TEST REPORT

Eurofins KCTL Co.,Ltd. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-31-285-0894 FAX: 82-505-299-8311 www.kctl.co.kr	Report No.: KR22-SRF0164 Page (1) of (17)	eurofins | KCTL

1. Client

- Name : SUPREMA INC
- Address : 17F-5, Parkview officetower,, 248, Jeongjail-ro, Bundang-gu, Seongnam-si, Gyeonggi-do 13554 Korea (Republic Of)
- Date of Receipt : 2022-08-23

2. Use of Report : Certification

3. Name of Product / Model : BioStation3 / BS3-DB

4. Manufacturer / Country of Origin : SUPREMA INC / Korea

5. FCC ID : TKWBS3-DB

6. IC Certificate No. : 23080-BS3DB

7. Date of Test : 2022-09-01 to 2022-09-08

8. Location of Test : ■ Permanent Testing Lab ☐ On Site Testing
(Address:65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea)

9. Test method used : FCC Part 15 Subpart C, 15.209
RSS-210 Issue 10 December 2019
RSS-Gen Issue 5 February 2021

10. Test Result : Refer to the test result in the test report

Affirmation	Tested by	Technical Manager
	Name : Eunseong Lim (Signature)	Name : Heesu Ahn (Signature)

2022-10-19

Eurofins KCTL Co.,Ltd.

REPORT REVISION HISTORY

Date	Revision	Page No
2022-10-19	Originally issued	-

General remarks for test reports

Statement concerning the uncertainty of the measurement systems used for the tests

(may be required by the product standard or client)

☐ **Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:**

Procedure number, issue date and title:

Calculations leading to the reported values are on file with the testing laboratory that conducted the testing.

☒ **Statement not required by the standard or client used for type testing**

CONTENTS

1. General information

Client	:	SUPREMA INC
Address	:	17F-5, Parkview officetower,, 248, Jeongjail-ro, Bundang-gu, Seongnam-si, Gyeonggi-do 13554 Korea (Republic Of)
Manufacturer	:	SUPREMA INC
Address	:	17F-5, Parkview officetower,, 248, Jeongjail-ro, Bundang-gu, Seongnam-si, Gyeonggi-do 13554 Korea (Republic Of)
Laboratory	:	Eurofins KCTL Co.,Ltd.
Address	:	65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
Accreditations	:	FCC Site Designation No: KR0040, FCC Site Registration No: 687132
		VCCI Registration No. : R-20080, G-20078, C-20059, T-20056
		CAB Identifier: KR0040, ISED Number: 8035A
		KOLAS No.: KT231

2. Device information

Equipment under test	:	BioStation3
Model	:	BS3-DB
Frequency range	:	13.56 ㎒ (NFC)
		125 ㎑ (RFID)
		2 402 ㎒ ~ 2 480 ㎒ (Bluetooth Low Energy)
Modulation technique	:	ASK (NFC,RFID), GFSK (Bluetooth Low Energy)
Number of channels	:	40 ch (Bluetooth Low Energy), 1 ch (NFC, RFID)
Power source	:	DC 12 V, DC 24 V
Antenna specification	:	PCB Loop antenna (NFC)
		Coil antenna (RFID)
		PCB antenna (Bluetooth Low Energy)
Antenna gain	:	-2.42 dBi (Bluetooth Low Energy)
Software version	:	1.0.0
Hardware version	:	1.0.0
Operation temperature	:	-20 ℃ ~ 50 ℃

2.1. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source
N/A	-	-	-	-

2.2. Frequency/channel operations

This device contains the following capabilities:
NFC, RFID(125 ㎑), Bluetooth Low Energy

Ch.	Frequency (㎑)
01	125

Table 2.2.1. RFID

3. Antenna requirement

Requirement of FCC part section 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.

Requirement of RSS-Gen Section 6.8:

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

-The transmitter has permanently attached Coil antenna (internal antenna) on board.

4. Summary of tests

FCC Part section(s)	IC Rule reference	Parameter	Test results
15.209(a)	RSS-210 Issue 9 (8.9)	Field Strength of Fundamental and Spurious Emission	Pass
2.1049	-	20dB Bandwidth	Pass
-	RSS-Gen Issue 5 (6.7)	Occupied Bandwidth	Pass
15.203	RSS-Gen Issue 5 (6.8)	Antenna requirement	Pass
15.207(a)	RSS-Gen Issue 5 (8.8)	AC Conducted Emission	N/A[7)]

Notes: (N/T: Not Tested, N/A: Not Applicable)

1. All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2. These tests were performed other than open field site, adequate comparison measurements were confirmed against 30 m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
3. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that **Y** orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in **Y** orientation.
4. The test procedure(s) in this report were performed in accordance as following.
   - ANSI C63.10-2013
5. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.
6. The radiated test was performed with and without passive tag. The test results shown in the following sections represent the worst case emissions.
   - Worst Case : Without passive tag
7. This test is not applicable because the EUT only connects DC power line.

5. Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of k=2 to indicated a 95 % level of confidence. The measurement data shown herein meets of exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine compliance.

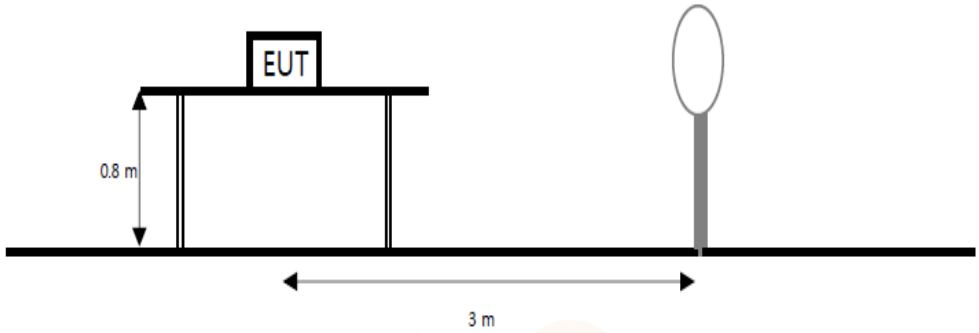
Parameter	Expanded uncertainty (±)	
Radiated spurious emissions	9 ㎑ ~ 30 ㎒	2.4 dB
Conducted emissions	9 ㎑ ~ 150 ㎑	1.6 dB
	150 ㎑ ~ 30 ㎒	1.7 dB

6. Test results

6.1. Field Strength of Fundamental and Spurious Emission

Test setup

The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ Emissions



Limit

FCC

According to section 15.209(a), RSS-Gen(8.9) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

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

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 ㎒, 76–88 ㎒, 174–216 ㎒ or 470–806 ㎒. However, operation within these frequency bands is permitted under other sections of this part, e.g., Section15.231 and 15.241.

IC

According to section RSS-Gen(8.9), except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.

Table 5 – General field strength limits at frequencies above 30 MHz

Frequency (MHz)	Field strength (µV/m at 3 m)
30 – 88	100
88 – 216	150
216 – 960	200
Above 960	500

Table 6 – General field strength limits at frequencies below 30 MHz

Frequency	Magnetic field strength (H-Field) (µA/m)	Measurement distance (m)
9 - 490 kHz [1]	6.37/F (F in kHz)	300
490 - 1705 kHz	63.7/F (F in kHz)	30
1.705 - 30 MHz	0.08	30

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

Test procedure

ANSI C63.10-2013

Test settings

Test Procedures for emission from 9 ㎑ to 30 ㎒

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.

b. Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement.

c. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.

d. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode.

e. Below 30 ㎒ frequency range, all orientations about parallel, perpendicular, and ground-parallel were investigated then reported and the worse orientations of Face-on and Face-off were set for final test.

- Face-on = Parallel, Face-off = Perpendicular

Notes:

1. *f* <30 ㎒, extrapolation factor of 40 ㏈/decade of distance. $F_d = 40\log(D_m/Ds)$
   Where:
   F_d = Distance factor in ㏈
   D_m = Measurement distance in meters
   D_s = Specification distance in meters
2. The test measurement distance is 3 meter
3. Limit (㏈(㎶/m)) = For 0.009 ㎒ - 0.490 ㎒, 20*log(2 400/F(㎑)) ㏈(㎶/m)
   For 0.490 ㎒ - 1.705 ㎒, 20*log(24 000/F(㎑)) ㏈(㎶/m)
   For 1.705 ㎒ - 30 ㎒, 20*log(30) = 29.54 ㏈(㎶/m)

Test results

[DC 12 V]
Radiated Emissions Fundamental & 9 ㎑ to 30 ㎒

[Face-on]

Frequency	Reading	Detector	Ant. Factor	Amp. + Cable	Distance factor	Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	Mode	(dB)	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
0.122	82.20	PK	19.99	-32.43	-80.00	-92.44	-10.24	45.67	55.91
0.122	76.30	AV	19.99	-32.43	-80.00	-92.44	-16.14	25.88	42.02
0.363	44.20	AV	19.90	-32.26	-80.00	-92.36	-48.16	16.41	64.57
0.956	38.20	QP	19.99	-32.21	-40.00	-52.22	-14.02	28.00	42.02
25.810	60.10	QP	20.87	-31.81	-40.00	-50.94	9.16	30.00	20.84

[Face-off]

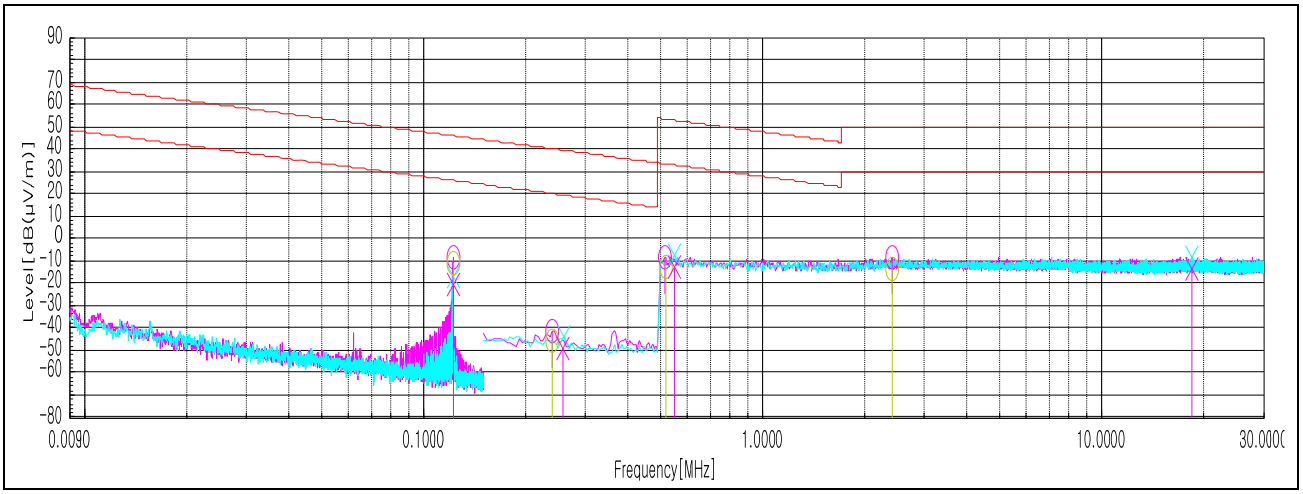
Frequency	Reading	Detector	Ant. Factor	Amp. + Cable	Distance factor	Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	Mode	(dB)	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
0.122	80.30	PK	19.99	-32.43	-80.00	-92.44	-12.14	45.67	57.81
0.122	75.60	AV	19.99	-32.43	-80.00	-92.44	-16.84	25.88	42.72
0.184	42.30	AV	19.96	-32.34	-80.00	-92.38	-50.08	22.31	72.39
0.751	40.30	QP	19.95	-32.19	-40.00	-52.24	-11.94	30.09	42.03
25.810	58.70	QP	20.87	-31.81	-40.00	-50.94	7.76	30.00	22.24

Note.

1) Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss + distance factor(dB)

2) -80 is distance factor = 40*log(3/300), -40 is distance factor = 40*log(3/30)

3) The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377Ω.
For example, the measurement frequency X KHz resulted in a level of Y dBuV/m, which is equivalent to Y-51.5 = Z dBuA/m, which has the same margin, W dB, to the corresponding RSS-GEN Table 6 limit as it has to the 15.209(a) limit



[DC 24 V]
Radiated Emissions Fundamental & 9 ㎑ to 30 ㎒

[Face-on]

Frequency	Reading	Detector	Ant. Factor	Amp. + Cable	Distance factor	Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	Mode	(dB)	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
0.122	79.90	PK	19.99	-32.43	-80.00	-92.44	-12.54	45.67	58.21
0.122	75.30	AV	19.99	-32.43	-80.00	-92.44	-17.14	25.88	43.02
0.221	46.10	AV	19.94	-32.32	-80.00	-92.38	-46.28	20.72	67.00
0.804	40.10	QP	19.96	-32.17	-40.00	-52.21	-12.11	29.50	41.61
25.810	54.10	QP	20.87	-30.54	-40.00	-49.67	4.43	30.00	25.57

[Face-off]

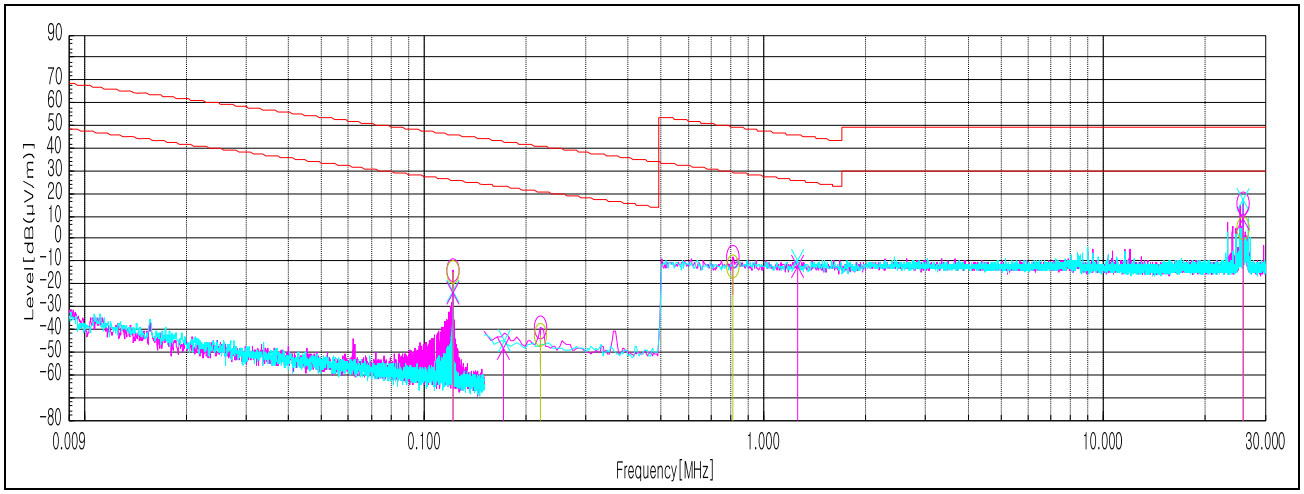
Frequency	Reading	Detector	Ant. Factor	Amp. + Cable	Distance factor	Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	Mode	(dB)	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
0.122	70.80	PK	19.99	-32.43	-80.00	-92.44	-21.64	45.67	67.31
0.122	65.20	AV	19.99	-32.43	-80.00	-92.44	-27.24	25.88	53.12
0.172	40.50	AV	19.96	-32.35	-80.00	-92.39	-51.89	22.89	74.78
1.262	39.50	QP	20.01	-32.04	-40.00	-52.03	-12.53	25.58	38.11
25.810	58.70	QP	20.87	-30.54	-40.00	-49.67	9.03	30.00	20.97

Note.

1) Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss + distance factor(dB)

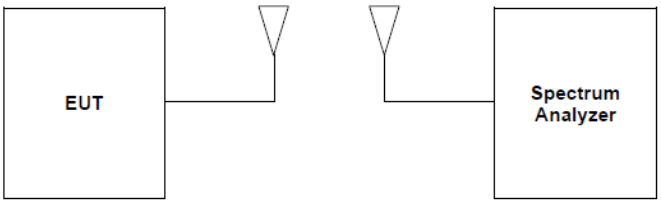
2) -80 is distance factor = 40*log(3/300), -40 is distance factor = 40*log(3/30)

3) The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377Ω.
For example, the measurement frequency X KHz resulted in a level of Y dBuV/m, which is equivalent to Y-51.5 = Z dBuA/m, which has the same margin, W dB, to the corresponding RSS-GEN Table 6 limit as it has to the 15.209(a) limit



6.2. 20dB Bandwidth & Occupied Bandwidth

Test setup



Limit

For reporting purpose only

Test settings

The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

- The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

A peak, or peak hold, may be used in place of the sampling detector as this may produce a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold may be necessary to determine the occupied bandwidth if the device is not transmitting continuously.

The trace data points are recovered and are directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded.

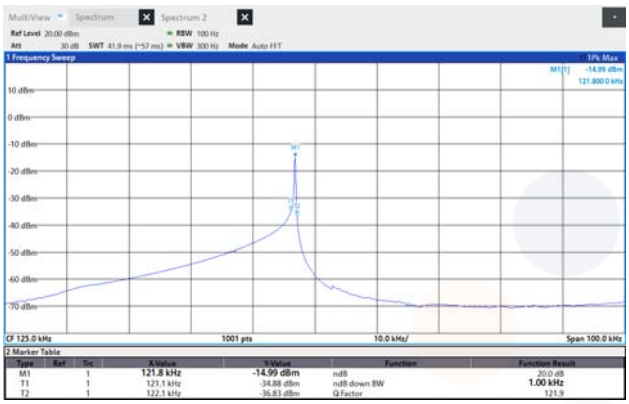
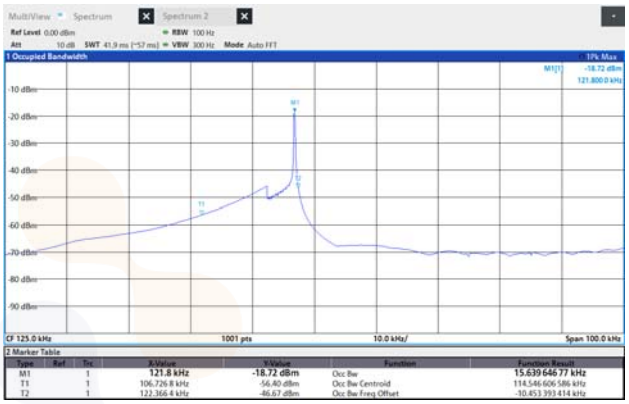
The difference between the two recorded frequencies is the 99% occupied bandwidth.

Test results

[DC 12 V]

Frequency (㎑)	20㏈ Bandwidth (㎑)		Occupied Bandwidth (㎑)	Limit
131	Low Frequency	121.1	15.64	Reporting purpose only
	High Frequency	122.1		

Test Plots

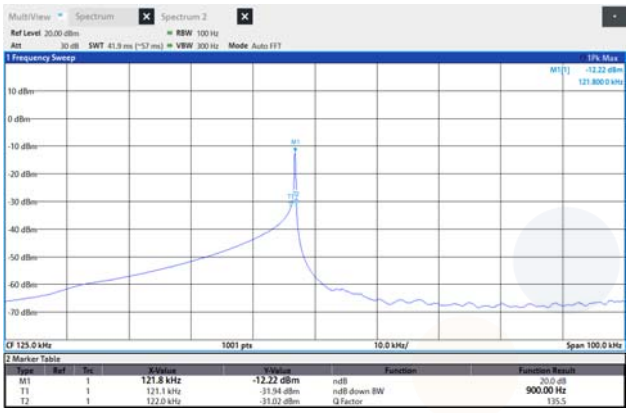
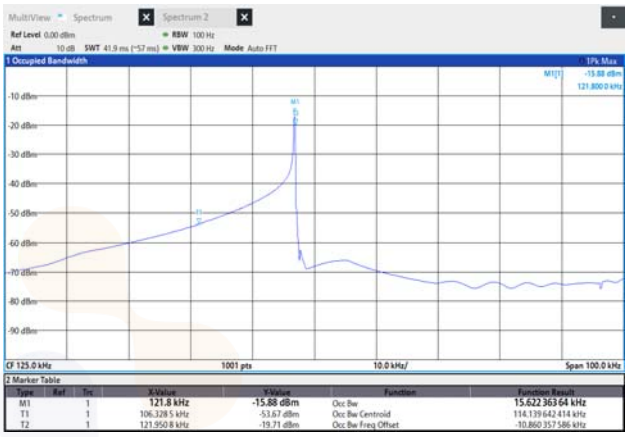
20㏈ Bandwidth	Occupied Bandwidth
131 ㎑	131 ㎑
	

Note. Because the measured signal is CW/CW-like, adjusting the RBW per C63.10 would not be practical since measured bandwidth will always follow the RBW and the result will be approximately twice the RBW.

[DC 24 V]

Frequency (㎑)	20㏈ Bandwidth (㎑)		Occupied Bandwidth (㎑)	Limit
131	Low Frequency	121.1	15.62	Reporting purpose only
	High Frequency	122.0		

Test Plots

20㏈ Bandwidth	Occupied Bandwidth
131 ㎑	131 ㎑
	

Note. Because the measured signal is CW/CW-like, adjusting the RBW per C63.10 would not be practical since measured bandwidth will always follow the RBW and the result will be approximately twice the RBW.

7. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
EMI TEST RECEIVER	R&S	ESCI7	100732	23.01.19
AMPLIFIER	SONOMA	310N	284608	23.08.18
ISOLATION TRANSFORMER	ONETECH CO., LTD	OT-IT500VA	OTR1-16026	23.03.28
Loop Antenna	R&S	HFH2-Z2	100355	24.08.10
Antenna Mast	Innco Systems	MA4000-EP	303	-
Turn Table	Innco Systems	CO3000	1175/45850319/P	-
TEMP. & HUMIDITY TEST CHAMBER	HANYOUNG NUX	HY-LTH2	A33-080910	22.12.21
Signal & Spectrum Analyzer	R&S	FSV3030	1330.5000K30-101710-Wt	23.08.10
Signal Generator	R&S	SMB100A	176206	23.01.19
DC Power Supply	AGILENT	E3632A	MY40007371	23.05.02

End of test report