



Canada

# EMC & RF Test Report

As per

## RSS-247 Issue 2:2017 & FCC Part 15 Subpart 15.247:2017

Unlicensed Intentional Radiators

on the

### QSun UV Tracker

Issued by:

**TÜV SÜD Canada Inc.**  
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Testing produced for



**Comfable**

See Appendix A for full client &  
EUT details.



Testing Laboratory  
Certificate #2955.02



R-4023, G-506  
C-4498, T-1246



Registration #  
CA6844

Client	<b>Comfable Inc</b>	
Product	<b>QSun UV Tracker</b>	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

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## Report Scope

This report addresses the EMC verification testing and test results of the **Comfable Inc's** Model: **QSun UV Tracker**, and is herein referred to as EUT (Equipment Under Test). The EUT was tested for compliance against the following standards:

RSS-247 Issue 2:2017

FCC Part 15 Subpart C 15.247:2017

Test procedures, results, justifications, and engineering considerations, if any, follow later in this report.

This report does not imply product endorsement by any government, accreditation agency, or TÜV SÜD Canada Inc.

Opinions or interpretations expressed in this report, if any, are outside the scope of TÜV SÜD Canada Inc. accreditations. Any opinions expressed do not necessarily reflect the opinions of TÜV SÜD Canada Inc., unless otherwise stated.

Client	Comfable Inc	
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## Summary

The results contained in this report relate only to the item(s) tested.

EUT:	QSun UV Tracker
FCC Certification #, FCC ID:	2AQTO-CMFGQS2
Industry Canada Certification #, IC:	24185-CMFGQS2
EUT passed all tests performed	Yes
Tests conducted by	Min Xie

For testing dates, see "Testing Environmental Conditions and Dates".

Client	Comfable Inc	
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## Test Results Summary

Standard/Method	Description	Class/Limit	Result
FCC 15.203	Antenna Requirement	Unique	Pass See Justification
FCC 15.205 RSS-GEN (Table 6)	Restricted Bands for Intentional Operation	QuasiPeak Average	Pass
FCC 15.207 RSS-GEN (Table 3)	Power Line Conducted Emissions	QuasiPeak Average	Pass
FCC 15.209 RSS-GEN (Table 4)	Spurious Radiated Emissions	QuasiPeak Average	Pass
FCC 15.247(a)2 RSS-247 5.2(a)	6 dB Bandwidth	> 500 kHz	Pass
FCC 15.247(b)2 RSS-247 5.4(d)	Max Output Power	< 1 Watt	Pass
FCC 15.247(b)4 RSS-247 5.4(d)	Antenna Gain	< 6 dBi	Pass See Justifications
FCC 15.247(d) RSS-247 5.5	Antenna Conducted Spurious	< 20 dBc	Pass
FCC 15.247(e) RSS-247 5.2(b)	Spectral Density	< 8 dBm (3 kHz BW)	Pass
<b>Overall Result</b>			<b>Pass</b>

If the product as tested or otherwise complies with the specification, the EUT is deemed to comply with the requirement and is deemed a 'PASS' grade. If not 'FAIL' grade will be issued. Note that 'PASS' / 'FAIL' grade is independent of any measurement uncertainties. A 'PASS' / 'FAIL' grade within measurement uncertainty is marked with a '\*'.

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### **Notes, Justifications, or Deviations**

The following notes, justifications for tests not performed or deviations from the above listed specifications apply:

For the Antenna requirement specified in FCC 15.203 (RSS-247 section 5.4(d)), the unit uses a permanently connected ceramic chip antenna (0.5 dbi gain - Johanson 2450AT18B0100E) with less than 6 dBi gain.

For the Restricted Bands of operation, the EUT is designed to only operate between 2400 – 2483.5 MHz.

The EUT is not a hybrid system and FCC 15.247 (f) does not apply to it. However the 15.247 (e) requirement of power density were met and are detailed later in this test report.

The EUT was mounted in three orthogonal axis. Worst case results were obtained with the EUT in the X-axis. Worst case results are presented.

SAR assessment is applicable to the EUT. The separation distance between radiating structure of the EUT and human body is 6 mm. According to FCC KDB 447498 Section 4.3.1 5), an assessment distance of 6 mm is applied. The maximum conducted power of the EUT is 0.36 mW which is less than the SAR Test Exclusion Power Threshold for 6 mm given in FCC KDB 447498 Appendix A. Therefore the device meets the SAR Test Exclusion criteria and no test is required.

Power line conducted emissions was not applicable since the EUT is a battery operated device. The battery is a CR2032 Coin Cell Battery. All tests were performed with full battery.

For antenna conducted measurement, the antenna is replaced by a reversed polarity SMA connector.

The client does not have the ability to set the EUT to >98% duty cycle. As per ANSI C63.10 Section 11.6, sweep triggering/signal gating technique was employed during testing.

### **Sample Calculation(s)**

#### **Radiated Emission Test**

Margin = Limit – (Received Signal + Antenna Factor + Cable Loss – Pre-Amp Gain)

Margin = 50.5dBμV/m – (50dBμV + 10dB + 2.5dB – 20dB)

Margin = 8.0 dB (pass)

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## Applicable Standards, Specifications and Methods

ANSI C63.4:2014	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10:2013	American National Standard For Testing Unlicensed Wireless Devices
CFR 47 FCC 15 Subpart C:2017	Code of Federal Regulations – Radio Frequency Devices, Intentional Radiators
CISPR 32:2012	Electromagnetic Compatibility of Multimedia Equipment – Emission Requirements
FCC KDB 558074: 2017	FCC KDB 558074 Digital Transmission Systems, measurements and procedures
FCC KDB 447498: 2015	RF exposure procedures and equipment authorization policies for mobile and portable devices
ICES-003 Issue 6 2017	Digital Apparatus - Spectrum Management and Telecommunications Policy Interference-Causing Equipment Standard
RSS-GEN Issue 5 2018	General Requirements and Information for the Certification of Radio Apparatus
RSS-247 Issue 2:2017	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSS) and Licence-Exempt Local Area Network (LE-LAN) Devices
ISO 17025:2005	General Requirements for the Competence of Testing and Calibration Laboratories

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## Document Revision Status

Revision 000 - Aug 24, 2018  
Initial Release

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## Definitions and Acronyms

The following definitions and acronyms are applicable in this report.  
See also ANSI C63.14.

**DTS** – Digital Transmission System

**LISN** – Line Impedance Stabilization Network

**NCR** – No Calibration Required

**NSA** – Normalized Site Attenuation

**N/A** – Not Applicable

**RF** – Radio Frequency

**AE** – Auxiliary Equipment. A digital accessory that feeds data into or receives data from another device (host) that in turn, controls its operation.

**Antenna Port** – Port, other than a broadcast receiver tuner port, for connection of an antenna used for intentional transmission and/or reception of radiated RF energy.

**BW** – Bandwidth. Unless otherwise stated, this refers to the 6 dB bandwidth.

**EMC** – Electro-Magnetic Compatibility. The ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.

**EMI** – Electro-Magnetic Immunity. The ability to maintain a specified performance when the equipment is subjected to disturbance (unwanted) signals of specified levels.

**EUT** – Equipment Under Test. A device or system being evaluated for compliance that is representative of a product to be marketed.

**ITE** – Information Technology Equipment. Has a primary function of entry, storage, display, retrieval, transmission, processing, switching, or control of data and/or telecommunication messages and which may be equipped with one or more ports typically for information transfer.

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## Testing Facility

Testing for EMC on the EUT was carried out at TÜV SÜD Canada labs near Toronto, Ontario. The testing lab consists of a 3m semi-anechoic chamber calibrated to be able to allow measurements on a EUT that has a maximum width or length of up to 2m and a height of up to 3m. The chamber is equipped with a turntable that is capable of testing devices up to 3300lb in weight. This facility is capable of testing products that are rated for 120Vac and 240Vac single phase, or devices that are rated for a 208Vac 3 phase input. DC capability is also available for testing. The chamber is equipped with a mast that controls the polarization and height of the antenna. Control of the mast occurs in the control room adjoining the shielded chamber. Radiated emission measurements are performed using a BiLog antenna and a Horn antenna where applicable. Conducted emissions, unless otherwise stated, are performed using a LISN and using the Vertical Ground plane if applicable.

### Calibrations and Accreditations

The 3m semi-anechoic chamber is registered with Federal Communications Commission (FCC, CA6844), Industry Canada (IC, 6844A-3) and Voluntary Control Council for Interference (VCCI, R-4023, G-506, C-4498, and T-1246). This chamber was calibrated for Normalized Site Attenuation (NSA) using test procedures outlined in ANSI C63.4 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The chamber is lined with ferrite tiles and absorption cones to minimize any undesired reflections. The NSA data is kept on file at TÜV SÜD Canada. For radiated susceptibility testing, a 16 point field calibration has been performed on the chamber. The field uniformity data is kept on file at TÜV SÜD Canada. TÜV SÜD Canada Inc. is accredited to ISO 17025 by A2LA with Testing Certificate #2555.01. The laboratory's current scope of accreditation listing can be found as listed on the A2LA website. All measuring equipment is calibrated on an annual or bi-annual basis as listed for each respective test.

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### ***Testing Environmental Conditions and Dates***

Following environmental conditions were recorded in the facility during time of testing

Date	Test	Initials	Temperature (°C)	Humidity (%)	Pressure (kPa)
2018/08/03	Radiated Emissions	MX	23.7	56.7	101.1
2018/08/07	Antenna Conducted Emissions	MX	25.1	48.4	101.4

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## Detailed Test Results Section

Client	Comfable Inc	
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## 6dB Bandwidth of Digitally Modulated Systems

### Purpose

The purpose of this test is to ensure that the bandwidth occupied exceeds a stated minimum. This helps ensure the utilization of the frequency allocation is sufficiently wide. This also helps prevent corruption of data by ensuring adequate data separation to distinguish the reception of the intended information.

### Limits and Method

The limit is as specified in FCC Part 15.247(a)2 and RSS-247 5.2(a).

Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz. This should be measured with a 100 kHz RBW and a 300 kHz VBW.

The method is given in Section 8.1 of FCC KDB 558074 and ANSI C63.10.

### Results

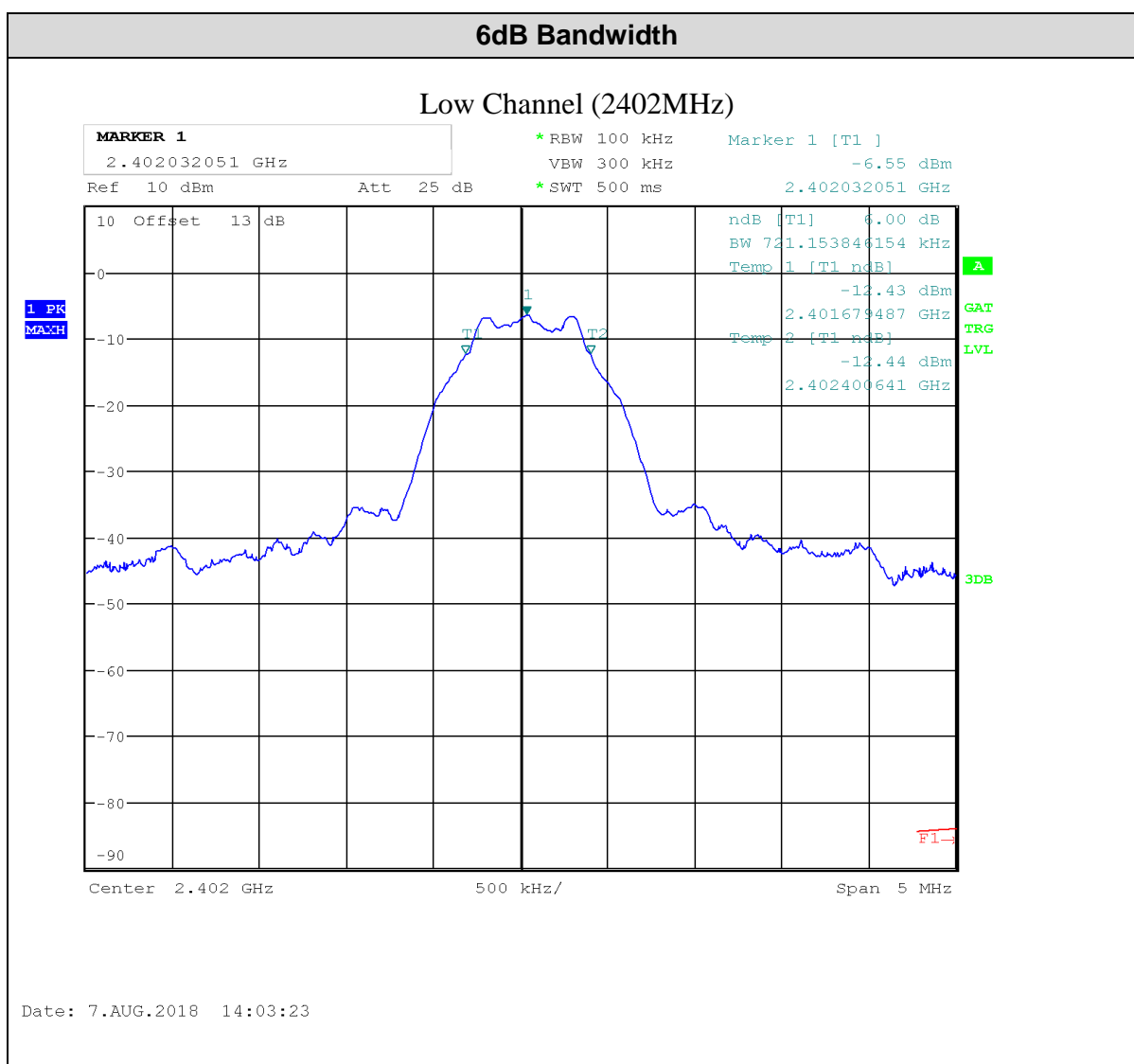
The EUT passed. The minimum 6 dB BW measured was 705 kHz and the maximum 99% Occupied Bandwidth at full power setting was 1080 kHz.


Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	0.721	1.08
Mid	2440	0.705	1.05
High	2480	0.713	1.05

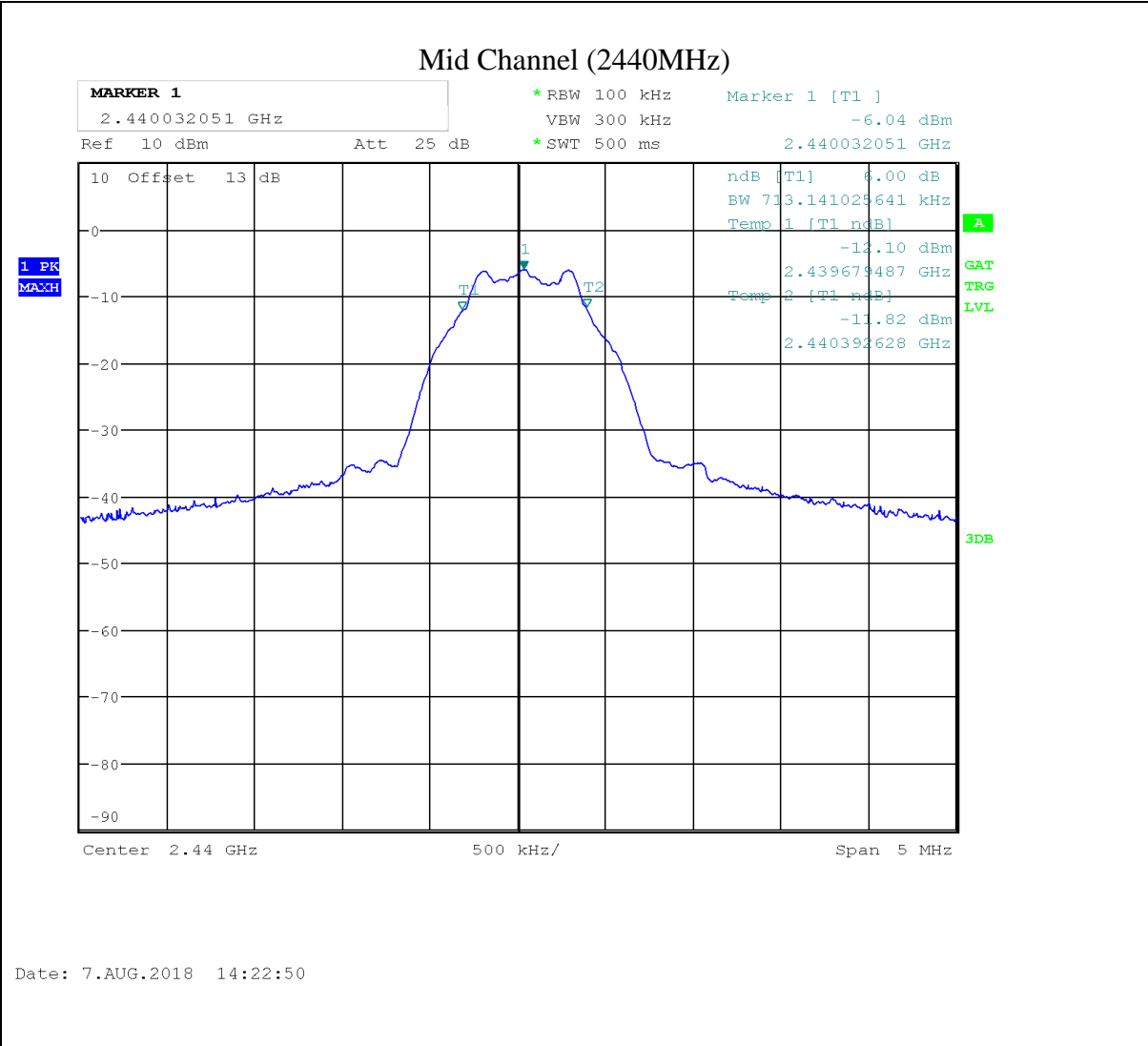
Client	Comfable Inc	 Canada
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

## Graphs

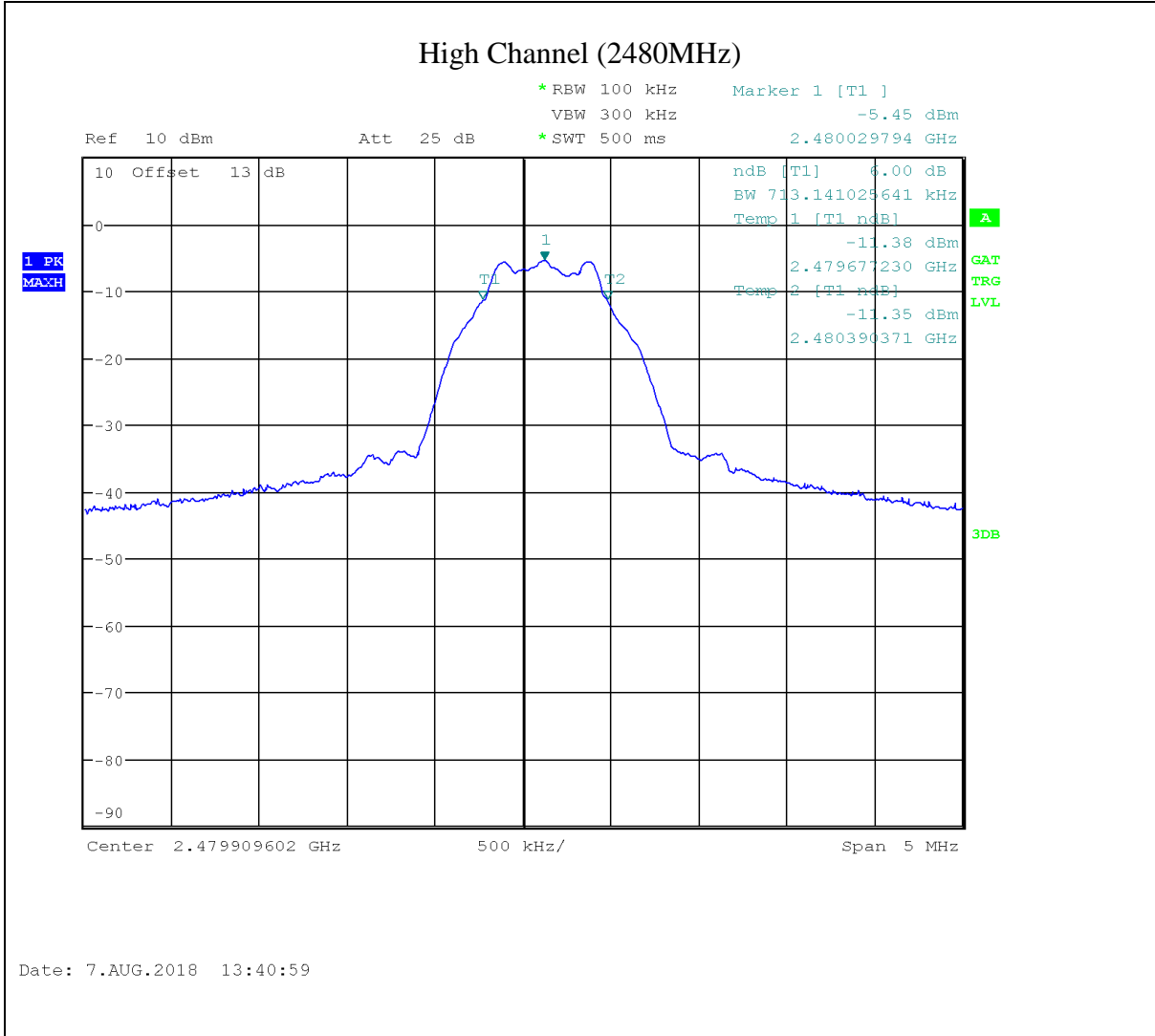
The graphs showed below show the OBW during the operation of the device. This is measured by a max hold on the spectrum analyzer and the highest resolution bandwidth that is sufficiently low to exhibit the 6 dB bandwidth of a channel during operation of the EUT. Max hold is performed for a duration of not less than 1 minute.




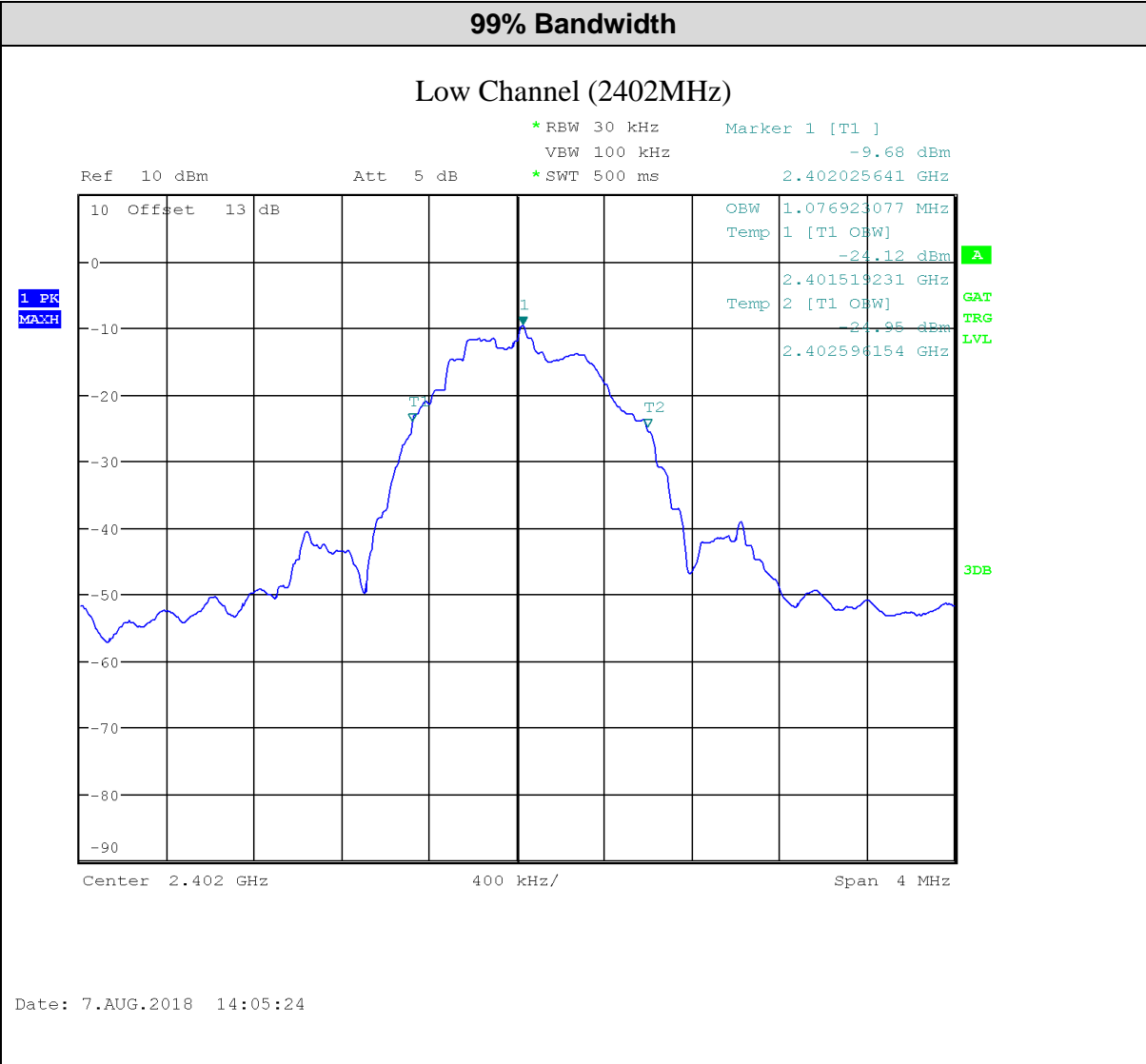
Client	Comfable Inc	 Canada
Product	QSun UV Tracker	
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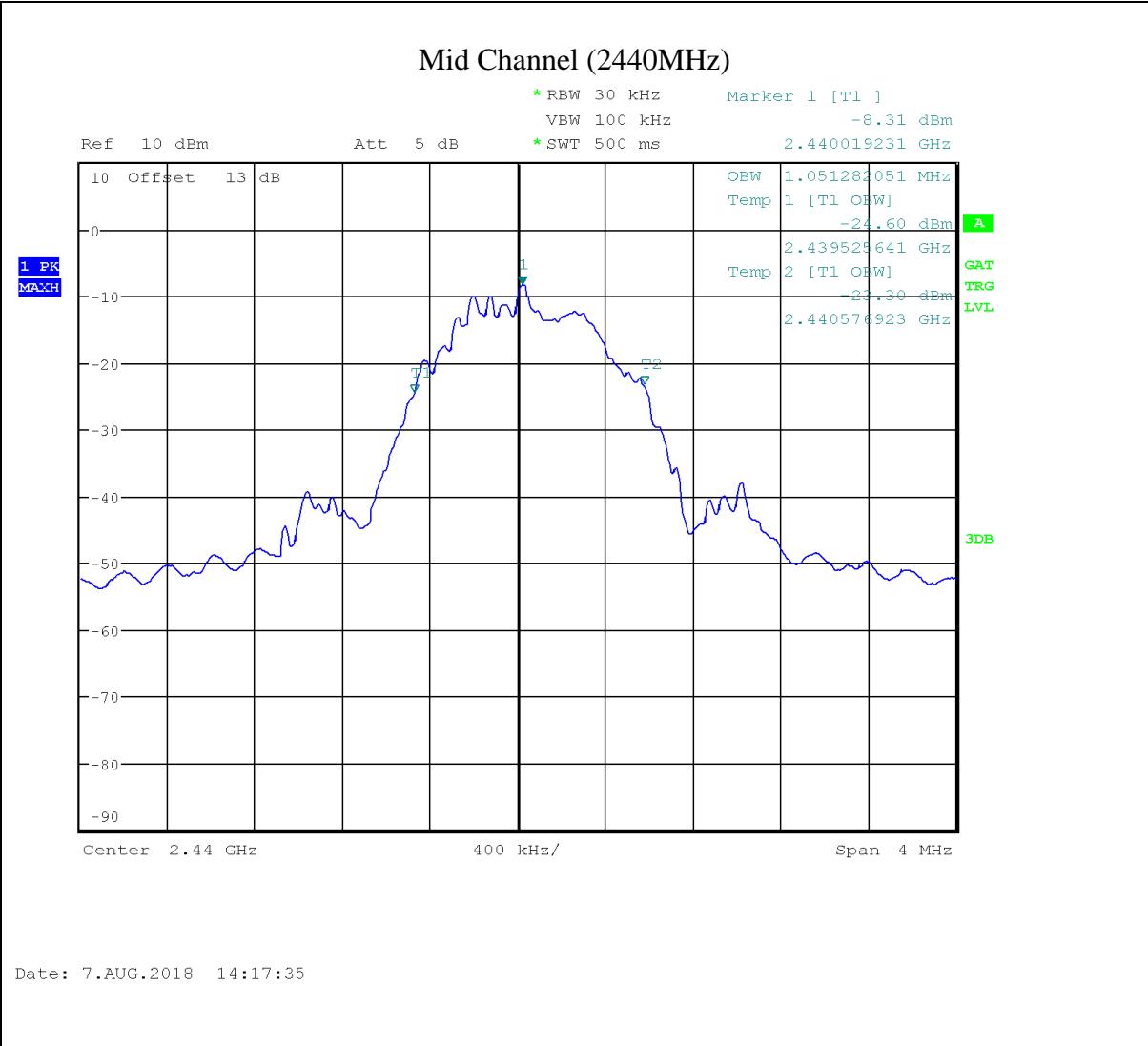
Client	Comfable Inc	 Canada
Product	QSun UV Tracker	
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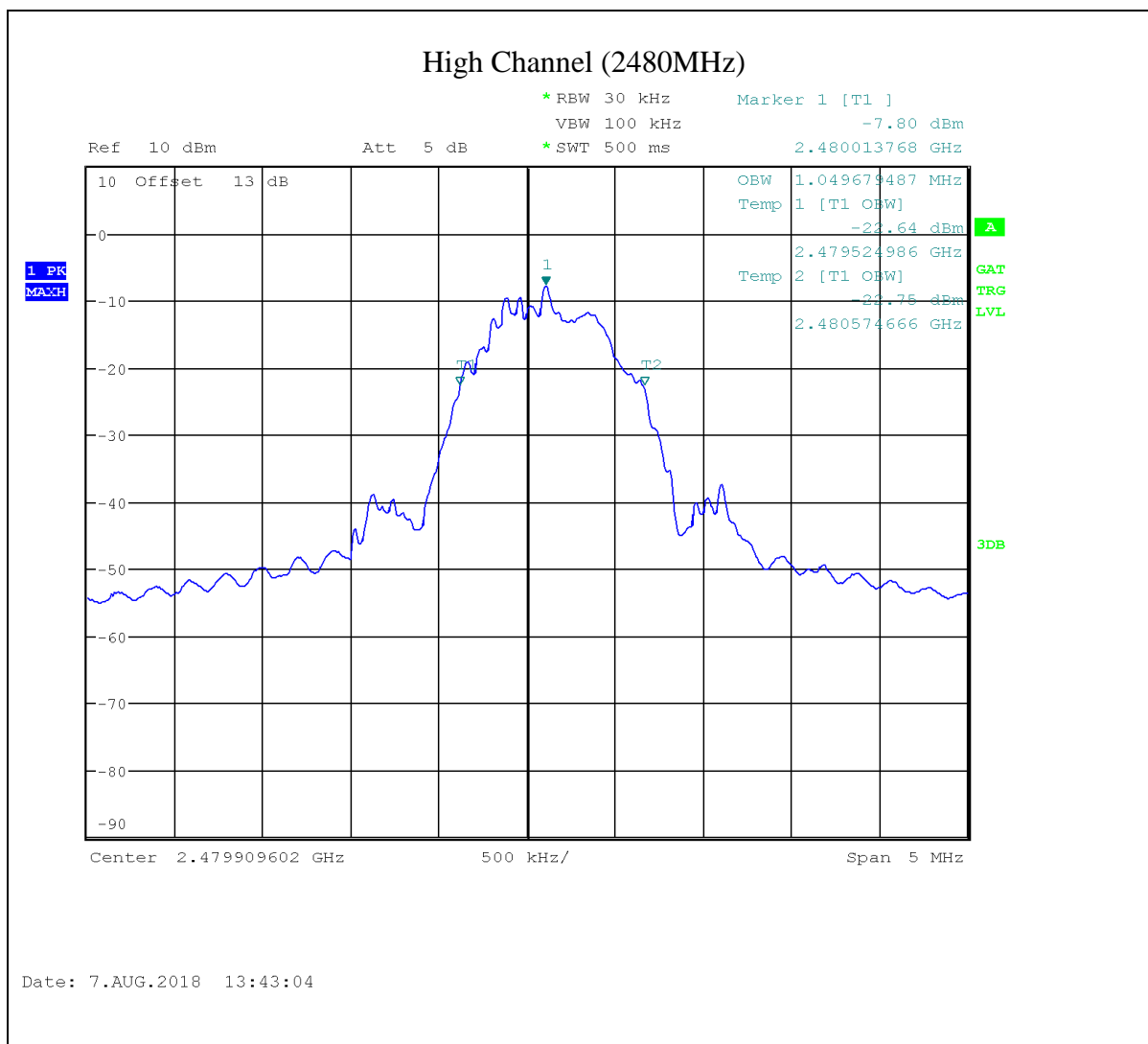
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Product	QSun UV Tracker	
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Client	Comfable Inc	 Canada
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Note: See 'Appendix B – EUT & Test Setup Photos' for photos showing the test set-up.

Client	Comfable Inc	 Canada
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

## Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Spectrum Analyzer	FSU 26	Rohde & Schwarz	Feb 15, 2017	Feb 15, 2019	GEMC 232
Attenuator 10 dB	612-10-1	Meca Electronics, Inc.	NCR	NCR	GEMC 223

Client	Comfable Inc	
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

## Maximum Peak Envelope Conducted Power

### Purpose

The purpose of this test is to ensure that the maximum power conducted to the radiating element does not exceed the limits specified. This ensures that if the end-user replaces the antenna, the maximum power does not exceed an amount which may create an excessive power level.

### Limits and Method

The limits are defined in FCC Part 15.247(b) and RSS-247.

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands, the peak limit is 1 watt (30 dBm).

The method is given in Section 9.1.2 of FCC KDB 558074 and ANSI C63.10.

### Results

The EUT passed. The EUT was set to transmit at maximum power. Three channels were measured. The following table shows the peak power:

Channel	Frequency (MHz)	Peak Power (dBm)	Peak Power (mW)
Low	2402	-5.54	0.28
Mid	2440	-4.97	0.32
High	2480	-4.42	0.36

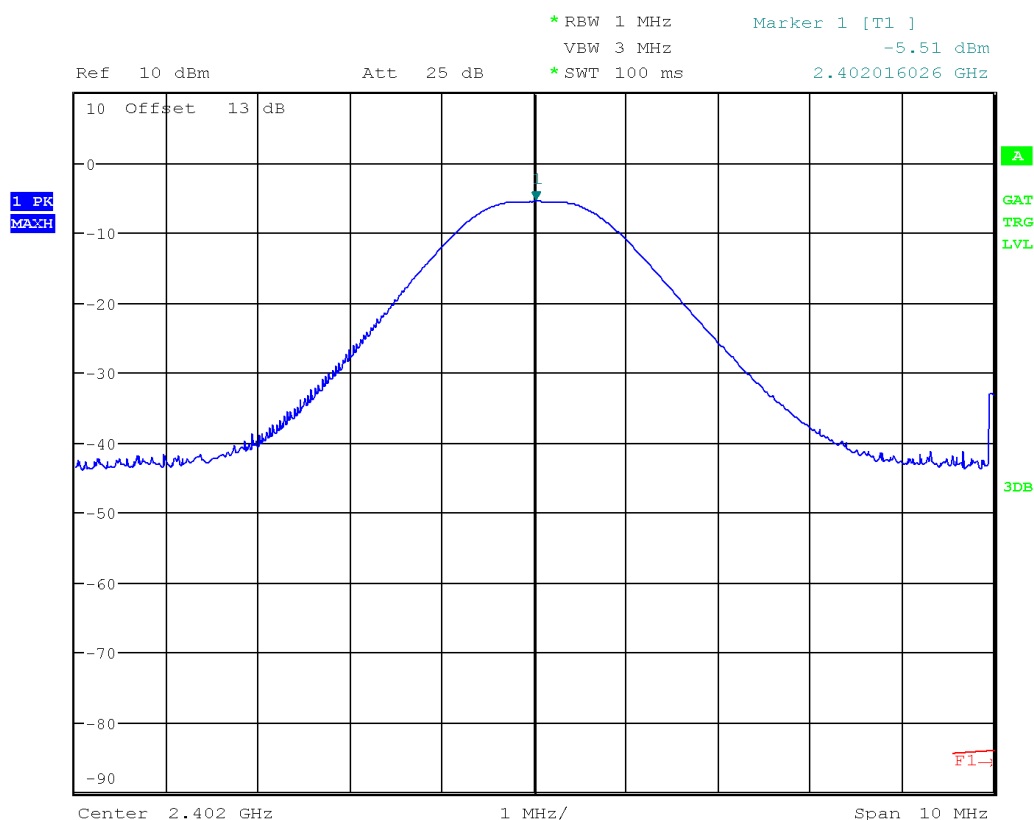
Note: The external attenuator and cable loss are accounted for as reference offset in the spectrum analyzer

### Graphs

The plots shown below show the peak power output of the device during the antenna conducted measurements during transmit operation of the EUT. The measurement RBW is  $\geq$  than the DTS bandwidth.

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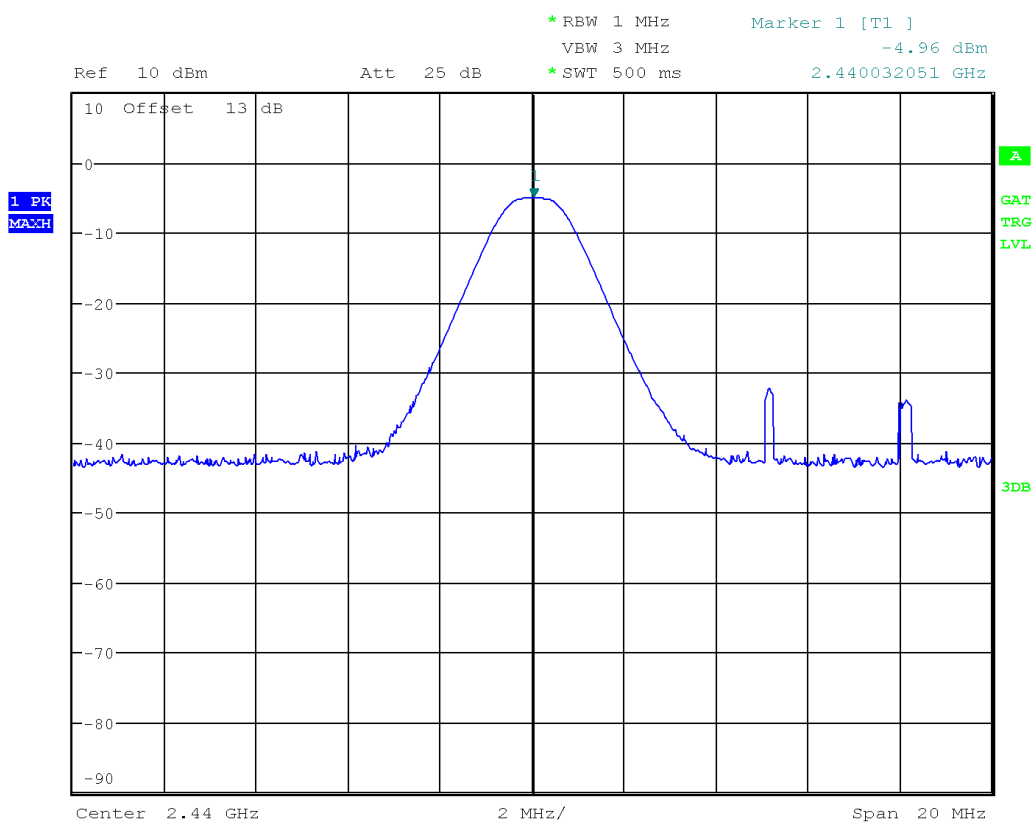
### Peak Power, Low Channel



Date: 7.AUG.2018 14:01:47

Client	Comfable Inc	 Canada
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

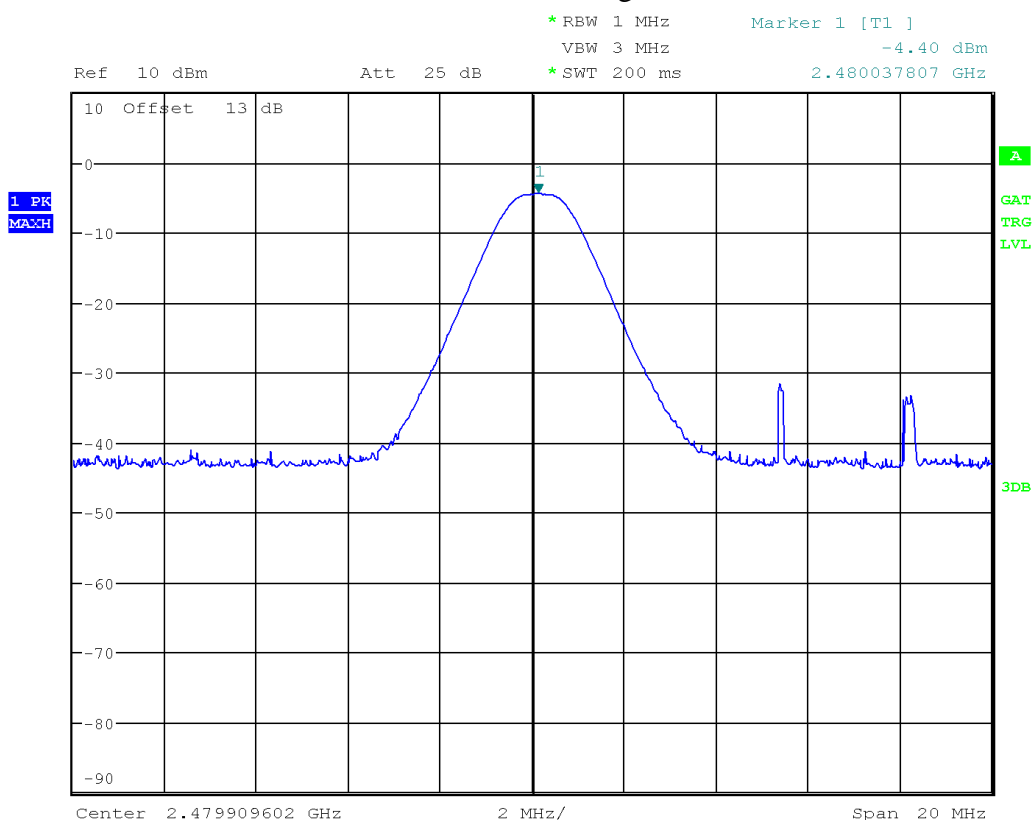
### Peak Power, Mid Channel



Date: 7.AUG.2018 14:21:42

Client	Comfable Inc	 Canada
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

### Peak Power, High Channel



Date: 7.AUG.2018 13:49:13

See 'Appendix B – EUT and Test Setup Photos' for photos showing the test set-up.

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## Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Spectrum Analyzer	FSU 26	Rohde & Schwarz	Feb 15, 2017	Feb 15, 2019	GEMC 232
Attenuator 10 dB	612-10-1	Meca Electronics, Inc.	NCR	NCR	GEMC 223

Client	Comfable Inc	
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

## ***Antenna Spurious Conducted Emissions (-20 dBc Requirement)***

### **Purpose**

The purpose of this test is to ensure that the maximum power conducted to the radiating element at frequencies outside of the authorized spectrum does not exceed the limits specified. This ensures that the only the intended signal is delivered to the radiating element.

### **Limits and Method**

The limits are defined in 15.247(d). In any 100 kHz band, the peak spurious harmonics emissions must be at least 20 dB below the fundamental. Spurious Conducted emissions are to be evaluated up to the 10<sup>th</sup> harmonic. This -20 dBc requirement also applies at the 'band edge' or 2.4 GHz and 2.4835 GHz.

The method is given in Section 11 of FCC KDB 558074 and ANSI C63.10

### **Results**

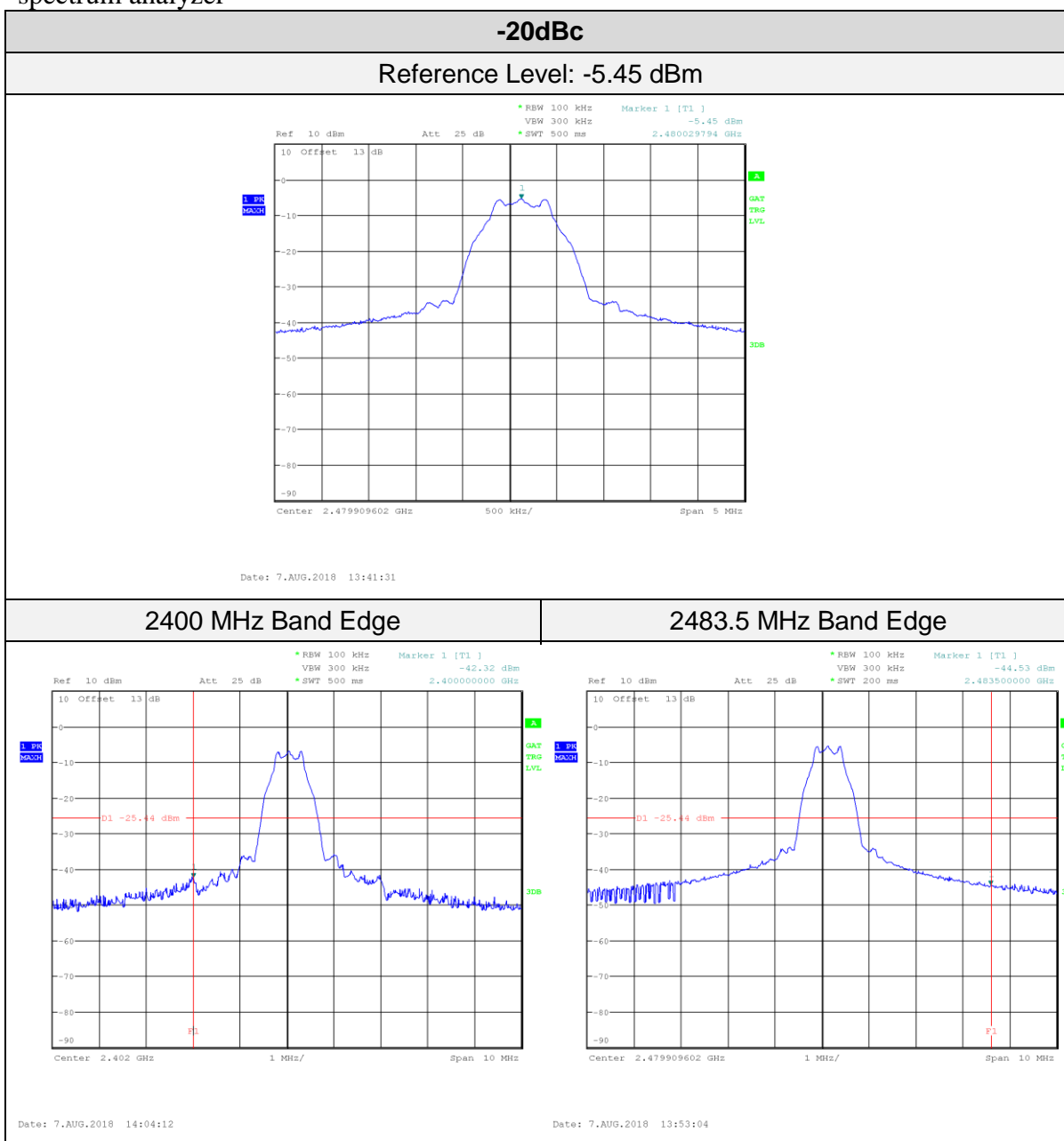
The EUT passed. Low, middle and high bands were measured. The worst case is presented as a graph for the spectrum. The -20 dBc requirement is shown for the lower band edge at 2.4 GHz in the low band and also for the higher band edge at 2.4835 GHz in the high band.

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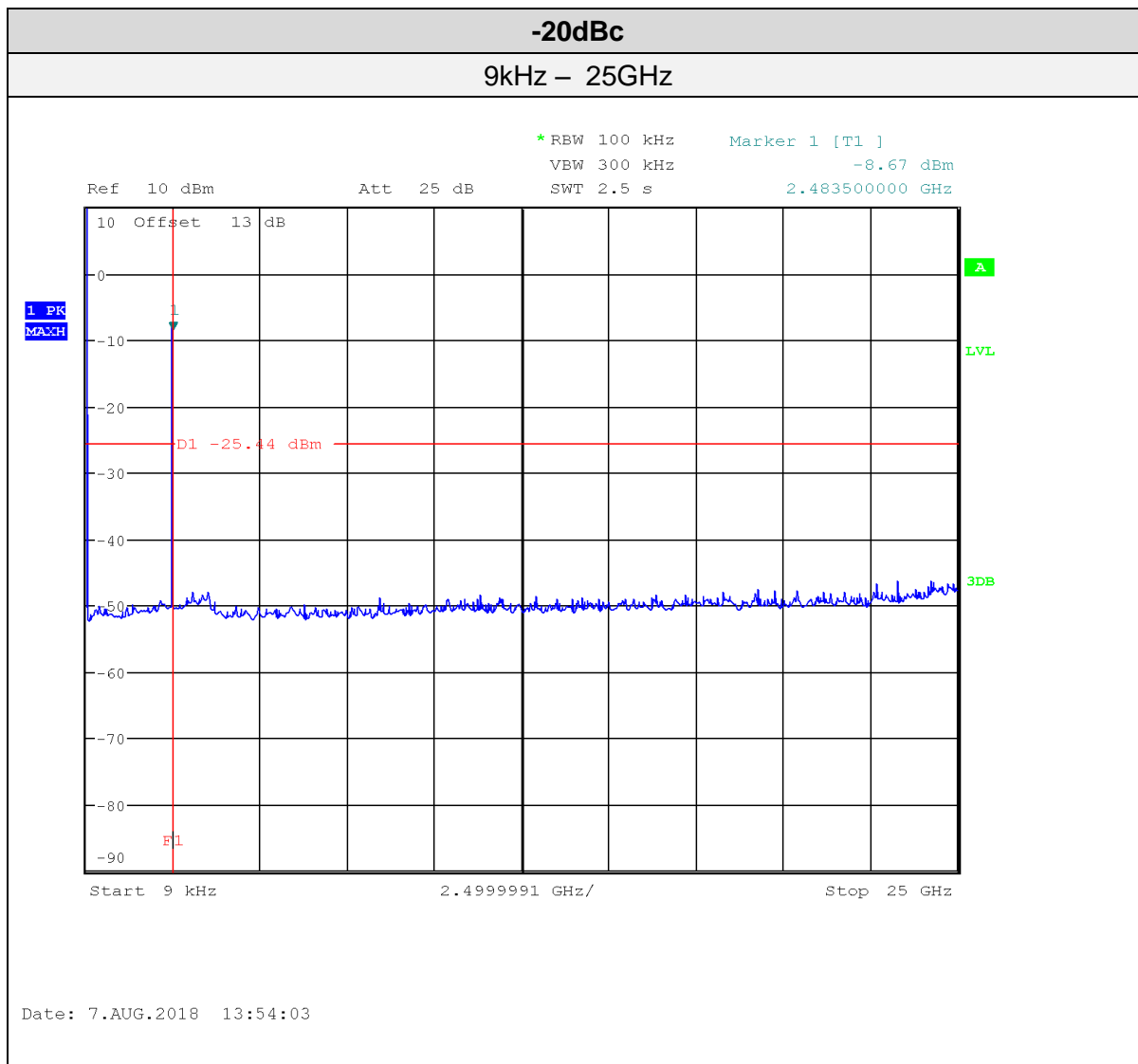
## Graphs

The graphs shown below show the peak power output of the device during the antenna conducted measurement during transmit operation of the EUT.

Note: The external attenuator and cable loss are accounted for as reference offset in the spectrum analyzer



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See 'Appendix B – EUT and Test Setup Photos' for photos showing the test set-up.

## Test Equipment List

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Attenuator 10 dB	612-10-1	Meca Electronics, Inc.	NCR	NCR	GEMC 223

Client	Comfable Inc	
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

## ***Transmitter Spurious Radiated Emissions***

### **Purpose**

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT does not exceed the limits listed below as defined in the applicable test standard, as measured from a receiving antenna. This helps protect broadcast radio services such as television, FM radio, pagers, cellular telephones, emergency services, and so on, from unwanted interference.

### **Limits and Method**

The method is as defined in Section 12.2 of FCC KDB 558074 and ANSI C63.10.

The limits, as defined in 15.247(d) for unintentional radiated emissions, apply for those emissions that fall in the restricted bands, as defined in Section 15.205(a). These emissions must comply with the radiated emission limits specified in Section 15.209(a).

All unintentional emissions must also meet the ‘Spurious Conducted Emissions’ requirements of -20 dBc or greater. See also ‘Antenna Spurious Conducted Emissions (-20dBc)’ for further details.

Frequency	Limit
0.009 MHz – 0.490 MHz	2400/F(kHz) uV/m at 300m <sup>1</sup>
0.490 MHz – 1.705 MHz	24000/F(kHz) uV/m at 30m <sup>1</sup>
1.705 MHz – 30 MHz	30 uV/m at 30m <sup>1</sup>
30 MHz – 88 MHz	100 uV/m (40.0 dBuV/m <sup>1</sup> ) at 3m
88 MHz – 216 MHz	150 uV/m (43.5 dBuV/m <sup>1</sup> ) at 3m
216 MHz – 960 MHz	200 uV/m (46.0 dBuV/m <sup>1</sup> ) at 3m
Above 960 MHz	500 uV/m (54.0 dBuV/m <sup>1</sup> ) at 3m
Above 1000 MHz	500 uV/m (54 dBuV/m <sup>2</sup> ) at 3m
Above 1000 MHz	500 uV/m (74 dBuV/m <sup>3</sup> ) at 3m

<sup>1</sup>Limit is with Quasi Peak detector with bandwidths as defined in CISPR-16-1-1

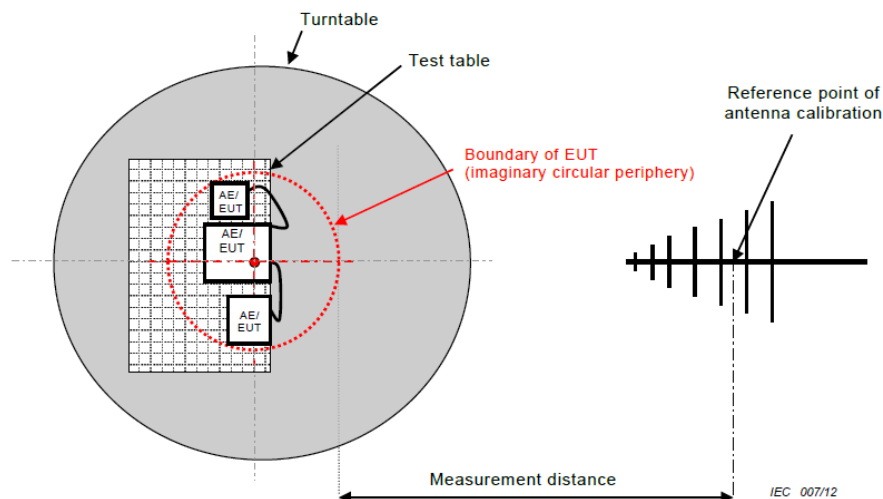
<sup>2</sup>Limit is with 1 MHz measurement bandwidth and using an Average detector

<sup>3</sup>Limit is with 1 MHz measurement bandwidth and using a Peak detector

Based on ANSI C63.4 Section 4.2, if the Peak detector measurements do not exceed the Quasi-Peak limits, where defined, then the EUT is deemed to have passed the requirements.

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### Typical Radiated Emissions Setup



### Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is  $\pm 4.25\text{dB}$  for 30MHz – 1GHz and  $\pm 4.93\text{dB}$  for 1GHz – 18GHz with a 'k=2' coverage factor and a 95% confidence level.

### Preliminary Graphs

The graphs shown below are maximized peak measurement graphs measured with a resolution bandwidth greater than or equal to the final required detector over a full 0-360°. This peaking process is done as a worst case measurement and enables the detection of frequencies of concern for final measurement. For final measurements with the appropriate detector, where applicable, please refer to the tables under Final Measurements.

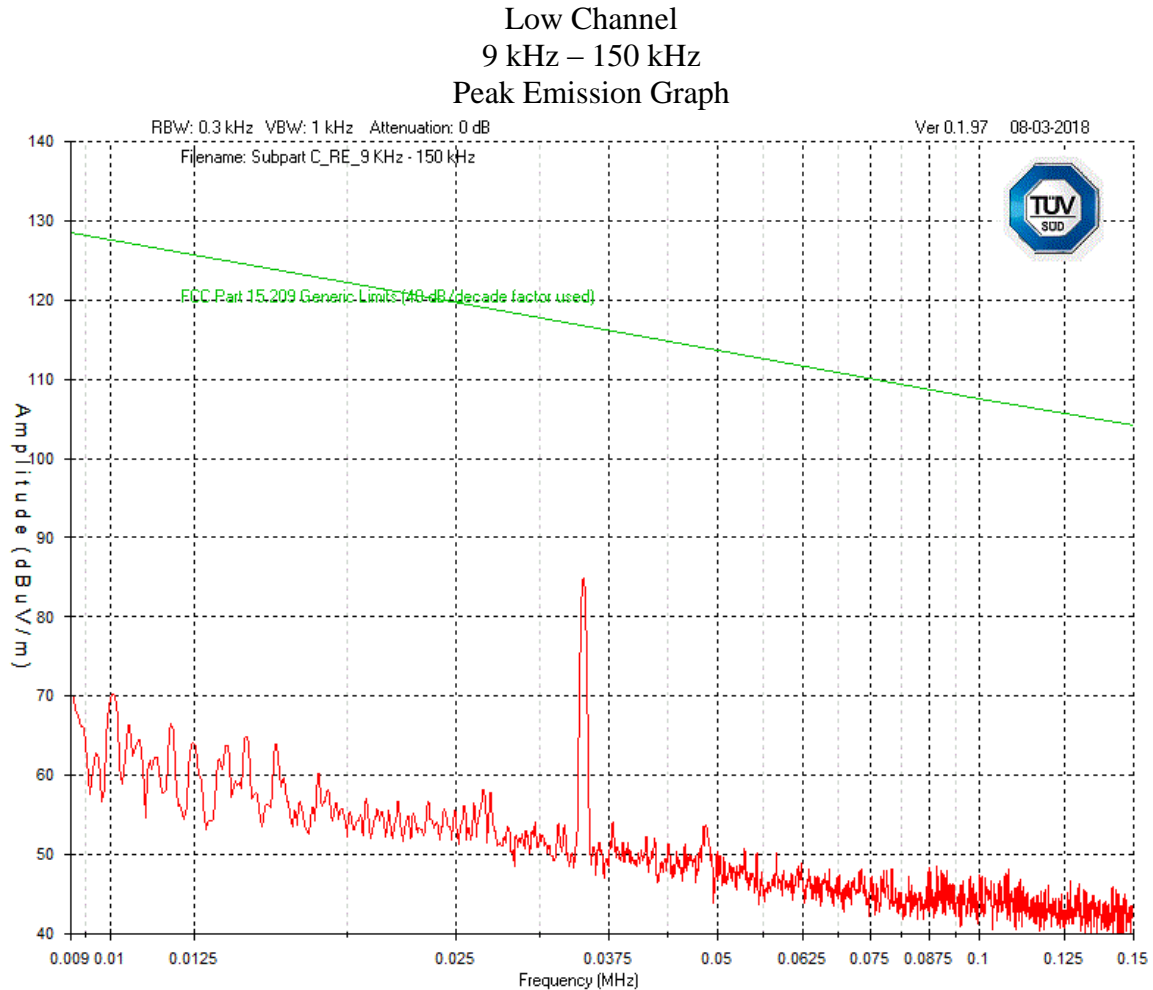
In accordance with FCC Part 15, Subpart A, Section 15.33, the device was scanned to the 10<sup>th</sup> harmonic (a minimum of 24.835 GHz).


Devices scanned may be scanned at alternate test distances and in accordance with FCC Part 15, Subpart A, Section 15.31, an extrapolation factor of 20 dB/decade was used above 30 MHz and 40 dB/decade below 30 MHz. For example for 1 meter measurements, an extrapolation factor 9.5 dB from 20 Log (1m / 3m) is applied.

Low, middle and high channels, each in three orthogonal axis were checked. However, the worst case graphs are presented.

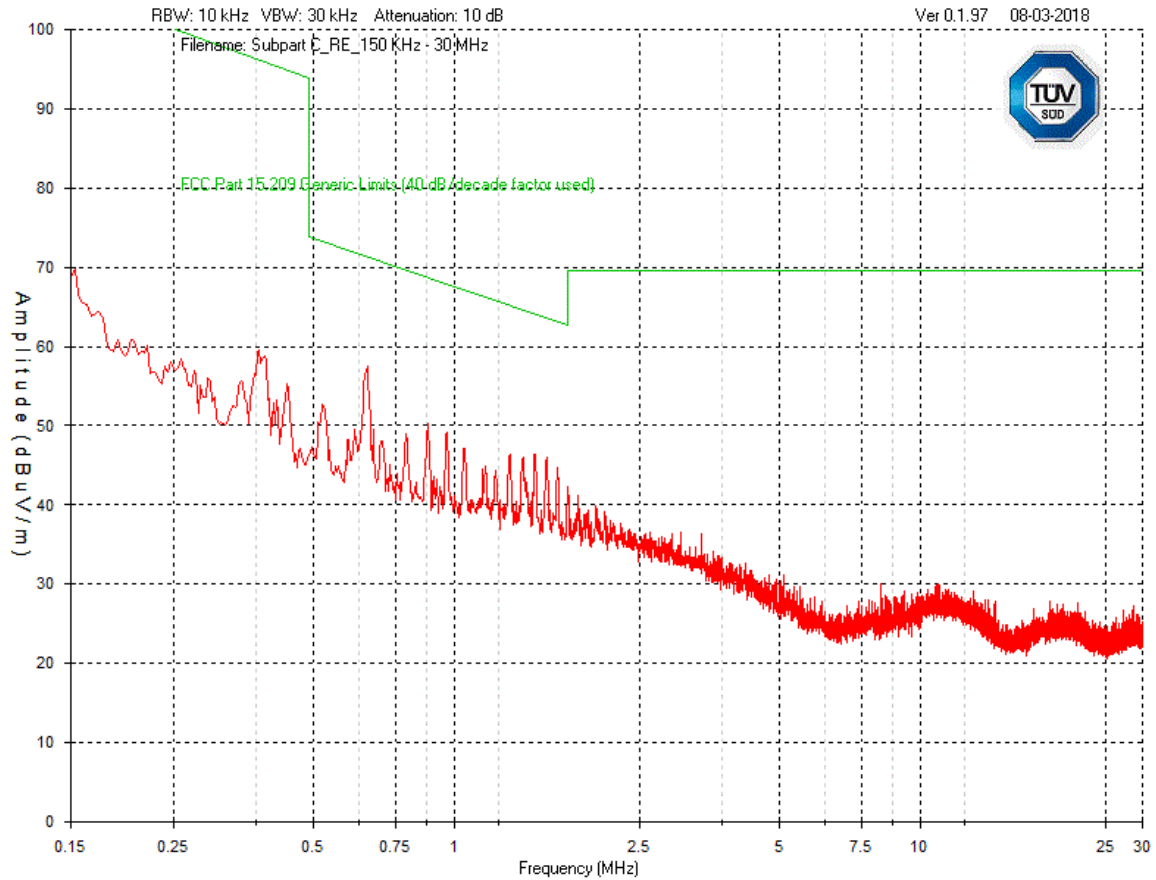
Client	Comfable Inc	
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Band-edge measurement graphs are shown for illustration purposes. See final measurement section for all measurements.



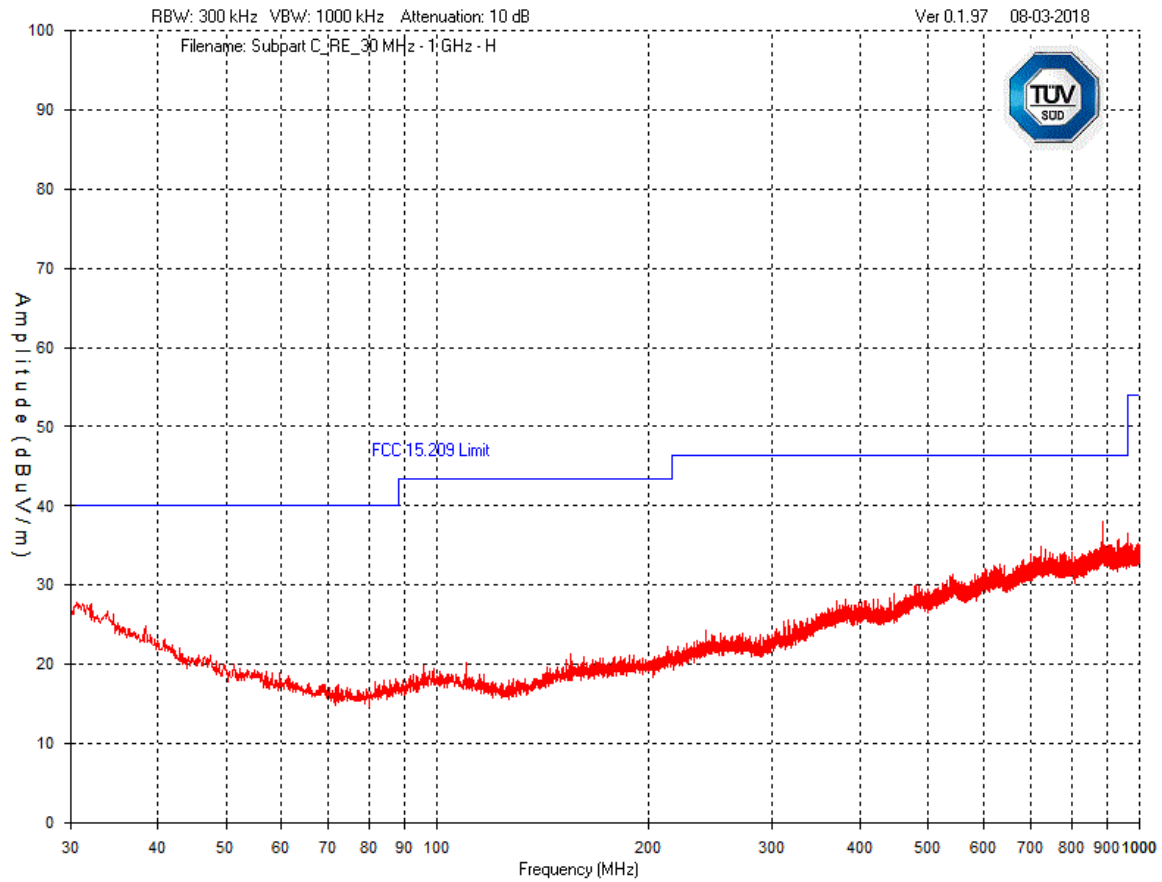
Client	Comfable Inc	
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Low Channel  
150 kHz – 30 MHz  
Peak Emission Graph



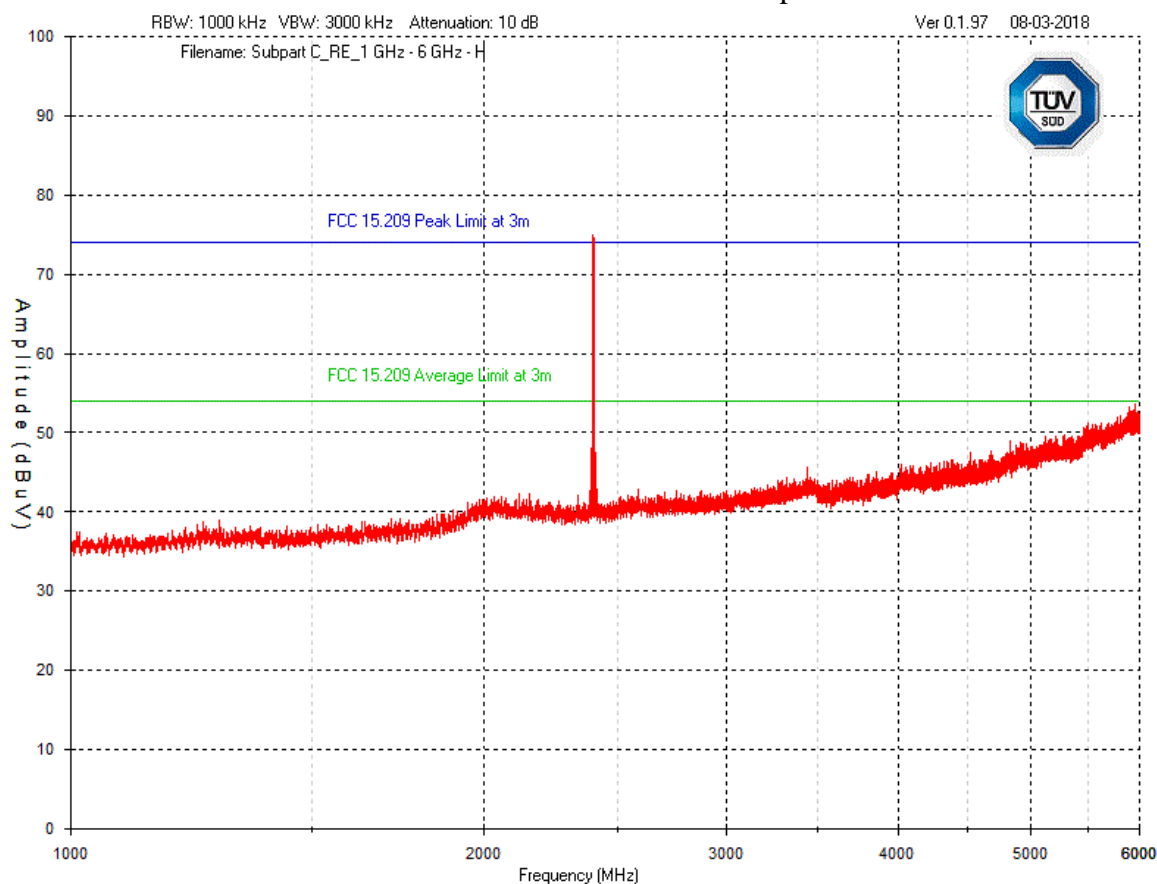
Client	Comfable Inc	
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

Low Channel – 30 MHz – 1 GHz  
Horizontal - Peak Emission Graph



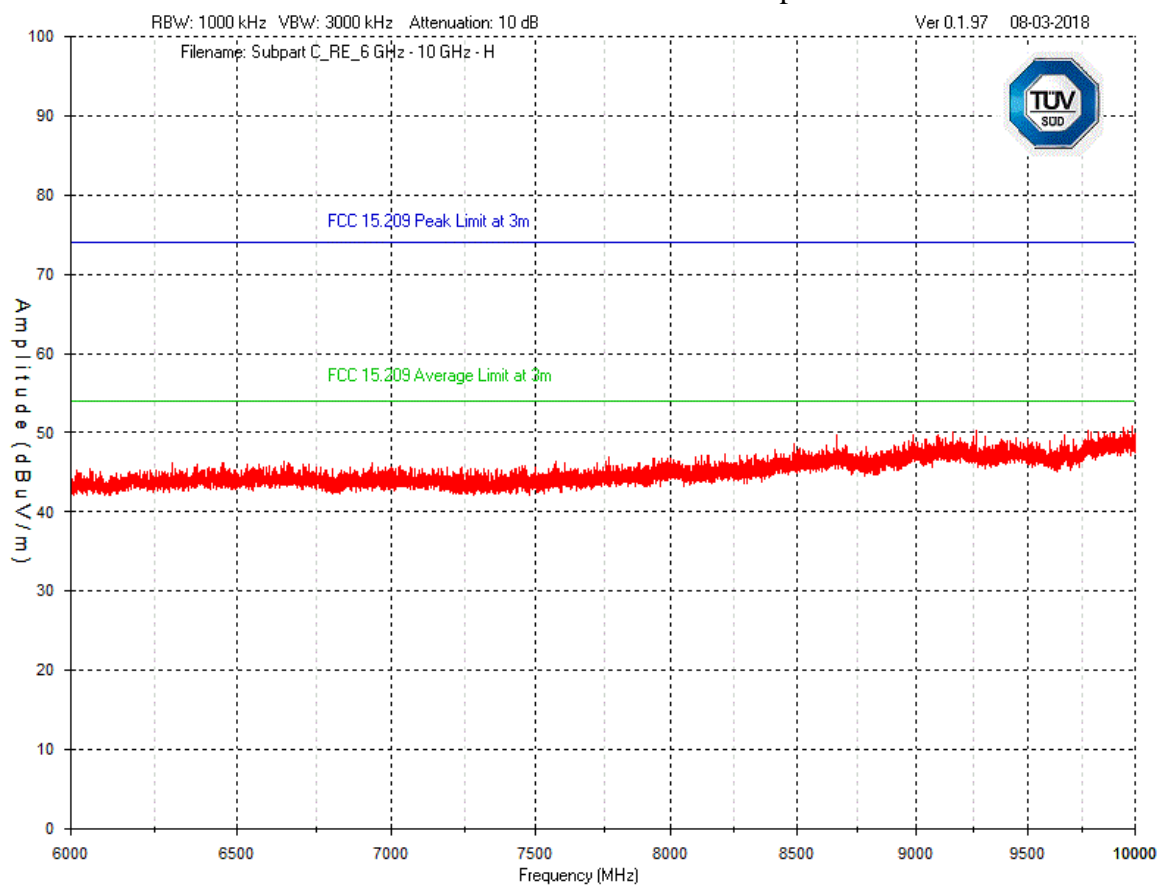
Client	Comfable Inc	
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

### Low Channel – 1 GHz – 6 GHz Horizontal - Peak Emission Graph

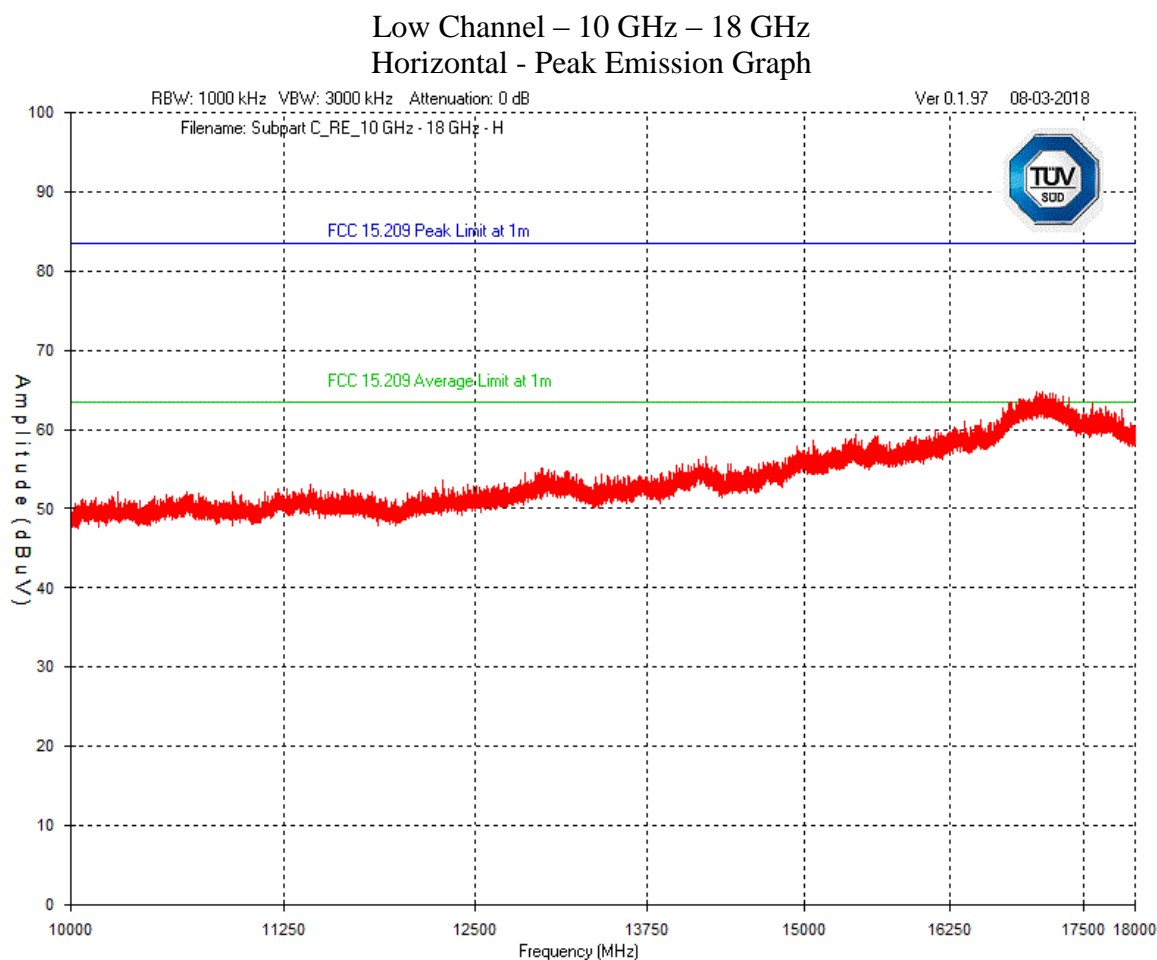


Client	Comfable Inc	
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

### Low Channel – 6 GHz – 10 GHz Horizontal - Peak Emission Graph



Client	Comfable Inc	
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

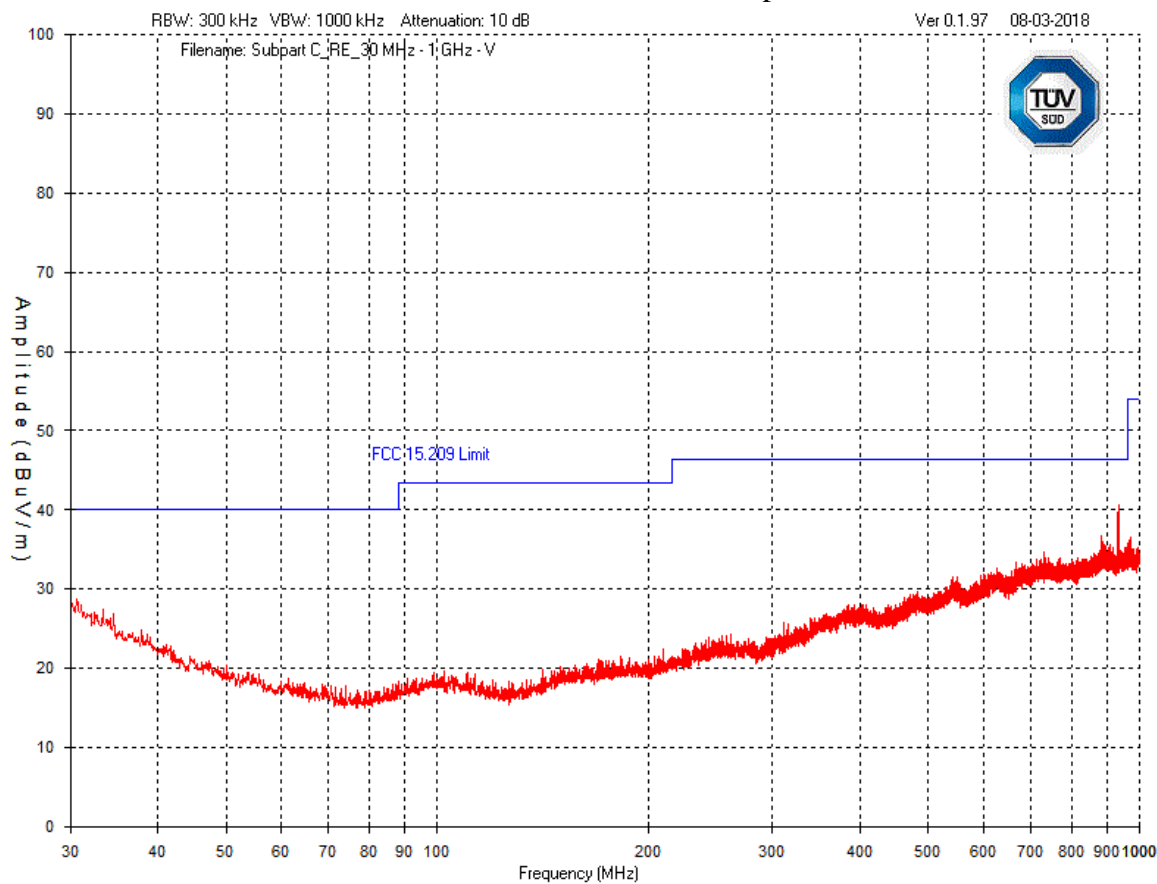


Plot was taken at a 1 meter distance. All emissions were noise floor of measurement instrument. No emissions were found in this frequency range.

Frequency range was scanned to 25 GHz, with no emissions detected above 18 GHz.

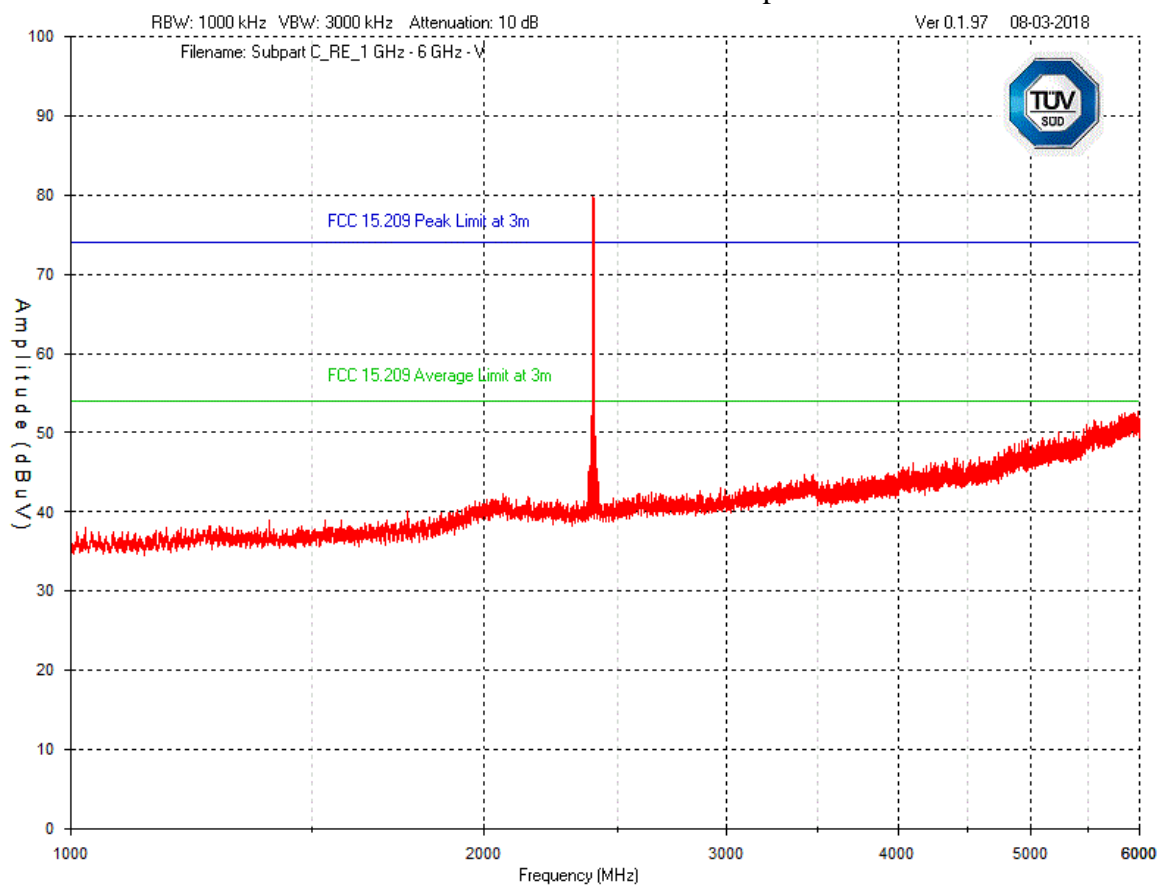
Client	Comfable Inc	
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

Low Channel – 30 MHz – 1 GHz  
Vertical - Peak Emission Graph



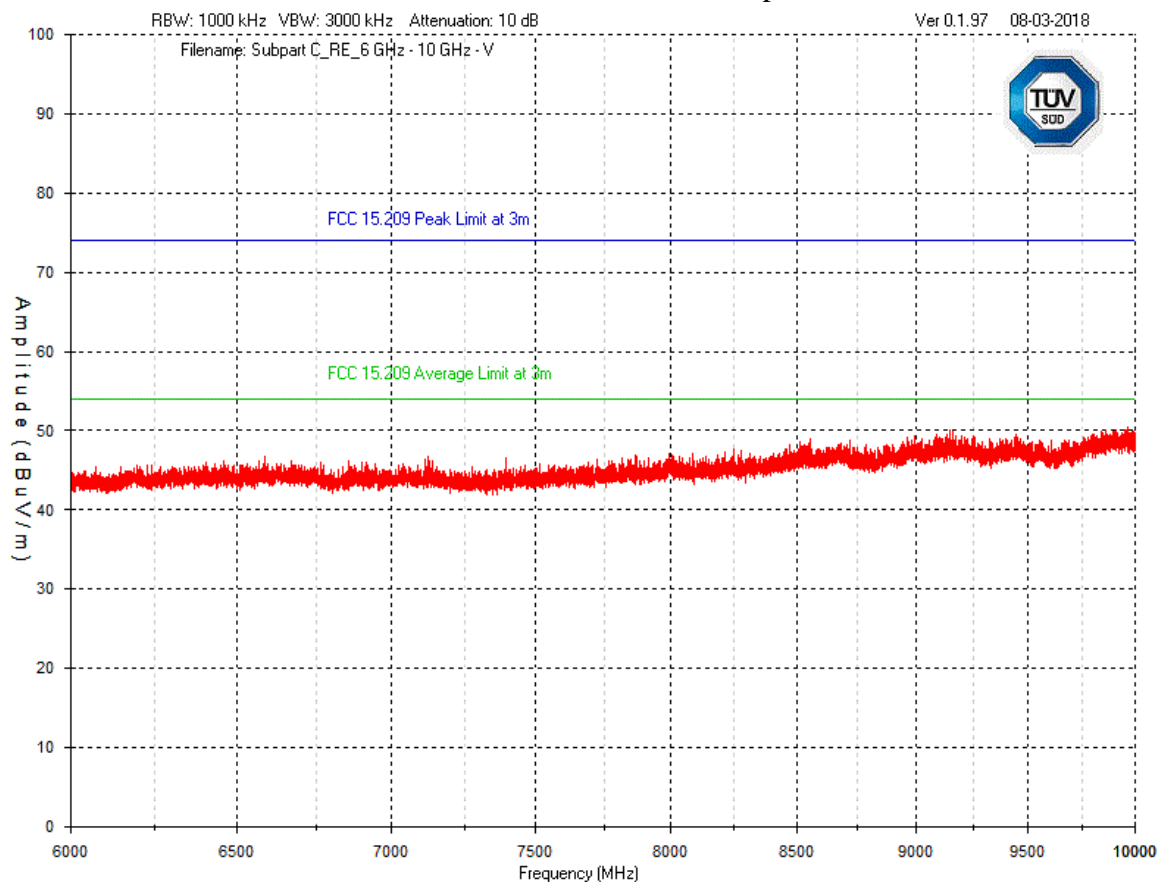
Client	Comfable Inc	
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

Low Channel – 1 GHz – 6 GHz  
Vertical - Peak Emission Graph



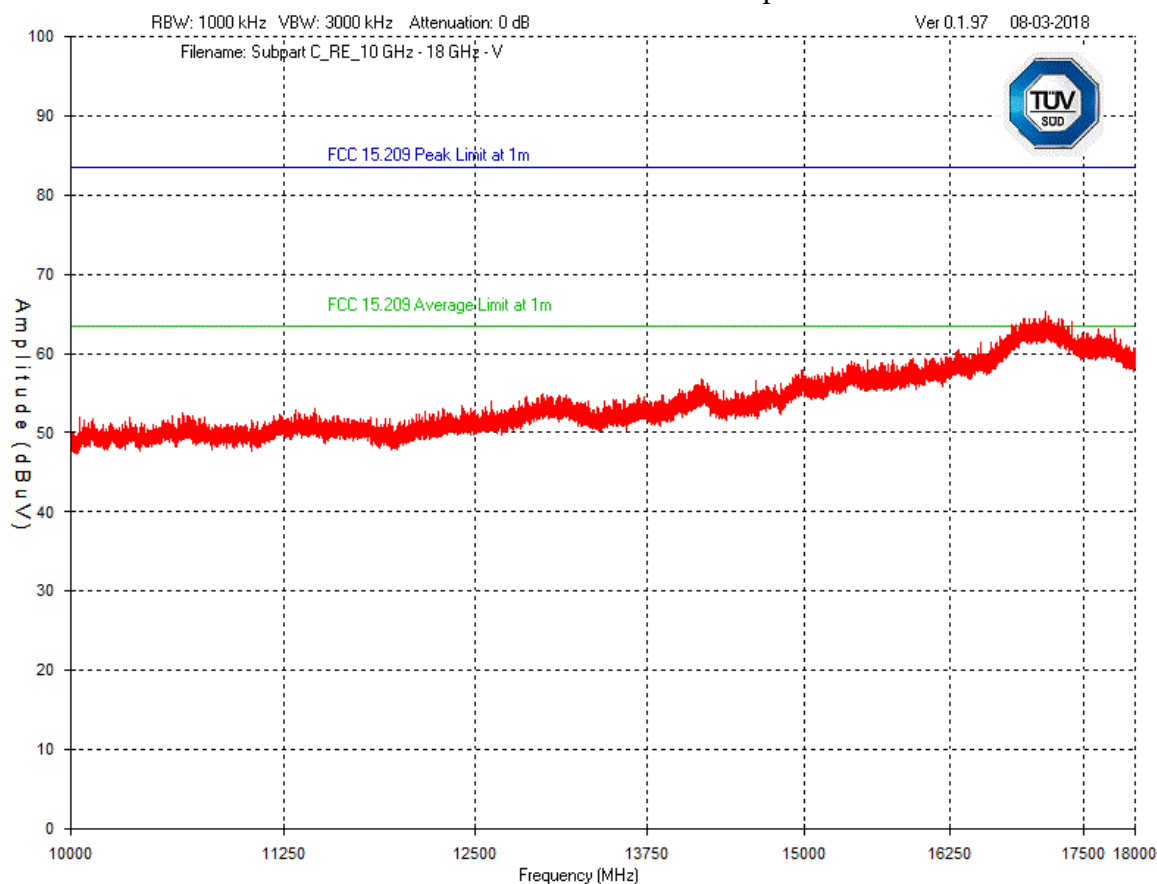
Client	Comfable Inc	
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

Low Channel – 6 GHz – 10 GHz  
Vertical - Peak Emission Graph



Client	Comfable Inc	
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

Low Channel – 10 GHz – 18 GHz  
Vertical - Peak Emission Graph

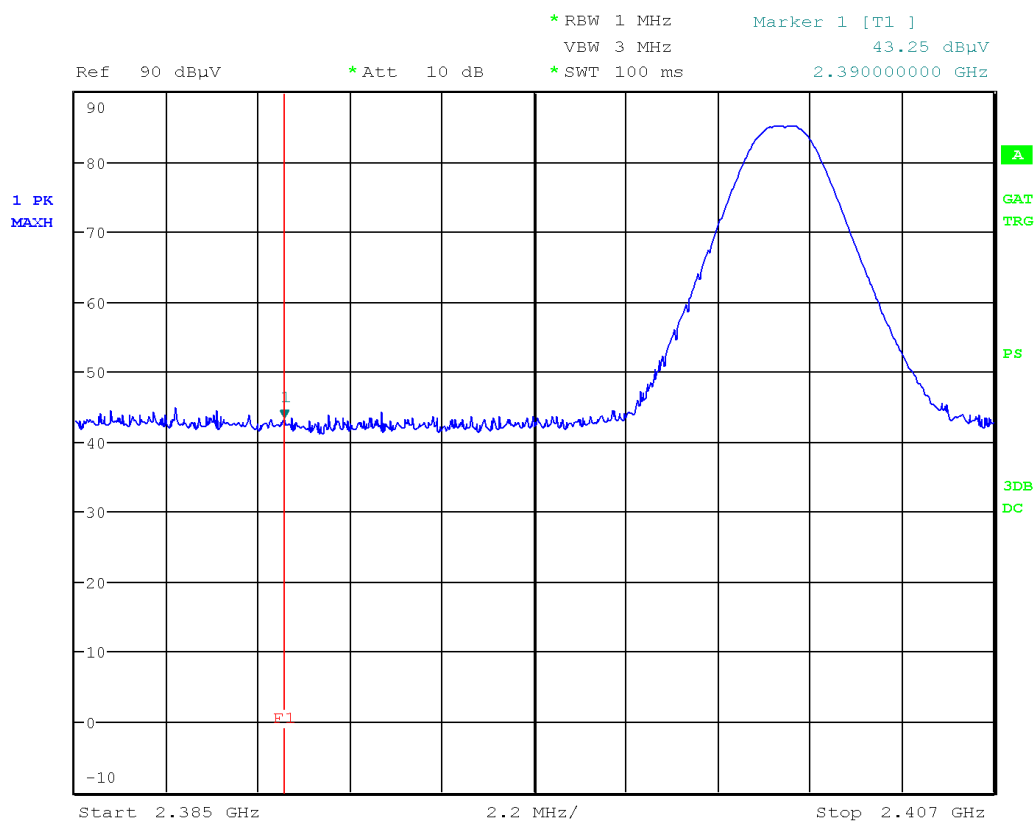


Plot was taken at a 1 meter distance. All emissions were noise floor of measurement instrument. No emissions were found in this frequency range.

Frequency range was scanned to 25 GHz, with no emissions detected above 18 GHz.

Client	Comfable Inc	 Canada
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

### Band Edge – Low Channel Horizontal - Peak Emission

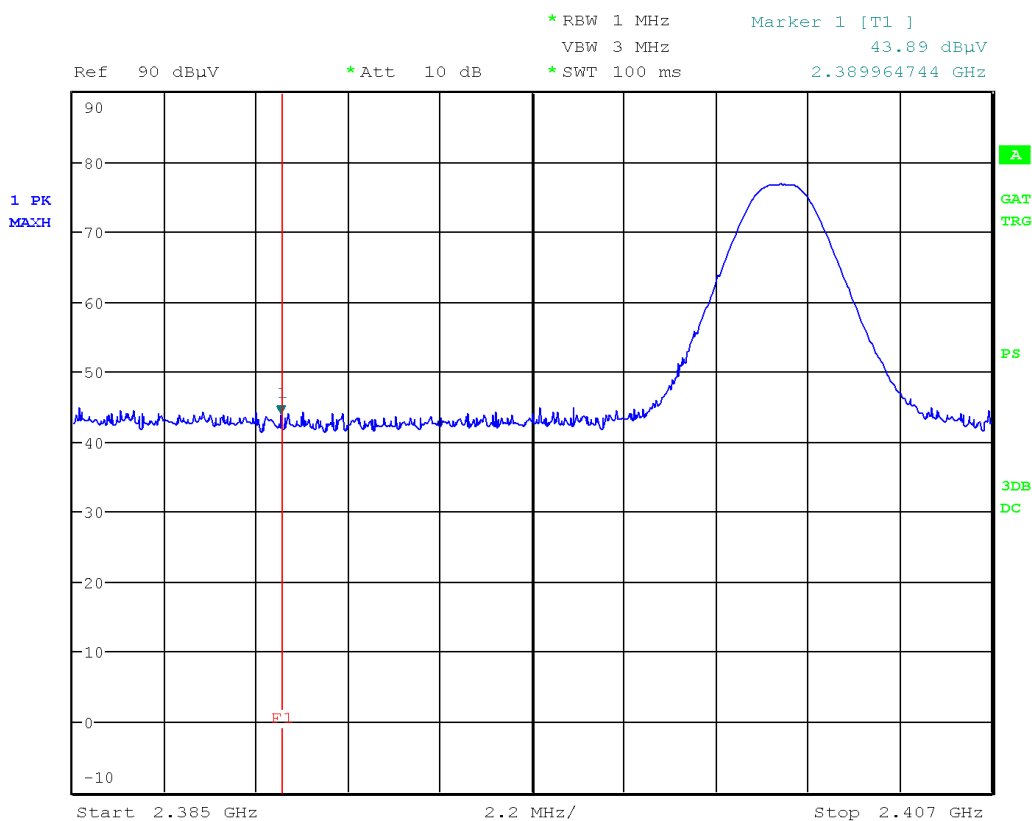


Date: 3.AUG.2018 17:47:39

Note: Restricted band Band Edge plot was taken at a 3m measurement distance. The marker shows the raw value. See the Final Measurements and Results section below for correct values.

Client	Comfable Inc	 Canada
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

### Band Edge – Low Channel Vertical - Peak Emission



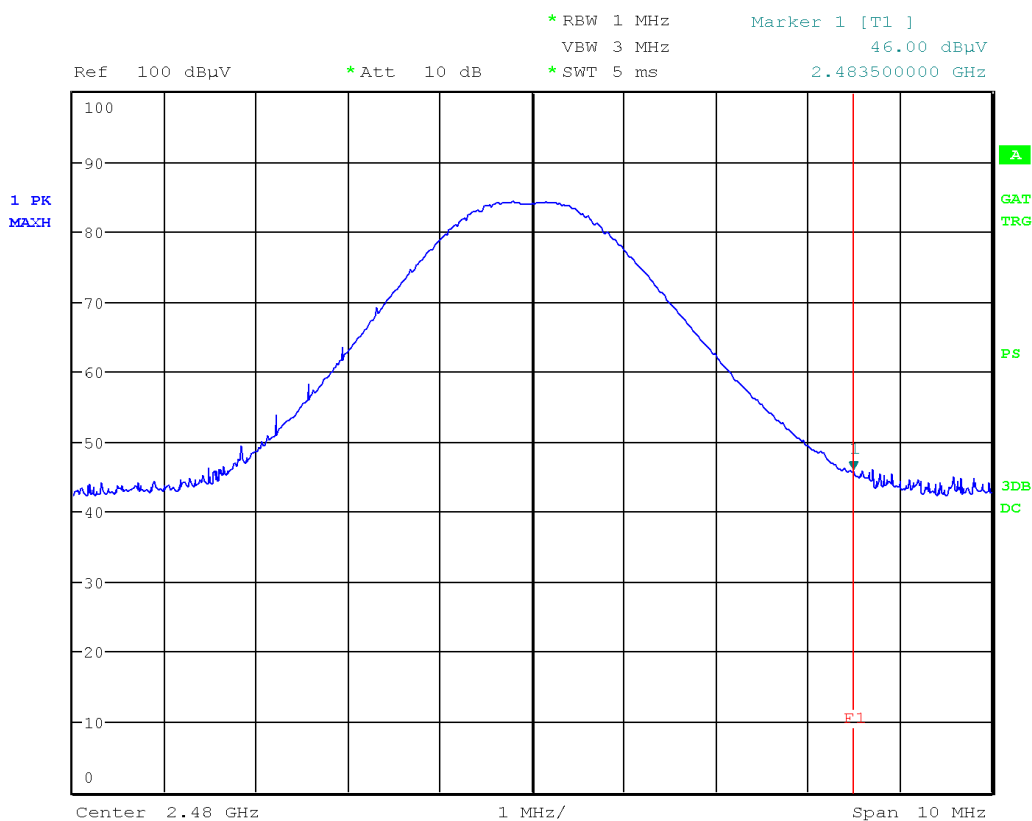
Date: 3.AUG.2018 17:43:35

Note: Restricted band Band Edge plot was taken at a 3m measurement distance. The marker shows the raw value. See the Final Measurements and Results section below for correct values.

Peak emissions were lower than Average limit; thus, Average requirements were met with peak emission and no Average measurement is required.

Client	Comfable Inc	 Canada
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

### Band Edge – High Channel Horizontal - Peak Emission

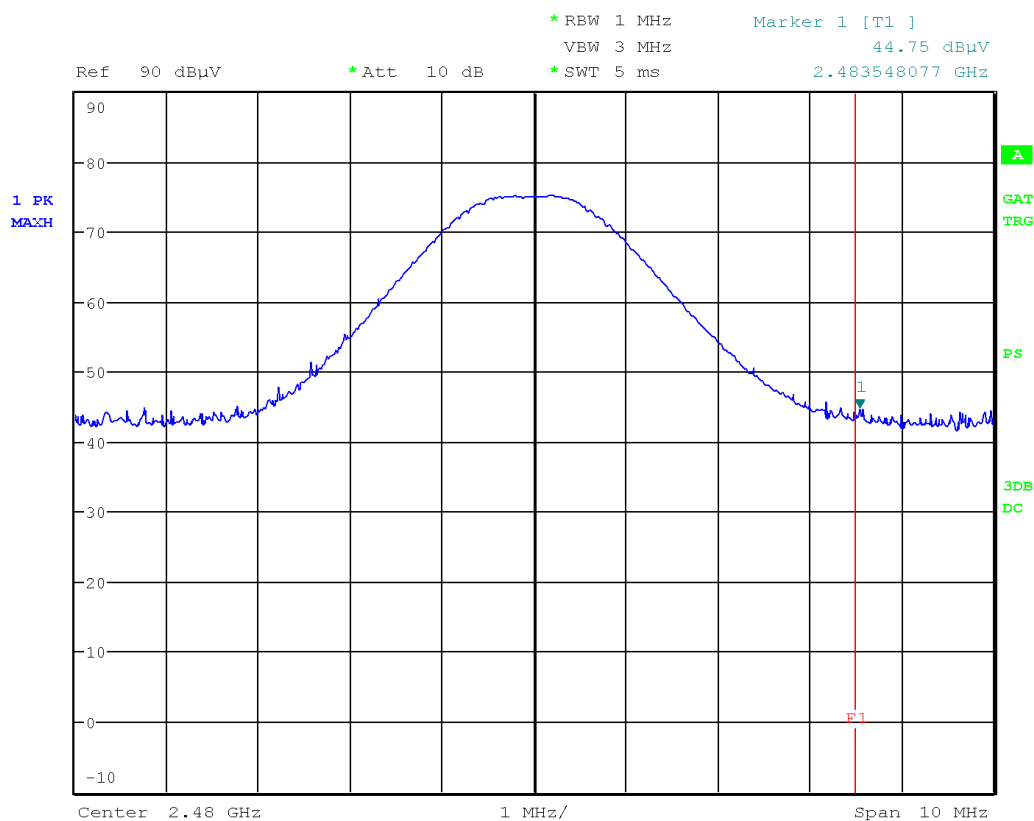


Date: 3.AUG.2018 15:09:46

Note: Restricted band Band Edge plot was taken at a 3m measurement distance. The marker shows the raw value. See the Final Measurements and Results section below for correct values.

Client	Comfable Inc	 Canada
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

### Band Edge – High Channel Vertical - Peak Emission



Date: 3.AUG.2018 15:13:59

Note: Restricted band Band Edge plot was taken at a 3m measurement distance. The marker shows the raw value. See the Final Measurements and Results section below for correct values.

Client	Comfable Inc	
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

## Final Measurements and Results

The EUT passed. Low, middle, and high bands were measured. Worst case results were shown in table below.

In accordance with 15.247(d), only frequencies exceeding the 15.209 limit that occur within the bands listed in 15.205 need to be verified with a final detector. Emissions outside the restricted bands were measured for informational purposes.

The measurements were maximized by rotating the turn table over a full 0-360 rotation and the antenna height was varied from 1 m to 4 m.

Test Frequency (MHz)	Detection Mode	Antenna Polarity (Horz/Vert)	Received Signal (dBμV)	Antenna Factor (dB/m)	Cable Factor (dB)	Attenuator (dB)	Pre-Amp Gain (dB)	Level (dBμV/m)	Emission Limit (dBμV/m)	Margin (dB)	Result
Low Channel 0 - Z axis (Display Facing Up)											
2402	Peak	Horz	85.15	26.6	3.6	0.0	-35.9	79.5			PASS
2402	Peak	Vert	76.81	26.6	3.6	0.0	-35.9	71.2			PASS
2390	PEAK	Horz	43.53	26.6	3.6	0.0	-35.9	37.8	54.0	16.2	PASS
2390	PEAK	Vert	44.26	26.6	3.6	0.0	-35.9	38.6	54.0	15.4	PASS
Low Channel - X axis (side/light up)											
2402	Peak	Horz	81.7	26.6	3.6	0.0	-35.9	76.1			PASS
2402	Peak	Vert	85.1	26.6	3.6	0.0	-35.9	79.4			PASS
2390	Avg	Horz	44.2	26.6	3.6	0.0	-35.9	38.5	54.0	15.5	PASS
2390	Avg	Vert	42.8	26.6	3.6	0.0	-35.9	37.1	54.0	16.9	PASS
Low Channel - Y axis (side / light 90 deg)											
2402	Peak	Horz	83.4	26.6	3.6	0.0	-35.9	77.7			PASS
2402	Peak	Vert	83.3	26.6	3.6	0.0	-35.9	77.7			PASS
2390	PK	Horz	42.9	26.6	3.6	0.0	-35.9	37.2	54.0	16.8	PASS
2390	PK	Vert	44.3	26.6	3.6	0.0	-35.9	38.6	54.0	15.4	PASS
High Channel 39 - Z axis (Flat)											
2480	Peak	Horz	84.3	26.3	3.6	0.0	-35.8	78.4			PASS
2480	Peak	Vert	75.1	26.3	3.6	0.0	-35.8	69.2			PASS
2483.5	PEAK	Horz	46.0	26.3	3.6	0.0	-35.8	40.1	54.0	13.9	PASS
2483.5	PEAK	Vert	44.8	26.3	3.6	0.0	-35.8	38.9	54.0	15.1	PASS
High Channel - X axis (side/light up)											
2480	Peak	Horz	80.2	26.3	3.6	0.0	-35.8	74.3			PASS
2480	Peak	Vert	78.0	26.3	3.6	0.0	-35.8	72.2			PASS
2483.5	PEAK	Horz	44.1	26.3	3.6	0.0	-35.8	38.2	54.0	15.8	PASS
2483.5	PEAK	Vert	45.1	26.3	3.6	0.0	-35.8	39.2	54.0	14.8	PASS
High Channel - Y axis (side/light 90 deg)											
2480	Peak	Horz	83.2	26.3	3.6	0.0	-35.8	77.4			PASS
2480	Peak	Vert	78.7	26.3	3.6	0.0	-35.8	72.8			PASS
2483.5	PEAK	Horz	45.3	26.3	3.6	0.0	-35.8	39.4	54.0	14.6	PASS
2483.5	PEAK	Vert	43.8	26.3	3.6	0.0	-35.8	37.9	54.0	16.1	PASS

Client	Comfable Inc	
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

Test Frequency (MHz)	Detection Mode	Antenna Polarity (Horz/Vert)	Received Signal (dBµV)	Antenna Factor (dB/m)	Cable Factor (dB)	Attenuator (dB)	Pre-Amp Gain (dB)	Level (dBµV/m)	Emission Limit @ 1m (dBµV/m)	Margin (dB)	Result
17124.2	AVG	Vert	28.6	36.8	14.5	0.0	-28.7	51.2	63.5	12.3	PASS
17038.7	AVG	Horz	28.5	36.6	14.7	0.0	-28.7	51.1	63.5	12.4	PASS

## Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration / Verification Date	Next Calibration / Verification Date	Asset #
Spectrum Analyzer	ESU 40	Rohde & Schwarz	Jan. 12, 2018	Jan. 12, 2020	GEMC 233
Pre-Amp 1 – 26.5 GHz	HP 8449B	HP	Jun. 12, 2018	Jun. 12, 2020	GEMC 312
Loop Antenna	EM 6871	Electro-Metrics	Feb 13, 2017	Feb 13, 2019	GEMC 70
Loop Antenna	EM 6872	Electro-Metrics	Feb 13, 2017	Feb 13, 2019	GEMC 71
BiLog Antenna	3142-C	ETS	Oct. 5, 2016	Oct. 5, 2018	GEMC 8
Horn Antenna 1 – 18 GHz	AH-118	Com-Power Corporation	July 12, 2017	July 12, 2019	GEMC 214
Horn Antenna 2 – 18 GHz	WBH218HN	Q-par	Feb. 27, 2018	Feb. 27, 2020	GEMC 6375
Horn Antenna 18 – 26.5 GHz	SAS-572	A.H. Systems	Oct 11, 2016	Oct 11, 2018	GEMC 6371
Pre-Amp 9 kHz – 1 GHz	CPA9231A	Chase	Oct 12, 2016	Oct 12, 2018	GEMC 6403
Attenuator 6 dB	612-6-1	Meca Electronics, Inc	NCR	NCR	GEMC 286
RF Cable 10m	LMR-400-10M-50Ω-MN-MN	LexTec	NCR	NCR	GEMC 274
RF Cable 2m	Sucoflex 104A	Huber+Suhner	NCR	NCR	GEMC 271
Emissions Software	0.1.97	Global EMC	NCR	NCR	GEMC 58

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Client	Comfable Inc	
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

## ***Power Spectral Density***

### **Purpose**

The purpose of this test is to ensure that the maximum power spectral density to the radiating element does not exceed the limits specified. This ensures that the modulation is significantly wide enough, or low enough in power that it will allow for co-operation of other wireless devices operating within this frequency allocation.

### **Limits and Method**

The limits are defined in 15.247(e).

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.


The method is given in Section 10.2 of FCC KDB 558074.

### **Results**

The EUT passed. Low, medium, and high bands were tested. The worst case value is -19.49 dBm as measured with a 3 kHz resolution bandwidth (peak power).

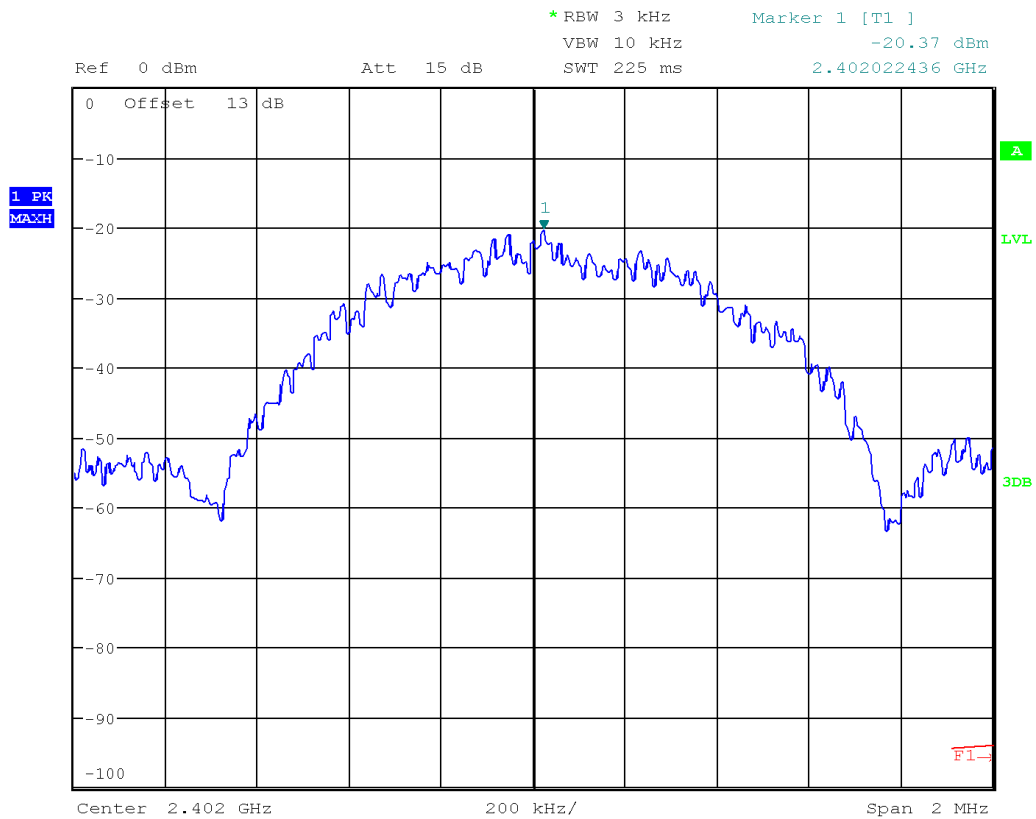
### **Graphs**

The graphs shown below show the power spectral density of the device during the conducted measurement operation of the EUT. Low, middle, and high channel was investigated in each mode, with the worst case being presented. The external attenuator and cable loss are accounted for as reference offset in the spectrum analyzer.


Client	Comfable Inc	 Canada
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

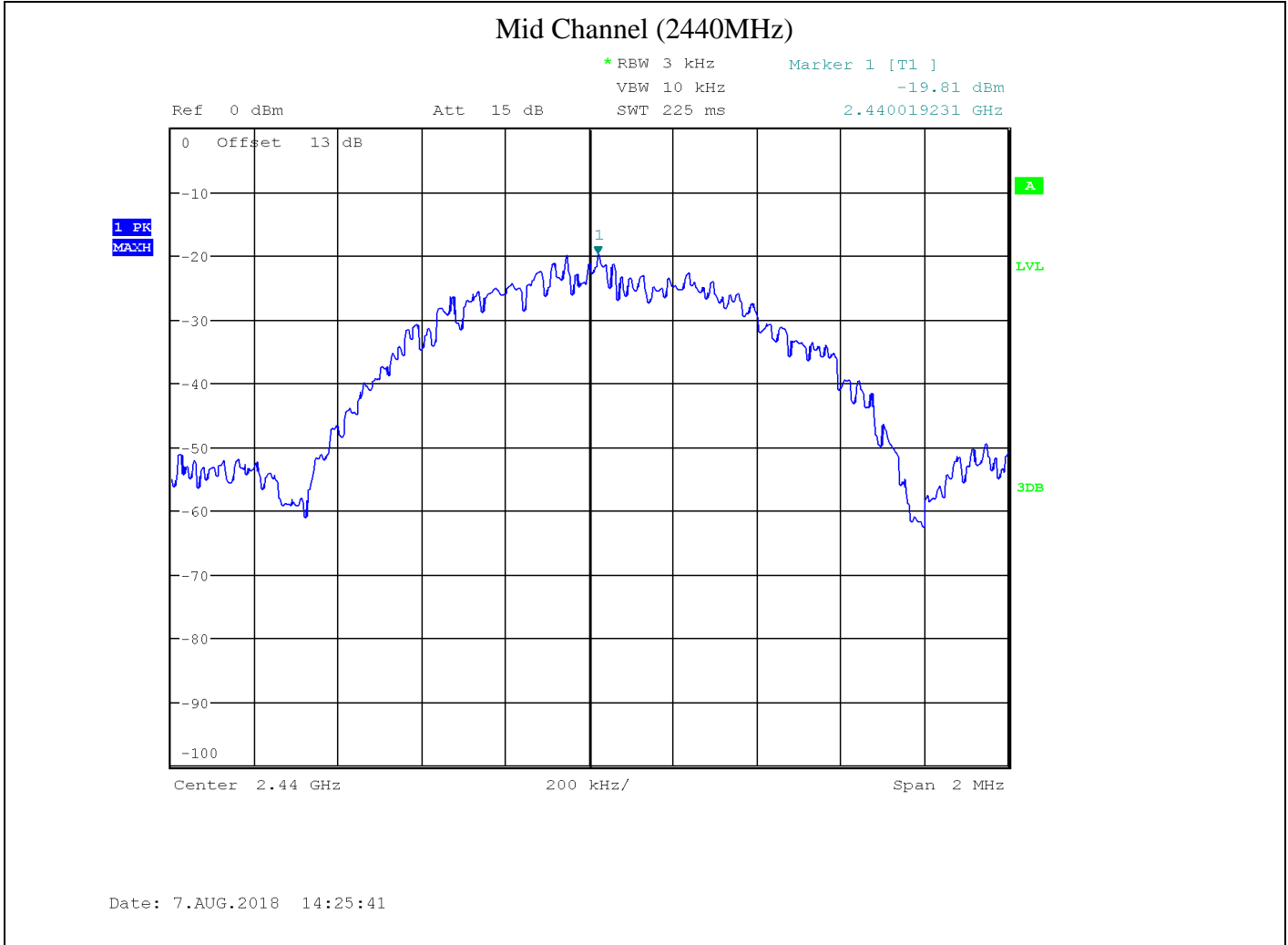
## PSD

### Low Channel (2402MHz)

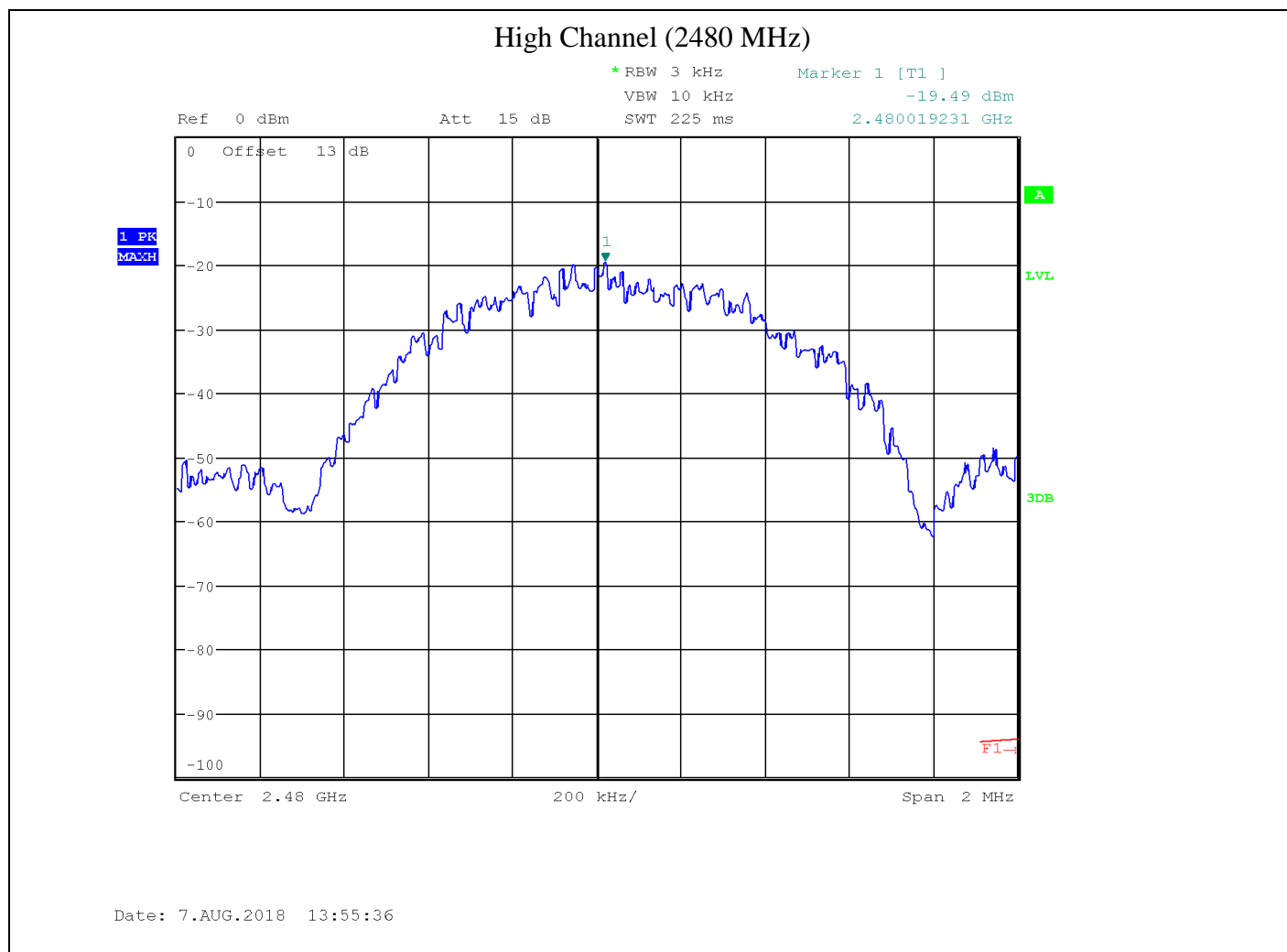


Date: 7.AUG.2018 13:59:45

Client	Comfable Inc	 Canada
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	



Client	Comfable Inc	 Canada
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	



See 'Appendix B – EUT and Test Setup Photos' for photos showing the test set-up.

Client	Comfable Inc	 Canada
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

## Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Spectrum Analyzer	FSU 26	Rohde & Schwarz	Feb 15, 2017	Feb 15, 2019	GEMC 232
Attenuator 10 dB	612-10-1	Meca Electronics, Inc.	NCR	NCR	GEMC 223

Client	<b>Comfable Inc</b>	 Canada
Product	<b>QSun UV Tracker</b>	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

## Appendix A – EUT Summary

Client	Comfable Inc	
Product	QSun UV Tracker	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

For further details for filing purposes, refer to filing package.

## General EUT Description

Client	
Organization / Address	Comfable Inc.
Contact	Neda Ghazi
Phone	416-880-8854
Email	Neda@comfable.com
EUT Details	
EUT Name	QSun UV Tracker
FCC ID	2AQTO-CMFGQS2
Industry Canada #	24185-CMFGQS2
Equipment Category	Residential use
Basic EUT Functionality	UV Meter
Input Voltage and Frequency	CR2032 Coin Cell Battery
Rated Input Current	100 mA
Connectors available on EUT	N/A
Peripherals Required for Test	None
Release type	Final
Intentional Radiator Frequency	2400 – 2483.5 MHz for BLE applications as described above.
EUT Configuration	Wireless configured to transmit continuously.

Note the EUT is considered to have been received the date of the commencement of the first test, unless otherwise stated. For a close-up picture of the EUT, see ‘Appendix B – EUT and Test Setup Photos’.

Client	<b>Comfable Inc</b>	 Canada
Product	<b>QSun UV Tracker</b>	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247:2017	

## Appendix B – EUT and Test Setup Photos

Refer to the files separate from this test report