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# **TEST REPORT**

Product : Card Case

Trade mark : Loop Card Case

Model/Type reference : LOOPMST0004

Serial number : N/A

Ratings : 3.7V, 350mAH

FCC ID : 2AB3L-LOOPMST0004

Report number : EESZG10230002-1

**Date** : Jan. 05, 2015

Regulations : See below

Test Standards	Results
	PASS

Prepared for:

LoopPay, Inc.

8 New England Executive Park, Suite 220, Burlington, MA 01803, United States

Prepared by:

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Tested by: \_\_\_\_ Reviewed by: \_\_\_\_ h

Approved by: \_\_\_\_\_ Date: \_\_\_\_\_Jan. 05, 2015

Check No.: 1702098331





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N/A me	eans not applicable.			



























### 1. CERTIFICATION INFORMATION

Applicant: LoopPay, Inc.

8 New England Executive Park, Suite 220, Burlington, MA

01803, United States

**BBPOS Limited** Manufacturer:

Suite 1602, 16/F, Tower 2, Nina Tower, No.8 Yeung UK Rd,

Tsuen Wan, Hong Kong

FCC ID: 2AB3L-LOOPMST0004

**Product:** Card Case

Model/Type reference: LOOPMST0004

**Trade Name: Loop Card Case** 

N/A **Serial Number:** 

EESZG10230002-1 **Report Number:** 

Oct. 25, 2014 Sample Received Date:

Oct. 25, 2014 to Dec. 01, 2014 Sample tested Date:

The above equipment was tested by Centre Testing International for compliance with the requirements set forth in the FCC Rules and the measurement procedure according to ANSI C63.4:2009.

### 2. TEST SUMMARY

No.	Test Item	Rule	Result
1	6dB Bandwidth	FCC PART15.247(a)(2)	PASS
2	Transmitter Output Power	FCC PART15.247(b)(3)	PASS
3	Power Spectral Density	FCC PART15.247(e)	PASS
4	Conducted Bandedge Emission / Conducted Spurious Emission	FCC PART15.247(d)	PASS
5	Radiated Bandedge Emission / Radiated Spurious Emission	FCC PART15.247(d)	PASS
6	AC Conducted Emission	FCC PART15.207	PASS
7	Antenna requirements	FCC PART15.203	PASS (See Notes)

<sup>\*:</sup> According to Section 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 EUT has a built in antenna which is a short wire solder on the PCB, this is permanently attached antenna and meets the requirements of this section.













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## 3. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Value (dB)
Conducted Emission Test	3.2 dB
Radiated Emissions / Bandedge Emission	4.5 dB

### 4. PRODUCT INFORMATION

<u> </u>			
Items		Description	
Rating	3.7V, 350mAH		
Type of Modulation	BT4.0/BLE, ASK for 125kHz	/0-	
Antenna Type	Integral antenna		(6
Frequency Range	2402 ~ 2480 MHz, 125kHz		
Gain	0dBi		

## 5. TEST EQUIPMENT LIST

Equipment	Manufacturer	Model	Serial No.	Due Date
3M Chamber & Accessory Equipment	TDK	SAC-3		06/01/2016
Receiver	R&S	ESCI	100435	07/19/2015
TRILOG Broadband Antenna	schwarzbeck	VULB 9163	617	06/25/2015
Multi device Controller	maturo	NCD/070/10711 112		N/A
Horn Antenna	ETS-LINGREN	3117	00057407	07/19/2015
Microwave Preamplifier	Agilent	8449B	3008A02425	03/19/2015
Spectrum Analyzer	R&S	FSP40	100416	07/06/2015
Receiver	R&S	ESCI	100009	07/19/2015
LISN	R&S	ENV216	100098	07/19/2015

### 6. SUPPORT EQUIPMENT LIST

Device Type	Brand	Model	Series No.	Data Cable	Remark
Notebook	Lenovo	E42L	R36037B10223	N/A	FCC DOC
Mouse	L.Selectron	M004	02284699	Un-shielded 1.2M	FCC DOC













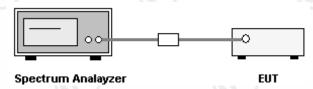


### 7. 6DB BANDWIDTH MEASUREMENT

### 7.1. LIMITS

Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

### 7.2. BLOCK DIAGRAM OF TEST SETUP



### 7.3. TEST PROCEDURE

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW)  $\geq 3 \times RBW$ .
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

### 7.4. TEST RESULT

The test data of worst case are below:

Frequency (MHz)	Measured Value (kHz)	Result
2402	676.5	PASS
2440	687	PASS
2480	690	PASS









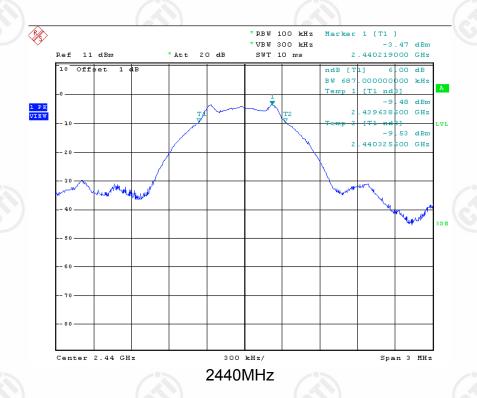
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Please see the following plots (worst case):







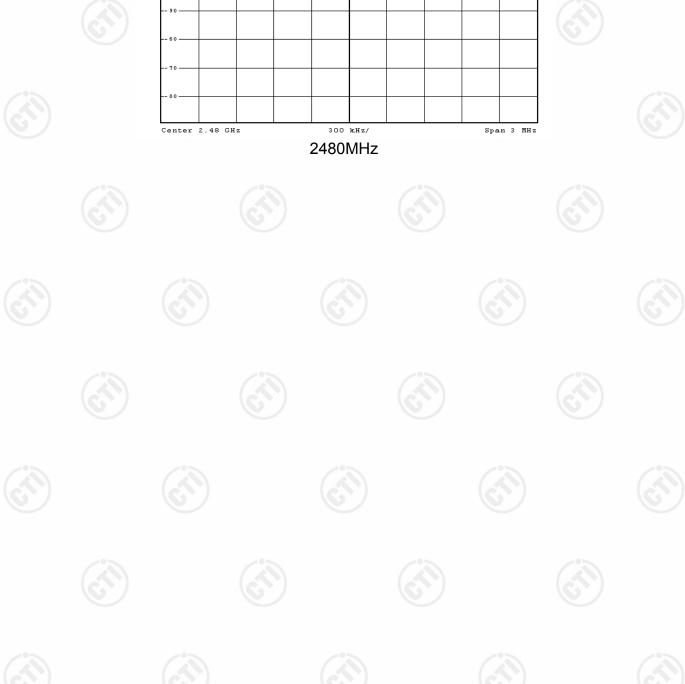








Page 8 of 38 \* RBW 100 kHz -3.82 dBm 2.479727000 GHz \* VBW 300 kHz SWT 10 ms Ref 11 dBm \* Att 20 dB ndB [T 0000000000 kHz 93 dBm -9.96 dBm





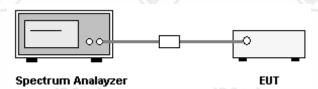


### 8. POWER SPECTRAL DENSITY

### 8.1. LIMITS

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### **8.2. BLOCK DIAGRAM OF TEST SETUP**



### **8.3. TEST PROCEDURE**

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to 3 kHz.
- d) Set the VBW  $\geq$  3×RBW.
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.

### **8.4. TEST RESULT**

The test data of worst case are below:

Frequency (MHz)	Measured Value (dBm)	Result
2402	-15.73	PASS
2440	-17.25	PASS
2480	-17.44	PASS







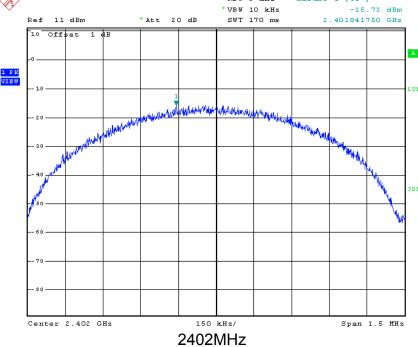


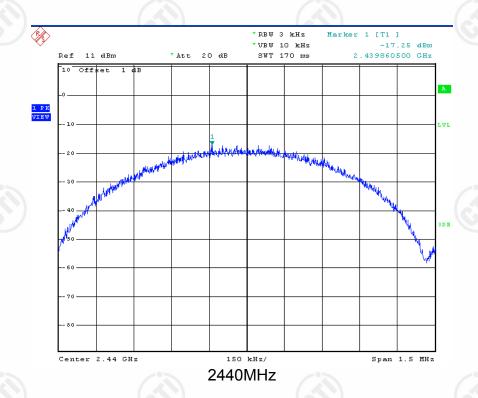
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Please see the following plots (worst case):

\*RBW 3 kHz Marker 1 [T1 ]







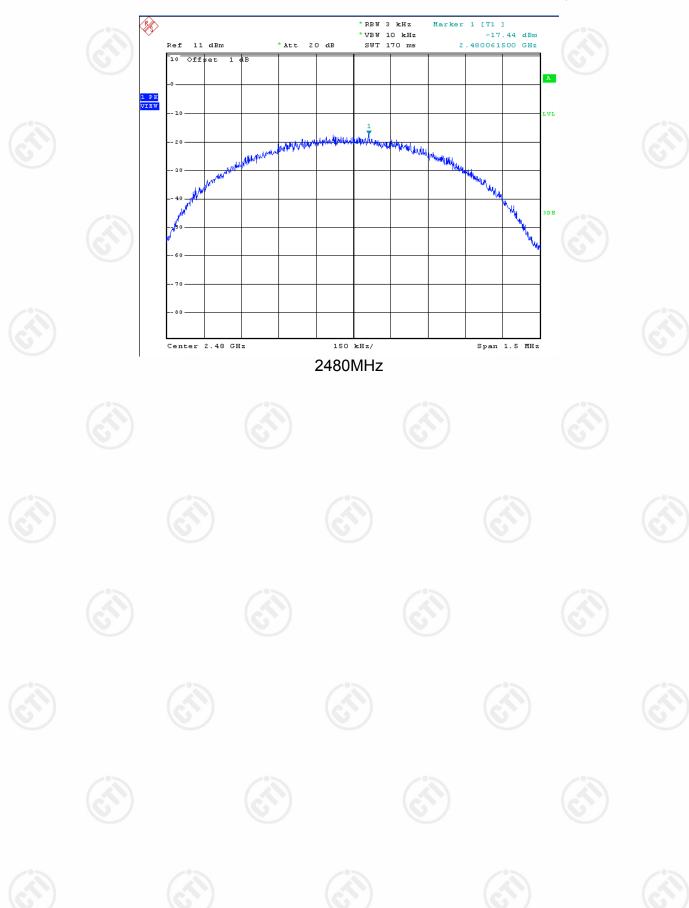








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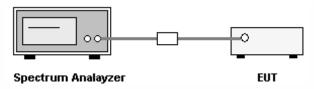
### 9. MAXIMUM PEAK CONDUCTED OUTPUT POWER MEASUREMENT

### **9.1. LIMITS**

The maximum peak conducted output power of the intentional radiator shall not exceed the following:

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt (30dBm).

## 9.2. BLOCK DIAGRAM OF TEST SETUP



### 9.3. TEST PROCEDURE

- a) Set the RBW ≥ DTS bandwidth.
- b) Set the VBW ≥ 3 x RBW
- c) Set span ≥ 3 x RBW
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

### 9.4. TEST RESULT

The test data of worst case are below:

Frequency (MHz)	Measured Value (dBm)	Result
2402	-2.49	PASS
2440	-3.01	PASS
2480	-3.47	PASS

Remark:

Antenna Gain: 0dBi







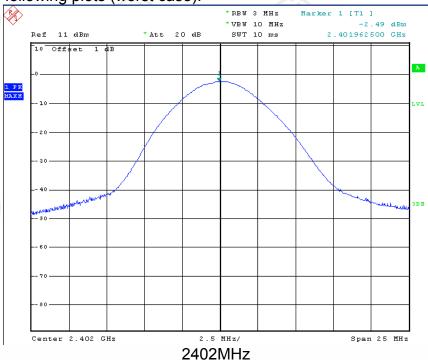




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Please see the following plots (worst case):





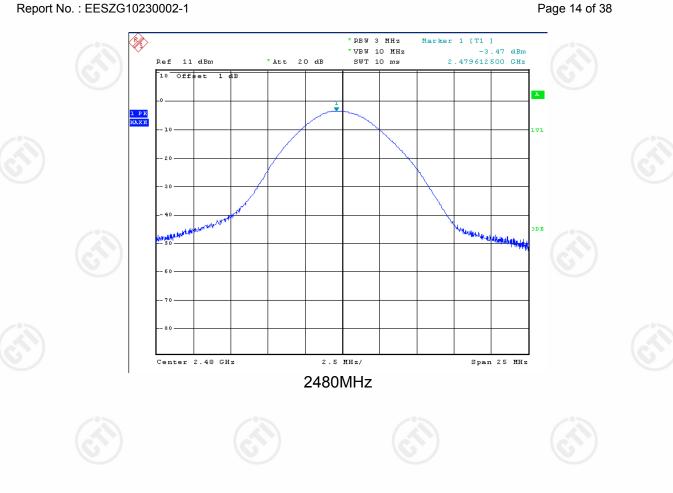


















































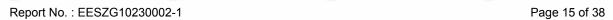










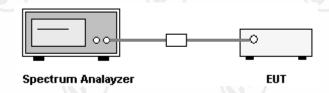


## 10. CONDUCTED BANDEDGE EMISSION MEASUREMENT

### **10.1. LIMITS**

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 below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

### 10.2. BLOCK DIAGRAM OF TEST SETUP



### 10.3. TEST PROCEDURE

- a) Set to the maximum power setting and enable the EUT transmit continuously.
- b) Set RBW = 100 kHz, VBW = 300 kHz (≥ RBW). Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.
- c) Enable hopping function of the EUT and then repeat step a and b.
- d) Measure and record the results in the test report.

### 10.4. TEST RESULT

Worst case data attached.--- please see the following plots.





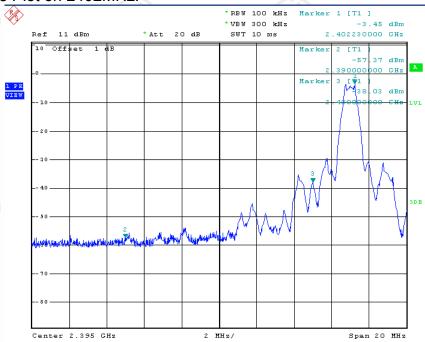




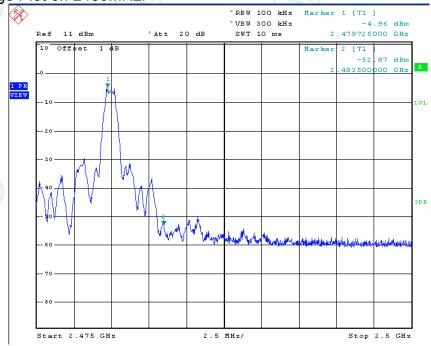


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## Low Band Edge Plot on 2402MHz:



## High Band Edge Plot on 2480MHz:









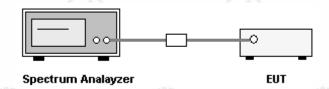


### 11. CONDUCTED SPURIOUS EMISSION MEASUREMENT

### **11.1. LIMITS**

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 below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

### 11.2. BLOCK DIAGRAM OF TEST SETUP



### 11.3. TEST PROCEDURE

- a) The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
- b) Set to the maximum power setting and enable the EUT transmit continuously.
- c) Set RBW = 100 kHz, VBW = 300 kHz, scan up through 10<sup>th</sup> harmonic. All harmonics / spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.
- d) Measure and record the results in the test report.
- e) The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

#### 11.4. TEST RESULT

Worst case data---Please see the following plots.



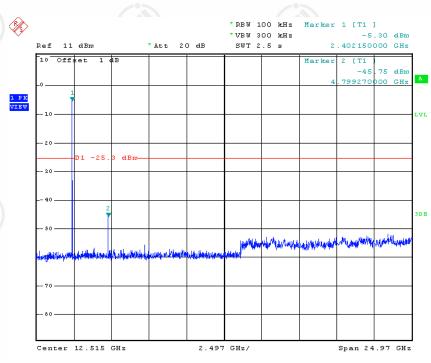




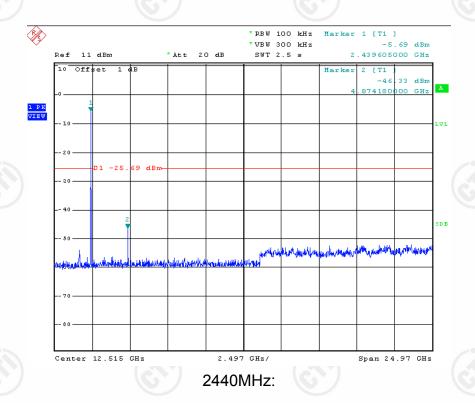








### 2402MHz:





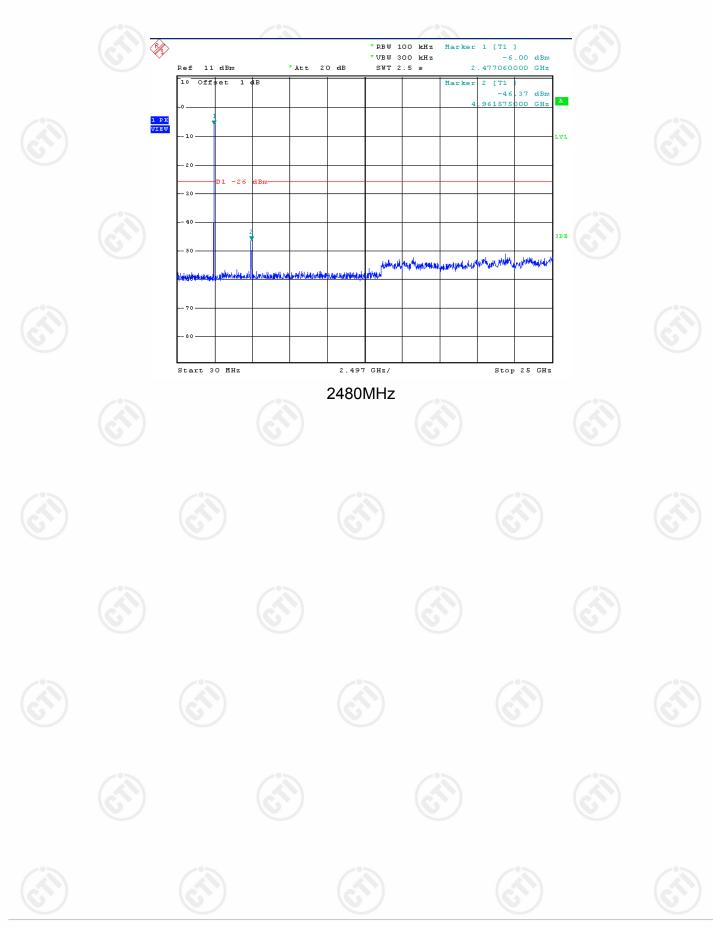








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# 12. RADIATED BANDEDGE EMISSION / RADIATED SPURIOUS EMISSION MEASUREMENT

### **12.1. LIMITS**

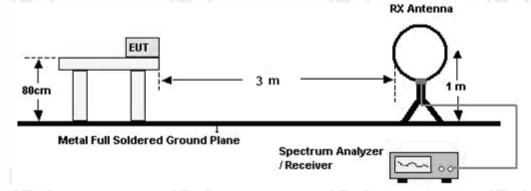
The field strength of any emissions, which appear outside of operating frequency band and restricted band specified on 15.205(a), shall not exceed the general radiated emission limits as below.

Distance (m)
200
300
30
30
3
3
3
3

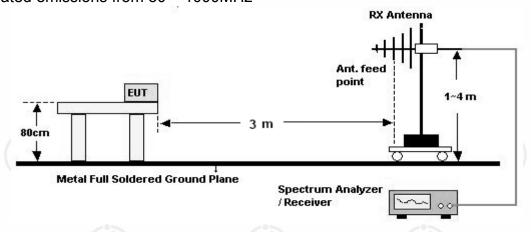
Note: the tighter limit applies at the band edges.

### 12.2. BLOCK DIAGRAM OF TEST SETUP

For radiated emissions from 9kHz to 30MHz



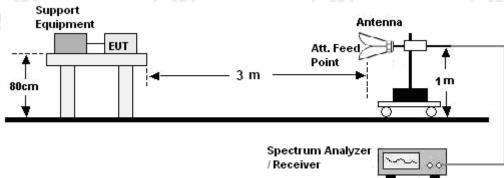
For radiated emissions from 30 – 1000MHz





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For radiated emissions from 1GHz to 25GHz



### 12.3. TEST PROCEDURE

### Below 30MHz

- a. The Product is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna (loop antenna). The maximum values of the field strength are recorded by adjusting the polarizations of the test antenna and rotating the turntable.
- b. For each suspected emission, the Product was arranged to its worst case and then turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
- c. The test frequency analyzer system was set to Peak Detect (300Hz RBW in 9kHz to 150kHz and 10kHz RBW in 150kHz to 30MHz) Function and Specified Bandwidth with Maximum Hold Mode.

### 30MHz ~ 1GHz:

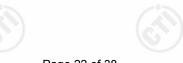
- a. The Product was placed on the non-conductive turntable 0.8m above the ground at a chamber.
- b. Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 100 kHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied between 1~4 m in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
- c. For each frequency whose maximum record was higher or close to limit, measure its QP value (120 kHz RBW): vary the antenna's height and rotate the turntable from 0 to 360 degrees to find the height and degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to QP Detector and specified bandwidth with Maximum Hold Mode, and record the maximum value.

### Above 1GHz:

- a. The EUT was placed on the non-conductive turntable 0.8 m above the ground at a chamber.
- b. Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 1MHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.







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### 12.4. TEST RESULT

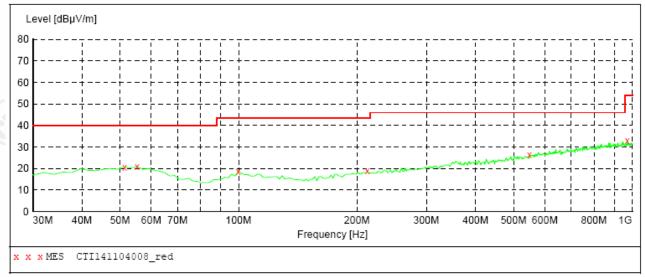
### **Below 30MHz:**

No emissions were found higher than the background below 30MHz and background is lower than the limit, so it deems to compliance with the limit without recorded.

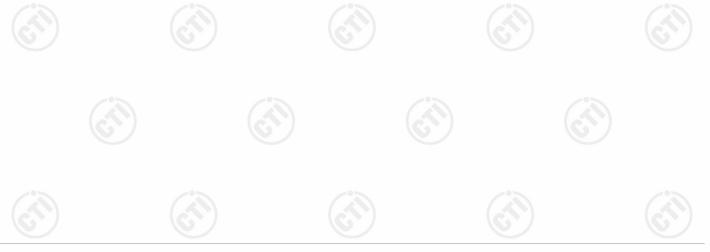
### 30MHz $\sim$ 1GHz:

The test data of low channel, middle channel and high channel are almost same in frequency bands 30MHz to 1GHz, and the data of middle channel are chosen as representative in below:

### H:



Frequency MHz	Level dBµV/m		Limit dBµV/m	_		Height cm	Azimuth deg	Polarization
51.340000	20.70	14.9	40.0	19.3	QP	200.0	133.00	HORIZONTAL
55.220000	20.90	14.4	40.0	19.1	QP	100.0	28.00	HORIZONTAL
99.840000	18.60	12.7	43.5	24.9	QP	200.0	203.00	HORIZONTAL
212.360000	18.80	13.7	43.5	24.7	QP	100.0	357.00	HORIZONTAL
547.980000	26.30	21.0	46.0	19.7	QP	200.0	14.00	HORIZONTAL
970.900000	33.10	26.6	54.0	20.9	QP	100.0	28.00	HORIZONTAL







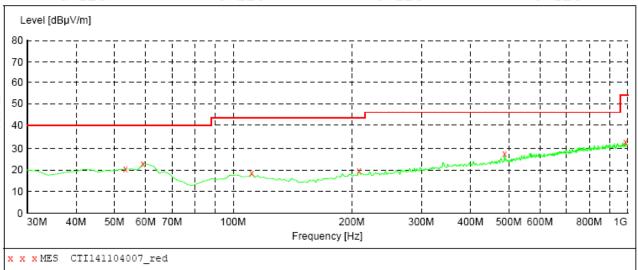


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## V:



•	Frequency MHz		Transd dB		_		Height cm	Azimuth deg	Polarization
	53.280000	20.40		40.0	19.6	~	200.0		VERTICAL
				40.0	17.0	~			VERTICAL
	111.480000 208.480000	18.60 19.60	11.9 13.6	43.5 43.5		~	100.0 100.0		VERTICAL VERTICAL
	487.840000		19.9	46.0	18.6	~	200.0		VERTICAL
	988.360000	32.90	26.8	54.0	21.1	OP	100.0	28.00	VERTICAL.























































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### **Above 1GHz:**

Test Results-(Measurement Distance: 3m)\_Channel low\_2402MHz\_GFSK mode:

Frequency (MHz)	Measurement (dBuV/m)	Limit (dBuV/m)	Detector Type	Antenna (H/V)	Result (P/F)
4804.0	56.96	74	PK	Н	Р
4804.0	5231	54	AV	( H )	P
4804.0	55.19	74	PK	V	Р
4804.0	51.69	54	PK	V	Р

Test Results-(Measurement Distance: 3m) Channel middle 2440MHz GFSK mode:

	(							
Frequency (MHz)	Measurement (dBuV/m)	Limit (dBuV/m)	Detector Type	Antenna (H/V)	Result (P/F)			
4880.0	56.96	74	PK	Н	Р			
4880.0	52.33	54	AV	Н	P			
4880.0	56.33	74	PK	V	Р			
4880.0	53.01	54	AV	V	Р			

Test Results-(Measurement Distance: 3m) Channel high 2480MHz GFSK mode:

100t Hoodito	Inioacai cinicite Biotai	dodromone Biotanion on j_onamior mgn_1 toomn12_or ore mode.						
Frequency (MHz)	Measurement (dBuV/m)	Limit (dBuV/m)	Detector Type	Antenna (H/V)	Result (P/F)			
4960.0	57.63	74	PK	Н	Р			
4960.0	53.01	54	AV	Н	Р			
4960.0	54.63	74	PK	V	Р			
4960.0	50.96	54	AV	V	Р			

### Remark:

- 1. The above tables show that the frequencies peak data are all below the average limit, so the average data of these frequencies are deems to fulfill the average limits and not reported.
- 2. No emission found from 18GHz to 25GHz.
- 3. All outside of operating frequency band and restricted band specified are below 15.209.

















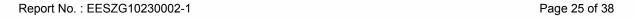






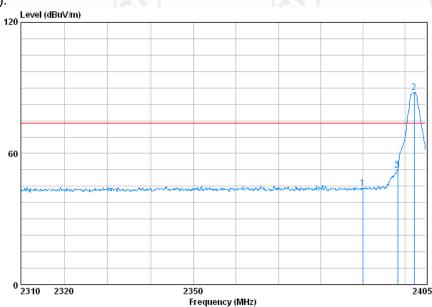






## **Radiated Bandedge Emission:**

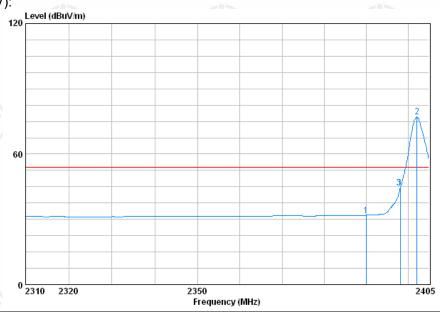
2402MHz (H-PK):



Frequency (MHz)	Measurement (dBuV/m)	Limit (dBuV/m)	Detector Type	Antenna (H/V)	Result (P/F)
2390	44.12	74	PK	Н	Р
2400	56.24	74	PK	Н	Р
2402*	87.91	<b></b>	PK	Н	Р

<sup>\*:</sup> fundamental frequency

### 2402MHz (H-AV):



Frequency (MHz)	Measurement (dBuV/m)	Limit (dBuV/m)	Detector Type	Antenna (H/V)	Result (P/F)
2390	36.21	54	AV	Н	Р
2400	48.96	54	AV	Н	Р
2402*	81.36	(4)	AV	H	P

<sup>\*:</sup> fundamental frequency

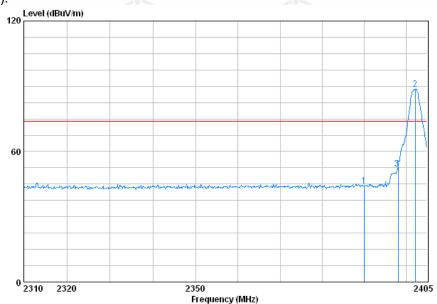








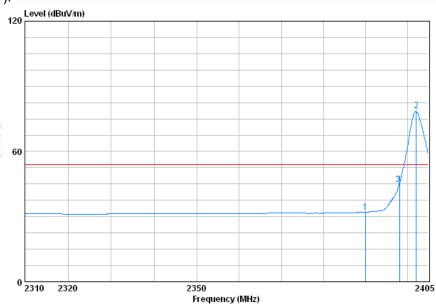
2402MHz (V-PK):



Frequency (MHz)	Measurement (dBuV/m)	Limit (dBuV/m)	Detector Type	Antenna (H/V)	Result (P/F)
2390	44.02	74	PK	V	Р
2400	56.86	74	PK	V	Р
2402*	88.62		PK	V	Р

<sup>\*:</sup> fundamental frequency

## 2402MHz (V-AV):



			y ()		
Frequency (MHz)	Measurement (dBuV/m)	Limit (dBuV/m)	Detector Type	Antenna (H/V)	Result (P/F)
2390	36.32	54	AV	V	Р
2400	47.98	54	AV	V	Р
2402*	83.06		AV	V	Р

<sup>\*:</sup> fundamental frequency



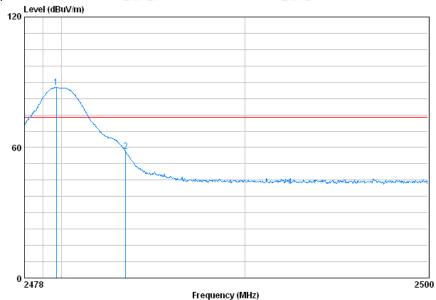






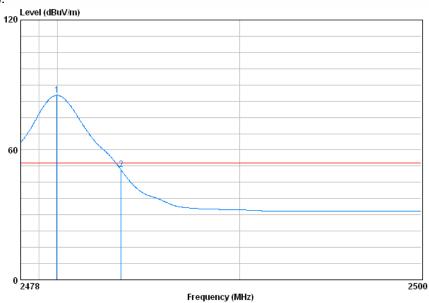
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### 2480MHz (H-PK):



Frequency Measurement Limit Detector Antenna Result (MHz) (dBuV/m) (P/F) (dBuV/m) Type (H/V) 2480\* 87.58 PΚ Н Ρ 2483.5 58.19 74 PK Н Ρ

## 2480MHz (H-AV):



Frequency (MHz)	Measurement (dBuV/m)	Limit (dBuV/m)	Detector Type	Antenna (H/V)	Result (P/F)
2480*	85.26		AV	Н	Р
2483.5	50.79	54	AV	Н	Р

<sup>\*:</sup> fundamental frequency



<sup>\*:</sup> fundamental frequency



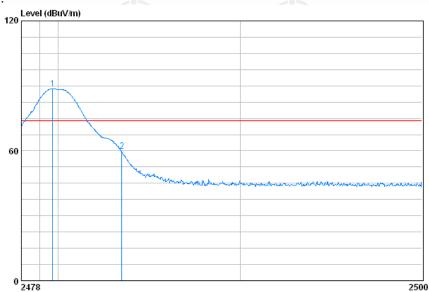






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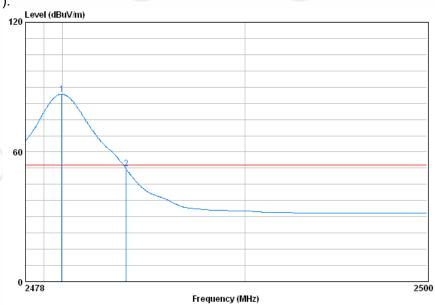
2480MHz (V-PK):



	2.110	Frequency (MHz)						
Frequency (MHz)	Measurement (dBuV/m)	Limit (dBuV/m)	Detector Type	Antenna (H/V)	Result (P/F)			
2480*	88.62		PK	V	Р			
2483.5	59.26	74	PK	V	P			

<sup>\*:</sup> fundamental frequency

## 2480MHz (V-AV):



Frequency (MHz)	Measurement (dBuV/m)	Limit (dBuV/m)	Detector Type	Antenna (H/V)	Result (P/F)
2480*	86.67		AV	V	Р
2483.5	52.19	54	AV	V	Р

<sup>\*:</sup> fundamental frequency







### 13. AC CONDUCTED EMISSION TEST

### **13.1. LIMITS**

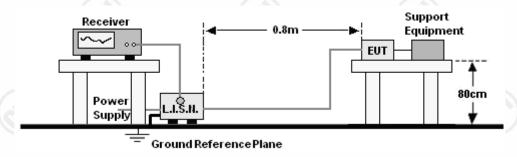
**Limits for Class B digital devices** 

Frequency range	Limits dB(	μ <b>V</b> )
(MHz)	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50

**NOTE:** 1. The lower limit shall apply at the transition frequencies.

The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.50 MHz.

### 13.2. BLOCK DIAGRAM OF TEST SETUP



### 13.3. PROCEDURE OF CONDUCTED EMISSION TEST

- a. The Product was placed on a nonconductive table above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).
- b. The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak and AVG detector in Max Hold mode. Run the receiver's pre-scan to record the maximum disturbance generated from Product in all power lines in the full band.
- c. For each frequency whose maximum record was higher or close to limit, measure its QP and AVG values and record.





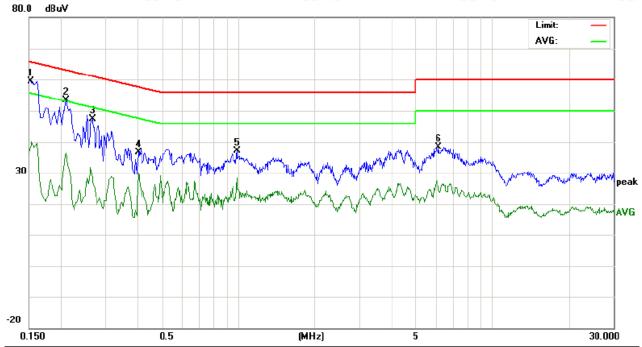
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## 13.4. GRAPHS AND DATA

Product : Card Case Model/Type reference : LOOPMST0004

Power : AC 120V/60Hz Temperature :  $18^{\circ}$ C Mode : Keeping TX Humidity :  $51^{\circ}$ 

L:



No.	Freq.	Reading_Level (dBuV)		Correct Factor				Limit (dBuV)		Margin (dB)				
	MHz	Peak	QP	AVG	dB	peak	QP	AVG	QP	AVG	QP	AVG	P/F	Comment
1	0.1539	49.03		30.10	9.90	58.93		40.00	65.78	55.78	-6.85	-15.78	Р	
2	0.2100	43.53		26.48	9.90	53.43		36.38	63.20	53.20	-9.77	-16.82	Р	
3	0.2620	36.14		22.01	9.90	46.04		31.91	61.36	51.36	-15.32	-19.45	Р	
4	0.4060	26.68		20.31	9.90	36.58		30.21	57.73	47.73	-21.15	-17.52	Р	
5	0.9900	27.15		18.40	9.90	37.05		28.30	56.00	46.00	-18.95	-17.70	Р	
6	6.0700	27.46		17.61	9.90	37.36		27.51	60.00	50.00	-22.64	-22.49	Р	



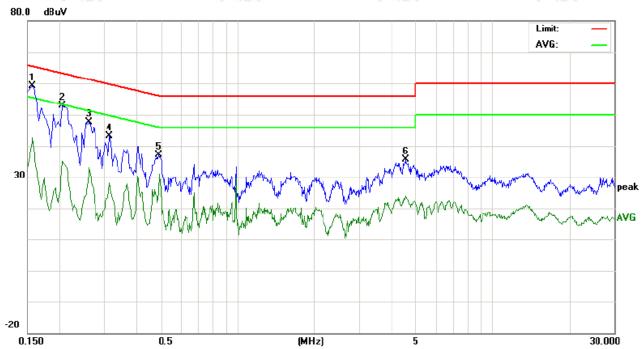






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### N:



No.	Freq.	Reading_Level (dBuV)			Correct Measurement Factor (dBuV)			Limit (dBuV)		Margin (dB)				
	MHz	Peak	QP	AVG	dB	peak	QP	AVG	QP	AVG	QP	AVG	P/F	Comment
1	0.1580	49.34		32.74	9.90	59.24		42.64	65.56	55.56	-6.32	-12.92	Р	
2	0.2060	42.98		25.34	9.90	52.88		35.24	63.36	53.36	-10.48	-18.12	Р	
3	0.2620	37.80		23.25	9.90	47.70		33.15	61.36	51.36	-13.66	-18.21	Р	
4	0.3140	33.15		18.13	9.90	43.05		28.03	59.86	49.86	-16.81	-21.83	Р	
5	0.4900	27.14		15.16	9.90	37.04		25.06	56.17	46.17	-19.13	-21.11	Р	
6	4.5620	25.75		14.05	9.90	35.65		23.95	56.00	46.00	-20.35	-22.05	Р	













































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## **APPENDIX 1 PHOTOGRAPHS OF TEST SETUP**



TEST SETUP OF RADIATED EMISSION (30MHz-1GHz)



TEST SETUP OF RADIATED EMISSION (above 1GHz)



















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TEST SETUP OF CONDUCTED EMISSION































































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## **APPENDIX 2 EXTERNAL PHOTOGRAPHS OF PRODUCT**



External View of product-1



External View of product-2





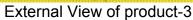






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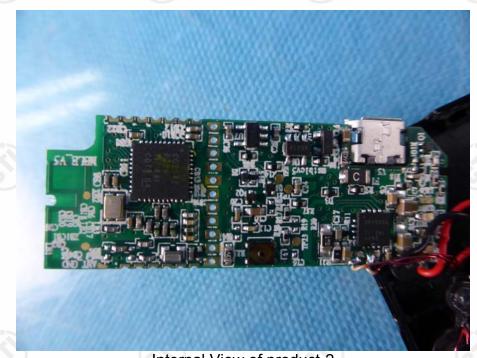
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## **APPENDIX 3 INTERNAL PHOTOGRAPHS OF PRODUCT**



Internal View of product-1



Internal View of product-2



















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Internal View of product-3



Internal View of product-4



















Internal View of product-5

## \*\*\* End of Report \*\*\*

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