

RF Test Report

Project Number: 5045970 **Offer Number:** SUW-202212003797
Report Number: 5045970EMC01 **Revision Level:** 0
Client: Philips Medical Systems

Equipment Under Test: Telemetry Monitor
Product Name: Philips Telemetry Monitor 5500
Model Number: 867232
FCC ID: PQC-5500SH1A4
IC: 3549B-5500SH1A4

Applicable Standards: FCC Part 15 Subpart C, § 15.247
RSS-247, Issue 3, August 2023
RSS-GEN, Issue 5, February 2021, Amendment 2
ANSI C63.10:2013

Report issued on: 02 November 2023

Test Result: Compliant



FOR THE SCOPE OF ACCREDITATION UNDER CERTIFICATE NUMBER: 3212.01

This 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.

Prepared by:

Martin Taylor, Project Engineer

Reviewed by:

Dan Alvarez, RF/EMC Sr. Staff Engineer

Remarks: This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>. And for electronic format documents, subject to Terms and Conditions for Electronic Documents at <http://www.sgs.com/en/Terms-and-Conditions/terms-e-document.aspx>.

Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful, and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for a maximum of 30 days only.

Table of Contents

1	SUMMARY OF TEST RESULTS	4
1.1	MODIFICATIONS REQUIRED FOR COMPLIANCE	4
2	GENERAL INFORMATION.....	5
2.1	CLIENT INFORMATION	5
2.2	TEST LABORATORY	5
2.3	GENERAL INFORMATION OF EUT	5
2.4	OPERATING MODES AND CONDITIONS	5
2.5	EUT CONNECTION BLOCK DIAGRAM – CONDUCTED MEASUREMENTS.....	6
2.6	EUT CONNECTION BLOCK DIAGRAM – RADIATED MEASUREMENTS	6
2.7	SYSTEM CONFIGURATIONS	6
2.8	CABLE LIST	6
3	BANDWIDTH	7
3.1	TEST RESULT.....	7
3.2	TEST METHODS	7
3.3	TEST SITE	7
3.4	TEST EQUIPMENT	7
3.5	TEST DATA – DTS BANDWIDTH (6dB)	7
3.6	TEST DATA – 99% OCCUPIED BANDWIDTH.....	9
4	OUTPUT POWER	10
4.1	TEST RESULT.....	10
4.2	TEST METHOD.....	10
4.3	TEST SITE	10
4.4	TEST EQUIPMENT	10
4.5	TEST DATA.....	10
5	POWER SPECTRAL DENSITY	12
5.1	TEST RESULT.....	12
5.2	TEST METHOD.....	12
5.3	TEST SITE	12
5.4	TEST EQUIPMENT	12
5.5	TEST DATA.....	12
6	CONDUCTED SPURIOUS EMISSIONS / BAND EDGE.....	14
6.1	TEST RESULT.....	14
6.2	TEST METHOD.....	14
6.3	TEST SITE	14
6.4	TEST EQUIPMENT	14
6.5	TEST DATA – DTS BAND EDGE.....	15
6.6	TEST DATA – DTS CONDUCTED SPURIOUS EMISSIONS	16
7	EMISSIONS IN RESTRICTED FREQUENCY BANDS	18
7.1	TEST RESULT.....	18
7.2	TEST METHOD.....	18
7.3	TEST SITE	18
7.4	TEST EQUIPMENT	19
7.5	TEST DATA.....	20
8	BAND EDGE EMISSIONS IN RESTRICTED FREQUENCY BANDS.....	29
8.1	TEST RESULT.....	29
8.2	TEST METHOD.....	29

8.3	TEST SITE	29
8.4	TEST EQUIPMENT	29
8.5	TEST DATA.....	29
9	MEASUREMENT UNCERTAINTY.....	31
10	REVISION HISTORY	32

1 Summary of Test Results

Test Description	Test Specification		Test Result
Bandwidth	15.247(a)(2)	RSS-247 S5.2 (a) RSS-GEN S6.7	Compliant
Output Power	15.247(b)(3)	RSS-247 S5.4 (d)	Compliant
Power Spectral Density	15.247(e)	RSS-247 S5.2 (b)	Compliant
Conducted Spurious Emissions / Band Edge	15.247(d)	RSS-247 S5.5	Compliant
Emissions in Restricted Frequency Bands	15.247(d) 15.205, 15.209	RSS-247 S5.5 RSS-GEN S8.9, S8.10	Compliant
Band Edge Emissions in Restricted Frequency Bands	15.205, 15.209	RSS-GEN S8.9, S8.10	Compliant
AC Powerline Conducted Emissions	15.207	RSS-GEN S8.8	N/A ⁽¹⁾
Antenna Requirement	15.203	RSS-GEN S6.8	Compliant ⁽²⁾

(1) The EUT has no facility to connect to AC Mains.

(2) The device uses an internal chip antenna which cannot be replaced by the end user.

1.1 Modifications Required for Compliance

None.

2 General Information

2.1 Client Information

Company Name: Philips Medical Systems North America Co.
 Address: 222 Jacobs Street
 City, State, Zip, Country: Cambridge, MA 02141, 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
 CAB Identification: US0186

2.3 General Information of EUT

Equipment Under Test: Telemetry Monitor
 Product Name: Philips Telemetry Monitor 5500
 Model Number: 867232
 Serial Numbers: USPP000164 (Conducted Sample)
 USPP000091 (Radiated Sample)
 FCC ID: PQC-5500SH1A4
 IC: 3549B-5500SH1A4
 Frequency Range: 2402 – 2480 MHz
 Data Modes: Bluetooth Low Energy (BLE) – GFSK (1M/2M/S8)
 Antenna: Inverted F Chip Antenna (1.7dBi peak gain)*
 Rated Voltage: 4.5V_{DC}
 Test Voltage: 4.5V_{DC} (from three D cell batteries or via USB from laptop)
 Sample Received Date: 18 May 2023
 Dates of testing: 06-07 June 2023

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

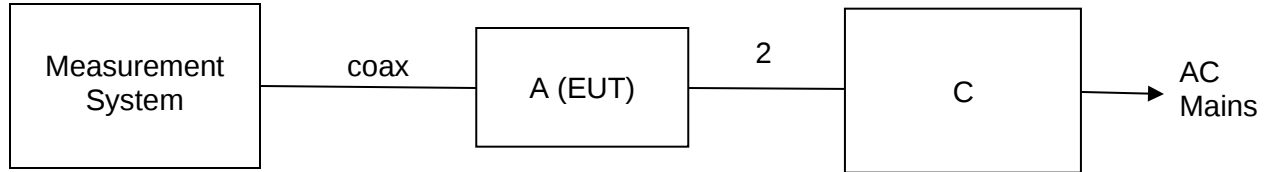
2.4 Operating Modes and Conditions

The EUT was running test mode firmware which allowed the following:

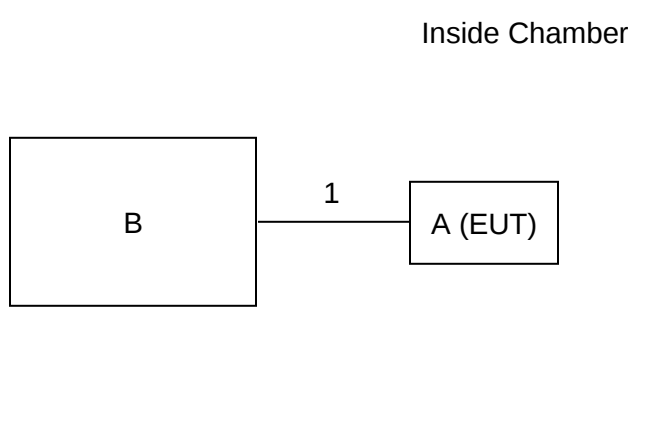
- 1) selecting low, middle and high BLE channels;
- 2) selecting all supported data modes; and
- 3) setting the transmitter output power level.

The maximum power setting of 14 (nominally 5dBm) was used for all tests.

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	Philips Medical Systems	Philips Telemetry Monitor 5500 (EUT)	867232	USPP000164 USPP000091
B	Philips Medical Systems	Test Power Adapter	(none)	(none)
C	Lenovo	Laptop Computer	T420	R8-X9XFV

2.8 Cable List

Cable reference	Port Name	Start	End	Cable Length (m)	Ferrite installed?	Shielded?
1	DC Power	Test Power Adapter	EUT	0.15	N	N
2	DC Power	Laptop Computer	EUT	0.80	N	N

3 Bandwidth

3.1 Test Result

Test Description	Test Specification		Test Result
DTS Bandwidth (6dB)	15.247(a)(2)	RSS-247 S5.2 (a)	Compliant
Occupied Bandwidth (99%)	2.1049	RSS-GEN S6.7	Reported

3.2 Test Methods

The DTS 6dB bandwidth measurements were performed using the procedure from ANSI C63.10 clause 11.8.1, and the 99% occupied bandwidth measurements were performed using the procedure from ANSI C63.10 clause 6.9.3. These procedures are referenced in KDB 558074 D01 15.247 Meas Guidance v05r02.

Limit

The minimum 6dB bandwidth shall be at least 500 kHz.

3.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.8 °C
Relative Humidity: 47.5 %
Atmospheric Pressure: 97.4 kPa

3.4 Test Equipment

Test End Date: 6-Jun-2023

Tester: MT

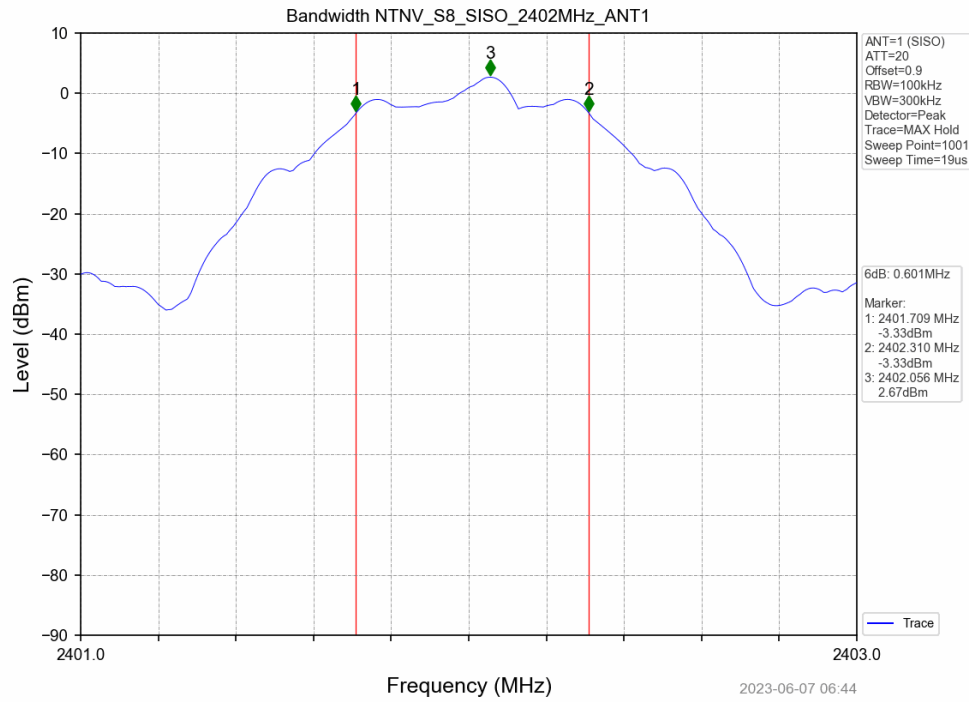
Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	7-Dec-2022	7-Dec-2023
RF CABLE SMA TO SMA, 0.01-40GHZ	084-0505-059	TELEDYNE STORM MICROWAVE	20108	13-Mar-2023	13-Mar-2024

Software: TSTPASS Version: 2.0

3.5 Test Data – DTS Bandwidth (6dB)

Test Mode	Frequency (MHz)	TX Type	ANT No.	6dB Bandwidth		Verdict
				Test Result (MHz)	Limits (MHz)	
1M	2402	SISO	1	0.667	≥0.5	PASS
	2440	SISO	1	0.674	≥0.5	PASS
	2480	SISO	1	0.685	≥0.5	PASS
2M	2402	SISO	1	1.160	≥0.5	PASS
	2440	SISO	1	1.145	≥0.5	PASS
	2480	SISO	1	1.157	≥0.5	PASS
S8	2402	SISO	1	0.601	≥0.5	PASS
	2440	SISO	1	0.602	≥0.5	PASS
	2480	SISO	1	0.607	≥0.5	PASS

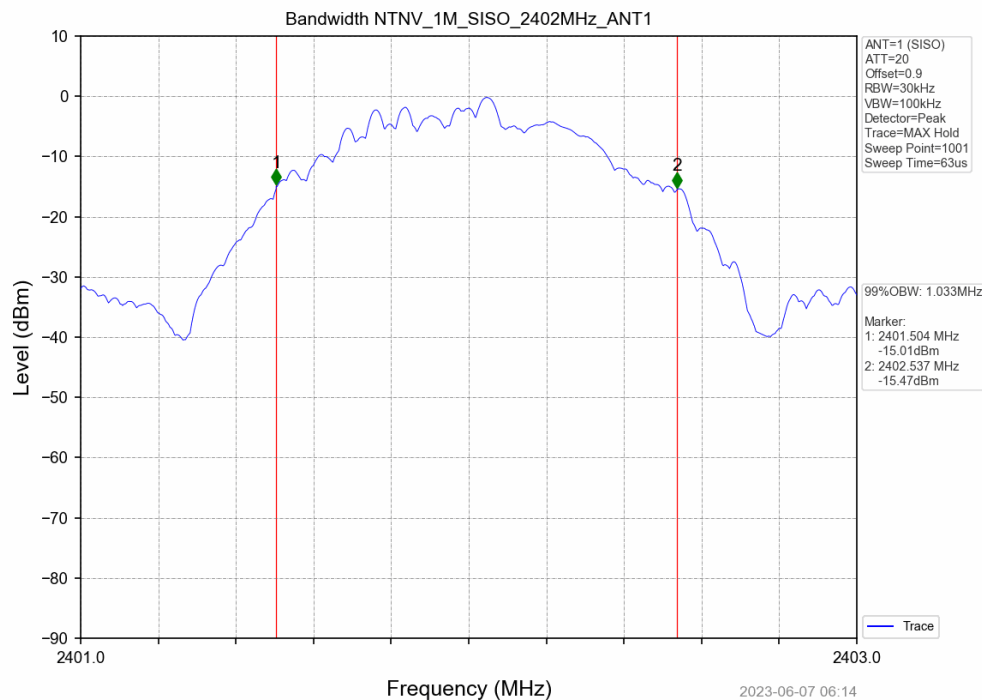
Example Plot



3.6 Test Data – 99% Occupied Bandwidth

Test Mode	Frequency (MHz)	TX Type	ANT No.	99% Occupied Bandwidth	
				Test Result (MHz)	
1M	2402	SISO	1	1.033	Only for Report Use
	2440	SISO	1	1.041	Only for Report Use
	2480	SISO	1	1.046	Only for Report Use
2M	2402	SISO	1	2.039	Only for Report Use
	2440	SISO	1	2.051	Only for Report Use
	2480	SISO	1	2.056	Only for Report Use
S8	2402	SISO	1	1.045	Only for Report Use
	2440	SISO	1	1.065	Only for Report Use
	2480	SISO	1	1.073	Only for Report Use

Example Plot



4 Output Power

4.1 Test Result

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

4.2 Test Method

Fundamental maximum peak conducted output power measurements were performed using the method described in ANSI C63.10:2013 clause 11.9.1.1. This procedure is referenced in KDB 558074 D01 15.247 Meas Guidance v05r02.

Limit

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). Also, the e.i.r.p. shall not exceed 4 Watts (36 dBm) based on RSS-247 S5.4 (d).

4.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.8 °C
Relative Humidity: 47.5 %
Atmospheric Pressure: 97.4 kPa

4.4 Test Equipment

Test End Date: 6-Jun-2023

Tester: MT

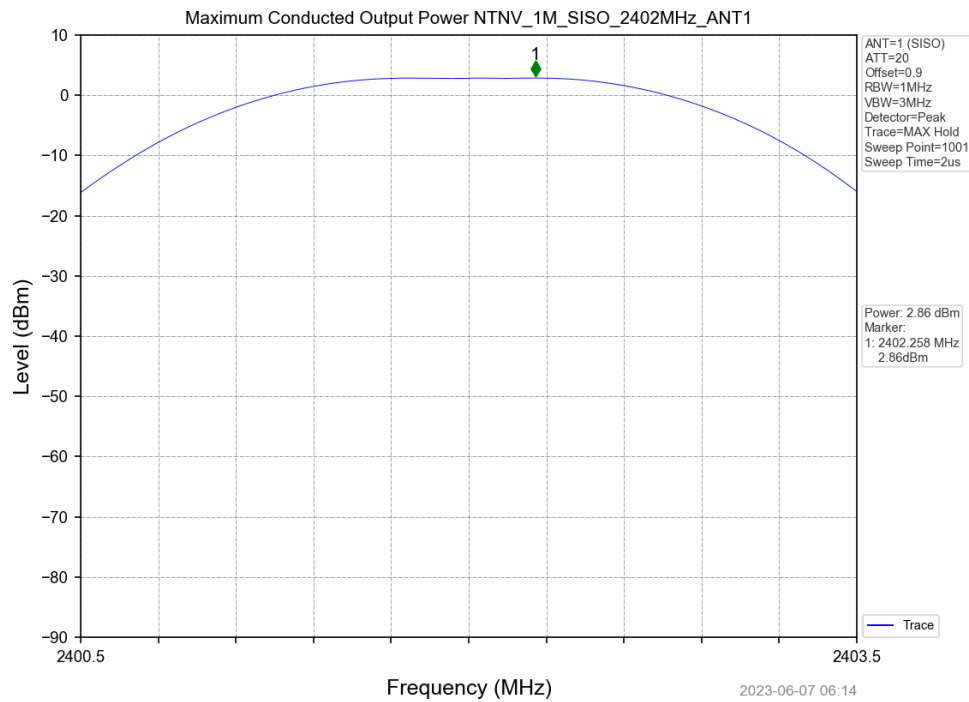
Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	7-Dec-2022	7-Dec-2023
RF CABLE SMA TO SMA, 0.01-40GHZ	084-0505-059	TELEDYNE STORM MICROWAVE	20108	13-Mar-2023	13-Mar-2024

Software: TSTPASS Version: 2.0

4.5 Test Data

Test Mode	Frequency (MHz)	Tx Type	Measured Peak Output Power (dBm)	Limits (dBm)	Verdict
1M	2402	SISO	2.86	30	PASS
	2440	SISO	2.65	30	PASS
	2480	SISO	2.60	30	PASS
2M	2402	SISO	2.85	30	PASS
	2440	SISO	2.69	30	PASS
	2480	SISO	2.61	30	PASS
S8	2402	SISO	2.82	30	PASS
	2440	SISO	2.63	30	PASS
	2480	SISO	2.57	30	PASS

Example Plot



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

Peak power spectral density measurements were performed using the procedures from ANSI C63.10: 2013 clause 11.10.2. These procedures are referenced in KDB 558074 D01 15.247 Meas Guidance v05r02.

Limit

The maximum limit is 8 dBm / 3 kHz.

5.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.8 °C
Relative Humidity: 47.5 %
Atmospheric Pressure: 97.4 kPa

5.4 Test Equipment

Test End Date: 6-Jun-2023

Tester: MT

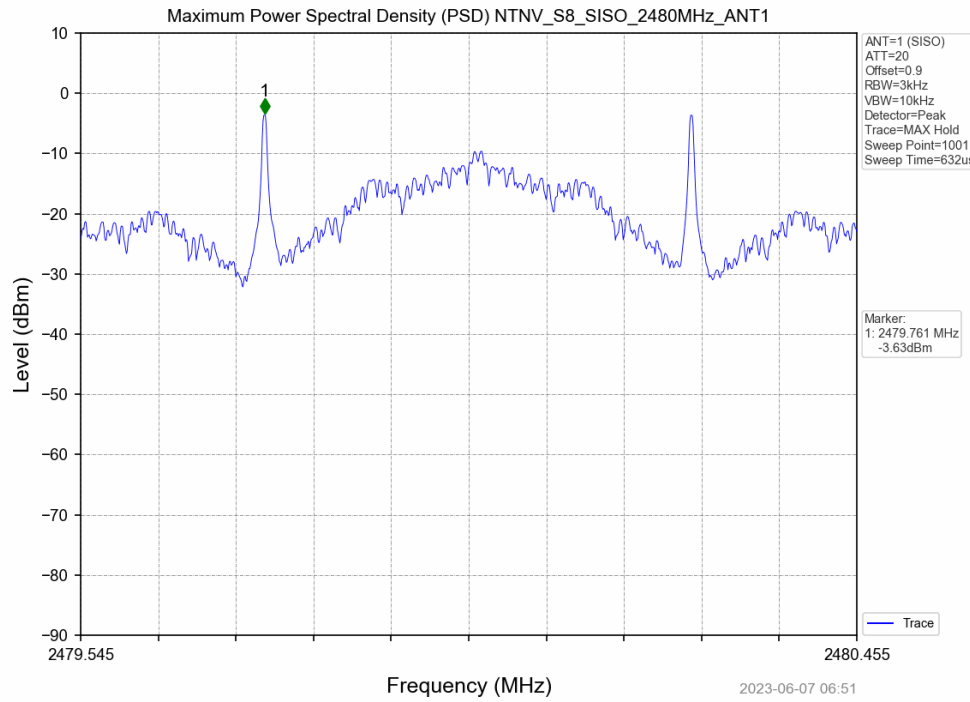
Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	7-Dec-2022	7-Dec-2023
RF CABLE SMA TO SMA, 0.01-40GHZ	084-0505-059	TELEDYNE STORM MICROWAVE	20108	13-Mar-2023	13-Mar-2024

Software: TSTPASS Version: 2.0

5.5 Test Data

Test Mode	Frequency (MHz)	Tx Type	Maximum Power Spectral Density (dBm/3KHz)	Limits (dBm/3kHz)	Verdict
1M	2402	SISO	-12.52	≤8	PASS
	2440	SISO	-13.02	≤8	PASS
	2480	SISO	-13.29	≤8	PASS
2M	2402	SISO	-14.00	≤8	PASS
	2440	SISO	-14.06	≤8	PASS
	2480	SISO	-13.84	≤8	PASS
S8	2402	SISO	-3.65	≤8	PASS
	2440	SISO	-3.63	≤8	PASS
	2480	SISO	-3.63	≤8	PASS

Example Plot



6 Conducted Spurious Emissions / Band Edge

6.1 Test Result

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

6.2 Test Method

Conducted band edge and spurious band emissions in non-restricted frequency bands were measured using the method defined in ANSI C63.10 clause 11.11. This procedure is referenced in KDB 558074 D01 15.247 Meas Guidance v05r02.

All supported data modes were tested, but just the worst-case results of the 2Mbps data mode are reported.

Limit

Because the maximum peak conducted 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: 23.8 °C
Relative Humidity: 47.5 %
Atmospheric Pressure: 97.4 kPa

6.4 Test Equipment

Test End Date: 6-Jun-2023

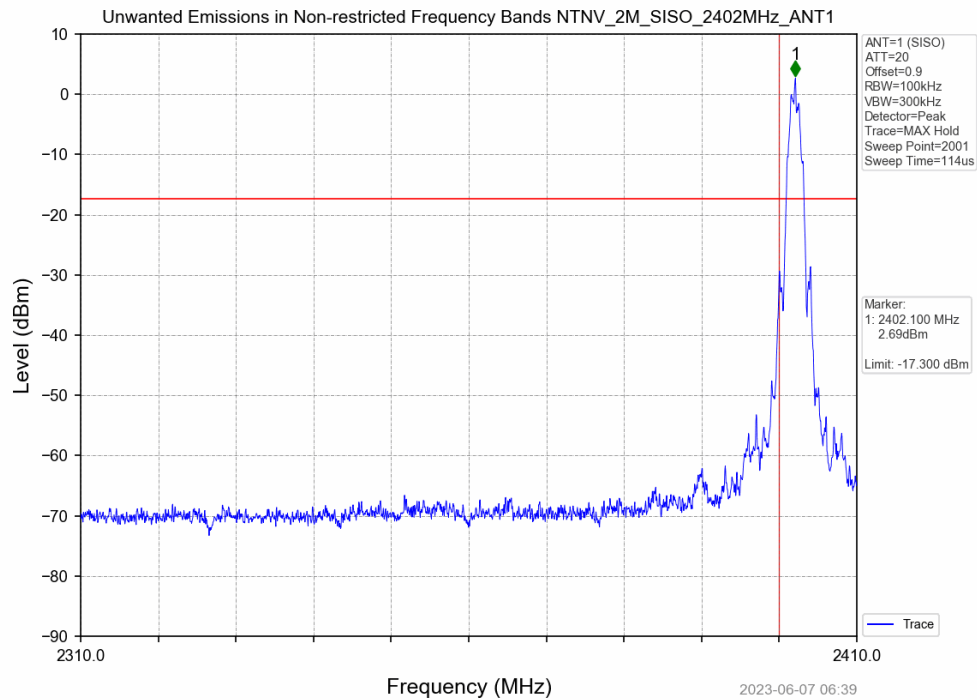
Tester: MT

Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	7-Dec-2022	7-Dec-2023
RF CABLE SMA TO SMA, 0.01-40GHZ	084-0505-059	TELEDYNE STORM MICROWAVE	20108	13-Mar-2023	13-Mar-2024

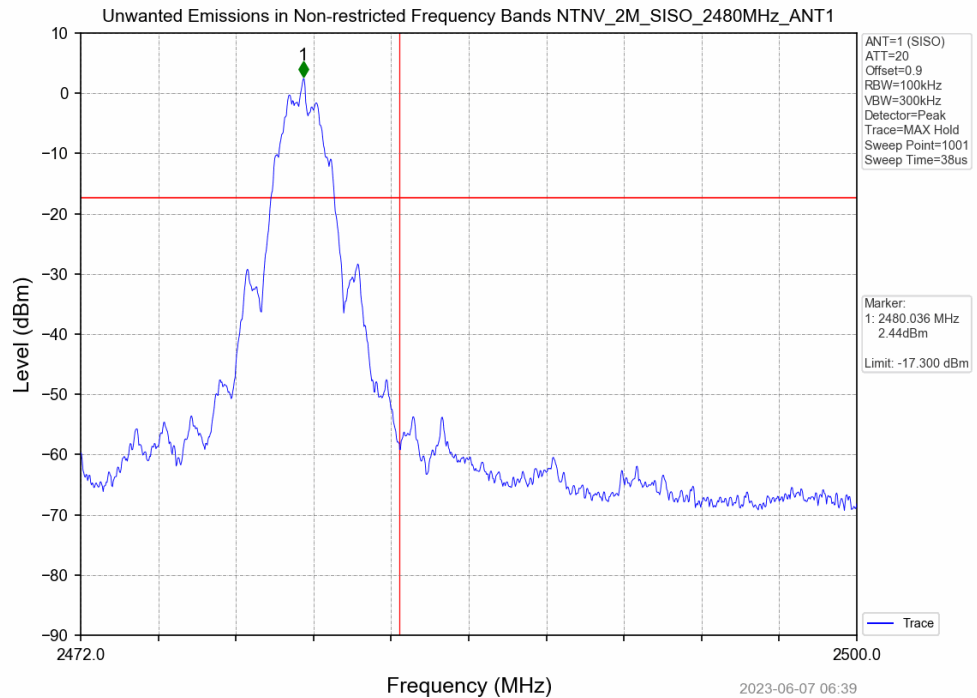
Software: TSTPASS Version: 2.0

6.5 Test Data – DTS Band Edge

BLE - Lower band edge

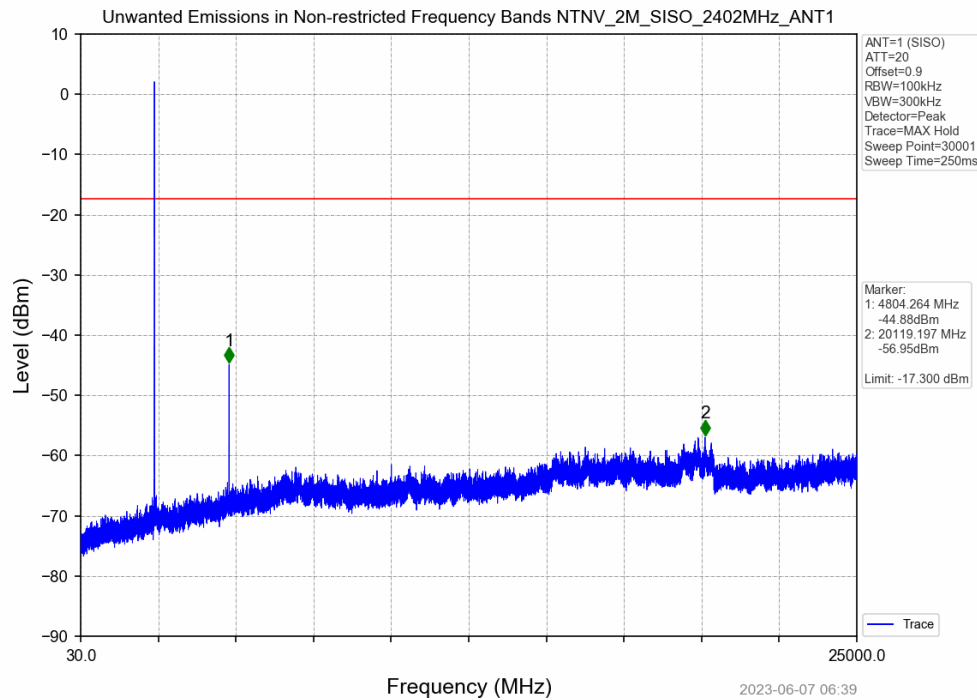


BLE - Upper band edge

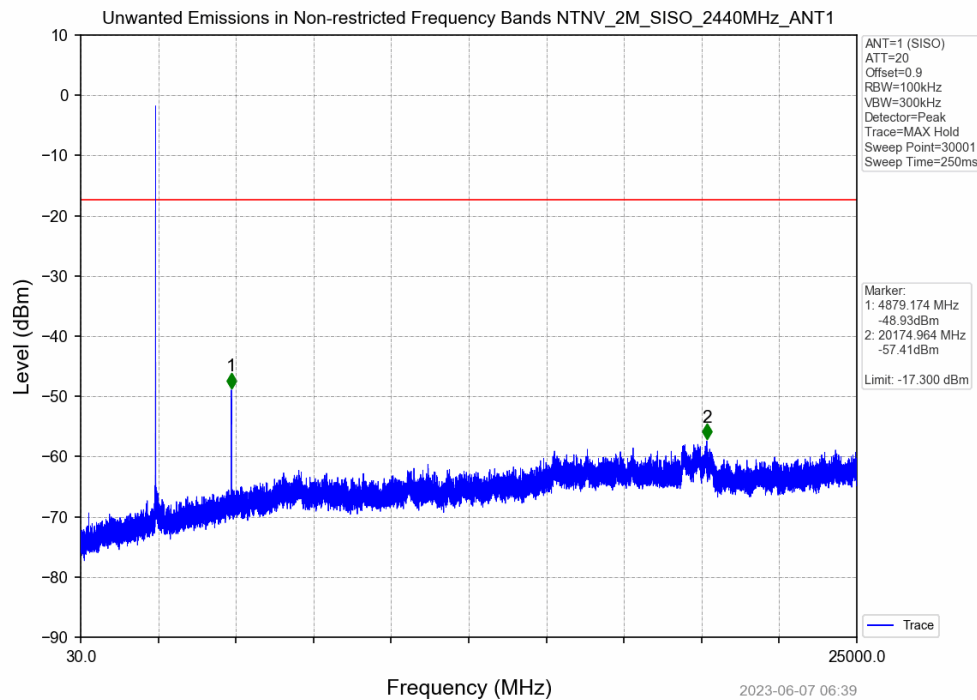


6.6 Test Data – DTS Conducted Spurious Emissions

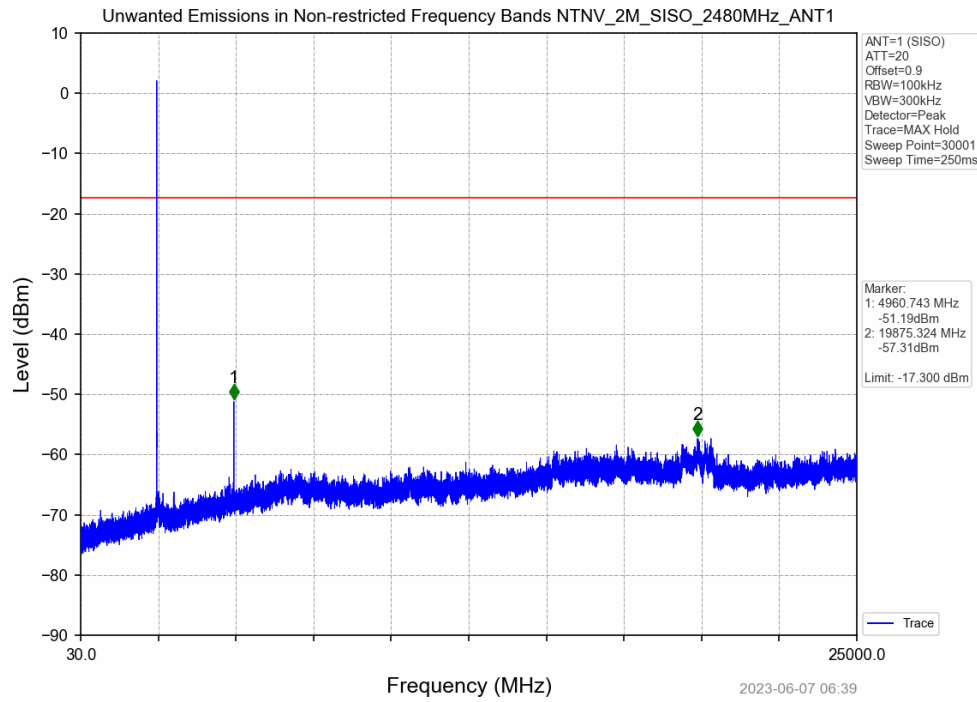
Conducted Spurs – BLE Channel 0



Conducted Spurs – BLE Channel 19



Conducted Spurs – BLE Channel 39



7 Emissions in Restricted Frequency Bands

7.1 Test Result

Test Description	Test Specification		Test Result
Emissions in Restricted Frequency Bands	15.247(d) 15.205, 15.209	RSS-247 S5.5 RSS-GEN S8.9, S8.10	Compliant

7.2 Test Method

Radiated emissions in restricted frequency bands were measured using methods defined in ANSI C63.10 clause 11.12. These procedures are referenced in KDB 558074 D01 15.247 Meas Guidance v05r02.

Lowest, middle and highest channels were investigated – the device was commanded to continuously transmit on channels 0, 19 and 39.

Test distances for radiated tests:

- 9k to 30 MHz – Near field prescan to determine if there were any emissions
- 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 ⁽¹⁾		Peak Limits dBuV/m
	Microvolts/m	dBuV/m	
30 - 88 MHz	100	40 ⁽²⁾	--
88 - 216 MHz	150	43.5 ⁽²⁾	--
216 - 960 MHz	200	46 ⁽²⁾	--
960 - 1000 MHz	500	54 ⁽²⁾	--
1 - 40 GHz	500	54 ⁽³⁾	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

3m and 10m Absorber Lined Shielded Enclosure (ALSE), Suwanee, GA

Environmental Conditions	30-1000MHz	1-26GHz
Temperature:	22.9 °C	22.0 °C
Relative Humidity:	47.3 %	48.9 %
Atmospheric Pressure:	97.3 kPa	96.8 kPa

7.4 Test Equipment

30-1000MHz

Test End Date: 6-Jun-2023

Tester: LM

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	EM-B810NM-276	Echelon	22034	23-Jan-2023	23-Jan-2024
RF CABLE	SF106	HUBER & SUHNER	B079713	25-Aug-2022	25-Aug-2023
RF CABLE, NM TO NM.	90-195-157	TELEDYNE STORM MICROWAVE	21019	14-Mar-2023	14-Mar-2024
RF CABLE RIGHT ANGLE NM TO NM, 0.01-18GHZ	90-076-020	TELEDYNE STORM MICROWAVE	20131	13-Mar-2023	13-Mar-2024
LOW NOISE AMPLIFIER	ZKL-2+	MINI-CIRCUITS	B079817	25-Aug-2022	25-Aug-2023
EMI TEST RECEIVER	ESW44	ROHDE & SCHWARZ	22027	13-Sep-2022	13-Sep-2023

1-26GHz

Test End Date: 7-Jun-2023

Tester: LM

Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
ANTENNA, DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079699	29-Jul-2022	29-Jul-2024
RF CABLE NM TO NF, 0.01-18GHZ	90-213-118	TELEDYNE STORM MICROWAVE	20118	13-Mar-2023	13-Mar-2024
RF CABLE NM TO NM, 0.01-18GHZ	90-195-118	TELEDYNE STORM MICROWAVE	20126	9-Feb-2023	9-Feb-2024
RF CABLE RIGHT ANGLE NM TO NM, 0.01-18GHZ	90-076-020	TELEDYNE STORM MICROWAVE	20131	13-Mar-2023	13-Mar-2024
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
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	13-Mar-2023	13-Mar-2024
RF CABLE SMA TO SMA, 0.01-40GHZ	084-0505-059	TELEDYNE STORM MICROWAVE	20107	13-Mar-2023	13-Mar-2024

Software: "RSE 30-1000 MHz T7 220318" TILE 7 profile dated Mar 2022
"RSE 1-26 GHz T7 210212" TILE 7 profile dated Feb 2021

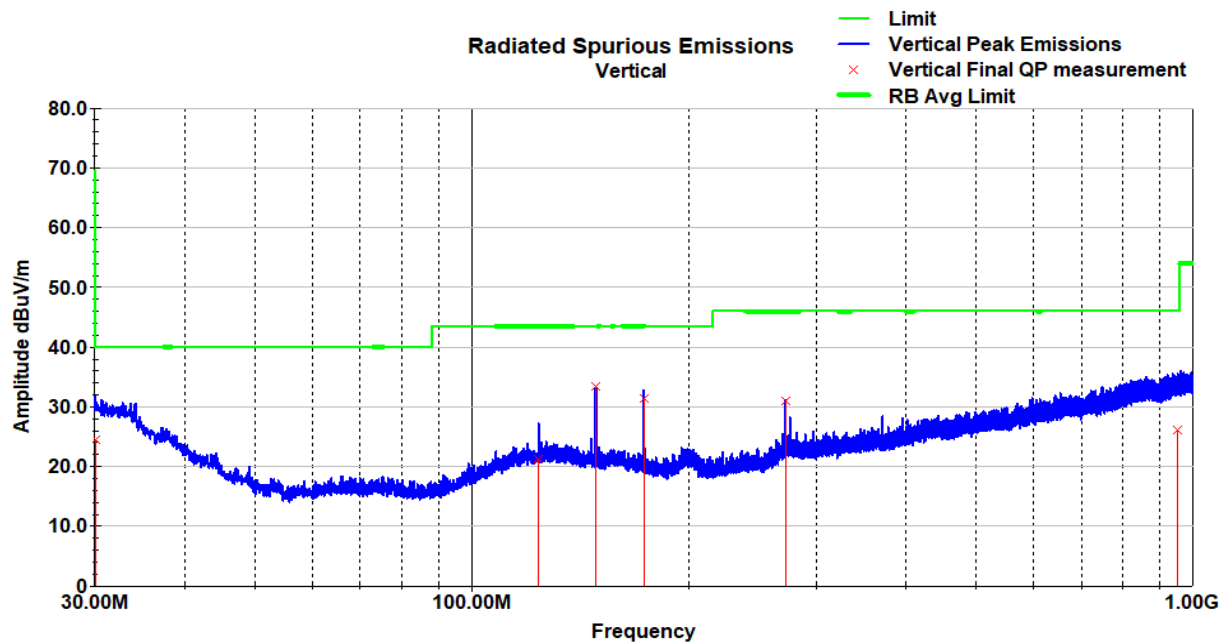
7.5 Test Data

No emissions were detected in the 9kHz to 30MHz frequency range.

7.5.1 30-1000 MHz

There was no significant deviation based on axis or channel in the 30-1000MHz frequency range.

30-1000MHz Vertical Plot – Mid Channel



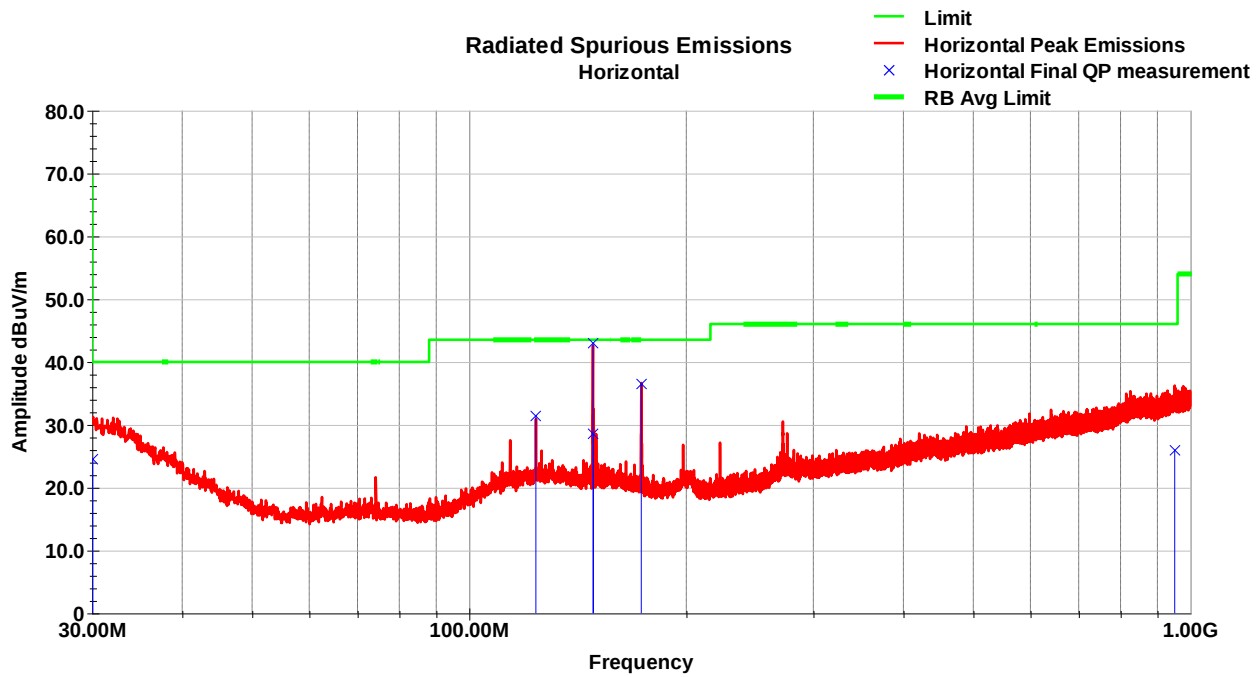
30-1000MHz Vertical Data – Mid Channel

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)
30.12	29.1	V	304.0	382.0	26.0	0.4	31.0	24.5	40.0	-15.5
123.78	33.3	V	113.0	247.0	17.8	1.0	30.8	21.3	43.5	-22.2
148.51	46.4	V	60.0	362.0	16.7	1.1	30.8	33.4	43.5	-10.1
173.25	45.2	V	117.0	267.0	15.7	1.2	30.7	31.4	43.5	-12.1
272.24	42.0	V	129.0	117.0	17.8	1.7	30.6	31.0	46.0	-15.0
953.67	25.1	V	205.0	118.0	27.4	3.0	29.3	26.1	46.0	-19.9

QP Value = Raw QP + AF + Loss - Amp

Margin = QP Value - Limit

30-1000MHz Horizontal Plot – Mid Channel



30-1000MHz Horizontal Data – Mid Channel

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)
30.05	29.1	H	42.0	400.0	26.1	0.4	31.0	24.6	40.0	-15.4
123.74	43.5	H	351.0	138.0	17.8	1.0	30.8	31.5	43.5	-12.0
148.50	55.9	H	351.0	100.0	16.8	1.1	30.8	43.0	43.5	-0.5
148.72	41.4	H	7.0	157.0	16.7	1.1	30.8	28.5	43.5	-15.0
173.25	50.2	H	289.0	100.0	15.7	1.2	30.7	36.4	43.5	-7.1
951.12	24.9	H	142.0	183.0	27.4	3.0	29.3	26.0	46.0	-20.0

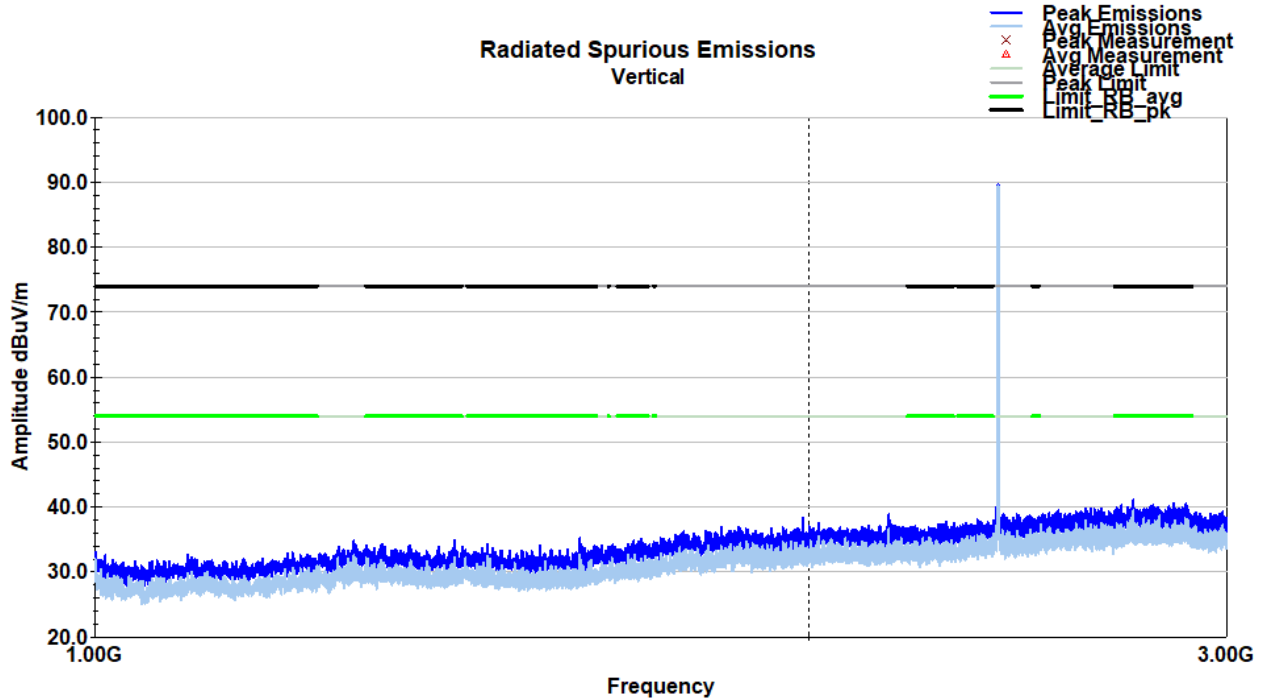
QP Value = Raw QP + AF + Loss - Amp

Margin = QP Value - Limit

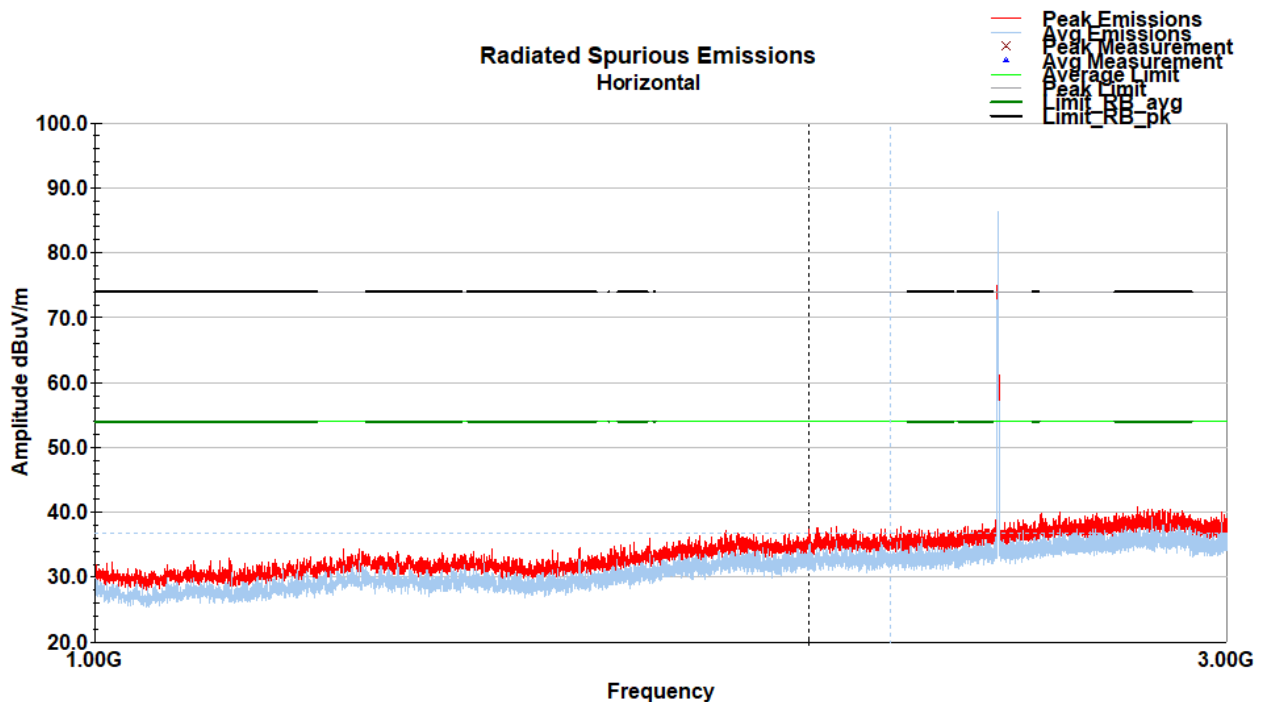
7.5.2 1-3 GHz

Besides the intentional radiator, there were no emissions in the 1-3GHz range regardless of channel.

1-3GHz Vertical – Low Channel

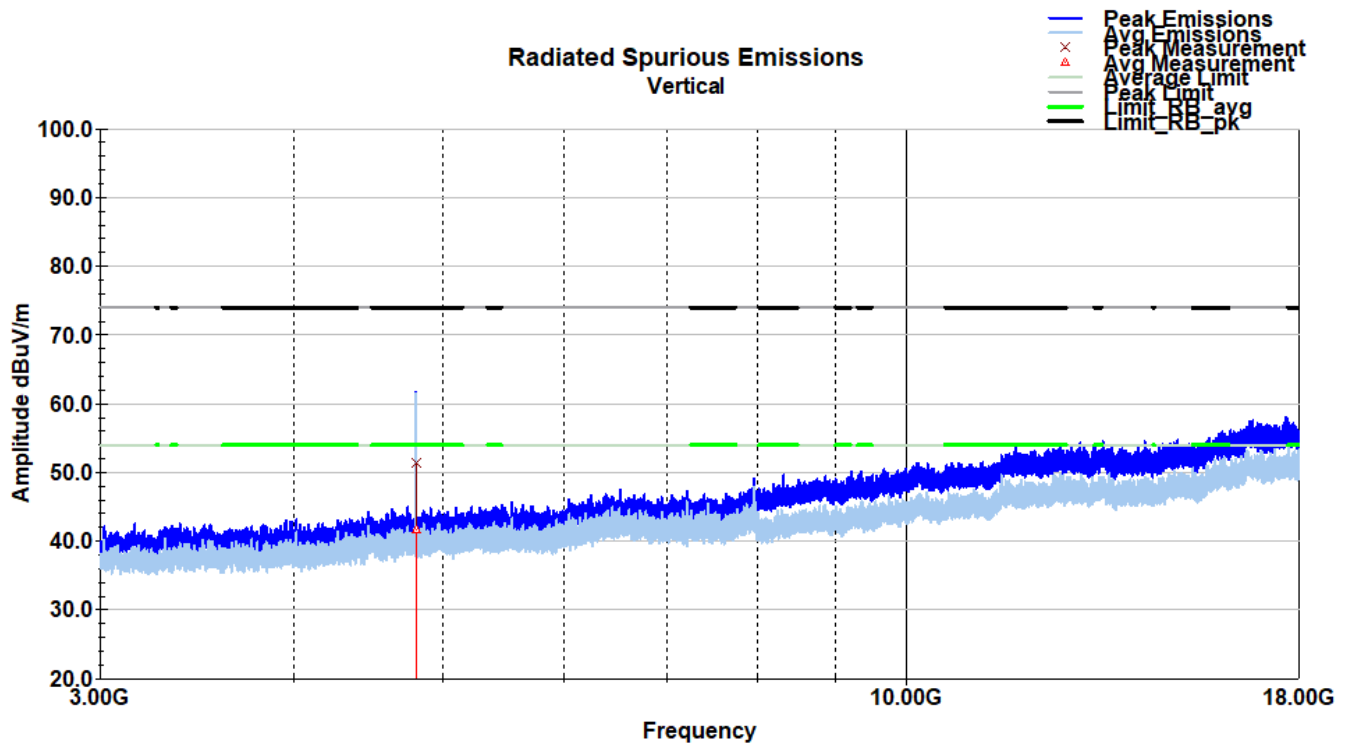


1-3 GHz Horizontal – Low Channel



7.5.3 3-26 GHz

3-18 GHz Vertical Plot – Low Channel



3-18 GHz Vertical Data – Low Channel Peak

Frequency MHz	Raw Pk dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Pk dBuV/m	Limit dBuV/m	Margin dB
4804.52	46.9	V	308.0	107.0	34.9	3.4	33.7	51.4	74.0	-22.6

Final Pk = Raw Pk + AF + Loss - Amp

Margin = Final Pk - Limit

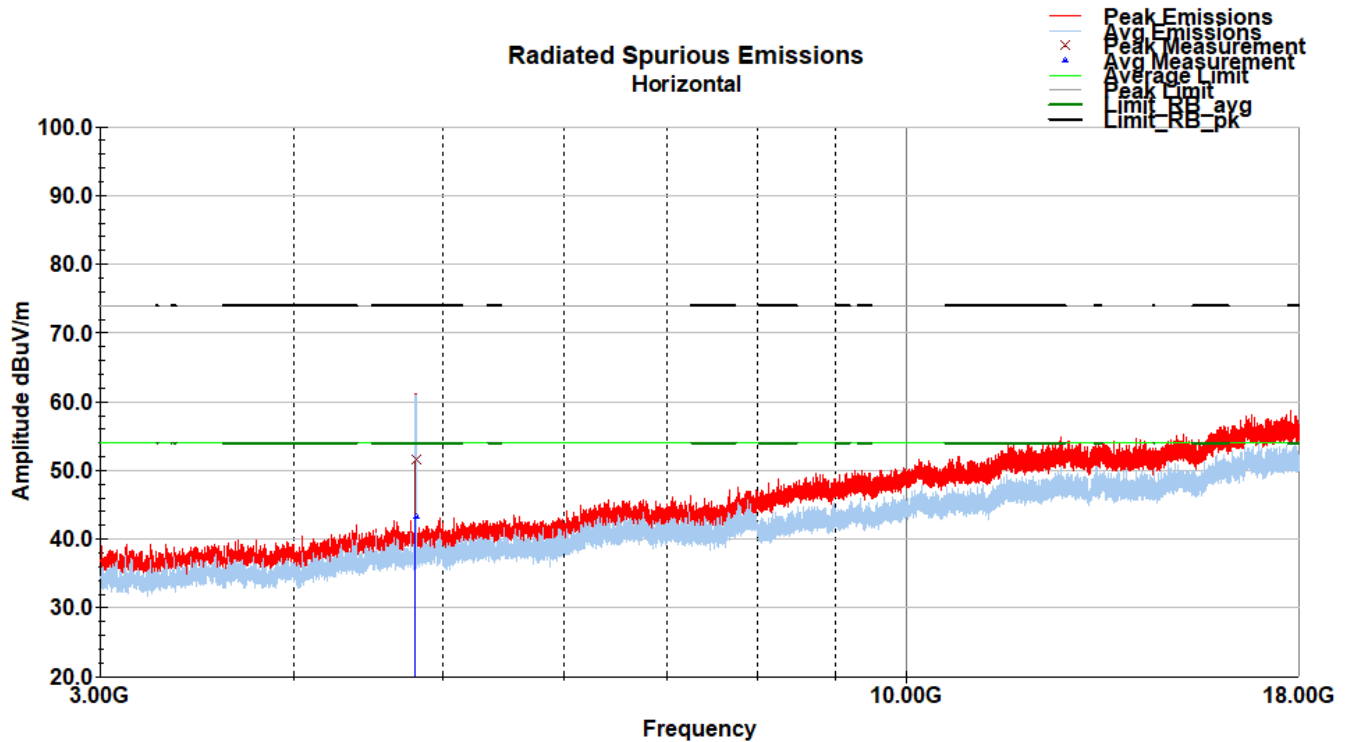
Average

Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Avg dBuV/m	Limit (dBuV/m)	Margin (dB)
4804.52	37.0	V	308.0	107.0	34.9	3.4	33.7	41.6	54.0	-12.4

Final Avg = Raw Avg + AF + Loss - Amp

Margin = Final Avg - Limit

3-18GHz Horizontal Plot – Low Channel



3-18 GHz Horizontal Data – Low Channel Peak

Frequency MHz	Raw Pk dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Pk dBuV/m	Limit dBuV/m	Margin dB
4803.80	47.0	H	221.0	100.0	34.9	3.4	33.7	51.6	74.0	-22.4

Final Pk = Raw Pk + AF + Loss - Amp

Margin = Final Pk - Limit

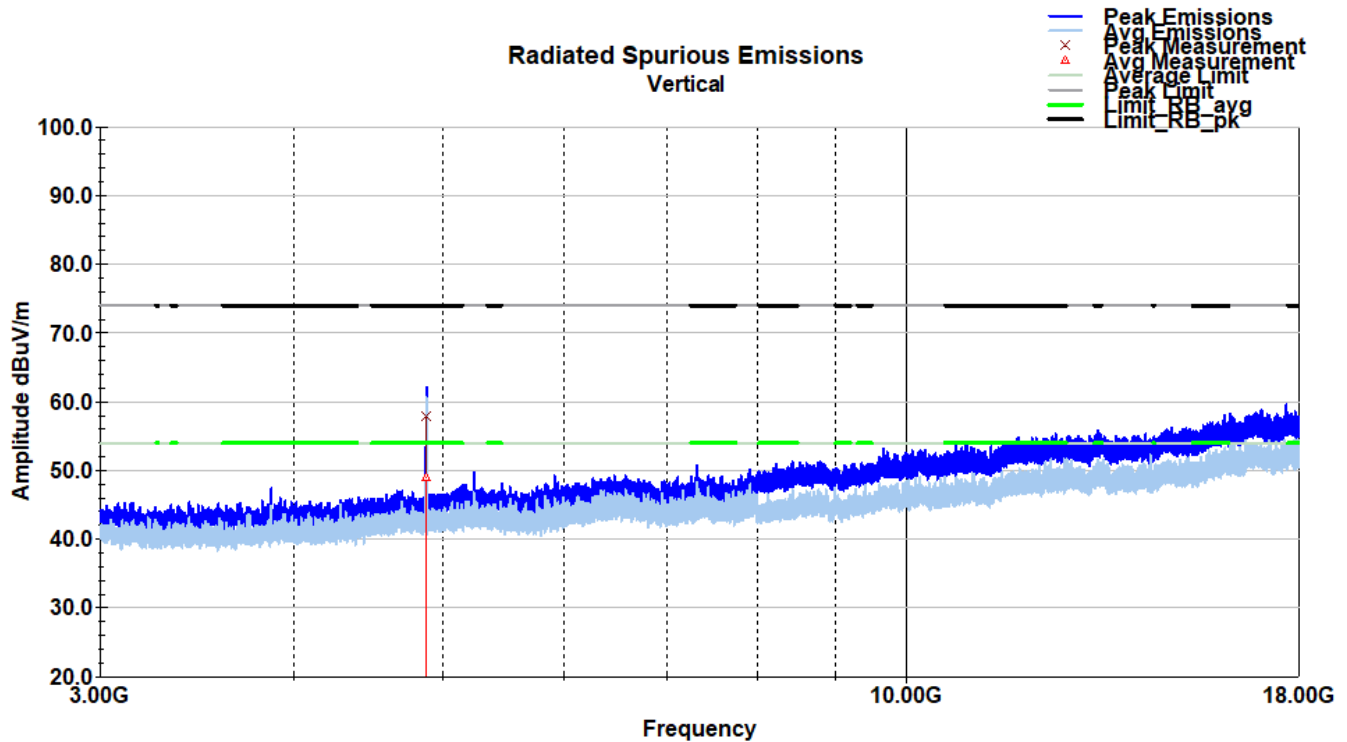
Average

Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Avg Value dBuV/m	Limit dBuV/m	Margin dB
4803.80	38.8	H	221.0	100.0	34.9	3.4	33.7	43.4	54.0	-10.6

Final Avg = Raw Avg + AF + Loss - Amp

Margin = Final Avg - Limit

3-18 GHz Vertical Plot – Mid Channel



3-18GHz Vertical Data – Mid Channel Peak

Frequency MHz	Raw Pk dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Pk dBuV/m	Limit dBuV/m	Margin dB
4879.44	53.2	V	100.0	168.0	34.9	3.5	33.7	57.9	74.0	-16.1

Final Pk = Raw Pk + AF + Loss - Amp

Margin = Final Pk - Limit

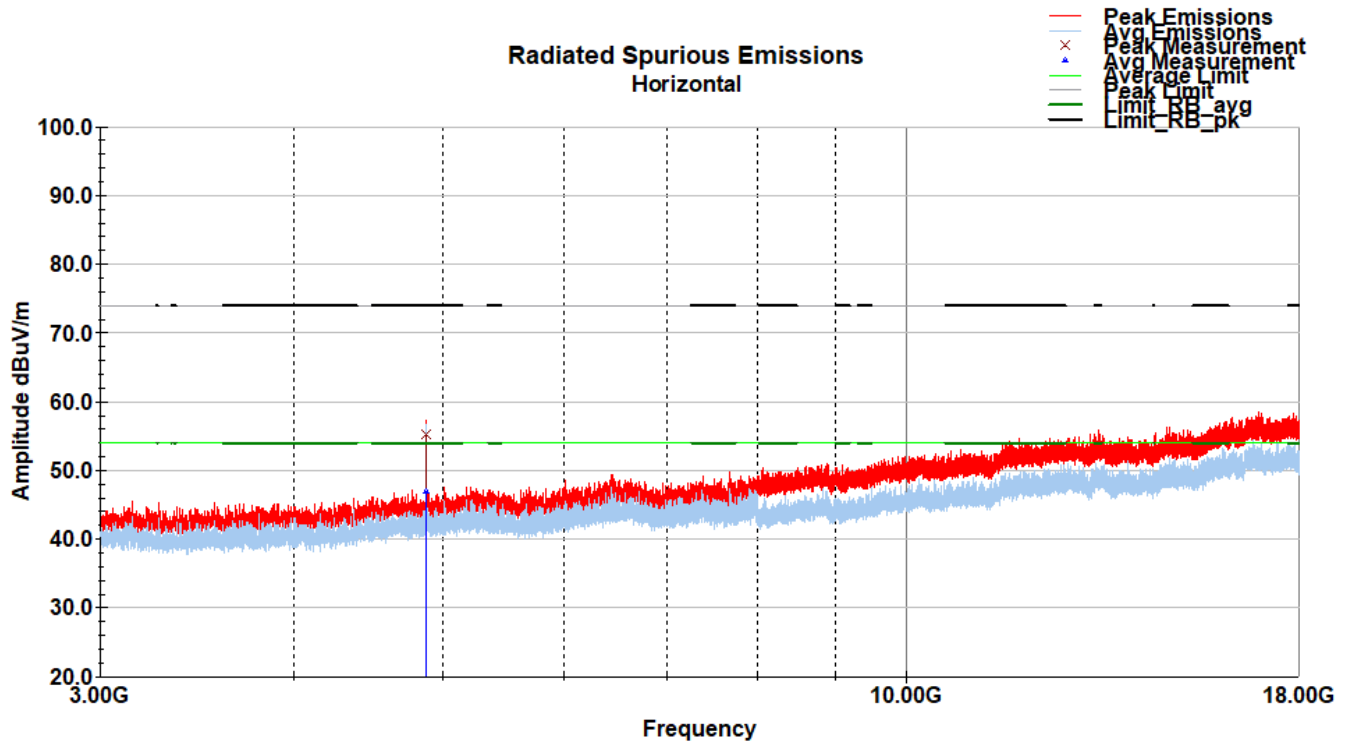
Average

Frequency MHz	Raw Pk dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Pk dBuV/m	Limit dBuV/m	Margin dB
4879.44	53.2	V	100.0	168.0	34.9	3.5	33.7	57.9	74.0	-16.1

Final Pk = Raw Pk + AF + Loss - Amp

Margin = Final Pk - Limit

3-18 GHz Horizontal Plot – Mid Channel



3-18GHz Horizontal Data – Mid Channel Peak

Frequency MHz	Raw Pk dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Pk dBuV/m	Limit dBuV/m	Margin dB
4879.68	50.6	H	250.0	213.0	34.9	3.5	33.7	55.3	74.0	-18.7

Final Pk = Raw Pk + AF + Loss - Amp

Margin = Final Pk - Limit

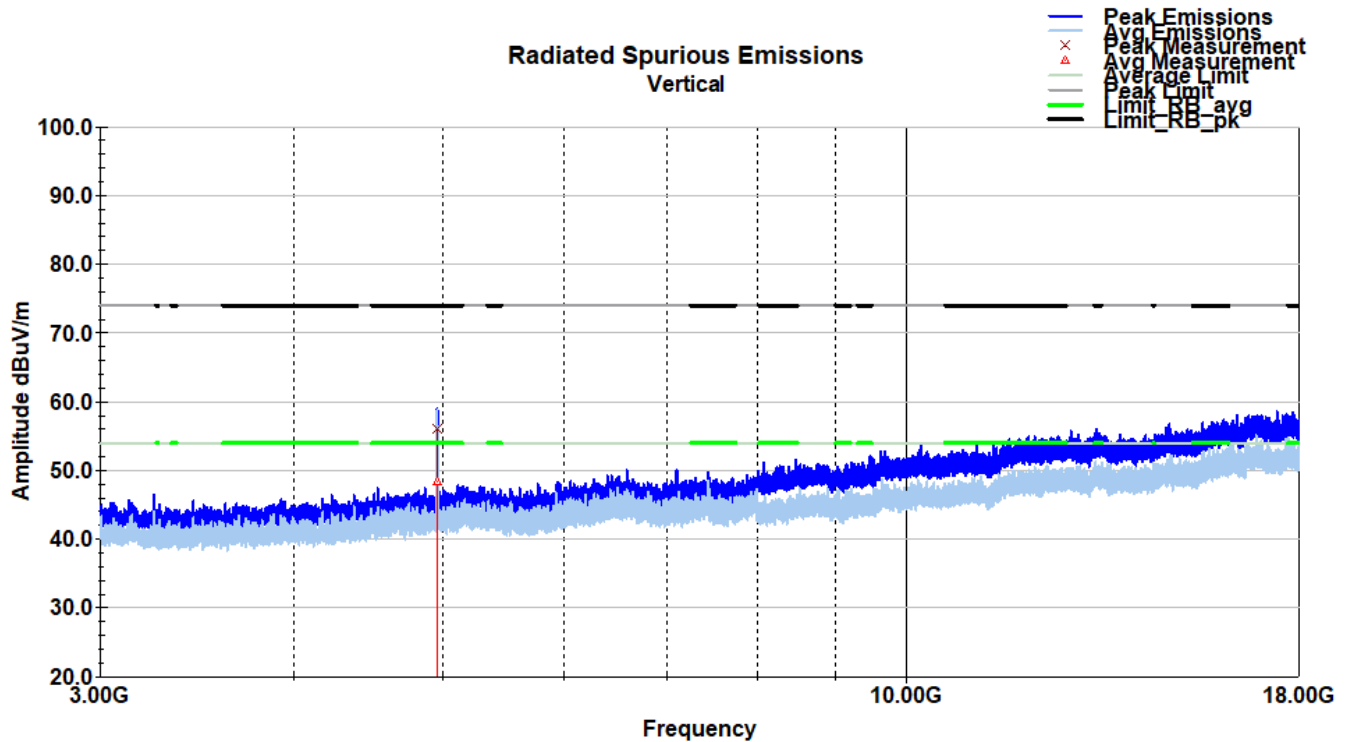
Average

Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Avg Value dBuV/m	Limit dBuV/m	Margin dB
4879.68	42.3	H	250.0	213.0	34.9	3.5	33.7	47.0	54.0	-7.0

Final Avg = Raw Avg + AF + Loss - Amp

Margin = Final Avg - Limit

3-18 GHz Vertical Plot – High Channel



3-18GHz Vertical Data – High Channel Peak

Frequency MHz	Raw Pk dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Pk dBuV/m	Limit dBuV/m	Margin dB
4959.72	51.2	V	112.0	156.0	35.0	3.7	33.7	56.1	74.0	-17.9

Final Pk = Raw Pk + AF + Loss - Amp

Margin = Final Pk - Limit

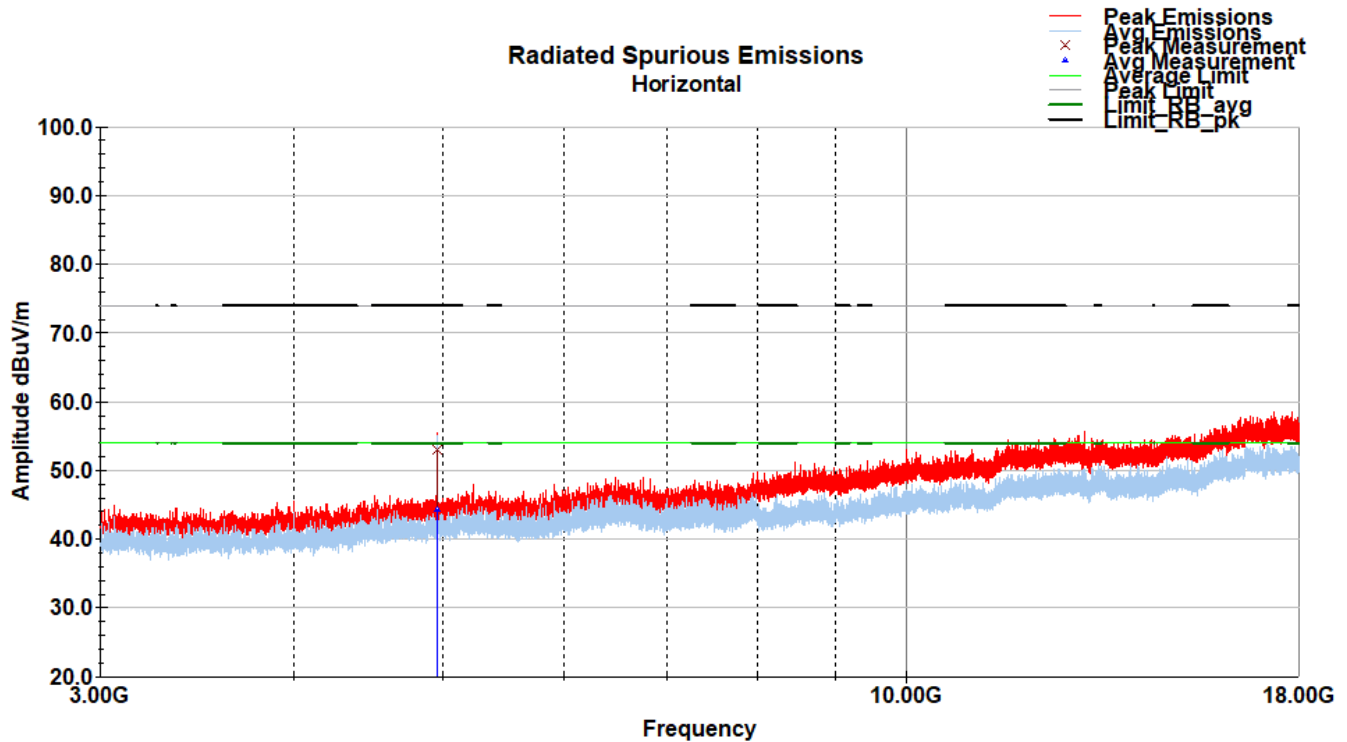
Average

Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Avg dBuV/m	Limit dBuV/m	Margin dB
4959.72	43.5	V	112.0	156.0	35.0	3.7	33.7	48.4	54.0	-5.6

Final Avg = Raw Avg + AF + Loss - Amp

Margin = Final Avg - Limit

3-18 GHz Horizontal Plot – High Channel



3-18GHz Horizontal Data – High Channel Peak

Frequency MHz	Raw Pk dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Pk dBuV/m	Limit dBuV/m	Margin dB
4959.60	48.2	H	189.0	167.0	35.0	3.7	33.7	53.1	74.0	-20.9

Final Pk = Raw Pk + AF + Loss - Amp

Margin = Final Pk - Limit

Average

Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Avg Value dBuV/m	Limit dBuV/m	Margin dB
4959.60	39.4	H	189.0	167.0	35.0	3.7	33.7	44.3	54.0	-9.6

Final Avg = Raw Avg + AF + Loss - Amp

Margin = Final Avg - Limit

There were no emissions in the 18-26GHz frequency range.

8 Band Edge Emissions in Restricted Frequency Bands

8.1 Test Result

Test Description	Test Specification		Test Result
Band Edge Emissions in Restricted Frequency Bands	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. Measurements were made using the conducted methods defined in ANSI C63.10: 2013 clause 11.12.2. The measurements were converted to a radiated field strength equivalent using the equations defined in that section. Both peak and average measurements were performed at the antenna port. These procedures are referenced in KDB 558074 D01 15.247 Meas Guidance v05r02.

A reference level offset was applied to the spectrum analyzer so that conducted measurements represent field strength measurements in dBμV/m.

All supported data modes were tested, but just the worst-case results of the 2Mbps data mode are reported.

8.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.8 °C
Relative Humidity: 47.5 %
Atmospheric Pressure: 97.4 kPa

8.4 Test Equipment

Test End Date: 6-Jun-2023

Tester: MT

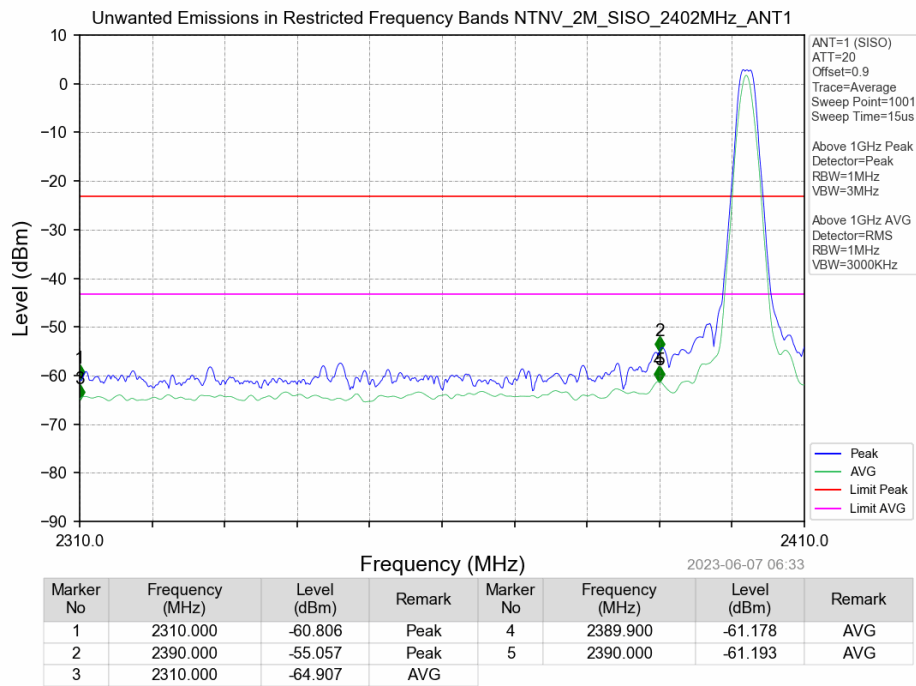
Equipment	Model	Manufacturer	Asset	Cal Date	Cal Due Date
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	7-Dec-2022	7-Dec-2023
RF CABLE SMA TO SMA, 0.01-40GHZ	084-0505-059	TELEDYNE STORM MICROWAVE	20108	13-Mar-2023	13-Mar-2024

Software: TSTPASS Version: 2.0

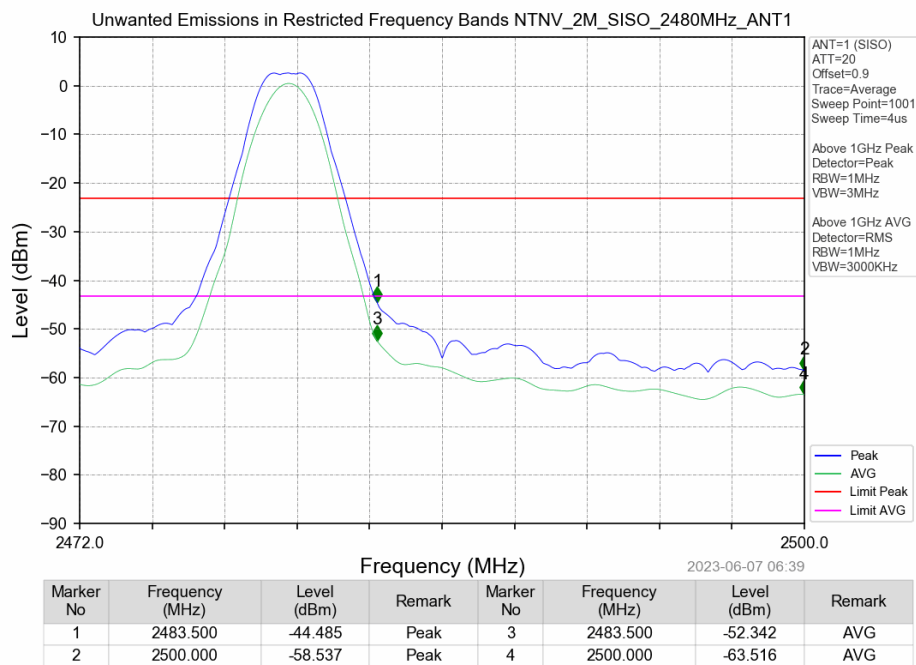
8.5 Test Data

Test Mode	Test Frequency (MHz)	TX Type	Frequency (MHz)	Reading Level (dBm)	Antenna Gain (dBi)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2M	2402	SISO	2310.0	-64.91	2.00	32.29	54	-21.71	AVG
				-60.81	2.00	36.39	74	-37.61	Peak
			2389.9	-61.18	2.00	36.02	54	-17.98	AVG
				-61.19	2.00	36.01	54	-17.99	AVG
				-55.06	2.00	42.14	74	-31.86	Peak
	2480	SISO	2483.5	-52.34	2.00	44.86	54	-9.14	AVG
				-44.48	2.00	52.72	74	-21.29	Peak
			2500.0	-63.52	2.00	33.68	54	-20.32	AVG
				-58.54	2.00	38.66	74	-35.34	Peak

BLE – Low Channel – Plot



BLE – High Channel – Plot



9 Measurement Uncertainty

The measurement uncertainty figures are calculated in accordance with TR 100 028-1 [2] and correspond to an expansion factor (coverage factor) $k = 2$ (which provides 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	± 1.5 dB	± 1.2 dB
RF power density, conducted	± 3 dB	± 0.7 dB
spurious emissions, conducted	± 3 dB	± 2.1 dB
all emissions, radiated	± 6 dB	± 4.8 dB
temperature	$\pm 1^{\circ}\text{C}$	$\pm 0.5^{\circ}\text{C}$
humidity	± 5 %	$\pm 3.5\%$
DC and low frequency voltages	± 3 %	$\pm 0.4\%$
Conducted disturbance at mains port using AMN	± 3.4 dB	± 2.5 dB

10 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	02 November 2023