시 험 성 적 서
TEST REPORT

성적서 번호 Report No.		ICRT-TR-E232963-0A
신청자 Client	기관명 Name	DREXIA Tomasz Wojtasik
	주 소 Address	ul. Regatowa 19a, 93-482 Łódź
시험대상품목 Sample description		RFID Reader 13.56MHz
모델명 Type designation		1W-H0-06 BZ M12 MS
정 격 Ratings		DC 12 V / 24 V
시험장소 Place of test		■ 고정시험(Inside test) □ 현장시험(Field test) 주소지(Address): 112, Hwanggeum 3-ro 7beon-gil, Hagun-ri, Yangchon-eup, Gimpo-si, Gyeonggi-do, Korea
시험기간 Date of test		18. Sep. 2023 ~ 25. Oct. 2023
시험방법/항목 Test Method/Item		FCC Part 15 Subpart C §15.225
시험결과 Test Results		Refer to 3. Test Summary
확 인 Affirmation	작성자 Tested by 성 명 Name Si-Yeon, Hwang (서 명) (Signature)	기술책임자 Technical Manager 성 명 Name Tae-Yang, Yoon (서 명) (Signature)

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2023. 11. 21

주식회사 아이씨알 대표이사

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경기도 김포시 양촌읍 황금3로7번길 112 / Tel: 02-6351-9001 ~ 6
112, Hwanggeum3-ro 7beon-gil, Yangchon-eup, Gimpo-si, Gyeonggi-do, Korea / Tel: 02-6351-9001 ~ 6

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Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
ICRT-TR-E232963-0A	2023. 11. 21	Initial Issue	All

1. Applicant & Manufacturer & Test Laboratory Information

1.1 Applicant information

Applicant	DREXIA Tomasz Wojtasik
Address	ul. Regatowa 19a, 93-482 Łódź
Contact Person	Piotr Opara
Telephone No.	48422072668
E-mail	t.wojtasik@drexia.pl

1.2 Manufacturer Information

Manufacturer	DREXIA Tomasz Wojtasik
Address	Ekonomiczna 30 93-426 Łódź Poland

1.3 Test Laboratory Information

Conducted tests were performed at	
Laboratory	ICR Co., Ltd.
Address	112, 113, Hwanggeum 3-ro 7beon-gil, Hagun-ri, Yangchon-eup, Gimpo-si, Gyeonggi-do, Korea
Telephone No.	+82-2-6351-9002
Fax No.	+82-2-6351-9007
RRA No.	KR0165
KOLAS No.	KT652

2. Equipment under Test(EUT) Information

2.1 General Information

Product Name	RFID Reader 13.56MHz
Brand Name	-
Model Name	1W-H0-06 BZ M12 MS
Additional Model Name	-
FCC ID	2BEXQ1WH006BZM12MS1
Power Supply	DC 12 V / 24 V

2.2 Additional Information

Equipment Class	DXX-Low Power communications Device Transmitter	
Operating Frequency	13.56 ㎒	
Channel Number	1	
Modulation Type	ASK	
Maximum output power	DC 12 V	75.42 dBμV/m
	DC 24 V	75.35 dBμV/m
Antenna Type	PCB Antenna	

2.3 Mode of operation during the test

- The EUT is continuous transmission mode during the test with set at Low Channel, Middle Channel, and High Channel. To get a maximum radiated emission levels from the EUT, the EUT was moved throughout the XY, YZ, XZ planes.

2.4 Modifications of EUT

- None

3. Test Summary

3.1 Test standards and results

FCC Part 15 Subpart C			
Clause	Test items	Applied	Results
§15.215 (c)	20 dB Bandwidth	☒	PASS
§15.225 (e)	Frequency Stability Tolerance	☒	PASS
§15.225 (a)(b)(c)	In-Band Emissions	☒	PASS
§15.225 (d) §15.209	Out-of-Band Emissions	☒	PASS

3.2 Purpose of the test

- To determine whether the equipment under test fulfills the requirements of the standards stated in FCC Part 15 Subpart C Section 15.225.

3.3 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2013, FCC CFR 47 PART 15.

3.4 Configuration of Test System

3.4.1 Radiated emission test

Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions.

The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

3.5 Antenna requirement

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.
The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section.
The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

3.5.1 Result: Pass

The transmitter has a ***PCB Antenna.***

4. Used equipment on test

	Description	Model Name	Manufacturer	Serial Number	Next Cal
☒	SIGNAL GENERATOR	SMB100A	R&S	180607	2024.03.02
☒	SIGNAL ANALYZER	FSV 40-N	R&S	101936	2024.03.03
☒	ATTENUATOR	PFA40K2-10	PSATEK	-	2024.03.07
☒	DC BLOCK	PDCB-00012650-SMSF-3	PSATEK INC.	-	2024.05.02
☒	CHAMBER	SH-641	ESPEC	92001266	2024.03.03
☒	LOOP ANTENNA	HFH2-Z2	R&S	100271	2025.03.08
☒	BI-Log ANTENNA	VULB 9162	R&S	120	2024.12.26
☒	SIGNAL CONDITIONING UNIT	SCU 08	R&S	100746	2024.04.03
☒	EMI TEST RECEIVER	ESR26	R&S	101462	2024.04.04
☒	DC POWER SUPPLY	AGILANT	E3632A	MY51300069	2024.03.03

※ All test equipment used is calibration on a regular basis.

5. Test Result DC 12 V

5.1 20 dB Bandwidth

5.1.1 Operating environment

Temperature : 21 ℃

Relative humidity : 45 %

5.1.2 Measurement method

Standard : §15.215 (c)

5.1.3 Test setup

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth(RBW) is set to 1% to 5% of the OBW. The Video bandwidth is set to 3 times the RBW. The 20 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 20 dB.

Spectrum Analyzer	—	EUT

5.1.4 Test data

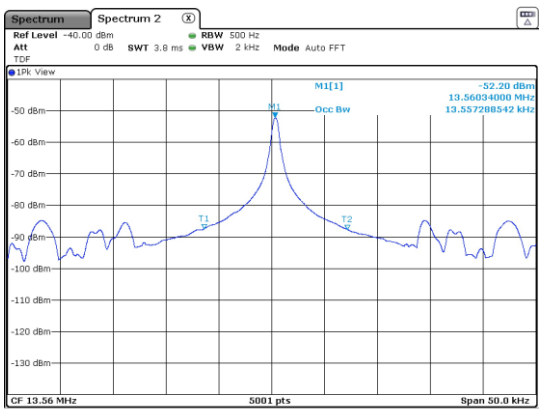
Operating mode : Transmit mode

Test Result : Pass

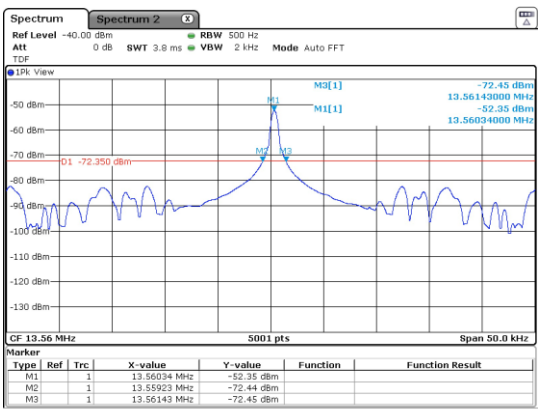
5.1.5 Measured Result

Modulation Type	Frequency (MHz)	Measured Value (MHz)		Limit (MHz)
		99% Occupied Bandwidth	20 dB Bandwidth	
ASK	13.56	0.0136	0.0003	do not exceed range in 13.110-14.010 MHz.

5.1.6 Measured Graph Occupied Bandwidth & 20 dB Bandwidth



99% Occupied Bandwidth



20 dB Bandwidth

5.2 Frequenct Stability Tolerance

5.2.1 Operating environment

Temperature : 21 ℃

Relative humidity : 45 %

5.2.2 Measurement method

Standard : §15.225 (e)

5.2.3 Test setup

Measurement procedures were implemented according to the test method of ANSI C63.10: 2013.

Part 15.225 requires that devices operating in the 13.553 ~ 13.567 ㎒ shall maintain the carrier frequency within 0.01% of the operating frequency over the temperature variation of -20 degrees to +50 degrees C at nomal voltage.

5.2.4 Test data

Operating mode : Transmit mode

Test Result : Pass

5.2.5 Measured Results

Modulation type	Voltage (%)	Power (DC)	Temperature (°C)	Frequency (㎐)	Freq. DEV (㎐)	Deviation (%)	Limit (%)
ASK	100%	12	50	13 560 200	200	0.0015	0.01
	100%		40	13 560 400	400	0.0029	
	100%		30	13 560 400	400	0.0029	
	100%		20	13 560 400	400	0.0029	
	100%		10	13 560 400	400	0.0029	
	100%		0	13 560 400	400	0.0029	
	100%		-10	13 560 400	400	0.0029	
	100%		-20	13 560 400	400	0.0029	
	85%	10.2	20	13 560 400	400	0.0029	
	115%	13.8	20	13 560 400	400	0.0029	

5.3 Radiated Emissions

5.3.1 Operating environment

Temperature : 23 ℃

Relative humidity : 44 %

5.3.2 Measurement method

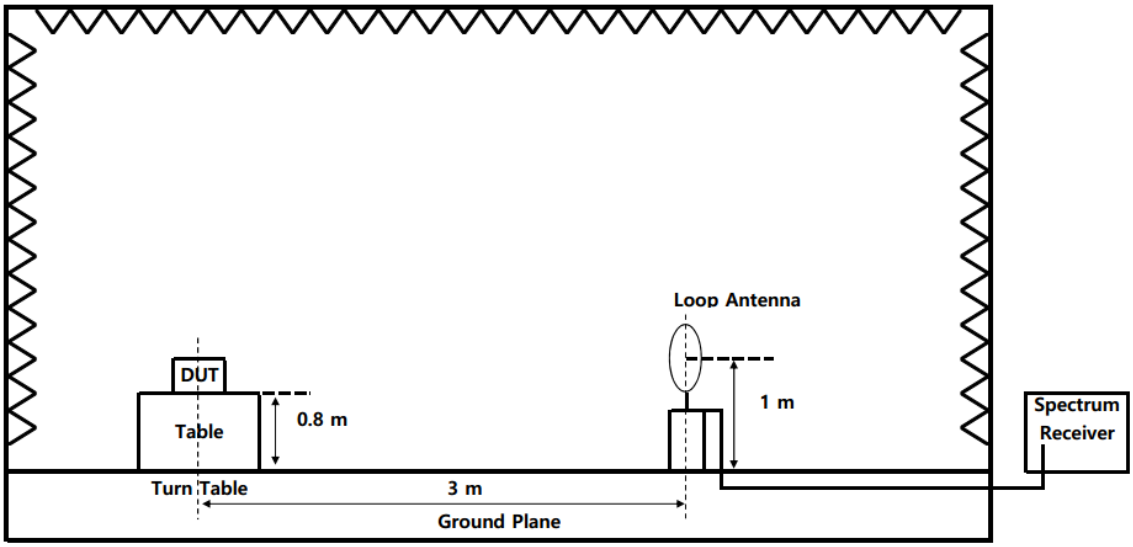
Standard : §15.225 (a)(b)(c)(d)

5.3.3 Test setup

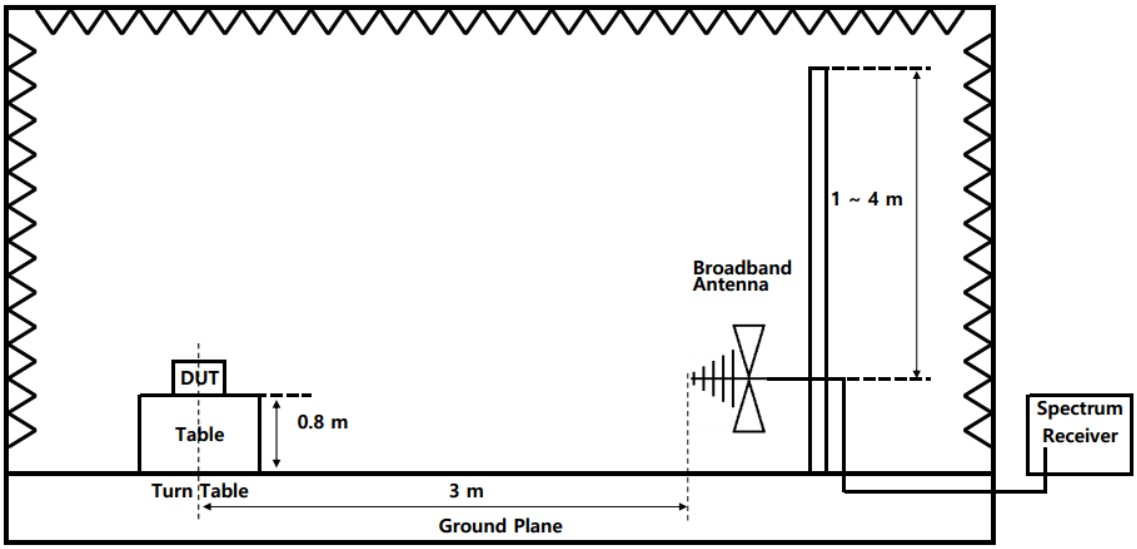
The radiated emissions measurements were performed on the 3 m, Semi-Anechoic Camber. The EUT was placed on a non-conductive turntable above the ground plane.

The frequency spectrum from 9 ㎑ to 1 ㎓ was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

5.3.4 Test setup layout Below 30 ㎒



5.3.5 Test setup layout 30 ㎒ to 1 ㎓



5.3.6 Regulation

The EUT must comply with field strength limits defined in section 15.225(a), (b) and (c) of cfr47 FCC Part 15, Subpart C:

Frequency (㎒)	Limit at 30m (dBμV/m)	Limit at 3m (dBμV/m)
13.110 to 13.410 and 13.710 to 14.010	40.5	80.5
13.410 to 13.553 and 13.567 to 13.710	50.5	90.5
13.553 to 13.567	84.0	124.0

According to §15.225(d), The field strength of any emissions appearing outside of the 13.110 to 14.010 ㎒ band shall not exceed the general radiated emission limits in § 15.209.
According to §15.209(a), for an intentional device, the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (㎒)	Field strength (μV/m)	Field strength (dBμV/m)	Measurement distance (m)
0.009 ~ 0.490	2 400 / F (㎑)	-	300
0.490 ~ 1.705	24 000 / F (㎑)	-	30
1.705 ~ 30	30	29.54	30
30 ~ 88	100	40.00	3
88 ~ 216	150	43.52	3
216 ~ 960	200	46.02	3
Above 960	500	53.98	3

The emission limits shown in the above table are based on measurement instrumentation employing a CISPR quasi-peak detector and above 1 000 ㎒ are based on the average value of measured emissions.

5.3.7 Test data for Radiated Electric Field Emissions

Operating mode : Transmit mode

Test Result : Pass

5.3.8 Measurement Results (13.553 ~ 13.567) ㎒

Frequency (㎒)	Reading (dBμV)	Detector	Ant. Pol. (H/V)	Corr. Factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
13.560	55.72	Peak	H	19.7	75.42	124.00	48.58
13.561	52.62	Peak	V	19.7	72.32	124.00	51.68

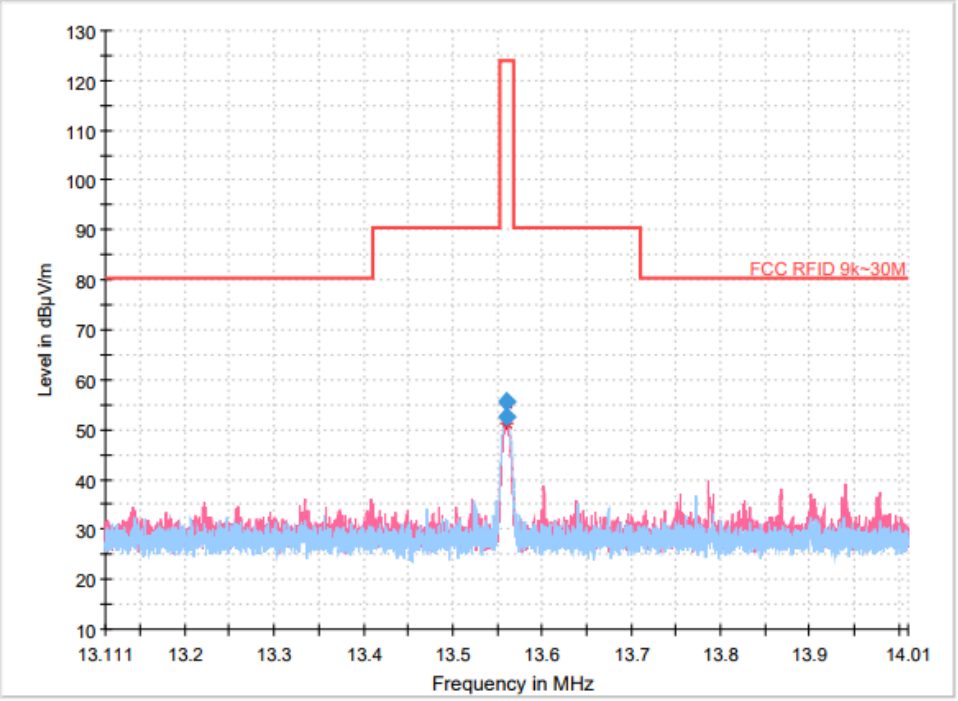
※ Ant. Pol. : Antenna Polarization

※ Corr. Factor. : Antenna Factor + Cable Loss - Amplifier Gain

※ Result = Reading + Corr. Factor

※ Margin =Limit - Result

5.3.9 Measured Graph (13.111 ㎒ ~ 14.01 ㎒)



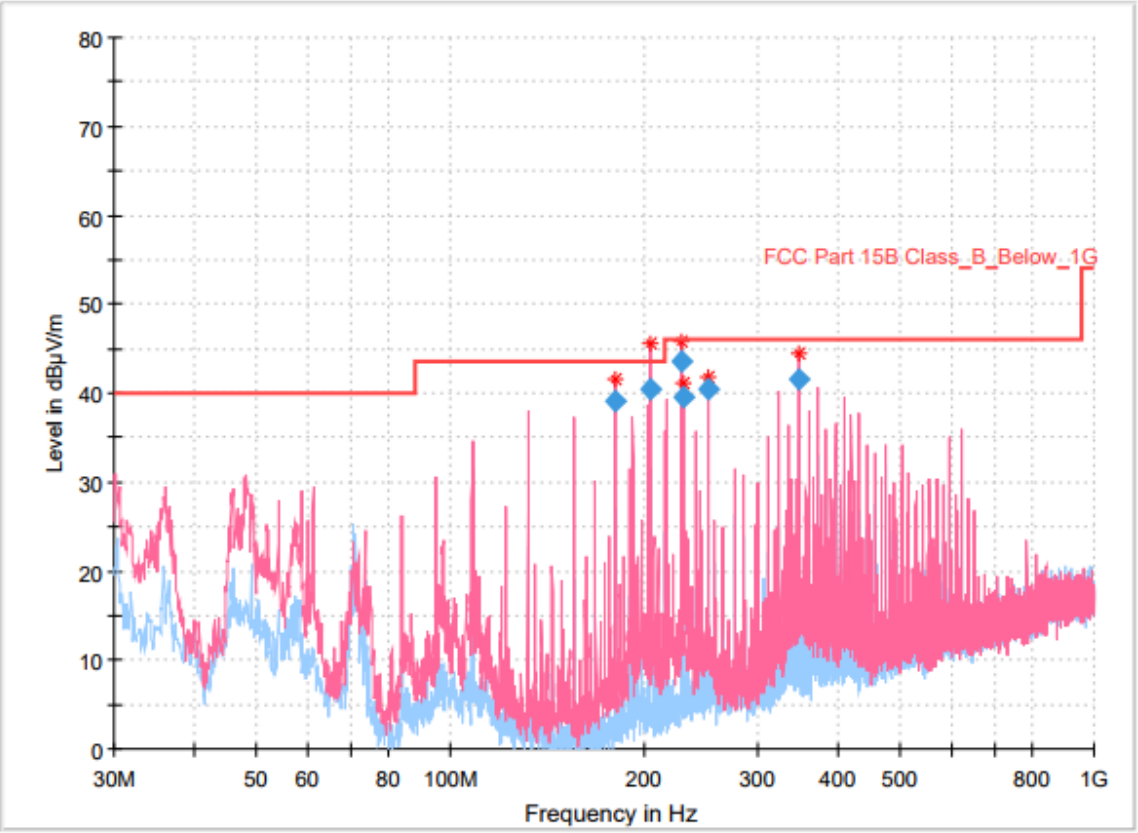
Acc. to above test data, the field strength level of 13.56 ㎒ is 75.42 dBμV/m and the worst limit subject to 15.225 (b) and (c) is 80.5 dBμV/m, so the EUT meets the requirement.

5.3.10 Spurious Emission Test

5.3.11 Measurement Results for Below 30 ㎒

Frequency (㎒)	Reading (dBμV)	Detector	Ant. Pol. (H/V)	Corr. Factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
It was not found any emissions peaks found from the EUT.							

5.3.12 Measurement Results for below 1 ㎓



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
179.962000	39.19	43.50	4.31	1000.0	120.000	100.0	V	52.0	-26.7
204.018000	40.49	43.50	3.01	1000.0	120.000	100.0	V	175.0	-25.1
227.977000	43.51	46.00	2.49	1000.0	120.000	100.0	V	120.0	-23.8
230.499000	39.63	46.00	6.37	1000.0	120.000	100.0	V	148.0	-23.6
252.033000	40.47	46.00	5.53	1000.0	120.000	100.0	V	293.0	-22.6
347.966000	41.63	46.00	4.37	1000.0	120.000	100.0	V	279.0	-19.8

6. Test Result DC 24 V

6.1 20 dB Bandwidth

6.1.1 Operating environment

Temperature : 21 ℃

Relative humidity : 45 %

6.1.2 Measurement method

Standard : §15.215 (c)

6.1.3 Test setup

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth(RBW) is set to 1% to 5% of the OBW. The Video bandwidth is set to 3 times the RBW. The 20 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 20 dB.

Spectrum Analyzer	——	EUT

6.1.4 Test data

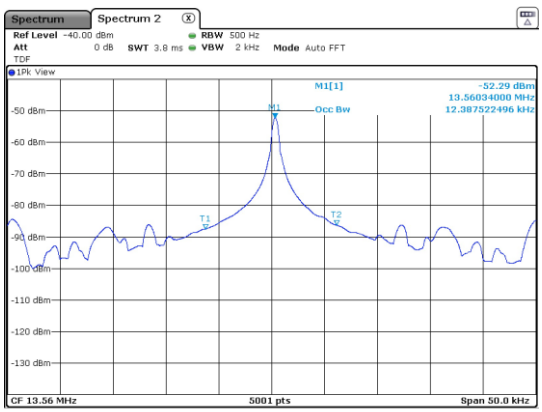
Operating mode : Transmit mode

Test Result : Pass

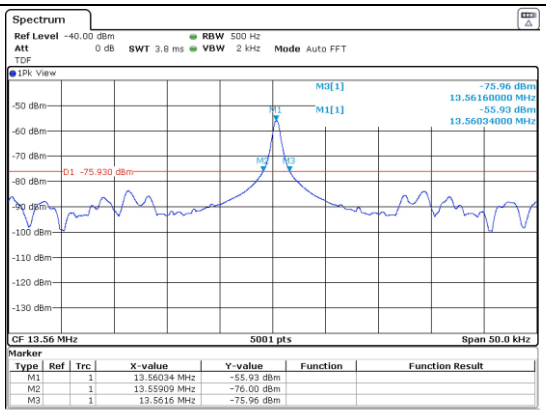
6.1.5 Measured Result

Modulation Type	Frequency (MHz)	Measured Value (MHz)		Limit (MHz)
		99% Occupied Bandwidth	20 dB Bandwidth	
ASK	13.562	0.0136	0.0003	do not exceed range in 13.110-14.010 MHz.

6.1.6 Measured Graph Occupied Bandwidth & 20 dB Bandwidth



99% Occupied Bandwidth



20 dB Bandwidth

6.2 Frequenct Stability Tolerance

6.2.1 Operating environment

Temperature : 21 ℃

Relative humidity : 45 %

6.2.2 Measurement method

Standard : §15.225 (e)

6.2.3 Test setup

Measurement procedures were implemented according to the test method of ANSI C63.10: 2013.

Part 15.225 requires that devices operating in the 13.553 ~ 13.567 ㎒ shall maintain the carrier frequency within 0.01% of the operating frequency over the temperature variation of -20 degrees to +50 degrees C at nomal voltage.

6.2.4 Test data

Operating mode : Transmit mode

Test Result : Pass

6.2.5 Measured Results

Modulation type	Voltage (%)	Power (DC)	Temperature (°C)	Frequency (㎐)	Freq. DEV (㎐)	Deviation (%)	Limit (%)
ASK	100%	12	50	13 560 200	200	0.0015	0.01
	100%		40	13 560 400	400	0.0029	
	100%		30	13 560 400	400	0.0029	
	100%		20	13 560 400	400	0.0029	
	100%		10	13 560 400	400	0.0029	
	100%		0	13 560 400	400	0.0029	
	100%		-10	13 560 400	400	0.0029	
	100%		-20	13 560 400	400	0.0029	
	85%	10.2	20	13 560 400	400	0.0029	
	115%	13.8	20	13 560 400	400	0.0029	

6.3 Radiated Emissions

6.3.1 Operating environment

Temperature : 23 ℃

Relative humidity : 44 %

6.3.2 Measurement method

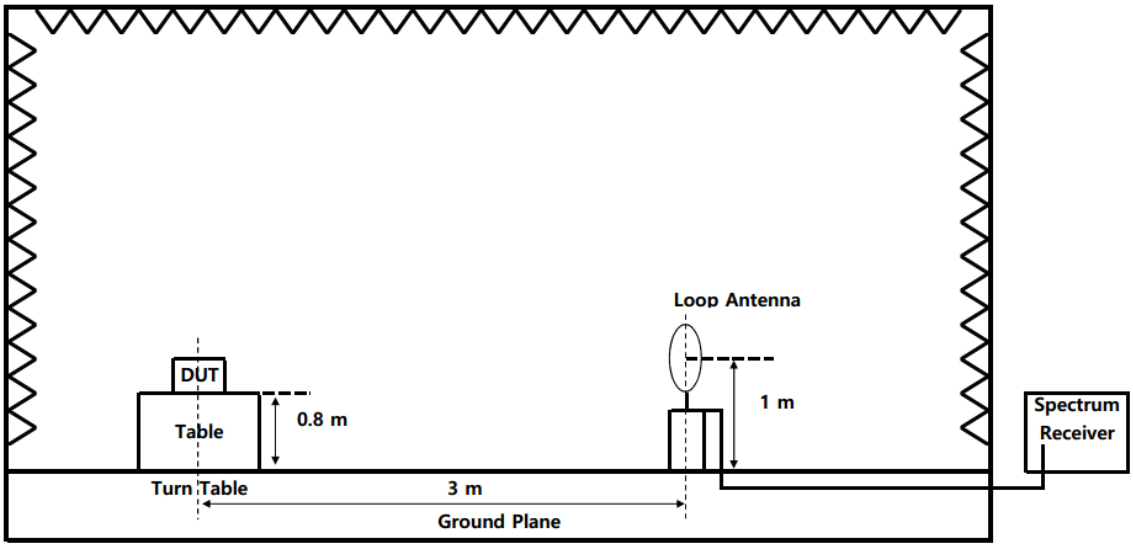
Standard : §15.225 (a)(b)(c)(d)

6.3.3 Test setup

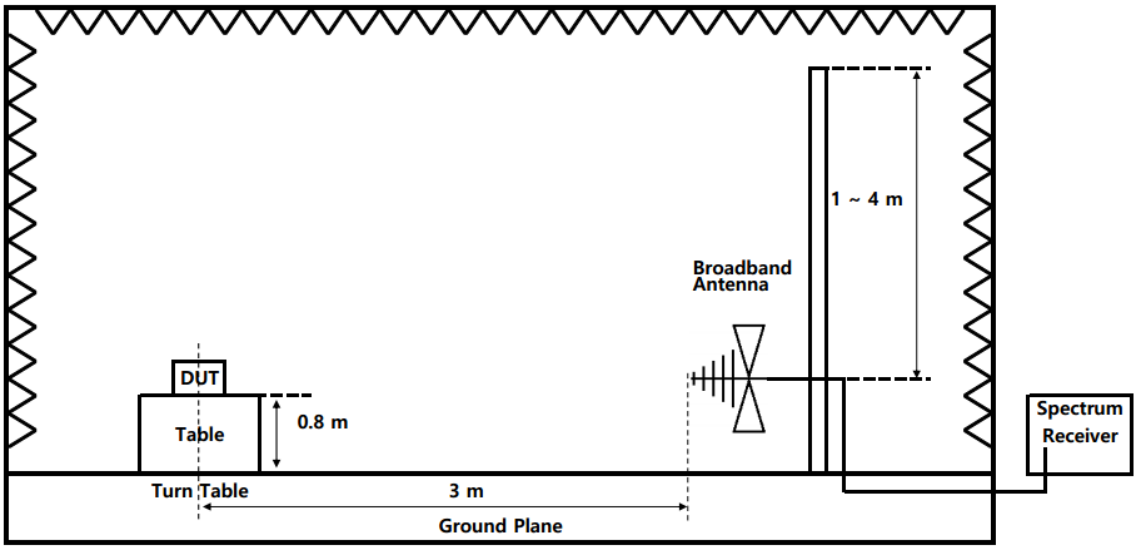
The radiated emissions measurements were performed on the 3 m, Semi-Anechoic Camber. The EUT was placed on a non-conductive turntable above the ground plane.

The frequency spectrum from 9 ㎑ to 1 ㎓ was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

6.3.4 Test setup layout Below 30 ㎒



6.3.5 Test setup layout 30 ㎒ to 1 ㎓



6.3.6 Regulation

The EUT must comply with field strength limits defined in section 15.225(a), (b) and (c) of cfr47 FCC Part 15, Subpart C:

Frequency (㎒)	Limit at 30m (dBμV/m)	Limit at 3m (dBμV/m)
13.110 to 13.410 and 13.710 to 14.010	40.5	80.5
13.410 to 13.553 and 13.567 to 13.710	50.5	90.5
13.553 to 13.567	84.0	124.0

According to §15.225(d), The field strength of any emissions appearing outside of the 13.110 to 14.010 ㎒ band shall not exceed the general radiated emission limits in § 15.209.
According to §15.209(a), for an intentional device, the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (㎒)	Field strength (μV/m)	Field strength (dBμV/m)	Measurement distance (m)
0.009 ~ 0.490	2 400 / F (㎑)	-	300
0.490 ~ 1.705	24 000 / F (㎑)	-	30
1.705 ~ 30	30	29.54	30
30 ~ 88	100	40.00	3
88 ~ 216	150	43.52	3
216 ~ 960	200	46.02	3
Above 960	500	53.98	3

The emission limits shown in the above table are based on measurement instrumentation employing a CISPR quasi-peak detector and above 1 000 ㎒ are based on the average value of measured emissions.

6.3.7 Test data for Radiated Electric Field Emissions

Operating mode : Transmit mode

Test Result : Pass

6.3.8 Measurement Results (13.553 ~ 13.567) ㎒

Frequency (㎒)	Reading (dBμV)	Detector	Ant. Pol. (H/V)	Corr. Factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
13.560	55.65	Peak	H	19.7	75.35	124.00	48.65
13.560	52.42	Peak	V	19.7	72.12	124.00	51.88

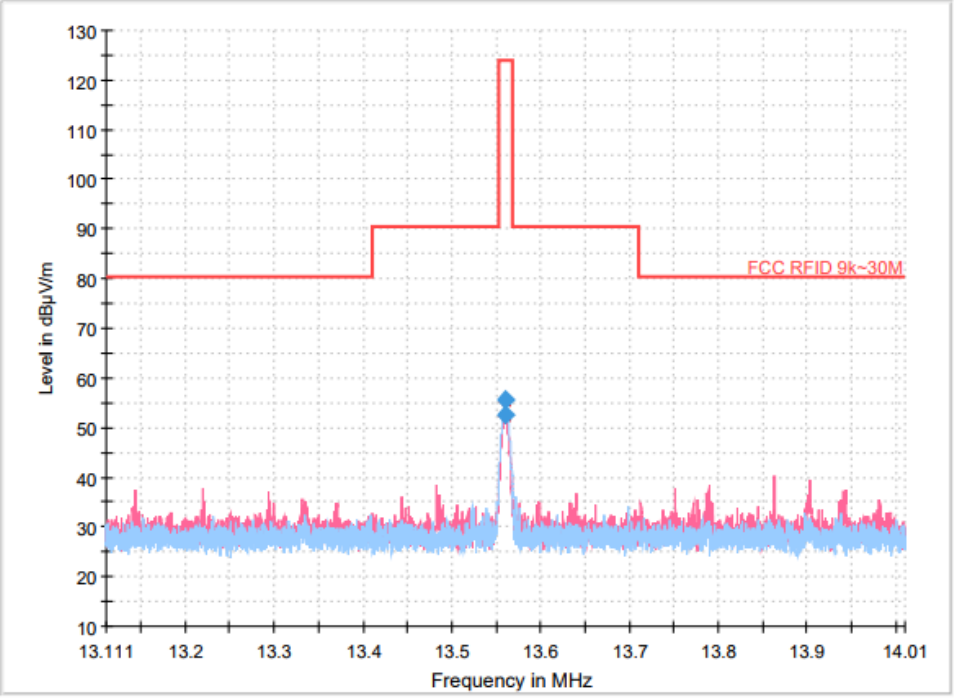
※ Ant. Pol. : Antenna Polarization

※ Corr. Factor. : Antenna Factor + Cable Loss - Amplifier Gain

※ Result = Reading + Corr. Factor

※ Margin =Limit - Result

6.3.9 Measured Graph (13.111 ㎒ ~ 14.01 ㎒)



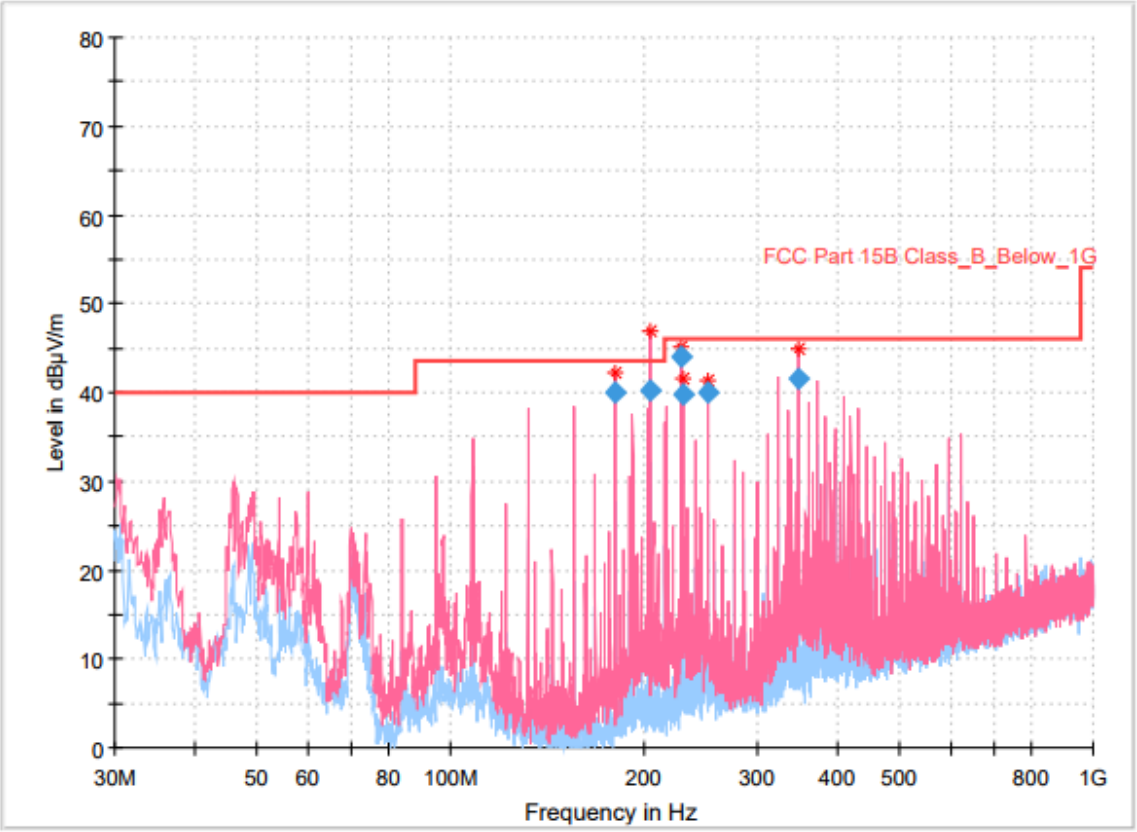
Acc. to above test data, the field strength level of 13.56 ㎒ is 75.35 dBμV/m and the worst limit subject to 15.225 (b) and (c) is 80.5 dBμV/m, so the EUT meets the requirement.

6.3.10 Spurious Emission Test

6.3.11 Measurement Results for Below 30 ㎒

Frequency (㎒)	Reading (dBμV)	Detector	Ant. Pol. (H/V)	Corr. Factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
It was not found any emissions peaks found from the EUT.							

6.3.12 Measurement Results for below 1 ㎓



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
179.962000	39.99	43.50	3.51	1000.0	120.000	100.0	V	35.0	-26.7
204.018000	40.32	43.50	2.82	1000.0	120.000	100.0	V	177.0	-25.1
227.977000	43.96	46.00	2.04	1000.0	120.000	100.0	V	125.0	-23.8
230.499000	39.79	46.00	6.21	1000.0	120.000	100.0	V	139.0	-23.6
252.033000	39.99	46.00	6.01	1000.0	120.000	100.0	V	299.0	-22.6
347.966000	41.53	46.00	4.47	1000.0	120.000	100.0	V	299.0	-19.8

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