CE Radio Test Report

APPLICANT	:	TomTom International BV
EQUIPMENT	:	GPS Navigation System
BRAND NAME	:	TomTom
MODEL NAME	:	4FA50,4FL50
STANDARD	:	ETSI EN 300 328 V1.8.1 (2012-06) AS/NZS 4268:2012
TEST DATE(S)	:	May 24, 2013 ~ Jun. 03, 2013

The measurements shown in this test report were made in accordance with the procedures given in EUROPEAN COUNCIL DIRECTIVE 1999/5/EC and found to be in compliance with ETSI Standard EN 300 328 V1.8.1 (2012-06) and AS/NZS 4268:2012.

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: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager

Testing Laboratory
1190

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

TABLE OF CONTENTS

REVISION HISTORY **3**
SUMMARY OF TEST RESULT **4**
1 GENERAL DESCRIPTION **5**
1.1 Applicant 5
1.2 Manufacturer 5
1.3 Feature of Equipment Under Test 5
1.4 Details of Tested Sample (EUT) Information 6
1.5 Modification of EUT 6
1.6 Testing Facility 6
1.7 Applied Standards 7
1.8 Test Condition 7
2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST **8**
2.1 Descriptions of Test Mode 8
2.2 Test Mode 8
2.3 Connection Diagram of EUT Test Configurations 9
2.4 Supported Unit used in test configuration and system 9
2.5 Description of EUT Operation Test Setup 9
3 TRANSMITTER PARAMETERS **10**
3.1 Maximum Transmit Power 10
3.2 Occupied Channel Bandwidth 12
3.3 Frequency Hopping Requirements 14
3.4 Transmitter unwanted emissions in the out-of-band domain 22
3.5 Transmitter spurious emissions 24
4 RECEIVER PARAMETERS **28**
4.1 Receiver spurious emissions 28
5 PHOTOGRAPHS OF RADIATED EMISSION TEST CONFIGURATION **32**
6 LIST OF MEASURING EQUIPMENT **33**
7 UNCERTAINTY EVALUATION **34**
APPENDIX A. PHOTOGRAPHS OF EUT

REVISION HISTORY

VERSION	DESCRIPTION	ISSUED DATE
Rev. 01	Initial issue of report	Jun. 28, 2013

SUMMARY OF TEST RESULT

CLAUSE (EN 300 328)	TEST PARAMETER	PASS/FAIL	REMARK
Transmitter Parameters			
4.3.1.1 4.3.2.1	Maximum Transmit Power	PASS	-
4.3.2.2	Maximum Equivalent Isotropically Radiated Power (E.I.R.P.) Spectral Density	Not Required	Only applicable for modulations other than FHSS
4.3.1.7 4.3.2.6	Occupied Channel Bandwidth	PASS	-
4.3.1.3 4.3.1.4	Frequency Hopping Requirements	PASS	Only applicable for FHSS
4.3.1.8 4.3.2.7	Transmitter spurious emissions in OOB	PASS	
4.3.1.9 4.3.2.8	Transmitter spurious emissions	PASS	Under limit 17.04 dB at 12521.250 MHz
Receiver Parameters			
4.3.1.10 4.3.2.9	Receiver spurious emissions	PASS	Under limit 7.06 dB at 12078.750 MHz
Adaptive Test Item			
4.3.1.6 4.3.2.5	Adaptivity	Not Required	Only applicable for adaptive equipment Output Power >10dBm
4.3.1.11 4.3.2.10	Receiver Blocking	Not Required	
Non-Adaptive Test Item			
4.3.1.2 4.3.2.3	Duty cycle, Tx-Sequence, Tx-gap	Not Required	Only applicable for non-adaptive equipment Output Power >10dBm
4.3.1.5 4.3.2.4	Medium Utilisation (MU) factor	Not Required	
Note: Bluetooth belongs to adaptive equipment and EIRP < 10dBm.			

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

The Equipment Under Test (hereafter called: EUT) is GPS Navigation System, GSM, Bluetooth, and GPS features, and below is details of information.

General Information of Equipment Under Test	
Equipment	GPS Navigation System
Brand Name	TomTom
Model Name	4FA50,4FL50
Bluetooth Version	V2.1 + EDR
Power Supply	Battery / AC Adapter / Car Charger

Remark:
1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. Model names 4FL50 support GPRS function where 4FA50 does not.

1.4 Details of Tested Sample (EUT) Information

Product Specification subjective to this Test Standard	
Transmitter / Receiver Frequency Range	2400 MHz ~ 2483.5 MHz
Number of Channels	Bluetooth : 79
Channel Spacing	Bluetooth : 1 MHz
Maximum EIRP Average Power	Bluetooth BR (1Mbps) : 1.20 dBm
Duty Cycle	Bluetooth BR (1Mbps) : 32.38%
Antenna Type / Gain	Bluetooth : Ground chip Antenna / 2.33 dBi
HW Version	1.0
SW Version	1.0
Type of Modulation	Bluetooth 2.1 BR (1Mbps) : GFSK Bluetooth 2.1 EDR (2Mbps) : π/4-DQPSK Bluetooth 2.1 EDR (3Mbps) : 8-DPSK
EUT Stage	Production Unit

Remark:

1. No modifications are made to the EUT during all test items.
2. For other wireless features of this EUT, test report will be issued separately.

1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Testing Facility

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No. 52, Hwa Ya 1st 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. :** 05CH01-HY ; TH02-HY

1.7 Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of **ETSI EN 300 328 V1.8.1 (2012-06) and AS/NZS 4268:2012.**

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

1.8 Test Condition

Normal Voltage	DC 3.7V
Normal Temperature	25℃
Extreme Temperature	-10℃ and 55℃

Note: The test temperature was between -10~55˚C by manufacturer requested.

2 Test Configuration of Equipment under Test

2.1 Descriptions of Test Mode

a. Preliminary tests were performed in different data rate and recorded the RF power output in the following tables:

Average Bluetooth RF Output Power (dBm)			
Data rate	**1Mbps**	**2Mbps**	**3Mbps**
Avg. Power	**1.20**	0.50	0.50

Note: Data rate Bluetooth 1Mbps was chosen to be tested due to the highest RF output power.

b. During radiated spurious emissions testing, the interface cables and equipment positions were varied according to European Standard EN 300 328 V1.8.1 (2012-06) and AS/NZS 4268:2012 and the frequency range of radiation was investigated from 25 MHz to 12750 MHz.

2.2 Test Mode

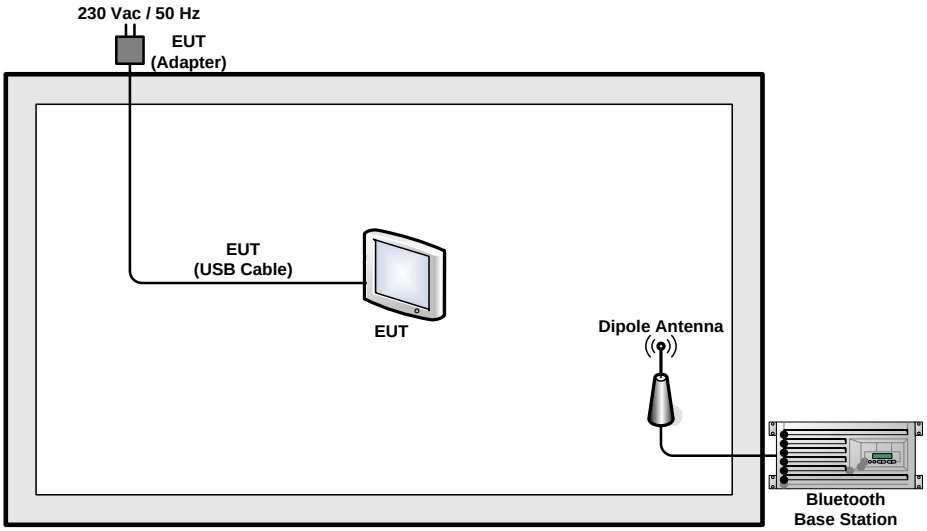
The following tables for radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Y plane) were recorded in this report.

Test Modes	
RF	**Bluetooth (1Mbps)** **GFSK**
Tx	**Bluetooth (1Mbps) CH00 (2402MHz)** Bluetooth (1Mbps) CH78 (2480MHz)
Rx	**Bluetooth (1Mbps) CH00 (2402MHz)** Bluetooth (1Mbps) CH78 (2480MHz)

Remark:

1. The worst case of the Transmitter Radiated Spurious Emission (RSE) was Bluetooth BR (1Mbps) CH00 Tx mode; only the test data of these modes was reported.
2. The worst case of the Receiver Radiated Spurious Emission (RSE) was Bluetooth BR (1Mbps) CH00 Rx mode; only the test data of these modes was reported.

2.3 Connection Diagram of EUT Test Configurations



2.4 Supported Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Bluetooth Base Station	R&S	CBT32	N/A	N/A	Unshielded, 1.8 m

2.5 Description of EUT Operation Test Setup

For Bluetooth function, the RF utility, ‘’Bluetooth Diagnosis’’ into AP mode which was programmed in order to make the EUT get into the engineering modes to contact with Bluetooth base station for continuous transmitting and receiving signals.

3 Transmitter Parameters

3.1 Maximum Transmit Power

3.1.1 Limit of Effective Isotropic Radiated Power

SUBCLAUSE 4.3.1.1.2 and 4.3.2.1.2	
TEST CONDITION	**LIMIT**
Normal and Extreme Temperature Conditions	20dBm (e.i.r.p)

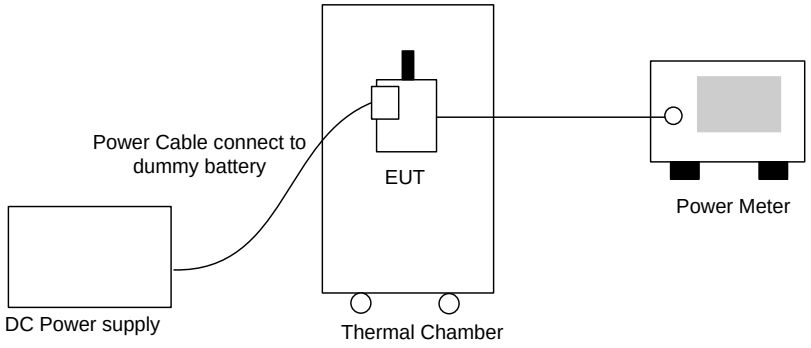
3.1.2 Measuring Instruments

The section 6.0 of List of Measuring Equipment of this test report is used for test.

3.1.3 Test Procedure

1. The measurement procedure follows the clause 5.3.2.2.1 of the ETSI EN 300 328 V1.8.1 (2012-06).
2. Placing the EUT in thermal chamber.
3. The EUT is connected to external power supply.
4. Setting thermal chamber temperature and power supply voltage at suitable values.
5. The EIRP = A+G+Y, where A is the power measured, G is the assembly gain of the individual antenna of the EUT in dBi and Y is the additional beamforming gain of the EUT in dB if applicable, here, Y=0.

3.1.4 Test Setup



3.1.5 Test Results

Test Item :	EIRP Power	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	48~51%

Mod.	Data Rate	N_{TX}	Channel	Freq. (MHz)	Conducted Power (dBm)			Gain (dBi)	Pass/Fail
					T nom	T min	T max		
					25 ℃	-10 ℃	55 ℃		
BT2.0	1Mbps	1	0	2402	-0.10	0.60	0.80	2.33	Pass
BT2.0	1Mbps	1	39	2441	1.00	1.20	1.50	2.33	Pass
BT2.0	1Mbps	1	78	2480	1.20	1.70	2.10	2.33	Pass

Mod.	Data Rate	N_{TX}	Channel	Freq. (MHz)	EIRP Power (dBm)			Power Limit (dBm)	Pass/Fail
					T nom	T min	T max		
					25 ℃	-10 ℃	55 ℃		
BT2.0	1Mbps	1	0	2402	2.23	2.93	3.13	20	Pass
BT2.0	1Mbps	1	39	2441	3.33	3.53	3.83	20	Pass
BT2.0	1Mbps	1	78	2480	3.53	4.03	4.43	20	Pass

Note: *EIRP = measured average power has offset cable loss + antenna gain.*

For example: Antenna gain = 2.33dBi at Ch00, 2402MHz,

EIRP = -0.10 dBm (measured average power has offset cable loss) + 2.33 dBm (antenna gain) = 2.23 dBm

3.2 Occupied Channel Bandwidth

3.2.1 Limit of Occupied Channel Bandwidth

Occupied Channel Bandwidth fall completely within 2.4 GHz – 2.4835 GHz

3.2.2 Measuring Instruments

The section 6.0 of List of Measuring Equipment of this test report is used for test.

3.2.3 Test Procedure

1. The measurement procedure follows the clause 5.3.8.2.1 of the ETSI EN 300 328 V1.8.1 (2012-06).
2. The measurement shall be performed only on the lowest and the highest frequency within the stated frequency range.
3. The test procedure shall be as follows:

Step 1:

Connect the EUT to the spectrum analyzer and use the following settings:

Center Frequency	Channel under test
Resolution BW	1 % of the span
Video BW	3 × RBW
Frequency Span	2 × Occupied Channel Bandwidth (e.g. 40 MHz for a 20 MHz channel)
Detector	RMS
Trace Mode	Max Hold

Step 2:

Wait until the trace is completed.

Find the peak value of the trace and place the analyzer marker on this peak.

Step 3:

Use the 99 % bandwidth function of the spectrum analyzer to measure the Occupied Channel Bandwidth of the EUT.

3.2.4 Test Setup

3.2.5 Test Results

Test Item :	99% Occupied BW	**Temperature :**	24~26℃
Test Engineer :	Book Lin	**Relative Humidity :**	48~51%

Occupied Channel Bandwidth Result				
Modulation Mode	**Frequency (MHz)**	**99% Bandwidth (MHz)**	**F_L at 99% BW (MHz)**	**F_H at 99% BW (MHz)**
Bluetooth (1Mbps)	2402	0.846	2401.586	2402.432
Bluetooth (1Mbps)	2480	0.846	2479.574	2480.42
Limit		N/A	2400	2483.5
Result		Complied		

3.3 Frequency Hopping Requirements

3.3.1 Dwell Time and Minimum Frequency Occupation Time

3.4.1.1 Limit of Dwell Time

SUBCLAUSE 4.3.1.3.2	
TEST CONDITION	**LIMIT**
Non-Adaptive Frequency Hopping Systems	15 ms within 15ms * hopping frequencies (N)
Adaptive Frequency Hopping Systems	0.4s within 0.4s * hopping frequencies (N)

Limit of Minimum Frequency Occupation Time

SUBCLAUSE 4.3.1.3.2	
TEST CONDITION	**LIMIT**
Normal and Extreme Temperature Conditions	The Minimum Frequency Occupation Time shall be equal to one dwell time within a period not exceeding four times the product of the dwell time per hop and the number of hopping frequencies in use.

Remark: This test item is not applicable to DSSS/OFDM device.

3.4.1.2 Measuring Instruments

The section 6.0 of List of Measuring Equipment of this test report is used for test.

3.4.1.3 Test Procedures

1. The measurement shall be performed on a minimum of 2 hopping frequencies chosen arbitrary from the actual hopping sequence. The results as well as the frequencies on which the test was performed shall be recorded in the test report.
2. The measurement procedure follows the clause 5.3.4.2.1 of the ETSI EN 300 328 V1.8.1 (2012-06).
3. The analyzer shall be set as follows:

Center Frequency	Channel under test
Frequency Span	0 Hz
Resolution BW	~ 50% of Occupied Bandwidth
Video BW	>= RBW
Detector	RMS
Sweep time	Equal to the Dwell Time × Minimum number of hopping frequencies (N)
Number of sweep points	30000
Trace Mode	Clear / Write
Trigger	Free Run

4. For accuracy measurement, the sweep time would be zoomed in and verify the dwell time which is from the dwell time per hop across the total number of hopping channel. Then record test result in the section 3.4.1.5.
5. Make the following changes on the analyzer to get Minimum Frequency Occupation Time
   Sweep time: Equal to 4 × Dwell Time × Actual number of hopping frequencies in use

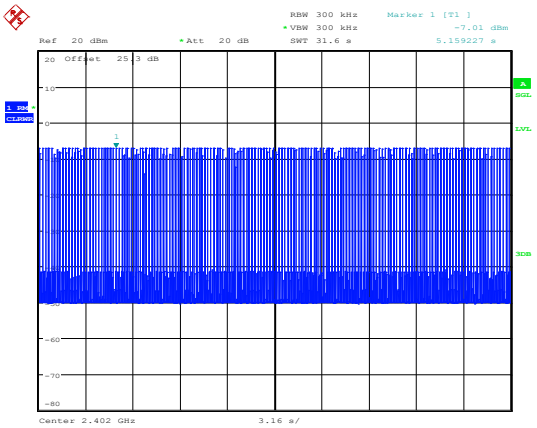
3.4.1.4 Test Setup

3.4.1.5 Test Results

Test Item :	Dwell Time and Occupation time	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	48~51%

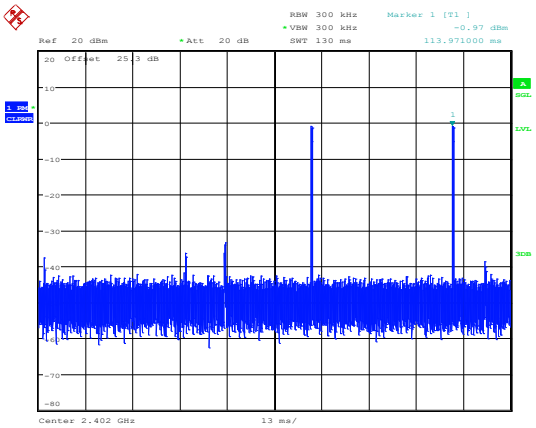
BT (Hopping Mode)		Dwell Time per hop(ms)	Dwell Time(sec)	Dwell Time Max. Limit (sec)	Frequency Occupation Time (ms)	Frequency Occupation Time min. Limit (ms)	Pass /Fail
DH1	2402 MHz	0.41	0.336	0.4	2.82	0.41	Pass
	2480 MHz	0.41	0.336	0.4	1.38	0.41	Pass
DH3	2402 MHz	1.68	0.249	0.4	13.17	1.68	Pass
	2480 MHz	1.68	0.257	0.4	13.17	1.68	Pass
DH5	2402 MHz	2.94	0.302	0.4	46.08	2.94	Pass
	2480 MHz	2.94	0.275	0.4	34.44	2.94	Pass

Dwell Time Channel 00 DH1



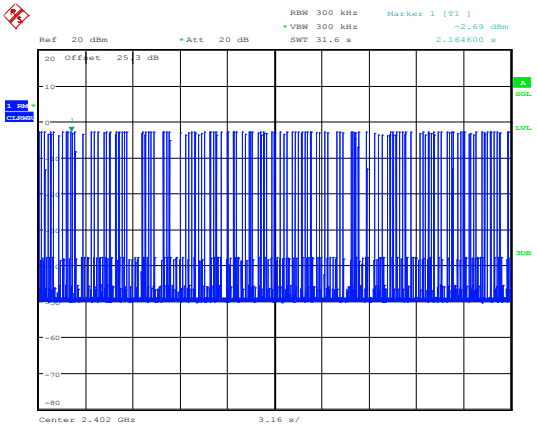
Date: 4.JUN.2013 15:09:38

Frequency Occupation Time - Channel 00 DH1



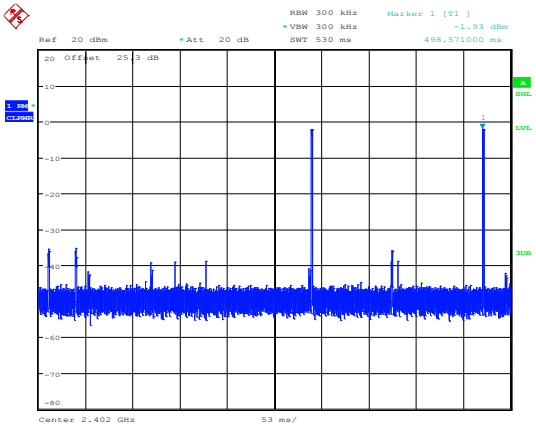
Date: 4.JUN.2013 15:09:44

Dwell Time Channel 00 DH3



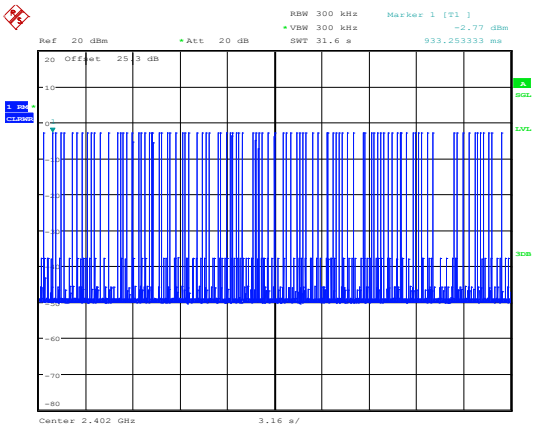
Date: 4.JUN.2013 15:17:08

Frequency Occupation Time - Channel 00 DH3



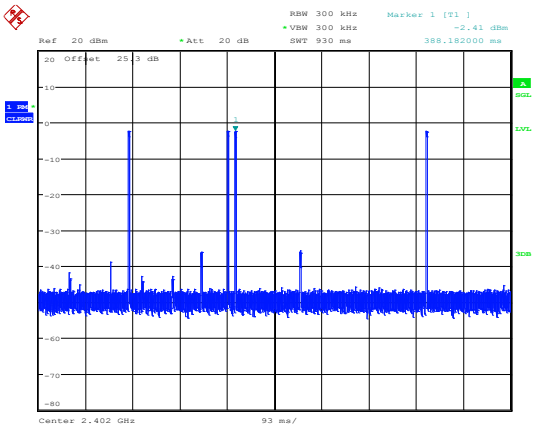
Date: 4.JUN.2013 15:17:15

Dwell Time Channel 00 DH5



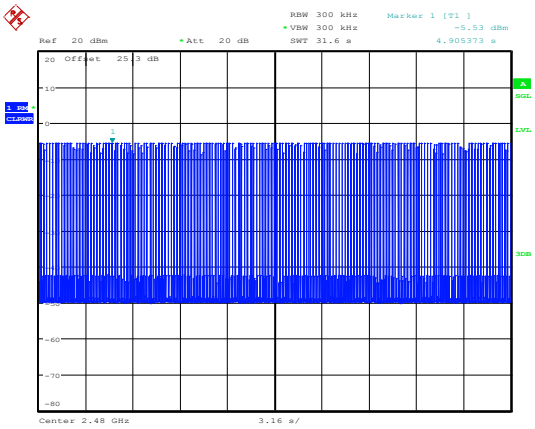
Date: 4.JUN.2013 15:21:01

Frequency Occupation Time - Channel 00 DH5



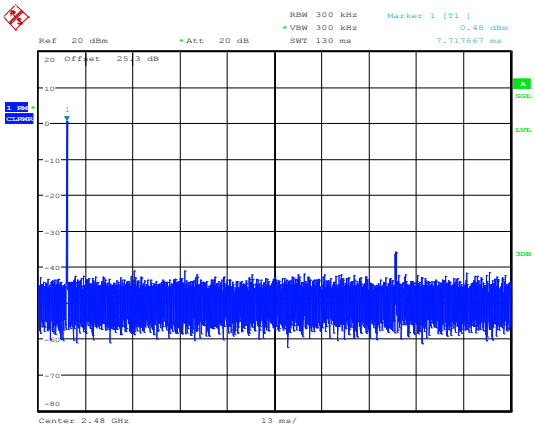
Date: 4.JUN.2013 15:21:07

Dwell Time Channel 78 DH1



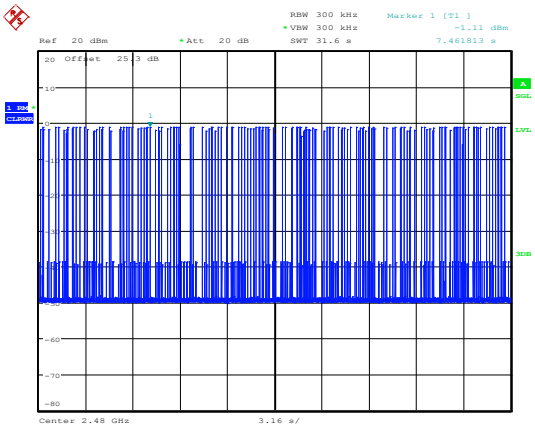
Date: 4.JUN.2013 15:12:53

Frequency Occupation Time - Channel 78 DH1



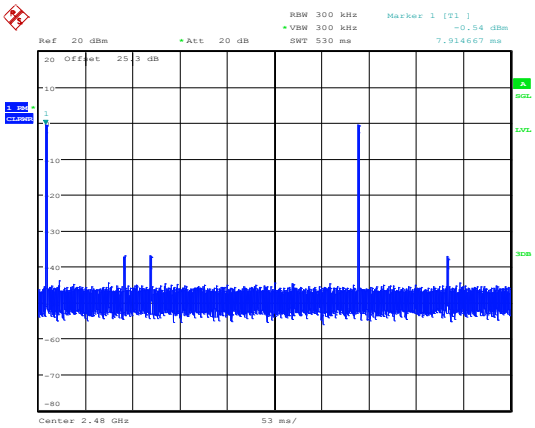
Date: 4.JUN.2013 15:12:59

Dwell Time Channel 78 DH3



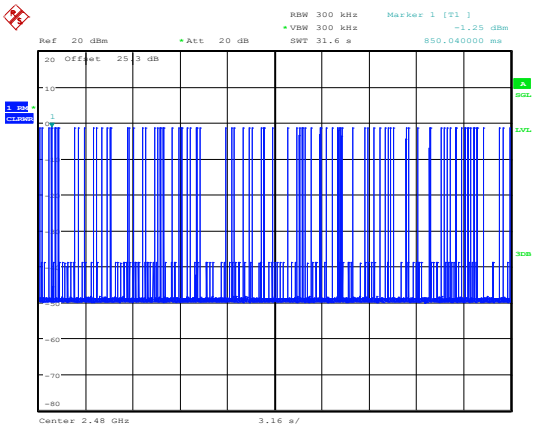
Date: 4.JUN.2013 15:15:35

Frequency Occupation Time - Channel 78 DH3



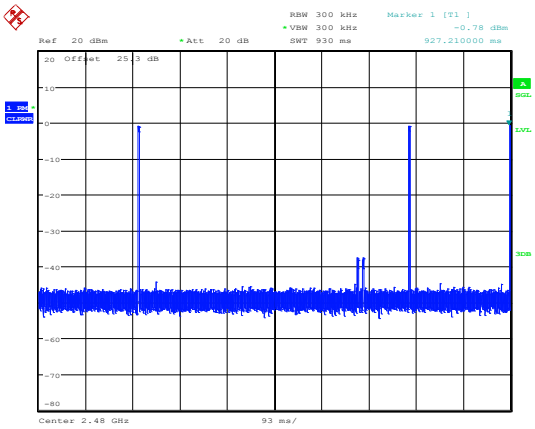
Date: 4.JUN.2013 15:15:41

Dwell Time Channel 78 DH5



Date: 4.JUN.2013 15:22:30

Frequency Occupation Time - Channel 78 DH5



Date: 4.JUN.2013 15:22:37

3.3.2 Hopping Sequence

3.4.2.1 Limit of Hopping Sequence

SUBCLAUSE 4.3.1.3.2	
TEST CONDITION	**LIMIT**
Non-Adaptive Frequency Hopping Systems	N
Adaptive Frequency Hopping Systems	N Ch 70% of band

N= 15 or 15 divided by the minimum Hopping Frequency Separation in MHz, whichever is the greater.

Remark: Hopping Sequence is not applicable to DSSS/OFDM device.

3.4.2.2 Measuring Instruments

The section 6.0 of List of Measuring Equipment of this test report is used for test.

3.4.2.3 Test Procedures

The measurement procedure follows the clause 5.3.4.2.1 of the ETSI EN 300 328 V1.8.1 (2012-06).

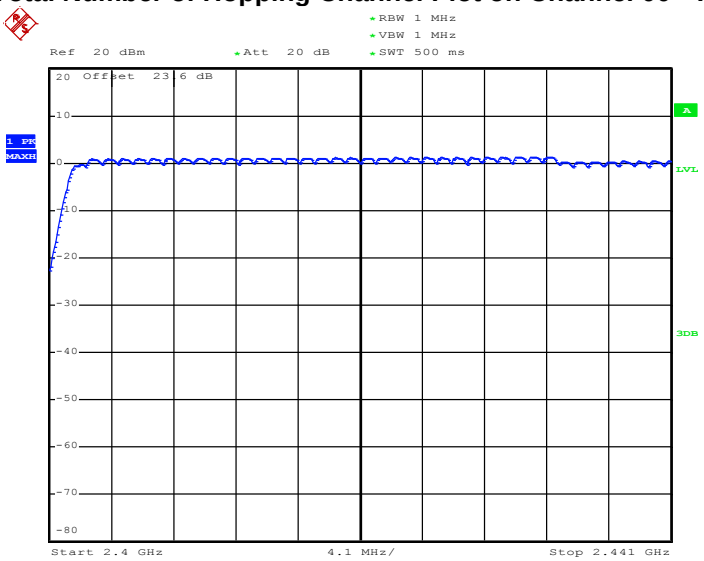
3.4.2.4 Test Setup

3.4.2.5 Test Results of Hopping Sequence

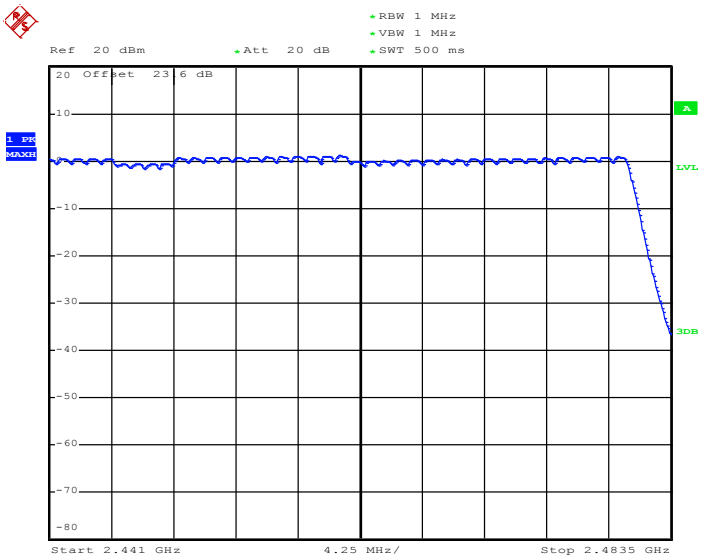
Test Item :	Hopping Sequence	**Temperature :**	24~26℃
Test Engineer :	Book Lin	**Relative Humidity :**	48~51%

Total Number of Hopping Frequency	Limit of operating channel (at least 70% of band)	Minimum Number of Adaptive Frequency Hopping	Limit of hopping frequencies at all times
79	59	20	15

Total Number of Hopping Channel Plot on Channel 00 - 78



Date: 3.JUN.2013 14:11:15



Date: 3.JUN.2013 14:14:31

3.3.3 Hopping Frequency Separation

3.4.4.1 Limit of Hopping Frequency Separation

SUBCLAUSE 4.3.1.4.2	
TEST CONDITION	**LIMIT**
Non-Adaptive Frequency Hopping Systems	MAX [OBW, 100kHz]
Adaptive Frequency Hopping Systems	100kHz

Remark: Hopping Frequency Separation is not applicable to DSSS/OFDM device.

3.4.4.2 Measuring Instruments

The section 6.0 of List of Measuring Equipment of this test report is used for test.

3.4.4.3 Test Procedures

1. These measurements shall only be performed at normal test conditions.
2. The measurement shall be performed on 2 adjacent hopping frequencies.
3. The frequencies on which the test was performed shall be recorded.
4. The measurement procedure follows the clause 5.3.5.2.1.2 Option 2 of the ETSI EN 300 328 V1.8.1 (2012-06).

3.4.4.4 Test Setup

3.4.4.5 Test Results

Test Item :	Frequency Separation	**Temperature :**	24~26℃
Test Engineer :	Book Lin	**Relative Humidity :**	48~51%

BT	Separation(MHz)	Limit(MHz)
CH 00	1.002	>0.1
CH 78	1.002	>0.1

3.4 Transmitter unwanted emissions in the out-of-band domain

3.4.1 Transmitter unwanted emissions in the out-of-band domain limit

out-of-band domain limit

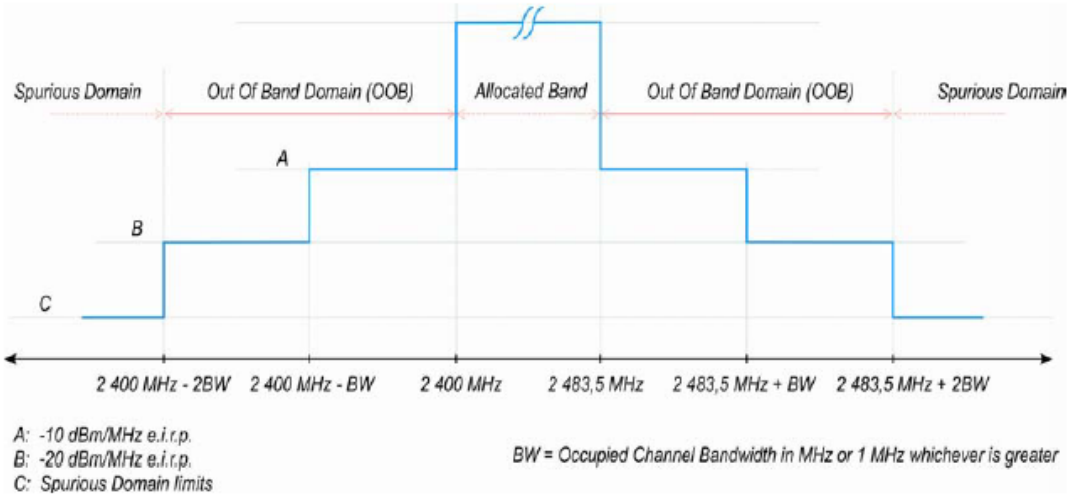


Figure 1: Transmit mask

3.4.2 Measuring Instruments

The section 6.0 of List of Measuring Equipment of this test report is used for test.

3.4.3 Test Procedures

1. The measurement procedure follows the clause 5.3.9.2.1 of the ETSI EN 300 328 V1.8.1 (2012-06).
2. The measurements shall be performed at both normal environmental conditions and at the extremes of the operating temperature range.
3. For conducted measurements on devices with multiple transmit chains using the results for each of the transmit chains for the corresponding 1 MHz segments shall be added and compared with the transmit mask limit. The test results are shown in 3.4.5 section and have offset directional gain, G_{ANT} / DG (dBi).

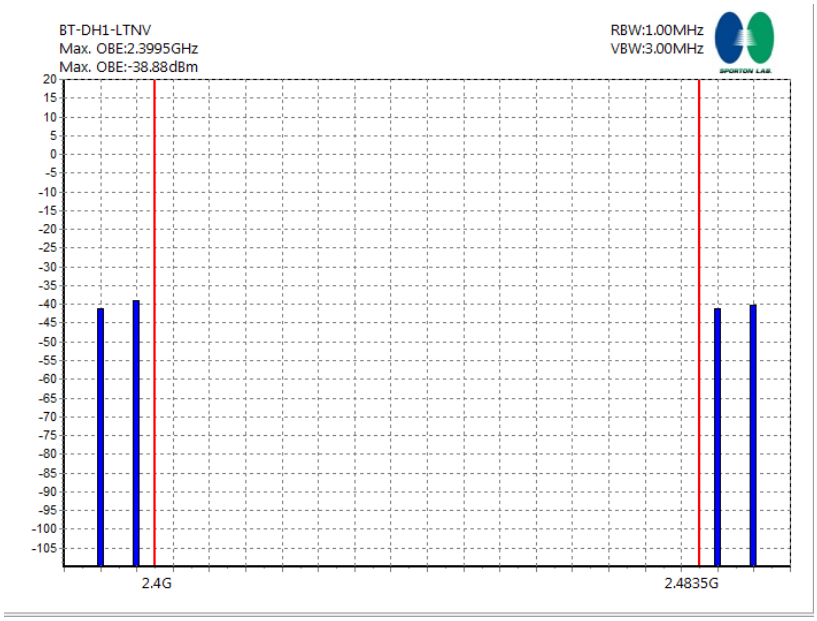
3.4.4 Test Setup

3.4.5 Test Results

Test Item :	OOB Emissions	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	48~51%

Mod.	Data Rate	N_{TX}	Channel (Low/High)	Temp. Condition	Low channel OOB Emissions (dBm/MHz)				High channel OOB Emissions (dBm/MHz)				Pass/Fail
					Freq. (MHz)	OOB Freq. (MHz)	Worst Level	Limit	Freq. (MHz)	OOB Freq. (MHz)	Worst Level	Limit	
BT2.0	1Mbps	1	hop	T nom	hop	2398.5	-39.9	-10	hop	2485	-39.67	-10	Pass
BT2.0	1Mbps	1	hop	T min	hop	2399.5	-38.88	-10	hop	2485	-40.36	-10	Pass
BT2.0	1Mbps	1	hop	T max	hop	2399.5	-39.04	-10	hop	2485	-39.82	-10	Pass

Lower band worst	Upper band worst



Result	Complied

Note: Normal and extreme condition can refer to the section 1.7 of this test report.

3.5 Transmitter spurious emissions

3.5.1 Limit of Transmitter spurious emissions

Spurious emission limits for transmitter:

SUBCLAUSE 4.3.1.9.2 and 4.3.2.8.2		
FREQUENCY RANGE	**MAXIMUM POWER E.R.P. (≤ 1 GHZ) E.I.R.P. (> 1 GHZ)**	**BANDWIDTH**
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87,5 MHz	-36 dBm	100 kHz
87,5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 862 MHz	-54 dBm	100 kHz
862 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 12,75 GHz	-30 dBm	1 MHz

3.5.2 Measuring Instruments

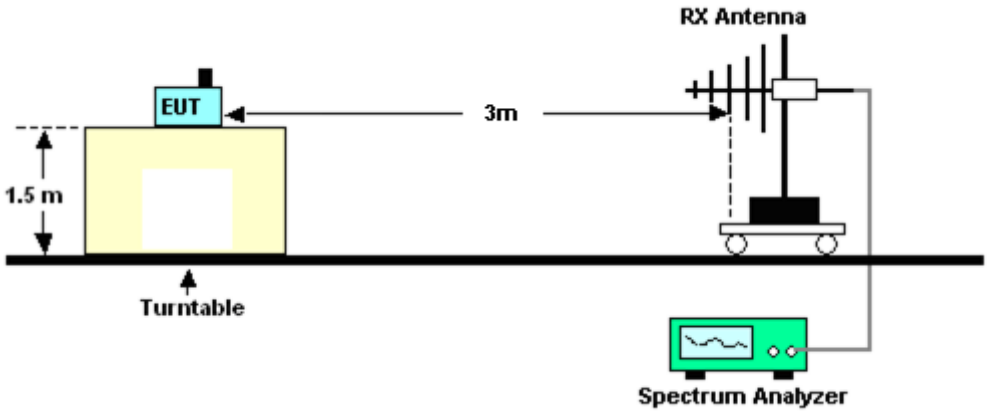
The section 6.0 of List of Measuring Equipment of this test report is used for test.

3.5.3 Test Procedures

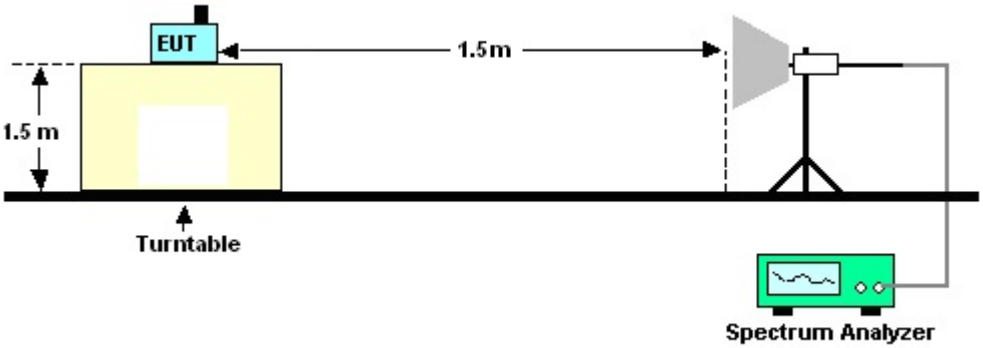
1. The measurement procedure follows the clause 5.3.10.2.2 of the ETSI EN 300 328 V1.8.1 (2012-06).
2. The EUT was placed on a turntable with 1.5m height.
3. The test distance between the receiving antenna and the EUT is 3meter below 1GHz frequency range, and 1.5 meter which is in far field test condition for measured frequency above 1GHz, while the receiving (test) antenna is kept at 1.5 meter height.
4. Set EUT in continuous transmitting with maximum output power.
5. The table was rotated from 0 to 360 degree to search the highest radiated emission.
6. Repeating step 3 and 4 for each polarization and channel to find the worst emission level.
7. The results obtained are compared to the limits in order to prove compliance with the requirement.

3.5.4 Test Setup

<Below 1GHz>

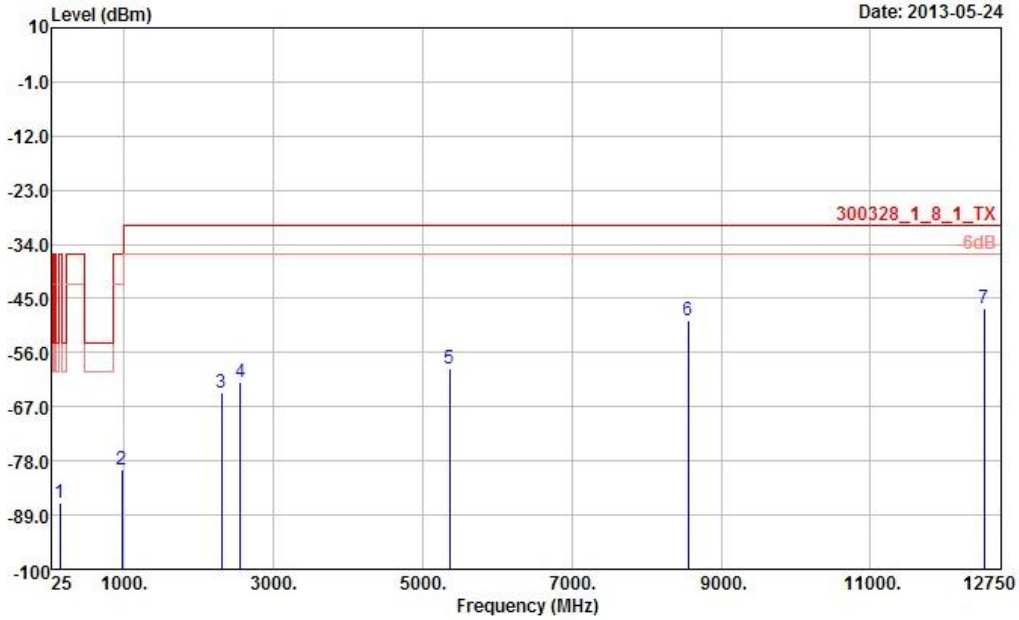


<Above 1GHz>



3.5.5 Test Results

Test Mode :	Bluetooth (1Mbps) CH00 (2402MHz)	**Temperature :**	22~23℃
Test Engineer :	Chivalry Liu	**Relative Humidity :**	43~44%
		Polarization :	Horizontal

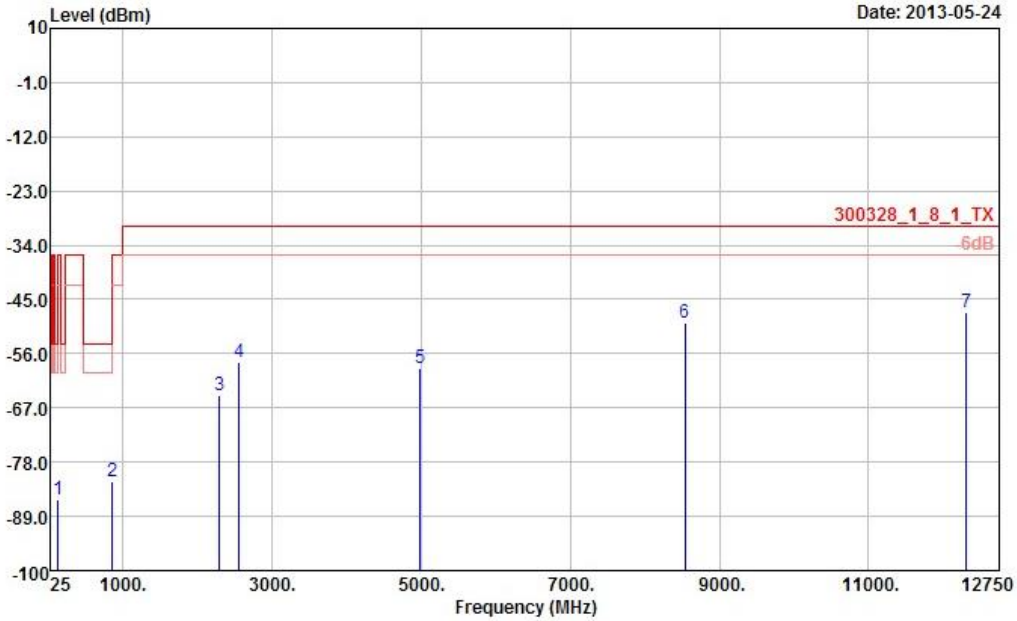


Site : 05CH01-HY
Condition : 300328_1_8_1_TX HORIZONTAL
Project : ER 332116-01

Plane : Y

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	139.68	-86.45	-50.45	-36.00	-84.48	-1.97	HORIZONTAL
2	968.50	-79.68	-43.68	-36.00	-90.66	10.98	HORIZONTAL
3	2302.00	-64.24	-34.24	-30.00	-71.00	6.76	HORIZONTAL
4	2558.00	-61.93	-31.93	-30.00	-68.79	6.86	HORIZONTAL
5	5361.00	-59.36	-29.36	-30.00	-73.77	14.41	HORIZONTAL
6	8562.00	-49.57	-19.57	-30.00	-73.01	23.44	HORIZONTAL
7	12521.25	-47.04	-17.04	-30.00	-73.59	26.55	HORIZONTAL

Test Mode :	Bluetooth (1Mbps) CH00 (2402MHz)	**Temperature :**	22~23℃
Test Engineer :	Chivalry Liu	**Relative Humidity :**	43~44%
		Polarization :	Vertical



Site : 05CH01-HY
Condition : 300328_1_8_1_TX VERTICAL
Project : ER 332116-01

Plane : Y

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	130.05	-85.54	-49.54	-36.00	-84.10	-1.44	VERTICAL
2	856.50	-82.02	-28.02	-54.00	-90.98	8.96	VERTICAL
3	2298.00	-64.32	-34.32	-30.00	-71.08	6.76	VERTICAL
4	2558.00	-57.84	-27.84	-30.00	-64.70	6.86	VERTICAL
5	4989.00	-58.90	-28.90	-30.00	-73.66	14.76	VERTICAL
6	8541.00	-49.74	-19.74	-30.00	-73.19	23.45	VERTICAL
7	12307.50	-47.53	-17.53	-30.00	-73.56	26.03	VERTICAL

4 Receiver Parameters

4.1 Receiver spurious emissions

4.1.1 Limit of Receiver spurious emissions

FHSS spurious emission limits for receivers:

SUBCLAUSE 4.3.1.10.2		
FREQUENCY RANGE	MAXIMUM POWER E.R.P. (≤ 1 GHZ) E.I.R.P. (> 1 GHZ)	MEASUREMENT BANDWIDTH
30 MHz to 1 GHz	-57 dBm	100kHz
1 GHz to 12,75 GHz	-47 dBm	1MHz

WLAN spurious emission limits for receivers

SUBCLAUSE 4.3.2.9		
FREQUENCY RANGE	MAXIMUM POWER, E.R.P.	MEASUREMENT BANDWIDTH
30 MHz to 1 GHz	-57 dBm	100kHz
1 GHz to 12,75 GHz	-47 dBm	1MHz

4.1.2 Measuring Instruments

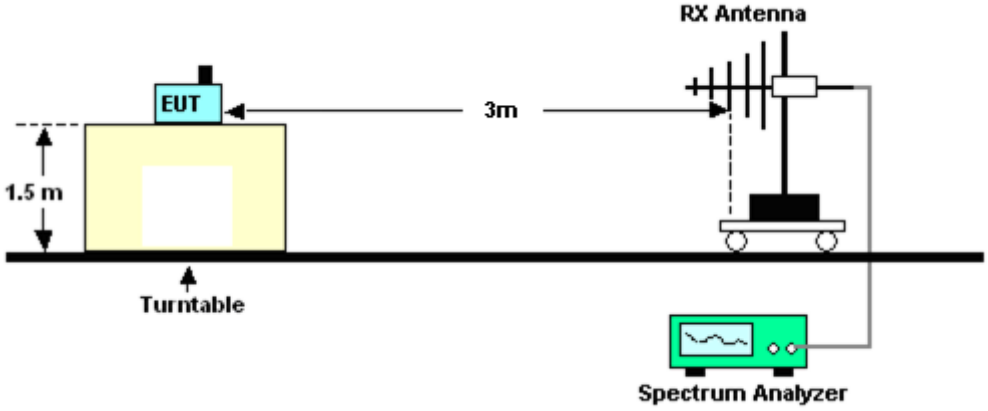
The section 6.0 of List of Measuring Equipment of this test report is used for test.

4.1.3 Test Procedures

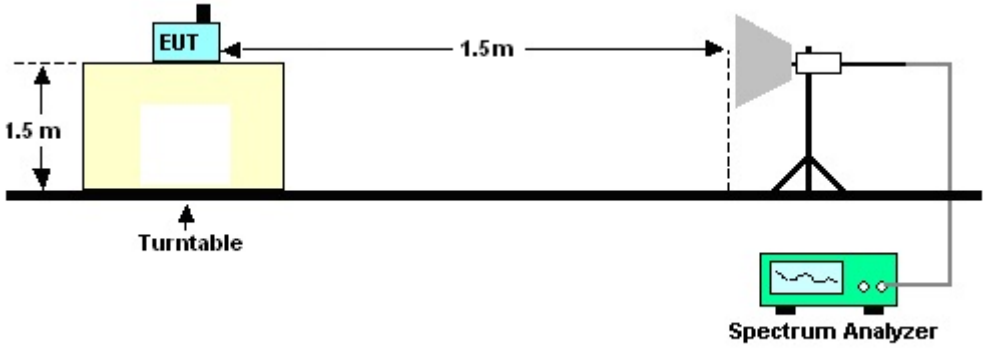
1. The measurement procedure follows the clause 5.3.11.2.2 of the ETSI EN 300 328 V1.8.1 (2012-06).
2. The EUT was placed on a turntable with 1.5m height.
3. The test distance between the receiving antenna and the EUT is 3meter below 1GHz frequency range, and 1.5 meter which is in far field test condition for measured frequency above 1GHz, while the receiving (test) antenna is kept at 1.5 meter height.
4. Set EUT in continuous transmitting with maximum output power.
5. The table was rotated from 0 to 360 degree to search the highest radiated emission.
6. Repeating step 3 and 4 for each polarization and channel to find the worst emission level.
7. The results obtained are compared to the limits in order to prove compliance with the requirement.

4.1.4 Test Setup

<Below 1GHz>

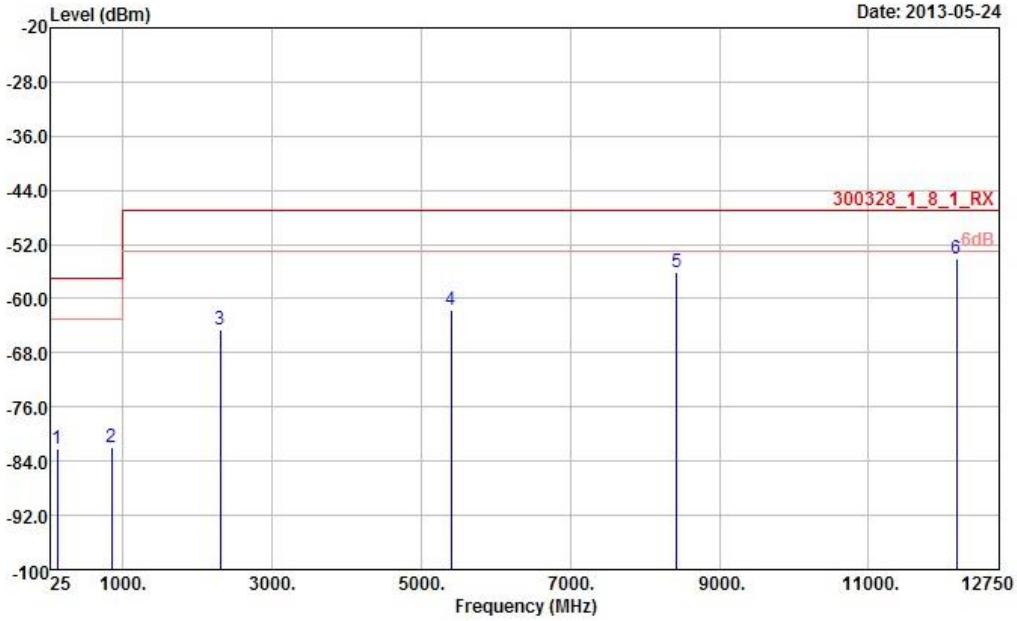


<Above 1GHz>



4.1.5 Test Results

Test Mode :	Bluetooth (1Mbps) CH00 (2402MHz)	**Temperature :**	22~23℃
Test Engineer :	Chivalry Liu	**Relative Humidity :**	43~44%
		Polarization :	Horizontal

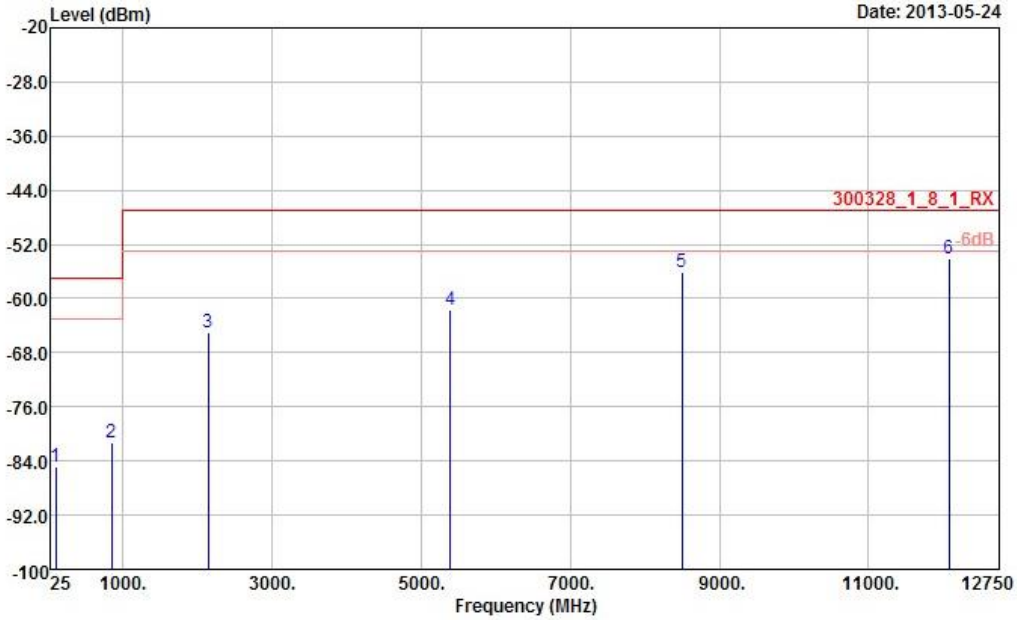


Site : 05CH01-HY
Condition : 300328_1_8_1_RX HORIZONTAL
Project : ER 332116-01

Plane : Y

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	116.30	-82.07	-25.07	-57.00	-80.43	-1.64	HORIZONTAL
2	846.00	-81.85	-24.85	-57.00	-90.76	8.91	HORIZONTAL
3	2302.00	-64.62	-17.62	-47.00	-71.38	6.76	HORIZONTAL
4	5397.00	-61.60	-14.60	-47.00	-74.11	12.51	HORIZONTAL
5	8430.00	-56.06	-9.06	-47.00	-75.58	19.52	HORIZONTAL
6	12176.25	-54.13	-7.13	-47.00	-76.08	21.95	HORIZONTAL

Test Mode :	Bluetooth (1Mbps) CH00 (2402MHz)	**Temperature :**	22~23℃
Test Engineer :	Chivalry Liu	**Relative Humidity :**	43~44%
		Polarization :	Vertical

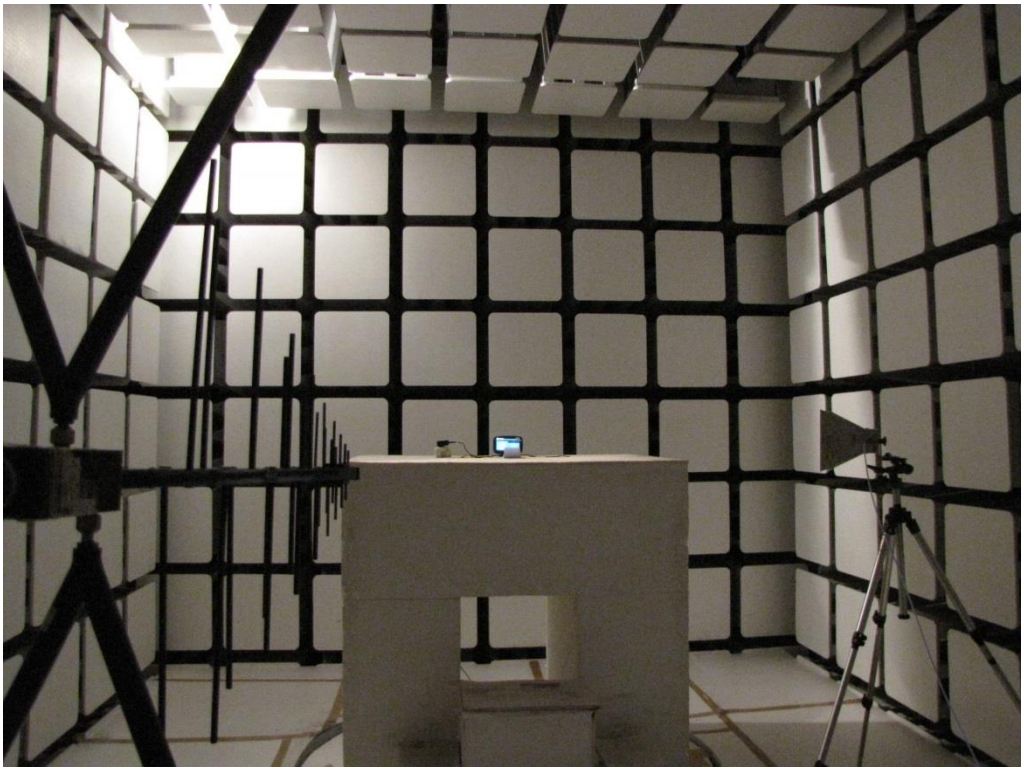


Site : 05CH01-HY
Condition : 300328_1_8_1_RX VERTICAL
Project : ER 332116-01

Plane : Y

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Pol/Phase
	MHz	dBm	dB	dBm	dBm	dB	
1	103.10	-84.96	-27.96	-57.00	-83.08	-1.88	VERTICAL
2	850.90	-81.22	-24.22	-57.00	-90.24	9.02	VERTICAL
3	2140.00	-64.92	-17.92	-47.00	-71.70	6.78	VERTICAL
4	5394.00	-61.58	-14.58	-47.00	-74.08	12.50	VERTICAL
5	8496.00	-56.07	-9.07	-47.00	-75.69	19.62	VERTICAL
6	12078.75	-54.06	-7.06	-47.00	-75.84	21.78	VERTICAL

5 Photographs of Radiated Emission Test Configuration



6 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSP40	100055	9kHz~40GHz	Jun. 06, 2012	May 24, 2013~ Jun. 03, 2013	Jun. 05, 2013	Conducted (TH02-HY)
Power Sensor	D.A.R.E	RPR3006	13I00030SNO06	9kHz~6GHz	Apr. 24, 2013	May 24, 2013~ Jun. 03, 2013	Apr. 23, 2014	Conducted (TH02-HY)
Thermal Chamber	Ten Billion	TTH-D3SP	TBN-930701	N/A	Jul. 23, 2012	May 24, 2013~ Jun. 03, 2013	Jul. 22, 2013	Conducted (TH02-HY)
Spectrum Analyzer	R&S	FSEK30	100189	9kHz ~ 40GHz	Dec. 03, 2012	May 24, 2013	Dec. 02, 2013	Radiation (05CH01-HY)
Amplifier	Agilent	8447D	2944A11146	100kHz ~ 1.3GHz	Jul. 09 , 2012	May 24, 2013	Jul. 08 , 2013	Radiation (05CH01-HY)
Amplifier	Agilent	8449B	3008A02096	1GHz ~ 26.5GHz	Mar. 27, 2013	May 24, 2013	Mar. 26, 2014	Radiation (05CH01-HY)
Bilog Antenna	SCHAFFNER	CBL6111C	2737	25MHz ~ 2GHz	Oct. 19, 2012	May 24, 2013	Oct. 18, 2013	Radiation (05CH01-HY)
Horn Antenna	COM-POWER	AH-118	10091	1GHz ~ 18GHz	Jan. 29, 2013	May 24, 2013	Jan. 28, 2014	Radiation (05CH01-HY)
RF Cable-R03m	Jye Bao	RG142	CB031	30MHz ~ 1GHz	Dec. 02, 2012	May 24, 2013	Dec. 01, 2013	Radiation (05CH01-HY)
RF Cable-high	SUHNER	SUCOFLEX 106	05CH01-HY	1GHz ~ 26.5GHz	Dec. 02, 2012	May 24, 2013	Dec. 01, 2013	Radiation (05CH01-HY)
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170221	15GHz ~ 40GHz	Jan. 08, 2013	May 24, 2013	Jan. 07, 2014	Radiation (05CH01-HY)
Turn Table	HD	DS 420	420/655/12	0 ~ 360 degree	N/A	May 24, 2013	N/A	Radiation (05CH01-HY)
Antenna Mast	HD	MA 240	240/569/12	1 ~ 4 m	N/A	May 24, 2013	N/A	Radiation (05CH01-HY)

7 Uncertainty Evaluation

Uncertainty of Radiated Emission Evaluation (25 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.16**

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

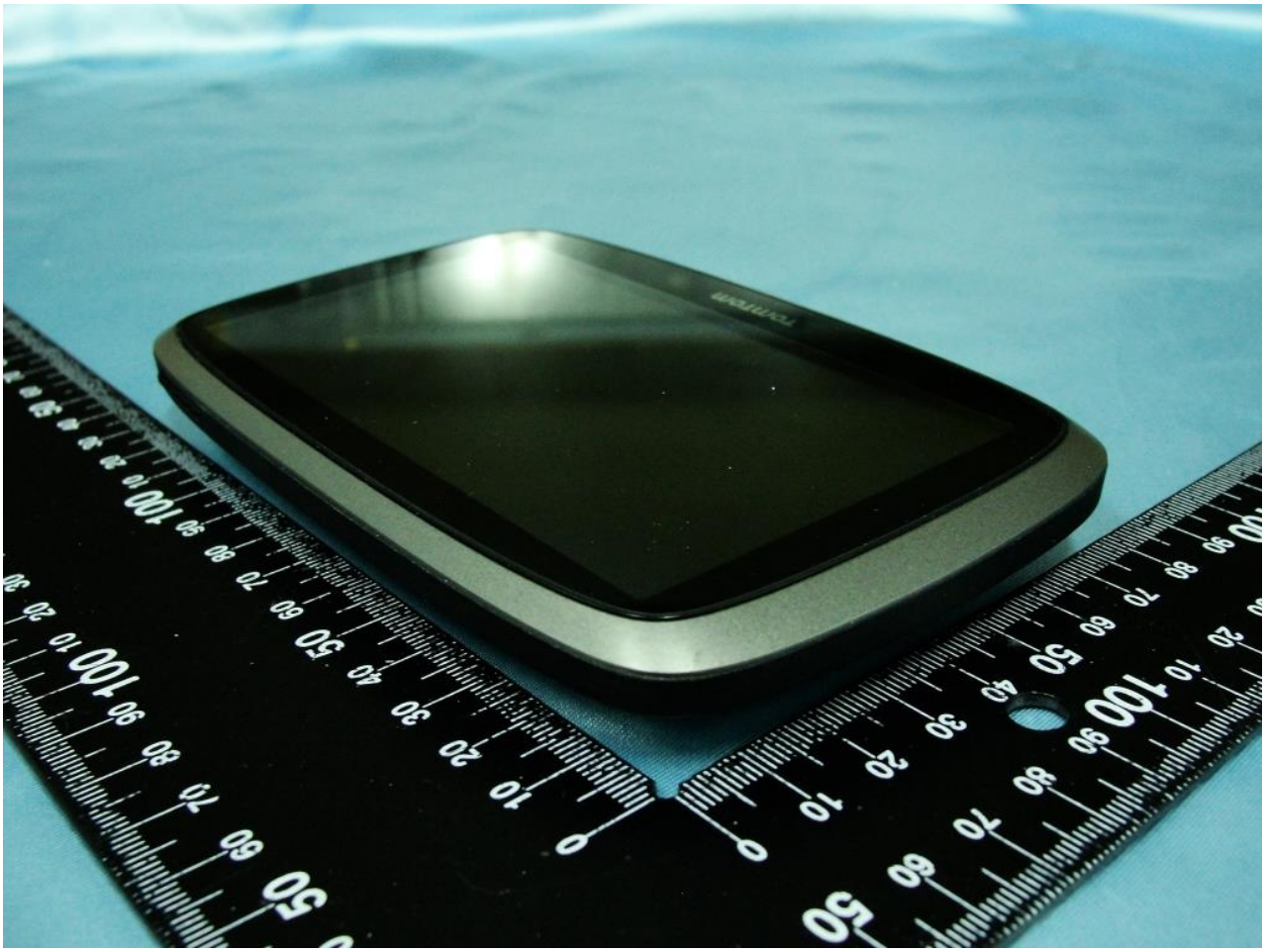
Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.72**

Appendix A. Photographs of EUT

Please refer to Sporton report number EP332116-01 as below.

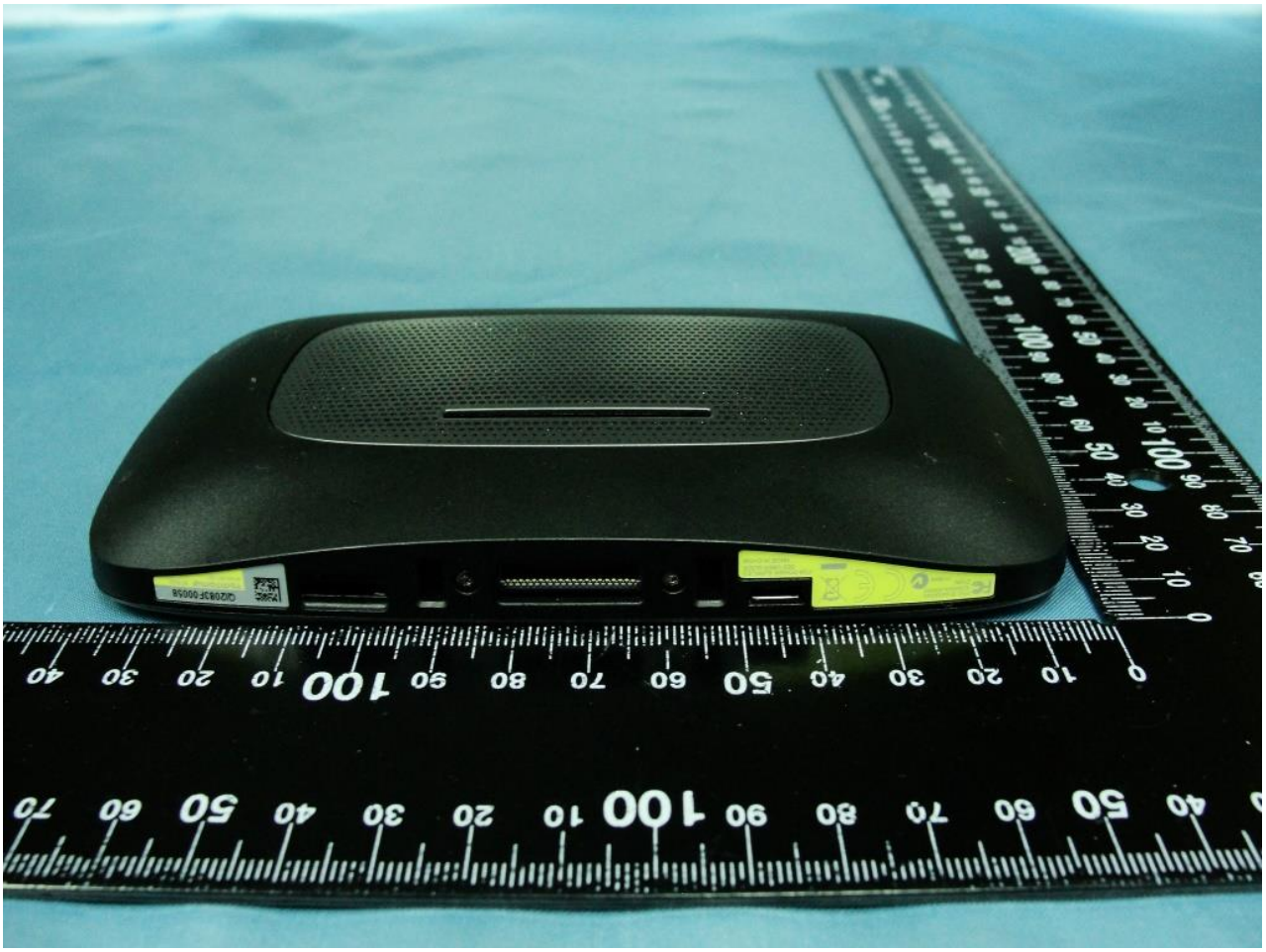
1. External Photograph of EUT

Brand Name: TomTom / Model Name: 4FA50,4FL50



Brand Name: TomTom / Model Name: 4FA50,4FL50

Brand Name: TomTom / Model Name: 4FA50,4FL50



2. Photograph of Accessory

Brand Name: TomTom / Model Name: 4FA50,4FL50

Specification of Accessory		
AC Adapter	**Brand Name**	TomTom
	Model Name	4UUC6B
Battery 1	**Power Rating**	3.7 Vdc, 920 mAh
Battery 2	**Power Rating**	3.7 Vdc, 1100 mAh
Car Charger 1	**Brand Name**	TomTom
	Model Name	4UUC23
Car Charger 2	**Brand Name**	TomTom
	Model Name	4UUC3Z
Car Charger 3	**Brand Name**	TomTom
	Model Name	4UUC3Z
Car Charger 4	**Brand Name**	TomTom
	Model Name	4UUC14
Car Charger 5	**Brand Name**	TomTom
	Model Name	4UUC9
Car Charger 6	**Brand Name**	TomTom
	Model Name	Car Charging Cable
USB Cable	**Brand Name**	TomTom
	Model Name	4UUC.001.24
Dock 1	**Brand Name**	TomTom
	Model Name	4UCB3
Dock 2	**Brand Name**	TomTom
	Model Name	4UCB3
Dock 3	**Brand Name**	TomTom
	Model Name	4UCB3
Dock 4	**Brand Name**	TomTom
	Model Name	4UUB2
WWAN Module	**Brand Name**	Telit
	Model Name	GL865-DUAL V3

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

Brand Name: TomTom / Model Name: 4FA50,4FL50

Brand Name: TomTom / Model Name: 4FA50,4FL50

Brand Name: TomTom / Model Name: 4FA50,4FL50

Battery 1

Brand Name: TomTom / Model Name: 4FA50,4FL50

Battery 2

Brand Name: TomTom / Model Name: 4FA50,4FL50

Car Charger 1

Brand Name: TomTom / Model Name: 4FA50,4FL50

Brand Name: TomTom / Model Name: 4FA50,4FL50

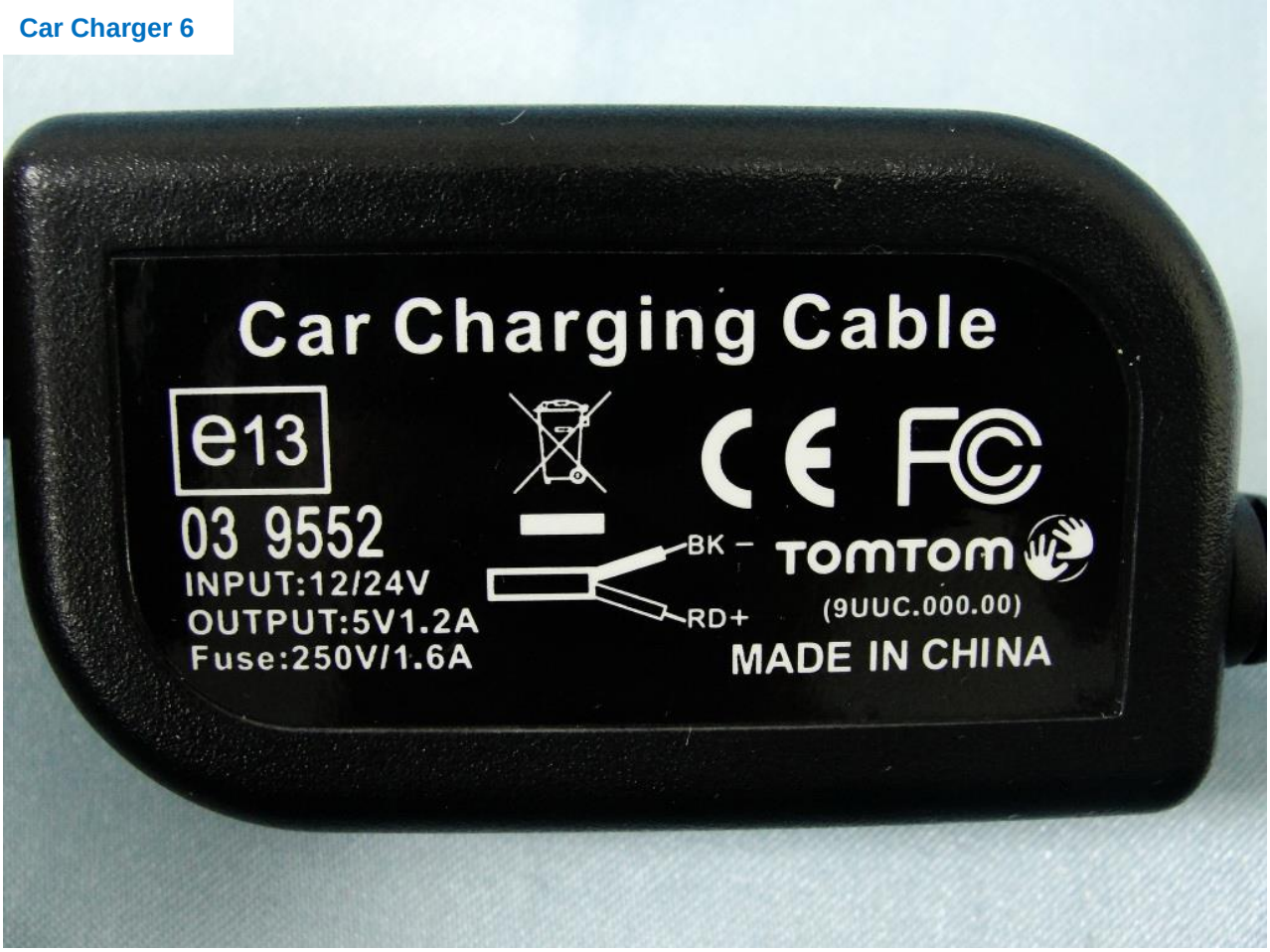
Car Charger 3

Brand Name: TomTom / Model Name: 4FA50,4FL50

Brand Name: TomTom / Model Name: 4FA50,4FL50

Brand Name: TomTom / Model Name: 4FA50,4FL50

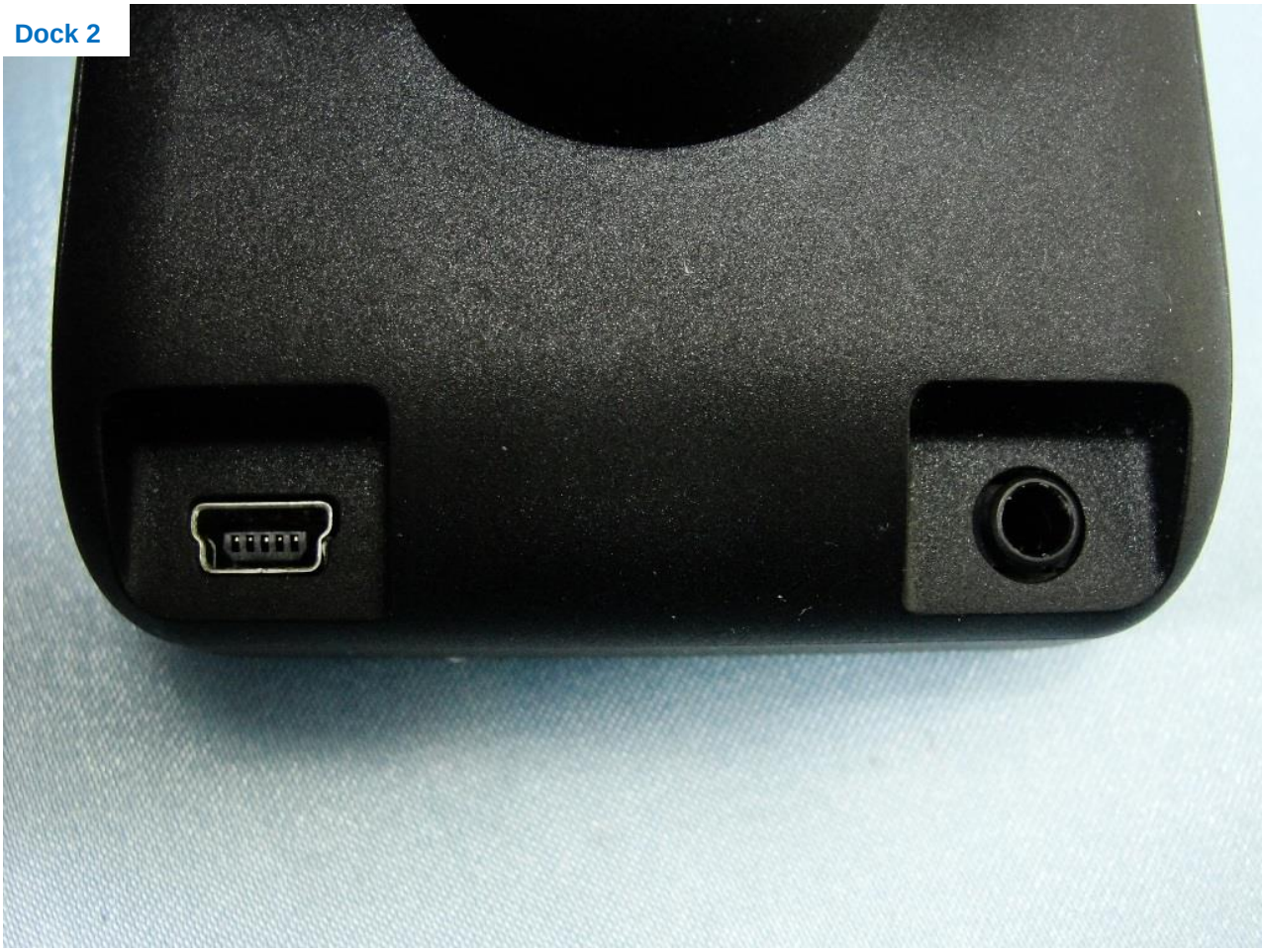
Car Charger 6



Brand Name: TomTom / Model Name: 4FA50,4FL50

Brand Name: TomTom / Model Name: 4FA50,4FL50

Dock 2

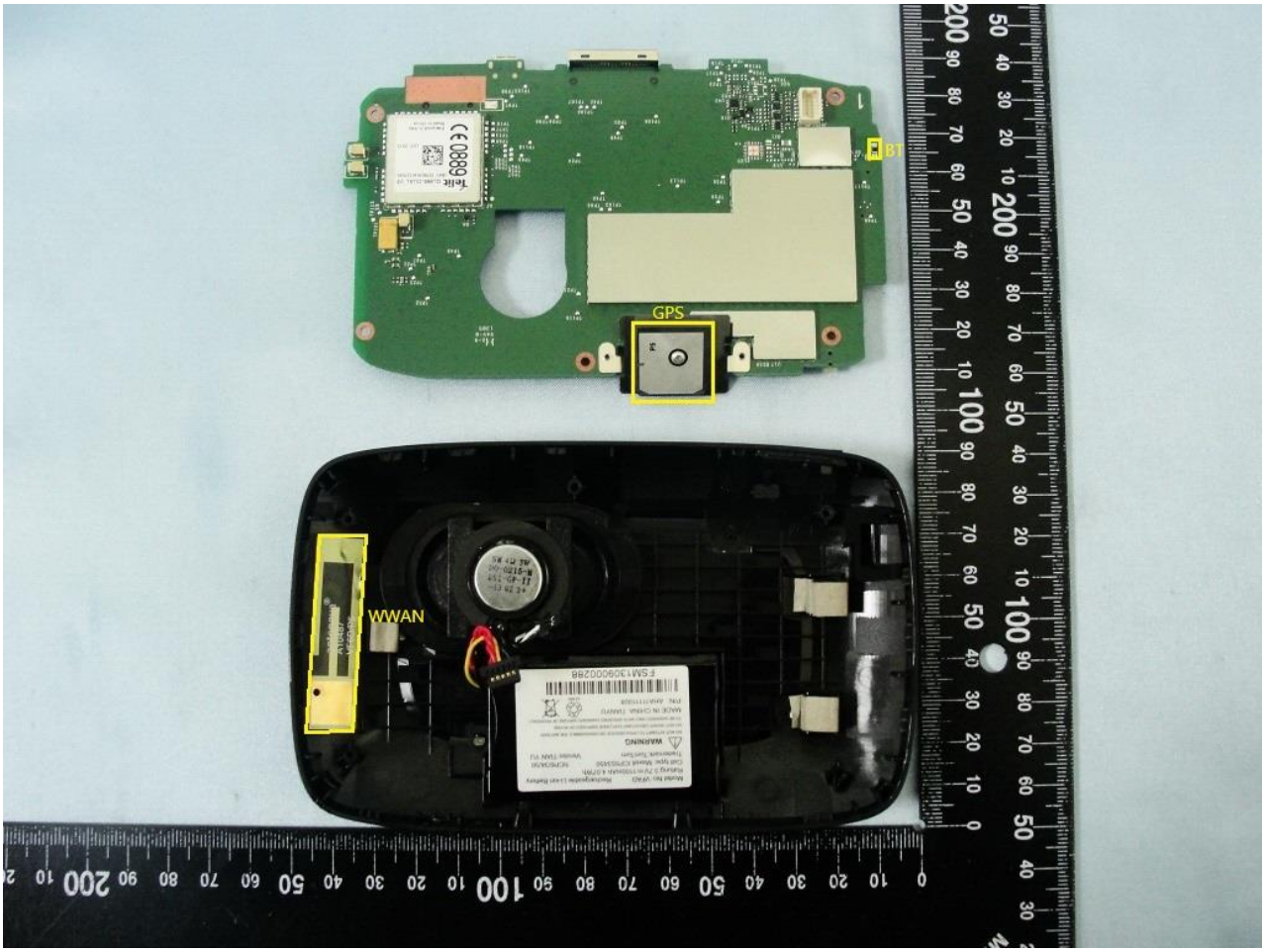


Brand Name: TomTom / Model Name: 4FA50,4FL50

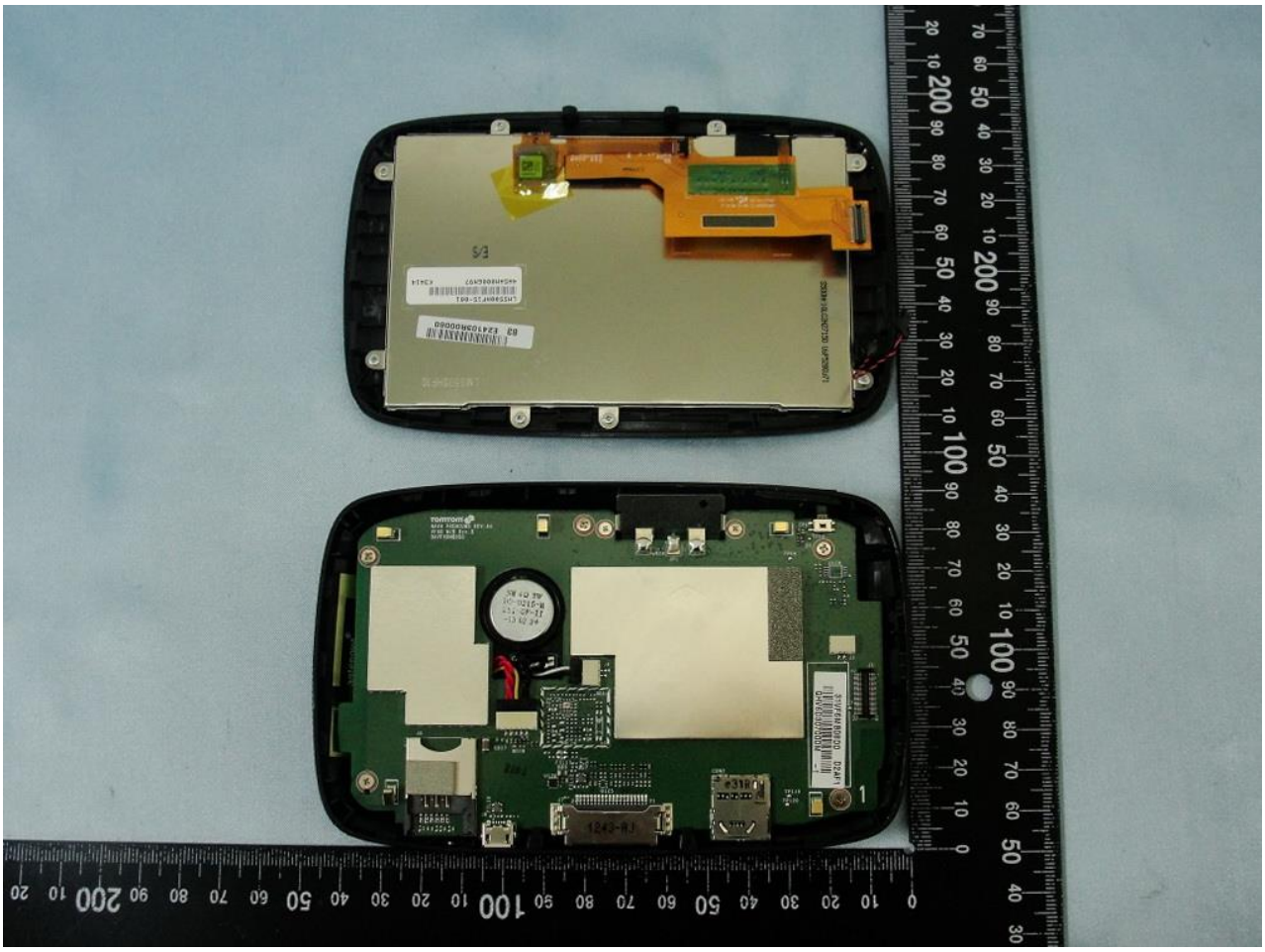
Brand Name: TomTom / Model Name: 4FA50,4FL50

3. Internal Photograph of EUT

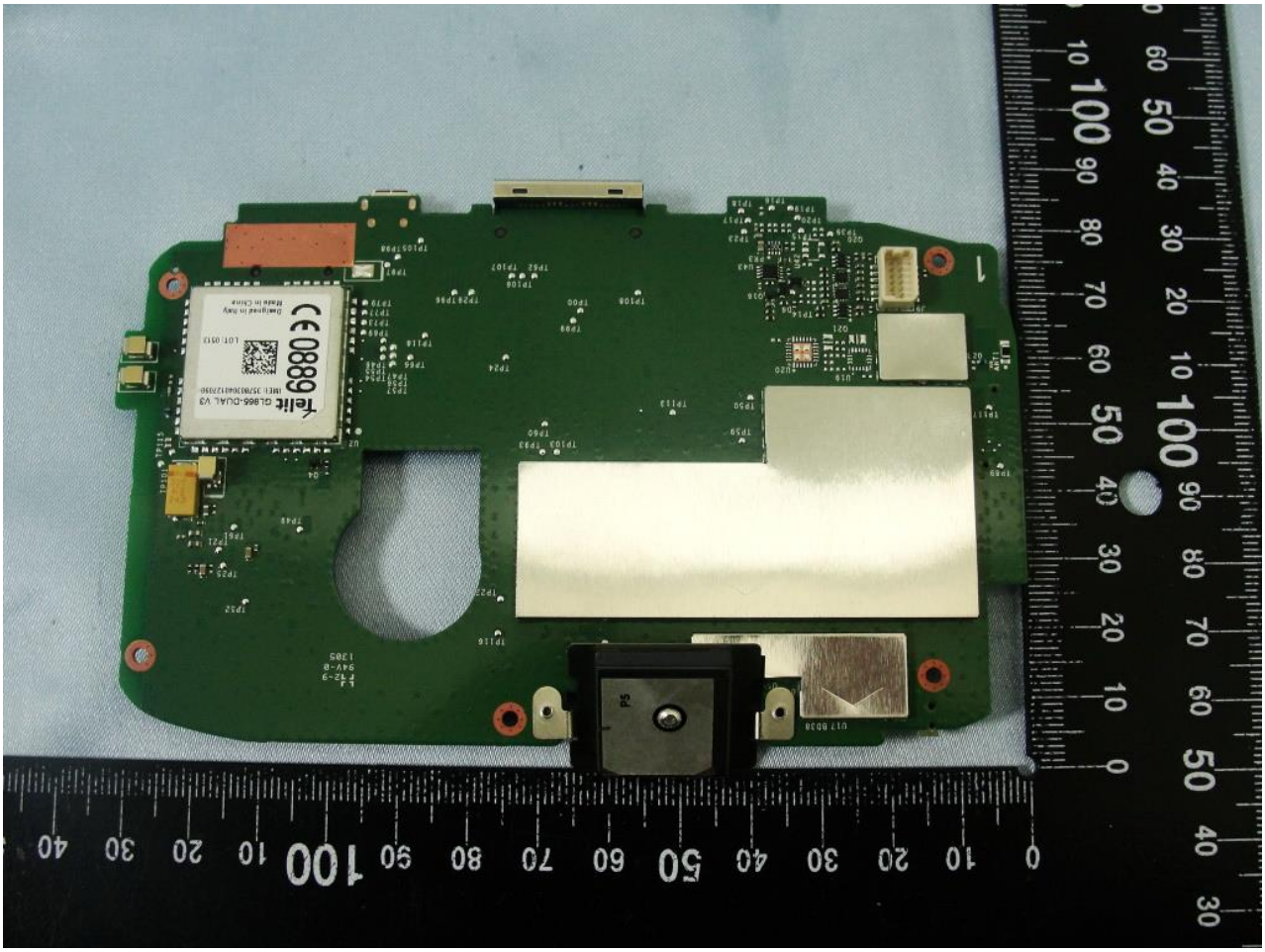
Brand Name: TomTom / Model Name: 4FA50,4FL50



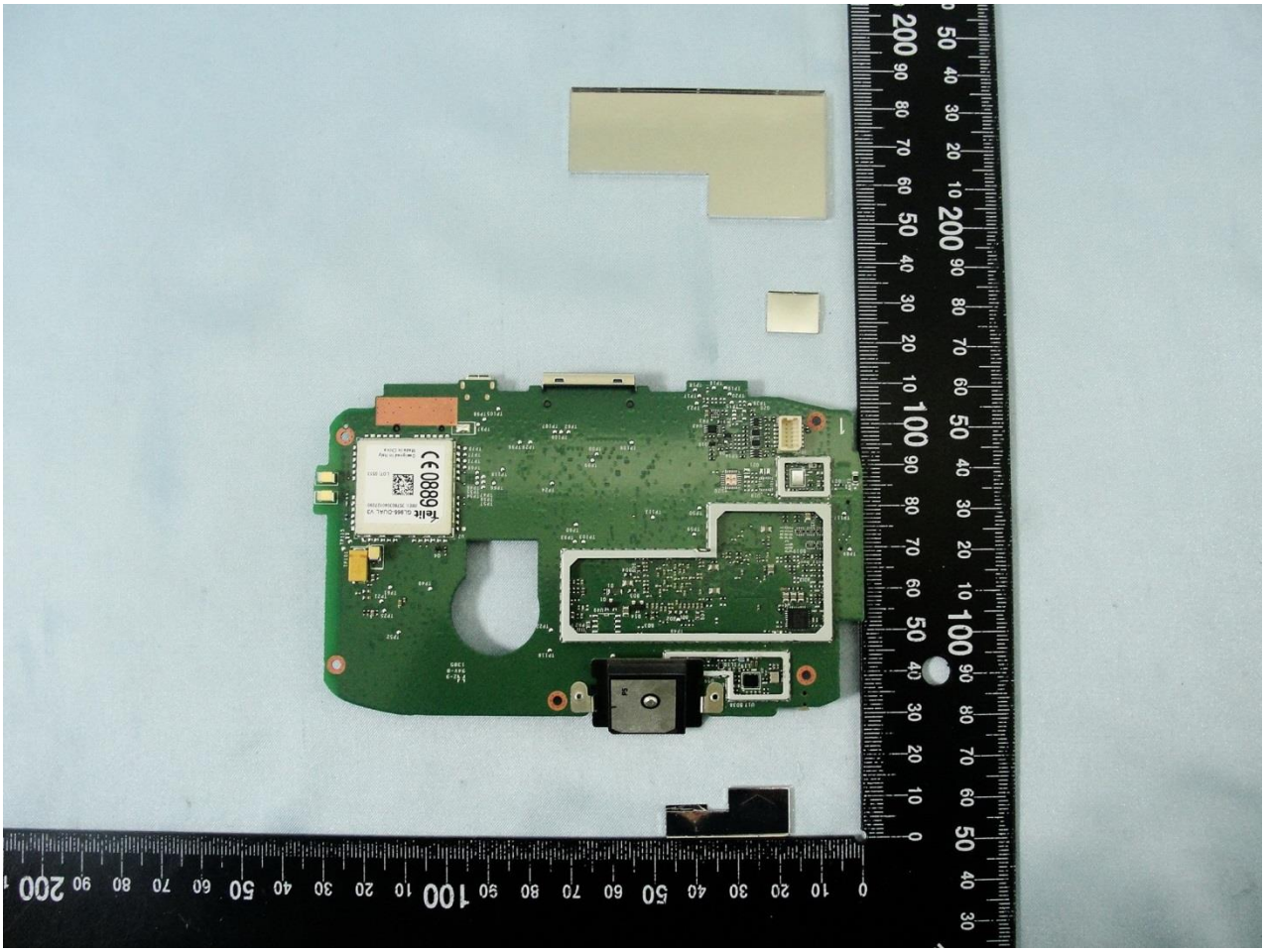
Brand Name: TomTom / Model Name: 4FA50,4FL50



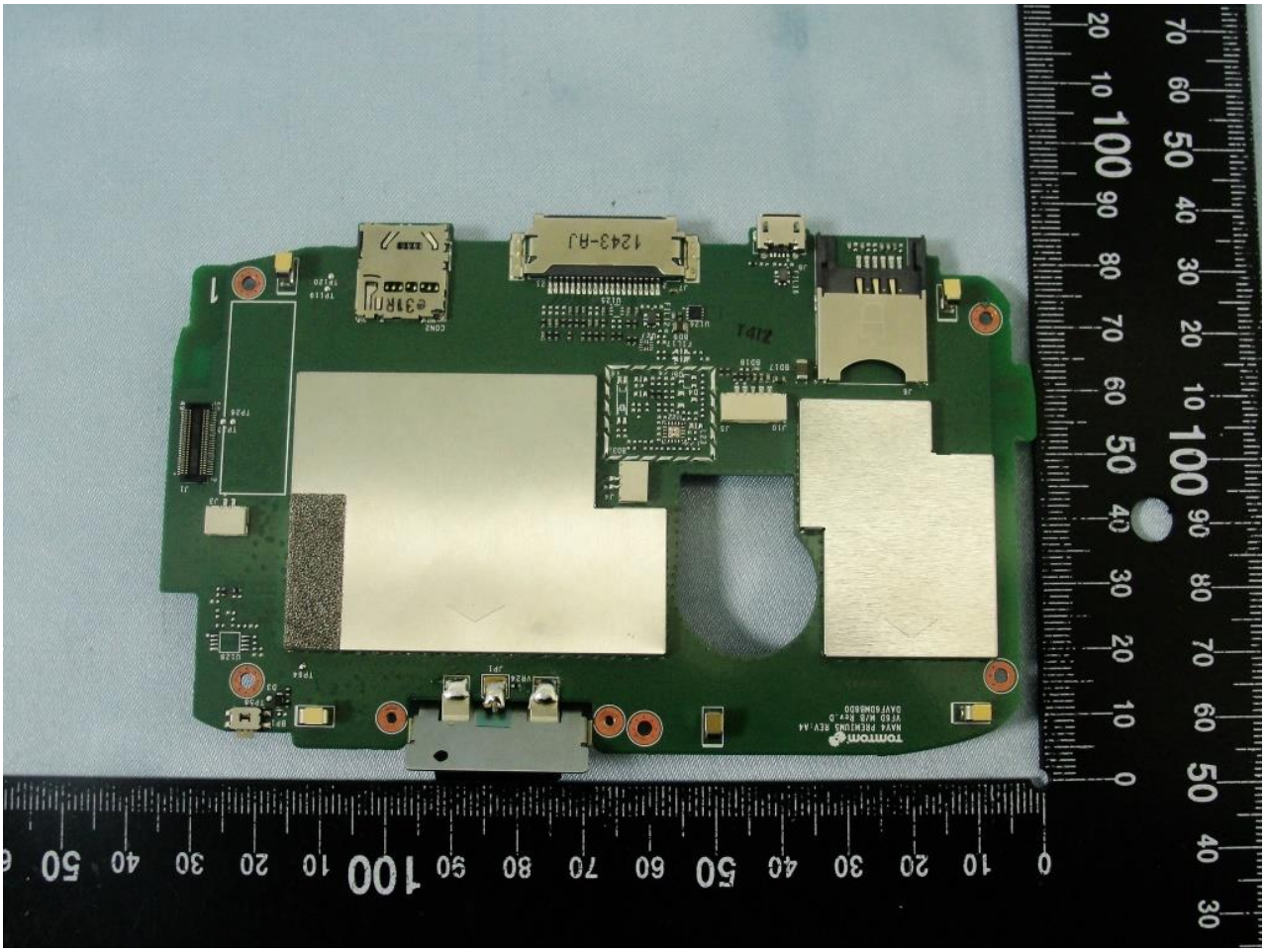
Brand Name: TomTom / Model Name: 4FA50,4FL50



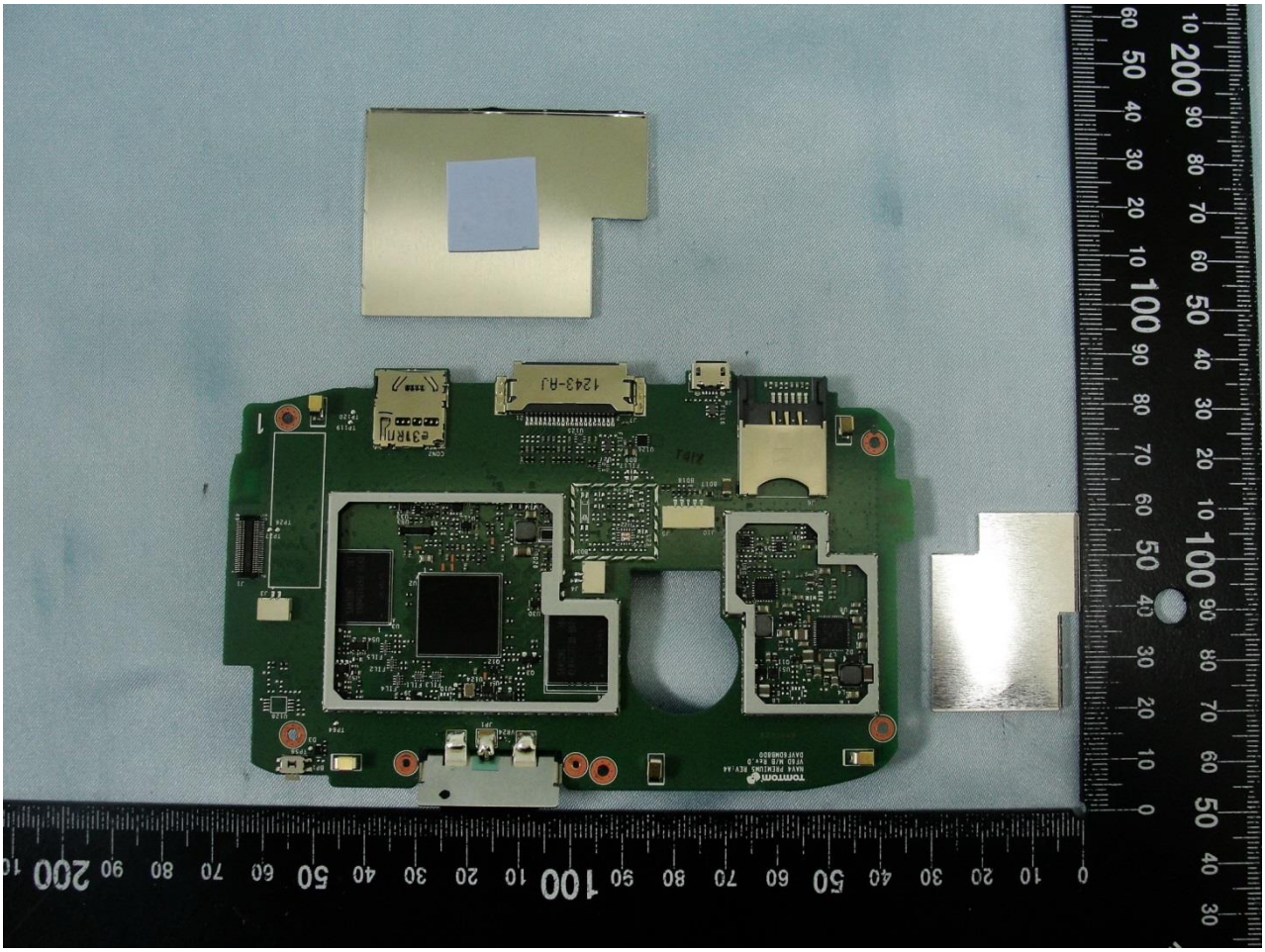
Brand Name: TomTom / Model Name: 4FA50,4FL50



Brand Name: TomTom / Model Name: 4FA50,4FL50



Brand Name: TomTom / Model Name: 4FA50,4FL50



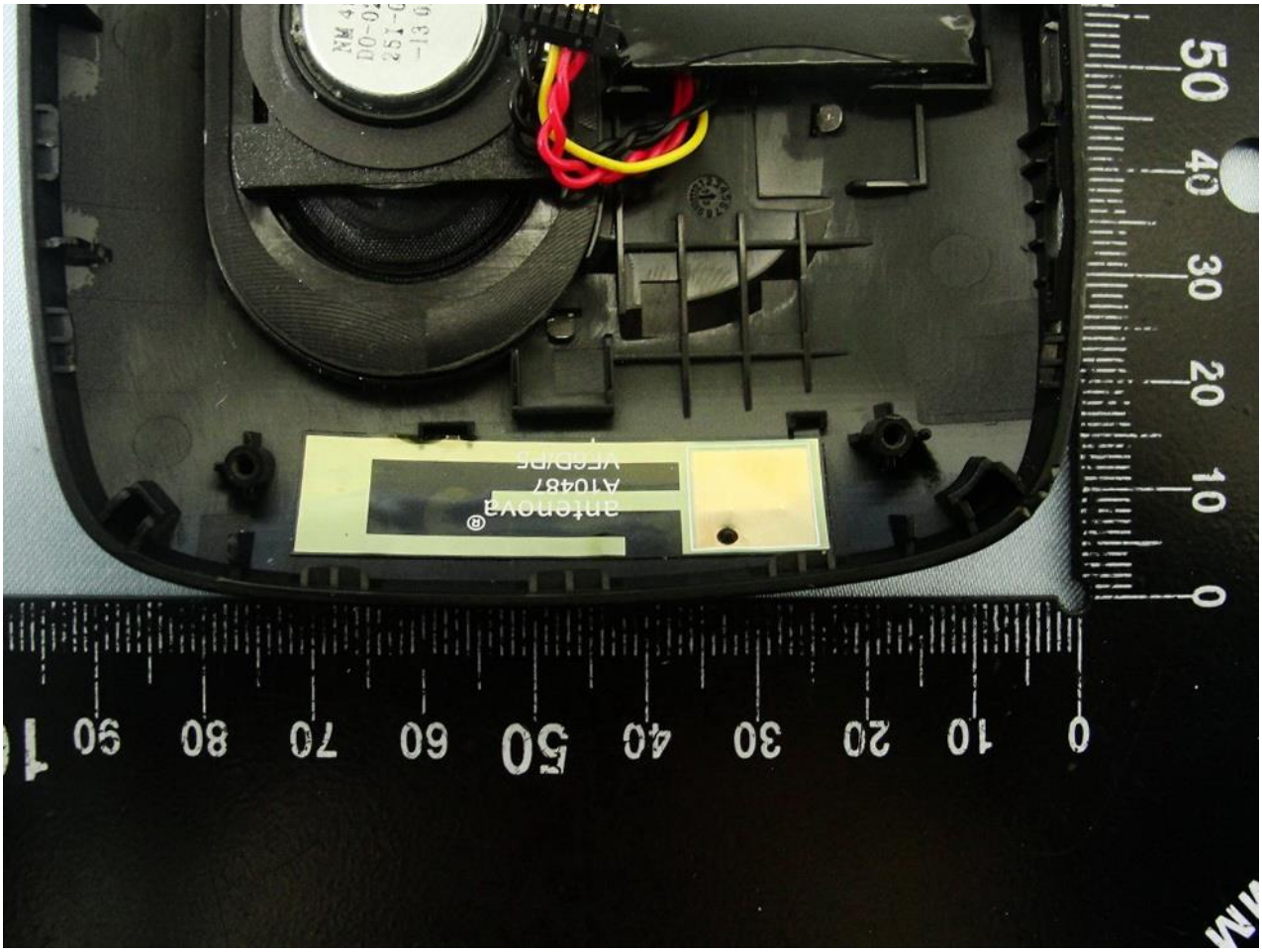
Brand Name: TomTom / Model Name: 4FA50,4FL50

Module

Brand Name: TomTom / Model Name: 4FA50,4FL50

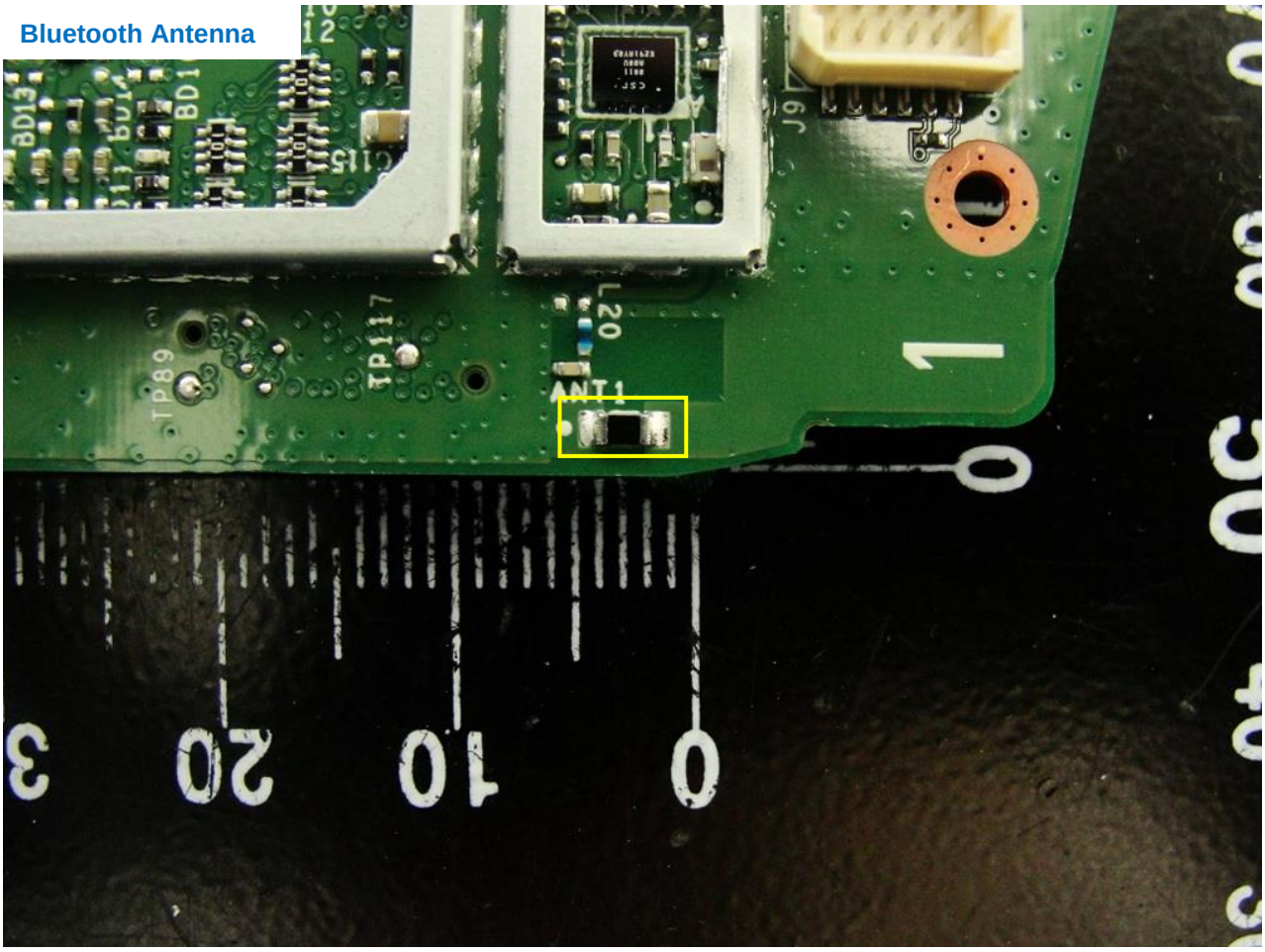
WWAN Antenna

Brand Name: TomTom / Model Name: 4FA50,4FL50



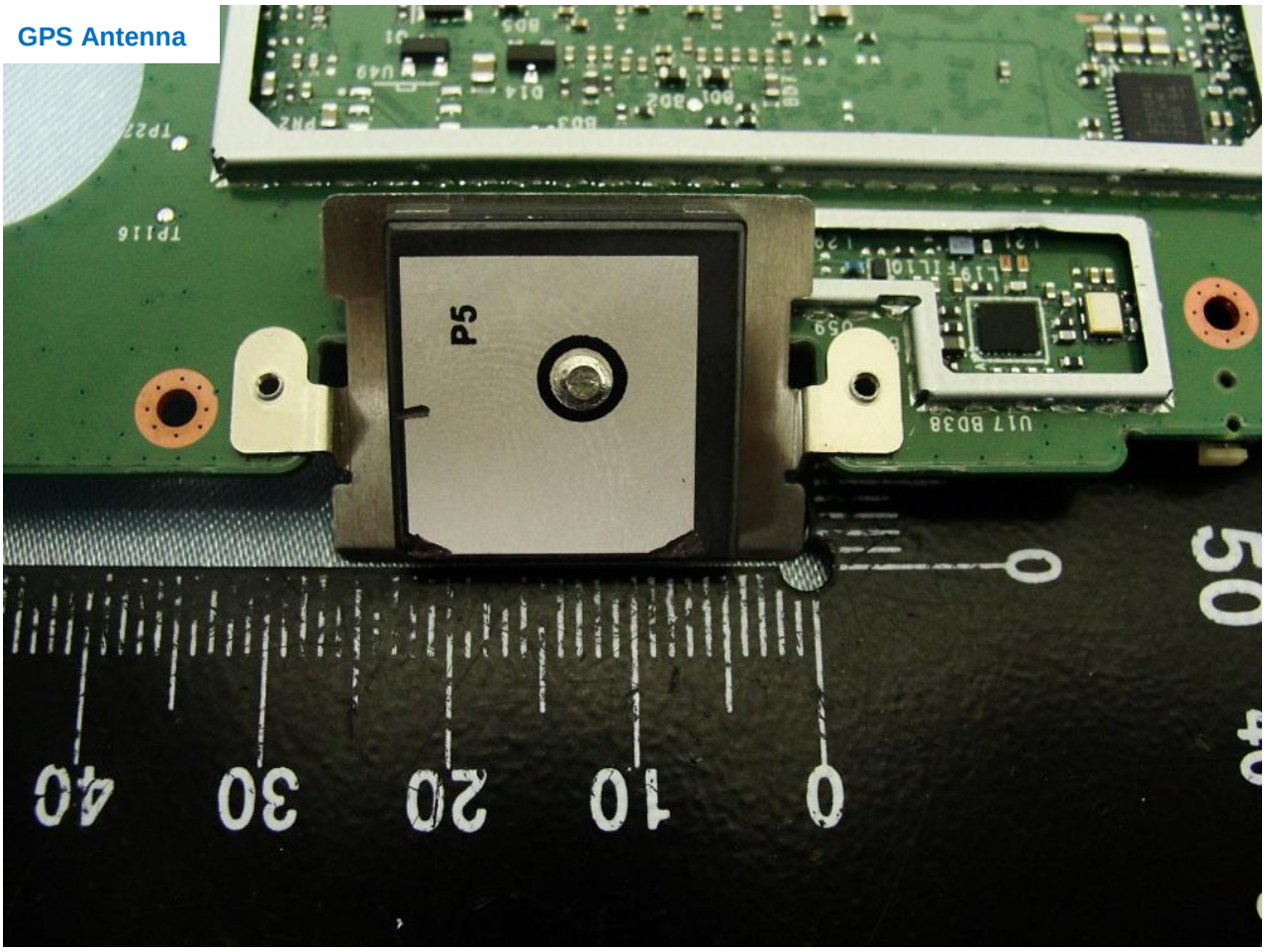
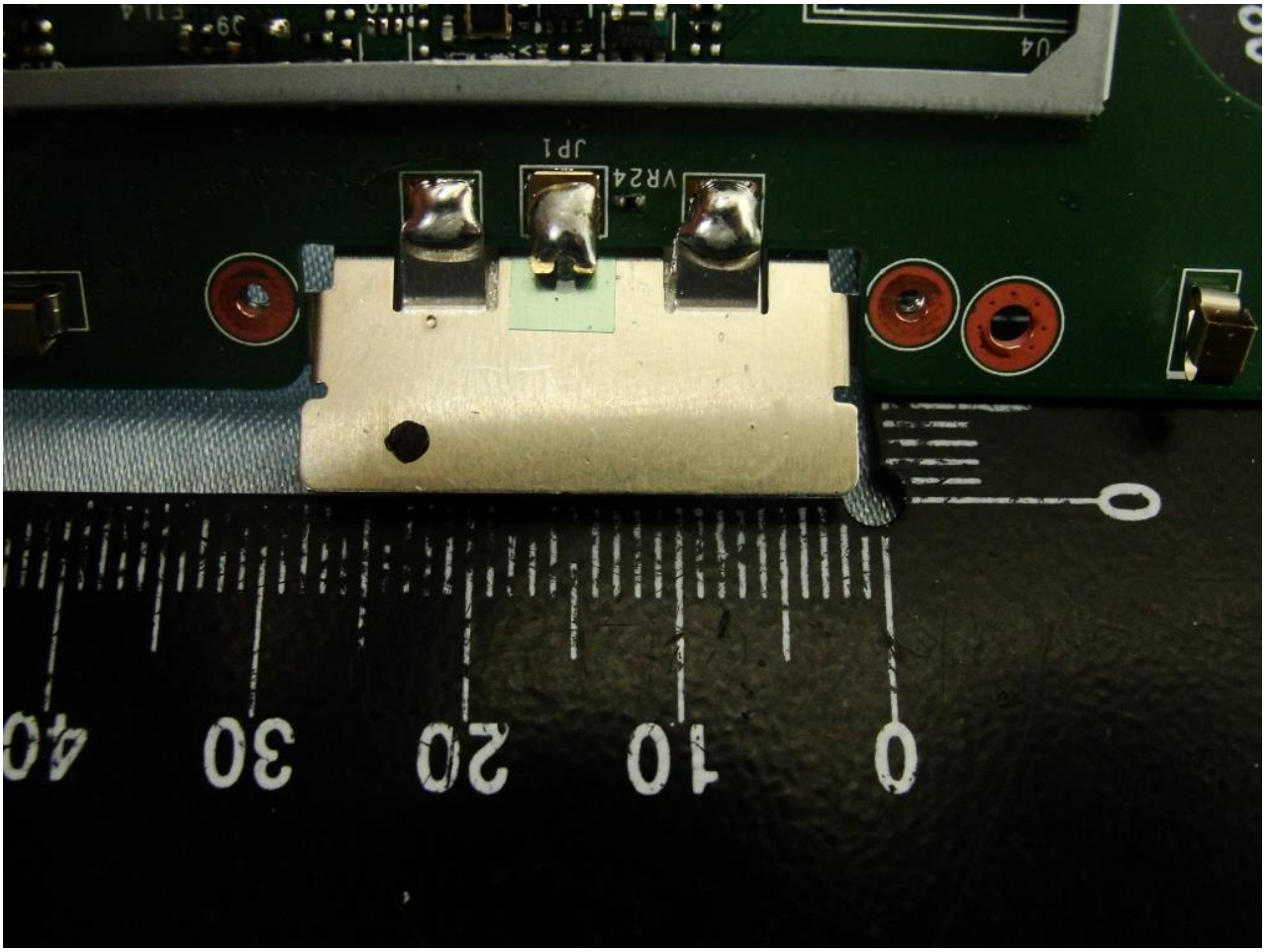
Brand Name: TomTom / Model Name: 4FA50,4FL50

Bluetooth Antenna



Brand Name: TomTom / Model Name: 4FA50,4FL50

GPS Antenna



Brand Name: TomTom / Model Name: 4FA50,4FL50