

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.:
NW2112-J002

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**1. Client**

- Name : SENA TECHNOLOGIES.Inc
- Address : 19, Heolleung-ro 569-gil, Gangnam-gu, Seoul, Korea
- Date of Receipt : 2021-10-22

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

- Description : 50R
- Model : SP76

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 : 2021-10-22 ~ 2021-10-29**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.

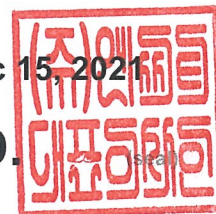
8. Test Results : Refer to the test results

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 Kwon E S Ther	 (Signature)	Technical Manager Changmin, Kim	 (Signature)
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Dec 15, 2021

NCT CO., LTD.



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

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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 : SENA TECHNOLOGIES.Inc
 Address : 19, Heolleung-ro 569-gil, Gangnam-gu, Seoul, Korea
 Telephone / Facsimile : - / -

2.2 Equipment Under Test (EUT) description

Test item particulars : 50R
 Model and/or type reference : SP76
 Additional model name : -
 Serial number : Proto Type
 Antenna gain : Chip Antenna with Max gain : 0.93 dBi (M/N:SENA_009)
 Date (s) of performance of tests: : 2021-10-22 ~ 2021-10-29
 Date of receipt of test item : 2021-10-22
 EUT condition : Pre-production, not damaged
 Number of channel : 40
 EUT Power Source : DC 3.7 V
 Type of Modulation : GFSK
 Firmware version : 1.0
 Note : -

2.3 Tested Frequency

	Low frequency	Middle frequency	High frequency
Frequency(MHz)	2 402	2 442	2 480

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3. Test Report

3.1 Test Summary

Applied	Test items	Result
<input checked="" type="checkbox"/>	Frequency Tolerance	C
<input checked="" type="checkbox"/>	Occupied Bandwidth (99%)	C
<input checked="" type="checkbox"/>	Antenna Power	C
<input checked="" type="checkbox"/>	Unwanted Emission Strength	C
<input checked="" type="checkbox"/>	RX Spurious Emission	C
<input checked="" type="checkbox"/>	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.

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3.2 Test Report Version

Test Report No.	Date	Description
NW2112-J002	2021-12-15	Initial issue

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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	Auto
Span	150 kHz
Sweep time	Auto
Detector mode	Positive peak
Trace mode	Max. hold

Measurement data :

Test voltage	Measured item	Operating frequency		
		Low frequency	Middle frequency	High frequency
3.70(V)	Measured value(MHz)	2 402.004 795	2 442.005 145	2 480.004 420
	Tolerance(ppm)	2.00	2.11	1.78

※ Remark

FT (ppm) = [(Measured value(MHz) - Operating frequency(MHz)) / Operating frequency(MHz)] * 10⁶

Limit:

±50 * 10⁻⁶ (50 ppm or below)

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3.3.2 Occupied Bandwidth (99%)

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	300 kHz
Video BW	Auto
Span	20 MHz
Sweep time	Auto
Detector mode	Positive peak
Trace mode	Max. hold

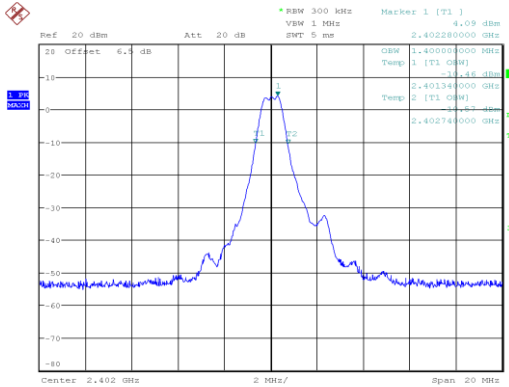
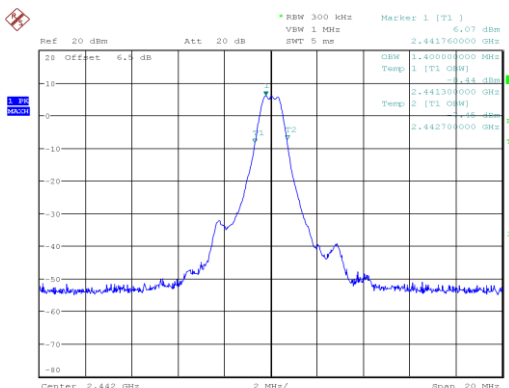
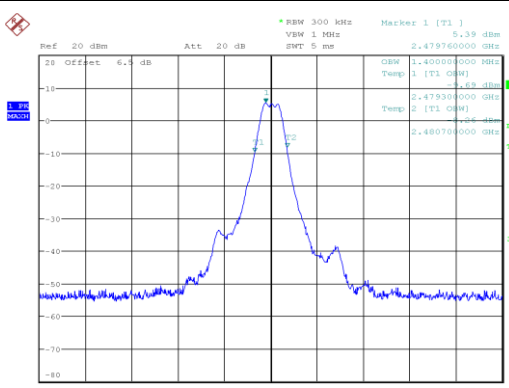
Measurement data :

Test voltage	Occupied bandwidth(MHz)		
	Low frequency	Middle frequency	High frequency
3.70(V)	1.40	1.40	1.40

Limit:

26 MHz or below

Test Plot :

<p>Low frequency 3.70(V)</p>	 <p>Date: 29.OCT.2021 13:52:28</p>
<p>Middle frequency 3.70(V)</p>	 <p>Date: 29.OCT.2021 13:53:03</p>
<p>High frequency 3.70(V)</p>	 <p>Date: 29.OCT.2021 13:53:23</p>

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3.3.3 Antenna Power

Test procedure

1. The transmitter output is connected to the power meter

Measurement data :

Test voltage	Measured item	Antenna power		
		Low frequency	Middle frequency	High frequency
3.70(V)	Measure value(dBm)	2.92	5.02	4.31
	Antenna power(mW)	1.96	3.18	2.70
	Power tolerance(%)	-34.71	5.90	-10.08
Declared power(mW)		3.00		
Antenna gain(dBi)		0.93		

Limit:

Output power: 10 mW or Below

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

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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 low, middle and high channel.
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 :

	Test mode		Max. emission value		
			Low frequency	Middle frequency	High frequency
30 MHz ~ 2 387 MHz	3.70(V)	Value(uW)	0.010	0.012	0.017
		Frequency(MHz)	2 247.242	2 288.792	2 326.564
2 387 MHz ~ 2 400 MHz		Value(uW)	10.617	0.009	0.008
		Frequency(MHz)	2 399.979	2 399.438	2 394.771
2 483.5 MHz ~ 2 496.5 MHz		Value(uW)	0.011	0.012	0.349
		Frequency(MHz)	2 490.479	2 493.625	2 483.521
2 496.5 MHz ~ 12.5 GHz		Value(uW)	0.035	0.016	0.016
		Frequency(MHz)	2 560.625	1 062.434	1 062.434

Limit:

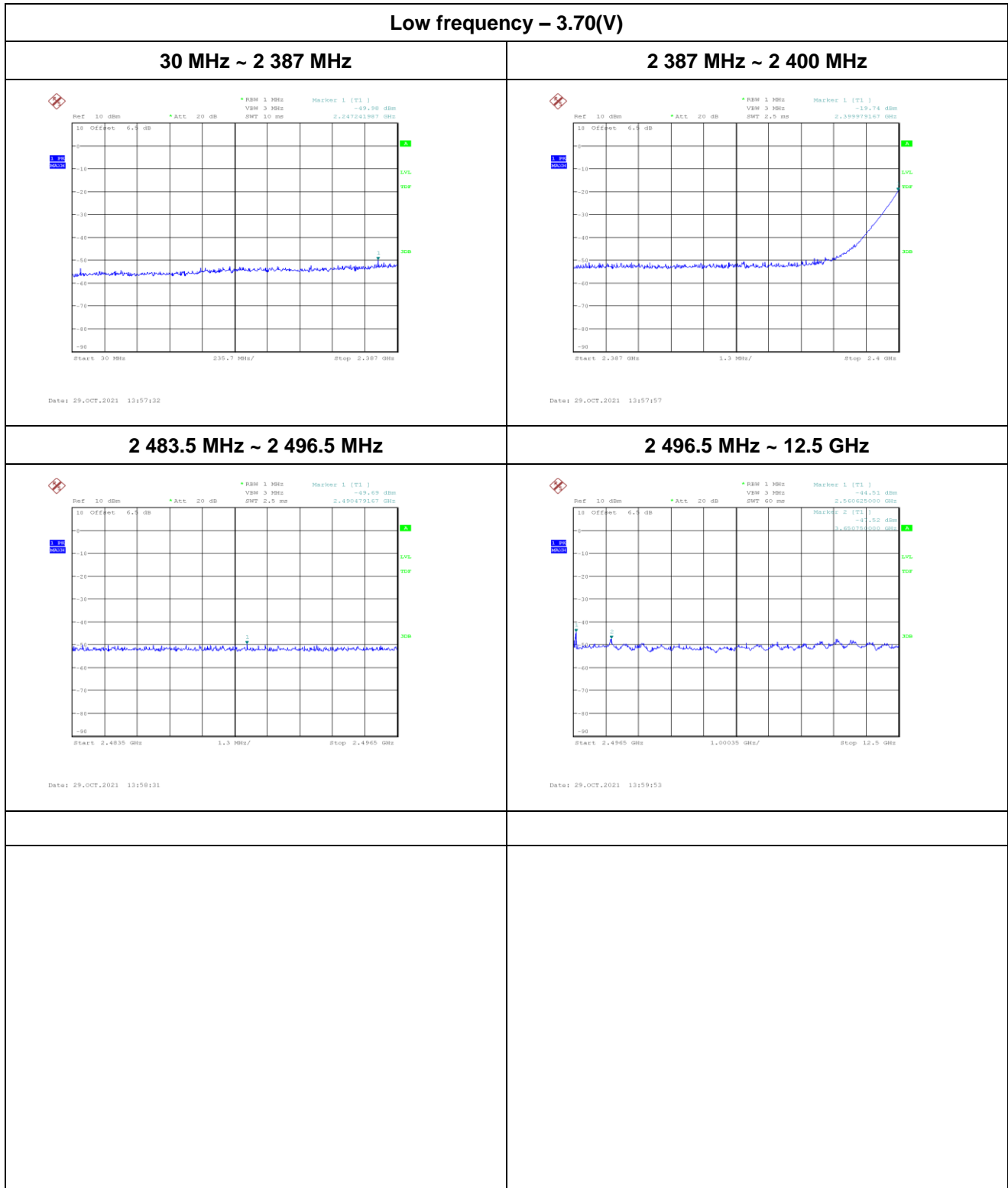
2 387 MHz \leq f \leq 2 400 MHz and 2 483.5 MHz < f \leq 2 496.5 MHz: 25 uW or less

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

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Test Plot :

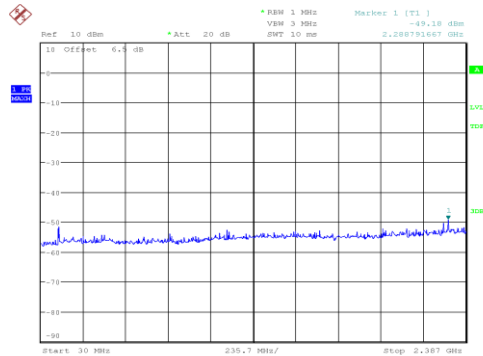


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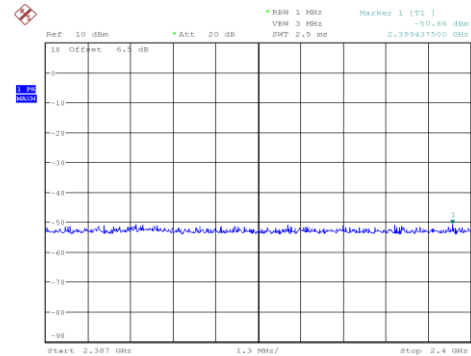
Middle frequency – 3.70(V)

30 MHz ~ 2 387 MHz



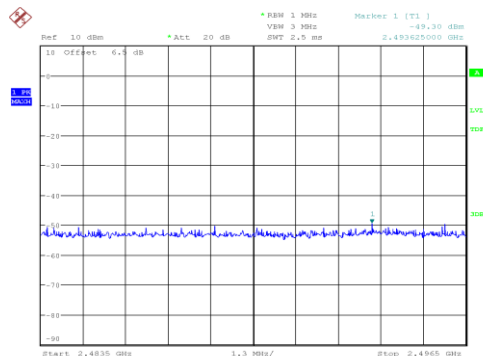
Date: 29.OCT.2021 14:01:19

2 387 MHz ~ 2 400 MHz



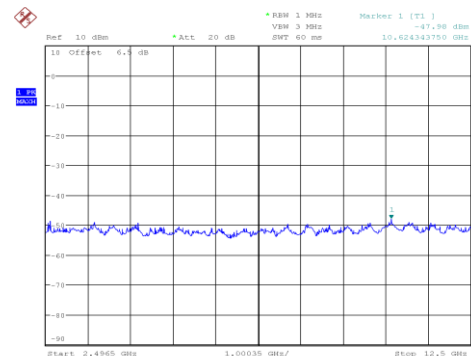
Date: 29.OCT.2021 14:01:51

2 483.5 MHz ~ 2 496.5 MHz



Date: 29.OCT.2021 14:02:14

2 496.5 MHz ~ 12.5 GHz



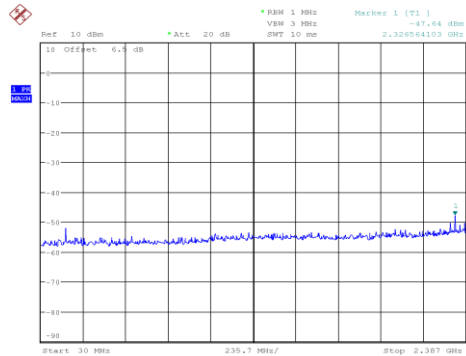
Date: 29.OCT.2021 14:02:41

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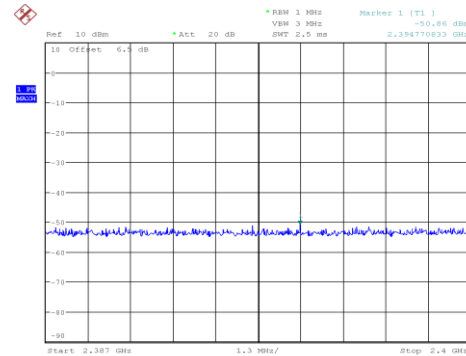
High frequency – 3.70(V)

30 MHz ~ 2 387 MHz



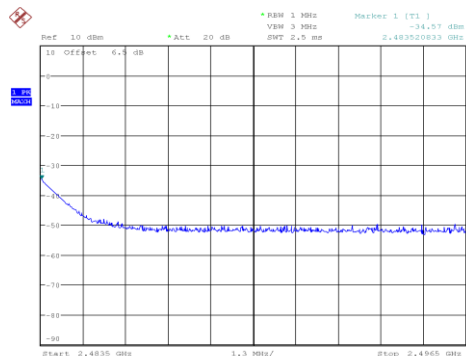
Date: 29.OCT.2021 14:03:17

2 387 MHz ~ 2 400 MHz



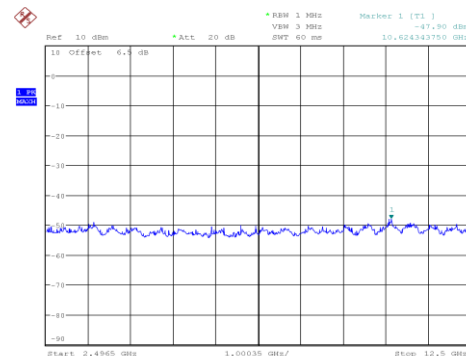
Date: 29.OCT.2021 14:03:44

2 483.5 MHz ~ 2 496.5 MHz



Date: 29.OCT.2021 14:04:40

2 496.5 MHz ~ 12.5 GHz



Date: 29.OCT.2021 14:05:01

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3.3.5 RX Spurious Emission

Test procedure

1. Connect transmitter output to the spectrum analyzer input port.
2. The EUT should be receiving at low, middle and high channel.
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 :

	Test mode		Max. emission value		
			Low frequency	Middle frequency	High frequency
30 MHz ~ 1 000 MHz	3.70(V)	Value(nW)	0.010	0.008	0.009
		Frequency(MHz)	210.321	819.679	350.224
1 000 MHz ~ 10 GHz		Value(nW)	0.132	0.111	0.128
		Frequency(MHz)	3 625.000	4 605.769	8 687.500
10 GHz ~ 12.5 GHz		Value(nW)	0.157	0.144	0.123
		Frequency(MHz)	1 060.497	1 056.090	1 061.699

Limit:

Below 1 GHz: 4 nW or less

Above 1 GHz: 20 nW or less

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3.3.6 Interference Prevention Function

Measurement data :

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

Limit:

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

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APPENDIX

TEST EQUIPMENT USED FOR TESTS

Test Repot No.: NW2112-J002

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	Description	Model No.	Manufacturer	Cal. Data	Cal. Due	Calibration body.	Calibration method.
1	SPECTRUM ANALYZER	FSU26	R&S	2021-09-29	2022-09-29	HCT	24-2 paragraph4 「ハ」
2	Triple Output DC Power Supply	E3631A	Agilent	2021-03-09	2022-03-09	HCT	24-2 paragraph4 「ハ」
3	USB Peak & Average Power Sensor	U2044XA	KEYSIGHT	2021-09-03	2022-09-03	HCT	24-2 paragraph4 「ハ」
4	Humi./Baro/Temp. data recorder	MHB-382SD	Lutron	2021-11-17	2022-11-17	HCT	24-2 paragraph4 「ハ」
5	TRUE RMS MULTIMETER	175	FLUKE	2021-02-15	2022-02-15	HCT	24-2 paragraph4 「ハ」
6	ATTENUATOR	8493C	Agilent	2021-03-10	2022-03-10	HCT	24-2 paragraph4 「ハ」

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