TEST REPORT

KCTL Inc.
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Suwon-si, Gyeonggi-do, 16677, Korea
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1. Client

- Name : Vieworks Co., Ltd.
- Address : 41-3, Burim-ro 170beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, 14055 Republic of Korea
- Date of Receipt : 2021-01-04

2. Use of Report : Certification

3. Name of Product / Model : Wireless Power Transmitter / FXRC-05A

4. Manufacturer / Country of Origin : Vieworks Co., Ltd. / Korea

5. FCC ID : PFRFXRC05A

6. IC Certificate No. : 11233A-FXRC05A

7. Date of Test : 2021-03-31 to 2021-04-26

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-216 Issue 2 January 2016
RSS-Gen Issue 5 March 2019

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

	Tested by	Technical Manager
Affirmation	Name : Hosung Lee (Signature)	Name : Heesu Ahn (Signature)

2021-06-28

KCTL Inc.

REPORT REVISION HISTORY

Date	Revision	Page No
2021-06-15	Originally issued	-
2021-06-18	Updated	1, 6-11, 13, 16
2021-06-28	Updated	11

Note. The report No. KR21-SRF0144-A is superseded by the report No. KR21-SRF0144-B

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	:	Vieworks Co., Ltd.
Address	:	41-3, Burim-ro 170beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, 14055, Republic of Korea
Manufacturer	:	Vieworks Co., Ltd.
Address	:	41-3, Burim-ro 170beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, 14055, Republic of Korea
Laboratory	:	KCTL Inc.
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	:	Wireless Power Transmitter
Model	:	FXRC-05A
Frequency range	:	127.7 ㎑
Modulation technique	:	ASK
Power source	:	DC 17 V
Antenna specification	:	FPCB Coil Antenna
Software version	:	1.0
Hardware version	:	1.0
Test device serial No.	:	N/A
Operation temperature	:	0 ℃ ~ 40 ℃

2.1. Accessory information

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

2.2. Frequency/channel operations

This device contains the following capabilities:
WPT

Frequency (㎑)
127.7

Table 2.2.1. WPT

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 mode	Test results
15.209	RSS-216	Field Strength of Fundamental and Spurious Emission	Radiated	Pass
2.1049	-	20dB Bandwidth	Conducted	Pass
-	RSS-Gen Issue 5 (6.7)	Occupied Bandwidth		Pass
15.203	RSS-Gen Issue 5 (6.8)	Antenna requirement		Pass
15.207	RSS-Gen Issue 5 (8.8)	AC Conducted Emission		N/A

Notes:

1. The test results shown in the following sections represent the worst case emissions.
2. This test is not applicable because the EUT only uses DC power source.
3. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that X orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in X 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.

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 kHz ~ 30 MHz	2.3 dB
Conducted emissions	9 kHz ~ 150 kHz	3.7 dB
	150 kHz ~ 30 MHz	3.3 dB

6. Classification of WPT Devices

6.1. WPT Source Subassembly

There are three possible types of WPT source subassemblies, as described in this sub-section.

6.1.1. Type 1 (Interference-causing Equipment)

Type 1 includes WPT source subassemblies that are incapable of transmitting any form of intelligent communication wirelessly 9including communication related to power transfer management). Type 1 WPT source subassemblies are classified as interference-causing equipment, specifically Industrial, Scientific and Medical (ISM) equipment.

6.1.2. Type 2 (Category II Radio Apparatus)

Type 2 includes all WPT source subassemblies that use some form of modulation on the wireless power transfer frequency for transmitting information (including WPT source subassemblies using load modulation techniques – see definition in section 4.7) and that comply with the following two conditions:

(i) Fundamental emissions are below 490 ㎑; and

(ii) All emission radiated by the device are at least 40 ㏈ below the general field strength limits for licence-exempt radio apparatus set out in RSS-Gen – General Requirements for Compliance of Radio Apparatus.

Type 2 WPT source subassemblies are classified as Category II radio apparatus, as per RSS-Gen.

6.1.3. Type 3 (Category I Radio Apparatus)

Type 3 includes all WPT source subassemblies that cannot be classified as either Type 1 or Type 2, i.e. WPT source subassemblies that use some form of modulation on the power transfer frequency for transmitting intelligent communication and which do not meet one or both of the conditions listed in section 1.2.1.2.

Type 3 WPT source subassemblies are classified as Category I radio apparatus, as per RSS-Gen, and require certification.

6.2 WPT Client Subassembly

The WPT subassembly of a WPT client device is only able to receive electromagnetic energy and is unable to transmit is (see definition in section 4.2). As such, this subassembly is classified as interference-causing equipment, specifically ISM equipment.

6.3 Wireless Transmitters

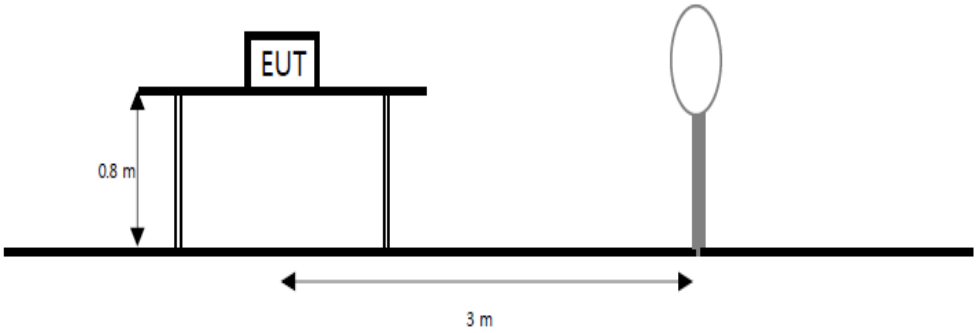
A wireless transmitter module or subassembly intentionally transmits radiated electromagnetic energy on a frequency other than the wireless power transfer frequency of the WPT device (i.e. on a secondary frequency, as defined in section 4.9). This type of module or subassembly is designated as a Category II radio apparatus if it satisfies both conditions (i) and (ii) from section 1.2.1.2; otherwise, it is a Category I radio apparatus and it requires certification.

Both WPT sources and WPT clients may include wireless modules.

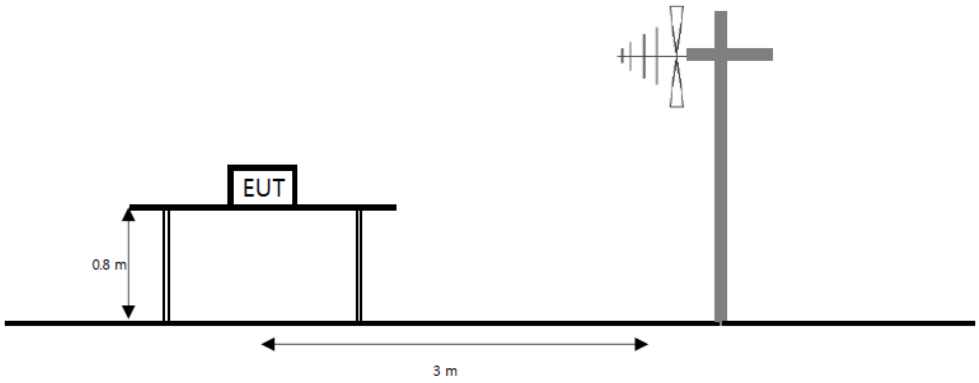
7. Test results
7.1. Field Strength of Fundamental and Spurious Emission

Test setup

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



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.



Limit

FCC

According to section 15.209(a). 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-216(6.2.2.2), the magnetic field radiated emissions within 9 ㎑– 30 ㎒ from the WPT subassembly of WPT source and client devices and WPT systems shall comply with the limits for induction cooking (group 2) equipment, as set out in the CISPR 11 standard referenced in ICES-001. The preferred test method for WPT devices that may be used in residential environments and that have a maximum dimension of less than or equal to 1.6m is the test method using the van Veen loop antenna system, as per the CISPR 11 standard referenced in ICES-001. However, it is acceptable to use the alternate **60 cm loop test method** and corresponding limit for these small residential WPT devices (the same as for commercial / industrial and large residential devices).

The electric field radiated emissions within 30 – 1 000 ㎒ from the WPT subassembly of WPT source and client devices and WPT systems shall comply with the Class B limits for group 2 equipment, as set out in the CISPR 11 standard referenced in ICES-001.

Frequency range (㎒)	Limits in dB(㎂/m) at 3m distance Quasi-peak
0.009 to 0.070	69
0.070 to 0.148 5	69 Decreasing linearly with logarithm of frequency to 39
0.148 5 to 4.0	39 Decreasing linearly with logarithm of frequency to 3
4.0 to 30	3
Note. The limits of Table 3b apply to induction cooking appliances for commercial use and those for domestic use with a diagonal diameter of more than 1.6m. Measurements are performed at 3m distance with a 0.6 m loop antenna as described in 5.5.2.1 of CISPR 16-1. The antenna shall be vertically installed, with the lower edge of the loop at 1m height Above the floor.	

Frequency range	Limits for a measuring distance D in m

(㎒)	Electric field				Magnetic field D = 3m
	D = 10 m		D = 3m[b]		
	Quasi-peak	Average[a]	Quasi-peak	Average[a]	Quasi-peak
	dB(㎶/m)		dB(㎶/m)		dB(㎶/m)
0.15 – 30	-	-	-	-	39 Decreasing linearly with logarithm of frequency to 3
30 – 80.872	30	25	40	35	-
80.872 – 81.848	50	45	60	55	-
81.848 – 134.786	30	25	40	35	-
134.786 – 136.414	50	45	60	55	-
136.414 – 230	30	25	40	35	-
230 – 1 000	37	32	47	42	-

On a test site, class B equipment can be measured at a nominal distance of 3m or 10m.
A measuring distance less than 10 m is allowed only for equipment which complies with the definition given in 3.10.

At the transition frequency the more stringent limit should apply.

[a] The average limits apply to magnetron driven equipment only. If magnetron driven equipment exceeds the quasi-peak limit at certain frequencies, then the measurement shall be repeated at these frequencies with the average detector, and the average limits specified in this table apply.

[b] The limits specified for the 3m separation distance apply only to small equipment meeting the size criterion defined in 3.10.

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 = Loop Antenna Horizontal, Face-off = Loop Antenna Vertical.

Test Procedures for emission from 10 ㎒ to 1 000 ㎒

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. During performing radiated emission below 1 ㎓, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 ㎓, the EUT was set 3 meter away from the Interference-receiving antenna.

c. The antenna is a broadband antenna, and its height is varied from on meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna ate set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold mode.

f. If the emission level of the EUT in peak mode was 10 ㏈ lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emission that did not have 10 ㏈ margin would be re-tested one by on using peak, quasi-peak or average method as specified and then reported in a data sheet.

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

Radiated Emissions Fundamental & 9 ㎑ to 30 ㎒

[Face-on]

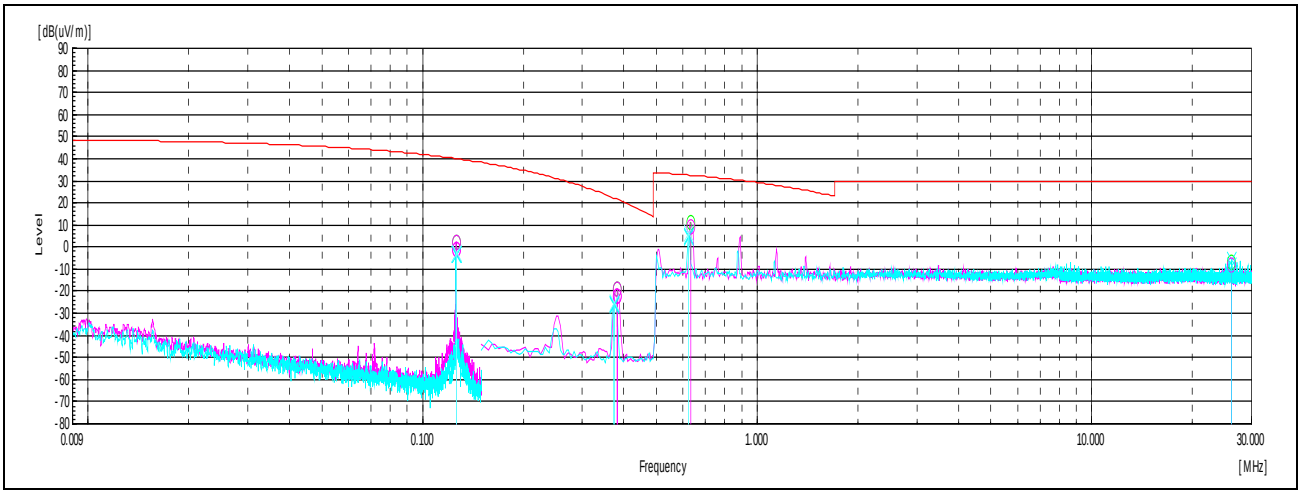
Frequency	Reading	Detector	Ant. Factor	Amp. + Cable	Distance factor	Factor	Result	Limit	Margin
(㎒)	(dB(㎶))	Mode	(dB)	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
0.128	94.9	AV	19.9	-32.3	-80.0	-92.4	2.5	39.9	37.4
0.128	95.6	PK	19.9	-32.3	-80.0	-92.4	3.2	59.9	56.7
0.381	72.2	AV	19.9	-32.2	-80.0	-92.3	-20.1	21.7	41.8
0.639	63	QP	19.9	-32.1	-40.0	-52.2	10.8	32.5	21.7
25.675	44.3	QP	20.7	-30.7	-40.0	-50.0	-5.7	29.5	35.2

[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)
0.128	91.2	AV	19.9	-32.3	-80.0	-92.4	-1.2	39.9	41.1
0.128	91.7	PK	19.9	-32.3	-80.0	-92.4	-0.7	59.9	60.6
0.381	67.9	AV	19.9	-32.2	-80.0	-92.3	-24.4	21.7	46.1
0.639	58.5	QP	19.9	-32.1	-40.0	-52.2	6.3	32.5	26.2
26.187	45.8	QP	20.6	-30.7	-40.0	-50.0	-4.2	29.5	33.7

Note:

1. According to ANSI C63.10:2013, conversion factor from E-field to H-field is considered as free-space Impedance [1㎶/m = (1/377 Ω)* 1㎂/m] = -51.53 dB.
2. Correction Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss + Conversion Factor(dB)



Radiated Emissions Fundamental & 30 ㎒ to 1 000 ㎒

[Face-on]

Frequency	Reading	Detector	Ant. Factor	Amp. + Cable	Correction Factor	Result at 3m	Limit at 3m	Margin
(㎒)	(dB(㎶))	Mode	(dB)	(dB)	(dB)	(dB(㎂/m))	(dB(㎂/m))	(dB)
271.65	27.40	QP	18.70	-26.91	19.19	26.81	271.65	27.40
365.14	31.50	QP	20.79	-26.00	26.29	19.71	365.14	31.50
574.17	23.70	QP	24.31	-24.24	23.77	22.23	574.17	23.70

[Face-off]

Frequency	Reading	Detector	Ant. Factor	Amp. + Cable	Correction Factor	Result at 3m	Limit at 3m	Margin
(㎒)	(dB(㎶))	Mode	(dB)	(dB)	(dB)	(dB(㎂/m))	(dB(㎂/m))	(dB)
74.26	37.00	QP	12.60	-29.49	20.11	19.89	74.26	37.00
197.81	36.40	QP	15.17	-27.73	23.84	19.66	197.81	36.40
357.38	38.10	QP	20.59	-26.07	32.62	13.38	357.38	38.10
374.96	38.10	QP	21.05	-25.92	33.23	12.77	374.96	38.10

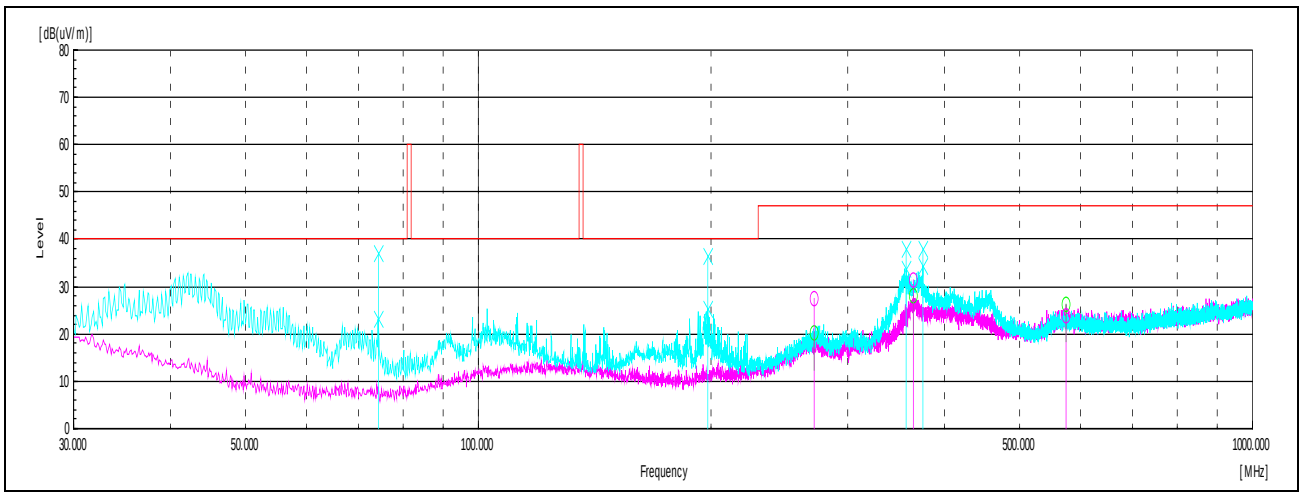
Note:

1. According to CISPR 11,

   basically the measurements above 30 ㎒ were tested by using quasi peak detector.

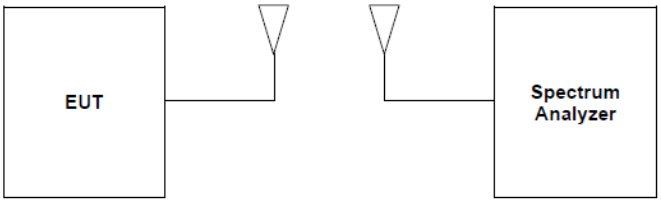
   If the equipment exceeds the quasi-peak limit at certain frequencies, then the measurement shall be Repeated at these frequencies with the average detector.

2. Correction Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss



7.2. 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.

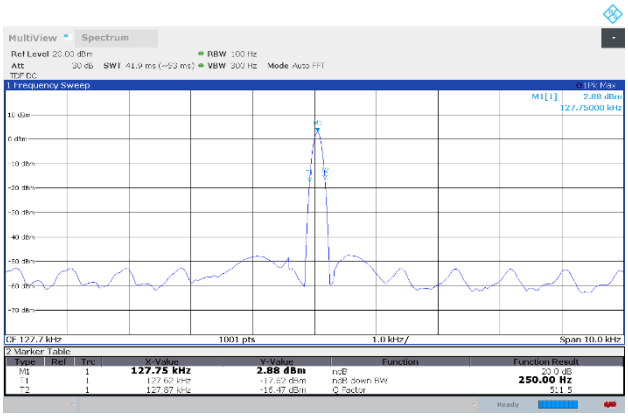
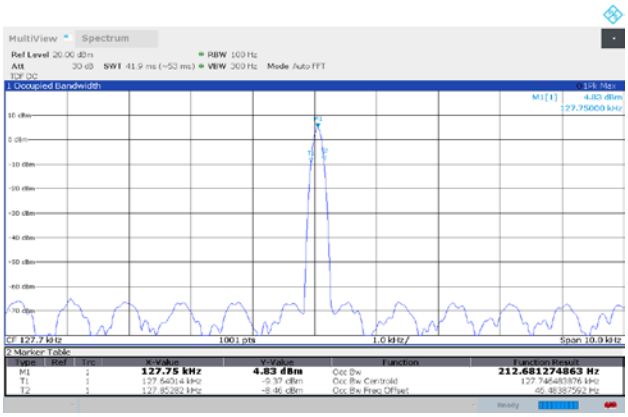
The trace data points are recovered and are directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency 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

Frequency (㎑)	20㏈ Bandwidth (㎑)	Occupied Bandwidth (㎑)	Limit
127.7	0.25	0.213	Reporting purpose only

Test Plots

20㏈ Bandwidth	Occupied Bandwidth
127.7 ㎑	127.7 ㎑
	

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.

8. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
EMI TEST RECEIVER	R&S	ESCI7	100732	22.03.05
DC Power Supply	Agilent	E3632A	MY40001543	22.05.10
Broadband Amplifier	SONOMA INSTRUMENT	315	300314	22.01.20
LOOP Antenna	R&S	HFH2-Z2	100355	22.08.21
Antenna Mast	Innco Systems	MA4640-XP-ET	1 m to 4 m, 10 kg	-
Bi-Log Antenna	SCHWARZBECK	VULB 9168	583	23.01.14
Antenna Mast	MATURO	EAS 1.5	042/8941211	-
Turn Table	Innco Systems	DT2000	79	-
Spectrum Analyzer	R&S	FSW26	101353	22.04.01

End of test report