

Report No.: FR163028-08AC





RADIO TEST REPORT

FCC ID

: VW3FAST5290

Equipment

: Wireless Home Router

Brand Name

: SAGEMCOM

Model Name

: FAST 5290V1.1

Applicant

: SAGEMCOM BROADBAND SAS

250 Route de l'Empereur - 92848 RUEIL

MALMAISON CEDEX- FRANCE

Manufacturer

: SAGEMCOM BROADBAND SAS

250 Route de l'Empereur - 92848 RUEIL

MALMAISON CEDEX- FRANCE

Standard

: 47 CFR FCC Part 15.247

The product was received on Apr. 18, 2022, and testing was started from Apr. 29, 2022 and completed on May 05, 2022. We, Sporton International Inc. Hsinchu 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 variant report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. Hsinchu Laboratory, the test report shall not be reproduced except in full.

Approved by: Sam Chen

Sporton International Inc. Hsinchu Laboratory

No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)

TEL: 886-3-656-9065 FAX: 886-3-656-9085

Report Template No.: CB-A10_10 Ver1.3

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: May 24, 2022

Report Version : 01

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Appendix A. Test Results of AC Power-line Conducted Emissions

Appendix B. Test Results of Emissions in Restricted Frequency Bands

Appendix C. Test Photos

Photographs of EUT v01

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History of this test report

Report No.: FR163028-08AC

Report No.	Version	Description	Issued Date
FR163028-08AC	01	Initial issue of report	May 24, 2022

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Summary of Test Result

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Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
1.1.2	15.203	Antenna Requirement	PASS	-
3.1	15.207	AC Power-line Conducted Emissions	PASS	-
3.2	15.247(d)	Emissions in Restricted Frequency Bands	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. It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results.
- 2. The measurement uncertainty please refer to report "Measurement Uncertainty".

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Sam Chen

Report Producer: Vicky Huang

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1 General Description

1.1 Information

1.1.1 RF General Information

Frequency Range (MHz)	IEEE Std. 802.11	Ch. Frequency (MHz)	Channel Number
2400-2483.5	b, g, n (HT20), VHT20, ax (HEW20)	2412-2462	1-11 [11]
2400-2483.5	n (HT40), VHT40, ax (HEW40)	2422-2452	3-9 [7]

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Band	Mode	BWch (MHz)	Nant
2.4-2.4835GHz	802.11b	20	3TX
2.4-2.4835GHz	802.11g	20	3TX
2.4-2.4835GHz	802.11n HT20	20	3TX
2.4-2.4835GHz	802.11n HT20-BF	20	3TX
2.4-2.4835GHz	VHT20	20	3TX
2.4-2.4835GHz	VHT20-BF	20	3TX
2.4-2.4835GHz	802.11ax HEW20	20	3TX
2.4-2.4835GHz	802.11ax HEW20-BF	20	3TX
2.4-2.4835GHz	802.11n HT40	40	3TX
2.4-2.4835GHz	802.11n HT40-BF	40	3TX
2.4-2.4835GHz	VHT40	40	3TX
2.4-2.4835GHz	VHT40-BF	40	3TX
2.4-2.4835GHz	802.11ax HEW40	40	3TX
2.4-2.4835GHz	802.11ax HEW40-BF	40	ЗТХ

Note:

- 11b mode uses a combination of DSSS-DBPSK, DQPSK, CCK modulation.
- 11g, HT20 and HT40 use a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.
- VHT20, VHT40 use a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM modulation.
- HEW20, HEW40 use a combination of OFDMA-BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM modulation.

BWch is the nominal channel bandwidth.

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1.1.2 Antenna Information

		Port			Down I May Isl Name			Gain
Ant.	WLAN 2.4GHz	WLAN 5GHz	WLAN 6GHz	Brand	Model Name	Antenna Type	Connector	(dBi)
1	1	2	-	Galtronics	02102140-07252C1 DB1	PCB	I-PEX	
2	2	3	-	Galtronics	02102140-07252C2 DB2	PCB	I-PEX	
3	3	4	-	Galtronics	02102140-07252c3 DB3	PCB	I-PEX	
4	-	1	-	Galtronics	02102142-07252CX 5G	PCB	I-PEX	Note 1
5	-	-	1	Galtronics	02102475-07252-1 6G1	PCB	I-PEX	Note 1
6	-	-	2	Galtronics	02102475-07252-2 6G2	PCB	I-PEX	
7	-	-	3	Galtronics	02102475-07252-3 6G3	PCB	I-PEX	
8	-	-	4	Galtronics	02102475-07252-4 6G4	PCB	I-PEX	

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Note 1:

	Antenna Gain (dBi)										
Ant.	WLAN 2.4GHz	WLAN 5GHz UNII 1	WLAN 5GHz UNII 2A	WLAN 5GHz UNII 2C	WLAN 5GHz UNII 3	WLAN 6GHz UNII 5	WLAN 6GHz UNII 6	WLAN 6GHz UNII 7	WLAN 6GHz UNII 8		
1	4.12	3.13	3.67	3.57	3.29	-	-	-	-		
2	3.66	4.52	5.1	5.33	5.58	-	-	-	-		
3	2.01	1.8	2.64	1.87	2.2	-	-	-	-		
4	-	3.19	1.58	2.36	3.7	-	-	-	-		
5	-	-	-	-	-	3.07	2.98	3.17	5.85		
6	-	-	-	-	-	4.39	4.2	4.57	5.95		
7	-	-	-	-	-	3.74	3.39	3.25	4.8		
8	-	-	-	-	-	4.68	5.79	6.18	4.91		

	Directional Gain (dBi)									
WLAN 2.4GHz [3T1S]	WLAN 5GHz UNII 1 [4T1S]	WLAN 5GHz UNII 2A [4T1S]			WLAN 6GHz UNII 5 [4T1S]	WLAN 6GHz UNII 6 [4T1S]	WLAN 6GHz UNII 7 [4T1S]	WLAN 6GHz UNII 8 [4T1S]		
4.65	4.68	5.22	5.53	5.91	5.11	6.19	6.29	6.22		

Note2: The above information was declared by manufacturer.

The directional gain is measured which follows the procedure of KDB 662911 D03. The antenna report is provided in the operational description for this application.

For 2.4GHz function:

For IEEE 802.11b/g/n/VHT/ax (3TX/3RX):

Port 1, Port 2 and Port 3 can be used as transmitting/receiving antenna.

Port 1, Port 2 and Port 3 could transmit/receive simultaneously.

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For 5GHz function:

For IEEE 802.11a/n/ac/ax (4TX/4RX):

Port 1, Port 2, Port 3 and Port 4 can be used as transmitting/receiving antenna.

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Port 1, Port 2, Port 3 and Port 4 could transmit/receive simultaneously.

For 6GHz function:

For IEEE 802.11ax (4TX/4RX):

Port 1, Port 2, Port 3 and Port 4 can be used as transmitting/receiving antenna.

Port 1, Port 2, Port 3 and Port 4 could transmit/receive simultaneously.

1.1.3 EUT Operational Condition

EUT Power Type	From Power Adapter				
	\boxtimes	With beamforming		Without beamforming	
Beamforming Function	The product has beamforming function for n/VHT/ax in 2.4GHz and n/ac/ax in 5GHz UNII 1~UNII 3 and ax in 6GHz UNII 5~UNII 8.				
Function	\boxtimes	Point-to-multipoint		Point-to-point	
Test Software Version	Acccess Manual Tool (ver.3.2.1.3)				

Note: The above information was declared by manufacturer.

1.1.4 Table for Permissive Change

This product is an extension of original one reported under Sporton project number: FR163028AA

Below is the table for the change of the product with respect to the original one.

Modifications	Performance Checking
1. Adding an adapter (Model: NBS50A120410VU).	
2. Change the WAN port from 1Gbps to 2.5Gbps.	1.AC Power-line Conducted Emissions
3. Change some components and shilded case on main board	2. Emissions in Restricted Frequency
(Please refer to internal photos for detail change.)	Bands below 1GHz
4. Adding a RJ-45 cable for accessory.	
5. Removing an adapter(Model: NBS60E120500M2) and power	
cable.	
6. Change the Model name from "FAST 5290" to "FAST 5290V1.1"	It does not affect the test results.
7. Remove 2 filters. And remove components which the correspond	it does not affect the test results.
postions UL16.UL33.UL10.UL34.UL12.UL35.UL14.UL36(for 5G),	
H17.UH18.UH11.UH19.UH13.UH20.UH15.UH21(for 6G).	

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1.2 Applicable Standards

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

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- 47 CFR FCC Part 15.247
- ANSI C63.10-2013

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

- FCC KDB 558074 D01 v05r02
- FCC KDB 662911 D01 v02r01
- FCC KDB 414788 D01 v01r01

1.3 Testing Location Information

Testing Location Infor	mation
------------------------	--------

Test Lab. : Sporton International Inc. Hsinchu Laboratory

Hsinchu ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)

(TAF: 3787) TEL: 886-3-656-9065 FAX: 886-3-656-9085

Test site Designation No. TW3787 with FCC.

Conformity Assessment Body Identifier (CABID) TW3787 with ISED.

Test Condition	Test Condition Test Site No.		Test Environment (°C / %)	Test Date	
Radiated (Below 1GHz)	03CH05-CB	KJ Chang	24.2-26.1 / 55-58	Apr. 29, 2022~ May 03, 2022	
AC Conduction	CO02-CB	Ryan Huang	22~23 / 56~58	May 05, 2022	

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
Conducted Emission (150kHz ~ 30MHz)	3.4 dB	Confidence levels of 95%
Radiated Emission (9kHz ~ 30MHz)	4.2 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	5.5 dB	Confidence levels of 95%

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2 Test Configuration of EUT

2.1 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests				
Tests Item AC power-line conducted emissions				
Condition AC power-line conducted measurement for line and neutral Test Voltage: 120Vac / 60Hz				
Operating Mode CTX				
1 EUT-WLAN 2.4GHz+Adapter				
2 EUT-WLAN 5GHz+Adapter				
3 EUT- WLAN 6GHz+Adapter				
For operating mode 1 is the worst case and it was record in this test report.				

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Th	The Worst Case Mode for Following Conformance Tests				
Tests Item	Emissions in Restricted Frequency Bands				
Test Condition Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in regardless of spatial multiplexing MIMO configuration), the radiated test be performed with highest antenna gain of each antenna type.					
Operating Mode < 1GHz	CTX				
The EUT was performed a measurement will follow the	t X axis, Z axis and Y axis position, and the worst case was found at Y axis. So the is same test configuration.				
1	EUT in Y axis-WLAN 2.4GHz+Adapter				
2	EUT in Y axis-WLAN 5GHz+Adapter				
3 EUT in Y axis- WLAN 6GHz+Adapter					
For operating mode 2 is the worst case and it was record in this test report.					

The Worst Case Mode for Following Conformance Tests				
Tests Item Simultaneous Transmission Analysis - Co-location RF Exposure Evaluation				
Operating Mode				
1	WLAN 2.4GHz + WLAN 5GHz UNII 1~UNII 3 + WLAN 6GHz UNII 5~UNII 8			
Refer to Sporton Test Report No.: FA163028-08 for Co-location RF Exposure Evaluation.				

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2.2 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

2.3 Accessories

Accessories						
Equipment Brand Model Name Name Name			Rating			
Adapter	SAGEMCOM	NBS50A120410VU	Input: 100-127V~50/60Hz, 1.5A Output: 12.0V, 4.1A			
	Other					
RJ-45 cable*1, Shielded, 1.8m						

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2.4 Support Equipment

For AC Conduction:

	Support Equipment							
No.	No. Equipment Brand Name Model Name FCC ID							
Α	LAN1 NB DELL		E6430	N/A				
В	Flash disk3.0	Transcend	JetFlash-700	N/A				

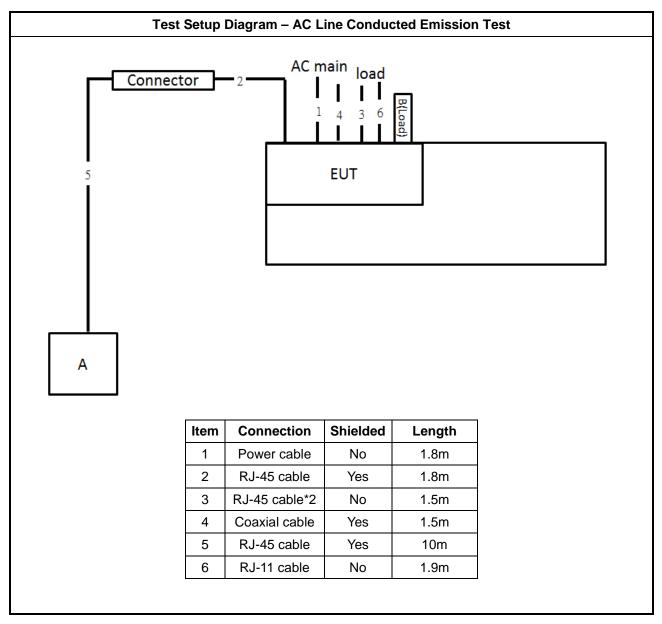
For Radiated:

	Support Equipment						
No.	No. Equipment Brand Name Model Name FCC ID						
Α	NB	DELL	E4300	N/A			

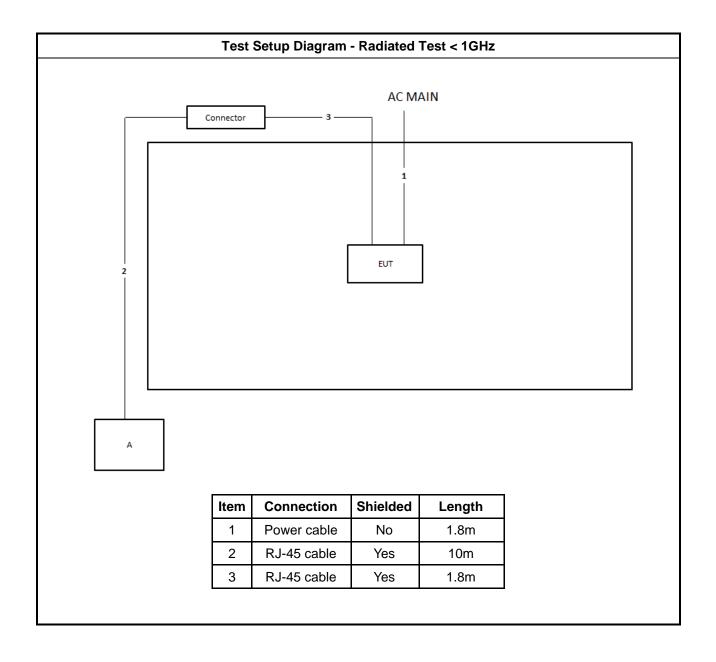
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2.5 Test Setup Diagram



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3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

AC Power-line Conducted Emissions Limit					
Frequency Emission (MHz) Quasi-Peak Average					
0.15-0.5 66 - 56 * 56 - 46 *					
0.5-5	56	46			
5-30 60 50					
Note 1: * Decreases with the logarithm of the frequency.					

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3.1.2 Measuring Instruments

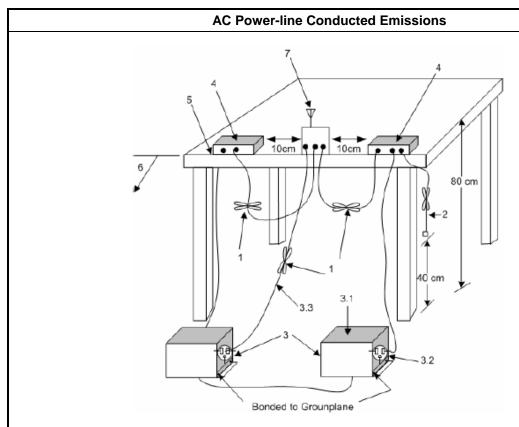
Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

Test Method	
Refer as ANSI C63.10-2013, clause 6.2 for AC power-line conducted emissions.	

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3.1.4 Test Setup



1—Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long.

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- 2—The I/O cables that are not connected to an accessory shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- 3—EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω loads. LISN may be placed on top of, or immediately beneath, reference ground plane.
- 3.1—All other equipment powered from additional LISN(s).
- 3.2—A multiple-outlet strip may be used for multiple power cords of non-EUT equipment.
- 3.3—LISN at least 80 cm from nearest part of EUT chassis.
- 4—Non-EUT components of EUT system being tested.
- 5—Rear of EUT, including peripherals, shall all be aligned and flush with edge of tabletop.
- 6—Edge of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.
- 7—Antenna can be integral or detachable. If detachable, then the antenna shall be attached for this test.

3.1.5 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

3.1.6 Test Result of AC Power-line Conducted Emissions

Refer as Appendix A

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3.2 Emissions in Restricted Frequency Bands

3.2.1 Emissions in Restricted Frequency Bands Limit

Restricted Band Emissions Limit						
Frequency Range (MHz)	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 Above 960 500		46	3			
		54	3			

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- 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: Using the distance of 1m during the test for above 18 GHz, and the test value to correct for the distance factor at 3m.

3.2.2 Measuring Instruments

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

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3.2.3 Test Procedures

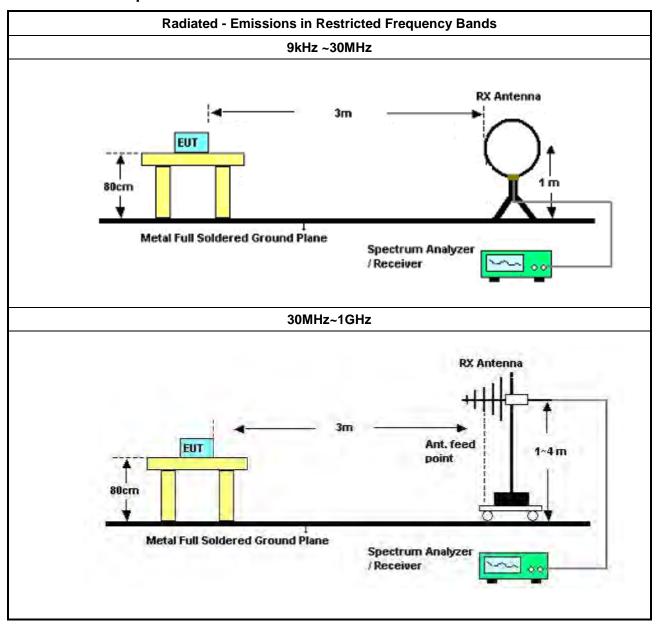
		Test Method					
•	The	average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].					
•		er as ANSI C63.10, clause 6.10.3 band-edge testing shall be performed at the lowest frequency nnel and highest frequency channel within the allowed operating band.					
•	For	the transmitter unwanted emissions shall be measured using following options below:					
	•	Refer as FCC KDB 558074, clause 8.6 for unwanted emissions into restricted bands.					
	☐ Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.1(trace averaging cycle ≥98%).						
		Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.2(trace averaging + duty factor).					
		Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.3(Reduced VBW≥1/T).					
		☐ Refer as ANSI C63.10, clause 11.12.2.5.3 (Reduced VBW). VBW ≥ 1/T, where T is pulse time.					
		Refer as ANSI C63.10, clause 7.5 average value of pulsed emissions.					
		Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.4 measurement procedure peak limit.					
•	For	the transmitter band-edge emissions shall be measured using following options below:					
	•	Refer as FCC KDB 558074 clause 8.7 & C63.10 clause 11.13.1, When the performing peak or average radiated measurements, emissions within 2 MHz of the authorized band edge may be measured using the marker-delta method described below.					
	•	Refer as FCC KDB 558074, clause 8.7 (ANSI C63.10, clause 6.10.6) for marker-delta method for band-edge measurements.					
		Refer as FCC KDB 558074, clause 8.7 for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz).					
	•	For conducted unwanted emissions into restricted bands (absolute emission limits). Devices with multiple transmit chains using options given below: (1) Measure and sum the spectra across the outputs or (2) Measure and add 10 log(N) dB					
	•	For FCC KDB 662911 The methodology described here may overestimate array gain, thereby resulting in apparent failures to satisfy the out-of-band limits even if the device is actually compliant. In such cases, compliance may be demonstrated by performing radiated tests around the frequencies at which the apparent failures occurred.					

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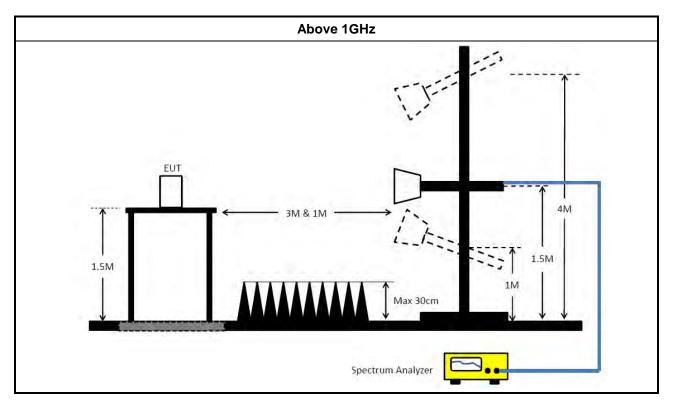


3.2.4 Test Setup



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3.2.5 Measurement Results Calculation

The measured Level is calculated using:

Corrected Reading: Antenna factor (AF) + Cable loss (CL) + Read level (Raw) - Preamp factor (PA)(if applicable) = Level.

3.2.6 Emissions in Restricted Frequency Bands (Below 30MHz)

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to KDB414788 Radiated Test Site, and the result came out very similar.

All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

The radiated emissions were investigated from 9 kHz or the lowest frequency generated within the device, up to the 10th harmonic or 40 GHz, whichever is appropriate.

3.2.7 Test Result of Emissions in Restricted Frequency Bands

Refer as Appendix B

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4 Test Equipment and Calibration Data

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
LISN	Schwarzbeck	NSLK 8127	8127650	9kHz ~ 30MHz	Jan. 07, 2022	Jan. 06, 2023	Conduction (CO02-CB)
LISN	Schwarzbeck	NSLK 8127	8127478	9kHz ~ 30MHz	Dec. 22, 2021	Dec. 21, 2022	Conduction (CO02-CB)
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.4GHz	Feb. 22, 2022	Feb. 21, 2023	Conduction (CO02-CB)
COND Cable	Woken	Cable	2	0.15MHz ~ 30MHz	Oct. 19, 2021	Oct. 18, 2022	Conduction (CO02-CB)
Pulse Limiter	Schwarzbeck	VTSD 9561F-N	00378	9kHz ~ 30MHz	Mar. 18, 2022	Mar. 17, 2023	Conduction (CO02-CB)
Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Conduction (CO02-CB)
3m Semi Anechoic Chamber NSA	TDK	SAC-3M	03CH05-CB	30 MHz ~ 1 GHz	Aug. 09, 2021	Aug. 08, 2022	Radiation (03CH05-CB)
Bilog Antenna with 6dB Attenuator	TESEQ & EMCI	CBL 6112D & N-6-06	35236 & AT-N0610	30MHz ~ 2GHz	Mar. 25, 2022	Mar. 24, 2023	Radiation (03CH05-CB)
Pre-Amplifier	EMCI	EMC330N	980331	20MHz ~ 3GHz	Apr. 26, 2022	Apr. 25, 2023	Radiation (03CH05-CB)
Spectrum Analyzer	R&S	FSP40	100304	9kHz ~ 40GHz	Mar. 14, 2022	Mar. 13, 2023	Radiation (03CH05-CB)
EMI Test Receiver	R&S	ESCS	826547/017	9kHz ~ 2.75GHz	Jun. 21, 2021	Jun. 20, 2022	Radiation (03CH05-CB)
RF Cable-low	Woken	RG402	Low Cable-04+23	30MHz~1GHz	Oct. 13, 2021	Oct. 12, 2022	Radiation (03CH05-CB)
Loop Antenna	Teseq	HLA 6120	31244	9kHz - 30 MHz	Mar. 18, 2022	Mar. 17, 2023	Radiation (03CH05-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (03CH05-CB)

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Note: Calibration Interval of instruments listed above is one year. NCR means Non-Calibration required.

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Conducted Emissions at Powerline

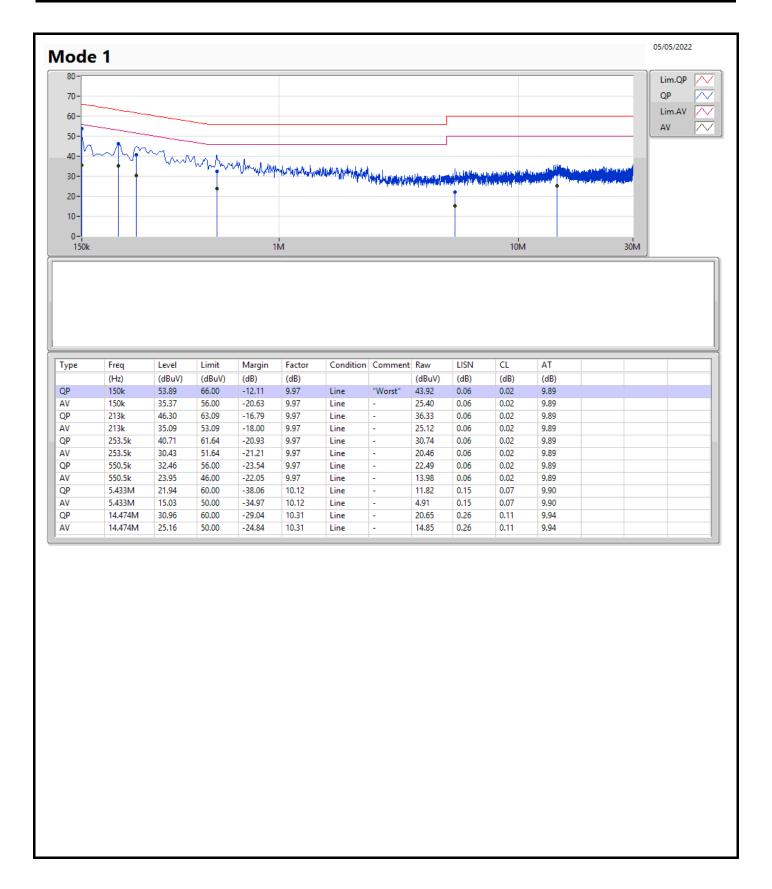
Appendix A

Summary

Mode	Result	Туре	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Condition
Mode 1	Pass	QP	150k	53.99	66.00	-12.01	Neutral

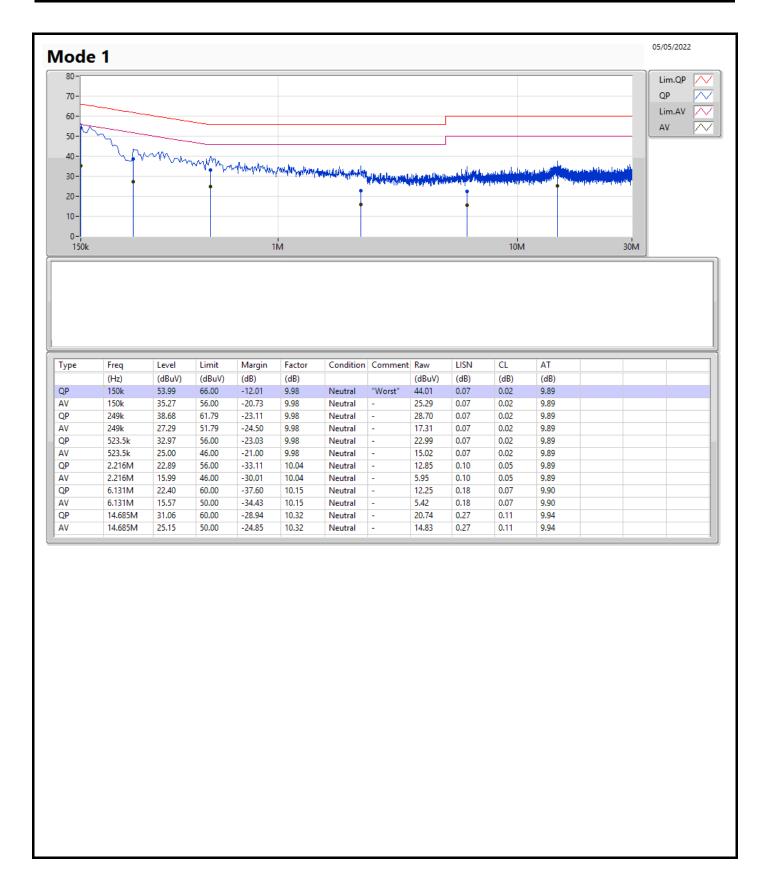
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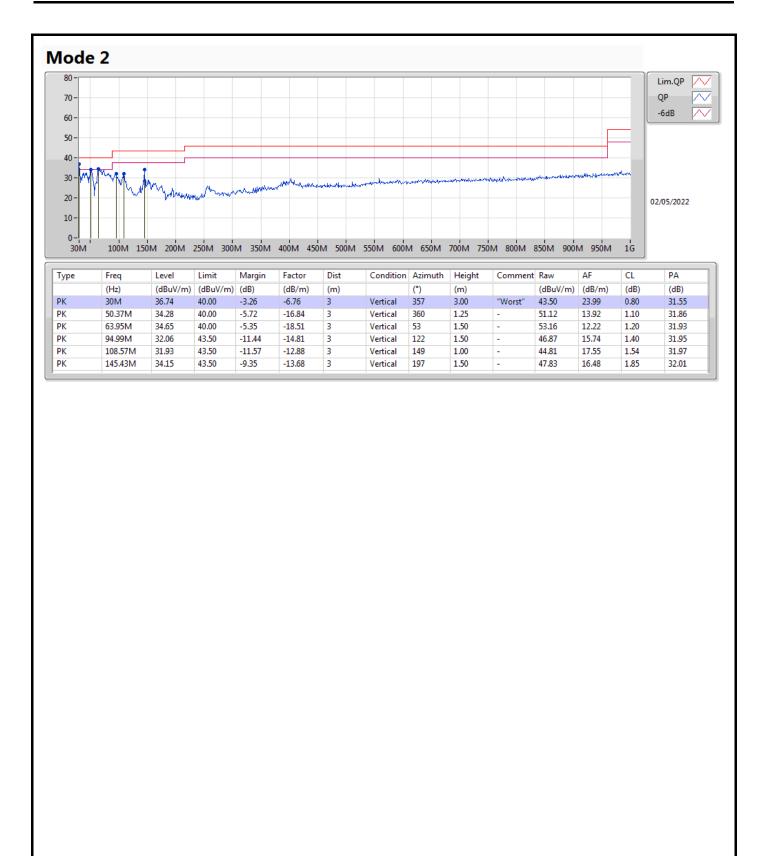
Radiated Emissions below 1GHz

Appendix B

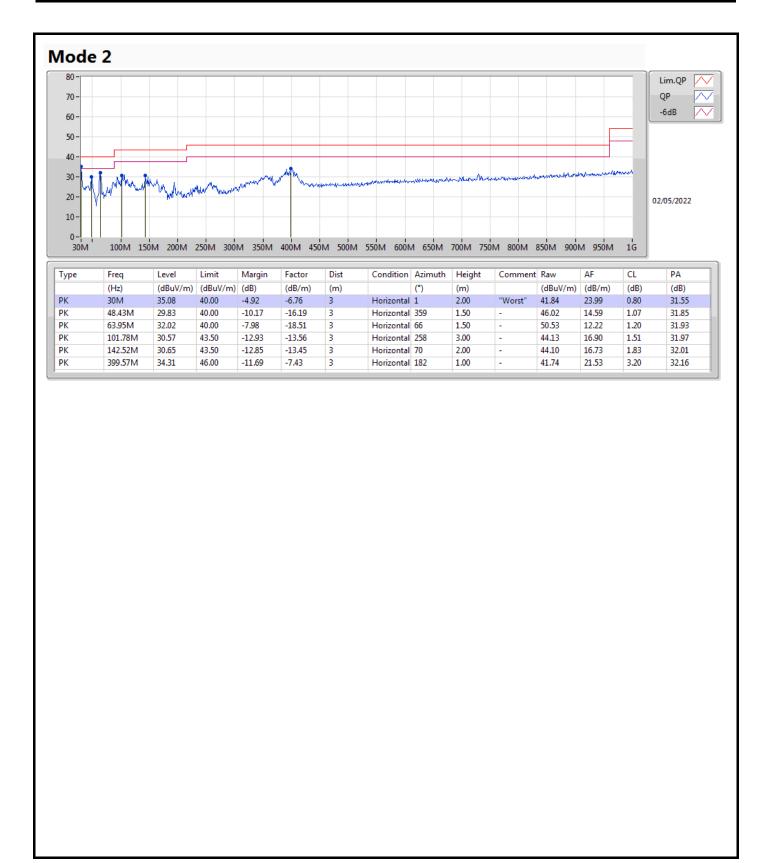
Summary

Mode	Result	Туре	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Condition
Mode 2	Pass	PK	30M	36.74	40.00	-3.26	Vertical

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