Test Report Serial Number:	**45461524 R3.0**
Test Report Date:	**23 November 2019**
Project Number:	**1458**

EMC Test Report - New Filing

Applicant:

Watts Water Technologies
815 Chestnut St.
North Andover, MA, 01845
USA

Watts Water Technologies Canada
5435 North Service Road
Burlington, ON, L7L 5H7
Canada

FCC ID: **2AFJT-CIMDOF18815**

IC Registration Number: **20938-CIMDOF18815**

Product Model Number / HVIN: **P07757**

Product Name / PMN: **H2iQ-WIRELESS-LEAK-SNSR**

In Accordance With:

CFR Title 47, Part 15 Subpart C (§15.249)

Part 15 Low Power Communication Device Transmitter (DXX)

RSS-Gen, RSS-210 Issue 9

Low Power Device (902-928MHz)

Approved By:

Ben Hewson, President
Celltech Labs Inc.
21-364 Lougheed Rd.
Kelowna, BC, V1X 7R8
Canada

Test Lab Certificate: 2470.01

IC Registration 3874A-1

FCC Registration: CA3874

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1.0 DOCUMENT CONTROL

Revision History				
Samples Tested By:	Art Voss, P.Eng.	**Date(s) of Evaluation:**		9 July - 6 November, 2019
Report Prepared By:	Art Voss, P.Eng.	**Report Reviewed By:**		Ben Hewson
Report Revision	**Description of Revision**	**Revised Section**	**Revised By**	**Revision Date**
0.1	Initial Draft Release	n/a	Art Voss	7 November 2019
1.0	Initial Release	n/a	Art Voss	7 November 2019
2.0	Corrected Plots Titles	9.0	Art Voss	20 November 2019
3.0	Revised SA Detector	9.0	Art Voss	23 November 2019

2.0 CLIENT AND DUT INFORMATION

Client Information	
Applicant Name (FCC)	**Watts Water Technologies**
Applicant Address (FCC)	815 Chestnut St.
	North Andover, MA, 01845
	USA
Applicant Name (ISED)	**Watts Water Technologies Canada**
Applicant Address (ISED)	5435 North Service Road
	Burlington, ON, L7L 5H7
	Canada
DUT Information	
Device Identifier(s):	FCC ID: **2AFJT-CIMDOF18815**
	ISED ID: **20938-CIMDOF18815**
Device Type:	Digital Transceiver
Equipment Class (FCC):	Part 15 Low Power Communication Device Transmitter (DXX)
Equipment Class (ISED):	Low Power Device (902-928MHz)
Device Model(s) / HVIN:	P07757
Device Marketing Name / PMN:	H2iQ-WIRELESS-LEAK-SNSR
Firmware Version ID Number / FVIN:	-
Host Marketing Name / HMN:	-
Test Sample Serial No.:	T/A Sample - Identical Prototype
Transmit Frequency Range:	912MHz
Test Channels:	1 Channel
Manuf. Max. Rated Output Power:	4dBm
Manuf. Max. Rated BW/Data Rate:	n/a
Antenna Make and Model:	PCB Single Ended Whip
Antenna Type and Gain:	0dBi
Modulation:	FSK
Mode:	Simplex
Emission Designator:	See Section 7.0
DUT Power Source:	3VDC Alkaline
DUT Dimensions [HxWxD] (mm)	H x W x D: 40mm x 85mm Dia.
Deviation(s) from standard/procedure:	None
Modification of DUT:	None

3.0 SCOPE

This Certification Report was prepared on behalf of:

Watts Water Technologies

,(the '*Applicant*'), in accordance with the applicable Federal Communications Commission (FCC) CFR 47 and Innovation, Scientific and Economic Development (ISED) Canada rules parts and regulations (the '*Rules*'). The scope of this investigation was limited to only the equipment, devices and accessories (the '*Equipment*') supplied by the *Applicant*. The tests and measurements performed on this *Equipment* were only those set forth in the applicable *Rules* and/or the Test and Measurement Standards they reference. The *Rules* applied and the Test and Measurement Standards used during this evaluation appear in the Normative References section of this report. The limits set forth in the technical requirements of the applicable *Rules* were applied to the measurement results obtained during this evaluation and ,unless otherwise noted, these limits were used as the Pass/Fail criteria. The Pass/Fail statements made in this report apply to only the tests and measurements performed on only the *Equipment* tested during this evaluation. Where applicable and permissible, information including test and measurement data and/or results from previous evaluations of same or similar equipment, devices and/or accessories may be cited in this report.

As per FCC CFR 47 Part §2.1091 and §2.1093 and Health Canada Safety Code 6, an RF Exposure evaluation report is required for this *Equipment* and the results of the RF Exposure evaluation appear in a separate exhibit from this report.

The Receiver of this *Equipment* is subject to Equipment Certification or Supplier's Declaration of Conformity (SDoC) in accordance with 47 CFR Part §15.101. The Receiver was evaluated in accordance with 47 CFR Part §15 Subpar B and ICES-003. A statement of the application the SDoC procedure appears in a separate exhibit from this report.

Application:

This application is for a new certification of a low power water sensor transceiver.

4.0 TEST RESULT SUMMARY

TEST SUMMARY						
Section	**Description of Test**	**Procedure Reference**	**Applicable Rule Part(s) FCC**	**Applicable Rule Part(s) ISED**	**Test Date**	**Result**
7.0	99% Occupied Bandwidth	ANSI C63.10-2013 KDB 558074 D01v05	§2.1049	RSS-Gen (6.7)	9 July 2019	Pass
8.0	20dB Bandwidth	ANSI C63.10-2013 KDB 558074 D01v05	§15.215(c)	RSS-Gen (6.7)	5 Nov 2019	Pass
9.0	Field Strength (Fundamental)	ANSI C63.10-2013 KDB 558074 D01v05	§15.249(a)	RSS-Gen (6.12) RSS-210 (B.10)	9 July 2019	Pass
10.0	Spurious Emissions	ANSI C63.10-2013 KDB 558074 D01v05	§15.249(d)(e)	RSS-Gen (6.12) RSS-210 (B.10)	10 July 2019 13 Aug 2019	Pass

Test Station Day Log					
Date	**Ambient Temp (°C)**	**Relative Humidity (%)**	**Barometric Pressure (kPa)**	**Test Station**	**Tests Performed Section(s)**
9 July 2019	24.0	28	101.6	**EMC**	**7**
5 Nov 2019	22.1	16	103.1	**EMC**	**8**
9 July 2019	29.0	32	101.3	**OATS**	**9**
10 July 2019	26.0	66	101.4	**OATS**	**9**
13 Aug 2019	27.1	46	101.9	**OATS**	**10**
23 Nov 2019	4.0	79	102.4	**OATS**	**9**

EMC - EMC Test Bench
OATS - Open Area Test Site
LISN - LISN Test Area
IMM - Immunity Test Area
SAC - Semi-Anechoic Chamber
TC - Temperature Chamber
ESD - ESD Test Bench
RI - Radiated Immunity Chamber

I attest that the data reported herein is true and accurate within the tolerance of the Measurement Instrument Uncertainty; that all tests and measurements were performed in accordance with accepted practices or procedures; and that all tests and measurements were performed by me or by trained personnel under my direct supervision. The results of this investigation are based solely on the test sample(s) provided by the client which were not adjusted, modified or altered in any manner whatsoever, except as required to carry out specific tests or measurements. This test report has been completed in accordance with ISO/IEC 17025.

Art Voss, P.Eng.
Technical Manager
Celltech Labs Inc.
7 November 2019
Date

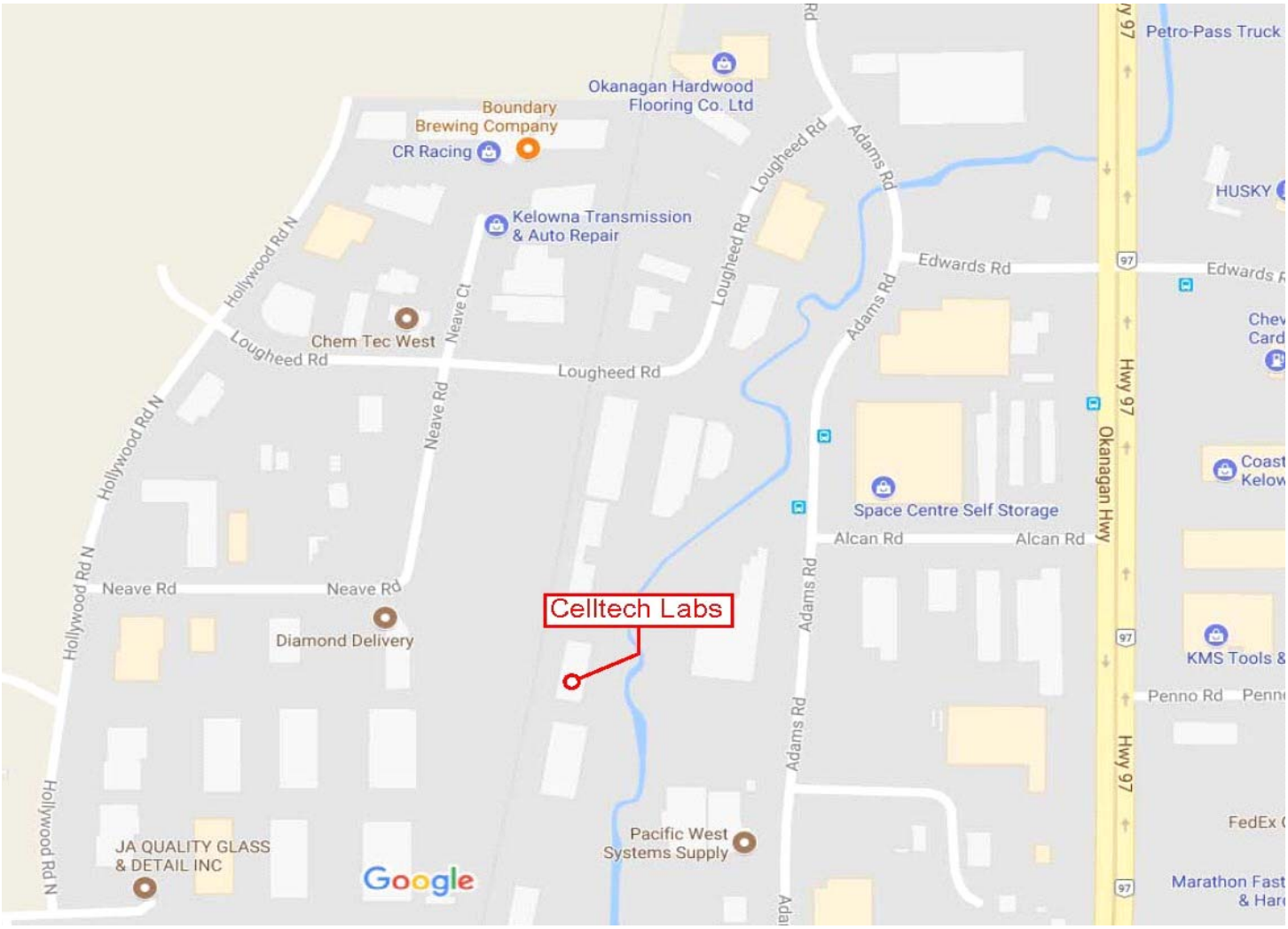
5.0 NORMATIVE REFERENCES

Normative References	
ISO/IEC 17025:2017	General requirements for the competence of testing and calibration laboratories
ANSI C63.10-2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
CFR Title 47: Part 2:	Code of Federal Regulations Telecommunication Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
CFR Title 47: Part 15: Sub Part C (15.249)	Code of Federal Regulations Telecommunication Radio Frequency Devices Intentional Radiators
CFR Title 47: Part 15: Subpart B:	Code of Federal Regulations Telecommunication Radio Frequency Devices Unintentional Radiators
ISED RSS-Gen Issue 5:	Innovation, Science and Economic Development Canada Spectrum Management and Telecommunications Radio Standards Specification General Requirements and Information for the Certification of Radiocommunication Equipment
ISED RSS-210 Issue 9:	Innovation, Science and Economic Development Canada Spectrum Management and Telecommunications Radio Standards Specification Licence-Exempt Radio Apparatus: Category I Equipment
FCC KDB 558074 D01v05	OET Major Guidance Publications, Knowledge Data Base Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under Section 15.247

6.0 FACILITIES AND ACCREDITATIONS

Facility and Accreditation:

The facilities used to evaluate this device outlined in this report are located at 21-364 Lougheed Road, Kelowna, British Columbia, Canada V1X 7R8. The radiated emissions site (OATS) conforms to the requirements set forth in ANSI C63.4 and is filed and listed with the FCC under Test Firm Registration Number CA3874A-1 and Industry Canada under Test Site File Number IC 3874A-1. Celltech is accredited to ISO 17025, through accrediting body A2LA and with certificate 2470.01.



7.0 99% OCCUPIED BANDWIDTH

Test Procedure	
Normative Reference	FCC 47 CFR §2.1046, RSS-Gen (6.7)
	KDB 558074 (8.3.2.1), ANSI C63.10 (6.9.3)

General Procedure	
KDB 558074 (8.3.2.1)	**8.3.2.1 General** Section 15.247 permits the maximum conducted (average) output power to be measured as an alternative to the maximum peak conducted output power for demonstrating compliance to the limit. When this option is exercised, the measured power is to be referenced to the OBW rather than the DTS bandwidth.
C63.10 (6.9.3)	**6.9.3 Occupied bandwidth—power bandwidth (99%) measurement procedure** The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The following procedure shall be used for measuring 99% power bandwidth: a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW. b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement. c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2. d) Step a) through step c) might require iteration to adjust within the specified range. e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used. f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.

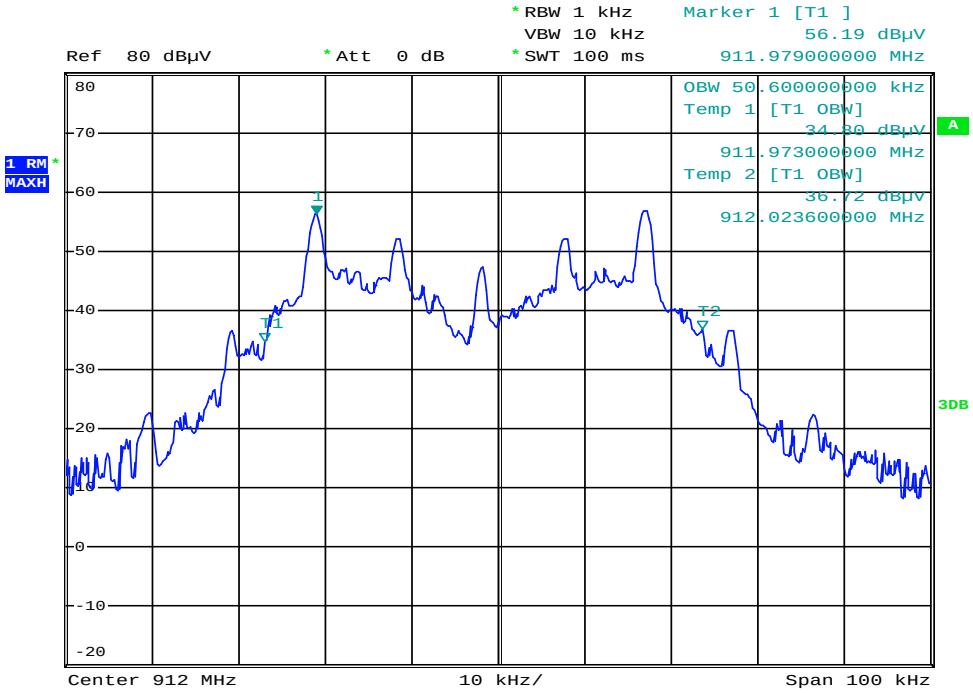
Test Setup	Appendix A - Figure A.1

Measurement Procedure

The DUT was connected to a Spectrum Analyzer (SA) via a 30dB attenuator connected to the DUT's antenna port. The SA was configured as described above using the 99% Occupied Bandwidth function. The output power of the DUT was set to the manufacturer's highest output power setting at the Low, Mid and High frequency channels as permitted by the device. The DUT was set to transmit at its maximum Duty Cycle. The 99% Occupied Bandwidth was measured and recorded.

Plot 7.1 – 99% Occupied Bandwidth

Occupied Bandwidth



Date: 9.JUL.2019 13:31:33

Channel Frequency:	Channel Bandwidth Setting:	Mode:
912.00 MHz	**Max** kHz	**n/a**
Modulation Setting:	**Channel Power Setting:**	**Measured OBW:**
FSK	**Max** dBm	**50.60** kHz

Table 7.1 - Summary of 99% Occupied Bandwidth Measurements

99% Occupied Bandwidth Measurements				
Frequency (MHz)	Bandwidth Setting (MHz)	Modulation	Measured OBW (kHz)	Emission Designator
912.00	Max	FSK	50.6	50K6F1D

8.0 20DB BANDWIDTH

Test Procedure	
Normative Reference	FCC 47 CFR §2.1049, §15.215(c), RSS-Gen (6.7)
	KDB 558074 (8.2), ANSI C63.10 (11.8.2)

Limits	
47 CFR §15.215(c)	(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

General Procedure	
KDB 558074 (8.2) C63.10 (11.8.2)	**11.8.2 Option 2** The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 20 dB, if the functionality described above (i.e., RBW = 100 kHz, VBW ≥ 3 X RBW, peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 20 dB.

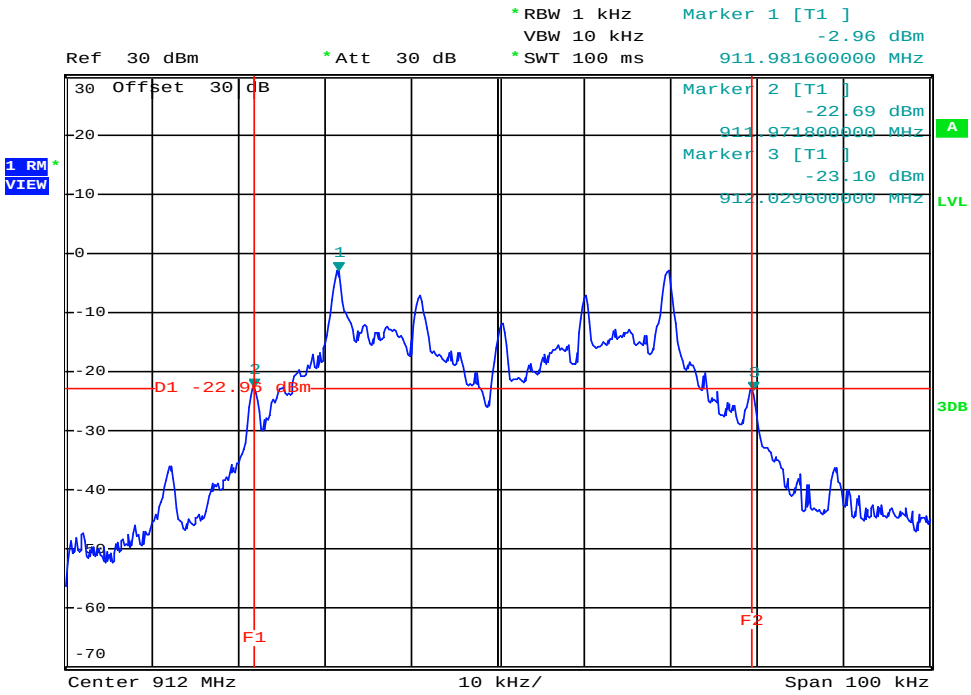
Test Setup	Appendix A - Figure A.1

Measurement Procedure

The DUT was connected to a Spectrum Analyzer (SA) via a 30dB attenuator connected to the DUT's antenna port. The SA was configured as above using the Automatic 20dB Cursor Bandwidth measurement. The output power of the DUT was set to the manufacturer's highest output power setting at the Low, Mid and High frequency channels as permitted by the device. The DUT was set to transmit at its maximum Duty Cycle.

Plot 8.1 – 20dB Bandwidth

20dB Bandwidth



Date: 5.NOV.2019 13:26:41

Channel Frequency:	Channel Bandwidth Setting:	Mode:
912.00 MHz	**Max** kHz	**n/a**
Modulation Setting:	**Channel Power Setting:**	**Measured OBW:**
FSK	**Max** dBm	**57.80** kHz

Table 8.1 - Summary of 20dB Bandwidth Measurements

20dB Bandwidth Measurements			
Frequency (MHz)	Bandwidth Setting (MHz)	Modulation	Measured OBW (kHz)
912.00	Max	FSK	57.8
		Result:	**Complies**

The Emissions at the 20dB BW point are contained within the 902 - 928 Band at 912MHz

9.0 FIELD STRENGTH

Test Procedure	
Normative Reference	FCC 47 CFR §15.249(a), RSS-210 (B.10)
	KDB 558074 (8.3.2), ANSI C63.10 (11.9.2.2.6)

Limits	
47 CFR §15.249(a)	**§15.249 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHZ, and 24.0-24.25 GHz.** (a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following: 902 - 928MHz: Fundamental: 50 mV/m, Harmonics: 500 uV/m (c) Field strength limits are specified at a distance of 3 meters.
RSS-210 (B.10)	**B.10 Bands 902-928 MHz, 2400-2483.5 MHz and 5725-5875 MHz** Devices shall comply with the following requirements: (a) The field strength of fundamental and harmonic emissions, measured at 3 m, shall not exceed 50 mV/m and 0.5 mV/m respectively.

General Procedure	
C63.10 (6.5.4)	**6.5.4 Final radiated emission tests** Using the orientation and equipment arrangement of the EUT, and based on the measurement results found during the exploratory measurement in 6.5.3, the EUT arrangement, appropriate modulation, and modes of operation that produce the emissions that have the highest amplitude relative to the limit shall be selected for the final measurement. The final measurement shall follow all the procedures in 6.3 with the EUT operating on frequencies per 5.6. For each mode selected, record the frequency and amplitude of the highest fundamental emission (if applicable) and the frequency and amplitude of the six highest spurious emissions relative to the limit; emissions more than 20 dB below the limit do not need to be reported. Measurements are performed with the EUT rotated from 0° to 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Variations in cable or wire placement shall be explored to maximize the measured emissions.

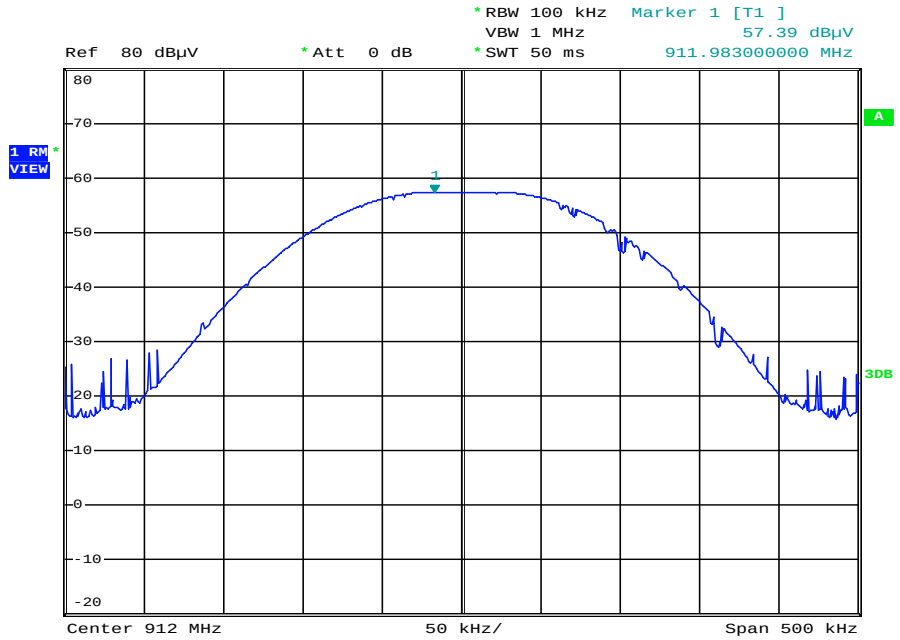
Test Setup	Appendix A Figure A.2

Measurement Procedure

The DUT place on a 80cm high turntable on an Open Area Test Site (OATS) at a distance of 3m from the measurement antenna. The DUT was set to transmit at maximum power and duty cycle. The DUT was rotated 360 degrees and scanned with the receive antenna elevated from 1 to 4m. The emissions were measured and recorded.

Plot 9.1 – Field Strength – RMS - Horizontal

Field Strength (RMS)

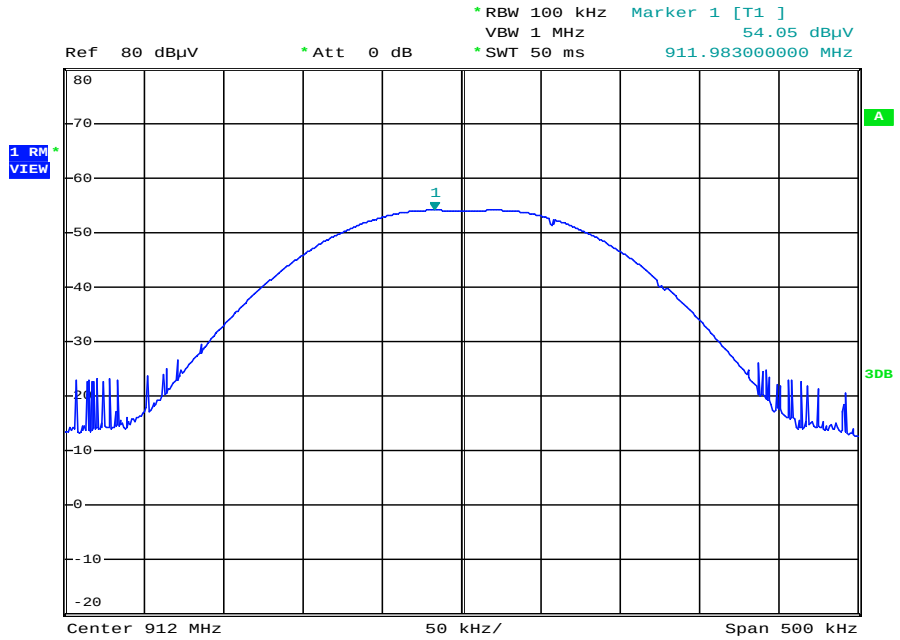


Date: 23.NOV.2019 13:02:02

Channel Frequency:	Modulation Setting:	Antenna Polarization:
912.00 MHz	**FSK**	**Horizontal**
	Detector:	Measured Field Strength:
	RMS	**57.39** dBuV

Plot 9.2 – Field Strength – RMS - Vertical

Field Strength (RMS)

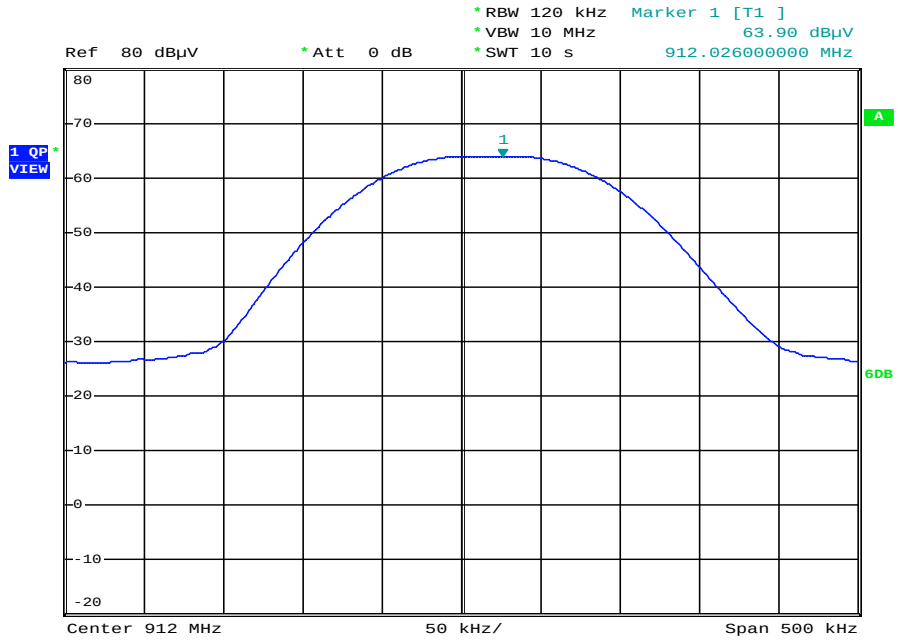


Date: 23.NOV.2019 12:59:21

Channel Frequency:	Modulation Setting:	Antenna Polarization:
912.00 MHz	**FSK**	**Vertical**
	Detector:	Measured Field Strength:
	RMS	**54.05** dBuV

Plot 9.3 – Field Strength – Quasi Peak - Horizontal

Field Strength (Quasi Peak)

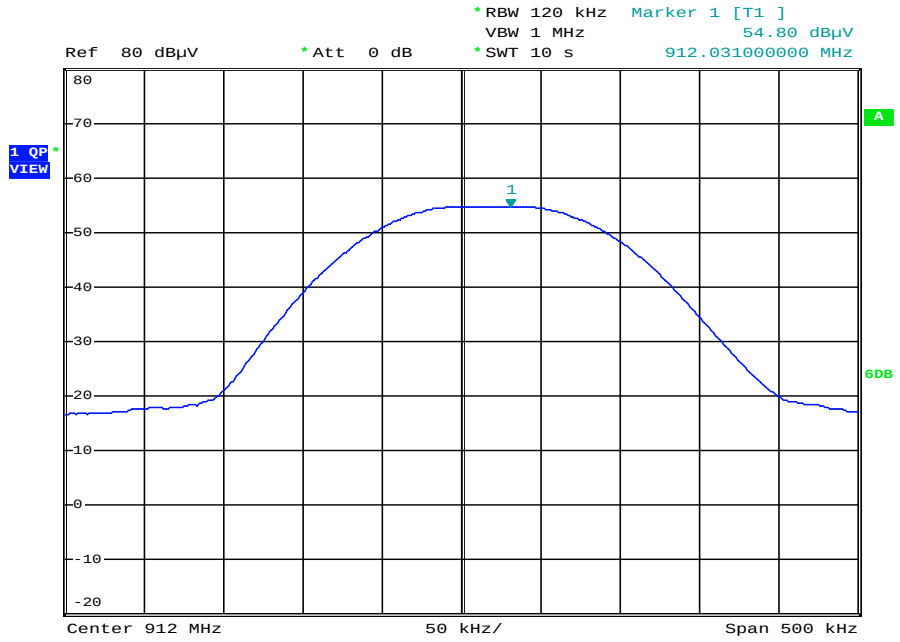


Date: 23.NOV.2019 12:31:36

Channel Frequency:	Modulation Setting:	Antenna Polarization:
912.00 MHz	**FSK**	**Horizontal**
	Detector:	Measured Field Strength:
	Quasi Peak	**63.90** dBuV

Plot 9.4 – Field Strength – Quasi Peak - Vertical

Field Strength (Quasi Peak)



Date: 23.NOV.2019 12:47:20

Channel Frequency:	Modulation Setting:	Antenna Polarization:
912.00 MHz	**FSK**	**Vertical**
	Detector:	Measured Field Strength:
	Quasi Peak	**54.80** dBuV

Table 9.1 - Summary of Field Strength Measurements

FCC §15.249(a), RSS-210 Radiated Field Strength										
Frequency (MHz)	Modulation	Power Setting[1] (dBm)	Detector	Antenna Polarization	Measured Field Strength [FS_{Meas}] (dBuV @ 3m)	Cable Loss [L_C] (dBm)	Receive Antenna [ACF] (dB)	Corrected Field Strength [FS_{Corr}] (dBuV @ 3m)	Limit (dBuV)	Margin (dB)
912.0	FSK	Max	RMS	Horizontal	57.39	4.6	29.5	91.49	94.0	**2.5**
				Vertical	54.05			88.15		**5.8**
			Quasi Peak	Horizontal	63.90			98.00	114.0	**16.0**
				Vertical	54.80			88.90		**25.1**
								Result:		**Complies**

$FS_{Corr} = FS_{Meas} + ACF + L_C$

Margin = Limit - FS_{Corr}

(1) The output power is factory set to maximum

10.0 RADIATED TX SPURIOUS EMISSIONS

Test Procedure	
Normative Reference	FCC 47 CFR §15.249(d), RSS-210 (B.10)
	KDB 558074 (8.3.2), ANSI C63.10 (11.9.2.2.6)

Limits	
47 CFR §15.249(d)	**§15.249 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHZ, and 24.0-24.25 GHz.** (d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.
RSS-210 (B.10)	**B.10 Bands 902-928 MHz, 2400-2483.5 MHz and 5725-5875 MHz** Devices shall comply with the following requirements: (b) Emissions radiated outside of the specified frequency bands, except for harmonic emissions, shall be attenuated by at least 50 dB below the level of the fundamental emissions or to the general field strength limits listed in RSS-Gen, whichever is less stringent.

General Procedure	
C63.10 (6.5.4)	**6.5.4 Final radiated emission tests** Using the orientation and equipment arrangement of the EUT, and based on the measurement results found during the exploratory measurement in 6.5.3, the EUT arrangement, appropriate modulation, and modes of operation that produce the emissions that have the highest amplitude relative to the limit shall be selected for the final measurement. The final measurement shall follow all the procedures in 6.3 with the EUT operating on frequencies per 5.6. For each mode selected, record the frequency and amplitude of the highest fundamental emission (if applicable) and the frequency and amplitude of the six highest spurious emissions relative to the limit; emissions more than 20 dB below the limit do not need to be reported. Measurements are performed with the EUT rotated from 0° to 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Variations in cable or wire placement shall be explored to maximize the measured emissions.

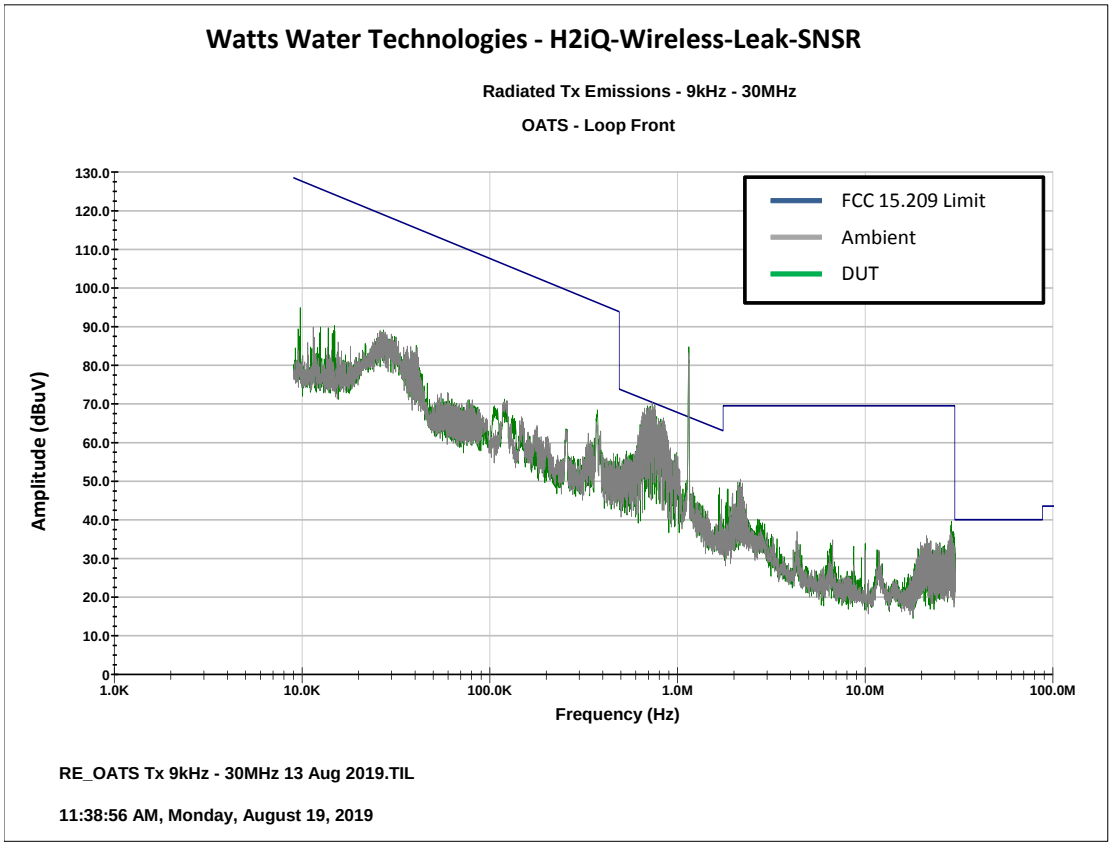
Test Setup	Appendix A Figure A.2

Measurement Procedure

The DUT place on a 80cm high turntable on an Open Area Test Site (OATS) at a distance of 3m from the measurement antenna. The DUT was set to transmit at maximum power and duty cycle. The DUT was rotated 360 degrees and scanned with the receive antenna elevated from 1 to 4m. The emissions were measured and recorded.

Plot 10.1 – Radiated Tx Spurious Emissions – 9kHz – 30MHz, Front Polarization

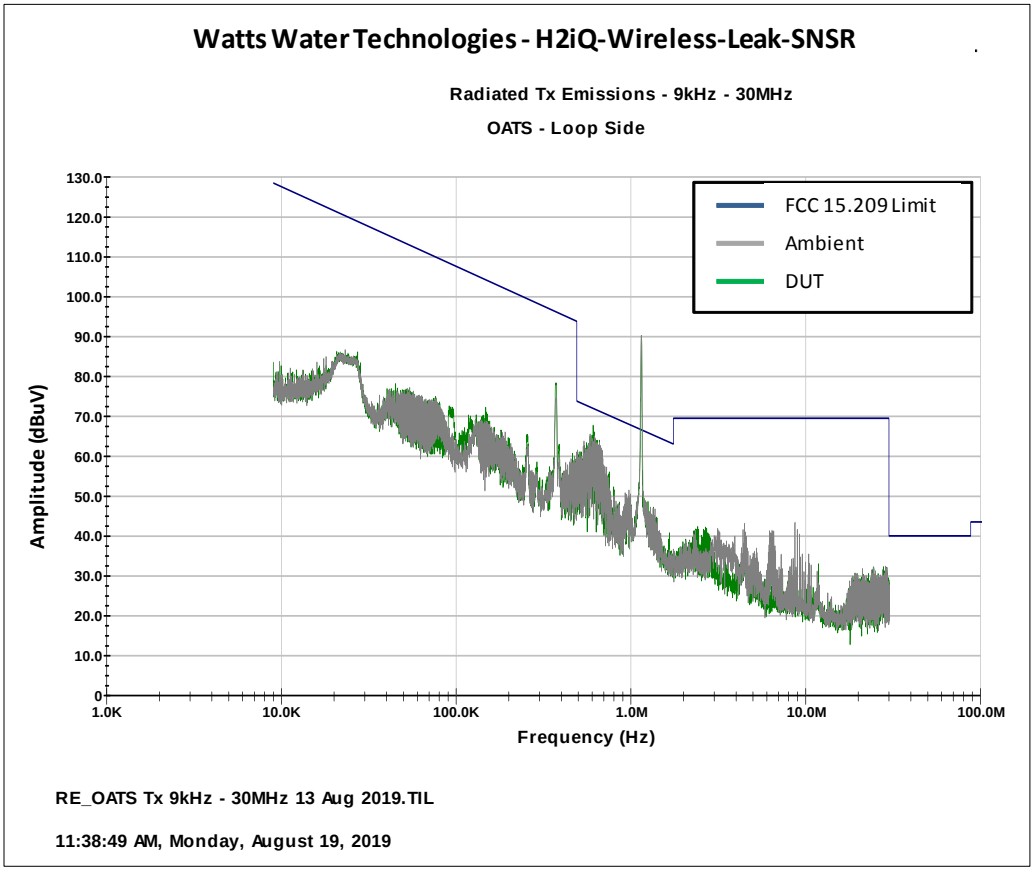
Radiated Spurious Emissions - 9kHz to 30MHz



Channel Frequency:	Modulation Setting:	Antenna Polarization
912.00 MHz	**FSK**	**Front**

Plot 10.2 – Radiated Tx Spurious Emissions – 9kHz – 30MHz, Side Polarization

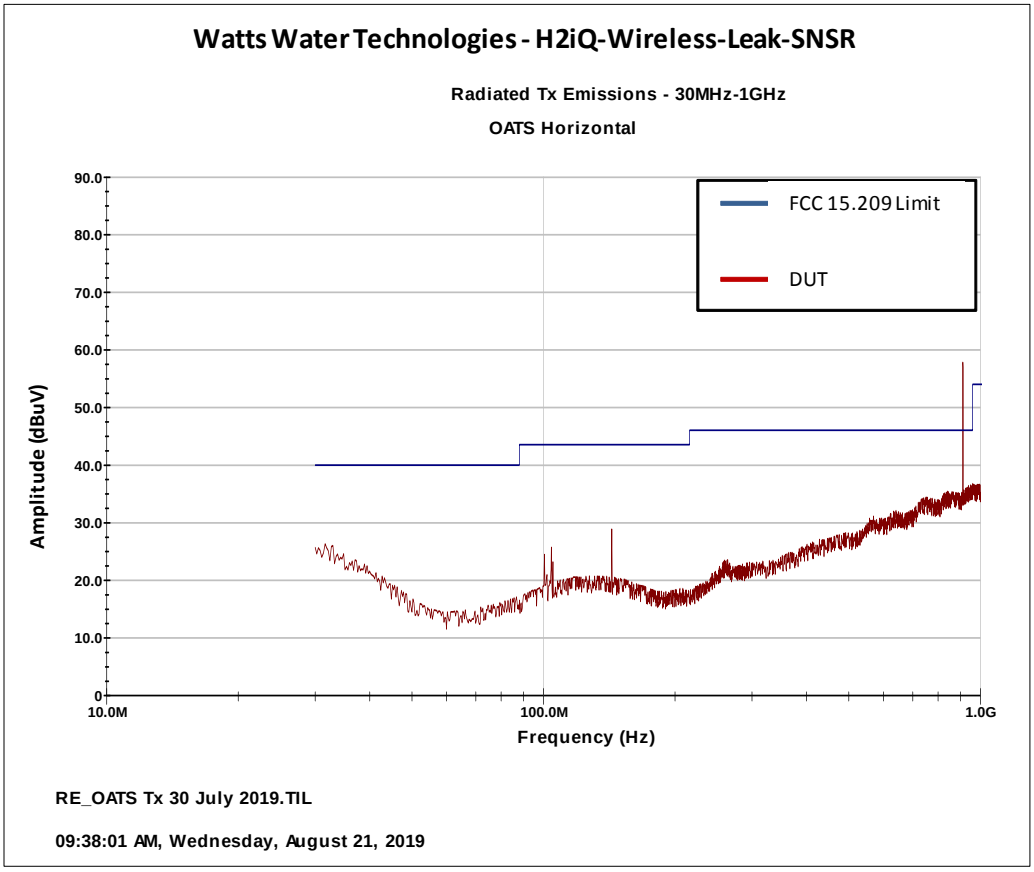
Radiated Spurious Emissions - 9kHz to 30MHz



Channel Frequency:	Modulation Setting:	Antenna Polarization
912.00 MHz	**FSK**	**Side**

Plot 10.3 – Radiated Tx Spurious Emissions – 30MHz – 1000MHz, Horizontal

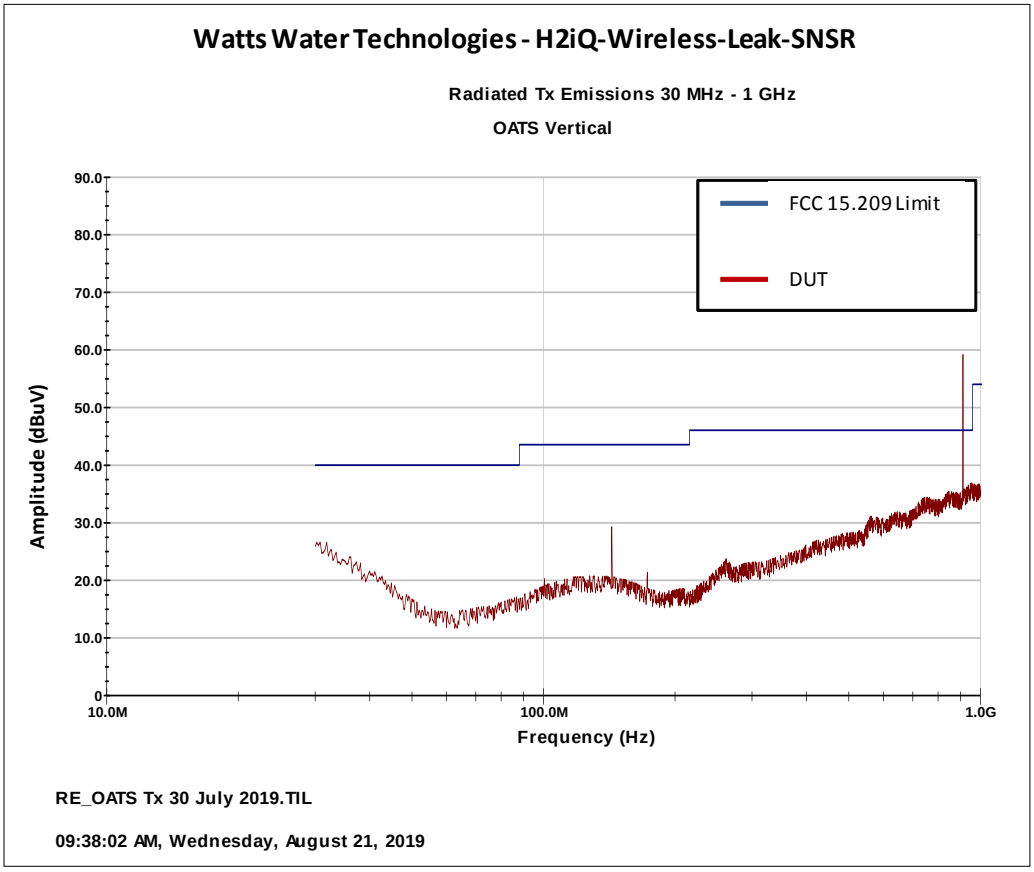
Radiated Spurious Emissions - 30MHz - 1000MHz



Channel Frequency:	Modulation Setting:	Antenna Polarization
912.00 MHz	**FSK**	**Horizontal**

Plot 10.4 – Radiated Tx Spurious Emissions – 30MHz – 1000MHz, Vertical

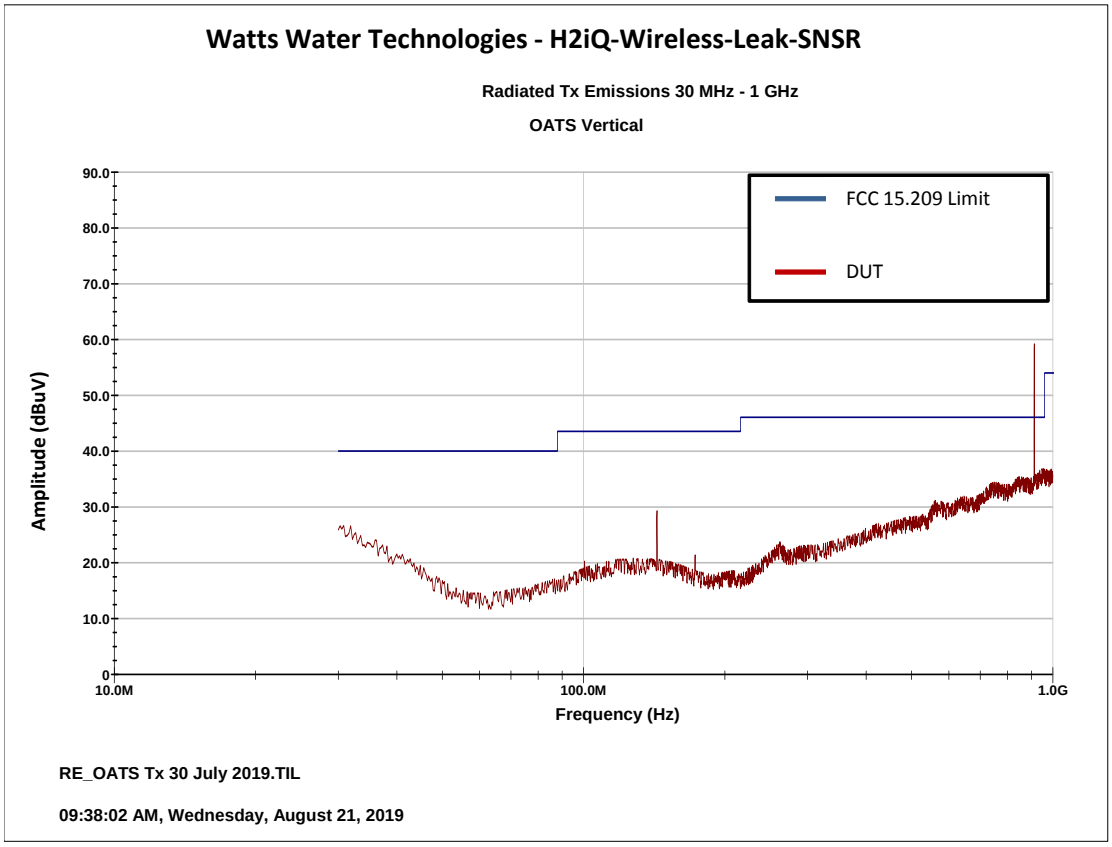
Radiated Spurious Emissions - 30MHz - 1000MHz



Channel Frequency:	Modulation Setting:	Antenna Polarization
912.00 MHz	**FSK**	**Vertical**

Plot 10.5 – Radiated Tx Spurious Emissions – 1GHz – 3GHz, Horizontal

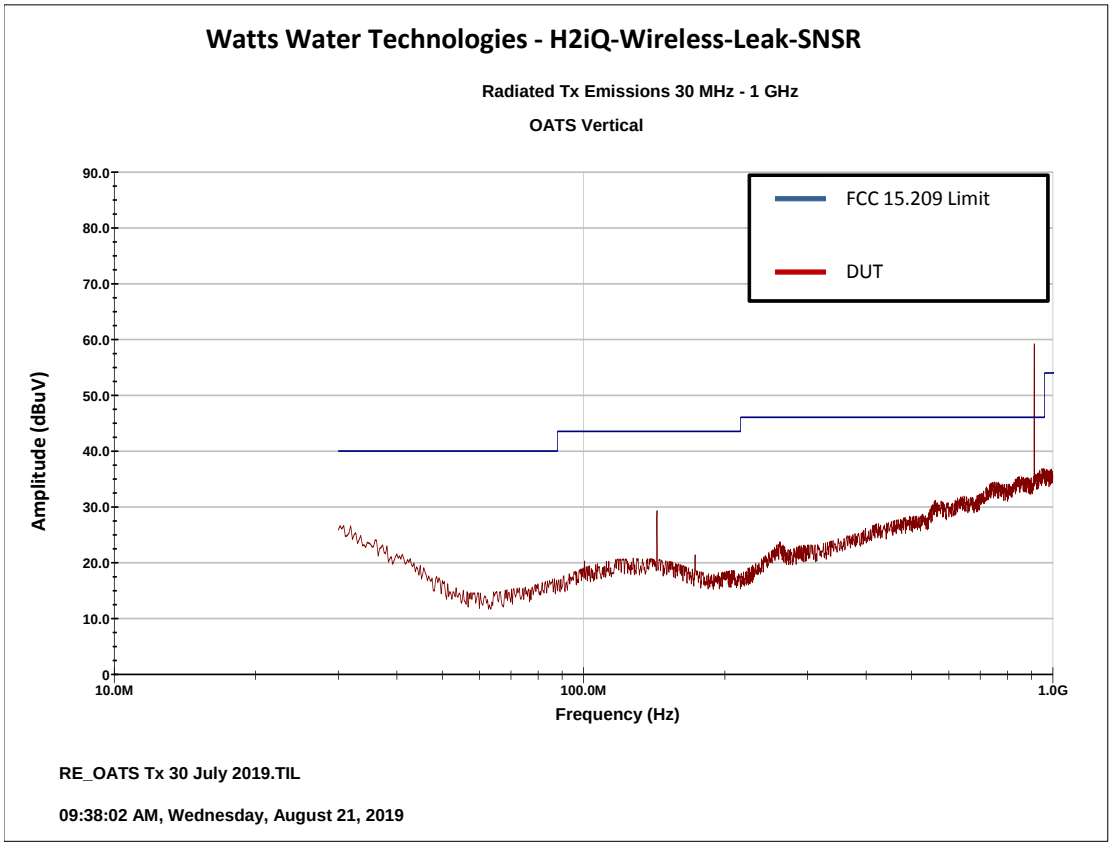
Radiated Spurious Emissions - 30MHz - 1000MHz



Channel Frequency:	Modulation Setting:	Antenna Polarization
912.00 MHz	**FSK**	**Vertical**

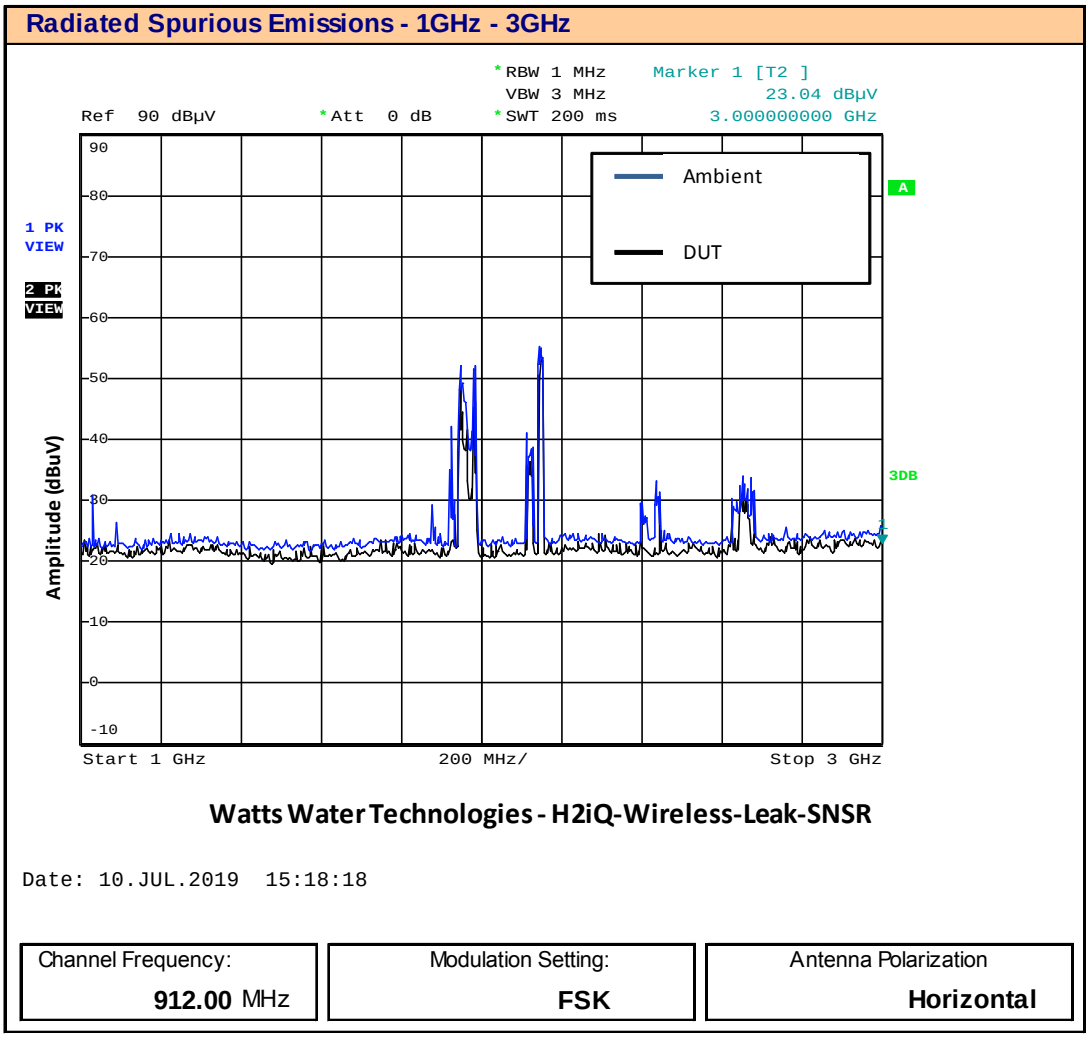
Plot 10.6 – Radiated Tx Spurious Emissions – 1GHz – 3GHz, Vertical

Radiated Spurious Emissions - 30MHz - 1000MHz



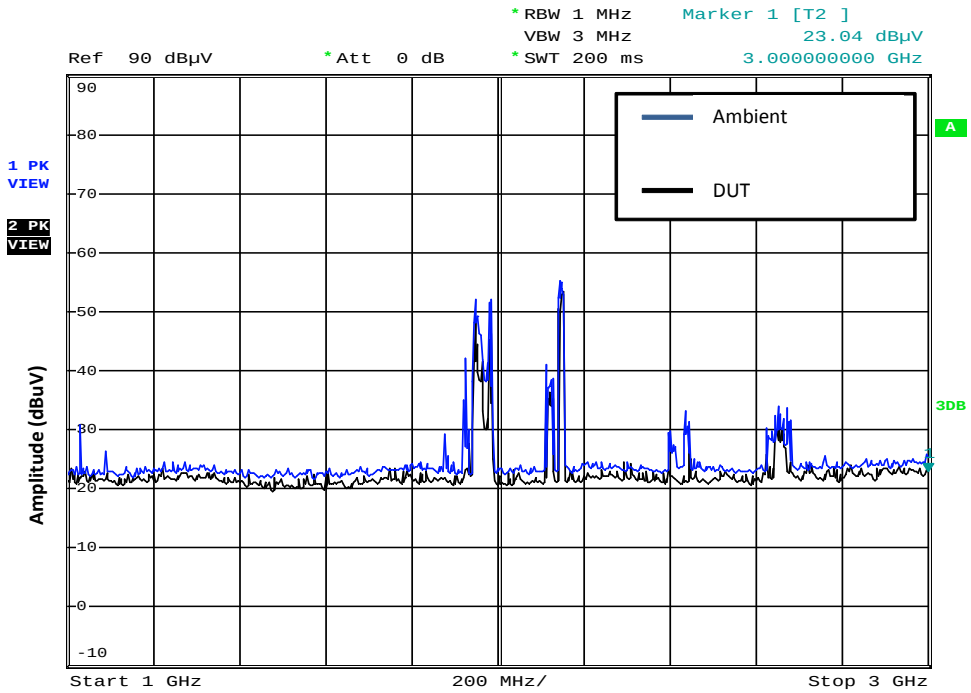
Channel Frequency:	Modulation Setting:	Antenna Polarization
912.00 MHz	**FSK**	**Vertical**

Plot 10.7 – Radiated Tx Spurious Emissions – 3GHz – 10GHz, Horizontal



Plot 10.8 – Radiated Tx Spurious Emissions – 3GHz – 10GHz, Vertical

Radiated Spurious Emissions - 1GHz - 3GHz



Watts Water Technologies - H2iQ-Wireless-Leak-SNSR

Date: 10.JUL.2019 15:18:18

Channel Frequency:	Modulation Setting:	Antenna Polarization
912.00 MHz	**FSK**	**Horizontal**

Table 10.1 - Summary of Field Strength Measurements, ANT

Emission Level Measurement					
Frequency Range	Emission Frequency (MHz)	Antenna Polarization	Measured Emission(1) [E_{Meas}] (dBuV @ 3m)	Limit Line [A_L] (dBuV)	Margin (dB)
9kHz - 30MHz	1.66	Front	48.3	64.0	15.7
30MHz - 1GHz	100.5	Horizontal	24.5	43.0	18.5
30MHz - 1GHz	104.3	Horizontal	25.7	43.0	17.3
30MHz - 1GHz	143.4	Horizontal	28.9	43.0	14.1
30MHz - 1GHz	143.4	Vertical	29.3	43.0	13.7
30MHz - 1GHz	172.8	Vertical	21.4	43.0	21.6
			Result:	Complies	

(1) Antenna Correction Factors (ACF) and cable loss corrected.

Margin = A_L - E_{MEAS}

No other spurious emissions within 20dB of the limit or above the ambient emissions were detected

APPENDIX A – TEST SETUP DRAWINGS AND EQUIPMENT

Table A.1 – Setup - Conducted Measurements Equipment

Equipment List			
Asset Number	Manufacturer	Model Number	Description
00241	R&S	FSU40	Spectrum Analyzer

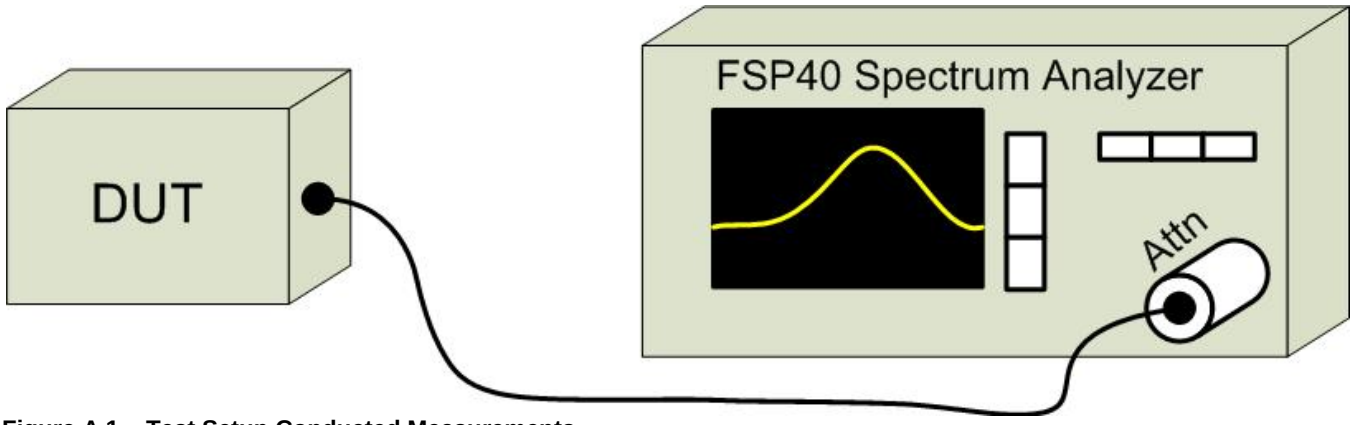


Figure A.1 – Test Setup Conducted Measurements

Table A.2 – Setup - Radiated Emissions Equipment

Equipment List			
Asset Number	**Manufacturer**	**Model Number**	**Description**
00051	HP	8566B	Spectrum Analyzer
00049	HP	85650A	Quasi-peak Adapter
00047	HP	85685A	RF Preselector
00072	EMCO	2075	Mini-mast
00073	EMCO	2080	Turn Table
00071	EMCO	2090	Multi-Device Controller
00265	Miteq	JS32-00104000-58-5P	Microwave L/N Amplifier
00241	R&S	FSU40	Spectrum Analyzer
00050	Chase	CBL-6111A	Bilog Antenna
00275	Coaxis	LMR400	25m Cable
00276	Coaxis	LMR400	4m Cable
00278	TILE	34G3	TILE Test Software
00034	ETS	3115	Double Ridged Guide Horn
00085	EMCO	6502	Loop Antenna
00161	Waveline Inc.	889	Standard Gain Horn 18-26GHz
00162	Waveline Inc.	889	Standard Gain Horn 18-26GHz
00163	Waveline Inc.	1099	Standard Gain Horn 26-40GHz
00164	Waveline Inc.	1099	Standard Gain Horn 26-40GHz
00165	Waveline Inc.	801-KF	Waveguide Adapter 18-26GHz
00166	Waveline Inc.	801-KF	Waveguide Adapter 18-26GHz
00167	Waveline Inc.	1001-KF	Waveguide Adapter 26-40GHz
00168	Waveline Inc.	1001-KF	Waveguide Adapter 26-40GHz

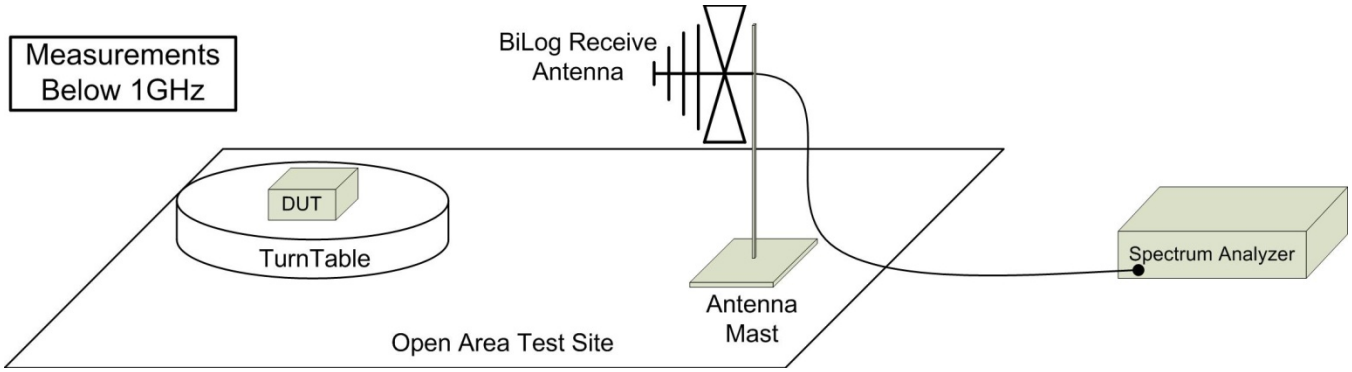


Figure A.2 – Test Setup Radiated Emissions Measurements 30-1000MHz

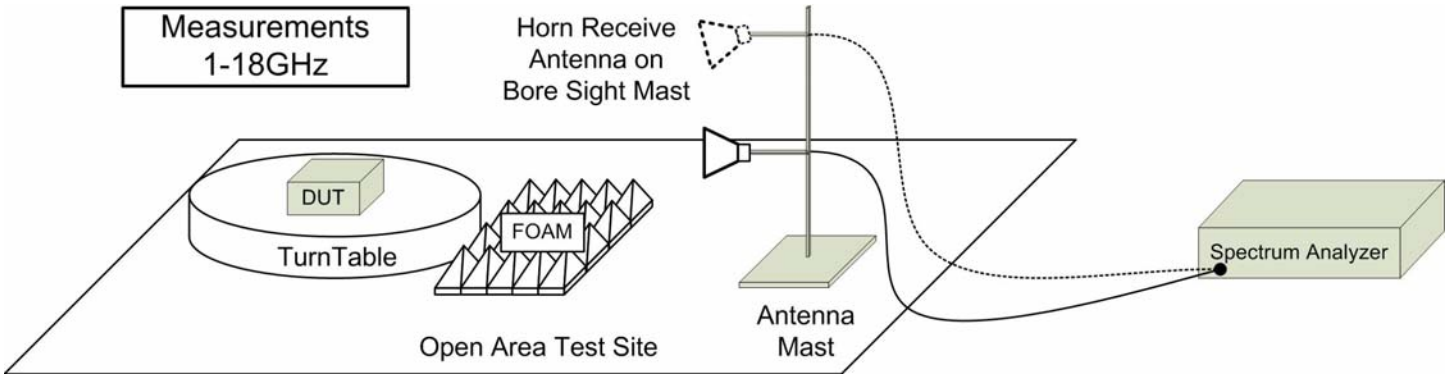


Figure A.3 – Test Setup Radiated Emissions Measurements 1-18GHz

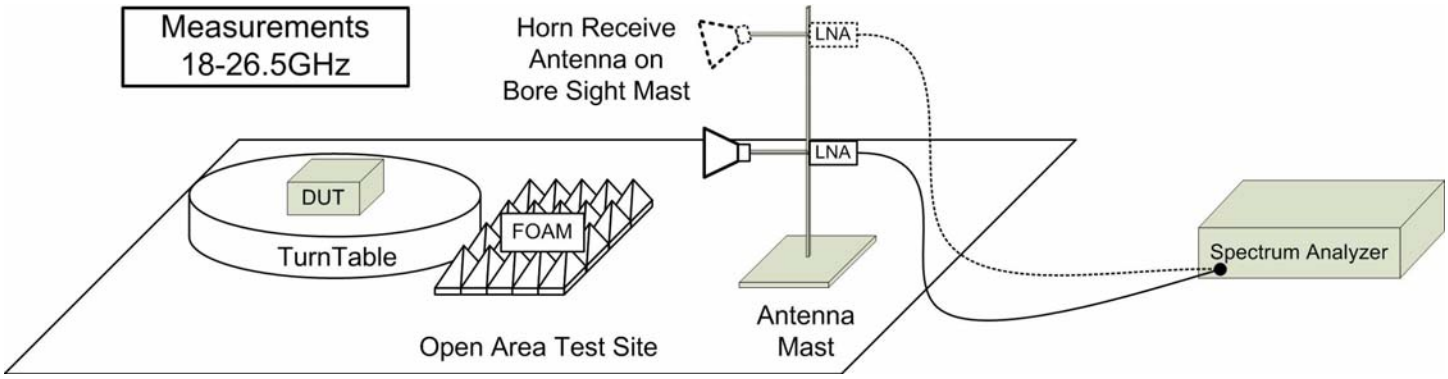


Figure A.4 – Test Setup Radiated Emissions Measurements 18-26.5GHz

APPENDIX B – EQUIPMENT LIST AND CALIBRATION

Equipment List								
(*)	Asset Number	Manufacturer	Model Number	Serial Number	Description	Last Calibrated	Calibration Interval	Calibration Due
*	00050	Chase	CBL-6111A	1607	Bilog Antenna	3 Jan 2019	Triennial	3 Jan 2022
*	00034	ETS	3115	6267	Double Ridged Guide Horn	26 Nov 2018	Triennial	26 Nov 2021
	00035	ETS	3115	6276	Double Ridged Guide Horn	22 Mar 2019	Triennial	21 Mar 2022
*	00085	EMCO	6502	9203-2724	Loop Antenna	11 Jun 2019	Triennial	11 Jun 2022
*	00161	Waveline Inc.	889		Standard Gain Horn 18-26GHz	NCR	n/a	NCR
	00162	Waveline Inc.	889		Standard Gain Horn 18-26GHz	NCR	n/a	NCR
	00163	Waveline Inc.	1099		Standard Gain Horn 26-40GHz	NCR	n/a	NCR
	00164	Waveline Inc.	1099		Standard Gain Horn 26-40GHz	NCR	n/a	NCR
*	00165	Waveline Inc.	801-KF		Waveguide Adapter 18-26GHz	NCR	n/a	NCR
	00166	Waveline Inc.	801-KF		Waveguide Adapter 18-26GHz	NCR	n/a	NCR
	00167	Waveline Inc.	1001-KF		Waveguide Adapter 26-40GHz	NCR	n/a	NCR
	00168	Waveline Inc.	1001-KF		Waveguide Adapter 26-40GHz	NCR	n/a	NCR
*	00047	HP	85685A	2837A00826	RF Preselector	23 Jun 2017	Triennial	23 Jun 2020
*	00049	HP	85650A	2043A00162	Quasi-peak Adapter	23 Jun 2017	Triennial	23 Jun 2020
*	00051	HP	8566B	2747A05510	Spectrum Analyzer	23 Jun 2017	Triennial	23 Jun 2020
	00223	HP	8901A	3749A07154	Modulation Analyzer	27 Dec 2017	Triennial	27 Dec 2020
	00224	HP	8903B	3729A18691	Audio Analyzer	28 Dec 2017	Triennial	28 Dec 2020
*	00241	R&S	FSU40	100500	Spectrum Analyzer	15 May 2018	Triennial	15 May 2021
*	00005	HP	8648D	3847A00611	Signal Generator	21 Jun 2017	Triennial	21 Jun 2020
	00006	R&S	SMR20	100104	Signal Generator	29 May 2017	Triennial	29 May 2020
	00243	Rigol	DS1102E	DS1ET150502164	Oscilloscope	7 Nov 2017	Triennial	7 Nov 2020
	00254	LeCroy	WM8600A	532	Oscilloscope	NCR	n/a	NCR
	00110	Gigatronics	8652A	1875801	Power Meter	26 Mar 2019	Triennial	26 Mar 2022
	00237	Gigatronics	80334A	1837001	Power Sensor	26 Mar 2019	Triennial	26 Mar 2022
	00232	ETS Lindgren	HI-6005	91440	Isotropic E-Field Probe	18 Dec 2017	Triennial	18 Dec 2020
	00003	HP	53181A	3736A05175	Frequency Counter	21 Jun 2017	Triennial	21 Jun 2020
	00257	Com-Power	LI-215A	191934	LISN	5 Jan 2018	Triennial	5 Jan 2021
	00041	AR	10W1000C	27887	Power Amplifier	NCR	n/a	NCR
	00106	AR	5SIG4	26235	Power Amplifier	NCR	n/a	NCR
	00280	AR	25A250AM6	22702	Power Amplifier	NCR	n/a	NCR
*	00265	Miteq	JS32-00104000-58-5P	1939850	Microwave L/N Amplifier	COU	n/a	COU
	00071	EMCO	2090	9912-1484	Multi-Device Controller	n/a	n/a	n/a
*	00072	EMCO	2075	0001-2277	Mini-mast	n/a	n/a	n/a
*	00073	EMCO	2080	0002-1002	Turn Table	n/a	n/a	n/a
	00081	ESPEC	ECT-2	0510154-B	Environmental Chamber	NCR	n/a	CNR
*	00234	VWR	61161-378	140320430	Temp/Humidity Meter	New	Triennial	New
	00236	Nokia	-	236	ESD Table	NCR	n/a	NCR
	00255	Expert ESD	A4001	A4001-155	ESD Target	COU	n/a	COU
	00064	NARDA	3020A	n/a	Bi-Directional Coupler	COU	n/a	COU
	00263	Koaxis	KP10-1.00M-TD	263	1m Armoured Cable	COU	n/a	COU
*	00263B	Koaxis	KP10-1.00M-TD	263B	1m Armoured Cable	COU	n/a	COU
*	00264	Koaxis	KP10-7.00M-TD	264	7m Armoured Cable	COU	n/a	COU
*	00275	TMS	LMR400	n/a	25m Cable	COU	n/a	COU
*	00276	TMS	LMR400	n/a	4m Cable	COU	n/a	COU
*	00277	TMS	LMR400	n/a	4m Cable	COU	n/a	COU
*	00278	TILE	34G3	n/a	TILE Test Software	NCR	n/a	NCR
Rented Equipment								

* Used during the course of this investigation
NCR: No Calibration Required
COU: Calibrate On Use

APPENDIX C – MEASUREMENT INSTRUMENT UNCERTAINTY

CISPR 16-4 Measurement Uncertainty (U_{LAB})	
This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence interval using a coverage factor of k=2	
30MHz - 200MHz	
U_{LAB} = 5.14dB U_{CISPR} = 6.3dB	
200MHz - 1000MHz	
U_{LAB} = 5.90dB U_{CISPR} = 6.3dB	
1GHz - 6GHz	
U_{LAB} = 4.80dB U_{CISPR} = 5.2dB	
6GHz - 18GHz	
U_{LAB} = 5.1dB U_{CISPR} = 5.5dB	
If the calculated uncertainty U_{lab} is **less** than U_{CISPR} then:	
1	Compliance is deemed to occur if **NO** measured disturbance exceeds the disturbance limit
2	Non-Compliance is deemed to occur if **ANY** measured disturbance **EXCEEDS** the disturbance limit
If the calculated uncertainty U_{lab} is **greater** than U_{CISPR} then:	
3	Compliance is deemed to occur if **NO** measured disturbance, increased by (U_{lab} - U_{CISPR}), exceeds the disturbance limit
4	Non-Compliance is deemed to occur if **ANY** measured disturbance, increased by (U_{lab} - U_{CISPR}), **EXCEEDS** the disturbance limit

