

# RF Test Report

Project Number: 4975321

Proposal: SUW-202108001433

Report Number: 4975321EMC10

Revision Level: 2

Client: Deere &amp; Company

Equipment Under Test: JDLINK™ M Modem - 4G

Model Number: MA4M

FCC ID: OV5-MA4M

IC ID: 11137A-MA4M

Applicable Standards: ANSI C63.10: 2013 (FCC Part 15 Subpart C, § 15.247)

RSS-247, Issue 2

RSS-GEN Issue 5

Report issued on: 28 February 2023

Test Result: Compliant



FOR THE SCOPE OF ACCREDITATION UNDER CERTIFICATE NUMBER: 3212.01

Report must not be used by the client to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the Federal Government.

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## 1 Summary of Test Results

Test Description	Test Specification		Test Result
Bandwidth	15.247(a)(2)	RSS-247 5.2(a) RSS-GEN 6.7	Compliant
Peak Output Power	15.247(b)(3)	RSS-247 5.4 (d)	Compliant
Power Spectral Density	15.247(e)	RSS-247 5.2 (b)	Compliant
Conducted Spurious Emissions / Band Edge	15.247(d)	RSS-247 5.5	Compliant
Field Strength of Spurious Radiation	15.247(d)	RSS-247 5.5	Compliant
Emissions in Restricted Frequency Bands	15.205, 15.209	RSS-GEN 8.9, 8.10	Compliant
Antenna Requirement	15.203	RSS-GEN 6.8	Compliant <sup>2</sup>
AC Powerline Conducted Emissions	15.107, 15.207	RSS-GEN 8.8	NA <sup>1</sup>

1) The device has no facility for connection to the AC mains.

2) All antennas are internal.

### 1.1 Modifications Required for Compliance

None

## 2 General Information

### 2.1 Client Information

Name: Deere & Company dba John Deere Intelligent Solutions  
Address: 9505 Northpark Drive  
City, State, Zip, Country: Urbandale, IA 50131 USA

### 2.2 Test Laboratory

Name: SGS North America, Inc.  
Address: 620 Old Peachtree Road NW, Suite 100  
City, State, Zip, Country: Suwanee, GA 30024, USA

Accrediting Body: A2LA  
Type of lab: Testing Laboratory  
Certificate Number: 3212.01  
Designation Number: US1126  
CAB Identifier: US0186

### 2.3 General Information of EUT

Product Description: JDLINK™ M Modem - 4G  
Model Number: MA4M  
Serial Number: PCMA4MA101503 (Radiated); PCMA4MA101508 (Conducted)

Frequency Range: 2402 – 2480 MHz  
Data Modes: Bluetooth LE / GFSK  
Antenna\*: Internal – (4dBi)

Rated Voltage: 9 – 32Vdc  
Test Voltage: 12Vdc

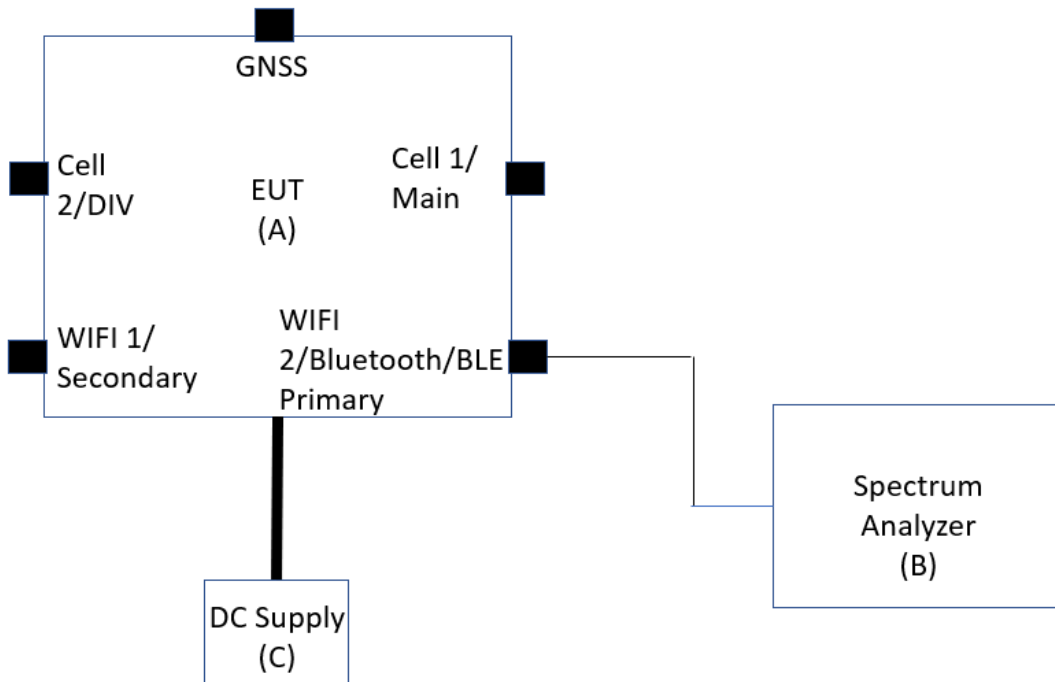
Sample Received Date: 24 October 2022  
Dates of testing: 4 November – 06 December 2022

*\*Data was not measured by SGS laboratory and therefore not responsible for accuracy. Data obtained via customer, specification sheet, previous regulatory filing or other.*

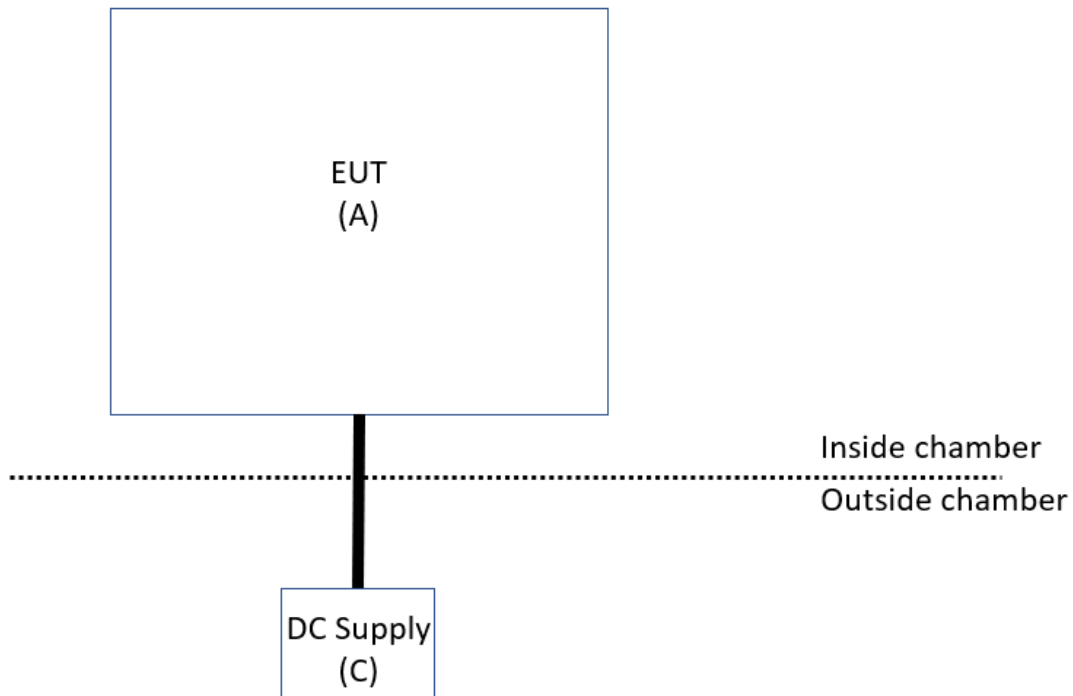
### 2.4 Operating Modes and Conditions

Using test commands through the Linux backbone, the EUT was programmed to transmit on low, mid and high channels. During testing the radio was configured for max power.

### 2.5 EUT Connection Block Diagram – Conducted Measurements



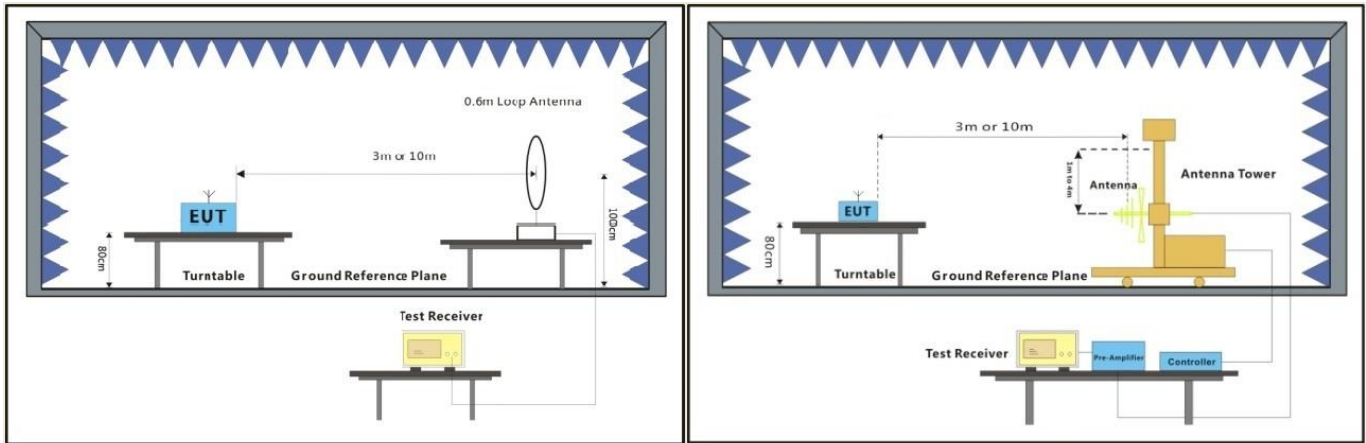
### 2.6 EUT Connection Block Diagram – Radiated Measurements



## 2.7 System Configurations

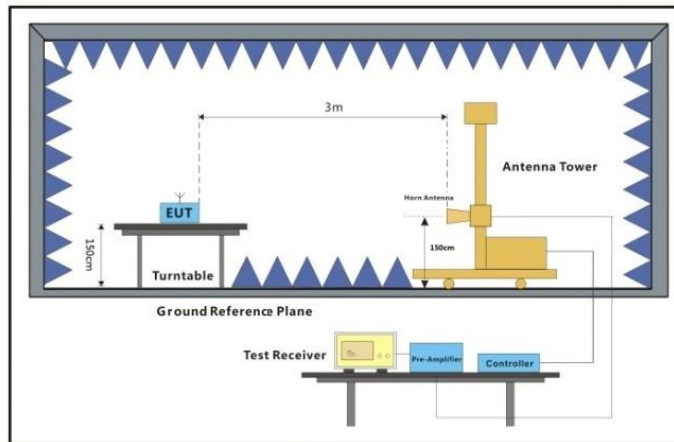
Device reference	Manufacturer	Description	Model Number	Serial Number
A	Deere & Company	JDLink™ R Modem - 4G	MA4M	PCMA4MA101503 (Radiated); PCMA4MA101508 (Conducted)
B	KEYSIGHT	EXA Signal Analyzer	N9010B	MY57110193
C	Rigol	DC Power Supply	DP711	DP7A202200419

## 2.8 Configuration Diagrams (Radiated)



Below 30MHz

30MHz-1GHz



Above 1GHz

### 3 Bandwidth

#### 3.1 Test Result

Test Description	Test Specification		Test Result
6 dB Bandwidth 99% Occupied Bandwidth	15.247(a)(2)	RSS-247 5.2(a) RSS-GEN 6.7	Compliant

#### 3.2 Test Method

The procedures from ANSI C63.10: 2013 clause 11.8 and 558074 D01 DTS Meas Guidance v05r2 were used to determine the 6 dB bandwidth.

The procedures from ANSI C63.10: 2013 clause 6.9.2 were used to measure the 99% Occupied Bandwidth.

#### 3.3 Test Site

EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.6 °C

Relative Humidity: 48.4 %

Atmospheric Pressure: 98.98 kPa

#### 3.4 Test Equipment

Test End Date: 4-Nov-2022

Tester: AB

Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
RF CABLE (TS8997)	141	HUBER & SUHNER	B095588	5-Jul-2022	5-Jul-2023
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	7-Dec-2022	7-Dec-2023
ATTENUATOR, 10DB (TS8997)	10DB	ROHDE & SCHWARZ	B095593	12-May-2022	12-May-2023
DC POWER SUPPLY, PROGRAMMABLE	DP711	RIGOL	18027	CNR	CNR
TSTPASS SWITCHBOX	SB1	TSTPASS	20168	CNR	CNR

Software Profile:

TSTPASS Version: 1.1.0, build 2020.11.15.01

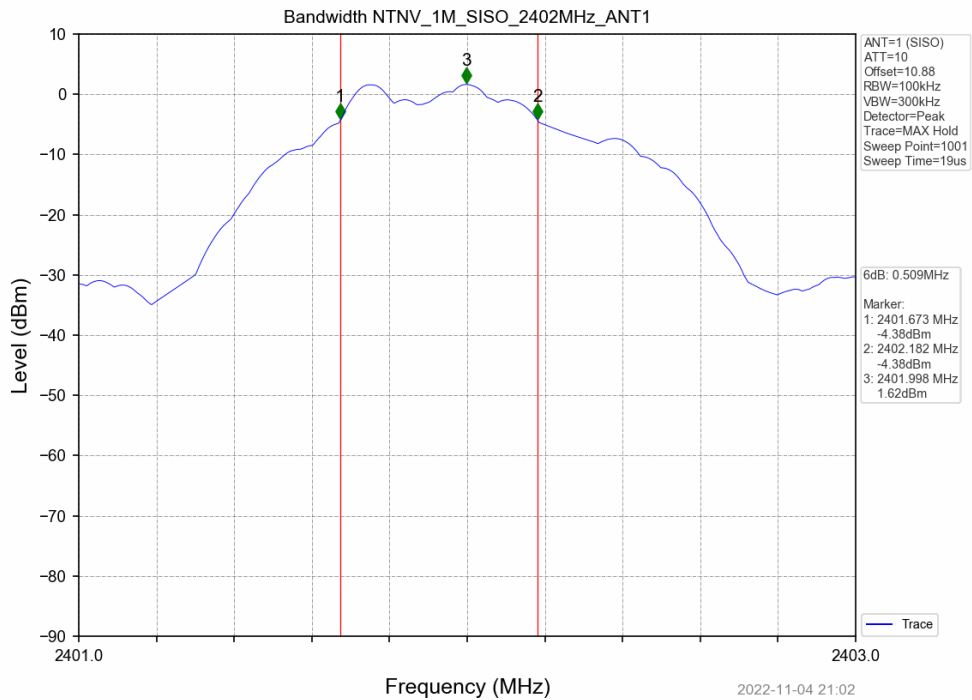


### 3.5 Test Data – 6dB Bandwidth

Frequency (MHz)	TX Type	ANT No.	6dB BW (MHz)	Limit (MHz)	Verdict
2402	SISO	WF2	0.509	≥0.5	PASS
2440	SISO	WF2	0.510	≥0.5	PASS
2480	SISO	WF2	0.514	≥0.5	PASS

#### Sample Plot

#### Low Channel (2402MHz)



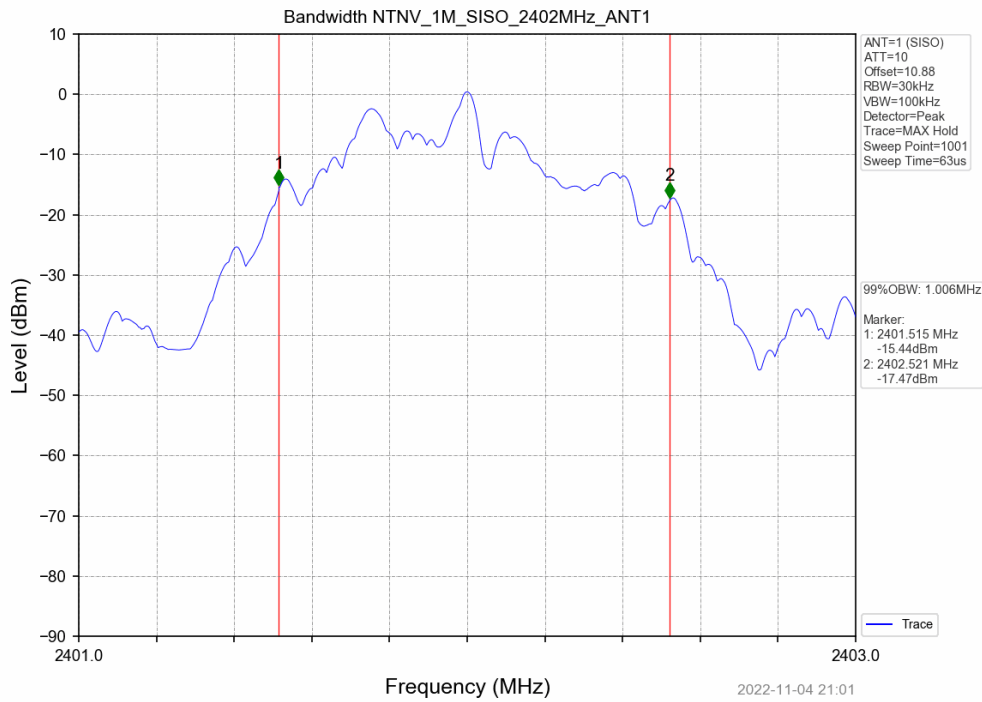
Note: WF2 (WiFi port 2 is the primary 2.4GHz port)

### 3.6 Test Data – 99% Bandwidth

Frequency (MHz)	TX Type	ANT No.	6dB BW (MHz)	Limit (MHz)	Verdict
2402	SISO	WF2	1.006	≥0.5	Reported
2440	SISO	WF2	1.009	≥0.5	Reported
2480	SISO	WF2	1.011	≥0.5	Reported

#### Sample Plot

#### Low Channel (2402MHz)



## 4 Peak Output Power

### 4.1 Test Result

Test Description	Test Specification		Test Result
Peak Output Power	15.247(b)(3)	RSS-247 S5.4 (d)	Compliant

### 4.2 Test Method

Fundamental peak power measurements were recorded using the procedures from ANSI C63.10: 2013 clause 11.9 and KDB 558074 D01 Measurement Guidance v05r2.

#### Limit

(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. For using antennas with greater than 6dBi of gain, the limit is reduced in dB by the amount the gain exceeds 6dBi (e.g. for a 7.4dBi antenna, the limit is reduced from 30dBm to 28.6dBm)

### 4.3 Test Site

EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.6 °C

Relative Humidity: 48.4 %

Atmospheric Pressure: 98.98 kPa

### 4.4 Test Equipment

Test End Date: 4-Nov-2022

Tester: AB

Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
RF CABLE (TS8997)	141	HUBER & SUHNER	B095588	5-Jul-2022	5-Jul-2023
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	7-Dec-2022	7-Dec-2023
ATTENUATOR, 10DB (TS8997)	10DB	ROHDE & SCHWARZ	B095593	12-May-2022	12-May-2023
DC POWER SUPPLY, PROGRAMMABLE	DP711	RIGOL	18027	CNR	CNR
TSTPASS SWITCHBOX	SB1	TSTPASS	20168	CNR	CNR

Software Profile:

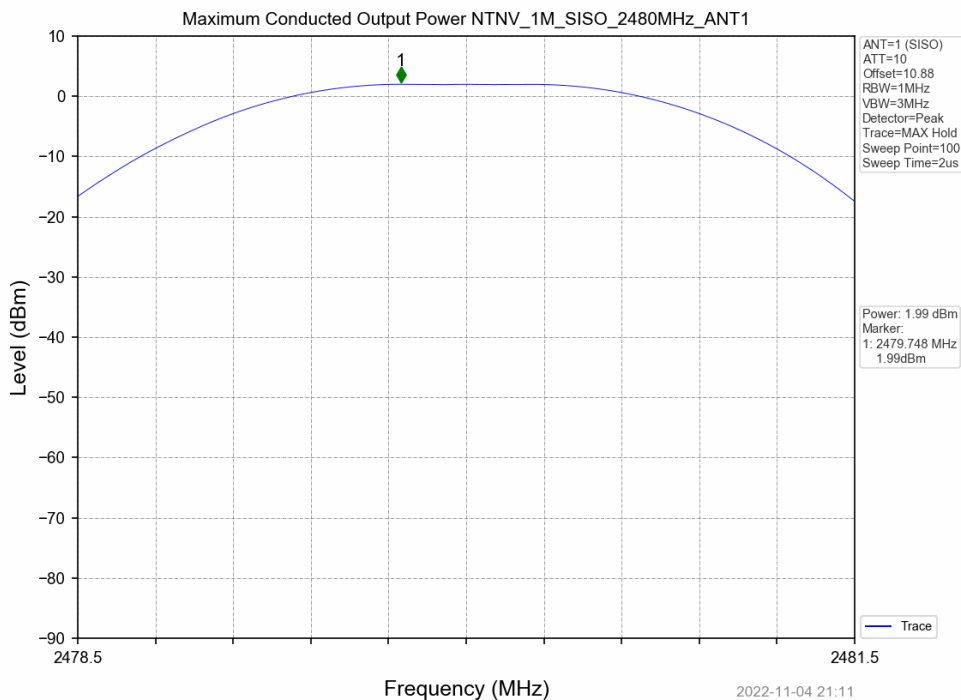
TSTPASS Version: 1.1.0, build 2020.11.15.01

### 4.5 Test Data

Frequency (MHz)	TX Type	ANT No.	Peak Output Power (dBm)	Limit (dBm)	Verdict
2402	SISO	WF2	1.65	30	PASS
2440	SISO	WF2	2.81	30	PASS
2480	SISO	WF2	1.99	30	PASS

### Sample Plot

#### High Channel (2480MHz)



## 5 Power Spectral Density

### 5.1 Test Result

Test Description	Test Specification		Test Result
Power Spectral Density	15.247(e)	RSS-247 S5.2 (b)	Compliant

### 5.2 Test Method

Power spectral density measurements were recorded using the procedures from ANSI C63.10: 2013 clause 11.10 and KDB 558074 D01 Measurement Guidance v05r2.

#### Limit

The limit is 8 dBm.

### 5.3 Test Site

EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.6 °C

Relative Humidity: 48.4 %

Atmospheric Pressure: 98.98 kPa

### 5.4 Test Equipment

Test End Date: 4-Nov-2022

Tester: AB

Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
RF CABLE (TS8997)	141	HUBER & SUHNER	B095588	5-Jul-2022	5-Jul-2023
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	7-Dec-2022	7-Dec-2023
ATTENUATOR, 10DB (TS8997)	10DB	ROHDE & SCHWARZ	B095593	12-May-2022	12-May-2023
DC POWER SUPPLY, PROGRAMMABLE	DP711	RIGOL	18027	CNR	CNR
TSTPASS SWITCHBOX	SB1	TSTPASS	20168	CNR	CNR

Software Profile:

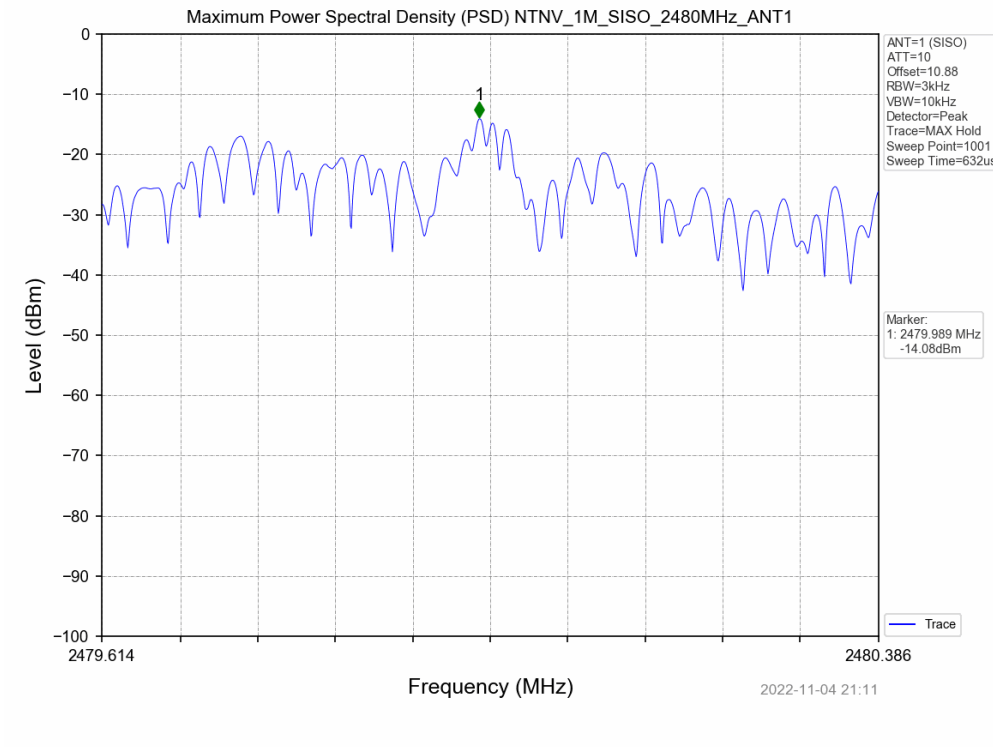
TSTPASS Version: 1.1.0, build 2020.11.15.01

### 5.5 Test Data

Frequency (MHz)	TX Type	ANT No.	Peak PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
2402	SISO	WF2	-14.11	≤8	PASS
2440	SISO	WF2	-13.09	≤8	PASS
2480	SISO	WF2	-14.08	≤8	PASS

### Sample Plot

#### High Channel (2480MHz)



## 6 Conducted Spurious Emissions / Band Edge

### 6.1 Test Result

Test Description	Test Specification		Test Result
Conducted Spurious Emissions	15.247(d)	RSS-247 S5.5	Compliant

### 6.2 Test Method

Spurious emissions in non-restricted frequency bands were recorded using the methods defined in ANSI C63.10: 2013 clause 11.11 and KDB 558074 D01 Measurement Guidance v05r2.

Lowest, middle, and highest channels were investigated.

Because the maximum conducted peak output power was used to determine compliance with the output power limits, the limit in any 100 kHz band outside of the authorized band is 20 dB below the maximum in-band peak level.

### 6.3 Test Site

SGS EMC Laboratory, Suwanee, GA

#### Environmental Conditions

Temperature: 22.6 °C

Relative Humidity: 48.4 %

Atmospheric Pressure: 98.98 kPa

#### Test Equipment

Test End Date: 4-Nov-2022

Tester: AB

Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
RF CABLE (TS8997)	141	HUBER & SUHNER	B095588	5-Jul-2022	5-Jul-2023
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	7-Dec-2022	7-Dec-2023
ATTENUATOR, 10DB (TS8997)	10DB	ROHDE & SCHWARZ	B095593	12-May-2022	12-May-2023
DC POWER SUPPLY, PROGRAMMABLE	DP711	RIGOL	18027	CNR	CNR
TSTPASS SWITCHBOX	SB1	TSTPASS	20168	CNR	CNR

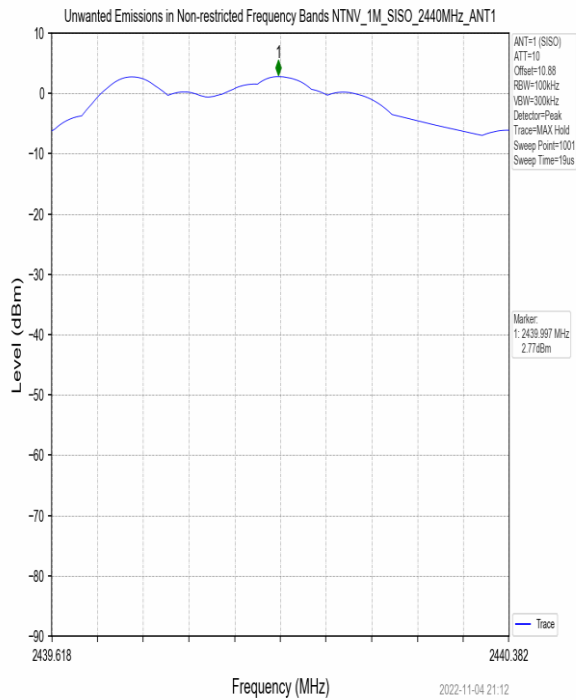
#### Software Profile:

TSTPASS Version: 1.1.0, build 2020.11.15.01

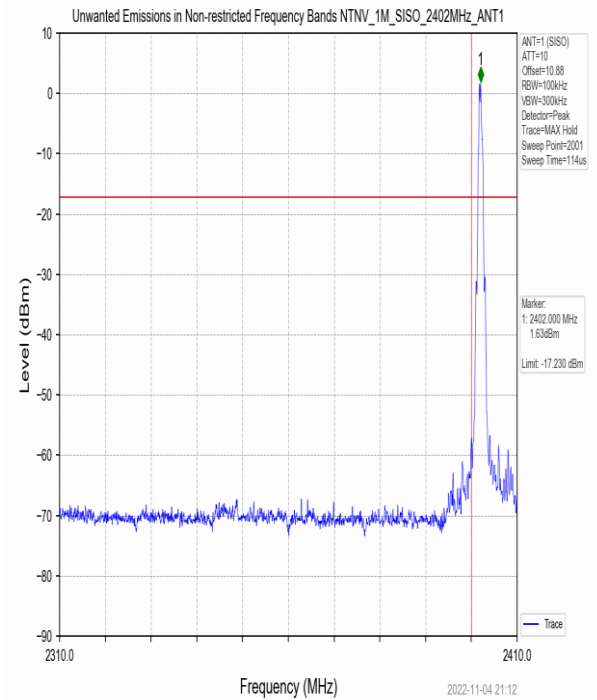
### 6.4 Test Data

Frequency (MHz)	TX Type	ANT No.	Spurious Conducted Emission (dBm)	Limit (dBm)	Verdict
2402	SISO	WF2	Refer to test graph	-17.23	PASS
2440	SISO	WF2	Refer to test graph	-17.23	PASS
2480	SISO	WF2	Refer to test graph	-17.23	PASS

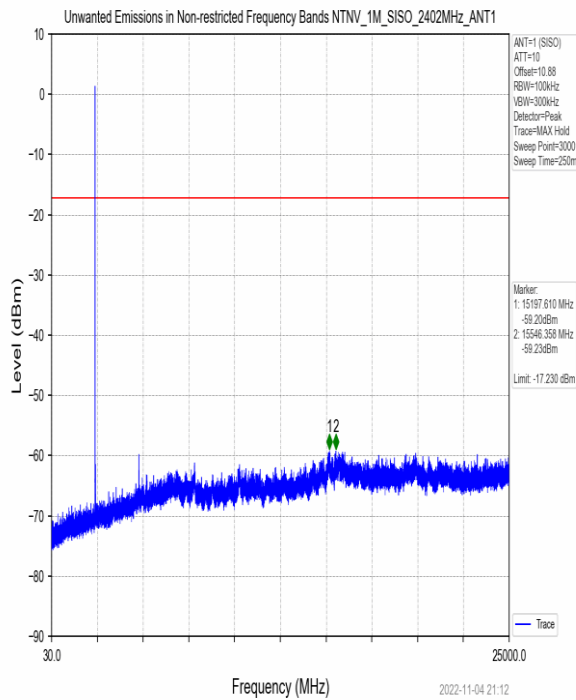
### In-Band Reference



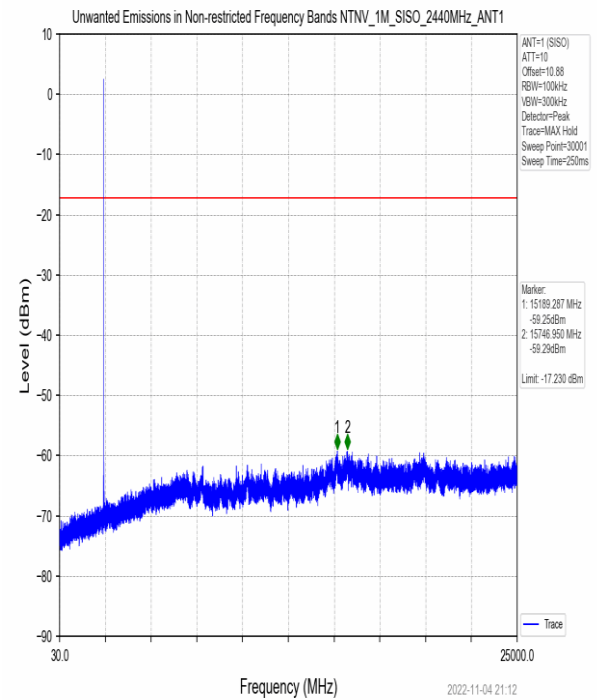
### Lower Band Edge - Low Channel (2402MHz)



### Full Spectrum - Low Channel (2402MHz)

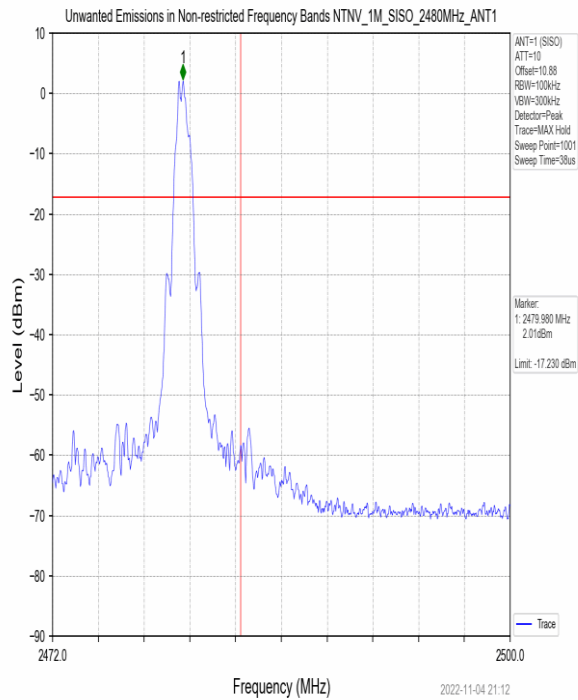


### Full Spectrum - Mid Channel (2440MHz)

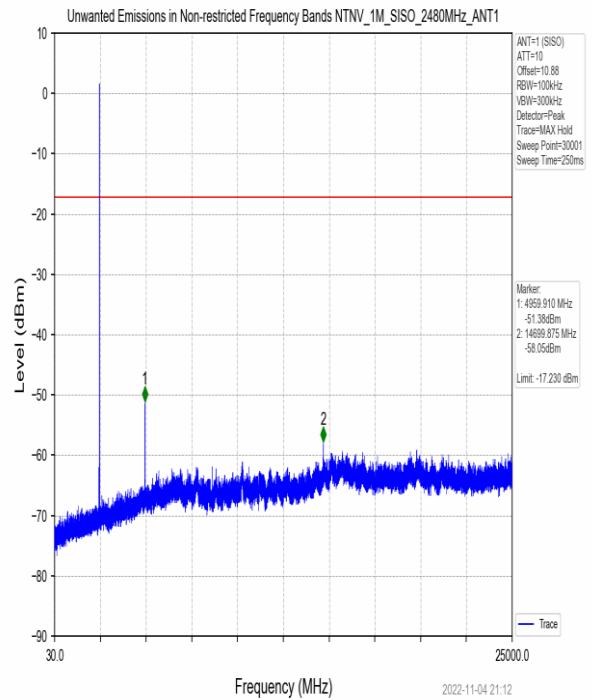




Upper Band Edge – High Channel (2480MHz)



Full Spectrum - High Channel (2480MHz)



## 7 Field Strength of Spurious Radiation (Restricted Bands)

### 7.1 Test Result

Test Description	Test Specification		Test Result
Radiated Spurious Emissions	15.247(d) and 15.209	RSS-247 S5.5	Compliant

### 7.2 Test Method

The measurement methods defined in ANSI C63.10: 2013 were used.

Lowest, middle, and highest channels were investigated – the device was commanded to continuously transmit on low, middle, and high channels.

Test distance:

- 9k to 30 MHz – The EUT to measurement antenna distance was 3 meters
- 30 to 1000 MHz - The EUT to measurement antenna distance was 3 meters
- 1 to 18 GHz - The EUT to measurement antenna distance was 3 meters
- 18 to 26 GHz - The EUT to measurement antenna distance was 3 meters

Limits within restricted bands of operation:

Frequency	Limits <sup>(1)</sup>		Peak Limits dBuV/m
	Microvolts/m	dBuV/m	
30 - 88 MHz	100	40 <sup>(2)</sup>	--
88 - 216 MHz	150	43.5 <sup>(2)</sup>	--
216 - 960 MHz	200	46 <sup>(2)</sup>	--
960 - 1000 MHz	500	54 <sup>(2)</sup>	--
1 - 40 GHz	500	54 <sup>(3)</sup>	74

(1) These limits are applicable to emissions outside of the intentional transmit frequency band.

(2) Quasi-peak limit

(3) Average limit

### 7.3 Test Site

10m Absorber Lined Shielded Enclosure (ALSE), Suwanee, GA

3m Absorber Lined Shielded Enclosure (ALSE), Suwanee, GA

Environmental Conditions	9kHz-30MHz	30-1000MHz	1-18GHz
Temperature:	21.39°C	24.7 °C	21.22°C
Relative Humidity:	38.8%	36.9 %	40.5%
Atmospheric Pressure:	97.9 kPa	98.0 kPa	98.6kPa

## 7.4 Test Equipment

### 9kHz-30MHz

Test End Date: 28-Nov-2022

Tester: PL

Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
ANTENNA, LOOP, ACTIVE	6502	ETS LINDGREN	B085752	11-Aug-2022	11-Aug-2024
N to N RF Cable	NC12-N1N1-276	MEGAPHASE	22001	9-Jan-2023	9-Jan-2024
RF CABLE NM TO NF, 0.01-18GHZ	90-213-118	TELEDYNE STORM MICROWAVE	20117	13-Feb-2023	13-Feb-2024
RF CABLE NM TO NM, 0.01-18GHZ	90-195-079	TELEDYNE STORM MICROWAVE	20123	9-Feb-2023	9-Feb-2024
EMI TEST RECEIVER	ESW44	ROHDE & SCHWARZ	22027	13-Sep-2022	13-Sep-2023
SOFTWARE	TILE 7	ETS LINDGREN	N/A	CNR	CNR

### 30MHz-1000MHz

Test End Date: 18-Nov-2022

Tester: ZH

Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
ANTENNA, BILOG	JB6	SUNOL	B079690	19-Apr-2022	19-Apr-2024
N to N RF Cable	NC12-N1N1-276	MEGAPHASE	22001	9-Jan-2023	9-Jan-2024
RF CABLE NM TO NF, 0.01-18GHZ	90-213-118	TELEDYNE STORM MICROWAVE	20117	13-Feb-2023	13-Feb-2024
RF CABLE NM TO NM, 0.01-18GHZ	90-195-079	TELEDYNE STORM MICROWAVE	20123	9-Feb-2023	9-Feb-2024
RF CABLE RIGHT ANGLE NM TO NM, 0.01-18GHZ	90-076-020	TELEDYNE STORM MICROWAVE	20132	16-Mar-2022	16-Mar-2023
LOW NOISE AMPLIFIER	ZKL-2+	MINI-CIRCUITS	B079800	14-Sep-2022	14-Sep-2023
EMI TEST RECEIVER	ESU8	ROHDE & SCHWARZ	B085759	8-Sep-2022	8-Sep-2023
SOFTWARE	TILE 7	ETS LINDGREN	N/A	CNR	CNR

### Above 1GHz

Test End Date: 10-Nov-2022

Tester: PL

Equipment	Model	Manufacturer	Asset Number	Cal Date	Cal Due Date
ANTENNA, DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079691	15-Aug-2022	15-Aug-2024
RF CABLE NM TO NF, 0.01-18GHZ	90-213-118	TELEDYNE STORM MICROWAVE	20118	16-Mar-2022	16-Mar-2023
RF CABLE NM TO NM, 0.01-18GHZ	90-195-118	TELEDYNE STORM MICROWAVE	20126	14-Feb-2022	14-Feb-2023
RF CABLE RIGHT ANGLE NM TO NM, 0.01-18GHZ	90-076-020	TELEDYNE STORM MICROWAVE	20131	16-Mar-2022	16-Mar-2023
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	B094463	13-Jul-2022	13-Jul-2023
EMI TEST RECEIVER	ESW44	ROHDE & SCHWARZ	22027	13-Sep-2022	13-Sep-2023
FILTER, HIGH PASS, >2800MHZ	HPM50111	MICRO-TRONICS	22017	16-Jun-2022	16-Jun-2023
ANTENNA, HORN (SMALL)	LB-180400-20-C-KF	A-INFO	15007	18-Apr-2022	18-Apr-2024
RF CABLE SMA TO SMA, 0.01-40GHZ	084-0505-138	TELEDYNE STORM MICROWAVE	20111	16-Mar-2022	16-Mar-2023
RF CABLE SMA TO SMA, 0.01-40GHZ	084-0505-059	TELEDYNE STORM MICROWAVE	20108	16-Mar-2022	16-Mar-2023
LOW NOISE AMPLIFIER	NSP1840-HG	MITEQ	B087572	13-Oct-2022	13-Oct-2023
SOFTWARE	TILE 7	ETS LINDGREN	N/A	CNR	CNR

#### Software Profile:

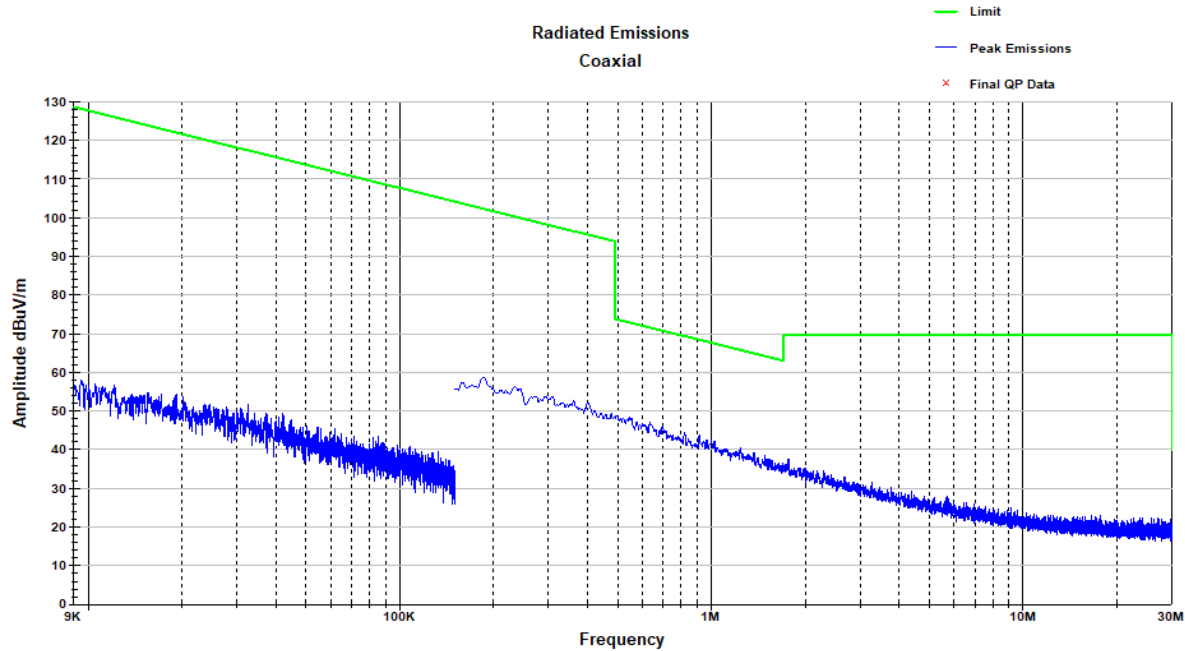
“RSE 9k - 30M 220804” ETS-Lindgren TILE! v7.6.0.14 profile dated 04 August 2022

“RSE 30-1000 MHz T7 220318” ETS-Lindgren TILE! v7.6.0.14 profile dated 18 March 2022

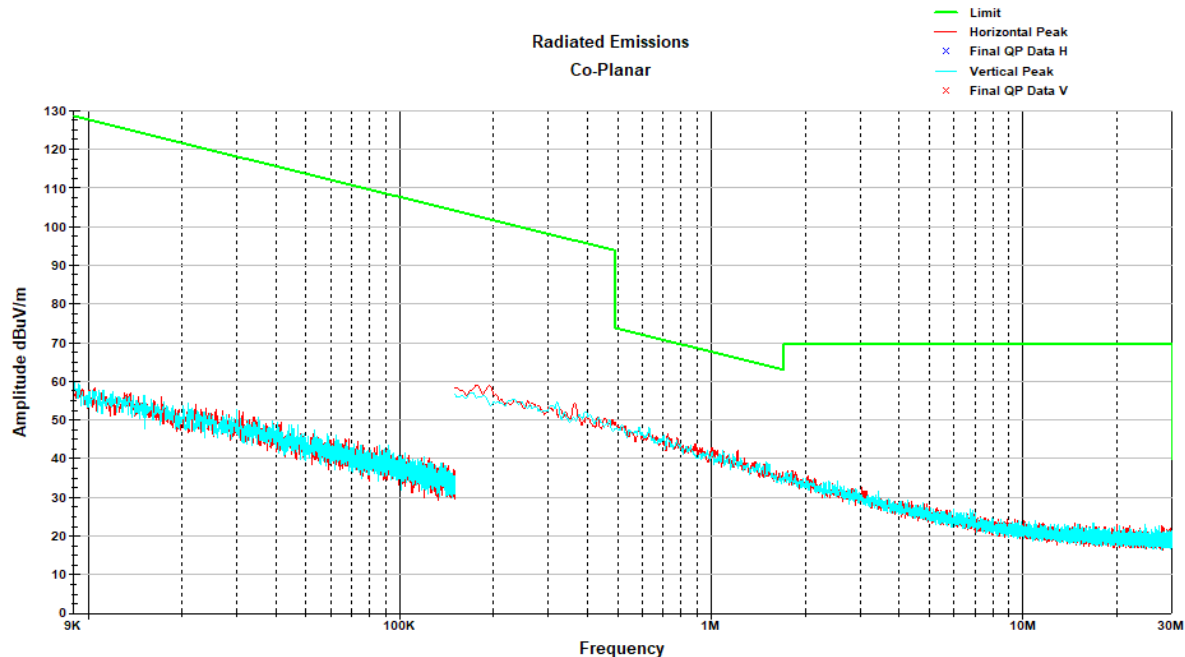
“RSE 1-18 GHz T7 210212” ETS-Lindgren TILE! v7.6.0.14 profile dated 12 February 2021

### 7.5 Test Data – Peak Plots

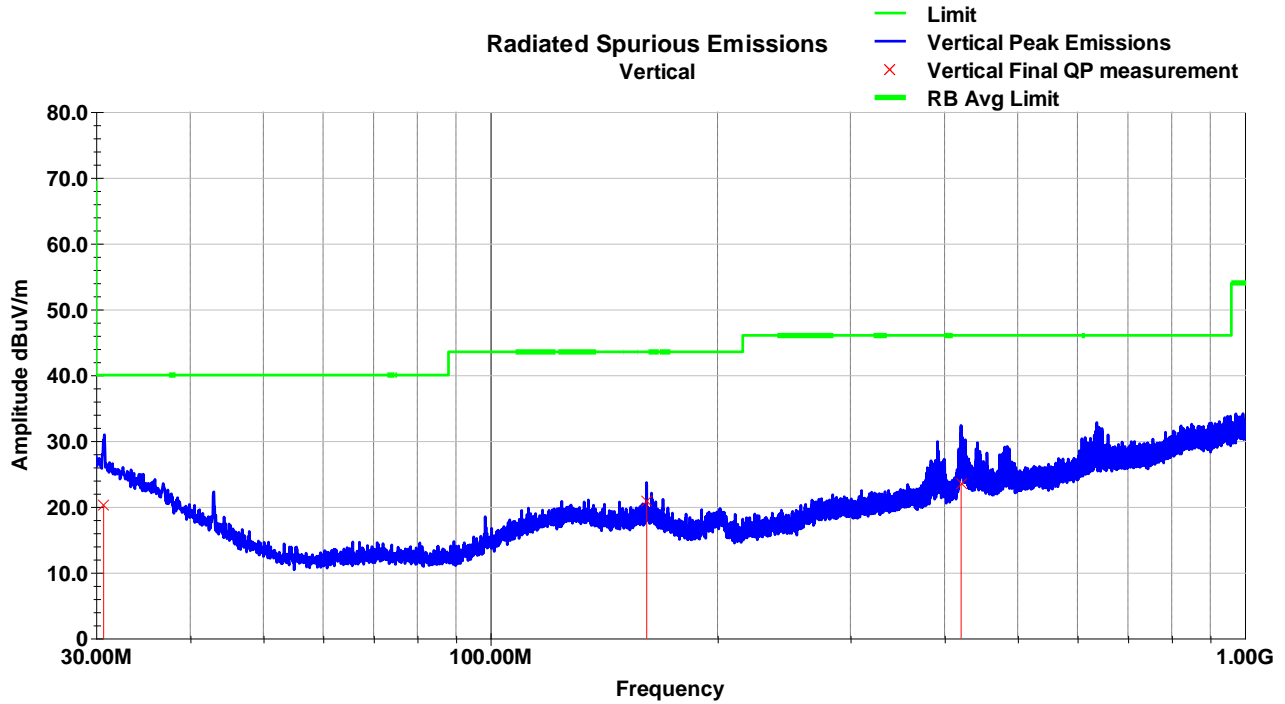
Between 9kHz and 1000MHz, there was no significant deviation with respect to axis or channel  
 Co-Axial Radiated Spurious Emissions – 9kHz-30MHz (LCH)



Co-Planar Radiated Spurious Emissions – 9kHz-30MHz (LCH)



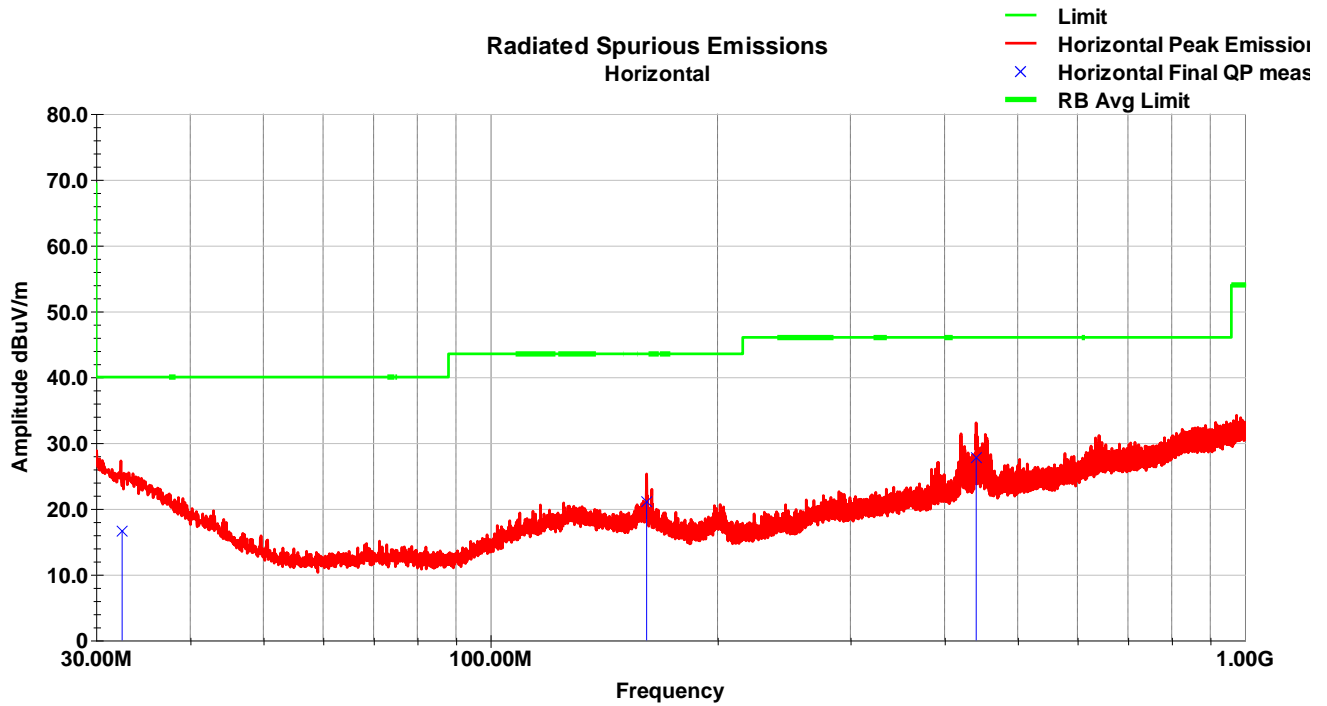
Vertical Radiated Spurious Emissions Plots – 30-1000MHz (LCH)



Vertical Radiated Spurious Emissions Data – 30-1000MHz (LCH)

Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.71	24.9	V	199.0	129.0	25.5	0.6	30.9	20.1	40.0	-19.9
161.13	33.9	V	12.0	220.0	16.7	1.6	31.5	20.8	43.5	-22.7
420.75	31.6	V	18.0	113.0	20.7	2.7	31.4	23.6	46.0	-22.5
QP Value = Raw QP + AF + Loss - Amp										
Margin = QP Value - Limit										

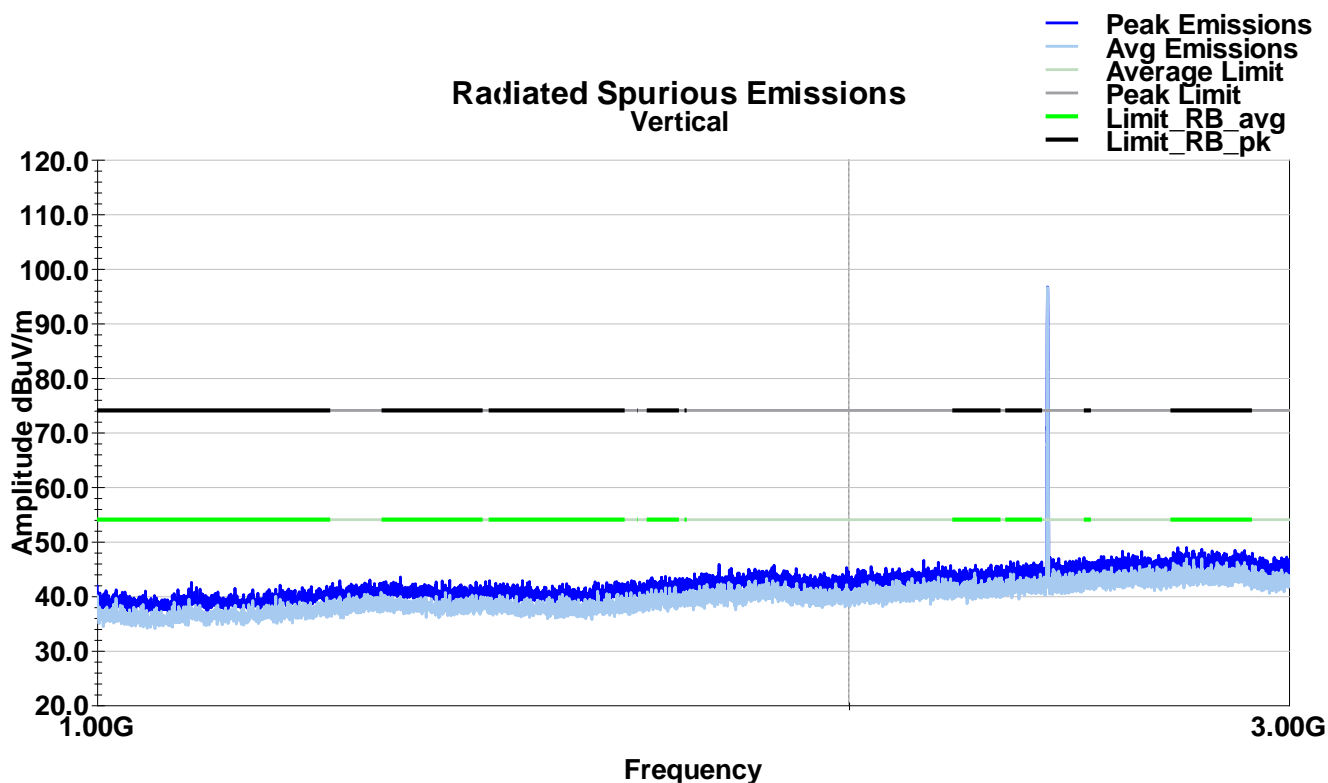
Horizontal Radiated Spurious Emissions Plots – 30-1000MHz (LCH)



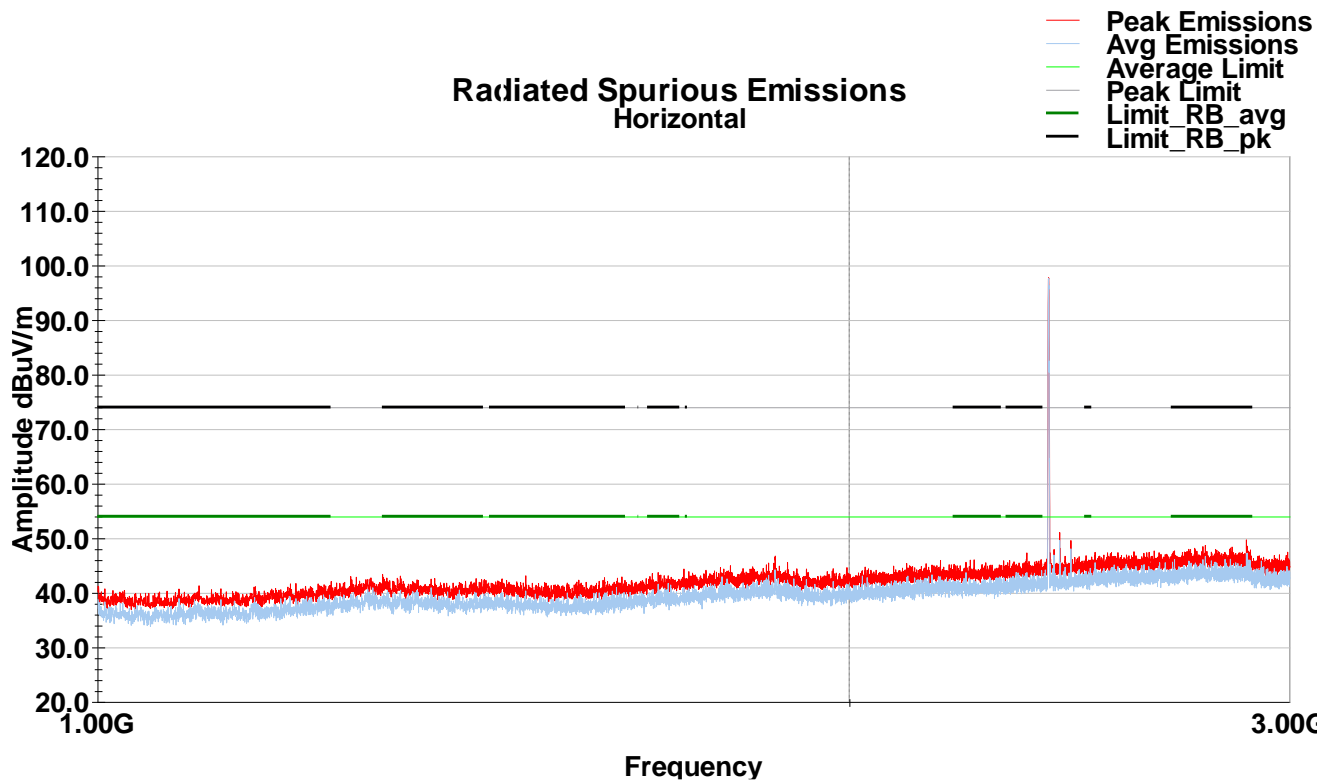
Horizontal Radiated Spurious Emissions Data – 30-1000MHz (LCH)

Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
32.49	22.6	H	285.0	246.0	24.3	0.7	30.9	16.6	40.0	-23.4
161.09	34.3	H	147.0	128.0	16.7	1.6	31.5	21.1	43.5	-22.4
440.49	35.2	H	166.0	100.0	21.2	2.7	31.4	27.7	46.0	-18.3
QP Value = Raw QP + AF + Loss - Amp										
Margin = QP Value - Limit										

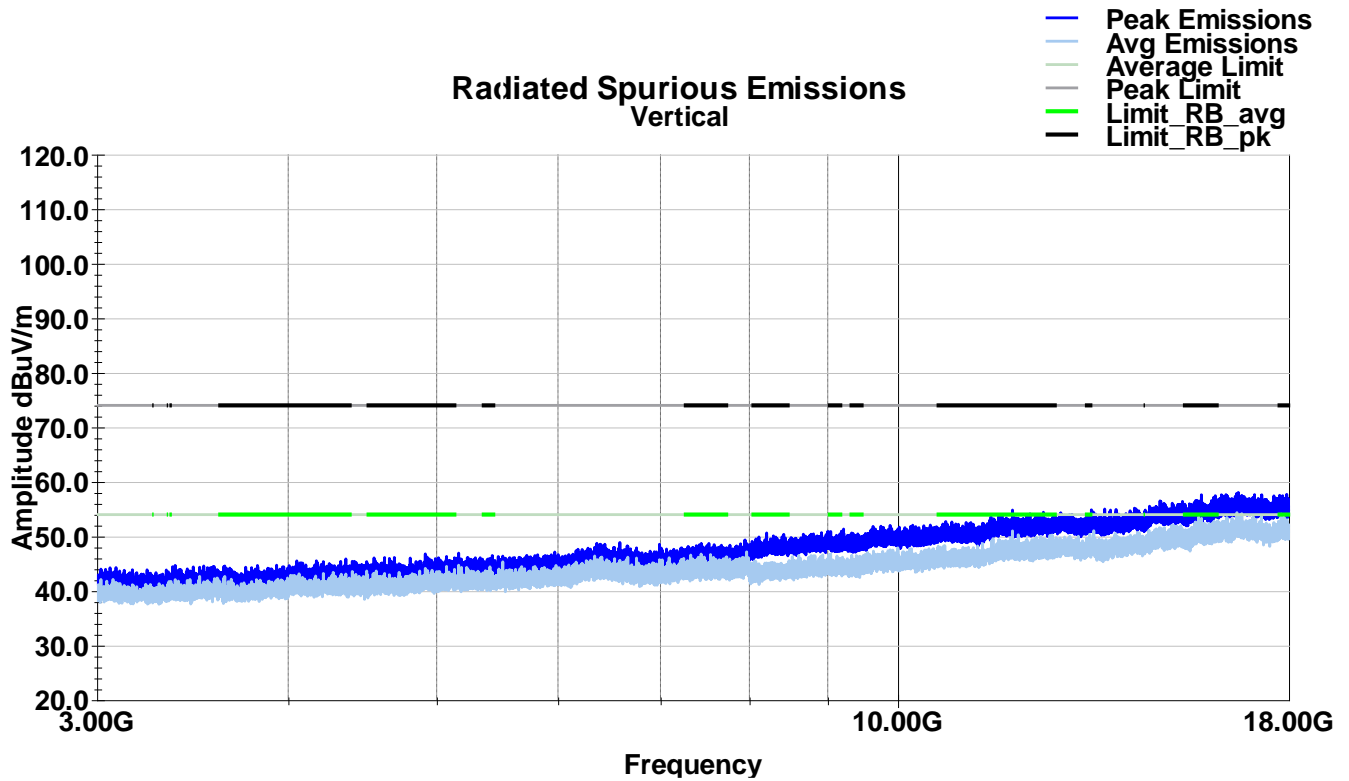
Vertical Radiated Spurious Emissions – 1-3GHz (LCH)



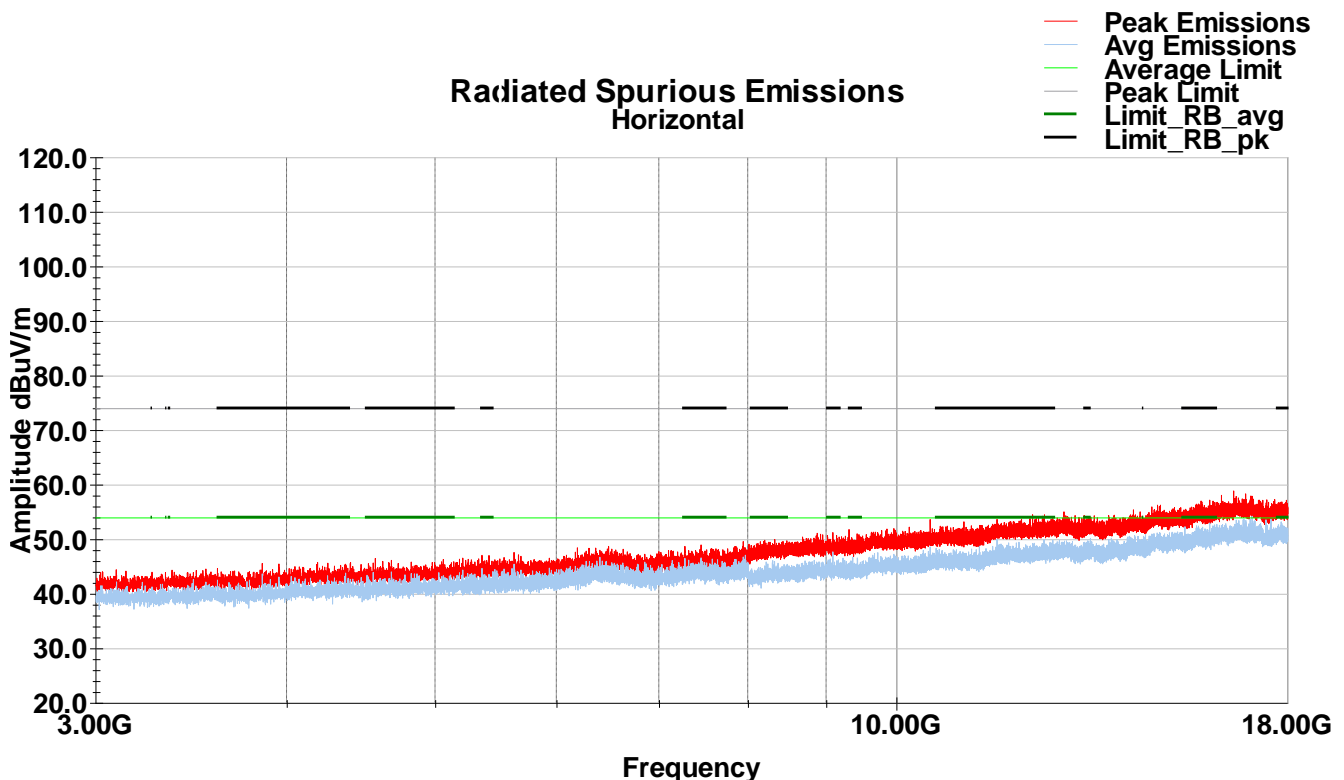
Horizontal Radiated Spurious Emissions – 1-3GHz (LCH)



Vertical Radiated Spurious Emissions – 3-18GHz (LCH)



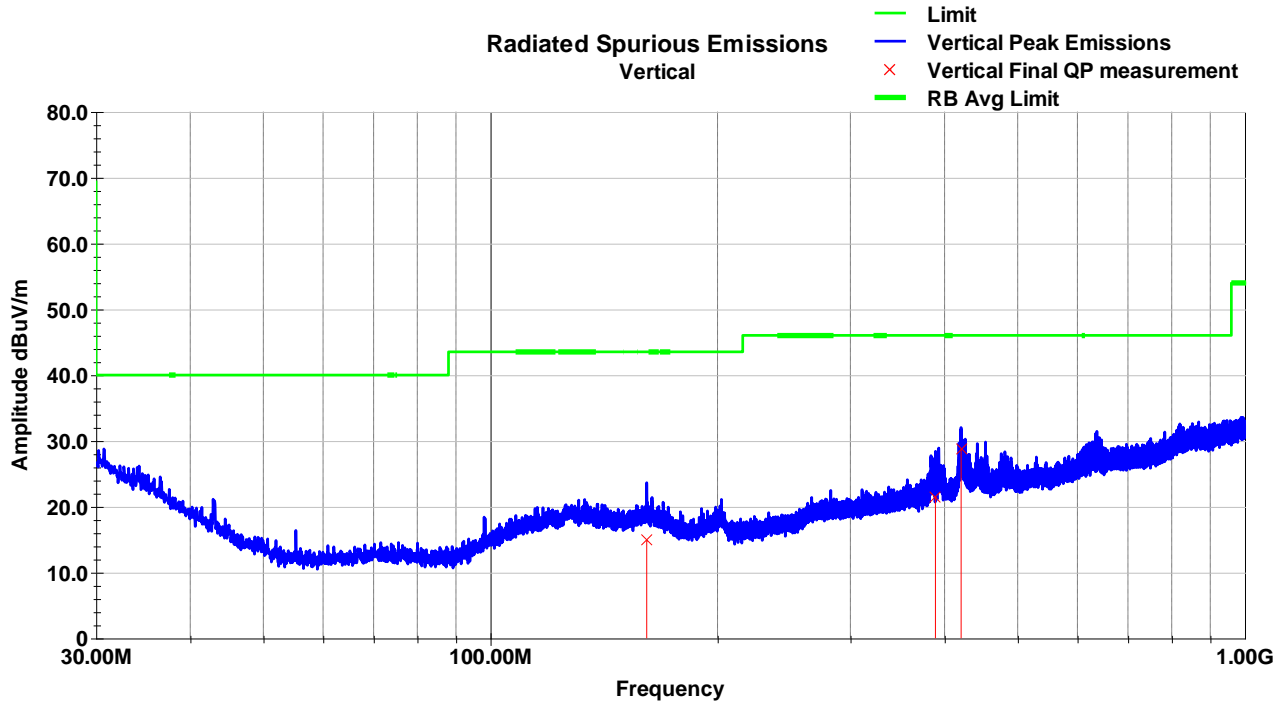
Horizontal Radiated Spurious Emissions – 3-18GHz (LCH)





No discernible emissions detected from 18GHz – 26GHz.

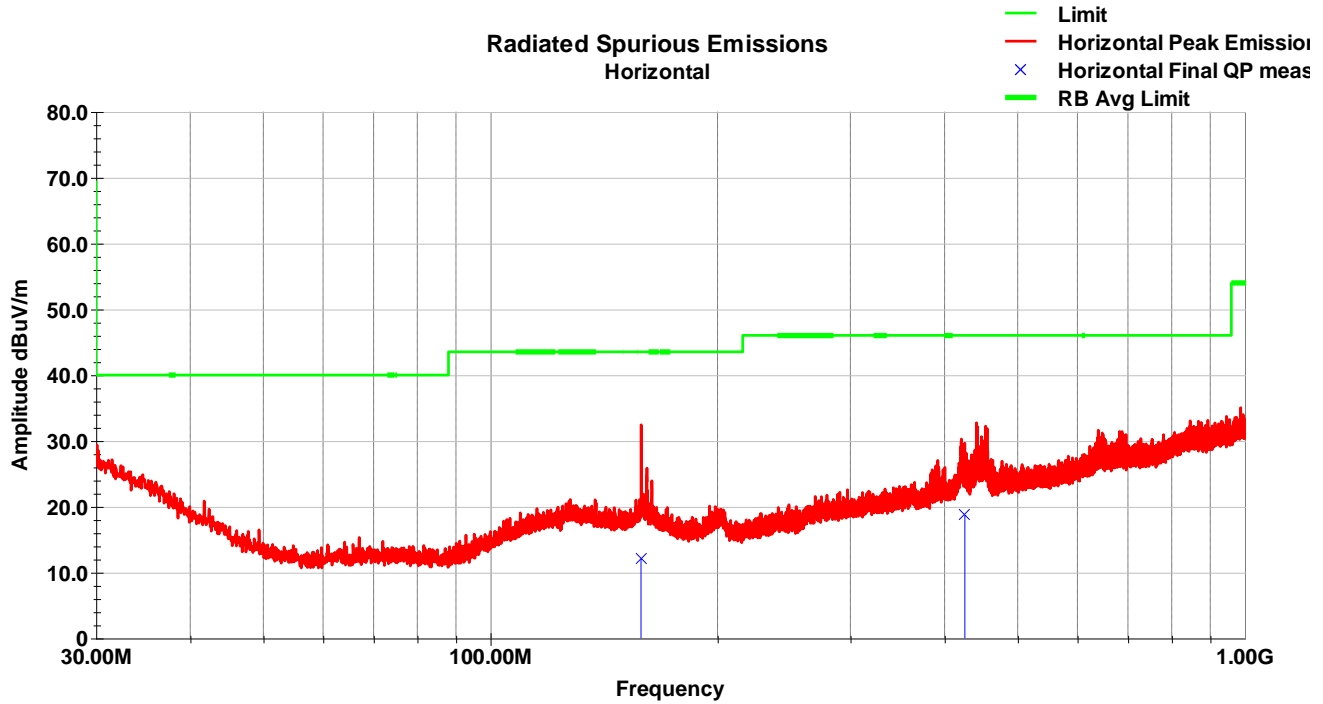
Vertical Radiated Spurious Emissions Plots – 30-1000MHz (MCH)



Vertical Radiated Spurious Emissions Data – 30-1000MHz (MCH)

Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
161.12	28.0	V	127.0	160.0	16.7	1.6	31.5	14.9	43.5	-28.6
389.03	30.3	V	165.0	114.0	20.0	2.6	31.4	21.5	46.0	-24.5
420.75	36.8	V	142.0	100.0	20.7	2.7	31.4	28.8	46.0	-17.2
QP Value = Raw QP + AF + Loss - Amp										
Margin = QP Value - Limit										

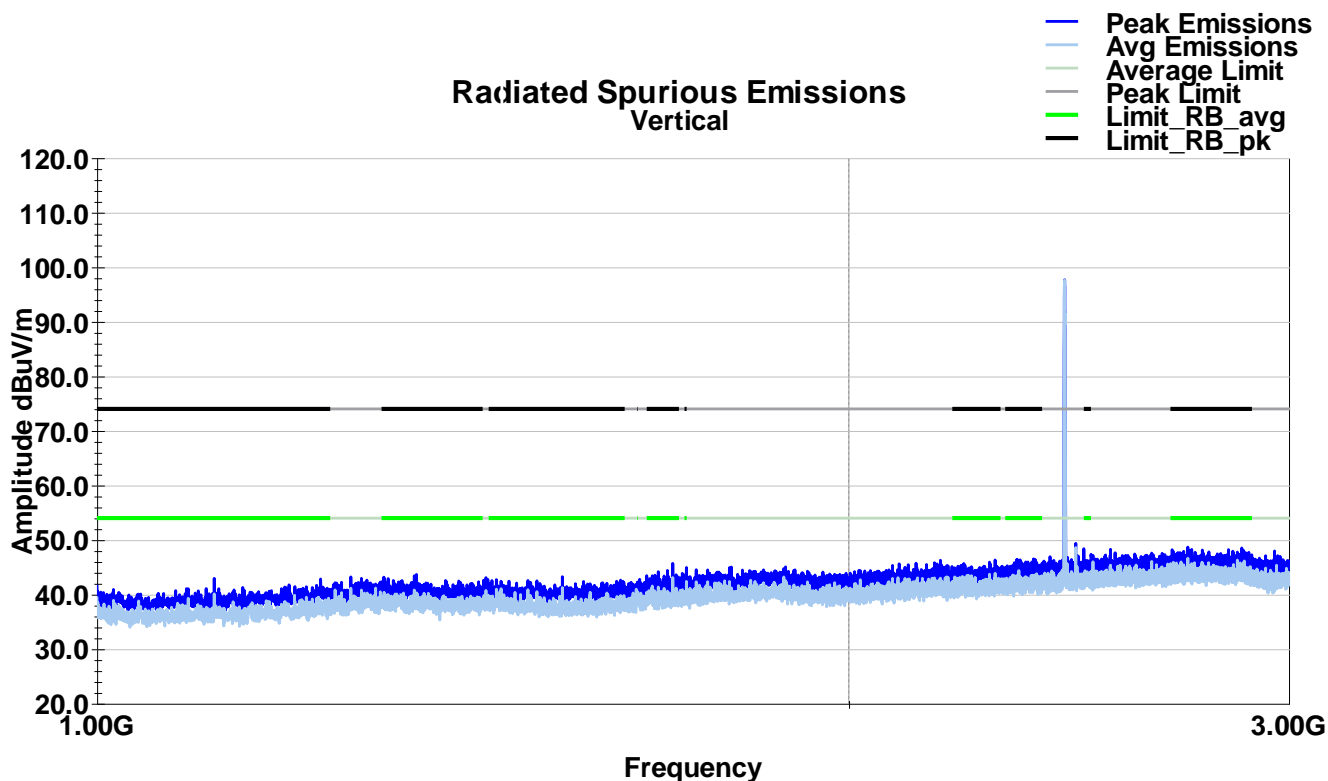
Horizontal Radiated Spurious Emissions Plots – 30-1000MHz (MCH)



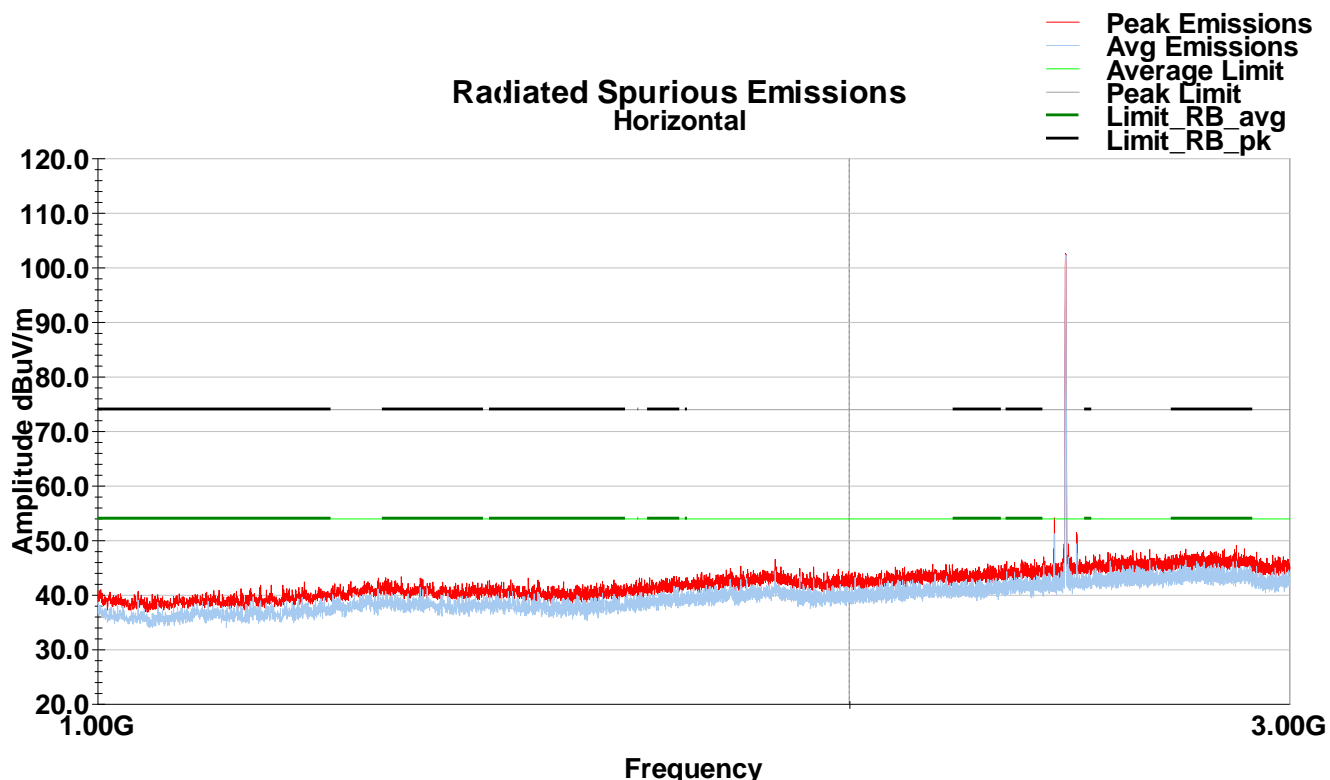
Horizontal Radiated Spurious Emissions Data – 30-1000MHz (MCH)

Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
158.35	25.1	H	331.0	172.0	16.8	1.6	31.5	12.1	43.5	-31.4
425.52	26.6	H	284.0	100.0	20.8	2.7	31.4	18.7	46.0	-27.3
QP Value = Raw QP + AF + Loss - Amp										
Margin = QP Value - Limit										

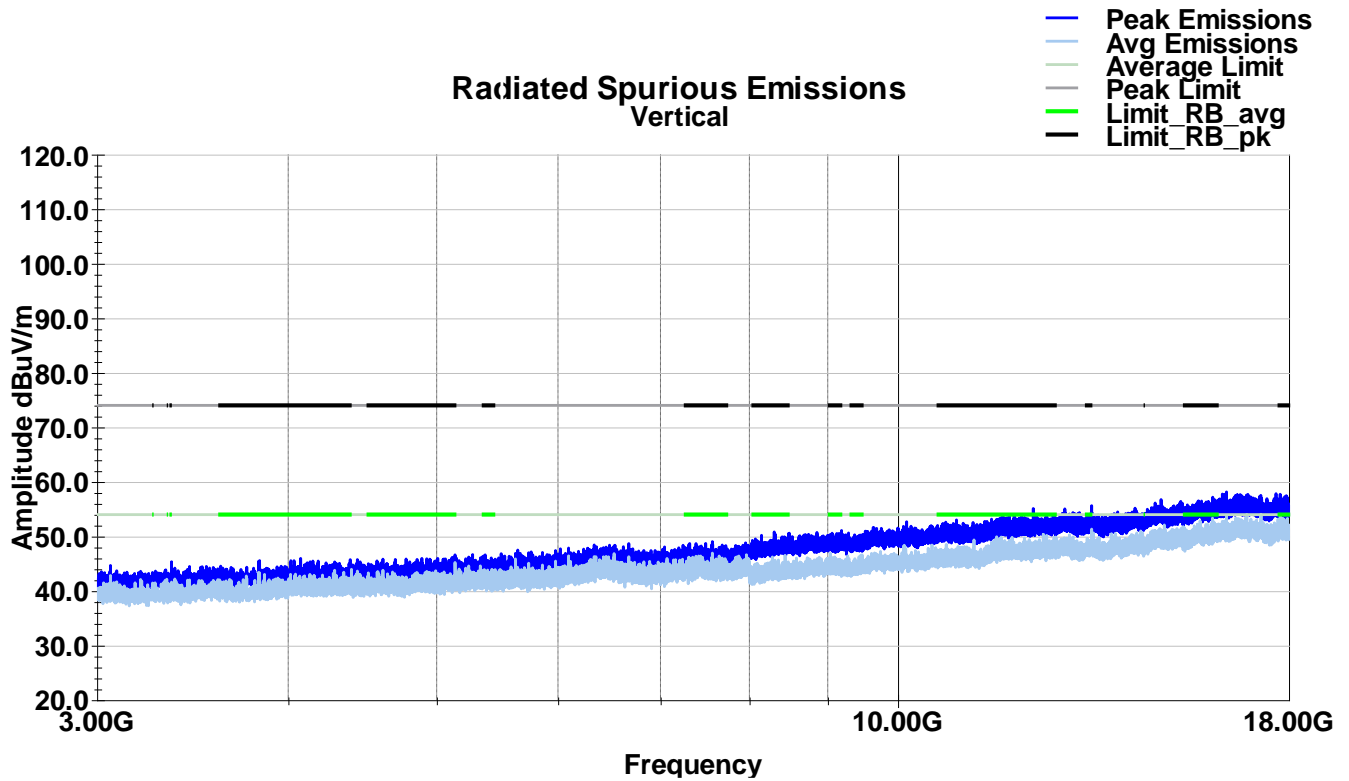
Vertical Radiated Spurious Emissions – 1-3GHz (MCH)



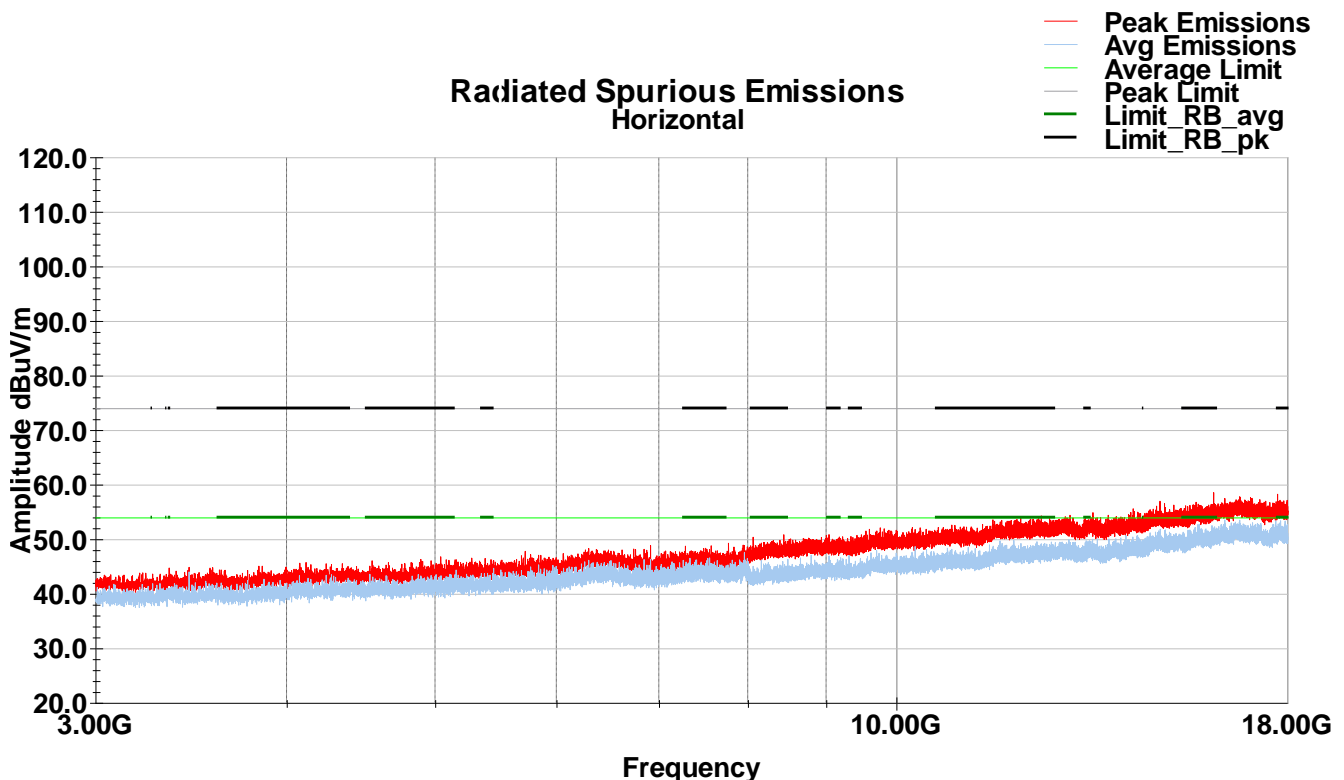
Horizontal Radiated Spurious Emissions – 1-3GHz (MCH)



Vertical Radiated Spurious Emissions – 3-18GHz (MCH)

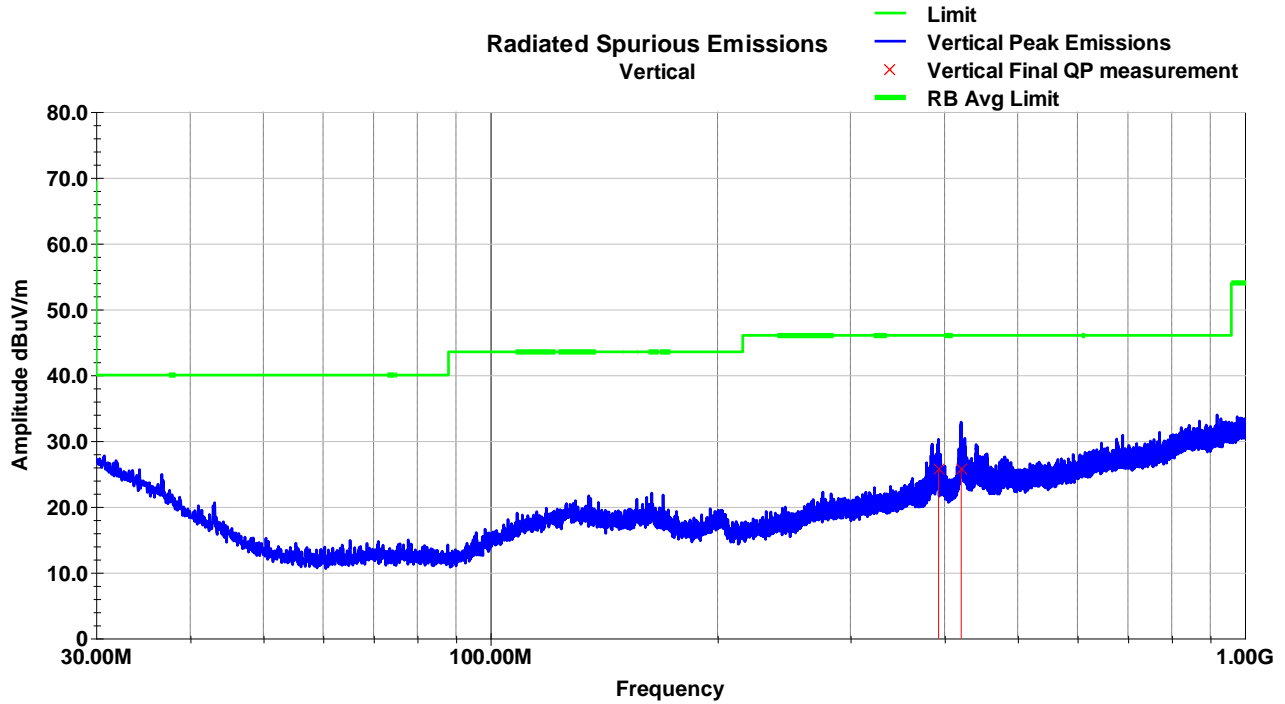


Horizontal Radiated Spurious Emissions – 3-18GHz (MCH)



No discernible emissions detected from 18GHz – 26GHz.

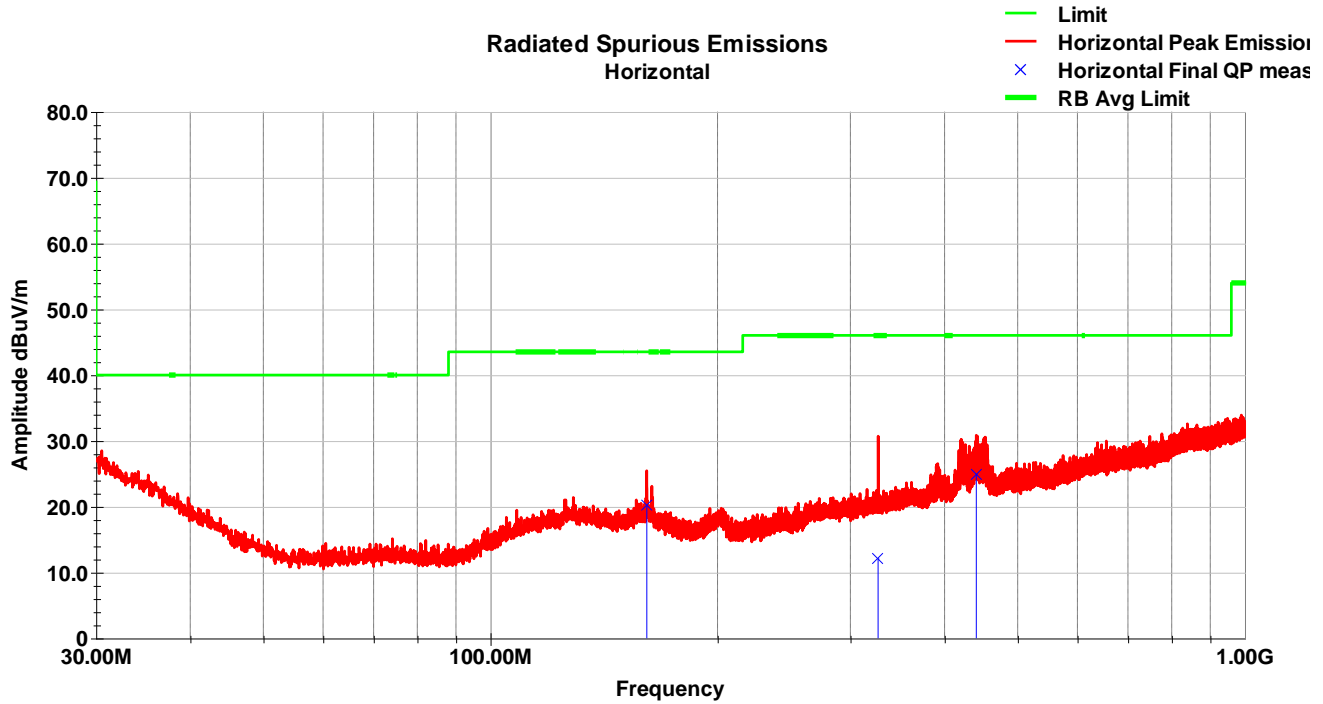
Vertical Radiated Spurious Emissions Plots – 30-1000MHz (HCH)



Vertical Radiated Spurious Emissions Data – 30-1000MHz (HCH)

Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
392.71	34.4	V	193.0	114.0	20.0	2.6	31.4	25.7	46.0	-20.4
420.84	33.8	V	192.0	114.0	20.7	2.7	31.4	25.8	46.0	-20.2
QP Value = Raw QP + AF + Loss - Amp										
Margin = QP Value - Limit										

Horizontal Radiated Spurious Emissions Plots – 30-1000MHz (HCH)

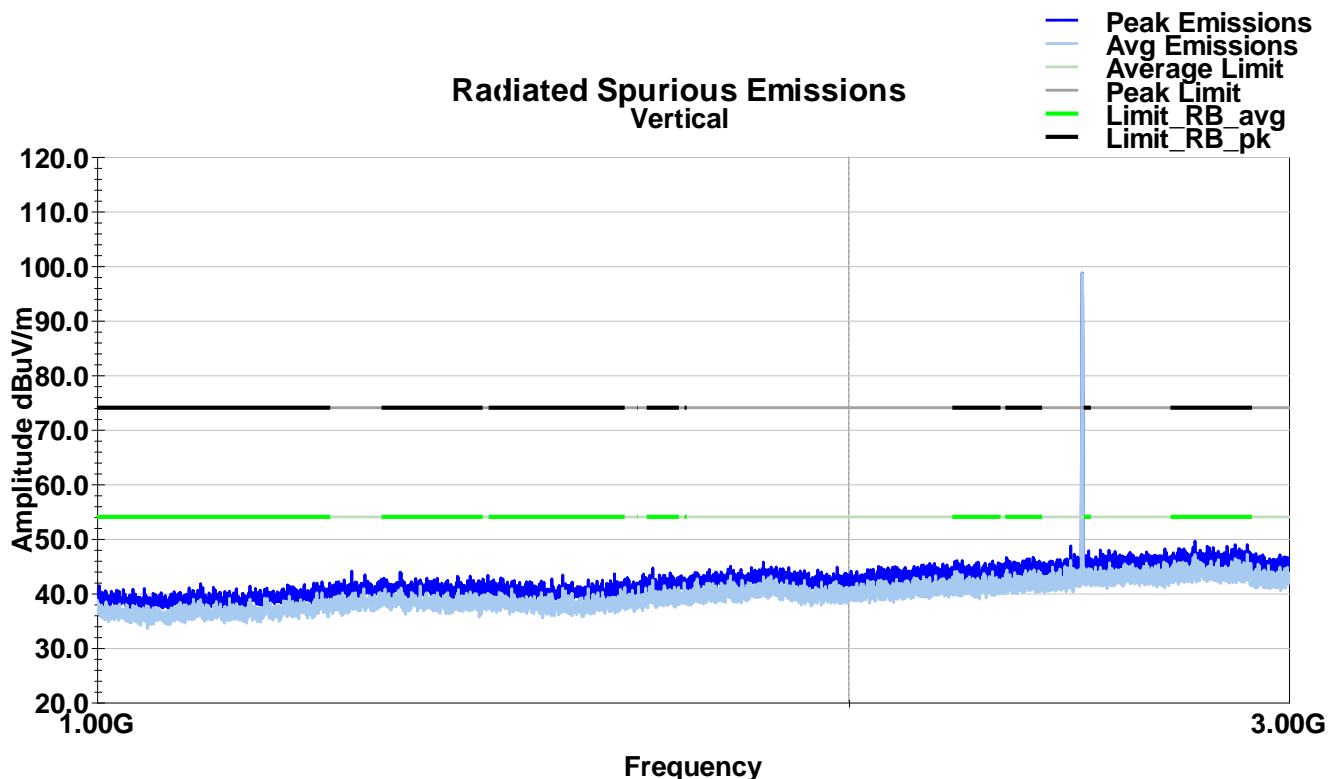


Horizontal Radiated Spurious Emissions Data – 30-1000MHz (HCH)

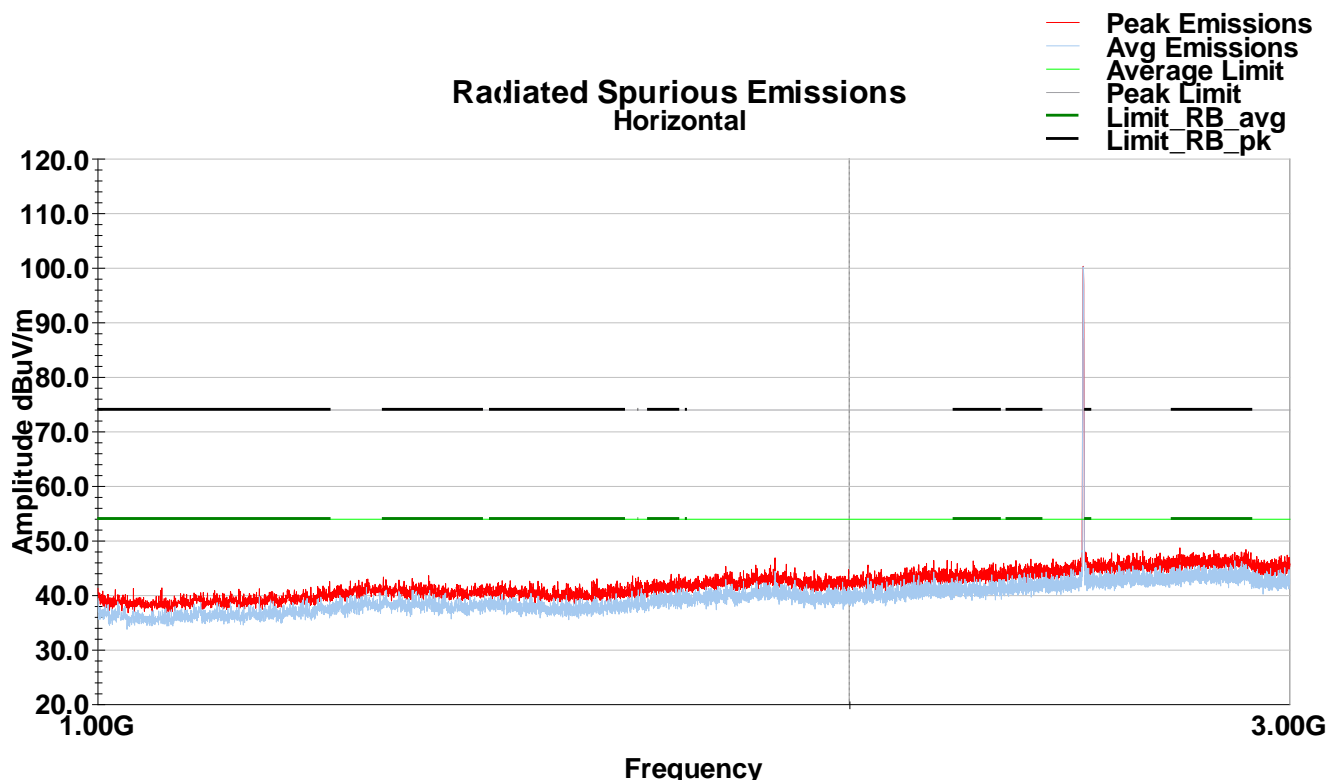
Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
161.19	33.3	H	302.0	126.0	16.7	1.6	31.5	20.2	43.5	-23.3
326.56	22.5	H	317.0	130.0	18.8	2.3	31.5	12.2	46.0	-33.9
440.60	32.4	H	339.0	129.0	21.2	2.7	31.4	24.9	46.0	-21.1
QP Value = Raw QP + AF + Loss - Amp										
Margin = QP Value - Limit										



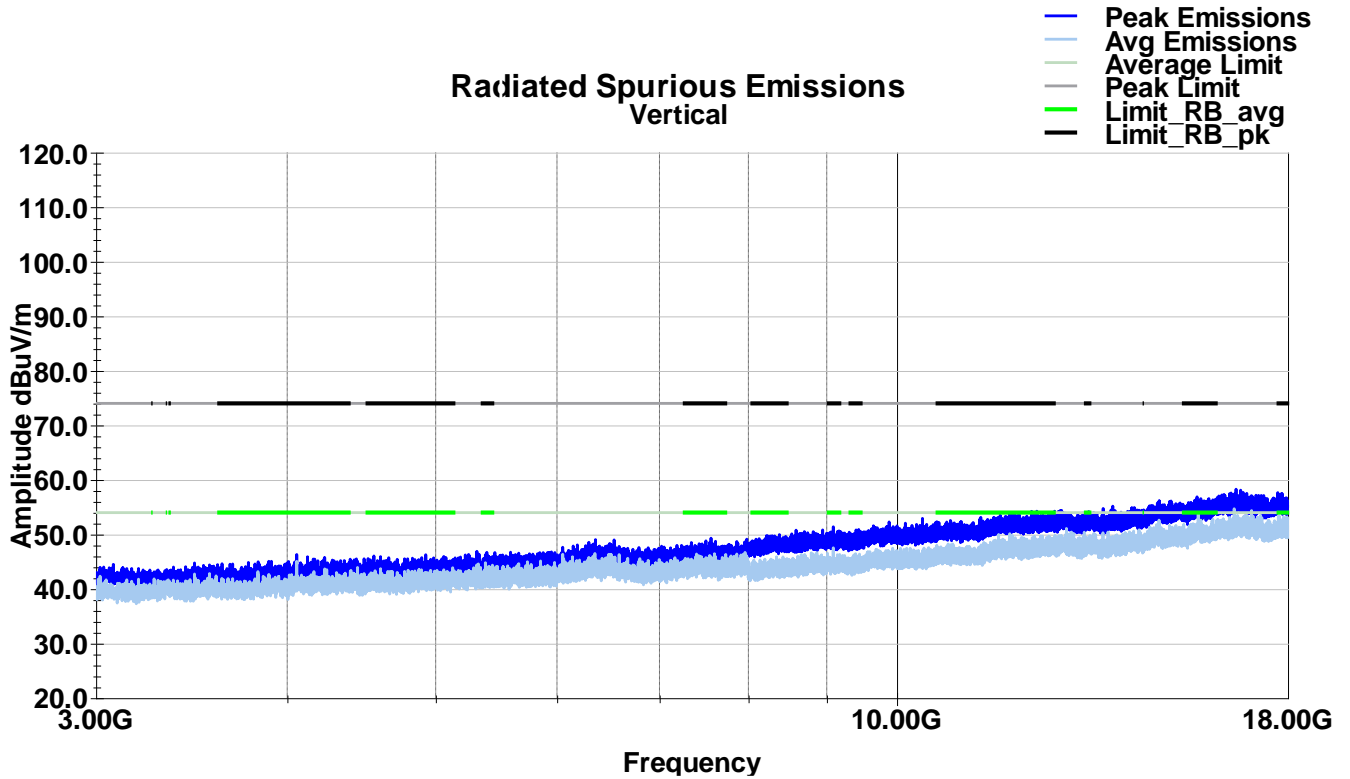
Vertical Radiated Spurious Emissions – 1-3GHz (HCH)



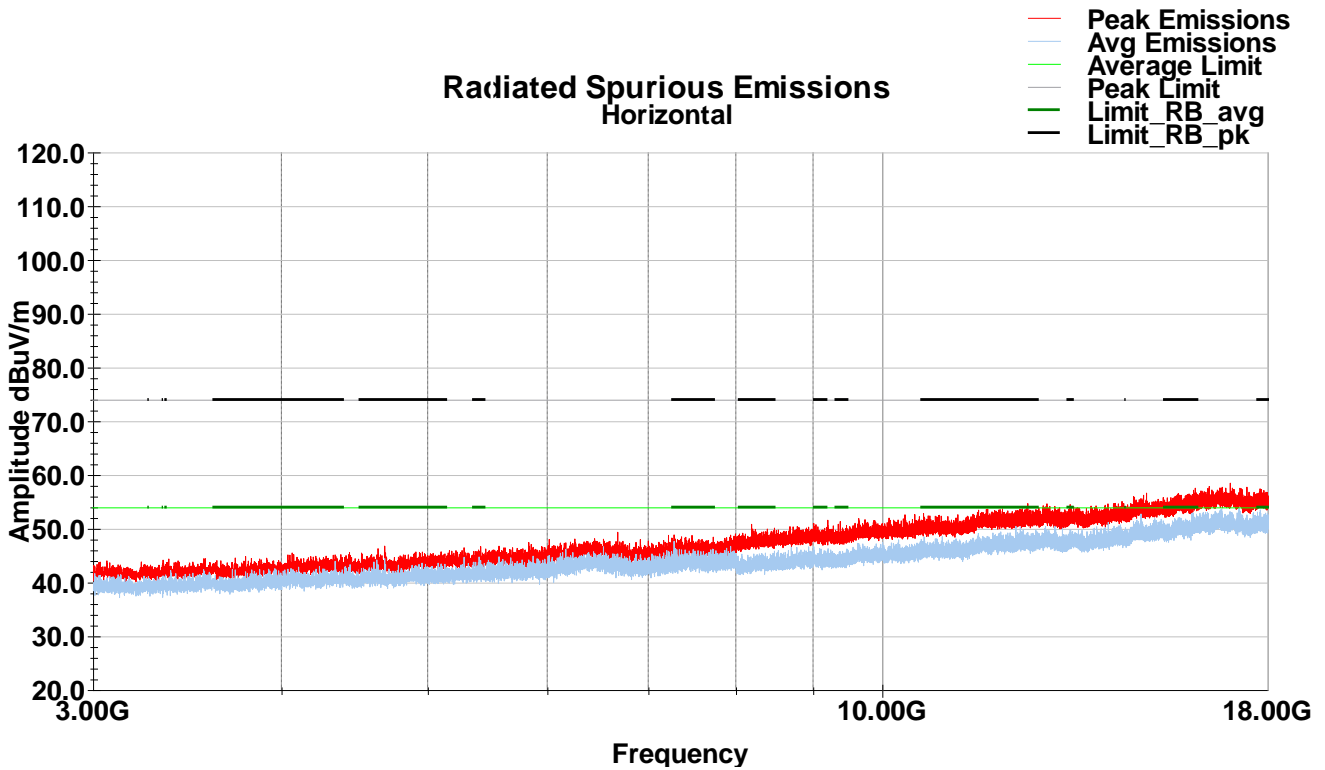
Horizontal Radiated Spurious Emissions – 1-3GHz (HCH)



Vertical Radiated Spurious Emissions – 3-18GHz (HCH)



Horizontal Radiated Spurious Emissions – 3-18GHz (HCH)



No discernible emissions detected from 18GHz – 26GHz.

## 8 Emissions in Restricted Frequency Bands (Band Edge)

### 8.1 Test Result

Test Description	Test Specification		Test Result
Restricted Band Emissions	15.205 / 15.209	RSS-GEN S8.9 / 8.10	Compliant

### 8.2 Test Method

Field strength measurements were performed at the restricted band edges of 2390MHz and 2483.5MHz for each modulation. Measurements were made using the conducted methods defined in ANSI C63.10, Section 11.12.2.

### 8.3 Test Site

EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.6 °C

Relative Humidity: 48.4 %

Atmospheric Pressure: 98.98 kPa

### 8.4 Test Equipment

Test End Date: 4-Nov-2022

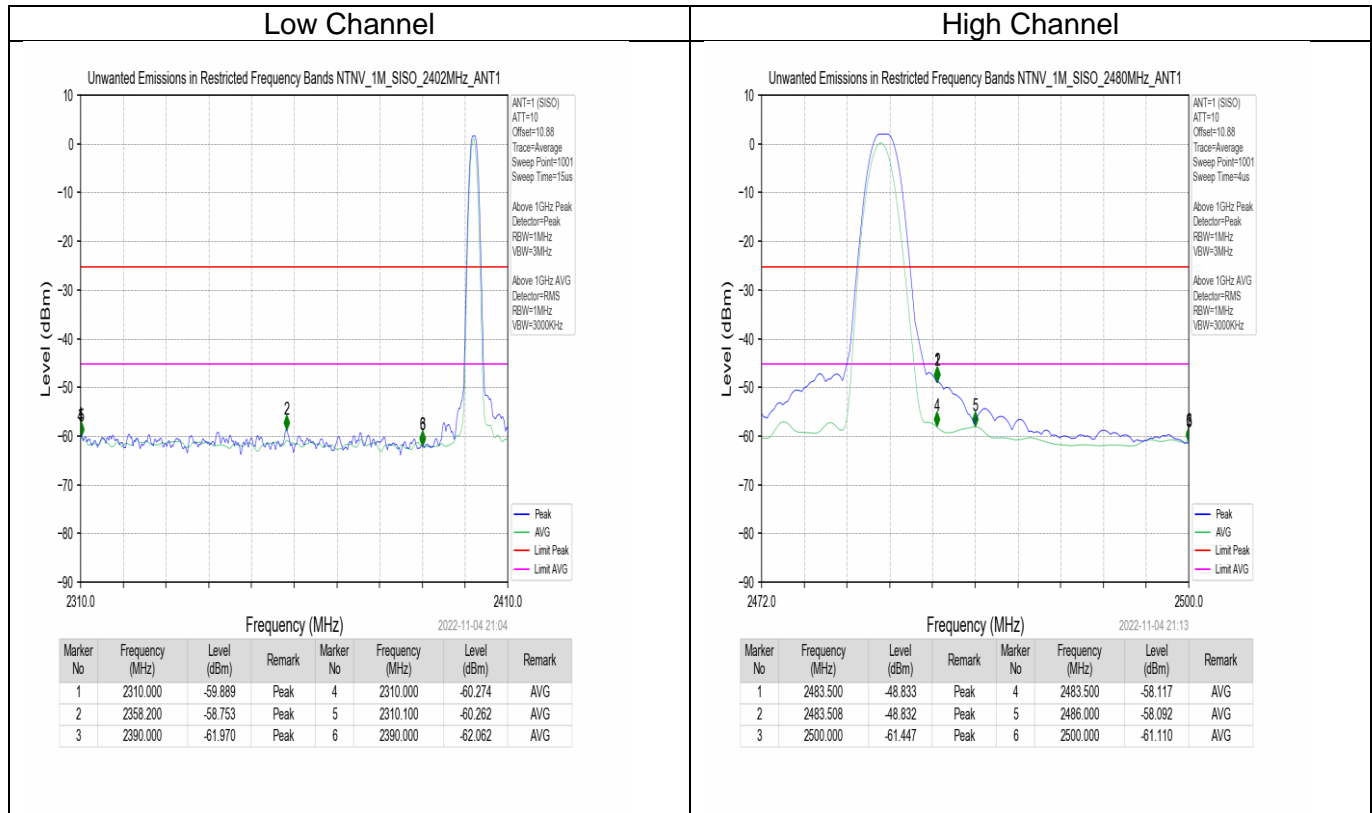
Tester: AB

Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
RF CABLE (TS8997)	141	HUBER & SUHNER	B095588	5-Jul-2022	5-Jul-2023
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	7-Dec-2022	7-Dec-2023
ATTENUATOR, 10DB (TS8997)	10DB	ROHDE & SCHWARZ	B095593	12-May-2022	12-May-2023
DC POWER SUPPLY, PROGRAMMABLE	DP711	RIGOL	18027	CNR	CNR
TSTPASS SWITCHBOX	SB1	TSTPASS	20168	CNR	CNR

Software Profile:

TSTPASS Version: 1.1.0, build 2020.11.15.01

### 8.5 Test Data – Restricted Band Edges



Frequency (MHz)	Reading Level (dBm)	Antenna Gain (dBi)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2310.000	-60.27	4.00	38.93	54	-15.07	AVG
	-59.89	4.00	39.31	74	-34.69	Peak
2310.100	-60.26	4.00	38.94	54	-15.06	AVG
2358.200	-58.75	4.00	40.45	74	-33.55	Peak
2390.000	-62.06	4.00	37.14	54	-16.86	AVG
	-61.97	4.00	37.23	74	-36.77	Peak
2483.500	-58.12	4.00	41.08	54	-12.92	AVG
	-48.83	4.00	50.37	74	-23.63	Peak
2483.508	-48.83	4.00	50.37	74	-23.63	Peak
2486.000	-58.09	4.00	41.11	54	-12.89	AVG
2500.000	-61.11	4.00	38.09	54	-15.91	AVG
	-61.45	4.00	37.75	74	-36.25	Peak

## 9 Measurement Uncertainty

The measurement uncertainty figures are be calculated in accordance with TR 100 028-1 [2] and correspond to an expansion factor (coverage factor)  $k = 2$  (which provide confidence levels of 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Parameter	Expanded Uncertainty for Normal k factor equal to 2	
	Required	Laboratory Actual
Radio Frequency	$\pm 1 \times 10^{-5}$	$\pm 9.8 \times 10^{-8}$
total RF power, conducted	$\pm 1.5$ dB	$\pm 1.2$ dB
RF power density, conducted	$\pm 3$ dB	$\pm 0.7$ dB
spurious emissions, conducted	$\pm 3$ dB	$\pm 2.1$ dB
all emissions, radiated	$\pm 6$ dB	$\pm 4.8$ dB
temperature	$\pm 1^{\circ}\text{C}$	$\pm 0.5^{\circ}\text{C}$
humidity	$\pm 5$ %	$\pm 3.5\%$
DC and low frequency voltages	$\pm 3$ %	$\pm 0.4\%$

## 10 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	3 December 2022
1	<p>Added notes in Section 7: No discernible emissions detected from 18GHz – 26GHz.</p> <p>Removed duplicate data on page 27 and page 28</p> <p>Changed test date range on page 5</p> <p>Added manufacturer and Tile! version to section 7.4</p> <p>Added TSTPASS Switchbox to equipment list</p> <p>Added software to equipment list</p> <p>Added statement for Section 1 All antennas are internal.</p> <p>Added field strength tabular data in section 8.5.</p>	24 February 2023
2	Updated Section 7.4 Above 1GHz Equipment List to include above 18GHz information	28 February 2023