

# RF TEST REPORT



Report No.: 17070107-FCC-R2 V1

Supersede Report No.: N/A

Applicant	STAR MICRONICS CO., LTD.	
Product Name	Portable Thermal Printer	
Model No.	SM-L304	
Serial No.	SM-L300	
Test Standard	FCC Part 15.247: 2016, ANSI C63.10: 2013	
Test Date	February 21 to 27, 2017	
Issue Date	March 16, 2017	
Test Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail	
Equipment complied with the specification		<input checked="" type="checkbox"/>
Equipment did not comply with the specification		<input type="checkbox"/>
Loren Luo	David Huang	
Loren Luo Test Engineer	David Huang Checked By	
This test report may be reproduced in full only		
Test result presented in this test report is applicable to the tested sample only		

Issued by:

**SIEMIC (SHENZHEN-CHINA) LABORATORIES**

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## Laboratories Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.



In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

### Accreditations for Conformity Assessment

Country/Region	Scope
USA	EMC, RF/Wireless, SAR, Telecom
Canada	EMC, RF/Wireless, SAR, Telecom
Taiwan	EMC, RF, Telecom, SAR, Safety
Hong Kong	RF/Wireless, SAR, Telecom
Australia	EMC, RF, Telecom, SAR, Safety
Korea	EMI, EMS, RF, SAR, Telecom, Safety
Japan	EMI, RF/Wireless, SAR, Telecom
Singapore	EMC, RF, SAR, Telecom
Europe	EMC, RF, SAR, Telecom, Safety

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## 1. Report Revision History

Report No.	Report Version	Description	Issue Date
17070107-FCC-R2 V1	NONE	Original	March 16, 2017

## 2. Customer information

Applicant Name	STAR MICRONICS CO., LTD.
Applicant Add	20-10 Nakayoshida, Suruga-ku Shizuoka-shi Japan
Manufacturer	Xiamen PRT Technology Co.,Ltd
Manufacturer Add	4,5/f,#8,gaoqi Nan Shi'er Road(Aide Airport Industrial Park),Xiamen,Fujian.

## 3. Test site information

Lab performing tests	SIEMIC (Shenzhen-China) LABORATORIES
Lab Address	Zone A, Floor 1, Building 2 Wan Ye Long Technology Park South Side of Zhoushi Road, Bao'an District, Shenzhen, Guangdong China 518108
FCC Test Site No.	718246
IC Test Site No.	4842E-1
Test Software	Radiated Emission Program-To Shenzhen v2.0

#### 4. Equipment under Test (EUT) Information

Description of EUT: Portable Thermal Printer

Main Model: SM-L304

Serial Model: SM-L300

Date EUT received: February 20, 2017

Test Date(s): February 21 to 27, 2017

Equipment Category : DTS

Antenna Gain: BT/BLE: 0dBi

Antenna Type: PCB antenna

Type of Modulation: Bluetooth: GFSK,  $\pi/4$ DQPSK, 8DPSK  
 BLE: GFSK

RF Operating Frequency (ies): BT/BLE: 2402-2480 MHz(TX/RX)

Max. Output Power: -0.063dBm

Number of Channels: Bluetooth: 79CH  
 BLE: 40CH

Port: USB Port, Power Port

Trade Name :



Battery:

Model: X000-002

Spec: 2000mAh, 7.4V, 14.8Wh

USB: DC 5V, 1.0A

FCC ID: R49SM-L300

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**Note:** The difference between the old case 16070599 and new case 17070107: battery cell change, and the two springs on top enclosure edge have change metal from plastic, cover a cotton on MCU, change the position of bottom wire, change the switch from metal material to plastic material, the other construction is the same.

So, we have retested the Radiated Emissions data in this report.

## 5. Test Summary

The product was tested in accordance with the following specifications.

All testing has been performed according to below product classification:

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.205, §15.209, §15.247(d)	Radiated Spurious Emissions & Restricted Band	Compliance

### Measurement Uncertainty

Emissions		
Test Item	Description	Uncertainty
Radiated Spurious Emissions & Restricted Band	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB
-	-	-

## **6. Measurements, Examination And Derived Results**

### **6.1 Antenna Requirement**

#### **Applicable Standard**

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### **Antenna Connector Construction**

The EUT has 1 antenna:

A permanently attached PCB antenna for Bluetooth/BLE, the gain is 0dBi for Bluetooth/BLE.

**The antenna meets up with the ANTENNA REQUIREMENT.**

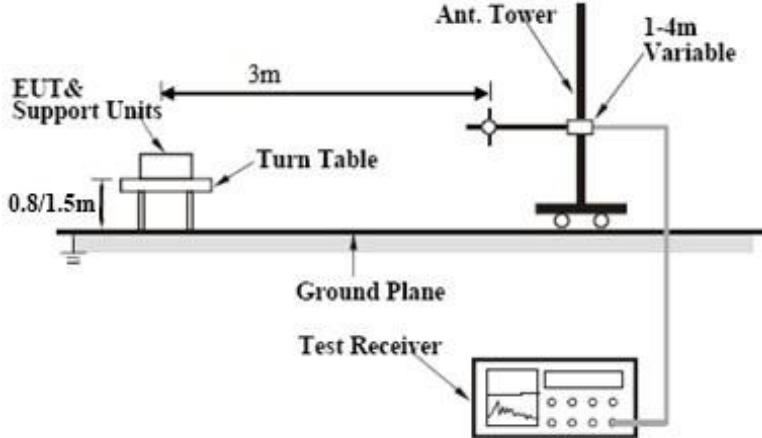
**Result:** Compliance.

## 6.2 Radiated Spurious Emissions & Restricted Band

Temperature	22°C
Relative Humidity	53%
Atmospheric Pressure	1029mbar
Test date :	November 29, 2016
Tested By :	Loren Luo

### Requirement(s):

Spec	Item	Requirement	Applicable								
47CFR§15. 247(d), RSS210 (A8.5)	a)	Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges	<input checked="" type="checkbox"/>								
		<table border="1"> <thead> <tr> <th>Frequency range (MHz)</th> <th>Field Strength (<math>\mu</math>V/m)</th> </tr> </thead> <tbody> <tr> <td>30 – 88</td> <td>100</td> </tr> <tr> <td>88 – 216</td> <td>150</td> </tr> <tr> <td>216 – 960</td> <td>200</td> </tr> <tr> <td>Above 960</td> <td>500</td> </tr> </tbody> </table>	Frequency range (MHz)	Field Strength ( $\mu$ V/m)	30 – 88	100	88 – 216	150	216 – 960	200	Above 960
Frequency range (MHz)	Field Strength ( $\mu$ V/m)										
30 – 88	100										
88 – 216	150										
216 – 960	200										
Above 960	500										
b)	For non-restricted band, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB or 30dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, determined by the measurement method on output power to be used. Attenuation below the general limits specified in § 15.209(a) is not required  <input checked="" type="checkbox"/> 20 dB down <input type="checkbox"/> 30 dB down	<input checked="" type="checkbox"/>									
	c)	or restricted band, emission must also comply with the radiated emission limits specified in 15.209	<input checked="" type="checkbox"/>								

Test Setup	 <p>The diagram illustrates the test setup. An EUT &amp; Support Units assembly is mounted on a Turn Table, which is positioned on a Ground Plane. The Turn Table is 0.8/1.5m high. A vertical Ant. Tower is connected to the Turn Table via a horizontal crossbar. The Ant. Tower has a height of 1-4m Variable. A Test Receiver is connected to the Ant. Tower. A 3m horizontal line connects the EUT &amp; Support Units to the Ant. Tower.</p>
Procedure	<ol style="list-style-type: none"> <li>1. The EUT was switched on and allowed to warm up to its normal operating condition.</li> <li>2. The test was carried out at the selected frequency points obtained from the EUT characterization. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:             <ol style="list-style-type: none"> <li>a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen.</li> <li>b. The EUT was then rotated to the direction that gave the maximum emission.</li> <li>c. Finally, the antenna height was adjusted to the height that gave the maximum emission.</li> </ol> </li> <li>3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz.</li> <li>4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak measurement at frequency above 1GHz.            The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz with Peak detection for Average Measurement as below at frequency above 1GHz.</li> <li>5. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.</li> </ol>
Remark	<p>Different RF configuration has been evaluated but not much difference was found. The data presented here is the worst case data with EUT under 802.11n – HT20-2437MHz mode.</p>
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

**Test Data**     Yes       N/A

**Test Plot**     Yes (See below)       N/A

**Above 1GHz**

<b>Test Mode:</b>	<b>Transmitting Mode</b>
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**Low Channel (2402 MHz)**

Frequency (MHz)	S.A. Reading (dB $\mu$ V)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
4804	38.42	AV	V	33.83	6.86	31.72	47.39	54	-6.61
4804	38.12	AV	H	33.83	6.86	31.72	47.09	54	-6.91
4804	48.16	PK	V	33.83	6.86	31.72	57.13	74	-16.87
4804	47.58	PK	H	33.83	6.86	31.72	56.55	74	-17.45
17785	24.13	AV	V	45.03	11.21	32.38	47.99	54	-6.01
17785	23.97	AV	H	45.03	11.21	32.38	47.83	54	-6.17
17785	40.52	PK	V	45.03	11.21	32.38	64.38	74	-9.62
17785	40.31	PK	H	45.03	11.21	32.38	64.17	74	-9.83

**Middle Channel (2440 MHz)**

Frequency (MHz)	S.A. Reading (dB $\mu$ V)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
4880	38.75	AV	V	33.86	6.82	31.82	47.61	54	-6.39
4880	38.46	AV	H	33.86	6.82	31.82	47.32	54	-6.68
4880	48.25	PK	V	33.86	6.82	31.82	57.11	74	-16.89
4880	47.87	PK	H	33.86	6.82	31.82	56.73	74	-17.27
17810	23.86	AV	V	45.15	11.18	32.41	47.78	54	-6.22
17810	23.57	AV	H	45.15	11.18	32.41	47.49	54	-6.51
17810	41.13	PK	V	45.15	11.18	32.41	65.05	74	-8.95
17810	40.82	PK	H	45.15	11.18	32.41	64.74	74	-9.26

## High Channel (2480 MHz)

Frequency (MHz)	S.A. Reading (dB $\mu$ V)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
4960	38.46	AV	V	33.9	6.76	31.92	47.2	54	-6.8
4960	38.28	AV	H	33.9	6.76	31.92	47.02	54	-6.98
4960	48.21	PK	V	33.9	6.76	31.92	56.95	74	-17.05
4960	48.03	PK	H	33.9	6.76	31.92	56.77	74	-17.23
17793	24.76	AV	V	45.22	11.35	32.38	48.95	54	-5.05
17793	24.51	AV	H	45.22	11.35	32.38	48.7	54	-5.3
17793	40.35	PK	V	45.22	11.35	32.38	64.54	74	-9.46
17793	40.13	PK	H	45.22	11.35	32.38	64.32	74	-9.68

**Note:**

- 1, The testing has been conformed to  $10*2480\text{MHz}=24,800\text{MHz}$
- 2, All other emissions more than 30 dB below the limit
- 3, X-Axis, Y-Axis and Z-Axis were investigated. The results above show only the worst case.

## Annex A. TEST INSTRUMENT

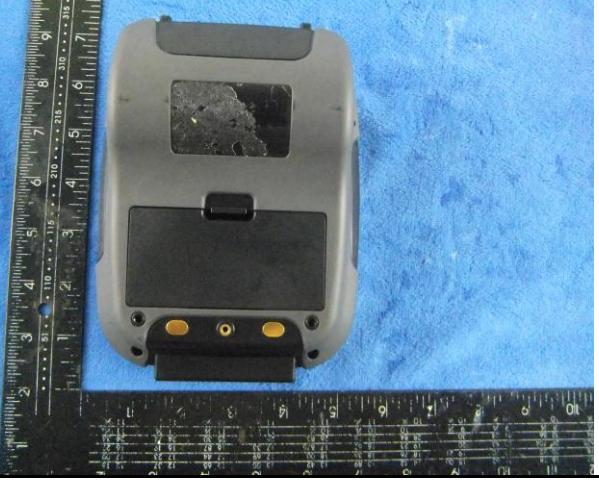
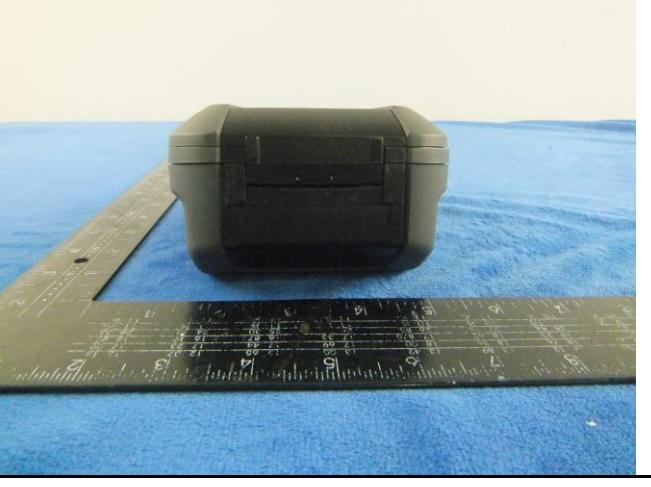
Instrument	Model	Serial #	Cal Date	Cal Due	In use
<b>Radiated Emissions</b>					
EMI test receiver	ESL6	100262	09/16/2016	09/15/2017	<input checked="" type="checkbox"/>
Positioning Controller	UC3000	MF780208282	11/18/2016	11/17/2017	<input checked="" type="checkbox"/>
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	08/31/2016	08/30/2017	<input checked="" type="checkbox"/>
Microwave Preamplifier (1 ~ 26.5GHz)	8449B	3008A02402	03/24/2016	03/23/2017	<input checked="" type="checkbox"/>
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/20/2016	09/19/2017	<input checked="" type="checkbox"/>
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/23/2016	09/22/2017	<input checked="" type="checkbox"/>
Universal Radio Communication Tester	CMU200	121393	09/24/2016	09/23/2017	<input checked="" type="checkbox"/>

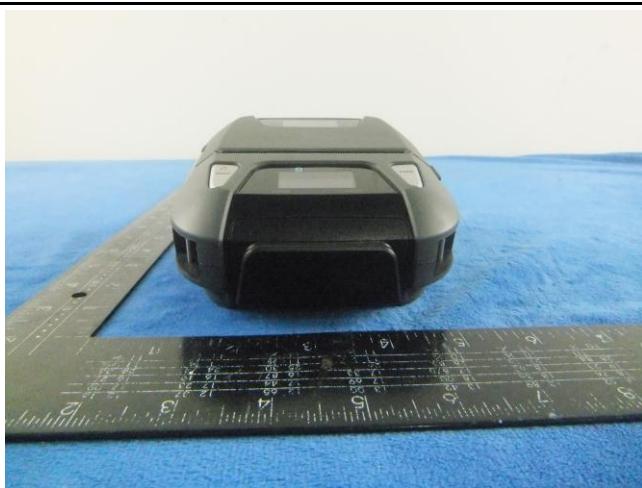
## Annex B. EUT And Test Setup Photographs

### Annex B.i. Photograph: EUT External Photo

Note: SM-L304 has magnetic reader head ; There's no magnetic reader head in SM-L300.

The internal circuit structure is the same.

	
Whole Package View (Left is Main Model No., Right is serial Model No.)	EUT - Front View(Main Model No.)
	
EUT - Rear View(Main Model No.)	EUT – Top View(Main Model No.)



EUT - Bottom View(**Main Model No.**)

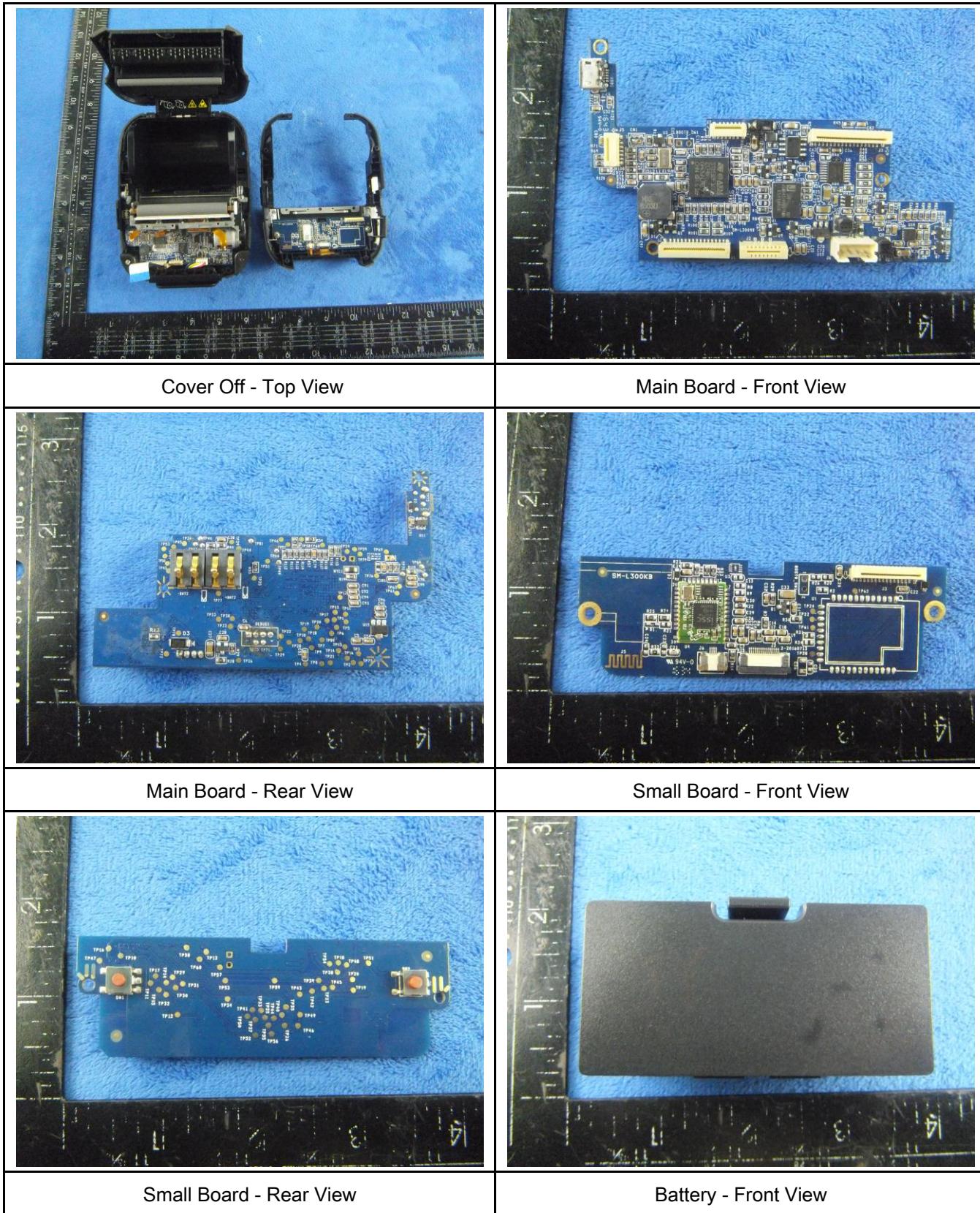
EUT - Left View(**Main Model No.**)



EUT - Right View(**Main Model No.**)

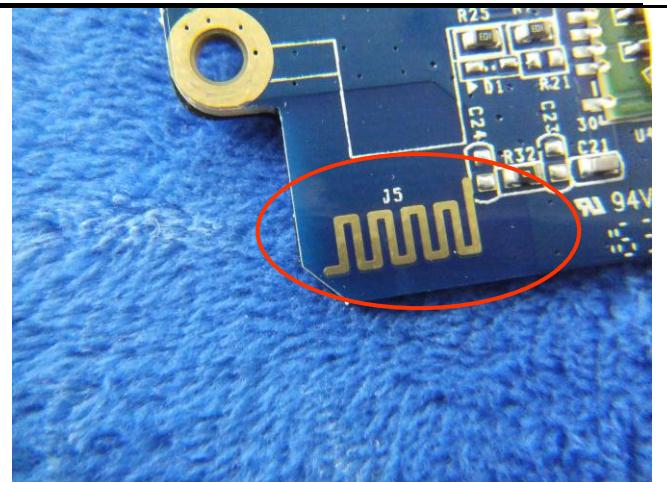


**Annex B.ii. Photograph: EUT Internal Photo**



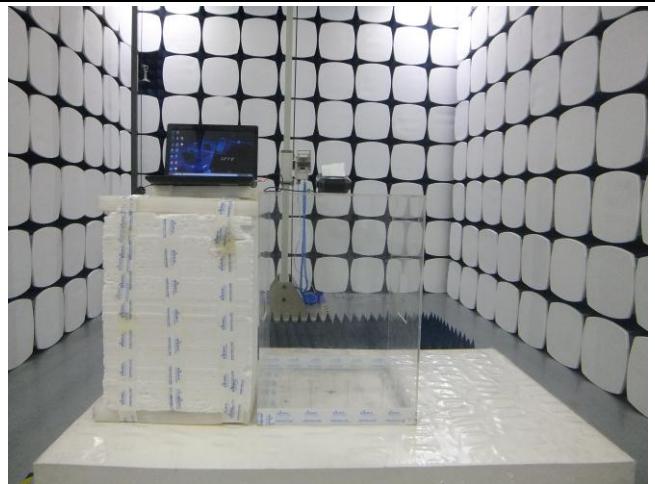


## Battery - Rear View



## BT/BLE – Antenna View

**Annex B.iii. Photograph: Test Setup Photo**



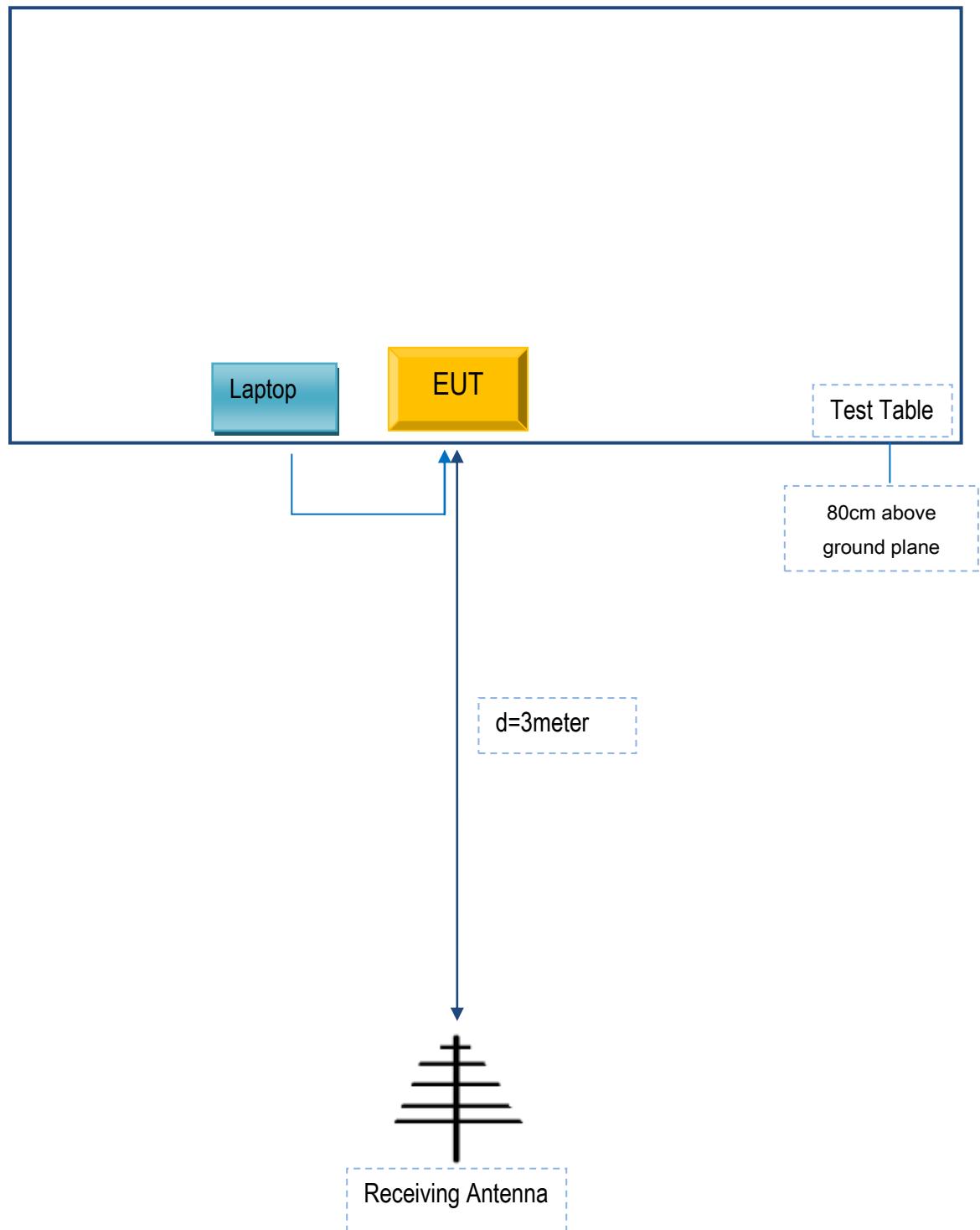
Radiated Spurious Emissions Test Setup Below 1GHz

Radiated Spurious Emissions Test Above 1GHz

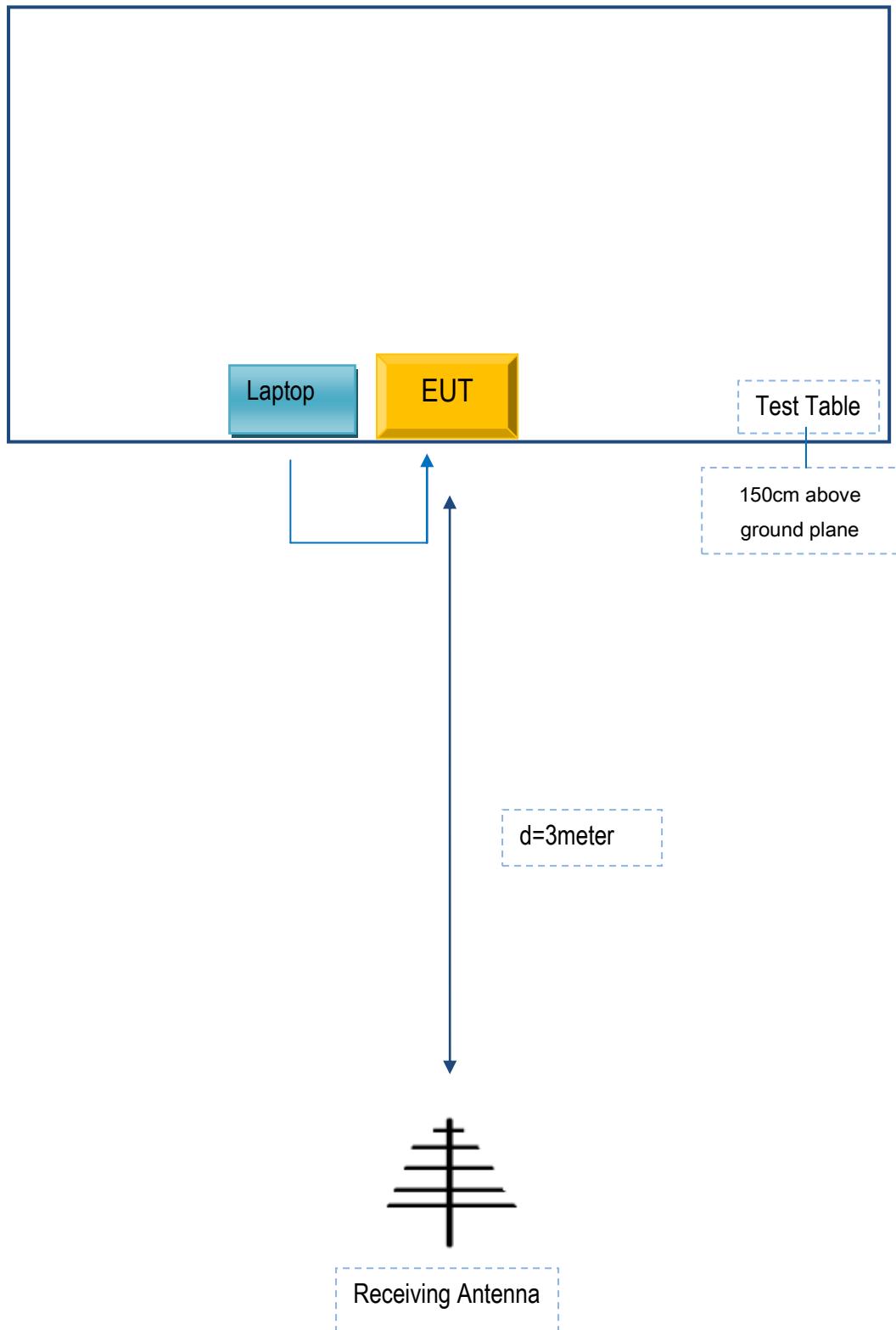
## Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

### Annex C.ii. TEST SET UP BLOCK

Block Configuration Diagram for Radiated Emission ( Below 1GHz ) .



Block Configuration Diagram for Radiated Emission ( Above 1GHz ) .



## Annex C. ii. SUPPORTING EQUIPMENT DESCRIPTION

The following is a description of supporting equipment and details of cables used with the EUT.

### Supporting Equipment:

Manufacturer	Equipment Description	Model	Serial No
Lenovo	Lenovo Laptop	E40	N3-F5022

### Supporting Cable:

Cable type	Shield Type	Ferrite Core	Length	Serial No
USB Cable	Un-shielding	No	50cm	TZ0215308

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## Annex D. User Manual / Block Diagram / Schematics / Partlist

Please see the attachment

## Annex E. DECLARATION OF SIMILARITY

STAR MICRONICS CO., LTD.

To: SIEMIC, 775 Montague Expressway, Milpitas, CA 95035, USA

## Declaration Letter

Dear Sir,

For our business issue and marketing requirement, we would like to list 2 model numbers on the **CE/IC/FCC/ TELEC** certificates and reports, as following:

Model No.: **SM-L304**

We declare that the difference of these is listed as below:

Main Model No	Serial Model No	Difference
SM-L304	SM-L300	SM-L304 has magnetic reader head ; There's no magnetic reader head in SM-L300. The internal circuit structure is the same.



Thank you!

Signature: *Tsuyoshi Tanamori*

Printed name/title: Tsuyoshi Tanamori

Tel: +81-54-347-2163

Fax: 81-54-347-0409

Address: 20-10 NAKAYOSHIDA, SURUGA-ku, SHIZUOKA-shi, SHIZUOKA 422-8654,  
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