

FCC TEST REPORT

FCC ID : RUK-MK104
Equipment : BLE Keyless System-Control Box
Brand Name : M.gear
Model Name : MK104
Applicant : Wha Yu Industrial Co., Ltd
No.326, Sec. 2, Kung Tao 5 Road., Hsinchu City
30070, Taiwan (R.O.C.)
Manufacturer : Wha Yu Industrial Co., Ltd
No.326, Sec. 2, Kung Tao 5 Road., Hsinchu City
30070, Taiwan (R.O.C.)
Standard : 47 CFR FCC Part 15.209

The product was received on Aug. 05, 2022, and testing was started from Aug. 26, 2022 and completed on Jan. 11, 2022. We, SPORTON INTERNATIONAL INC. Hsinhua Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. Hsinhua Laboratory, the test report shall not be reproduced except in full.


Approved by: Jackson Tsai

SPORTON INTERNATIONAL INC. Hsinhua Laboratory

No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan (R.O.C.)

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APPENDIX A. TEST RESULT OF TRANSMITTER RADIATED EMISSIONS

APPENDIX B. TEST RESULT OF EMISSION BANDWIDTH

APPENDIX C. TEST PHOTOS

PHOTOGRAPHS OF EUT v01

History of this test report

Report No.	Version	Description	Issued Date
FR280433AO	01	Initial issue of report	Oct. 04, 2022

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
1.1.2	15.203	Antenna Requirement	PASS	-
-	15.207	AC Power-line Conducted Emissions	PASS	Only employ battery power.
3.1	15.209	Transmitter Radiated Emissions	PASS	-
3.2	15.215(c)	Emission Bandwidth	PASS	-

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

None.

Reviewed by: Barry Hsiao

Report Producer: Amber Chiu

1 General Description

1.1 Information

1.1.1 RF General Information

RF General Information			
Modulation	Ch. Frequency(kHz)	Channel Number	Field Strength (dBuV/m)
OOK	125	1	95.02
Note 1: Field strength performed peak level at 3m.			

1.1.2 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector
1	YaFai Intelligent	LF65M491J-125K-BW	PKE Antenna	N/A

Note 1: The antenna mentioned above will not be sold with the EUT in the market.

1.1.3 Type of EUT

Operational Condition	
EUT Power Type	From DC Power Supply
Type of EUT	
<input checked="" type="checkbox"/>	Stand-alone
<input type="checkbox"/>	Combined (EUT where the radio part is fully integrated within another device) Combined Equipment - Brand Name / Model No.: ...
<input type="checkbox"/>	Plug-in radio (EUT intended for a variety of host systems) Host System - Brand Name / Model No.: ...
<input type="checkbox"/>	Other:

1.1.4 Test Signal Duty Cycle

Operated Mode for Worst Duty Cycle	
<input type="checkbox"/>	Operated normal mode for worst duty cycle
<input checked="" type="checkbox"/>	Operated test mode for worst duty cycle
Test Signal Duty Cycle (x)	
<input checked="" type="checkbox"/>	100.00%

1.2 Testing Applied Standards

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

- ♦ 47 CFR FCC Part 15
- ♦ ANSI C63.10-2013

The following reference test guidance is not within the scope of accreditation of TAF:

- ♦ KDB 414788 D01 v01r01

1.3 Testing Location Information

Test Lab. : Sporton International Inc. Hsinhua Laboratory				
<input checked="" type="checkbox"/> Hsinhua (TAF: 3785)	ADD: No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan (R.O.C.)			
	TEL: 886-3-327-3456		FAX: 886-3-327-0973	
Test site Designation No. TW3785 with FCC.				
Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
RF Conducted	TH01-HY	XieXun	21.5~26.9°C / 50~60%	22/Aug/2022
Radiated	03CH02-HY	Jack Tang	21.5~23.2°C / 56~58%	08/Aug/2022~26/Aug/2022
<input type="checkbox"/> Wen 33rd.St. (TAF: 3785)	ADD: No.14-1, Ln. 19, Wen 33rd St., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)			
	TEL: 886-3-318-0787		FAX: 886-3-318-0287	
Test site Designation No. TW0008 with FCC.				

1.4 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))

Test Items	Uncertainty	Remark
Transmitter Radiated Emissions	4.8 dB	Confidence levels of 95%
Bandwidth	0.005 MHz	Confidence levels of 95%
Temperature	0.41 °C	Confidence levels of 95%
Humidity	3.4 %	Confidence levels of 95%

2 Test Configuration of EUT




2.1 Test Condition

Condition Item	Abbreviation/Remark	Remark
TnomVnom	Tnom	20°C
-	Vnom	12V

2.2 The Worst Case Configuration

Mode	Test Channel Frequencies(kHz)	Field Strength (dBuV/m@3m)
RFID	125	95.02

2.3 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests			
Tests Item	Emission Bandwidth, Field Strength of Fundamental Emissions Transmitter Radiated Unwanted Emissions		
Test Condition	Radiated measurement		
User Position	<input type="checkbox"/> EUT will be placed in fixed position.		
	<input checked="" type="checkbox"/> EUT will be placed in mobile position and operating multiple positions. EUT shall be performed three orthogonal planes.		
	<input type="checkbox"/> EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions.		
Operating Mode	CTX		
1	DC Power Supply		
Orthogonal Planes of EUT	X Plane	Y Plane	Z Plane
			
Worst Planes of EUT			V

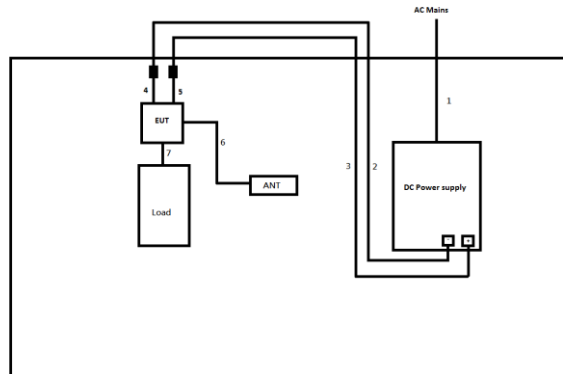
2.4 Support Equipment

Support Equipment – Conducted					
No.	Equipment	Brand Name	Model Name	FCC ID	Remark
1	Notebook	DELL	E5410	-	-
2	Adapter for NB	DELL	HA65NM130	-	-
3	locker-connector	inf-switch	YAMAHA VP9 Keyless System	-	-
4	DC Power Supply	GW	GPS-3030DD	-	-

Support Equipment – Radiated					
No.	Equipment	Brand Name	Model Name	FCC ID	Remark
1	DC Power Supply	GW	GPS-3030DD	-	-
2	DC power cable(-)	MiSUMi	WTN1229-BLACK	-	-
3	DC power cable(+)	MiSUMi	WTN1229-RED	-	-
4	AC Power Cable	Power Sync	PW-GPC180-3	-	-
5	antenna for SRD	SunBright	LF65M491J-125K- BW	-	-

2.5 Test Setup Diagram

Test Setup Diagram - Radiated Test



Item	Connection	Shielded	Length(m)	Remark
1	AC Power cable	No	1.8	-
2	DC Power cable(+)	No	1.0	-
3	DC Power cable(-)	No	1.0	-
4	DC Power cable(+)	No	0.2	-
5	DC Power cable(-)	No	0.3	-
6	RF cable	No	0.2	-
7	Antenna cable	No	0.3	-

3 Transmitter Test Result

3.1 Transmitter Radiated Emissions

3.1.1 Transmitter Radiated Emissions Limit

Transmitter Radiated Emissions Limit			
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

Note 3: the frequency bands 9-90 kHz, 110-490 kHz measurements employing an average detector and other below 1GHz measurements employing a CISPR quasi-peak detector.

3.1.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

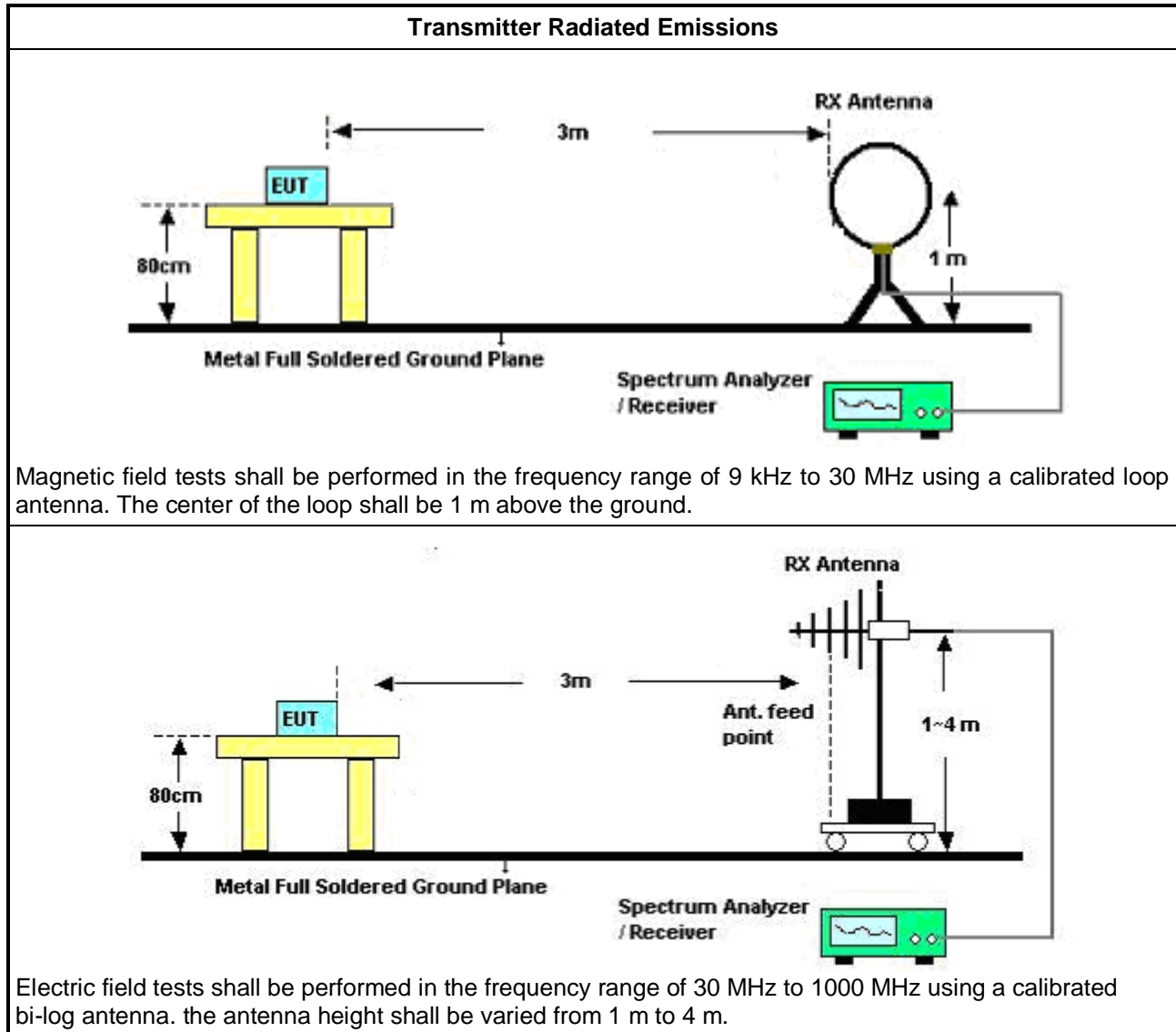
Test Method	
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.5 for radiated emissions from 30 MHz to 1 GHz and test distance is 3m.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz. The frequency bands 9-90 kHz, 110-490 kHz measurements employing an average detector and other below 30MHz measurements employing a CISPR quasi-peak detector. Test distance is 3m.
<input checked="" type="checkbox"/>	At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the requirements; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be following below methods. Note: If fundamental emission level is smaller than noise at 3m , we will change distance to 1m.
<input type="checkbox"/>	The results shall be extrapolated to the specified distance by making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor.
<input checked="" type="checkbox"/>	The results shall be by using the square of an inverse linear distance extrapolation factor (40 dB/decade).
<input checked="" type="checkbox"/>	For radiated measurement. Loop antenna was rotated about the horizontal and vertical axis and the equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted field strength level.
<input checked="" type="checkbox"/>	The any unwanted emissions level shall not exceed the fundamental emission level.
<input checked="" type="checkbox"/>	All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.
<input checked="" type="checkbox"/>	KDB 414788 Open-Field Test Sites and Chamber Correlation Justification.
<input type="checkbox"/>	<ul style="list-style-type: none"> Based on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in regulations; however, an attempt should be made to avoid making measurements in the near field.
<input type="checkbox"/>	<ul style="list-style-type: none"> Open-field site and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

3.1.4 Measurement Results Calculation

The measured Level is calculated using:

Corrected Reading: Raw(Read Level) + AF(Antenna Factor) + CL(Cable Loss) - PA(Preamplifier Factor)

3.1.5 Test Setup



3.1.6 Test Result of Transmitter Radiated Emissions (Below 30MHz)

Refer as Appendix A

3.2 Emission Bandwidth

3.2.1 Emission Bandwidth Limit

Emission Bandwidth Limit
N/A

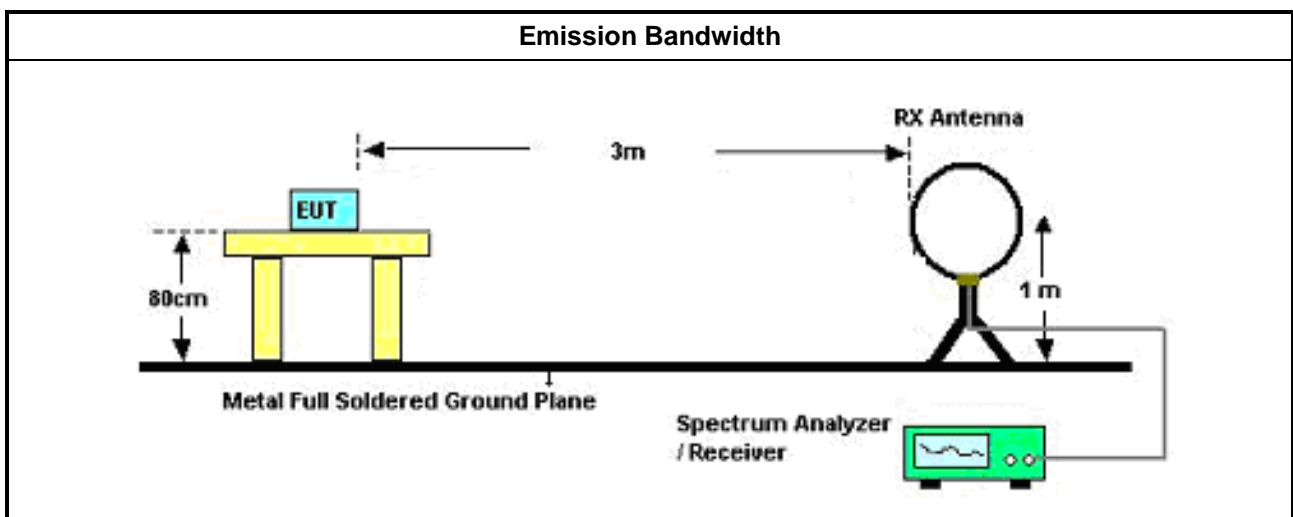
3.2.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.2.3 Test Procedures

Test Method
<input checked="" type="checkbox"/> Because the measured signal is CW or 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.
<input checked="" type="checkbox"/> For radiated measurement. Loop antenna was rotated about the horizontal and vertical axis and the equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted field strength level.

3.2.4 Test Setup



3.2.5 Test Result of Emission Bandwidth

Refer as Appendix B

4 Test Equipment and Calibration Data

Instrument for Conducted Test

Instrument	Manufacturer / Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date
Signal Analyzer	R&S	FSV 40	101013	10Hz~40GHz	01/Apr/2022	31/Mar/2023
SMB100A Signal Generator	R&S	SMB100A	181147	100kHz~40GHz	21/Oct/2021	20/Oct/2022
Pulse Sensor	Anritsu	MA2411B	0917017	300MHz~40GHz	21/Feb/2022	20/Feb/2023
Power Meter	Anritsu	ML2495A	0949003	300MHz~40GHz	21/Feb/2022	20/Feb/2023
SENSE-NFC	Sporton	V5.11.0	N/A	N/A	N/A	N/A

Instrument for Radiated Test

Instrument	Manufacturer / Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	30MHz~1GHz 3m	31/Jul/2022	30/Jul/2023
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	1GHz~18GHz 3m	30/Jul/2022	29/Jul/2023
Signal Analyzer	R&S	FSP40	100305	9kHz~40GHz	21/Mar/2022	20/Mar/2023
Amplifier	Agilent	8447D	2944A11149	100kHz~1.3GHz	28/Jun/2022	27/Jun/2023
Bilog Antenna & 5dB Attenuator	SCHAFFNER / MTJ	CBL 6112B / MTJ6102-05	2723 / 2	30MHz~1GHz	04/Sep/2021	03/Sep/2022
RF Cable	MVE	400LL	MVE-1-0802	9kHz~30MHz	04/May/2022	03/May/2023
RF Cable	MVE	400LL	MVE-1-0802	30MHz~1GHz	04/May/2022	03/May/2023
Loop Antenna	TESEQ	HLA 6120	31244	9kHz~30MHz	18/Mar/2022	17/Mar/2023
EMI Test Receiver	R&S	ESR3	102052	9kHz~3.6GHz	13/May/2022	12/May/2023
SENSE-303417	Sporton	V5.10.4	N/A	N/A	N/A	N/A



Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
110-495kHz	-	-	-	-	-	-	-	-	-	-	-	-
SRD	Pass	PK	125k	95.02	105.65	-10.63	20.10	3	Horizontal	360	1.00	-



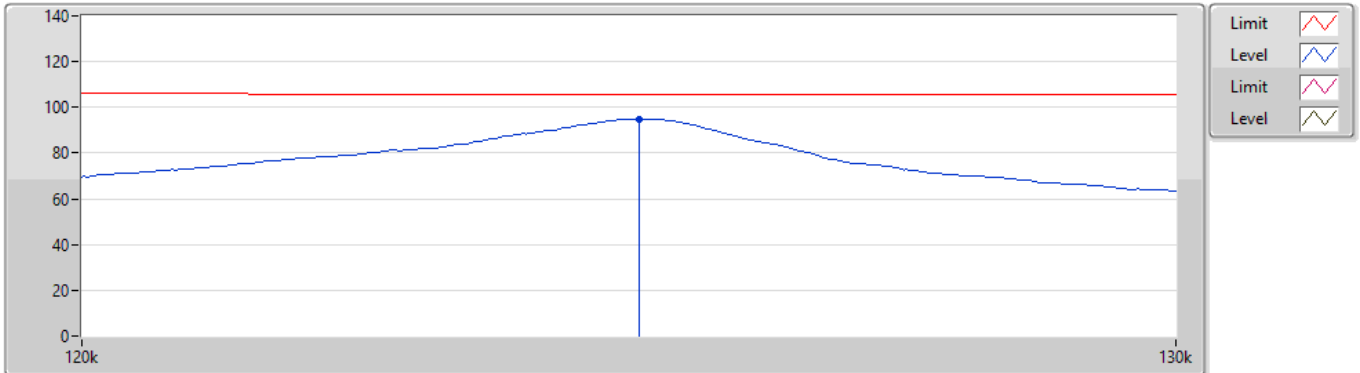
Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
SRD	-	-	-	-	-	-	-	-	-	-	-	-
0.125MHz_TX	Pass	PK	125k	95.02	105.65	-10.63	20.10	3	Horizontal	360	1.00	-
0.125MHz_TX	Pass	PK	10.41k	71.55	127.24	-55.69	19.19	3	Horizontal	0	1.00	-
0.125MHz_TX	Pass	PK	20.28k	67.98	121.44	-53.46	20.86	3	Horizontal	0	1.00	-
0.125MHz_TX	Pass	PK	35.226k	75.36	116.65	-41.29	21.59	3	Horizontal	0	1.00	-
0.125MHz_TX	Pass	PK	329.1k	60.94	97.26	-36.32	20.18	3	Horizontal	360	1.00	-
0.125MHz_TX	Pass	PK	627.6k	51.41	71.65	-20.24	20.57	3	Horizontal	360	1.00	-
0.125MHz_TX	Pass	PK	2.18M	45.04	69.50	-24.46	20.26	3	Horizontal	360	1.00	-

SRD

08/08/2022

0.125MHz_TX

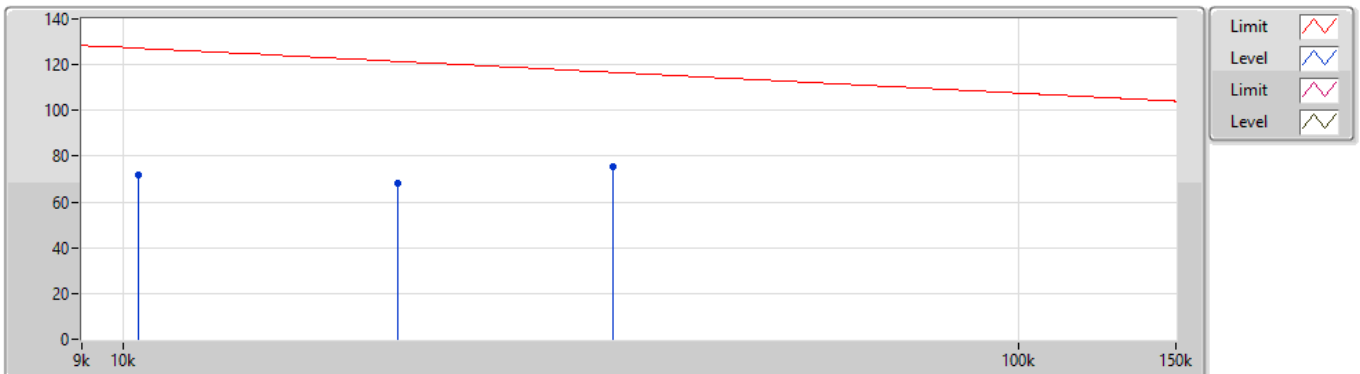


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)
PK	125k	95.02	105.65	-10.63	20.10	3	Horizontal	360	1.00	-	74.92	19.80	0.30	-

SRD

08/08/2022

0.125MHz_TX

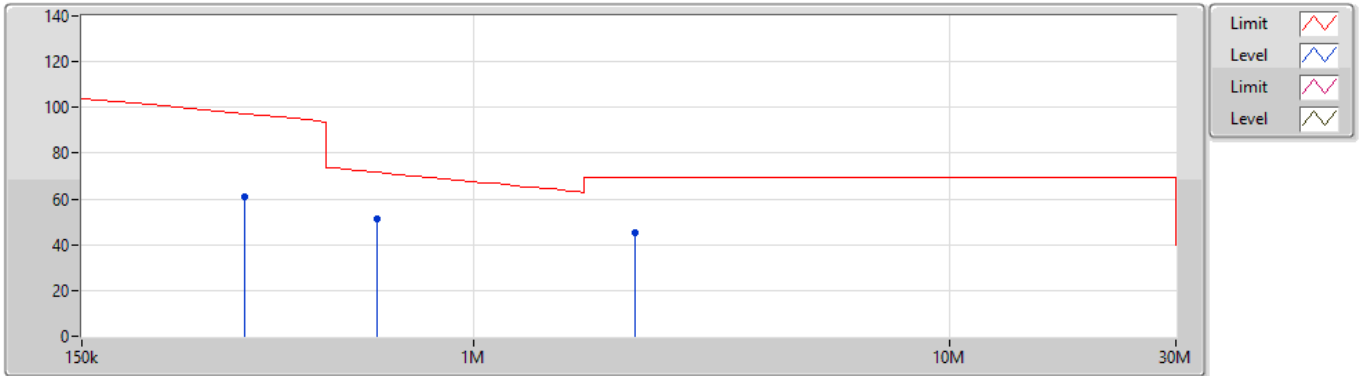


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)
PK	10.41k	71.55	127.24	-55.69	19.19	3	Horizontal	0	1.00	-	52.36	19.00	0.19	-
PK	20.28k	67.98	121.44	-53.46	20.86	3	Horizontal	0	1.00	-	47.12	20.64	0.22	-
PK	35.226k	75.36	116.65	-41.29	21.59	3	Horizontal	0	1.00	-	53.77	21.35	0.24	-

SRD

0.125MHz_TX

08/08/2022



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)
PK	329.1k	60.94	97.26	-36.32	20.18	3	Horizontal	360	1.00	-	40.44	20.20	0.30	-
PK	627.6k	51.41	71.65	-20.24	20.57	3	Horizontal	360	1.00	-	30.84	20.23	0.34	-
PK	2.18M	45.04	69.50	-24.46	20.26	3	Horizontal	360	1.00	-	24.78	19.80	0.46	-



Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
110-495kHz	-	-	-	-	-	-	-	-	-	-	-	-
SRD	Pass	PK	30M	31.24	40.00	-8.76	-2.68	3	Vertical	360	1.00	-

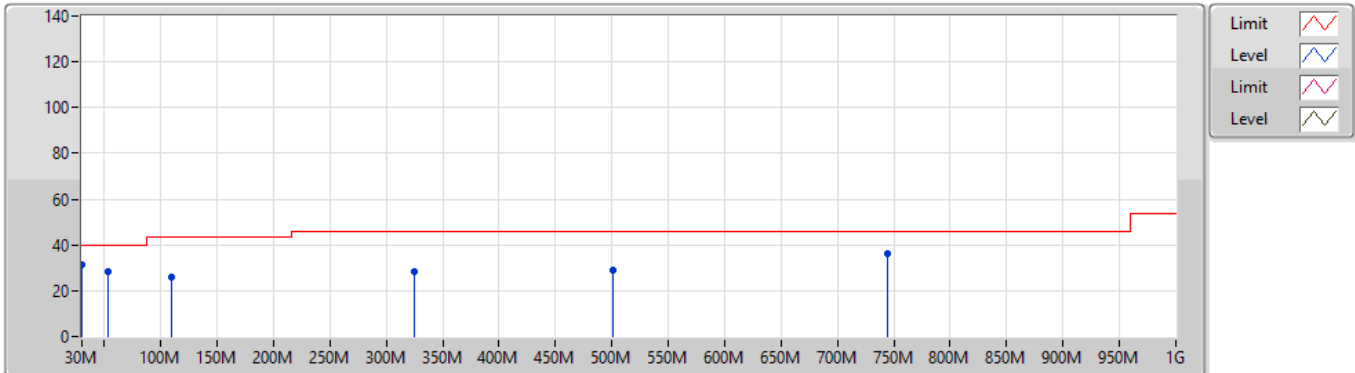
**Result**

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
SRD	-	-	-	-	-	-	-	-	-	-	-	-
0.125MHz_TX	Pass	PK	30M	31.24	40.00	-8.76	-2.68	3	Vertical	360	1.00	-
0.125MHz_TX	Pass	PK	53.28M	28.62	40.00	-11.38	-14.23	3	Vertical	360	1.00	-
0.125MHz_TX	Pass	PK	109.54M	25.74	43.50	-17.76	-9.25	3	Vertical	360	1.00	-
0.125MHz_TX	Pass	PK	324.88M	28.20	46.00	-17.80	-5.91	3	Vertical	360	1.00	-
0.125MHz_TX	Pass	PK	501.42M	29.11	46.00	-16.89	-2.29	3	Vertical	360	1.00	-
0.125MHz_TX	Pass	PK	743.92M	36.48	46.00	-9.52	0.56	3	Vertical	360	1.00	-
0.125MHz_TX	Pass	PK	33.88M	28.63	40.00	-11.37	-4.57	3	Horizontal	0	1.00	-
0.125MHz_TX	Pass	PK	107.6M	30.30	43.50	-13.20	-9.38	3	Horizontal	0	1.00	-
0.125MHz_TX	Pass	PK	183.26M	24.12	43.50	-19.38	-11.17	3	Horizontal	0	1.00	-
0.125MHz_TX	Pass	PK	322.94M	36.20	46.00	-9.80	-5.91	3	Horizontal	0	1.00	-
0.125MHz_TX	Pass	PK	604.24M	31.53	46.00	-14.47	-0.90	3	Horizontal	0	1.00	-
0.125MHz_TX	Pass	PK	730.34M	35.31	46.00	-10.69	0.31	3	Horizontal	0	1.00	-

SRD

08/08/2022

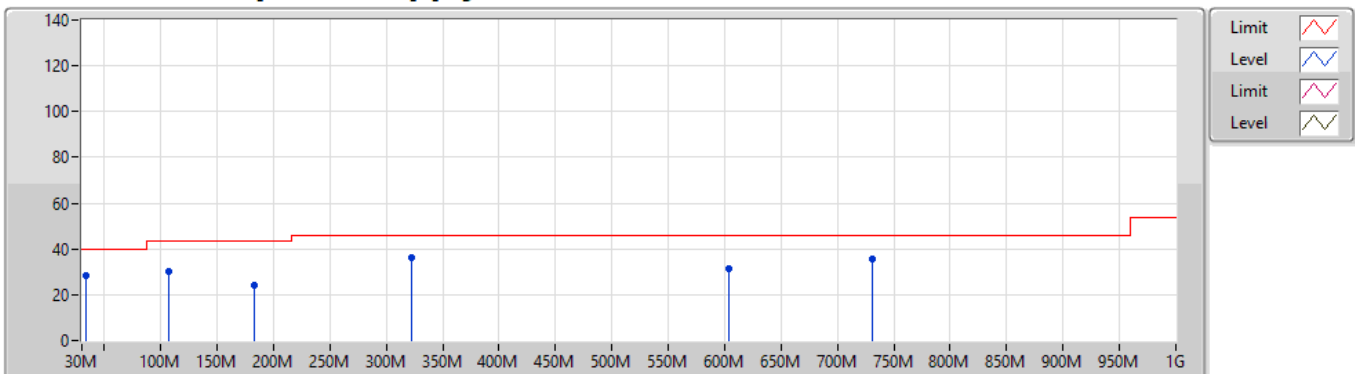
0.125MHz_DC power supply



SRD

08/08/2022

0.125MHz_DC power supply



Summary

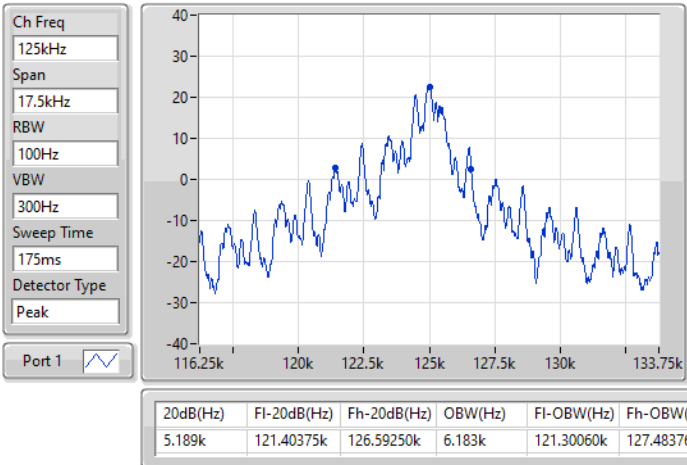
Mode	20dB (Hz)	FI-20dB (Hz)	Fh-20dB (Hz)	OBW (Hz)	Limit (Range)
110-495kHz	-	-	-	-	-
SRD	5.189k	121.40375k	126.59250k	6.183k	--

Result

Mode	Result	20dB (Hz)	FI-20dB (Hz)	Fh-20dB (Hz)	OBW (Hz)	FI-OBW (Hz)	Fh-OBW (Hz)	Limit (Range)
SRD	-	-	-	-	-	-	-	-
0.125MHz_TnomVnom	Pass	5.189k	121.40375k	126.59250k	6.183k	121.30060k	127.48376k	--

SRD

0.125MHz_TnomVnom



EBW

22/08/2022

