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FCC TEST REPORT

REPORT NO.: RF140502D05

MODEL NO.: C51-700

FCC ID: NQ8C51

RECEIVED: May 2, 2014

TESTED: May 5 ~ 16, 2014

ISSUED: May 20, 2014

APPLICANT: Pace Micro Technology plc

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF140502D05	Original release	May 20, 2014



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1. CERTIFICATION

PRODUCT: SET TOP BOX

MODEL NO.: C51-700

BRAND: DIRECTV

APPLICANT: Pace Micro Technology plc

TESTED: May 5 ~ 16, 2014

TEST SAMPLE: ENGINEERING SAMPLE

STANDARDS: 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 : *Jessica Cheng* , **DATE:** May 20, 2014
(Jessica Cheng / Senior Specialist)

APPROVED BY : *Rex Lai* , **DATE:** May 20, 2014
(Rex Lai / Assistant Manager)



2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.247)			
STANDARD SECTION	TEST TYPE	RESULT	REMARK
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -7.30dB at 0.53672MHz.
15.247(d) 15.209	Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -7.4dB at 83.93MHz.
15.247(d)	Band Edge Measurement	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	UNCERTAINTY
Conducted emissions	150kHz~30MHz	3.43 dB
Radiated emissions	30MHz ~ 1GHz	4.30 dB
	Above 1GHz	3.36 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

EUT	SET TOP BOX
MODEL NO.	C51-700
POWER SUPPLY	12Vdc (from Adapter)
MODULATION TYPE	OQPSK
TRANSFER RATE	250Kbps/ 500Kbps/ 1Mbps/ 2Mbps
OPERATING FREQUENCY	2425MHz ~ 2475MHz
NUMBER OF CHANNEL	11
OUTPUT POWER	1.8mW
ANTENNA TYPE	PCB antenna with 4.7dBi gain
ANTENNA CONNECTOR	N/A
DATA CABLE	N/A
I/O PORTS	Refer to user's manual
ACCESSORY DEVICES	Refer to Note as below

Note:

1. The EUT uses following adapter.

Adapter	1	2
Brand	DIRECTV	DIRECTV
Model	EPS10R1-16	EPS10R1-15
AC Input Power	120V 0.5A 60Hz	120V 0.5A 60Hz
DC Output Power	12V 1.5A 18W	12V 1.5A 18W
Power Line	Non-shielded AC cable (0.9m) 2 Pin Non-shielded DC cable with one core (1.8m)	Non-shielded AC cable (0.9m) 2 Pin Non-shielded DC cable with one core (1.8m)

After pre-tested, the Adapter 1 was the worse case and only its test data was recorded in this report

2. The above EUT information was 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

11 channels are listed as below:

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
15	2425MHz	21	2455MHz
16	2430MHz	22	2460MHz
17	2435MHz	23	2465MHz
18	2440MHz	24	2470MHz
19	2445MHz	25	2475MHz
20	2450MHz		



3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO					DESCRIPTION
	RE ³ 1G	RE<1G	PLC	APCM	OB	
A	√	√	√	√	√	With adapter 1
B	-	-	√	-	-	With adapter 2

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

RADIATED EMISSION TEST (ABOVE 1GHz):

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
A	15 to 25	15, 20, 25	OQPSK

RADIATED EMISSION TEST (BELOW 1GHz):

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
A	15 to 25	15	OQPSK

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
A	15 to 25	15	OQPSK
B	15 to 25	15	OQPSK



CONDUCTED OUT-BAND EMISSION MEASUREMENT:

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
A	15 to 25	15, 20, 25	OQPSK

ANTENNA PORT CONDUCTED MEASUREMENT:

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
A	15 to 25	15, 20, 25	OQPSK

TEST CONDITION:

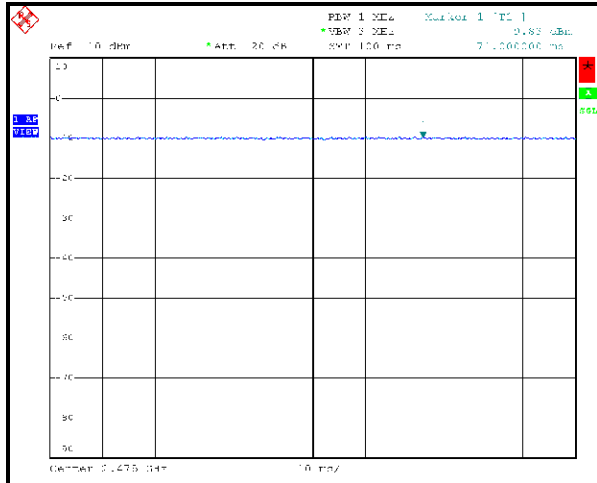
APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE [≥] 1G	23deg. C, 72%RH	120Vac, 60Hz	Joey Liu
RE<1G	23deg. C, 72%RH	120Vac, 60Hz	Joey Liu
PLC	23deg. C, 73%RH	120Vac, 60Hz	Joey Liu
OB	25deg. C, 60%RH	120Vac, 60Hz	Chad Lee
APCM	25deg. C, 60%RH	120Vac, 60Hz	Chad Lee



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3.3 DUTY CYCLE OF TEST SIGNAL

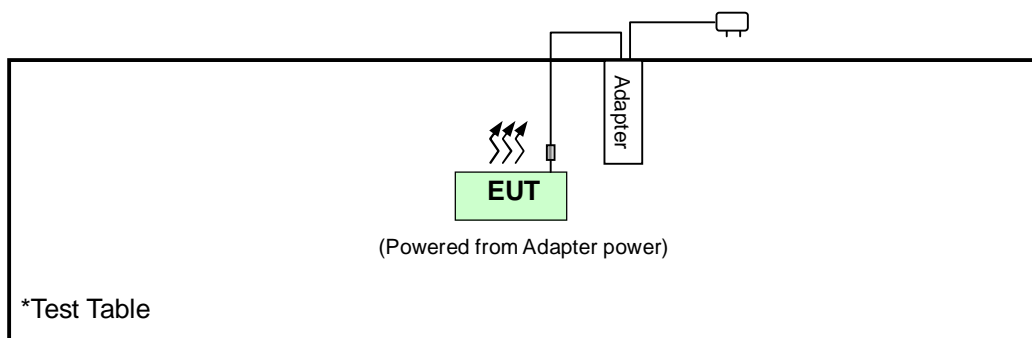
Duty cycle of test signal is 100 %



3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together without any necessary accessory or support unit.

3.4.1 CONFIGURATION OF SYSTEM UNDER TEST





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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)

ANSI C63.10-2009

558074 D01 DTS Meas Guidance v03r01

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.



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4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
HP Preamplifier	8447D	2432A03504	Feb. 26, 2014	Feb. 25, 2015
HP Preamplifier	8449B	3008A01201	Feb. 26, 2014	Feb. 25, 2015
Agilent TEST RECEIVER	N9038A	MY51210129	Jan. 18, 2014	Jan. 17, 2015
Schwarzbeck Antenna	VULB 9168	139	Feb. 24, 2014	Feb. 23, 2015
Schwarzbeck Antenna	VHBA 9123	480	May 29, 2013	May 28, 2015
ADT. Turn Table	TT100	0306	NA	NA
ADT. Tower	AT100	0306	NA	NA
Software	ADT_Radiated_V 7.6.15.9.4	NA	NA	NA
SUHNER RF cable	SF102	CABLE-CH6	Aug. 16, 2013	Aug. 15, 2014
EMCO Horn Antenna	3115	00028257	Sep. 27, 2013	Sep. 26, 2014
Highpass filter Wainwright Instruments	WHK 3.1/18G-10SS	SN 8	NA	NA
ROHDE & SCHWARZ Spectrum Analyzer	FSP 40	100036	May 17, 2013	May 16, 2014
Anritsu Power Sensor	MA2411B	0738404	Apr. 21, 2014	Apr. 20, 2015
Anritsu Power Meter	ML2495A	0842014	Apr. 21, 2014	Apr. 20, 2015

- 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.



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4.1.3 TEST PROCEDURES

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

NOTE:

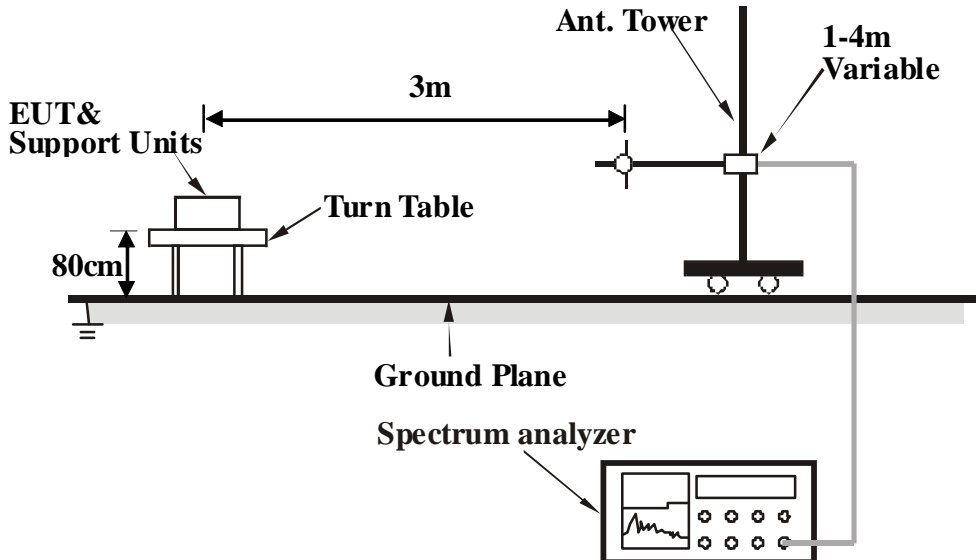
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution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

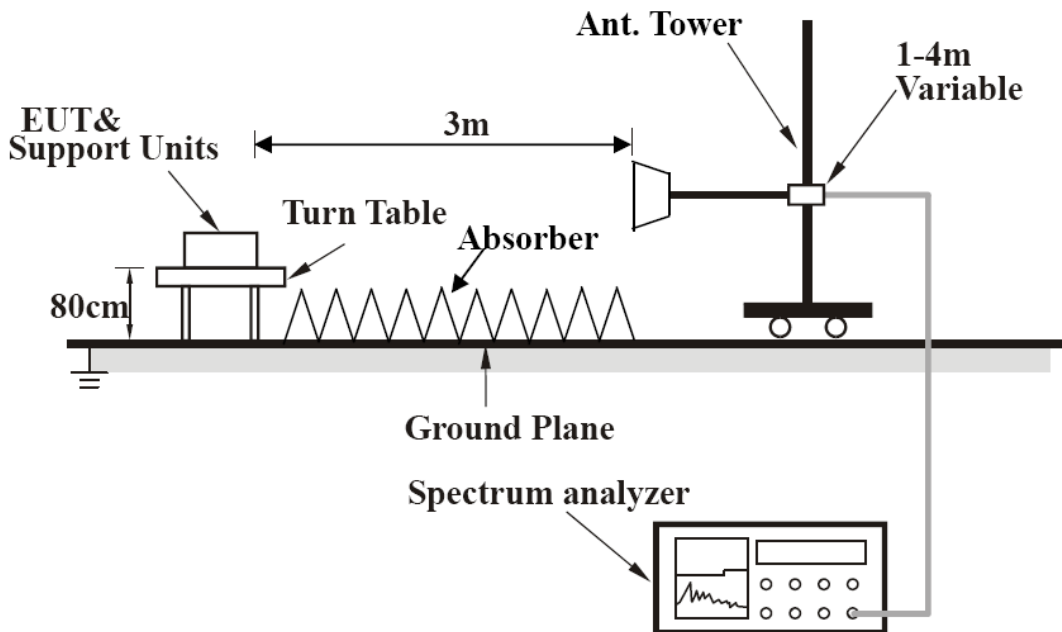
No deviation.

4.1.5 TEST SETUP

Frequency range 30MHz~1GHz



Frequency range above 1GHz



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

4.1.6 EUT OPERATING CONDITIONS

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



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4.1.7 TEST RESULTS

BELOW 1GHz WORST-CASE DATA

CHANNEL	TX Channel 15	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	83.93	32.6 QP	40.0	-7.4	1.18 H	116	51.40	-18.78
2	166.58	34.9 QP	43.5	-8.6	1.59 H	277	48.47	-13.55
3	283.46	36.6 QP	46.0	-9.4	1.37 H	306	49.19	-12.56
4	359.99	36.2 QP	46.0	-9.8	1.86 H	215	47.35	-11.19
5	432.02	35.5 QP	46.0	-10.5	1.46 H	338	45.13	-9.65
6	630.38	33.3 QP	46.0	-12.7	1.29 H	0	39.44	-6.10

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	84.03	32.2 QP	40.0	-7.8	1.45 V	137	51.01	-18.79
2	166.58	32.2 QP	43.5	-11.4	1.38 V	282	45.70	-13.55
3	299.85	34.1 QP	46.0	-11.9	1.24 V	214	46.22	-12.08
4	432.06	33.8 QP	46.0	-12.2	1.63 V	355	43.45	-9.65
5	598.52	34.1 QP	46.0	-11.9	1.17 V	24	40.86	-6.73
6	779.47	37.5 QP	46.0	-8.6	1.29 V	313	41.38	-3.93

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



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ABOVE 1GHz DATA

CHANNEL	TX Channel 15	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	52.5 PK	74.0	-21.6	1.04 H	116	57.12	-4.67
2	2390.00	38.0 AV	54.0	-16.0	1.04 H	116	42.67	-4.67
3	*2425.00	102.8 PK			1.04 H	116	107.28	-4.52
4	*2425.00	100.7 AV			1.04 H	116	105.19	-4.52
5	4850.00	48.6 PK	74.0	-25.4	1.04 H	132	46.37	2.25
6	4850.00	36.4 AV	54.0	-17.6	1.04 H	132	34.16	2.25
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	51.2 PK	74.0	-22.8	1.07 V	219	55.86	-4.67
2	2390.00	38.0 AV	54.0	-16.0	1.07 V	219	42.68	-4.67
3	*2425.00	96.2 PK			1.07 V	219	100.72	-4.52
4	*2425.00	93.8 AV			1.07 V	219	98.35	-4.52
5	4850.00	46.2 PK	74.0	-27.8	1.07 V	239	43.92	2.25
6	4850.00	34.0 AV	54.0	-20.0	1.07 V	239	31.77	2.25

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.



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CHANNEL	TX Channel 20	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	*2450.00	100.9 PK			1.05 H	120	105.35	-4.44
2	*2450.00	99.2 AV			1.05 H	120	103.62	-4.44
3	4900.00	47.6 PK	74.0	-26.4	1.05 H	226	45.21	2.39
4	4900.00	35.4 AV	54.0	-18.6	1.05 H	226	32.97	2.39

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	*2450.00	95.5 PK			1.10 V	210	99.92	-4.44
2	*2450.00	93.2 AV			1.10 V	210	97.62	-4.44
3	4900.00	47.0 PK	74.0	-27.0	1.10 V	236	44.62	2.39
4	4900.00	33.8 AV	54.0	-20.3	1.10 V	236	31.36	2.39

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.



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CHANNEL	TX Channel 25	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	*2475.00	101.4 PK			1.10 H	118	105.73	-4.34
2	*2475.00	99.3 AV			1.10 H	118	103.61	-4.34
3	2483.50	57.1 PK	74.0	-17.0	1.10 H	118	61.36	-4.31
4	2483.50	45.2 AV	54.0	-8.8	1.10 H	118	49.54	-4.31
5	4950.00	48.1 PK	74.0	-25.9	1.10 H	163	45.66	2.41
6	4950.00	35.8 AV	54.0	-18.2	1.10 H	163	33.36	2.41

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	*2475.00	93.8 PK			1.08 V	213	98.13	-4.34
2	*2475.00	91.3 AV			1.08 V	213	95.62	-4.34
3	2483.50	53.5 PK	74.0	-20.5	1.08 V	213	57.85	-4.31
4	2483.50	40.2 AV	54.0	-13.8	1.08 V	213	44.53	-4.31
5	4950.00	46.4 PK	74.0	-27.6	1.08 V	263	44.01	2.41
6	4950.00	33.0 AV	54.0	-21.0	1.08 V	263	30.59	2.41

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.



4.2 CONDUCTED EMISSION MEASUREMENT

4.2.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

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

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

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

4.2.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
ROHDE & SCHWARZ TEST RECEIVER	ESCS 30	100276	Apr. 18, 2014	Apr. 17, 2015
ROHDE & SCHWARZ Artificial Mains Network (for EUT)	ESH3-Z5	100219	Nov. 17, 2013	Nov. 16, 2014
LISN With Adapter (for EUT)	AD10	C10Ada-001	Nov. 17, 2013	Nov. 16, 2014
ROHDE & SCHWARZ Artificial Mains Network (for peripherals)	ESH3-Z5	100218	Nov. 25, 2013	Nov. 24, 2014
SCHWARZBECK Artificial Mains Network (For EUT)	NNLK8129	8129229	May 08, 2014	May 07, 2015
Software	ADT_Cond_V7.3.7	NA	NA	NA
RF cable (JYBAO)	5D-FB	Cable-C10.01	Feb. 18, 2014	Feb. 17, 2015
SUHNER Terminator (For ROHDE & SCHWARZ LISN)	65BNC-5001	E1-011484	May 23, 2013	May 22, 2014
Isolation Transformer (Erika Fiedler)	D-65396	017	Jul. 29, 2013	Jul. 28, 2014

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. 10.

3. The VCCI Site Registration No. C-1852.



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4.2.3 TEST PROCEDURES

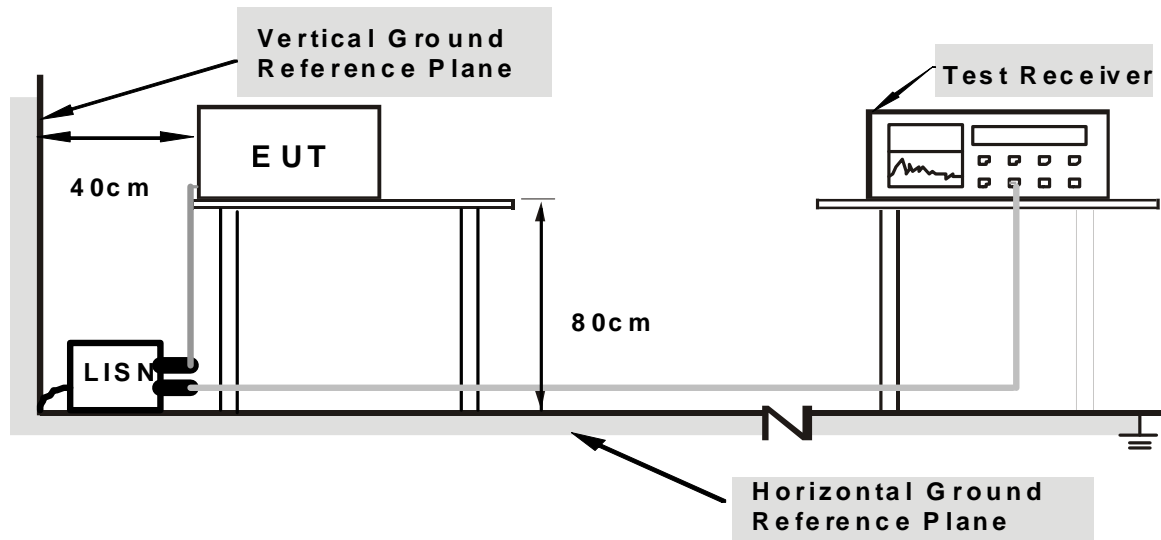
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling 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: 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 item 4.1.6.

4.2.7 TEST RESULTS

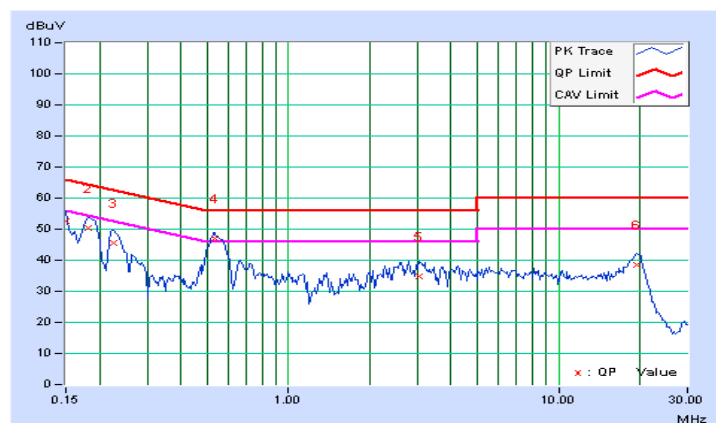
CONDUCTED WORST-CASE DATA :

PHASE	Line 1	6dB BANDWIDTH	9kHz
TEST MODE	A		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.15	52.60	33.68	52.75	33.83	66.00	56.00	-13.25	-22.17
2	0.18125	0.16	50.35	34.99	50.51	35.15	64.43	54.43	-13.92	-19.28
3	0.22422	0.16	45.36	32.76	45.52	32.92	62.66	52.66	-17.14	-19.74
4	0.53672	0.17	47.03	38.53	47.20	38.70	56.00	46.00	-8.80	-7.30
5	3.04297	0.24	34.41	23.66	34.65	23.90	56.00	46.00	-21.35	-22.10
6	19.41016	1.09	37.50	31.39	38.59	32.48	60.00	50.00	-21.41	-17.52
7	3.10156	0.32	30.69	10.04	31.01	10.36	56.00	46.00	-24.99	-35.64

Remarks:

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





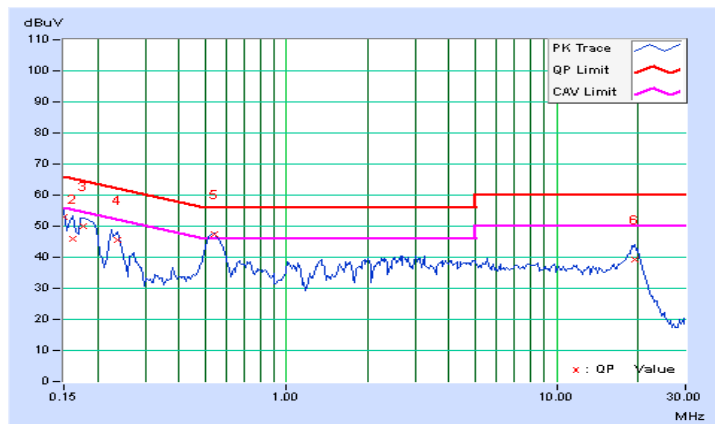
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PHASE	Line 2	6dB BANDWIDTH	9kHz
TEST MODE	A		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.55	52.51	34.33	53.06	34.88	66.00	56.00	-12.94	-21.12
2	0.16172	0.55	45.54	28.79	46.09	29.34	65.38	55.38	-19.29	-26.04
3	0.17734	0.54	49.61	32.04	50.15	32.58	64.61	54.61	-14.45	-22.02
4	0.23594	0.54	45.02	33.48	45.56	34.02	62.24	52.24	-16.68	-18.22
5	0.54063	0.54	46.90	36.62	47.44	37.16	56.00	46.00	-8.56	-8.84
6	19.53125	1.07	38.14	32.25	39.21	33.32	60.00	50.00	-20.79	-16.68

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





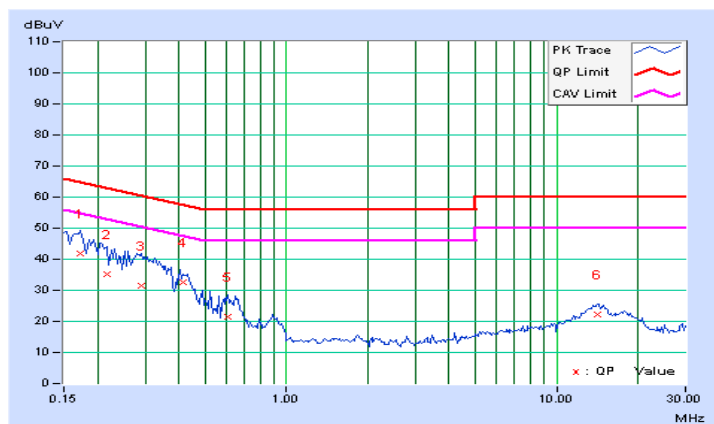
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PHASE	Line 1	6dB BANDWIDTH	9kHz
TEST MODE	B		

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	0.17344	0.15	41.54	27.54	41.69	27.69	64.79
2	0.21641	0.16	34.90	23.29	35.06	23.45	62.96	52.96	-27.89	-29.50
3	0.29063	0.16	31.47	20.92	31.63	21.08	60.51	50.51	-28.87	-29.42
4	0.41563	0.17	32.57	26.50	32.74	26.67	57.54	47.54	-24.80	-20.87
5	0.60313	0.17	21.13	8.26	21.30	8.43	56.00	46.00	-34.70	-37.57
6	14.21094	0.82	21.24	15.70	22.06	16.52	60.00	50.00	-37.94	-33.48

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





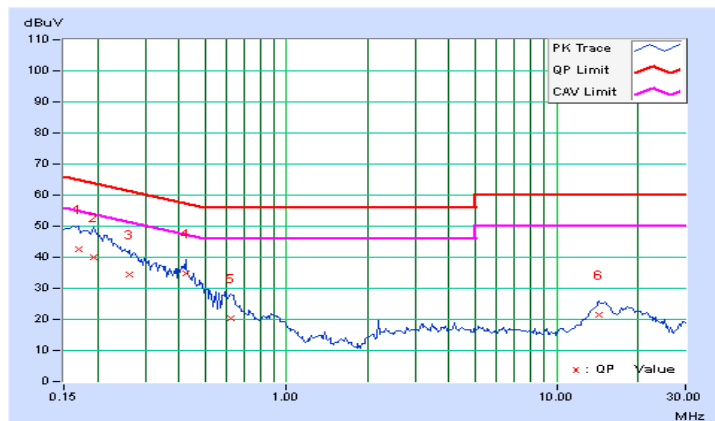
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PHASE	Line 2	6dB BANDWIDTH	9kHz
TEST MODE	B		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16953	0.55	41.94	27.21	42.49	27.76	64.98	54.98	-22.50	-27.23
2	0.19297	0.54	39.48	26.52	40.02	27.06	63.91	53.91	-23.89	-26.85
3	0.26328	0.54	33.85	19.04	34.39	19.58	61.33	51.33	-26.94	-31.75
4	0.42344	0.53	34.21	27.14	34.74	27.67	57.38	47.38	-22.64	-19.71
5	0.61875	0.54	19.94	10.32	20.48	10.86	56.00	46.00	-35.52	-35.14
6	14.33203	0.94	20.47	14.18	21.41	15.12	60.00	50.00	-38.59	-34.88

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

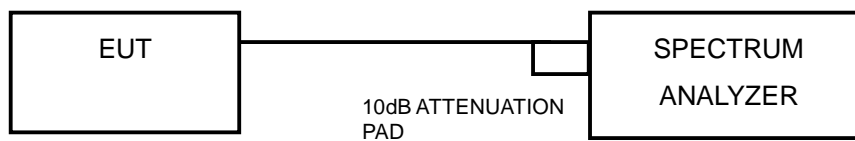


4.3 6dB BANDWIDTH MEASUREMENT

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

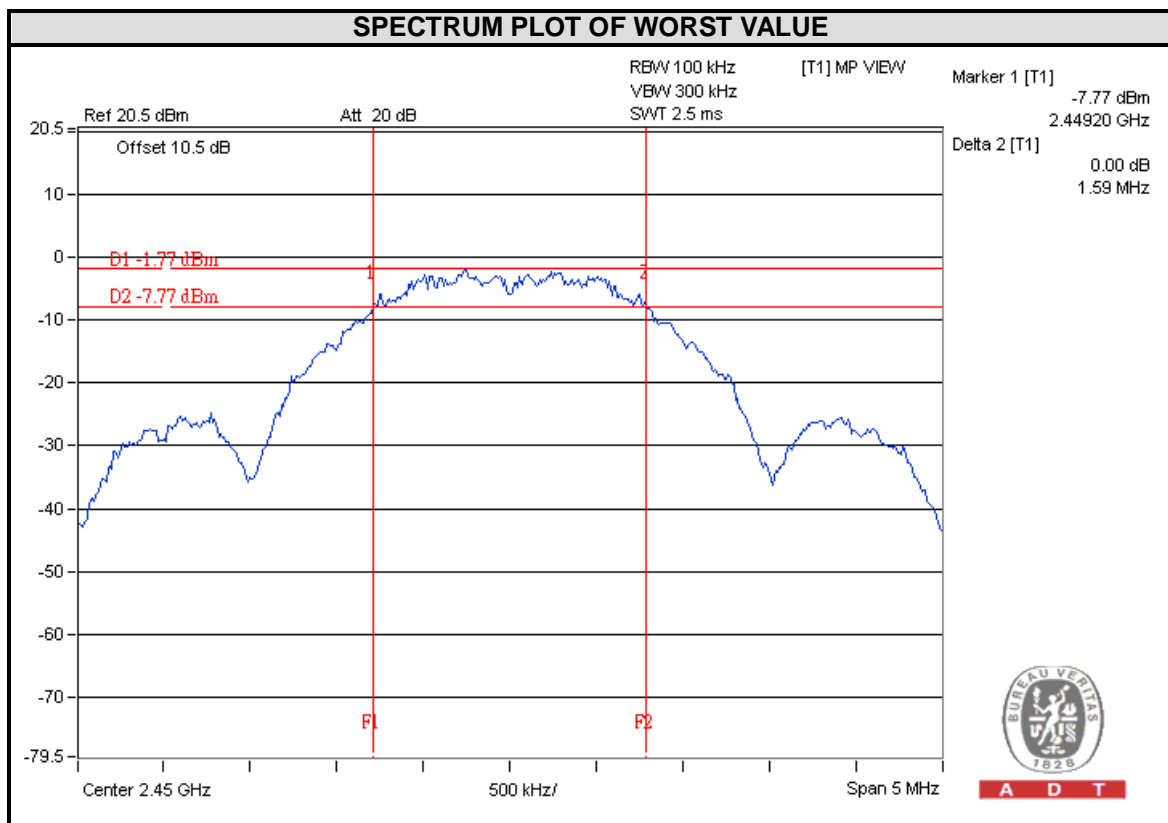
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.



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4.3.7 TEST RESULTS

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
15	2425	1.58	0.5	PASS
20	2450	1.59	0.5	PASS
25	2475	1.57	0.5	PASS

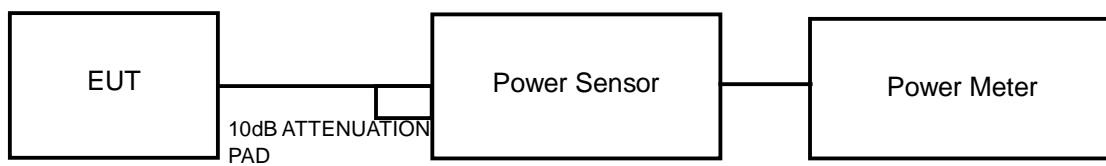


4.4 CONDUCTED OUTPUT POWER

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

4.4.5 DEVIATION FROM TEST STANDARD

No deviation.

4.4.6 EUT OPERATING CONDITIONS

Same as Item 4.3.6.



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4.4.7 TEST RESULTS

FOR PEAK POWER

CHAN.	CHAN. FREQ. (MHz)	POWER OUTPUT (mW)	POWER OUTPUT (dBm)	POWER LIMIT (dBm)	PASS / FAIL
15	2425	1.8	2.43	30	PASS
20	2450	1.7	2.20	30	PASS
25	2475	1.6	2.01	30	PASS

FOR AVERAGE POWER

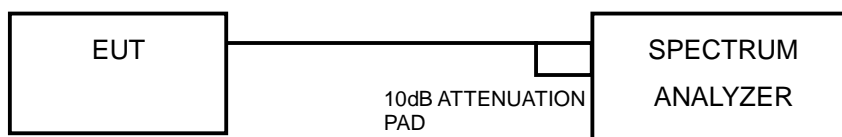
CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (dBm)
15	2425	2.28
20	2450	2.07
25	2475	1.83

4.5 POWER SPECTRAL DENSITY MEASUREMENT

4.5.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm.

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 the RBW = 3 kHz, VBW = 10 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.

4.5.5 DEVIATION FROM TEST STANDARD

No deviation.

4.5.6 EUT OPERATING CONDITION

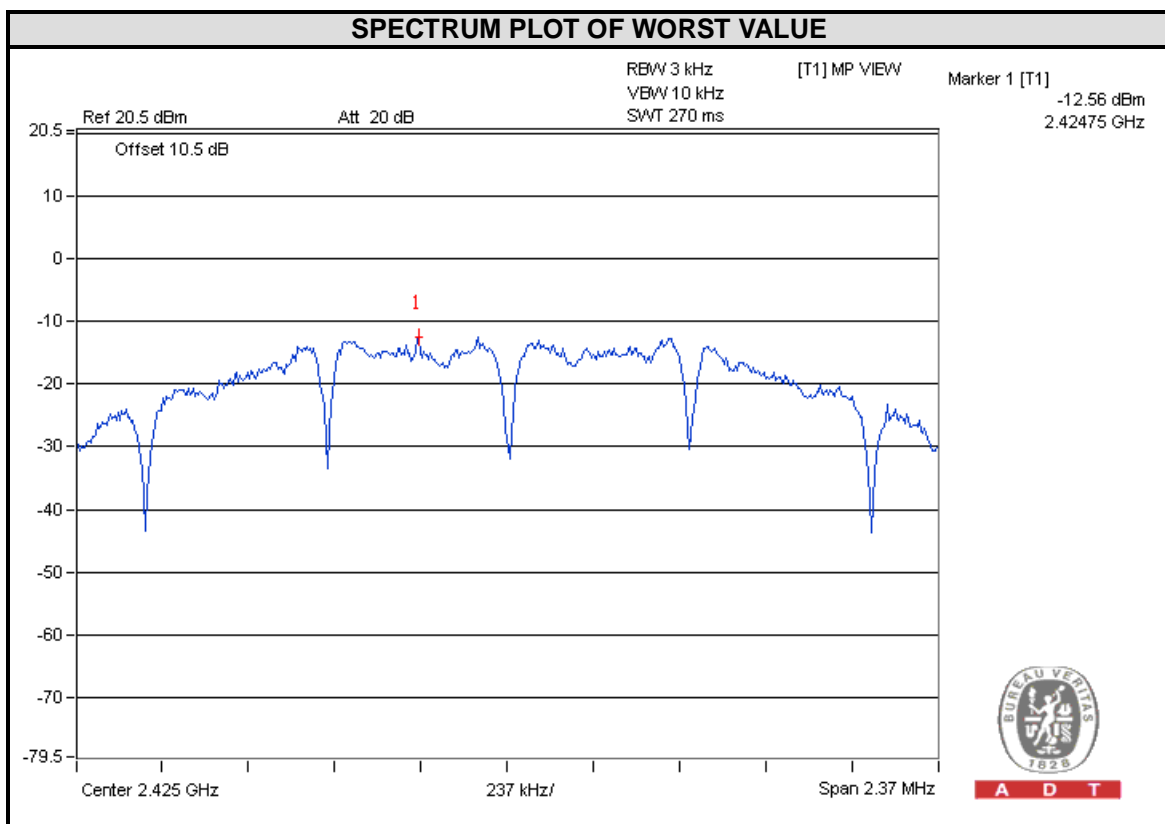
Same as Item 4.3.6



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4.5.7 TEST RESULTS

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
15	2425	-12.56	8	PASS
20	2450	-14.12	8	PASS
25	2475	-14.42	8	PASS

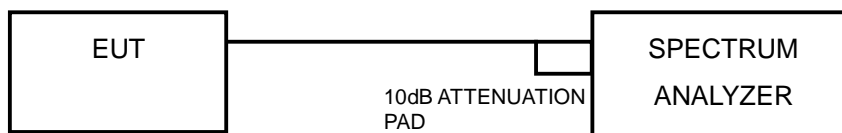


4.6 CONDUCTED OUT OF BAND EMISSION MEASUREMENT

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

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



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MEASUREMENT PROCEDURE OOB

1. Set RBW = 100 kHz.
2. Set VBW \geq 300 kHz.
3. Set span to encompass the spectrum to be examined.
4. Detector = peak.
5. Trace Mode = max hold.
6. Sweep = auto couple.

4.6.5 DEVIATION FROM TEST STANDARD

No deviation.

4.6.6 EUT OPERATING CONDITION

Same as Item 4.3.6

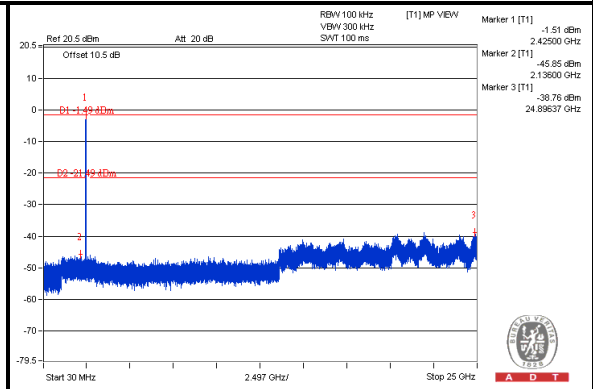
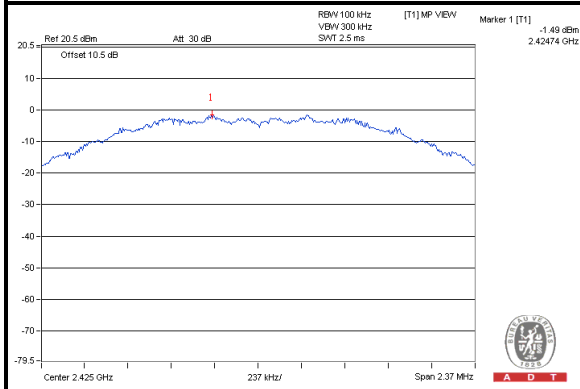
4.6.7 TEST RESULTS

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

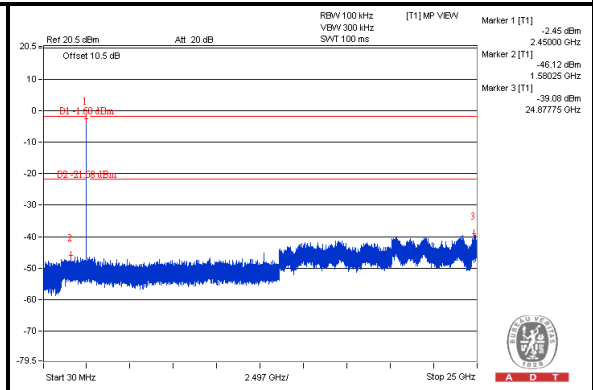
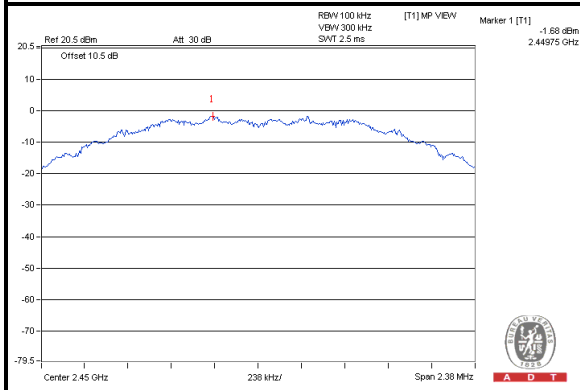


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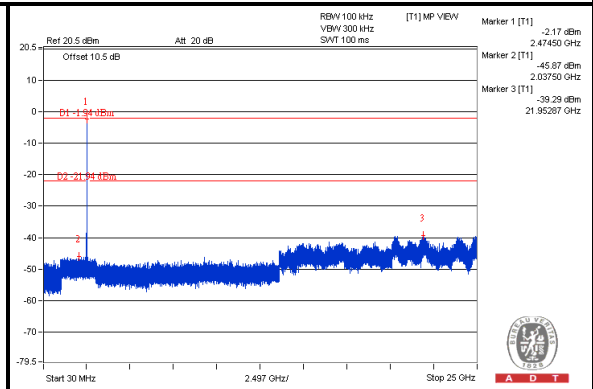
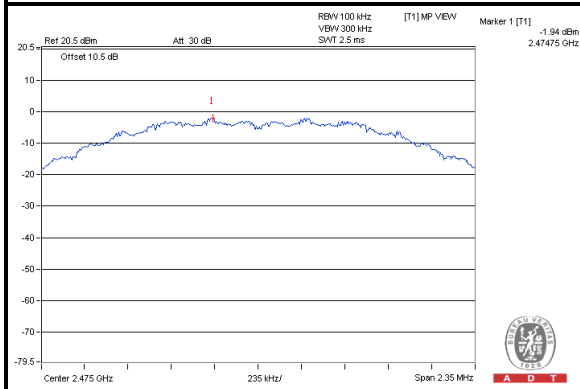
CH 15



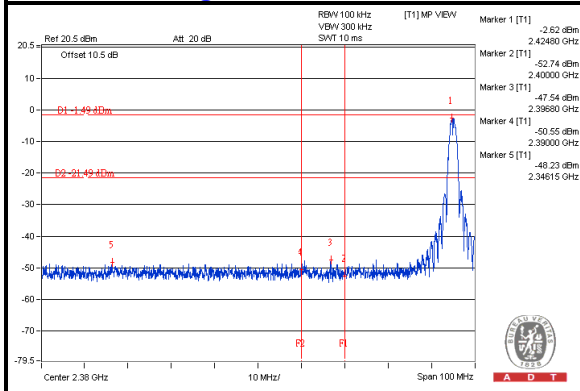
CH 20



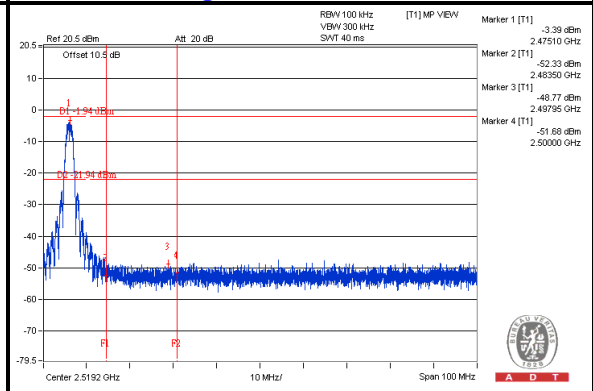
CH 25



CH 15 Band edge



CH 25 Band edge





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5. PHOTOGRAPHS OF THE TEST CONFIGURATION

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



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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:

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Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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



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

No modifications were made to the EUT by the lab during the test.

---END---