FCC TEST REPORT

REPORT NO.: RF140729C08-4
MODEL NO.: DCH-G021
FCC ID : KA2CHG021A1
RECEIVED: Jul. 29, 2014
TESTED: Aug. 29 ~ Sep. 16, 2014
ISSUED: Sep. 17, 2014

APPLICANT : D-LINK CORPORATION

ADDRESS : 17595 Mt. Hermann, Fountain Valley, CA 92708, U.S.A.

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.)

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

This report should not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF140729C08-4	Original release	Sep. 17, 2014

1 CERTIFICATION

PRODUCT:	Wireless smart hub
MODEL:	DCH-G021
BRAND:	D-Link
APPLICANT:	D-LINK CORPORATION
TESTED:	Aug. 29 ~ Sep. 16, 2014
TEST SAMPLE:	ENGINEERING SAMPLE
STANDARDS:	**FCC Part 15, Subpart C (Section 15.231)**
	ANSI C63.10-2009

The above equipment (model: DCH-G021) 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:** Sep. 17, 2014
Polly Chien / Specialist

APPROVED BY : _____ , **DATE:** Sep. 17, 2014
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 15.231)			
STANDARD SECTION	**TEST TYPE AND LIMIT**	**RESULT**	**REMARK**
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -11.88dB at 0.15000MHz.
15.209 15.231(b)	Radiated Emission Test	PASS	Meet the requirement of limit. Minimum passing margin is –1.1dB at 437.00MHz.
15.231(c)	Emission Bandwidth Measurement	PASS	Meet the requirement of limit.
15.231(a)	De-activation	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	UNCERTAINTY
Conducted emissions	9kHz~30MHz	2.44 dB
Radiated emissions	30MHz ~ 200MHz	3.59 dB
	200MHz ~1000MHz	3.60 dB
	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

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

PRODUCT	Wireless smart hub
MODEL NO.	DCH-G021
POWER SUPPLY	12Vdc (Adapter)
MODULATION TYPE	2-FSK, 4-FSK, GFSK, MSK and OOK
CARRIER FREQUENCY	431MHz ~ 437MHz
NUMBER OF CHANNEL	61
ANTENNA TYPE	PCB antenna with -2.9dBi gain
ANTENNA CONNECTOR	NA
DATA CABLE	NA
I/O PORTS	Refer to User's Manual
ACCESSORY DEVICE	Adapter

NOTE:

1. The EUT was powered by the following adapter:

BRAND:	JENTEC TECHNOLOGY CO., LTD.
MODEL:	CH1812-B
INPUT:	100-240Vac, 50-60Hz, 0.5A
OUTPUT:	12Vdc, 1.5A
POWER LINE:	1.55m cable with 1 core attached on adapter

2. The above EUT information is 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

61 channels were provided to this EUT.

CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)
1	431.0	18	432.7	35	434.4	52	436.1
2	431.1	19	432.8	36	434.5	53	436.2
3	431.2	20	432.9	37	434.6	54	436.3
4	431.3	21	433.0	38	434.7	55	436.4
5	431.4	22	433.1	39	434.8	56	436.5
6	431.5	23	433.2	40	434.9	57	436.6
7	431.6	24	433.3	41	435.0	58	436.7
8	431.7	25	433.4	42	435.1	59	436.8
9	431.8	26	433.5	43	435.2	60	436.9
10	431.9	27	433.6	44	435.3	61	437.0
11	432.0	28	433.7	45	435.4		
12	432.1	29	433.8	46	435.5		
13	432.2	30	433.9	47	435.6		
14	432.3	31	434.0	48	435.7		
15	432.4	32	434.1	49	435.8		
16	432.5	33	434.2	50	435.9		
17	432.6	34	434.3	51	436.0		

3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

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

Where **RE ≥ 1G:** Radiated Emission above 1GHz
RE < 1G: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission
PLC: Power Line Conducted Emission
EB: 20dB Bandwidth measurement
DT: Deactivation Time measurement

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

RADIATED EMISSION TEST (ABOVE 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations.

☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL (MHz)	MODULATION TYPE
1 to 61	1, 61	2-FSK

RADIATED EMISSION TEST (BELOW 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations.

☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL (MHz)	MODULATION TYPE
1 to 61	1, 61	2-FSK

POWER LINE CONDUCTED EMISSION TEST:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations.

AVAILABLE CHANNEL	TESTED CHANNEL (MHz)	MODULATION TYPE
1 to 61	1, 61	2-FSK

EMISSION BANDWIDTH MEASUREMENT:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations.

☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL (MHz)	MODULATION TYPE
1 to 61	1, 61	2-FSK

DEACTIVATION TIME MEASUREMENT:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations.

☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL (MHz)	MODULATION TYPE
1 to 61	61	2-FSK

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	22deg. C, 68%RH	120Vac, 60Hz	Brad Tung
RE<1G	22deg. C, 68%RH	120Vac, 60Hz	Brad Tung
PLC	26deg. C, 64%RH	120Vac, 60Hz	Alan Wu
EB	25deg. C, 65%RH	120Vac, 60Hz	Alan Wu
DT	25deg. C, 65%RH	120Vac, 60Hz	Alan Wu

3.3 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 (15.231)
ANSI C63.10-2009

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

NOTE: The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

3.4 DESCRIPTION OF SUPPORT UNITS

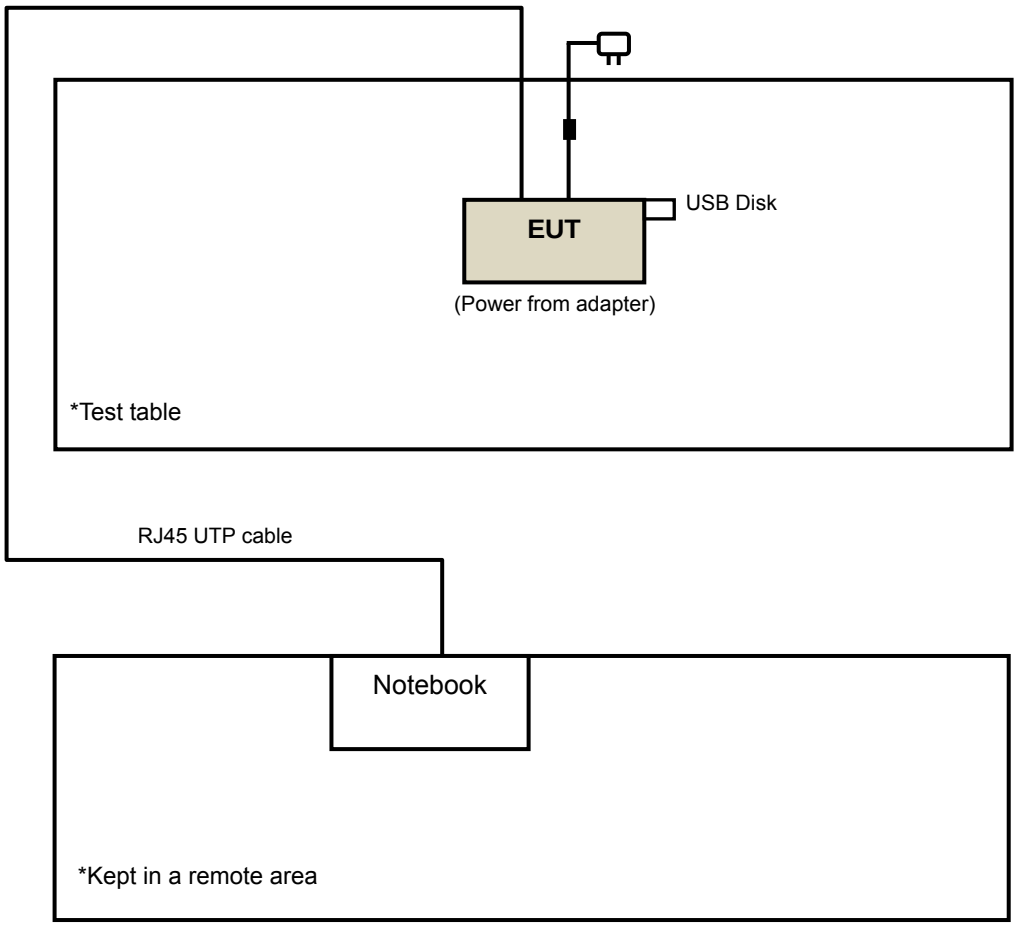
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK	DELL	D531	CN-0XM006-48643 -81U-2610	QDS-BRCM1020
2	USB DISK	SANDISK	SDCZ6-1024	NA	NA

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	10m RJ45 UTP cable
2	NA

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

3.4.1 CONFIGURATION OF SYSTEM UNDER TEST



4 TEST PROCEDURE AND RESULT

4.1 RADIATED EMISSION MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

According to 15.231 the field strength of emissions from intentional radiators operated under these frequencies bands shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental		Field Strength of Spurious	
	uV/meter	dBuV/meter	uV/meter	dBuV/meter
40.66 ~ 40.70	2250	67.04	225	48.04
70 ~ 130	1250	61.94	125	41.94
130 ~ 174	1250 ~ 3750	61.94 ~ 71.48	125 ~ 375	41.94 ~ 51.48
174 ~ 260	3750	71.48	75	37.50
260 ~ 470	3750 ~ 12500	71.48 ~ 81.94	375 ~ 1250	51.48 ~ 61.94
Above 470	12500	81.94	1250	61.94

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. As shown in 15.35(b), 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 INSTRUMENT

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESIB7	100187	Jan. 02, 2014	Jan. 01, 2015
Spectrum Analyzer ROHDE & SCHWARZ	FSU 43	100115	Dec. 18, 2013	Dec. 17, 2014
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Feb. 26, 2014	Feb. 25, 2015
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-404	Jan. 05, 2014	Jan. 04, 2015
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Feb. 17, 2014	Feb. 16, 2015
Preamplifier Agilent	8449B	3008A01961	Oct. 28, 2013	Oct. 27, 2014
Preamplifier Agilent	8447D	2944A10738	Oct. 18, 2013	Oct. 17, 2014
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	309220/4	Aug. 09, 2014	Aug. 08, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	250724/4	Aug. 09, 2014	Aug. 08, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	295012/4	Aug. 09, 2014	Aug. 08, 2015
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller inn-co GmbH	CO2000	019303	NA	NA
Turn Table BV ADT	TT100.	TT93021704	NA	NA
Turn Table Controller BV ADT	SC100.	SC93021704	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 Chamber 4.

3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.

4. The FCC Site Registration No. is 460141.

5. The IC Site Registration No. is IC7450F-4.

4.1.3 TEST PROCEDURE

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter 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. The antenna is a broadband antenna, and its height 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.

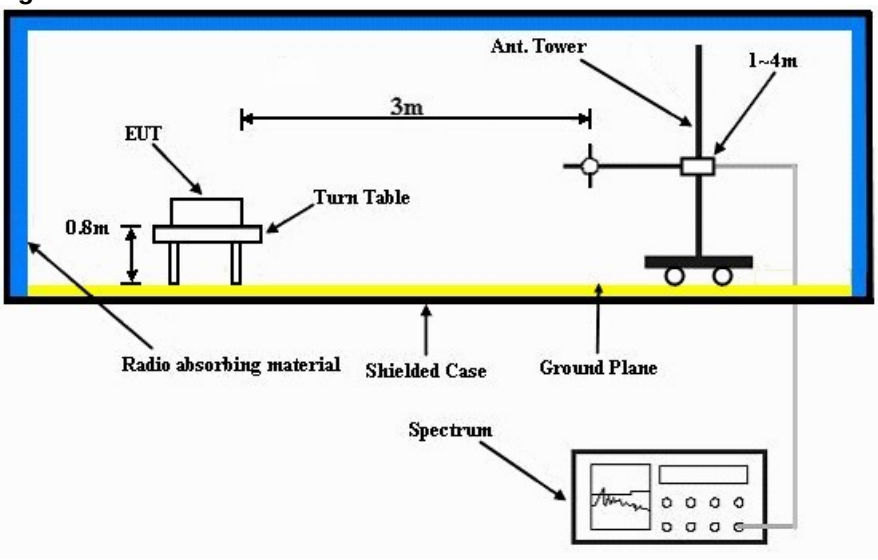
f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using the quasi-peak method or average method as specified and then reported in Data sheet peak mode and QP mode.

NOTE:

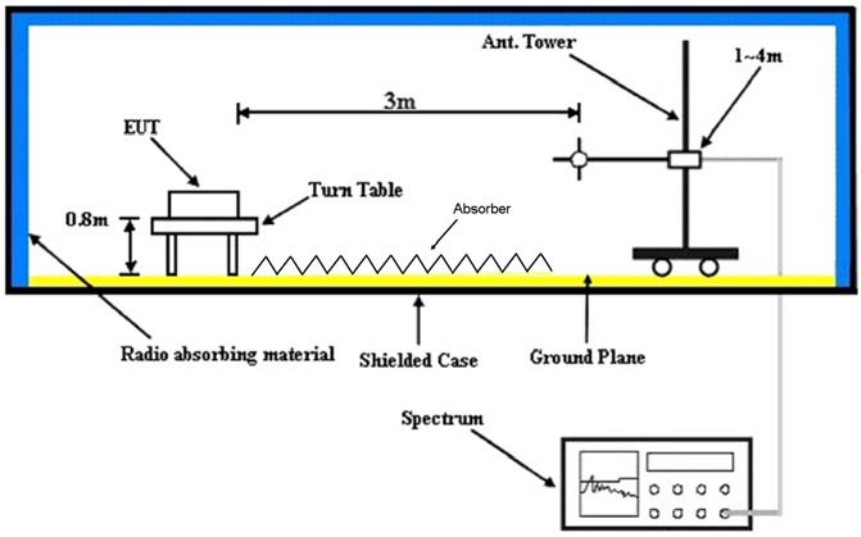
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz(Duty cycle > 98%) 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 TEST SETUP

Frequency range 30MHz~1GHz



Frequency range above 1GHz



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

4.1.5 EUT OPERATING CONDITION

a. Placed the EUT on a testing table.

b. Prepared notebook to act as communication partner and placed it outside of testing area.

c. Set the EUT under transmission condition continuously at specific channel frequency.

d. The necessary accessories enable the EUT in full functions.

4.1.6 TEST RESULTS

ABOVE 1GHz WORST-CASE DATA

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	431MHz	FREQUENCY RANGE	1 ~ 10GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	22deg. C, 68%RH	TESTED BY	Brad Tung

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	1293.00	51.6 PK	80.8	-29.2	1.00 H	56	58.20	-6.60
2	1293.00	29.4 AV	60.8	-31.4	1.00 H	56	36.00	-6.60
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	1293.00	50.5 PK	80.8	-30.3	1.00 V	200	57.10	-6.60
2	1293.00	28.6 AV	60.8	-32.2	1.00 V	200	35.20	-6.60

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.
5. The average value = peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:
20 log (Duty cycle) = 20 log (4.92 ms +5 ms / 100 ms) = -20dB

Please see page 23 for plotted duty.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	437MHz	FREQUENCY RANGE	1 ~ 10GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	22deg. C, 68%RH	TESTED BY	Brad Tung

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	1311.00	51.5 PK	80.8	-29.3	1.00 H	42	58.00	-6.50
2	1311.00	29.4 AV	60.8	-31.4	1.00 H	42	35.90	-6.50
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	1311.00	49.9 PK	80.8	-30.9	1.00 V	228	56.40	-6.50
2	1311.00	27.7 AV	60.8	-33.1	1.00 V	228	34.20	-6.50

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.
5. The average value = peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:
20 log (Duty cycle) = 20 log (4.92 ms +5 ms / 100 ms) = -20dB

Please see page 23 for plotted duty.

BELOW 1GHz WORST-CASE DATA

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	431MHz	FREQUENCY RANGE	Below 1000MHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	22deg. C, 68%RH	TESTED BY	Brad Tung

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	*431.00	93.5 PK	100.7	-7.2	1.00 H	232	75.10	18.40
2	*431.00	65.9 AV	80.7	-14.8	1.00 H	232	47.50	18.40
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	*431.00	99.4 PK	100.7	-1.3	1.16 V	0	81.00	18.40
2	*431.00	75.3 AV	80.7	-5.4	1.16 V	0	56.90	18.40

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 average value = peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:
   20 log (Duty cycle) = 20 log (4.92 ms +5 ms / 100 ms) = -20dB

   Please see page 23 for plotted duty.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	437MHz	FREQUENCY RANGE	Below 1000MHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	22deg. C, 68%RH	TESTED BY	Brad Tung

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	437.00	94.2 PK	100.9	-6.7	1.00 H	237	75.60	18.60
2	437.00	66.7 AV	80.9	-14.2	1.00 H	237	48.10	18.60
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	**437.00**	**99.8 PK**	**100.9**	**-1.1**	**1.13 V**	**178**	**81.20**	**18.60**
2	437.00	75.8 AV	80.9	-5.1	1.13 V	178	57.20	18.60

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.
5. " * ": Fundamental frequency.
6. The average value = peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:
   20 log (Duty cycle) = 20 log (4.92 ms +5 ms / 100 ms) = -20dB

   Please see page 23 for plotted duty.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	431MHz	FREQUENCY RANGE	Below 1000MHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	22deg. C, 68%RH	TESTED BY	Brad Tung

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	575.14	27.0 QP	80.8	-53.8	1.50 H	17	34.60	-7.60
2	666.32	26.7 QP	80.8	-54.1	1.50 H	309	32.40	-5.70
3	726.46	29.7 QP	80.8	-51.1	1.00 H	350	34.20	-4.50
4	749.74	33.4 QP	80.8	-47.4	1.00 H	10	37.00	-3.60
5	774.96	28.3 QP	80.8	-52.5	1.00 H	285	31.70	-3.40
6	862.00	58.1 PK	80.8	-22.7	1.50 H	227	60.30	-2.20
7	862.00	31.0 AV	60.8	-29.8	1.50 H	227	33.20	-2.20
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	528.58	27.7 QP	80.8	-53.1	1.50 V	352	36.20	-8.50
2	575.14	30.2 QP	80.8	-50.6	1.00 V	323	37.80	-7.60
3	625.58	31.4 QP	80.8	-49.4	1.00 V	332	37.60	-6.20
4	664.38	29.6 QP	80.8	-51.2	1.25 V	345	35.30	-5.70
5	749.74	29.8 QP	80.8	-51.0	1.50 V	10	33.40	-3.60
6	862.00	59.7 PK	80.8	-21.1	1.25 V	9	61.90	-2.20
7	862.00	33.3 AV	60.8	-27.5	1.25 V	9	35.50	-2.20

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	437MHz	FREQUENCY RANGE	Below 1000MHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	22deg. C, 68%RH	TESTED BY	Brad Tung

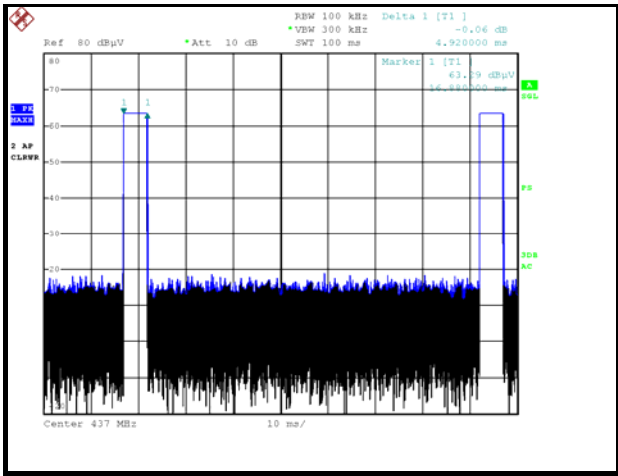
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	625.58	27.5 QP	80.8	-53.3	1.50 H	134	33.70	-6.20
2	666.32	27.6 QP	80.8	-53.2	1.00 H	198	33.30	-5.70
3	687.66	28.7 QP	80.8	-52.1	2.00 H	53	34.10	-5.40
4	726.46	30.9 QP	80.8	-49.9	1.25 H	8	35.40	-4.50
5	749.74	30.6 QP	80.8	-50.2	1.00 H	190	34.20	-3.60
6	874.00	58.8 PK	80.8	-22.0	1.50 H	85	60.80	-2.00
7	874.00	31.5 AV	60.8	-29.3	1.50 H	85	33.50	-2.00
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	528.58	25.0 QP	80.8	-55.8	1.50 V	118	33.50	-8.50
2	575.14	27.0 QP	80.8	-53.8	1.00 V	327	34.60	-7.60
3	625.58	26.0 QP	80.8	-54.8	1.00 V	43	32.20	-6.20
4	749.74	27.9 QP	80.8	-52.9	1.25 V	22	31.50	-3.60
5	784.66	28.5 QP	80.8	-52.3	1.00 V	320	31.60	-3.10
6	874.00	60.2 PK	80.8	-20.6	1.25 V	15	62.20	-2.00
7	874.00	33.8 AV	60.8	-27.0	1.25 V	15	35.80	-2.00

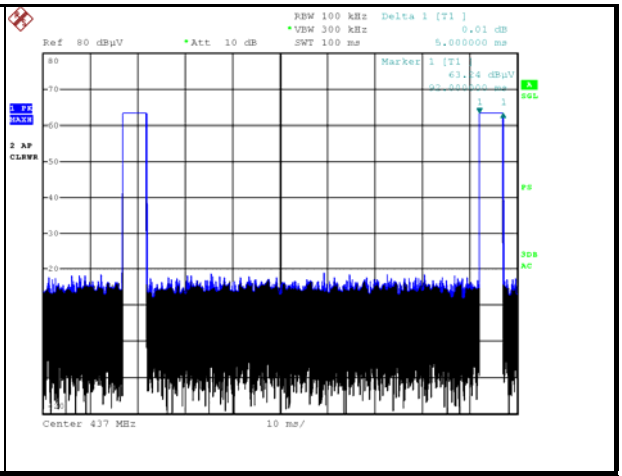
REMARKS: 1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).

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.





20 log (Duty cycle) = 20 log (4.92 ms +5 ms / 100 ms) = -20dB

4.2 CONDUCTED EMISSION MEASUREMENT

4.2.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBμV)	
	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 0.50 MHz.
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	100289	Nov. 29, 2013	Nov. 28, 2014
RF signal cable Woken	5D-FB	Cable-HYC01-01	Dec. 27, 2013	Dec. 26, 2014
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Feb. 13, 2014	Feb. 12, 2015
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 21, 2014	Jul. 20, 2015
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 1.
3. The VCCI Site Registration No. is C-2040.

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.

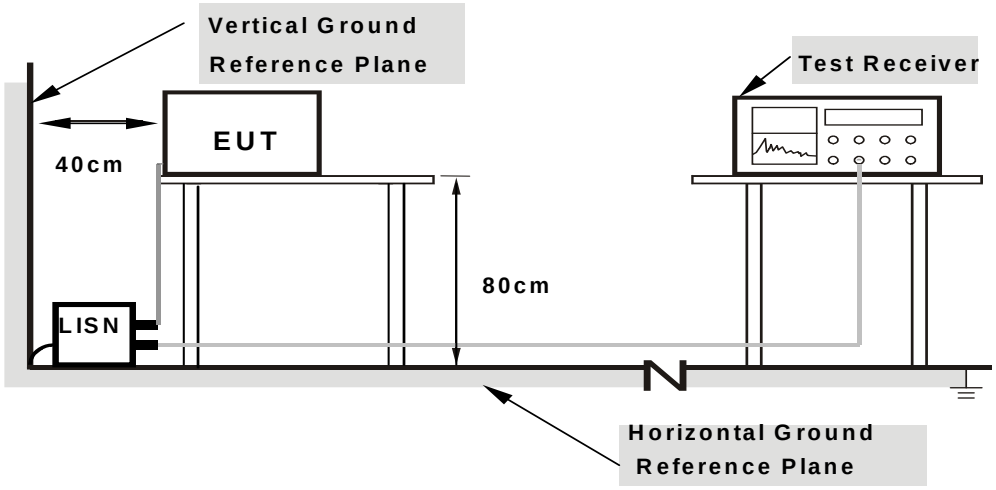
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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.

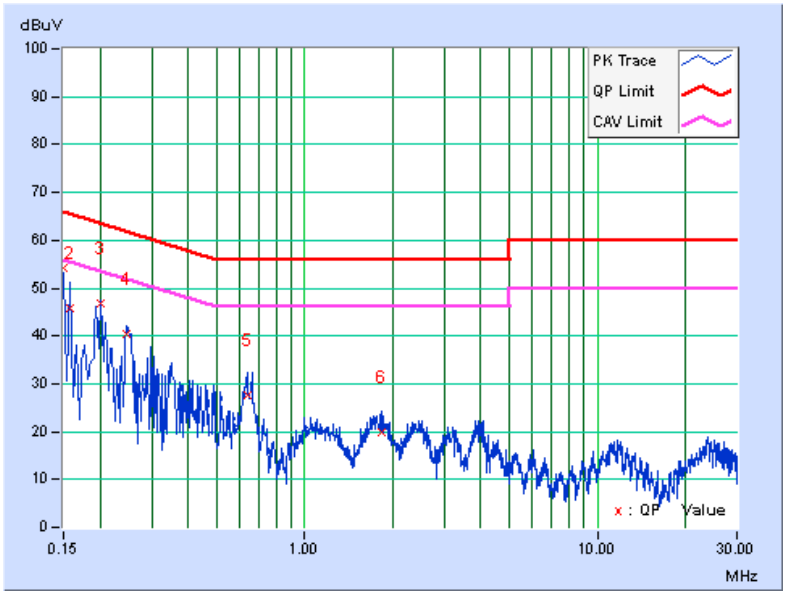
4.2.7 TEST RESULTS

CONDUCTED WORST-CASE DATA :

CHANNEL	431MHz	PHASE	Line 1
6dB BANDWIDTH	9kHz		

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	**0.15000**	**0.11**	**54.01**	**41.47**	**54.12**	**41.58**	**66.00**	**56.00**	**-11.88**	**-14.42**
2	0.15782	0.11	45.81	31.34	45.92	31.45	65.58	55.58	-19.66	-24.13
3	0.20084	0.09	46.73	36.30	46.82	36.39	63.58	53.58	-16.76	-17.19
4	0.24775	0.09	40.36	28.24	40.45	28.33	61.83	51.83	-21.38	-23.50
5	0.63484	0.15	27.52	21.01	27.67	21.16	56.00	46.00	-28.33	-24.84
6	1.82739	0.24	19.53	13.26	19.77	13.50	56.00	46.00	-36.23	-32.50

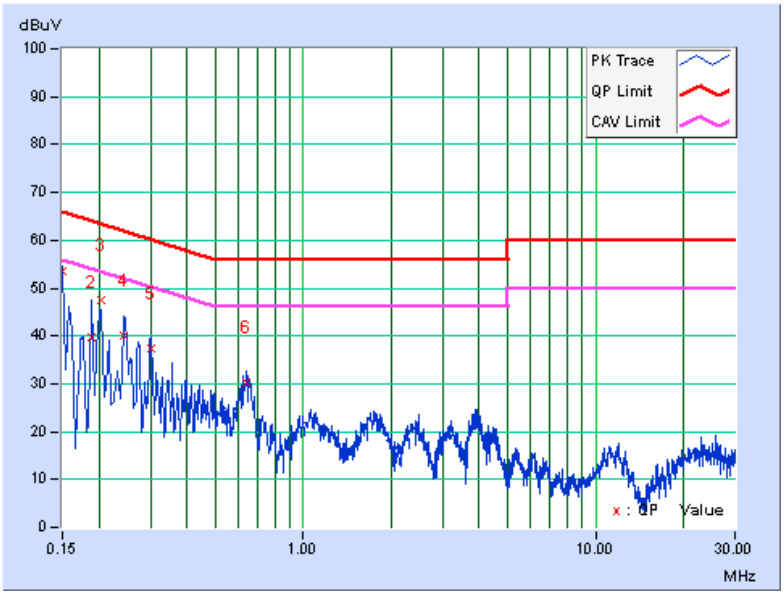
REMARKS:
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading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



CHANNEL	431MHz	PHASE	Line 2
6dB BANDWIDTH	9kHz		

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.05	53.40	41.42	53.45	41.47	66.00	56.00	-12.55	-14.53
2	0.18910	0.08	39.52	26.71	39.60	26.79	64.08	54.08	-24.47	-27.28
3	0.20243	0.09	47.40	36.79	47.49	36.88	63.51	53.51	-16.02	-16.63
4	0.24407	0.11	39.96	28.80	40.07	28.91	61.96	51.96	-21.89	-23.05
5	0.30135	0.13	37.41	26.54	37.54	26.67	60.21	50.21	-22.67	-23.54
6	0.63875	0.19	30.11	22.85	30.30	23.04	56.00	46.00	-25.70	-22.96

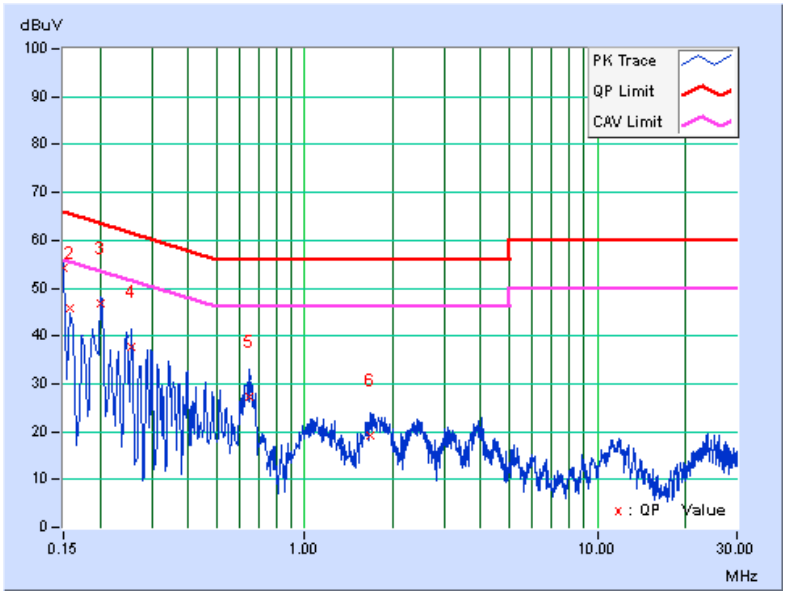
REMARKS:
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading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



CHANNEL	437MHz	PHASE	Line 1
6dB BANDWIDTH	9kHz		

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.11	53.95	41.34	54.06	41.45	66.00	56.00	-11.94	-14.55
2	0.15782	0.11	45.81	31.33	45.92	31.44	65.58	55.58	-19.66	-24.14
3	0.20084	0.09	46.62	36.22	46.71	36.31	63.58	53.58	-16.87	-17.27
4	0.25557	0.10	37.75	24.95	37.85	25.05	61.57	51.57	-23.73	-26.53
5	0.65044	0.15	27.12	20.04	27.27	20.19	56.00	46.00	-28.73	-25.81
6	1.67502	0.24	18.88	12.83	19.12	13.07	56.00	46.00	-36.88	-32.93

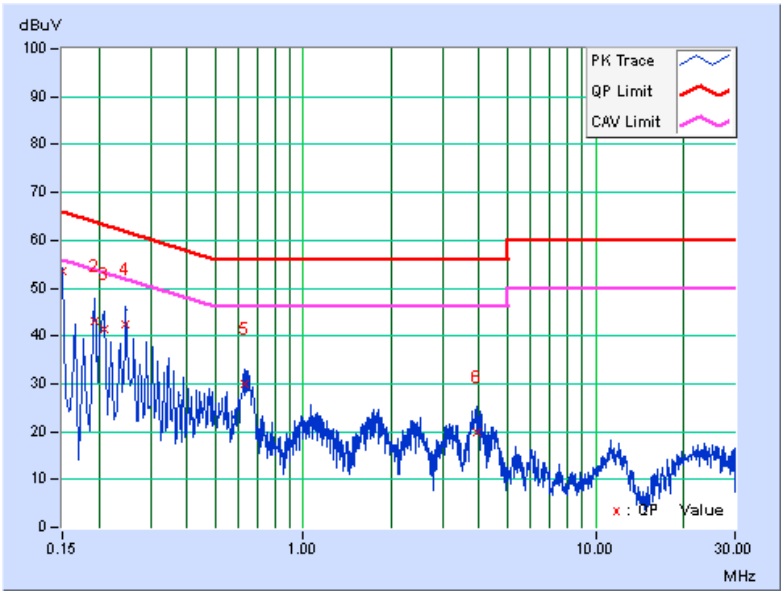
REMARKS:
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading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



CHANNEL	437MHz	PHASE	Line 2
6dB BANDWIDTH	9kHz		

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.05	53.40	41.39	53.45	41.44	66.00	56.00	-12.55	-14.56
2	0.19305	0.08	43.01	31.13	43.09	31.21	63.90	53.90	-20.81	-22.69
3	0.20865	0.09	41.41	29.16	41.50	29.25	63.26	53.26	-21.76	-24.01
4	0.24775	0.11	42.40	31.83	42.51	31.94	61.83	51.83	-19.32	-19.89
5	0.62702	0.19	29.90	23.12	30.09	23.31	56.00	46.00	-25.91	-22.69
6	3.93879	0.26	19.62	10.54	19.88	10.80	56.00	46.00	-36.12	-35.20

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 20dB OCCUPIED BANDWIDTH MEASUREMENT

4.3.1 LIMITS OF EMISSION BANDWIDTH MEASUREMENT

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for device operating above 70 MHz and below 900 MHz.

4.3.2 TEST INSTRUMENT

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
SPECTRUM ANALYZER R&S	FSP40	100040	Jul. 25, 2014	Jul. 24, 2015

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

4.3.3 TEST PROCEDURE

a. The EUT was placed on the turn table.

b. The signal was coupled to the spectrum analyzer through an antenna.

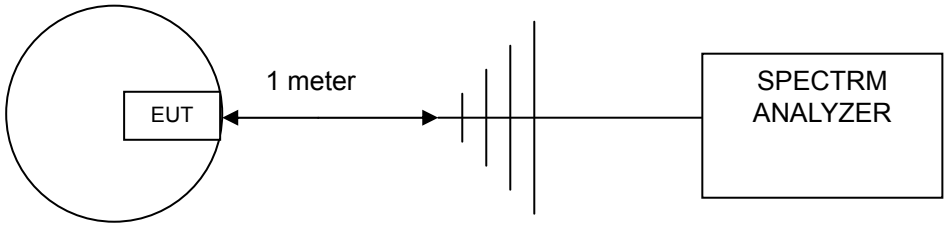
c. Set the resolution bandwidth to 100kHz and video bandwidth to 300kHz then select Peak function to scan the channel frequency.

d. The emission bandwidth was measured and recorded.

4.3.4 DEVIATION FROM TEST STANDARD

No deviation.

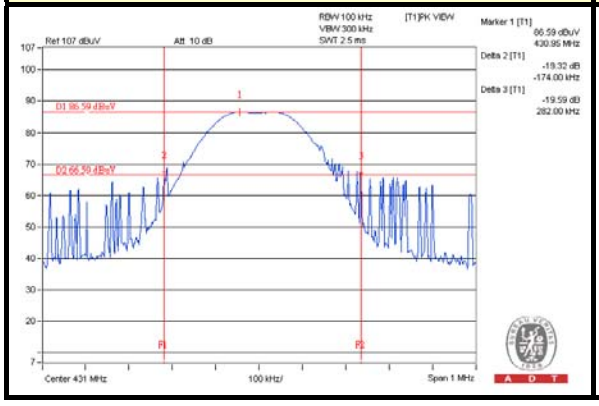
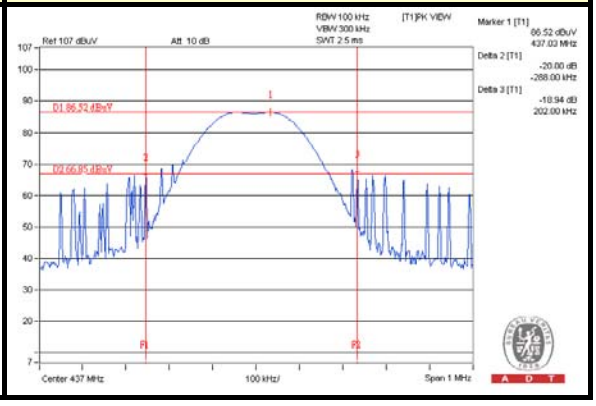
4.3.5 TEST SETUP



4.3.6 TEST RESULTS

FREQUENCY (MHz)	20dB BANDWIDTH (kHz)	MAXIMUM LIMIT (kHz)	PASS/FAIL
431	456	1077.5	PASS
437	490	1092.5	PASS

The plot of test result is attached as below.

431MHz	437MHz
	

4.4 DEACTIVATION TIME

4.4.1 LIMITS OF DEACTIVATION TIME MEASUREMENT

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

4.4.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
SPECTRUM ANALYZER R&S	FSP40	100040	Jul. 25, 2014	Jul. 24, 2015

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

4.4.3 TEST PROCEDURES

a. The EUT was placed on the turning table.

b. The signal was coupled to the spectrum analyzer through an antenna.

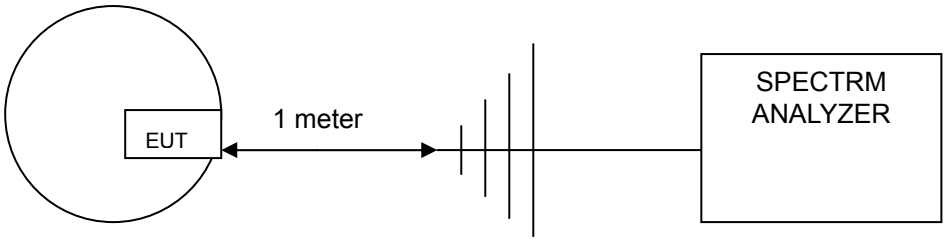
c. Set the resolution bandwidth to 100kHz and video bandwidth to 300kHz. The spectrum analyzer was turned to the centre frequency of the transmitter's and the analyzer's marker function was used to determine the duration of transmission.

d. The transmission duration was measured and recorded.

4.4.4 DEVIATION FROM TEST STANDARD

No deviation.

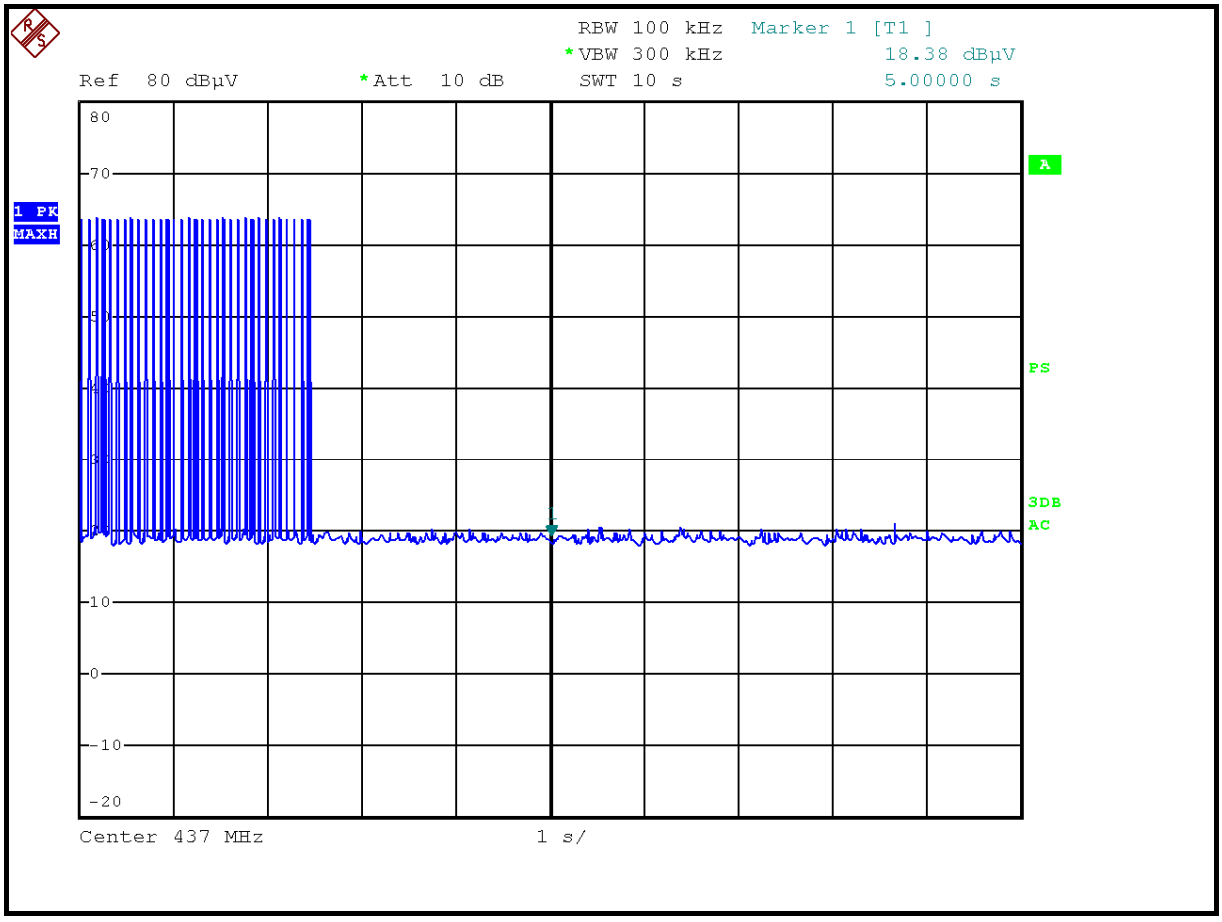
4.4.5 TEST SETUP



4.4.6 TEST RESULTS

PUSH BUTTON	FREQUENCY (MHz)	MAXIMUM LIMIT (sec)	PASS/FAIL
1	437	5	PASS

The plots of test results are attached as below.



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/Telecom Lab
Tel: 886-3-5935343
Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety 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.

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.

--- END ---