

FCC Test Report

APPLICANT : TomTom International BV
EQUIPMENT : GPS Navigation System
BRAND NAME : TomTom
MODEL NAME : 4CS01, 4CS03, 4KH00, 4KI00
FCC ID : S4L4CS03
STANDARD : FCC 47 CFR FCC Part 15 Subpart B
CLASSIFICATION : Certification

The product was received on Aug. 12, 2010 and completely tested on Aug. 23, 2010. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.4-2003 and shown the compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:



Anderson Chiu / Deputy Manager



SPORTON INTERNATIONAL INC.

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FCC ID : S4L4CS03

Page Number : 1 of 22

Report Issued Date : Sep. 03, 2010

Report Version : Rev. 01

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FD042404-01	Rev. 01	Initial issue of report	Sep. 03, 2010

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.107	7.2.2	AC Conducted Emission	< 15.107 limits < RSS-Gen table 2 limits	PASS	Under limit 13.2 dB at 0.198 MHz
3.2	15.109	7.2.3.2	Radiated Emission	< 15.109 limits or < RSS-Gen table 1 limits (Section 6)	PASS	Under limit 3.43 dB at 36.48 MHz

1. General Description

1.1. Applicant

TomTom International BV

Rembrandtplein 35 1017 CT Amsterdam The Netherlands

1.2. Manufacturer

Tech-Giant (Shanghai) Computer Co., Ltd.

C#, No. 1, South Rongteng Road, Songjiang Export Processing Zone, Shanghai, China

1.3. Feature of Equipment Under Test

Product Feature & Specification	
Equipment	GPS Navigation System
Brand Name	TomTom
Model Name	4CS01, 4CS03, 4KH00, 4KI00
FCC ID	S4L4CS03
Tx Frequency Range	Bluetooth : 2400 MHz ~ 2483.5 MHz
Rx Frequency Range	Bluetooth : 2400 MHz ~ 2483.5 MHz GPS : 1.57542 GHz
Antenna Type	Fixed Internal Antenna
HW Version	1.1
SW Version	10.001
Type of Modulation	Bluetooth (1Mbps) : GFSK Bluetooth EDR (2Mbps) : $\pi/4$ -DQPSK Bluetooth EDR (3Mbps) : 8-DPSK GPS : BPSK
EUT Stage	Production Unit

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4. Test Site

Test Site	SPORTON INTERNATIONAL INC.		
Test Site Location	No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978		
Test Site No.	Sporton Site No.		FCC/IC Registration No.
	CO05-HY	03CH06-HY	TW1022/4086B-1

1.5. Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC 47 CFR FCC Part 15 Subpart B
- ANSI C63.4-2003
- IC RSS-Gen Issue 2

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.

1.6. Ancillary Equipment List

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	GPS Station	T&E	GS-50	N/A	N/A	Unshielded, 1.8 m
2.	Mobile Phone	Nokia	2730C-1	QTLRM-578	N/A	N/A
3.	Notebook	DELL	Vostro 1510	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	LCD Monitor	Lenovo	6135-AB1	FCC DoC	Shielded, 1.6 m	Unshielded, 1.8 m
5.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A
6.	TMC Generator	Levear	VP-8194D	KADIR628A2	N/A	Shielded, 1.8 m
7.	Car Battery	GS	GTH60LS(55B24LS)	N/A	N/A	N/A
8.	iPod Earphone	Apple	N/A	FCC DoC	Unshielded, 1.2 m	N/A

2. Test Configuration of Equipment Under Test

2.1. Test Mode

The EUT has been associated with peripherals pursuant to ANSI C63.4-2003 and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

Frequency range investigated: conduction (150 kHz to 30 MHz), radiation (30MHz to the 5th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

The following tables are showing the test modes as the worst cases and recorded in this report.

Item	EUT Configuration	Test Condition		
		EMI AC	EMI RE<1G	EMI RE≥1G
1.	Charging Mode (EUT with adapter)	☒	☒	Note 1
2.	Charging Mode (EUT with notebook)	☒	☒	☒
3.	Charging Mode (EUT with car charger)	Note 1	☒	Note 1

Abbreviations:

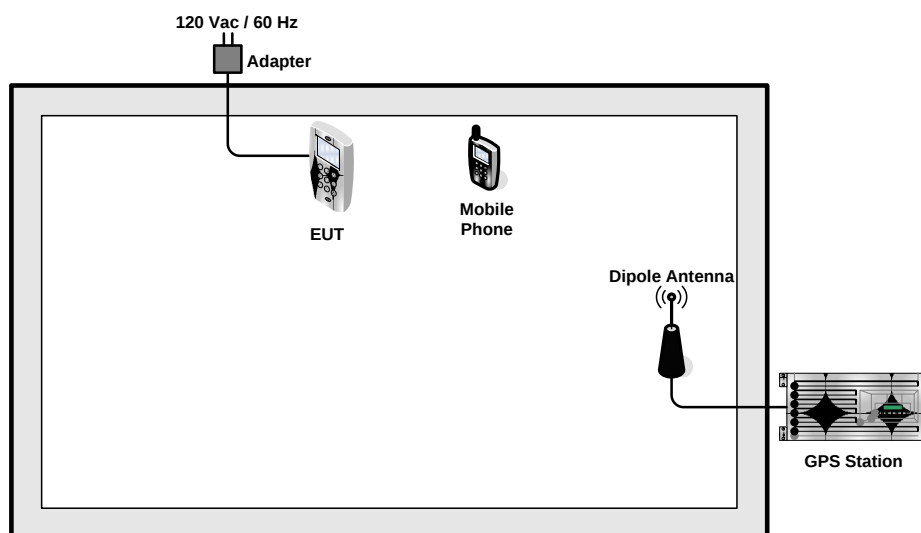
- EMI AC: AC conducted emissions
- EMI RE ≥ 1G: EUT radiated emissions ≥ 1GHz
- EMI RE < 1G: EUT radiated emissions < 1GHz

Note 1: Testing for this mode is not required or not the worst case.

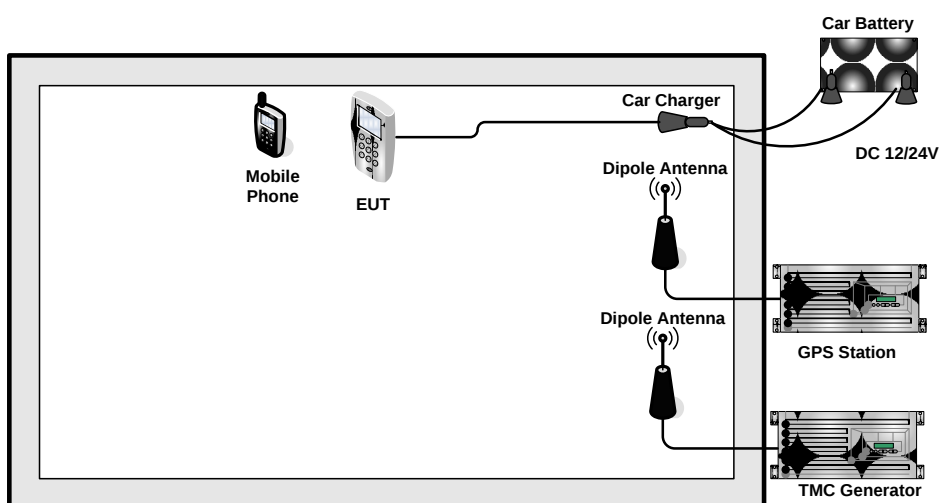
Test Items	EUT Configure Mode	Function Type
AC Conducted Emission	1/2	Mode 1: Bluetooth Idle + GPS Rx + Adapter 1 Mode 2: Bluetooth Idle + GPS Rx + Adapter 2 Mode 3: EUT + USB Cable 1 (Link with Notebook)
Radiated Emissions < 1GHz	1/2/3	Mode 1: Bluetooth Idle + GPS Rx + Adapter 1 Mode 2: Bluetooth Idle + GPS Rx + Adapter 2 Mode 3: Bluetooth Idle + GPS Rx + Car Charger 2 (DC 12V) with TMC Mode 4: Bluetooth Idle + GPS Rx + Car Charger 2 (DC 24V) with TMC Mode 5: Bluetooth Idle + GPS Rx + Car Charger 1 (DC 24V) Mode 6: Bluetooth Idle + GPS Rx + Car Charger 3 (DC 24V) + USB Cable 1 Mode 7: EUT + USB Cable 1 (Link with Notebook) Mode 8: Bluetooth Idle + GPS Rx + Dock 1 + USB Cable 2 + Car Charger 3 (DC 12V) + Earphone Mode 9: Bluetooth Idle + GPS Rx + Dock 1 + USB Cable 2 + Car Charger 3 (DC 24V) + Earphone Mode 10: Bluetooth Idle + GPS Rx + Car Charger 4 (DC 12V) with TMC Mode 11: Bluetooth Idle + GPS Rx + Car Charger 4 (DC 24V) with TMC
Radiated Emissions $\geq$ 1GHz	2	Mode 1: EUT + USB Cable 1 (Link with Notebook)
Remark: - The worst case of AC is mode 1; only the test data of this mode was reported. - The worst case of RE < 1G is mode 7; only the test data of this mode was reported.		

2.2. Connection Diagram of Test System

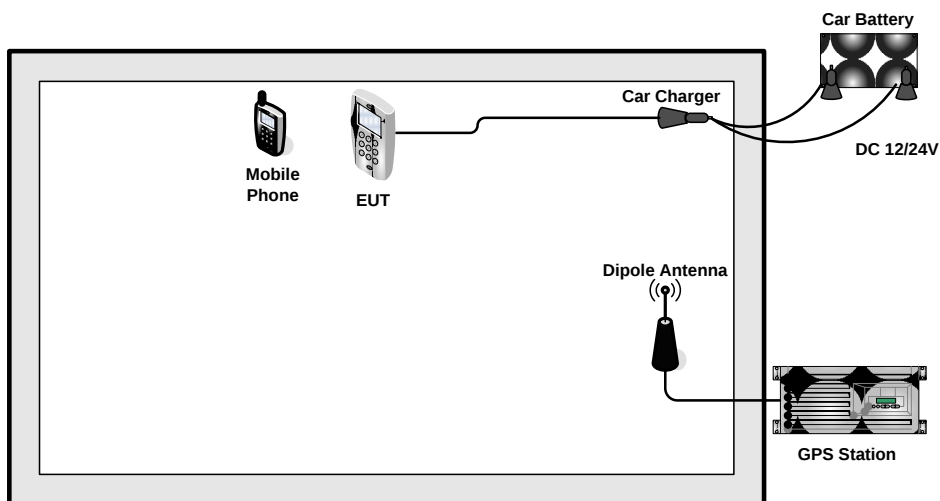
<EUT with Adapter Mode>



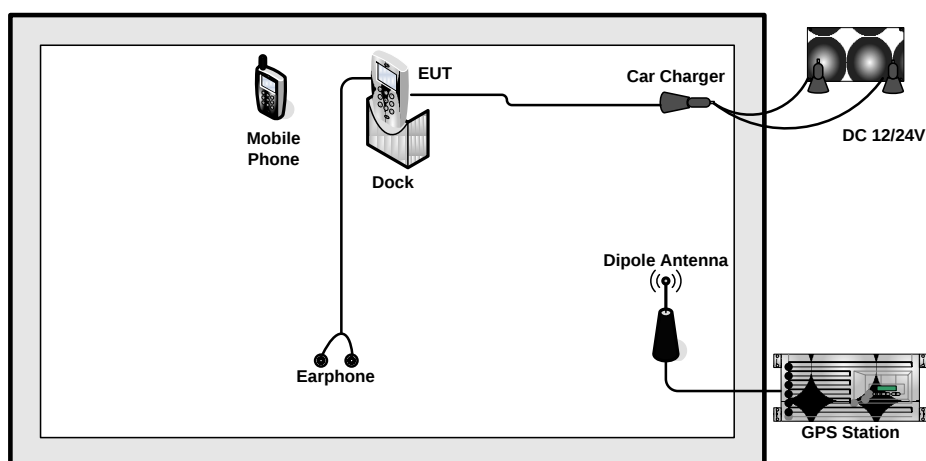
<EUT with Car Charger Mode (with TMC Generator)>



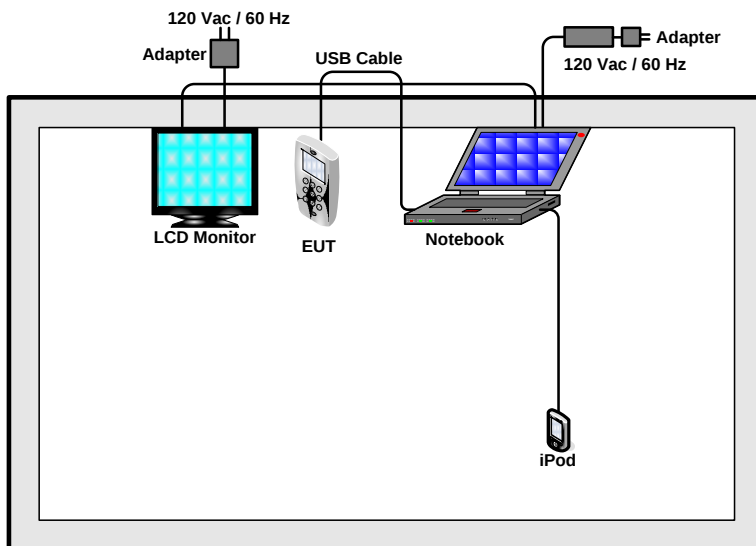
<EUT with Car Charger Mode>



<EUT with Car Charger and Dock Mode>



<EUT with USB Cable (Link with Notebook) Mode>



2.3. Test Software

The EUT executes "Manage phones" for attaching to the Bluetooth mobile phone, and the following programs installed in the EUT were programmed during the test.

1. Execute the program, "WinSCP.exe", installed in notebook for active sync files transfer with EUT via USB cable.
2. EUT receives signals continuously in TMC Rx mode.
3. Execute "Putty" to make the EUT receive signals from GPS station and then execute "Advent" to browse GPS signals after the test.

3. Test Result

3.1. Test of AC Conducted Emission Measurement

3.1.1 Limits of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

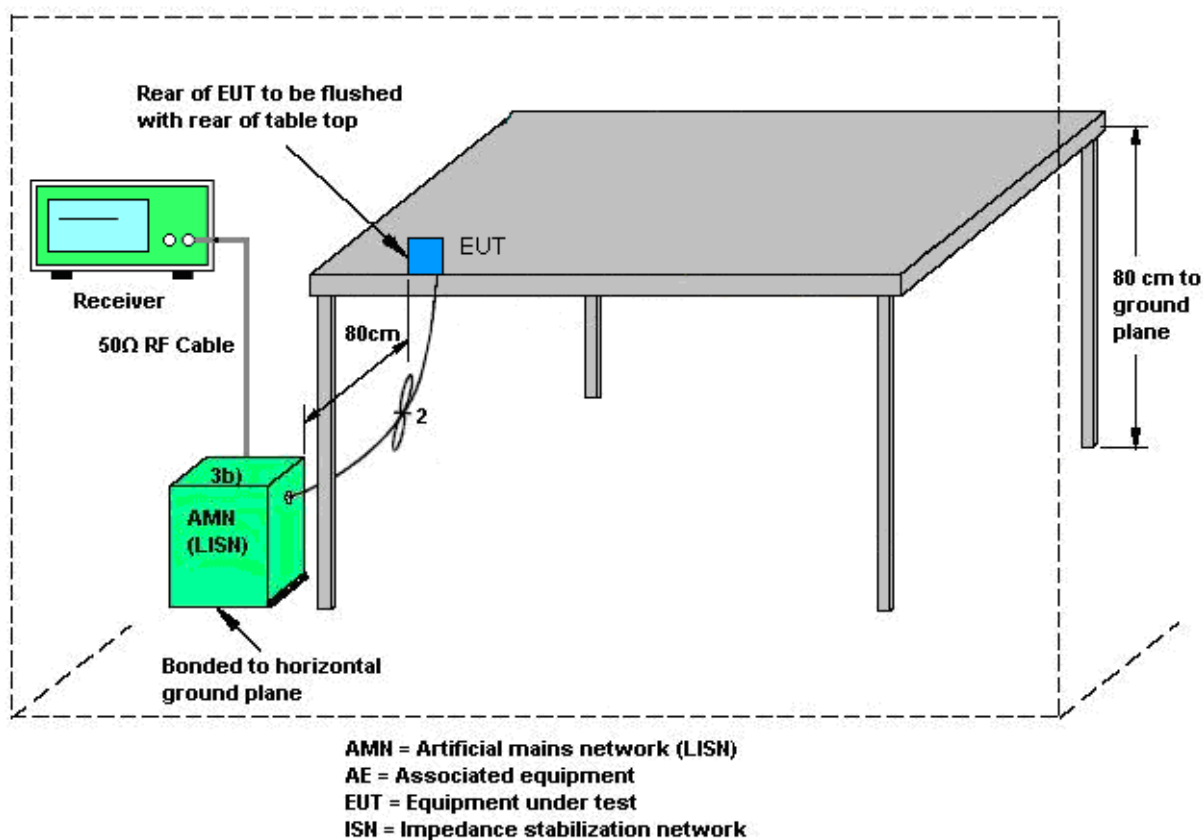
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedure

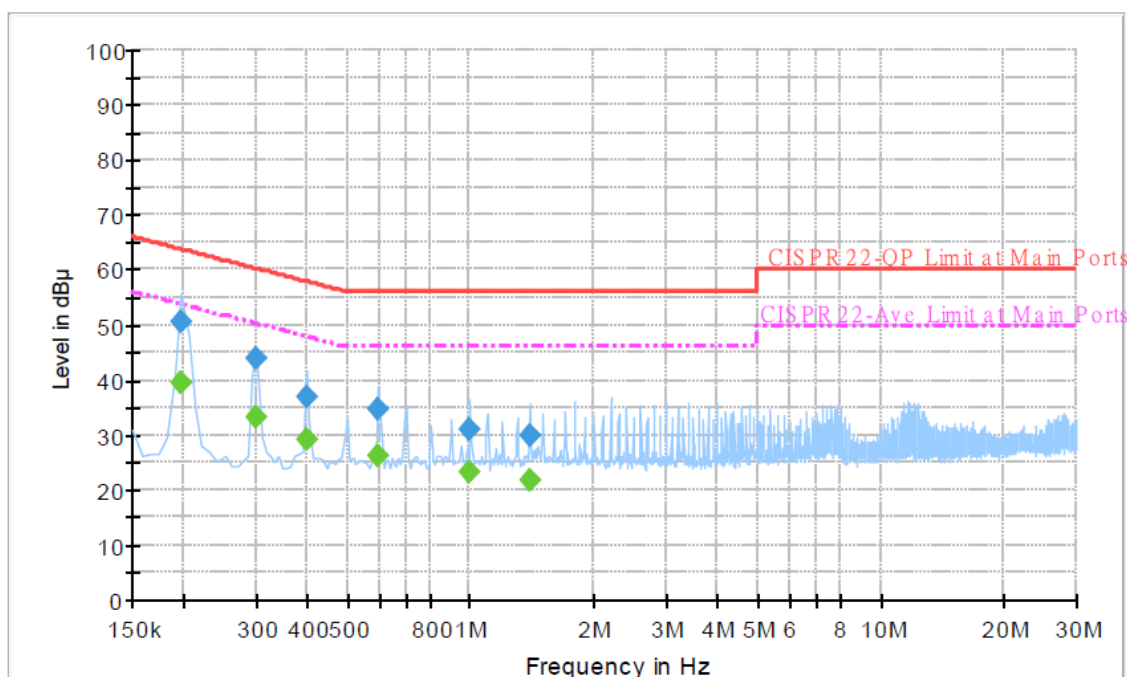
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

3.1.4 Test Setup



3.1.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	20~22℃
Test Engineer :	Novic Chiang	Relative Humidity :	42~44%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	Bluetooth Idle + GPS Rx + Adapter 1		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



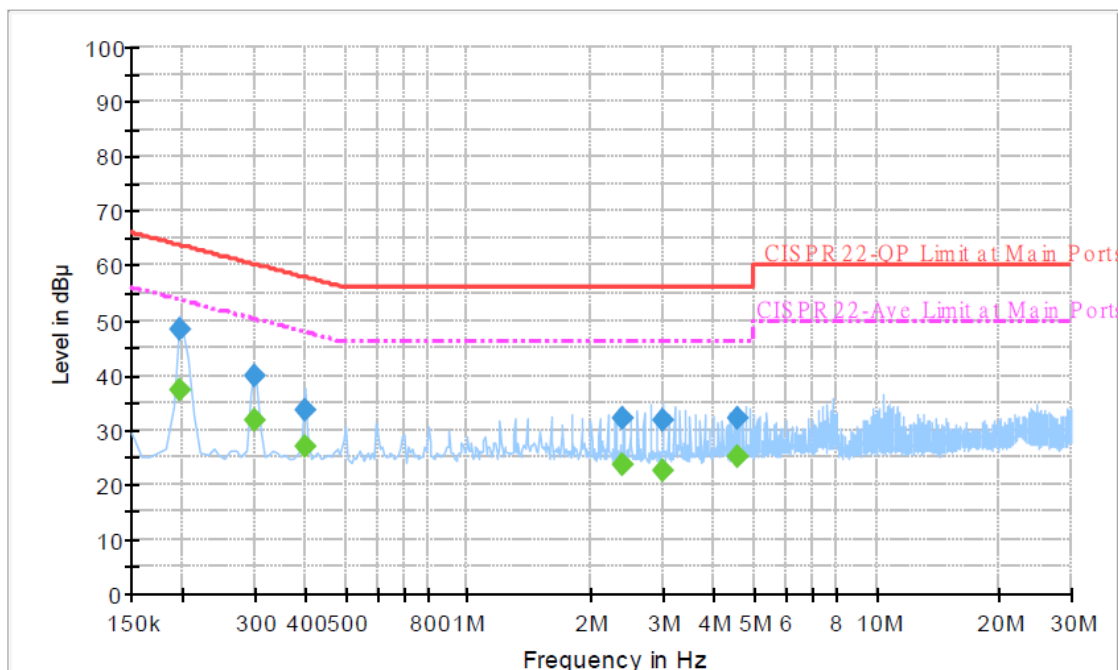
Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.198000	50.5	Off	L1	19.3	13.2	63.7
0.302000	43.8	Off	L1	19.3	16.4	60.2
0.398000	36.8	Off	L1	19.4	21.1	57.9
0.598000	34.6	Off	L1	19.4	21.4	56.0
0.998000	30.9	Off	L1	19.4	25.1	56.0
1.398000	29.8	Off	L1	19.4	26.2	56.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.198000	39.4	Off	L1	19.3	14.3	53.7
0.302000	33.4	Off	L1	19.3	16.8	50.2
0.398000	29.2	Off	L1	19.4	18.7	47.9
0.598000	26.4	Off	L1	19.4	19.6	46.0
0.998000	23.2	Off	L1	19.4	22.8	46.0
1.398000	21.7	Off	L1	19.4	24.3	46.0

Test Mode :	Mode 1	Temperature :	20~22°C
Test Engineer :	Novic Chiang	Relative Humidity :	42~44%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	Bluetooth Idle + GPS Rx + Adapter 1		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		


Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.198000	48.2	Off	N	19.3	15.5	63.7
0.302000	39.7	Off	N	19.3	20.5	60.2
0.398000	33.4	Off	N	19.4	24.5	57.9
2.398000	31.9	Off	N	19.5	24.1	56.0
2.998000	31.7	Off	N	19.5	24.3	56.0
4.598000	32.2	Off	N	19.6	23.8	56.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.198000	37.4	Off	N	19.3	16.3	53.7
0.302000	31.7	Off	N	19.3	18.5	50.2
0.398000	26.8	Off	N	19.4	21.1	47.9
2.398000	23.8	Off	N	19.5	22.2	46.0
2.998000	22.4	Off	N	19.5	23.6	46.0
4.598000	25.1	Off	N	19.6	20.9	46.0

3.2. Test of Radiated Emission Measurement

3.2.1. Limit of Radiated Emission

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (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

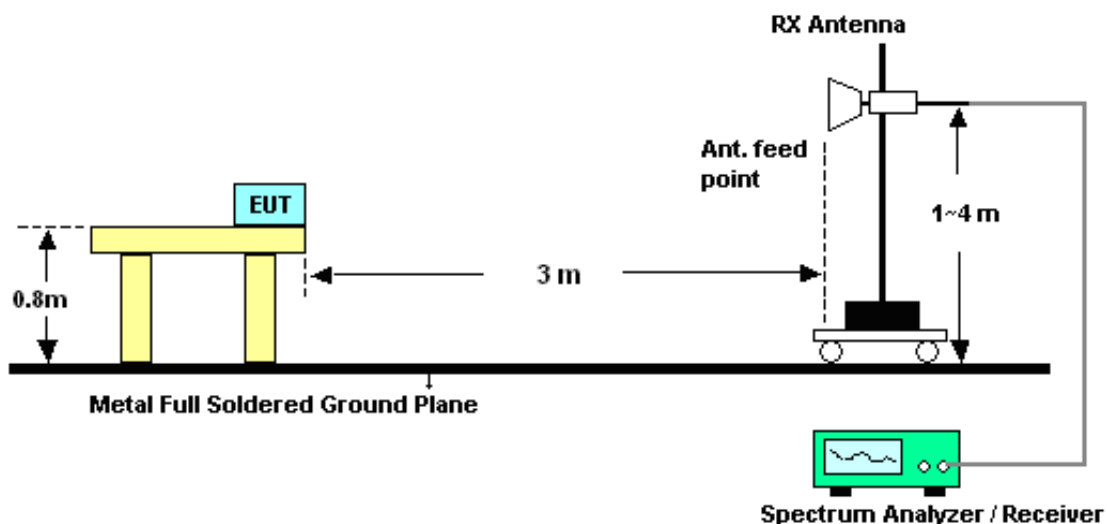
3.2.2. Measuring Instruments

See list of measuring instruments of this test report.

3.2.3. Test Procedures

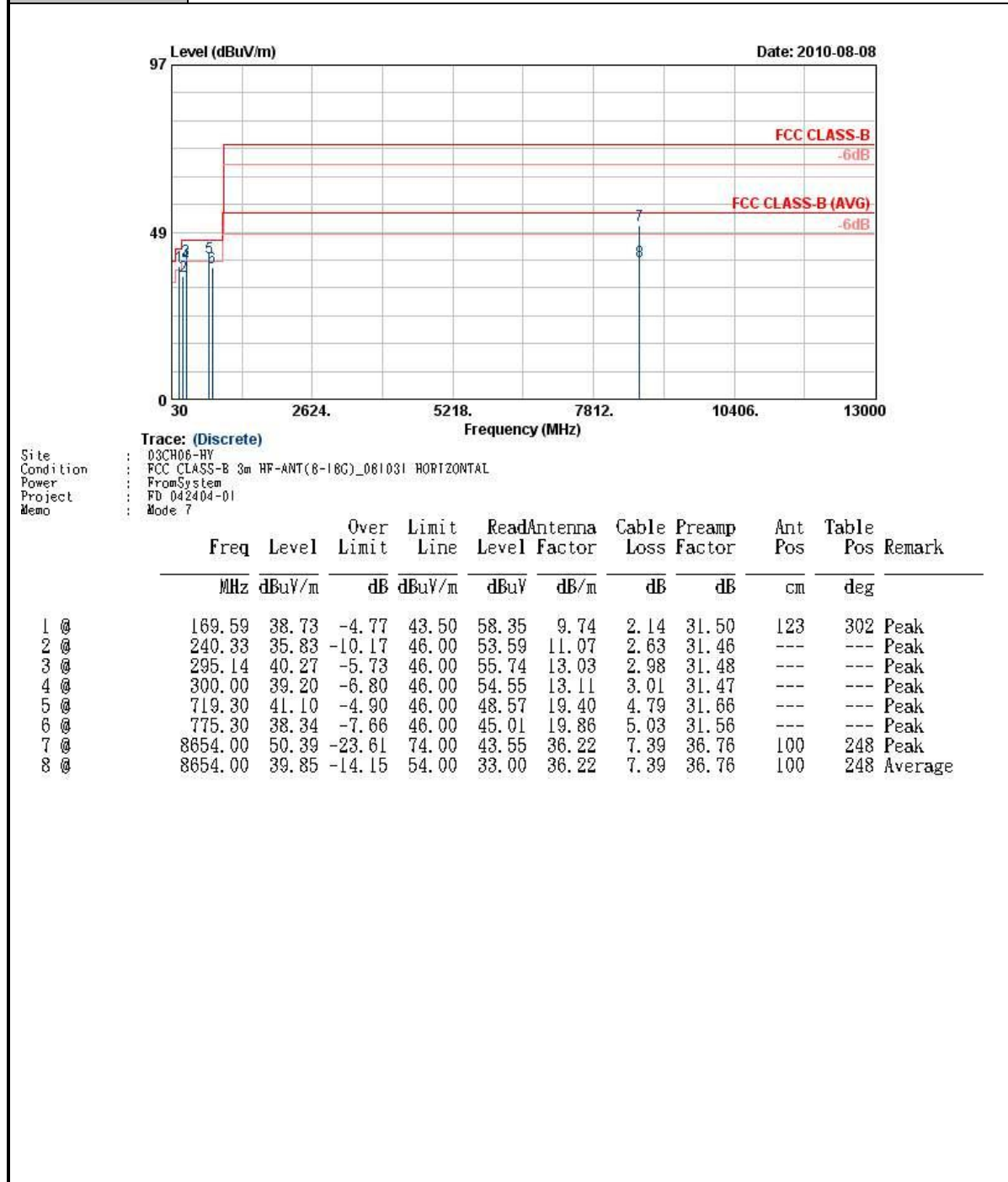
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is a Bi-Log antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.
7. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the quasi-peak method and reported
8. Emission level (dBuV/m) = 20 log Emission level (uV/m)
9. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

3.2.4. Test Setup of Radiated Emission

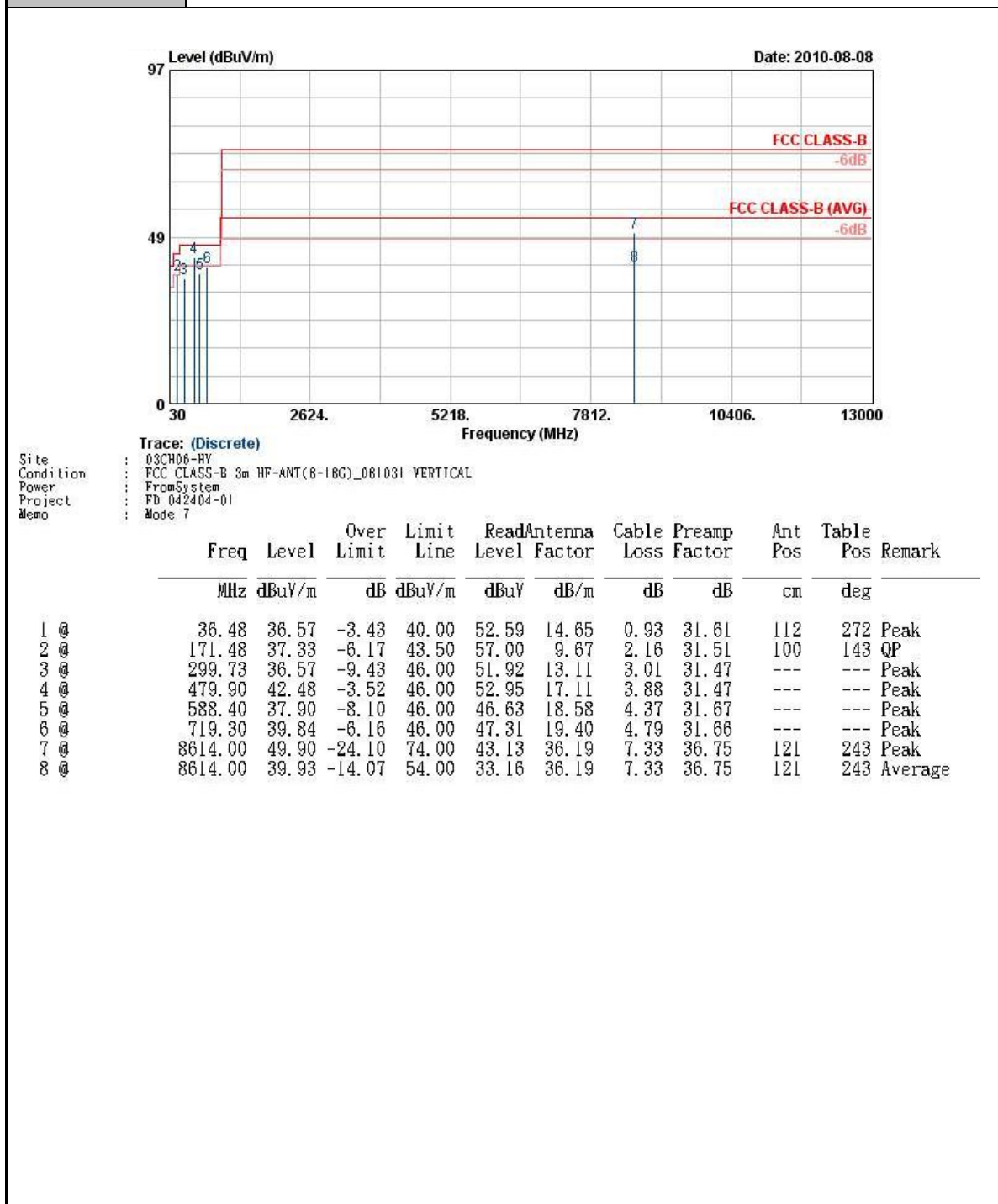


3.2.5. Test Result of Radiated Emission

Test Mode :	Mode 7	Temperature :	22~23°C
Test Engineer :	Hayden Wu	Relative Humidity :	47~48%
Test Distance :	3m	Polarization :	Horizontal
Function Type :	EUT + USB Cable 1 (Link with Notebook)		



Test Mode :	Mode 7	Temperature :	22~23°C
Test Engineer :	Hayden Wu	Relative Humidity :	47~48%
Test Distance :	3m	Polarization :	Vertical
Function Type :	EUT + USB Cable 1 (Link with Notebook)		



4. List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Due Date	Remark
EMI Test Receive	R&S	ESU	100211	9KHz – 2.75GHz	May 28, 2010	May 27, 2011	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100081	9kHz~30MHz	Nov. 30, 2009	Nov. 29, 2010	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100080	9kHz~30MHz	Nov. 23, 2009	Nov. 22, 2010	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	N/A	Conduction (CO05-HY)
Spectrum Analyzer	Agilent	E4408B	MY44211030	9KHz-26.5GHz	Oct. 23, 2009	Oct. 22, 2010	Radiation (03CH06-HY)
Spectrum Analyzer	R&S	FSP40	100057	9KHz-40GHz	Oct. 20, 2009	Oct. 19, 2010	Radiation (03CH06-HY)
EMI Test Receiver	R&S	ESVS10	834468/003	20MHz-1000M Hz	Apr. 28, 2010	Apr. 27, 2011	Radiation (03CH06-HY)
Bilog Antenna	SCHAFFNER	CBL6112B	2885	30MHz -2GHz	Oct. 31, 2009	Oct. 31, 2010	Radiation (03CH06-HY)
Double Ridge Horn Antenna	EMCO	3117	00066583	1GHz~18GHz	Aug. 02, 2010	Aug. 01, 2011	Radiation (03CH06-HY)
Double Ridge Horn Antenna	Training Research	AH-0801	95119	8GHz~18GHz	Nov. 02, 2009	Nov. 01, 2010	Radiation (03CH06-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	15GHz- 40GHz	Oct. 14, 2009	Oct. 13, 2010	Radiation (03CH06-HY)
Pre Amplifier	Agilent	8449B	3008A01917	1GHz- 26.5GHz	Apr. 15, 2010	Apr. 14, 2011	Radiation (03CH06-HY)
Amplifier	Agilent	310N	186713	9KHz~1GHz	Apr. 15, 2010	Apr. 14, 2011	Radiation (03CH06-HY)
Loop Antenna	R&S	HFH2-Z2	860004/001	9 kHz~30 MHz	Jul. 29, 2010	Jul. 28, 2011	Radiation (03CH06-HY)
GPS Station	T&E	GS-50	N/A	N/A	N/A	N/A	Radiation (03CH06-HY)

5. Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Contribution	Uncertainty of X_i		$u(X_i)$
	dB	Probability Distribution	
Receiver Reading	0.10	Normal (k=2)	0.05
Cable Loss	0.10	Normal (k=2)	0.05
AMN Insertion Loss	2.50	Rectangular	0.63
Receiver Specification	1.50	Rectangular	0.43
Site Imperfection	1.39	Rectangular	0.80
Mismatch	+0.34 / -0.35	U-Shape	0.24
Combined Standard Uncertainty $U_c(y)$	1.13		
Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.26		

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Contribution	Uncertainty of X_i		$u(X_i)$
	dB	Probability Distribution	
Receiver Reading	0.41	Normal (k=2)	0.21
Antenna Factor Calibration	0.83	Normal (k=2)	0.42
Cable Loss Calibration	0.25	Normal (k=2)	0.13
Pre-Amplifier Gain Calibration	0.27	Normal (k=2)	0.14
RCV/SPA Specification	2.50	Rectangular	0.72
Antenna Factor Interpolation for Frequency	1.00	Rectangular	0.29
Site Imperfection	1.43	Rectangular	0.83
Mismatch	+0.39 / -0.41	U-Shape	0.28
Combined Standard Uncertainty $U_c(y)$	1.27		
Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.54		

Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

Contribution	Uncertainty of X_i		$u(X_i)$	C_i	$C_i * u(X_i)$
	dB	Probability Distribution			
Receiver Reading	± 0.10	Normal (k=2)	0.10	1	0.10
Antenna Factor Calibration	± 1.70	Normal (k=2)	0.85	1	0.85
Cable Loss Calibration	± 0.50	Normal (k=2)	0.25	1	0.25
Receiver Correction	± 2.00	Rectangular	1.15	1	1.15
Antenna Factor Directional	± 1.50	Rectangular	0.87	1	0.87
Site Imperfection	± 2.80	Triangular	1.14	1	1.14
Mismatch Receiver VSWR $\Gamma_1 = 0.197$ Antenna VSWR $\Gamma_2 = 0.194$ Uncertainty = $20\text{Log}(1-\Gamma_1\Gamma_2)$	+0.34 / -0.35	U-Shape	0.244	1	0.244
Combined Standard Uncertainty $U_c(y)$	2.36				
Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	4.72				



Appendix A. Photographs of EUT

Please refer to Sporton report number EP042404-01 as below.