FCC RADIO TEST REPORT

FCC ID	:	**2BCY2-RKKCP01**
Equipment	:	**Coil Pro**
Brand Name	:	**Rokoko**
Model Name	:	**RKK-CP-01**
Marketing Name	:	**Coil Pro**
Applicant	:	**Rokoko Electronics ApS Sankt Gertruds Stræde 10, 1129 København**
Manufacturer	:	**Rokoko Electronics ApS Sankt Gertruds Stræde 10, 1129 København**
Standard	:	**FCC Part 15 Subpart C §15.209**

The product was received on Sep. 12, 2023 and testing was performed from Sep. 20, 2023 to Dec. 05, 2023. We, Sporton International Inc. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval from Sporton International Inc. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

The TAF ISO 17025 excludes the Radiated Emission Test accreditation

Louis Wu

Approved by: Louis Wu

Sporton International Inc. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)
TEL : 886-3-327-3456
FAX : 886-3-328-4978

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History of this test report

Report No.	Version	Description	Issue Date
FR370328	01	Initial issue of report	Dec. 11, 2023
FR370328	02	Revise Appendix D This report is an updated version, replacing the report issued on Dec. 11, 2023.	Dec. 27, 2023

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	2.1049	20dB Bandwidth	Reporting Only	-
	2.1049	99% Occupied Bandwidth	Reporting Only	-
3.2	15.209	Radiated Emission	Pass	35.04 dB under the limit at 0.03MHz
3.3	15.207	AC Conducted Emission	Pass	6.58 dB under the limit at 0.15MHz
-	15.203	Antenna Requirements	Not Required	-

Remark: There is no antenna. We are only radiating a magnetic field.

Conformity Assessment Condition:
1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account. 2. The measurement uncertainty please refer to each test result in the section “Measurement Uncertainty”.
Disclaimer:
The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Alan Liu

Report Producer: Lucy Wu

1. General Description

1.1. Feature of Equipment Under Test

Product Feature
General Specs 21kHz Tx **Antenna Type** There is no antenna. We are only radiating a magnetic field by passing a known current through the windings of the product.

Remark: The EUT's information above is declared by manufacturer. Please refer to Disclaimer in report summary.

1.2. Modification of EUT

No modifications are made to the EUT during all test items.

1.3. Test Location

Test Site	Sporton International Inc. EMC & Wireless Communications Laboratory
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	**Sporton Site No.**
	TH03-HY, CO05-HY

Note: The test site complies with ANSI C63.4 2014 requirement.

Test Site	Sporton International Inc. Wensan Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	Open Field Test Site
Remark	The Radiated Emission test item subcontracted to Sporton International Inc. Wensan Laboratory.

FCC designation No.: TW1190 and TW3786

1.4. Applied Standards

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

- FCC Part 15 Subpart C §15.209
- ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2. Test Configuration of Equipment Under Test

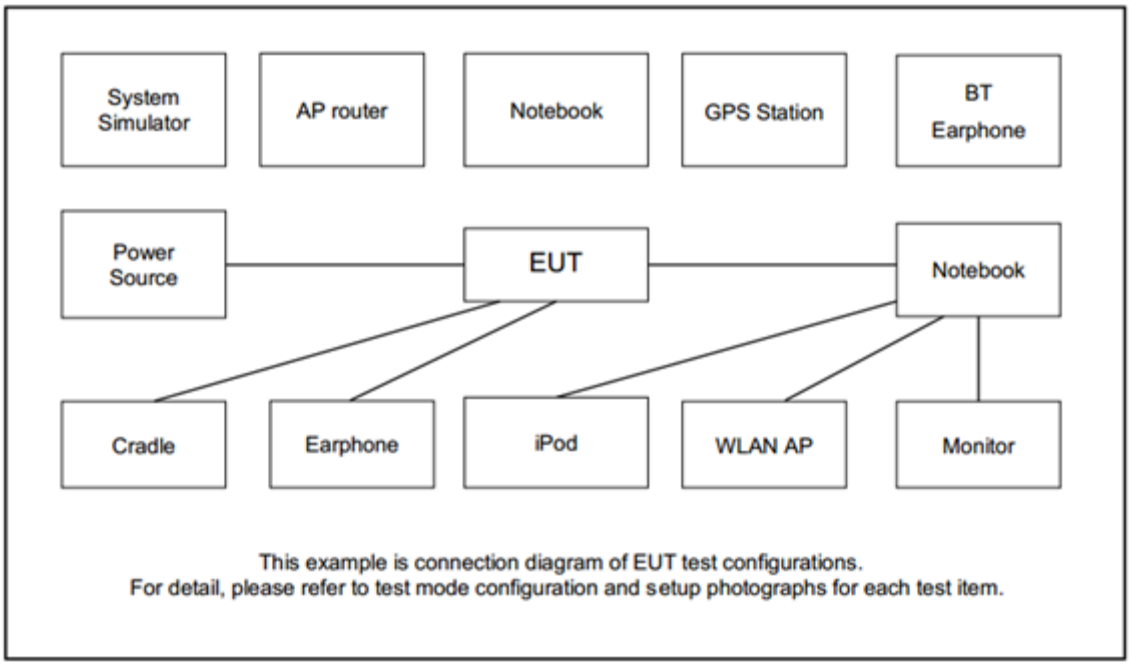
2.1. Test Mode

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

Frequency range investigated: radiation (9 kHz to the 490 kHz).

Test Items	Function Type
AC Conducted Emission	Mode 1 : 21kHz Tx + Adapter
Radiated Emission	Mode 1 :21kHz Tx

2.2. Connection Diagram of Test System



3. Test Result

3.1. 20dB and 99% Occupied Bandwidth Measurement

3.1.1. Limit of 20dB and 99% Occupied Bandwidth

Reporting only

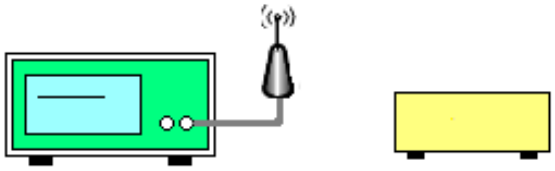
3.1.2. Measuring Instruments

See list of measuring equipment of this test report.

3.1.3. Test Procedures

1. The 20dB bandwidth is measured with a spectrum analyzer connected via a receiver antenna placed near the EUT in peak Max hold mode.
2. Use the following spectrum analyzer settings for 99 % Bandwidth measurement.
3. For Bandwidth measurement, the RBW is set 1-5% of the emission bandwidth, and set the Video bandwidth (VBW) ≥ 3 * RBW, Sweep = 20ms.
4. Measure and record the results in the test report.

3.1.4. Test Setup



3.1.5. Test Result of 20dB and 99% Bandwidth

Please refer to Appendix B.

3.2. Radiated Emission

3.2.1. Limit of Radiated Emission

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.2.2. Measuring Instruments

See list of measuring equipment of this test report.

3.2.3. Measuring Instrument Setting

The following table is the setting of receiver.

Receiver Parameter	Setting
Attenuation	Auto
Frequency Range: 9 kHz ~ 150 kHz	RBW 200 Hz for QP
Frequency Range: 150 kHz ~ 30 MHz	RBW 9 kHz for QP
Frequency Range: 30 MHz ~ 1000 MHz	RBW 120 kHz for Peak

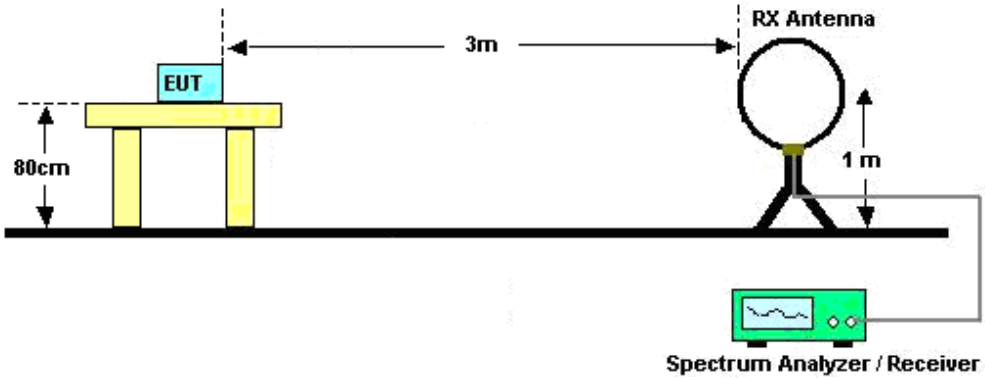
Note: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz and 110-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.

3.2.4. Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the loop receiving antenna mounted antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the receiving antenna was fixed at one meter above ground to find the maximum emissions field strength.
4. For emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver.
5. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.

3.2.5. Test Setup of Radiated Emission

For radiated emissions below 30MHz (Open Field Test Site)



Follow C63.10.5.2 Radiated emission test site
Radiated emission test sites below 30 MHz shall be free from metal objects, buried pipes, and any objects that can affect radiated measurements. An alternative test site that can demonstrate equivalence to a test site as described in the preceding sentence shall be accepted for the purposes of this standard.

3.2.6. Test Result of Radiated Emission

Please refer to Appendix C.

3.3. AC Power Line Conducted Emissions Measurement

3.3.1. Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

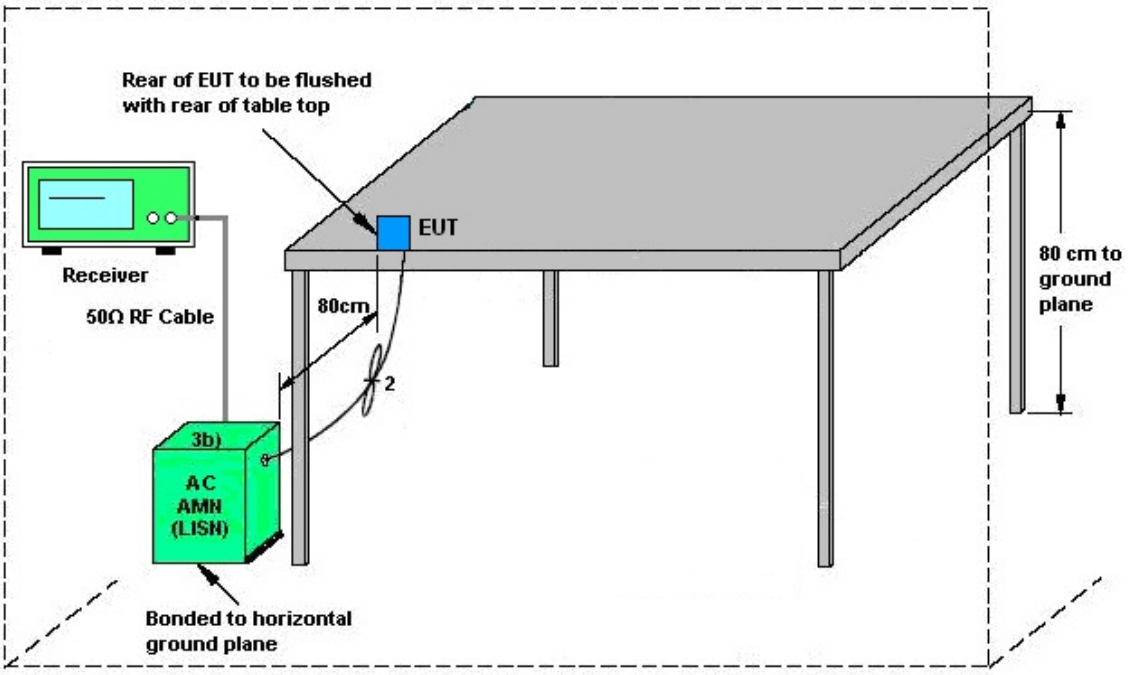
3.3.2. Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.3.3. Test Procedures

1. The EUT is placed 0.4 meter away from the conducting wall of the shielding room, and is kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN shall be used.
6. Both Line and Neutral shall be tested in order to find out the maximum conducted emission.
7. The frequency range from 150 kHz to 30 MHz is scanned.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9 kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

3.3.4. Test setup



AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

3.3.5. Test Result of AC Conducted Emission

Please refer to Appendix A.

4. List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Sep. 12, 2023	Dec. 05, 2023	Sep. 11, 2024	Radiation (open field test site)
EMI Test Receiver	Keysight	N9038B	MY62210111	N/A	Aug. 23, 2023	Dec. 05, 2023	Aug. 22, 2024	Radiation (open field test site)
Software	Audix	N/A	RK-002347	N/A	N/A	Dec. 05, 2023	N/A	Radiation (open field test site)
Hygrometer	TECPEL	DTM-303A	TP201996	N/A	Nov. 17, 2022	Sep. 25, 2023	Nov. 16, 2023	Near Field (TH03-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP30	101329	9kHz~30GHz	Sep. 20, 2023	Sep. 25, 2023	Sep. 19, 2024	Near Field (TH03-HY)
AC Power Source	AC POWER	AFC-500W	F104070011	50Hz~60Hz	Sep. 22, 2023	Sep. 25, 2023	Sep. 21, 2024	Near Field (TH03-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Sep. 20, 2023	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Dec. 01, 2022	Sep. 20, 2023	Nov. 30, 2023	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Nov. 17, 2022	Sep. 20, 2023	Nov. 16, 2023	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Nov. 17, 2022	Sep. 20, 2023	Nov. 16, 2023	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32	N/A	N/A	N/A	Sep. 20, 2023	N/A	Conduction (CO05-HY)
Pulse Limiter	SCHWARZBECK	VTSD 9561-F N	00691	9kHz-200MHz	Jul. 28, 2023	Sep. 20, 2023	Jul. 27, 2024	Conduction (CO05-HY)
LISN Cable	MVE	RG-400	260260	N/A	Dec. 29, 2022	Sep. 20, 2023	Dec. 28, 2023	Conduction (CO05-HY)

5. Measurement Uncertainty

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.5 dB**

Uncertainty of Radiated Emission Measurement (9 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.7 dB**

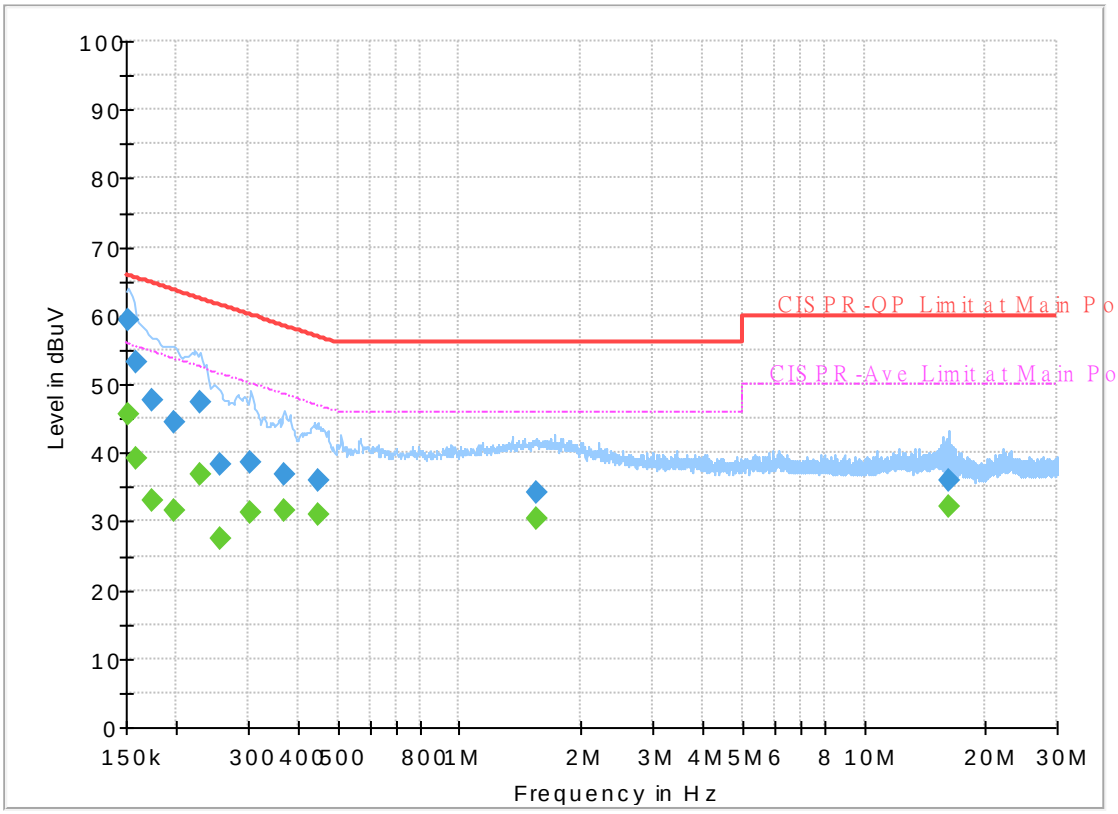
Appendix A. Test Results of Conducted Emission Test

Test Engineer :	Calvin Wang	**Temperature :**	23~26℃
		Relative Humidity :	45~55%

EUT Information

Report NO :	370328
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Line

Full Spectrum



Final_Result

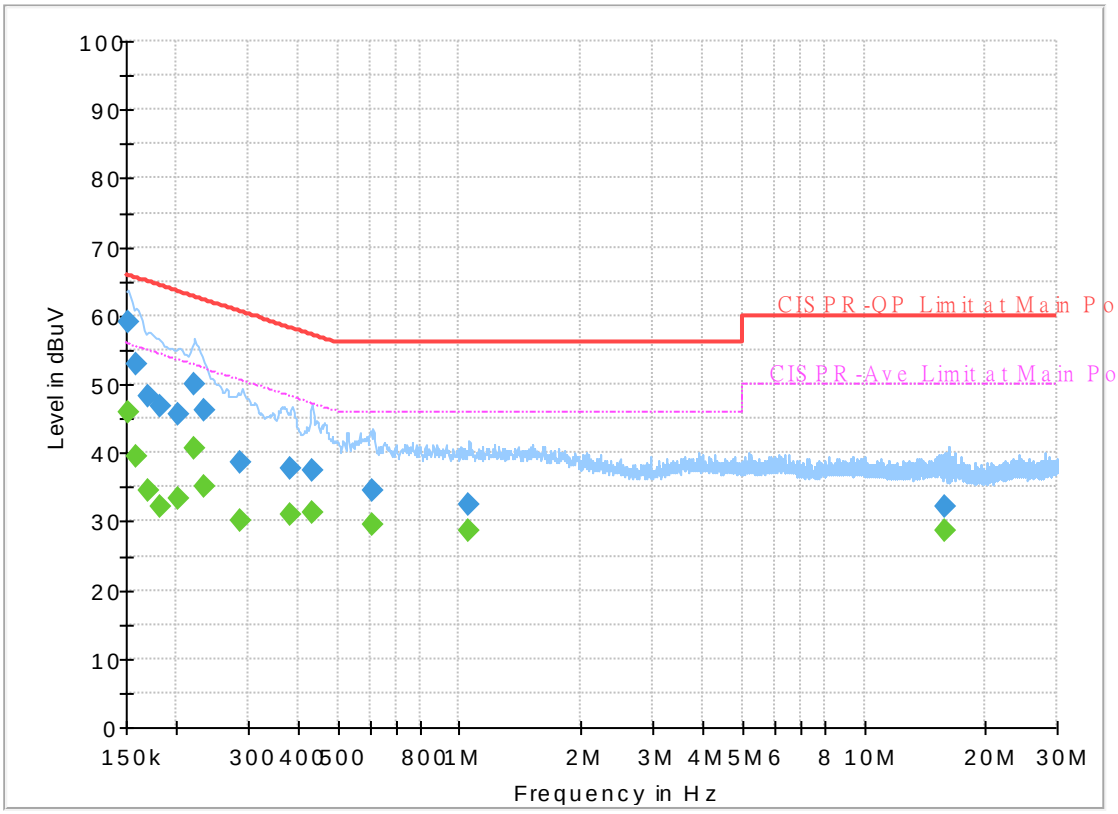
Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	45.74	55.88	10.14	L1	OFF	19.8
0.152250	59.30	---	65.88	6.58	L1	OFF	19.8
0.159000	---	39.31	55.52	16.21	L1	OFF	19.8
0.159000	53.22	---	65.52	12.30	L1	OFF	19.8
0.174750	---	33.09	54.73	21.64	L1	OFF	19.8
0.174750	47.54	---	64.73	17.19	L1	OFF	19.8
0.197250	---	31.58	53.73	22.15	L1	OFF	19.8
0.197250	44.53	---	63.73	19.20	L1	OFF	19.8
0.228750	---	36.96	52.50	15.54	L1	OFF	19.9
0.228750	47.44	---	62.50	15.06	L1	OFF	19.9
0.255750	---	27.59	51.57	23.98	L1	OFF	19.9
0.255750	38.39	---	61.57	23.18	L1	OFF	19.9
0.305250	---	31.20	50.10	18.90	L1	OFF	19.9
0.305250	38.51	---	60.10	21.59	L1	OFF	19.9
0.368250	---	31.53	48.54	17.01	L1	OFF	19.9
0.368250	36.74	---	58.54	21.80	L1	OFF	19.9
0.447000	---	30.87	46.93	16.06	L1	OFF	19.9
0.447000	35.99	---	56.93	20.94	L1	OFF	19.9
1.551750	---	30.38	46.00	15.62	L1	OFF	19.9
1.551750	34.31	---	56.00	21.69	L1	OFF	19.9
16.248750	---	32.31	50.00	17.69	L1	OFF	20.3

16.248750	**35.97**	**---**	**60.00**	**24.03**	**L1**	**OFF**	**20.3**

EUT Information

Report NO :	370328
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Neutral

Full Spectrum



Final_Result

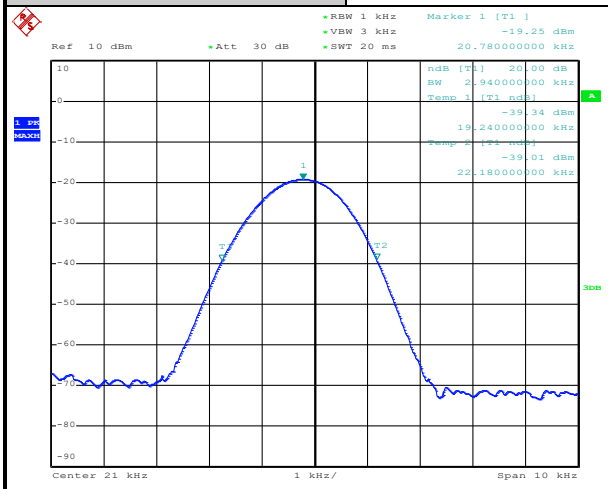
Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	45.98	55.88	9.90	N	OFF	19.8
0.152250	59.18	---	65.88	6.70	N	OFF	19.8
0.159000	---	39.39	55.52	16.13	N	OFF	19.8
0.159000	52.92	---	65.52	12.60	N	OFF	19.8
0.170250	---	34.62	54.95	20.33	N	OFF	19.8
0.170250	48.20	---	64.95	16.75	N	OFF	19.8
0.181500	---	32.08	54.42	22.34	N	OFF	19.8
0.181500	46.68	---	64.42	17.74	N	OFF	19.8
0.201750	---	33.34	53.54	20.20	N	OFF	19.9
0.201750	45.75	---	63.54	17.79	N	OFF	19.9
0.222000	---	40.58	52.74	12.16	N	OFF	19.9
0.222000	50.04	---	62.74	12.70	N	OFF	19.9
0.233250	---	35.13	52.33	17.20	N	OFF	19.9
0.233250	46.29	---	62.33	16.04	N	OFF	19.9
0.287250	---	30.01	50.60	20.59	N	OFF	19.9
0.287250	38.52	---	60.60	22.08	N	OFF	19.9
0.384000	---	31.10	48.19	17.09	N	OFF	19.9
0.384000	37.80	---	58.19	20.39	N	OFF	19.9
0.433500	---	31.36	47.19	15.83	N	OFF	19.9
0.433500	37.34	---	57.19	19.85	N	OFF	19.9
0.611250	---	29.50	46.00	16.50	N	OFF	19.9

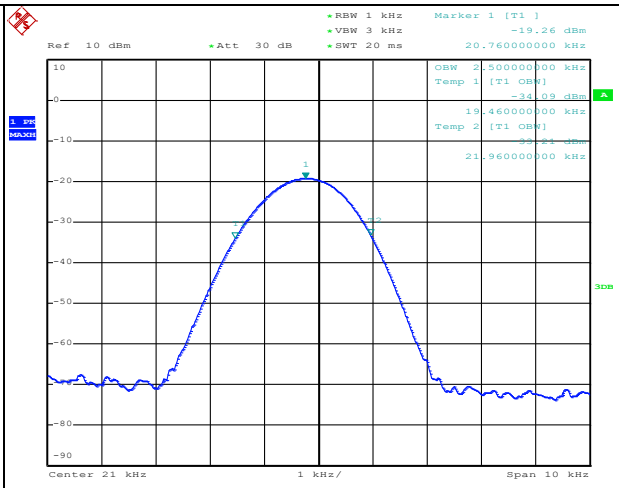
0.611250	**34.46**	**---**	**56.00**	**21.54**	**N**	**OFF**	**19.9**
1.056750	**---**	**28.67**	**46.00**	**17.33**	**N**	**OFF**	**19.9**
1.056750	**32.59**	**---**	**56.00**	**23.41**	**N**	**OFF**	**19.9**
15.866250	**---**	**28.74**	**50.00**	**21.26**	**N**	**OFF**	**20.4**
15.866250	**32.02**	**---**	**60.00**	**27.98**	**N**	**OFF**	**20.4**

Appendix B. Test Results of Near Field Test Items

B1. Test Result of 20dB Spectrum Bandwidth

Test mode	21kHz		



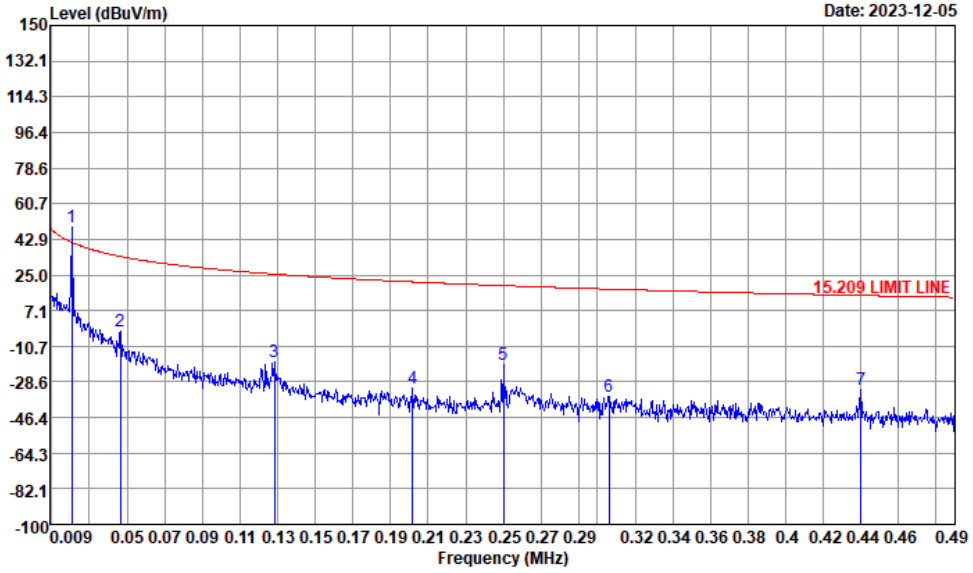


20dB Bandwidth (kHz)	2.940	99% Occupied BW(kHz)	2.500

Appendix C. Test Results of Radiated Test Items

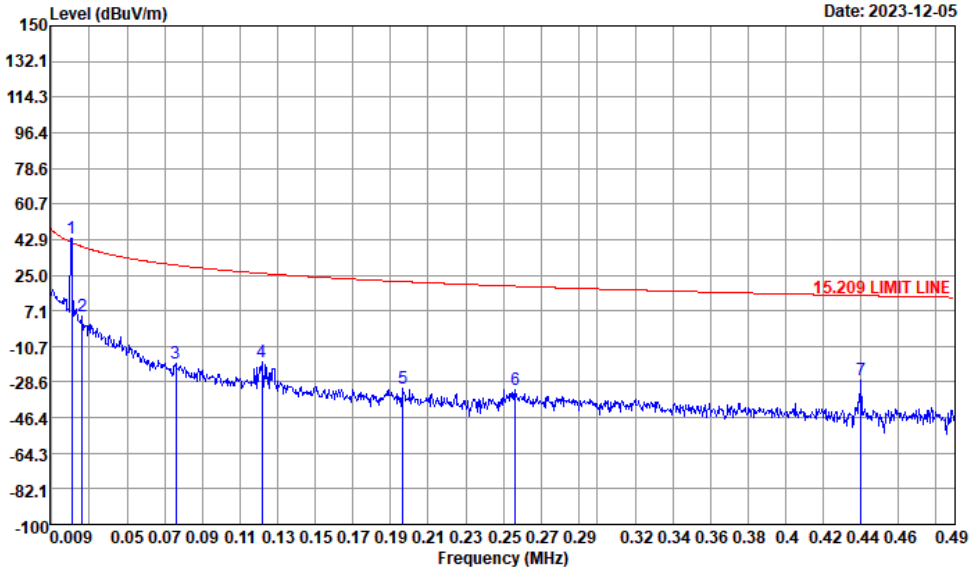
C1. Results of Radiated Spurious Emissions (9 kHz~490 kHz)

Test Mode :	Mode 1	**Temperature :**	18~19°C
Test Engineer :	Karl Hou	**Relative Humidity :**	65~73%
Test Distance :	3m	**Polarization :**	Horizontal
Remark:	1. #1 is fundamental signal, the distance extrapolation factor follow C63.10 6.4.4.4 Calculation of extrapolation factor from two points. (See report clause C2) 2. Trace used 40 log (300/3) distance extrapolation factor. 3. Level = Read Level + Ant. Factor + Cable Loss - Distance extrapolation Factor		



Mark	Freq. (MHz)	Level (dBµV/m)	Margin (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Ant. Factor + Cable Loss (dB)	Distance extrapolation Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
1	0.02054	20.23	-21.12	41.35	109.87	19.41	109.05	100	180	Peak
2	0.04652	-3.43	-37.68	34.25	57.47	19.1	80	100	180	Peak
3	0.12829	-18.72	-44.16	25.44	43.07	18.21	80	100	180	Peak
4	0.20188	-31.76	-53.26	21.5	29.74	18.5	80	100	180	Peak
5	0.24998	-19.64	-39.29	19.65	41.91	18.45	80	100	180	Peak
6	0.30626	-35.9	-53.78	17.88	25.67	18.43	80	100	180	Peak
7	0.43998	-32.59	-47.33	14.74	28.57	18.84	80	100	180	Peak

Test Mode :	Mode 1	Temperature :	18~19°C
Test Engineer :	Karl Hou	Relative Humidity :	65~73%
Test Distance :	3m	Polarization :	Vertical
Remark:	1. #1 is fundamental signal, the distance extrapolation factor follow C63.10 6.4.4.4 Calculation of extrapolation factor from two points. (See report clause C2) 2. Trace used 40 log (300/3) distance extrapolation factor. 3. Level = Read Level + Ant. Factor + Cable Loss - Distance extrapolation Factor		



Mark	Freq. (MHz)	Level (dBµV/m)	Margin (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Ant. Factor + Cable Loss (dB)	Distance extrapolation Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
1	0.02054	14.56	-26.79	41.35	104.2	19.41	109.05	100	90	Peak
2	0.02632	4.16	-35.04	39.2	64.7	19.46	80	100	90	Peak
3	0.07586	-19.07	-49.07	30	42.81	18.12	80	100	90	Peak
4	0.12155	-18.49	-44.4	25.91	43.32	18.19	80	100	90	Peak
5	0.19659	-31.6	-53.33	21.73	29.91	18.49	80	100	90	Peak
6	0.25623	-32.47	-51.9	19.43	29.09	18.44	80	100	90	Peak
7	0.43998	-27.59	-42.33	14.74	33.57	18.84	80	100	90	Peak

C2. C63.10 6.4.4.4 Calculation of extrapolation factor from two points

If two measurement points and the limit distance are all at a distance equal to or greater than λ/2π and are used to determine the extrapolation value, or if the measurement points and the limit distance are within λ/2π, then Equation (5) shall be used to calculate the extrapolation factor in dB/decade of distance:

$$N = 20 \frac{\log(E1/E2)}{\log(d1/d2)} \quad (5)$$

where

E1 is the field strength at the measurement distance closest to the radiating source, expressed in μV/m

E2 is the field strength at the measurement distance farthest from the radiating source, expressed in μV/m

d1 is the measurement distance closest to the radiating source

d2 is the measurement distance farthest from the radiating source

N is the distance extrapolation factor in dB/decade of distance. The field strength at the limit distance shall then be calculated using the methods and formula described in 6.4.4.7.

If measurements of two or more points at distances greater than λ/2π are made, then it is not necessary to evaluate the field strength at distances closer than λ/2π or to determine the rate of decay of the field strength within the λ/2π boundary.

Formula:

dBuV/m to uV/m formula: uV/m = $10^{dBuV/m/20}$

Distance extrapolation factor = N * log (300/3)

Calculation:

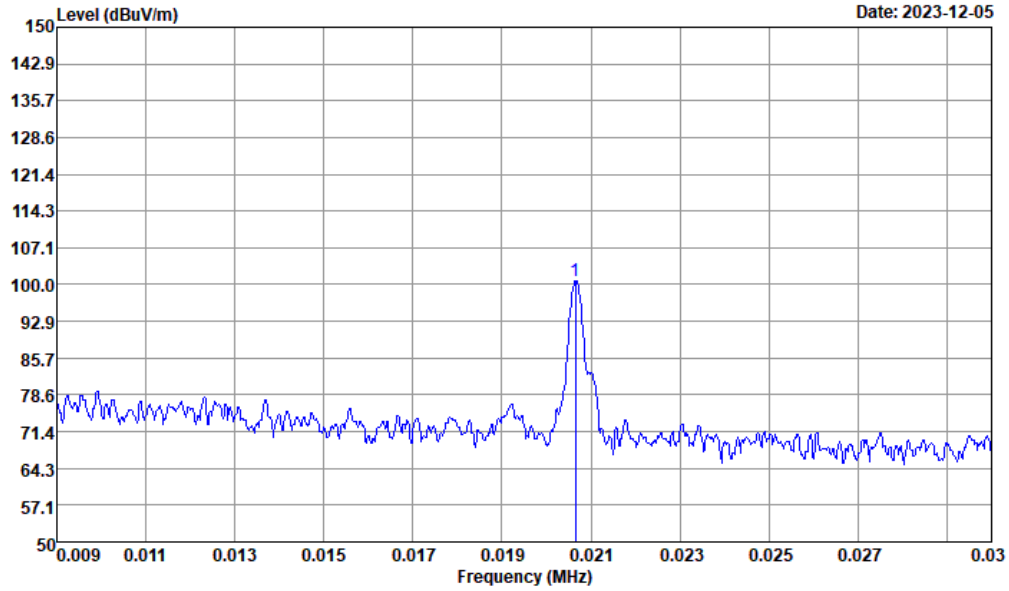
E1 10m field strength (uV/m) = $10^{100.79/20}$ = 109521.66

E2 3m field strength (uV/m) = $10^{129.30/20}$ = 2917427.01

N = 20 * [log (109521.66 / 2917427.01) / log (10/3)] = -54.53

Distance extrapolation factor = -54.53 * log (300/3) = -109.05

E1 10m field strength is 100.79dBuV/m



E2 3m field strength is 129.3dBuV/m