

EMC TEST REPORT



Standard(s):

**47 CFR FCC Part 15.247
RSS 247, Issue 4, 2025**

**FCC ID: DGFSCOTT41367
IC:458A-SCOTT41367**

Class II Permissive Change

Product: 3M™ SCBA Advanced Electronics Console (LoRa)

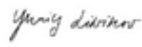
Model (HVIN): 78-8151-4137-5

**Company Name:
3M Company**

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

**Report Number: HRE202307432-5
Report Issue Date: March 3, 2026**

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 15.247(a)(2)/ RSS-247(6.3.1(a))/RSS-Gen (6.7)	DTS Bandwidth	pass	
4.2	FCC Part 15.247(b)(3)/ RSS-247(6.3.2)	Maximum Peak Conducted Output Power	pass	
4.3	FCC Part 15.247(e)/ RSS-247(6.3.1(b))	Maximum Power Spectral Density level	pass	
4.4	FCC Part 15.209 RSS-Gen, 8.9	Radiated Emissions in restricted band	pass	
4.5	FCC Part 15.247(d)/ RSS-247(6.6)	Radiated Emissions in non-restricted band	pass	
4.6	FCC Part 15.247(d)(1)/ RSS-247(6.6)	DTS Band-edge Emissions Measurements	pass	
4.7	FCC Part 15.207/ RSS-Gen (8.8)	Conducted Emissions	pass	

Note:	Console is battery operated
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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

Test Facility Accreditations:	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			
Description:	Advanced Electronics Self-Contained Breathing Apparatus (SCBA) Telemetry System Console. It contains LoRa 915MHz, Bluetooth (Low Energy) 2.4GHz and RFID 13.56MHz transmitters			
Model(s):	78-8151-4137-5			
Serial number:	N/A			
3M Division:	Personal Safety			
Modifications and Special Measures:	none			
Frequency Range:	902.58 - 927.42 MHz			
Channel No.:	20			
Modulation Type:	GFSK			
FCC Classification:	Digital Transmission System (DTS)			
RF Conducted Power:	16.2dBm (41.7mW)			
Antenna Type and Antenna Assembly Gain:	☐ External	☒ U.FL Antenna	☒ Dedicated	
	☒ 3dBi	☒ Declared by the Manufacturer	☐ Measured	
Test Deviations or Exclusions	☐ Yes	☒ No		
Rated Power:	Voltage:	☐ 120VAC	☐ 230VAC	☒ 3.3VDC
	Phase:	☐ 1ph	☐ 3ph	☒ "AA" Batteries
	Frequency:	☐ 50Hz	☐ 60Hz	
	Current:			
Test Dates:	02/26/2026			
Received Date:	11/14/2025			
Received Conditions:	☐ Poor	☒ Good		
	☐ Prototype	☒ Production		

3.0 EUT Configuration

3.1 System Configuration

No.	Product Type	Manufacturer	Model	Comments
1	Valor 2A Console	3M	78-8151-4137-5	
2	DC Power Supply			Support Equipment

3.2 Input/Output Ports of EUT

No.	Description	Type	Comments
1	DC Power	Round Cable plug	
2			

3.3 Cables

No.	Description	Type	Length	Shielding	Comments
1	SCBA Power	Twisted pair	1m	No	
2					

3.4 Measurement Arrangements of EUT

	Intended Operational Arrangement(s)	Comments
☒	Table-top only	
☐	Floor-standing only	
☐	Floor-standing or table-top	
☒	Other	Body-worn

3.5 Primary function(s) of EUT

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

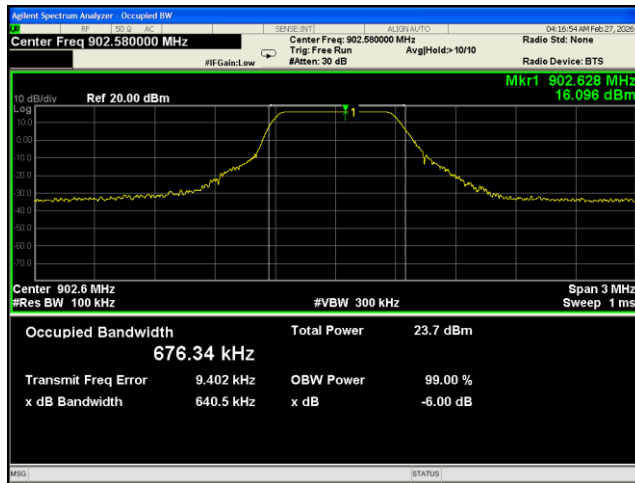
3.6 Exercising of EUT and Interfaces

No.	Mode of Operation
1	Transmitting at lowest 902.58MHz, middle 915MHz and highest 927.42MHz channels of operation with unmodulated CW carrier
2	Continues transmission of modulated signal at lowest, middle and highest channels with a single channel BW >500KHz, Tx=19 and SF=11.
3	Device programming using Tera Term software for continues transmission at maximum rated RF output power and Duty Cycle

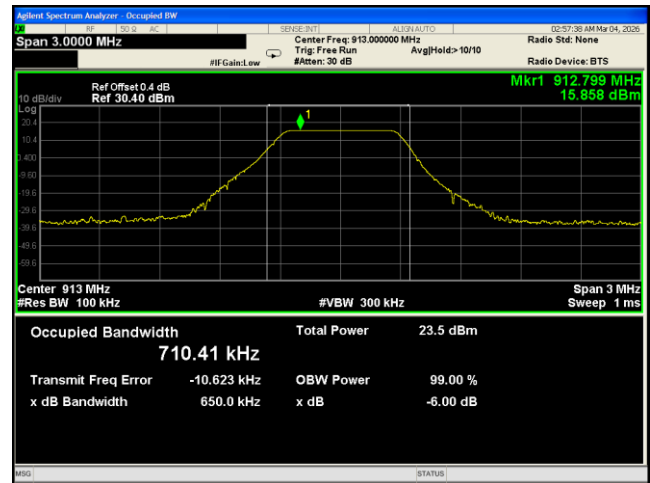
4.0 Test Conditions and Results

4.1	DTS Bandwidth		
	Laboratory Ambient Temperature:	23°C	
	Relative Humidity:	48%	
	Atmospheric Pressure:	1011 mbars	
Reference Standard(s):	☒ ANSI C63.10:2020, Section 11.8.2 ☒ RSS-Gen, Issue 5, Section 6.7 ☒ FCC Part 15.247/RSS 247 ☒ KDB 558074		Measurement Point ☒ Conducted ☐ Radiated
Frequency Range:	☒ 902.58-927.42MHz		RBW = 100KHz, VBW ≥ 3 x RBW (FCC 15.247) RBW = 30KHz, VBW ≥ 3 x RBW (RSS-Gen)
Nominal Voltage:	☐ 120VAC ☒ 3.3VDC		
Test Personnel:	Yuriy Litvinov <i>Yuriy Litvinov</i>		Date: 02/26/2026

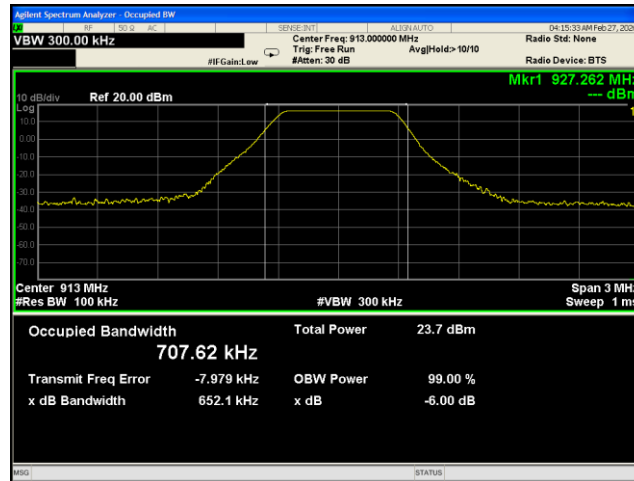
Frequency (MHz)	Data Rate	RSS-Gen 99% dB Bandwidth (KHz)	FCC 15.247 6 dB Bandwidth (KHz)	6dB OBW Limit (KHz)	Results
902.58	2 Kbps	544.5	640.5	> 500	pass
913.00	2 Kbps	552.0	650.0	> 500	pass
927.42	2 Kbps	544.5	652.1	> 500	pass



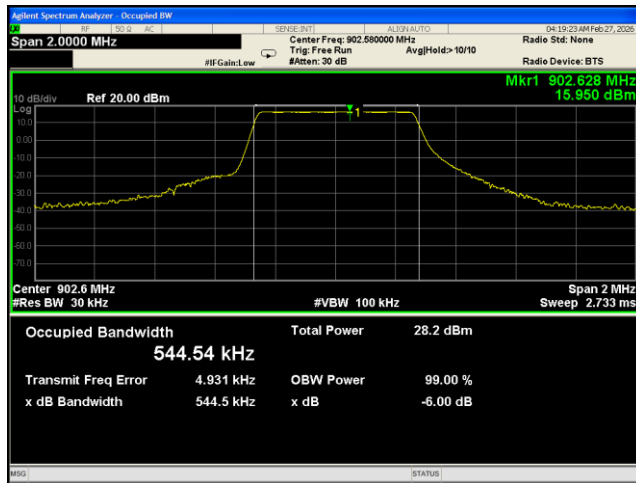
FCC OBW – Low Channel



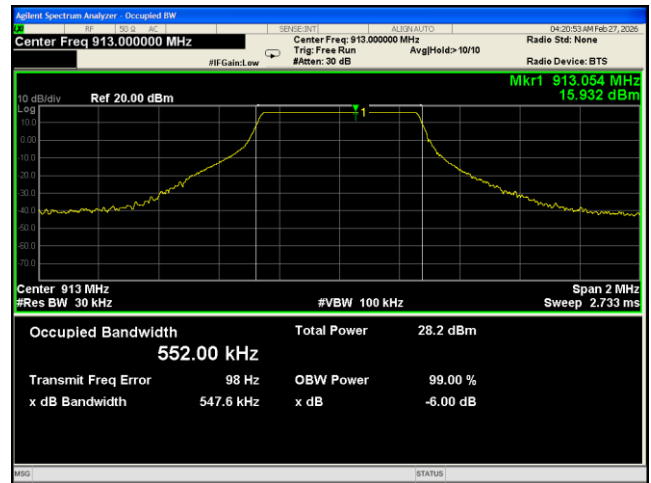
FCC OBW – Mid Channel



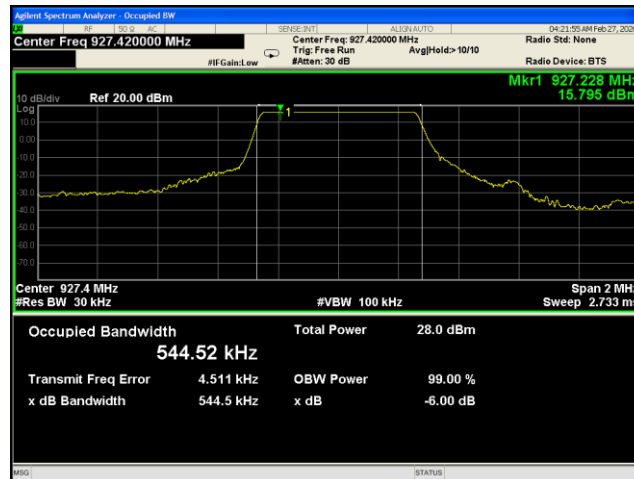
FCC OBW – High Channel



RSS-Gen OBW – Low Channel



RSS Gen – Mid Channel

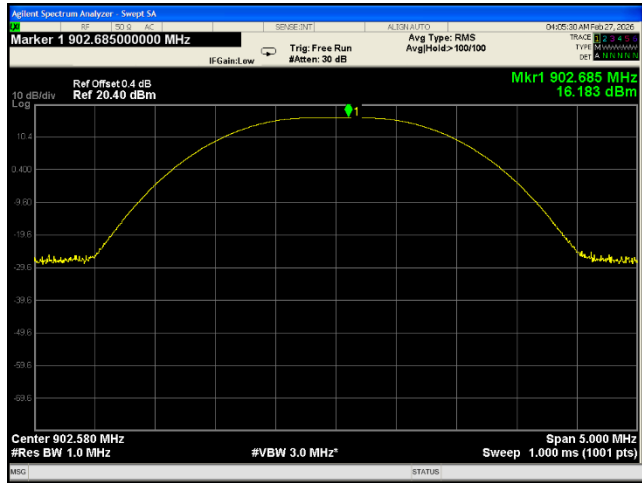


RSS-Gen OBW – High Channel

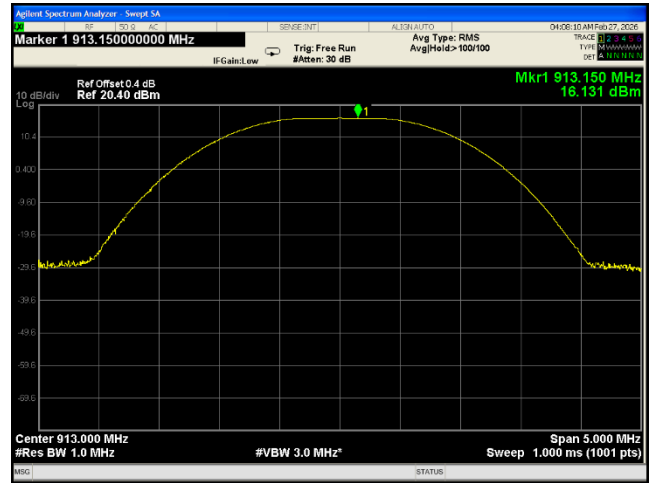
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4.2	Maximum Output Power		
Method:	Measurements was performed with CW carrier at the highest power level at which the transmitter is intended to operate. The analyzer offset was adjusted to compensate for the attenuator and other losses.		
	Laboratory Ambient Temperature:	23°C	
	Relative Humidity:	48%	
	Atmospheric Pressure:	1011 mbars	
Reference Standard(s):	☒ ANSI C63.10:2020, Section 11.9 ☒ FCC Part 15.247/RSS 247 ☒ KDB 558074	Measurement Point ☒ Conducted ☐ Radiated	
Frequency Range:	☒ 902.58-927.42MHz		
Antenna Gain:	3dBi	Maximum RF Conducted Power (RMS):	
Limit:	30 dBm	16.2dBm (41.7mW)	
Nominal Voltage:	☐ 120VAC ☒ 3.3VDC		
Test Personnel:	Yuriy Litvinov <i>Yuriy Litvinov</i>	Date: 02/26/2026	

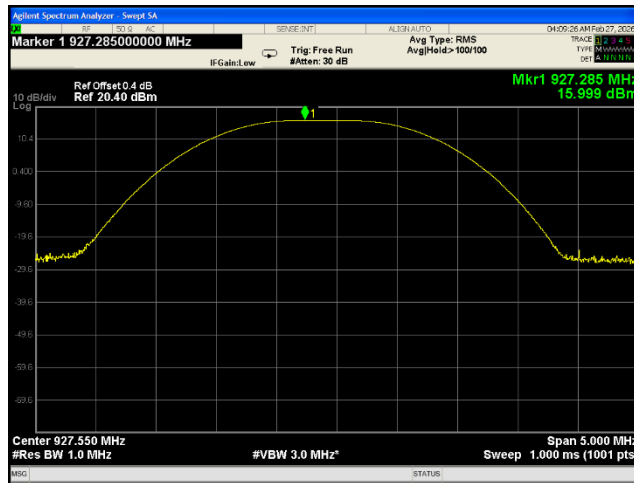
Note:	EIRP (dBm) = Conducted Power (dBm) +Antenna Gain (dBi)= 16.2dBm+3dBi =19.2dBm
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Low Channel



Mid Channel

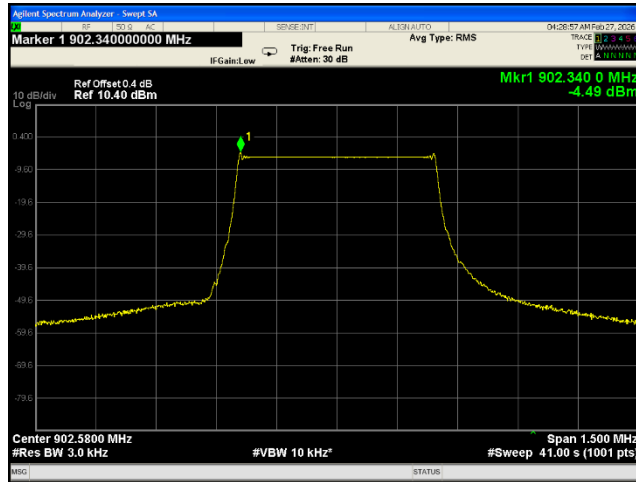


High Channel

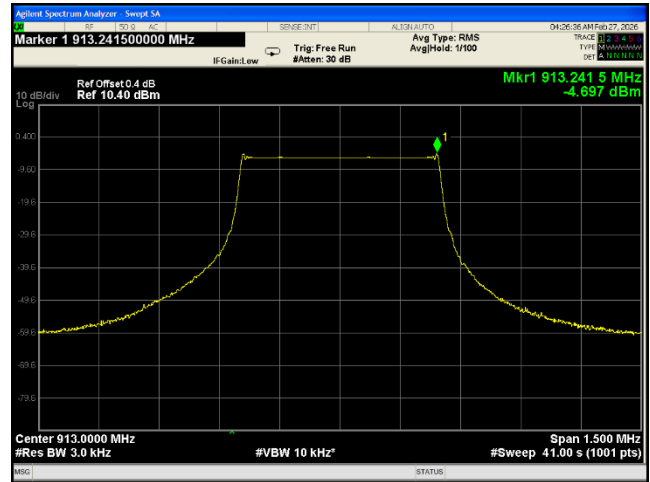
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4.3	Maximum Power Spectral Density level		
Method:	Measurements was performed with modulated carrier at the highest power level at which the transmitter is intended to operate. The analyzer offset was adjusted to compensate for the attenuator and other losses.		
	Laboratory Ambient Temperature:	23°C	
	Relative Humidity:	48%	
	Atmospheric Pressure:	1011 mbars	
Reference Standard(s):	☒ ANSI C63.10:2020, Section 11.10.4 ☒ FCC Part 15.247/RSS 247 ☒ KDB 558074	Measurement Point ☒ Conducted ☐ Radiated	
Frequency Range:	☒ 902.58-927.42 MHz	PSD Results	
PSD Limit:	8 dBm in any 3KHz band	-4.5dBm	
Nominal Voltage:	☐ 120VAC ☒ 3.3VDC		
Test Personnel:	Yuriy Litvinov <i>Yuriy Litvinov</i>		Date: 02/26/2026

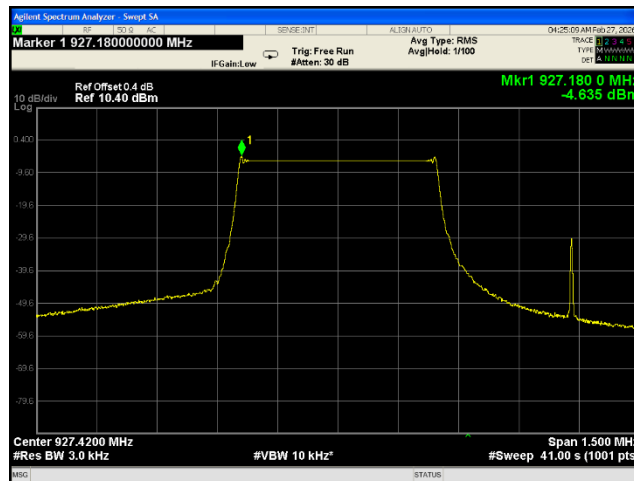
Note:	Section 11.10.4 Method AVGPS-1A (alternative) The sweep time is set to the symbol period (4.1ms for SF11, BW500) as defined by the manufacturer for SX1262 LoRa transmitter. Sweep time: $\geq [10 \times (\text{number of measurement points in sweep}) \times (\text{transmission symbol period})] = 10 \times 1000 \times 0.0041 \text{s} = 41 \text{sec}$.
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PSD Low Channel



PSD Mid Channel



PSD High Channel

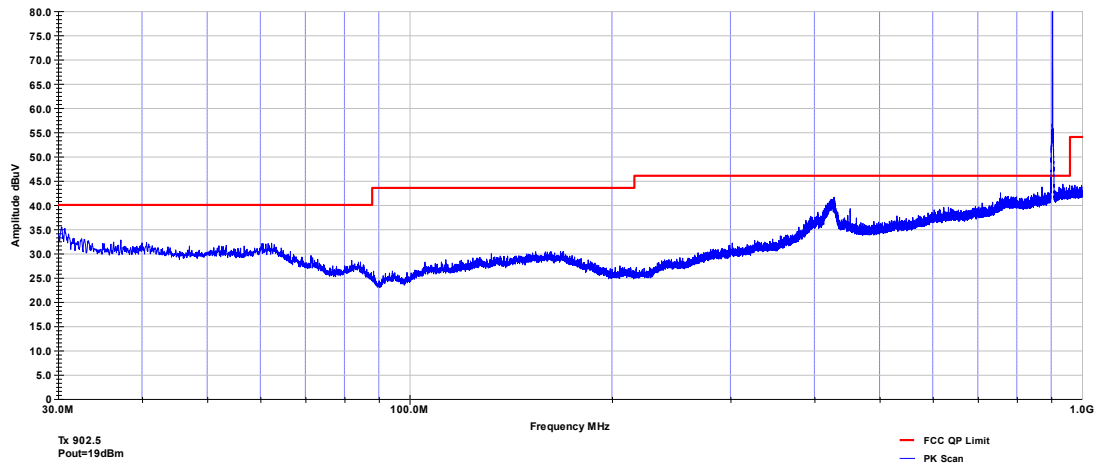
4.4	Radiated Emissions in restricted band				
Method:	Measurements were made in a 3-meter semi-anechoic chamber that complies to CISPR 16/ANSI C63.4 standards. EUT was rotated through three orthogonal axes to determine which attitude (orientation) and arrangement produces the highest emission relative 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.				
Test Verification: ☒	Laboratory Ambient Temperature:		23°C		
	Relative Humidity:		55%		
	Atmospheric Pressure:		1011 mbars		
Reference Standard(s):	☒ ANSI C63.10:2020, Section 11.12.1 ☒ FCC Part 15.205/15.209/RSS Gen (8.9) ☒ KDB 558074			Measurement Distance	
				☒ 3 Meters ☐	
Frequency Range:	☒ 30 MHz to 1 GHz ☒ 1 GHz to 10 GHz			RBW 120KHz - 30 MHz to 1000MHz RBW 1MHz - above 1GHz VBW ≥ 3 x RBW	
Nominal Voltage:	☐ 120VAC ☒ 3.3VDC				
Test Personnel:	Jayden Alstad <i>J.A.</i>			Date: 11/24/2025	
Limits –15.209 and RSS Gen					
Frequency (MHz)	Limit dB (µV/m)				
	Quasi-Peak	Average	Peak	Distance	Results
0.009-0.490		2400/F(KHz)		300	N/A
0.490-1.705	24000/F(KHz)			30	N/A
1.705-30	30			30	N/A
30 to 88	40			3	pass
88 to 216	43.5			3	pass
216 to 960	46			3	pass
Above 960		54	74	3	pass

Modifications:	
Note:	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 For emission in the restricted bands, the limit of 15.209 was used. The Gateway fundamental frequencies of operation at low, mid and high channels shown on the graphs are above 15.209 limit.



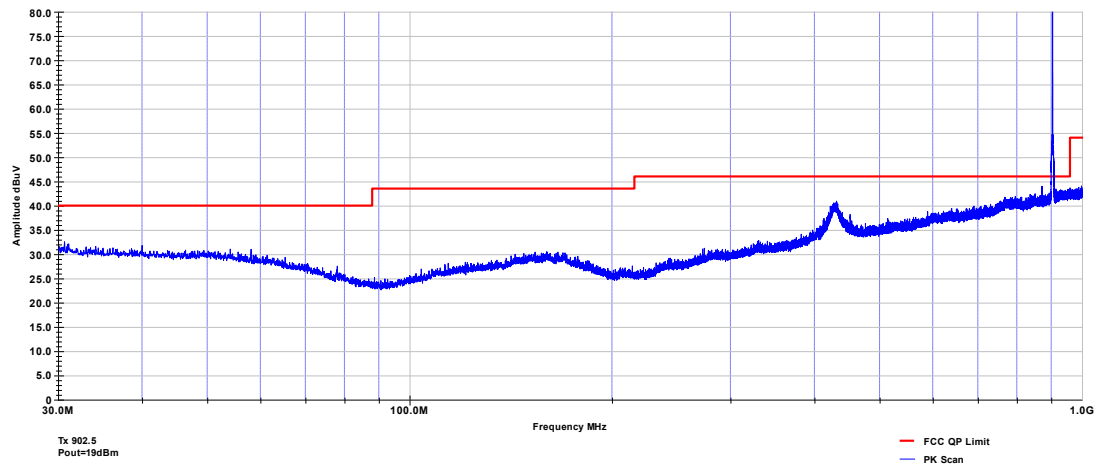
3M Company
Radiated Emissions Pre-scan
 FCC Part 15, Class B, Vertical

Project # - HRE202509497
 Model # - Advanced Electronics Gateway (BARM)
 Serial # - N/A
 EUT Power - 3.3VDC

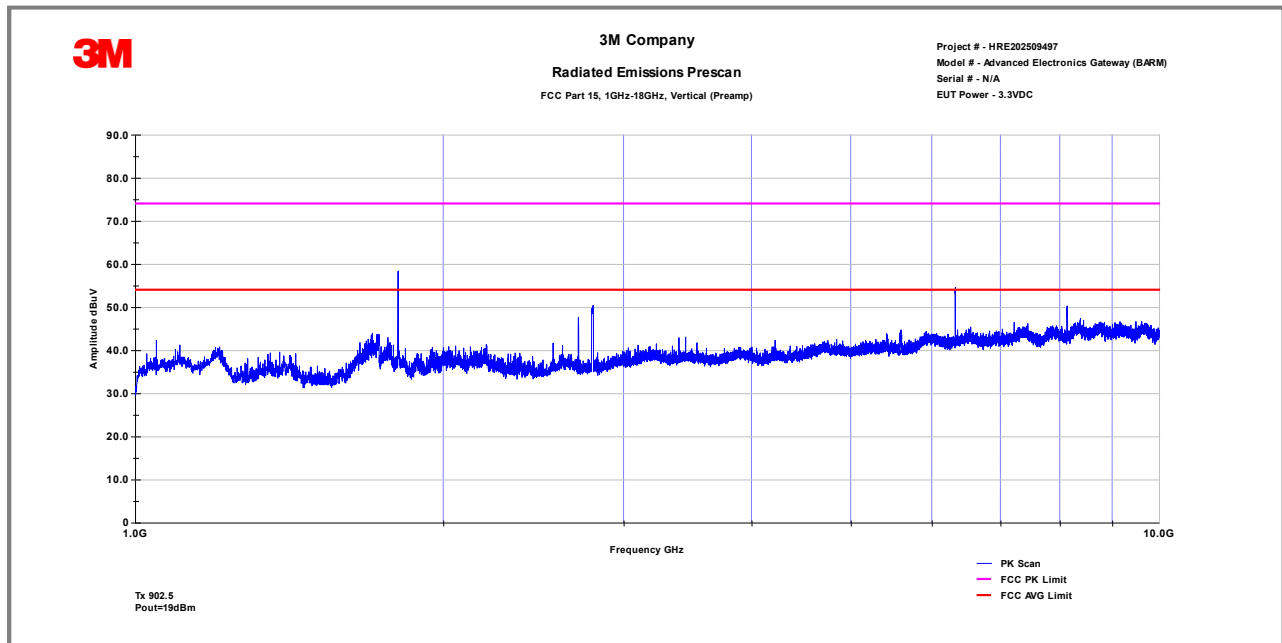
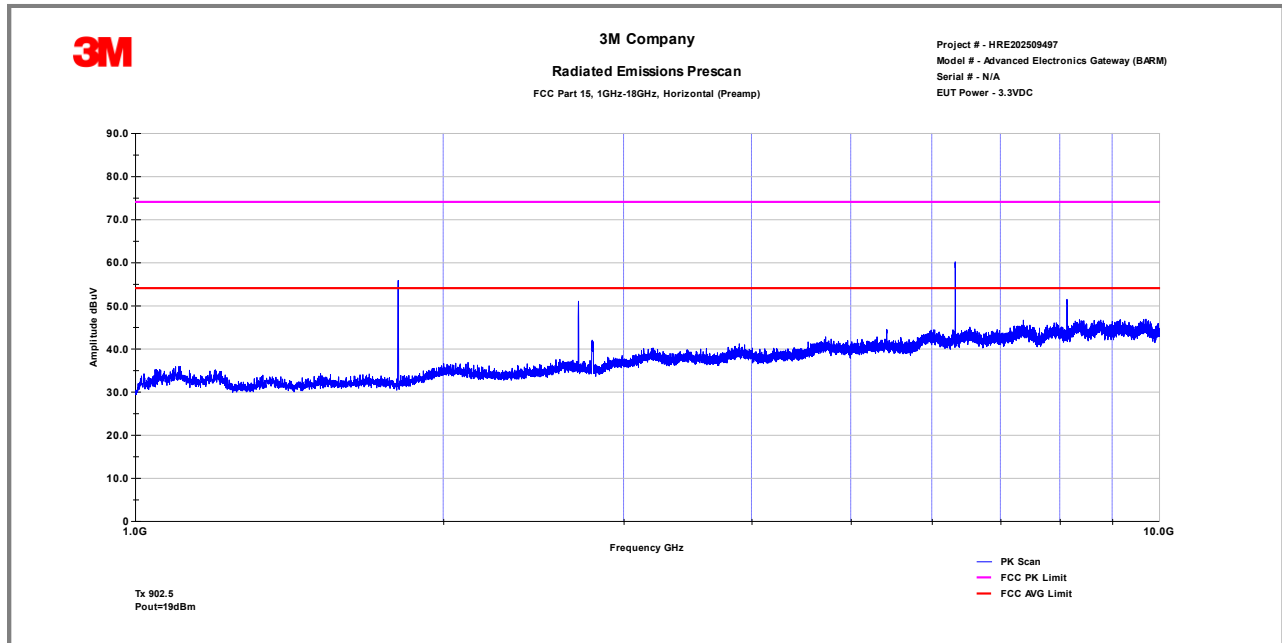


3M Company
Radiated Emissions Pre-scan
 FCC Part 15, Class B, Horizontal

Project # - HRE202509497
 Model # - Advanced Electronics Gateway (BARM)
 Serial # - N/A
 EUT Power - 3.3VDC



FCC Part 15.209 Radiated Emissions in restricted band – Low Channel

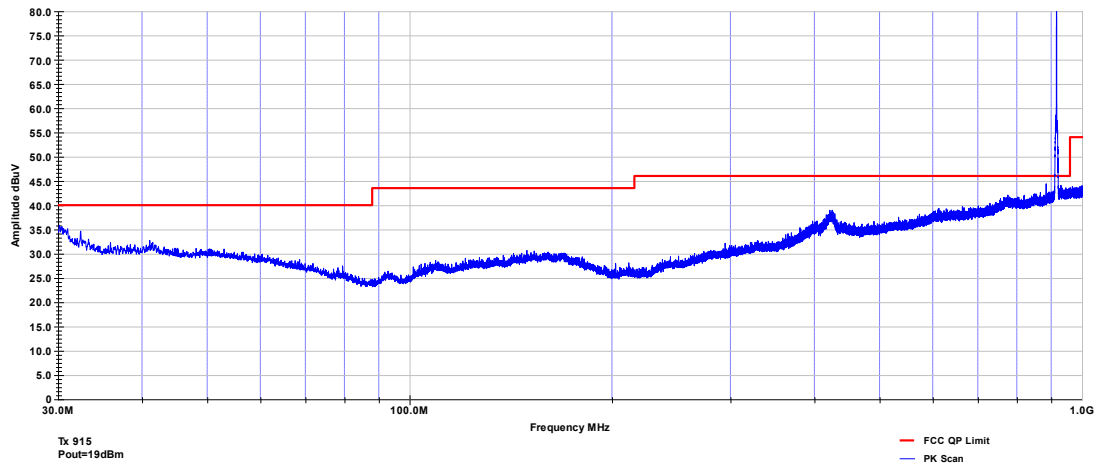


FCC Part 15.209 Radiated Emissions in restricted band – Low Channel



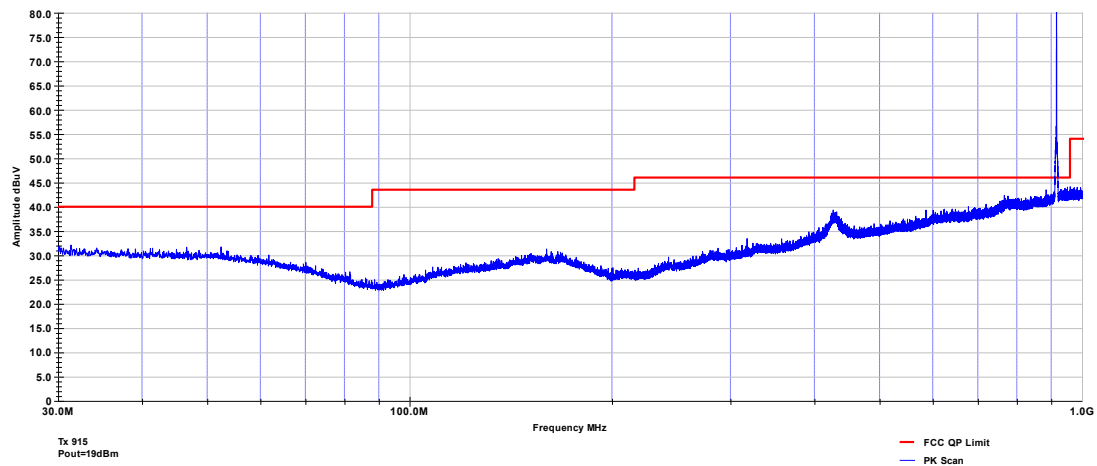
3M Company
Radiated Emissions Pre-scan
 FCC Part 15, Class B, Vertical

Project # - HRE202509497
 Model # - Advanced Electronics Gateway (BARM)
 Serial # - N/A
 EUT Power - 3.3VDC

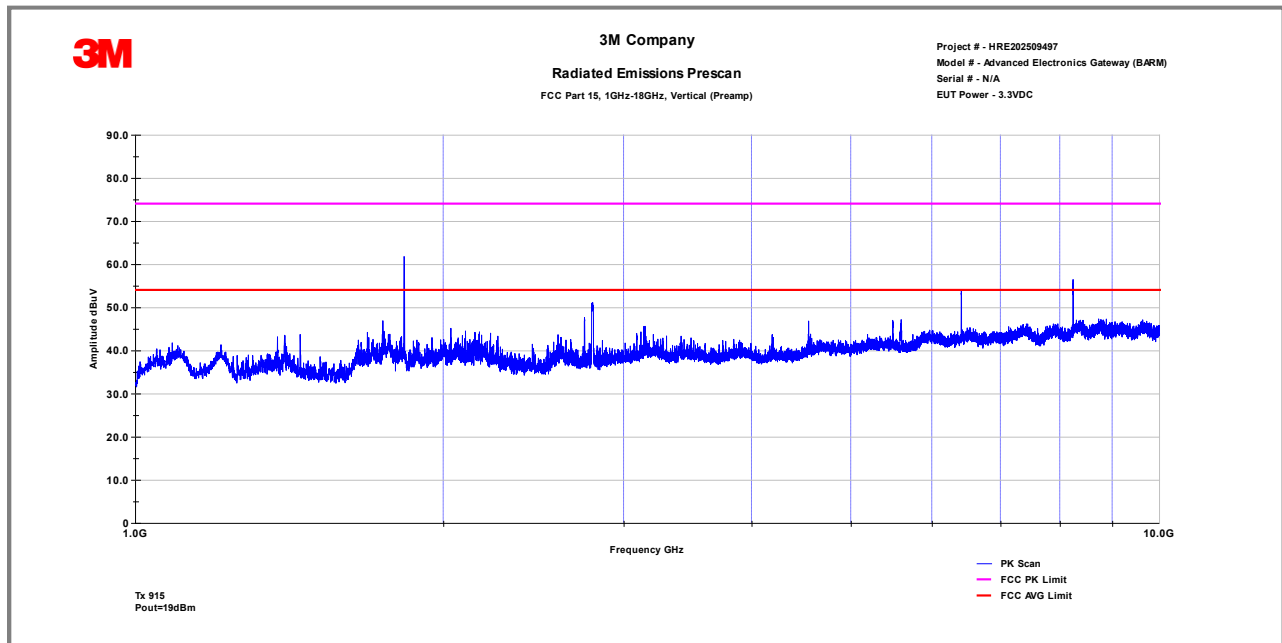
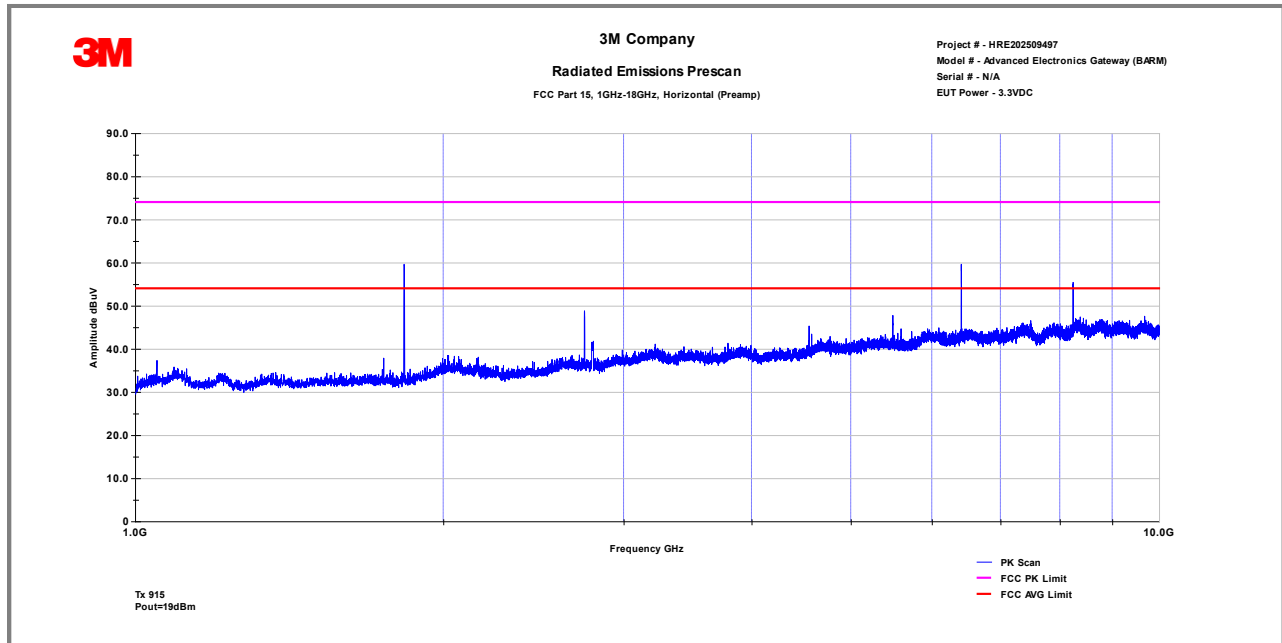


3M Company
Radiated Emissions Pre-scan
 FCC Part 15, Class B, Horizontal

Project # - HRE202509497
 Model # - Advanced Electronics Gateway (BARM)
 Serial # - N/A
 EUT Power - 3.3VDC



FCC Part 15.209 Radiated Emissions in restricted band – Mid Channel

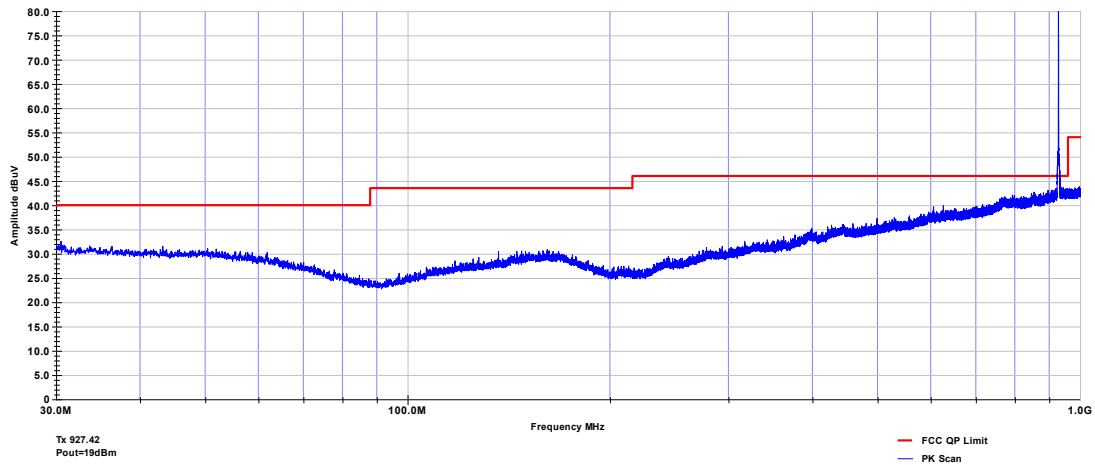


FCC Part 15.209 Radiated Emissions in restricted band – Mid Channel



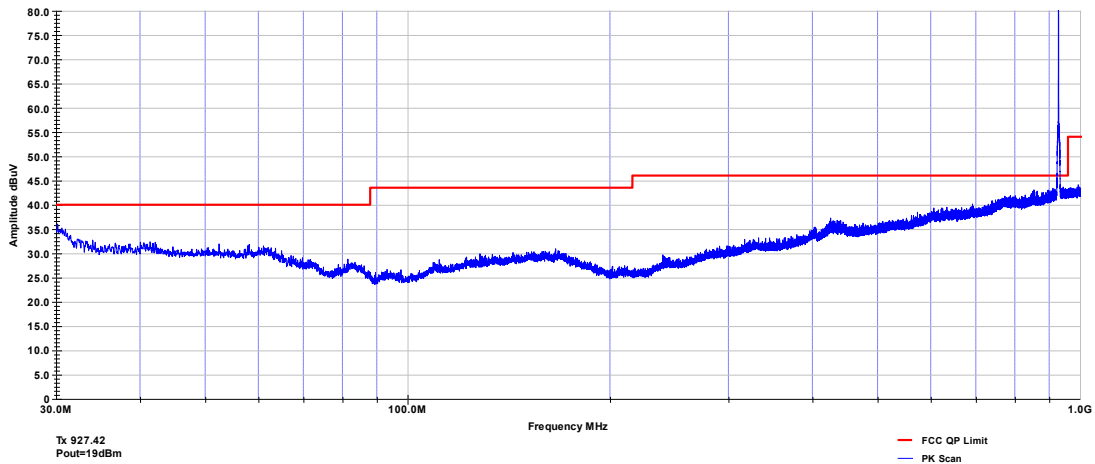
3M Company
Radiated Emissions Pre-scan
 FCC Part 15, Class B, Horizontal

Project # - HRE202509497
 Model # - Advanced Electronics Gateway (BARM)
 Serial # - N/A
 EUT Power - 3.3VDC

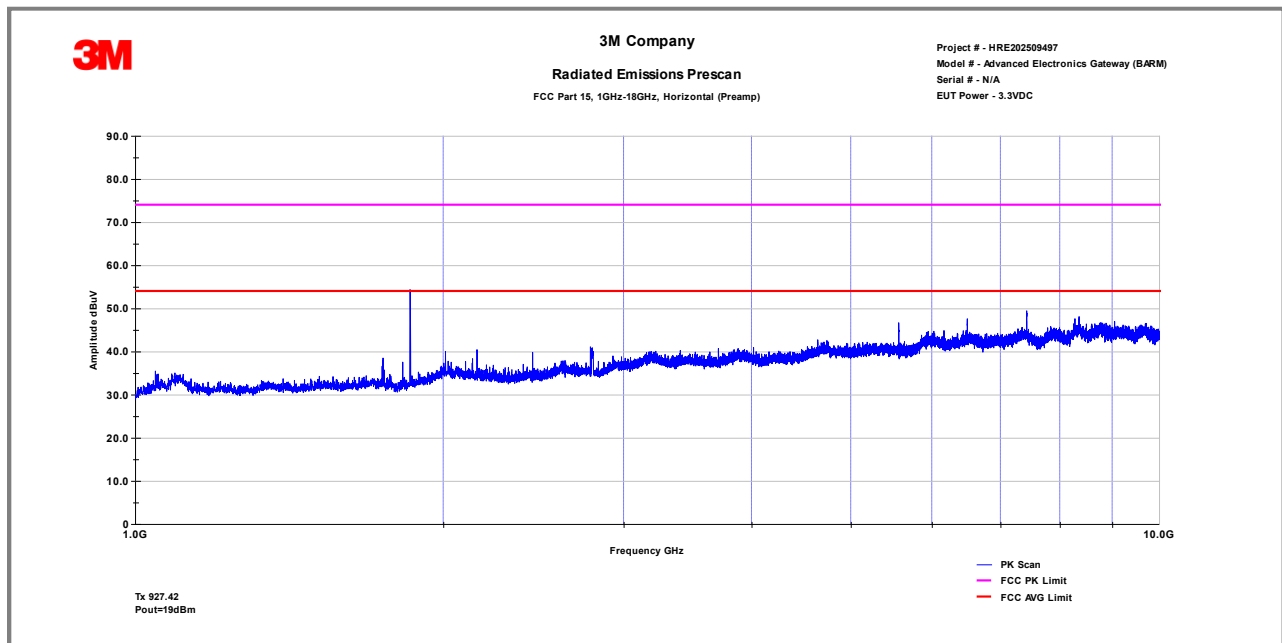
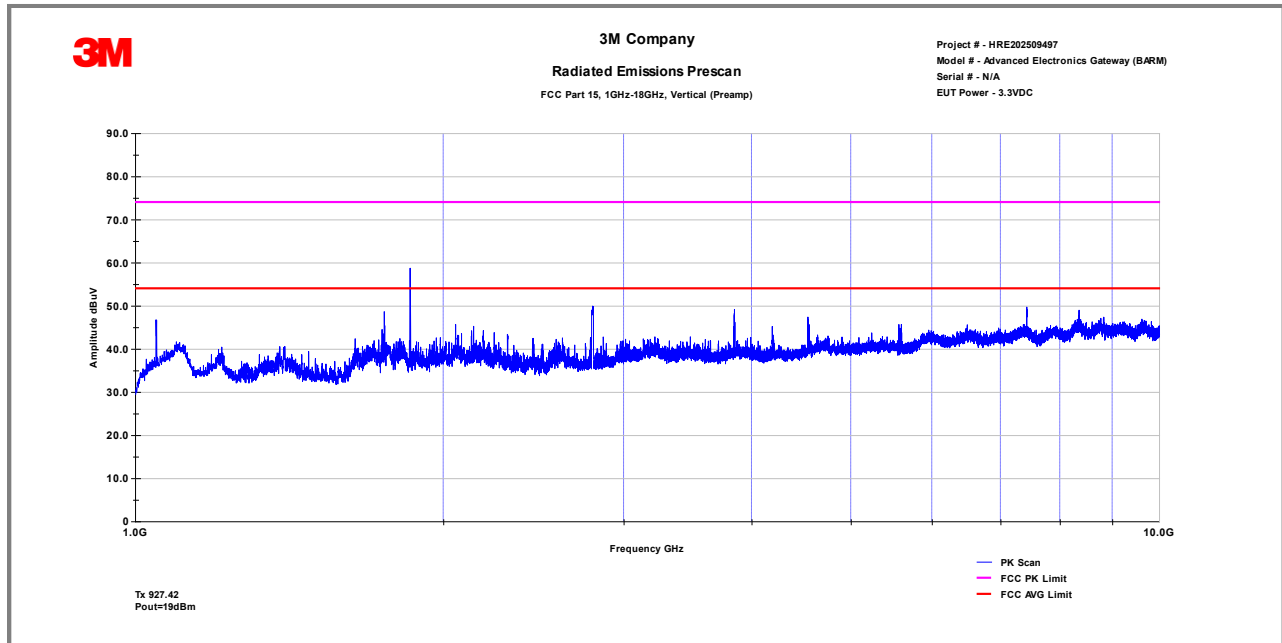


3M Company
Radiated Emissions Pre-scan
 FCC Part 15, Class B, Vertical

Project # - HRE202509497
 Model # - Advanced Electronics Gateway (BARM)
 Serial # - N/A
 EUT Power - 3.3VDC



FCC Part 15.209 Radiated Emissions in restricted band – High Channel



FCC Part 15.209 Radiated Emissions in restricted band – High Channel



Tables - Radiated Emissions in restricted band

Frequency (MHz)	Pol.	QP Reading dB μ V/m	Total CF dB	Net at 3 m dB μ V/m	Limit (dB μ V/m)	Margin dB
30.21	V	8.3	16.9	25.2	40	-14.8
53.8	H	2.5	18.4	20.9	40	-19.1
150.68	H	2.2	18.5	20.6	43.5	-22.9
277.56	V	2.3	18.3	20.6	46	-25.4
429.05	H	10.5	22.1	32.6	46	-13.4
850.38	H	3.5	29.1	32.6	46	-13.4
30.21	V	8.3	16.9	25.2	40	-14.8
Notes:	Net Reading (dB μ V) = Reading (dB μ V) + Antenna CF(dB)+Cable CF(dB) – Amp Gain(dB) Low Channel					

Frequency (MHz)	Pol.	QP Reading dB μ V/m	Total CF dB	Net at 3 m dB μ V/m	Limit (dB μ V/m)	Margin dB
30.99	V	7.9	16.8	24.8	40	-15.2
32.3	V	7	16.8	23.8	40	-16.2
40.07	V	4.5	17.5	22	40	-18
148.19	H	2.3	18.1	20.4	43.5	-23.1
424.22	V	9.8	21.9	31.7	46	-14.3
883.46	H	3.7	29.2	32.9	46	-13.1
Notes:	Net Reading (dB μ V) = Reading (dB μ V) + Antenna CF(dB)+Cable CF(dB) – Amp Gain(dB) Mid Channel					

Frequency (MHz)	Pol.	QP Reading dB μ V/m	Total CF dB	Net at 3 m dB μ V/m	Limit (dB μ V/m)	Margin dB
30.51	V	10.1	16.9	26.9	40	-13.1
59.03	V	3.2	17.9	21.1	40	-18.9
165.08	H	2.6	17.9	20.5	43.5	-23
424.42	V	6.4	21.9	28.4	46	-17.6
625.31	V	3.3	26.2	29.6	46	-16.4
860.12	H	3.6	29	32.7	46	-13.3
Notes:	Net Reading (dB μ V) = Reading (dB μ V) + Antenna CF(dB)+Cable CF(dB) – Amp Gain(dB) Mid Channel					

Tables - Radiated Emissions in restricted band

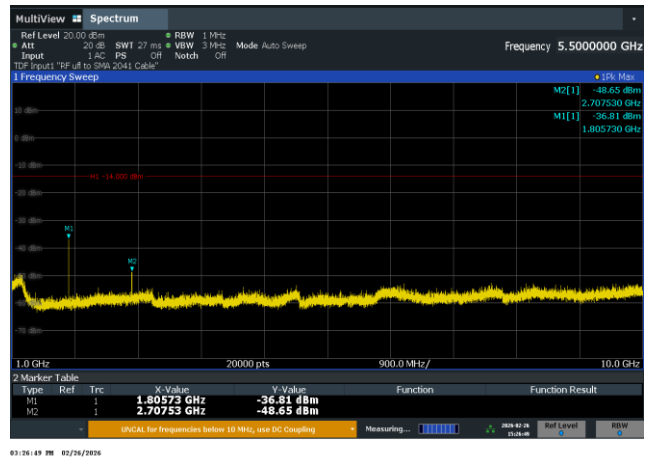
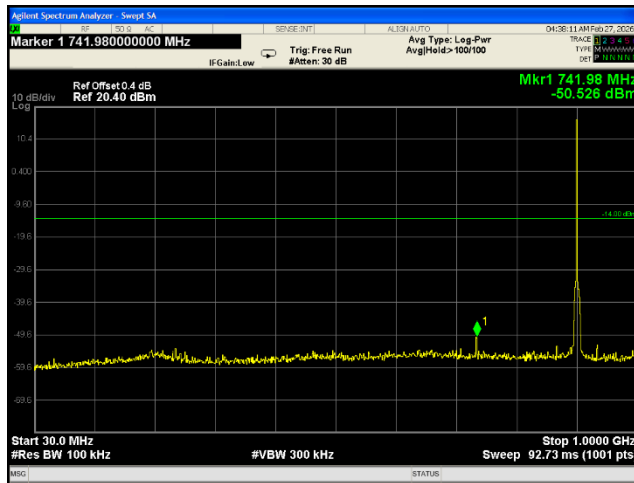
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Tables - Radiated Emissions in restricted band

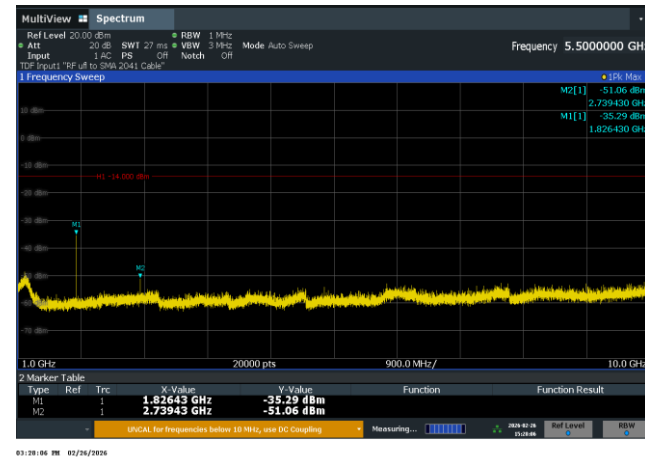
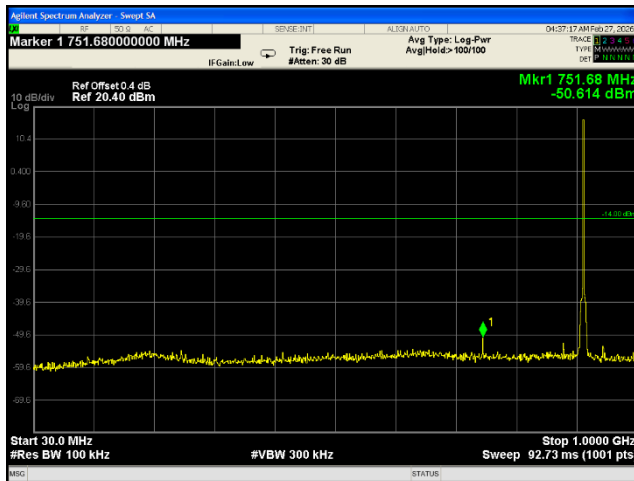
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4.5	Radiated Emissions in non-restricted band		
Method:	The measurements were made with transmitter set to transmit continuously at low and high channels.		
	Laboratory Ambient Temperature:	23°C	
	Relative Humidity:	48%	
	Atmospheric Pressure:	1011 mbars	
Reference Standard(s):	☒ ANSI C63.10:2020, Section 11.11 ☒ FCC Part 15.247/RSS 247 ☒ KDB 558074	Measurement Point ☒ Conducted ☐ Radiated	
Frequency Range:	☒ 902.58-924.42 MHz		
In-band power in 100KHz:	☒ 16.2dBm	Results:	
Limit:	☒ -13.8dBm (30dBc below in-band power)	>60dBc	
Nominal Voltage:	☐ 120VAC ☒ 3.3VDC		
Test Personnel:	Yuriy Litvinov <i>Yuriy Litvinov</i>	Date: 02/26/2026	

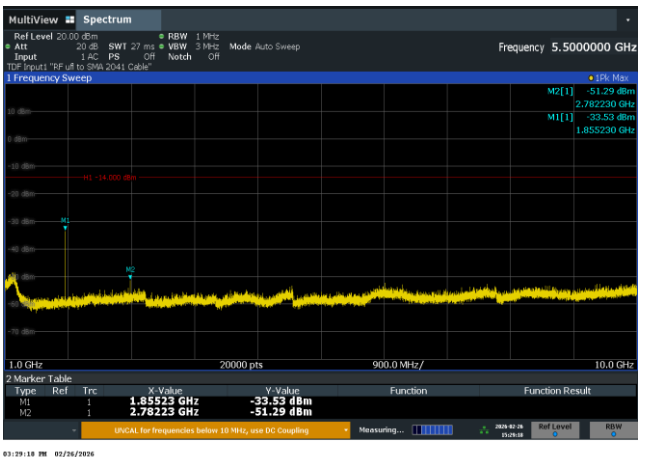
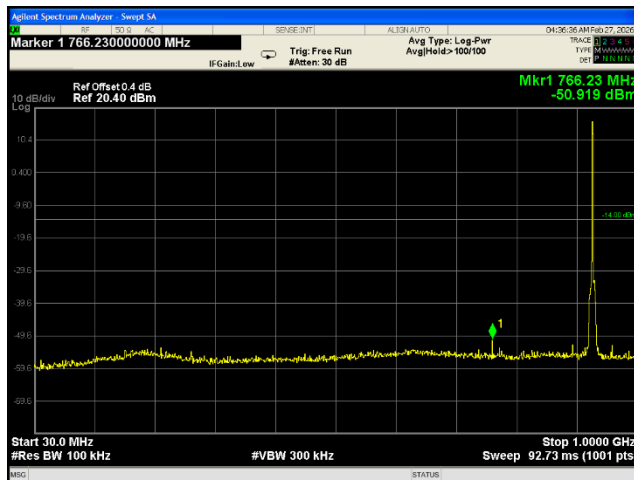
Note:	
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Conducted Spurious - Low Channel



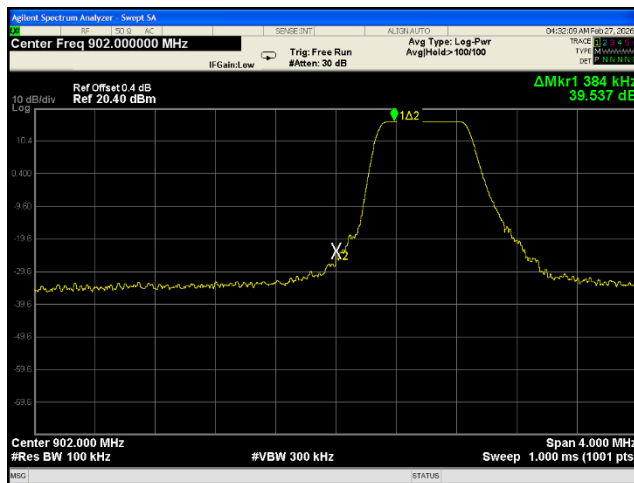
Conducted Spurious – Mid Channel



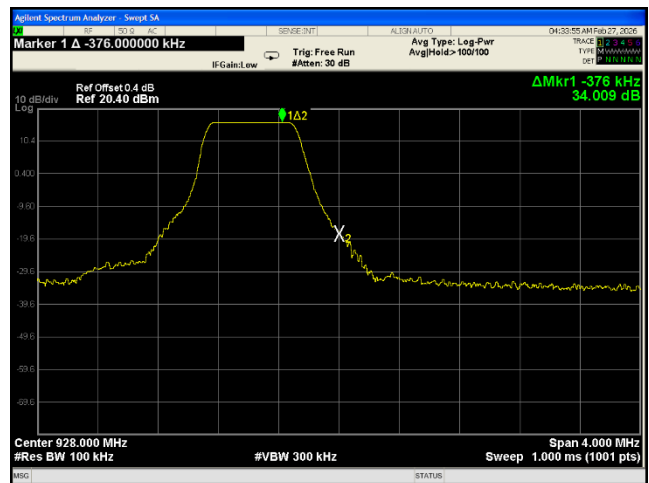
Conducted Spurious – High Channel



4.6	Band-Edge Compliance		
Method:	The measurements were made with transmitter set to transmit continuously with modulated signal at low and high channels.		
	Laboratory Ambient Temperature:	23°C	
	Relative Humidity:	48%	
	Atmospheric Pressure:	1011 mbars	
Reference Standard(s):	☒ ANSI C63.10:2020, Section 11.13.2 ☒ FCC Part 15.247/RSS 247 ☒ KDB 558074	Measurement Point ☒ Conducted ☐ Radiated	
Frequency Range:	☒ 902.58-927.42 MHz	Results	
Limit:	☒ >30dBc	Low Ch., 902.58 MHz > 39.5dBc High Ch., 927.42 MHz > 34.0dBc	
Nominal Voltage:	☐ 120VAC ☒ 5VDC		
Test Personnel:	Yuriy Litvinov <i>Yuriy Litvinov</i>		Date: 02/26/2026

Note:

Band Edge - Low Channel



Band Edge - High Channel

4.7	Conducted Emissions Data			
Method:	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.			
Test Verification: ☐		Laboratory Ambient Temperature:		
		Relative Humidity:		
		Atmospheric Pressure:		
Reference Standard(s):		☐ RSS GEN/FCC 15.207 ☐ ANSI C63.4:2014 ☐ ANSI C63.10:2020	Measurement Point ☐ Mains ☐ Telecommunication ports ☐	
Nominal Voltage:		☐ 120VAC ☐ 230VAC ☐ VDC		
Test Personnel:			Date:	
Limits – Part 15.209/RSS Gen – AC Mains				
Frequency (MHz)	Limit dB (µV)			
	Quasi-Peak	Average	Result	Comments
0.15 to 0.50	66 to 56	56 to 46	N/A	Time Domain Scan
0.50 to 5	56	46	N/A	Time Domain Scan
5 to 30	60	50	N/A	Time Domain Scan

Modifications:	
Note:	



4.8	RF Exposure Evaluation	
Reference Standard(s):	☐ KDB 447498 RF Exposure Guidance v06 ☒ KDB 447498 Interim RF Exposure Guidance v01 ☒ RSS 102, Issue 6 ☐	☐ MPE ☐ SAR Evaluation ☒ SAR Test Exclusion
Frequency Range(s):	☒ 902.58 - 927.42MHz ☒ 2402-2480.0MHz ☒ 13.56MHz	
Antenna Separation Distance LoRa/BT/RFID:	>100mm/40mm/40mm	
RF Exposure Conditions:	Portable (Body-worn)	
BT 2.4GHz Antenna Gain:	4.3dBi	
LoRa 900MHz Antenna Gain:	3.0dBi	
LoRa source-based output power:	41.7mW(16.2dBm)*0.85(worst case duty cycle)= 35.4mW(15.5dBm)	
LoRa EIRP/ERP output power:	EIRP=15.5dBm + 3.0dBi=18.5dBm, ERP=18.5dBm - 2.15dB=16.35dBm(43.2mW)	
The estimated 1-g SAR Value of LoRa transmitter:	[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] * [sqrt(f(GHz)/x)] W/kg, for test separation distances ≤ 50 mm; where x = 7.5 for 1-g SAR (43.2mW/100mm)*(sqrt(0.92/7.5))=(0.43)*(0.96/7.5)=0.06W/Kg	
BLE the source-based output power:	0.6mW(-2.24dBm)*0.85(worst case duty cycle)=0.5mW(-3.0dBm)	
BLE EIRP/ERP output power:	EIRP=-3.0dBm + 4.3dBi=1.3dBm, ERP=1.3dBm - 2.15dB= -0.85dBm(0.82mW)	
The estimated 1-g SAR Value of the BLE transmitter:	[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] * [sqrt(f(GHz)/x)] W/kg, for test separation distances ≤ 50 mm; where x = 7.5 for 1-g SAR (0.82mW/40mm)*(sqrt(2.45/7.5))=(0.02)*(1.57/7.5)<0.01 W/Kg	
RFID Maximum Output Power:	60dBuV(from the field strength)	
The estimated 1-g SAR Value of the RFID transmitter:	(0.00018mW/40mm)*(sqrt(0.01356/7.5)) <0.01W/Kg	
The sum of ratios (1-g SAR value) for all simultaneously transmitting BT and ISRD antennas incorporated in a radio:	(SAR value of BT EDR Transmitter/SAR limit) + (SAR value of ISRD Transmitter/SAR limit) + (SAR value of BT EDR Transmitter/SAR limit) = (0.06/1.6) + (0.01/1.6) + (0.01/1.6) = 0.06 < 1	
The SAR Exclusion Threshold Level		
FCC Part 2.1093	143mW/40mm @2.45GHz	
FCC Part 2.1093	666mW/100mm @900MHz	
RSS 102, Issue 6	170mW/40mm @2.45GHz	
RSS 102, Issue 6	>300mW/100mm @900MHz	

Note:

The device has three simultaneously transmitting antennas for LoRa, BLE and RFID.

5.0	Test Equipment				
Test Equipment Used					
Description	Manufacturer	Model	Identifier	Last Cal. Date	Check
Biconilog Antenna	Schwarzbeck	VULB 9168	9168-1070	10/20/2025	☒
Horn Antenna	A.H. Systems	SAS 571	1010	10/20/2025	☒
Loop Antenna	A.H. Systems	EHA-51B	1213E	10/20/2025	☐
EMI Receiver	Rohde & Schwarz	ESW26	101412	10/20/2025	☒
Signal Analyzer	Agilent	N9000A	MY53031040	10/20/2025	☒
EMI Receiver	Agilent	E4448A	1530975	10/20/2025	☒
LISN	TESEQ	NNB51	1130	10/20/2025	☐
Coaxial Cable	Insulated Wire	2803	CBL2039	10/20/2025	☒
EMC Software	ETS-Lindgren	TILE 7		N/A	☒
Equipment Calibration Interval:		☒ 12 months ☐ 24 months			

6.0	Report revision history		
Revision Level	Date	Report Number	Notes
0	03/05/2026	HRE202307432-5	Original Issue