



Test Report

FCC ID: 2ARXB-B21-C

Date of issue: Oct. 13, 2020

Report Number: MTi20082807-5E5

Sample Description: remembrance portable printer

Model(s): B21-C, B21-C2B, B21-C2W, B21-C2U, B21-D, B21-D2B, B21-D2W, B21-D2U, B21-A, B21-B

Applicant: Wuhan Jingchen Intelligent Identification Technology Co., Ltd.

Address: Room 1201-1, Mars Space No.366, Heng'an road hongshan district, Wuhan, China

Date of Test: Sept. 15, 2020 – Oct. 13, 2020

Shenzhen Microtest Co., Ltd.
<http://www.mtitest.com>

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Test Result Certification

Applicant's name: Wuhan Jingchen Intelligent Identification Technology Co., Ltd.

Address: Room 1201-1, Mars Space No.366, Heng'an road hongshan district, Wuhan, China

Manufacture's Name: Wuhan Jingchen Intelligent Identification Technology Co., Ltd.

Address: Room 1201-1, Mars Space No.366, Heng'an road hongshan district, Wuhan, China

Product name: remembrance portable printer

Trademark: NIIMBOT

Model name: B21-C, B21-C2B, B21-C2W, B21-C2U, B21-D, B21-D2B, B21-D2W, B21-D2U, B21-A, B21-B

Standards: FCC Part 15.225

Test Procedure: ANSI C63.10-2013

This device described above has been tested by Shenzhen Microtest Co., Ltd. and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

Tested by:

Demi Mu

Oct. 13, 2020

Reviewed by:

Leo Su

Oct. 13, 2020

Approved by:

Tom Xue

Oct. 13, 2020



1 General description

1.1 Feature of equipment under test (EUT)

Product name:	remembrance portable printer
Model name:	B21-C
Series model:	B21-C2B, B21-C2W, B21-C2U, B21-D, B21-D2B, B21-D2W, B21-D2U, B21-A, B21-B
Difference of series model:	All the models are the same circuit and RF module, except the sales methods, sales areas and colors.
Operating frequency:	13.56MHz
Modulation type:	ASK
Antenna Tpye:	PCB antenna
Maximum Field Strength:	53.15dB μ V/m at 3 meter
Hardware Version:	V1.01
Software Version:	V1.01
Power Supply:	DC 7.4V from battery or DC 5V from adapter AC 120/60Hz
Battery:	DC 7.4V 1200mAh
Serial number:	MTi20082807-5-S0001



1.2 Operation channel list

Channel	Frequency (MHz)
01	13.56

1.3 Test channel list

Channel	Frequency (MHz)
01	13.56

1.4 Ancillary equipment list

Equipment	Model	S/N	Manufacturer	Certificate type
Adapter	HW-090200CH0	/	Huizhou BYD Electronics Co., Ltd.	/

1.5 Description of support units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Brand	Model/Type No.	Series No.	Note
/	/	/	/	/	/
/	/	/	/	/	/

Note:

(1)The support equipment was authorized by Declaration of Confirmation.

(2)For detachable type I/O cable should be specified the length in cm in 『Length』 column.

1.6 EUT operation mode

During testing, the EUT is operated in a keeping TX mode.



2 SUMMARY OF TEST RESULT

Test procedures according to the technical standards:

No.	Standard Section	Test Item	Result	Remark
1	15.203	Antenna Requirement	Pass	
2	15.207	Conducted Emission	Pass	
3	15.225(d)/15.209	Radiated Emissions	Pass	
4	15.227(a)(b)(c)/15.205	Field Strength of Fundamental Emissions	Pass	
5	15.215	20dB Bandwidth	Pass	
6	15.225(e)	Frequency Tolerance	Pass	

3 Test Facilities and Accreditations

3.1 Test laboratory

Test Laboratory	Shenzhen Microtest Co., Ltd
Location	101, No. 7, Zone 2, Xinxing Industrial Park, Fuhai Avenue, Xinhe Community, Fuhai Street, Bao' an District, Shenzhen, Guangdong, China.
FCC Registration No.:	FCC Registration No.: 448573

3.2 Environmental conditions

Temperature:	15°C~35°C
Humidity	20%~75%
Atmospheric pressure	98kPa~101kPa

3.3 Measurement uncertainty

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %

No.	Item	Uncertainty
1	Conducted Emission Test	$\pm 1.38\text{dB}$
2	RF power, conducted	$\pm 0.16\text{dB}$
3	Spurious emissions, conducted	$\pm 0.21\text{dB}$
4	All emissions, radiated(<1G)	$\pm 4.68\text{dB}$
5	All emissions, radiated(>1G)	$\pm 4.89\text{dB}$
6	Temperature	$\pm 0.5^\circ\text{C}$
7	Humidity	$\pm 2\%$

3.4 Test software

Software Name	Manufacturer	Model	Version
RF Test System	Shenzhen JS tonscond co., ltd	JS1120-3	2.5.77.0418



4 List of test equipment

Equipment No.	Equipment Name	Manufacturer	Model	Serial No.	Calibration date	Due date
MTI-E043	EMI Test Receiver	Rohde&schwarz	ESCI7	101166	2020/06/04	2021/06/03
MTI-E044	TRILOG Broadband Antenna	schwarzbeck	VULB 9163	9163-1338	2020/06/05	2021/06/04
MTI-E047	Amplifier	Hewlett-Packard	8447F	3113A06150	2020/06/04	2021/06/03
MTI-E089	ESG Vector Signal Generator	Agilent	N5182A	MY49060455	2020/06/03	2021/06/02
MTI-E058	ESG Series Analog Ssignal Generator	Agilent	E4421B	GB40051240	2020/07/03	2021/07/04
MTI-E062	PXA Signal Analyzer	Agilent	N9030A	MY51350296	2020/06/04	2021/06/03
MTI-E078	Synthesized Sweeper	Agilent	83752A	3610A01957	2020/06/04	2021/06/03
MTI-E079	DC Power Supply	Agilent	E3632A	MY40027695	2020/06/04	2021/06/03
MTI-E045	Double Ridged Broadband Horn Antenna	schwarzbeck	BBHA 9120D	9120D-2278	2020/06/05	2021/06/04
MTI-E021	EMI Test Receiver	Rohde&schwarz	ESCS30	100210	2020/06/04	2021/06/03
MTI-E022	Pulse Limiter	Schwarzbeck	VSTD 9561-F	00679	2020/06/03	2021/06/02
MTI-E023	Artificial mains network	Schwarzbeck	NSLK 8127	NSLK 8127 #841	2020/06/04	2021/06/03
MTI-E046	Active Loop Antenna	Schwarzbeck	FMZB 1519B	00044	2020/06/05	2021/06/04
MTI-E048	Amplifier	Agilent	8449B	3008A02400	2020/07/03	2021/07/04
MTI-E072	Thermometer Clock Humidity Monitor	-	HTC-1	/	2020/06/07	2021/06/06

Note: the calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

5 Test Result

5.1 Antenna requirement

5.1.1 Standard requirement

15.203 requirement: For intentional device, 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

5.1.2 EUT Antenna

The antenna is an integrated antenna, which was permanently affixed to the device and un-replaced, complies with 15.203. In addition, the maximum antenna gain is 0.82dBi.

5.2 Conducted emission

5.2.1 Limits

FREQUENCY (MHz)	Class B (dBuV)	
	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

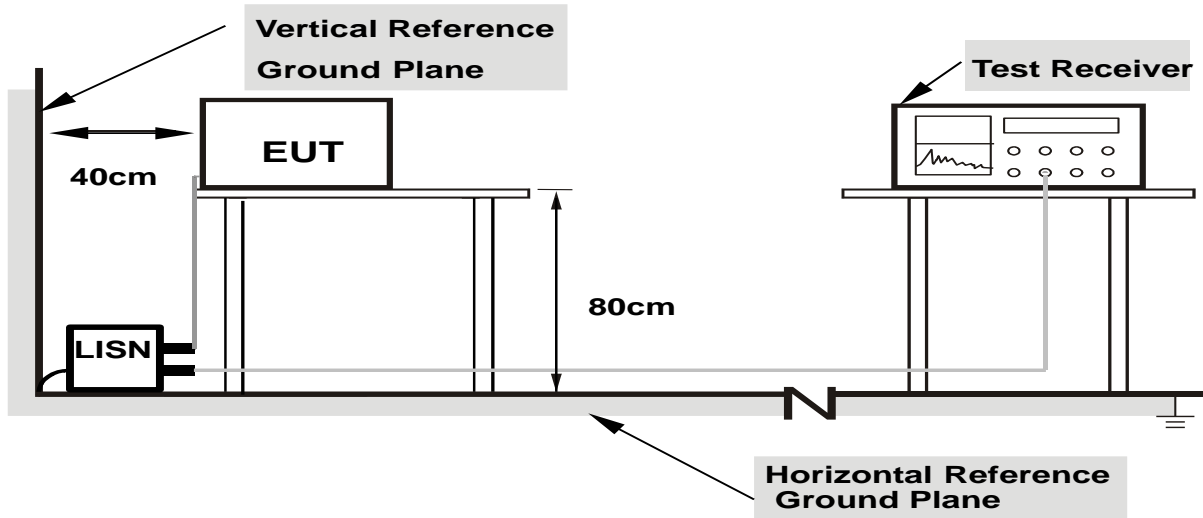
Note

(1)The tighter limit applies at the band edges.

(2)The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.



5.2.2 Test setup



- Note: 1.Support units were connected to second LISN.**
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes



5.2.3 Test procedure

a. EUT Operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

b. The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

- c. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- d. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- e. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- f. LISN at least 80 cm from nearest part of EUT chassis.

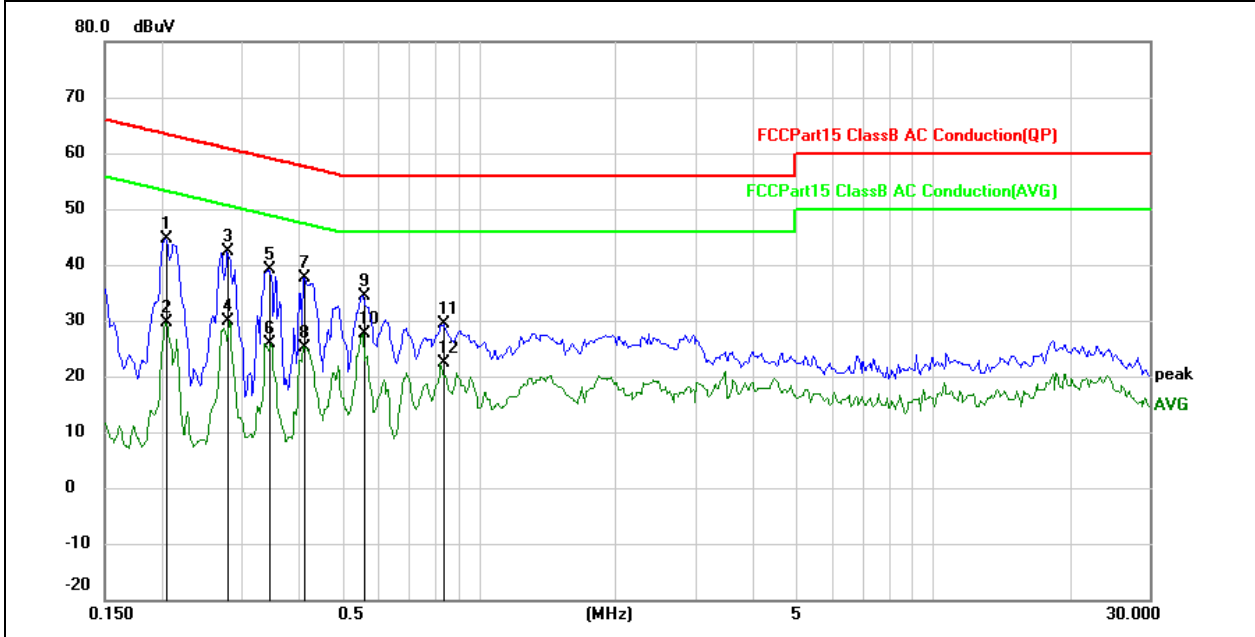
For the actual test configuration, please refer to the related Item –EUT Test Photos.



5.2.4 Test results

Note1: Emission Level = Reading Level + Factor, Margin = Emission Level - Limit, Factor = LISN modulus + Cable Loss

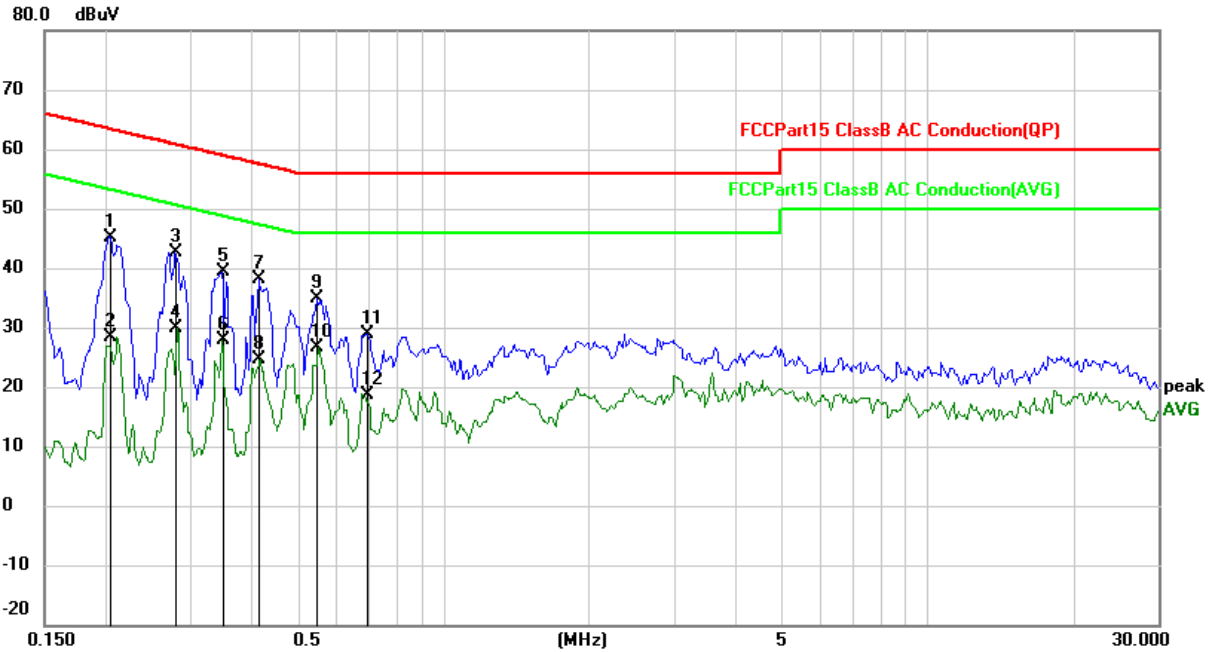
EUT :	remembrance portable printer	Model Name :	B21-C
Pressure:	101kPa	Phase:	L
Test voltage:	DC 5V from adapter AC 120V/60Hz	Test mode:	NFC



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector
1		0.2047	34.97	9.73	44.70	63.42	-18.72	QP
2		0.2047	19.96	9.73	29.69	53.42	-23.73	AVG
3		0.2789	32.61	9.75	42.36	60.85	-18.49	QP
4		0.2789	20.19	9.75	29.94	50.85	-20.91	AVG
5		0.3453	29.40	9.78	39.18	59.07	-19.89	QP
6		0.3453	15.99	9.78	25.77	49.07	-23.30	AVG
7		0.4117	27.91	9.82	37.73	57.61	-19.88	QP
8		0.4117	15.43	9.82	25.25	47.61	-22.36	AVG
9		0.5563	24.55	9.89	34.44	56.00	-21.56	QP
10	*	0.5563	17.69	9.89	27.58	46.00	-18.42	AVG
11		0.8375	19.37	9.93	29.30	56.00	-26.70	QP
12		0.8375	12.33	9.93	22.26	46.00	-23.74	AVG



EUT :	remembrance portable printer	Model Name :	B21-C
Pressure:	101kPa	Phase:	N
Test voltage:	DC 5V from adapter AC 120V/60Hz	Test mode:	NFC



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector
1		0.2050	35.33	9.73	45.06	63.41	-18.35	QP
2		0.2050	18.75	9.73	28.48	53.41	-24.93	AVG
3	*	0.2789	32.93	9.75	42.68	60.85	-18.17	QP
4		0.2789	20.01	9.75	29.76	50.85	-21.09	AVG
5		0.3492	29.48	9.79	39.27	58.98	-19.71	QP
6		0.3492	18.14	9.79	27.93	48.98	-21.05	AVG
7		0.4156	28.40	9.83	38.23	57.54	-19.31	QP
8		0.4156	14.78	9.83	24.61	47.54	-22.93	AVG
9		0.5484	25.10	9.89	34.99	56.00	-21.01	QP
10		0.5484	16.77	9.89	26.66	46.00	-19.34	AVG
11		0.6969	19.05	9.90	28.95	56.00	-27.05	QP
12		0.6969	8.82	9.90	18.72	46.00	-27.28	AVG



5.3 Radiated Emissions

5.3.1 Limit

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength ($\mu\text{V}/\text{m}$)
0.009 - 0.490	2400/F(kHz)
0.490 - 1.705	24000/F(kHz)
1.705 - 30.0	30
30 - 88	100
88 - 216	150
216 - 960	200
Above 960	500

Note1: For Above 1000 MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.

Note2: For above 1000 MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (Peak).

5.3.2 Test Procedure

The measurement frequency range is from 9 kHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented. The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW \geq RBW

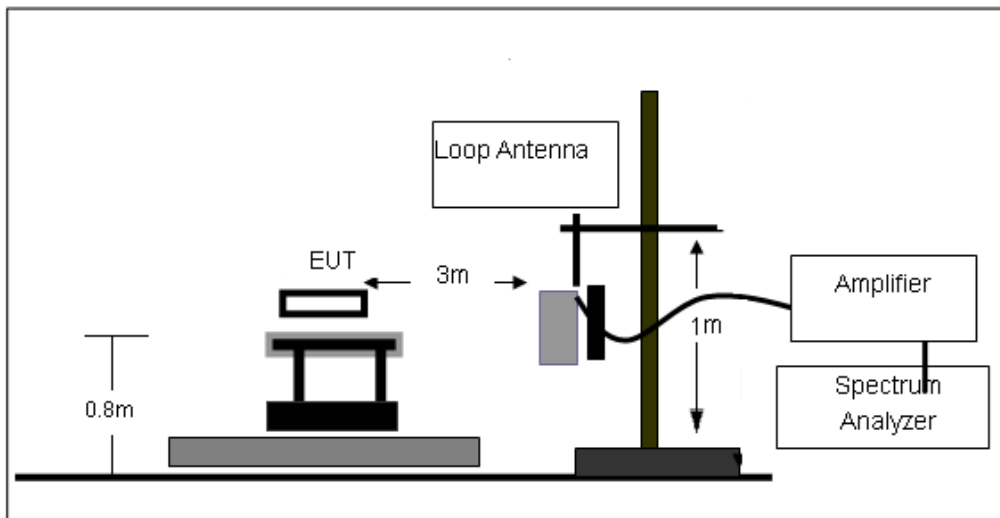
Sweep = auto

Detector function = peak

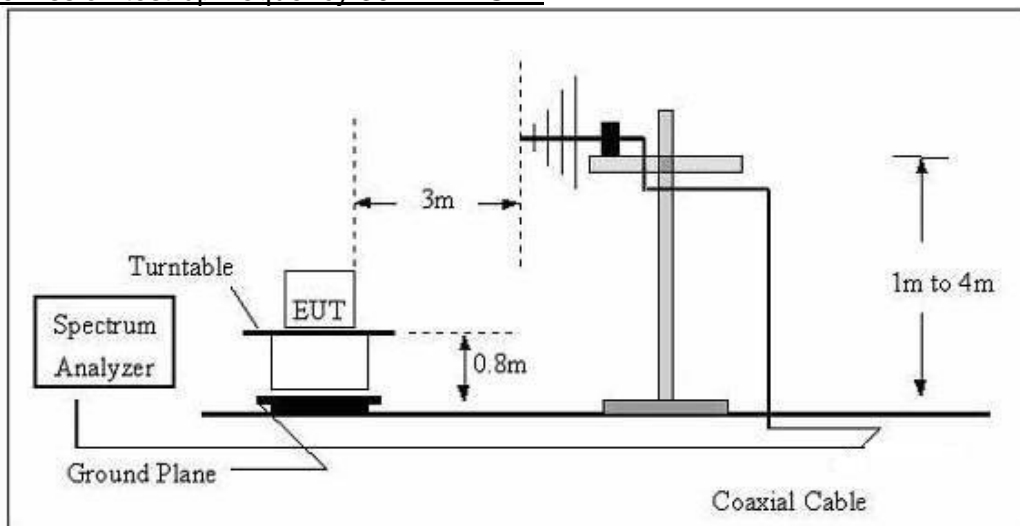
Trace = max hold

5.3.3 Test Setup

Radiated emission test-up frequency below 30MHz



Radiated emission test-up frequency 30MHz~1GHz





5.3.4 **Test Result**

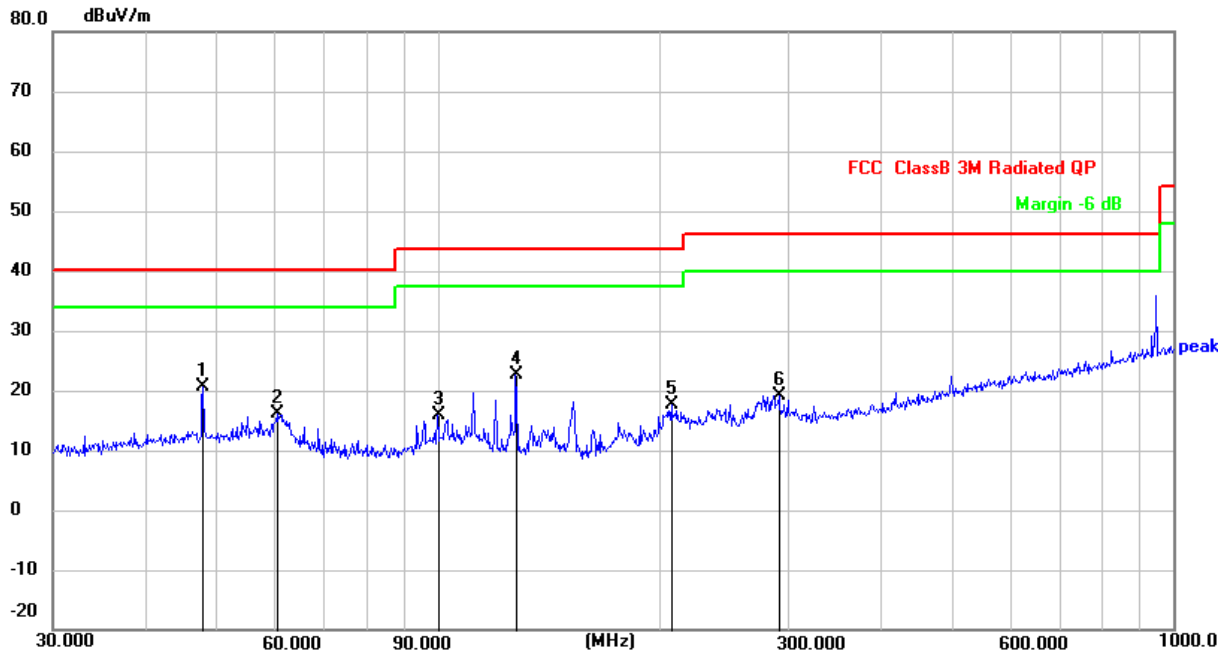
9 kHz-30MHz

No.	Freq.	Level	Factor	Measurement	Limit	Margin
	MHz	dBuV	dBuV/m	dBuV/m	dBuV/m	dB
1	0.0311	22.73	20.47	43.20	117.62	-74.42
2	0.0677	20.44	20.44	40.88	110.9	-70.02
3	0.11	25.58	20.40	45.98	106.7	-60.72
4	1.2034	18.61	20.21	38.82	66.02	-27.20
5	1.464	14.78	20.26	35.04	64.32	-29.28
6	1.7437	11.27	20.22	31.49	69.5	-38.01



30MHz – 1GHz

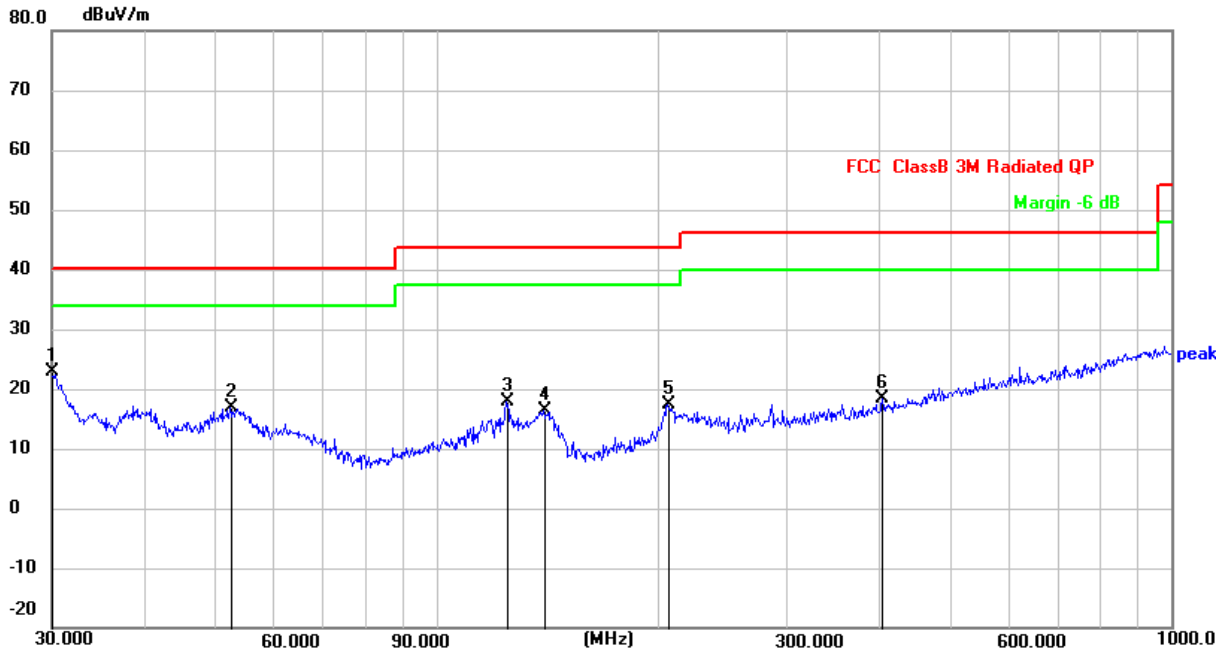
EUT :	remembrance portable printer	Model Name :	B21-C
Pressure:	1010 hPa	Phase:	H
Test Mode :	NFC	Test Voltage :	DC 5V from adapter AC 120V/60Hz



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	47.9940	34.86	-14.15	20.71	40.00	-19.29	QP
2	60.5980	31.42	-15.28	16.14	40.00	-23.86	QP
3	99.9653	30.99	-15.07	15.92	43.50	-27.58	QP
4	128.0007	39.68	-17.10	22.58	43.50	-20.92	QP
5	208.2148	31.37	-13.80	17.57	43.50	-25.93	QP
6	291.2911	30.35	-11.13	19.22	46.00	-26.78	QP



EUT :	remembrance portable printer	Model Name :	B21-C
Pressure:	1010 hPa	Phase:	V
Test Mode :	NFC	Test Voltage :	DC 5V from adapter AC 120V/60Hz



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	30.0263	39.84	-17.05	22.79	40.00	-17.21	QP
2	52.5292	31.18	-14.28	16.90	40.00	-23.10	QP
3	124.7876	34.73	-16.75	17.98	43.50	-25.52	QP
4	140.2191	34.02	-17.70	16.32	43.50	-27.18	QP
5	206.7598	31.13	-13.85	17.28	43.50	-26.22	QP
6	404.6665	27.81	-9.42	18.39	46.00	-27.61	QP

5.4 Field Strength of Fundamental Emissions

5.4.1 Limits:

According to FCC section 15.225, for <30 MHz, Radiated emissions were measured according to ANSI C63.4. The EUT was set to transmit at the highest output power. The EUT was set 10 meter away from the measuring antenna. The loop antenna was positioned 1 meter above the ground from the center of the loop. The measuring bandwidth was set to 10 KHz. (Note: During testing the receive antenna was rotated about its axis to maximize the emission from the EUT)

There was no detected Restricted bands and Radiated suprious emission below 30MHz. The 30m limit was converted to 3m Limit using square factor(x) as it was found by measurements as follows;
 3 m Limit(dBuV/m) = $20\log(X)+40\log(30/3)= 20\log(15848)+40\log(30/3) = 124\text{dBuV}$

Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

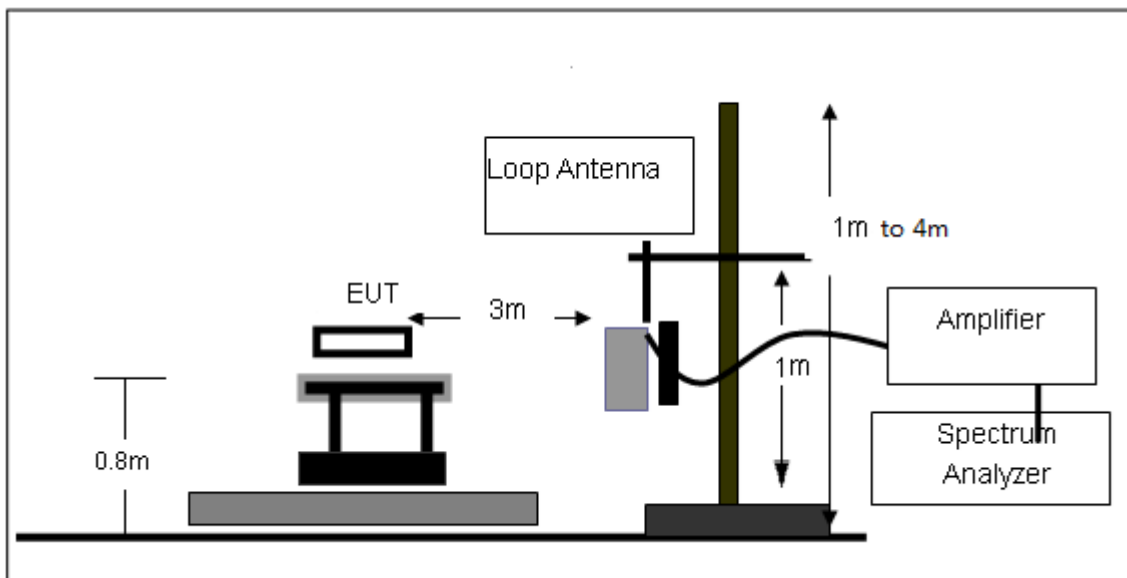
Frequency range (MHz)	Field Strength@30m		Field Strength@3m
	$\mu\text{V/m}$	$\text{dB}\mu\text{V/m}$	$\text{dB}\mu\text{V/m}$
Below 13.110	30	29.5	69.5
13.110 ~ 13.410	106	40.5	80.5
13.410 ~ 13.553	334	50.5	90.5
13.553 ~13.567	15.848	84	124
13.567 ~ 13.710	334	50.5	90.5
13.710 ~14.010	106	40.5	80.5
Above 14.010	30	29.5	69.5

Note:

1. Field Strength ($\text{dB}\mu\text{V/m}$) = $20*\log[\text{Field Strength } (\mu\text{V/m})]$.
2. In the emission tables above, the tighter limit applies at the band edges.

5.4.2 Test Setup:

Radiated emission test-up frequency below 30MHz





5.4.3 Test Procedures

As the radiation test, set the RBW=10kHz VBW=30kHz, observed the outside band of 13.110 MHz to 14.010 MHz, than mark the higher-level emission for comparing with the FCC rules.

5.4.4 Test Result

Maximum Field Strength:

13.553 MHz – 13.567 MHz					
Frequency (MHz)	Level dBuV	Factor dBuV/m	Result @3m (dBμV/m)	Limit @3m dBuV/m	Margin dB
13.56	32.48	20.42	52.90	124	-71.10

13.410 MHz – 13.553 MHz and 13.567 MHz – 13.710 MHz					
Frequency (MHz)	Level dBuV	Factor dBuV/m	Result @3m (dBμV/m)	Limit @3m dBuV/m	Margin dB
13.52	23.86	20.42	44.28	90.5	-46.22
13.63	24.89	20.42	45.31	90.5	-45.19

13.110 MHz – 13.410 MHz and 13.710 MHz – 14.010 MHz					
Frequency (MHz)	Level dBuV	Factor dBuV/m	Result @3m (dBμV/m)	Limit @3m dBuV/m	Margin dB
13.36	22.28	20.42	42.70	80.5	-37.80
13.95	22.95	20.42	43.37	80.5	-37.13

5.5 20dB bandwidth

5.5.1 Limit

Operation within the band 13.110 MHz to 14.010 MHz

5.5.2 Requirement

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that 20dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equip compliance with the 20dB attenuation specification may base on measurement at the intentional radiator's antenna output terminal unless the intentional radiator uses a permanently attached antenna, in which case compliance shall be. Demonstrated by measuring the radiated emissions.

5.5.3 Test Procedure

The 20dB bandwidth is measured with a spectrum analyzer connected via a receiver antenna placed near the EUT while the EUT is operating in transmission mode.

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth

RBW \geq 1% of the 20 dB bandwidth

VBW \geq RBW

Sweep = auto

Detector function = peak

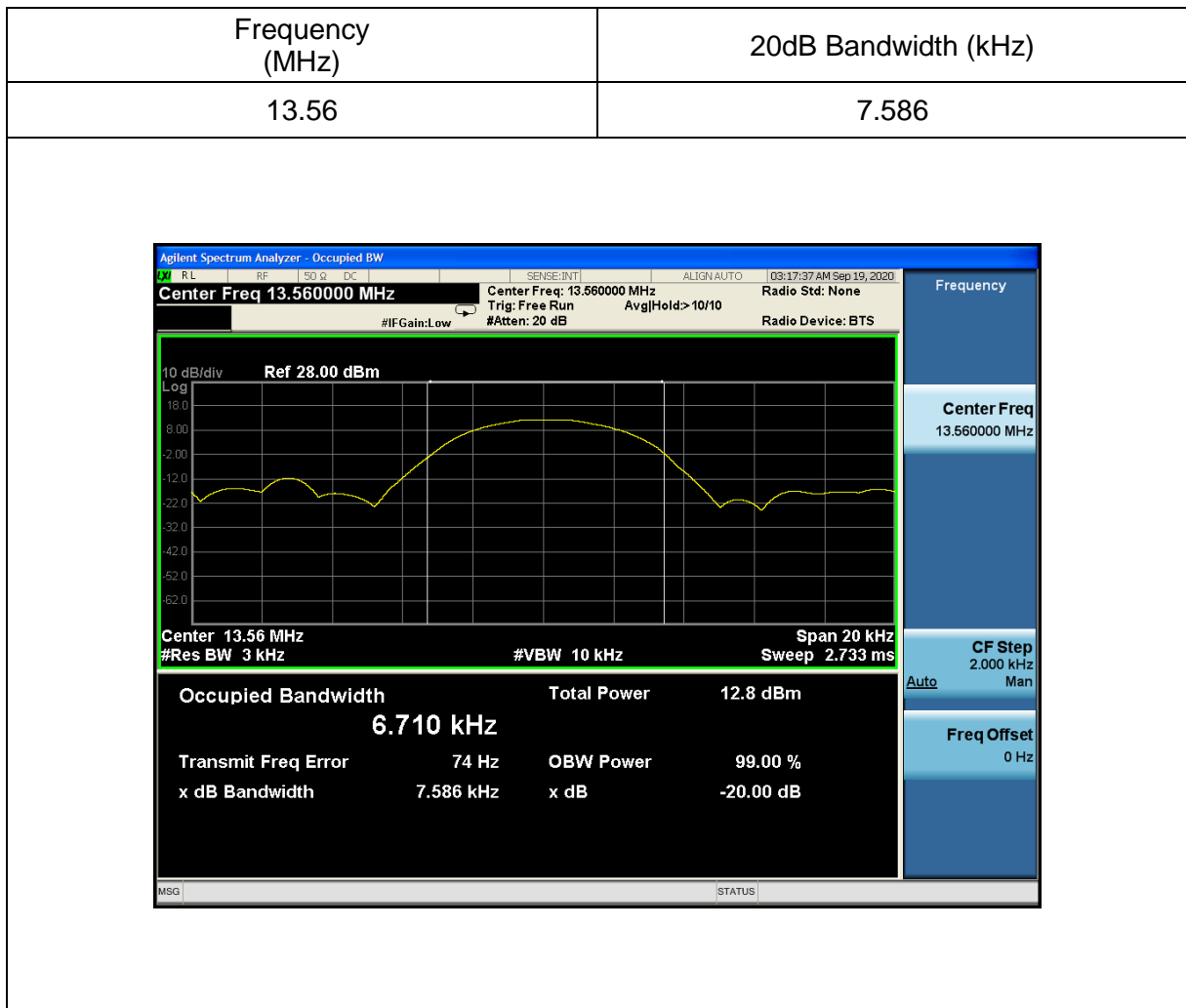
Trace = max hold



5.5.4 Test results

EUT :	remembrance portable printer	Model Name :	B21-C
Pressure :	1012 hPa	Test Voltage :	DC 7.4V from battery
Test Mode :	TX Mode		

The test plot as follows:



5.6 Frequency stability

5.6.1 Limit

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to $+ 50$ degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

5.6.2 Test Procedure

1. The test is performed in a Temperature Chamber.

5.6.3 Test result

Voltage (Vdc)	Temp. (°C)	Frequency (MHz)	Deviation (%)	Limit (%)
7.40	-20	13.560849	0.002%	+/-0.01%
7.40	-10	13.560264	0.001%	
7.40	0	13.560544	0.001%	
7.40	10	13.560678	0.004%	
7.40	20	13.560769	0.003%	
7.40	30	13.560583	0.0046%	
7.40	40	13.560585	0.004%	
7.40	50	13.560264	0.001%	
6.66	20	13.560680	0.005%	
8.14	20	13.560495	0.002%	



Photographs of the EUT

See the APPENDIX 1: EUT PHOTO in the report No.: MTi20082807-5E1-1.

----END OF REPORT----