TEST REPORT

Report Number: 103103871MIN-005
Project Number: G103103871

Testing performed on the
ICON Scanner OEM (Gen 1.1)

FCC ID: WTM-ICONNFC1
IC: 7998A-ICONNFC1

to
47 CFR Part 15.225:2017
RSS- 210, Issue 9, 2016
RSS-Gen, Issue 4, 2014
47 CFR, Part 15:2017, §15.107 and §15.109, Class / ICES-003, Issue 6:2016

For
DESKO GmbH

Test Performed by:	Test Authorized by:
Intertek Testing Services NA, Inc.	DESKO GmbH
7250 Hudson Blvd., Suite 100	Gottlieb-Keim- Strabe 56
Oakdale, MN 55128 USA	Bayreuth HB 95448 Germany

Prepared by: _____
Simon Khazon

Reviewed by: _____ Date of issue: July 17, 2017
Norman Shpilsher

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1.0 GENERAL DESCRIPTION

Model:	ICON Scanner OEM (Gen 1.1)
Type of EUT:	Passport Scanner
Serial Number:	201721 003838
FCC ID:	WTM-ICONNFC1
IC:	7998A-ICONNFC1
Related Submittal(s) Grants:	None
Company:	DESKO GmbH
Customer:	Mr. Harald Schmaus
Address:	Gottlieb-Keim- Strabe 56 Bayreuth HB 95448 Germany
Phone:	+49 (921) 79279-0
e-mail:	harold.schmaus@desko.com
Test Standards:	☒ 47 CFR, Part 15:2017, §15.225 ☒ RSS–210, Issue 9, 2016 ☒ RSS-Gen, Issue 4, 2014 ☒ 47 CFR, Part 15:2017, §15.107 and §15.109, Class B, test method: ANSI C63.4-2014 ☒ ICES-003, Issue 6:2016 ☐ Other
Type of radio:	☒ Stand -alone ☐ Module ☐ Hybrid
Date Sample Submitted:	June 12, 2017
Test Work Started:	July 3, 2017
Test Work Completed:	July 17, 2017
Test Sample Conditions:	☐ Damaged ☐Poor (Usable) ☒ Good

1.1 Product Description; Test Facility

Product Description:	RFID Transmitter
Operating Frequency	13.56MHz
Modulation:	ASK
Emission Designator:	2K92A1D
Antenna(s) Info:	Internal loop soldered to a PCB antenna, 2.0dBi antenna gain
Antenna Installation:	☐ User ☐ Professional ☒ Factory
Power Configuration:	☒ 12VDC; 4.1 Amps.
Special Test Arrangement:	None
Test Facility Accreditation:	A2LA (Certificate No. 1427.01)
Test Methodology:	Measurements performed according to the procedures in ANSI C63.10-2013

1.2 EUT Configuration

The equipment under test was operated during the measurement under the following conditions:

☐ - Standby
☒ - Continuous (See below)
☐ - Continuous un-modulated
☐ - Test program (customer specific)
☐ -

Operating modes of the EUT:

No.	Description
1	Continuous RF transmitting (modulated mode)

Cables:

No.	Type	Length	Designation	Note
1	Ethernet / Power	3.6 m	Shielded, RJ45	

Support equipment/Services:

No.	Item	Description
1	EDAKPOWER EA10521D-120 100-240VAC, 50-60Hz / 12VDC Power Adapter	DC Power Source

Note: The ICON Scanner RFID transmitter contains no receiver portion.

1.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

☒ **Normal**

Temperature: 15-35°C

Humidity: 30-60%

Atmospheric pressure: 86-106kPa

☒ **Extreme**

Temperature: -20 to +50°C

Primary Supply Voltage: ± 15%

1.4 Measurement uncertainty

The expanded uncertainty (k = 2) for radiated emissions from 30 to 1000 MHz has been determined to be: ±4 dB at 10m and ±5.4 dB at 3m

The expanded uncertainty (k = 2) for radiated emissions above 1GHz has been determined to be: ±6.4 dB at 3m

The expanded uncertainty (k = 2) for conducted emissions from 150 kHz to 30 MHz has been determined to be:
±2.6 dB

1.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured emissions reading on the EMI Receiver.
The basic equation with a sample calculation is as follows:
FS = RA + AF + CF - AG

Where: FS = Field Strength in dB(µV/m)
RA = Receiver Amplitude in dB(µV)
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB(m^{-1})
AG = Amplifier Gain in dB

Assume a receiver reading of 48.1 dB(µV) is obtained. The antenna factor of 7.4 dB(m^{-1}) and cable factor of 1.6 dB is added and amplifier gain of 16.0 dB is subtracted giving field strength of 41.1 dB(µV/m).

RA = 48.1 dB(µV)
AF = 7.4 dB(m^{-1})
CF = 1.6 dB
AG = 16.0 dB
FS = RA + AF + CF - AG
FS = 48.1 + 7.4 + 1.6 – 16.0
FS = 41.1 dB(µV/m)

General notes: None

2.0 TEST SUMMARY

Referring to the performance criteria and the operating mode during the tests specified in this report, the equipment complies with the requirements according to the following standards.

TEST SPECIFICATION	TEST PARAMETERS	RESULT
15.225(a)(b)(c) / RSS-210 A2.6(a)(b)(c)	Field strength within the band of operation	Pass
15.225(d) / RSS-210 A2.6(d)	Out of band emissions	Pass
15.215(c) / RSS- Gen 4.6.1	Bandwidth of the emission	Pass
15.225(e) / RSS-210 A2.6	Frequency tolerance	Pass
15.207/RSS-Gen 7.2.2	Transmitter Power Line conducted emissions	Pass
15.109/ICES-003	Receiver radiated emissions	N/A
15.107/ ICES-003	Receiver conducted emissions	N/A

3.0 TEST CONDITIONS AND RESULTS

3.1 Field strength within the band of operation

Test location: ☒ OATS ☒ Anechoic Chamber ☐ Other

Test distance: ☒ 10 meters ☒ 3 meters

Test result: **Pass**

Max. Emissions margin at fundamental: **44.8** dB below the limits

Max. margin of harmonics and spurious emissions: **14.1** dB below the limits

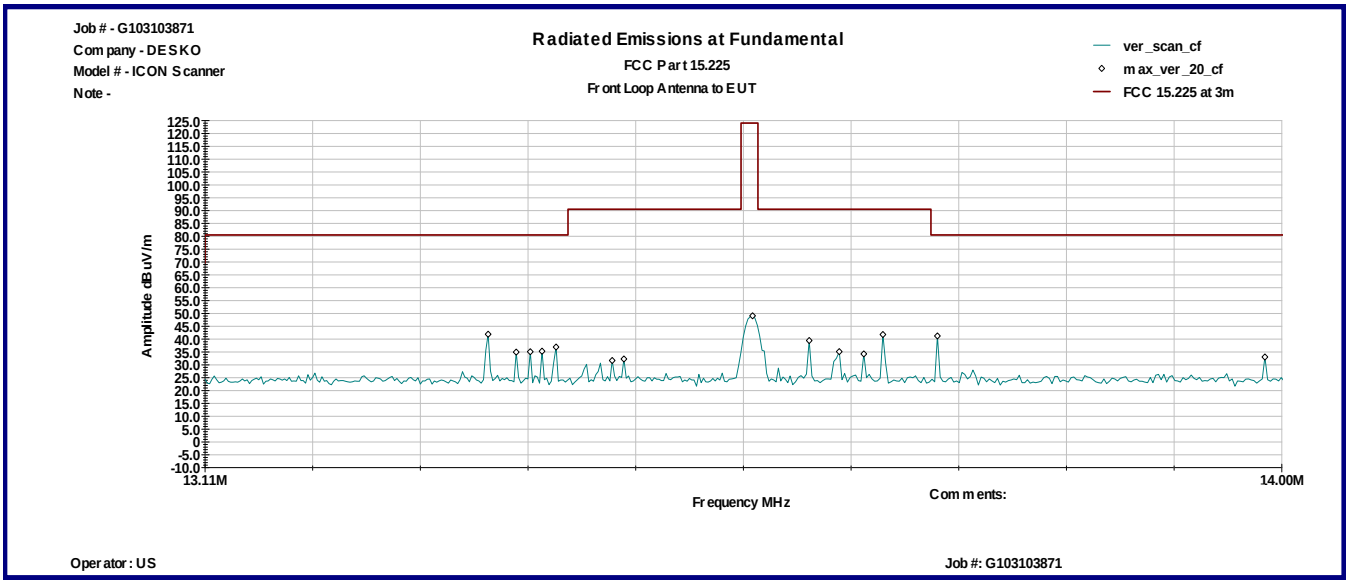
Notes:

1. The Emissions testing pre-scan was performed in the anechoic chamber at 3m measurement distance (see Graphs 3.1.1 - 3.1.2).
2. Final measurements were taken in the Open Area Test Site at 10 m measurement distance (see Table 3.1).
3. Measurements were taken with RBW=9 kHz

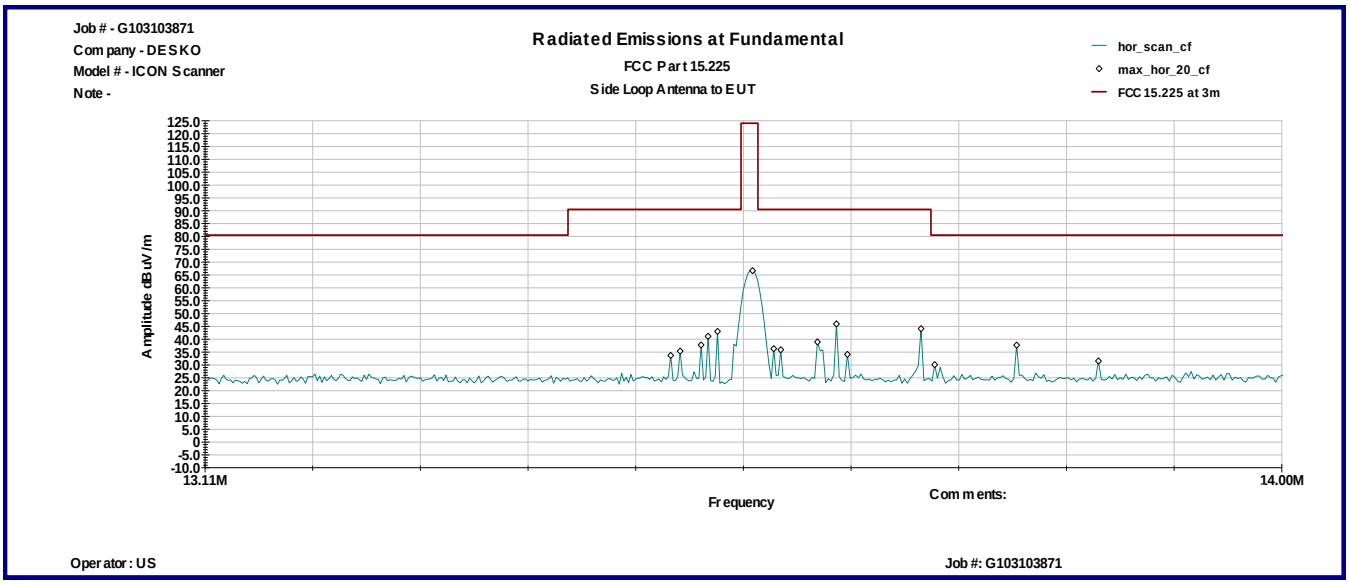
Date:	July 17, 2017	**Result: Pass**
Tested by:	Simon Khazon	
Standard:	FCC 15.225(a)(b)(c) / RSS-210 A2.6(a)(b)(c)	
Test Point:	Enclosure with antenna	
Operation mode:	See page 5	
Environmental Conditions:	24°C; 40%(RH); 97.7kPa	
Equipment Verification:	☒	
Note:	None	

Table 3.1

Frequency	Ant. Orientation	Peak Reading dBµV	Ant.Factor dB1/m	Total at 10m dBµV/m	Limit dBµV/m	Margin dB
13.110 MHz	Front	-0.7	34.7	34.0	59.6	-25.6
13.410 MHz	Front	2.6	34.7	37.3	59.6	-22.3
13.553 MHz	Front	20.8	34.7	55.5	69.6	-14.1
13.560 MHz	Front	23.6	34.7	58.3	103.1	-44.8
13.567 MHz	Front	11.5	34.7	46.2	69.6	-23.4
13.710 MHz	Front	3.9	34.7	38.6	59.6	-21.0
14.010 MHz	Front	-0.9	34.7	33.8	59.6	-25.8
13.110 MHz	Side	-0.4	34.7	34.3	59.6	-25.3
13.410 MHz	Side	2.7	34.7	37.4	59.6	-22.2
13.553 MHz	Side	18.1	34.7	52.8	69.6	-16.8
13.560 MHz	Side	20.3	34.7	55.0	103.1	-48.1
13.567 MHz	Side	7.6	34.7	42.3	69.6	-27.3
13.710 MHz	Side	6.9	34.7	41.6	59.6	-18.0
14.010 MHz	Side	-0.1	34.7	34.6	59.6	-25.0



Graph 3.1.1



Graph 3.1.2

3.2 Field strength outside of the band of operation

Test location: ☒ OATS ☒ Anechoic Chamber ☐ Other

Test distance: ☒ 10 meters ☒ 3 meters

Frequency range of measurements: 9kHz-5000MHz

Test result: **Pass**

Max. margin of spurious emissions: **5.0** dB below the limits

Notes: The Emissions test pre-scan in frequency range from 9kHz to 30MHz was performed in the Anechoic chamber at 3m measurement distance (see Graph 3.2.1);
Final measurements were taken in the Open Area Test Site at 10 m measurement distance (see Table 3.2.1).
The Emissions test in frequency range from 30MHz to 5GHz was performed in the Anechoic chamber at 3m measurement distance (see Tables 3.2.2 and Graph 3.2.2 and 3.2.3).

Date:	July 17, 2017	**Result: Pass**
Tested by:	Simon Khazon	
Standard:	FCC 15.225(d) / RSS-210 A2.6(d)	
Test Point:	Enclosure with antenna	
Operation mode:	See page 5	
Environmental Conditions:	24°C; 42%(RH); 98.1kPa	
Equipment Verification:	☒	
Note:	Frequency Range: 9kHz-30MHz	

Table 3.2.1

Frequency MHz	Reading dBµV	Antenna Factor dB/m	Net at 10m. dBµV/m	Net at 10m. dBµA/m	Limit at 10m dBµA/m	Margin dB	Antenna pos.
0.035	-1.8	68.2	66.4	14.9	21.1	-6.3	Front
0.070	-4.6	62.0	57.4	5.9	18.1	-12.2	Front
27.12	1.1	14.7	15.8	-35.7	-7.7	-28.0	Front
0.035	-1.1	68.2	67.1	15.6	21.1	-5.6	Side
0.070	-4.0	62.0	58.0	6.5	18.1	-11.6	Side
27.12	1.5	14.7	16.2	-35.3	-7.7	-27.6	Side

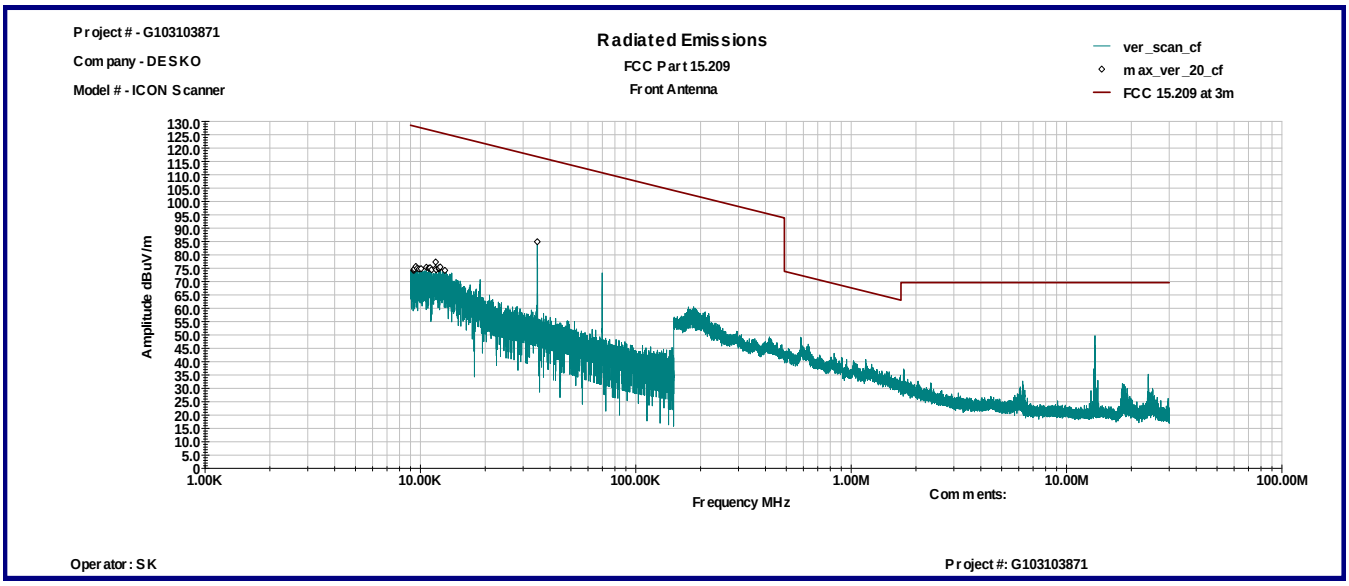
Date:	July 3-10, 2017	**Result: Pass**
Tested by:	Simon Khazon	
Standard:	FCC 15.225(d) / RSS-210 A2.6(d)	
Test Point:	Enclosure with antenna	
Operation mode:	See page 5	
Environmental Conditions:	24°C; 42%(RH); 98.1kPa	
Equipment Verification:	☒	
Note:	Frequency Range: 30-1000MHz	

Table 3.2.2

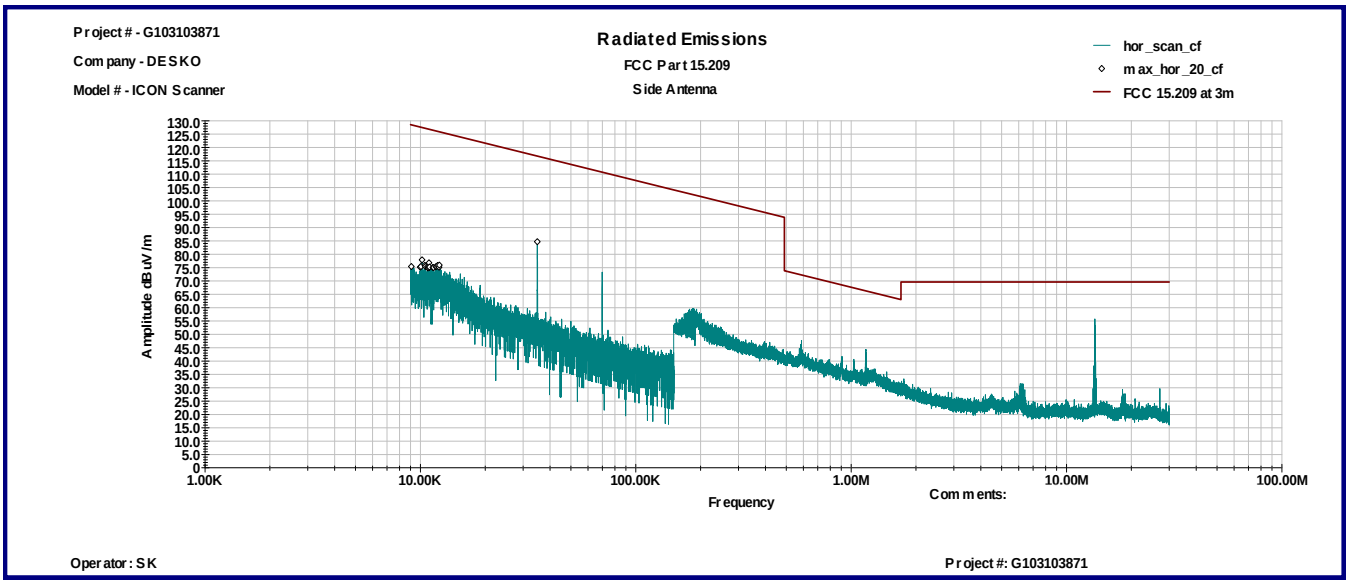
Frequency MHz	Antenna Polarity	Peak Reading dBµV	Total C.F. dB1/m	Total at 3m dBµV/m	Limit dBµV/m	Margin dB
132.49 MHz	V	15.4	14.2	29.6	43.5	-13.9
163.75 MHz	V	18.8	12.3	31.1	43.5	-12.5
165.66 MHz	V	20.5	12.2	32.8	43.5	-10.8
166.48 MHz	V	18.0	12.2	30.1	43.5	-13.4
191.86 MHz	V	17.2	11.4	28.6	43.5	-14.9
528.06 MHz	V	17.1	20.3	37.4	46.0	-8.7
660.05 MHz	V	16.4	21.7	38.1	46.0	-7.9
960.11 MHz	V	15.9	23.8	39.7	54.0	-14.3
189.07 MHz	H	20.2	10.8	31.1	43.5	-12.5
189.92 MHz	H	19.8	10.9	30.6	43.5	-12.9
396.03 MHz	H	15.2	18.0	33.2	46.0	-12.8
415.07 MHz	H	14.0	19.3	33.2	46.0	-12.8
432.03 MHz	H	13.0	18.9	31.9	46.0	-14.1
479.97 MHz	H	15.9	19.5	35.4	46.0	-10.6
528.06 MHz	H	19.8	20.1	39.8	46.0	-6.2
660.05 MHz	H	19.1	22.0	41.0	46.0	-5.0
924.0 MHz	H	15.0	24.3	39.3	46.0	-6.8
960.11 MHz	H	24.3	24.6	48.9	54.0	-5.1

Graph 3.2.1

Front antenna orientation

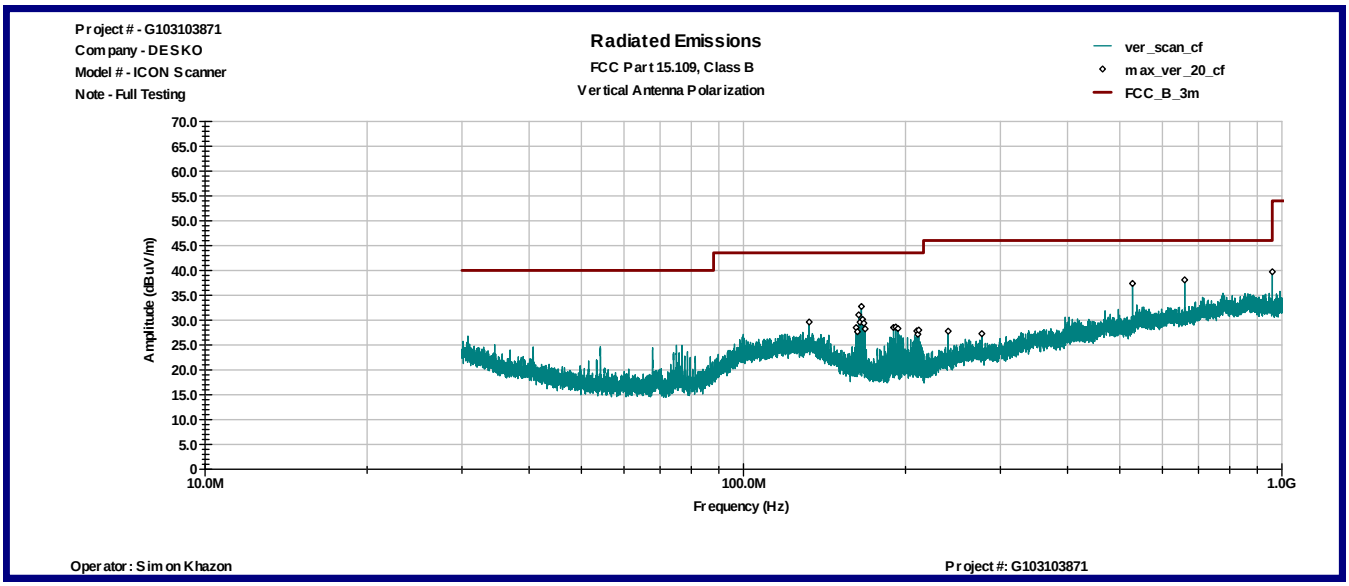


Side antenna orientation

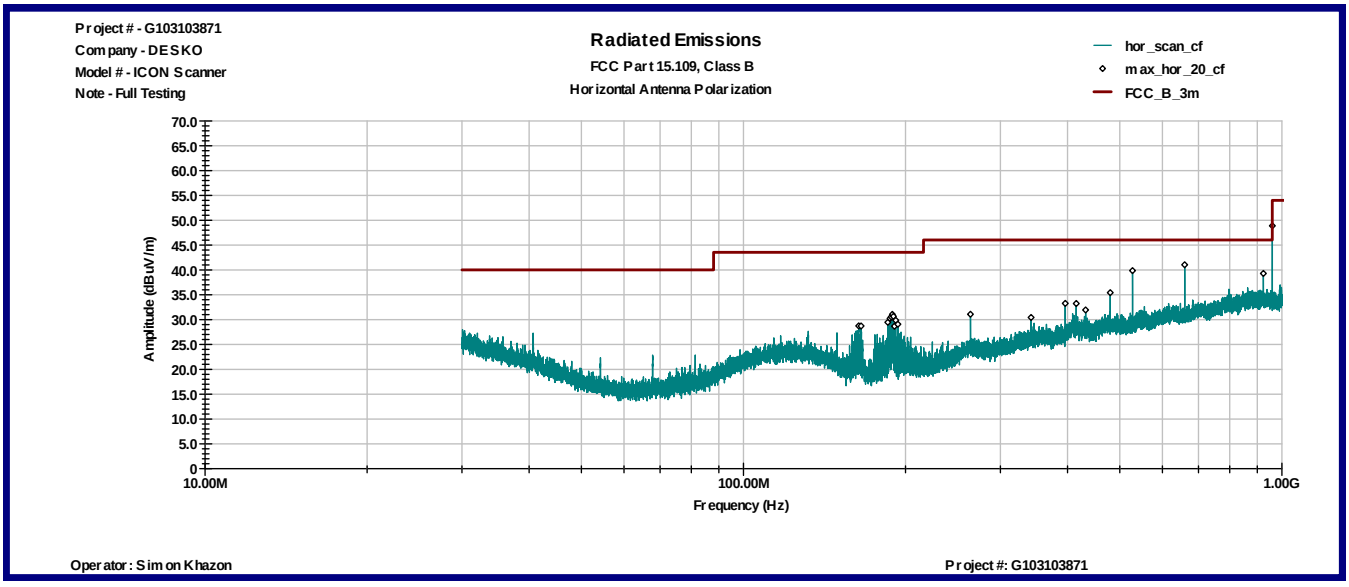


Graph 3.2.2

Vertical antenna polarization

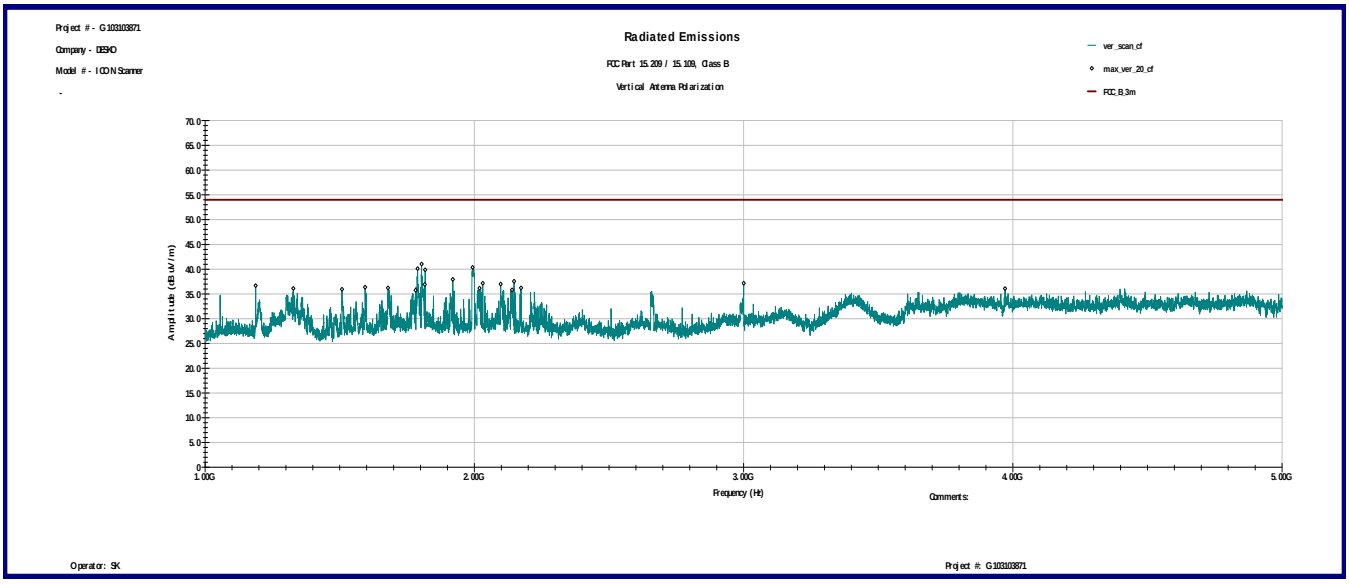


Horizontal antenna polarization

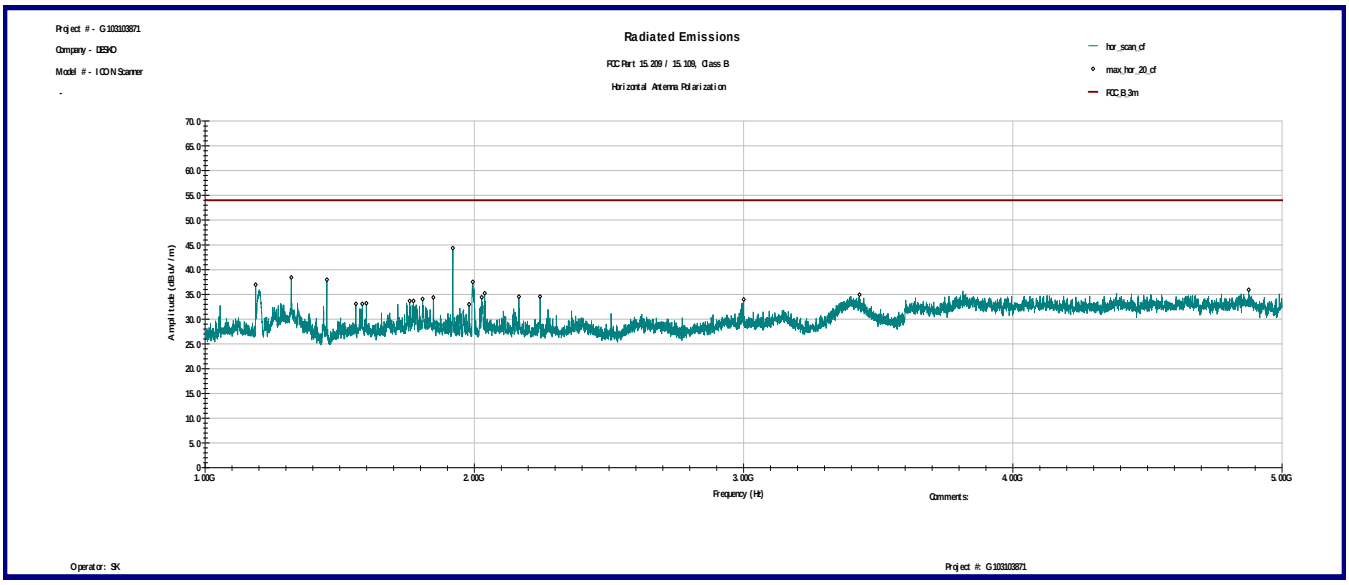


Graph 3.2.3

Vertical antenna polarization



Horizontal antenna polarization



3.3 Frequency Tolerance

Test date: July 6, 2017

Tested by: Simon Khazon

Test result: **Pass**

Test Parameter		Measured Deviation (Hz)	Maximum Allowed Deviation (Hz)	Test Result
Temperature °C	Voltage V			
-20	120	80	±1356	**Pass**
-10		215	±1356	**Pass**
0		97	±1356	**Pass**
10		17	±1356	**Pass**
20		0	±1356	**Pass**
30		7	±1356	**Pass**
40		7	±1356	**Pass**
50		3	±1356	**Pass**
20	102	0	±1356	**Pass**
	108	0	±1356	**Pass**
	114	0	±1356	**Pass**
	120	0	±1356	**Pass**
	126	0	±1356	**Pass**
	132	0	±1356	**Pass**
	138	0	±1356	**Pass**

Notes: None

3.4 Bandwidth of Emissions

Test location: ☐ OATS ☒ Anechoic Chamber ☐ Other

Test distance: ☐ 10 meters ☒ 3 meters

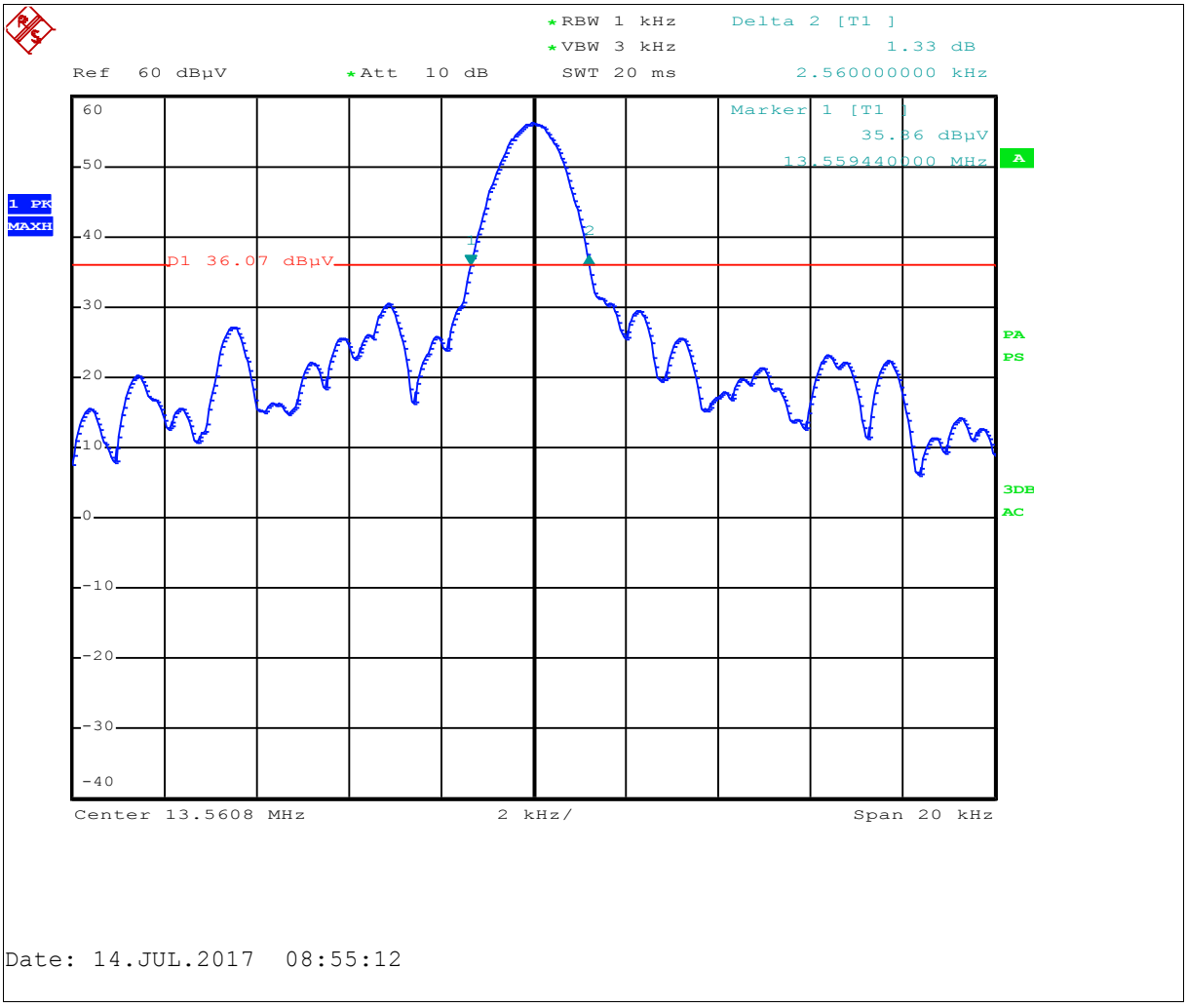
Test result: **Pass**

Center Frequency of operation MHz	Measured 20dB bandwidth kHz	Measured 99% bandwidth kHz
13.56	2.56	2.92

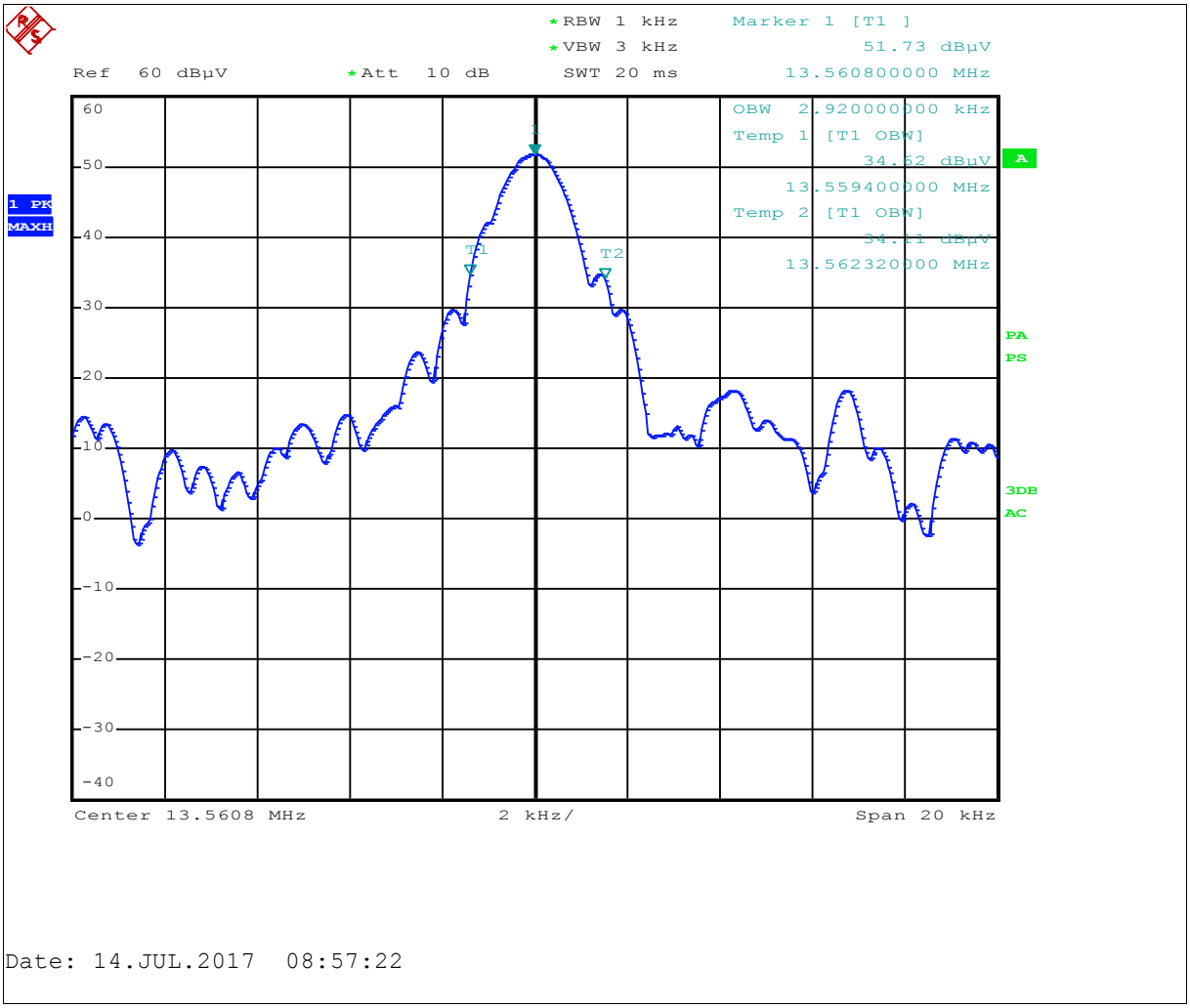
Graphs 3-4-1 and 3-4-2 are show bandwidth of emissions

Notes: The bandwidth of emissions is contained within the frequency band of operation

Graph 3.4.1


RBW 1 kHz
VBW 3 kHz
SWT 20 ms
Delta 2 [T1]
1.33 dB
2.560000000 kHz
Ref 60 dBµV
Att 10 dB
Marker 1 [T1]
35.86 dBµV
13.559440000 MHz
1 PK
MAXH
A
D1 36.07 dBµV
PA
PS
3DB
AC
60
50
40
30
20
10
0
-10
-20
-30
-40
Center 13.5608 MHz
2 kHz/
Span 20 kHz
Date: 14.JUL.2017 08:55:12

Graph 3.4.2


*RBW 1 kHz
*VBW 3 kHz
Ref 60 dBµV
*Att 10 dB
SWT 20 ms
Marker 1 [T1]
51.73 dBµV
13.560800000 MHz
OBW 2.920000000 kHz
Temp 1 [T1 OBW]
34.62 dBµV
13.559400000 MHz
Temp 2 [T1 OBW]
34.11 dBµV
13.562320000 MHz
1 PK
MAXH
A
PA
PS
3DB
AC
60
50
40
30
20
10
0
-10
-20
-30
-40
T1
T2
Center 13.5608 MHz
2 kHz/
Span 20 kHz
Date: 14.JUL.2017 08:57:22

3.5 Transmitter power line conducted emissions

Test location:	☐ OATS ☒ Anechoic Chamber ☐ Other
Test result:	**Pass**
Frequency range:	0.15MHz-30MHz
Max. Emissions margin:	5.6 dB below the limits

Notes: The Transmitter Antenna Port was terminated (50 Ohm) during testing.
Testing was performed at AC port of the DC Power Source.

Date:	July 5, 2017	**Result: Pass**
Tested by:	Simon Khazon	
Standard:	FCC Part 15.207	
Test Point:	Power Line	
Operation mode:	See page 5	
Environmental Conditions:	24°C; 41%(RH); 97.9kPa	
Equipment Verification:	☒	
Note:	EUT was powered at 120VAC, 60Hz	

Table 3.5.1

Line 1

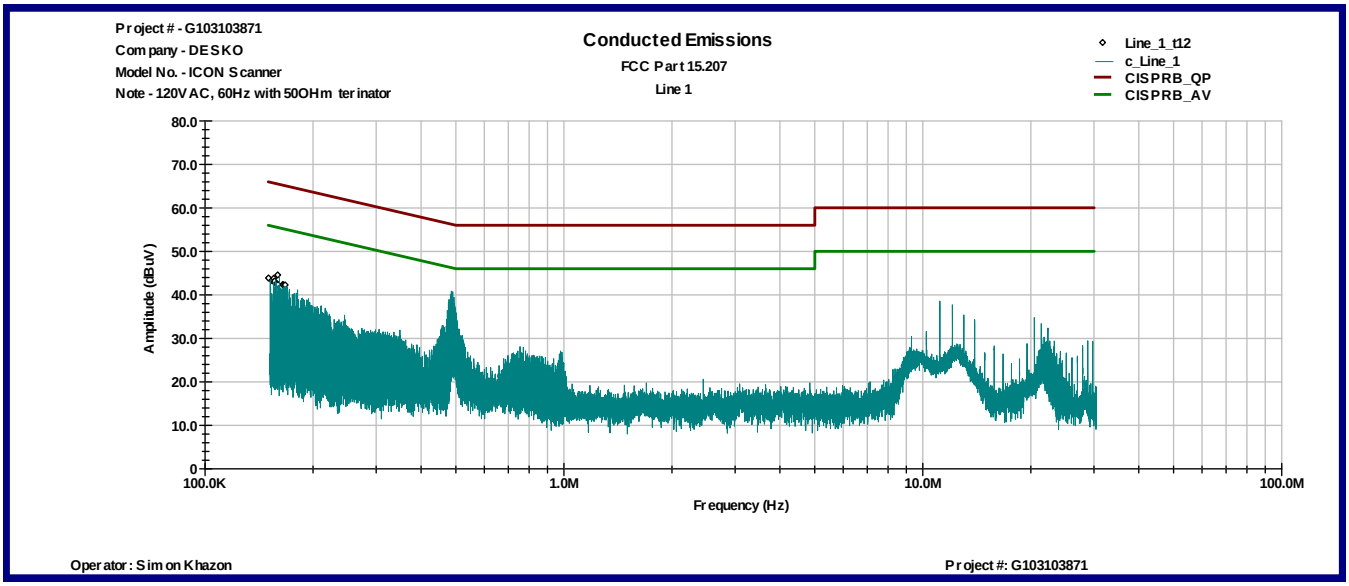
Frequency	Peak dBµV	QP Limit dBµV	AVG Limit dBµV	QP Margin dB	AVG Margin dB
150.27 KHz	43.9	66.0	56.0	-22.1	-12.1
153.61 KHz	43.3	65.8	55.8	-22.5	-12.5
155.48 KHz	43.8	65.7	55.7	-21.9	-11.9
155.67 KHz	43.0	65.7	55.7	-22.7	-12.7
156.18 KHz	43.2	65.7	55.7	-22.5	-12.5
158.04 KHz	42.6	65.6	55.6	-23.0	-13.0
158.23 KHz	42.4	65.6	55.6	-23.2	-13.2
159.36 KHz	44.6	65.5	55.5	-20.9	-10.9
159.55 KHz	42.4	65.5	55.5	-23.1	-13.1
164.76 KHz	42.4	65.2	55.2	-22.9	-12.9
165.26 KHz	42.2	65.2	55.2	-23.0	-13.0
167.13 KHz	42.3	65.1	55.1	-22.8	-12.8

Line 2

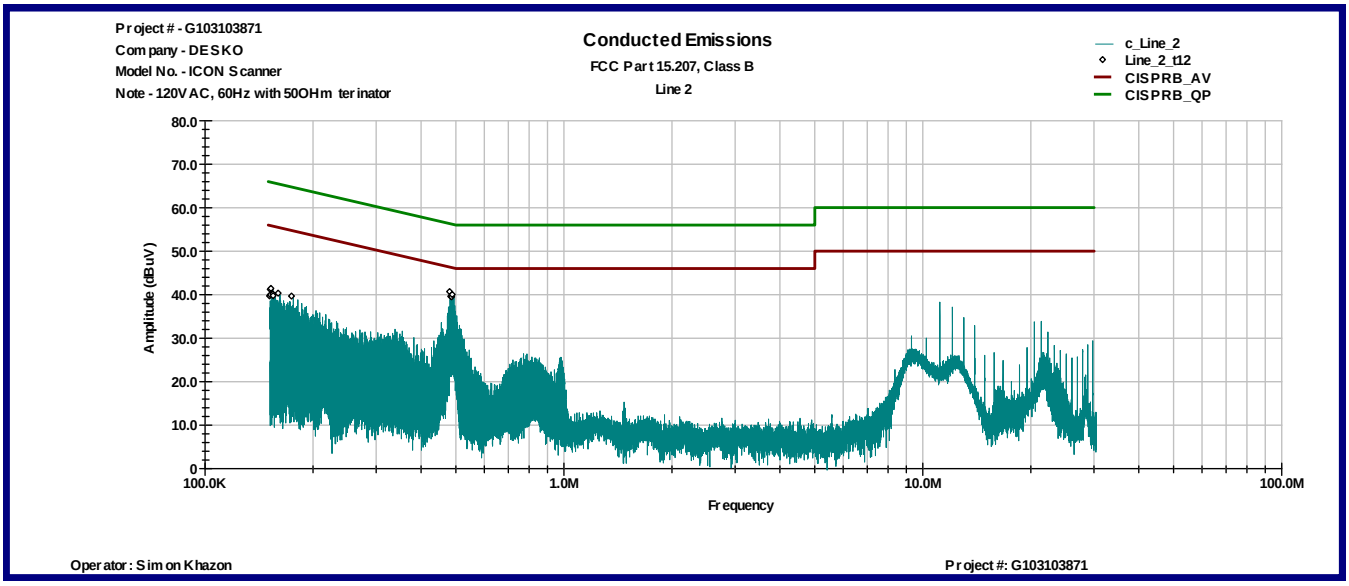
Frequency	Peak dBµV	QP Limit dBµV	AVG Limit dBµV	QP Margin dB	AVG Margin dB
151.24 KHz	39.7	65.9	55.9	-26.2	-16.2
151.94 KHz	41.2	65.9	55.9	-24.7	-14.7
152.14 KHz	40.0	65.9	55.9	-25.9	-15.9
152.64 KHz	41.4	65.9	55.9	-24.4	-14.4
154.58 KHz	40.2	65.8	55.8	-25.6	-15.6
154.74 KHz	39.8	65.7	55.7	-26.0	-16.0
159.9 KHz	40.4	65.5	55.5	-25.1	-15.1
174.16 KHz	39.7	64.8	54.8	-25.1	-15.1
480.24 KHz	40.7	56.3	46.3	-15.6	-5.6
483.43 KHz	39.6	56.3	46.3	-16.7	-6.7
486.38 KHz	39.5	56.2	46.2	-16.7	-6.7
488.47 KHz	40.0	56.2	46.2	-16.2	-6.2

Graph 3.5.1

Line 1



Line 2



3.6 Receiver radiated emissions

Test location:	☐ OATS ☐ Anechoic Chamber
Test distance:	☐ 10 meters ☐ 3 meters
Test result:	**N/A**
Frequency range:	30MHz-1000MHz
Max. Emissions margin:	dB below the limits

Notes: EUT does not contain a Receiver portion.

3.7 Receiver conducted emissions

Test location: ☐ OATS ☐ Anechoic Chamber ☐ Other

Test result: **N/A**

Frequency range: 0.15MHz-30MHz

Max. Emissions margin: dB below the limits

Notes: EUT does not contain a Receiver portion.

3.8 SAR Test Exclusion Calculation

RF Exposure requirements are described in FCC KDB 447498 D01 v05r02, Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

Annex C of this document set SAR Test Exclusions for devices operated in frequency range below 100MHz, which are based on the power at the EUT output RF power according to the Table below

MHz	< 50	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	mm
100	237	474	481	487	494	501	507	514	521	527	534	541	547	554	561	567	
50	308	617	625	634	643	651	660	669	677	686	695	703	712	721	729	738	
10	474	948	961	975	988	1001	1015	1028	1041	1055	1068	1081	1095	1108	1121	1135	
1	711	1422	1442	1462	1482	1502	1522	1542	1562	1582	1602	1622	1642	1662	1682	1702	mW
0.1	948	1896	1923	1949	1976	2003	2029	2056	2083	2109	2136	2163	2189	2216	2243	2269	
0.05	1019	2039	2067	2096	2125	2153	2182	2211	2239	2268	2297	2325	2354	2383	2411	2440	
0.01	1185	2370	2403	2437	2470	2503	2537	2570	2603	2637	2670	2703	2737	2770	2803	2837	

The EUT Output Power (W) can be calculated using the formula:

$P = (E \times d)^2/30G$, where

E – field strength in V/m,
D – field strength measurement distance in m,
G – numerical value of antenna gain.

The EUT Output Power is calculated based on technical characterization and operation of the EUT:
-maximum measured field strength of 58.3dBµV/m, or 0.00082V/m
-measured distance of 10m
-antenna gain of 2dBi, or 1.58 numeric gain

The power calculation is $P = (0.00082*10)^2 / 30*1.58 = 0.00000142W = 0.00142mW$

The Minimum SAR Test Exclusion Threshold power for frequency range 10-50MHz per the Table above is 308mW.
The EUT calculated power of 0.00142mW is below the is Minimum SAR Test Exclusion Threshold power of 308mW, and also below the Minimum Exemption Limits for SAR Routine Evaluation of RSS-102 (section 2.5) is 345mW.

Therefore, the transmitter is exempt from SAR testing.

4.0 TEST EQUIPMENT

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NO.	INTERTEK ID	LAST CAL DATE	CAL DUE	USED
Spectrum Analyzer	R & S	ESU	100398	25283	03/21/2017	03/21/2018	☒
Spectrum Analyzer	R & S	ESCI	100358	12909	10/31/2016	10/31/2017	☒
Bicono-Log Antenna	Teseq	CBL6112D	32859	25289	10/03/2016	10/03/2017	☒
Loop Antenna	ETS	6512	00060486	19942	01/03/2017	01/03/2018	☒
Horn Antenna	EMCO	3115	6579	15580	09/15/2016	09/15/2017	☒
Pre-Amplifier	MITEQ	AMF-5D-00501800-28-13P	1122951	13475	12/01/2016	12/01/2017	☒
LISN	COM-Power	Li-215A	191970	172315	06/27/2017	06/27/2018	☒
Environmental Chamber	CSZ	ZH-16-3.5-SCT/AC	Z0414046	17092	04/17/2017	04/17/2018	☒
System	Quantum Change	TILE! Instrument Control	Ver. 3.4.K.29	15259	VBU	VBU	☒

5.0 Revision History

REVISION LEVEL	DATE	REPORT NUMBER	PREPARED	REVIEWED	NOTES
0	07-17-2017	103103871MIN-005	SK	NS	Original Issue
1	07-31-2017	103103871MIN-005	SK 	NS 	Radiated Emissions test data from 1 to 5GHz is added