

Certificate of Test

NCT CO., LTD.

211-71, Geumgok-ro, Hwaseong-si, Gyeonggi-do, 18511, Republic of Korea
(Tel: +82-31-323-6070 / Fax: +82-31-323-6071)

Report No.:
NW2102-J002-1

Page (1) / (15)

**1. Client**

- Name : Doors Korea Co., Ltd
- Address : 1F, 27, Mangu-ro 81-gil, Jungnang-gu, Seoul, Republic of Korea
- Date of Receipt : 2021-01-18

2. Use of Report : Japan MIC Approval**3. Test Sample**

- Description : Wireless Karaoke Mic
- Model : miracle,m M90

4. Place of Test : ■ Fixed test □ Field test

(Address:211-71, Geumgok-ro, Hwaseong-si, Gyeonggi-do, 18511, Republic of Korea)

5. Date of Test : 2021-02-02 ~ 2021-02-04**6. Test method used : Appendix No. 43JN****7. Testing Environment :**

- Temperature: (25 ± 5) °C, Humidity: More than 45 % R.H. and less than 75 % R.H.
- * Unless specified otherwise in the individual methods, the tests were conducted on ambient conditions.

8. Test Results : Refer to the test results

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
This Test Report cannot be reproduced, except in full
This test report is not related to KOLAS recognition and RRA designation.

Affirmation	Tested by Woo-hyoung, Jeong	Technical Manager Changmin, Kim
-------------	---------------------------------------	---

Feb 15, 2021

NCT CO., LTD.



Contact us at report@nct.re.kr to confirm the authenticity of this report

Table of contents

1. General Information	3
2. Information's about Test Item	3
3. Test Report	4
3.1 Test Summary	4
3.2 Test Report Version	5
3.3 Test Result	
3.3.1 Frequency tolerance	6
3.3.2 Occupied bandwidth (99%) & spread bandwidth (90%)	7
3.3.3 Antenna power	9
3.3.4 Unwanted emission strength	10
3.3.5 Dwell Time	12
3.3.6 RX spurious emission	13
3.3.7 Interference prevention function	14

APPENDIX

Attachment TEST EQUIPMENT USED FOR TESTS	15
---	----

Test Repot No.: NW2102-J001-1

211-71, Geumgok-ro, Hwaseong-si, Gyeonggi-do, Korea 18511
www.nct.re.kr TEL: +82-31-323-6070 FAX: +82-31-323-6071

1. General information's

1-1 Test Performed

Laboratory : NCT CO., LTD.
Address : 211-71, Geumgok-ro, Hwaseong-si, Gyeonggi-do, Korea 18511
Telephone : +82-31-323-6070
Facsimile : +82-31-323-6071

2. Information's about test item

2-1 Applicant information

Company name : Doors Korea Co., Ltd
Address : 1F, 27, Mangu-ro 81-gil, Jungnang-gu, Seoul, Republic of Korea
Telephone / Facsimile : +82-1566-4520 / +82-70-5165-3275

2-2 Equipment Under Test (EUT) description

Test item particulars : Wireless Karaoke Mic
Model and/or type reference : miracle,m M90
Additional model name : -
Serial number : Proto type
Antenna gain : PCB Pattern Antenna with Max gain : -0.58 dBi (M/N:2.4G ANT)
Date (s) of performance of tests: : 2021-02-02 ~ 2021-02-04
Date of receipt of test item : 2021-01-18
EUT condition : Pre-production, not damaged
Number of channel : 79
EUT Power Source : DC 3.7 V by Battery
Type of Modulation : BDR Mode(GFSK)
Firmware version : 1.0
Note : -

2-3 Tested Frequency

	Low frequency	Middle frequency	High frequency
Frequency (MHz) (BDR)	2 402	2 441	2 480

Test Report No.: NW2102-J002-1

211-71, Geumgok-ro, Hwaseong-si, Gyeonggi-do, Korea 18511
www.nct.re.kr TEL: +82-31-323-6070 FAX: +82-31-323-6071

3. Test Report

3.1 Test Summary

Applied	Test items	Result
☒	Frequency Tolerance	C
☒	Occupied Bandwidth (99%) & Spread Bandwidth(90%)	C
☒	Antenna power	C
☒	Unwanted emission strength	C
☒	Dwell time	C
☒	RX spurious emission	C
☒	Interference prevention function	C

Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable

Note 2: Compliance was determined by specification limits of the applicable standard according to customer requirements.

TEST STANDARD: The measurement procedure of Certification of Conformity with Technical Regulations for Specified Radio Equipment, Item 19 of Article 2 Paragraph 1

TEST MEASUREMENT METHOD: Appendix No. 43. Compliance was determined by specification limits of the applicable standard according to customer requirements.

Test Report No.: NW2102-J002-1

211-71, Geumgok-ro, Hwaseong-si, Gyeonggi-do, Korea 18511
www.nct.re.kr TEL: +82-31-323-6070 FAX: +82-31-323-6071

3.2 Test Report Version

Test Report No.	Date	Description
NW2102-J002	2021-02-08	Initial issue
NW2102-J002-1	2021-02-15	Reissue due to incorrect write

Test Repot No.: NW2102-J002-1

211-71, Geumgok-ro, Hwaseong-si, Gyeonggi-do, Korea 18511
www.nct.re.kr TEL: +82-31-323-6070 FAX: +82-31-323-6071

3.3 Test Result

3.3.1 Frequency tolerance

Test procedure

1. The transmitter output is connected to the Spectrum analyzer(or Frequency counter)
2. Setting the spectrum analyzer is as follows.

Center frequency	Operating frequency
Resolution BW	1 kHz
Video BW	30 kHz
Span	150 kHz
Sweep time	Auto
Detector mode	Positive peak
Trace mode	Max. hold

Measurement data : BDR

Test voltage	Measured item	Frequency Tolerance		
		Low frequency	Middle frequency	High frequency
4.07 (V)	Measured value (MHz)	2 402.053 654	2 441.053 423	2 480.053 192
	Tolerance (ppm)	22.34	21.89	21.45
3.70 (V)	Measured value (MHz)	2 402.052 761	2 441.052 696	2 480.052 435
	Tolerance (ppm)	21.97	21.59	21.14
3.33 (V)	Measured value (MHz)	2 402.053 606	2 441.053 846	2 480.054 327
	Tolerance (ppm)	22.32	22.06	21.91

※ Remark

FT (ppm) = [(Measured value(MHz)–Operating frequency(MHz))/Operating frequency(MHz)] × 10⁶

Limit:

±50×10⁻⁶(50 ppm or below)

Test Report No.: NW2102-J002-1

211-71, Geumgok-ro, Hwaseong-si, Gyeonggi-do, Korea 18511
 www.nct.re.kr TEL: +82-31-323-6070 FAX: +82-31-323-6071

3.3.2 Occupied Bandwidth (99%) & Spread Bandwidth(90%)

Test procedure

1. The transmitter output is connected to the Spectrum analyzer
2. Setting the spectrum analyzer is as follows.

Center frequency	2 441 MHz
Resolution BW	300 kHz
Video BW	Auto
Span	100 MHz
Sweep time	Auto
Detector mode	Positive peak
Trace mode	Max. hold

Measurement data : BDR

Test voltage	Measured item	Occupied bandwidth & Spread bandwidth			
		Normal Hopping	AFH		
			Low frequency	Middle frequency	High frequency
4.07 (V)	Occupied bandwidth (MHz)	78.23	-	-	-
	Spread bandwidth (MHz)	70.99	-	-	-
3.70 (V)	Occupied bandwidth (MHz)	78.21	-	-	-
	Spread bandwidth (MHz)	71.15	-	-	-
3.33 (V)	Occupied bandwidth (MHz)	78.21	-	-	-
	Spread bandwidth (MHz)	71.15	-	-	-

Note 1: EUT does not operate in AFH mode.

Limit:

Occupied Bandwidth (99%): 83.5 MHz or less

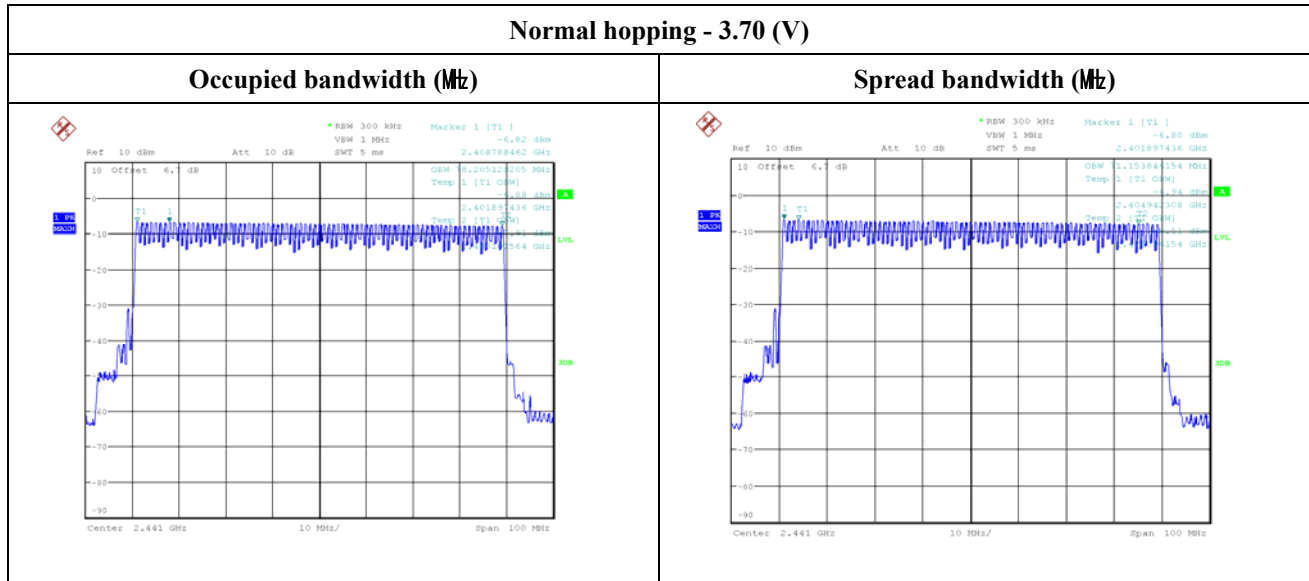
Spread Bandwidth (90%): 500 kHz or more

Spreading Factor 5 or more

Test Report No.: NW2102-J002-1

211-71, Geumgok-ro, Hwaseong-si, Gyeonggi-do, Korea 18511
www.nct.re.kr TEL: +82-31-323-6070 FAX: +82-31-323-6071

Test Plot : BDR



Test Report No.: NW2102-J002-1

211-71, Geumgok-ro, Hwaseong-si, Gyeonggi-do, Korea 18511
www.nct.re.kr TEL: +82-31-323-6070 FAX: +82-31-323-6071

3.3.3 Antenna power

Test procedure

1. The transmitter output is connected to the Power meter
2. Setting the EUT is operating frequency(hopping mode).

Measurement data : BDR

Test mode	Test voltage	Measured item	Antenna power		
			Low frequency	Middle frequency	High frequency
Normal Hopping	4.07 (V)	Measure value (dBm)	-8.15	-8.64	-9.29
		Antenna power (mW/MHz)	0.0028	0.0025	0.0022
		Power tolerance (%)	-44.08	-50.05	-56.99
	3.70 (V)	Measure value (dBm)	-8.18	-8.65	-9.32
		Antenna power (mW/MHz)	0.0028	0.0025	0.0021
		Power tolerance (%)	-44.59	-50.27	-57.38
	3.33 (V)	Measure value (dBm)	-8.16	-8.94	-9.80
		Antenna power (mW/MHz)	0.0028	0.0023	0.0019
		Power tolerance (%)	-44.33	-53.49	-61.84
Declared power(mW/MHz)			0.005		
Antenna gain(dBi)			-0.58		

※ Remark:

Antenna power(mW/MHz) = Measured value(mW) ÷ Spread bandwidth(MHz) ÷ Burst ratio

Power tolerance (%) = {[Antenna power(mW/MHz)- Declared power(mW/MHz)] ÷ Declared power(mW/MHz)} × 100

Limit:

Output power: 3 mW/MHz or Below

Output power tolerance: Maximum +20 %, Minimum -80 %

Test Report No.: NW2102-J002-1

211-71, Geumgok-ro, Hwaseong-si, Gyeonggi-do, Korea 18511
www.nct.re.kr TEL: +82-31-323-6070 FAX: +82-31-323-6071

3.3.4 Unwanted emission strength

Test procedure

1. Connect transmitter output to the spectrum analyzer input port.
2. The EUT should be transmitting at hopping mode
3. Unwanted emission strength is measured by following setting:
4. Set the spectrum analyzer RBW: 1 MHz, VBW: Auto, Sweep time: auto, Start: 30 MHz, Stop: 2 387 MHz.
5. Set the spectrum analyzer RBW: 1 MHz, VBW: Auto, Sweep time: auto, Start: 2 387 MHz, Stop: 2 400 MHz.
6. Set the spectrum analyzer RBW: 1 MHz, VBW: Auto, Sweep time: auto, Start: 2 483.5 MHz, Stop: 2 496.5 MHz.
7. Set the spectrum analyzer RBW: 1 MHz, VBW: Auto, Sweep time: auto, Start: 2 496.5 MHz, Stop: 12.5 GHz.
8. Detector mode: Peak mode.

Measurement data : BDR

	Test mode		Max. emission value(Middle Frequency)		
			4.07 (V)	3.70 (V)	3.33 (V)
30 MHz ~ 2 387 MHz	Normal Hopping	Value(μ W)	0.005	0.005	0.005
		Frequency(MHz)	2 303.901	2 368.114	2 383.223
2 387 MHz ~ 2 400 MHz		Value(μ W)	2.286	2.259	2.371
		Frequency(MHz)	2 399.979	2 399.979	2 399.979
2 483.5 MHz ~ 2 496.5 MHz		Value(μ W)	0.020	0.020	0.016
		Frequency(MHz)	2 483.521	2 483.521	2 483.521
2 496.5 MHz ~ 12.5 GHz		Value(μ W)	0.028	0.033	0.031
		Frequency(MHz)	4 805.000	4 821.031	4 821.031

Limit:

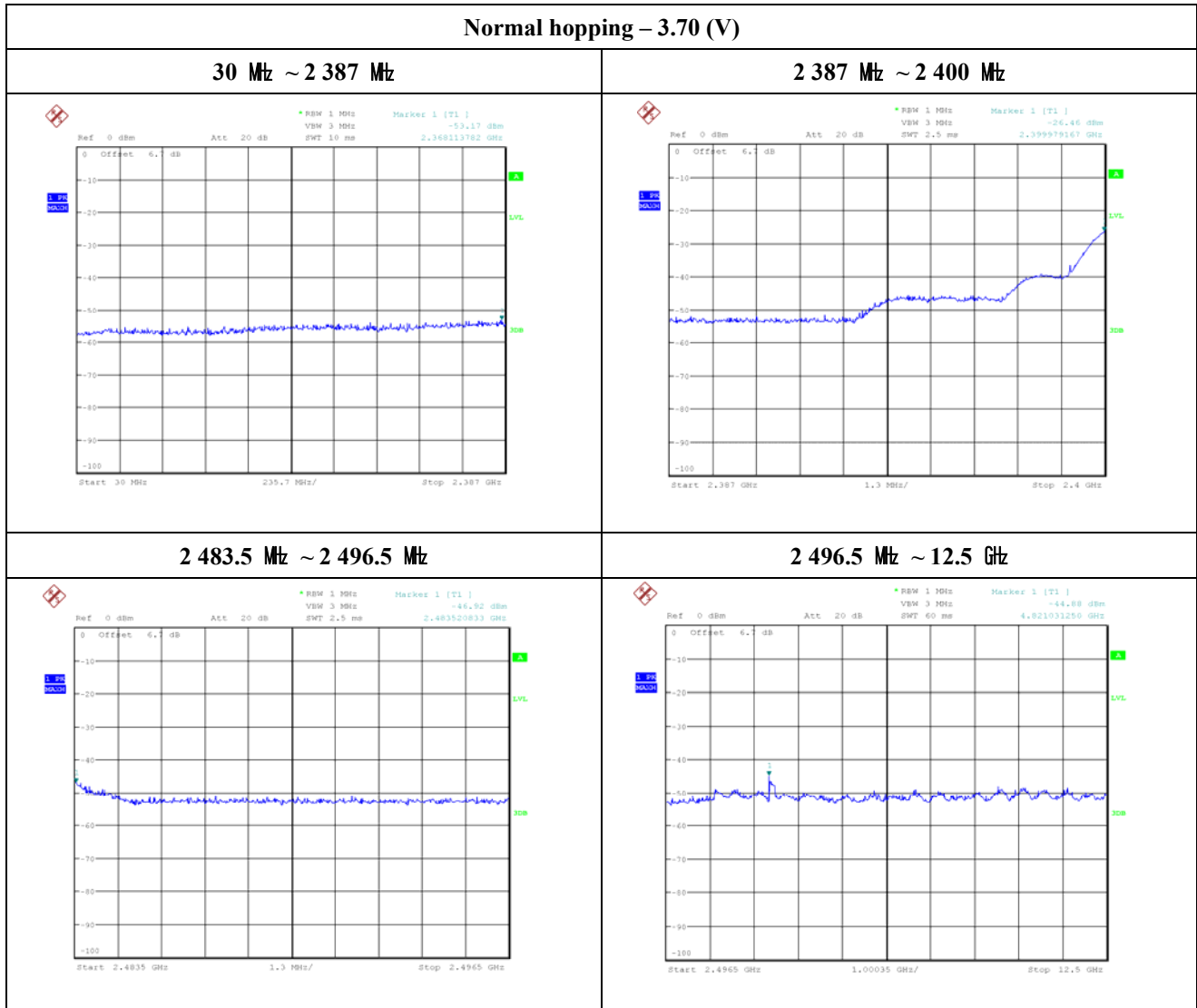
2 387 MHz $\leq$ f $\leq$ 2 400 MHz and 2 483.5 MHz < f $\leq$ 2 496.5 MHz: 25 μ W or less

2 387 MHz > f and 2 496.5 MHz < f: 2.5 μ W or less

Test Report No.: NW2102-J002-1

211-71, Geumgok-ro, Hwaseong-si, Gyeonggi-do, Korea 18511
www.nct.re.kr TEL: +82-31-323-6070 FAX: +82-31-323-6071

Test Plot : BDR



Test Report No.: NW2102-J002-1

211-71, Geumgok-ro, Hwaseong-si, Gyeonggi-do, Korea 18511
www.nct.re.kr TEL: +82-31-323-6070 FAX: +82-31-323-6071

3.3.5 Dwell time

Test procedure

1. The transmitter output is connected to the Spectrum analyzer
2. Setting the spectrum analyzer is as follows.

Center frequency	Operating frequency
Resolution BW	1 MHz
Video BW	Auto
Span	Zero span
Sweep time	Burst period
Detector mode	Positive peak
Trace mode	Single
Trigger	Video trigger

3. Selected the longest among the packet type.

Measurement data

- Normal hopping mode

Test voltage	Frequency hopping dwell time (one wave) (ms)	Result Dwell time (sec)	Limit for Time of Occupancy (sec)
4.07 (V)	2.897	0.278	0.4
3.70 (V)	2.897	0.278	0.4
3.33 (V)	2.897	0.278	0.4

3.3.6 RX spurious emission

Test procedure

1. Connect transmitter output to the spectrum analyzer input port.
2. The EUT should be receiving at hopping mode
3. RX spurious emission is measured by following setting:
4. Set the spectrum analyzer RBW: 100 kHz, VBW: Auto, Sweep: Auto, Start: 30 MHz, Stop: 1 000 MHz.
5. Set the spectrum analyzer RBW: 1 MHz, VBW: Auto, Sweep: Auto, Start: 1 000 MHz, Stop: 10 GHz.
6. Set the spectrum analyzer RBW: 1 MHz, VBW: Auto, Sweep: Auto, Start: 10 GHz, Stop: 12.5 GHz.
7. Detector mode: Peak mode.

Measurement data : BDR

	Test mode		Max. emission value		
			Low frequency	Middle frequency	High frequency
30 MHz ~ 1 000 MHz	4.07 (V)	Value(nW)	-	0.051	-
		Frequency(MHz)	-	892.740	-
1 000 MHz ~ 10 GHz		Value(nW)	-	0.123	-
		Frequency(MHz)	-	3 682.692	-
10 GHz ~ 12.5 GHz		Value(nW)	-	0.167	-
		Frequency(MHz)	-	10 580.929	-
30 MHz ~ 1 000 MHz	3.70 (V)	Value(nW)	-	0.064	-
		Frequency(MHz)	-	706.048	-
1 000 MHz ~ 10 GHz		Value(nW)	-	0.142	-
		Frequency(MHz)	-	3 602.174	-
10 GHz ~ 12.5 GHz		Value(nW)	-	0.194	-
		Frequency(MHz)	-	10 582.609	-
30 MHz ~ 1 000 MHz	3.33 (V)	Value(nW)	-	0.044	-
		Frequency(MHz)	-	892.740	-
1 000 MHz ~ 10 GHz		Value(nW)	-	0.136	-
		Frequency(MHz)	-	4 043.269	-
10 GHz ~ 12.5 GHz		Value(nW)	-	0.201	-
		Frequency(MHz)	-	10 592.949	-

Test Report No.: NW2102-J002-1

211-71, Geumgok-ro, Hwaseong-si, Gyeonggi-do, Korea 18511
www.nct.re.kr TEL: +82-31-323-6070 FAX: +82-31-323-6071

3.3.7 Interference prevention function

Measurement data : BDR

Test voltage	Low frequency	Middle frequency	High frequency
4.07 (V)	Pass	Pass	Pass
3.70 (V)	Pass	Pass	Pass
3.33 (V)	Pass	Pass	Pass

Limit:

Radio equipment used mainly on the same premises and automatically transmits or receives identification code

Test Report No.: NW2102-J002-1

211-71, Geumgok-ro, Hwaseong-si, Gyeonggi-do, Korea 18511
www.nct.re.kr TEL: +82-31-323-6070 FAX: +82-31-323-6071

APPENDIX

TEST EQUIPMENT USED FOR TESTS

	Description	Model No.	Manufacturer	Cal. Data	Cal. Due	Calibration body.	Calibration method.
1	ATTENUATOR	8493C	Agilent	2020-03-11	2021-03-11	HCT	24-2 paragraph4 「ㄱ」
2	SPECTRUM ANALYZER	FSU26	R&S	2020-09-22	2021-09-22	HCT	24-2 paragraph4 「ㄱ」
3	Power supply	PST-3202	GWInstsk	2020-03-10	2021-03-10	HCT	24-2 paragraph4 「ㄱ」
4	USB Power sensor	U2044XA	Keysight	2020-09-02	2021-09-02	HCT	24-2 paragraph4 「ㄱ」
5	Multi-meter	34401A	HP	2020-03-10	2021-03-10	HCT	24-2 paragraph4 「ㄱ」
6	8360B SERIES SWEPT SIGNAL GENERATOR	83640B	HP	2020-12-30	2021-12-30	HCT	24-2 paragraph4 「ㄱ」

Test Report No.: NW2102-J002-1

211-71, Geumgok-ro, Hwaseong-si, Gyeonggi-do, Korea 18511
www.nct.re.kr TEL: +82-31-323-6070 FAX: +82-31-323-6071