

FCC RADIO TEST REPORT

The device described below is tested by Dongguan Nore Testing Center Co., Ltd. to determine the maximum emission levels emanating from the device, the severe levels which the device can endure and E.U.T.'s performance criterion. The test results, data evaluation, test procedures, and equipment of configurations shown in this report were made in accordance with the procedures in ANSI C63.10(2013).

Applicant : Pinsheng technologies Co., Ltd.
Address : 7Floor, No.5 middle Huangshan Avenue, North New Zone, Chongqing

Manufacturer : Pinsheng technologies Co., Ltd.
Address : 7Floor, No.5 middle Huangshan Avenue, North New Zone, Chongqing

Factory : Chongqing Datiejiang Science and Technology Co.,Ltd.
Address : NO.368, BOE Avenue, Beibei District, Chongqing

E.U.T. : Label Printer

Brand Name : MakeID

Model No. : ML60R-WT

FCC ID : 2AVAP-ML60

Measurement Standard : FCC PART 15.249

Date of Receiver : November 27, 2019

Date of Test : November 28, 2019 to December 02, 2019

Date of Report : December 03, 2019

This Test Report is Issued Under the Authority of :

Prepared by



Bowen Zhu / Engineer

Approved & Authorized Signer



Iori Fan / Authorized Signatory

This test report is for the customer shown above and their specific product only. This report applies to above tested sample only and shall not be reproduced in part without written approval of Dongguan Nore Testing Center Co., Ltd.

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Revision History of This Test Report

Report Number	Description	Issued Date
NTC1911348FV00	Initial Issue	2019-12-03

1. GENERAL INFORMATION

1.1 Product Description for Equipment under Test

Product Name	: Label Printer
Brand Name	: MakeID
Main Model Name	: ML60R-WT
Additional Model Name	: Refer to Serial Model List
E.U.T. Type	: Class B
Rating	: Input: 24Vdc, 2.5A
Adapter	: Model: EA10682P-240 Input: 100-240V~, 50/60Hz, 2.0A Output: 24V  2.5A
Test voltage	: AC 120V/60Hz
Model difference	: These models have different exterior colors.
Note	: According to the model difference, all tests were performed on model ML60R-WT.

Technical Specification:

RFID Function

Frequency Range	: 902.25-927.75MHz
Modulation Type	: ASK
Number of Channel	: 52
Channel Space	: 0.5MHz
Antenna Type	: FPC antenna
Antenna Gain	: 3.0dBi

Note: This report is applicable to RFID function.

Serial Model List

ML60-2N	ML60A-2N	ML60B-2N	ML60C-2N	ML60T-2N	ML60S-2N
ML60-3N	ML60A-3N	ML60B-3N	ML60C-3N	ML60T-3N	ML60S-3N
ML60-2NW	ML60A-2NW	ML60B-2NW	ML60C-2NW	ML60T-2NW	ML60S-2NW
ML60-3NW	ML60A-3NW	ML60B-3NW	ML60C-3NW	ML60T-3NW	ML60S-3NW
ML60-2F	ML60A-2F	ML60B-2F	ML60C-2F	ML60T-2F	ML60S-2F
ML60-3F	ML60A-3F	ML60B-3F	ML60C-3F	ML60T-3F	ML60S-3F
ML60-2FW	ML60A-2FW	ML60B-2FW	ML60C-2FW	ML60T-2FW	ML60S-2FW
ML60-3FW	ML60A-3FW	ML60B-3FW	ML60C-3FW	ML60T-3FW	ML60S-3FW
ML60-2NR	ML60A-2NR	ML60B-2NR	ML60C-2NR	ML60T-2NR	ML60S-2NR
ML60-3NR	ML60A-3NR	ML60B-3NR	ML60C-3NR	ML60T-3NR	ML60S-3NR
ML60-2FR	ML60A-2FR	ML60B-2FR	ML60C-2FR	ML60T-2FR	ML60S-2FR
ML60-3FR	ML60A-3FR	ML60B-3FR	ML60C-3FR	ML60T-3FR	ML60S-3FR
ML60-2NRW	ML60A-2NRW	ML60B-2NRW	ML60C-2NRW	ML60T-2NRW	ML60S-2NRW
ML60-3NRW	ML60A-3NRW	ML60B-3NRW	ML60C-3NRW	ML60T-3NRW	ML60S-3NRW
ML60-2FRW	ML60A-2FRW	ML60B-2FRW	ML60C-2FRW	ML60T-2FRW	ML60S-2FRW
ML60-3FRW	ML60A-3FRW	ML60B-3FRW	ML60C-3FRW	ML60T-3FRW	ML60S-3FRW
DS60-2N	DS60A-2N	DS60B-2N	DS60C-2N	DS60T-2N	DS60S-2N
DS60-3N	DS60A-3N	DS60B-3N	DS60C-3N	DS60T-3N	DS60S-3N
DS60-2NW	DS60A-2NW	DS60B-2NW	DS60C-2NW	DS60T-2NW	DS60S-2NW
DS60-3NW	DS60A-3NW	DS60B-3NW	DS60C-3NW	DS60T-3NW	DS60S-3NW
DS60-2F	DS60A-2F	DS60B-2F	DS60C-2F	DS60T-2F	DS60S-2F
DS60-3F	DS60A-3F	DS60B-3F	DS60C-3F	DS60T-3F	DS60S-3F
DS60-2FW	DS60A-2FW	DS60B-2FW	DS60C-2FW	DS60T-2FW	DS60S-2FW
DS60-3FW	DS60A-3FW	DS60B-3FW	DS60C-3FW	DS60T-3FW	DS60S-3FW
DS60-2NR	DS60A-2NR	DS60B-2NR	DS60C-2NR	DS60T-2NR	DS60S-2NR
DS60-3NR	DS60A-3NR	DS60B-3NR	DS60C-3NR	DS60T-3NR	DS60S-3NR
DS60-2FR	DS60A-2FR	DS60B-2FR	DS60C-2FR	DS60T-2FR	DS60S-2FR
DS60-3FR	DS60A-3FR	DS60B-3FR	DS60C-3FR	DS60T-3FR	DS60S-3FR
DS60-2NRW	DS60A-2NRW	DS60B-2NRW	DS60C-2NRW	DS60T-2NRW	DS60S-2NRW
DS60-3NRW	DS60A-3NRW	DS60B-3NRW	DS60C-3NRW	DS60T-3NRW	DS60S-3NRW
DS60-2FRW	DS60A-2FRW	DS60B-2FRW	DS60C-2FRW	DS60T-2FRW	DS60S-2FRW
DS60-3FRW	DS60A-3FRW	DS60B-3FRW	DS60C-3FRW	DS60T-3FRW	DS60S-3FRW
DT60-2N	DT60A-2N	DT60B-2N	DT60C-2N	DT60T-2N	DT60S-2N
DT60-3N	DT60A-3N	DT60B-3N	DT60C-3N	DT60T-3N	DT60S-3N
DT60-2NW	DT60A-2NW	DT60B-2NW	DT60C-2NW	DT60T-2NW	DT60S-2NW
DT60-3NW	DT60A-3NW	DT60B-3NW	DT60C-3NW	DT60T-3NW	DT60S-3NW
DT60-2F	DT60A-2F	DT60B-2F	DT60C-2F	DT60T-2F	DT60S-2F
DT60-3F	DT60A-3F	DT60B-3F	DT60C-3F	DT60T-3F	DT60S-3F
DT60-2FW	DT60A-2FW	DT60B-2FW	DT60C-2FW	DT60T-2FW	DT60S-2FW
DT60-3FW	DT60A-3FW	DT60B-3FW	DT60C-3FW	DT60T-3FW	DT60S-3FW
DT60-2NR	DT60A-2NR	DT60B-2NR	DT60C-2NR	DT60T-2NR	DT60S-2NR
DT60-3NR	DT60A-3NR	DT60B-3NR	DT60C-3NR	DT60T-3NR	DT60S-3NR
DT60-2FR	DT60A-2FR	DT60B-2FR	DT60C-2FR	DT60T-2FR	DT60S-2FR
DT60-3FR	DT60A-3FR	DT60B-3FR	DT60C-3FR	DT60T-3FR	DT60S-3FR
DT60-2NRW	DT60A-2NRW	DT60B-2NRW	DT60C-2NRW	DT60T-2NRW	DT60S-2NRW

DT60-3NRW	DT60A-3NRW	DT60B-3NRW	DT60C-3NRW	DT60T-3NRW	DT60S-3NRW
DT60-2FRW	DT60A-2FRW	DT60B-2FRW	DT60C-2FRW	DT60T-2FRW	DT60S-2FRW
DT60-3FRW	DT60A-3FRW	DT60B-3FRW	DT60C-3FRW	DT60T-3FRW	DT60S-3FRW
DP60-2N	DP60A-2N	DP60B-2N	DP60C-2N	DP60T-2N	DP60S-2N
DP60-3N	DP60A-3N	DP60B-3N	DP60C-3N	DP60T-3N	DP60S-3N
DP60-2NW	DP60A-2NW	DP60B-2NW	DP60C-2NW	DP60T-2NW	DP60S-2NW
DP60-3NW	DP60A-3NW	DP60B-3NW	DP60C-3NW	DP60T-3NW	DP60S-3NW
DP60-2F	DP60A-2F	DP60B-2F	DP60C-2F	DP60T-2F	DP60S-2F
DP60-3F	DP60A-3F	DP60B-3F	DP60C-3F	DP60T-3F	DP60S-3F
DP60-2FW	DP60A-2FW	DP60B-2FW	DP60C-2FW	DP60T-2FW	DP60S-2FW
DP60-3FW	DP60A-3FW	DP60B-3FW	DP60C-3FW	DP60T-3FW	DP60S-3FW
DP60-2NR	DP60A-2NR	DP60B-2NR	DP60C-2NR	DP60T-2NR	DP60S-2NR
DP60-3NR	DP60A-3NR	DP60B-3NR	DP60C-3NR	DP60T-3NR	DP60S-3NR
DP60-2FR	DP60A-2FR	DP60B-2FR	DP60C-2FR	DP60T-2FR	DP60S-2FR
DP60-3FR	DP60A-3FR	DP60B-3FR	DP60C-3FR	DP60T-3FR	DP60S-3FR
DP60-2NRW	DP60A-2NRW	DP60B-2NRW	DP60C-2NRW	DP60T-2NRW	DP60S-2NRW
DP60-3NRW	DP60A-3NRW	DP60B-3NRW	DP60C-3NRW	DP60T-3NRW	DP60S-3NRW
DP60-2FRW	DP60A-2FRW	DP60B-2FRW	DP60C-2FRW	DP60T-2FRW	DP60S-2FRW
DP60-3FRW	DP60A-3FRW	DP60B-3FRW	DP60C-3FRW	DP60T-3FRW	DP60S-3FRW
ML60	ML60A	ML60B			
ML60C	ML51A-BU	ML51B-BU	ML51R-BU		
ML60D	ML60A-GN	ML60B-GN	ML60R-GN		
ML60E	ML51A-PK	ML51B-PK	ML51R-PK		
ML60F	ML60A-WT	ML60B-WT	ML60R-WT		

RFID Channel List

Channel	Frequency MHz	Channel	Frequency MHz	Channel	Frequency MHz	Channel	Frequency MHz
1	902.25	11	907.25	21	912.25	31	917.25
2	902.75	12	907.75	22	912.75	32	917.75
3	903.25	13	908.25	23	913.25	33	918.25
4	903.75	14	908.75	24	913.75	34	918.75
5	904.25	15	909.25	25	914.25	35	919.25
6	904.75	16	909.75	26	914.75	36	919.75
7	905.25	17	910.25	27	915.25	37	920.25
8	905.75	18	910.75	28	915.75	38	920.75
9	906.25	19	911.25	29	916.25	39	921.25
10	906.75	20	911.75	30	916.75	40	921.75
Channel	Frequency MHz	Channel	Frequency MHz	Channel	Frequency MHz	Channel	Frequency MHz
41	922.25	51	927.25	---	---	---	---
42	922.75	52	927.75	---	---	---	---
43	923.25	---	---	---	---	---	---
44	923.75	---	---	---	---	---	---
45	924.25	---	---	---	---	---	---
46	924.75	---	---	---	---	---	---
47	925.25	---	---	---	---	---	---
48	925.75	---	---	---	---	---	---
49	926.25	---	---	---	---	---	---
50	926.75	---	---	---	---	---	---

Note: According to section 15.31(m), regards to the operating frequency range over 10MHz, the Lowest, Middle, and the Highest frequency of channel were selected to perform the test. The selected frequency see below:

Channel	Frequency (MHz)
1	902.25
20	915.25
40	927.75

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: 2AVAP-ML60 filing to comply with Section 15.249 of the FCC Part 15, Subpart C Rule.

1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013). Radiated emission measurement was performed in semi-anechoic chamber and conducted emission measurement was performed in shield room. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters. All other measurements were made in accordance with the procedures in 47 CFR Part 2.

1.4 Equipment Modifications

Not available for this EUT intended for grant.

1.5 Support Device

Notebook	:	Manufacturer: IBM Model: 1834 P/N: 13N5615 CE, FCC: DOC
Adapter (For Notebook)	:	Manufacturer: Huntkey Model: HKA09019047-6D I/P: AC 100-240V 50-60Hz, 1.5A O/P: DC 19V 4.74A

1.6 Test Facility and Location

Site Description

- EMC Lab : Listed by CNAS, August 13, 2018
The certificate is valid until August 13, 2024
The Laboratory has been assessed and proved to be in compliance with CNAS/CL01
The Certificate Registration Number is L5795.
- Listed by A2LA, November 01, 2017
The certificate is valid until December 31, 2021
The Laboratory has been assessed and proved to be in compliance with ISO17025
The Certificate Registration Number is 4429.01
- Listed by FCC, November 06, 2017
The Designation Number is CN1214
Test Firm Registration Number: 907417
- Listed by Industry Canada, June 08, 2017
The Certificate Registration Number. Is 46405-9743
- Name of Firm : Dongguan Nore Testing Center Co., Ltd.
(Dongguan NTC Co., Ltd.)
- Site Location : Building D, Gaosheng Science and Technology
Park, Hongtu Road, Nancheng District, Dongguan
City, Guangdong Province, China

1.7 Summary of Test Results

FCC Rules	Description Of Test	Uncertainty	Result
§15.207 (a)	AC Power Line Conducted Emission	±1.06dB	Compliant
§15.215(c)	20dB Bandwidth	±1.42 x10 ⁻⁴ %	Compliant
§15.249(d)	Band Edge	±1.70dB	Compliant
§15.249, §15.209(a), §15.205(a), §15.35	Radiated Spurious Emissions and Restricted Bands	±3.70dB	Compliant
§15.203	Antenna Requirement	N/A	Compliant

2. SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 Special Accessories

Not available for this EUT intended for grant.

2.3 Description of test modes

The EUT has been tested under continuous operating condition (The duty cycle >98%). Test program used to control the EUT staying in continuous transmitting mode. The Lowest, Middle and highest channel were chosen for testing, and modulation type ASK was tested, but only the worst case data is shown in this report.

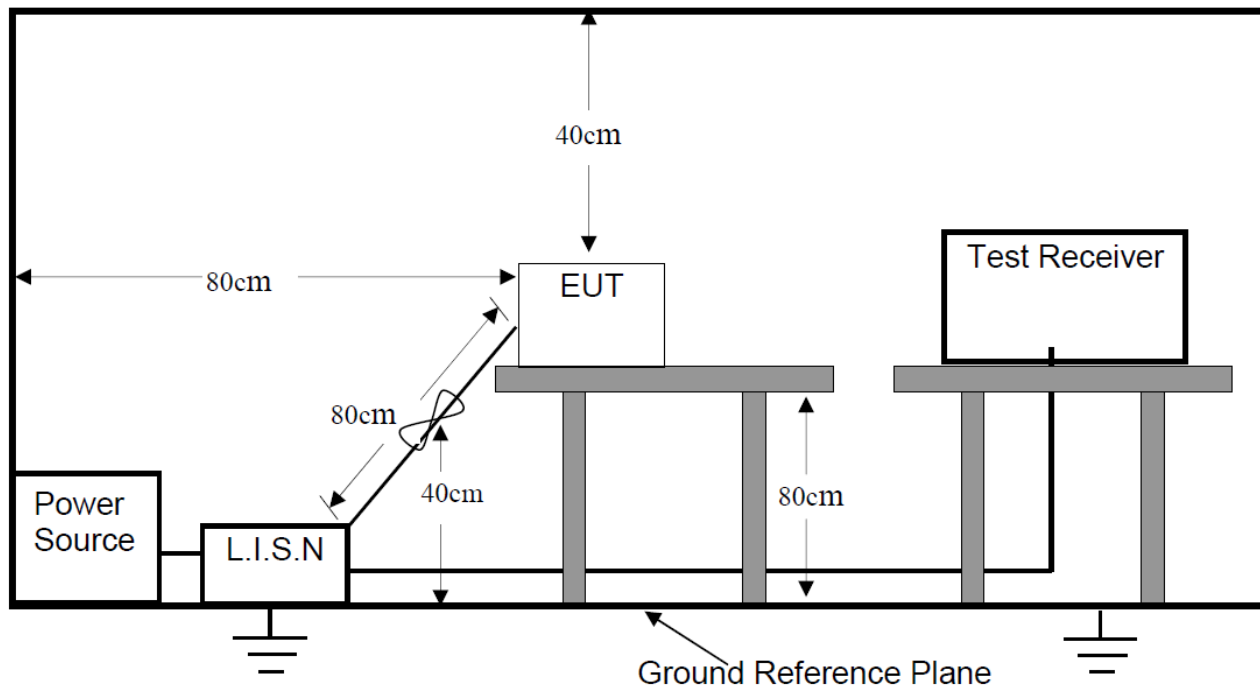
Test Item	Software	Description
Conducted RF Testing and Radiated testing	RFID_Reader_GUI_V2.1	Set the EUT to different modulation and channel

2.4 EUT Exercise

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements.

3. AC POWER LINE CONDUCTED EMISSIONS TEST

3.1 Test SET-UP (Block Diagram of Configuration)



3.2 Test Condition

Test Requirement: FCC Part 15.207

Frequency Range: 150KHz ~ 30MHz

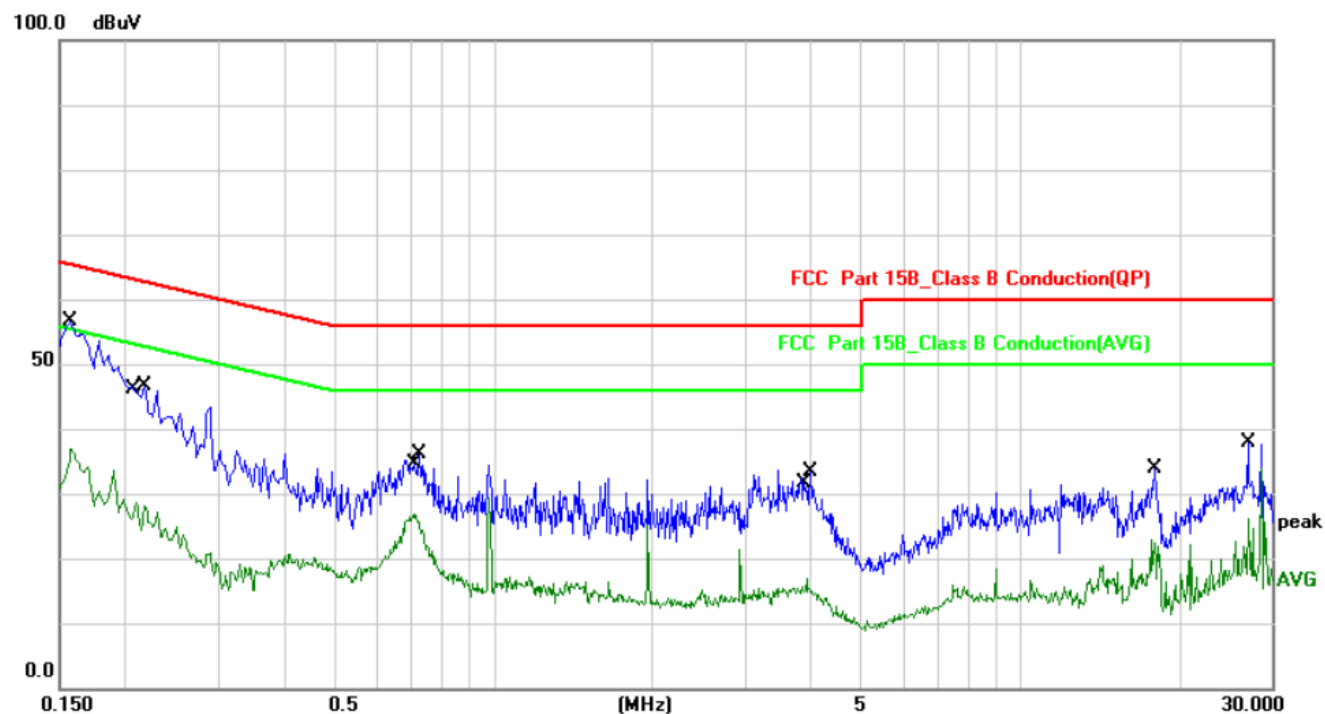
Detector: RBW 9KHz, VBW 30KHz

Operation Mode: RFID Communication

3.3 Measurement Results

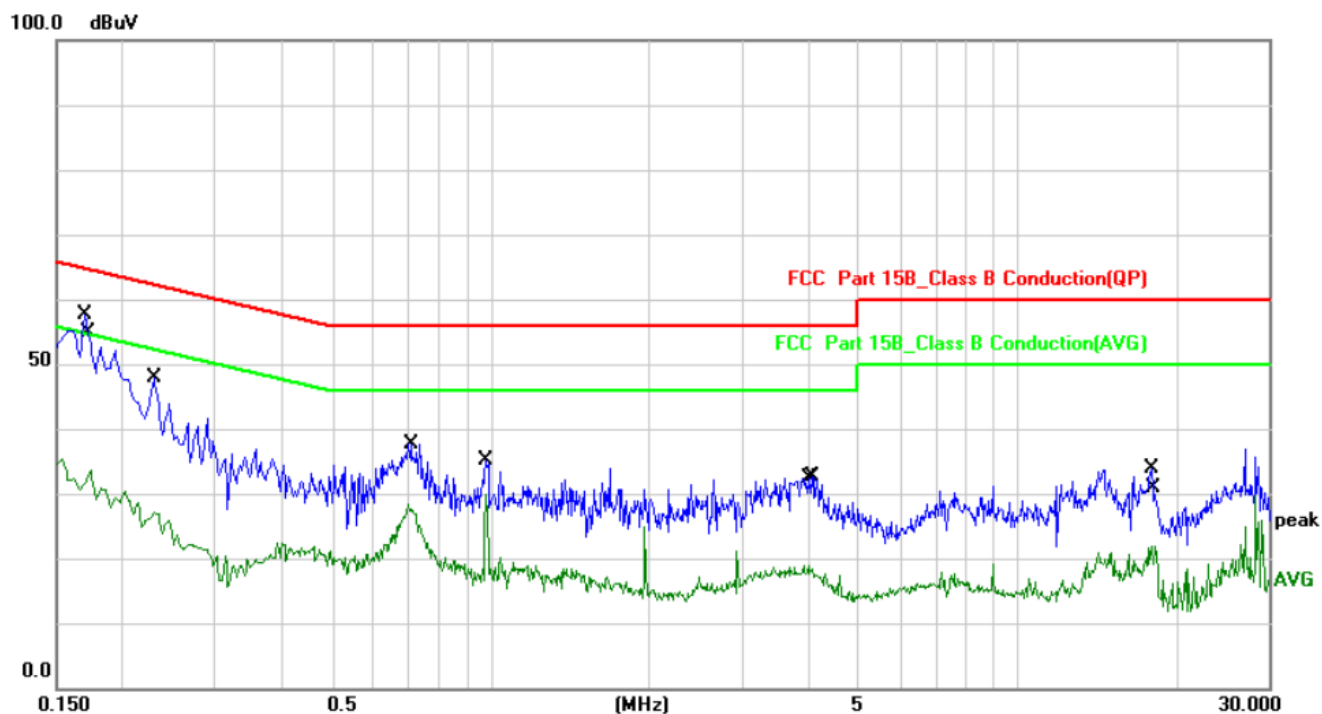
Please refer to following plots of the worst case.

E.U.T :	Label Printer	Model Name :	ML60R-WT
Temperature :	24°C	Relative Humidity :	52.8 %
Pressure :	1006 hPa	Test Voltage :	AC 120V/60Hz
Test Mode :	rfid Printing	Phase:	Line



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1580	6.62	50.01	56.63	65.56	-8.93	QP	P	
2	0.1580	6.62	30.23	36.85	55.56	-18.71	AVG	P	
3	0.2099	6.54	21.99	28.53	53.21	-24.68	AVG	P	
4	0.2179	6.52	40.03	46.55	62.89	-16.34	QP	P	
5	0.7059	6.49	20.40	26.89	46.00	-19.11	AVG	P	
6	0.7259	6.49	29.60	36.09	56.00	-19.91	QP	P	
7	3.9260	6.58	10.30	16.88	46.00	-29.12	AVG	P	
8	3.9940	6.58	26.91	33.49	56.00	-22.51	QP	P	
9	17.6938	6.53	16.42	22.95	50.00	-27.05	AVG	P	
10	18.0018	6.53	27.37	33.90	60.00	-26.10	QP	P	
11	27.0019	6.71	31.13	37.84	60.00	-22.16	QP	P	
12	27.1499	6.73	19.45	26.18	50.00	-23.82	AVG	P	

E.U.T :	Label Printer	Model Name :	ML60R-WT
Temperature :	24°C	Relative Humidity :	52.8 %
Pressure :	1006 hPa	Test Voltage :	AC 120V/60Hz
Test Mode :	rfid Printing	Phase:	Neutral



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1700	6.60	50.95	57.55	64.96	-7.41	QP	P	
2	0.1737	6.60	27.06	33.66	54.78	-21.12	AVG	P	
3	0.2300	6.52	41.42	47.94	62.45	-14.51	QP	P	
4	0.2300	6.52	20.51	27.03	52.45	-25.42	AVG	P	
5	0.6978	6.49	21.80	28.29	46.00	-17.71	AVG	P	
6	0.7058	6.49	31.17	37.66	56.00	-18.34	QP	P	
7	0.9818	6.47	28.64	35.11	56.00	-20.89	QP	P	
8	0.9818	6.47	23.35	29.82	46.00	-16.18	AVG	P	
9	4.0179	6.58	12.33	18.91	46.00	-27.09	AVG	P	
10	4.0857	6.58	26.15	32.73	56.00	-23.27	QP	P	
11	18.0017	6.53	27.46	33.99	60.00	-26.01	QP	P	
12	18.2419	6.53	15.44	21.97	50.00	-28.03	AVG	P	

4. 20DB BANDWIDTH

4.1 Measurement Procedure

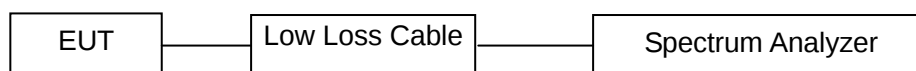
ASK 20dB Channel Bandwidth, FCC Rule 15.215(c):

Must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer was set as below according to FCC KDB558074(v03r05):

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW.
4. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

4.2 Test SET-UP (Block Diagram of Configuration)



4.3 Measurement Results

RBW:	30kHz	VBW:	100kHz
Spectrum Detector:	PK	Test By:	Sance
Temperature:	24 °C	Humidity:	50 %
Test Result:	PASS	Test Date:	December 13, 2019

Channel	Test Frequency (MHz)	20dB Bandwidth (kHz)
Low	902.25	208.74
Middle	914.75	205.82
High	927.75	206.44

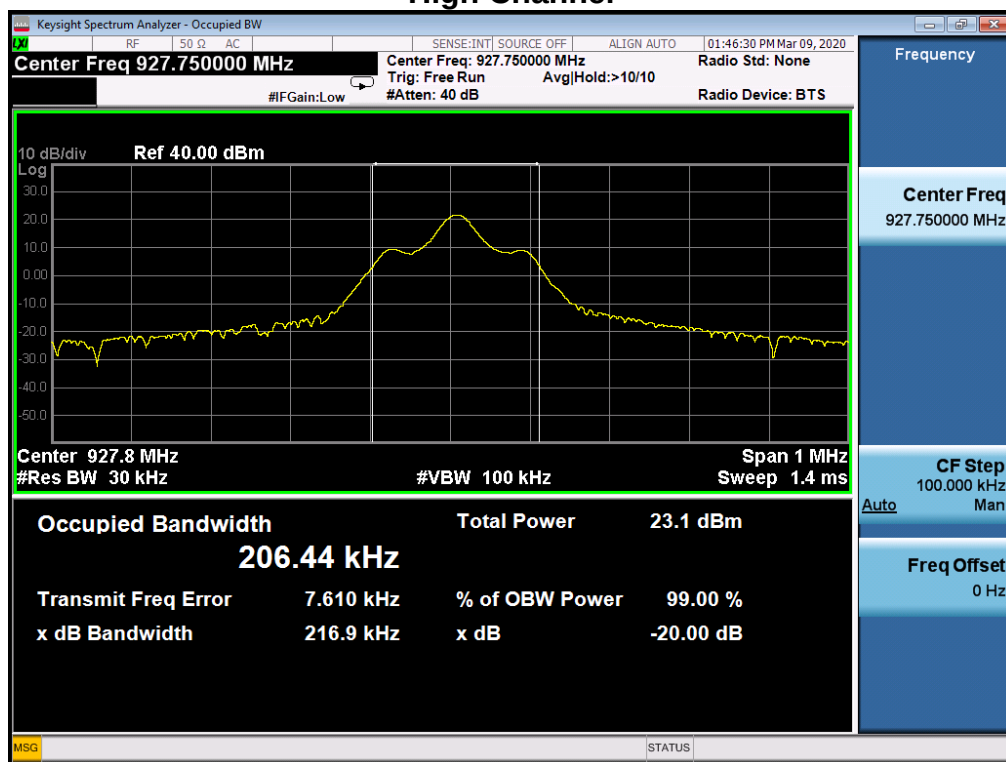
Low Channel



Middle Channel



High Channel



5. BAND EDGE

5.1 Measurement Procedure

Radiate Band Edge:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
RBW=120kHz, VBW=300kHz
6. The band edges was measured and recorded.

5.2 Limit

The Requirement For Section 15.249(d):

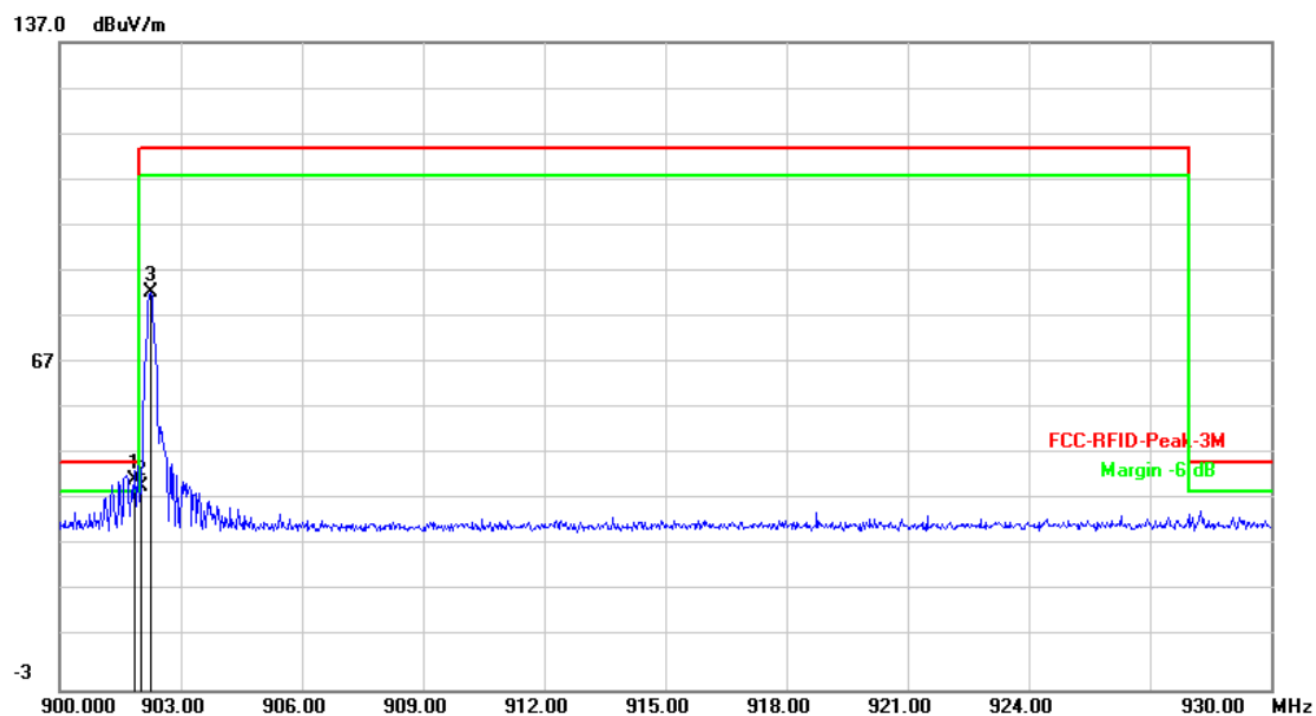
Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

5.3 Measurement Results

Please see below test table and plots.

For Radiated restricted band:

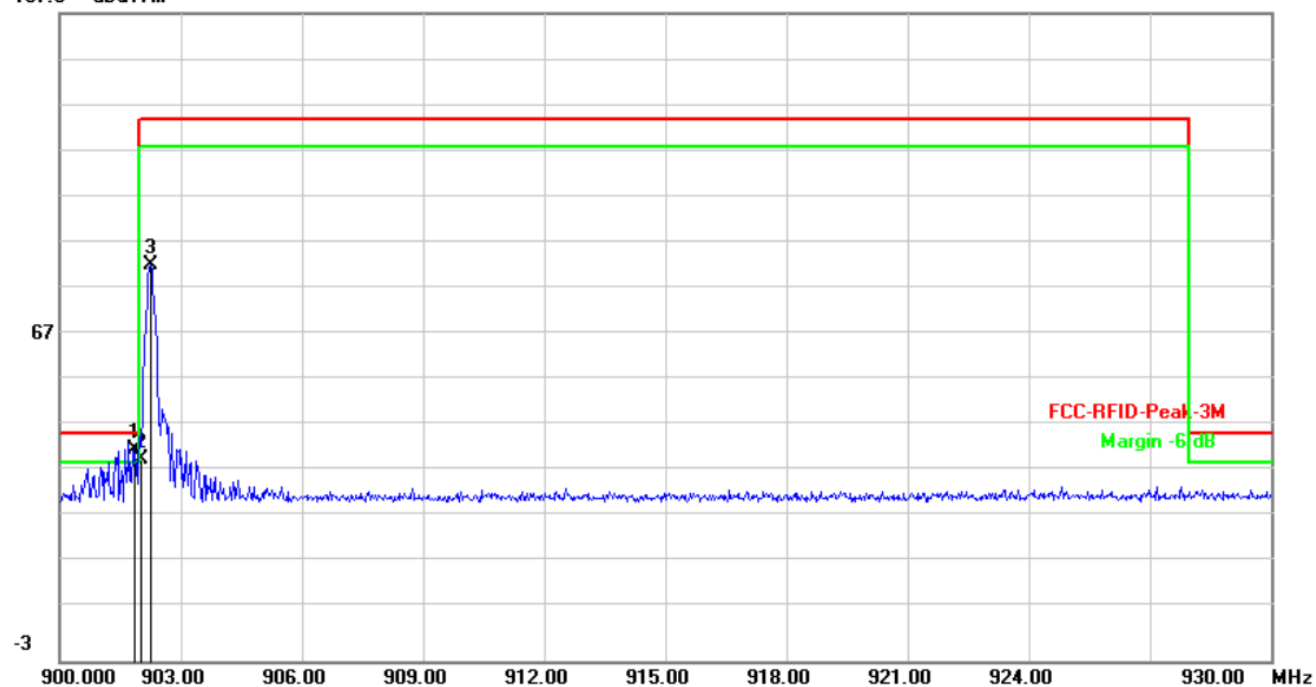
Temperature:	25 °C	Humidity:	64 %
Test By:	Sance	Test Date:	December 03, 2019
Measured Distance:	3m	Test Result:	PASS
Test Mode:	902.25MHz	Ant. Polarization:	Horizontal



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	901.8600	-1.20	43.70	42.50	46.00	-3.50	QP	100	97	P	
2	902.0000	-1.19	42.29	41.10	46.00	-4.90	QP	100	87	P	
3	902.2500	-1.18	83.99	82.81	114.00	-31.19	QP	100	305	P	

Temperature:	25 °C	Humidity:	64 %
Test By:	Sance	Test Date:	December 03, 2019
Measured Distance:	3m	Test Result:	PASS
Test Mode:	902.25MHz	Ant. Polarization:	Vertical

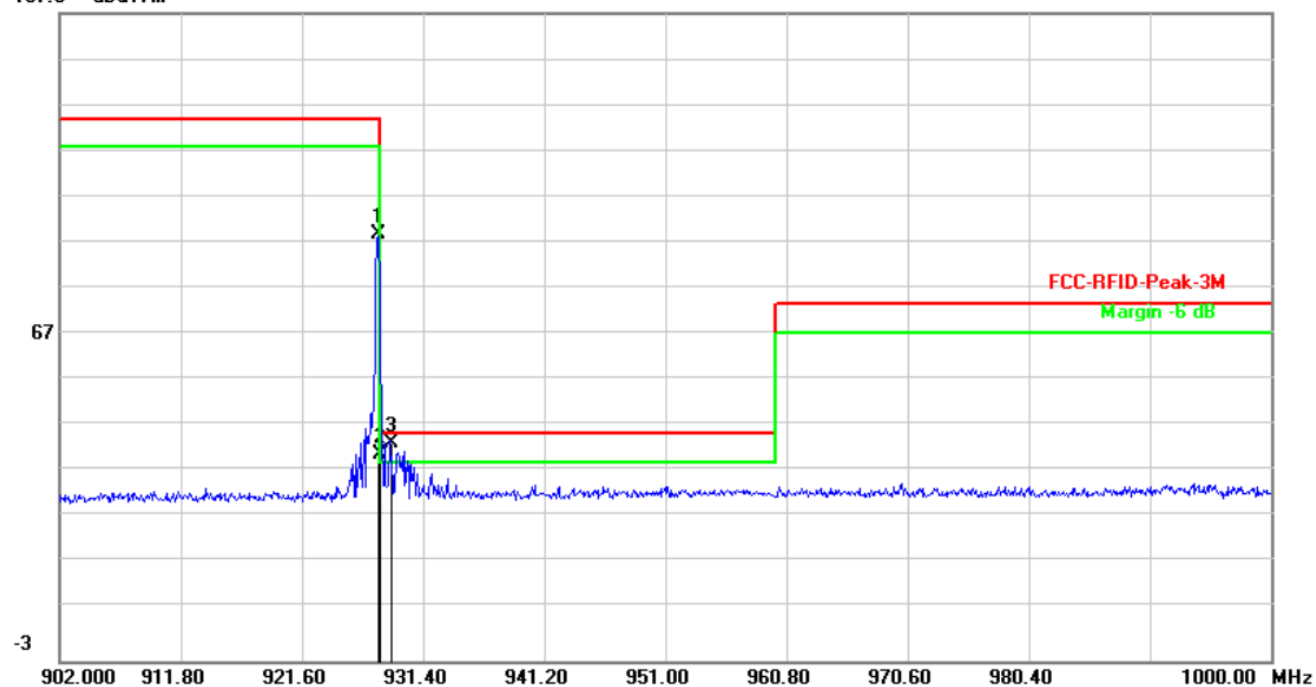
137.0 dBuV/m



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	901.8600	-1.20	43.90	42.70	46.00	-3.30	QP	100	23	P	
2	902.0000	-1.19	41.79	40.60	46.00	-5.40	QP	100	21	P	
3	902.2500	-1.18	83.80	82.62	114.00	-31.38	QP	100	105	P	

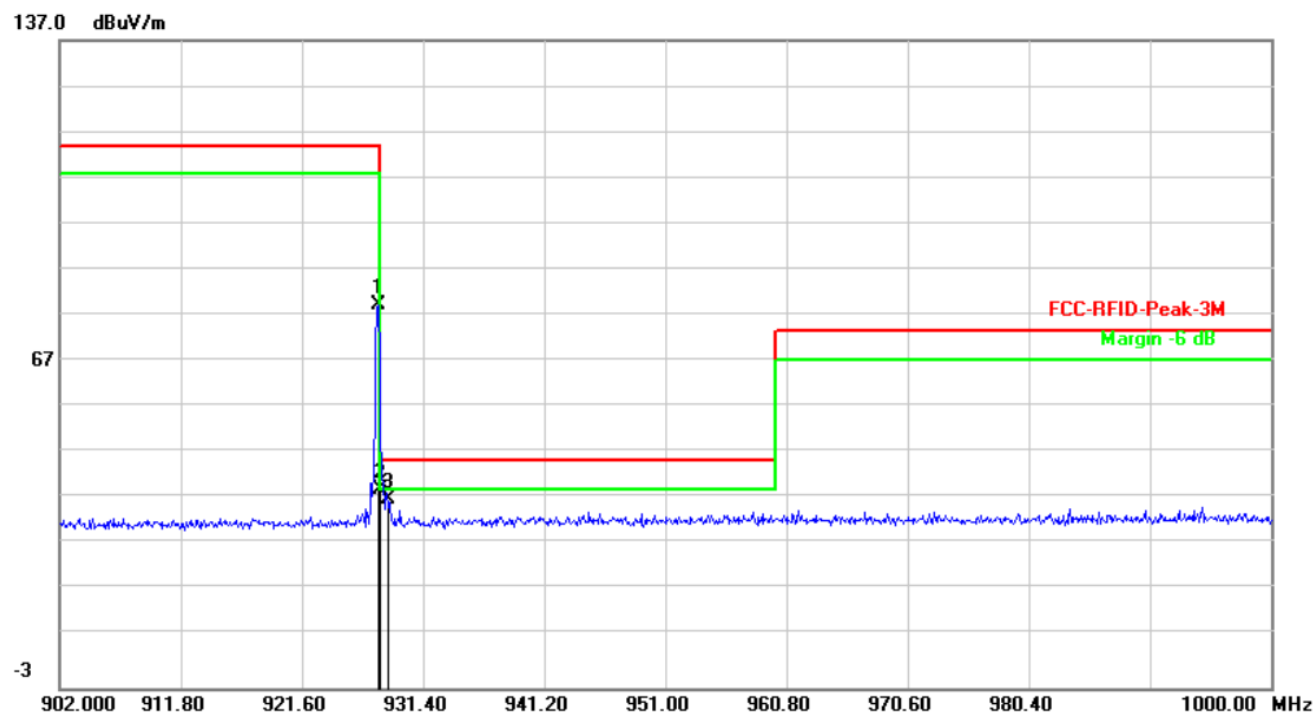
Temperature:	25 °C	Humidity:	64 %
Test By:	Sance	Test Date:	December 03, 2019
Measured Distance:	3m	Test Result:	PASS
Test Mode:	927.75MHz	Ant. Polarization:	Horizontal

137.0 dBuV/m



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	927.7500	-0.67	89.94	89.27	114.00	-24.73	QP	100	98	P	
2	928.0000	-0.67	42.17	41.50	46.00	-4.50	QP	200	205	P	
3	928.8519	-0.65	44.81	44.16	46.00	-1.84	QP	100	46	P	

Temperature:	25 °C	Humidity:	64 %
Test By:	Sance	Test Date:	December 03, 2019
Measured Distance:	3m	Test Result:	PASS
Test Mode:	927.75MHz	Ant. Polarization:	Vertical



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	927.7500	-0.67	80.58	79.91	114.00	-34.09	QP	100	103	P	
2	928.0000	-0.67	40.67	40.00	46.00	-6.00	QP	100	201	P	
3	928.6557	-0.65	38.39	37.74	46.00	-8.26	QP	100	103	P	

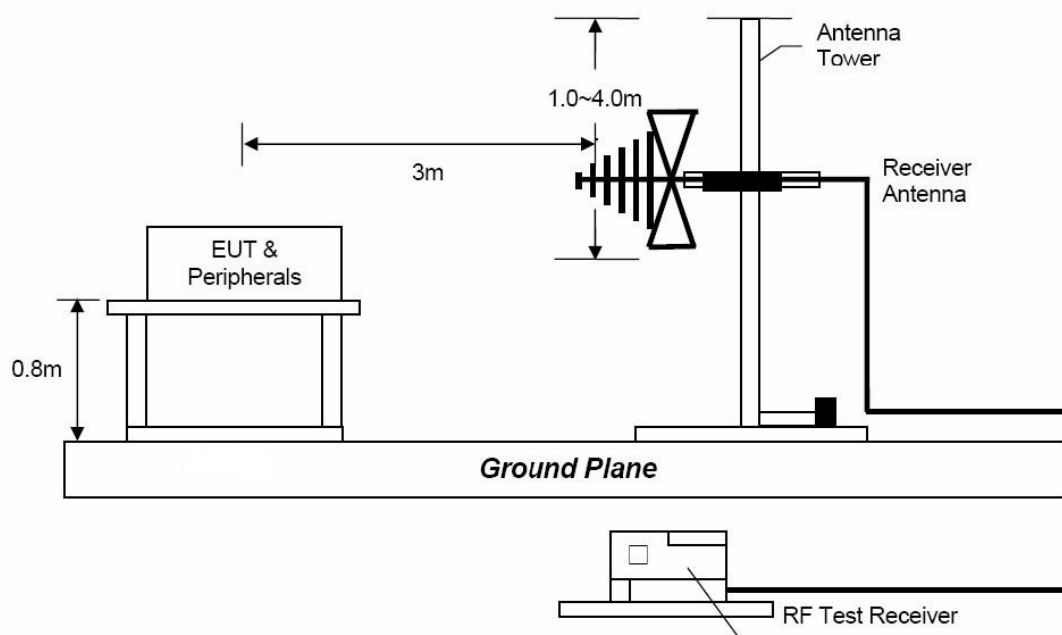
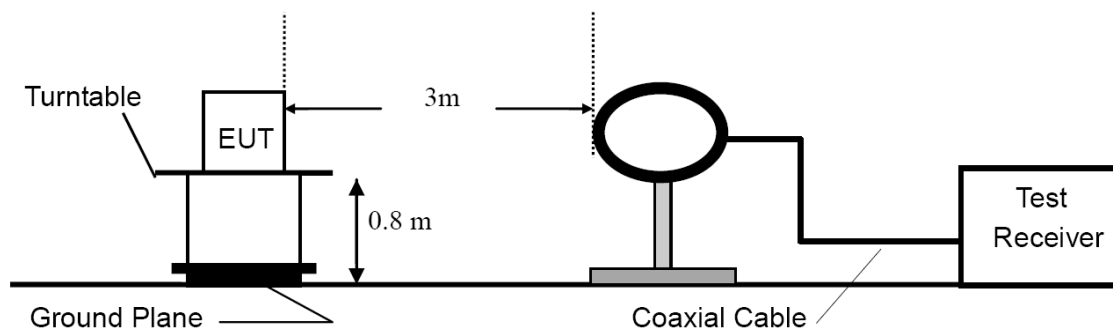
Note:

- (1) Result= Reading + Factor
- (2) Factor= Antenna Gain + Cable Loss – Amplifier Gain
- (3) Horn antenna used for the emission over 1000MHz.

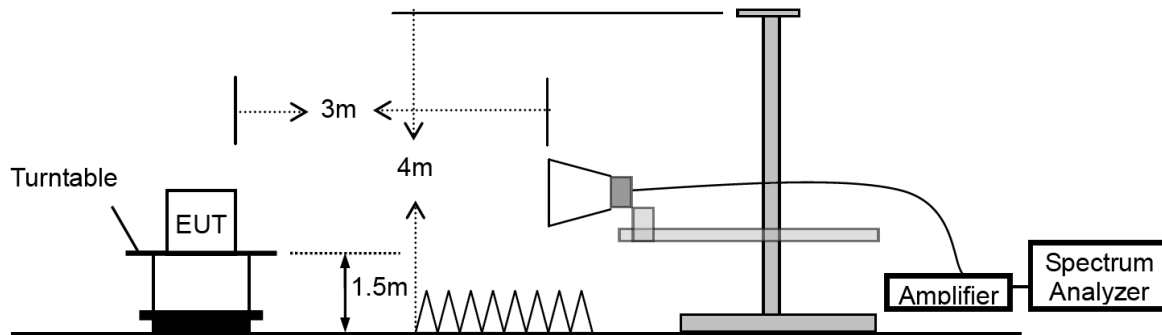
6. RADIATED SPURIOUS EMISSIONS

6.1 Test SET-UP (Block Diagram of Configuration)

6.1.1 Radiated Emission Test Set-Up, Frequency below 30MHz



6.1.2 Radiated Emission Test Set-Up, Frequency above 1GHz



6.2 Measurement Procedure

- Blow 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi- anechoic chamber room.
- For the radiated emission test above 1GHz:
The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter full anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. The test-receiver system was set to peak detect function and specified bandwidth with maximum hold mode.
- A Quasi-peak measurement was then made for that frequency point for below 1GHz test. PK and AV for above 1GHz emission test.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

Frequency Band (MHz)	Level	Resolution Bandwidth	Video Bandwidth
30 to 1000	QP	120 kHz	300 kHz
Above 1000	Peak	1 MHz	3 MHz
	Average	1 MHz	10 Hz

6.3 Limit

Frequency range MHz	Distance Meters	Field Strengths Limit (15.209)
		$\mu\text{V/m}$
0.009 ~ 0.490	300	$2400/F(\text{kHz})$
0.490 ~ 1.705	30	$24000/F(\text{kHz})$
1.705 ~ 30	30	30
30 ~ 88	3	100
88 ~ 216	3	150
216 ~ 960	3	200
Above 960	3	500

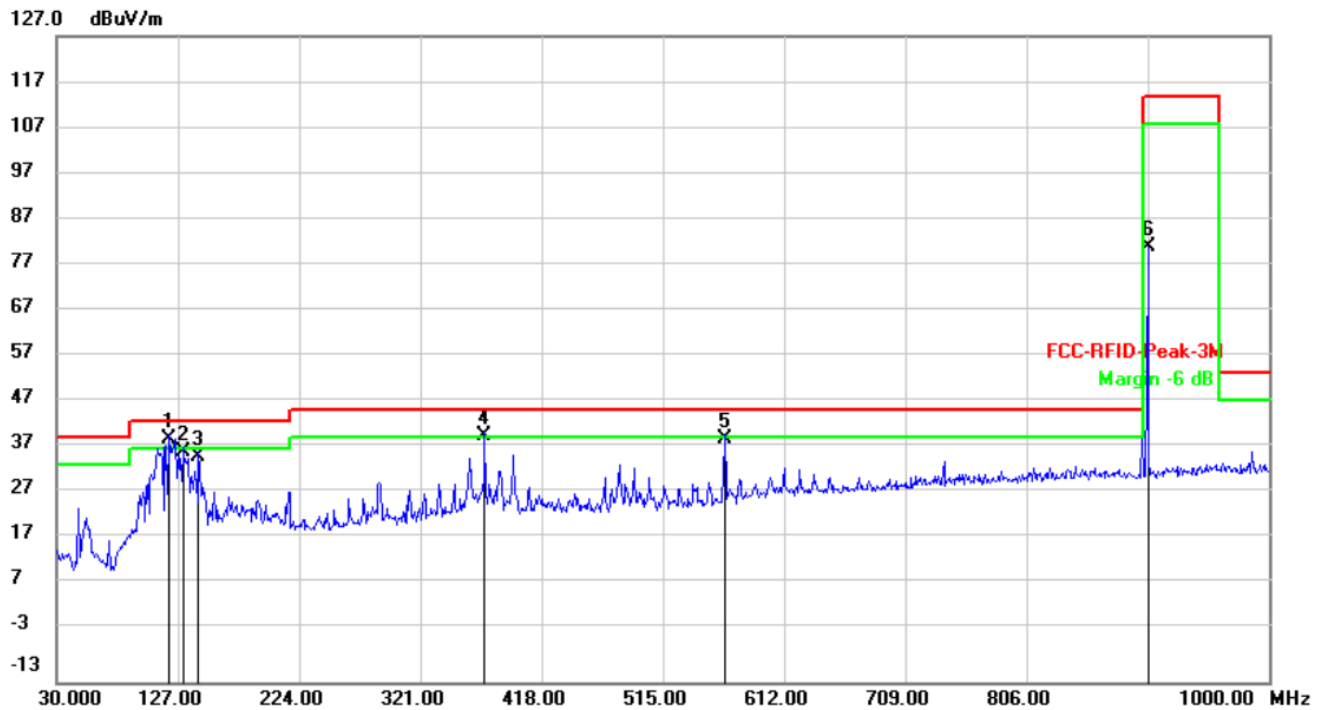
- Remark :
- (1) Emission level (dB) μV = 20 log Emission level $\mu\text{V/m}$
 - (2) The smaller limit shall apply at the cross point between two frequency bands.
 - (3) As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.
 - (4) The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.
 - (5) §15.247(d) specifies that emissions which fall in the restricted bands, as defined in §15.205 comply with radiated emission limits specified in §15.209.

6.4 Measurement Results

Please refer to following plots of the worst case: Low channel.

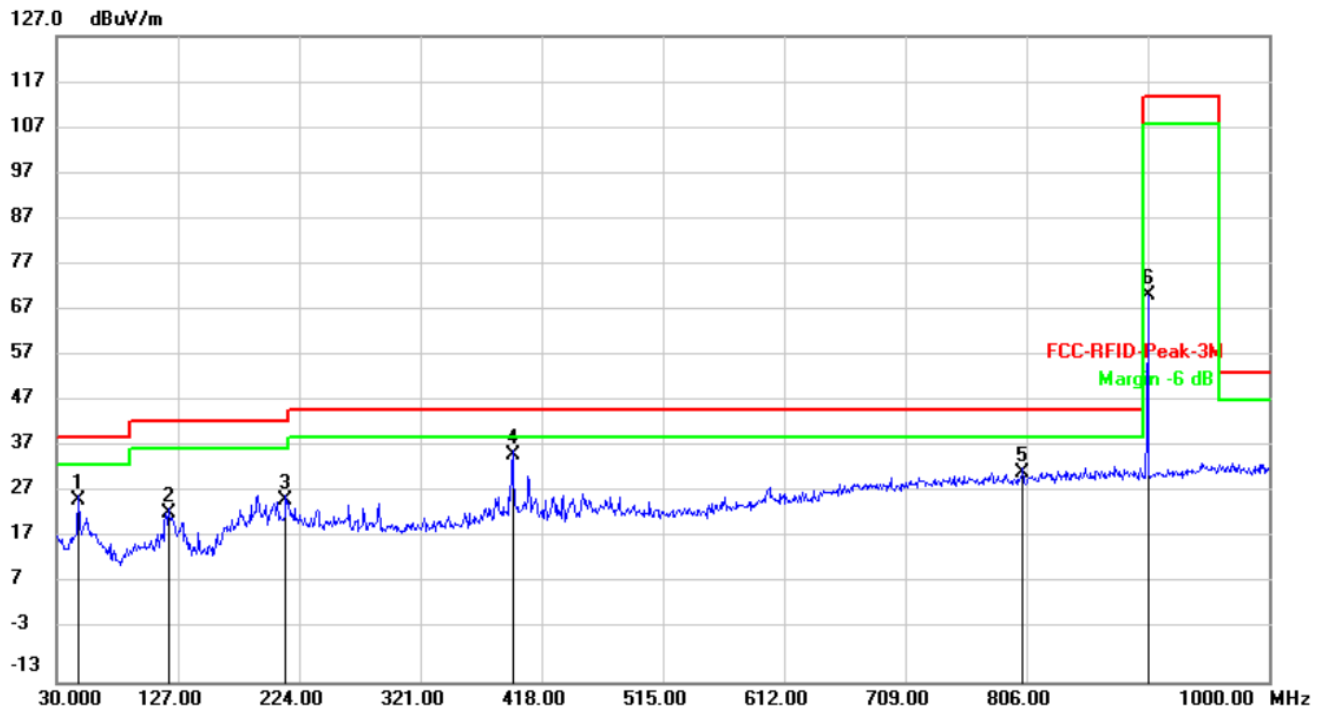
Note: Below 30MHz, the emissions are lower than 20dB below the allowable limit. Therefore, 9kHz-30MHz data were not recorded.

E.U.T :	Label Printer	Model Name :	ML60R-WT
Temperature :	25°C	Relative Humidity :	64 %
Pressure :	1006 hPa	Test Voltage :	AC 120V/60Hz
Test Mode :	902.25MHz	Phase:	Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB/m	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree	Comment
1	*	119.2400	53.49	-13.89	39.60	43.50	-3.90	QP	200	183	
2		130.8800	52.00	-15.20	36.80	43.50	-6.70	QP	200	85	
3		143.4900	51.39	-15.59	35.80	43.50	-7.70	QP	200	93	
4	!	372.4100	49.58	-9.18	40.40	46.00	-5.60	QP	300	201	
5		564.4699	45.78	-6.08	39.70	46.00	-6.30	QP	100	255	
6		903.0000	82.52	-1.17	81.35	114.00	-32.65	QP	100	31	

E.U.T :	Label Printer	Model Name :	ML60R-WT
Temperature :	25°C	Relative Humidity :	64 %
Pressure :	1006 hPa	Test Voltage :	AC 120V/60Hz
Test Mode :	902.25MHz	Phase:	Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB/m	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree	Comment
1		47.4600	39.80	-13.50	26.30	40.00	-13.70	QP	300	95	
2		119.2400	40.39	-16.89	23.50	43.50	-20.00	QP	100	254	
3		213.3300	42.66	-16.16	26.50	43.50	-17.00	QP	100	102	
4	*	394.7200	47.34	-11.14	36.20	46.00	-9.80	QP	100	25	
5		803.0900	34.19	-1.89	32.30	46.00	-13.70	QP	100	36	
6		903.0000	72.13	-1.17	70.96	114.00	-43.04	QP	100	131	

Radiated Emission(Above 1G)

Modulation:	ASK	Test Date:	December 03, 2019
Frequency Range:	1-25GHz	Temperature:	25 °C
Test Result:	PASS	Humidity:	64 %
Measured Distance:	3m	Test Results:	PASS
Test By:	Sance		

Freq. (MHz)	Ant. Pol. (H/V)	Reading Level(dBuV)		Factor (dB/m)	Emission Level (dBuV)		Limit 3m (dBuV/m)		Margin (dB)	
		PK	AV		PK	AV	PK	AV	PK	AV
Operation Mode: TX Mode (Low)										
1805	H	59.44	43.95	-3.43	56.01	40.52	74.00	54.00	-17.99	-13.48
2706.75	H	47.66	32.38	1.13	48.79	33.51	74.00	54.00	-25.21	-20.49

1805	V	55.82	42.45	-3.43	52.39	39.02	74.00	54.00	-21.61	-14.98
2706.75	V	48.74	33.52	1.13	49.87	34.65	74.00	54.00	-24.13	-19.35

Operation Mode: TX Mode (Mid)										
1830.5	H	58.20	43.22	-3.09	55.11	40.13	74.00	54.00	-18.89	-13.87
2745.75	H	48.01	32.58	1.27	49.28	33.85	74.00	54.00	-24.72	20.15

1830.5	V	55.47	43.10	-3.09	52.38	40.01	74.00	54.00	-21.62	-13.99
2745.75	V	48.49	32.32	1.27	49.76	33.59	74.00	54.00	-24.24	-20.41

Operation Mode: TX Mode (High)										
1855.5	H	61.08	43.11	-2.76	58.32	40.35	74.00	54.00	-15.68	-13.65
2783.25	H	48.70	33.32	1.35	50.05	34.67	74.00	54.00	-23.95	-19.33

1855.5	V	55.14	43.32	-2.76	52.38	40.56	74.00	54.00	-21.62	-13.44
2783.25	V	48.66	33.61	1.35	50.01	34.96	74.00	54.00	-23.99	-19.04

Other harmonics emissions are lower than 10dB below the allowable limit.

- Note:**
- (1) All Readings are Peak Value and AV.
 - (2) Emission Level= Reading Level + Factor
 - (3) Factor= Antenna Gain + Cable Loss – Amplifier Gain
 - (4) Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 10dB below the permissible limits.
 - (5) Measurement uncertainty: ± 3.7 dB.
 - (6) Horn antenna used for the emission over 1000MHz.

7. FUNDAMENTAL WAVE FIELD STRENGTH

7.1 Measurement Procedure

Fundamental wave:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the field strength of the emission:
RBW=1MHz, VBW=3MHz
6. The field strength was measured and recorded.

7.2 Limit

Fundamental frequency	Distance Meters	Limit (dBuV/m)
902-928 MHz	3	114

7.3 Measurement Results

Please see below test table

Modulation:	ASK		
Frequency Range:	902.25-927.75MHz	Test Date:	December 03, 2019
Test Result:	PASS	Temperature:	25 °C
Measured Distance:	3m	Humidity:	64 %
Test By:	Sance	Test Results:	PASS

Freq. (MHz)	Ant. Pol. (H/V)	Reading Level(dBuV)	Factor (dB/m)	Emission Level (dBuV)	Limit 3m (dBuV/m)	Margin (dB)
Operation Mode: TX Mode (Low)						
902.25	V	83.24	-1.18	82.06	114	-31.94
902.25	H	83.77	-1.18	82.59	114	-31.41
Operation Mode: TX Mode (Mid)						
915.25	V	78.36	-0.92	77.44	114	-36.56
915.25	H	85.64	-0.92	84.72	114	-29.28
Operation Mode: TX Mode (High)						
927.75	V	80.24	-0.67	79.57	114	-34.43
927.75	H	87.97	-0.67	87.30	114	-26.70

8. ANTENNA APPLICATION

8.1 Antenna requirement

According to of FCC part 15C section 15.203 and 15.240:

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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Systems operating in the 2400-2483.5MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

8.2 Measurement Results

The antenna is FPC antenna that no antenna other than furnished by the responsible party shall be used with the device, and the best case gain of the antenna is 3dBi, So, the antenna is consider meet the requirement.

9. TEST EQUIPMENT LIST

Description	Manufacturer	Model Number	Serial Number	Characteristics	Calibration Date	Calibration Due Date
Test Receiver	Rohde & Schwarz	ESCI7	100837	9KHz~7GHz	Mar. 14, 2019	1 year
Antenna	Schwarzbeck	VULB9162	9162-010	30MHz~7GHz	Mar. 23, 2019	1 year
Spectrum Analyzer	Rohde & Schwarz	FSU26	200409/026	20Hz~26.5GHz	Mar. 14, 2019	1 year
Spectrum Analyzer	Keysight	N9020A	MY54200831	20Hz~26.5GHz	Apr. 24, 2019	1 year
Spectrum Analyzer	Rohde & Schwarz	FSV40	101003	10Hz~40GHz	Apr. 24, 2019	1 year
Horn Antenna	Schwarzbeck	BBHA9170	9170-372	15GHz~40GHz	Mar. 23, 2019	1 year
Pre-Amplifier	EMCI	EMC 184045	980102	18GHz~40GHz	Apr. 24, 2019	1 year
Power Sensor	DARE	RPR3006W	15100041SN O64	100MHz~6GHz	Mar. 14, 2019	1 year
Communication Tester	Rohde & Schwarz	CMW500	149004	70MHz~6GHz	Mar. 14, 2019	1 year
Horn Antenna	COM-Power	AH-118	071078	500MHz~18GHz	Mar. 23, 2019	1 year
Pre-Amplifier	HP	HP 8449B	3008A00964	1GHz~26.5GHz	Mar. 14, 2019	1 year
Pre-Amplifier	HP	HP 8447D	1145A00203	100KHz~1.3GHz	Mar. 14, 2019	1 year
Loop Antenna	Schwarzbeck	FMZB 1513	1513-272	9KHz~30MHz	Apr. 24, 2019	1 year
Temperature & Humidity Chamber	REMAFEE	SYHR225L	N/A	-40~150℃	Apr. 24, 2019	1 year
DC Source	MY	MY8811	N/A	0~30V	N/A	N/A
Temporary antenna connector	TESCOM	SS402	N/A	9KHz~25GHz	N/A	N/A
Power Meter	Anritsu	ML2495A	1139001	100k-65GHz	Apr. 24, 2019	1 year
Power Sensor	Anritsu	MA2411B	100345	300M-40GHz	Apr. 24, 2019	1 year
Test Software	EZ	EZ_EMC	N/A	N/A	N/A	N/A

---END---