

# EMC TEST REPORT



**Standard(s):**

**47 CFR FCC Part 15.225  
RSS 210, Issue 10, 2019**

**FCC ID: DGFPD225B  
IC: 458A-PSD225B**

**Product: 3M™ Scott™ Advanced Electronics Gateway**

**Model (HVIN): 70-0020-1020-8**

**Company Name:  
3M Company**

**Address:  
Fire & SCBA Solutions  
4320 Goldmine Road, Monroe, NC 28110**

**Report Number: HRE202105206-3  
Report Issue Date: March 25, 2024**

**Report Prepared by:**

**Signature:**   
**Yuriy Litvinov  
Lead EMC Engineer**

**Tested by:  
3M Hardgoods Regulatory Engineering Laboratory  
410 E. Fillmore Avenue, Building 76  
St. Paul, Minnesota 55107-1208, USA**



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## 1.0 Test Summary

Based on the results of our investigation, we have concluded the product tested **comply** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested.

	Requirement – Test	Test Description	Result	Comments
4.1	FCC Part 2.1049/RSS-Gen (6.7)	Occupied Bandwidth	pass	
4.2	FCC Part 15.209/RSS210 B.6(a) RSS-Gen, 8.9	Radiated Emissions outside of the specified band	pass	
4.3	FCC Part 15.225(a)(b)(c)/ RSS210 B.6(a)	In Band Radiated Spurious Emissions	pass	
4.4	FCC Part 15.225(e)/ RSS210 B.6(b)	Frequency Stability	pass	
4.5	FCC Part 15.207/ RSS-Gen (8.8)	Conducted Emissions	pass	

**Note:**

## 1.1 Measurement Uncertainty

The measured value related to the corresponding limit will be used to decide whether the equipment meets the requirements. The measurement uncertainty figures were calculated and correspond to a coverage factor of k=2, providing a confidence level of respectively 95.45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian).

Radiated emissions 30MHz to 1000MHz	4.9 dB
Radiated emissions 1GHz to 18GHz	4.6 dB
Conducted emissions 150KHz to 30MHz (AMN)	2.7 dB
Conducted emissions 150KHz to 30MHz (AAN)	1.92 dB
RF frequency	$\pm 3 \times 10^{-8}$
RF power, conducted	1.4 dB
RF Power Spectral Density	0.96 dB

## 1.2 Test Facility

<b>Test Facility Accreditations:</b>	ISO/IEC 17025:2017, NVLAP LAB CODE: 200033-0
	FCC US5320
	ISED Canada CAB identifier: US0012



## 2.0 Equipment Description

2.1 Equipment Under Test	
<b>Description:</b>	The Valor Gateway is a device used to "connect" a handheld Toughbook tablet or computer to SCBA (a self-contained breathing apparatus) telemetry systems worn by firefighters inside a fire scene. It contains LORA 915MHz, Bluetooth (Low Energy) 2.4GHz and RFID 13.56MHz transmitters.
<b>Model(s):</b>	70-0020-1020-8
<b>Serial number:</b>	N/A
<b>3M Division:</b>	Personal Safety
<b>Modifications and Special Measures:</b>	none
<b>Frequency Range:</b>	13.56 MHz
<b>Channel No.:</b>	1
<b>Modulation Type:</b>	ASK
<b>FCC Classification:</b>	Low Power Communication device transmitter
<b>Output Power EIRP:</b>	N/A
<b>Antenna Type and Antenna Assembly Gain:</b>	<input type="checkbox"/> External <input checked="" type="checkbox"/> Integral PCB Loop Antenna <input type="checkbox"/> Dedicated
	<input type="checkbox"/> dBi <input type="checkbox"/> Declared by the Manufacturer <input type="checkbox"/> Measured
<b>Test Deviations or Exclusions</b>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<b>Rated Power:</b>	<b>Voltage:</b> <input type="checkbox"/> 120VAC <input type="checkbox"/> 230VAC <input checked="" type="checkbox"/> 5.0VDC
	<b>Phase:</b> <input type="checkbox"/> 1ph <input type="checkbox"/> 3ph <input checked="" type="checkbox"/> via USB-c
	<b>Frequency:</b> <input type="checkbox"/> 50Hz <input type="checkbox"/> 60Hz
	<b>Current:</b> N/A
<b>Test Dates:</b>	09/13-09/15/2021
<b>Received Date:</b>	08/16/2021
<b>Received Conditions:</b>	<input type="checkbox"/> Poor <input checked="" type="checkbox"/> Good
	<input checked="" type="checkbox"/> Prototype <input type="checkbox"/> Production



### 3.0 EUT Configuration

#### 3.1 System Configuration

No.	Product Type	Manufacturer	Model	Comments
1	Valor Gateway	3M	70-0020-1020-8	
2	USB Power Supply	Samsung	ETA-U90AWS	Support Equipment

#### 3.2 Input/Output Ports of EUT

No.	Description	Type	Comments
1	DC Power	USB-C	
2			

#### 3.3 Cables

No.	Description	Type	Length	Shielding	Comments
1	USB-C	USB 2.0	1m	Yes	
2					

#### 3.4 Measurement Arrangements of EUT

	Intended Operational Arrangement(s)	Comments
<input checked="" type="checkbox"/>	Table-top only	
<input type="checkbox"/>	Floor-standing only	
<input type="checkbox"/>	Floor-standing or table-top	
<input type="checkbox"/>	Other	

#### 3.5 Primary function(s) of EUT

No.	List of Essential Functions
1	Transferring of various data via Bluetooth radio to SCBA telemetry systems.
2	

#### 3.6 Exercising of EUT and Interfaces

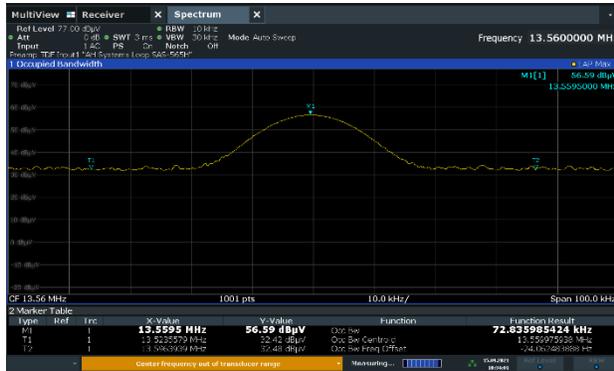
No.	Mode of Operation
1	Continues transmission of modulated signal at 13.56MHz
2	Device programming using YAT v2.4.1 (Yet Another Terminal) software for continues transmission of modulated carrier at maximum rated RF output power and Duty Cycle.



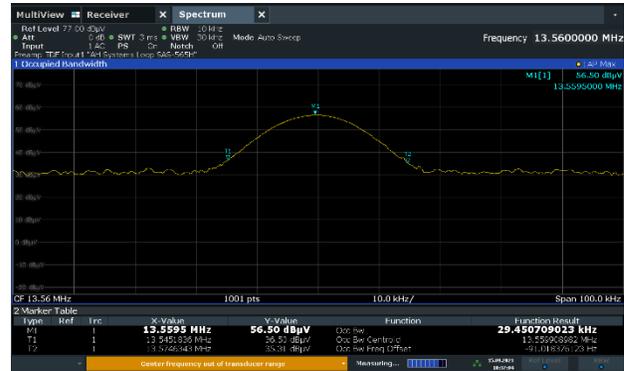
### 4.0 Test Conditions and Results

4.1 Occupied Bandwidth	
Laboratory Ambient Temperature:	23°C
Relative Humidity:	48%
Atmospheric Pressure:	1011 mbars
Reference Standard(s):	<input checked="" type="checkbox"/> ANSI C63.10:2020 <input checked="" type="checkbox"/> FCC Part 15.225/RSS 210 <input type="checkbox"/>
Measurement Point	<input checked="" type="checkbox"/> Conducted <input type="checkbox"/> Radiated
Frequency Range:	<input checked="" type="checkbox"/> 13.56MHz RBW = 10KHz VBW ≥ 3 x RBW
Nominal Voltage:	<input type="checkbox"/> 120VAC <input checked="" type="checkbox"/> 5VDC
Test Personnel:	Yuriy Litvinov <i>Yuriy Litvinov</i> Date: 09/15/2021

Frequency (MHz) (PR-ASK)	20 dB Bandwidth (KHz)	99% Bandwidth (KHz)	Results
13.553 -13.567	29.4	72.8	pass



10:31:07 13.09.2021

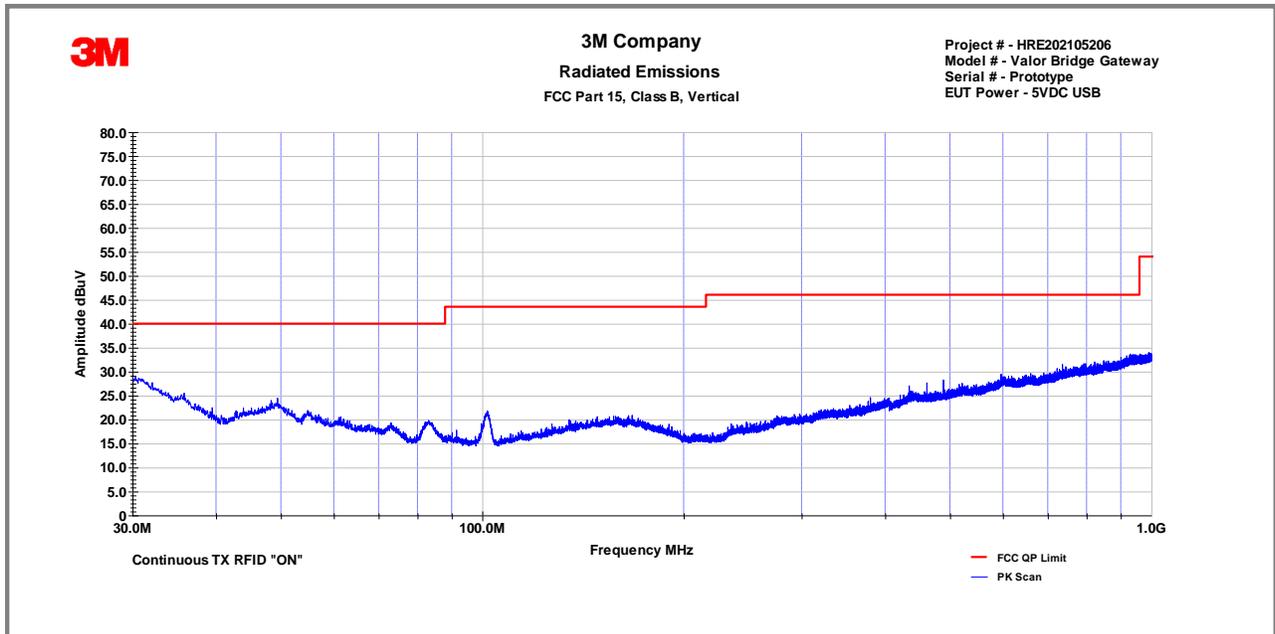
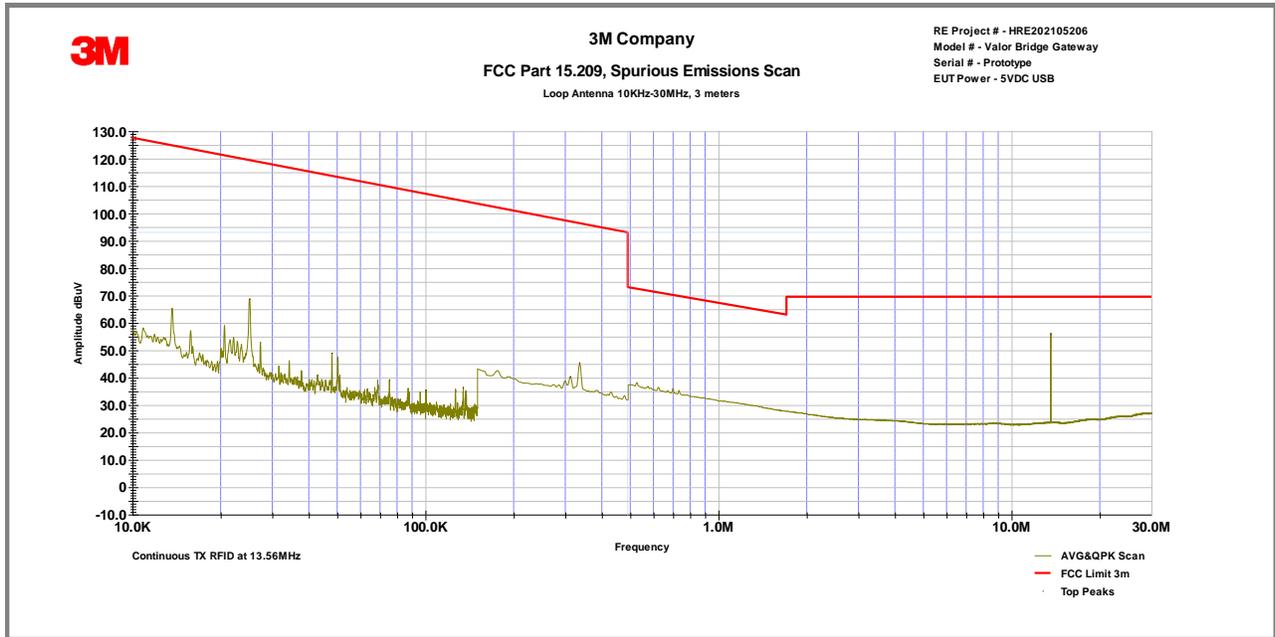


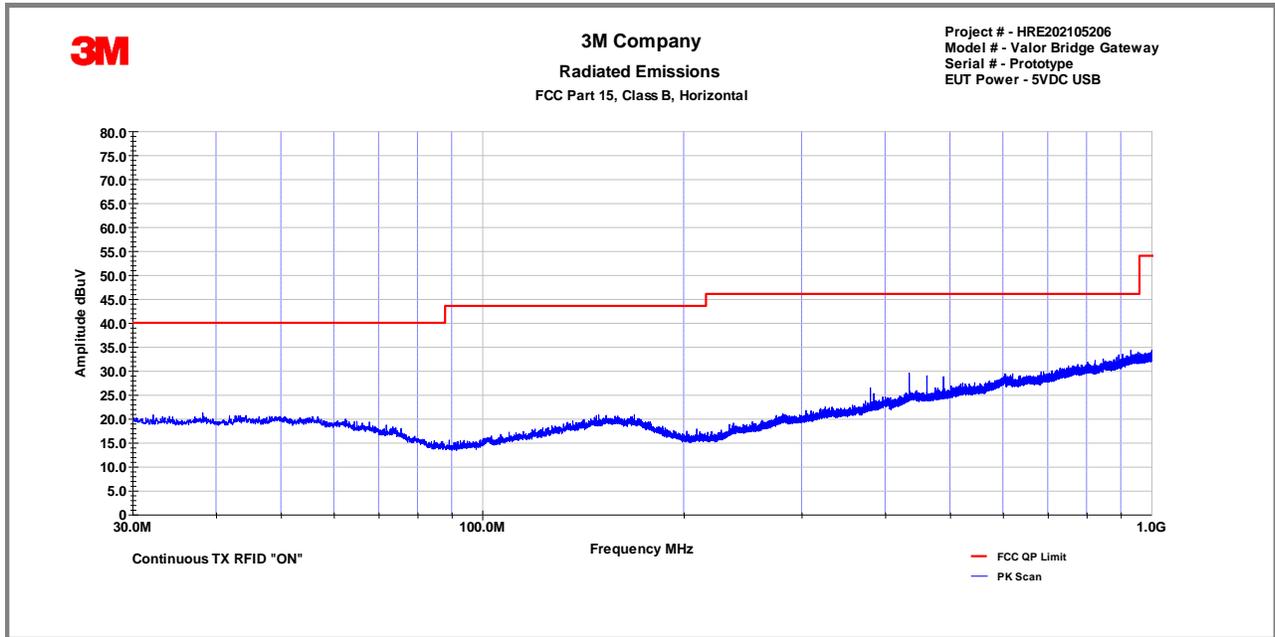
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<b>4.2</b>	<b>Radiated Emissions outside of the specified band</b>				
<b>Method:</b>	Measurements were made in a 3-meter semi-anechoic chamber that complies to CISPR 16/ANSI C63.4 standards. EUT was rotated through three orthogonal axes to determine which attitude (orientation) and arrangement produces the highest emission relative to the limit; the attitude and device arrangement that produces the highest emission relative to the limit was used in making final radiated emission measurements. Spurious Radiated emissions measurements were performed with external preamp and a high pass filter. Final measurements were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4 m. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.				
<b>Test Verification:</b> <input checked="" type="checkbox"/>	Laboratory Ambient Temperature:		23°C		
	Relative Humidity:		55%		
	Atmospheric Pressure:		1011 mbars		
<b>Reference Standard(s):</b>	<input checked="" type="checkbox"/> ANSI C63.10:2020, Section 11.12.1		<b>Measurement Distance</b>		
	<input checked="" type="checkbox"/> FCC Part 15.205/15.209/RSS Gen (8.9) <input type="checkbox"/>				
<b>Frequency Range:</b>	<input checked="" type="checkbox"/> 9KHz to 30MHz <input checked="" type="checkbox"/> 30MHz to 1GHz		<input checked="" type="checkbox"/> 3 Meters <input type="checkbox"/>		
<b>Nominal Voltage:</b>	<input type="checkbox"/> 120VAC <input checked="" type="checkbox"/> 5VDC				
<b>Test Personnel:</b>	Keith Schwartz <i>KS</i>			<b>Date:</b> 09/13/2021	
<b>Limits –15.209 and RSS Gen</b>					
Frequency (MHz)	Limit dB (µV/m)			Distance	Results
	Quasi-Peak	Average	Peak		
0.009-0.490		2400/F(KHz)		300	<b>pass</b>
0.490-1.705	24000/F(KHz)			30	<b>pass</b>
1.705-30	30			30	<b>pass</b>
30 to 88	40			3	<b>pass</b>
88 to 216	43.5			3	<b>pass</b>
216 to 960	46			3	<b>pass</b>
Above 960		54	74	3	<b>N/A</b>

<b>Modifications:</b>	
<b>Note:</b>	<p>The lower limit applies at the transition frequency. An inverse proportionality factor of 20 dB per decade has been used to normalize the measured data to the specified distance for determining compliance</p> <p>For emission in the restricted bands, the limit of 15.209 was used.</p> <p>Measurements &lt;30MHz includes Loop Antenna correction factor. Field strength of emissions measurements outside 13.110-14.010MHz band of operation was found to be attenuated below Part 15.209 limits.</p>





Frequency (MHz)	Pol.	QP Reading dBμV/m	Total CF dB	Net at 3 m dBμV/m	Limit (dBμV/m)	Margin dB
30.51	V	6.4	16.6	23	40	-17
50.09	H	4.1	18.5	22.6	40	-17.4
100.67	H	3.9	13.7	17.6	43.5	-25.9
158.99	H	3.9	18.5	22.4	43.5	-21.2
434.75	H	4.5	22.4	26.9	46	-19.1
594.59	H	5	25.4	30.4	46	-15.6
<b>Notes:</b> Net Reading (dBuV) = Reading (dBμV)+Total CF(dB)						



<b>4.3</b>	<b>In-Band Radiated Spurious Emissions</b>		
<b>Method:</b>	Measurements was performed with modulated carrier at the highest power level at which the transmitter is intended to operate. The analyzer offset was adjusted to compensate for the attenuator and other losses.		
	Laboratory Ambient Temperature:	23°C	
	Relative Humidity:	55%	
	Atmospheric Pressure:	1011 mbars	
<b>Reference Standard(s):</b>	<input checked="" type="checkbox"/> ANSI C63.10:2020, Section 6 <input checked="" type="checkbox"/> FCC Part 15.225/RSS210 <input type="checkbox"/>	<b>Measurement Point</b> <input type="checkbox"/> Conducted <input checked="" type="checkbox"/> Radiated at 3 meters	
<b>Frequency Range:</b>	<input checked="" type="checkbox"/> 13.553 MHz -13.567 MHz		
	<b>Frequency (MHz)</b>	<b>Limit (uV/m) at 30m</b>	<b>Limit (dBuV/m) at 3m</b>
<b>The Field Strength Limit:</b>	1.705-13.110	30	69.5
	13.110-13.410	106	80.5
	13.410-13.553	334	90.5
	13.553-13.567	15848	124.0
	13.567-13.710	334	90.5
	13.710-14.010	106	80.5
	14.010-30.0	30	69.5
<b>Max. field strength at 3m</b>	<b>58.02dBuV/m</b>		
<b>Nominal Voltage:</b>	<input type="checkbox"/> 120VAC <input checked="" type="checkbox"/> 5VDC		
<b>Test Personnel:</b>	Keith Schwartz <i>KS</i>		<b>Date:</b> 09/15/2021





4.4		Frequency Stability	
<b>Method:</b>	Measurements was performed with modulated carrier at the highest power level at which the transmitter is intended to operate. The frequency was measured under normal and extreme test conditions test conditions. The analyzer offset was adjusted to compensate for the attenuator and other losses. During extreme test conditions, both extreme temperature and voltage apply simultaneously.		
	Laboratory Ambient Temperature:	23°C	
	Relative Humidity:	55%	
	Atmospheric Pressure:	1011 mbars	
<b>Reference Standard(s):</b>	<input checked="" type="checkbox"/> FCC Part 15.225/RSS210 <input checked="" type="checkbox"/> ANSI C63.10:2020, Section 6.8		<b>Measurement Point</b> <input type="checkbox"/> Conducted <input checked="" type="checkbox"/> Radiated
<b>Frequency Range:</b>	<input checked="" type="checkbox"/> 13.553 MHz -13.567MHz		<b>Maximum Deviation</b>
<b>Limit:</b>	<input checked="" type="checkbox"/> ± 100ppm (± 0.01%)		28.8 ppm
<b>Nominal Voltage:</b>	<input checked="" type="checkbox"/> 120VAC (Primary) <input checked="" type="checkbox"/> 5VDC		
<b>Extreme Temperature Ranges:</b>	<input checked="" type="checkbox"/> General	<input checked="" type="checkbox"/> - 20.0 to +55.0C <sup>0</sup>	
	<input type="checkbox"/> Portable	<input type="checkbox"/>	
	<input type="checkbox"/> Indoor Use	<input type="checkbox"/>	
<b>Extreme Test Voltages:</b>	<input checked="" type="checkbox"/> Mains Voltage	<input checked="" type="checkbox"/> ± 15%	
	<input type="checkbox"/> Battery	<input type="checkbox"/> 0.85 <input type="checkbox"/> 1.15	
<b>Test Personnel:</b>	Keith Schwartz <i>KS</i>		<b>Date:</b> 09/14/2021

Channel Frequency (MHz)	Temperature C <sup>0</sup>	Voltage (AC)	Measured Frequency (MHz)	Frequency Deviation (ppm)	Result
13.56MHz	-20	120	13.55968	23.6	pass
	-10	120	13.559725	20.3	pass
	0	120	13.55974	19.2	pass
	10	120	13.559725	20.3	pass
	20	120	13.559695	22.5	pass
	30	120	13.559655	25.4	pass
	40	120	13.55962	28.0	pass
	55	120	13.55961	28.8	pass



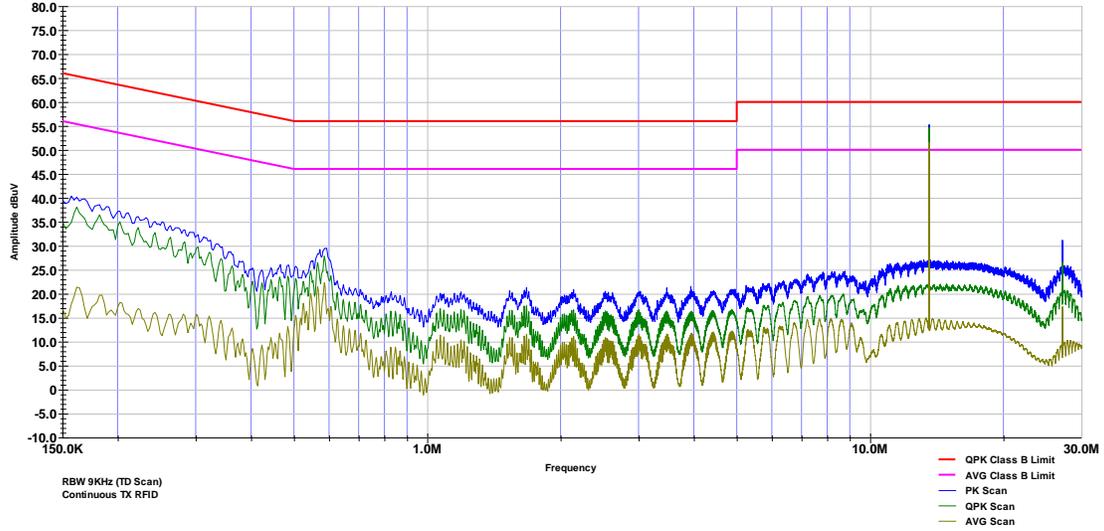
4.5		Conducted Emissions Data		
<b>Method:</b>	The AMN was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane. This distance was between the closest points of the AMN and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the AMN. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on mains lines were made at the output of the AMN.			
	All power was connected to the system through Artificial Mains Network (AMN). All tested telecommunications lines were connected to an Asymmetric Artificial Network (AAN) and conducted voltage measurements on telecommunications lines were made at the output of the ISN. Where an AAN was not appropriate or available measurements were made using a Capacitive Voltage Probe.			
<b>Test Verification:</b> <input checked="" type="checkbox"/>	Laboratory Ambient Temperature:	23°C		
	Relative Humidity:	48%		
	Atmospheric Pressure:	1011 mbars		
<b>Reference Standard(s):</b>	<input checked="" type="checkbox"/> RSS GEN/FCC Part 15.207 <input checked="" type="checkbox"/> ANSI C63.4:2014 <input type="checkbox"/> ANSI C63.10:2020	<b>Measurement Point</b> <input checked="" type="checkbox"/> Mains <input type="checkbox"/> Telecommunication ports <input type="checkbox"/>		
<b>Nominal Voltage:</b>	<input checked="" type="checkbox"/> 120VAC <input type="checkbox"/> 230VAC <input type="checkbox"/> 5VDC			
<b>Test Personnel:</b>	Keith Schwartz <i>KS</i>	<b>Date:</b> 09/14/2021		
<b>Limits – Part 15.207/RSS Gen – AC Mains</b>				
Frequency (MHz)	Limit dB (µV)			
	Quasi-Peak	Average	Result	Comments
0.15 to 0.50	66 to 56	56 to 46	<b>pass</b>	Time Domain Scan
0.50 to 5	56	46	<b>pass</b>	Time Domain Scan
5 to 30	60	50	<b>pass</b>	Time Domain Scan

<b>Modifications:</b>	
<b>Note:</b>	



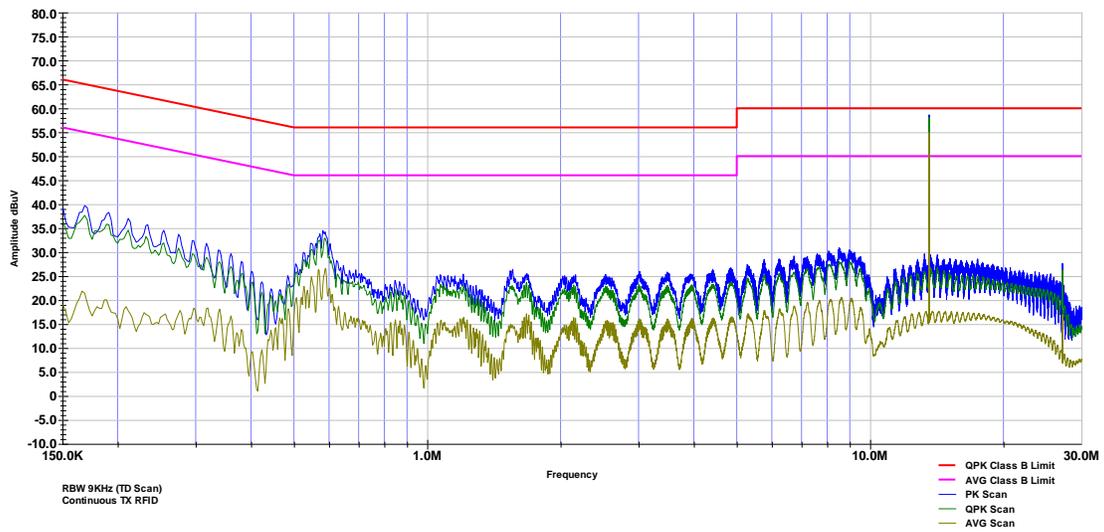
3M Company  
Conducted Emissions  
CISPR 32\_FCC Part 15, Class B, Line 2

Project # - HRE202105206  
Model # - Valor Bridge Gateway  
Serial # - Prototype  
EUT Power - 120VAC/60Hz to 5VDC USB adaptor



3M Company  
Conducted Emissions  
CISPR 32\_FCC Part 15, Class B, Line 1

Project # - HRE202105206  
Model # - Valor Bridge Gateway  
Serial # - Prototype  
EUT Power - 120VAC/60Hz to 5VDC USB adaptor





5.0	Test Equipment				
Test Equipment Used					
Description	Manufacturer	Model	Identifier	Last Cal. Date	Check
Biconilog Antenna	Schwarzbeck	VULB 9168	9168-1070	10/20/2020	<input checked="" type="checkbox"/>
Horn Antenna	A.H. Systems	SAS 571	1010	10/20/2020	<input type="checkbox"/>
Loop Antenna	A.H. Systems	SAS-565H	1213E	10/20/2020	<input checked="" type="checkbox"/>
EMI Receiver	Rohde & Schwarz	ESW26	101412	10/20/2020	<input checked="" type="checkbox"/>
Signal Analyzer	Agilent	N9000A	MY53031040	10/20/2020	<input type="checkbox"/>
EMI Receiver	Agilent	E4448A	1530975	10/20/2020	<input type="checkbox"/>
LISN	TESEQ	NNB51	1130	10/20/2020	<input checked="" type="checkbox"/>
Coaxial Cable	Insulated Wire	2803	CBL2039	10/20/2020	<input checked="" type="checkbox"/>
EMC Software	ETS-Lindgren	TILE 7		N/A	<input checked="" type="checkbox"/>
<b>Equipment Calibration Interval:</b>		<input checked="" type="checkbox"/> 12 months		<input type="checkbox"/> 24 months	

6.0	Report revision history		
Revision Level	Date	Report Number	Notes
0	03/25/2024	HRE202105206-3	Original Issue