

TEST REPORT



SongDam Certification Center

#601, Creation Hall, Yongin Arts & Science University, 61 Dongbu-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Republic Of Korea [17145]
Tel: +82-31-333-3220 Fax: +82-31-624-8855

Report No.:
SDCC-2025-00283
Page (1) / (19) pages

1. Applicant

Name NEOLAB CONVERGENCE
Address #1501, Mario Tower, 28, Digital-ro 30-gil, Guro-gu, Seoul, Korea 08389
Date of receipt April 24, 2025

2. Manufacturer

Name NEOLAB CONVERGENCE
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 SMARTPEN / NWP-F55

5. Date(s) of Test July 22, 2025 ~ July 22, 2025

6. Place of Test ☒ Inside test ☐ Field test

Address: #601, Creation Hall, Yongin Arts & Science University, 61 Dongbu-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Republic Of Korea, 17145

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

8. Environment (25 ± 10) °C

9. Result Pass

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

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Affirmation	Tested by:	Technical Manager:
	Name: Seok Hoon, Woo (Signature)	Name: Gyung Nam, Park (Signature)

This report is not related to KOLAS accreditation.

July 23, 2025

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Revision History of Report

Report No.	Issued Date	Description
SDCC-2025-00283	July 23, 2025	Initial Issue

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GENERAL INFORMATION

1.1. Applicant & Manufacturer & Test Laboratory Information

1.1.1. Applicant Information

Applicant	NEOLAB CONVERGENCE
Address	#1501, Mario Tower, 28, Digital-ro 30-gil, Guro-gu, Seoul, Korea 08389

1.1.2. Manufacturer Information

Manufacturer	NEOLAB CONVERGENCE
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 Arts & Science University, 61 Dongbu-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Republic Of Korea [17145]
Telephone No.	+82-31-333-3220
Fax No.	+82-31-624-8855

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

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1.3. General Description of EUT

Equipment	SMARTPEN
Model Name	NWP-F55
Model Different	N/A
Hardware / Software version	N/A
Operating Band	2 400 MHz ~ 2 483.5 MHz
Operating Frequency Range	2 402 MHz ~ 2 480 MHz
Operating Mode	BLE 1 Mbps
Rated Power	3.00 mW
Antenna Power (EIRP)	BLE 1 Mbps : 0.93 dBm/MHz (1.24 mW/MHz)
Power Supply	3.70 Vdc / Li-polymer Battery
Antenna Type	Dielectric Chip Antenna
Antenna Gain	0.51 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	1. BLE 1 Mbps : WCN Combo Tool Ver 2.1440.00 For test items, the test tool was provided and enabled to make EUT continuous transmitting and receiving signals.
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1.5. Test Frequencies

Modulation	Channel	Frequency (MHz)
BLE 1 Mbps	Lowest: CH0	2 402
	Middle: CH19	2 440
	Highest: CH39	2 480

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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	± 3.50 kHz
Frequency Tolerance	± 3.59 kHz
RF Output Power, conducted	± 1.42 dB
Unwanted Emissions, conducted	± 1.01 dB

1.7. Test Condition

Normal Condition	Temperature / Relative Humidity		(25 $\pm$ 10) °C / (45 ~ 75) %
	Power source	Normal voltage (Rated)	3.70 Vdc
		Upper voltage	4.07 Vdc
		Lower voltage	3.33 Vdc

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1.8. Construction Protection Confirmation

1.8.1. Confirmation Requirements

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

1.8.2. 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.

1.8.3. Result

Result
Good

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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 Note 1)
4.7	Principal radiation angle width of transmission antenna (3dB Beam width)	N/A (See Note 1)
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 12.14 dBm or less.		

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3. TEST EQUIPMENT

Equipment	Model	Manufacturer	Serial No.	Calibration Date	Due Date	Calibrated by	Cal. Method
PXA SIGNAL ANALYZER	N9030A	KEYSIGHT	MY55410718	2025.05.09	2026.05.09	SICT	Note2
MXG ANALOG SIGNAL GENERATOR	N5183B	KEYSIGHT	MY53271390	2025.05.09	2026.05.09	SICT	Note2
DC power supply	E3632A	Agilent	MY40017681	2024.09.10	2025.09.10	SICT	Note2
CONSTANT TEMP. & HUMI. TEST CHAMBER	SE-CT-02	SUKSAN TECHNOLOGY	220128	2025.02.12	2026.02.12	SICT	Note2
P-SERIES POWER METER	N1911A	KEYSIGHT	MY56410004	2025.05.09	2026.05.09	SICT	Note2
WIDEBAND POWER SENSOR	N1922A	KEYSIGHT	MY56310008	2025.05.09	2026.05.09	SICT	Note2

Note: All test equipment is calibrated by a calibration laboratory accredited to the requirements of ISO 17025.

Note2: Calibration conducted in foreign countries, which shall be equivalent to the calibration conducted by the NICT or a designated calibration agency under Article 102-18 paragraph (1)~ TELECOM Engineering Center, Intertek Japan K.K., Keysight Technologies, Inc~.

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4. TEST RESULTS

4.1. Frequency Error

4.1.1. Limit

Item	Limits
Frequency Error	±50 ppm

4.1.2. Test Procedures

- Set the EUT at modulation off.
- Set the EUT operates at channel low, middle, and highest and normal voltage.
- Set SA is following as:
 - Center Frequency: the center frequency of testing for EUT
 - RBW: 3 kHz
 - VBW: 3 kHz
 - Span: 500 kHz
 - Sweep time: Auto
 - Detector mode: Positive Peak
 - Trace mode: Maximum hold
- Mark function: Frequency Counter
- Marker Max. level to get measuring frequency (RF).
- Varied input voltage to upper voltage and lower voltage and repeat procedure 1 ~ 5 again.
- The frequency error formula is $FT (ppm) = (RF - MF) / MF \times 10^6$.
(FT: Frequency Tolerance, RF: Reading Frequency, MF: Measurement Frequency)

4.1.3. Test Setup



4.1.4. Test Result

Test Mode	Test Conditions	Test Items	Lower Voltage	Normal Voltage	Upper Voltage	Limit (ppm)	Result
BLE 1 Mbps	Lowest Channel	Freq. (MHz)	2 402 023 197	2 402 023 182	2 402 023 182	±50	Pass
		Tolerance (ppm)	9.657	9.651	9.651		
	Middle Channel	Freq. (MHz)	2 440 023 654	2 440 023 636	2 440 023 641		
		Tolerance (ppm)	9.694	9.687	9.689		
	Highest Channel	Freq. (MHz)	2 480 024 065	2 480 024 048	2 480 024 052		
		Tolerance (ppm)	9.704	9.697	9.698		

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4.2. Occupied Bandwidth

4.2.1. Limit

Item	Limits
Occupied Bandwidth	DS or Others ≤ 26 MHz

4.2.2. Test Procedures

1. Set the EUT at modulation on.
 2. Set the EUT operates at channel low, middle, and highest 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
4. Read measured OBW result.
 5. Varied input voltage to upper voltage and lower voltage and repeat procedure 1 ~ 4 again.

4.2.3. Test Setup



4.2.4. Test Result

Test Mode	Test Conditions	Occupied Bandwidth (MHz)			Limit (MHz)	Result
		Lower Voltage	Normal Voltage	Upper Voltage		
BLE 1 Mbps	Lowest Channel	1.040	1.040	1.040	≤ 26	Pass
	Middle Channel	1.039	1.039	1.039	≤ 26	
	Highest Channel	1.040	1.040	1.040	≤ 26	

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4.3. Spurious and Unwanted Emission Intensity

4.3.1. Limit

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

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, middle, and highest 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 ~ 4 again.

4.3.3. Test Setup



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4.3.4. Test Result

Test Mode	Test Conditions	Test Ranges		Lower Voltage	Normal Voltage	Upper Voltage	Limit ($\mu\text{W}/\text{MHz}$)	Result
BLE 1 Mbps	Lowest Channel	30 MHz ~ 2 387 MHz	Level ($\mu\text{W}/\text{MHz}$)	0.003	0.003	0.003	≤ 2.5	Pass
			Freq. (MHz)	2 375.20	2 375.20	2 375.20		
		2 387 MHz ~ 2 400 MHz	Level ($\mu\text{W}/\text{MHz}$)	0.202	0.206	0.207	≤ 25	
			Freq. (MHz)	2 400.00	2 400.00	2 400.00		
		2 483.5 MHz ~ 2 496.5 MHz	Level ($\mu\text{W}/\text{MHz}$)	0.002	0.001	0.002	≤ 25	
			Freq. (MHz)	2 484.98	2 488.15	2 493.73		
		2 496.5 MHz ~ 12 500 MHz	Level ($\mu\text{W}/\text{MHz}$)	0.005	0.005	0.005	≤ 2.5	
			Freq. (MHz)	4 947.00	4 487.00	3 987.00		
	Middle Channel	30 MHz ~ 2 387 MHz	Level ($\mu\text{W}/\text{MHz}$)	0.002	0.002	0.002	≤ 2.5	Pass
			Freq. (MHz)	2 323.40	2 313.90	2 191.40		
		2 387 MHz ~ 2 400 MHz	Level ($\mu\text{W}/\text{MHz}$)	0.001	0.001	0.001	≤ 25	
			Freq. (MHz)	2 393.25	2 389.73	2 395.67		
		2 483.5 MHz ~ 2 496.5 MHz	Level ($\mu\text{W}/\text{MHz}$)	0.002	0.002	0.002	≤ 25	
			Freq. (MHz)	2 489.77	2 490.39	2 485.81		
		2 496.5 MHz ~ 12 500 MHz	Level ($\mu\text{W}/\text{MHz}$)	0.006	0.006	0.006	≤ 2.5	
			Freq. (MHz)	4 877.00	4 877.00	4 877.00		
	Highest Channel	30 MHz ~ 2 387 MHz	Level ($\mu\text{W}/\text{MHz}$)	0.002	0.002	0.002	≤ 2.5	Pass
			Freq. (MHz)	2 321.00	2 304.50	2 361.10		
		2 387 MHz ~ 2 400 MHz	Level ($\mu\text{W}/\text{MHz}$)	0.001	0.001	0.001	≤ 25	
			Freq. (MHz)	2 397.47	2 392.38	2 391.84		
		2 483.5 MHz ~ 2 496.5 MHz	Level ($\mu\text{W}/\text{MHz}$)	0.003	0.003	0.003	≤ 25	
			Freq. (MHz)	2 483.66	2 483.57	2 483.60		
		2 496.5 MHz ~ 12 500 MHz	Level ($\mu\text{W}/\text{MHz}$)	0.006	0.006	0.006	≤ 2.5	
			Freq. (MHz)	4 957.00	4 957.00	4 957.00		

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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, middle, and highest 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 ~ 4 again.

4.4.3. Test Setup



4.4.4. Test Result

Rated Power		3.00 mW					
Test Mode	Test Conditions	Test Items	Lower Voltage	Normal Voltage	Upper Voltage	Limit	Result
BLE 1 Mbps	Lowest Channel	Level (mW)	1.09	1.09	1.09	≤ 10 mW	Pass
		Tolerance (%)	-63.67	-63.67	-63.67	+20 %, -80 %	
	Middle Channel	Level (mW)	1.10	1.09	1.09	≤ 10 mW	
		Tolerance (%)	-63.33	-63.67	-63.67	+20 %, -80 %	
	Highest Channel	Level (mW)	1.04	1.04	1.04	≤ 10 mW	
		Tolerance (%)	-65.33	-65.33	-65.33	+20 %, -80 %	

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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

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

4.5.3. Test Setup



4.5.4. Test Result

Test Mode	Test Conditions	Test Ranges		Lower Voltage	Normal Voltage	Upper Voltage	Limit (nW)	Result
BLE 1 Mbps	Lowest Channel	30 MHz ~ 1 000 MHz	Level (nW)	0.114	0.120	0.118	≤4	Pass
			Freq. (MHz)	64.92	62.98	63.95		
		1 000 MHz ~ 12 500 MHz	Level (nW)	0.490	0.488	0.496	≤20	
			Freq. (MHz)	7 417.00	4 025.00	3 783.00		
	Middle Channel	30 MHz ~ 1 000 MHz	Level (nW)	0.124	0.113	0.118	≤4	Pass
			Freq. (MHz)	68.80	68.80	68.80		
		1 000 MHz ~ 12 500 MHz	Level (nW)	0.500	0.487	0.477	≤20	
			Freq. (MHz)	4 013.00	4 979.00	4 761.00		
	Highest Channel	30 MHz ~ 1 000 MHz	Level (nW)	0.128	0.144	0.115	≤4	Pass
			Freq. (MHz)	68.80	68.80	68.80		
		1 000 MHz ~ 12 500 MHz	Level (nW)	0.483	0.494	0.475	≤20	
			Freq. (MHz)	3 818.00	3 841.00	3 829.00		

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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

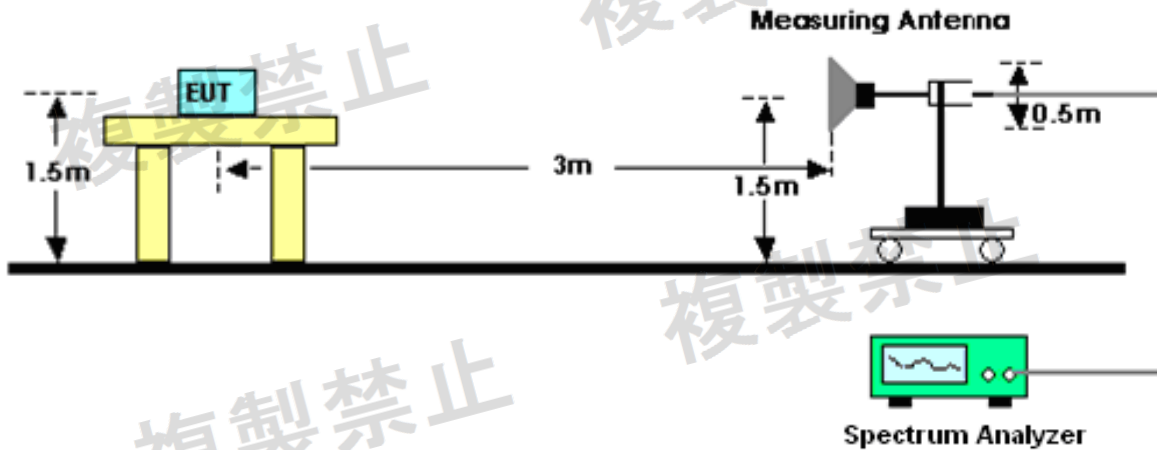
1. Set EUT and measuring antenna at the same height and roughly facing each other.
2. Move the measuring antenna height up and down within ± 50 cm of EUT height and swing it to find the maximum output of the measuring antenna. The output level at the spectrum analyzer is read as "E".
3. Remove the EUT 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 Pt to give the equivalent output level of "E" or calculate Pt with SSG output which gives the nearest of "E" and difference (± 1 dB). Record the Pt.
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

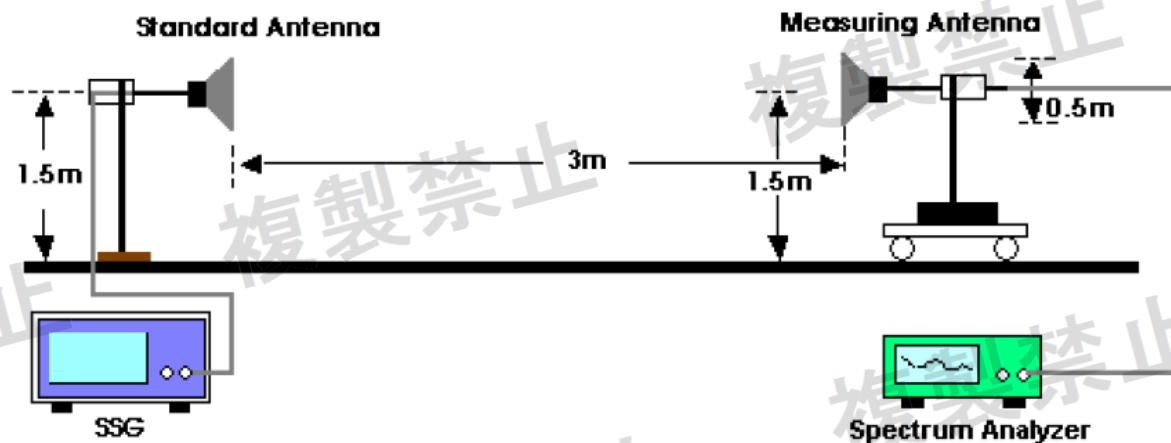
 송담인증센터 SDCC SongDam Certification Center	SongDam Certification Center #601, Creation Hall, Yongin Arts & Science University, 61 Dongbu-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Republic Of Korea [17145] Tel: +82-31-333-3220 Fax: +82-31-624-8855	Report No.: SDCC-2025-00283 Page (17) / (19) pages	
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4.6.3. Test Setup

<For EUT radiation measurement>



<For standard antenna measurement>



4.6.4. Test Result

Not Applicable

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

TEST REPORT

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

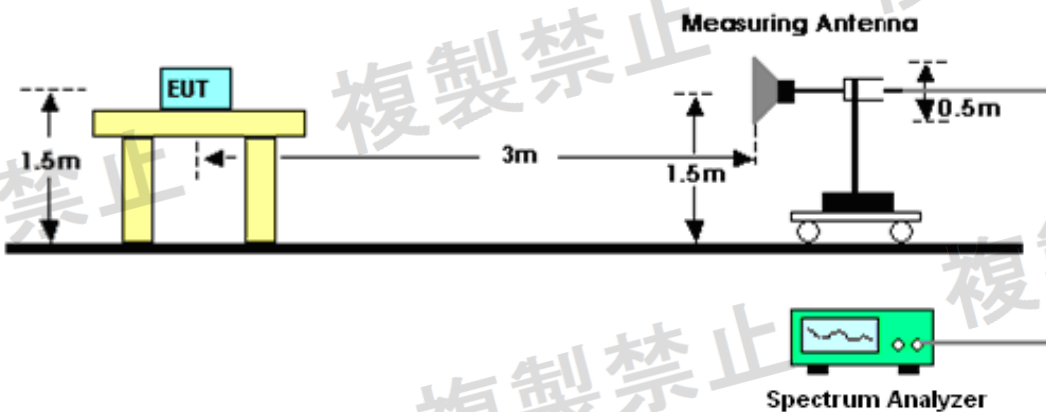
4.7.1. Limit

Item	Limits
3dB antenna beamwidth	$360/A$ (If $A < 1$; then $A = 1$) $A = \{EIRP \text{ Power [dBm]} - 12.14 \text{ [dBm]}\}$
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 3 dB antenna beam width by the formula below $360/A$ (If $A < 1$; then $A = 1$).
 $A = \{EIRP \text{ Power [dBm]} - 12.14 \text{ [dBm]}\}$

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

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4.8. Interference prevention function

4.8.1. Limit

Item	Limits
Identification code	≥48 bits

4.8.2. Test Procedures

1. Set EUT below 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

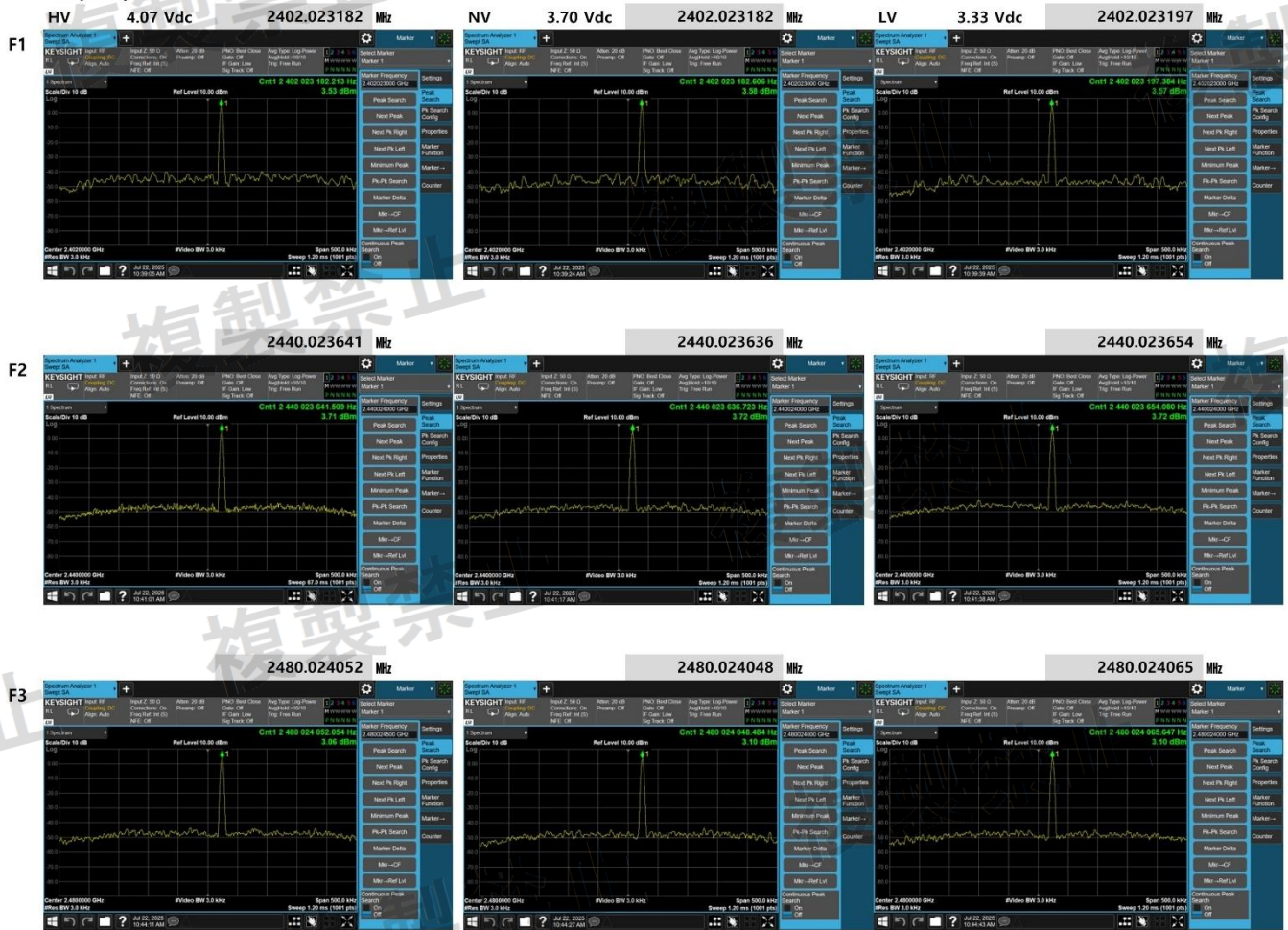
Test Mode	ID Code (MAC Address)	Limit	Result
BLE 1 Mbps	00:00:46:25:03:01	≥48 bits	Good

---END OF REPORT---

Appendix A. Test Plots

1. Frequency Error

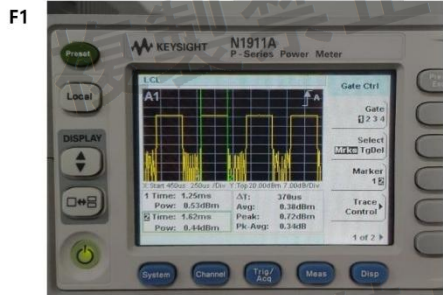
Frequency error



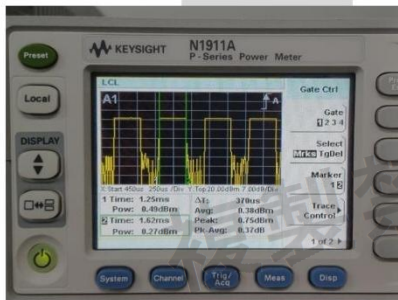
2. Antenna Power

Antenna power

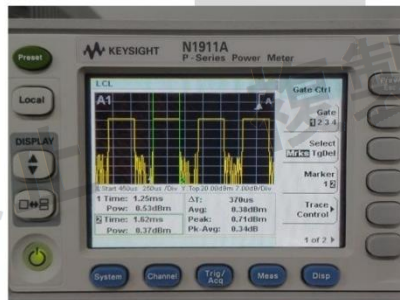
HV 4.07 Vdc 0.38 dBm



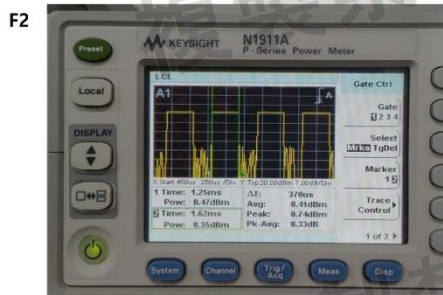
NV 3.70 Vdc 0.38 dBm



LV 3.33 Vdc 0.38 dBm



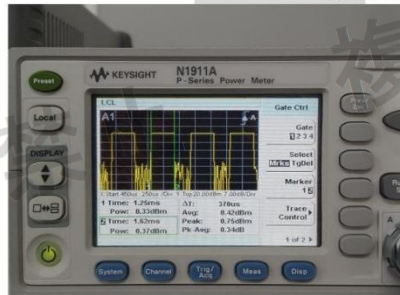
0.41 dBm



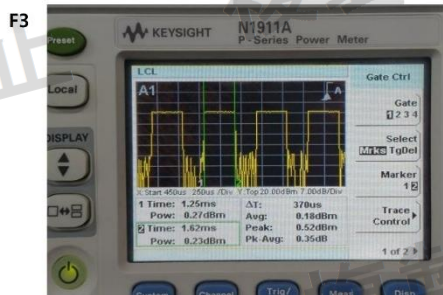
0.41 dBm



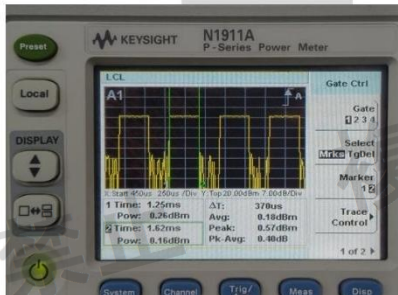
0.42 dBm



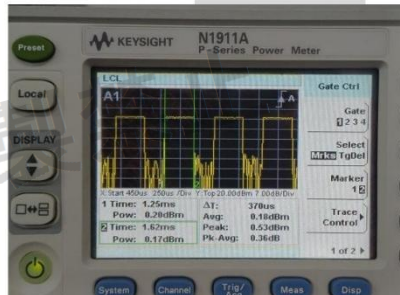
0.18 dBm



0.18 dBm

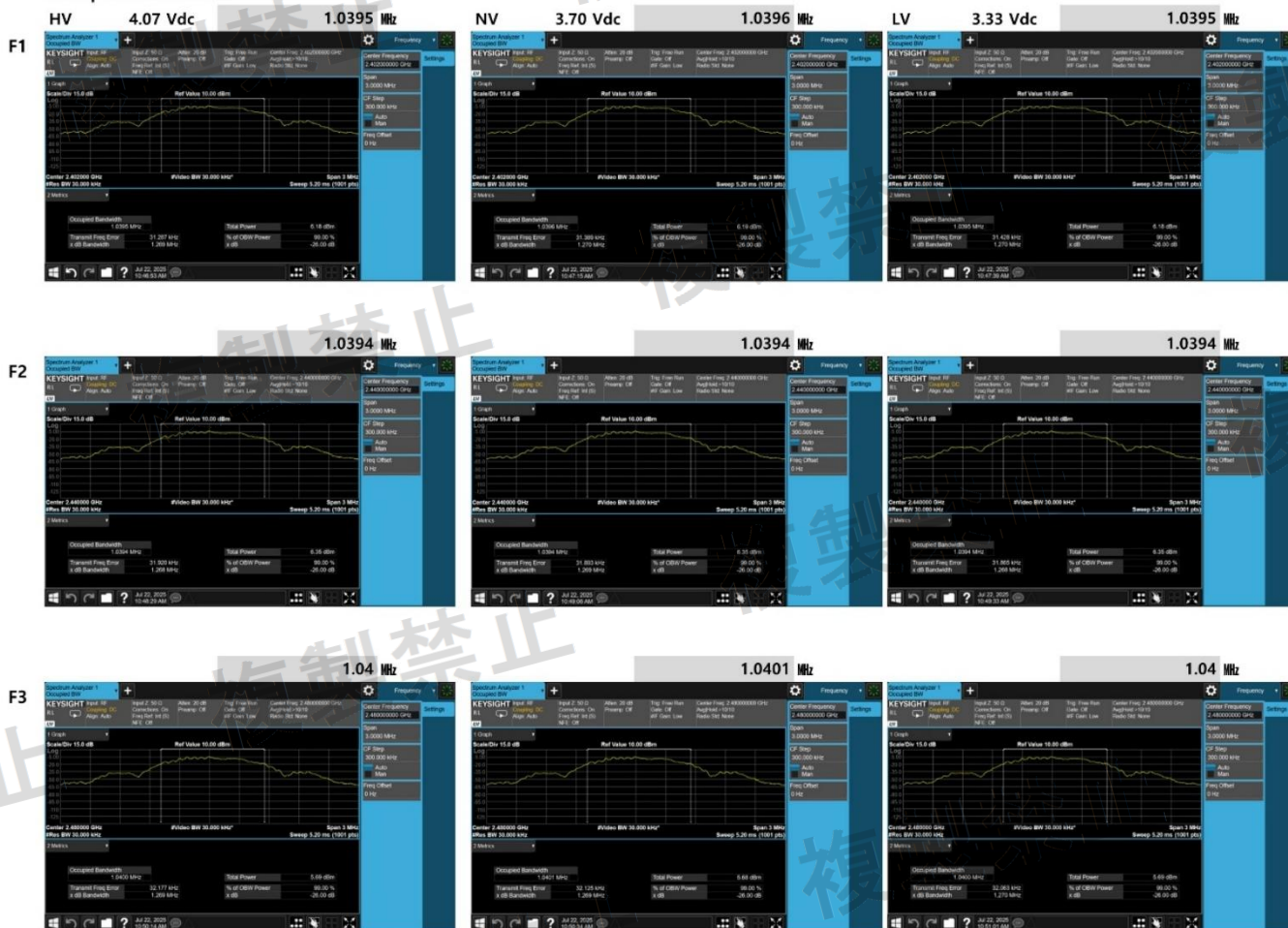


0.18 dBm



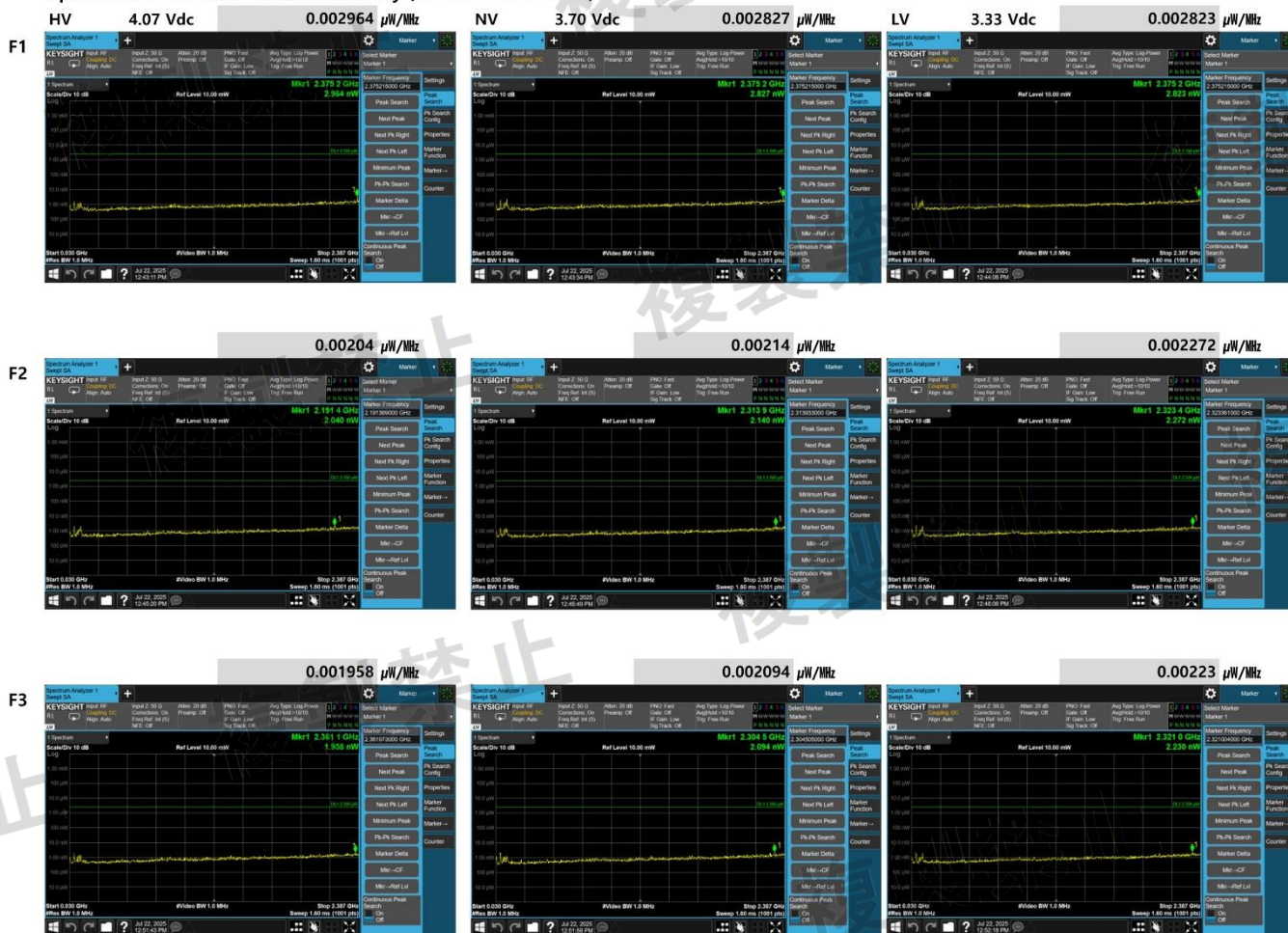
3. Occupied Bandwidth

Occupied Bandwidth



4. Spurious and Unwanted Emission Intensity (30 MHz ~ 2 387 MHz)

Spurious and unwanted emission intensity (30 MHz ~ 2387 MHz)



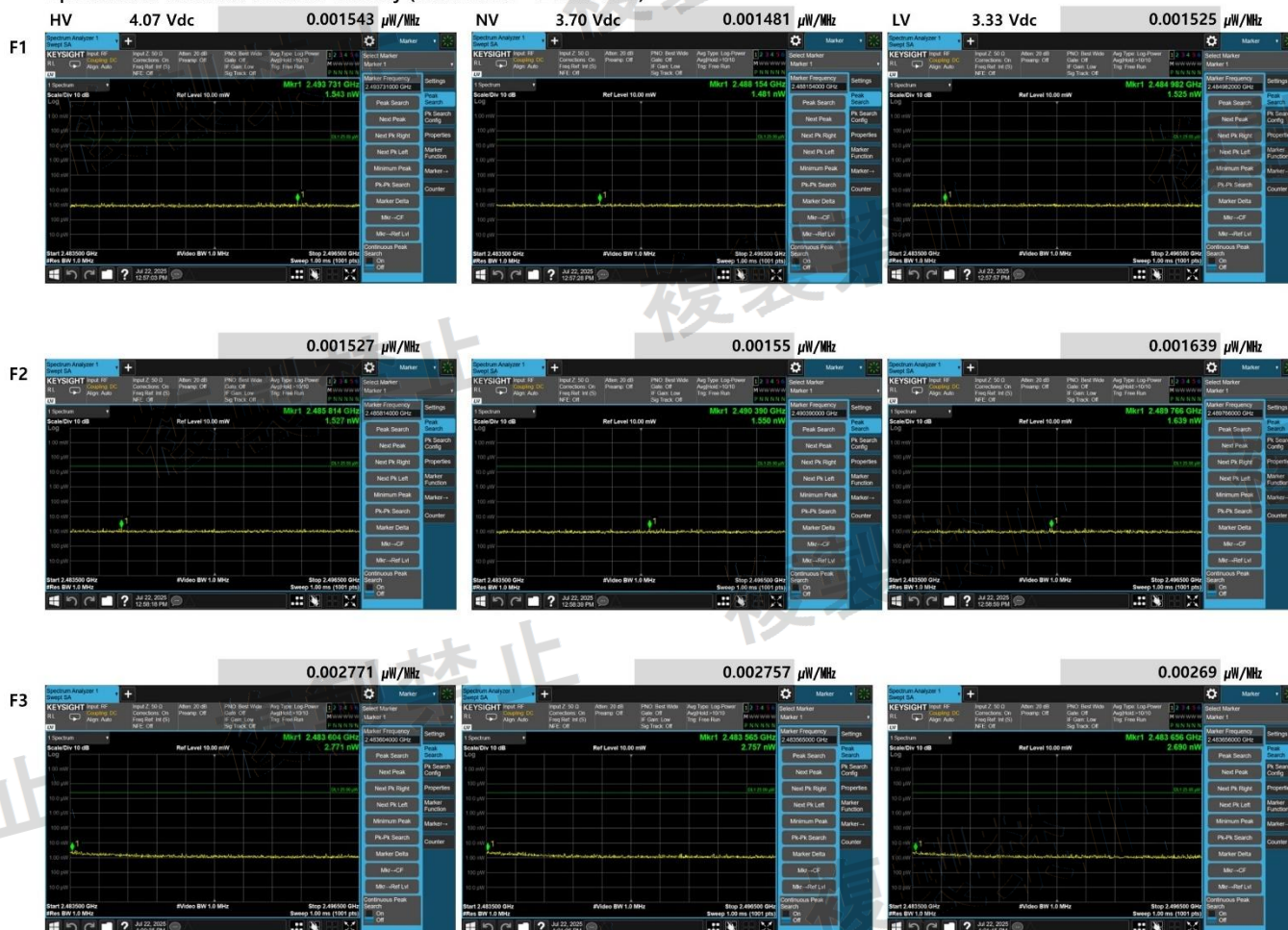
5. Spurious and Unwanted Emission Intensity (2 387 MHz ~ 2 400 MHz)

Spurious and unwanted emission intensity (2387 MHz ~ 2400 MHz)



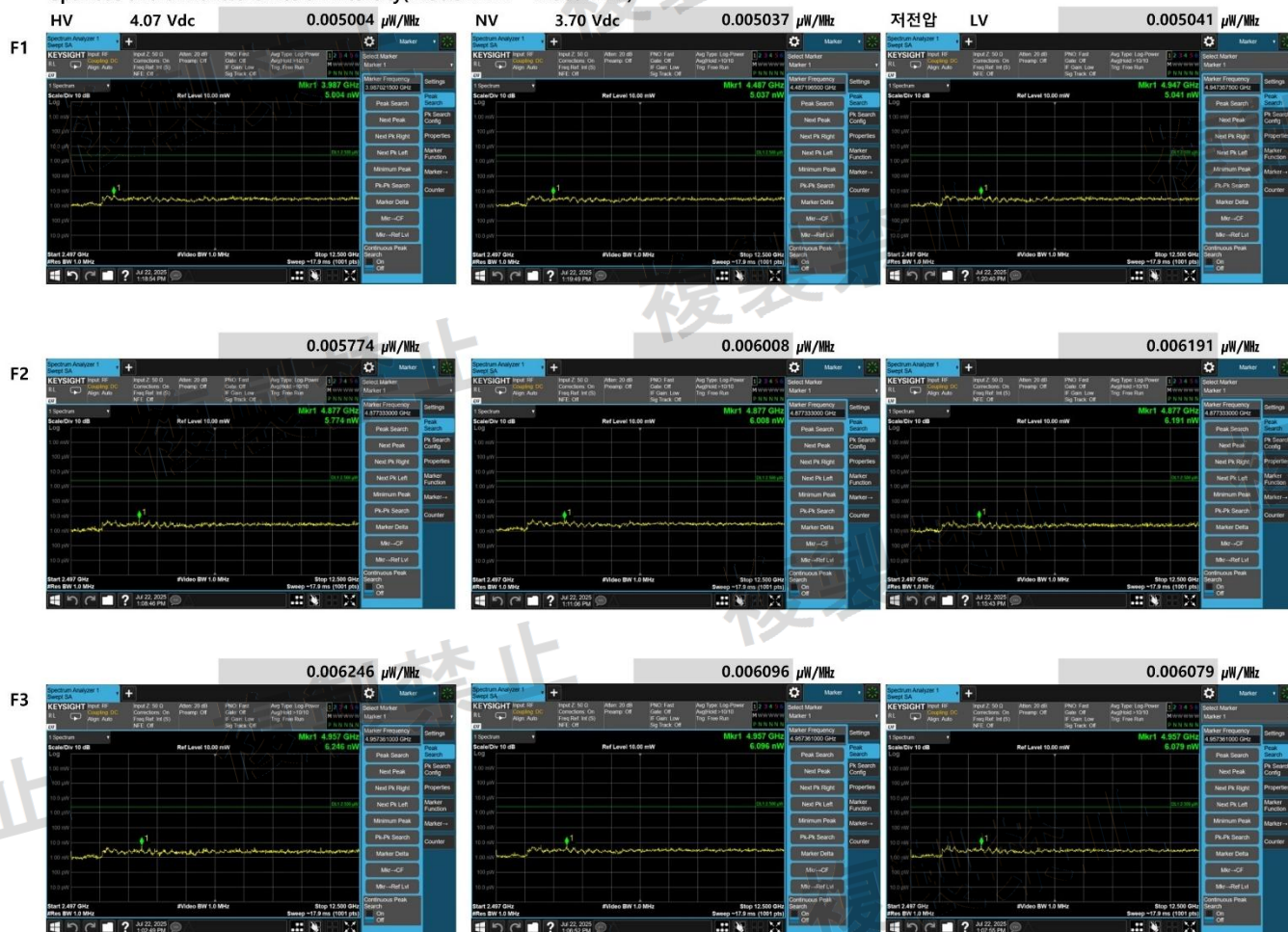
6. Spurious and Unwanted Emission Intensity (2 483.5 MHz ~ 2 496.5 MHz)

Spurious and unwanted emission intensity (2483.5 MHz ~ 2496.5 MHz)



7. Spurious and Unwanted Emission Intensity (2 496.5 MHz ~ 12 500 MHz)

Spurious and unwanted emission intensity(2496.5 MHz ~ 12500 MHz)



Limit of secondary radiated emission (30 MHz to 1 GHz)



9. Limit of Secondary Radiated Emission (1 000 MHz ~ 12 500 MHz)

Limit of secondary radiated emission (1 GHz to 12.5 GHz)

