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# FCC TEST REPORT

**REPORT NO.:** RF110503C18 R 1

**MODEL NO.:** FHA-0513

**FCC ID:** M6E-FHA0513

**RECEIVED:** May 03, 2011

**TESTED:** May 05 ~ May 25, 2011

**ISSUED:** May 26, 2011

**APPLICANT:** Cheng Uei Precision Industry Co Ltd

**ADDRESS:** No. 18, Chung Shan Rd., Tu-Cheng Industry Park  
Tu Cheng City, Taipei Hsien, Taiwan, R.O.C.

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

**LAB ADDRESS:** No. 47, 14th Ling, Chia Pau Tsuen, Lin Kou  
Hsiang, Taipei Hsien 244, Taiwan, R.O.C.

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

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## RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
Original release	N/A	May 16, 2011
RF110503C18 R 1	Revised and retested the highest frequency	May 26, 2011



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## 1. CERTIFICATION

**PRODUCT:** HP 2.4GHz Wireless Optical Mobile Mouse

**MODEL NO.:** FHA-0513

**BRAND:** HP

**APPLICANT:** Cheng Uei Precision Industry Co Ltd

**TESTED:** May 05 ~ May 25, 2011

**TEST SAMPLE:** ENGINEERING SAMPLE

**STANDARDS:** FCC Part 15, Subpart C (Section 15.249)

ANSI C63.4-2003

ANSI C63.10-2009

The above equipment (Model: FHA-0513) have 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** : Ivy Lin , DATE: May 26, 2011  
Ivy Lin / Specialist

**APPROVED BY** : Gary Chang , DATE: May 26, 2011  
Gary Chang / Assistant Manager



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## 2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C (Section 15.249)			
STANDARD PARAGRAPH	TEST TYPE	RESULT	REMARK
15.207	Conducted Emission Test	NA	Power supply is 1.5Vdc from battery.
15.209	Radiated Emission Test		Meet the requirement of limit.
15.249	Band Edge Measurement		Minimum passing margin is
15.249 (d)	Limit: 50dB less than the peak value of fundamental frequency or meet radiated emission limit in section 15.209	PASS	-15.3dB at 832.89MHz.

### 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
Radiated emissions	30MHz ~ 200MHz	2.93 dB
	200MHz ~ 1000MHz	2.95 dB
	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	1.94 dB

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



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### 3. GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

<b>EUT</b>	HP 2.4GHz Wireless Optical Mobile Mouse
<b>MODEL NO.</b>	FHA-0513
<b>FCC ID</b>	M6E-FHA0513
<b>POWER SUPPLY</b>	1.5Vdc
<b>MODULATION TYPE</b>	GFSK
<b>DATA RATE</b>	2Mbps
<b>OPERATING FREQUENCY</b>	2402 ~ 2480MHz
<b>NUMBER OF CHANNEL</b>	79
<b>ANTENNA TYPE</b>	PCB antenna with -4.9dBi gain
<b>DATA CABLE</b>	NA
<b>I/O PORT</b>	NA
<b>ACCESSORY DEVICES</b>	NA

**NOTE:**

1. The EUT has transmitter and receiver functions.
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.



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### 3.2 DESCRIPTION OF TEST MODES

79 channels are provided to this EUT.

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
1	2402	28	2429	55	2456
2	2403	29	2430	56	2457
3	2404	30	2431	57	2458
4	2405	31	2432	58	2459
5	2406	32	2433	59	2460
6	2407	33	2434	60	2461
7	2408	34	2435	61	2462
8	2409	35	2436	62	2463
9	2410	36	2437	63	2464
10	2411	37	2438	64	2465
11	2412	38	2439	65	2466
12	2413	39	2440	66	2467
13	2414	40	2441	67	2468
14	2415	41	2442	68	2469
15	2416	42	2443	69	2470
16	2417	43	2444	70	2471
17	2418	44	2445	71	2472
18	2419	45	2446	72	2473
19	2420	46	2447	73	2474
20	2421	47	2448	74	2475
21	2422	48	2449	75	2476
22	2423	49	2450	76	2477
23	2424	50	2451	77	2478
24	2425	51	2452	78	2479
25	2426	52	2453	79	2480
26	2427	53	2454		
27	2428	54	2455		



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### 3.2.1 CONFIGURATION OF SYSTEM UNDER TEST



**EUT**  
(Power from battery)

\*Test table



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### 3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE $\geq$ 1G	RE $<$ 1G	PLC	BM	
-	✓	✓	NOTE	✓	-

Where **PLC**: Power Line Conducted Emission**RE $<$ 1G**: Radiated Emission below 1GHz**RE $\geq$ 1G**: Radiated Emission above 1GHz**BM**: Bandedge Measurement**NOTE**: No need to concern of Conducted Emission due to the EUT is powered by battery

#### RADIATED EMISSION TEST (ABOVE 1 GHz):

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

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
1 to 79	1, 49, 79	GFSK

#### RADIATED EMISSION TEST (BELOW 1 GHz):

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

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
1 to 79	1	GFSK

#### BANDEDGE MEASUREMENT:

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

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
1 to 79	1, 79	GFSK

#### TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE $\geq$ 1G	25deg. C, 68%RH, 1007hPa	1.5 Vdc	Sun Line
RE $<$ 1G	25deg. C, 68%RH, 1009hPa	1.5 Vdc	Sun Line
BM	25deg. C, 68%RH, 1007hPa	1.5 Vdc	Sun Line



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### **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 (Section 15.249)**

**ANSI C63.4-2003**

**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.



## 4. TEST TYPES AND RESULTS

### 4.1 RADIATED EMISSION MEASUREMENT

#### 4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209, 15.249 as following:

15.209 Limit		
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

15.249 Limit		
Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
902 ~ 928 MHz	50	500
2400 ~ 2483.5 MHz	50	500
5725 ~ 5875 MHz	50	500
24 ~ 24.25 GHz	250	2500

#### NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dB<sub>B</sub>V/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.



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#### 4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESI7	838496/016	Dec. 27, 2010	Dec. 26, 2011
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	100115	Aug. 02, 2010	Aug. 01, 2011
BILOG Antenna SCHWARZBECK	VULB9168	9168-156	Apr. 12, 2011	Apr. 11, 2012
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-408	Jan. 06, 2011	Jan. 05, 2012
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170243	Dec. 27, 2010	Dec. 26, 2011
Preamplifier Agilent	8449B	3008A01961	Nov. 02, 2010	Nov. 01, 2011
Preamplifier Agilent	8447D	2944A10738	Nov. 02, 2010	Nov. 01, 2011
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	274041/4	Aug. 21, 2010	Aug. 20, 2011
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	283397/4	Aug. 21, 2010	Aug. 20, 2011
Software ADT.	ADT_Radiated_ V7.6.15.9.2	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 ADT.	TT100.	TT93021704	NA	NA
Turn Table Controller 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 988962.
5. The IC Site Registration No. is IC7450F-4.



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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 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 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.

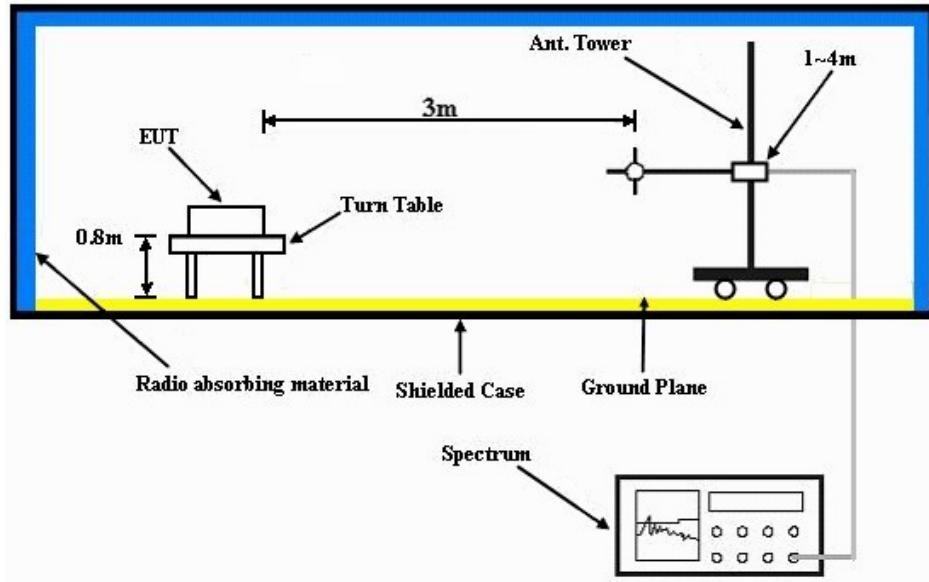
**NOTE:**

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

#### 4.1.4 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.1.5 TEST SETUP



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

#### 4.1.6 EUT OPERATING CONDITIONS

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



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#### 4.1.7 TEST RESULTS

##### ABOVE 1GHz DATA

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	1.5 Vdc	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 68%RH 1007 hPa	TESTED BY	Sun Lin

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2386.00	36.8 PK	74.0	-37.2	1.34 H	112	6.30	30.50
2	2386.00	27.5 AV	54.0	-26.5	1.34 H	112	-3.00	30.50
3	2398.00	43.6 PK	74.0	-30.4	1.34 H	112	13.00	30.60
4	2398.00	34.3 AV	54.0	-19.7	1.34 H	112	3.70	30.60
5	2400.00	45.7 PK	74.0	-28.3	1.34 H	112	15.10	30.60
6	2400.00	26.5 AV	54.0	-27.5	1.34 H	112	-4.10	30.60
7	*2402.00	87.8 PK	114.0	-26.2	1.34 H	112	57.20	30.60
8	*2402.00	68.6 AV	94.0	-25.4	1.34 H	112	38.00	30.60
9	4804.00	52.9 PK	74.0	-21.1	1.02 H	6	16.40	36.50
10	4804.00	33.7 AV	54.0	-20.3	1.02 H	6	-2.80	36.50

**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. “\*”: Fundamental frequency  
 6. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:  
 $20 \log (\text{Duty cycle}) = 20 \log (35 * 2 * 0.156 \text{ ms} / 100 \text{ ms}) = -19.2 \text{ dB}$   
 Please see page 19 ~ 20 for plotted duty.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	1.5 Vdc	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 68%RH 1007 hPa	TESTED BY	Sun Lin

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2386.00	41.9 PK	74.0	-32.1	1.00 V	279	11.40	30.50
2	2386.00	27.1 AV	54.0	-26.9	1.00 V	279	-3.40	30.50
3	2398.00	41.4 PK	74.0	-32.6	1.00 V	279	10.80	30.60
4	2398.00	28.0 AV	54.0	-26.0	1.00 V	279	-2.60	30.60
5	2400.00	37.5 PK	74.0	-36.5	1.00 V	279	6.90	30.60
6	2400.00	18.3 AV	54.0	-35.7	1.00 V	279	-12.30	30.60
7	*2402.00	77.0 PK	114.0	-37.0	1.00 V	279	46.40	30.60
8	*2402.00	57.8 AV	94.0	-36.2	1.00 V	279	27.20	30.60
9	4804.00	49.9 PK	74.0	-24.1	1.29 V	75	13.40	36.50
10	4804.00	30.7 AV	54.0	-23.3	1.29 V	75	-5.80	36.50

**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. “\*”: Fundamental frequency
6. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:  

$$20 \log (\text{Duty cycle}) = 20 \log (35 * 2 * 0.156 \text{ ms} / 100 \text{ ms}) = -19.2 \text{ dB}$$
Please see page 19 ~ 20 for plotted duty.



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EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		Channel 49		FREQUENCY RANGE 1 ~ 25GHz
INPUT POWER		1.5 Vdc		DETECTOR FUNCTION Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS		25deg. C, 68%RH 1007 hPa		TESTED BY Sun Lin

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2450.00	87.5 PK	114.0	-26.5	1.38 H	107	56.80	30.70
2	*2450.00	68.3 AV	94.0	-25.7	1.38 H	107	37.60	30.70
3	4900.00	53.5 PK	74.0	-20.5	1.01 H	5	16.70	36.80
4	4900.00	34.3 AV	54.0	-19.7	1.01 H	5	-2.50	36.80
5	7350.00	52.1 PK	74.0	-21.9	1.00 H	183	8.70	43.40
6	7350.00	32.9 AV	54.0	-21.1	1.00 H	183	-10.50	43.40

## ANTENNA POLARITY &amp; 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	76.3 PK	114.0	-37.7	1.02 V	292	45.60	30.70
2	*2450.00	57.1 AV	94.0	-36.9	1.02 V	292	26.40	30.70
3	4900.00	50.2 PK	74.0	-23.8	1.01 V	8	13.40	36.80
4	4900.00	31.0 AV	54.0	-23.0	1.01 V	8	-5.80	36.80
5	7350.00	50.2 PK	74.0	-23.8	1.53 V	115	6.80	43.40
6	7350.00	31.0 AV	54.0	-23.0	1.53 V	115	-12.40	43.40

**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 of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:  

$$20 \log (\text{Duty cycle}) = 20 \log (35 * 2 * 0.156 \text{ ms} / 100 \text{ ms}) = -19.2 \text{ dB}$$
Please see page 19 ~ 20 for plotted duty.



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EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		FREQUENCY RANGE		1 ~ 25GHz
INPUT POWER		DETECTOR FUNCTION		Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS		TESTED BY		Sun Lin

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	85.9 PK	114.0	-28.1	1.29 H	102	55.00	30.90
2	*2480.00	66.7 AV	94.0	-27.3	1.29 H	102	35.80	30.90
3	2483.50	31.8 PK	74.0	-42.2	1.29 H	102	0.90	30.90
4	2483.50	12.6 AV	54.0	-41.4	1.29 H	102	-18.30	30.90
5	2485.50	36.9 PK	74.0	-37.1	1.29 H	102	6.00	30.90
6	2485.50	26.2 AV	54.0	-27.8	1.29 H	102	-4.70	30.90
7	4960.00	54.7 PK	74.0	-19.3	1.00 H	356	17.80	36.90
8	4960.00	35.5 AV	54.0	-18.5	1.00 H	356	-1.40	36.90
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	75.3 PK	114.0	-38.7	1.00 V	288	44.40	30.90
2	*2480.00	56.1 AV	94.0	-37.9	1.00 V	288	25.20	30.90
3	2483.50	34.6 PK	74.0	-39.4	1.00 V	288	3.70	30.90
4	2483.50	15.4 AV	54.0	-38.6	1.00 V	288	-15.50	30.90
5	2485.50	38.4 PK	74.0	-35.6	1.00 V	288	7.50	30.90
6	2485.50	24.8 AV	54.0	-29.2	1.00 V	288	-6.10	30.90
7	4960.00	50.4 PK	74.0	-23.6	1.00 V	7	13.50	36.90
8	4960.00	31.2 AV	54.0	-22.8	1.00 V	7	-5.70	36.90

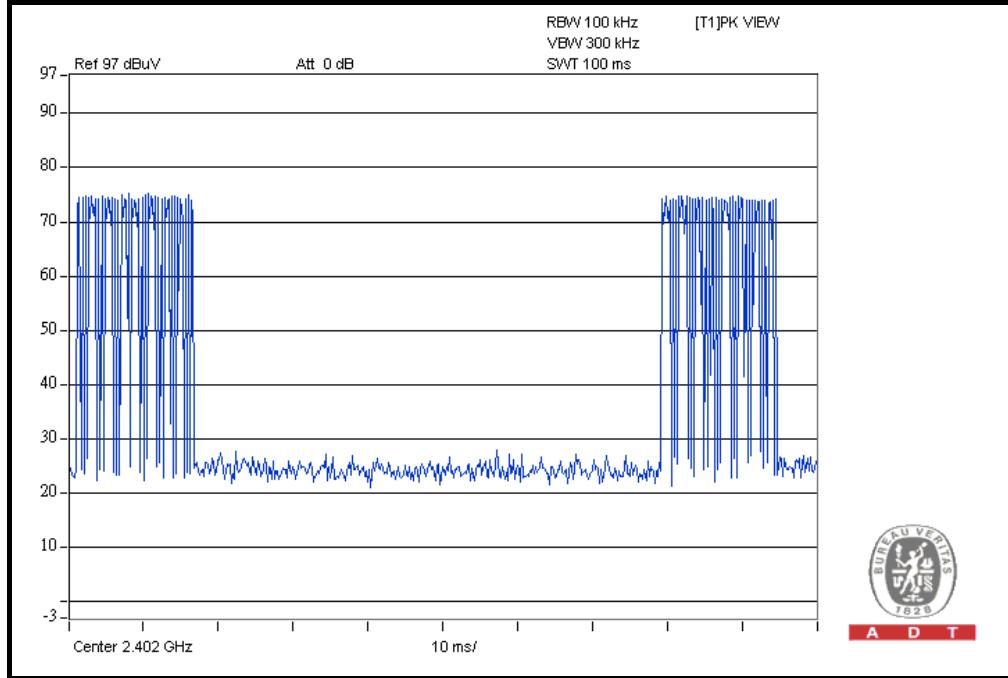
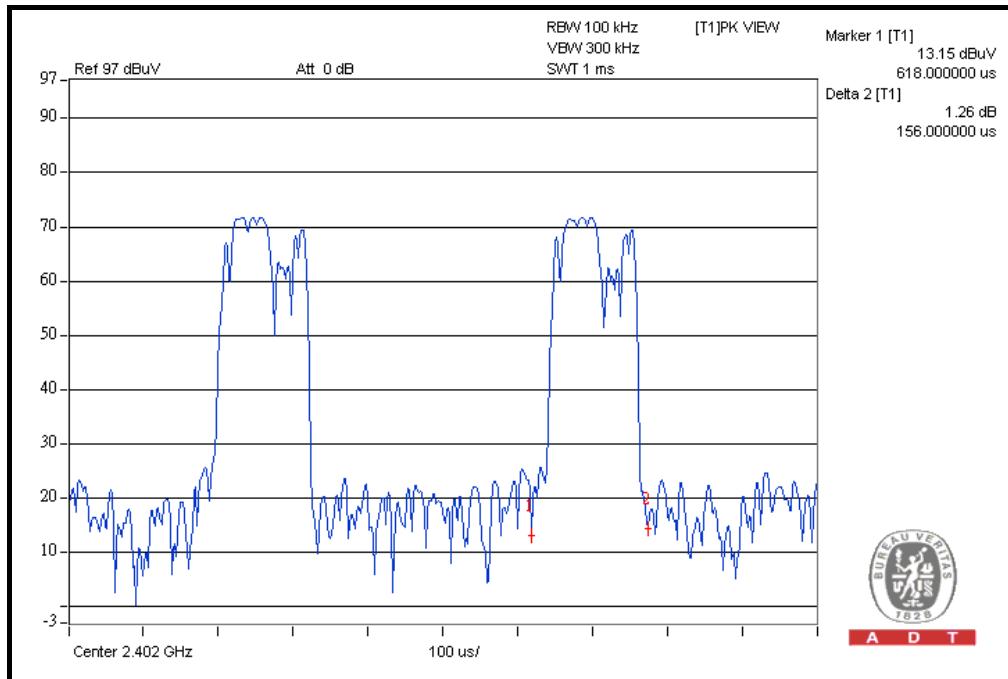
**REMARKS:**

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “\*”: Fundamental frequency
6. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:  

$$20 \log (\text{Duty cycle}) = 20 \log (35 * 2 * 0.156 \text{ ms} / 100 \text{ ms}) = -19.2 \text{ dB}$$
Please see page 19 ~ 20 for plotted duty.

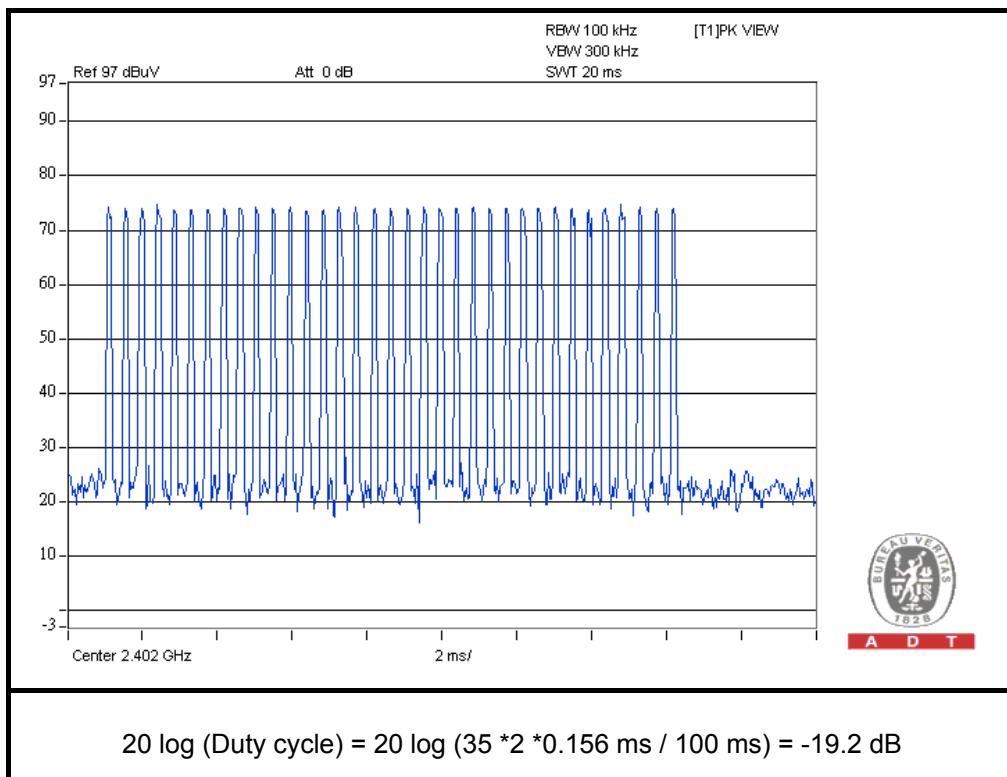


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## BELOW 1GHz WORST-CASE DATA

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		Channel 1		FREQUENCY RANGE Below 1000MHz
INPUT POWER		1.5 Vdc		DETECTOR FUNCTION Quasi-Peak
ENVIRONMENTAL CONDITIONS		25deg. C, 68%RH 1009 hPa		TESTED BY Sun Lin

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	101.84	17.8 QP	43.5	-25.7	1.25 H	46	8.30	9.50
2	175.72	18.8 QP	43.5	-24.7	1.00 H	199	5.90	12.90
3	391.54	17.9 QP	46.0	-28.1	1.50 H	289	1.30	16.60
4	525.69	24.2 QP	46.0	-21.8	1.00 H	148	4.30	19.90
5	700.68	23.9 QP	46.0	-22.1	1.25 H	34	1.90	22.00
6	762.90	24.3 QP	46.0	-21.7	1.50 H	235	0.80	23.50
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	31.84	19.4 QP	40.0	-20.6	1.25 V	1	6.90	12.50
2	101.84	26.9 QP	43.5	-16.6	1.25 V	1	17.40	9.50
3	175.72	23.8 QP	43.5	-19.7	1.00 V	307	10.90	12.90
4	234.05	16.1 QP	46.0	-29.9	1.00 V	109	4.00	12.10
5	609.30	22.0 QP	46.0	-24.0	1.00 V	76	0.30	21.70
6	832.89	30.7 QP	46.0	-15.3	2.00 V	109	6.00	24.70

**REMARKS:**

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



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## 4.2 BAND EDGES MEASUREMENT

### 4.2.1 LIMITS OF BAND EDGES MEASUREMENT

Below –50dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

### 4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
SPECTRUM ANALYZER R&S	FSP40	100040	Jul. 17, 2010	Jul. 16, 2011

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

### 4.2.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low loss cable. Set both RBW and VBW of spectrum analyzer to 100 kHz and 300 kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

The spectrum plots are attached on the following pages.

### 4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

### 4.2.5 EUT OPERATING CONDITION

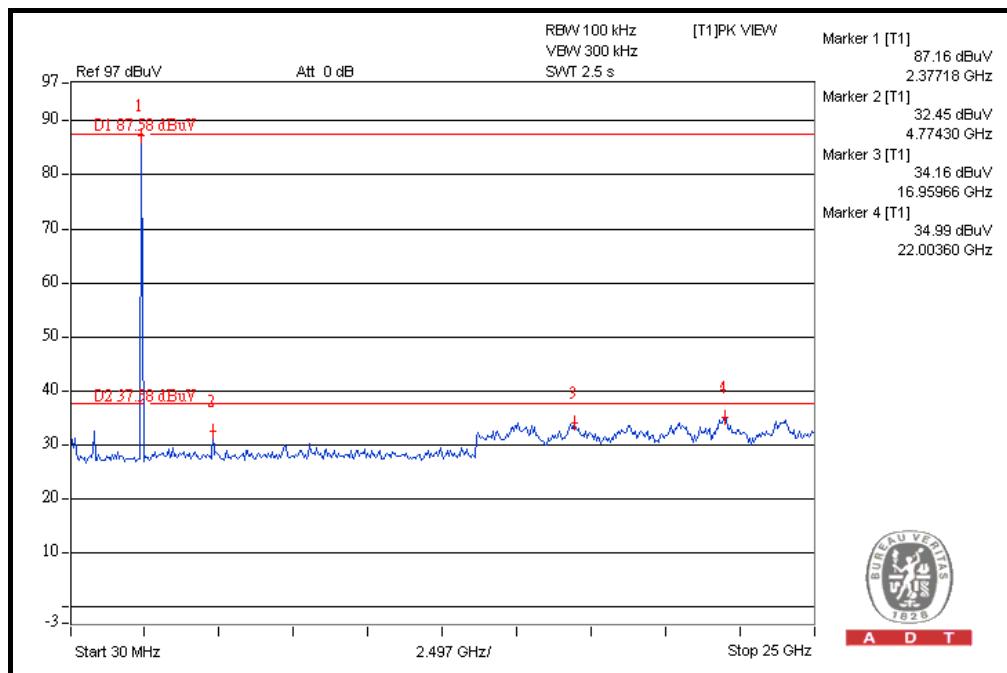
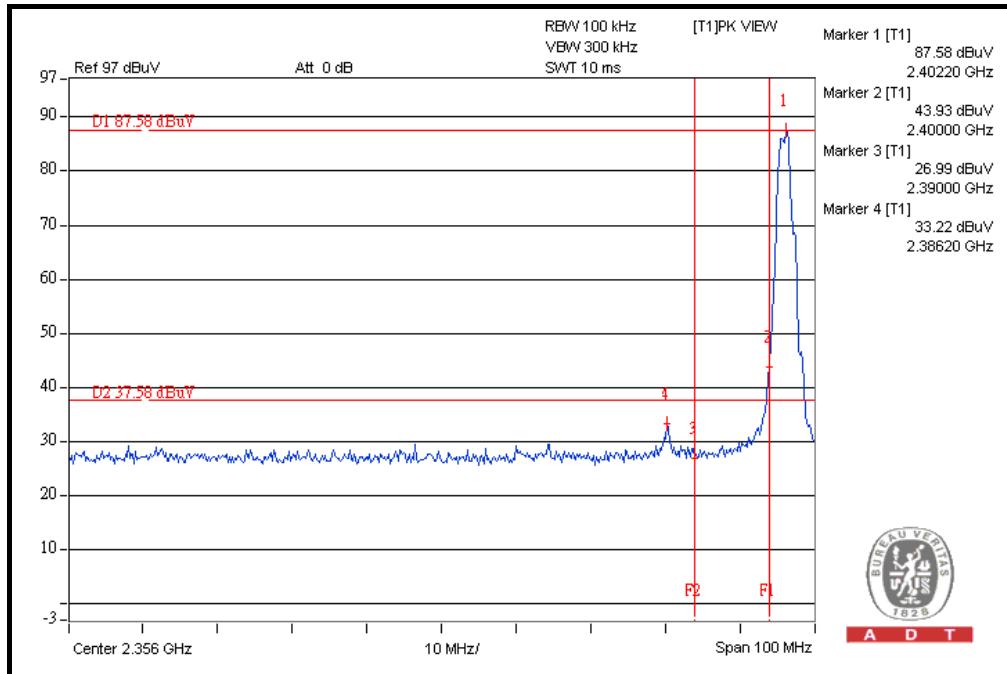
The software provided by client to enable the EUT under transmission condition continuously at lowest and highest channel frequencies individually.



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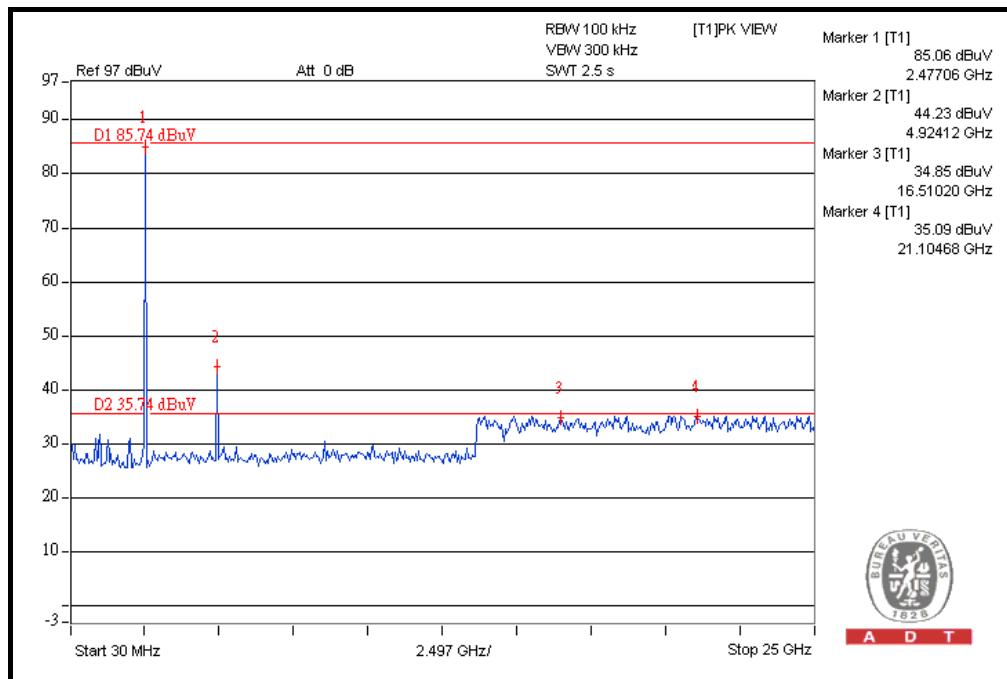
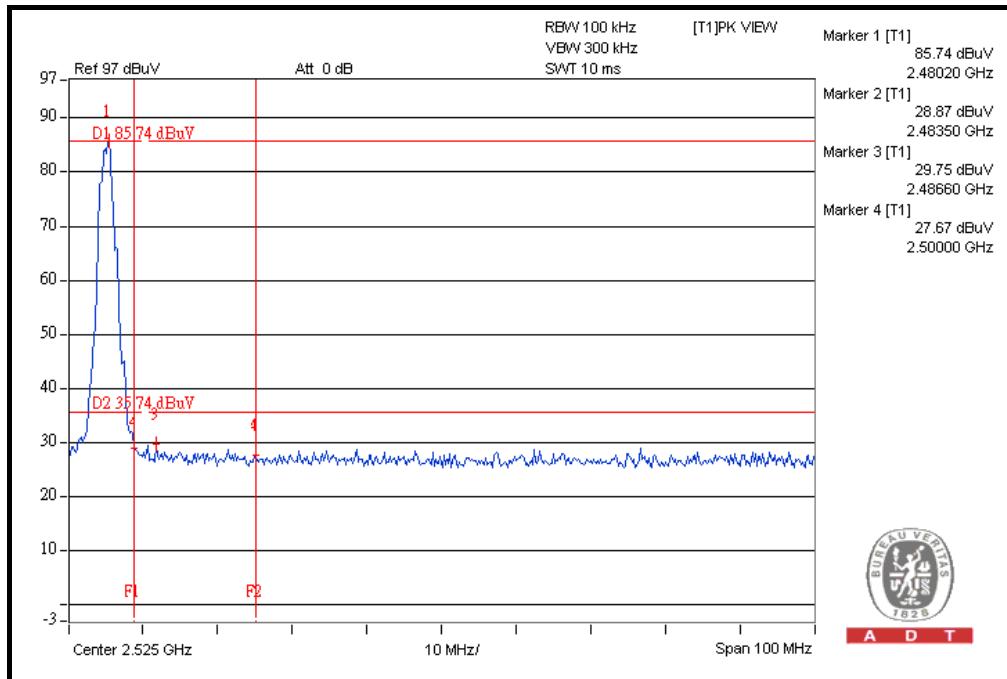
## 4.2.6 TEST RESULTS

The spectrum plots are attached on the following images. D1 line indicates the highest level, and D2 line indicates the 50dB offset below D1. It shows compliance with the requirement in part 15.249 (d).





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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.

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site: [www.adt.com.tw/index.5.phtml](http://www.adt.com.tw/index.5.phtml). If you have any comments, please feel free to contact us at the following:

### **Linko EMC/RF Lab**

Tel: 886-2-26052180

Fax: 886-2-26051924

### **Hsin Chu EMC/RF Lab**

Tel: 886-3-5935343

Fax: 886-3-5935342

### **Hwa Ya EMC/RF/Safety Telecom Lab**

Tel: 886-3-3183232

Fax: 886-3-3185050

**Web Site:** [www.adt.com.tw](http://www.adt.com.tw)

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



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

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

---END---