



FCC EMI TEST REPORT

Filing Type : Certification
FCC ID : W34UMRR1230S
Equipment : TRUGRD Stream
Brand Name : smartmicro
Model Name : UMRR-12 Type 48
Applicant : s.m.s, smart microwave sensors GmbH
In den Waashainen 1, 38108 Braunschweig,
Germany
Manufacturer : s.m.s, smart microwave sensors GmbH
In den Waashainen 1, 38108 Braunschweig,
Germany
Standard : 47 CFR FCC Rules and Regulations Part 15
Subpart B Class B Digital Device

The product was received on Nov. 30, 2020, and testing was started from Dec. 08, 2020 and completed on Dec. 21, 2020. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.4-2014 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. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: Sin Chang

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



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History of this test report



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
4	15.107	AC Power Port Conducted Emission	PASS	Under limit 13.89 dB at 22.313 MHz
5	15.109	Radiated Emission below 1GHz	PASS	Under limit 0.49 dB at 72.68 MHz
5	15.109	Radiated Emission above 1GHz	PASS	Under limit 18.49 dB at 18.1414 GHz

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:

The test configuration, test mode and test software were written in this test report are declared by the manufacturer.

Reviewed by: Sin Chang

Report Producer: Wendy Pan



1. General Description of Equipment under Test

Product Detail	
Equipment Name	TRUGRD Stream
Model Name	UMRR-12 Type 48
Brand Name	smartmicro
Power Supply	From DC power supply
Accessories	Sensor cable*1: Shielded, 11m.

1.1. Feature of Equipment under Test

1. The EUT's highest operating frequency is 24GHz.
2. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

1.2. Modification of EUT

Please refer to the technical specifications of EUT.



2. Test Configuration of Equipment under Test

2.1. Test Mode

The following table is a list of the test modes shown in this test report.

Conducted Emissions	
Test Mode	Description
1	Normal Link - EUT with Sensor cable (CAN-USB Port)

Radiated Emissions	
Test Mode	Description
1	Normal Link - EUT with Sensor cable (CAN-USB Port)

Note: The EUT can only be used at Y axis position.

2.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

For Conducted Emissions test:

No.	Support Unit	Brand	Model	FCC ID
A	Power Supply	Advanced	LPS-305	N/A
B	NB	DELL	E6430	N/A
C	Earphone	e-Power	S90W	N/A
D	Mouse	HP	FM100	N/A

For Radiated Emissions test:

No.	Support Unit	Brand	Model	FCC ID
A	Notebook	DELL	E4300	N/A
B	Power Supply	Advanced	LPS-305	N/A
C	Earphone	e-Power	S90W	N/A
D	Mouse	Logitech	M-U0026	N/A



2.3. EUT Operation Condition

The EUT will transmit the RF signal continuously after power on.

An executive program, EMCTEST.EXE under WIN X7, which generates a complete line of continuously repeating “H” pattern was used as the test software.

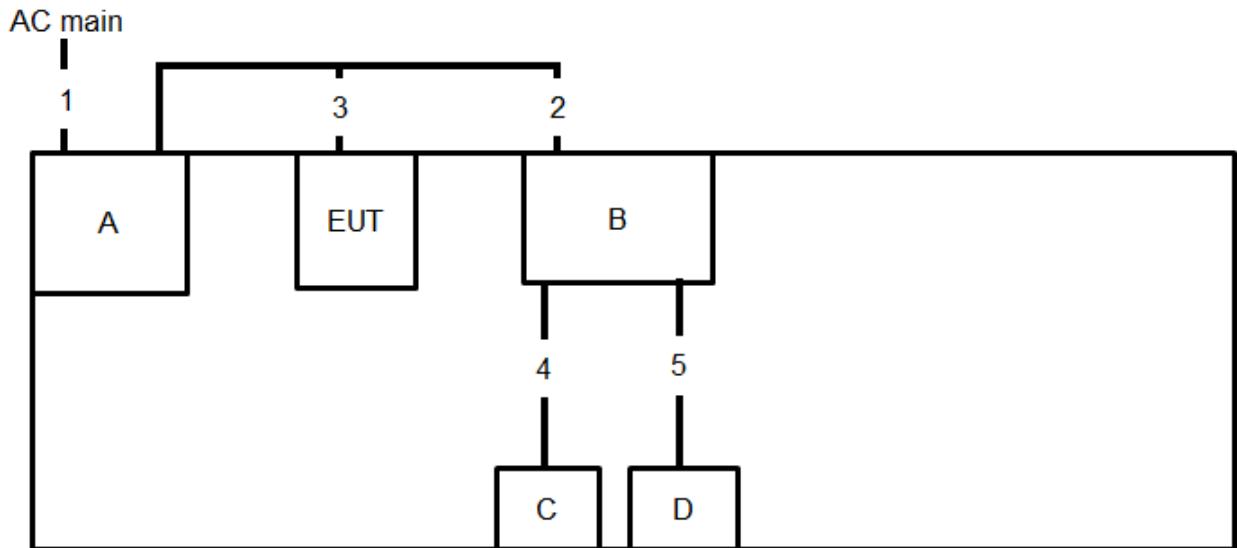
The program was executed as follows :

- a. Turn on the power of all equipment.
- b. The NB sends “H” messages to the panel, and the panel displays “H” patterns on the screen.
- c. Repeat the step from c.

At the same time, the remote notebook executed “DriveRecorder3.exe” under Win 7 to link with the EUT to transmit and receive data by Sensor cable.

2.4. Connection Diagram of Test System

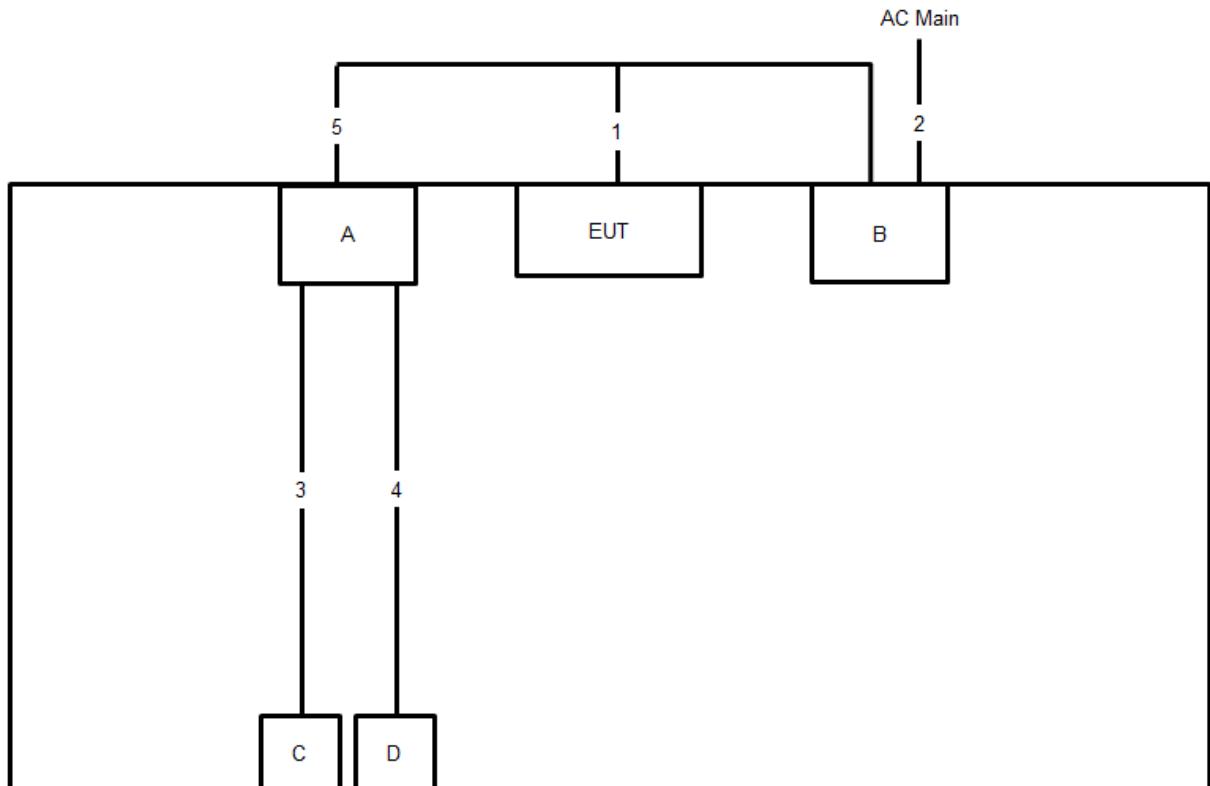
2.4.1. AC Power Line Conduction Emissions Test Configuration



Item	Connection	Shielded	Length
1	Power cable	No	1.5m
2	Console cable	Yes	0.8m
3	Sensor Cable	Yes	11m
4	Audio cable	No	1.5m
5	USB cable	Yes	1.5m



2.4.2. Radiation Emissions Test Configuration



Item	Connection	Shielded	Length
1	Sensor Cable	Yes	11m
2	Power Cable	No	1m
3	Audio Cable	No	1.4m
4	USB Cable	Yes	1.8m
5	Console cable	Yes	0.8m



3. General Information of Test

3.1. Test Facility

EMI		
JHU BEI	ADD : No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302, Taiwan (R.O.C.)	
TEL	886-3-656-9065	FAX : 886-3-656-9085

Test site Designation No. TW0006 with FCC.

Test site registered number IC 4086D with Industry Canada.

3.2. Test Environment

Test Items	Test Site No.	Test Engineer	Test Environment			Test Date	Remark
			Temp (°C)	Humidity (%)	Pressure (kPa)		
AC Power Port Conducted Emission	CO01-CB	Ryo Fan	20~22	58~60	-	Dec. 18, 2020	-
Radiated Emission below 1GHz	03CH06-CB	Brian Sun	22.4-23.5	55-58	-	Dec. 08, 2020 ~ Dec. 21, 2020	-
Radiated Emission above 1GHz	03CH03-CB	Brian Sun	22.6-23.4	57-60	-	Dec. 08, 2020 ~ Dec. 21, 2020	-



3.3. Test Voltage

Power Type	Test Voltage
AC Power Supply	120 V / 60 Hz

3.4. Standard for Methods of Measurement

ANSI C63.4-2014

3.5. Frequency Range Investigated

Test Items	Frequency Range
Conducted emission test	150 kHz to 30 MHz
Radiated emission test	30 MHz to 40,000 MHz

3.6. Test Distance

Test Items	Test Distance
Radiated emission test below 1 GHz (30 MHz to 1,000 MHz)	3 m
Radiated emission test above 1 GHz (1,000 MHz to 18,000 MHz)	3 m
Radiated emission test above 1 GHz (18,000 MHz to 40,000 MHz)	1 m



4. Test of Conducted Emission

4.1. Limit

Frequency (MHz)	QP Limit (dBuV)	AV Limit (dBuV)
0.15~0.5	66~56	56~46
0.5~5	56	46
5~30	60	50

4.2. Test Procedures

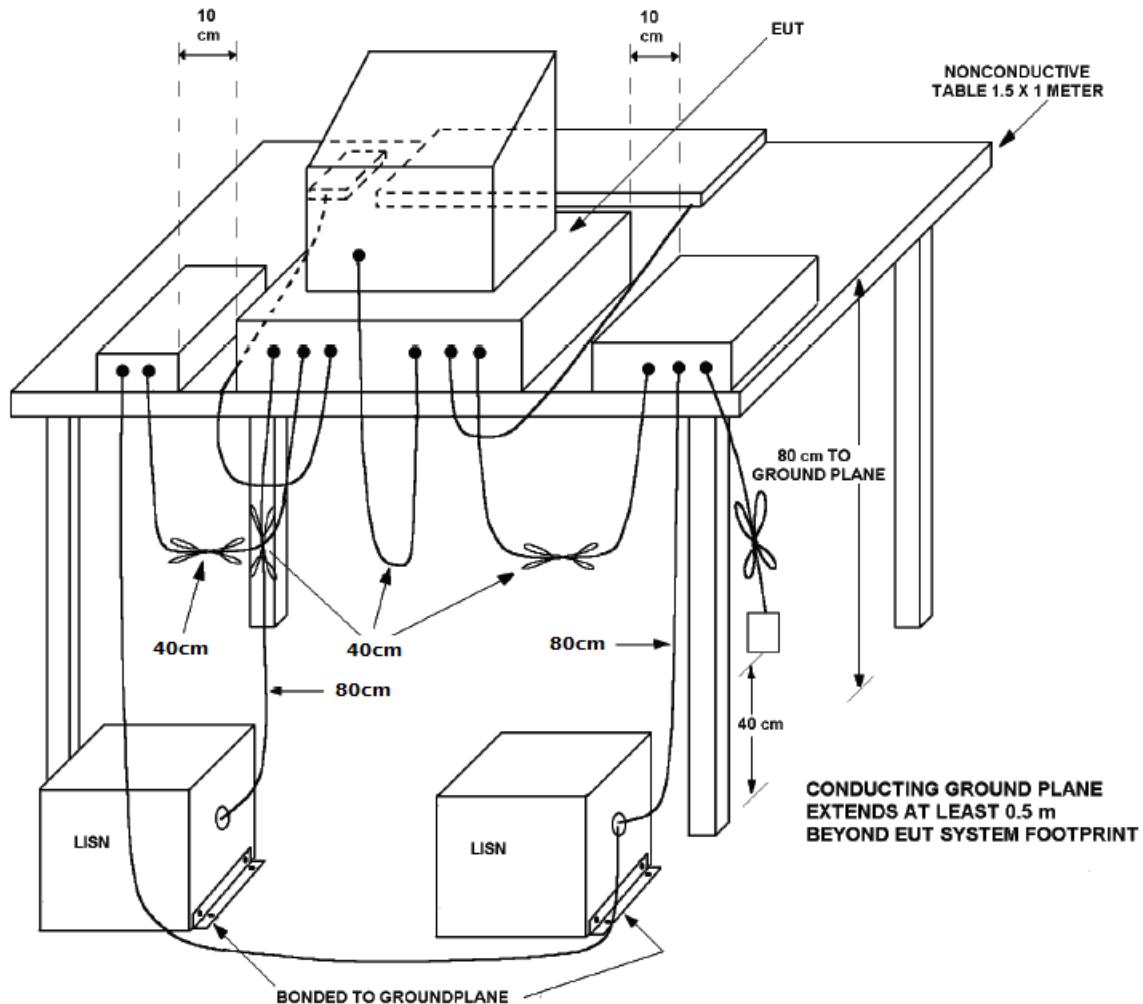
- a. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
- b. Connect EUT to the power mains through a line impedance stabilization network (LISN).
- c. All the support units are connect to the other LISN.
- d. The LISN provides 50 Ω coupling impedance for the measuring instrument.
- e. The FCC states that a 50 Ω, 50 uH LISN should be used.
- f. Both sides of AC line were checked for maximum conducted interference.
- g. The frequency range from 150 kHz to 30 MHz was searched.
- h. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

4.3. Measurement Results Calculation

The measured Level is calculated using:

- a. Corrected Reading: LISN Factor (LISN) + Attenuator (AT/AUX) + Cable Loss (CL) + Read Level (Raw)
= Level
- b. Margin = -Limit + Level

4.4. Typical Test Setup Layout of Conducted Emission



4.5. Test Result of AC Power Ports

Refer as Appendix A



5. Test of Radiated Emission

5.1. Limit

Radiated Emission below 1 GHz test at 3 m:

Frequency (MHz)	QP (dBuV/m)
30~88	40
88~216	43.5
216~960	46
Above 960	54

Radiated Emission 1~18 GHz test at 3 m:

Frequency (MHz)	PK (dBuV/m)	AV (dBuV/m)
1,000 to 18,000	74	54

Radiated Emission 18~40 GHz test at 1 m:

Frequency (MHz)	PK (dBuV/m)	AV (dBuV/m)
18,000 to 40,000	83.54	63.54

5.2. Test Procedures

- a. The EUT was placed on a rotatable table top 0.8 meter above ground.
- b. The EUT was set 3m (below 1GHz) / 3m (1GHz-18GHz) / 1m (18GHz-40GHz) meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- c. The table was rotated 360 degrees to determine the position of the highest radiation.
- d. The antenna height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- f. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
- h. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.



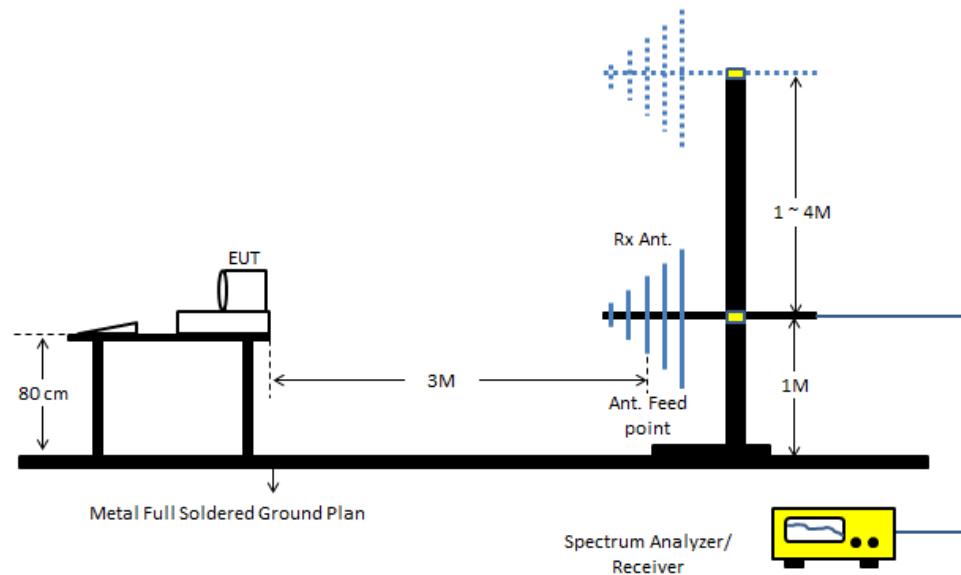
5.3. Measurement Results Calculation

The measured Level is calculated using:

- a. Corrected Reading: Antenna factor (AF) + Cable loss (CL) + Read level (Raw) - Preamp factor (PA) = Level
- b. Margin = -Limit + Level

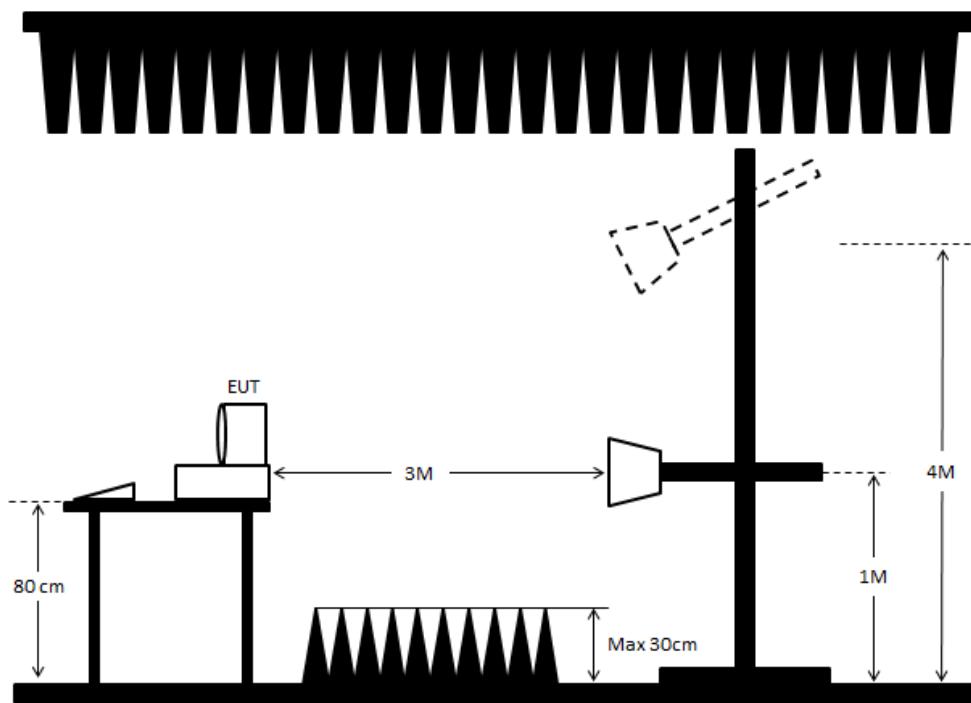
5.4. Typical Test Setup Layout of Radiated Emission

<Below 1 GHz>:

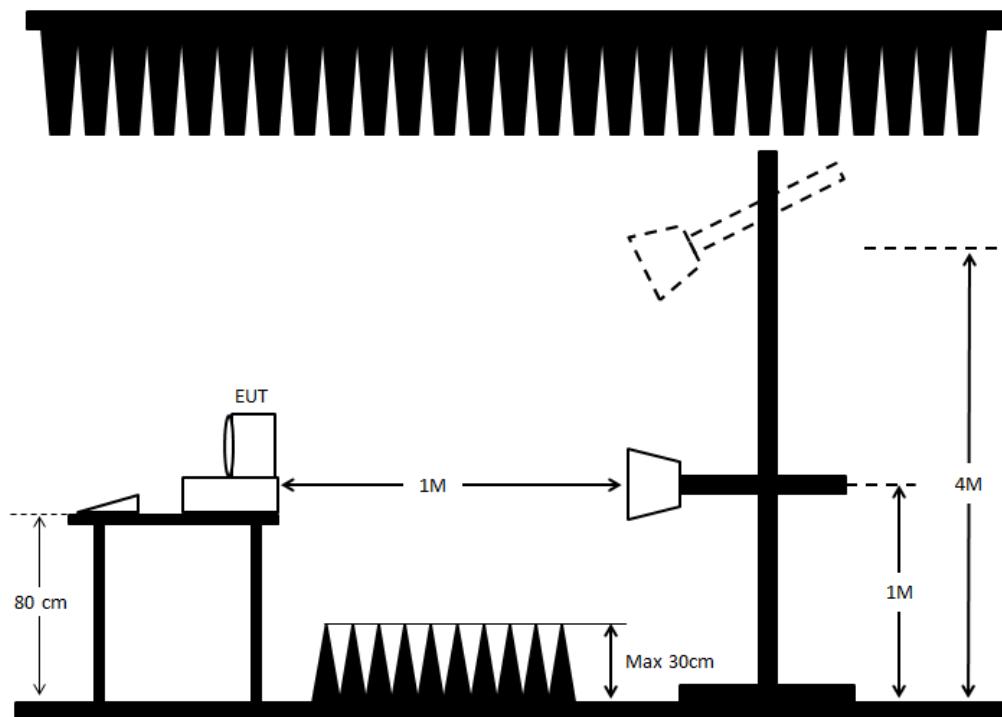


<Above 1 GHz>:

1,000~18,000 MHz



18,000~40,000 MHz



5.5. Test Result of Radiated Emission below 1 GHz

Refer as Appendix B

5.6. Test Result of Radiated Emission above 1 GHz

Refer as Appendix B



6. List of Measuring Equipment Used

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.4GHz	Feb. 26, 2020	Feb. 25, 2021	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-1 6-2	04083	150kHz ~ 100MHz	Dec. 25, 2019	Dec. 24, 2020	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Feb. 25, 2020	Feb. 24, 2021	Conduction (CO01-CB)
Pulse Limiter	Rohde&Schwarz	ESH3-Z2	100430	9kHz ~ 30MHz	Jan. 31, 2020	Jan. 30, 2021	Conduction (CO01-CB)
COND Cable	Woken	Cable	Low cable-CO01	9kHz ~ 30MHz	May 20, 2020	May 19, 2021	Conduction (CO01-CB)
Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Conduction (CO01-CB)
3m Semi Anechoic Chamber NSA	TDK	SAC-3M	03CH06-CB	30 MHz ~ 1 GHz	Aug. 10, 2020	Aug. 09, 2021	Radiation (03CH06-CB)
Bilog Antenna with 6 dB attenuator	TESEQ & EMCI	CBL6112D & N-6-06	37878 & AT-N0606	20MHz ~ 2GHz	Aug. 02, 2020	Aug. 01, 2021	Radiation (03CH06-CB)
Pre-Amplifier	Agilent	310N	187290	0.1MHz ~ 1GHz	Nov. 05, 2020	Nov. 04, 2021	Radiation (03CH06-CB)
Signal Analyzer	R&S	FSV40	101904	9kHz ~ 40GHz	May 12, 2020	May 11, 2021	Radiation (03CH06-CB)
EMI Test Receiver	R&S	ESCS	826547/017	9kHz ~ 2.75GHz	May 13, 2020	May 12, 2021	Radiation (03CH06-CB)
RF Cable-low	Woken	RG402	Low Cable-05+24	30MHz~1GHz	Oct. 05, 2020	Oct. 04, 2021	Radiation (03CH06-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (03CH06-CB)
3m Semi Anechoic Chamber VSWR	TDK	SAC-3M	03CH03-CB	1GHz ~18GHz 3m	May 28, 2020	May 27, 2021	Radiation (03CH03-CB)
Horn Antenna	ETS • Lindgren	3115	6821	750MHz~18GHz	Jan. 20, 2020	Jan. 19, 2021	Radiation (03CH03-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jul. 21, 2020	Jul. 20, 2021	Radiation (03CH03-CB)
Pre-Amplifier	Agilent	8449B	3008A02097	1GHz ~ 26.5GHz	Jul. 03, 2020	Jun. 02, 2021	Radiation (03CH03-CB)
Pre-Amplifier	MITEQ	TTA1840-35-H G	1864479	18GHz ~ 40GHz	Jul. 08, 2020	Jul. 07, 2021	Radiation (03CH03-CB)
Spectrum Analyzer	R&S	FSP40	100019	9kHz ~ 40GHz	Jun. 09, 2020	Jun. 08, 2021	Radiation (03CH03-CB)



RF Cable-high	Woken	RG402	High Cable-20+29	1GHz ~ 18GHz	Oct. 05, 2020	Oct. 04, 2021	Radiation (03CH03-CB)
RF Cable-high	Woken	RG402	High Cable-29	1GHz ~ 18GHz	Oct. 05, 2020	Oct. 04, 2021	Radiation (03CH03-CB)
RF Cable-high	Woken	RG402	High Cable-40G#1	18GHz ~ 40 GHz	Jul. 16, 2020	Jul. 15, 2021	Radiation (03CH03-CB)
RF Cable-high	Woken	RG402	High Cable-40G#2	18GHz ~ 40 GHz	Jul. 16, 2020	Jul. 15, 2021	Radiation (03CH03-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (03CH03-CB)

※ Calibration Interval of instruments listed above is one year.

※ N.C.R. means Non-Calibration required.



7. Uncertainty of Test Site

Test Items	Uncertainty	Remark
Conducted Emissions	2.0 dB	Confidence levels of 95%
Radiated Emissions below 1GHz	5.6 dB	Confidence levels of 95%
Radiated Emissions 1GHz ~ 18GHz	5.0 dB	Confidence levels of 95%
Radiated Emissions 18GHz ~ 40GHz	4.9 dB	Confidence levels of 95%



Conducted Emissions at Powerline

Appendix A

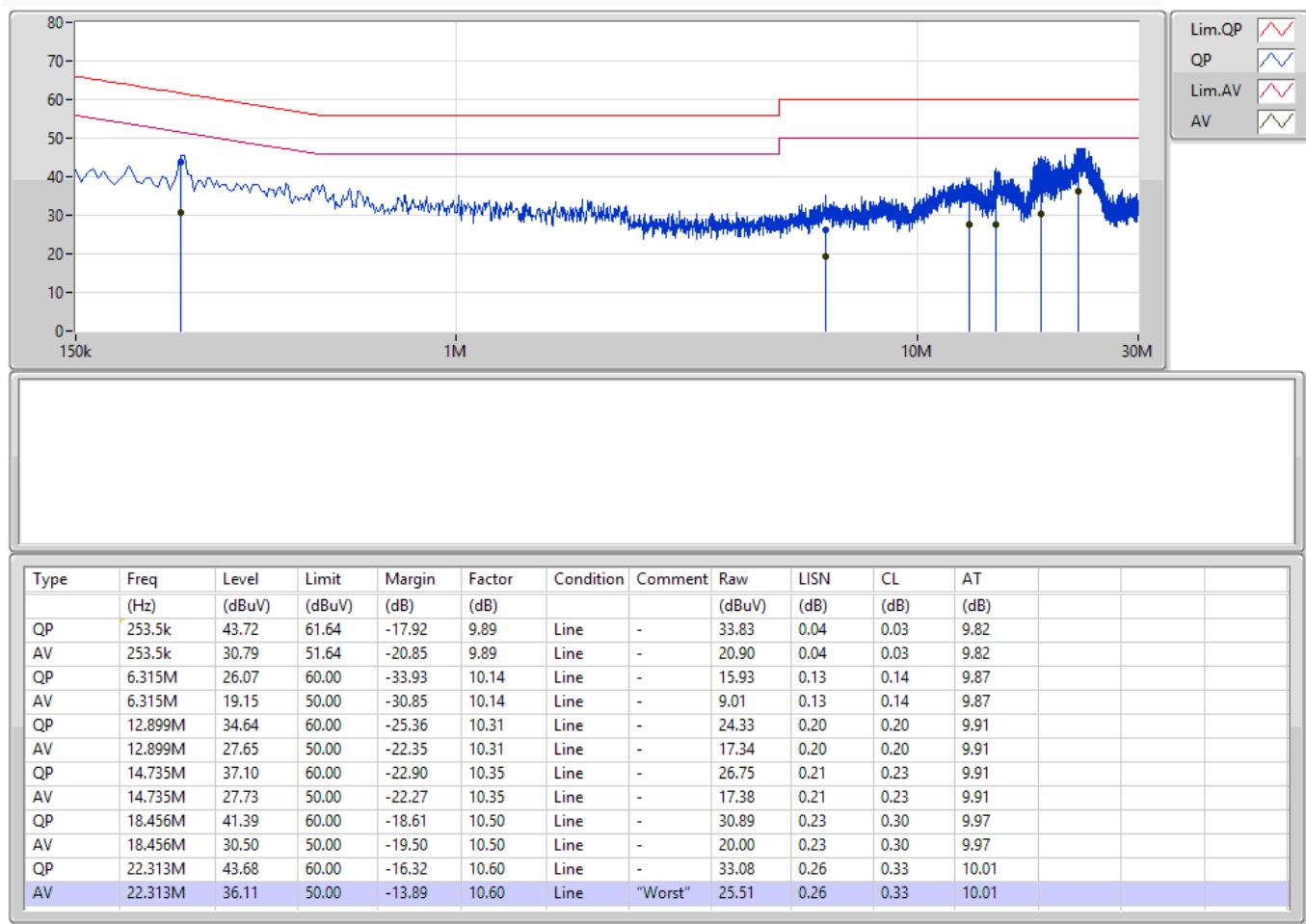
Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Condition
Mode 1	Pass	AV	22.313M	36.11	50.00	-13.89	Line

Mode 1

18/12/2020

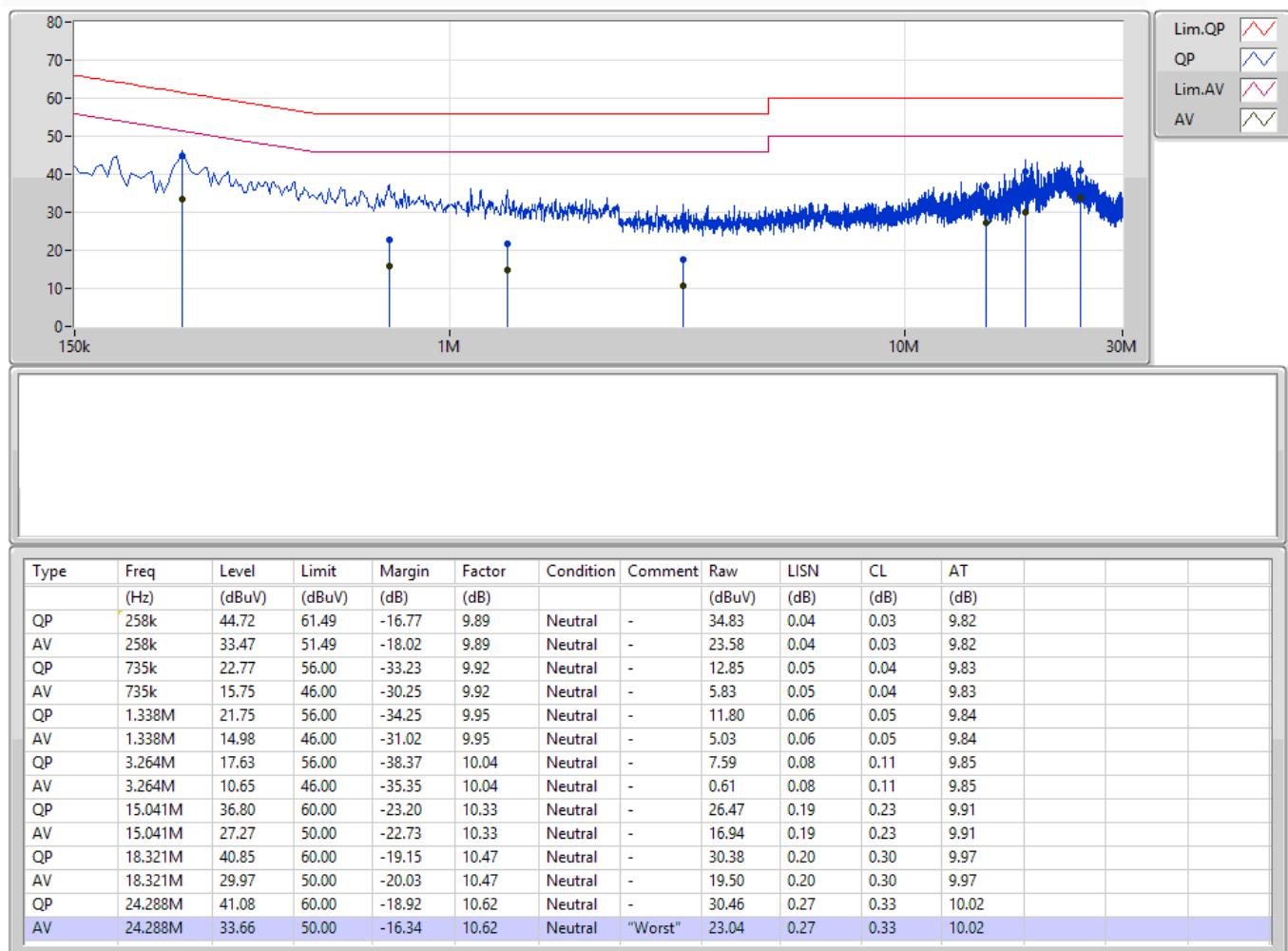
Lim.QP	
QP	
Lim.AV	
AV	



Mode 1

18/12/2020

Lim.QP	
QP	
Lim.AV	
AV	

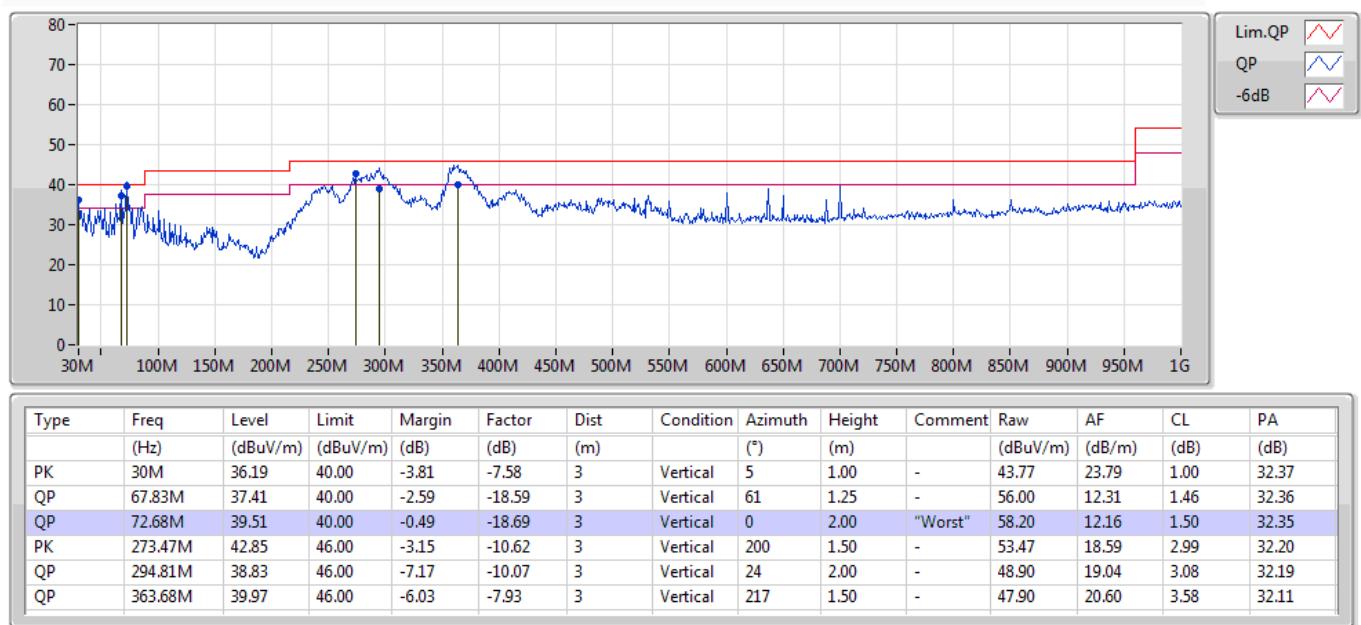


**Summary**

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Condition
Mode 1	Pass	QP	72.68M	39.51	40.00	-0.49	Vertical

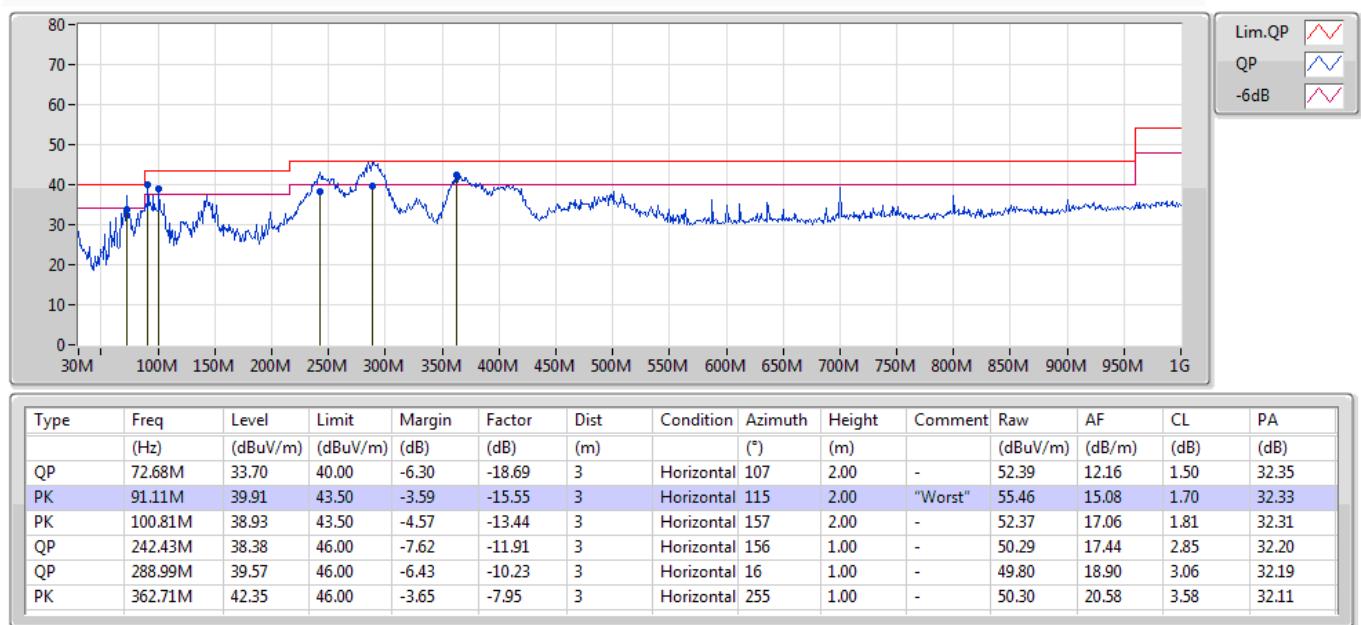
Mode 1

10/12/2020



Mode 1

10/12/2020





Radiated Emissions above 1GHz

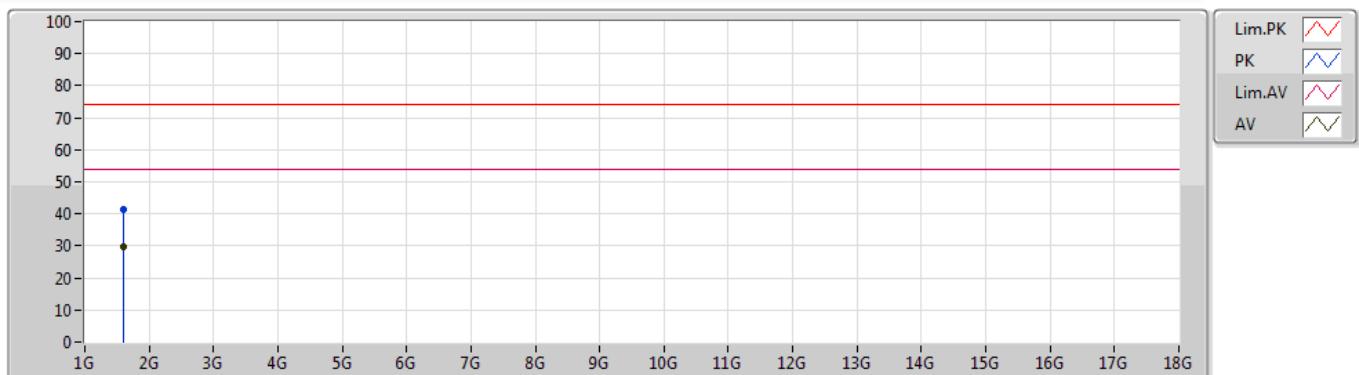
Appendix B.2

Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Condition
Mode 1	Pass	AV	18.1414G	45.05	63.54	-18.49	Vertical

Mode 1

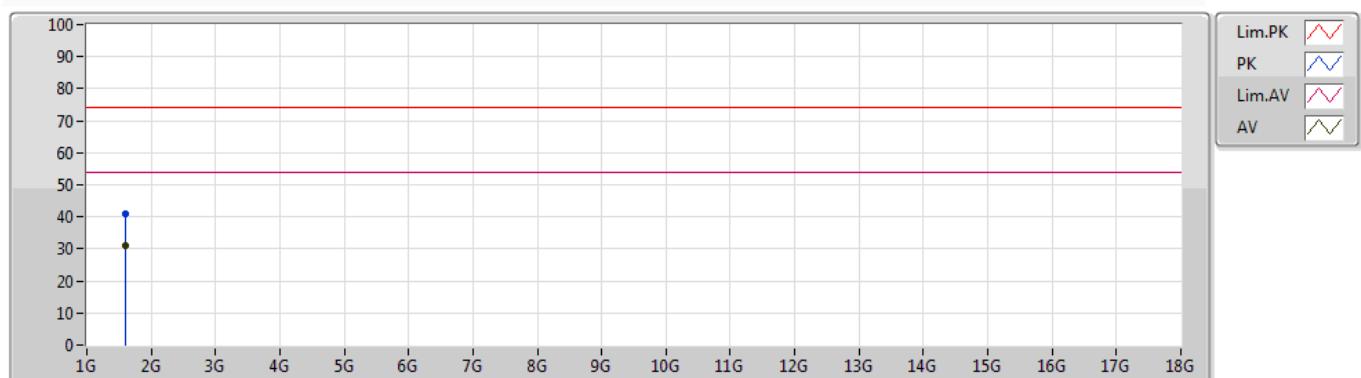
21/12/2020



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	1.59941G	41.38	74.00	-32.62	-5.46	3	Vertical	226	1.02	-	46.84	25.40	3.70	34.56
AV	1.59602G	29.66	54.00	-24.34	-5.49	3	Vertical	226	1.02	"Worst"	35.15	25.38	3.69	34.56

Mode 1

21/12/2020

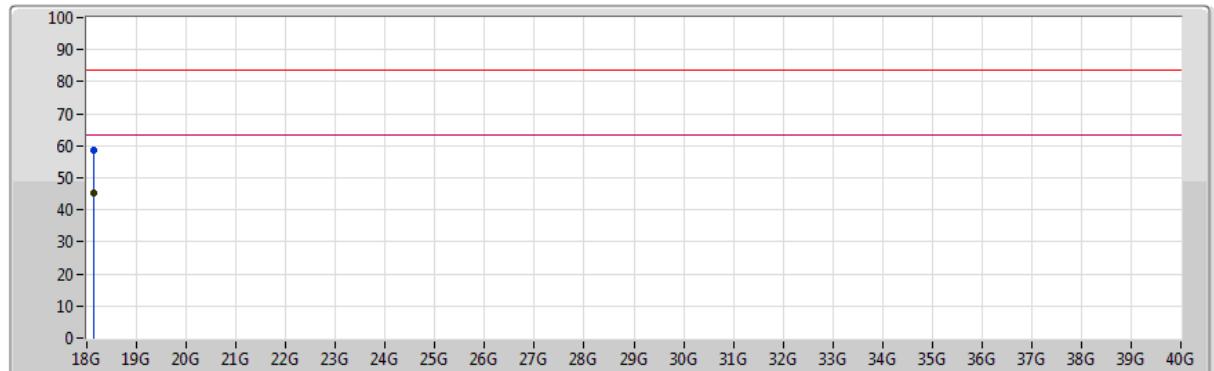


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)
PK	1.59597G	40.84	74.00	-33.16	-5.49	3	Horizontal	275	1.13	-	46.33	25.38	3.69	34.56
AV	1.5959G	30.98	54.00	-23.02	-5.49	3	Horizontal	275	1.13	"Worst"	36.47	25.38	3.69	34.56

Mode 1

21/12/2020

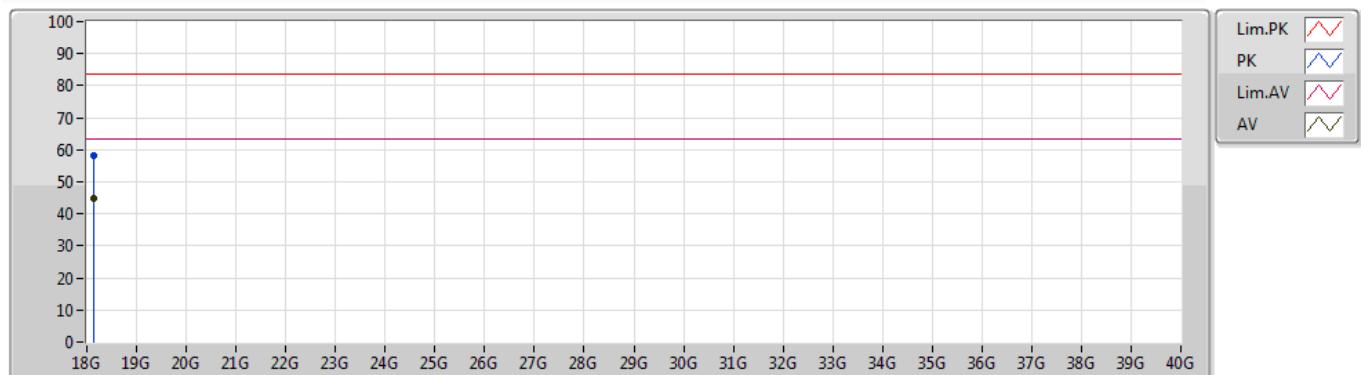
Lim.PK	
PK	
Lim.AV	
AV	



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	18.14134G	58.58	83.54	-24.96	1.42	1	Vertical	356	1.12	-	57.16	37.41	14.21	50.20
AV	18.1414G	45.05	63.54	-18.49	1.42	1	Vertical	356	1.12	"Worst"	43.63	37.41	14.21	50.20

Mode 1

21/12/2020



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	18.13753G	58.19	83.54	-25.35	1.42	1	Horizontal	358	1.05	-	56.77	37.41	14.21	50.20
AV	18.14004G	44.92	63.54	-18.62	1.42	1	Horizontal	358	1.05	"Worst"	43.50	37.41	14.21	50.20