

FCC Test Report

Report No.: RF150116D04-3

FCC ID: P27DLC200SUS

Test Model: DLC-200SUS

Series Model: DLC-200Sxxx (where "x" is blank, number or any characters)

Received Date: Jan. 16, 2015

Test Date: Jan. 26 ~ Jul. 17, 2015

Issued Date: Jul. 23, 2015

Applicant: Sercomm Corp.

Address: 8F, No. 3-1, YuangQu St., NanKang, Taipei 115, Taiwan, R.O.C. (NanKang Software Park)

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C.)



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A D T

Release Control Record

Issue No.	Description	Date Issued
RF150116D04-3	Original release.	Jul. 23, 2015

1 Certificate of Conformity

Product: Digital Life Controller

Brand: Sercomm

Test Model: DLC-200SUS

Series Model: DLC-200Sxxx (where "x" is blank, number or any characters)

Sample Status: Engineering sample

Applicant: Sercomm Corp.

Test Date: Jan. 26 ~ Jul. 17, 2015

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10:2009

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:

Jul. 23, 2015

Celia Chen / Senior Specialist

Approved by :



Date:

Jul. 23, 2015

Rex Lai / Assistant 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	PASS	Meet the requirement of limit. Minimum passing margin is -12.04dB at 0.20477MHz.
15.247(a)(1)(iii)	Number of Hopping Frequency Used	PASS	Meet the requirement of limit.
15.247(a)(1)(iii)	Dwell Time on Each Channel	PASS	Meet the requirement of limit.
15.247(a)(1)	1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	PASS	Meet the requirement of limit.
15.247(b)	Maximum Peak Output Power	PASS	Meet the requirement of limit.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -6.0dB at 49.41MHz.
15.247(d)	Antenna Port Emission	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	Antenna connector is I-PEX.

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) ($\pm$)
Conducted Emissions at mains ports	150kHz ~ 30MHz	3.43 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1000MHz	4.00 dB
Radiated Emissions above 1 GHz	1GHz ~ 40GHz	3.36 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Digital Life Controller
Brand	Sercomm
Test Model	DLC-200SUS
Series Model	DLC-200Sxxx (where “x” is blank, number or any characters)
Model Difference	Marketing Differentiation
Status of EUT	Engineering sample
Power Supply Rating	55Vdc or 56Vdc from PoE or 7.4Vdc from battery
Modulation Type	GFSK
Modulation Technology	FHSS
Transfer Rate	38.8298 Kbps
Operating Frequency	903.248MHz ~ 927.715MHz
Number of Channel	81
Output Power	11.912mW
Antenna Type	PIFA antenna with 1.22dBi gain
Antenna Connector	I-PEX
Accessory Device	Refer to note below
Data Cable Supplied	N/A

Note:

1. The EUT uses following PoE (support unit provided by client) or battery (accessory device).

Support unit		
PoE 1	Brand	Microsemi
	Model	PD-9001GR/AT/AC
	Input Power	100-240V, 50/60Hz, 0.67A
	Output Power	55V, 0.6A
PoE 2	Brand	PHIHONG
	Model	POE31U-1AT(SC)-R
	Input Power	100-240V, 0.8A, 50-60Hz
	Output Power	56V, 0.536A
Accessory device		
Battery	Brand	Simplo
	Model	DLC-200S
	Rating	7.4V, 8100mAh, 59.9Wh

After pre-tested above power source, the **PoE 2** was the worst case, therefore, only its test data was recorded in this report.

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

81 channels are provided for EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
4	903.248	36	911.237	63	917.978	85	923.471
5	903.498	37	911.487	64	918.228	86	923.720
6	903.747	38	911.736	65	918.477	87	923.970
7	903.997	39	911.986	66	918.727	88	924.220
8	904.247	40	912.236	67	918.977	89	924.469
9	904.496	41	912.485	68	919.226	90	924.719
12	905.245	42	912.735	69	919.476	91	924.969
14	905.745	43	912.985	70	919.726	92	925.218
15	905.994	44	913.234	71	919.975	93	925.468
16	906.244	45	913.484	72	920.225	94	925.718
17	906.494	46	913.734	74	920.724	95	925.967
18	906.743	47	913.983	75	920.974	96	926.217
19	906.993	48	914.233	76	921.224	97	926.467
20	907.243	49	914.483	77	921.473	98	926.716
21	907.492	50	914.732	78	921.723	99	926.966
28	909.240	51	914.982	79	921.973	100	927.216
29	909.489	58	916.730	80	922.222	101	927.465
32	910.238	59	916.979	81	922.472	102	927.715
33	910.488	60	917.229	82	922.722		
34	910.738	61	917.479	83	922.971		
35	910.987	62	917.728	84	923.221		

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE ³ 1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

Where **RE³1G**: Radiated Emission above 1GHz **RE<1G**: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **APCM**: Antenna Port Conducted Measurement

NOTE: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.

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 TECHNOLOGY	MODULATION TYPE
-	4 to 102	4, 51, 102	FHSS	GFSK

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 TECHNOLOGY	MODULATION TYPE
-	4 to 102	4, 51, 102	FHSS	GFSK

Power Line Conducted Emission Test:

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
-	4 to 102	4	FHSS	GFSK

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 TECHNOLOGY	MODULATION TYPE
-	4 to 102	4, 51, 102	FHSS	GFSK

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (PoE)	TESTED BY
RE ³ 1G	27deg. C, 70%RH	120Vac, 60Hz	Aaron You
RE<1G	27deg. C, 70%RH	120Vac, 60Hz	Aaron You
PLC	22deg. C, 78%RH	120Vac, 60Hz	Justin Liu
APCM	25deg. C, 60%RH	120Vac, 60Hz	Saxon Lee

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.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	EUT	Sercomm	DLC-200SUS	-	-	-
B.	PoE	PHIHONG	POE31U-1AT(SC)-R	N/A	N/A	Supplied by client
C.	Notebook	DELL	E5410	BW33YM1	FCC DoC Approved	Provided by Lab

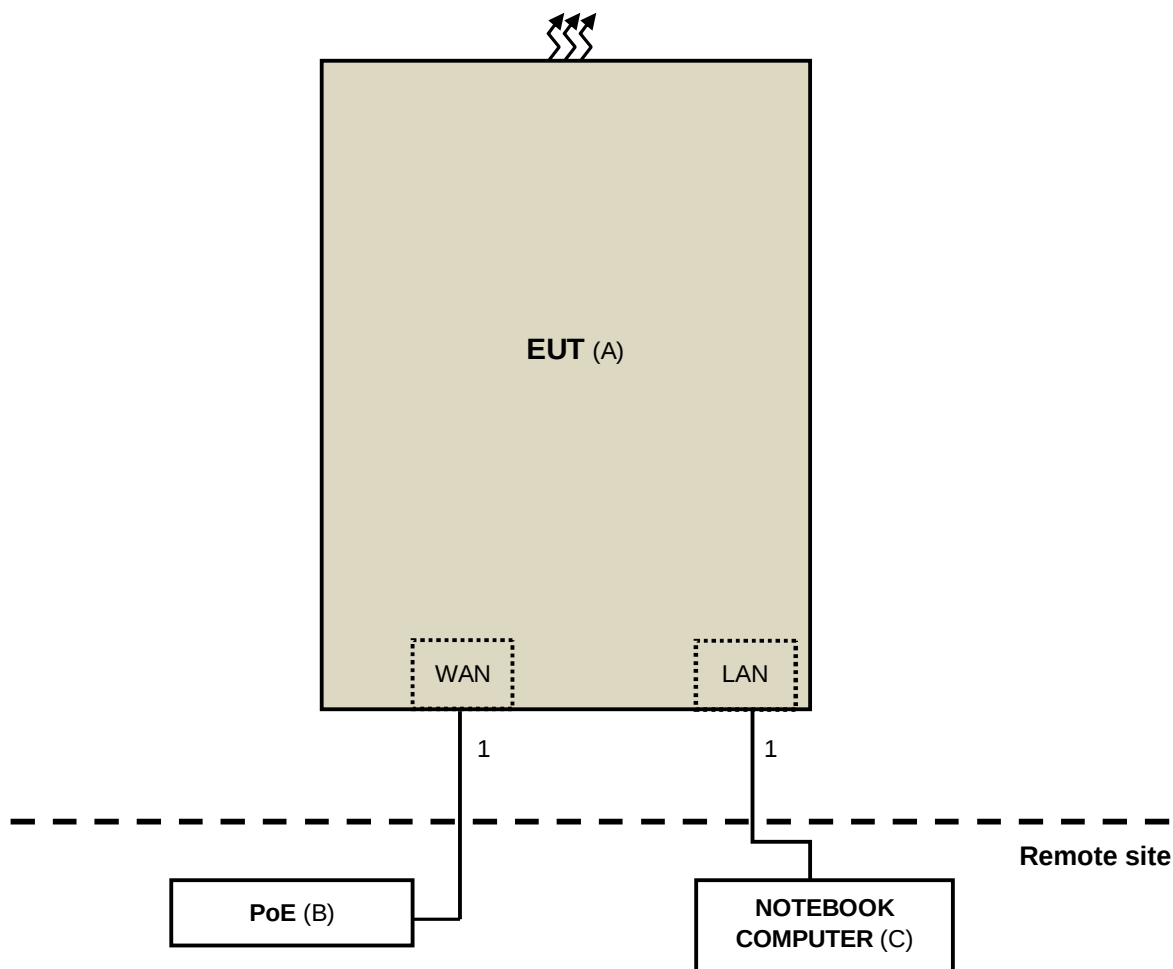
Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Items B-C acted as communication partners to transfer data.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	LAN cable	2	10	N	0	Provided by Lab

Note: The core(s) is(are) originally attached to the cable(s).

3.3.1 Configuration of System under Test



3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.247)

ANSI C63.10-2009

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

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

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
HP Preamplifier	8447D	2432A03504	Feb. 26, 2015	Feb. 25, 2016
HP Preamplifier	8449B	3008A01201	Feb. 26, 2015	Feb. 25, 2016
MITEQ Preamplifier	AMF-6F-260400-3 3-8P	892164	Mar. 01, 2015	Feb. 28, 2016
Agilent Spectrum	E4446A	MY51100050	Oct. 24, 2014	Oct. 23, 2015
Agilent TEST RECEIVER	N9038A	MY51210129	Jan. 20, 2015	Jan. 19, 2016
Schwarzbeck Antenna	VULB 9168	139	Feb. 04, 2015	Feb. 03, 2016
Schwarzbeck Horn Antenna	BBHA-9170	212	Feb. 09, 2015	Feb. 08, 2016
Schwarzbeck Horn Antenna	BBHA 9120-D1	D130	Feb. 10, 2015	Feb. 09, 2016
ADT. Turn Table	TT100	0306	NA	NA
ADT. Tower	AT100	0306	NA	NA
Software	ADT_Radiated_V7. 6.15.9.4	NA	NA	NA
SUHNER RF cable	SF104	CABLE-CH6	Aug. 15, 2014	Aug. 14, 2015
SUHNER RF cable	SF102	Cable-CH8-3.6m	Aug. 15, 2014	Aug. 14, 2015
EMCO Horn Antenna	3115	00028257	Feb. 05, 2015	Feb. 04, 2016
Highpass filter Wainwright Instruments	WHK 3.1/18G-10SS	SN 8	NA	NA
ROHDE & SCHWARZ Spectrum Analyzer	FSV40	101042	Sep. 29, 2014	Sep. 28, 2015
Anritsu Power Sensor	MA2411B	0738404	Apr. 21, 2015	Apr. 20, 2016
Anritsu Power Meter	ML2495A	0842014	Apr. 21, 2015	Apr. 20, 2016

- NOTE:**
1. The calibration interval of the above test instruments is 12/24 months. And the calibrations are traceable to NML/ROC and NIST/USA.
 2. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
 3. The test was performed in Chamber No. 6.
 4. The Industry Canada Reference No. IC 7450E-6.
 5. The FCC Site Registration No. is 447212.

4.1.3 Test Procedures

- a. The EUT was placed on the top of a rotating table 0.8 meters 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:

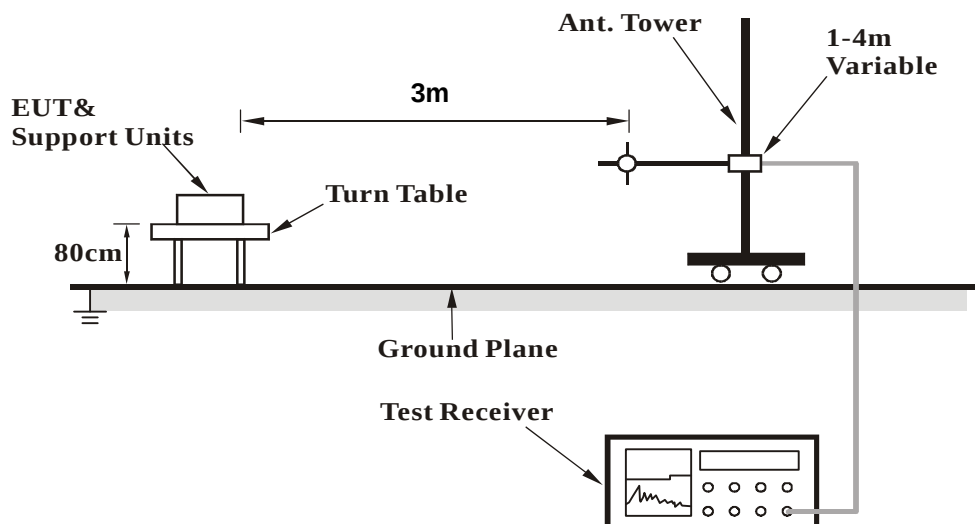
1. For emission measurements above 1 GHz, the EUT shall be placed at a height of 1.5 m above the ground at 3 meter chamber room for test
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz for Average detection (AV) at frequency above 1GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

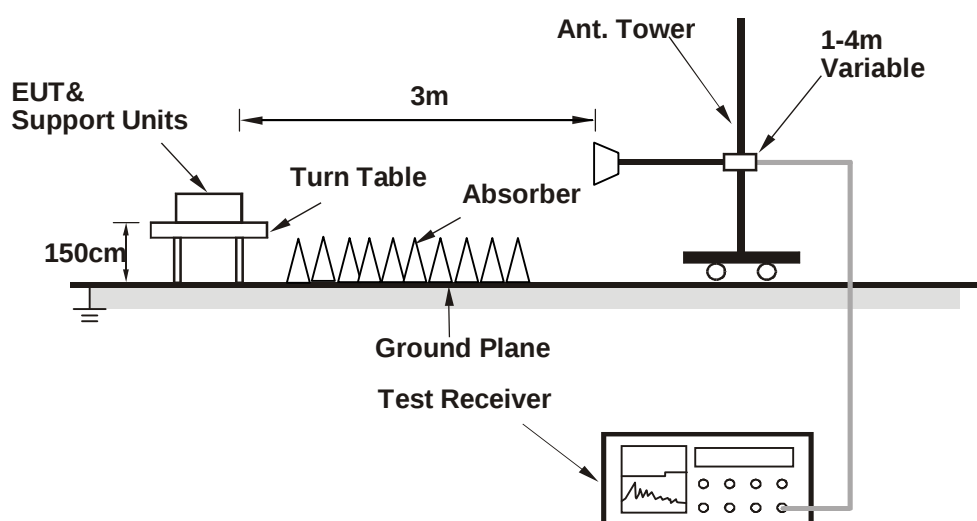
No deviation.

4.1.5 Test Set Up

<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

- Placed the EUT on the testing table.
- Prepared notebooks to act as communication partner and placed it outside of testing area.
- The communication partner connected with EUT via a RJ45 cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
- The necessary accessories enable the system in full functions.

4.1.7 Test Results

BELOW 1GHz DATA

CHANNEL	TX Channel 4	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 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	106.63	30.3 QP	43.5	-13.2	4.00 H	214	47.84	-17.51
2	288.99	31.4 QP	46.0	-14.6	4.00 H	133	44.02	-12.61
3	450.01	32.0 QP	46.0	-14.0	2.07 H	59	41.32	-9.36
4	500.45	33.3 QP	46.0	-12.7	1.37 H	110	41.80	-8.47
5	727.43	38.3 QP	46.0	-7.7	1.08 H	307	42.65	-4.37
6	*903.248	98.2 QP			1.01 H	90	99.71	-1.55
7	986.42	34.1 QP	54.0	-19.9	1.00 H	186	34.41	-0.27
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	42.61	33.5 QP	40.0	-6.5	1.25 V	323	47.69	-14.15
2	148.34	28.3 QP	43.5	-15.2	1.00 V	297	41.98	-13.68
3	287.05	24.9 QP	46.0	-21.1	1.52 V	213	37.57	-12.63
4	500.45	34.1 QP	46.0	-11.9	2.27 V	61	42.58	-8.47
5	727.43	38.7 QP	46.0	-7.3	2.83 V	241	43.04	-4.37
6	*903.248	90.2 QP			1.69 V	274	91.70	-1.55
7	971.87	28.2 QP	54.0	-25.8	1.93 V	35	28.61	-0.44

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 51	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 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	106.63	34.5 QP	43.5	-9.0	4.00 H	224	52.02	-17.51
2	226.91	29.3 QP	46.0	-16.7	4.00 H	112	45.67	-16.35
3	293.84	32.9 QP	46.0	-13.1	4.00 H	192	45.33	-12.47
4	500.45	34.5 QP	46.0	-11.5	2.11 H	275	43.00	-8.47
5	600.36	31.4 QP	46.0	-14.6	1.38 H	77	37.96	-6.54
6	739.07	38.0 QP	46.0	-8.0	1.10 H	189	42.11	-4.09
7	*914.982	96.6 QP			1.05 H	112	97.91	-1.32
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	49.41	34.0 QP	40.0	-6.0	1.34 V	226	47.81	-13.81
2	148.34	26.8 QP	43.5	-16.8	1.00 V	73	40.43	-13.68
3	288.99	24.2 QP	46.0	-21.8	1.00 V	144	36.81	-12.61
4	500.45	31.3 QP	46.0	-14.7	1.86 V	203	39.73	-8.47
5	739.07	31.5 QP	46.0	-14.5	2.34 V	302	35.55	-4.09
6	*914.982	89.6 QP			1.79 V	292	90.90	-1.32
7	968.96	28.5 QP	54.0	-25.5	1.88 V	109	28.98	-0.52

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 102	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 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	47.46	19.9 QP	40.0	-20.1	4.00 H	224	33.76	-13.85
2	226.91	27.8 QP	46.0	-18.2	4.00 H	208	44.15	-16.35
3	292.87	29.6 QP	46.0	-16.5	3.78 H	41	42.05	-12.50
4	450.01	32.0 QP	46.0	-14.0	1.83 H	165	41.32	-9.36
5	779.81	31.0 QP	46.0	-15.0	1.10 H	184	34.23	-3.23
6	*927.715	96.6 QP			1.01 H	116	97.71	-1.15
7	981.57	31.3 QP	54.0	-22.7	1.00 H	322	31.52	-0.22
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	52.31	31.7 QP	40.0	-8.3	1.62 V	89	45.51	-13.83
2	160.95	21.7 QP	43.5	-21.8	1.00 V	85	35.28	-13.57
3	199.75	24.6 QP	43.5	-18.9	1.00 V	117	40.91	-16.29
4	292.87	23.3 QP	46.0	-22.7	1.00 V	242	35.83	-12.50
5	500.45	31.7 QP	46.0	-14.3	1.60 V	13	40.18	-8.47
6	786.60	27.6 QP	46.0	-18.4	2.34 V	326	30.82	-3.24
7	*927.715	89.7 QP			1.15 V	296	90.89	-1.16

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.

ABOVE 1GHz DATA

CHANNEL	TX Channel 4	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	#1806.52	42.8 PK	74.0	-31.2	1.66 H	158	49.60	-6.81
2	#1806.52	38.6 AV	54.0	-15.4	1.66 H	158	45.45	-6.81
3	5419.32	50.5 PK	74.0	-23.5	1.00 H	0	46.38	4.09
4	5419.32	47.1 AV	54.0	-6.9	1.00 H	0	43.03	4.09
5	#6322.92	61.8 PK	98.2	-36.4	1.01 H	162	55.64	6.14
6	#6322.92	57.6 AV	78.2	-20.6	1.01 H	162	51.50	6.14
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	#1806.36	40.9 PK	74.0	-33.1	1.00 V	3	47.67	-6.81
2	#1806.36	31.3 AV	54.0	-22.7	1.00 V	3	38.14	-6.81
3	5419.33	50.6 PK	74.0	-23.4	1.20 V	182	46.51	4.09
4	5419.33	45.9 AV	54.0	-8.1	1.20 V	182	41.84	4.09
5	#6322.91	58.3 PK	90.2	-31.9	1.02 V	167	52.11	6.14
6	#6322.91	55.5 AV	70.2	-14.7	1.02 V	167	49.31	6.14

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. " # ": The radiated frequency is out of the restricted band.

CHANNEL	TX Channel 51	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	#1829.91	42.8 PK	74.0	-31.2	1.00 H	222	49.53	-6.71
2	#1829.91	35.9 AV	54.0	-18.1	1.00 H	222	42.62	-6.71
3	#5490.03	51.3 PK	74.0	-22.7	1.15 H	1	46.88	4.42
4	#5490.03	45.0 AV	54.0	-9.0	1.15 H	1	40.55	4.42
5	#6405.09	60.0 PK	96.6	-36.6	1.07 H	182	53.58	6.46
6	#6405.09	56.2 AV	76.6	-20.4	1.07 H	182	49.71	6.46
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	#1829.89	41.0 PK	74.0	-33.0	1.07 V	360	47.73	-6.71
2	#1829.89	32.8 AV	54.0	-21.2	1.07 V	360	39.51	-6.71
3	#5490.12	52.4 PK	74.0	-21.6	1.32 V	248	47.96	4.42
4	#5490.12	45.8 AV	54.0	-8.2	1.32 V	248	41.37	4.42
5	#6405.02	56.8 PK	89.6	-32.8	1.00 V	168	50.36	6.46
6	#6405.02	52.4 AV	69.6	-17.2	1.00 V	168	45.93	6.46

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. " # ": The radiated frequency is out of the restricted band.

CHANNEL	TX Channel 102	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	#1855.39	43.0 PK	74.0	-31.0	1.00 H	201	49.57	-6.59
2	#1855.39	34.6 AV	54.0	-19.5	1.00 H	201	41.14	-6.59
3	#5566.24	53.1 PK	74.0	-20.9	1.01 H	360	48.54	4.53
4	#5566.24	47.2 AV	54.0	-6.8	1.01 H	360	42.66	4.53
5	#6493.97	58.6 PK	96.6	-38.0	1.07 H	179	51.70	6.85
6	#6493.97	54.7 AV	76.6	-21.9	1.07 H	179	47.86	6.85
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	#1855.44	41.7 PK	74.0	-32.3	1.22 V	17	48.30	-6.59
2	#1855.44	34.4 AV	54.0	-19.6	1.22 V	17	41.02	-6.59
3	#5566.46	52.3 PK	74.0	-21.8	1.41 V	242	47.72	4.53
4	#5566.46	46.4 AV	54.0	-7.6	1.41 V	242	41.91	4.53
5	#6494.03	56.9 PK	89.7	-32.8	1.00 V	360	50.09	6.85
6	#6494.03	34.9 AV	69.7	-34.8	1.00 V	360	28.08	6.85

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. " # ": The radiated frequency is out of the restricted band.

4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
ROHDE & SCHWARZ TEST RECEIVER	ESCS 30	100292	Dec. 18, 2014	Dec. 17, 2015
ROHDE & SCHWARZ Artificial Mains Network (for EUT)	ESH2-Z5	100104	Dec. 04, 2014	Dec. 03, 2015
LISN With Adapter (for EUT)	AD10	C09Ada-001	Dec. 04, 2014	Dec. 03, 2015
ROHDE & SCHWARZ Artificial Mains Network (for peripherals)	ESH3-Z5	847265/023	Oct. 21, 2014	Oct. 20, 2015
SCHWARZBECK Artificial Mains Network (For EUT)	NNLK8129	8129229	May 06, 2015	May 05, 2016
Software	ADT_Cond_V7.3.7	NA	NA	NA
RF cable (JYEBAO)	5D-FB	Cable-C09.01	Feb. 24, 2015	Feb. 23, 2016
SUHNER Terminator (For ROHDE & SCHWARZ LISN)	65BNC-5001	E1-010789	May 19, 2015	May 18, 2016
ROHDE & SCHWARZ Artificial Mains Network (For TV EUT)	ESH3-Z5	100220	Nov. 20, 2014	Nov. 19, 2015
LISN With Adapter (for TV EUT)	100220	N/A	Nov. 20, 2014	Nov. 19, 2015

Notes: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in Shielded Room No. 9.

3. The VCCI Site Registration No. C-1312.

4.2.3 Test Procedures

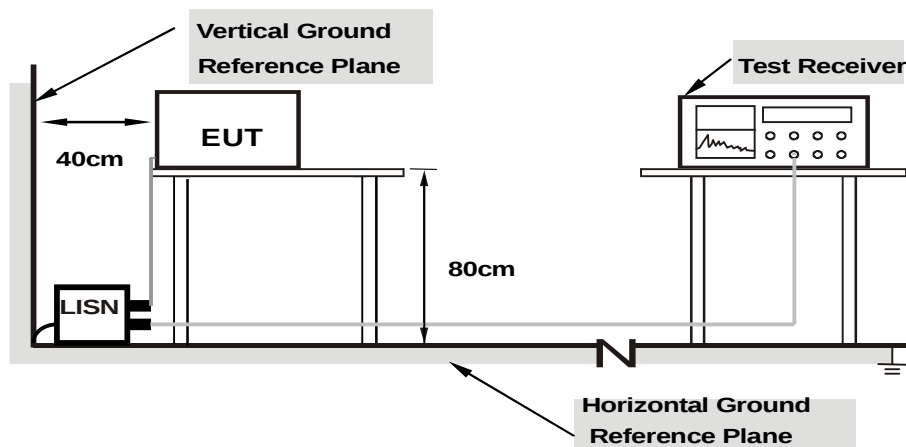
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

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 Condition

Same as item 4.1.6.

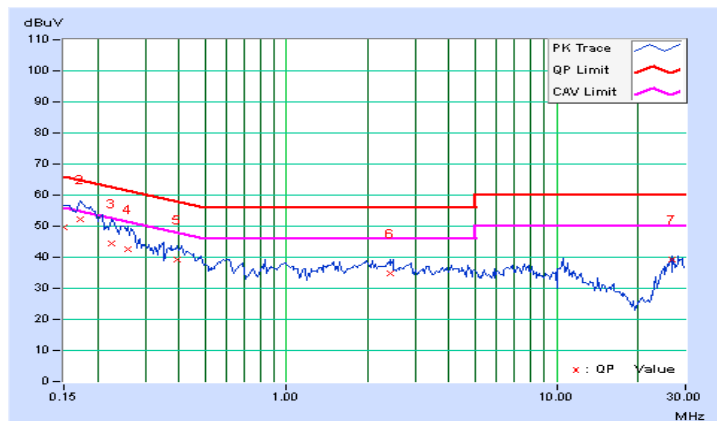
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.20	49.53	31.08	49.73	31.28	66.00	56.00	-16.27	-24.72
2	0.17344	0.20	51.99	30.02	52.19	30.22	64.79	54.79	-12.60	-24.57
3	0.22422	0.21	44.27	23.91	44.48	24.12	62.66	52.66	-18.18	-28.54
4	0.25938	0.22	42.29	25.15	42.51	25.37	61.45	51.45	-18.94	-26.08
5	0.39219	0.25	38.87	27.01	39.12	27.26	58.02	48.02	-18.90	-20.76
6	2.41406	0.40	34.57	23.20	34.97	23.60	56.00	46.00	-21.03	-22.40
7	26.60938	1.03	38.37	34.78	39.40	35.81	60.00	50.00	-20.60	-14.19

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

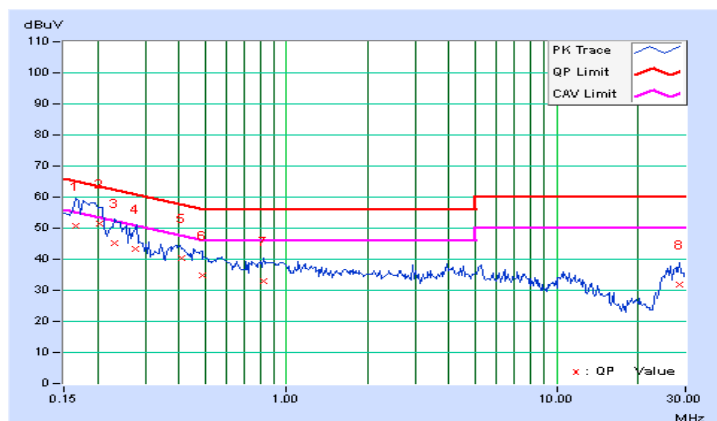


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16562	0.21	50.41	33.50	50.62	33.71	65.18	55.18	-14.56	-21.47
2	0.20477	0.22	51.15	31.45	51.37	31.67	63.41	53.41	-12.04	-21.74
3	0.23203	0.23	44.98	25.45	45.21	25.68	62.38	52.38	-17.17	-26.70
4	0.27509	0.24	43.13	27.74	43.37	27.98	60.96	50.96	-17.60	-22.99
5	0.41027	0.26	39.93	30.64	40.19	30.90	57.64	47.64	-17.45	-16.74
6	0.48594	0.27	34.37	22.38	34.64	22.65	56.24	46.24	-21.60	-23.59
7	0.82578	0.31	32.48	20.22	32.79	20.53	56.00	46.00	-23.21	-25.47
8	28.50391	0.50	31.47	26.19	31.97	26.69	60.00	50.00	-28.03	-23.31

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

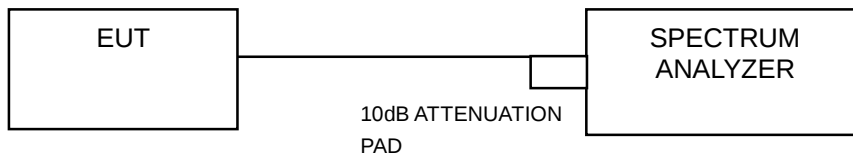


4.3 Number of Hopping Frequency Used

4.3.1 Limits of Hopping Frequency Used Measurement

At least 25 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 Procedure

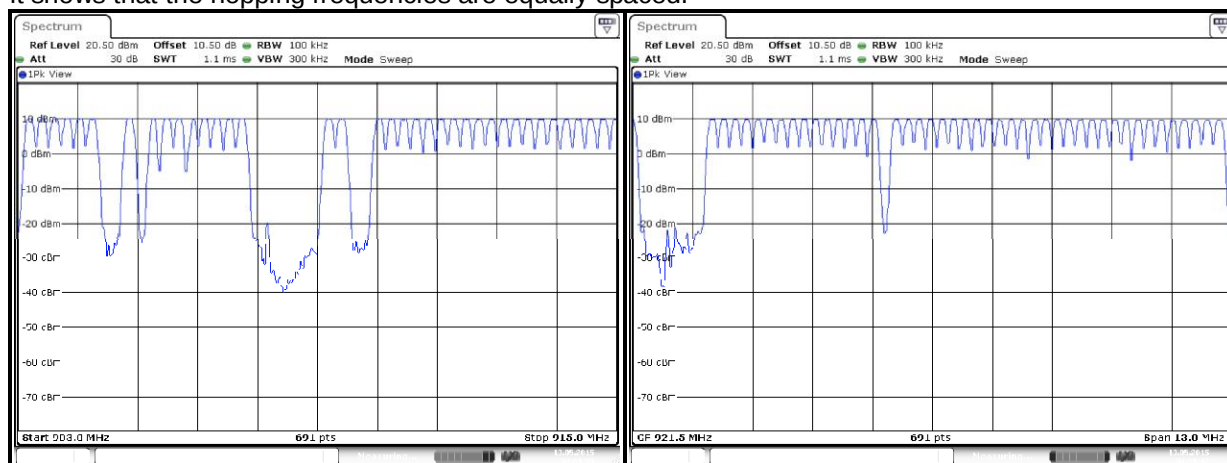
- Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
- 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.
- Set the SA on View mode and then plot the result on SA screen.
- 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 81 hopping frequencies in the hopping mode. Please refer to below for the test result. On the plots, it shows that the hopping frequencies are equally spaced.

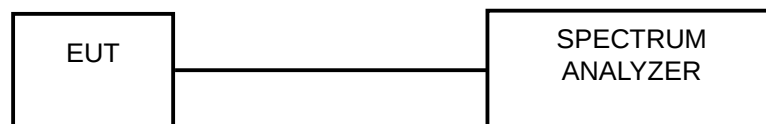


4.4 Dwell Time on Each Channel

4.4.1 Limits of Dwell Time on Each Channel Measurement

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

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

- Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- 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.
- 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.
- Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
- Repeat above procedures until all different time-slot modes have been completed.

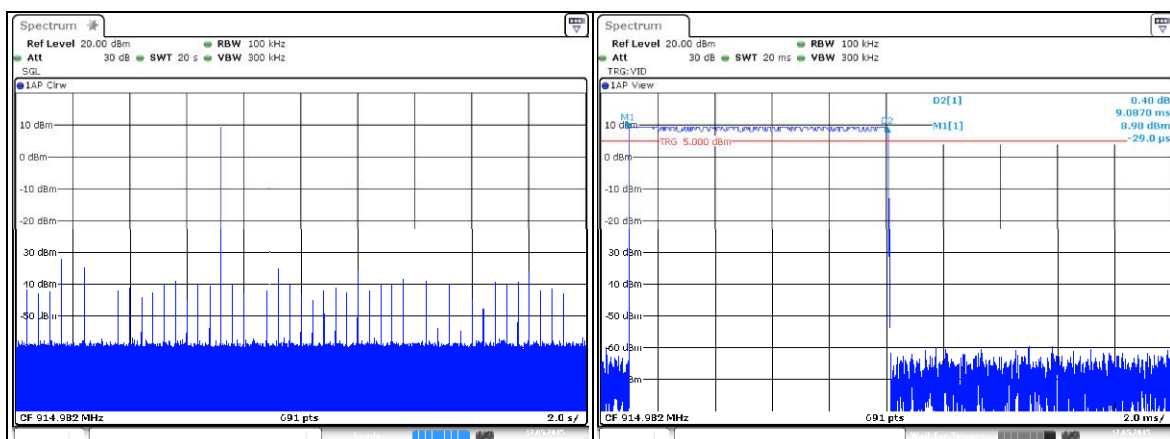
4.4.5 Deviation from Test Standard

No deviation.

4.4.6 Test Results

Number of transmission in a 32.4 (80Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
1 (times / 20 sec) * 1.62 = 1.62 times	9.087	14.72094	400

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

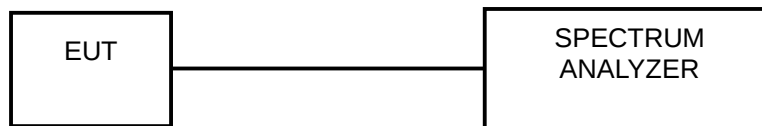


4.5 Channel Bandwidth

4.5.1 Limits of Channel Bandwidth Measurement

The 20 dB bandwidth of the hopping channel shall be less than 500 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

- 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.
- Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
- Repeat above procedures until all frequencies measured were complete.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

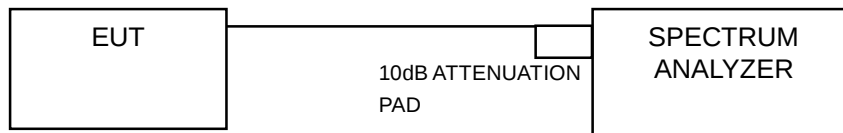
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.6 Hopping Channel Separation

4.6.1 Limits of Hopping Channel Separation Measurement

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 Procedure

Measurement Procedure REF

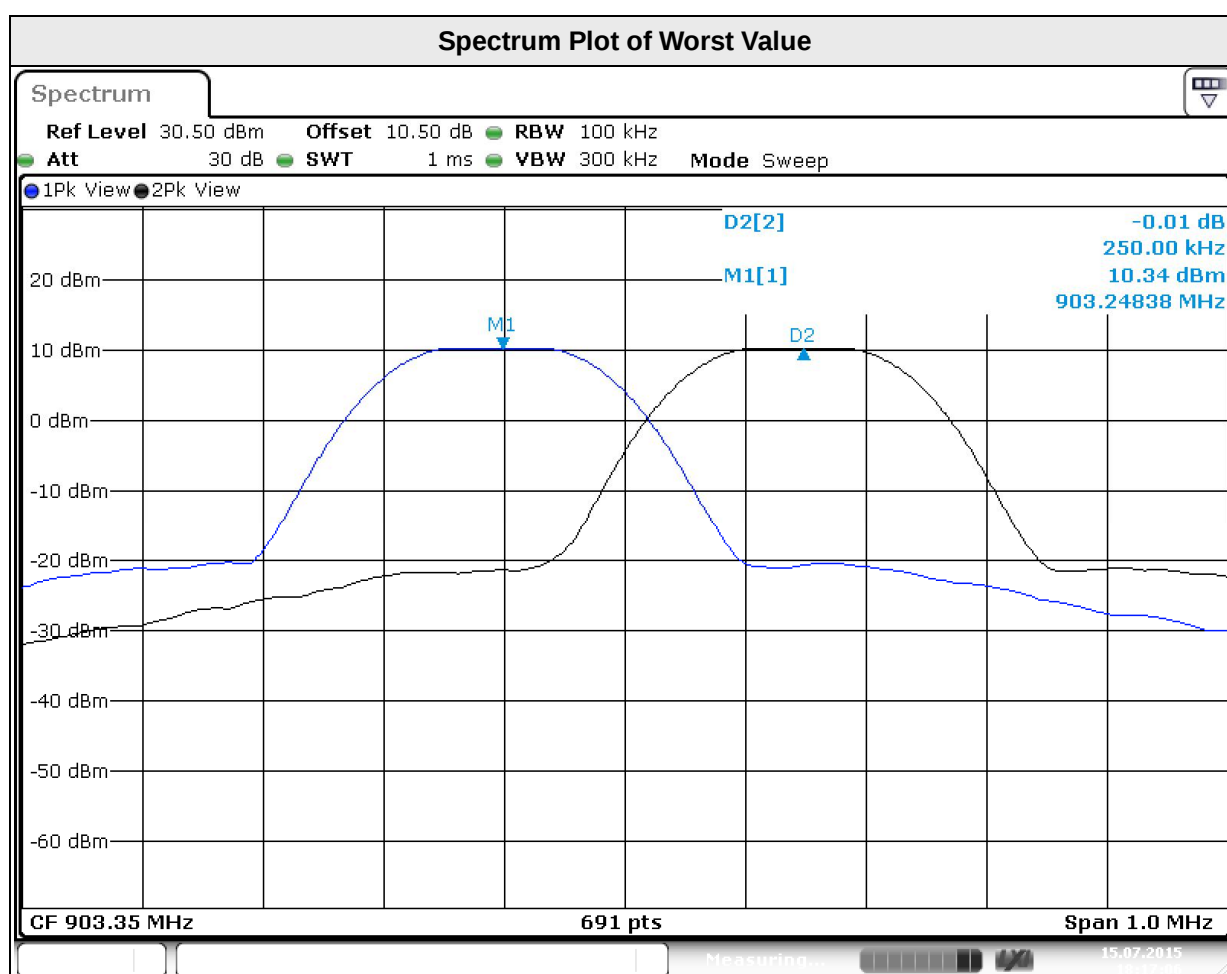
- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
- By using the MaxHold function record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

4.6.5 Deviation From Test Standard

No deviation.

4.6.6 Test Results

Channel	Frequency (MHz)	Adjacent Channel Separation (MHz)	Minimum Limit (MHz)	Pass / Fail
4	903.248	0.25	0.09	Pass
51	914.982	0.25	0.09	Pass
102	927.715	0.25	0.09	Pass

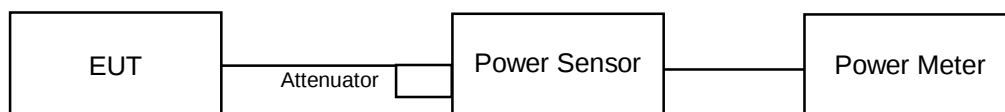


4.7 Maximum Output Power

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 Procedure

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

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.

4.7.7 Test Results

Channel	Frequency (MHZ)	Output Power (mW)	Output Power (dBm)	Power Limit (dBm)	Pass / Fail
4	903.248	11.912	10.76	30	Pass
51	914.982	11.695	10.68	30	Pass
102	927.715	11.194	10.49	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 kHz and 300 kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

4.8.4 Deviation From Test Standard

No deviation.

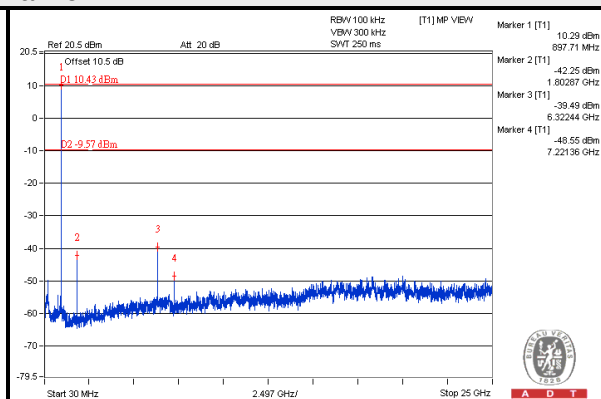
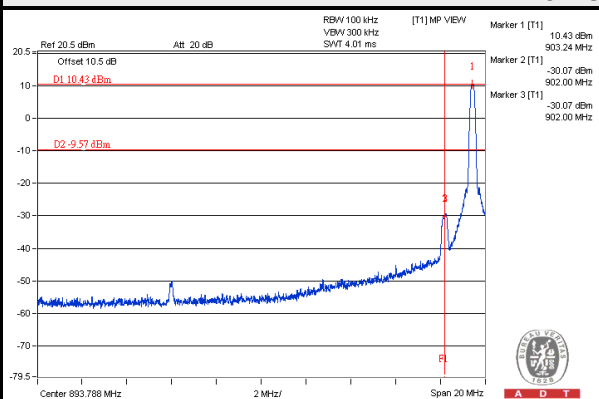
4.8.5 Eut Operating Condition

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

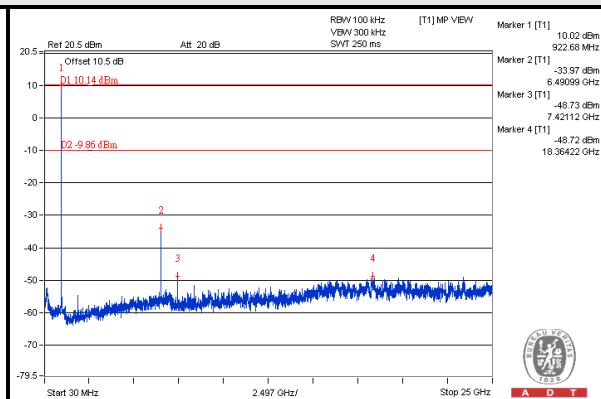
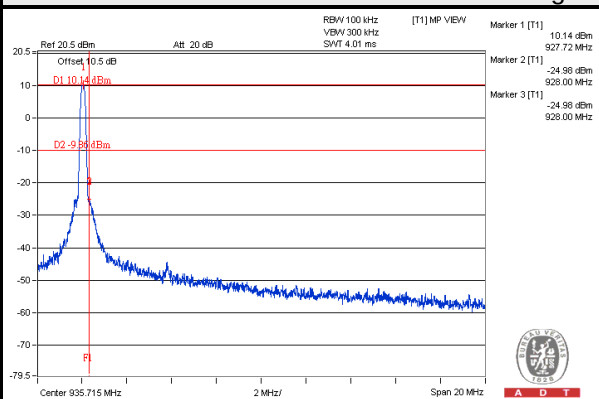
4.8.6 Test Results

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

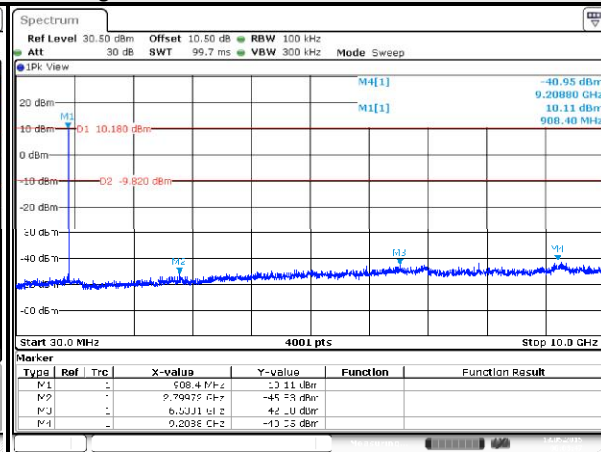
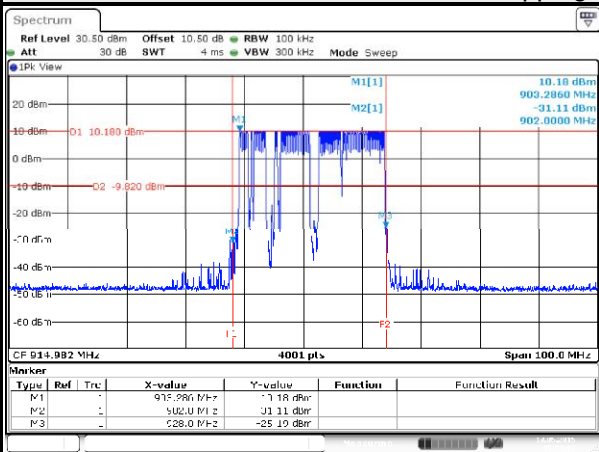
Low Channel



High Channel



Hopping 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.

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