TEST REPORT

Applicant	:	STONEX SRL
Address of Applicant	:	Via Zucchi 1,Monza(MB) 20900,italy
Product Name	:	Handheld data collection terminal
Model No.	:	SH5A
Sample No.	:	E20080008-01#02 E20080008-01#01
FCC ID	:	Y44-SH5A
ISED Number	:	9932A-SH5A
Standards	:	FCC CFR47 Part 15, Subpart C RSS-Gen (Issue 5, March 2019) RSS-247 (Issue 2, February 2017)
Date of Receipt	:	2020-08-05
Date of Test	:	2020-08-22 ~ 2020-08-25
Date of Issue	:	2020-09-07

Remark:

This report details the results of the testing carried out on one sample, the results contained in this report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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TEST REPORT

Revision Record			
Version	**Date**	**Revisions**	**Revised By**
1.0	2019-10-31	Original	--

Contents

1 General Information

1.1 Testing Laboratory

Company Name	ICAS Testing Technology Service (Shanghai) Co., Ltd.
Address	No.1298 Pingan Rd, Minhang District, Shanghai, China
Telephone	0086 21-51682999
Fax	0086 21-54711112
Homepage	www.icasiso.com

1.2 Details of Application

Company Name	STONEX SRL
Address	Via Zucchi 1,Monza(MB) 20900,italy
Contact Person	Ivana Bucci
Telephone	+390278619201
Email	Ivana.Bucci@stonex.it

1.3 Details of EUT

Product Name	Handheld data collection terminal
Brand Name	Stonex
Model No.	SH5A
FCC ID	Y44-SH5A
ISED Number	9932A-SH5A
Mode of Operation	Bluetooth BLE
Frequency Range	2400MHz ~ 2483.5MHz
Number of Channels	40 (at intervals of 2 MHz)
Modulation Type	GFSK
Antenna Type	Internal Antenna
Antenna Gain	2.80 dBi
Extreme Temperature Range	-20℃~ +55℃
Test Voltage	DC 3.8V

1.4 Test Methodology

47 CFR Part 15, Subpart C (10-1-16 Edition)	Miscellaneous Wireless Communications Services
KDB Publication 558074 D01 v05r02	DTS Meas Guidance.
RSS-Gen (Issue 5, March 2019)	General Requirements for Compliance of Radio Apparatus
RSS-247	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs)

(Issue 2, February 2017)	and Licence-Exempt Local Area Network (LE-LAN) Devices
ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

Note(s):

All test items were verified and recorded according to the standards and without any addition/deviation/exclusion during the test.

2 Test Condition

2.1 Environmental conditions

Temperature (°C)	18-25
Humidity (%RH)	40-65
Barometric Pressure (mbar)	960-1060

2.2 Equipment List

Name of Equipment	Manufacturer	Model	Serial No.	Cal. Due Date
Spectrum Analyzer	Keysight	N9020B	MY59260184	2021-08-18
Spectrum Analyzer	Rohde & Schwarz	FSV40N	101450	2021-06-08
EMI Test Receiver	Rohde & Schwarz	ESPI3	100173	2021-06-08
EMI Test Receiver	Rohde & Schwarz	ESR 7	101911	2021-06-08
V-network	SCHWARZBECK	NSLK 8127	8127-902	2021-02-20
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	100687	2021-08-18
Broadband Antenna	SCHWARZBECK	VULB9163	9163-1037	2021-06-08
Horn Antenna-18G	SCHWARZBECK	BBHA9120D	9120D-1775	2021-06-08
Loop Antenna	SCHWARZBECK	FMZB 1513	N/A	2021-03-19
Horn Antenna-40G	YINGLIAN	LB-180400-KF	N/A	2021-07-26
EMC chamber 9*6*6（L*W*H)	CHANGNING	966	N/A	2021-06-08
Shielded Enclosure 8*5*4（L*W*H)	CHANGNING	854	N/A	2021-06-08
Test Software	BL	BL410_E	N/A	N/A

2.3 Measurement Uncertainty

Parameter	Frequency	Uncertainty
Antenna Port Conducted Emission	< 1GHz	± 1.5 dB
	> 1GHz	± 1.5 dB
Radiated Emission	30 MHz – 1 GHz	± 3 dB
	> 1GHz	± 3 dB

3 Test Set-up and Operation Modes

3.1 Details of Test Mode

Using test software was control EUT work in continuous transmitter and receiver mode. Select test channel as below:

Channel	Frequency
The lowest channel(CH0)	2402MHz
The middle channel(CH19)	2440MHz
The Highest channel(CH39)	2480MHz

The basic operation modes are:

A. On
   1. BLE mode
      a. Transmitting
         i. Low Channel
         ii. Middle Channel
         iii. High Channel
      b. Receiving
   2. Normal working with Bluetooth on
B. Standby
C. Off

3.2 Special Accessories and Auxiliary Equipment

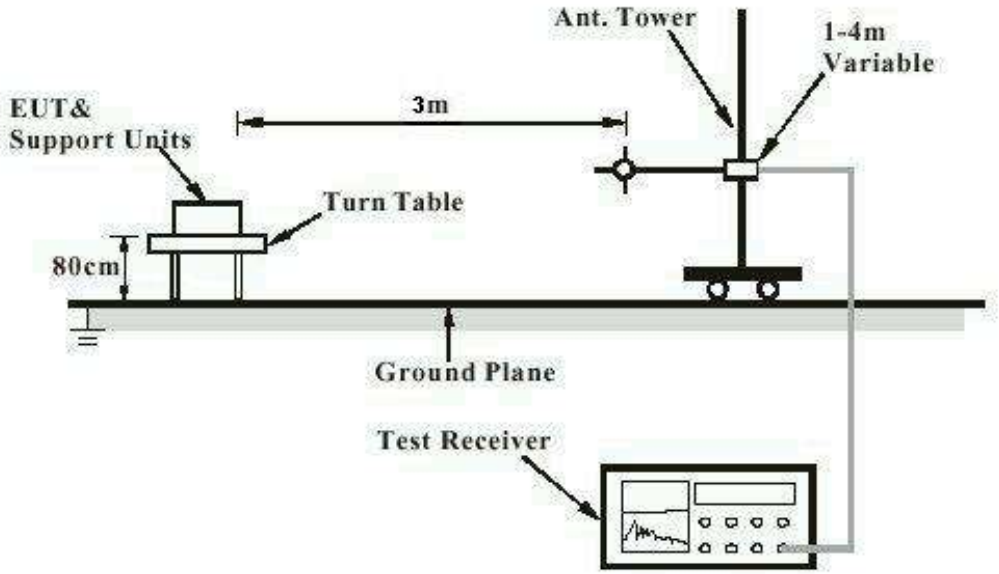
Description	Manufacturer	Model No.	Serial No.
Laptop	Lenovo	TP00083A	N/A

3.3 Support Software

Description	Manufacturer	Software Name
Software	UniStrong	mtk

3.4 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1GHz are done with a table height of 1.5m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

Diagram of Measurement Equipment Configuration for Conduction Measurement

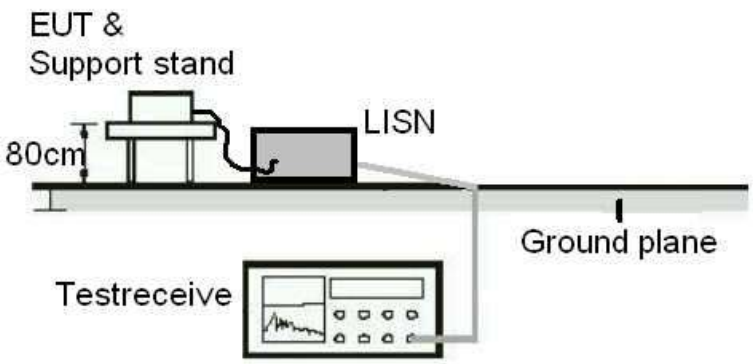
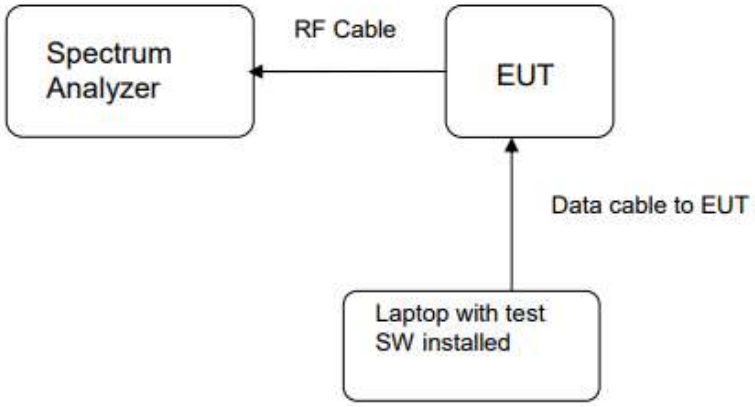


Diagram of Measurement Equipment Configuration for Transmitter Measurement



4 Test Results

4.1 Transmitter Requirement & Test Suites

4.1.1 Antenna Requirement

RESULT: **PASS**

Test standard	:	FCC Part 15.247(b)(4), Part 15.203 RSS-247 5.4(6)
Requirement	:	The use of approved antennas only with directional gains that do not exceed 6 dBi

According to the manufacturer declaration, the EUT has an antenna with a directional gain of 2.80 dBi. The antenna is an internal antenna with no possibility of replacement with a non-approvrd antenna by the end-user.

Therefore, the EUT is considered to comply with this provision.

4.1.2 Peak Output Power and E.I.R.P

RESULT: **PASS**

Test standard	:	FCC Part 15.247(b)(3) RSS-247 5.4(4)
Requirement	:	ANSI C63.10-2013, KDB 558074
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/Middle/High
Operation Mode	:	A.1.a
Ambient temperature	:	25°C
Relative humidity	:	52%

Table 1: Peak Output Power

Test Mode	Test Channel (MHz)	Measured Peak Power		Limit (W)
		(dBm)	(mW)	
BLE	2402	-3.17	0.48	< 1
	2440	-3.46	0.45	
	2480	-4.08	0.39	

Table 2: E.I.R.P

Test Mode	Test Channel (MHz)	E.I.R.P		Limit (W)
		(dBm)	(mW)	
BLE	2402	-0.37	0.92	< 4
	2440	-0.66	0.86	
	2480	-1.28	0.74	

Figure 1: Peak Output Power, 2402MHz

Figure 2: Peak Output Power, 2440MHz

Figure 3: Peak Output Power, 2480MHz

4.1.3 6dB Bandwidth and 99% Bandwidth

RESULT: **PASS**

Test standard	:	FCC Part 15.247(a)(2) RSS-247 5.2(1) RSS-Gen 6.6
Requirement	:	ANSI C63.10-2013, KDB 558074
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/Middle/High
Operation Mode	:	A.1.a
Ambient temperature	:	25°C
Relative humidity	:	52%

Table 3: 6dB Bandwidth and 99% Bandwidth

Test Mode	Test Channel (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	6dB Bandwidth Limit
BLE	2402	0.665	0.928	0.5 MHz
	2441	0.640	0.936	
	2480	0.655	0.923	

Figure 4: 6dB Bandwidth and 99% Bandwidth, 2402MHz

Figure 5: 6dB Bandwidth and 99% Bandwidth, 2440MHz

Figure 6: 6dB Bandwidth and 99% Bandwidth, 2480MHz

4.1.4 Power Spectral Density

RESULT: **PASS**

Test standard	:	FCC Part 15.247(e) RSS-247 5.2(2)
Requirement	:	ANSI C63.10-2013, KDB 558074
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/Middle/High
Operation Mode	:	A.1.a
Ambient temperature	:	25°C
Relative humidity	:	52%

Table 4: Power Spectral Density

Test Mode	Test Channel (MHz)	Measured Result (dBm/3kHz)	Limit (dBm/3kHz)
BLE	2402	-19.42	8
	2441	-20.05	
	2480	-21.11	

Figure 7: Power Spectral Density, 2402MHz

Figure 8: Power Spectral Density, 2440MHz

Figure 9: Power Spectral Density, 2480MHz

4.1.5 Conducted Spurious Emission & Authorized-band band-edge

RESULT: **PASS**

Test standard	:	FCC Part 15.247(d) RSS-247 5.5
Requirement	:	ANSI C63.10-2013, KDB 558074
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/Middle/High for spurious, Low/High for Band Edge
Operation Mode	:	A.1.a
Ambient temperature	:	25°C
Relative humidity	:	52%

For details refer to following test plot.

Figure 10: Conducted Spurious Emission & Authorized-band band-edge, 2402MHz, BLE

Carrier Level

Band Edge

Conducted spurious emissions 30MHz-25GHz

Figure 11: Conducted Spurious Emission & Authorized-band band-edge, 2440MHz, BLE Carrier Level

Conducted spurious emissions 30MHz-25GHz

Figure 12: Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, BLE

Carrier Level

Band Edge

Conducted spurious emissions 30MHz-25GHz


Spectrum Analyzer 1
Swept SA
KEYSIGHT
Input: RF
Coupling: AC
Align: Off
Input Z: 50 Ω
Corrections: Off
Freq Ref: Internal
#Atten: 30 dB
Preamp: Off
PNO: Fast
Gate: Off
IF Gain: Low
Sig Track: Off
Avg Type: Log-Power
Avg|Hold: 10/10
Trig: Free Run
Display
1 Spectrum
Scale/Div 10 dB
Ref Lvl Offset 1.00 dB
Ref Level 15.00 dBm
Mkr2 1.515 00 GHz
--- dBm
Start 2.00 GHz
#Res BW 100 kHz
#Video BW 300 kHz
Stop 25.00 GHz
Sweep ~2.22 s (4001 pts)
5 Marker Table
Mode Trace Scale X Y Function Function Width Function Value
1 N 1 f 2.480 00 GHz -5.584 dBm
2 N 1 f 1.515 00 GHz --- dBm
Select Display Line
Display Line 1
Display Line
-25.04 dBm
On
Off
Select Freq Line
Freq Line 1
Freq Line
1.0000 GHz
On
Off
Meas Display
View
Annotation
Aug 25, 2020
3:14:32 PM

4.1.6 Spurious Emission

RESULT: **PASS**

Test standard	:	FCC Part 15.247(d), 15.205, 15.209 RSS-247 5.5
Requirement	:	ANSI C63.10-2013, KDB 558074
Kind of test site	:	3m Semi-Anechoic Chamber

Test setup

Test Channel	:	Low/Middle/High
Operation Mode	:	A
Ambient temperature	:	25°C
Relative humidity	:	52%

Notes

Test plots please refer to the annex document "BLE-TX EXHIBIT A of SHE20080008-02FE".

1. For 9 kHz ~ 30 MHz, the amplitude of spurious emissions that are attenuated by more than 20dB below the permissible. The value has no need to be reported.
2. The spurious above 18GHz is noise only and 20dB below the limit. The value has no need to be reported.
3. The EUT is working in the Normal link mode below 1 GHz.

4.1.7 Band Edge (Restricted-band band-edge)

RESULT: **PASS**

Test standard	:	FCC Part 15.247(d), 15.205, 15.209 RSS-247 5.5
Requirement	:	ANSI C63.10-2013, KDB 558074
Kind of test site	:	3m Semi-Anechoic Chamber

Test setup

Test Channel	:	Low/Middle/High
Operation Mode	:	A.1
Ambient temperature	:	25°C
Relative humidity	:	52%

Notes

Test plots please refer to the annex document "BLE-TX EXHIBIT A of SHE20080008-02FE".

4.2 Mains Emissions

4.2.1 Conducted Emission on AC Mains

RESULT: **PASS**

Test standard	:	FCC Part 15.207(a) RSS-Gen 8.8
Requirement	:	ANSI C63.10-2013
Kind of test site	:	Shielded room

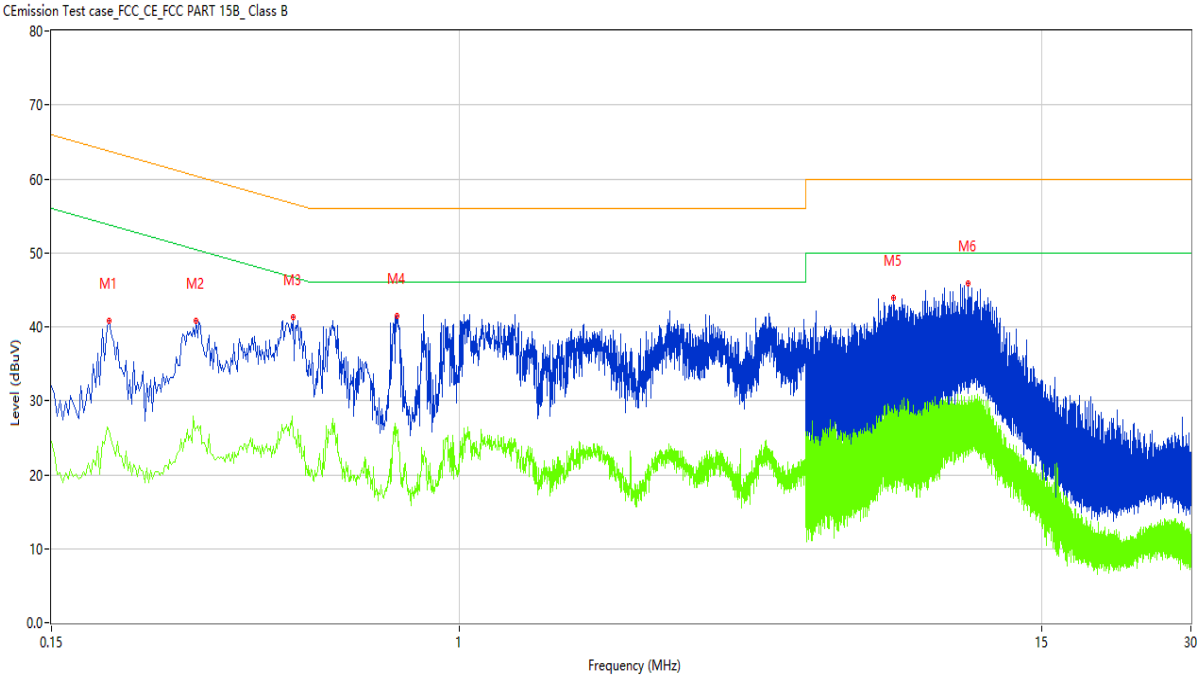
Test setup

Input Voltage	:	AC 120V, 60Hz; AC 240V, 50Hz
Operation Mode	:	A.2
Earthing	:	Not Connected
Ambient temperature	:	25°C
Relative humidity	:	52%

For details refer to following test plot.

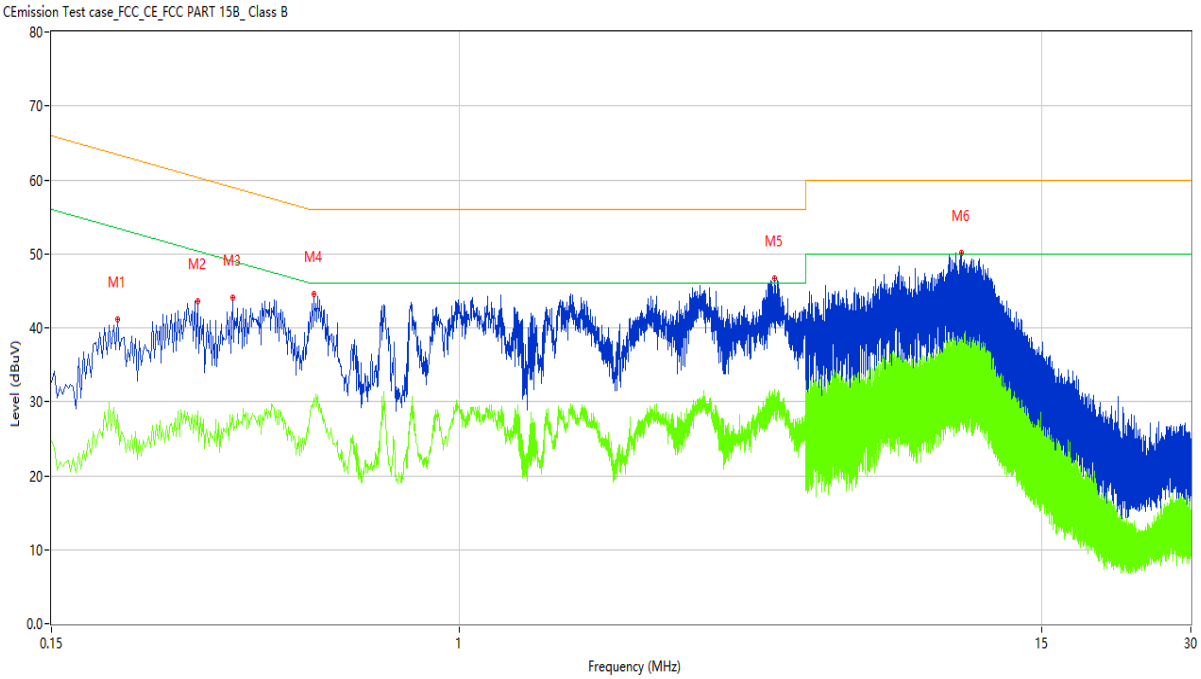
Note：The all configurations were tested respectively, but only the worst configuration shown here.

Figure 13: Conducted Emission on AC Mains, L Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.196	41.13	10.15	63.78	-22.65	Peak	L	Pass
1*	0.196	36.26	10.15	63.78	-27.52	QP	L	Pass
1**	0.196	25.89	10.15	53.78	-27.89	AV	L	Pass
2	0.294	42.31	10.14	60.41	-18.10	Peak	L	Pass
2*	0.294	36.36	10.14	60.41	-24.05	QP	L	Pass
2**	0.294	26.34	10.14	50.41	-24.07	AV	L	Pass
3	0.462	43.09	10.15	56.66	-13.57	Peak	L	Pass
3*	0.462	37.52	10.15	56.66	-19.14	QP	L	Pass
3**	0.462	25.26	10.15	46.66	-21.40	AV	L	Pass
4	0.748	41.84	10.15	56.00	-14.16	Peak	L	Pass
4*	0.748	36.83	10.15	56.00	-19.17	QP	L	Pass
4**	0.748	25.79	10.15	46.00	-20.21	AV	L	Pass
5	7.540	44.04	10.32	60.00	-15.96	Peak	L	Pass
5*	7.540	36.50	10.32	60.00	-23.50	QP	L	Pass
5**	7.540	25.71	10.32	50.00	-24.29	AV	L	Pass
6	10.638	46.85	10.43	60.00	-13.15	Peak	L	Pass
6*	10.638	35.83	10.43	60.00	-24.17	QP	L	Pass
6**	10.638	29.82	10.43	50.00	-20.18	AV	L	Pass

Figure 14: Conducted Emission on AC Mains, N Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.204	43.10	10.15	63.45	-20.35	Peak	N	Pass
1*	0.204	35.96	10.15	63.45	-27.49	QP	N	Pass
1**	0.204	28.28	10.15	53.45	-25.17	AV	N	Pass
2	0.296	44.67	10.14	60.35	-15.68	Peak	N	Pass
2*	0.296	37.43	10.14	60.35	-22.92	QP	N	Pass
2**	0.296	28.77	10.14	50.35	-21.58	AV	N	Pass
3	0.348	44.82	10.14	59.01	-14.19	Peak	N	Pass
3*	0.348	37.49	10.14	59.01	-21.52	QP	N	Pass
3**	0.348	28.21	10.14	49.01	-20.80	AV	N	Pass
4	0.508	45.18	10.15	56.00	-10.82	Peak	N	Pass
4*	0.508	39.65	10.15	56.00	-16.35	QP	N	Pass
4**	0.508	30.52	10.15	46.00	-15.48	AV	N	Pass
5	4.336	47.23	10.25	56.00	-8.77	Peak	N	Pass
5*	4.336	39.97	10.25	56.00	-16.03	QP	N	Pass
5**	4.336	31.70	10.25	46.00	-14.30	AV	N	Pass
6	10.322	51.11	10.41	60.00	-8.89	Peak	N	Pass
6*	10.322	43.18	10.41	60.00	-16.82	QP	N	Pass
6**	10.322	32.12	10.41	50.00	-17.88	AV	N	Pass

5 Appendixes

5.1 Photographs of the Sample

Front of the sample

Rear of the sample

5.2 Set-up for Conducted Emissions

5.3 Set-up for Conducted RF test at Antenna Port

5.4 Set-up for Spurious Emissions below 1GHz

Below 1 GHz

5.5 Set-up for Spurious Emissions above 1GHz

Above 1GHz

End of the report