



## **FCC 47 CFR PART 15 SUBPART B & IC ICES-003**

### **TEST REPORT**

**For**

**Optical Mouse**

**Model: M843TU, M843U**

**Trade Name: EMPREX**

*Issued to*

**BEHAVIOR TECH COMPUTER CORP.**

**20F, 98, Sec. 1, Hsin Tai Wu Rd., Hsichih,  
Taipei Hsien 221, Taiwan, R.O.C.**

*Issued by*

**Compliance Certification Services Inc.**

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## 1 TEST RESULT CERTIFICATION

**Applicant:** BEHAVIOR TECH COMPUTER CORP.  
20F, 98, Sec. 1, Hsin Tai Wu Rd., Hsichih,  
Taipei Hsien 221, Taiwan, R.O.C.

**Manufacturer:** BEHAVIOR TECH COMPUTER CORP.  
20F, 98, Sec. 1, Hsin Tai Wu Rd., Hsichih,  
Taipei Hsien 221, Taiwan, R.O.C.

**Equipment Under Test:** Optical Mouse

**Trade Name:** EMPREX

**Model:** M843TU, M843U

**Detailed EUT Description:** See Item 2 of this report

**Date of Test:** November 2 ~ 6, 2006

Applicable Standard	Class / Limit	Test Result
FCC Part 15 Subpart B, IC ICES-003	Class B	No non-compliance noted
Deviation from Applicable Standard		
None		

The above equipment was tested by Compliance Certification Services Inc. for compliance with the requirements set forth in the FCC Part 15, Subpart B, and Industry Canada ICES-003. The measurement procedures were according to ANSI C63.4: 2003. This said equipment in the configuration described in this report shows the maximum emission levels emanating from equipment are within the compliance requirements.

**Approved by:**

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Gavin Lim  
Section Manager  
Compliance Certification Services Inc.

**Reviewed by:**

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Amanda Wu  
Section Manager  
Compliance Certification Services Inc.



## 2 EUT DESCRIPTION

<b>Product</b>	Optical Mouse
<b>Trade Name</b>	EMPREX
<b>Model</b>	M843TU, M843U
<b>Model Discrepancy</b>	Scroll wheel of M843U does not have the function for horizontal movement.
<b>Housing Type</b>	Plastic
<b>Power Supply</b>	Powered from host device



### 3 TEST METHODOLOGY

#### 3.1 EUT SYSTEM OPERATION

Software Used During the Test	
<b>Operating System</b>	Windows XP
<b>File Name</b>	EMCTEST.EXE
<b>Program Sequence</b>	<ol style="list-style-type: none"><li>1. EMI test program (file name: EMCTEST) was loaded and executed in "Windows XP" mode.</li><li>2. The detect signal was sent to EUT.</li><li>3. Data was sent to the monitor, filling the screen with upper case of "H" patterns.</li><li>4. Test program sequentially all related I/O's of Host PC include EUT and sent "H" patterns to all applicable output ports of Host PC.</li><li>5. Repeat 2 to 4.</li></ol>
<b>RF Management Software</b>	DOS/TEST MODE SETUP

**Remark:** Test program is self-repeating throughout the test.



### **3.2 DECISION OF FINAL TEST MODE**

The EUT (model: M843TU) had been tested under operating condition.

1. The following test mode was scanned during the preliminary test:

**Mode 1**

**Operating**

2. After the preliminary scan, the following test mode was found to produce the highest emission level.

**Mode 1**

Then, the EUT configuration and cable configuration of the above highest emission mode was chosen for all final test items.



## 4 INSTRUMENT AND CALIBRATION

### 4.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the IEC 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

### 4.2 TEST AND MEASUREMENT EQUIPMENT

The following list contains measurement equipment used for testing. The equipment conforms to the requirement of CISPR 16-1, ANSI C63.2 and other equivalent standards.

Calibration of all test and measurement, including any accessories that may effect such calibration, is checked frequently to ensure the accuracy. Adjustments are made and correction factors are applied in accordance with the instructions contained in the respective manual.

#### Equipment Used for Emission Measurement

Open Area Test Site # 1				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	ADVANTEST	R3261C	81720301	N.C.R
EMI Test Receiver	R&S	ESVS20	838804/004	01/18/2007
Pre-Amplifier	HP	8447D	2944A09173	03/22/2007
Bilog Antenna	Sunol Sciences	JB1	A111203	03/24/2007
Turn Table	EMCO	2081-1.21	N/A	N.C.R
Antenna Tower	EMCO	2075-2	9707-2604	N.C.R
Controller	EMCO	2090	N/A	N.C.R
RF Switch	Anritsu	MP59B	M54367	N.C.R
Site NSA	CCS	N/A	N/A	08/18/2007
Test S/W	LabVIEW 6.1 (CCS OATS EMI SW V2.4)			

**Remark:** The measurement uncertainty is less than +/- 4.5272dB, which is evaluated as per the NAMAS NIS 81 and CISPR/A/291/CDV.

Powerline Conducted Emission Test Site # 3				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCS30	845552/030	03/21/2007
LISN	R&S	ESH2-Z5	843285/010	01/04/2007
LISN	R&S	ESH3-Z5	848773/014	10/23/2007
ISN	FCC	FCC-TLISN-T4	20065	05/07/2007
ISN	FCC	FCC-TLISN-T8-02	20148	11/09/2006
Test S/W	LabVIEW 6.1 (CCS Conduction Test SW Version_01)			

**Remark:** The measurement uncertainty is less than +/- 3.4509dB, which is evaluated as per the NAMAS NIS 81 and CISPR/A/291/CDV.



## **5 FACILITIES AND ACCREDITATIONS**

### **5.1 FACILITIES**

All measurement facilities used to collect the measurement data are located at

☐ No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.

Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

☒ No.11, Wugong 6th Rd., Wugu Industrial Park, Taipei Hsien 248, Taiwan

Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045

☒ No.81-1, Lane 210, Bade 2nd Rd., Luchu Hsiang, Taoyuan Hsien 338, Taiwan








Tel: 886-3-324-0332 / Fax: 886-3-324-5235

The measurement facilities are constructed in conformance with the requirements of CISPR 16-1, ANSI C63.4 and other equivalent standards.



## 5.2 TABLE OF ACCREDITATIONS AND LISTINGS

The test facilities used to perform Electromagnetic compatibility tests are registered or accredited by the organizations listed in the following table which includes the recognized scope specifically.

Country	Agency	Scope of Accreditation	Logo
USA	A2LA	EN 55011, EN 55014-1/2, CISPR 11, CISPR 14-1/2, EN 55022, EN 55015, CISPR 22, CISPR 15, AS/NZS 3548, VCCI V3 (2001), CFR 47, FCC Part 15/18, CNS 13783-1, CNS 13439, CNS 13438, CNS 13803, CNS 14115, EN 55024, IEC 801-2, IEC 801-3, IEC 801-4, IEC/EN 61000-3-2, IEC/EN 61000-3-3, IEC/EN 61000-4-2/3/4/5/6/8/11, EN 50081-1/ EN 61000-6-3, EN 50081-2/EN 61000-6-4, EN 50081-2/EN 61000-6-1: 2001	 0824-01
USA	FCC	3/10 meter Open Area Test Sites (93105, 90471) / 3M Semi Anechoic Chamber (965860) to perform FCC Part 15/18 measurements	 93105, 90471 965860
Japan	VCCI	3/10 meter Open Area Test Sites to perform conducted/radiated measurements	 R-393/1066/725/879 C-402/747/912
Norway	NEMKO	EN 50081-1/2, EN 50082-1/2, IEC 61000-6-1/2, EN 50091-2, EN 50130-4, EN 55011, EN 55013, EN 55014-1/2, EN 55015, EN 55022, EN 55024, EN 61000-3-2/3, EN 61326-1, IEC 61000-4-2/3/4/5/6/8/11, EN 60601-1-2, EN 300 328, EN 300 422-2, EN 301 419-1, EN 301 489-01/03/07/08/09/17, EN 301 419-2/3, EN 300 454-2, EN 301 357-2	 ELA 124a ELA 124b ELA 124c
Taiwan	TAF	EN 300 328, EN 300 220-1, EN 300 220-2, EN 300 220-3, 47 CFR FCC Part 15 Subpart C, EN 61000-3-2, EN 61000-3-3, CNS 13439, CNS 13783-1, CNS 14115, CNS 13438, AS/NZS CISPR 22, CNS 13022-1, IEC 61000-4-2/3/4/5/6/8/11, CNS 13022-2/3	 0363
Taiwan	BSMI	CNS 13438, CNS 13783-1, CNS 13439, CNS 14115	 SL2-IS-E-0014 SL2-IN-E-0014 SL2-A1-E-0014 SL2-R1-E-0014 SL2-R2-E-0014 SL2-L1-E-0014
Canada	Industry Canada	3/10 meter Open Area Test Sites (IC 3991-3, IC 3991-4) / 3M Semi Anechoic Chamber (IC 6106) to perform RSS 212 Issue 1	 IC 3991-3 IC 3991-4 IC 6106

\* No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.



## 6 SETUP OF EQUIPMENT UNDER TEST

### 6.1 SETUP DIAGRAM

See test photographs attached in Appendix I for the actual connections between EUT and support equipment.

### 6.2 SUPPORT EQUIPMENT

No	Equipment	Brand	Model	Serial No.	FCC ID	Data Cable	Power Cord
1.	PC	Compaq	EVO D300	6K1BKF83F10T	FCC DoC	N/A	Unshielded, 1.8m
2.	CRT Monitor	Samsung	959NF	AQ19H2RT706139P	FCC DoC	Shielded, 1.8m with two cores	Unshielded, 1.8m
4.	USB Keyboard	Compaq	KU-9978	B463AOAGALT097	FCC DoC	Shielded, 1.8m	N/A
5.	Printer	EPSON	STYLUS C60	DR3K039633	FCC DoC	Shielded, 1.8m	Unshielded, 1.8m
6.	Modem	Hayes	231AA	A08431083982	BFJ9D93108US	Shielded, 1.2m	Unshielded, 1.8m
7.	Test kit	N/A	N/A	N/A	N/A	N/A	N/A

**Remark:** All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.

## 7 LINE CONDUCTED & RADIATED EMISSION TEST

### 7.1 LIMIT

#### Maximum permissible level of Line Conducted Emission

Frequency (MHZ)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

**Remark:** The lower limit shall apply at the transition frequency.

#### Maximum permissible level of Radiated Emission measured at 10 meter

Frequency (MHZ)	Class A (dBuV/m) Quasi-peak	Class B (dBuV/m) Quasi-peak
30 – 230	40	30
230 - 1000	47	37

#### Maximum permissible level of Radiated Emission measured at 3 meter

Frequency (MHZ)	Class A (dBuV/m)		Class B (dBuV/m)	
	Average	Peak	Average	Peak
Above 1000	59.3	79.3	53.9	73.9

**Remark:** The lower limit shall apply at the transition frequency.

#### Maximum permissible level of Radiated Emission measured at 3 meter

Frequency (MHz)	Field Strength ( $\mu$ V/m at 3-meter) Average	Field Strength (dBuV/m at 3-meter) Average
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

**Remark:** The lower limit shall apply at the transition frequency.



## **7.2 TEST PROCEDURE OF LINE CONDUCTED EMISSION**

### **Procedure of Preliminary Test**

- The EUT was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- Support equipment, if needed, was placed as per ANSI C63.4.
- All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.
- The test equipment EUT installed received AC power, 120VAC/60Hz, through a Line Impedance Stabilization Network (LISN), which supplied power source and was grounded to the ground plane.
- All support equipment received power from a second LISN.
- The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a EMI Test Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to the Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Receiver.
- The Receiver scanned from 150kHz to 30MHz for emissions in each of the test modes.
- During the above scans, the emissions were maximized by cable manipulation.
- The test mode(s) described in Item 3.2 were scanned during the preliminary test.
- After the preliminary scan, we found the test mode described in Item 3.2 producing the highest emission level.
- The EUT configuration and cable configuration of the above highest emission level were recorded for reference of the final test.

### **Procedure of Final Test**

- EUT and support equipment were set up on the test bench as per step 10 of the preliminary test.
- A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.
- The test data of the worst-case condition(s) was recorded.



## **7.3 TEST PROCEDURE OF RADIATED EMISSION**

### **Procedure of Preliminary Test**

- The equipment was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane. When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- Support equipment, if needed, was placed as per ANSI C63.4.
- All I/O cables were positioned to simulate typical usage as per ANSI C63.4.
- The EUT received AC power source, 120VAC/60Hz, from the outlet socket under the turntable. All support equipment received power from another socket under the turntable.
- The antenna was placed at 10 meter away from the EUT as stated in ANSI C63.4. The antenna connected to the Spectrum Analyzer via a cable and at times a pre-amplifier would be used.
- The Analyzer / Receiver quickly scanned from 30MHz to 40GHz maximum, if any. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- The test mode(s) described in Item 3.2 were scanned during the preliminary test:
- After the preliminary scan, we found the test mode described in Item 3.2 producing the highest emission level.
- The EUT and cable configuration, antenna position, polarization and turntable position of the above highest emission level were recorded for the final test.

### **Procedure of Final Test**

- EUT and support equipment were set up on the turntable as per step 8 of the preliminary test.
- The Analyzer / Receiver scanned from 30MHz to 40GHz maximum, if any. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- Recorded at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and only Q.P. reading is presented.
- The test data of the worst case condition(s) was recorded.



## 7.4 TEST RESULTS

### Power Line Conducted Emission

**Operation Mode:** Mode 1

**Test Date:** November 2, 2006

**Temperature:** 25°C

**Tested by:** Nan Tsai

**Humidity:** 55% RH

Frequency (MHz)	QP Reading (dBuV)	AV Reading (dBuV)	Corr. factor (dB)	QP Result (dBuV)	AV Result (dBuV)	QP Limit (dBuV)	AV Limit (dBuV)	QP Margin (dB)	AV Margin (dB)	Note
0.180	40.830	37.370	0.140	40.970	37.510	64.486	54.486	-23.516	-16.976	L1
0.554	26.160	25.660	0.100	26.260	25.760	56.000	46.000	-29.740	-20.240	L1
0.923	23.780	22.790	0.100	23.880	22.890	56.000	46.000	-32.120	-23.110	L1
1.290	24.830	24.170	0.100	24.930	24.270	56.000	46.000	-31.070	-21.730	L1
3.781	25.730	24.720	0.100	25.830	24.820	56.000	46.000	-30.170	-21.180	L1
9.529	33.040	28.000	0.653	33.693	28.653	60.000	50.000	-26.307	-21.347	L1
0.183	39.500	36.500	0.134	39.634	36.634	64.348	54.348	-24.714	-17.714	L2
0.554	25.090	25.020	0.100	25.190	25.120	56.000	46.000	-30.810	-20.880	L2
0.923	25.320	24.540	0.100	25.420	24.640	56.000	46.000	-30.580	-21.360	L2
1.846	24.230	23.870	0.100	24.330	23.970	56.000	46.000	-31.670	-22.030	L2
3.781	25.020	23.260	0.100	25.120	23.360	56.000	46.000	-30.880	-22.640	L2
9.529	33.160	27.880	0.653	33.813	28.533	60.000	50.000	-26.187	-21.467	L2

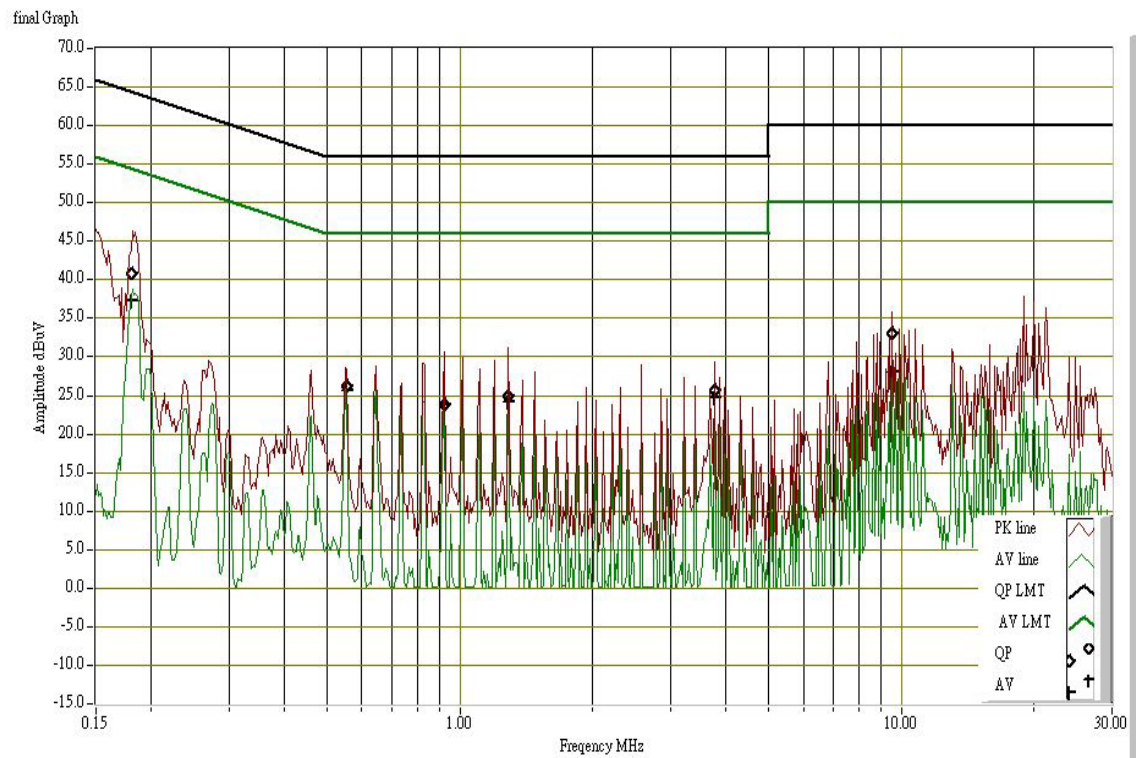
**Remark:**

1. Measuring frequencies from 0.15 MHz to 30MHz.
2. The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-peak detector and average detector.
3. The IF bandwidth of SPA between 0.15MHz to 30MHz was 10kHz; the IF bandwidth of Test Receiver between 0.15MHz to 30MHz was 9kHz;
4. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)

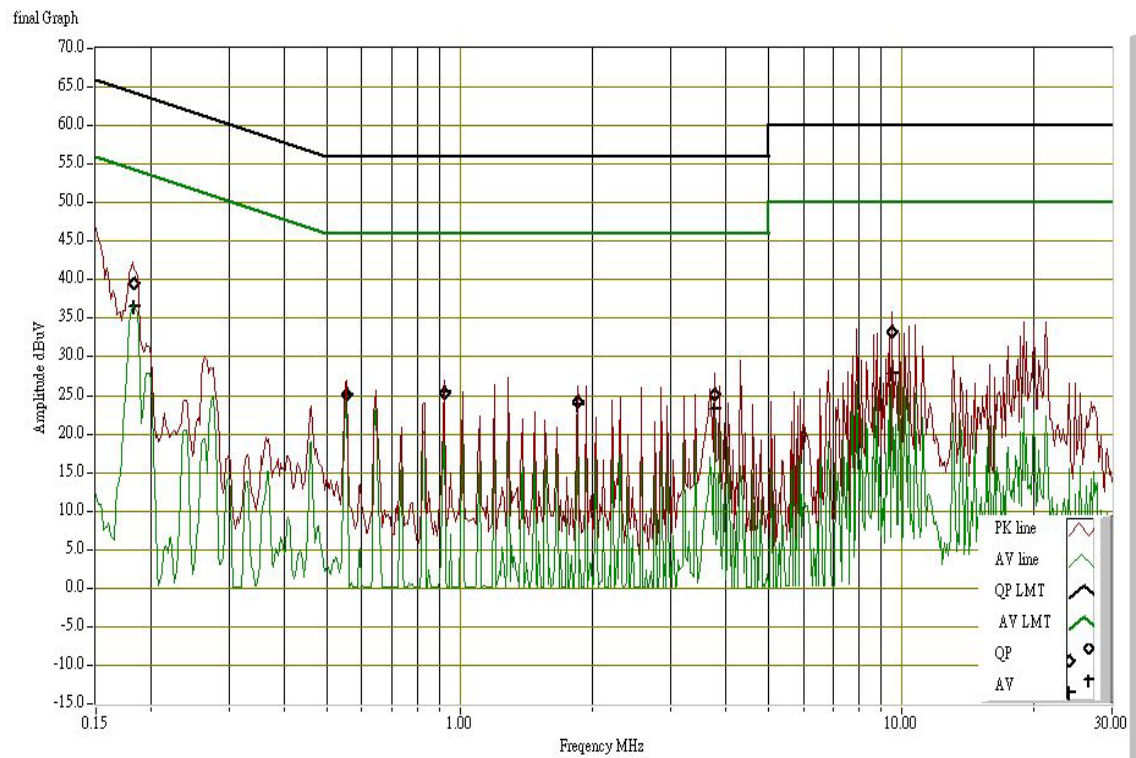


## Test Plots

### Conducted emissions (Line 1)



### Conducted emissions (Line 2)



**Radiated Emission****Operation Mode:** Mode 1**Test Date:** November 6, 2006**Temperature:** 31°C**Tested by:** Ivan Tsai**Humidity:** 56 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Detector Mode (PK/QP)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit 10m (dBuV/m)	Margin (dB)
73.57	V	Peak	8.70	10.40	19.10	30.00	-10.90
118.80	V	Peak	7.82	15.85	23.67	30.00	-6.33
124.38	V	Peak	8.87	16.03	24.90	30.00	-5.10
134.34	V	Peak	8.51	15.88	24.39	30.00	-5.61
435.27	V	Peak	5.83	21.04	26.87	37.00	-10.13
436.56	V	Peak	6.61	21.09	27.70	37.00	-9.30
117.27	H	Peak	4.12	15.53	19.65	30.00	-10.35
118.53	H	Peak	2.48	15.79	18.27	30.00	-11.73
123.36	H	Peak	3.02	16.05	19.07	30.00	-10.93
136.64	H	Peak	4.40	15.85	20.25	30.00	-9.75
432.31	H	Peak	3.72	20.93	24.65	37.00	-12.35
716.72	H	Peak	3.68	26.97	30.65	37.00	-6.35

***Remark:***

- 1. Measuring frequencies from 30 MHz to the 1GHz.*
- 2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.*
- 3. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
- 4. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.*