

FCC Test Report

Report No.: RF171127C13-1

FCC ID: AZ489FT7104

Test Model: LEX L11n

Received Date: Nov. 27, 2017

Test Date: Dec. 13, 2017 ~ Feb. 01, 2018

Issued Date: Mar. 02, 2018

Applicant: Motorola Solutions, Inc.

Address: 8000 West Sunrise Boulevard, Fort Lauderdale, Florida 33322

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

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Test Location: No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)

**FCC Registration/
Designation Number:** 788550 / TW0003



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Release Control Record

Issue No.	Description	Date Issued
RF171127C13-1	Original release.	Mar. 02, 2018

1 Certificate of Conformity

Product: LEX L11 Mission Critical LTE Device

Brand: Motorola Solutions

Test Model: LEX L11n

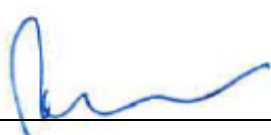
Sample Status: Engineering sample

Applicant: Motorola Solutions, Inc.

Test Date: Dec. 13, 2017 ~ Feb. 01, 2018

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

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

Prepared by :  , **Date:** Mar. 02, 2018
Pettie Chen / Senior Specialist

Approved by :  , **Date:** Mar. 02, 2018
Bruce Chen / Project Engineer

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 -15.66dB at 0.27120MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -3.8dB at 34.85MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	Pass	Meet the requirement of limit.
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	No antenna connector is used.

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.94 dB
Radiated Emissions	30MHz ~ 200MHz	3.59 dB
	200MHz ~ 1000MHz	3.60 dB
	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	LEX L11 Mission Critical LTE Device
Brand	Motorola Solutions
Test Model	LEX L11n
Status of EUT	Engineering sample
Power Supply Rating	3.7Vdc (Battery) 5Vdc or 9Vdc or 12Vdc (adapter) 5Vdc or 9Vdc (Car Charger)
Modulation Type	GFSK
Transfer Rate	1Mbps
Operating Frequency	2402 ~ 2480MHz
Number of Channel	40
Channel Spacing	2MHz
Output Power	1.164mW
Antenna Type	Monopole antenna with -3.0 dBi gain
Antenna Connector	Connector RF, Female(Receptacle/Socket), 8, Straight, Micro Coaxial, 2W, 50ohm, SMD, T/R
Accessory Device	Refer to Note as below
Data Cable Supplied	Refer to Note as below

Note:

1. The EUT uses following devices and cables.

Item	Brand	Model	Specification	Remark
Charger 1	Motorola Solutions	MU27-4090300-A1 Part No: PS000278A01	Quick USB Wall Charger Input: 100-240Vac, 50/60Hz, 0.7A Output: 5V / 3A 9V / 3A 12V / 2.25A	Accessory
Charger 2	Motorola Solutions	MU08-L050150-A1 Part No: PS000150A31	Micro USB Wall Charger Input: 100-240Vac, 50/60Hz, 16-22VA, 0.25A Output: 5V / 1.5A	Accessory
Charger 3 (Car charger)	Motorola Solutions	CB18-2090200-C Part No: PMLN7779A	Vehicle Charger Input: 12/24V / 2.0A Output: 5V / 3A; 9V / 2A 0.35m DC cable without core attached	Accessory
Battery 1 (Hi-Cap)	Motorola Solutions	PMNN4546A	3.7V RECHARGEABLE LITHIUM ION BATTERY Rating: 3.7Vdc 5000mAh	Accessory
Battery 2 (Standard)	Motorola Solutions	PMNN4545A	3.7V RECHARGEABLE LITHIUM ION BATTERY Rating: 3.7Vdc 2500mAh	Accessory
Cable 1	Motorola Solutions	CB0000756A01	Type C to Type C 0.95m shielded USB cable without core	Accessory (for Charger PS000278A01 used)
Cable 2	Motorola Solutions	CB0000754A01	Type A to Type C 0.95m shielded USB cable without core	Accessory (for Charger PS000150A31 used)

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

3.2 Description of Test Modes

40 channels are provided to this EUT:

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE $\geq$ 1G	RE<1G	PLC	APCM	
A	-	√	√	-	Power from Charger 1
B	√	√	√	√	Power from Charger 2
C	-	√	-	-	Power from Charger 3 (12Vdc)
D	-	√	-	-	Power from Charger 3 (24Vdc)

Where **RE $\geq$ 1G**: Radiated Emission above 1GHz & Bandedge Measurement

RE<1G: Radiated Emission below 1GHz

PLC: Power Line Conducted Emission

APCM: Antenna Port Conducted Measurement

Note:

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

Radiated Emission Test (Above 1GHz):

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
B	0 to 39	0, 19, 39	GFSK	1

Radiated Emission Test (Below 1GHz):

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
A, B, C, D	0 to 39	0	GFSK	1

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	DATA RATE (Mbps)
A, B	0 to 39	0	GFSK	1

Antenna Port Conducted Measurement:

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
B	0 to 39	0, 19, 39	GFSK	1

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE $\geq$ 1G	25deg. C, 66%RH	120Vac, 60Hz	Greg Lin
RE<1G	25deg. C, 65%RH	120Vac, 60Hz	Greg Lin
PLC	25deg. C, 75%RH	120Vac, 60Hz	Greg Lin
APCM	25deg. C, 60%RH	120Vac, 60Hz	Chris Lin

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.	Power Supply	acpower	ADC-48-20A	802001	NA	-

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Power cable	1	1.8	N	0	-

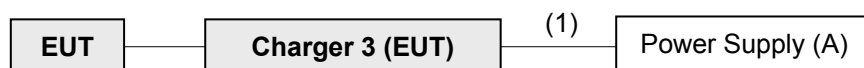
Note: The core(s) is(are) originally attached to the cable(s).

3.3.1 Configuration of System under Test

Test Mode A, B

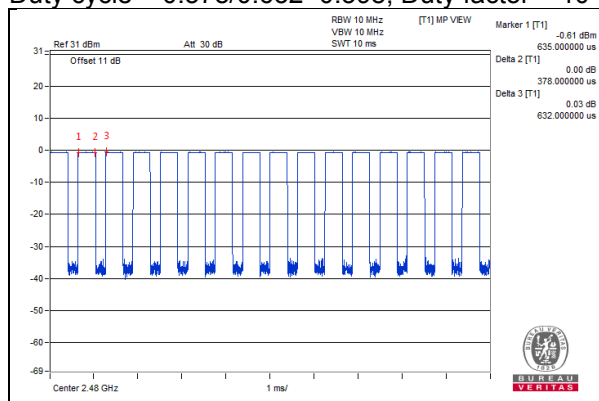


Test Mode C, D



3.4 Duty Cycle of Test Signal

Duty cycle = $0.378/0.632=0.598$, Duty factor = $10 * \log(1/0.598) = 2.23$



3.5 General Description of Applied Standards

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

FCC Part 15, Subpart C (15.247)

KDB 558074 D01 DTS Meas Guidance v04

ANSI C63.10-2013

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

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.	Cal. Date	Cal. Due
Test Receiver KEYSIGHT	N9038A	MY55420137	Mar. 27, 2017	Mar. 26, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	May 11, 2017	May 10, 2018
BILOG Antenna SCHWARZBECK	VULB9168	9168-148	Dec. 11, 2017	Dec. 10, 2018
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Dec. 12, 2017	Dec. 11, 2018
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Dec. 01, 2017	Nov. 30, 2018
Loop Antenna EMCI	EM-6879	269	Aug. 11, 2017	Aug. 10, 2018
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Aug. 08, 2017	Aug. 07, 2018
Preamplifier Agilent (Above 1GHz)	8449B	3008A01922	Sep. 15, 2017	Sep. 14, 2018
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM8000	CABLE-CH9-02 (248780+171006)	Jan. 15, 2018	Jan. 14, 2019
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/ 4)	Aug. 08, 2017	Aug. 07, 2018
RF signal cable Woken	8D-FB	Cable-CH9-01	Aug. 01, 2017	Jul. 31, 2018
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower & Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
High Speed Peak Power Meter	ML2495A	0824012	Aug. 18, 2017	Aug. 17, 2018
Power Sensor	MA2411B	0738171	Aug. 18, 2017	Aug. 17, 2018

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 Chamber 9.
 3. The FCC Designation Number is TW0003. The number will be varied with the Lab location and scope as attached.
 4. The IC Site Registration No. is IC 7450F-9.

4.1.3 Test Procedures

For Radiated emission below 30MHz

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- Both X and Y axes of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

- The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- 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.
- 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.
- 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:

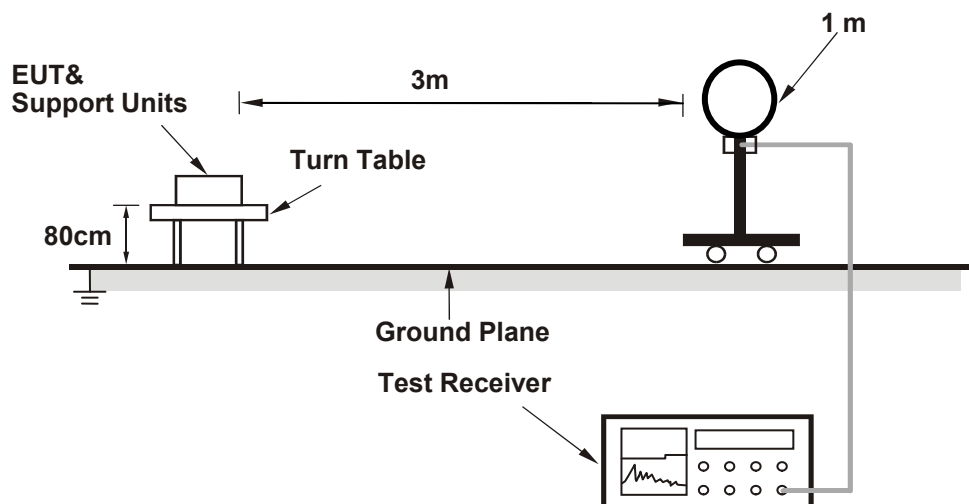
- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or $3 \times \text{RBW}$ (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.
- All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

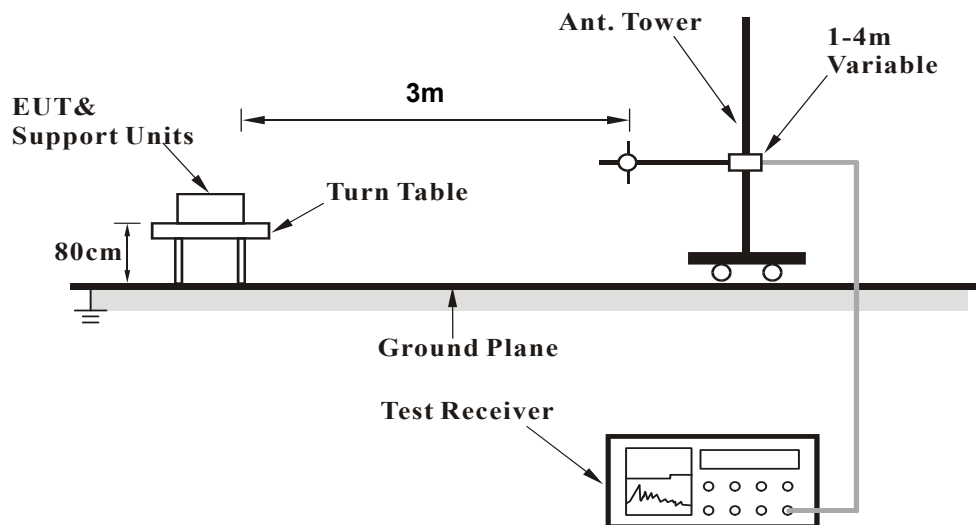
No deviation.

4.1.5 Test Set Up

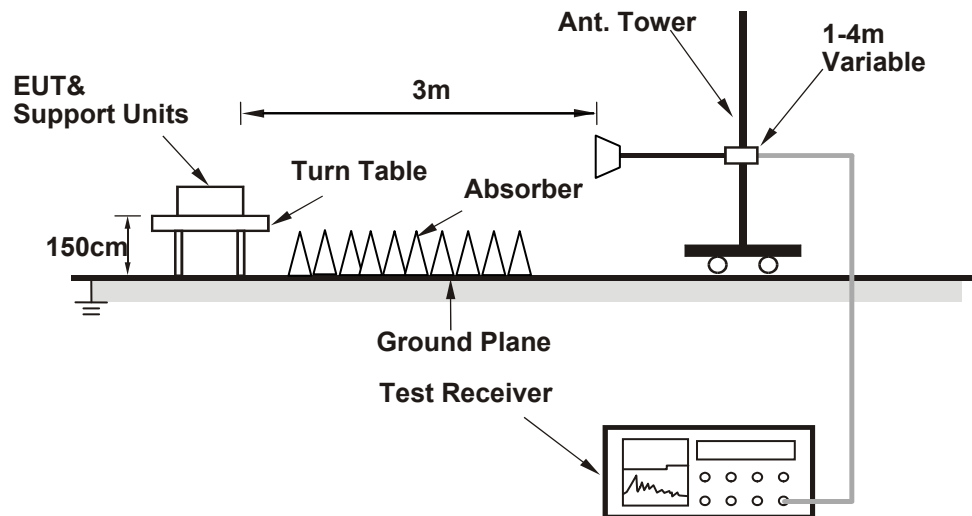
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

- Connected the EUT with the notebook and placed them on the testing table.
- The notebook ran a test program to enable EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1GHz Worst-Case Data

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	57.0 PK	74.0	-17.0	1.28 H	120	23.4	33.6
2	2390.00	46.3 AV	54.0	-7.7	1.28 H	120	12.7	33.6
3	*2402.00	90.7 PK			1.00 H	85	57.1	33.6
4	*2402.00	86.8 AV			1.00 H	85	53.2	33.6
5	4804.00	46.0 PK	74.0	-28.0	1.24 H	317	42.5	3.5
6	4804.00	33.8 AV	54.0	-20.2	1.24 H	317	30.3	3.5
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	57.1 PK	74.0	-16.9	1.15 V	168	23.5	33.6
2	2390.00	45.9 AV	54.0	-8.1	1.15 V	168	12.3	33.6
3	*2402.00	88.2 PK			1.00 V	194	54.6	33.6
4	*2402.00	84.1 AV			1.00 V	194	50.5	33.6
5	4804.00	45.7 PK	74.0	-28.3	1.72 V	246	42.2	3.5
6	4804.00	33.7 AV	54.0	-20.3	1.72 V	246	30.2	3.5

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.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2440.00	89.9 PK			1.00 H	79	56.1	33.8
2	*2440.00	85.8 AV			1.00 H	79	52.0	33.8
3	4880.00	47.0 PK	74.0	-27.0	2.14 H	175	43.2	3.8
4	4880.00	34.2 AV	54.0	-19.8	2.14 H	175	30.4	3.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2440.00	87.1 PK			1.00 V	191	53.3	33.8
2	*2440.00	83.0 AV			1.00 V	191	49.2	33.8
3	4880.00	45.7 PK	74.0	-28.3	1.42 V	297	41.9	3.8
4	4880.00	33.2 AV	54.0	-20.8	1.42 V	297	29.4	3.8

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.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	89.2 PK			1.00 H	46	55.2	34.0
2	*2480.00	85.0 AV			1.00 H	46	51.0	34.0
3	2483.50	59.4 PK	74.0	-14.6	1.17 H	57	25.4	34.0
4	2483.50	47.2 AV	54.0	-6.8	1.17 H	57	13.2	34.0
5	4960.00	47.3 PK	74.0	-26.7	2.73 H	151	43.2	4.1
6	4960.00	34.5 AV	54.0	-19.5	2.73 H	151	30.4	4.1
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	86.5 PK			1.00 V	194	52.5	34.0
2	*2480.00	82.4 AV			1.00 V	194	48.4	34.0
3	2483.50	57.6 PK	74.0	-16.4	2.08 V	109	23.6	34.0
4	2483.50	46.4 AV	54.0	-7.6	2.08 V	109	12.4	34.0
5	4960.00	45.6 PK	74.0	-28.4	1.94 V	206	41.5	4.1
6	4960.00	33.8 AV	54.0	-20.2	1.94 V	206	29.7	4.1

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.

Below 1GHz worst-case data

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz	TEST MODE	A

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	35.82	24.9 QP	40.0	-15.1	1.50 H	340	39.6	-14.7
2	111.48	18.8 QP	43.5	-24.7	1.00 H	99	35.3	-16.5
3	191.99	21.1 QP	43.5	-22.4	1.25 H	78	37.0	-15.9
4	610.06	22.4 QP	46.0	-23.6	1.00 H	274	29.4	-7.0
5	714.82	32.4 QP	46.0	-13.6	2.00 H	353	37.9	-5.5
6	881.66	27.6 QP	46.0	-18.4	1.00 H	33	30.5	-2.9
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	59.10	25.4 QP	40.0	-14.6	2.00 V	18	39.0	-13.6
2	90.14	27.6 QP	43.5	-15.9	1.25 V	185	46.4	-18.8
3	198.78	19.5 QP	43.5	-24.0	1.50 V	158	35.7	-16.2
4	444.19	20.4 QP	46.0	-25.6	1.25 V	192	30.3	-9.9
5	716.76	24.7 QP	46.0	-21.3	1.50 V	179	30.2	-5.5
6	954.41	27.8 QP	46.0	-18.2	1.00 V	176	29.0	-1.2

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 of frequency range 30MHz ~ 1000MHz.
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz.

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz	TEST MODE	B

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	34.85	31.3 QP	40.0	-8.7	1.25 H	321	46.0	-14.7
2	90.14	27.7 QP	43.5	-15.8	1.50 H	152	46.5	-18.8
3	198.78	26.2 QP	43.5	-17.3	1.25 H	149	42.4	-16.2
4	444.19	21.3 QP	46.0	-24.7	1.00 H	62	31.2	-9.9
5	729.37	28.4 QP	46.0	-17.6	1.00 H	18	33.6	-5.2
6	956.35	28.0 QP	46.0	-18.0	1.50 H	198	29.2	-1.2
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	34.85	34.8 QP	40.0	-5.2	1.00 V	26	49.5	-14.7
2	90.14	28.8 QP	43.5	-14.7	1.00 V	192	47.6	-18.8
3	198.78	18.8 QP	43.5	-24.7	1.50 V	55	35.0	-16.2
4	625.58	22.7 QP	46.0	-23.3	1.00 V	30	29.6	-6.9
5	729.37	31.5 QP	46.0	-14.5	1.25 V	198	36.7	-5.2
6	968.96	28.1 QP	54.0	-25.9	1.50 V	271	29.3	-1.2

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 of frequency range 30MHz ~ 1000MHz.
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz.

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz	TEST MODE	C

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	111.48	18.8 QP	43.5	-24.7	1.25 H	99	35.3	-16.5
2	191.99	21.1 QP	43.5	-22.4	1.50 H	78	37.0	-15.9
3	433.52	20.7 QP	46.0	-25.3	1.00 H	247	30.7	-10.0
4	610.06	22.4 QP	46.0	-23.6	2.00 H	274	29.4	-7.0
5	823.46	26.2 QP	46.0	-19.8	1.25 H	133	29.8	-3.6
6	954.41	28.0 QP	46.0	-18.0	1.50 H	6	29.2	-1.2
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	34.85	36.2 QP	40.0	-3.8	1.25 V	308	50.9	-14.7
2	95.96	24.4 QP	43.5	-19.1	1.50 V	252	42.8	-18.4
3	444.19	20.4 QP	46.0	-25.6	2.00 V	192	30.3	-9.9
4	587.75	22.5 QP	46.0	-23.5	1.50 V	309	30.1	-7.6
5	805.03	25.3 QP	46.0	-20.7	1.25 V	12	29.1	-3.8
6	954.41	27.8 QP	46.0	-18.2	1.50 V	148	29.0	-1.2

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 of frequency range 30MHz ~ 1000MHz.
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz.

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz	TEST MODE	D

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	30.97	27.4 QP	40.0	-12.6	1.25 H	69	42.4	-15.0
2	87.23	18.2 QP	40.0	-21.8	1.50 H	253	36.9	-18.7
3	207.51	19.2 QP	43.5	-24.3	2.00 H	246	35.4	-16.2
4	433.52	20.7 QP	46.0	-25.3	2.00 H	239	30.7	-10.0
5	657.59	23.2 QP	46.0	-22.8	1.50 H	89	29.7	-6.5
6	954.41	28.0 QP	46.0	-18.0	1.50 H	12	29.2	-1.2
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	39.70	30.0 QP	40.0	-10.0	1.25 V	321	44.1	-14.1
2	95.96	24.4 QP	43.5	-19.1	1.25 V	256	42.8	-18.4
3	205.57	17.8 QP	43.5	-25.7	2.00 V	137	34.0	-16.2
4	444.19	20.4 QP	46.0	-25.6	1.50 V	189	30.3	-9.9
5	655.65	23.6 QP	46.0	-22.4	1.25 V	12	30.1	-6.5
6	830.25	26.2 QP	46.0	-19.8	1.25 V	13	29.7	-3.5

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 of frequency range 30MHz ~ 1000MHz.
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz ~ 30MHz.

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.	Date Of Calibration	Due Date Of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 23, 2017	Nov. 22, 2018
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Sep. 05, 2017	Sep. 04, 2018
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Mar. 10, 2017	Mar. 09, 2018
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 15, 2017	Aug. 14, 2018
Software ADT	BV ADT_Cond_ V7.3.7.4	NA	NA	NA
Extension Cord	Extension Cord	1-1	Dec. 22, 2016	Dec. 21, 2017
			Dec. 22, 2017	Dec. 21, 2018

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 1.
3. The VCCI Site Registration No. is C-2040.

4.2.3 Test Procedures

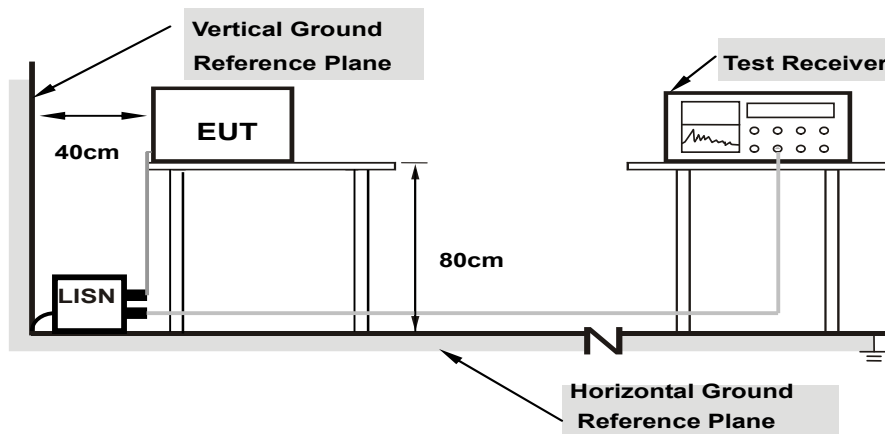
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance 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.

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.

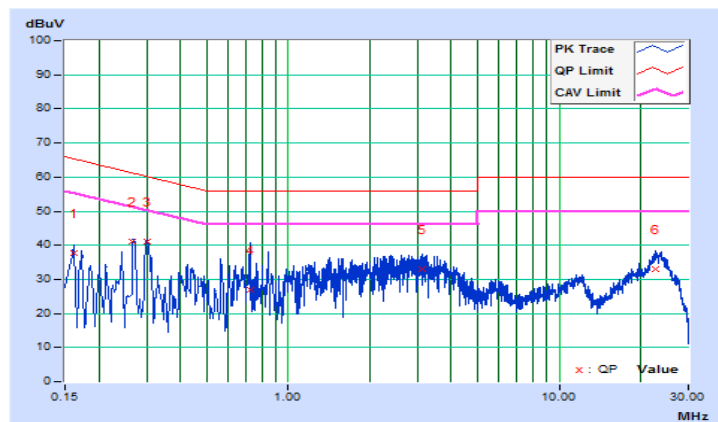
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Channel	Channel 0	Test Mode	A

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	0.16173	10.45	27.25	11.61	37.70	22.06	65.37	55.37	-27.67	-33.31
2	0.26730	10.47	30.65	24.96	41.12	35.43	61.20	51.20	-20.08	-15.77
3	0.30214	10.49	30.65	22.14	41.14	32.63	60.18	50.18	-19.04	-17.55
4	0.72086	10.50	16.39	5.18	26.89	15.68	56.00	46.00	-29.11	-30.32
5	3.14115	10.59	22.35	8.92	32.94	19.51	56.00	46.00	-23.06	-26.49
6	22.75762	11.54	21.60	10.54	33.14	22.08	60.00	50.00	-26.86	-27.92

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.

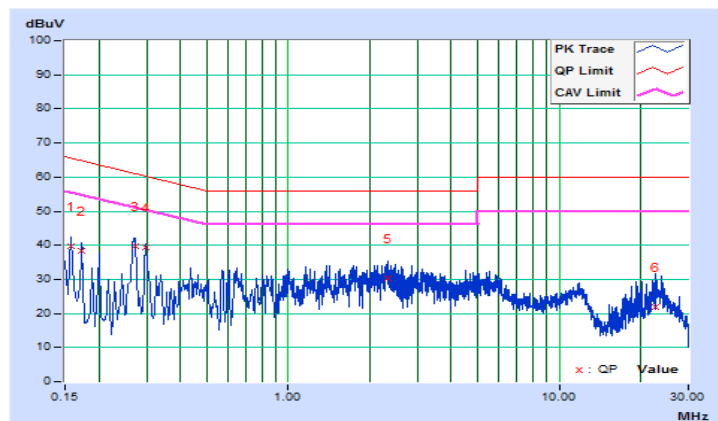


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Channel	Channel 0	Test Mode	A

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	0.15782	10.21	29.61	13.50	39.82	23.71	65.58	55.58	-25.76	-31.87
2	0.17346	10.21	28.16	15.03	38.37	25.24	64.79	54.79	-26.42	-29.55
3	0.27120	10.23	29.41	25.19	39.64	35.42	61.08	51.08	-21.44	-15.66
4	0.29858	10.23	29.17	23.35	39.40	33.58	60.28	50.28	-20.88	-16.70
5	2.33569	10.33	20.07	9.77	30.40	20.10	56.00	46.00	-25.60	-25.90
6	22.64814	11.13	10.69	1.86	21.82	12.99	60.00	50.00	-38.18	-37.01

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.

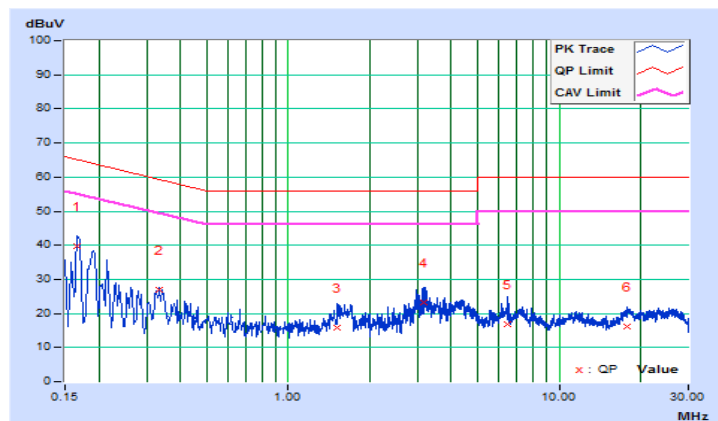


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Channel	Channel 0	Test Mode	B

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	0.16623	10.45	29.17	14.02	39.62	24.47	65.15	55.15	-25.53	-30.68
2	0.33400	10.50	16.55	10.42	27.05	20.92	59.35	49.35	-32.30	-28.43
3	1.51800	10.50	5.38	0.26	15.88	10.76	56.00	46.00	-40.12	-35.24
4	3.15000	10.59	12.67	2.77	23.26	13.36	56.00	46.00	-32.74	-32.64
5	6.48600	10.76	6.20	0.77	16.96	11.53	60.00	50.00	-43.04	-38.47
6	17.83000	11.32	4.77	0.08	16.09	11.40	60.00	50.00	-43.91	-38.60

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.

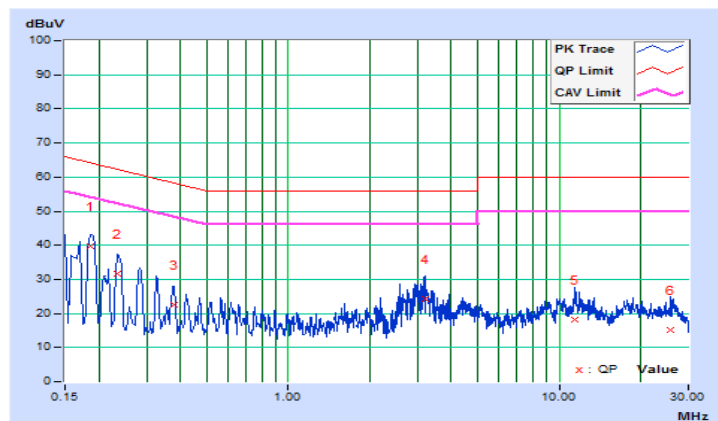


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Channel	Channel 0	Test Mode	B

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	0.18617	10.22	29.53	14.99	39.75	25.21	64.21	54.21	-24.46	-29.00
2	0.23412	10.23	21.54	10.04	31.77	20.27	62.30	52.30	-30.53	-32.03
3	0.37718	10.23	12.41	3.61	22.64	13.84	58.34	48.34	-35.70	-34.50
4	3.19400	10.37	13.77	3.16	24.14	13.53	56.00	46.00	-31.86	-32.47
5	11.42600	10.72	7.37	1.46	18.09	12.18	60.00	50.00	-41.91	-37.82
6	25.61000	11.21	3.79	1.94	15.00	13.15	60.00	50.00	-45.00	-36.85

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.

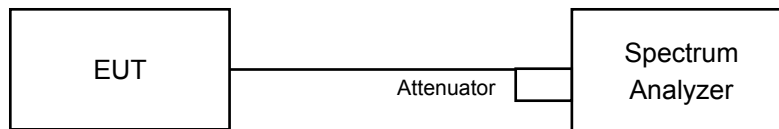


4.3 6dB Bandwidth Measurement

4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

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

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

4.3.5 Deviation from Test Standard

No deviation.

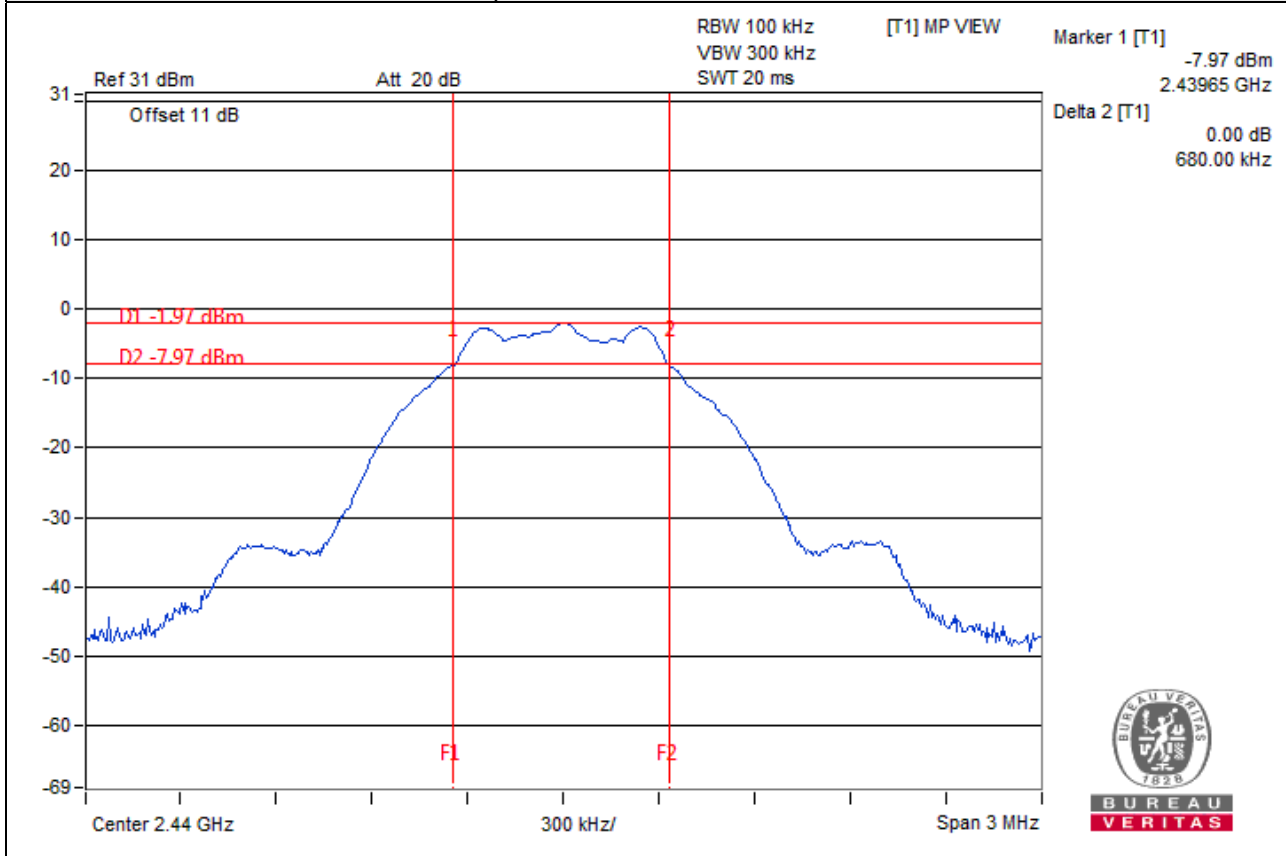
4.3.6 EUT Operating Conditions

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

4.3.7 Test Result

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	0.67	0.5	Pass
19	2440	0.68	0.5	Pass
39	2480	0.67	0.5	Pass

Spectrum Plot of Worst Value

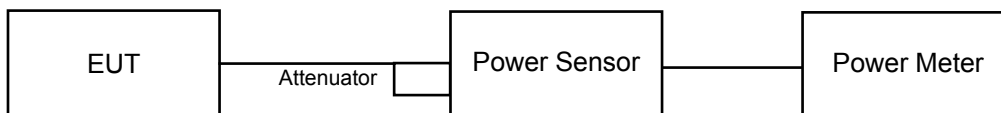


4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

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

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 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.

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

Same as Item 4.3.6.

4.4.7 Test Results

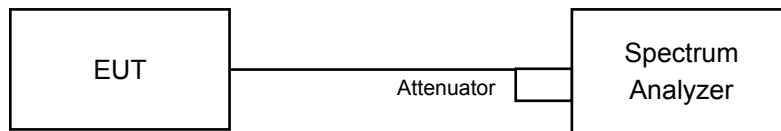
Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
0	2402	1.094	0.39	30	Pass
19	2440	0.800	-0.97	30	Pass
39	2480	1.164	0.66	30	Pass

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8dBm/3kHz.

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

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

4.5.5 Deviation from Test Standard

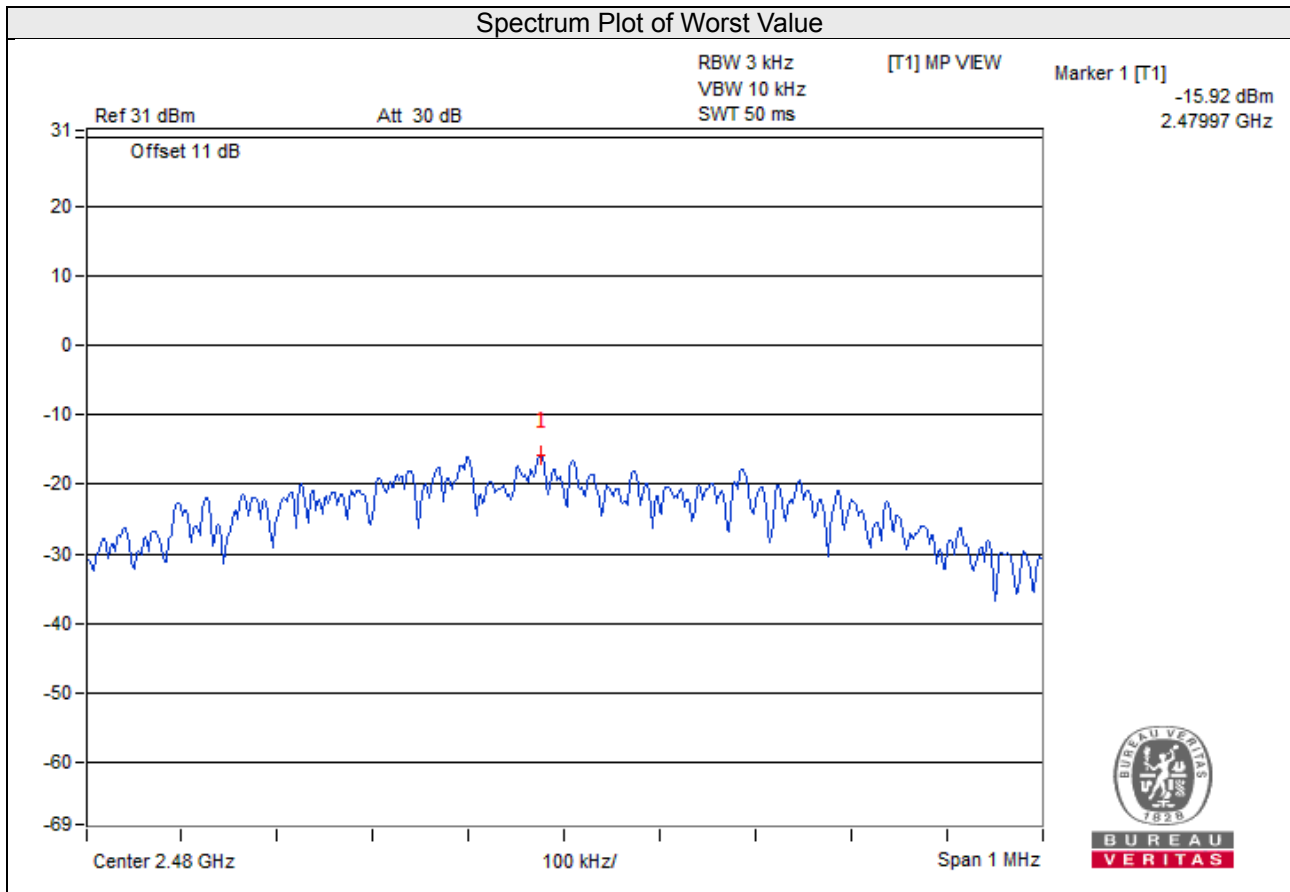
No deviation.

4.5.6 EUT Operating Condition

Same as Item 4.3.6

4.5.7 Test Results

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	2402	-15.99	8	Pass
19	2440	-17.30	8	Pass
39	2480	-15.92	8	Pass

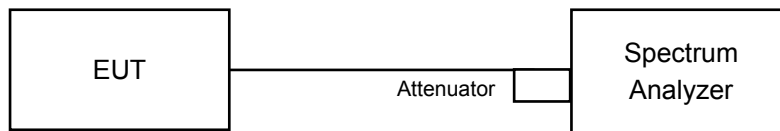


4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

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

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

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

MEASUREMENT PROCEDURE OOB

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

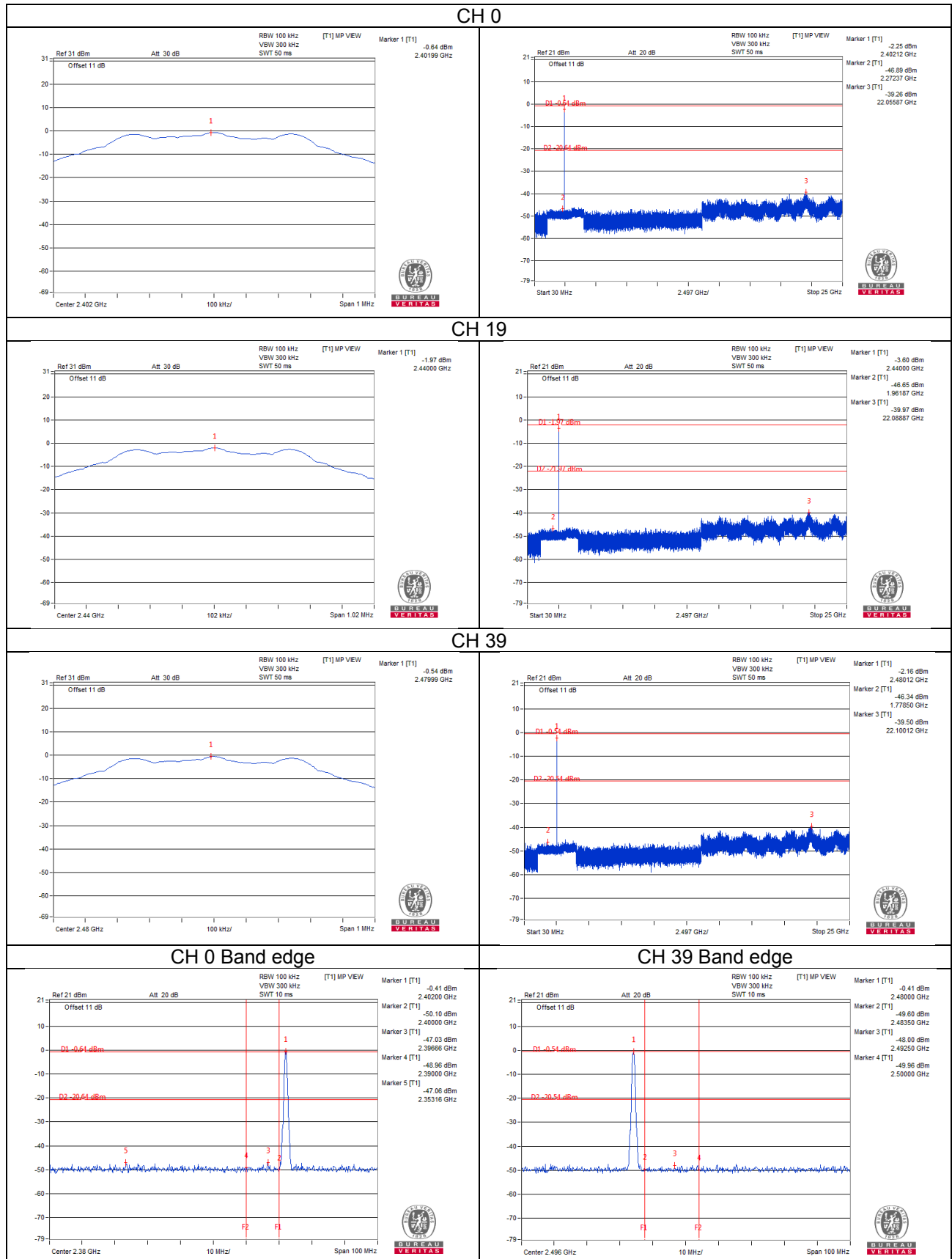
4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

Same as Item 4.3.6

4.6.7 Test Results



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 FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

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

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

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