EMC Test Report

Project Number: **4451806**

Report Number: **4451806EMC01** **Revision Level:** **0**

Client: **3Si Security Systems Inc.**

Equipment Under Test: **Wireless Tracking Device**

Model Number: **AT170503US**

Applicable Standards: **FCC 47CFR Part 15, Subpart B**
ICES-003, Issue 6

Report issued on: **13 May 2019**

Test Result: **Compliant**

Tested by: _____
Shawn Mcguinness, EMC Engineering Leader

Reviewed by: _____
Martin Taylor, RF/EMC Engineer

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

Basic Standards	Test Result
Emissions Testing	
FCC Part 15, Subpart B, Class B, 15.109 Radiated Emissions	Compliant
FCC Part 15, Subpart B, Class B, 15.107 Conducted Emissions	Compliant

1.1 *Modifications Required for Compliance*

None

2 General Information

2.1 *Client Information*

Name:	3Si Security Systems Inc.
Address:	2055 N Brown Rd, Ste 225
City, State, Zip, Country:	Lawrenceville, GA 30043, 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

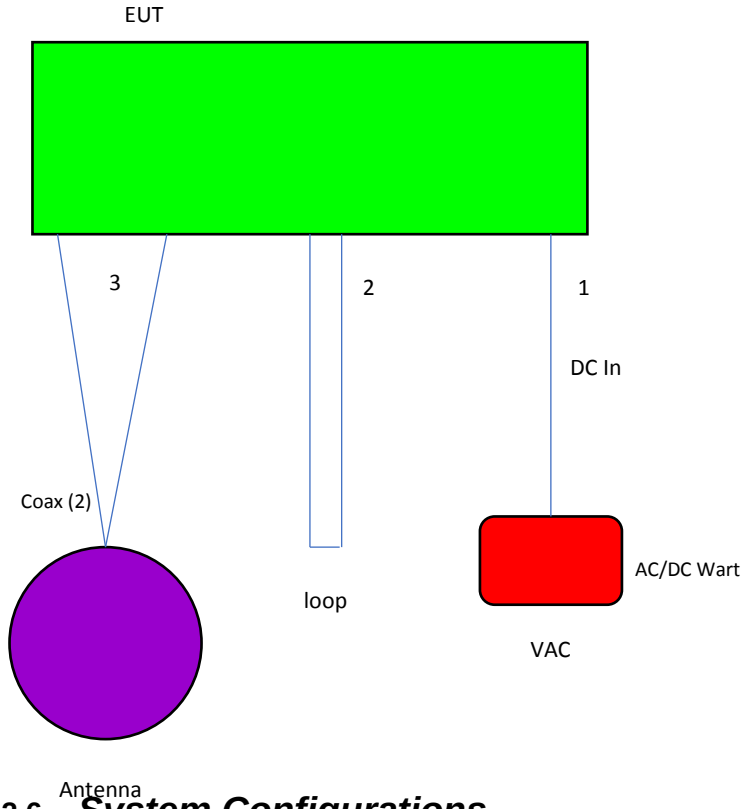
2.3 *General Information of EUT*

Type of Product:	Wireless Tracking Device
Model Number:	AT170503US
FCC ID:	Q6KAT170503A
IC:	5043A-AT170503A
IMEI:	352753092914371
FW Ver:	13.1.36072
Rated Voltage:	3.7Vdc Battery/DC In
Tested Voltage:	3.7Vdc DC In
AC Power In:	120VAC/60Hz, 1.2A
Sample Received Date:	29 April 2019
Dates of testing:	29 April to 1 May 2019

2.4 *Operating Modes and Conditions*

During testing, the device was powered on and all wireless radios were placed in standby mode. Highest digital Clock is less than 108MHz.

2.5 *EUT Connection Block Diagram*



2.6 *System Configurations*

Device reference	Manufacturer	Description	Model Number	Serial Number
A	3Si Security	Wireless Tracking Device	AT170503US	PROTO-1U

2.7 *Cable List*

Cable reference	Port Name	Start	End	Cable Length (m)	Ferrite installed?	Shielded?
1	DC input	AC mains	EUT	1.8	No	No
2	I/O Port Lines (3)	EUT	EUT	1.0	No	No
3	Coaxial RF (2)	Antenna	EUT	1.0	No	Yes

3 Radiated Emissions

3.1 *Test Result*

Test Description	Basic Standards	Test Result
Radiated Emissions, Class B	FCC Part 15, Subpart B ICES-003 ANSI C63.4:2014	Compliant

3.2 *Test Method*

Exploratory scans were performed over the frequency range as indicated in the tables below using the max hold function and incorporating a Peak detector and using TILE! software. The final test data was measured using a Quasi-Peak detector below 1GHz and a Peak and Average detector above 1GHz. The receiver's resolution bandwidth was set to 120 kHz for measurements taken in the 30MHz to 1GHz frequency range and 1MHz for measurements for 1GHz and higher. Measurements were made with the antenna positioned in both the horizontal and vertical planes of polarization. The antenna height was varied from 1 m to 4 m and the EUT was rotated 360° to find the maximum emitting point for each frequency. The radiated measurements were recorded and compared to the limits indicated in the table below.

Radiated emissions limit below 1 GHz

Frequency Range	Limits (dBuV/m) Quasi-Peak		Equipment Classification
	3 m	10 m	
30 to 88 MHz	40.0	29.5	Class B
88 to 216MHz	43.5	33.0	
216 to 960 MHz	46.0	35.5	
960 to 1000MHz	54.0	43.5	

Frequency Range	Limits (dBuV/m) Quasi-Peak		Equipment Classification
	3 m	10 m	
30 to 88 MHz	49.6	39.1	Class A
88 to 216MHz	54.0	43.5	
216 to 960 MHz	56.9	46.4	
960 to 1000MHz	60.0	49.5	

Radiated emissions limit above 1 GHz (3 meter test distance)

Frequency Range	Class A Limits (dBuV/m)	Class B Limits (dBuV/m)
1 to 40 GHz	Avg 60 Pk 80	Avg 54 Pk 74

3.3 *Test Site*

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

Environmental Conditions

Temperature:	22.2. °C
Relative Humidity:	42.8 %
Atmospheric Pressure:	98.3 kPa

3.4 *Test Equipment*

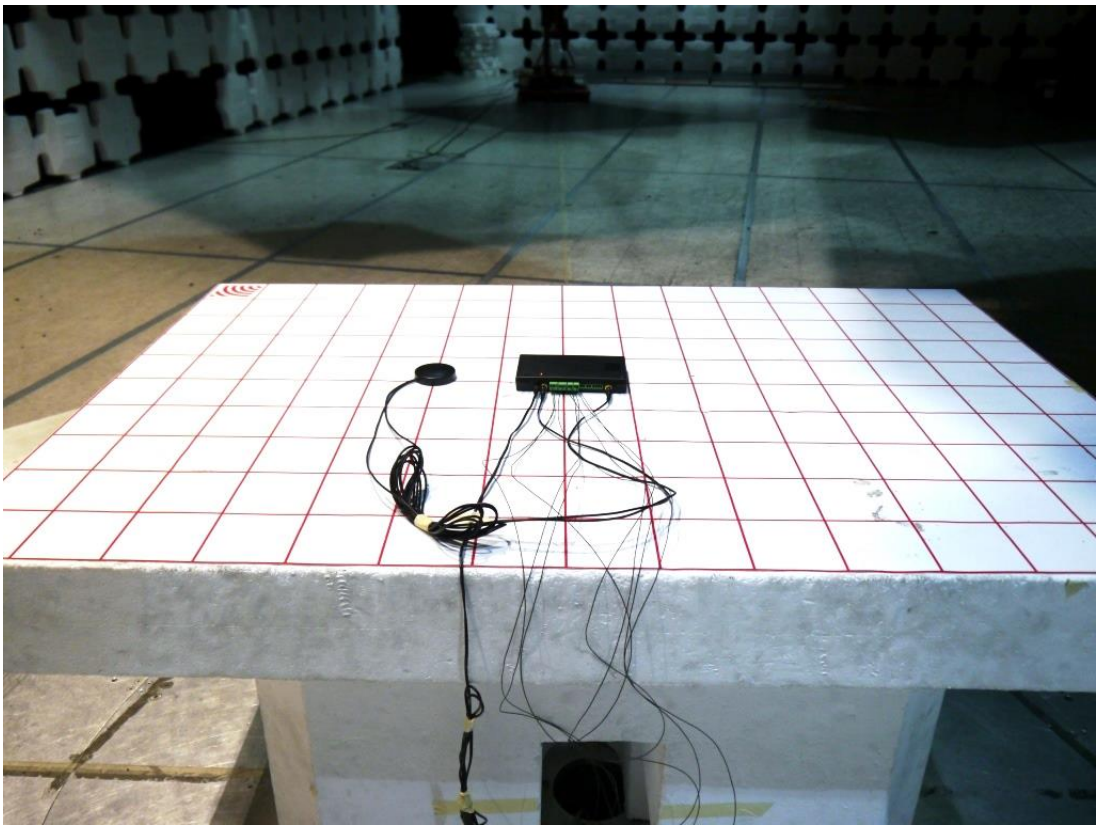
Test End Date: 29-Apr-2019 Tester: SKM

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ANTENNA, BILOG	JB6	SUNOL	B079689	30-Oct-2019
RF CABLE	SF106	HUBER & SUHNER	B079712	24-Jul-2019
RF CABLE	SF106	HUBER & SUHNER	B079717	24-Jul-2019
RF CABLE	SF106	HUBER & SUHNER	B079659	23-Jul-2019
RF CABLE	SUCOFLEX 100	HUBER & SUHNER	B108523	24-Jul-2019
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	24-Jan-2020
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	2-Jul-2019

Note: The equipment calibration period is 1 year.

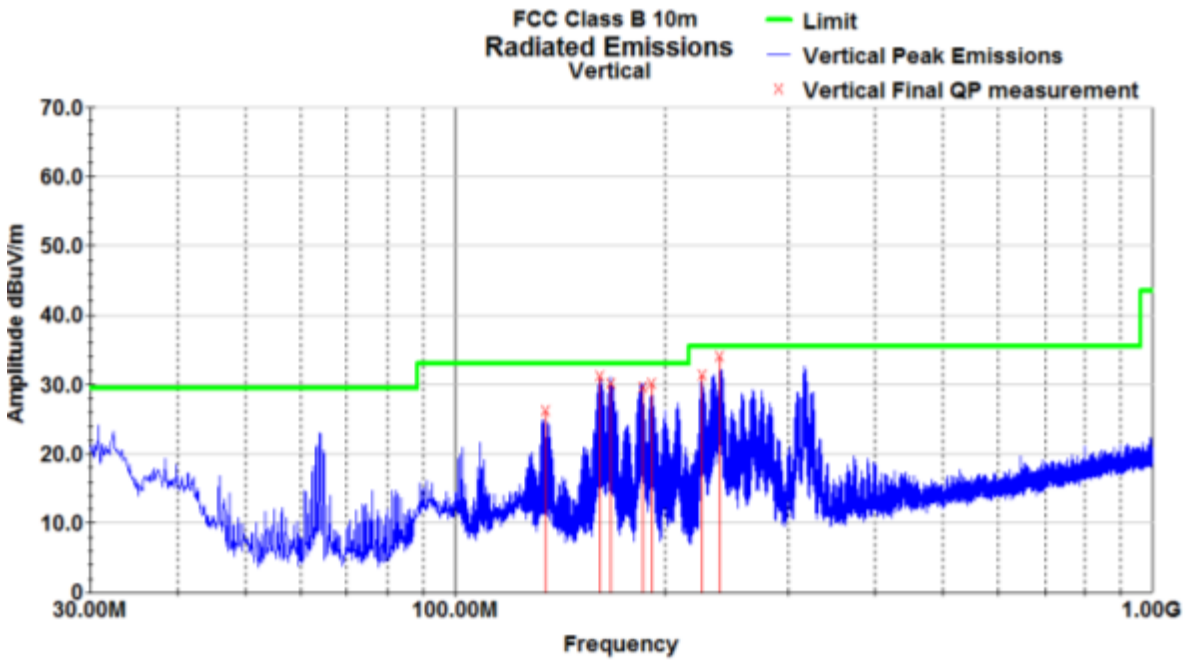
Software:
“Radiated Emissions” TILE! profile dated Dec 2015

3.1 *Test Setup Photographs*



3.2 *Test Data*

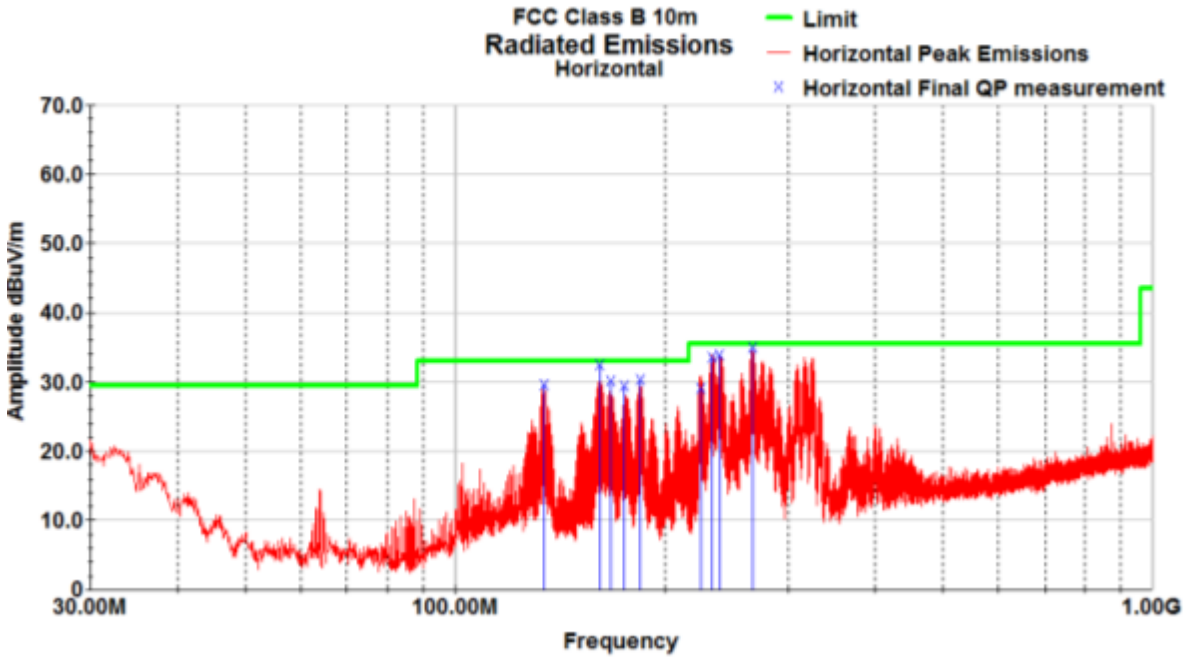
Vertical Radiated Emissions Plot (30-1000MHz)



Vertical Radiated Emissions Data (30-1000MHz)

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)
134.86	46.2	V	152.0	100.0	13.3	1.5	34.7	26.3	33.0	-6.7
161.24	51.8	V	265.0	119.0	12.5	1.6	34.7	31.2	33.0	-1.8
167.28	51.2	V	276.0	201.0	12.1	1.7	34.7	30.2	33.0	-2.8
186.07	51.8	V	127.0	116.0	10.8	1.8	34.7	29.6	33.0	-3.4
191.37	52.0	V	97.0	129.0	11.0	1.8	34.7	30.1	33.0	-2.9
226.00	53.0	V	271.0	102.0	11.2	2.0	34.8	31.5	35.5	-4.0
239.58	55.0	V	97.0	102.0	11.8	2.0	34.8	34.1	35.5	-1.4
QP Value = Level + AF + CL - Amp										

Horizontal Radiated Emissions Plot (30-1000MHz)



Horizontal Radiated Emissions Data (30-1000MHz)

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)
134.08	49.5	H	100.0	362.0	13.4	1.5	34.7	29.7	33.0	-3.3
161.24	53.0	H	115.0	395.0	12.5	1.6	34.7	32.4	33.0	-0.6
167.28	51.1	H	118.0	399.0	12.1	1.7	34.7	30.1	33.0	-2.9
174.78	51.3	H	102.0	399.0	11.2	1.7	34.7	29.5	33.0	-3.5
184.58	52.5	H	276.0	394.0	10.8	1.8	34.7	30.3	33.0	-2.7
225.26	50.7	H	3.0	361.0	11.1	2.0	34.8	29.1	35.5	-6.4
233.57	54.6	H	293.0	369.0	11.6	2.0	34.8	33.4	35.5	-2.1
239.58	54.8	H	105.0	399.0	11.8	2.0	34.8	33.8	35.5	-1.7
266.68	54.2	H	235.0	389.0	13.3	2.1	34.7	34.9	35.5	-0.6

Margin = QP Value - Limit

4 Conducted Emissions

4.1 *Test Result*

Test Description	Basic Standards	Test Result
Conducted Emissions	ANSI C63.4	Compliant

4.2 *Test Method*

With the receiver's resolution bandwidth set to 9 kHz, exploratory scans were performed over the measuring frequency range (0.15 MHz to 30 MHz) using a max hold mode incorporating a Peak detector and Average detector and using the TILE! software. The final test data was measured using a Quasi-Peak detector and Average detector and compared against the limits indicated in the table below.

Frequency Range	Class A Limits (dBuV)	Class B Limits (dBuV)
0.15 to 0.5 MHz	Avg 66 QP 79	Avg 56 to 46 QP 66 to 56
0.5 to 5 MHz	Avg 60 QP 73	Avg 46 Pk 56
5 to 30 MHz		Avg 50 Pk 60

4.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions:

Temperature:	22.8 °C
Relative Humidity:	39.8 %
Atmospheric Pressure	98.63 kpa

4.4 *Test Equipment*

Test End Date: 29-Apr-2019 Tester: SKM

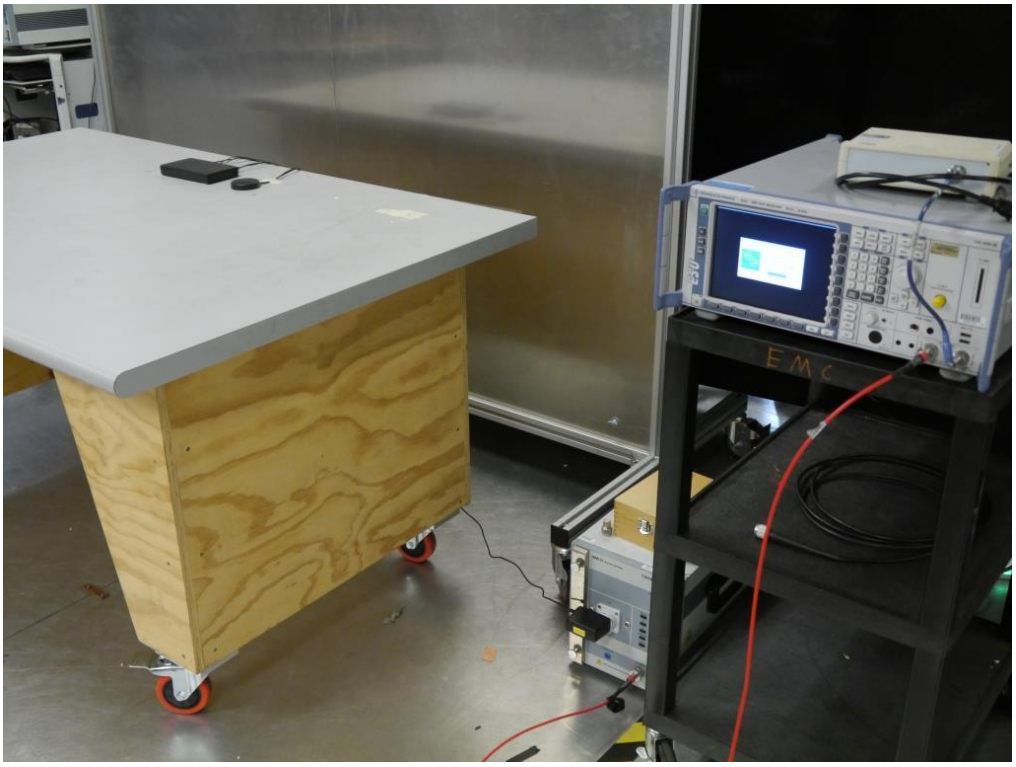
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
CONDUCTED COMB GENERATOR	CGC-255	COM-POWER	B079696	CNR
LINE IMPEDANCE STABILIZATION NETWORK	NNB 51	TESEQ	B085882	14-Nov-2019
RF CABLE	UC-N-MM-78	MAURY MICROWAVE	17017	24-Jul-2019
EMI TEST RECEIVER	ESU8	ROHDE & SCHWARZ	B085759	17-Aug-2019

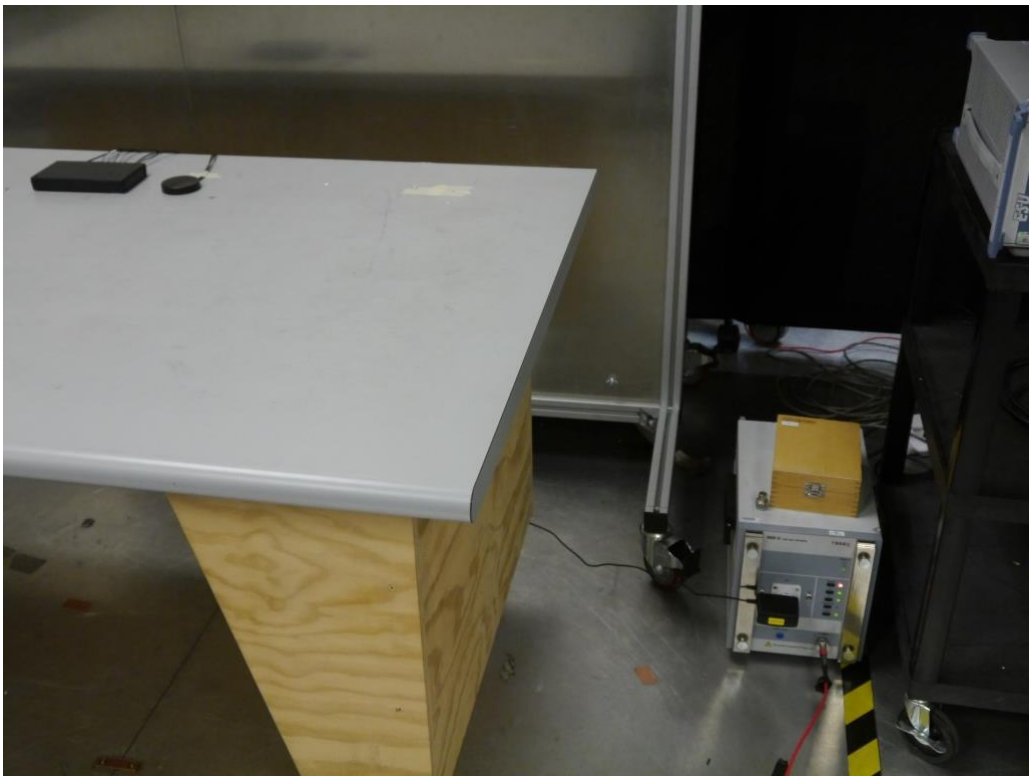
Notes:

The calibration period equipment is 1 year.
CNR – Calibration Not Required

Software:
TILE! software profile: 181112 Conducted Emissions Tile7.TIL

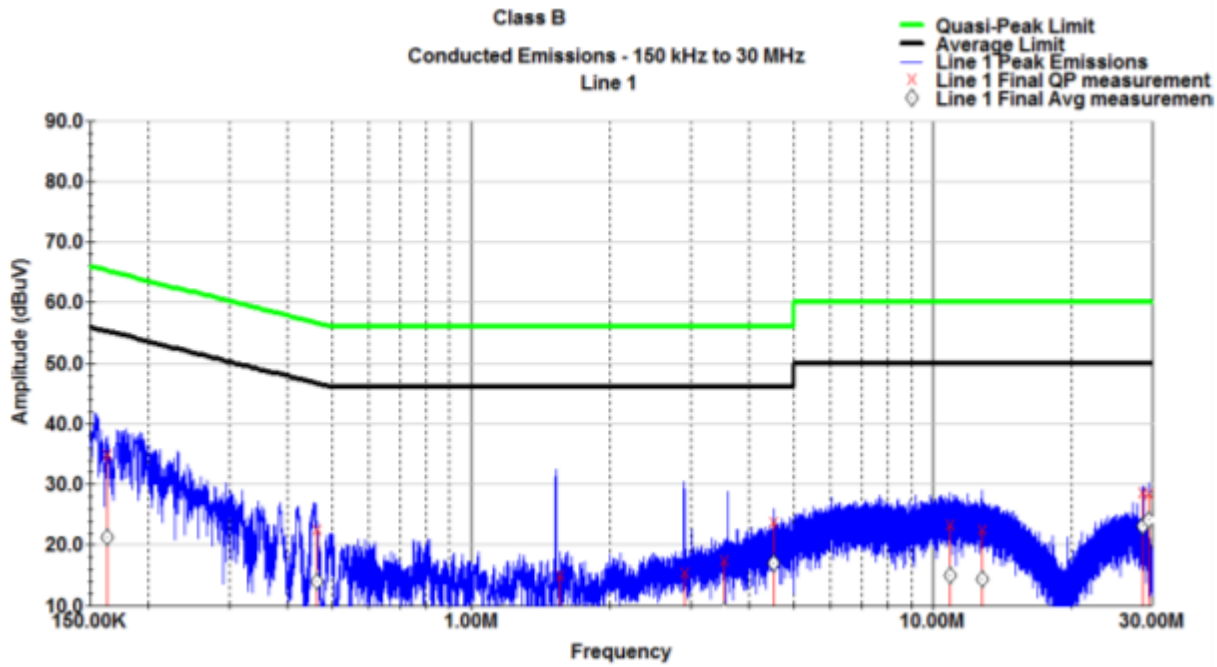
4.5 *Test Setup Photographs*





4.6 *Test Data*

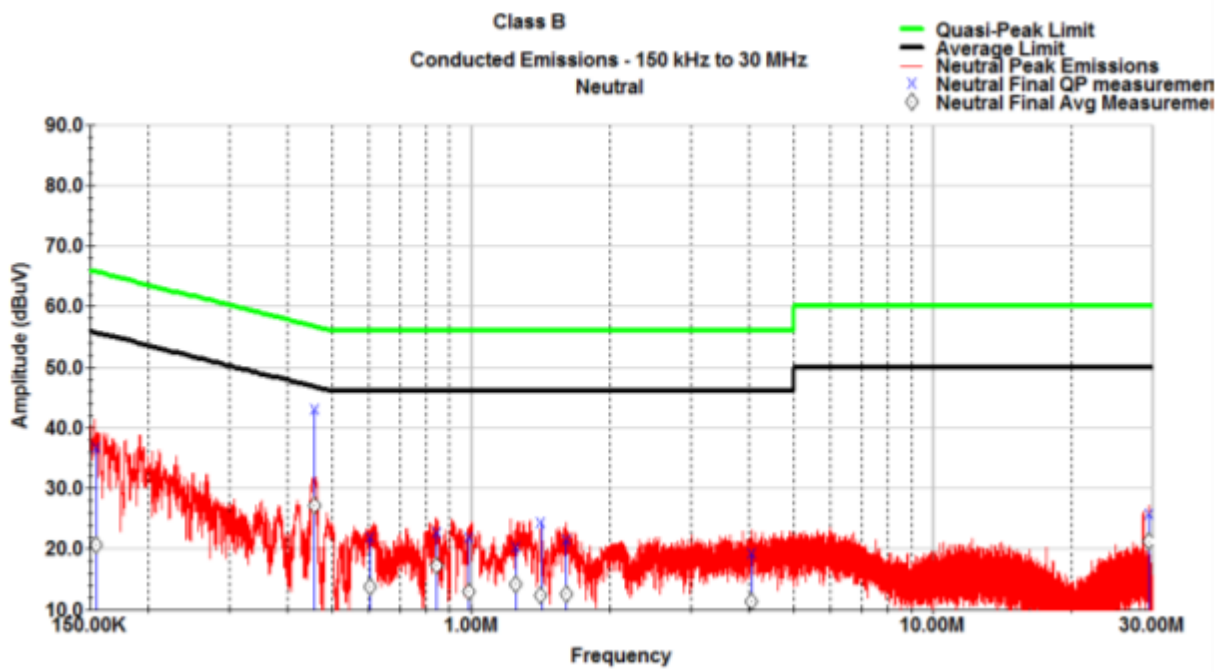
Line 1 Conducted Emissions Plot



Line 1 Conducted Emissions Data

Frequency MHz	QP Value dBuV	QP Limit dBuV	QP Margin dB	Avg Value dBuV	Avg Limit dBuV	Avg Margin dB
0.164	35.0	65.3	-30.3	21.3	55.3	-34.0
0.464	22.6	56.6	-34.0	14.1	46.6	-32.6
1.565	15.0	56.0	-41.0	7.4	46.0	-38.6
2.906	15.3	56.0	-40.7	8.4	46.0	-37.6
3.552	17.5	56.0	-38.5	9.2	46.0	-36.8
4.519	23.6	56.0	-32.4	17.0	46.0	-29.0
10.932	23.3	60.0	-36.7	15.0	50.0	-35.0
12.835	22.6	60.0	-37.4	14.5	50.0	-35.5
28.624	28.6	60.0	-31.4	23.1	50.0	-26.9
29.384	28.4	60.0	-31.6	24.1	50.0	-25.9

Neutral Conducted Emissions Plot



Neutral Conducted Emissions Data

Frequency MHz	QP Value dBuV	QP Limit dBuV	QP Margin dB	Avg Value dBuV	Avg Limit dBuV	Avg Margin dB
0.154	36.8	65.7	-29.0	20.7	55.7	-35.0
0.459	43.0	56.7	-13.7	27.2	46.7	-19.5
0.606	21.9	56.0	-34.1	13.7	46.0	-32.3
0.844	22.7	56.0	-33.3	17.3	46.0	-28.7
0.990	22.0	56.0	-34.0	13.0	46.0	-33.0
1.248	20.3	56.0	-35.7	14.2	46.0	-31.8
1.419	24.4	56.0	-31.6	12.4	46.0	-33.6
1.608	21.5	56.0	-34.5	12.6	46.0	-33.4
4.049	19.2	56.0	-36.8	11.3	46.0	-34.7
29.380	25.7	60.0	-34.3	21.2	50.0	-28.8

5 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	13 May 2019