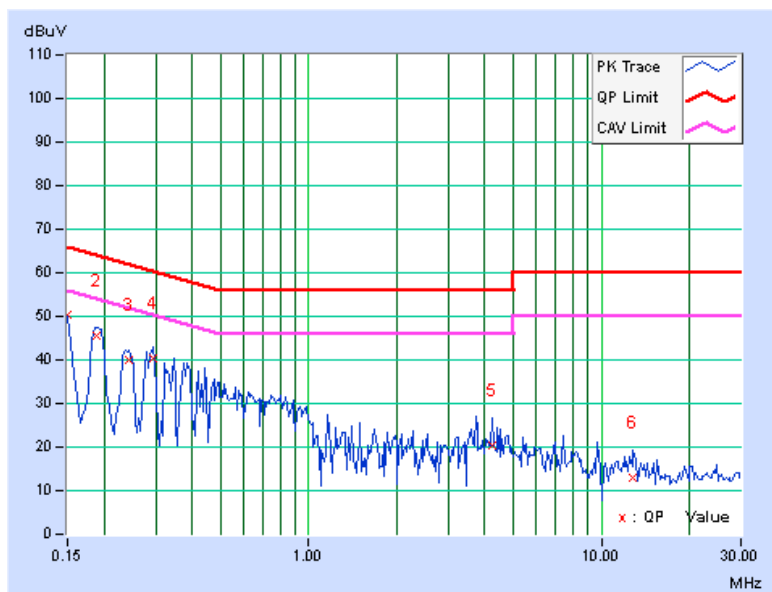


PHASE	Line 2	6dB BANDWIDTH	9kHz
CHANNEL	Channel 50		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.18	50.05	34.86	50.23	35.04	66.00	56.00	-15.77	-20.96
2	0.18906	0.17	45.21	33.36	45.38	33.53	64.08	54.08	-18.70	-20.55
3	0.24375	0.18	39.71	25.37	39.89	25.55	61.97	51.97	-22.08	-26.42
4	0.29453	0.19	40.22	25.25	40.41	25.44	60.40	50.40	-19.99	-24.96
5	4.24609	0.39	20.09	3.75	20.48	4.14	56.00	46.00	-35.52	-41.86
6	12.87891	0.69	12.41	-3.33	13.10	-2.64	60.00	50.00	-46.90	-52.64

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.

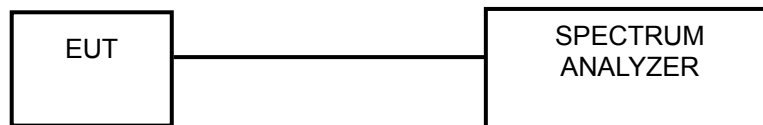


4.3 NUMBER OF HOPPING FREQUENCY USED

4.3.1 LIMIT OF HOPPING FREQUENCY USED

At least 50 channels frequencies, and should be equally spaced.

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. 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.

4.3.5 DEVIATION FROM TEST STANDARD

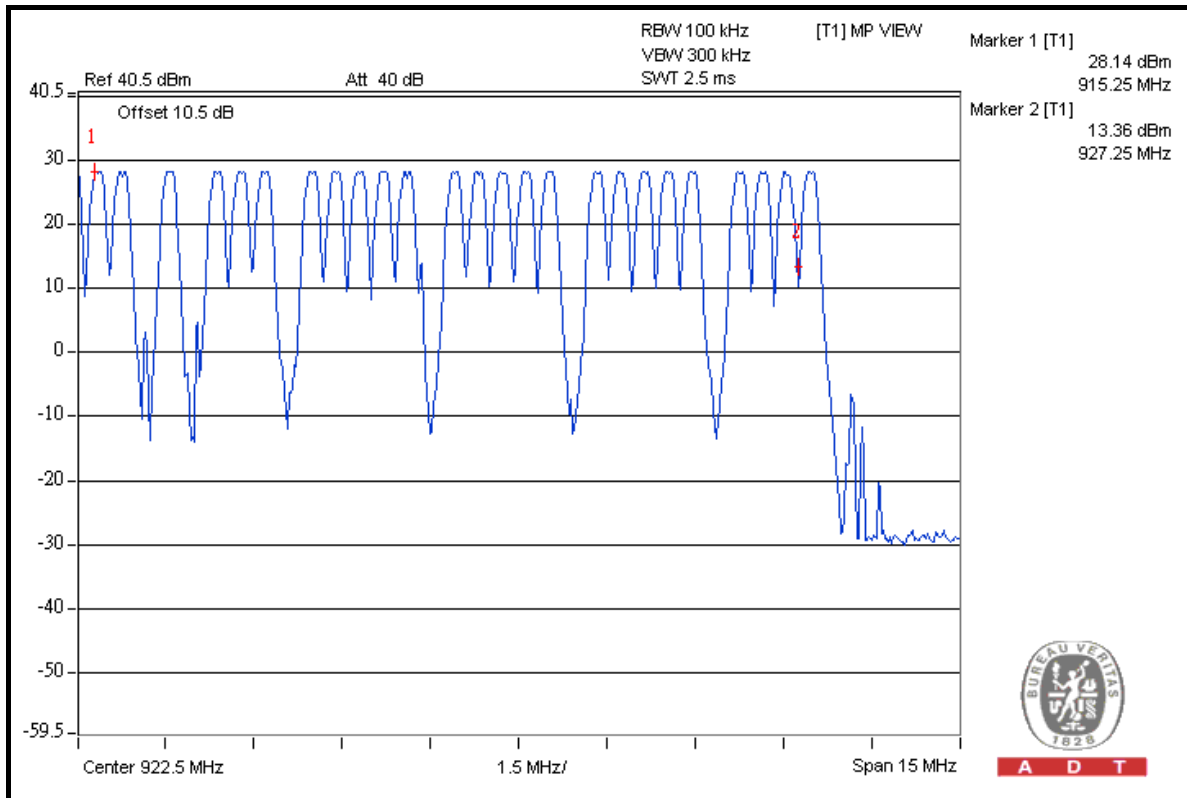
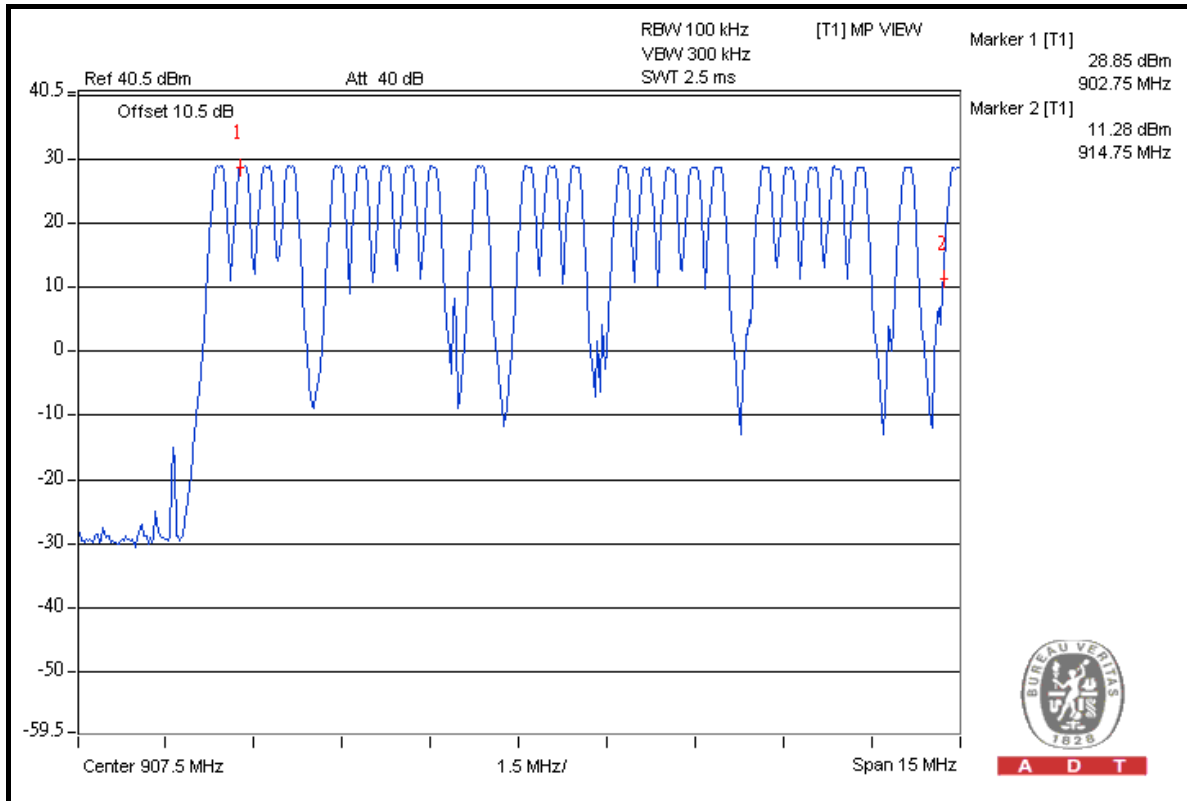
No deviation.

4.3.6 TEST RESULTS

There are 50 hopping frequencies in the hopping mode. Please refer to next page for the test result. On the plots, it shows that the hopping frequencies are equally spaced.



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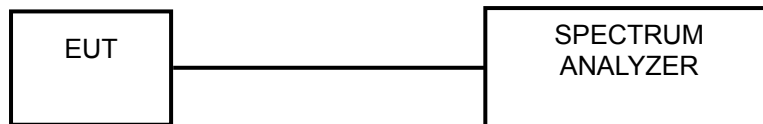


4.4 DWELL TIME ON EACH CHANNEL

4.4.1 LIMIT OF DWELL TIME USED

The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period.

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 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.

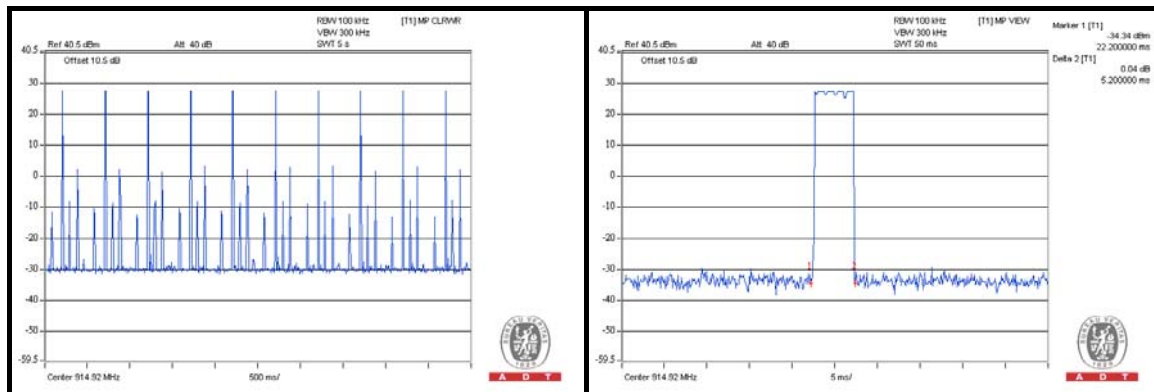
4.4.5 DEVIATION FROM TEST STANDARD

No deviation.

4.4.6 TEST RESULTS

Length of transmission time (ms)	TX Burst of 20s period	Result	Limit
5.2	40	208.00ms / 20s	400ms / 20s

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

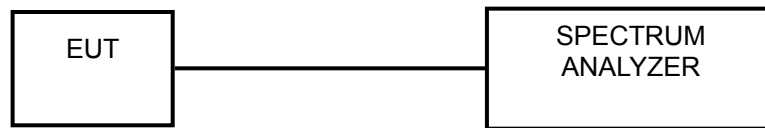


4.5 CHANNEL BANDWIDTH

4.5.1 LIMITS OF CHANNEL BANDWIDTH

The 20 dB bandwidth of the hopping channel shall be less than 250 kHz.

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

- 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.

4.5.5 DEVIATION FROM TEST STANDARD

No deviation.

4.5.6 EUT OPERATING CONDITION

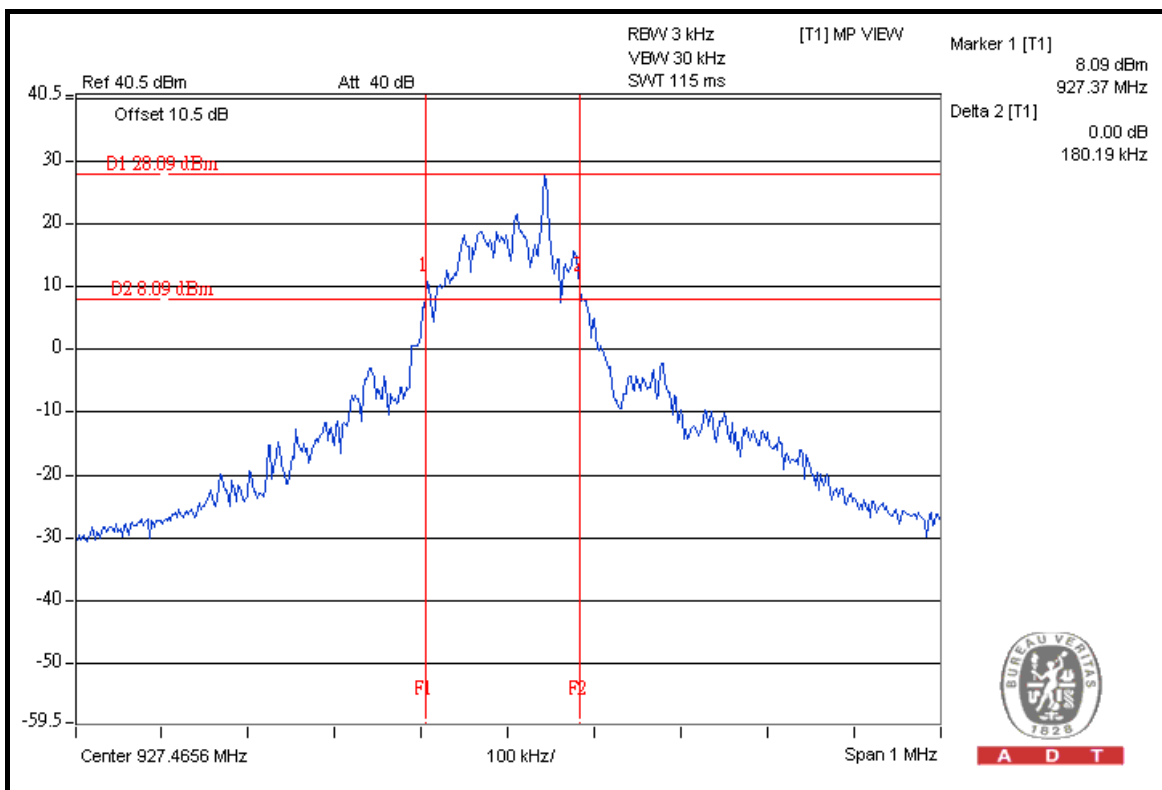
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.



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4.5.7 TEST RESULTS

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (kHz)	LIMIT (kHz)
1	902.3840	178.56	250
25	914.9248	178.17	250
50	927.4656	180.19	250

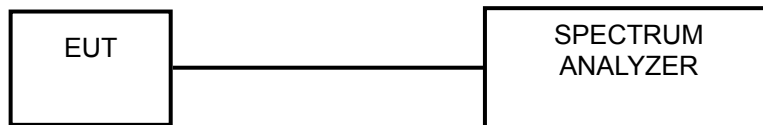


4.6 HOPPING CHANNEL SEPARATION

4.6.1 LIMIT OF HOPPING CHANNEL SEPARATION

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

4.6.2 TEST SETUP



4.6.3 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.6.4 TEST PROCEDURES

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
3. By using the MaxHold function record the separation of two adjacent channels.
4. Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

4.6.5 DEVIATION FROM TEST STANDARD

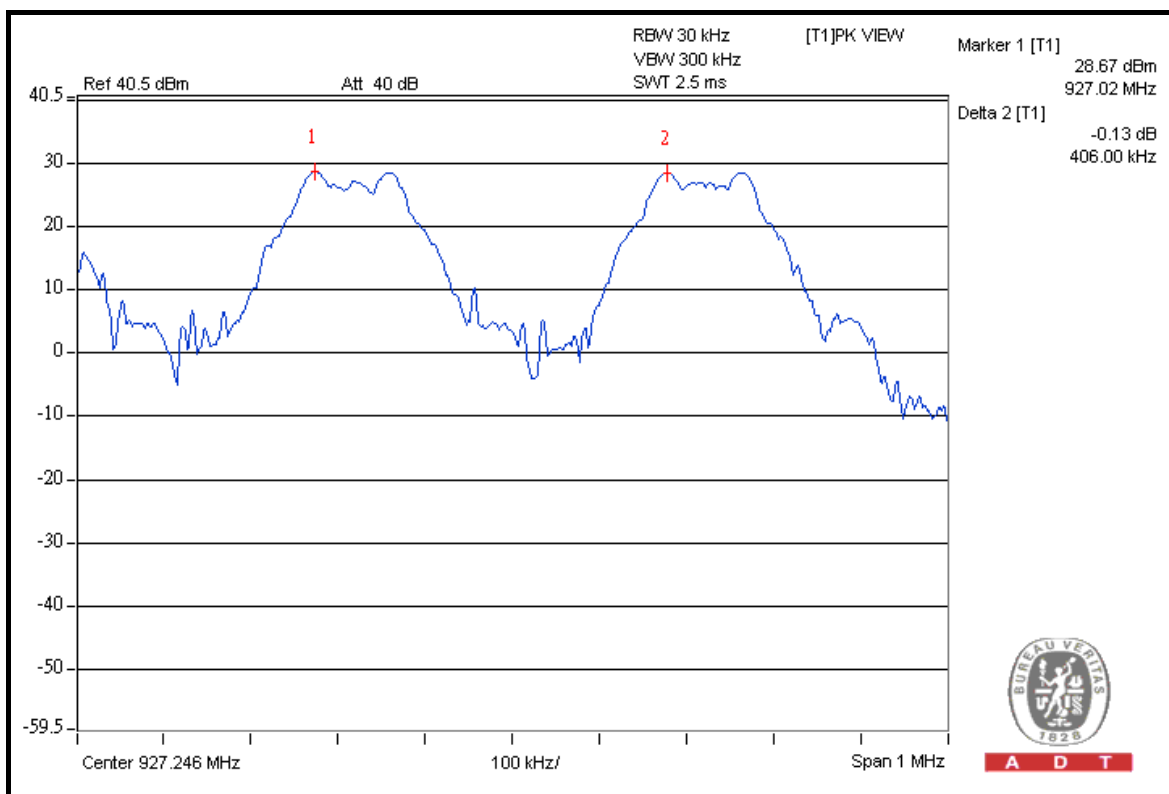
No deviation.



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4.6.6 TEST RESULTS

CHANNEL	FREQUENCY (MHz)	ADJACENT CHANNEL SEPARATION (kHz)	MINIMUM LIMIT (kHz)	PASS / FAIL
1	902.3840	406.00	100.00	PASS
25	914.9248	406.00	100.00	PASS
50	927.4656	406.00	100.00	PASS



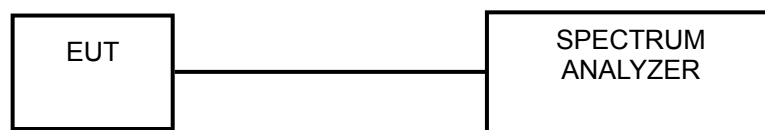
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4.7 MAXIMUM OUTPUT POWER

4.7.1 LIMITS OF MAXIMUM OUTPUT POWER MEASUREMENT

The Maximum Output Power Measurement is 30dBm.

4.7.2 TEST SETUP



4.7.3 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.7.4 TEST PROCEDURES

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 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.
- The center frequency of the spectrum analyzer is set to the fundamental frequency and using 1MHz RBW and 3 MHz VBW.
- Measure the captured power within the band and recording the plot.
- Repeat above procedures until all frequencies required were complete.

4.7.5 DEVIATION FROM TEST STANDARD

No deviation

4.7.6 EUT OPERATING CONDITION

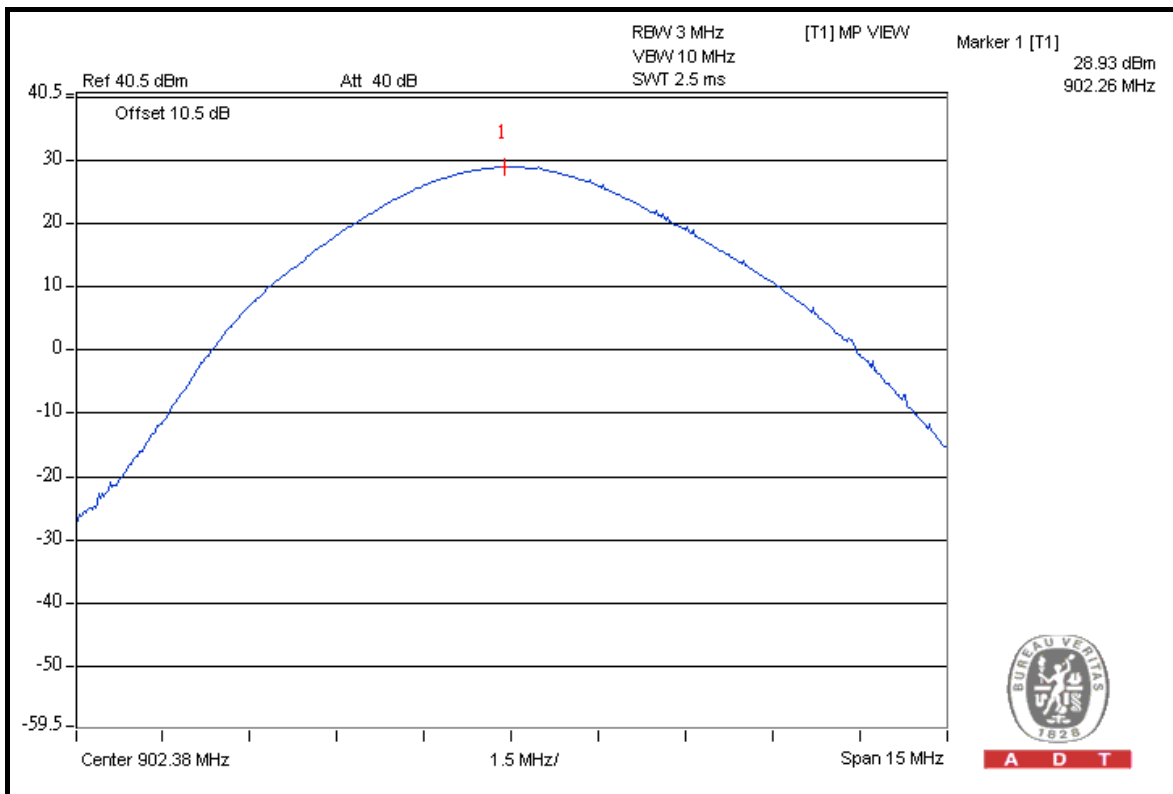
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.



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4.7.7 TEST RESULTS

CHANNEL	CHANNEL FREQUENCY (MHz)	POWER OUTPUT (mW)	POWER OUTPUT (dBm)	POWER LIMIT (dBm)	PASS/FAIL
1	902.3840	781.628	28.93	30	PASS
25	914.9248	765.597	28.84	30	PASS
50	927.4656	760.326	28.81	30	PASS



4.8 CONDUCTED OUT OF BAND EMISSION MEASUREMENT

4.8.1 LIMITS OF CONDUCTED OUT OF BAND EMISSION MEASUREMENT

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

4.8.2 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.8.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to $100 / 300 \text{ kHz}$ 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 and highest channel frequencies individually.

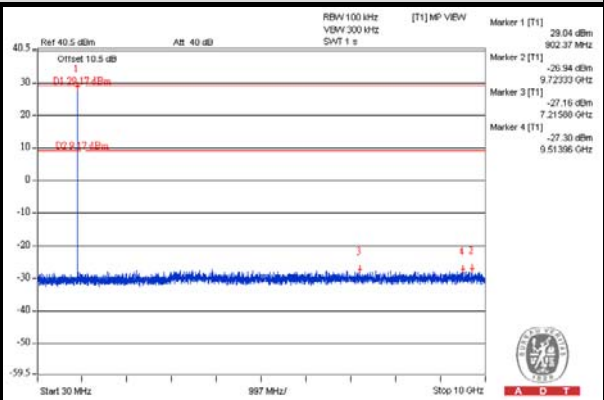
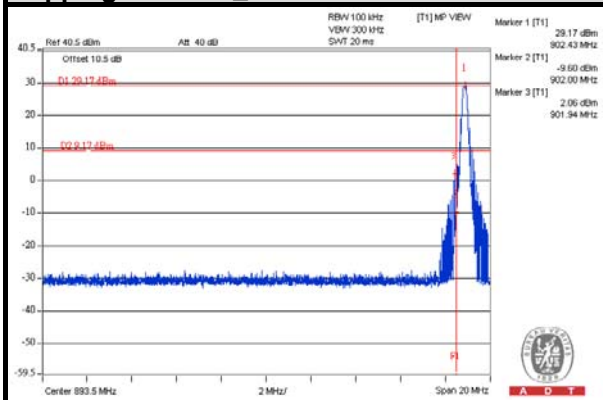
4.8.6 TEST RESULTS

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

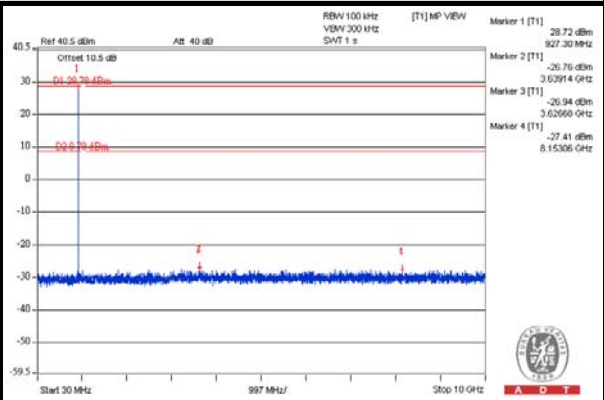
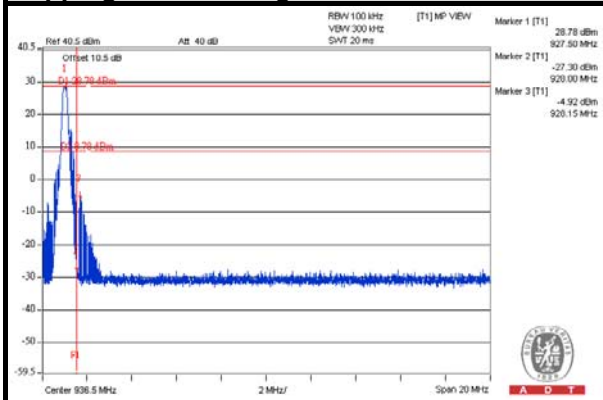


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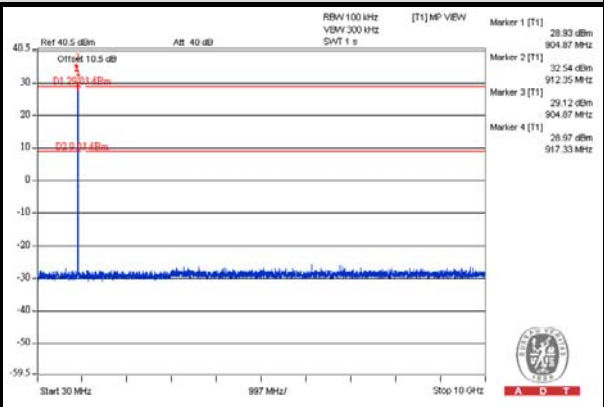
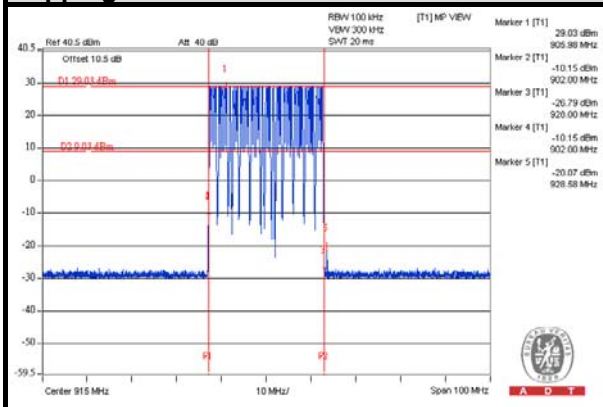
Hopping disabled_Low Channel



Hopping disabled_High Channel



Hopping enabled





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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:

Linko EMC/RF Lab:

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF Lab:

Tel: 886-3-5935343

Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety Telecom Lab:

Tel: 886-3-3183232

Fax: 886-3-3270892

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

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

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