

EMC Test Report

Project Number: 4660518

Report Number: 4660518EMC02

Revision Level: 2

Client: Foundation Fitness LLC

Equipment Under Test: Indoor Cycling Console

Model Number: SIC2

Contains FCC ID: 2AA9B10

Contains IC: 12208A-10

Applicable Standards: LP0002 (2018-10)

Report issued on: 22 December 2020

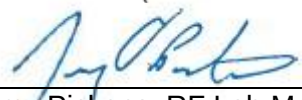
Test Result: Compliant

Prepared by:



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Reviewed by:



Jeremy Pickens, RF Lab Manager

Remarks: This report details the results of the testing carried out on one sample; the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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1 Summary of Test Results

Test Description	Test Specification	Test Result
Bandwidth	3.10.1.6 (2) (A)	Compliant
RF Output Power	3.10.1.2 (1) (C)	Compliant
Power Spectral Density	3.10.1.6 (2) (B)	Compliant
Conducted Spurious Emissions / Band Edge	3.10.1.5	Compliant
Field Strength of Spurious Radiation	3.10.2.2 & 3.10.1.5	Compliant
Emissions in Restricted Frequency Bands	2.7 / 2.8 / 3.10.1.5	Compliant
Antenna Requirement	3.10.1.3	Compliant
AC Powerline Conducted Emissions	2.3	N/A ¹

Notes:

1. DUT is DC Powered

1.1 Modifications Required for Compliance

None

2 General Information

2.1 Client Information

Name: Foundation Fitness LLC
Address: 606 SE 9th Ave
City, State, Zip, Country: Portland, OR 97214, United States

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

2.3 General Information of EUT

Product Marketing Name (PMN): Indoor Cycling Console
Model Number (HVIN): SIC2
Serial Number: F0527200019

Frequency Range: 2457 MHz
Data Modes: ANT+
Antenna: Integrated Antenna; -1 dBi max

Rated Voltage: 5 Vdc
Test Voltage: 5 Vdc

Test Software Name: Direct Test Mode Tool
Test Software Developer: Nordic Semiconductor
Test Software Version: 1.0.0
Test Software Power Setting: 8 dBm

Sample Received Date: 03 September 2020
Dates of testing: 30 October – 06 November 2020 -

Brand: Stages Cycling
Manufacturer Name: Digital Concepts, Inc.
Manufacturer Address: Ponciano Arriaga No 716
Col. Parque Industrial Los Aztecas, Cd. Juarez
Chihuahua, Mexico, CP, 32679

Trade Mark: 

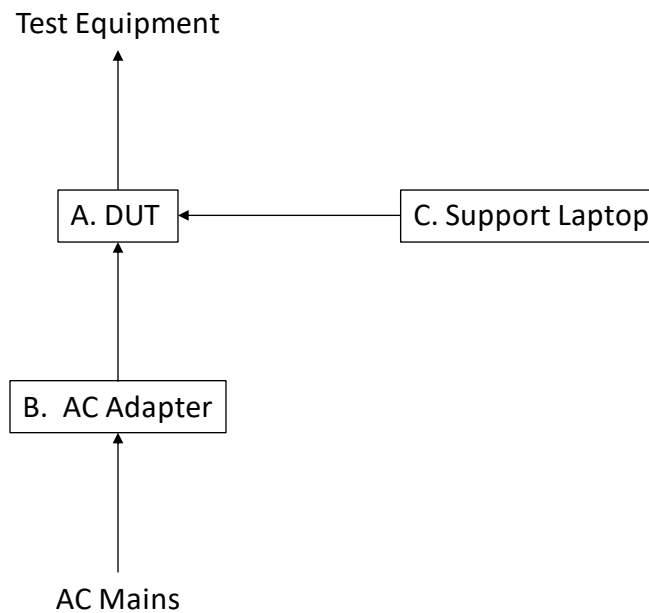
2.4 Operating Modes and Conditions

Test modes were utilized to control the radio and transmit at full power and at maximum duty cycle, on any specified channel in the desired data mode.

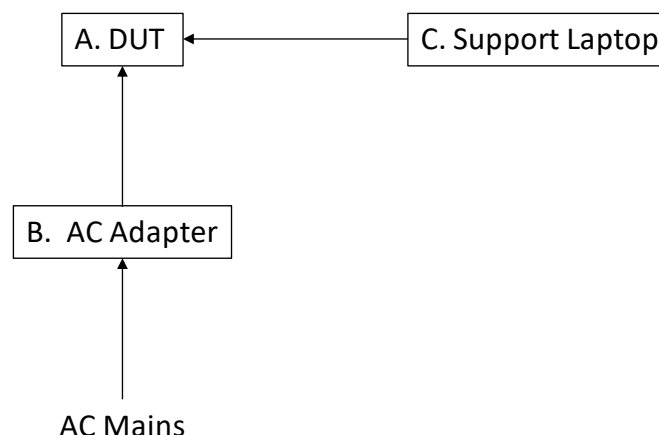
A sample with chipset BMD-341 (Conducted Sample) and a sample with chipset BMD-340 (Radiated Sample) were provided for testing. The BMD-341 has a u.fl connector for antenna port measurements instead of the trace antenna. This is the only difference between the samples under test. Production units will utilize the BMD-340 chipset.

The AC Adapter was utilized to facilitate testing only and is not part of the system. Normally the DUT is battery-operated.

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 ₁	Digital Concepts, Inc.	DUT (Conducted)	SIC2	F0527200019
A ₂	Digital Concepts, Inc.	DUT (Radiated)	SIC2	F0527200017
Support Equipment				
B	CUI INC	Switching Adapter	SWI10-5-N	5660
C	Lenovo	Laptop	ThinkPad T420	4236B85

3 Bandwidth

3.1 Test Result

Test Description	Test Specification	Test Result
6 dB bandwidth	3.10.1.6 (2) (A)	Compliant

3.2 Test Method

The procedures from ANSI C63.10: 2013 clause 11.8 and 558074 D01 DTS Meas Guidance v05r02 were used to determine the 6 dB bandwidth.

3.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.1 °C
Relative Humidity: 57.7 %
Atmospheric Pressure: 98.2 kPa

3.4 Test Equipment

Test End Date: 30-Oct-2020

Tester: ASF

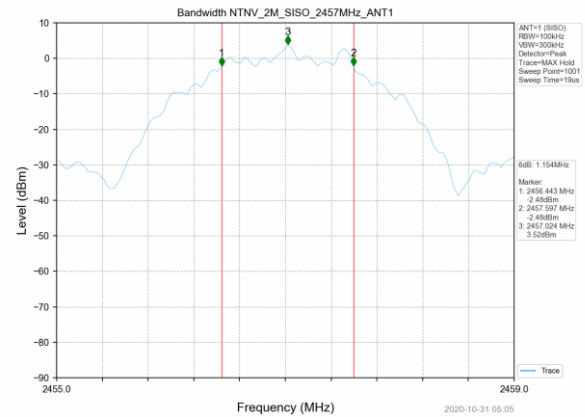
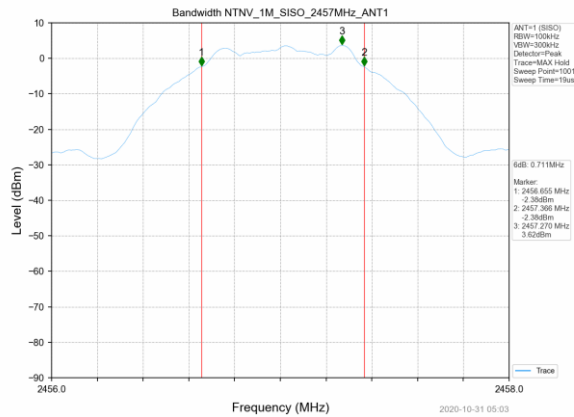
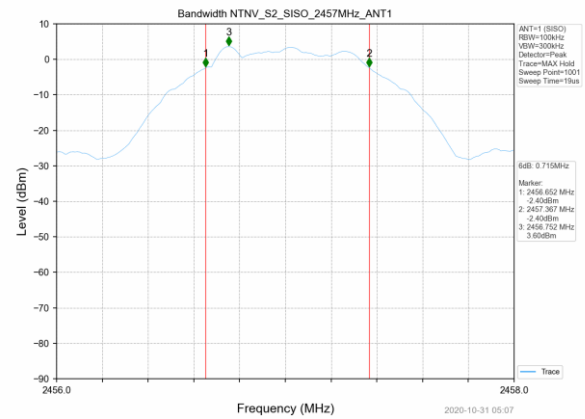
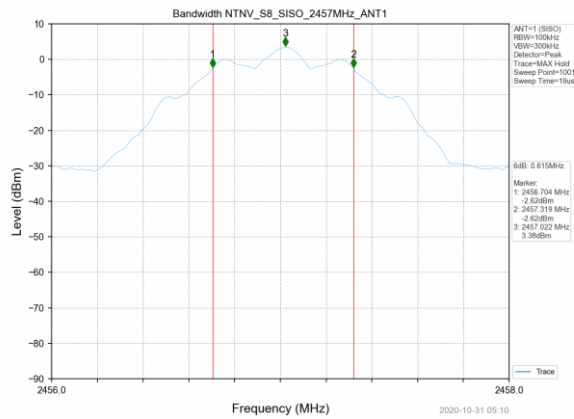
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
RF Cable SMA to SMA, 0.01-40GHz	084-0505-059	TELEDYNE STORM MICROWAVE	20108	6-Mar-2021
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	27-Dec-2021

Note: The equipment calibration period is 1 year except for the FSV30 which is on a 2-year cycle.

3.5 Test Data

Test Mode	Frequency (MHz)	TX Type	ANT No.	6dB Bandwidth		Verdict
				Test Result (MHz)	Limits (MHz)	
S8	2457	SISO	1	0.615	≥ 0.5	PASS
S2	2457	SISO	1	0.715	≥ 0.5	PASS
1M	2457	SISO	1	0.711	≥ 0.5	PASS
2M	2457	SISO	1	1.154	≥ 0.5	PASS

3.5.1 Plots



4 RF Output Power

4.1 Test Result

Test Description	Test Specification	Test Result
RF Output Power	3.10.1.2	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 v05r02.

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

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.1 °C
Relative Humidity: 57.7 %
Atmospheric Pressure: 98.2 kPa

4.4 Test Equipment

Test End Date: 30-Oct-2020

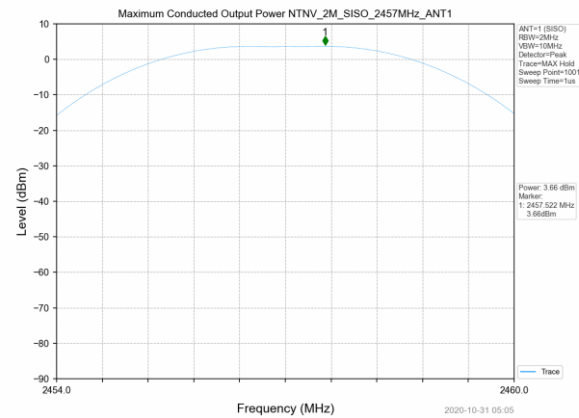
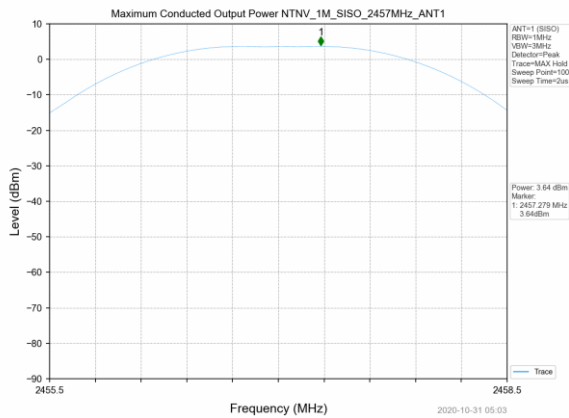
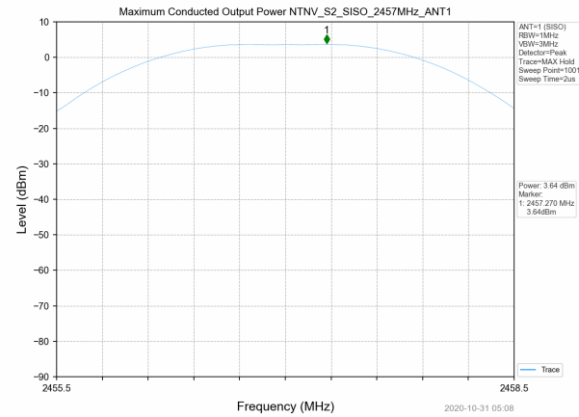
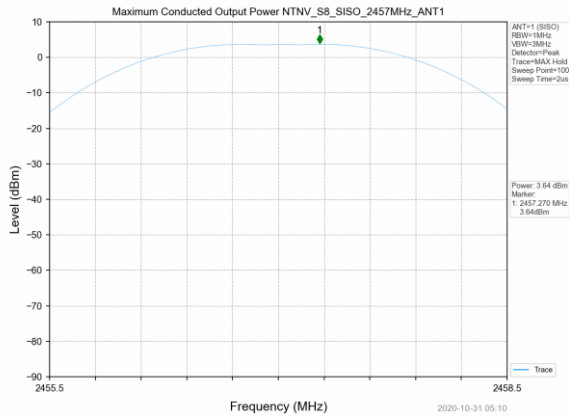
Tester: ASF

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
RF Cable SMA to SMA, 0.01-40GHz	084-0505-059	TELEDYNE STORM MICROWAVE	20108	6-Mar-2021
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	27-Dec-2021

Note: The equipment calibration period is 1 year except for the FSV30 which is on a 2-year cycle.

4.5 Test Data

Test Mode	Frequency (MHz)	Tx Type	Measured Peak Output Power (dBm)	Limits (dBm)	Verdict
			Ant 1		
S8	2457	SISO	3.64	30	PASS
S2	2457	SISO	3.64	30	PASS
1M	2457	SISO	3.64	30	PASS
2M	2457	SISO	3.66	30	PASS



5 Power Spectral Density

5.1 Test Result

Test Description	Test Specification	Test Result
Power Spectral Density	3.10.1.6 (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 v05r02.

Limit

The limit is 8 dBm.

5.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.1 °C
Relative Humidity: 57.7 %
Atmospheric Pressure: 98.2 kPa

5.4 Test Equipment

Test End Date: 30-Oct-2020

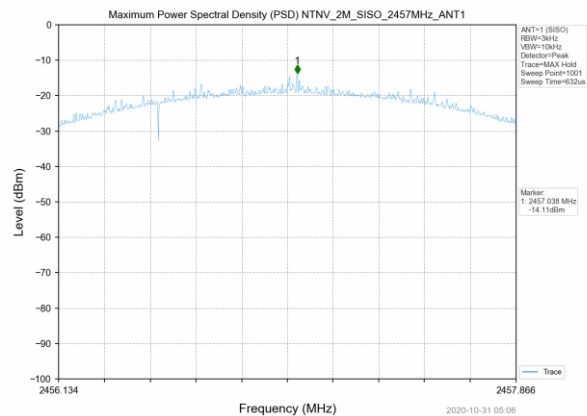
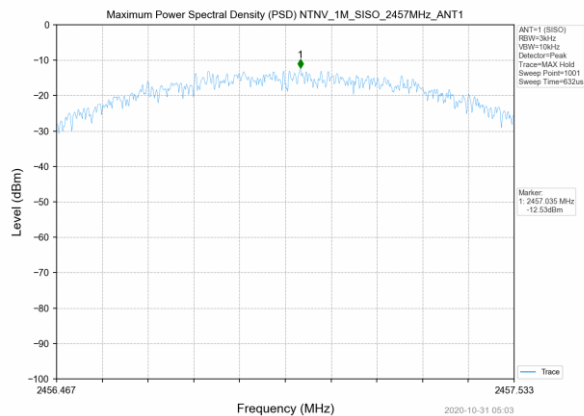
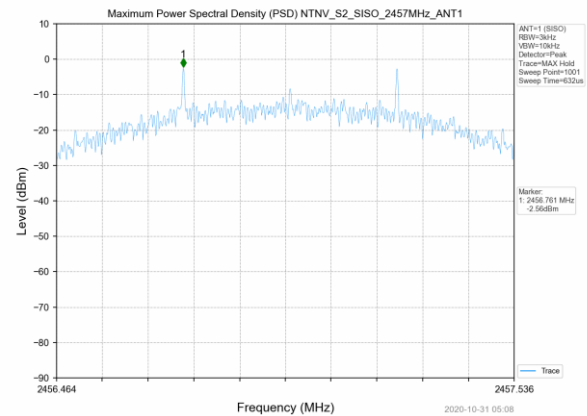
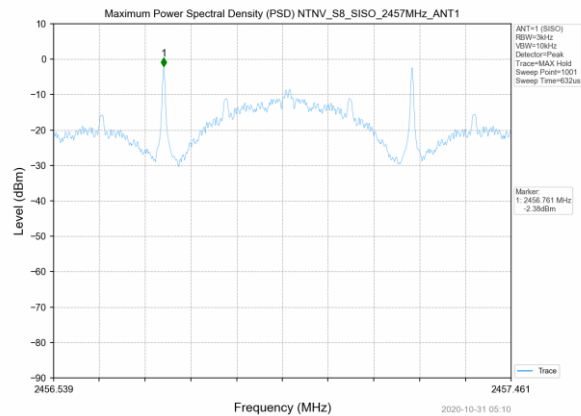
Tester: ASF

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
RF Cable SMA to SMA, 0.01-40GHz	084-0505-059	TELEDYNE STORM MICROWAVE	20108	6-Mar-2021
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	27-Dec-2021

Note: The equipment calibration period is 1 year except for the FSV30 which is on a 2-year cycle.

5.5 Test Data

Test Mode	Frequency (MHz)	Tx Type	Maximum Power Spectral Density (dBm/3KHz)	Limits (dBm/3kHz)	Verdict
			Ant 1		
S8	2457	SISO	-2.38	≤8	PASS
S2	2457	SISO	-2.56	≤8	PASS
1M	2457	SISO	-12.53	≤8	PASS
2M	2457	SISO	-14.11	≤8	PASS



6 Conducted Spurious Emissions / Band Edge

6.1 Test Result

Test Description	Test Specification	Test Result
Conducted Spurious Emissions	3.10.1.5	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 v05r02.

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: 22.1 °C

Relative Humidity: 57.7 %

Atmospheric Pressure: 98.2 kPa

6.4 Test Equipment

Test End Date: 30-Oct-2020

Tester: ASF

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
RF Cable SMA to SMA, 0.01-40GHz	084-0505-059	TELEDYNE STORM MICROWAVE	20108	6-Mar-2021
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	27-Dec-2021

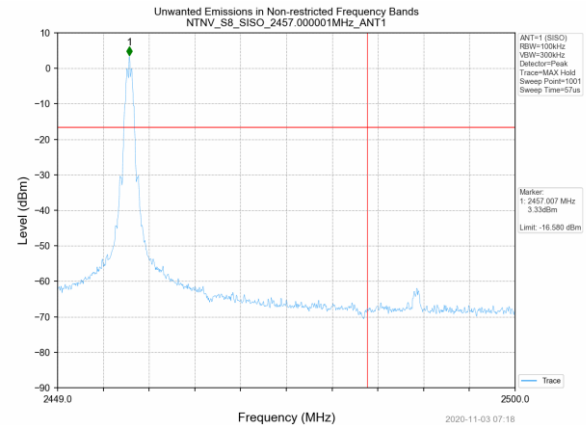
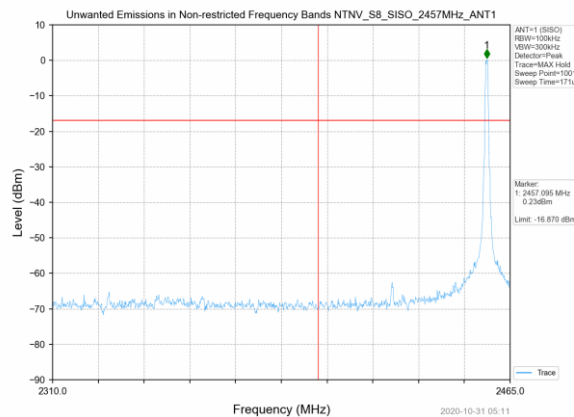
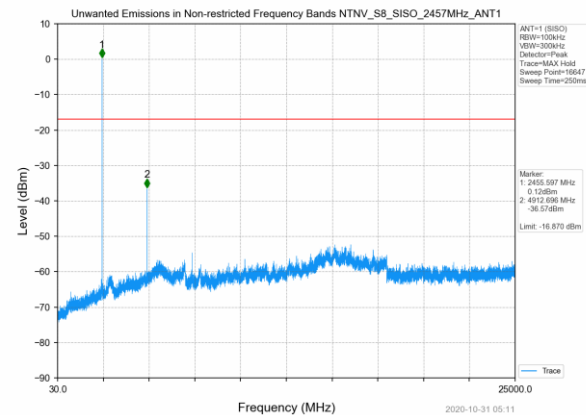
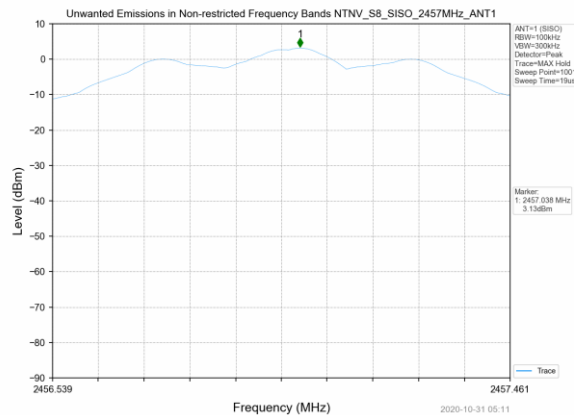
Note: The equipment calibration period is 1 year except for the FSV30 which is on a 2-year cycle.

6.5 Test Data – DTS Band Edge

Test Mode	Frequency (MHz)	TX Type	ANT No.	Spurious Conducted Emission (dBm)	Limits (dBm)	Verdict
S8	2457	SISO	1	Refer to test graph	-16.87	PASS
S2	2457	SISO	1	Refer to test graph	-16.39	PASS
1M	2457	SISO	1	Refer to test graph	-16.38	PASS
2M	2457	SISO	1	Refer to test graph	-16.49	PASS

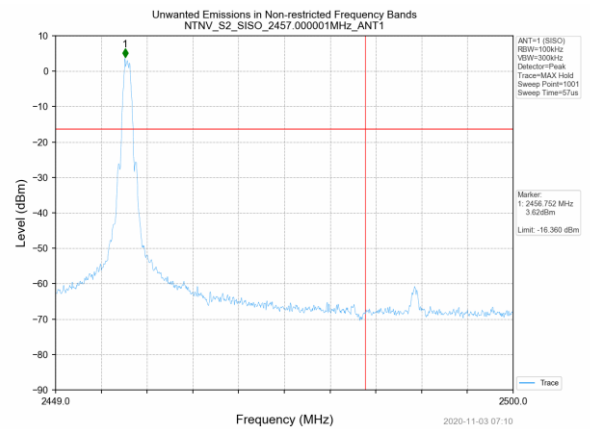
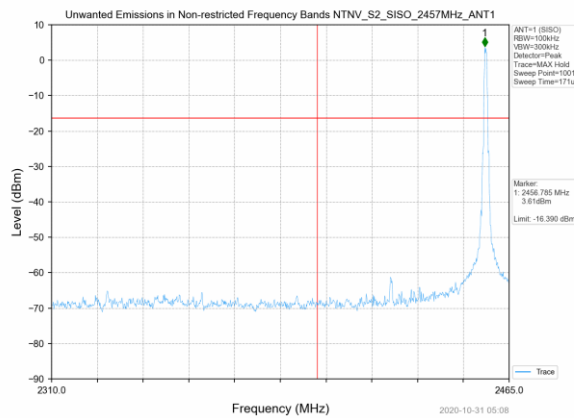
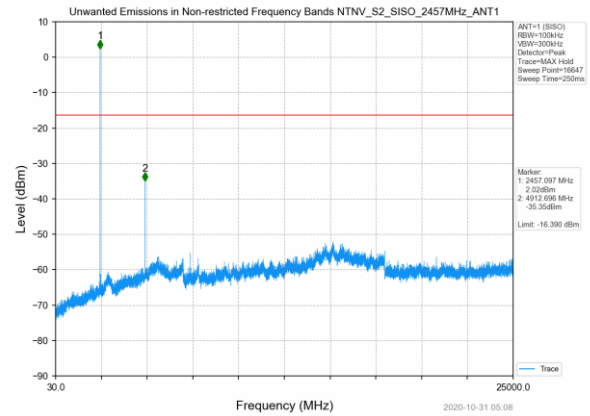
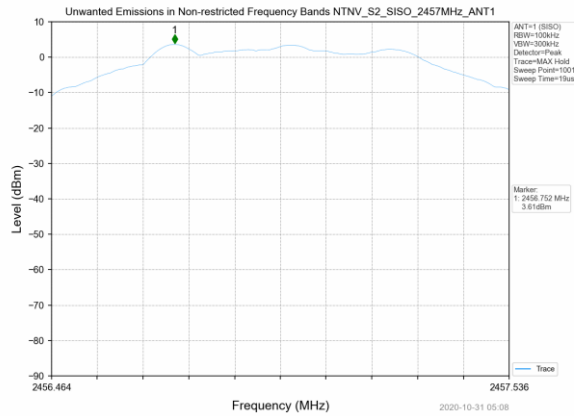
6.5.1 Plots

6.5.1.1 S8



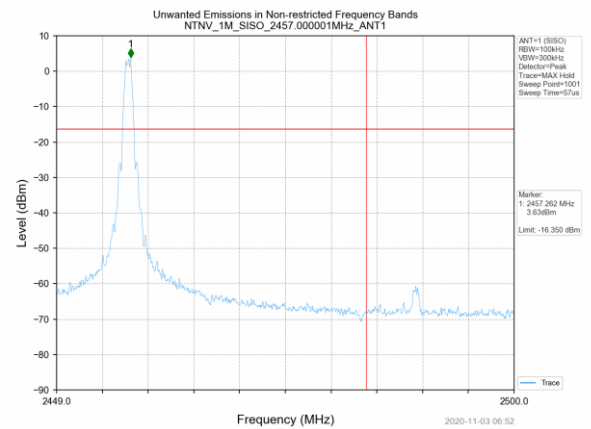
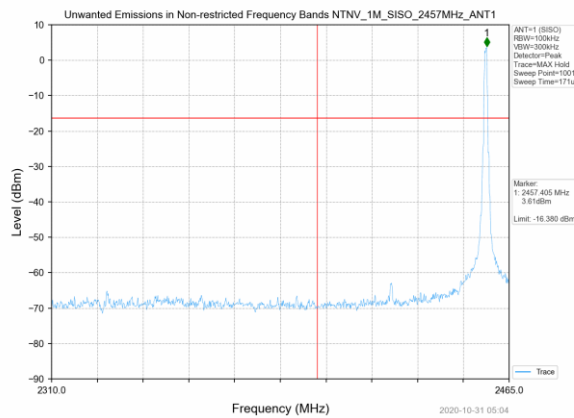
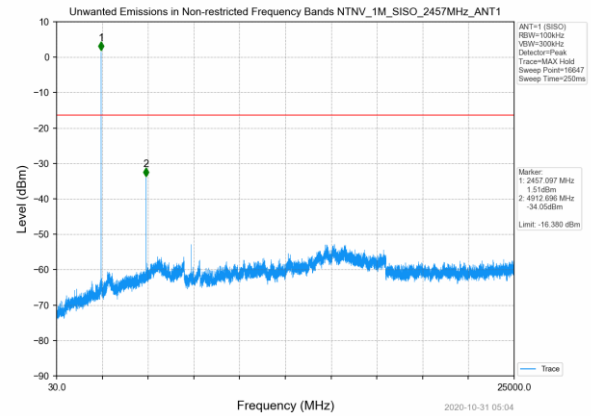
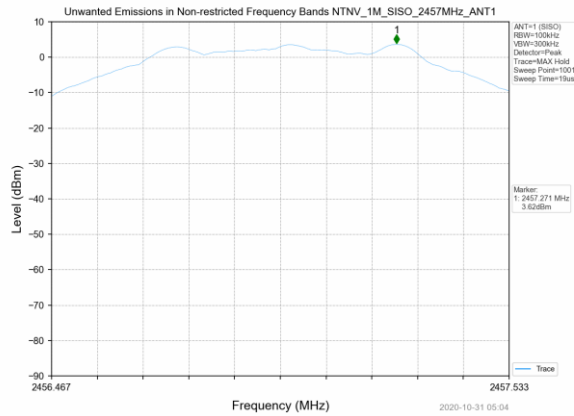
Note: DUT was only transmitting at 2457 MHz. Automation software required designation of 2457.000001 MHz to display upper band edge.

6.5.1.3 S2



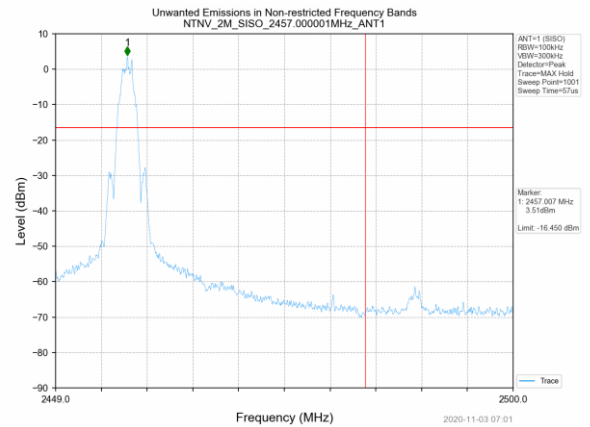
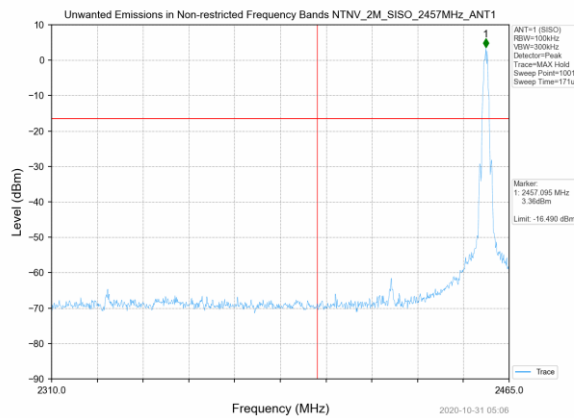
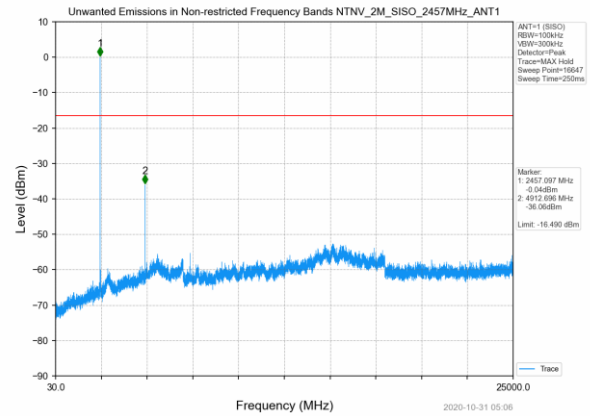
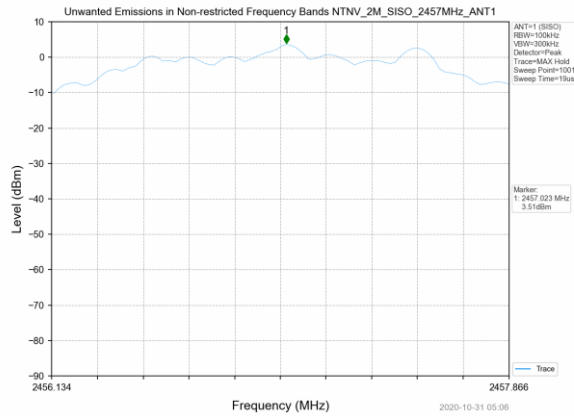
Note: DUT was only transmitting at 2457 MHz. Automation software required designation of 2457.000001 MHz to display upper band edge.

6.5.1.4 1M



Note: DUT was only transmitting at 2457 MHz. Automation software required designation of 2457.000001 MHz to display upper band edge.

6.5.1.5 2M



Note: DUT was only transmitting at 2457 MHz. Automation software required designation of 2457.000001 MHz to display upper band edge.

7 Field Strength of Spurious Radiation

7.1 Test Result

Test Description	Test Specification	Test Result
Radiated Spurious Emissions	3.10.2.2 & 3.10.1.5	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 channels low, middle, and high channels.

Test distance:

9k to 30 MHz – Near field prescan to determine if there were any emissions within 20 dB of the limit.

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

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23 °C

Relative Humidity: 25 %

Atmospheric Pressure: 98 kPa

7.4 Test Equipment

Test End Date: 6-Nov-2020

Tester: PV

Equipment	Model	Manufacturer	Asset Number	Cal Date	Cal Due Date
ANTENNA, BILOG	CBL 6143A	TESEQ	B085931	30-Jan-2020	30-Jan-2022
RF Cable Nm to Nm, 0.01-18GHz	90-195-354	ELEDYNE STORM MICROWAVE	20120	2-Mar-2020	2-Mar-2021
RF Cable Nm to Nf, 0.01-18GHz	90-213-118	ELEDYNE STORM MICROWAVE	20117	2-Mar-2020	2-Mar-2021
RF Cable Nm to Nm, 0.01-18GHz	90-195-118	ELEDYNE STORM MICROWAVE	20125	2-Mar-2020	2-Mar-2021
RF CABLE	104PE	HUBER & SUHNER	B079793	3-Sep-2020	3-Sep-2021
LOW NOISE AMPLIFIER	ZKL-2+	Mini-Circuits	B079800	25-Sep-2020	25-Sep-2021
EMI TEST RECEIVER	ESU8	ROHDE & SCHWARZ	B085759	7-May-2020	7-May-2021

Note: The equipment calibration period is 1 year.

Tile Profile: "RSE 30-1000 MHz T7 200910" dated 10 Sep 2020

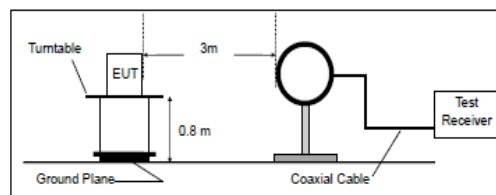
Test End Date: 6-Nov-2020

Tester: PV

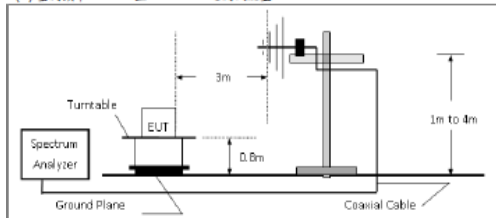
Equipment	Model	Manufacturer	Asset Number	Cal Date	Cal Due Date
ANTENNA, DRG HORN (MEDIUM)	3117	ETS Lindgren	B079699	15-Jul-2020	15-Jul-2022
RF Cable Nm to Nm, 0.01-18GHz	90-195-354	ELEDYNE STORM MICROWAVE	20120	2-Mar-2020	2-Mar-2021
RF CABLE	SUCOFLEX 100	Huber & Suhner	B108523	3-Sep-2020	3-Sep-2021
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	B094463	3-Dec-2019	3-Dec-2020
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	6-Apr-2020	6-Apr-2021

Note: the equipment calibration period is 1 year with the exception of asset B069691, which is on a 2 yr cycle.

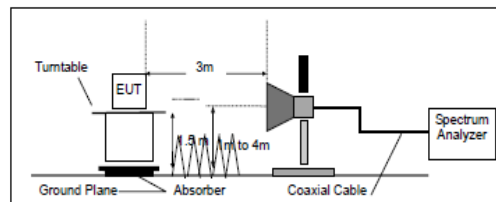
Tile Profile: "RSE 1-18 GHz T7 200910" dated 10 Sep 2020



(B) 量測頻率 30MHz 至 1000MHz 之測試配置



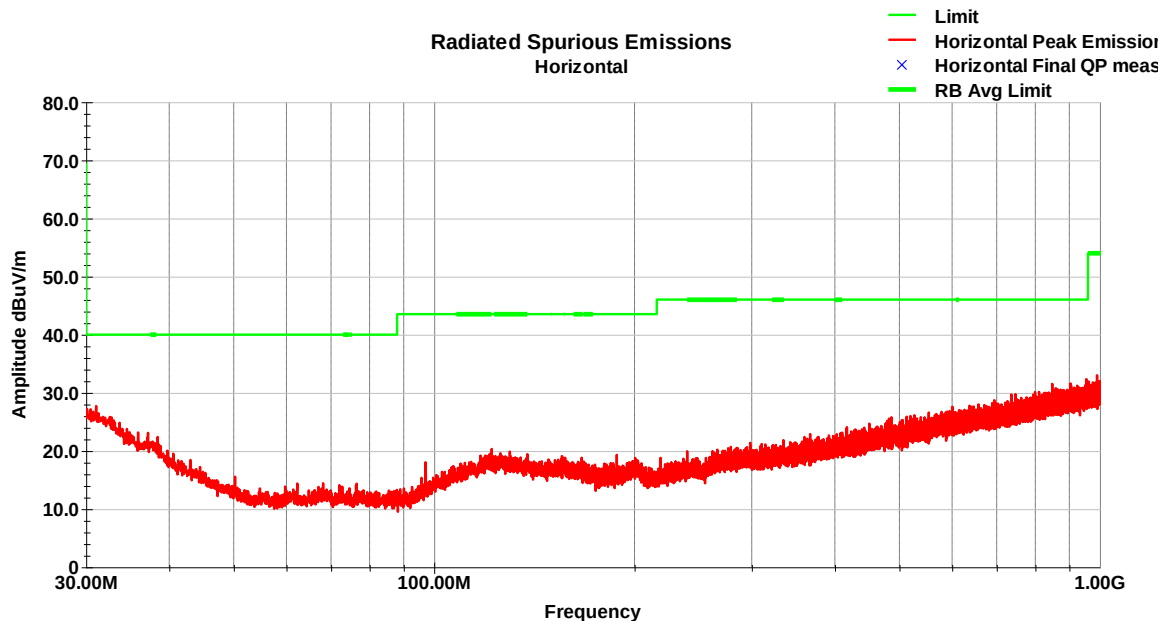
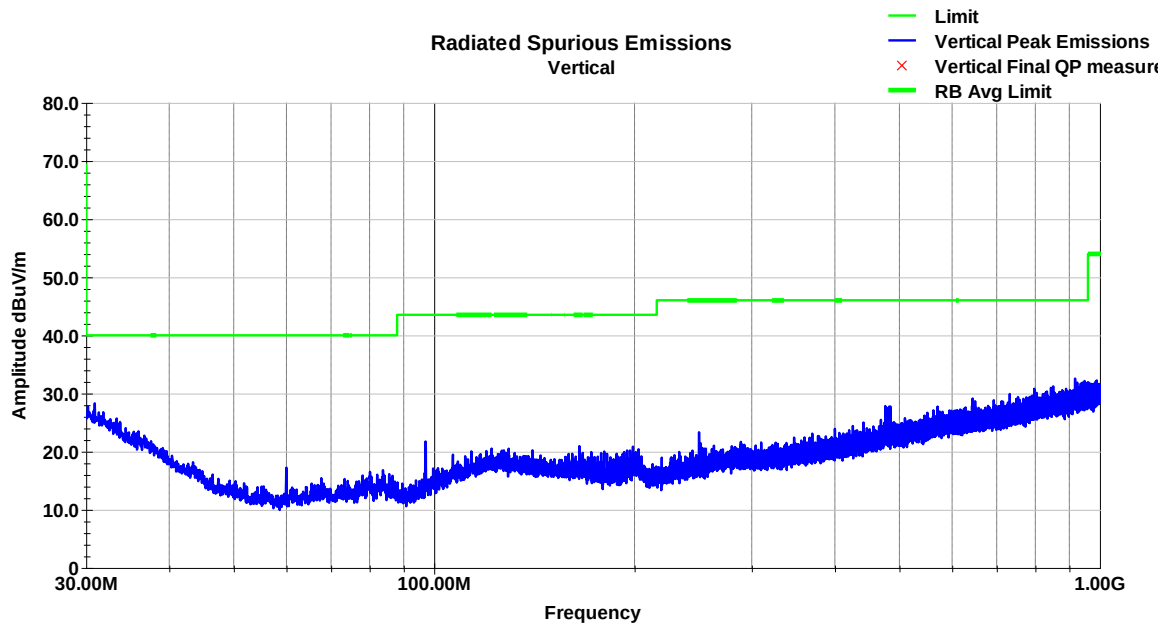
(C) 量測頻率 1000MHz 以上之測試配置



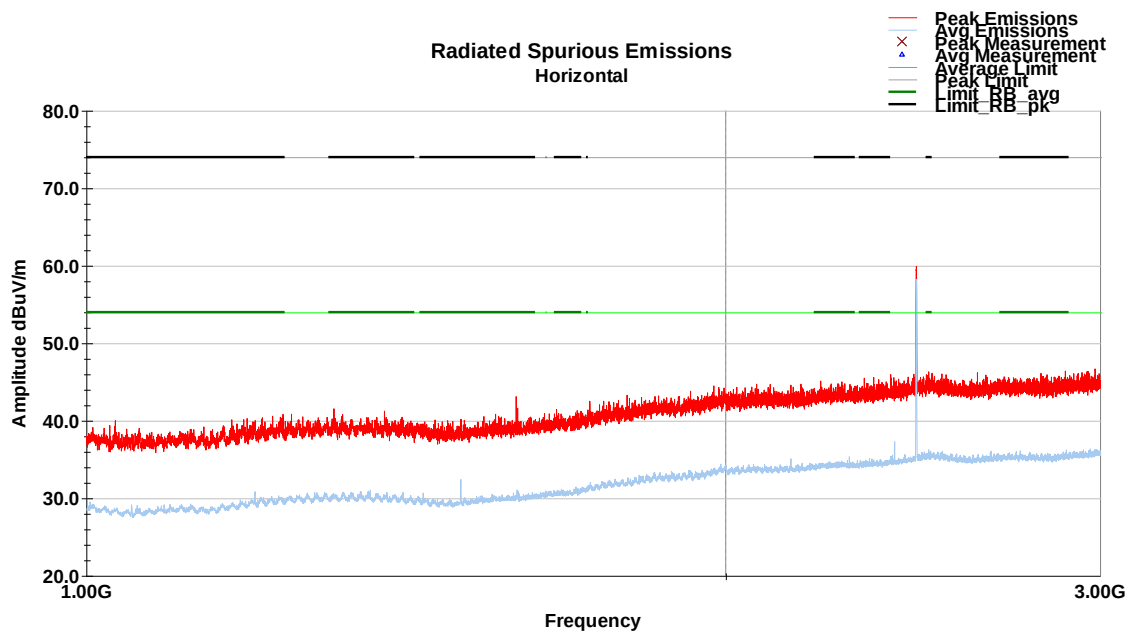
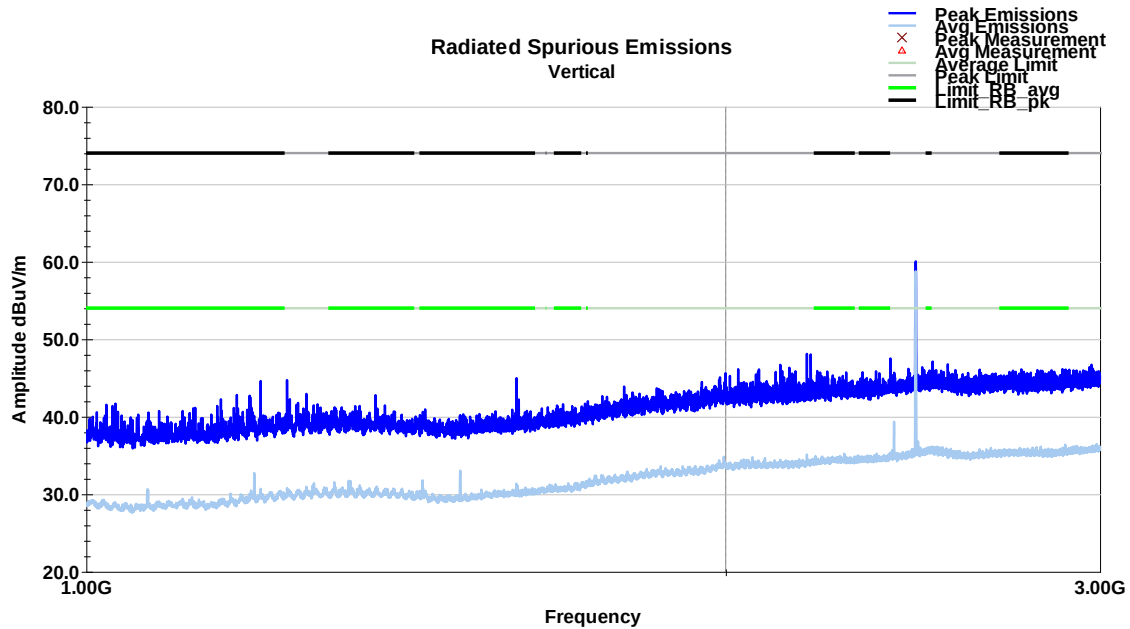
7.5 Test Data

7.5.1 30-1000 MHz

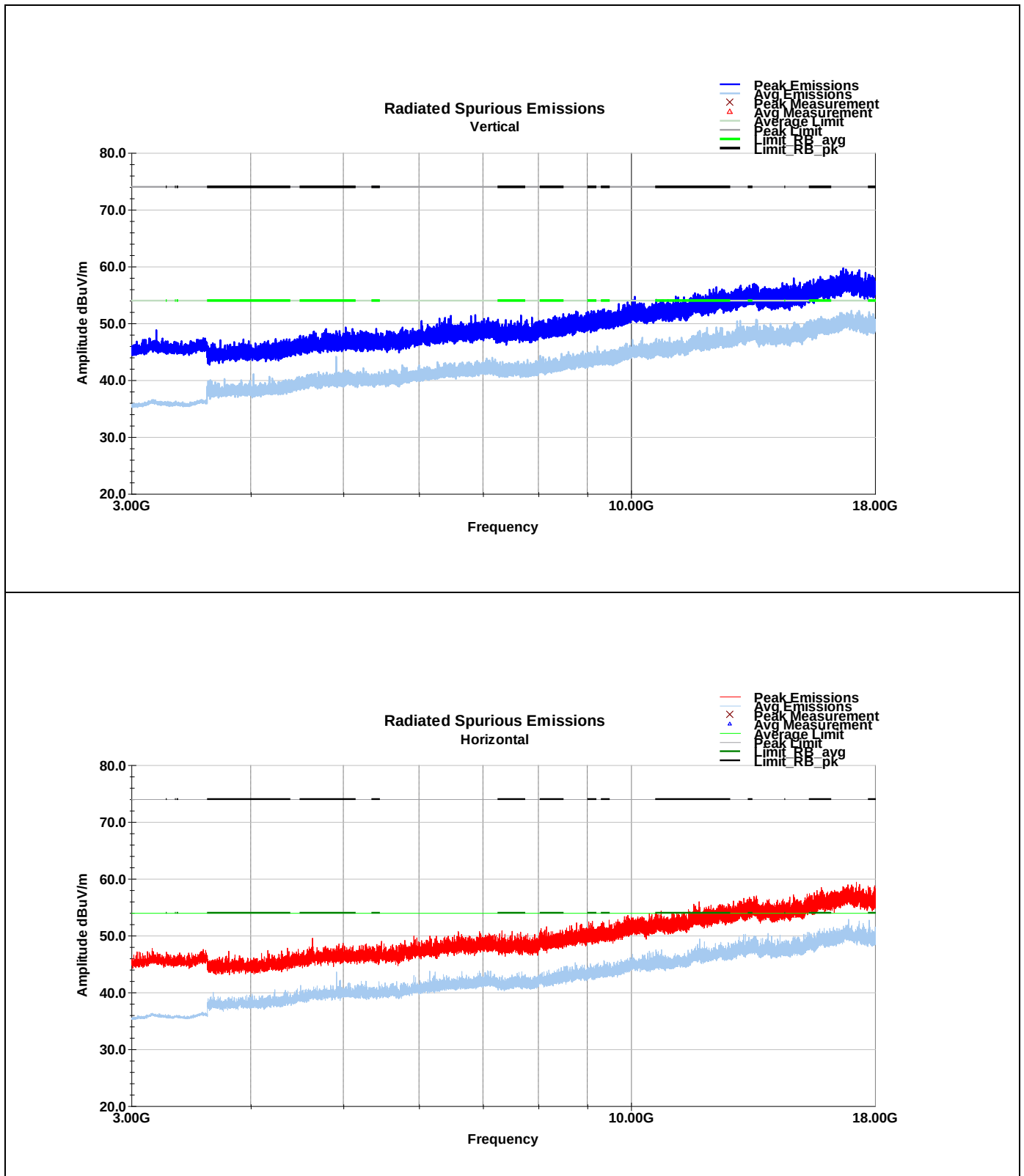
No significant deviation with respect to axis or channel, No Emissions within 20 dB of the limit detected below 30 MHz



7.5.2 1-3 GHz



7.5.3 3-18 GHz



No Emissions within 20 dB of the limit detected above 18 GHz

8 Emissions in Restricted Frequency Bands

8.1 Test Result

Test Description	Test Specification	Test Result
Restricted Band Emissions	3.10.1.5	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

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.1 °C
Relative Humidity: 57.7 %
Atmospheric Pressure: 98.2 kPa

8.4 Test Equipment

Test End Date: 30-Oct-2020

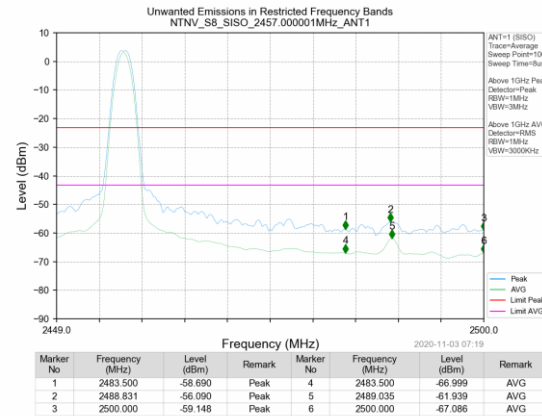
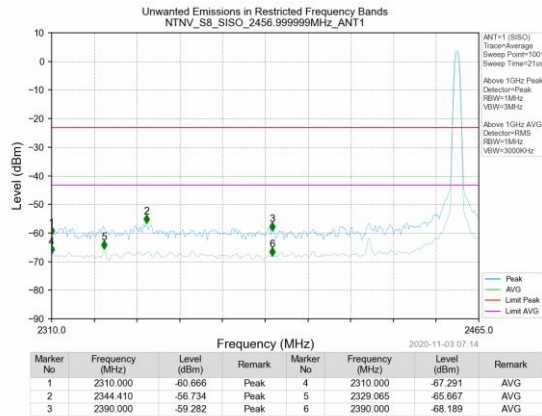
Tester: ASF

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
RF Cable SMA to SMA, 0.01-40GHz	084-0505-059	TELEDYNE STORM MICROWAVE	20108	6-Mar-2021
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	27-Dec-2021

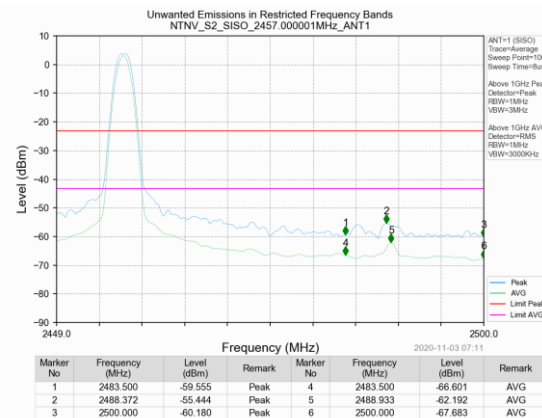
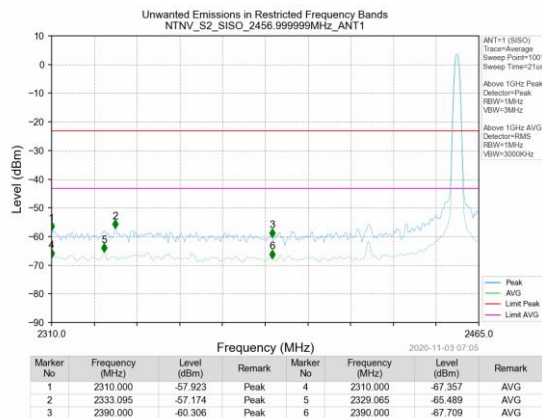
Note: The equipment calibration period is 1 year except for the FSV30 which is on a 2-year cycle.

8.5 Test Data – Restricted Band Edges

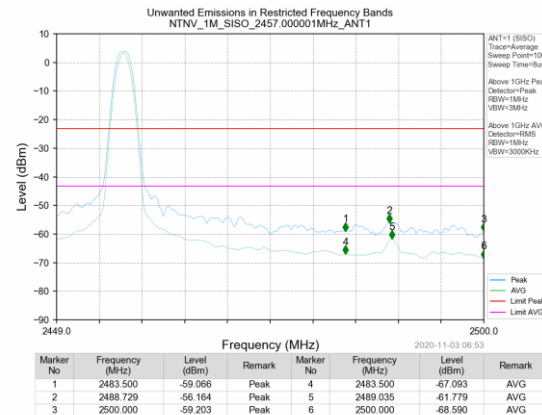
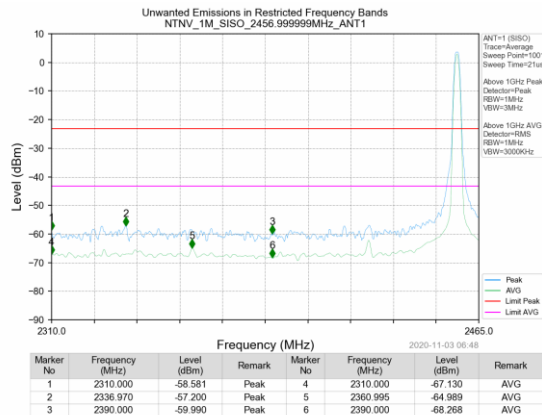
8.5.1 S8



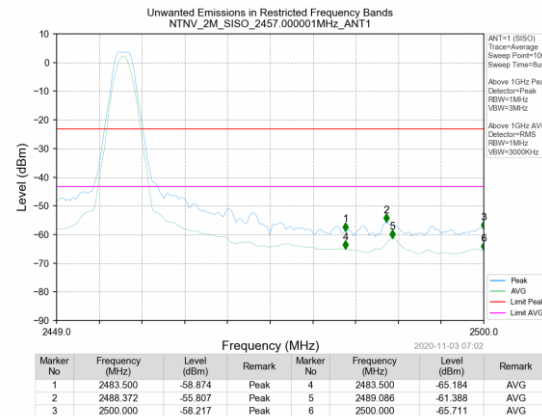
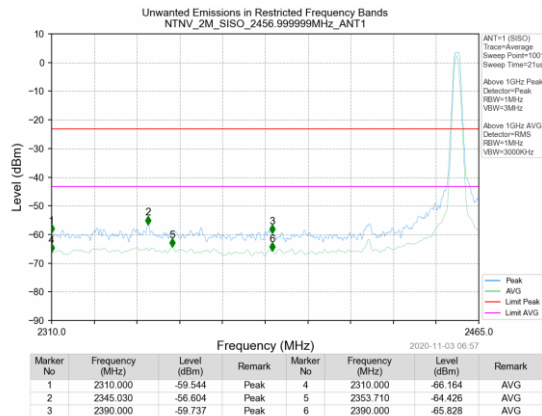
8.5.2 S2



8.5.3 1M



8.5.4 2M



9 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	23 November 2020
1	Added notes to section 7.5 about emissions below 30 MHz and above 18 GHz Removed Test Setup Photos to external exhibit Added reference to 3.10.1.5 to section 7.1	21 December 2020
2	Added reference to 3.10.1.5 to Section 1 Revised notes in section 7 to callout 20 dB requirement.	22 December 2020