

FCC Test Report

APPLICANT : TomTom International BV
EQUIPMENT : GPS Navigation System
BRAND NAME : TomTom
MODEL NAME : 4CR51
FCC ID : S4L4CR51
STANDARD : FCC 47 CFR FCC Part 15 Subpart B
CLASSIFICATION : Declaration of Conformity

The product was received on Mar. 12, 2013 and completely tested on Mar. 25, 2013. 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: Louis Wu / Manager



Approved by: Jones Tsai / Manager



SPORTON INTERNATIONAL INC.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

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REVISION HISTORY

VERSION	DESCRIPTION	ISSUED DATE
Rev. 01	Initial issue of report	Apr. 16, 2013

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.107	7.2.4	AC Conducted Emission	< 15.107 limits < RSS-Gen table 2 limits	PASS	Under limit 14.70 dB at 0.478 MHz and 0.534 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 3.50 dB at 189.030 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	
Equipment	GPS Navigation System
Brand Name	TomTom
Model Name	4CR51
FCC ID	S4L4CR51
EUT supports Radios application	Bluetooth EDR
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.

Product Specification subjective to this standard	
Tx Frequency	Bluetooth: 2402 MHz ~ 2480 MHz
Rx Frequency Range	Bluetooth: 2402 MHz ~ 2480 MHz GPS : 1.57542 GHz
Antenna Type	Bluetooth: Chip Antenna
Type of Modulation	Bluetooth (1Mbps) : GFSK Bluetooth EDR (2Mbps) : $\pi/4$ -DQPSK Bluetooth EDR (3Mbps) : 8-DPSK GPS : BPSK

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	03CH06HY	722060/4086B-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

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

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 car charger)	Note 1	☒	Note 1
3.	Data application transferred mode (EUT with notebook)	Note 1	☒	☒

Abbreviations:

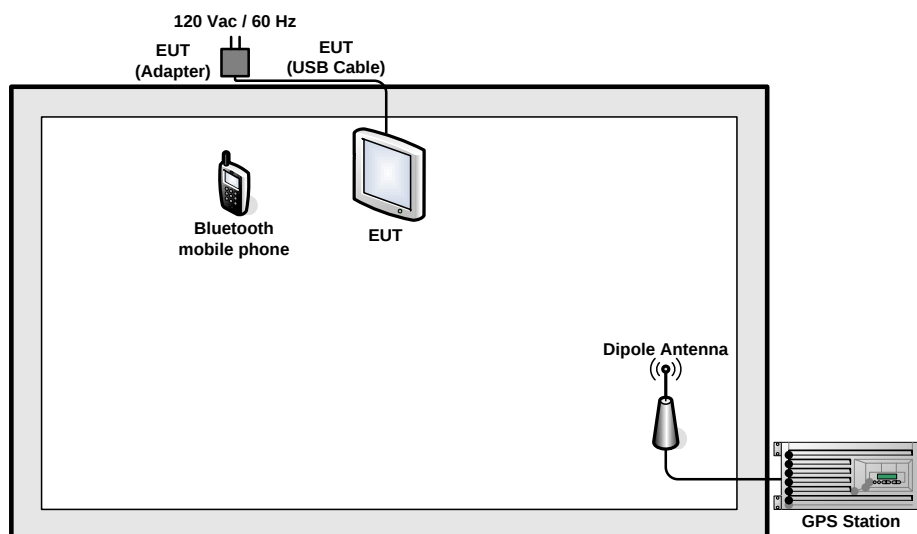
- EMI AC: AC conducted emissions
- EMI RE ≥ 1G: EUT radiated emissions ≥ 1GHz
- EMI RE < 1G: EUT radiated emissions < 1GHz

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

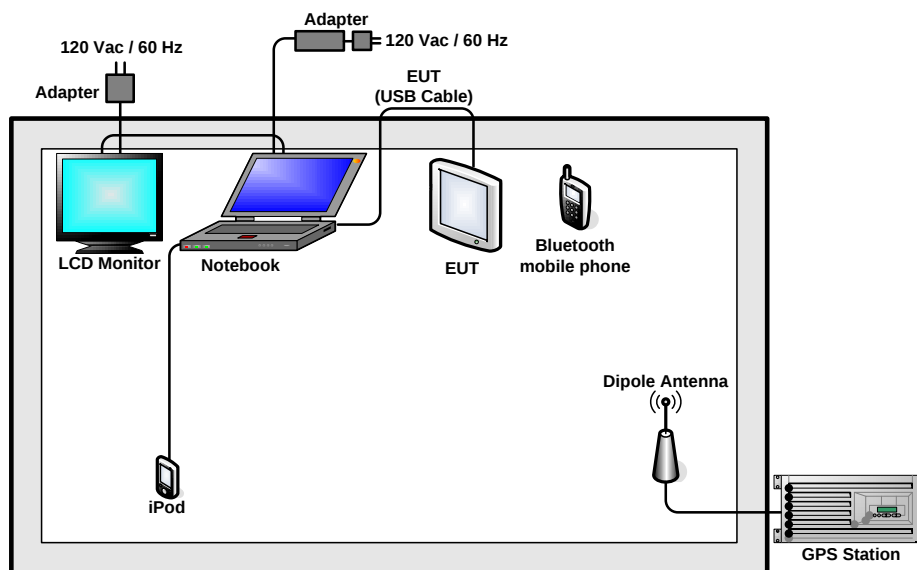
Remark: For signal above 1GHz, the worst case was test item 3.

Test Items	EUT Configure Mode	Function Type
AC Conducted Emission	1	Mode 1: Bluetooth Link + GPS Rx + USB Cable (Charging from Adapter) <Fig. 1> Mode 2: Bluetooth Link + GPS Rx + USB Cable (Data Link with Notebook) <Fig. 2>
Radiated Emissions < 1GHz	1/2/3	Mode 1: Bluetooth Link + GPS Rx + USB Cable (Charging from Adapter) <Fig. 1> Mode 2: Bluetooth Link + GPS Rx + USB Cable (Data Link with Notebook) <Fig. 2> Mode 3: Bluetooth Link + TMC + Car Charge 2 (DC 12V) + Earphone + Docking 1 <Fig. 3> Mode 4: Bluetooth Link + GPS Rx + Car Charge 4 (DC 12V) <Fig. 4> Mode 5: Bluetooth Link + GPS Rx + Car Charge 3 (DC 24V) <Fig. 4> Mode 6: Bluetooth Link + TMC + Car Charge 1 (DC 24V) + Earphone + Docking 2 <Fig. 3> Mode 7: Bluetooth Link + TMC + Car Charge 5 (DC 12V) <Fig. 5>
Radiated Emissions $\geq$ 1GHz	3	Mode 1: Bluetooth Link + GPS Rx + USB Cable (Data Link with Notebook) <Fig. 2>
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 2; only the test data of this mode was reported. - Link with Notebook means data application transferred mode between EUT and Notebook		

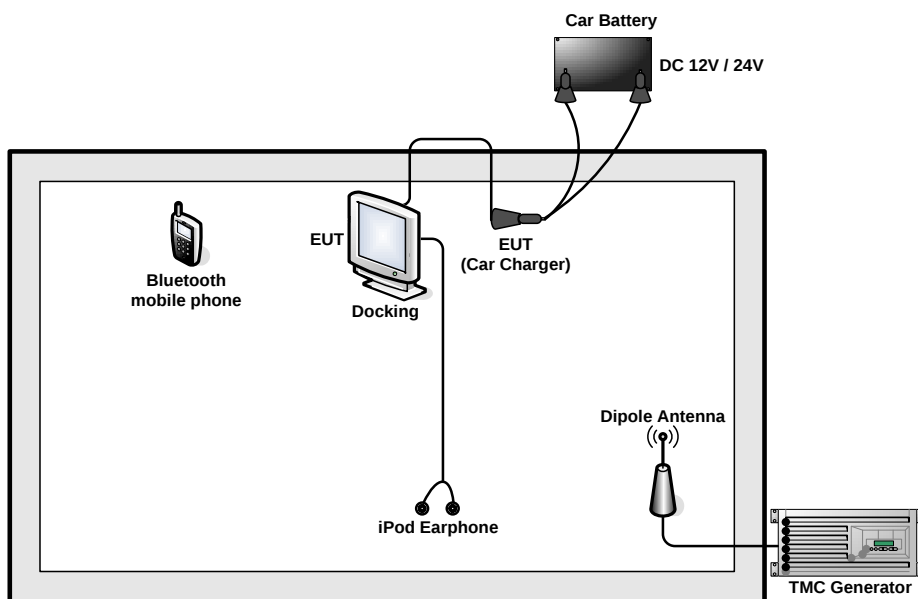
2.2. Connection Diagram of Test System



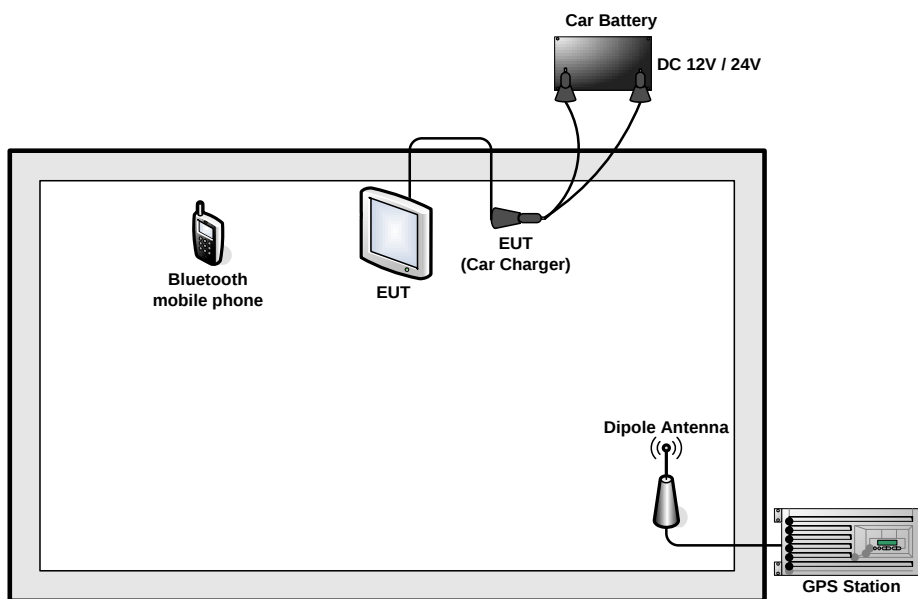
<Fig. 1>



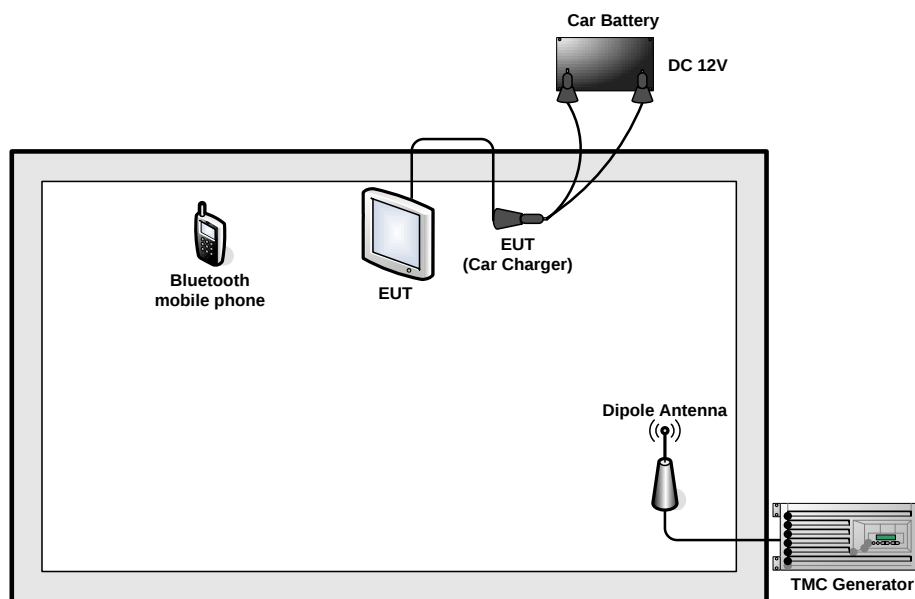
<Fig. 2>



<Fig. 3>



<Fig. 4>



<Fig. 5>

2.3. Support Unit used in test configuration and system

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.	GPS Station	Pendulum	GSG-54	N/A	N/A	Unshielded, 1.8 m
3.	TMC Generator	KIKUSU	KSG-4310	N/A	N/A	Unshielded, 1.8 m
4.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A
5.	MicroSD Card	SanDisk	4G class 4	FCC DoC	N/A	N/A
6.	Bluetooth Mobile Phone	Samsung	GT-N7000	A3LGTI9220	N/A	N/A
7.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A
8.	Notebook	DELL	Latitude E6320	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
9.	LCD Monitor	Dell	U2410	FCC DoC	Shielded, 1.6 m	Unshielded, 1.8 m
10.	iPod Earphone	Apple	N/A	N/A	Shielded, 1.0 m	N/A



2.4. Test Software

The EUT was attached to the Bluetooth mobile phone, and the following programs installed in the EUT were programmed during the test.

1. Execute the program, "WinSCP" under WIN7 installed in notebook for files transfer with EUT via USB cable.
2. Execute "PUTTY.EXE" to make the EUT receive continuous signals from GPS station.
3. EUT connect with TMC Generator to keep EUT receiving signals continuously in TMC Rx mode.

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.

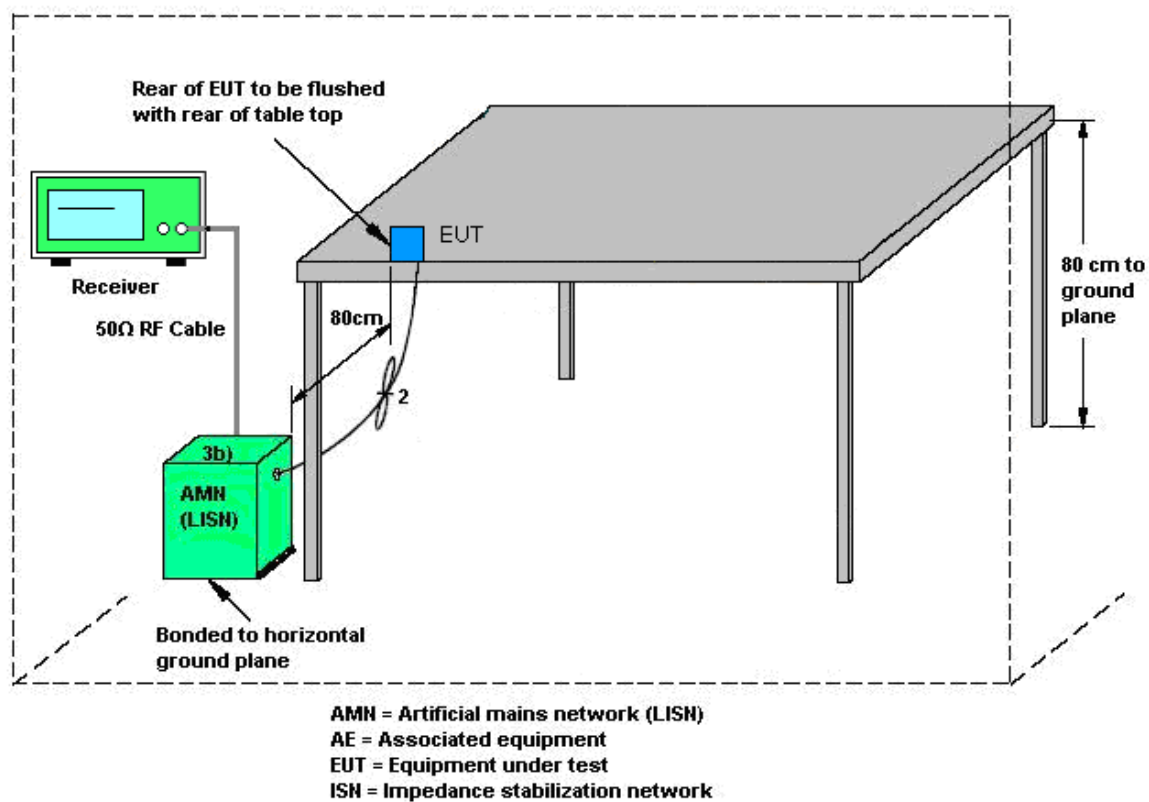
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedure

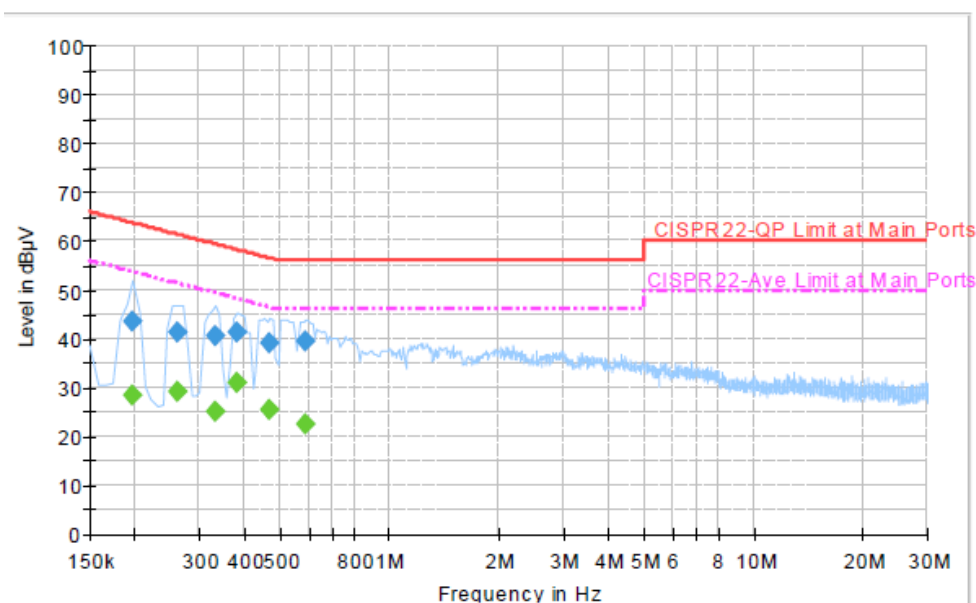
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
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 :	Slash Huang	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	Bluetooth Link + GPS Rx + USB Cable (Charging from Adapter)		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



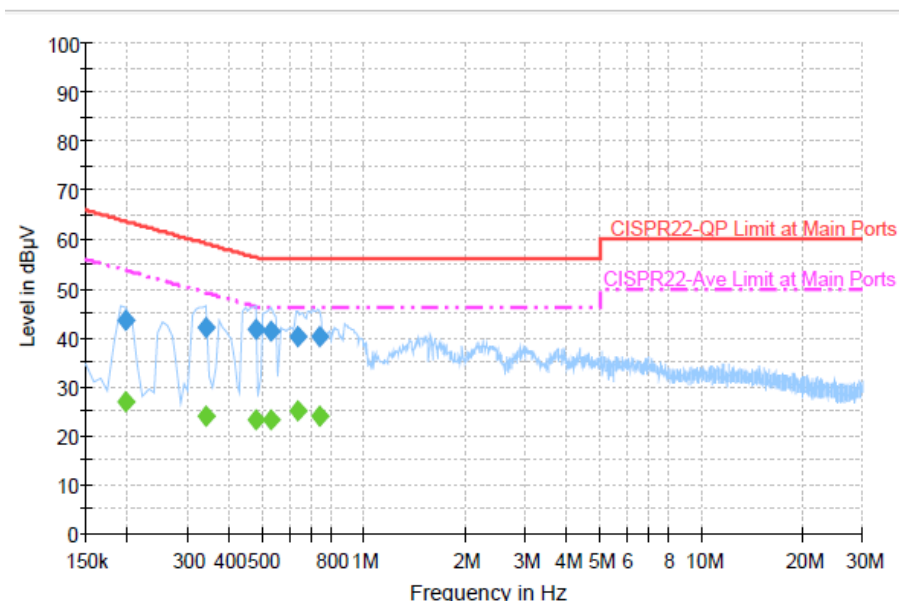
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.198000	43.6	Off	L1	19.4	20.1	63.7
0.262000	41.4	Off	L1	19.4	20.0	61.4
0.334000	40.6	Off	L1	19.3	18.8	59.4
0.382000	41.4	Off	L1	19.4	16.8	58.2
0.470000	39.1	Off	L1	19.4	17.4	56.5
0.590000	39.4	Off	L1	19.4	16.6	56.0

Final Result : Average

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.198000	28.5	Off	L1	19.4	25.2	53.7
0.262000	29.3	Off	L1	19.4	22.1	51.4
0.334000	25.2	Off	L1	19.3	24.2	49.4
0.382000	31.1	Off	L1	19.4	17.1	48.2
0.470000	25.5	Off	L1	19.4	21.0	46.5
0.590000	22.7	Off	L1	19.4	23.3	46.0

Test Mode :	Mode 1	Temperature :	20~22°C
Test Engineer :	Slash Huang	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	Bluetooth Link + GPS Rx + USB Cable (Charging from Adapter)		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		


Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.198000	43.5	Off	N	19.4	20.2	63.7
0.342000	42.0	Off	N	19.3	17.2	59.2
0.478000	41.7	Off	N	19.4	14.7	56.4
0.534000	41.3	Off	N	19.4	14.7	56.0
0.638000	40.3	Off	N	19.5	15.7	56.0
0.742000	40.3	Off	N	19.5	15.7	56.0

Final Result : Average

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.198000	27.0	Off	N	19.4	26.7	53.7
0.342000	24.1	Off	N	19.3	25.1	49.2
0.478000	23.2	Off	N	19.4	23.2	46.4
0.534000	23.1	Off	N	19.4	22.9	46.0
0.638000	25.0	Off	N	19.5	21.0	46.0
0.742000	24.0	Off	N	19.5	22.0	46.0

3.2. Test of Radiated Emission Measurement

3.2.1. Limit of Radiated Emission

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

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.2.2. Measuring Instruments

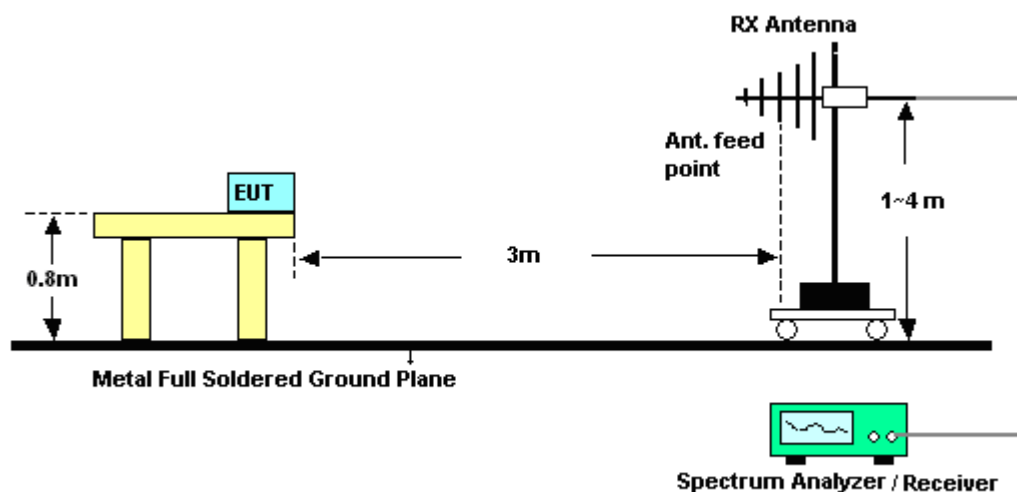
See list of measuring instruments of this test report.

3.2.3. Test Procedures

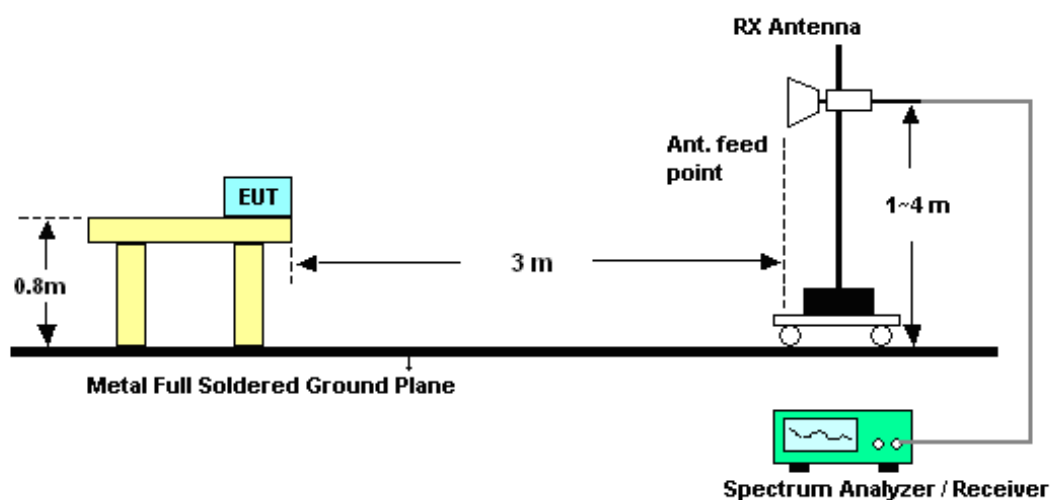
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is a Bi-Log antenna and its height is adjusted between one to 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, peak values of EUT will be reported. Otherwise, the emission will be repeated by 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

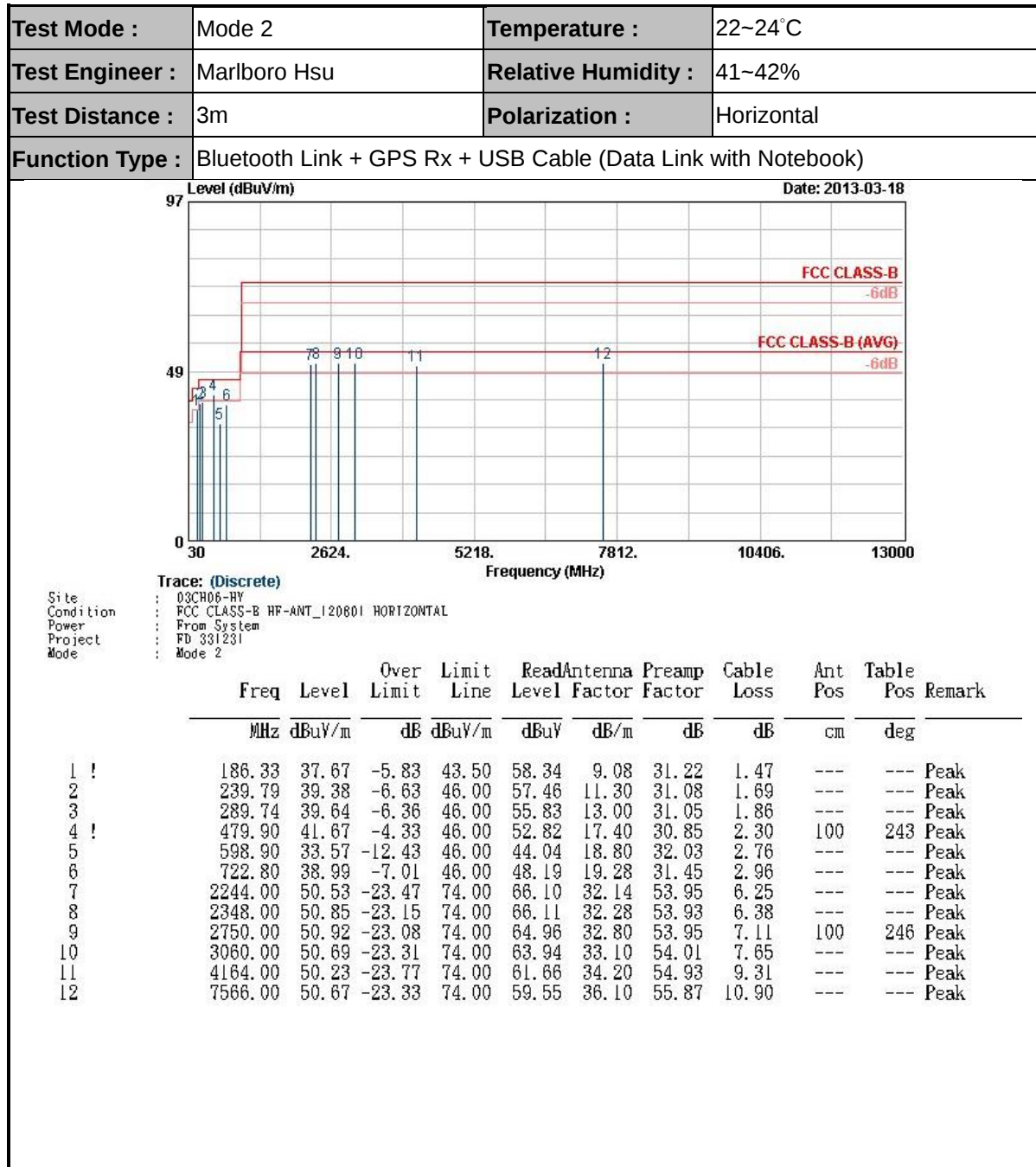
3.2.4. Test Setup of Radiated Emission

For radiated emissions from 30MHz to 1GHz

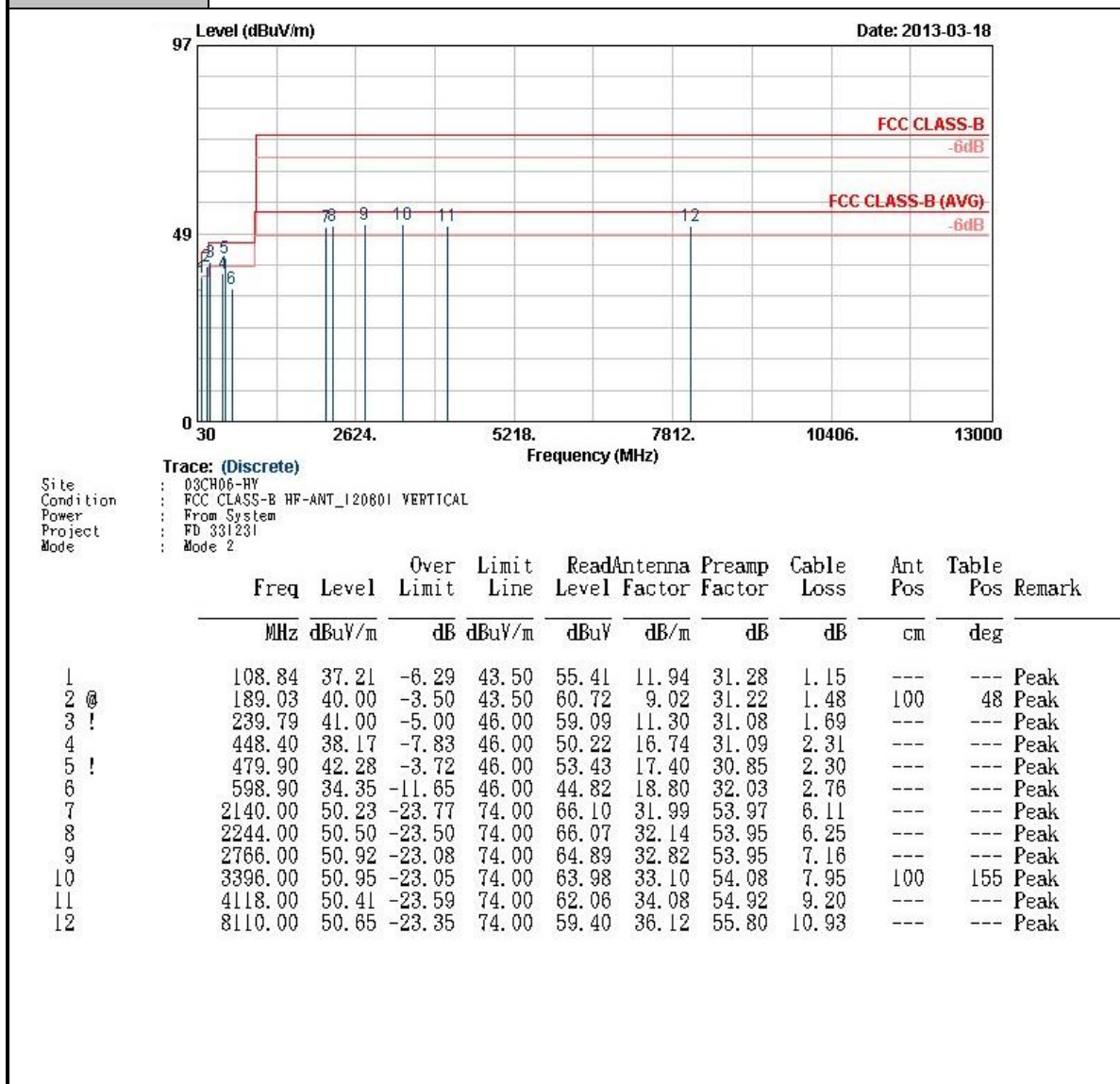


For radiated emissions above 1GHz



3.2.5. Test Result of Radiated Emission


Test Mode :	Mode 2	Temperature :	22~24°C
Test Engineer :	Marlboro Hsu	Relative Humidity :	41~42%
Test Distance :	3m	Polarization :	Vertical
Function Type :	Bluetooth Link + GPS Rx + USB Cable (Data Link with Notebook)		



4. List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100356	9KHz – 2.75GHz	Nov. 13, 2012	Mar. 18, 2013 ~ Mar. 25, 2013	Nov. 12, 2013	Conduction (CO05-HY)
Two-LISN	Rohde & Schwarz	ENV216	100081	9KHz ~ 30MHz	Dec. 12, 2012	Mar. 18, 2013 ~ Mar. 25, 2013	Dec. 11, 2013	Conduction (CO05-HY)
Two-LISN	Rohde & Schwarz	ENV216	100080	9KHz ~ 30MHz	Dec. 06, 2012	Mar. 18, 2013 ~ Mar. 25, 2013	Dec. 05, 2013	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	Mar. 18, 2013 ~ Mar. 25, 2013	N/A	Conduction (CO05-HY)
GPS Station	T&E	GS-50	N/A	N/A	N/A	Mar. 18, 2013 ~ Mar. 25, 2013	N/A	Conduction (CO05-HY)
Spectrum Analyzer	R&S	FSP30	101352	9KHz~30GHz	Nov. 07, 2012	Mar. 17, 2013 ~ Mar. 18, 2013	Nov. 06, 2013	Radiation (03CH06-HY)
Spectrum Analyzer	Agilent	E4408B	MY44211030	9KHz ~ 26.5GHz	Nov. 26, 2012	Mar. 17, 2013 ~ Mar. 18, 2013	Nov. 25, 2013	Radiation (03CH06-HY)
EMI Test Receiver	R&S	ESVS10	834468/0003	20MHz ~ 1000MHz	May 04, 2012	Mar. 17, 2013 ~ Mar. 18, 2013	May 03, 2013	Radiation (03CH06-HY)
Bilog Antenna	SCHAFFNER	CBL6112B	2885	30MHz ~ 2GHz	Oct. 06, 2012	Mar. 17, 2013 ~ Mar. 18, 2013	Oct. 05, 2013	Radiation (03CH06-HY)
Double Ridge Horn Antenna	EMCO	3117	00066583	1GHz ~ 18GHz	Aug. 01, 2012	Mar. 17, 2013 ~ Mar. 18, 2013	Jul. 31, 2013	Radiation (03CH06-HY)
Double Ridge Horn Antenna	COM-POWER	AH-118	071025	1GHz~18GHz	Aug. 09, 2012	Mar. 17, 2013 ~ Mar. 18, 2013	Aug. 08, 2013	Radiation (03CH06-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	15GHz ~ 40GHz	Sep. 28, 2012	Mar. 17, 2013 ~ Mar. 18, 2013	Sep. 27, 2013	Radiation (03CH06-HY)
Preamplifier	Agilent	8449B	3008A01917	1GHz ~ 26.5GHz	Apr. 13, 2012	Mar. 17, 2013 ~ Mar. 18, 2013	Apr. 12, 2013	Radiation (03CH06-HY)
Amplifier	Agilent	310N	186713	9KHz ~ 1GHz	Apr. 11, 2012	Mar. 17, 2013 ~ Mar. 18, 2013	Apr. 10, 2013	Radiation (03CH06-HY)
Pre Amplifier	EMCI	EMC051845	SN980048	1GHz ~ 18GHz	Jul. 21, 2012	Mar. 17, 2013 ~ Mar. 18, 2013	Jul. 20, 2013	Radiation (03CH06-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	159087	1GHz~18GHz	Feb. 26, 2013	Mar. 17, 2013 ~ Mar. 18, 2013	Feb. 25, 2014	Radiation (03CH06-HY)
GPS Station	Pendulum	GSG-54	N/A	N/A	N/A	Mar. 17, 2013 ~ Mar. 18, 2013	N/A	Radiation (03CH06-HY)

5. Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.26
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.54
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Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.72
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Appendix A. Photographs of EUT

Please refer to Sporton report number EP331231 as below.

1. External Photograph of EUT

Brand Name: TomTom / Model Name: 4CR51



Brand Name: TomTom / Model Name: 4CR51



Brand Name: TomTom / Model Name: 4CR51



2. Photograph of Accessory

Brand Name: TomTom / Model Name: 4CR51

List of Accessory:

Specification of Accessory		
AC Adapter	Brand Name	TomTom
	Manufacturer	Phihong
	Model Name	4UUC6B
Battery	Power Rating	3.7 Vdc, 1100 mAh
Car Charger 1	Brand Name	TomTom
	Manufacturer	Foxlink
	Model Name	4UUC2
Car Charger 2	Brand Name	TomTom
	Manufacturer	Supatech
	Model Name	4UUC1B
Car Charger 3	Brand Name	TomTom
	Manufacturer	Monoeric
	Model Name	4UUC3Z
Car Charger 4	Brand Name	TomTom
	Manufacturer	Supatech
	Model Name	4UUC3Z
Car Charger 5	Brand Name	TomTom
	Manufacturer	Foxlink
	Model Name	4UUC3
Dock 1	Brand Name	TomTom
	Model Name	4UCB3
Dock 2	Brand Name	TomTom
	Model Name	4UCB3
Dock 3	Brand Name	TomTom
	Model Name	4UCB3
USB Cable	Brand Name	TomTom
	Model Name	4CQ0.001.06

Remark: For accessories equipped with this EUT, please refer to the following photos.

Brand Name: TomTom / Model Name: 4CR51



Brand Name: TomTom / Model Name: 4CR51

Battery



Brand Name: TomTom / Model Name: 4CR51

Car Charger 1



Brand Name: TomTom / Model Name: 4CR51

Car Charger 2



Brand Name: TomTom / Model Name: 4CR51

Car Charger 3



Brand Name: TomTom / Model Name: 4CR51

Car Charger 4



Brand Name: TomTom / Model Name: 4CR51

Car Charger 5



Brand Name: TomTom / Model Name: 4CR51

Dock 1



Brand Name: TomTom / Model Name: 4CR51

Dock 2



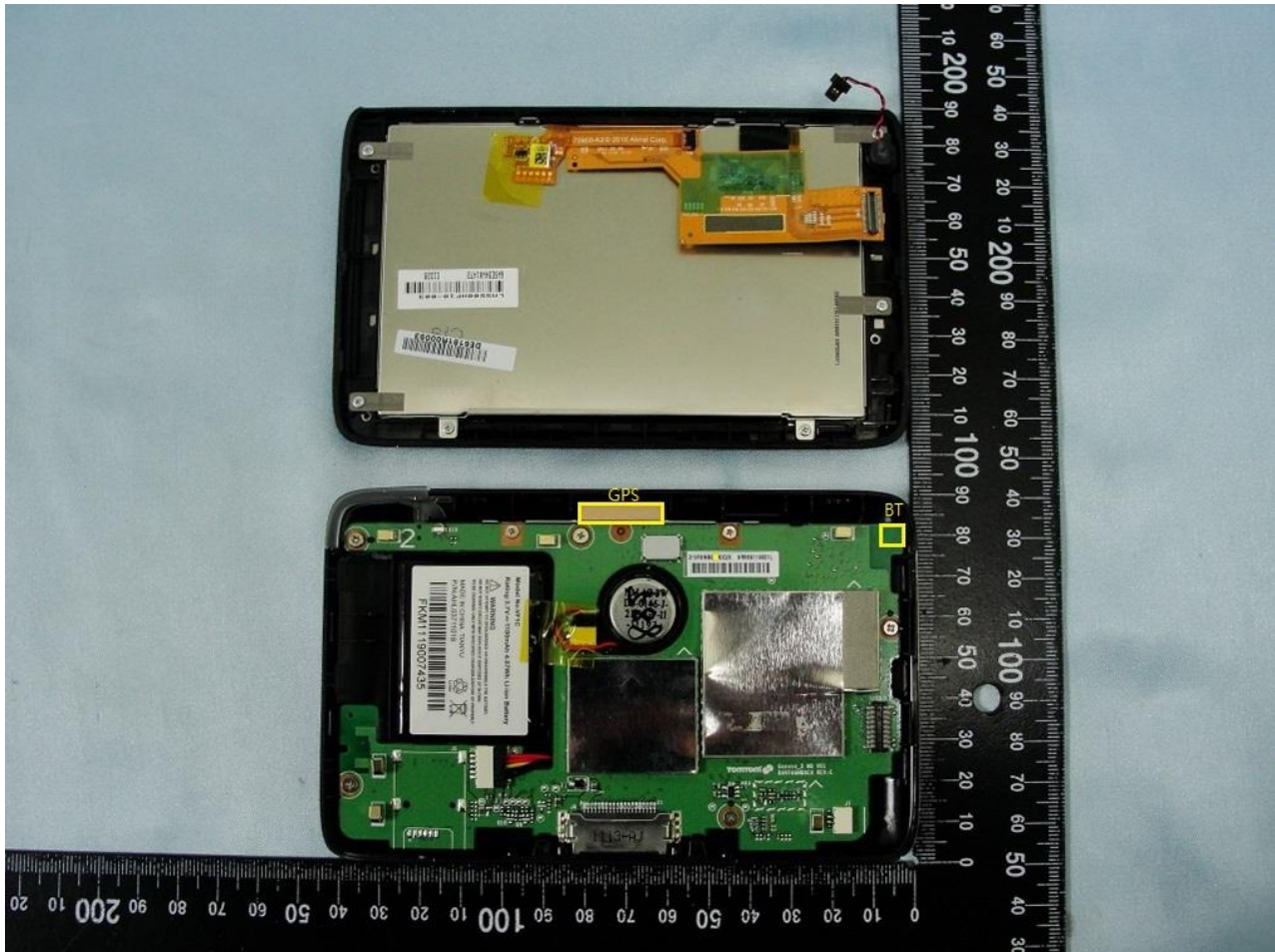
Brand Name: TomTom / Model Name: 4CR51

Dock 3

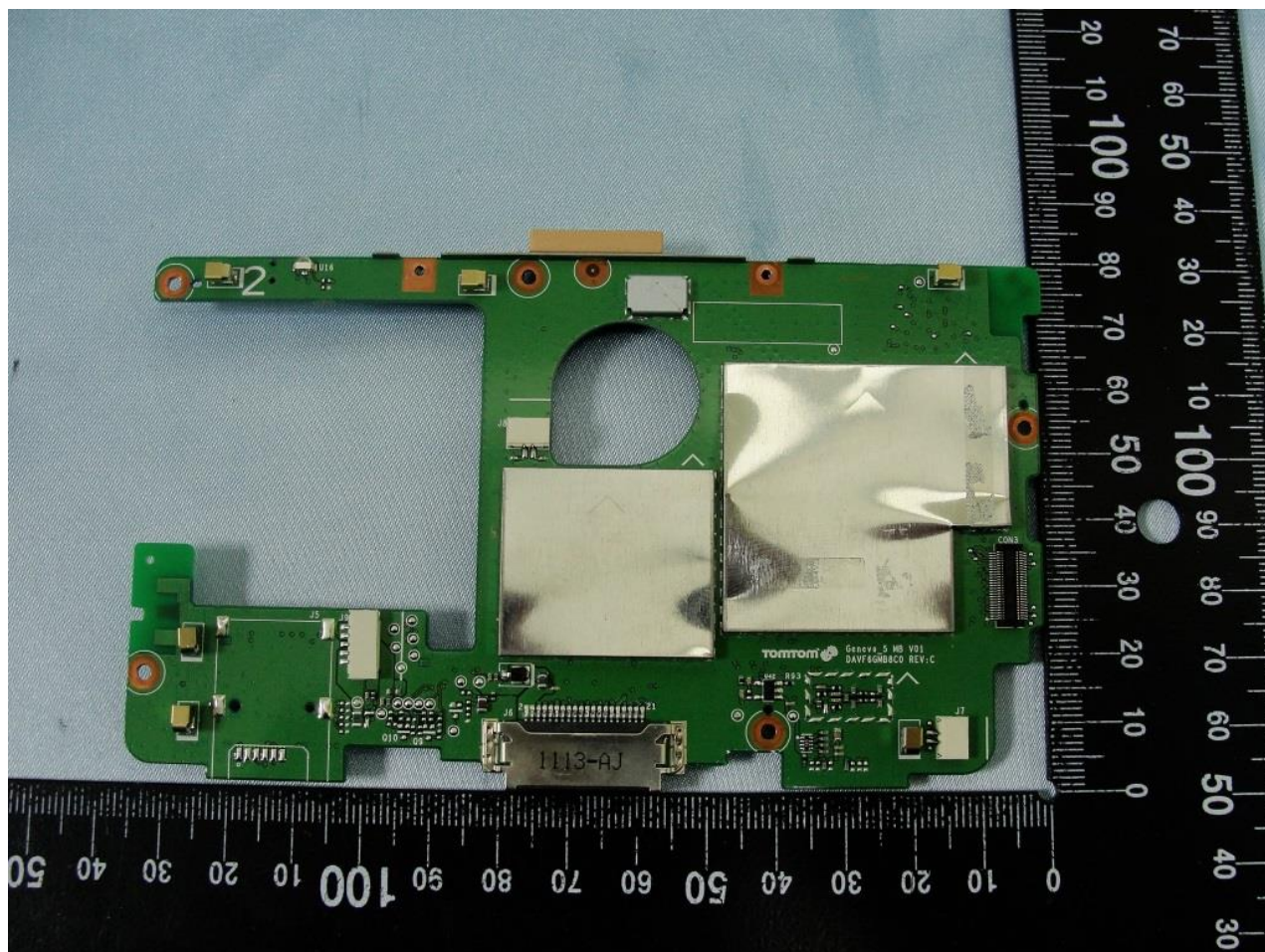


3. Internal Photograph of EUT

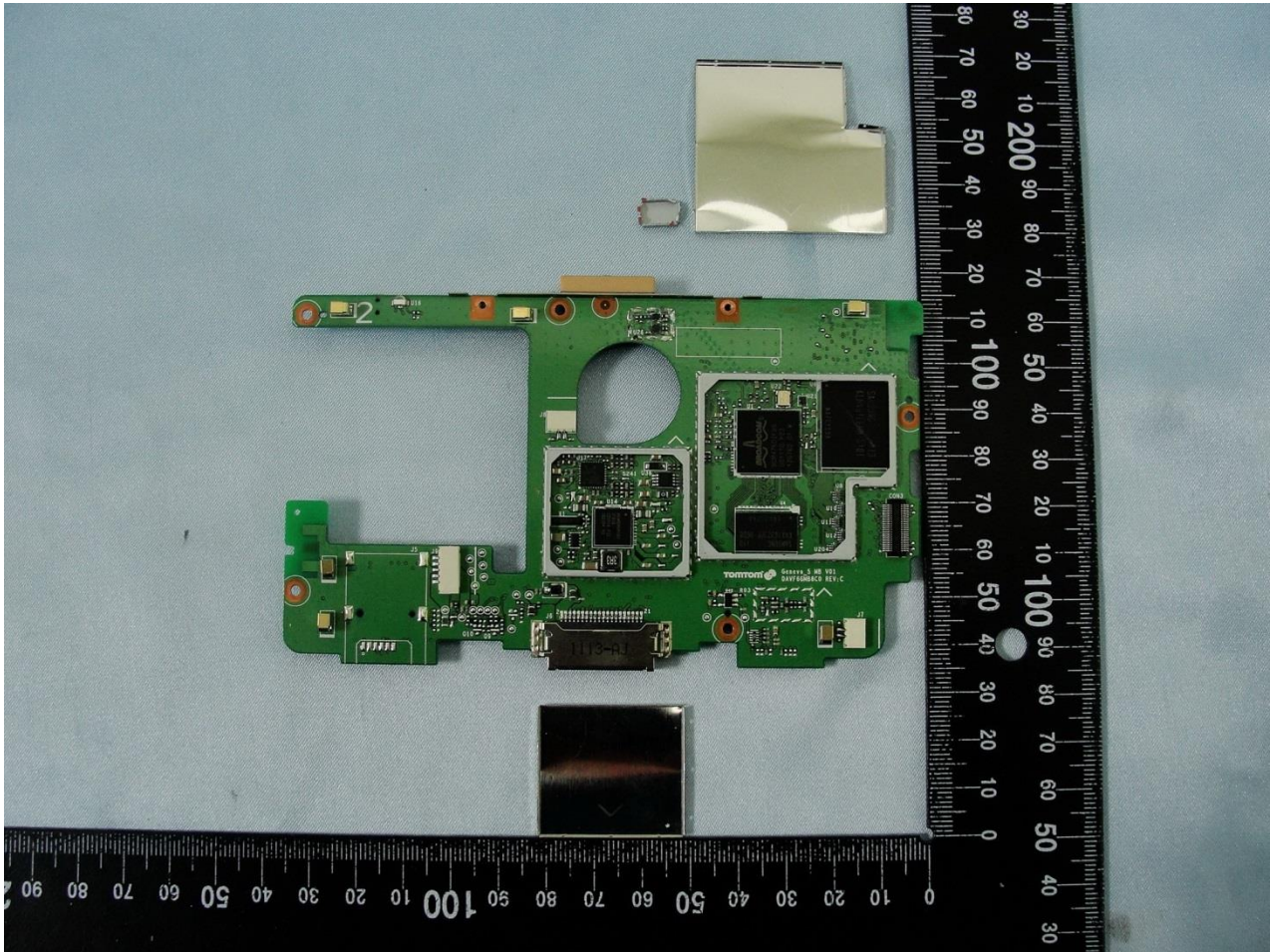
Brand Name: TomTom / Model Name: 4CR51



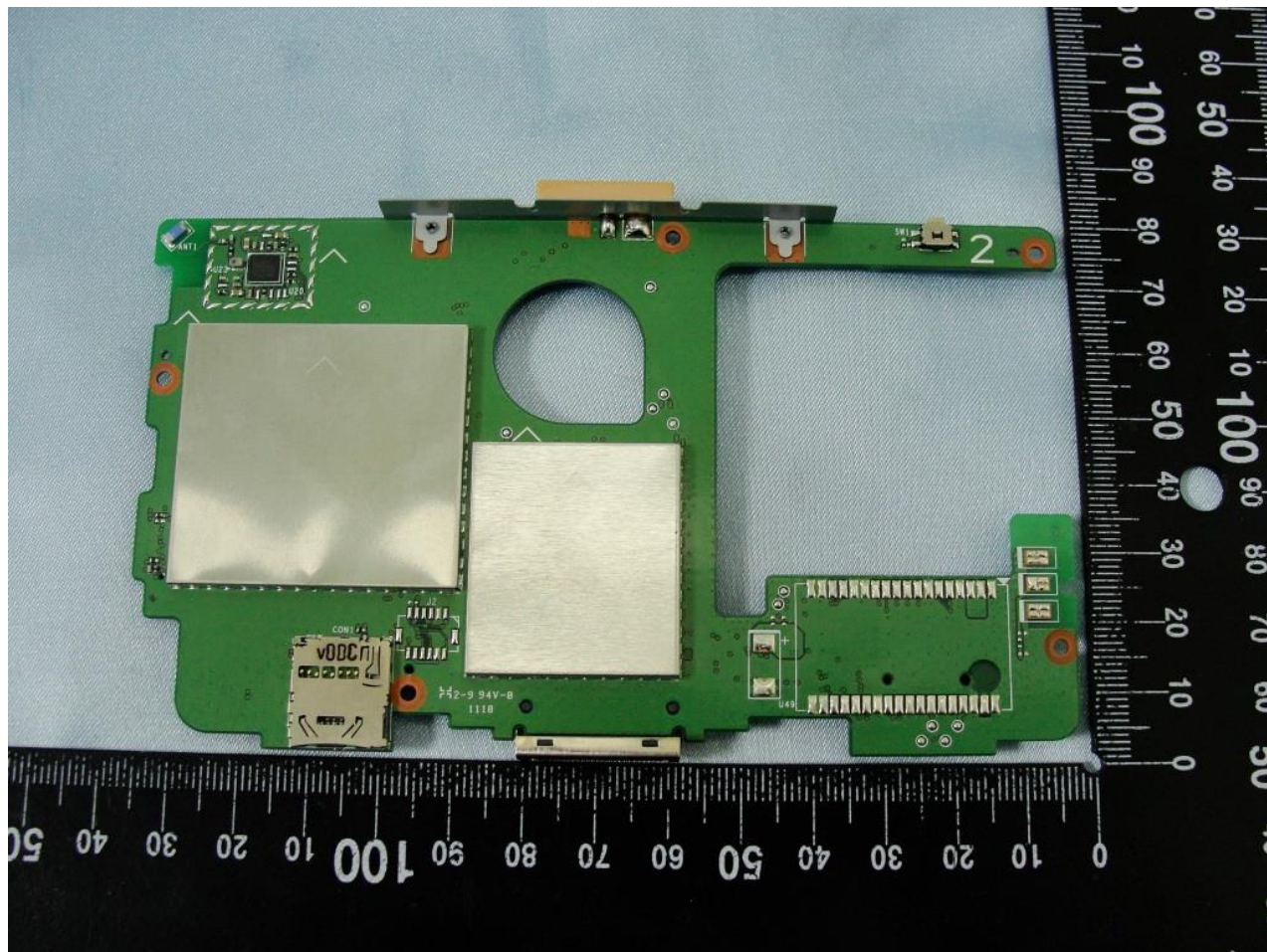
Brand Name: TomTom / Model Name: 4CR51



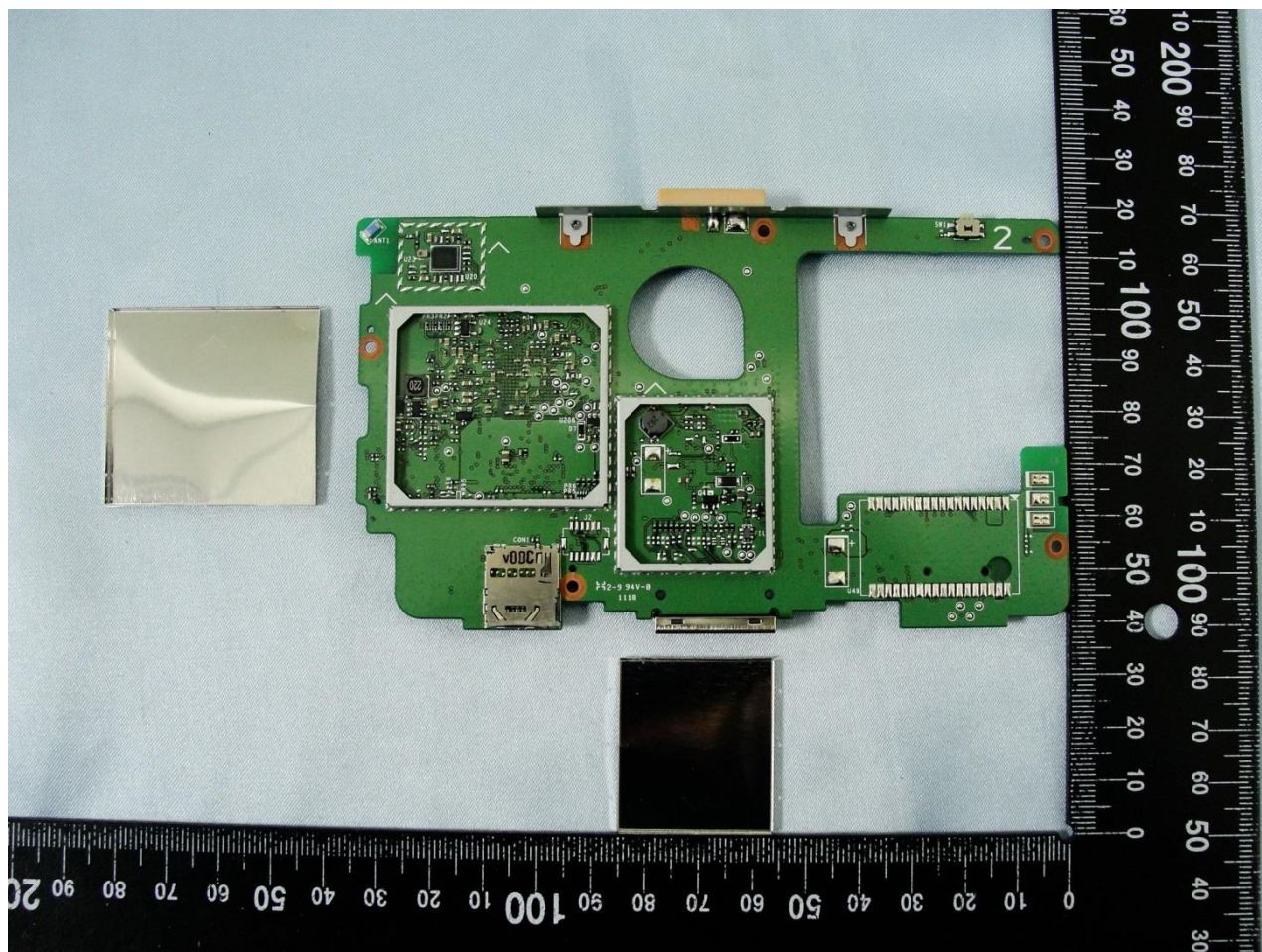
Brand Name: TomTom / Model Name: 4CR51



Brand Name: TomTom / Model Name: 4CR51

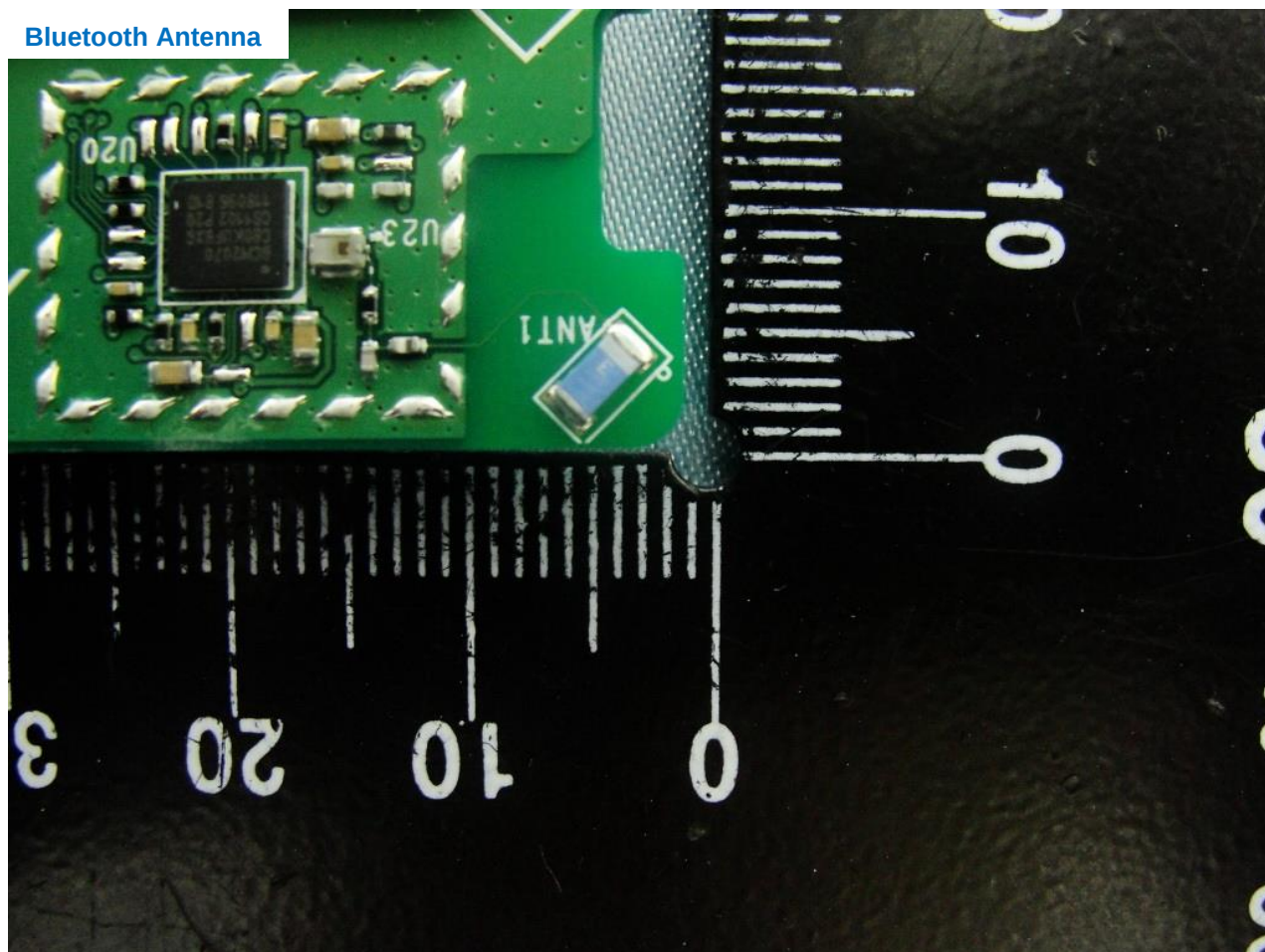


Brand Name: TomTom / Model Name: 4CR51



Brand Name: TomTom / Model Name: 4CR51

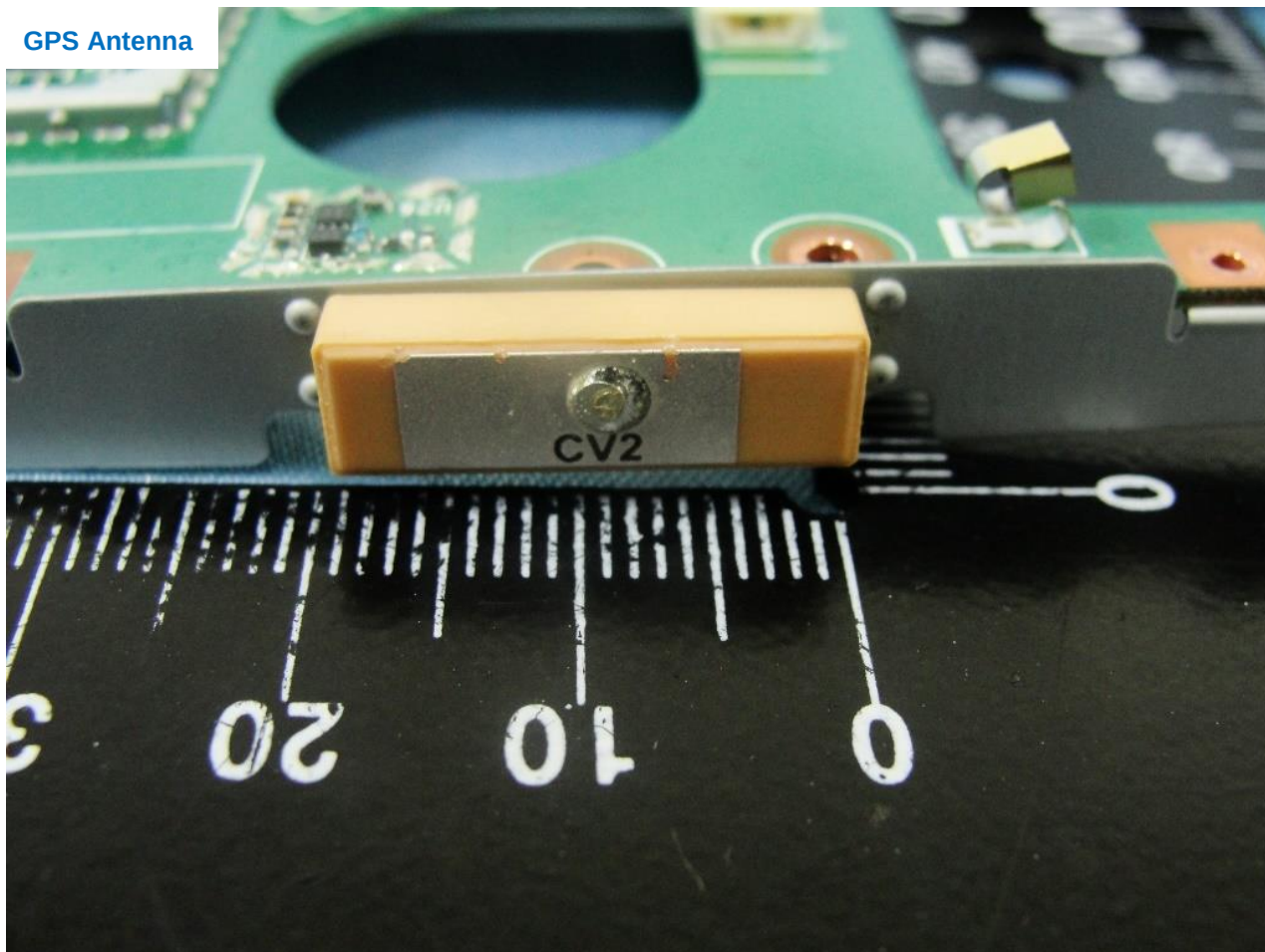
Bluetooth Antenna





Brand Name: TomTom / Model Name: 4CR51

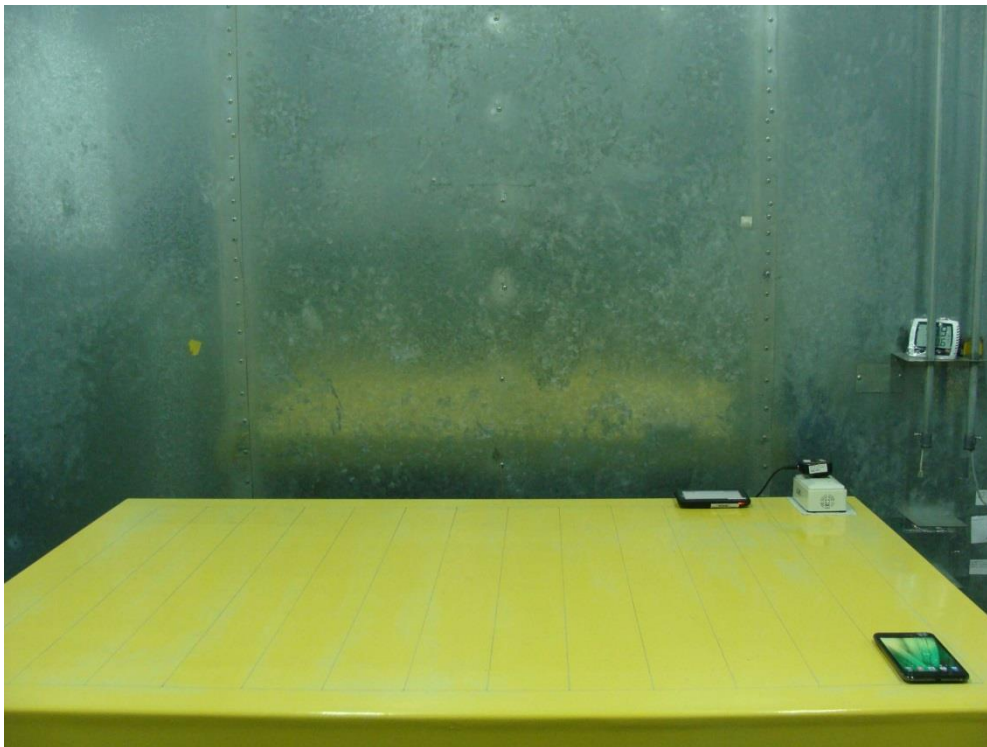
GPS Antenna



Appendix B. Setup Photographs

<Conducted Emission>

Mode 1



<Radiated Emission>

Mode 2

LF



HF

