

TEST REPORT

 SongDam Certification Center #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, 17030, Korea Tel: +82-31-333-3220 Fax: +82-31-624-8855	Report No.: SDCC-2021-00224 Page (1) / (29) pages
--	--

1. Applicant

Name : NeoLAB Convergence, Inc.
Address : #1501, Mario Tower, 28, Digital-ro 30-gil, Guro-gu, Seoul, Korea 08389
Date of receipt : July 5, 2021

2. Manufacturer

Name : NeoLAB Convergence, Inc.
Address : #1501, Mario Tower, 28, Digital-ro 30-gil, Guro-gu, Seoul, Korea 08389

3. Use of Report : For Japan MIC Certification

4. Test sample / Model : Smart Pen / NWP-F130

5. Date(s) of Test : July 19, 2021 ~ July 20, 2021

6. Place of Test : ☒ Inside test ☐ Field test

(Address: #601, Creation Hall, Yongin Songdam College, 61, Dongbu-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Republic Of Korea, 17145)

7. Classification of radio : Radio Equipment specified in Article 2-1-19 of the certification ordinance

8. Environment : 10 °C to 35 °C

9. Result : Pass

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
This report shall not be reproduced except in full without the written approval of SDCC.

Affirmation	Tested by: Name: Jin Hee, Goo (Signature)	Technical Manager: Name: Dong Youl, Lim (Signature)
-------------	---	---

The above testing certificate is not related to KOLAS accreditation.

August 5, 2021

SongDam Certification Center

TEST REPORT

 SongDam Certification Center #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, 17030, Korea Tel: +82-31-333-3220 Fax: +82-31-624-8855	Report No.: SDCC-2021-00224 Page (2) / (29) pages	
--	---	--

Revision History of Report

Report No.	Rev	Issued Date	Description
SDCC-2021-00224	00	July 27, 2021	Initial Issue
SDCC-2021-00224	01	August 5, 2021	HW version change

TEST REPORT

 SongDam Certification Center #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, 17030, Korea Tel: +82-31-333-3220 Fax: +82-31-624-8855	Report No.: SDCC-2021-00224 Page (3) / (29) pages	
--	---	--

Table of Contents

Section	Page No
1. GENERAL INFORMATION	4
1.1. Applicant & Manufacturer & Test Laboratory Information	4
1.1.1. Applicant Information	4
1.1.2. Manufacturer Information	4
1.1.3. Test Laboratory Information	4
1.2. Applicable Standards	4
1.3. General Description of EUT	5
1.4. Description Test Modes	5
1.5. Test Frequencies	5
1.6. Measurement Uncertainty	6
1.7. Test Condition	6
2. TEST SUMMARY	7
3. TEST EQUIPMENT	8
4. TEST RESULTS	9
4.1. Frequency Error	9
4.2. Occupied Bandwidth and Spread Bandwidth	11
4.3. Spurious and Unwanted Emission Intensity	12
4.4. Antenna Power	14
4.5. Limit of Secondary Radiated Emission	15
4.6. Absolute Gain of Transmission Antenna (EIRP Antenna Power)	17
4.7. Principal Radiation Angle Width of Transmission Antenna (3dB Beam Width)	19
4.8. Interference prevention function	20
4.9. Construction Protection Confirmation	21
Appendix A. Test Plots	22

TEST REPORT

 SongDam Certification Center #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, 17030, Korea Tel: +82-31-333-3220 Fax: +82-31-624-8855	Report No.: SDCC-2021-00224 Page (4) / (29) pages	
--	---	--

GENERAL INFORMATION

1.1. Applicant & Manufacturer & Test Laboratory Information

1.1.1. Applicant Information

Applicant	NeoLAB Convergence, Inc.
Address	#1501, Mario Tower, 28, Digital-ro 30-gil, Guro-gu, Seoul, Korea 08389

1.1.2. Manufacturer Information

Manufacturer	NeoLAB Convergence, Inc.
Address	#1501, Mario Tower, 28, Digital-ro 30-gil, Guro-gu, Seoul, Korea 08389

1.1.3. Test Laboratory Information

Conducted tests were performed at	
Laboratory	SongDam Certification Center
Address	#601, Creation Hall, Yongin Songdam College, 61 Dongbu-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, 17145, Korea
Telephone No.	+82-31-333-3220
Fax No.	+82-31-624-8855
KOLAS No.	KT790

1.2. Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

Test method	According to Table No.43 of Notification No.88 of MIC
Technical standard(s)	Article 2-1-19: 2.4GHz band wide-band low-power data communication system

TEST REPORT

 SongDam Certification Center #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, 17030, Korea Tel: +82-31-333-3220 Fax: +82-31-624-8855	Report No.: SDCC-2021-00224 Page (5) / (29) pages	
--	---	--

1.3. General Description of EUT

Equipment	Smart Pen
Model Name	NWP-F130
Model Different	N/A
Brand Name	MOLESKINE
Hardware / Software version	Main Board: REV02, Sub Board: REV01 / 1.00
Operating Band	2 400 MHz ~ 2 483.5 MHz
Operating Frequency Range	2 402 MHz ~ 2 480 MHz
Rated Power	0.7 mW
Power Supply	DC 3.70 V / Li-Polymer Battery
Antenna Type	Integral Antenna
Antenna Gain	-1.62 dBi

1.4. Description Test Modes

The EUT has been tested under Normal Operating condition. Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Test Tool	MediaTek BT Tool (Version: W1537) For test items, the test tool was provided and enabled to make EUT continuous transmitting and receiving signals.
-----------	--

1.5. Test Frequencies

Modulation	Channel	Frequency (MHz)
BLE	Lowest: CH0	2 402
	Middle: CH19	2 440
	Highest: CH39	2 480

TEST REPORT

 SongDam Certification Center #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, 17030, Korea Tel: +82-31-333-3220 Fax: +82-31-624-8855	Report No.: SDCC-2021-00224 Page (6) / (29) pages	
--	---	--

1.6. Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95 % confidence level (based on a coverage factor ($k=2$))

Parameter	Uncertainty
Occupied Bandwidth / Spread Bandwidth	± 6.5 kHz
Frequency Tolerance	± 2.79 ppm
RF Output Power, conducted	± 1.13 dB
Unwanted Emissions, conducted	± 2.39 dB
Supply voltages	± 0.05 %
Time	± 0.585 %

1.7. Test Condition

Normal Condition	Temperature / Relative Humidity		5 °C ~ 35 °C / 45 % ~ 85 %
	Power source	Normal voltage (Rated)	3.70 Vdc
		Upper voltage	4.07 Vdc
		Lower voltage	3.33 Vdc

TEST REPORT

 SongDam Certification Center #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, 17030, Korea Tel: +82-31-333-3220 Fax: +82-31-624-8855	Report No.: SDCC-2021-00224 Page (7) / (29) pages	
--	---	--

2. TEST SUMMARY

The results in this report apply only to sample tested:

Report Section	Parameter	Result
4.1	Frequency error	Pass
4.2	Occupied bandwidth and Spread bandwidth	Pass
4.3	Spurious and unwanted emission intensity	Pass
4.4	Antenna power	Pass
4.5	Limit of secondary radiated emission	Pass
4.6	Absolute gain of transmission antenna (EIRP Antenna Power)	N/A (See note1)
4.7	Principal radiation angle width of transmission antenna (3dB Beam width)	N/A (See note1)
4.8	Interference prevention function	Pass
4.9	Construction Protection Confirmation	Pass
Note 1: This test item does not apply to EUT which EIRP is 12.14dBm or less.		

TEST REPORT

 SongDam Certification Center #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, 17030, Korea Tel: +82-31-333-3220 Fax: +82-31-624-8855	Report No.: SDCC-2021-00224 Page (8) / (29) pages	
--	---	--

3. TEST EQUIPMENT

Equipment	Model	Manufacturer	Serial No.	Calibration Date	Due Date	Calibration Agency
PXA SIGNAL ANALYZER	N9030A	KEYSIGHT	MY55410718	2020-10-21	2021-10-21	HCT
P-SERIES POWER METER	N1911A	KEYSIGHT	MY56410004	2020-10-22	2021-10-22	HCT
WIDEBAND POWER SENSOR	N1922A	KEYSIGHT	MY56310008	2020-10-22	2021-10-22	HCT
DC POWER SUPPLY	E3632A	KEYSIGHT	MY59206342	2020-10-21	2021-10-21	HCT
EXG VECTOR SIGNAL GENERATOR	N5172B	KEYSIGHT	MY56200197	2020-10-22	2021-10-22	HCT

Note: The Calibration agency is accredited by KOLAS (Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA.
Calibration by the calibration agencies listed in the table correspond to paragraph 4(ii)(c) of Article 24-2 in the Radio Law.

TEST REPORT



SongDam Certification Center
#419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si,
Gyeonggi-do, 17030, Korea
Tel: +82-31-333-3220 Fax: +82-31-624-8855

Report No.:
SDCC-2021-00224
Page (9) / (29) pages

4. TEST RESULTS

4.1. Frequency Error

4.1.1. Limit

Item	Limits
Frequency Error	$\leq 50 \text{ ppm}$

4.1.2. Test Procedures

1. Set the EUT at modulation off.
2. Set the EUT operates at channel low, mid and high and normal voltage.
3. Set SA is following as:
 - Center Frequency: the center frequency of testing for EUT
 - RBW: 1 kHz
 - VBW: 30 kHz
 - Span: 150 kHz
 - Sweep time: Auto
 - Detector mode: Positive Peak
 - Trace mode: Clear Write
4. Mark function: Frequency Counter
5. Marker Max. level to get measuring frequency (RF).
6. Varied input voltage to upper voltage and lower voltage and repeat procedure 1 to 5 again.
7. The frequency error formula is $FT \text{ (ppm)} = (RF - MF) / MF \times 10^6$.
(FT: Frequency Tolerance, RF: Reading Frequency, MF: Measurement Frequency)

4.1.3. Test Setup



4.1.4. Test Plots

Please refer to Appendix A.

TEST REPORT

 송담인증센터 SongDam Certification Center	SongDam Certification Center #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, 17030, Korea Tel: +82-31-333-3220 Fax: +82-31-624-8855	Report No.: SDCC-2021-00224 Page (10) / (29) pages	
---	--	--	--

4.1.5. Test Result

Test Conditions	Test Items	Lower Voltage	Normal Voltage	Upper Voltage	Limit (ppm)	Result
Lowest Channel	Measured Frequency (MHz)	2 402.02	2 402.02	2 402.02	≤ 50	Pass
	Frequency Tolerance(ppm)	6.881	6.886	6.867		
Middle Channel	Measured Frequency (MHz)	2 440.02	2 440.02	2 440.02		
	Frequency Tolerance(ppm)	6.986	6.957	6.943		
Highest Channel	Measured Frequency (MHz)	2 480.02	2 480.02	2 480.02		
	Frequency Tolerance(ppm)	6.962	6.940	6.933		

TEST REPORT

 SongDam Certification Center #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, 17030, Korea Tel: +82-31-333-3220 Fax: +82-31-624-8855	Report No.: SDCC-2021-00224 Page (11) / (29) pages	
--	--	--

4.2. Occupied Bandwidth and Spread Bandwidth

4.2.1. Limit

Item	Limits
Occupied Bandwidth	DS or Others ≤ 26 MHz
Spread Bandwidth	N/A

4.2.2. Test Procedures

1. Set the EUT at modulation on.
2. Set the EUT operates at channel low, mid and high and normal voltage.
3. Set SA is following as:

Use OBW function

- Center Frequency: the center frequency of testing for EUT
- RBW: 30 kHz
- VBW: 30 kHz
- Span: 3 MHz
- Sweep time: Auto
- Detector mode: Positive Peak
- Trace mode: Maximum hold

99% spectrum OBW function on to measure occupied bandwidth

90% spectrum OBW function on to measure spread-spectrum bandwidth

4. Read measured OBW result.
5. Varied input voltage to upper voltage and lower voltage and repeat procedure 1 to 4 again.

4.2.3. Test Setup



4.2.4. Test Plots

Please refer to Appendix A.

4.2.5. Test Result

Test Conditions	Occupied Bandwidth (MHz)			Limit (MHz)	Result
	Lower Voltage	Normal Voltage	Upper Voltage		
Lowest Channel	1.044	1.044	1.044	≤ 26	Pass
Middle Channel	1.043	1.043	1.043	≤ 26	
Highest Channel	1.044	1.044	1.044	≤ 26	

TEST REPORT

 SongDam Certification Center #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, 17030, Korea Tel: +82-31-333-3220 Fax: +82-31-624-8855	Report No.: SDCC-2021-00224 Page (12) / (29) pages	
--	--	--

4.3. Spurious and Unwanted Emission Intensity

4.3.1. Limit

Item	Limits
Spurious and Unwanted Emission Intensity	$\leq 2.5 \mu\text{W}$ ($2\ 387\ \text{MHz} > f, 2\ 496.5\ \text{MHz} < f$)
	$\leq 25 \mu\text{W}$ ($2\ 387\ \text{MHz} \leq f < 2\ 400\ \text{MHz}$ and $2\ 483.5\ \text{MHz} < f \leq 2\ 496.5\ \text{MHz}$)

4.3.2. Test Procedures

1. Set the EUT to transmit at rated power and channel to perform test.
2. Set the EUT operates at channel low, mid and high and normal voltage.
3. Set SA is following as:
 - RBW: 1 MHz
 - VBW: 1 MHz
 - Sweep time: Auto
 - Sweep mode: Continuous sweep
 - Detector mode: Positive Peak
 - Trace mode: Maximum hold
4. Marker Max. level.
5. Varied input voltage to upper voltage and lower voltage and repeat procedure 1 to 4 again.

4.3.3. Test Setup



4.3.4. Test Plots

Please refer to Appendix A.

TEST REPORT

 SongDam Certification Center #419, Geumseo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, 17030, Korea Tel: +82-31-333-3220 Fax: +82-31-624-8855	Report No.: SDCC-2021-00224 Page (13) / (29) pages	
---	---	--

4.3.5. Test Result

Test Conditions	Test Ranges		Lower Voltage	Normal Voltage	Upper Voltage	Limit (μW)	Result
Lowest Channel	30 MHz ~ 2 387 MHz	Level (μW)	0.000 49	0.000 49	0.000 55	≤ 2.5	Pass
		Fre. (MHz)	2 375.20	2 375.20	2 375.20		
	2 387 MHz ~ 2 400 MHz	Level (μW)	0.183	0.180	0.181	≤ 25	
		Fre. (MHz)	2 400.00	2 400.00	2 400.00		
	2 483.5 MHz ~ 2 496.5 MHz	Level (μW)	0.001	0.001	0.002	≤ 25	
		Fre. (MHz)	2 484.01	2 484.68	2 489.10		
	2 496.5 MHz ~ 12 500 MHz	Level (μW)	0.002	0.002	0.003	≤ 2.5	
		Fre. (MHz)	4 807.00	4 807.00	4 807.00		
Middle Channel	30 MHz ~ 2 387 MHz	Level (μW)	0.000 12	0.000 16	0.000 11	≤ 2.5	Pass
		Fre. (MHz)	2 375.20	2 375.20	2 375.20		
	2 387 MHz ~ 2 400 MHz	Level (μW)	0.001	0.001	0.001	≤ 25	
		Fre. (MHz)	2 396.27	2 391.25	2 388.39		
	2 483.5 MHz ~ 2 496.5 MHz	Level (μW)	0.001	0.001	0.001	≤ 25	
		Fre. (MHz)	2 490.03	2 491.70	2 495.56		
	2 496.5 MHz ~ 12 500 MHz	Level (μW)	0.002	0.002	0.002	≤ 2.5	
		Fre. (MHz)	4 877.00	4 877.00	4 877.00		
Highest Channel	30 MHz ~ 2 387 MHz	Level (μW)	0.000 07	0.000 09	0.000 07	≤ 2.5	Pass
		Fre. (MHz)	2 349.30	2 351.60	2 358.70		
	2 387 MHz ~ 2 400 MHz	Level (μW)	0.001	0.001	0.001	≤ 25	
		Fre. (MHz)	2 394.93	2 387.82	2 389.73		
	2 483.5 MHz ~ 2 496.5 MHz	Level (μW)	0.003	0.003	0.002	≤ 25	
		Fre. (MHz)	2 483.66	2 483.93	2 483.73		
	2 496.5 MHz ~ 12 500 MHz	Level (μW)	0.002	0.002	0.002	≤ 2.5	
		Fre. (MHz)	2 507.00	2 507.00	4 957.00		

TEST REPORT

 SongDam Certification Center #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, 17030, Korea Tel: +82-31-333-3220 Fax: +82-31-624-8855	Report No.: SDCC-2021-00224 Page (14) / (29) pages	
--	--	--

4.4. Antenna Power

4.4.1. Limit

Item	Limits
Antenna Power	Others ≤ 10 mW
Antenna Power Error	+20%, -80% (Base on manufacturer declare antenna power density)

4.4.2. Test Procedures

1. Set the EUT to transmit at rated power and channel to perform test.
2. Set the EUT operates at channel low, mid and high and normal voltage.
3. Connect the EUT to power meter using the gate function.
4. Record the power level.
5. Varied input voltage to upper voltage and lower voltage and repeat procedure 1 to 4 again.

4.4.3. Test Setup



4.4.4. Test Result

Rated Power	0.7 mW					
Test Conditions	Test Items	Lower Voltage	Normal Voltage	Upper Voltage	Limit	Result
Lowest Channel	Level (mW)	0.500	0.360	0.420	≤ 10 mW	Pass
	Tolerance (%)	-28.57	-48.57	-40.00	+20%, -80%	
Middle Channel	Level (mW)	0.680	0.630	0.520	≤ 10 mW	
	Tolerance (%)	-2.86	-10.00	-25.71	+20%, -80%	
Highest Channel	Level (mW)	0.350	0.520	0.430	≤ 10 mW	
	Tolerance (%)	-50.00	-25.71	-38.57	+20%, -80%	

TEST REPORT

 SongDam Certification Center #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, 17030, Korea Tel: +82-31-333-3220 Fax: +82-31-624-8855	Report No.: SDCC-2021-00224 Page (15) / (29) pages	
--	--	--

4.5. Limit of Secondary Radiated Emission

4.5.1. Limit

Item	Limits
Rx Spurious Emission	$\leq 4 \text{ nW (f < 1 GHz)}$ $\leq 20 \text{ nW (1 GHz} \leq \text{f)}$

4.5.2. Test Procedures

1. Set the EUT on the continuous reception mode.
2. Set the EUT operates at channel low, mid and high and normal voltage.
3. Set SA is following as:
 - RBW: 1 MHz above 1 GHz, 100 kHz under 1 GHz,
 - VBW: 1 MHz above 1 GHz, 100 kHz under 1 GHz,
 - Sweep time: Auto
 - Sweep mode: Continuous sweep
 - Detector mode: Positive Peak
 - Trace mode: Maximum hold
4. Marker Max. level.
5. Varied input voltage to upper voltage and lower voltage and repeat procedure 1 to 4 again.

4.5.3. Test Setup



4.5.4. Test Plots

Please refer to Appendix A.

TEST REPORT

 SongDam Certification Center #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, 17030, Korea Tel: +82-31-333-3220 Fax: +82-31-624-8855	Report No.: SDCC-2021-00224 Page (16) / (29) pages	
--	---	--

4.5.5. Test Result

Test Conditions	Test Ranges		Lower Voltage	Normal Voltage	Upper Voltage	Limit (nW)	Result
Lowest Channel	30 MHz ~ 1 000 MHz	Level (nW)	0.026	0.030	0.029	≤ 4	Pass
		Fre. (MHz)	31.94	31.94	31.94		
	1 000 MHz ~ 12 500 MHz	Level (nW)	0.664	0.653	0.596	≤ 20	
		Fre. (MHz)	4 807.00	4 807.00	4 807.00		
Middle Channel	30 MHz ~ 1 000 MHz	Level (nW)	0.021	0.022	0.022	≤ 4	Pass
		Fre. (MHz)	31.94	31.94	31.94		
	1 000 MHz ~ 12 500 MHz	Level (nW)	0.492	0.506	0.437	≤ 20	
		Fre. (MHz)	4 876.00	4 876.00	4 876.00		
Highest Channel	30 MHz ~ 1 000 MHz	Level (nW)	0.021	0.022	0.039	≤ 4	Pass
		Fre. (MHz)	31.94	31.94	94.99		
	1 000 MHz ~ 12 500 MHz	Level (nW)	0.382	0.388	0.341	≤ 20	
		Fre. (MHz)	4 956.00	4 956.00	4 956.00		

TEST REPORT

 송담인증센터 SongDam Certification Center	SongDam Certification Center #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, 17030, Korea Tel: +82-31-333-3220 Fax: +82-31-624-8855	Report No.: SDCC-2021-00224 Page (17) / (29) pages	
---	--	--	--

4.6. Absolute Gain of Transmission Antenna (EIRP Antenna Power)

4.6.1. Limit

Item	Limits
Absolute gain	≤ 12.14 dBi
EIRP Antenna Power	other ≤ 12.14 dBm
Remark: This test item does not apply to EUT which EIRP is 12.14 dBm or less.	

4.6.2. Test Procedures

1. Set EUT and measuring antenna at the same height and roughly facing each other.
2. Move the measuring antenna height up and down within ± 50 cm of EUT height and swing it to find the maximum output of the measuring antenna. The output level at the spectrum analyzer is read as "E".
3. Remove the EUT from the turn table and put the replacing antenna facing to measuring antenna at same height. Set the standard signal generator (SSG) at same frequency and transmit on then receive the signal.
4. Swing the replacing antenna give a maximum receiving level.
5. Move the measuring antenna height up and down within ± 50 cm of replacing antenna height and swing it to find the maximum receiving level.
6. Set SSG output power at P_t to give the equivalent output level of "E" or calculate P_t with SSG output which gives the nearest of "E" and difference (± 1 dB). Record the P_t .
7. Calculate EIRP by the formula below $EIRP = G_t - L + P_t$.
8. G_t : gain of replacing antenna (dBi)
9. L : feeder loss between SSG and replacing antenna
10. P_t : Output power of the SSG
11. If the antenna for the EUT has circular polarization, sum of V-field and H-field will be result if measuring antenna is linear polarization.

TEST REPORT

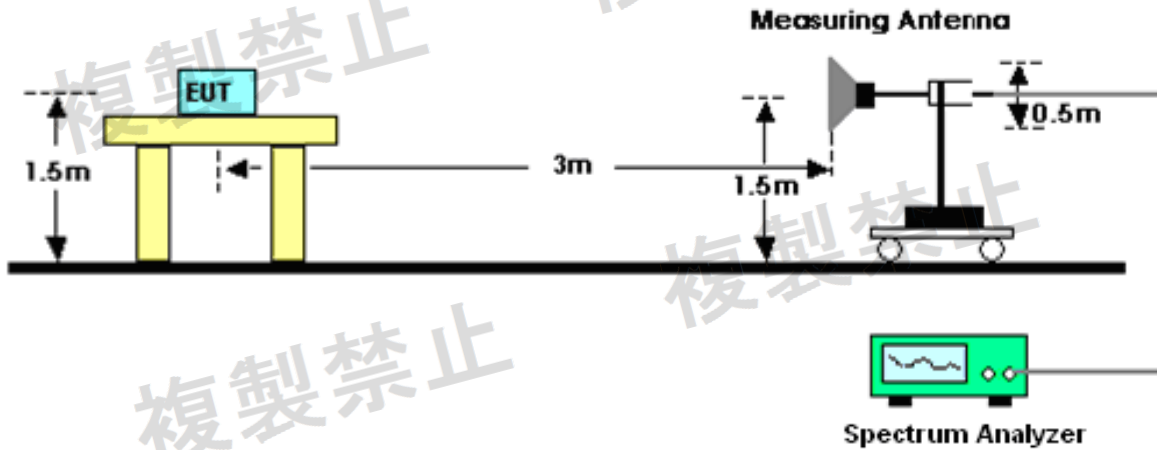


SongDam Certification Center
 #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si,
 Gyeonggi-do, 17030, Korea
 Tel: +82-31-333-3220 Fax: +82-31-624-8855

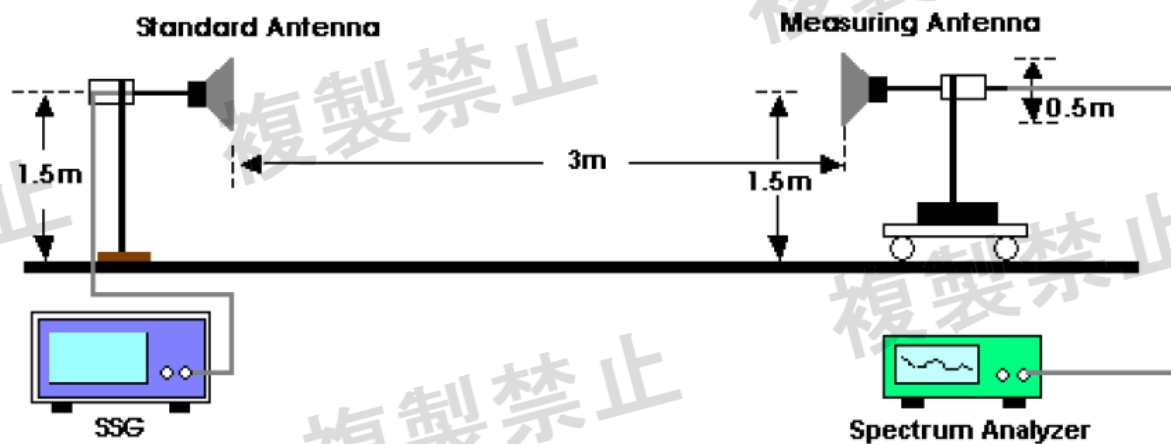
Report No.:
 SDCC-2021-00224
 Page (18) / (29) pages

4.6.3. Test Setup

<For EUT radiation measurement>



<For standard antenna measurement>



4.6.4. Test Result

Antenna Gain	-1.62 dBi				
Test Conditions	E.I.R.P (dBm)			Limit	Result
	Lower Voltage	Normal Voltage	Upper Voltage		
Lowest Channel	-4.630	-6.057	-5.388	≤ 12.14 dBm	Pass
Middle Channel	-3.295	-3.627	-4.460	≤ 12.14 dBm	
Highest Channel	-6.179	-4.460	-5.285	≤ 12.14 dBm	

TEST REPORT

 송담인증센터 SongDam Certification Center	SongDam Certification Center #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, 17030, Korea Tel: +82-31-333-3220 Fax: +82-31-624-8855	Report No.: SDCC-2021-00224 Page (19) / (29) pages	
---	--	--	--

4.7. Principal Radiation Angle Width of Transmission Antenna (3dB Beam Width)

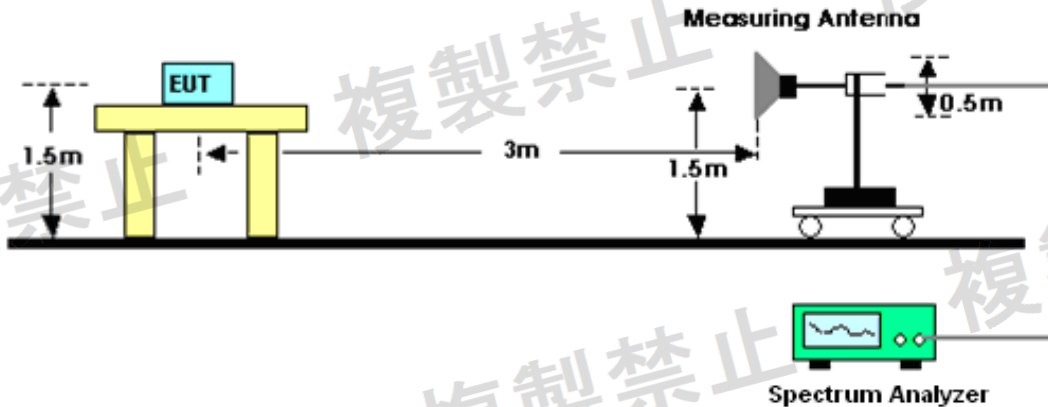
4.7.1. Limit

Item	Limits
3dB antenna beamwidth	$360/A$ (If $A < 1$; then $A = 1$) $A = \{ \text{EIRP Power [dBm]} - 12.14 [\text{dBm}] \}$
Remark: This test item does not apply to EUT which EIRP is 12.14 dBm or less.	

4.7.2. Test Procedures

1. Set EUT and measuring antenna at the same height and roughly facing each other.
2. Set spectrum analyzer with condition in section 3.7.2 and tune reference level to observe receiving signal position.
3. Rotate directions of the EUT horizontally and vertically to find the maximum receiving power.
4. Move the measuring antenna height up and down within $\pm 50\text{cm}$ of EUT height and swing it to find the maximum output of measuring antenna. The output level at the spectrum analyzer is read as "E".
5. Calculate permitted radiation angle in horizontal and vertical using EIRP measured in another test method.
6. Calculate 3dB antenna beam width by the formula below $360/A$ (If $A < 1$; then $A = 1$).
 $A = \{ \text{EIRP Power [dBm]} - 12.14 [\text{dBm}] \}$

4.7.3. Test Setup



4.7.4. Test Result

Not Applicable

Remark: This test item was not applied to the EUT which EIRP is 12.14 dBm or less.

TEST REPORT

 SongDam Certification Center #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, 17030, Korea Tel: +82-31-333-3220 Fax: +82-31-624-8855	Report No.: SDCC-2021-00224 Page (20) / (29) pages	
--	--	--

4.8. Interference prevention function

4.8.1. Limit

Item	Limits
Identification code	≥ 48 bits

4.8.2. Test Procedures

1. Set EUT under operating mode and link up with companion equipment.
2. Check communication status between EUT and companion equipment is normal.
3. Confirm the MAC address of EUT

4.8.3. Test Setup



PC with Net Tool Software
(Get EUT's MAC Address)

4.8.4. Test Result

ID Code (MAC Address)	Limit	Result
FF:FF:FF:01:02:03	≥ 48 bits	Good / Pass

TEST REPORT

 송담인증센터 SDCC SongDam Certification Center	SongDam Certification Center #419, Geumseo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, 17030, Korea Tel: +82-31-333-3220 Fax: +82-31-624-8855	Report No.: SDCC-2021-00224 Page (21) / (29) pages	
---	---	--	--

4.9. Construction Protection Confirmation

4.9.1. Limit

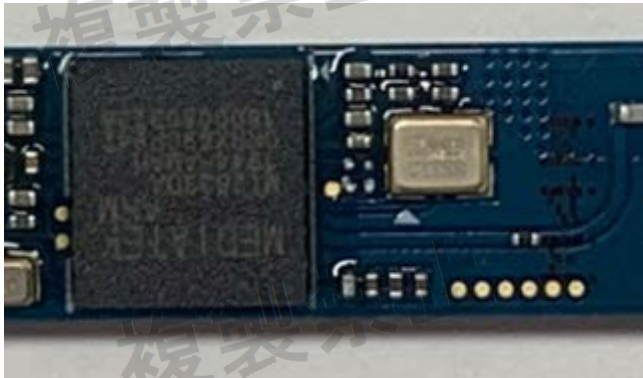
The high-frequency section and modulation section of the radio equipment except for the antenna system shall not be capable of being opened easily.

4.9.2. Confirmation method

The RF and modulation portions are protected against illegal modification as following method

	Sealed with special screws.
	Plastic chassis is being welded using ultrasonic waves.
	Chassis is glued using a special adhesive.
	Metal covers are spot-fused.
	Cover is specially interlocked.
	RF and Modulation components are covered with shielding case and this shielding case is soldered.
	Shield case is welded at RF and modulation parts, and ID-ROM is welded using the BGA Method.
	Shield case is welded at RF and modulation parts, and ID-ROM is glued at its lead with a special adhesive
	Shield case is welded at RF and modulation parts, and ID-ROM is glued with a non-transparent laminating agent.
✓	RF and Modulation parts are mounted on PCB with surface mount technology, and there is no any adjustable part on PCB or adjustable parts are not exposed.

4.9.3. Test Result

Result
Good / Pass


TEST REPORT



SongDam Certification Center
 #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si,
 Gyeonggi-do, 17030, Korea
 Tel: +82-31-333-3220 Fax: +82-31-624-8855

Report No.:
 SDCC-2021-00224
 Page (22) / (29) pages

5. Appendix A. Test Plots

Test Item		Frequency Error		
Lowest Channel				
Lower Voltage		Normal Voltage		Upper Voltage
Middle Channel				
Lower Voltage		Normal Voltage		Upper Voltage
Highest Channel				
Lower Voltage		Normal Voltage		Upper Voltage

TEST REPORT



SongDam Certification Center
 #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si,
 Gyeonggi-do, 17030, Korea
 Tel: +82-31-333-3220 Fax: +82-31-624-8855

Report No.:
 SDCC-2021-00224
 Page (23) / (29) pages

Test Item		Occupied Bandwidth		
Lowest Channel				
Lower Voltage		Normal Voltage		Upper Voltage
Middle Channel				
Lower Voltage		Normal Voltage		Upper Voltage
Highest Channel				
Lower Voltage		Normal Voltage		Upper Voltage

TEST REPORT



SongDam Certification Center
 #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si,
 Gyeonggi-do, 17030, Korea
 Tel: +82-31-333-3220 Fax: +82-31-624-8855

Report No.:
 SDCC-2021-00224
 Page (24) / (29) pages

Test Item		Spurious and unwanted emission intensity	
Lowest Channel			
Lower Voltage		Normal Voltage	
Upper Voltage		Upper Voltage	

TEST REPORT



SongDam Certification Center
 #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si,
 Gyeonggi-do, 17030, Korea
 Tel: +82-31-333-3220 Fax: +82-31-624-8855

Report No.:
 SDCC-2021-00224
 Page (25) / (29) pages

Test Item		Spurious and unwanted emission intensity		
		Middle Channel		
Lower Voltage		Normal Voltage	Upper Voltage	

TEST REPORT



SongDam Certification Center
 #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si,
 Gyeonggi-do, 17030, Korea
 Tel: +82-31-333-3220 Fax: +82-31-624-8855

Report No.:
 SDCC-2021-00224
 Page (26) / (29) pages

Test Item		Spurious and unwanted emission intensity		
		Highest Channel		
Lower Voltage		Normal Voltage	Upper Voltage	

TEST REPORT



SongDam Certification Center
 #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si,
 Gyeonggi-do, 17030, Korea
 Tel: +82-31-333-3220 Fax: +82-31-624-8855

Report No.:
 SDCC-2021-00224
 Page (27) / (29) pages

Test Item		Antenna power error		
Lowest Channel				
Lower Voltage		Normal Voltage		Upper Voltage
Middle Channel				
Lower Voltage		Normal Voltage		Upper Voltage
Highest Channel				
Lower Voltage		Normal Voltage		Upper Voltage

TEST REPORT



SongDam Certification Center
 #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si,
 Gyeonggi-do, 17030, Korea
 Tel: +82-31-333-3220 Fax: +82-31-624-8855

Report No.:
 SDCC-2021-00224
 Page (28) / (29) pages

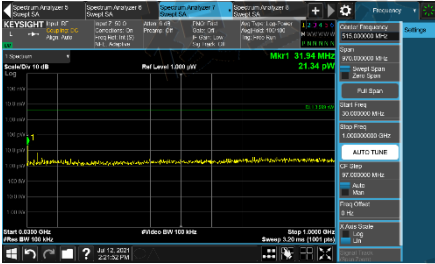
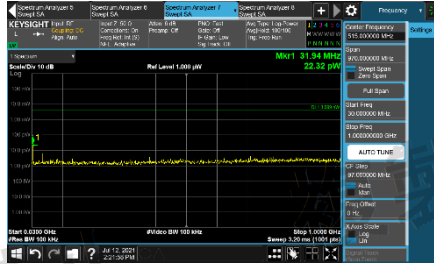
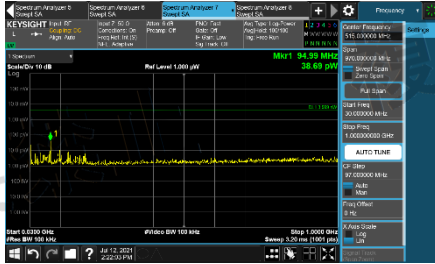
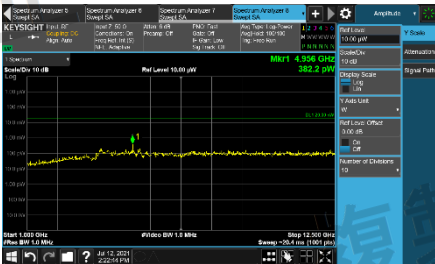
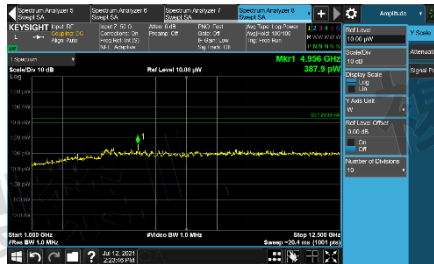
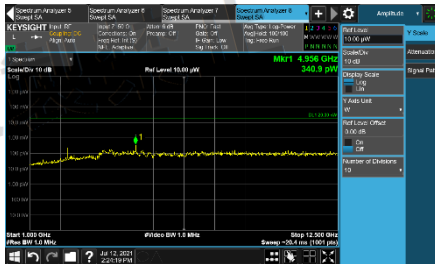
Test Item		Limit of secondary radiated emission		
Lowest Channel				
Lower Voltage		Normal Voltage		Upper Voltage
Middle Channel				
Lower Voltage		Normal Voltage		Upper Voltage
Upper Channel				
Lower Voltage		Normal Voltage		Upper Voltage

TEST REPORT



SongDam Certification Center
 #419, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si,
 Gyeonggi-do, 17030, Korea
 Tel: +82-31-333-3220 Fax: +82-31-624-8855

Report No.:
 SDCC-2021-00224
 Page (29) / (29) pages

Test Item	Limit of secondary radiated emission		
	Highest Channel		
Lower Voltage	Normal Voltage	Upper Voltage	
			
			

---END OF REPORT---