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Newberry, FL 32669 USA
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FCC PART 15.247 & IC RSS-247 2.4 GHz DTS TEST REPORT

Applicant	ONE WORLD TECHNOLOGIES, INC
Address	1428 PEARMAN DAIRY ROAD
	ANDERSON SOUTH CAROLINA 29625 USA
FCC ID	VMZES3001
IC Certification Number	9880A-ES3001
Model Number	ES3001
Product Description	MOISTURE SENSOR WITH BT
Date Sample Received	06/13/2018
Final Test Date	06/14/2018
Tested By	Tim Royer
Approved By	Franklin Rose

Report Number	Version Number	Description	Issue Date
851AUT18TestReport	Rev1	Initial Issue	06/15/2018

THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.
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GENERAL REMARKS

The attached report shall not be reproduced except in full without the written permission of Timco Engineering Inc.

Summary

The device under test does:

- ☒ Fulfill the general approval requirements as identified in this test report and was selected by the customer.
- ☐ Not fulfill the general approval requirements as identified in this test report

Attestations

This equipment has been tested in accordance with the standards identified in this test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025 requirements.

I attest that the necessary measurements were made at:

Timco Engineering Inc.
849 NW State Road 45
Newberry, FL 32669



Sr. EMC Engineer
EMC-003838-NE



Tested by:

Name and Title: Tim Royer, Project Manager/Testing Engineer

Date: 06/15/2018



Reviewed and approved by:

Name and Title: Franklin Rose, Project Manager/EMC Testing Technician

Date: 06/15/2018

Applicant: ONE WORLD TECHNOLOGIES, INC
FCC ID: VMZES3001
IC: 9880A-ES3001
Report: 851AUT18TestReport_Rev1

GENERAL INFORMATION

EUT Specification

Regulatory Standards	FCC Title 47 CFR Part 15.247 IC RSS-247 Issue 1 IC RSS-GEN Issue 4		
FCC ID	VMZES3001		
IC Certification Number	9880A-ES3001		
Model	ES3001		
EUT Description	MOISTURE SENSOR WITH BT		
Modulation Type	Bluetooth LE (GFSK 1 Mbps)		
Operating Frequency	TX: 2400 – 2483.5 MHz		
EUT Power Source	☐ 110–120Vac/50– 60Hz		
	☐ DC Power		
	☒ Battery Operated Exclusively		
Test Item	☐ Prototype	☒ Pre-Production	☐ Production
Type of Equipment	☐ Fixed	☐ Mobile	☒ Portable
Antenna Connector	N/A		
Antenna	Integral		
Test Facility	Timco Engineering Inc. located at 849 NW State Road 45 Newberry, FL 32669 USA. Designation #: US1070		
Test Conditions	Temperature: 24-26°C Relative humidity: 50-65%		
Measurement Standard	ANSI C63.10-2013 (Measurement Procedures) ANSI C63.4-2009 (Radiated Site Validation)		
Test Exercise	The EUT was stopped 3 places and tested as a normal operational sample.		

Test Supporting Equipment

Device	Manufacturer	Model	S / N	Supplied By	Used For
N/A	N/A	N/A	N/A	N/A	N/A

Applicant: ONE WORLD TECHNOLOGIES, INC
 FCC ID: VMZES3001
 IC: 9880A-ES3001
 Report: 851AUT18TestReport_Rev1

RESULTS SUMMARY

FCC Rule Part No.	IC Standard Ref.	Requirement	Test Item	Result
15.215 (c)	RSS-GEN 6.6	Occupied Bandwidth	99% Bandwidth	Pass
			20 dB Bandwidth	Pass
15.247(a)(e)	RSS-247 § 5.2	Digital Transmission Systems	6 dB Bandwidth	Pass
			Power Spectral Density	Pass
15.247(b)	RSS-247 § 5.4	Transmitter Output Power and Equivalent Isotropically Radiated Power	Peak Power Output (ERP)	Pass
			Antenna Gain (EIRP)	Pass
15.247(d)	RSS-247 § 5.5	Unwanted Emissions	Bandedge	Pass
			Radiated Spurious	Pass

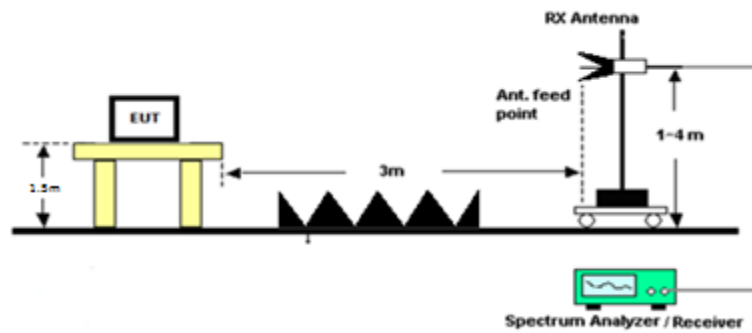
DTS BANDWIDTH

Rules Part No.: FCC 15.247 (a)(2) , IC RSS 247 § 5.2.1

Requirements: The minimum 6 dB bandwidth shall be 500 kHz.

Test Method: ANSI C63.10 § 11.8.1 DTS Bandwidth Option 1
ANSI C63.10 § 6.3 Radiated Emissions testing- Common

Setup:



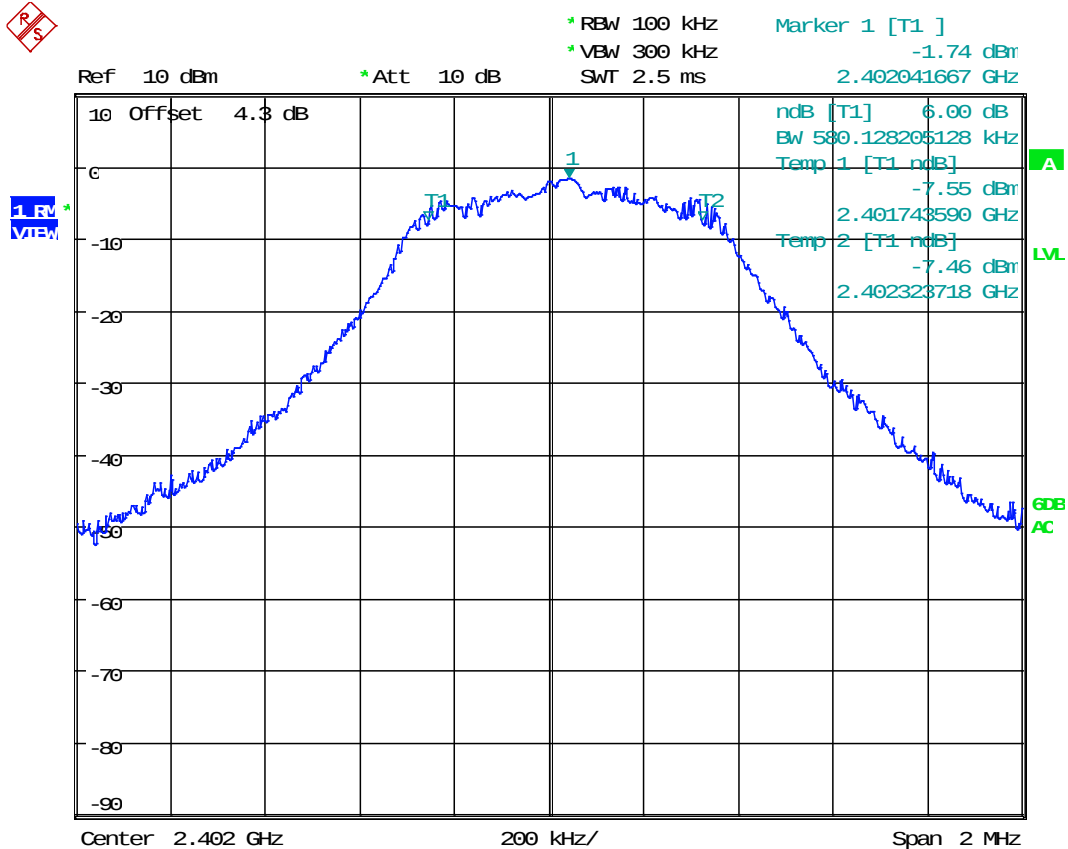
Test Data: 6 dB Occupied Bandwidth Measurement Table

Tuned Frequency (MHz)	6 dB BW (KHz)	Limit (KHz)	Margin (KHz)
2402	580.13	≥ 500	80.13
2440	648.21	≥ 500	148.21
2480	552.95	≥ 500	52.95

RESULTS: Meets Requirements

DTS BANDWIDTH

Test Data: 6dB Bandwidth Plot Low End of Band



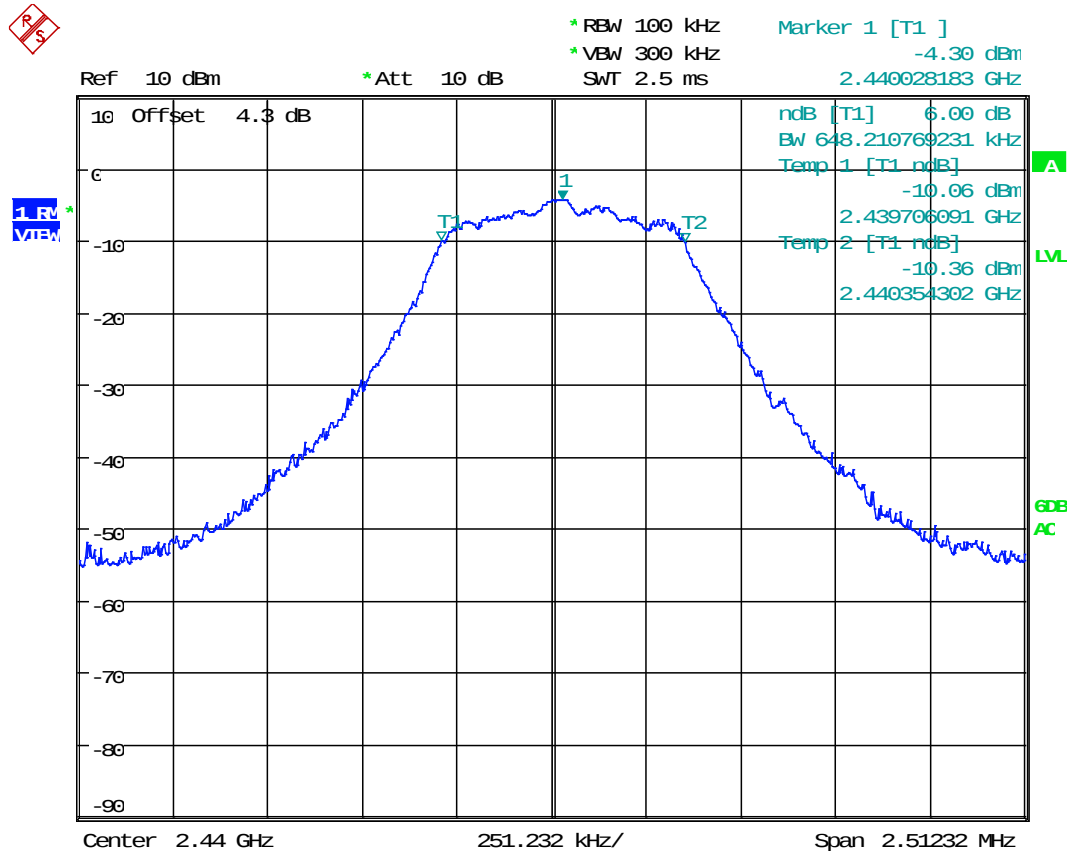
Date: 13.JUN.2018 14:58:47

RESULTS: Meets Requirements

Applicant: ONE WORLD TECHNOLOGIES, INC
FCC ID: VMZES3001
IC: 9880A-ES3001
Report: 851AUT18TestReport_Rev1

DTS BANDWIDTH

Test Data: 6dB Bandwidth Plot Middle of Band



Date: 13.JUN.2018 15:10:22

RESULTS: Meets Requirements

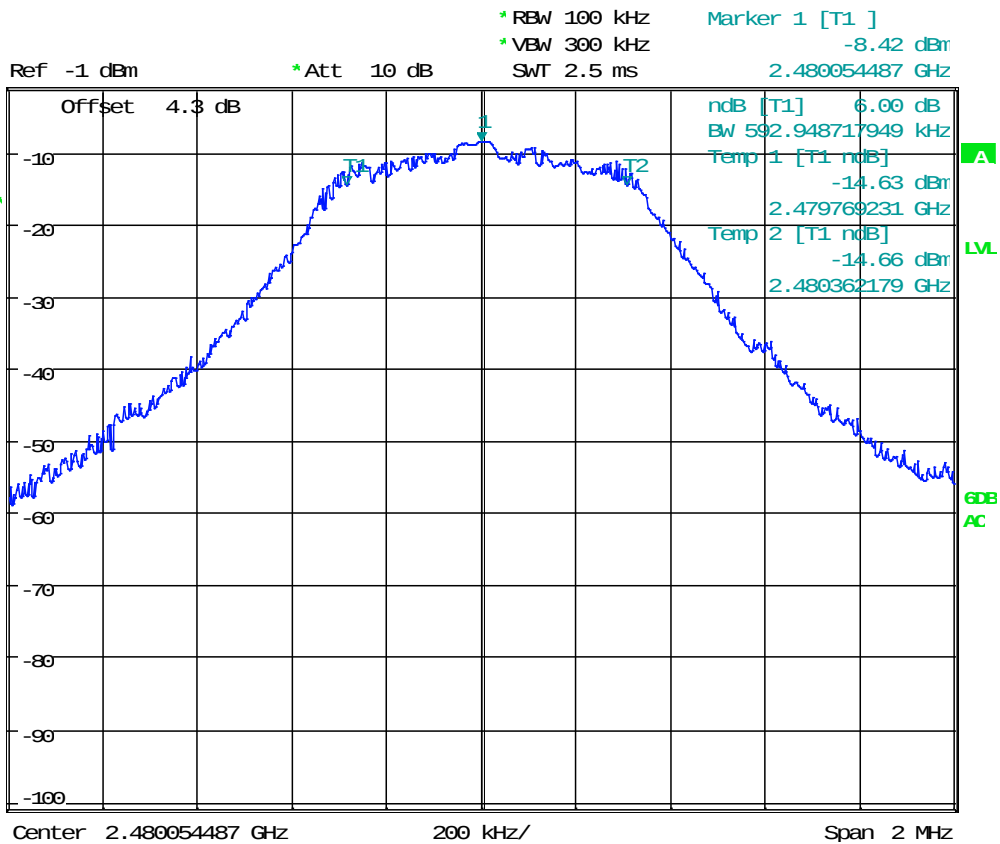
Applicant: ONE WORLD TECHNOLOGIES, INC
FCC ID: VMZES3001
IC: 9880A-ES3001
Report: 851AUT18TestReport_Rev1

DTS BANDWIDTH

Test Data: 6dB Bandwidth Plot High end of Band



PLRU
VBW



Date: 13.JUN.2018 14:56:02

RESULTS: Meets Requirements

Applicant: ONE WORLD TECHNOLOGIES, INC
FCC ID: VMZES3001
IC: 9880A-ES3001
Report: 851AUT18TestReport_Rev1

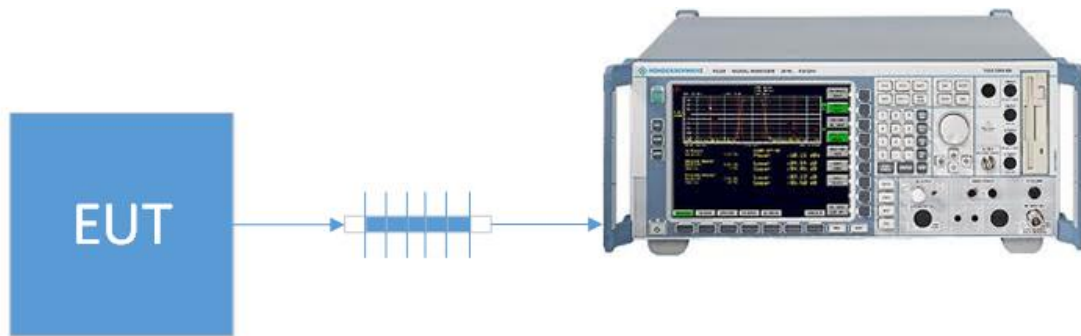
PEAK POWER OUTPUT

Rules Part No.: FCC 15.247(b) (3) (4), IC RSS 247 § 5.4.4

Requirements: Maximum Conducted Peak Power Output shall not exceed 1 Watt
Also the Peak Power Output shall not exceed 4 Watts EIRP

Test Method: ANSI C63.10 § 11.2 Power Limits, definitions, and device configuration
ANSI C63.10 § 11.9.1.1 Fundamental Output Power $RBW \geq DTS$ Bandwidth
ANSI C63.10 § Annex G Relationship among Field Strength and ERP/EIRP

Setup:



PEAK POWER OUTPUT

Test Data: Peak Conducted Power Output Measurement Table

Peak Conducted Power Output Measurement				
Tuned Frequency (MHz)	P _{Conducted} (dBm)	P _{Conducted} (W)	Limit (W)	Margin (W)
2402	-5.79	0.00026	1.00	0.99974
2442	-3.91	0.00041	1.00	0.99959
2480	-4.17	0.00038	1.00	0.99962

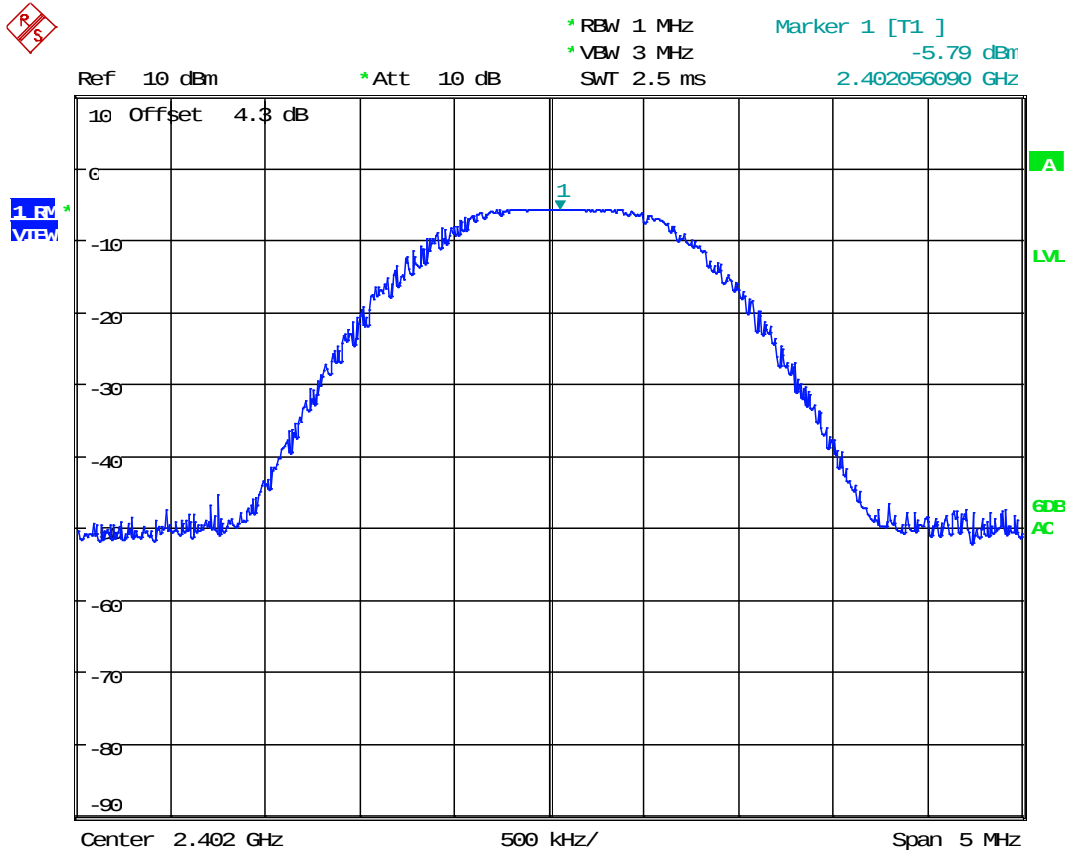
ERP to EIRP Conversion formula: $EIRP = ERP + 2.15 \text{ dB}$

Peak EIRP Power Output Calculation				
Tuned Frequency (MHz)	P _{Conducted} (dBm)	EIRP (W)	Limit (W)	Margin (W)
2402	-5.79	0.00043	4.00	3.99957
2442	-3.91	0.00067	4.00	3.99933
2480	-4.17	0.00063	4.00	3.99937

RESULTS: Meets Requirements

PEAK POWER OUTPUT

Test Data: Peak Power Output Plot Low End of Band



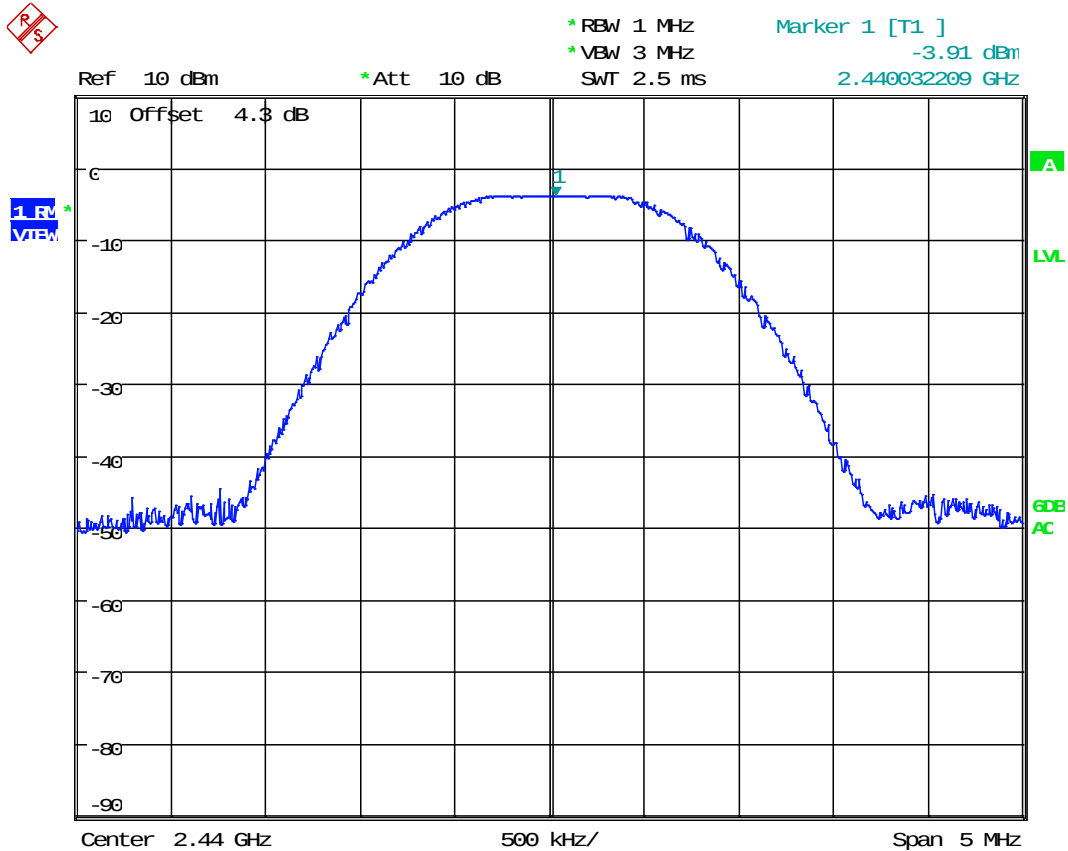
Date: 13.JUN.2018 15:26:14

RESULTS: Meets Requirements

Applicant: ONE WORLD TECHNOLOGIES, INC
 FCC ID: VMZES3001
 IC: 9880A-ES3001
 Report: 851AUT18TestReport_Rev1

PEAK POWER OUTPUT

Test Data: Peak Power Output Plot Middle of Band



Date: 13.JUN.2018 15:24:41

RESULTS: Meets Requirements

Applicant: ONE WORLD TECHNOLOGIES, INC
 FCC ID: VMZES3001
 IC: 9880A-ES3001
 Report: 851AUT18TestReport_Rev1

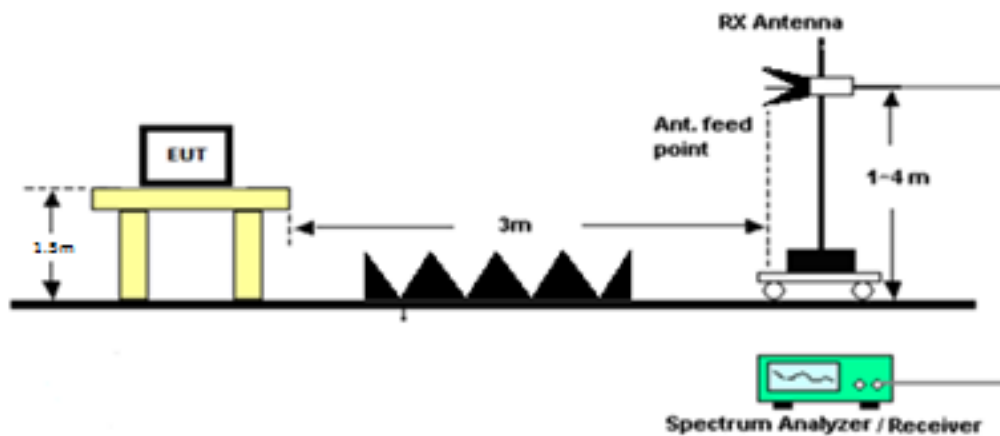
POWER SPECTRAL DENSITY

Rules Part No.: FCC 15.247(e), IC RSS 247 § 5.2.2

Requirements: The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Test Method: ANSI C63.10 § 11.2 Power Limits, definitions, and device configuration
ANSI C63.10 § 11.10.2 Maximum PSD in the fundamental- Method PKPSD
ANSI C63.10 § 6.3 Radiated Emissions testing- Common
ANSI C63.10 § Annex G Relationship among Field Strength and ERP/EIRP

Setup:



POWER SPECTRAL DENSITY

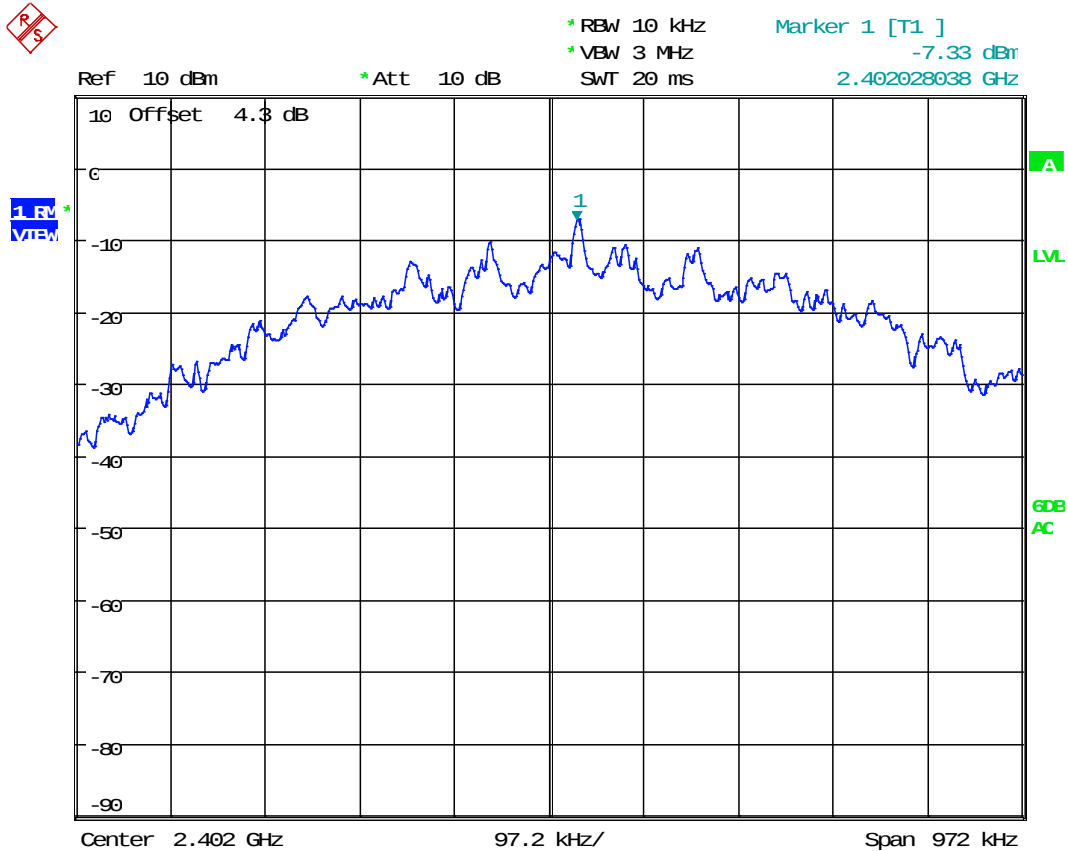
Test Data: Power Spectral Density Measurement Table

Peak Power Spectral Density				
Tuned Frequency (MHz)	3M Field Strength (dBuV/m)	Calculated PSD (dBm/100KHz)	Limit (dBm/3KHz)	Margin (dB)
2402	133.86	4.44915	8.00000	3.55085
2440	135.31	6.21266	8.00000	1.78734
2480	134.31	4.93489	8.00000	3.06511

RESULTS: Meets Requirements

POWER SPECTRAL DENSITY

Test Data: Power Spectral Density Plot Low End of Band



Date: 13.JUN.2018 15:46:30

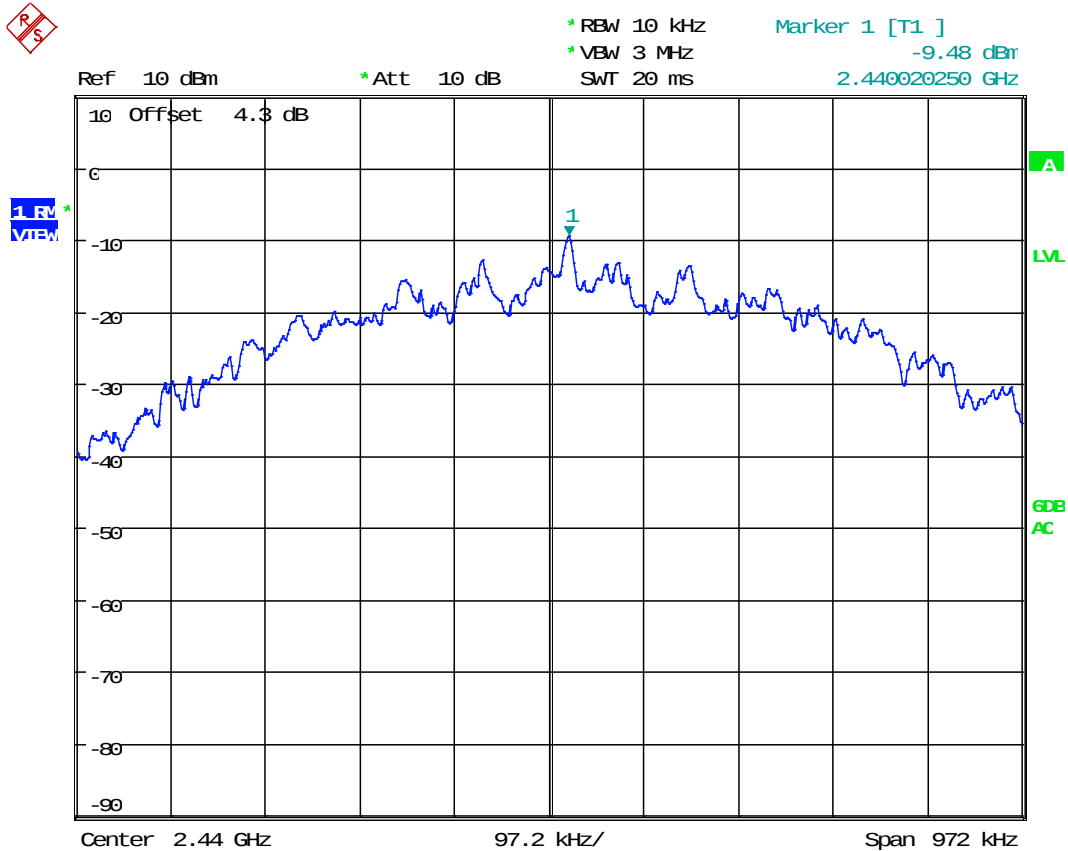
-7.33dBm = 133.86dBuV/m

RESULTS: Meets Requirements

Applicant: ONE WORLD TECHNOLOGIES, INC
 FCC ID: VMZES3001
 IC: 9880A-ES3001
 Report: 851AUT18TestReport_Rev1

POWER SPECTRAL DENSITY

Test Data: Power Spectral Density Plot Middle of Band



Date: 13.JUN.2018 15:41:08

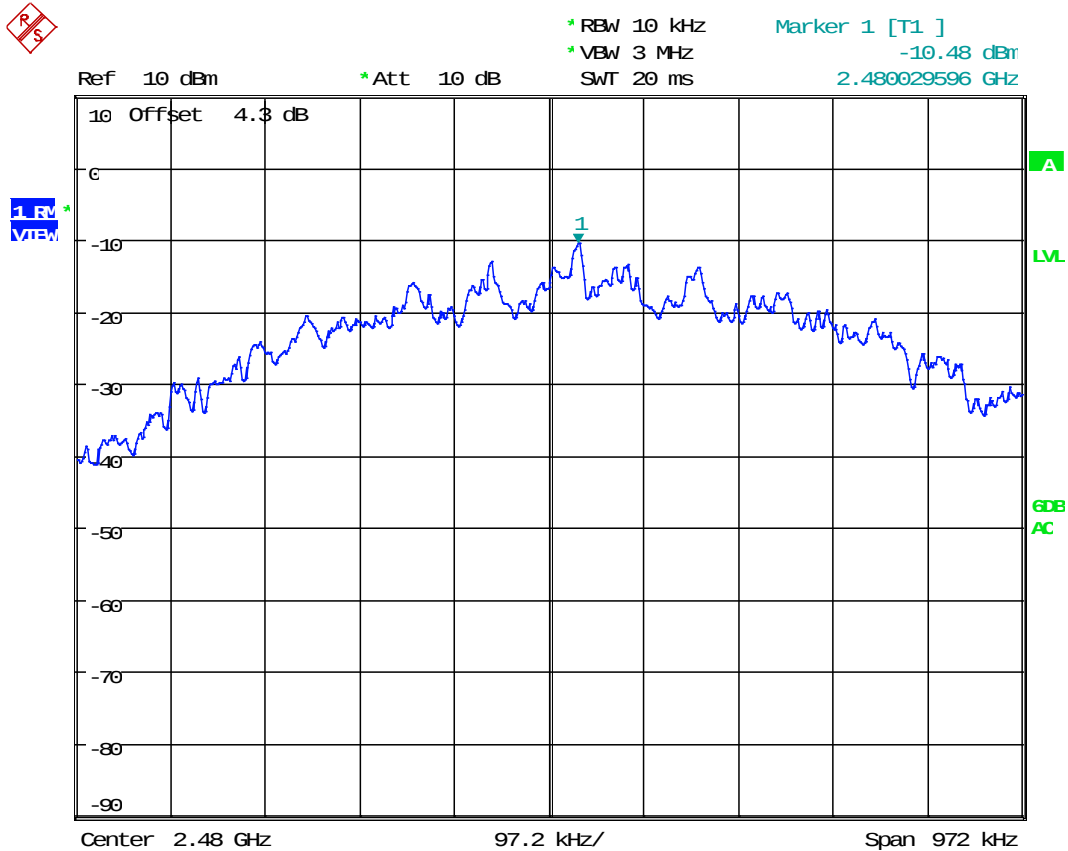
-93.48dBm = 135.31dBuV/m

RESULTS: Meets Requirements

Applicant: ONE WORLD TECHNOLOGIES, INC
 FCC ID: VMZES3001
 IC: 9880A-ES3001
 Report: 851AUT18TestReport_Rev1

POWER SPECTRAL DENSITY

Test Data: Power Spectral Density Plot High End of Band



Date: 13.JUN.2018 15:37:19

-10.48 dBm = 134.31 dBuV / m

RESULTS: Meets Requirements

Applicant: ONE WORLD TECHNOLOGIES, INC
 FCC ID: VMZES3001
 IC: 9880A-ES3001
 Report: 851AUT18TestReport_Rev1

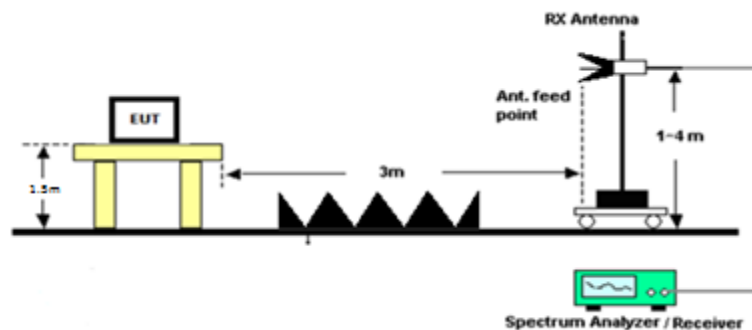
OCCUPIED BANDWIDTH

Rules Part No.: FCC 15.215 (c), IC RSS GEN § 6.6

Requirements: The 20 dB Bandwidth shall remain inside the band of operation.
The 99% Bandwidth is for reporting only.

Test Method: ANSI C63.10 § 6.9.2 Occupied Bandwidth- Relative procedure
ANSI C63.10 § 6.9.3 Occupied Bandwidth- 99% Power Bandwidth procedure
ANSI C63.10 § 6.3 Radiated Emissions testing- Common

Setup:



Test Data: Occupied Bandwidth Measurement Table

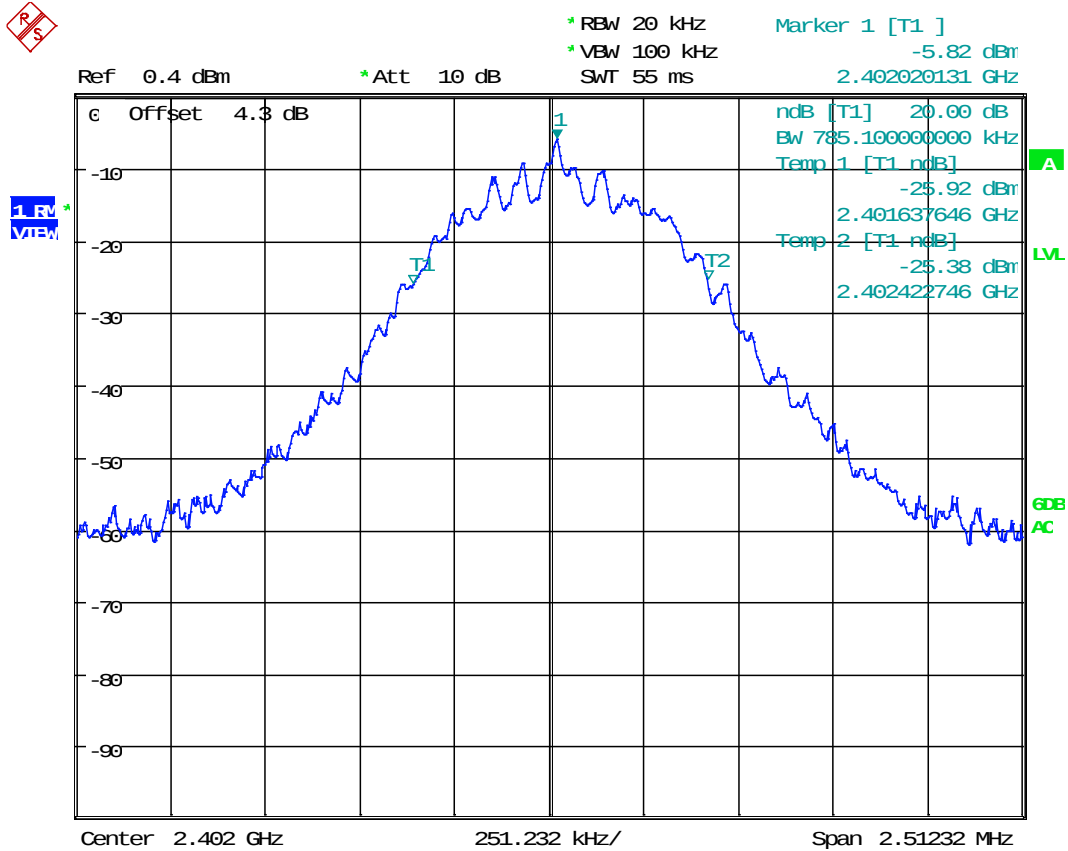
Tuned Frequency (MHz)	20 dB BW (kHz)	99 % BW (kHz)
2402	785.1	781.07
2440	785.1	781.07
2480	782.34	786.55

RESULTS: Meets Requirements

Applicant: ONE WORLD TECHNOLOGIES, INC
FCC ID: VMZES3001
IC: 9880A-ES3001
Report: 851AUT18TestReport_Rev1

OCCUPIED BANDWIDTH

Test Data: 20 dB Bandwidth Plot Low End of Band



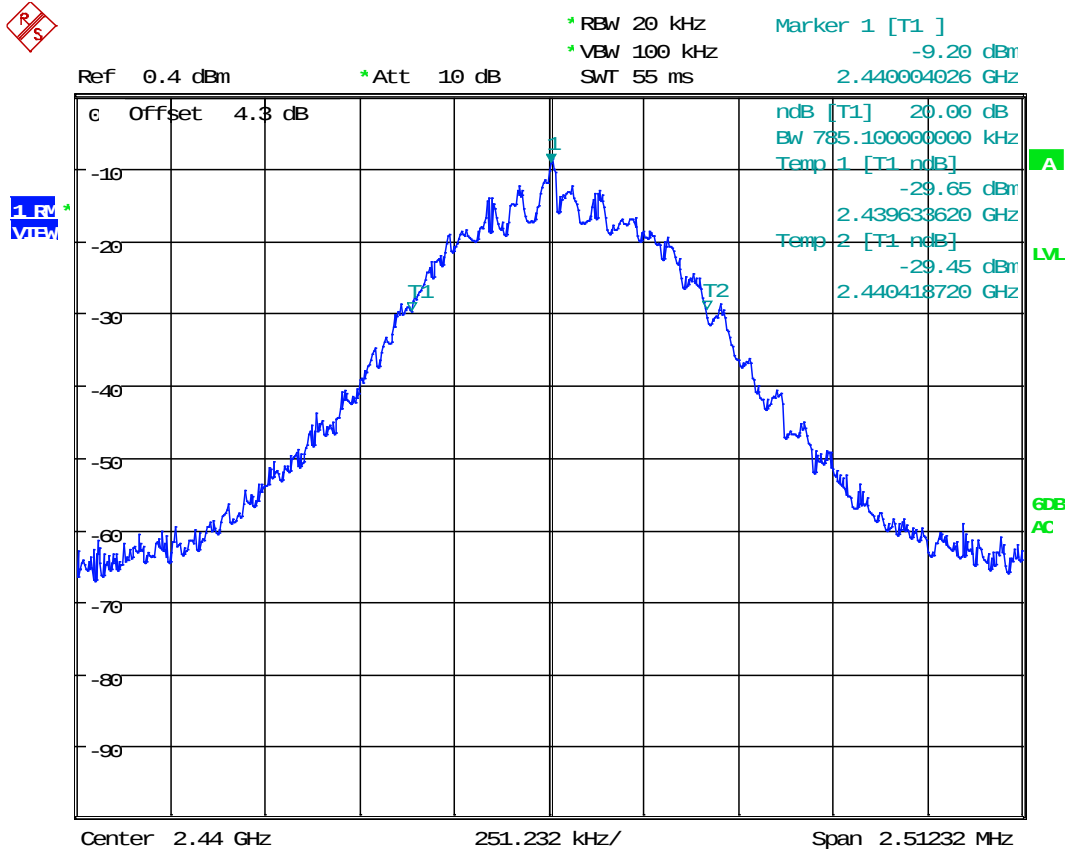
Date: 13.JUN.2018 15:04:36

RESULTS: Meets Requirements

Applicant: ONE WORLD TECHNOLOGIES, INC
FCC ID: VMZES3001
IC: 9880A-ES3001
Report: 851AUT18TestReport_Rev1

OCCUPIED BANDWIDTH

Test Data: 20 dB Bandwidth Plot Middle of Band



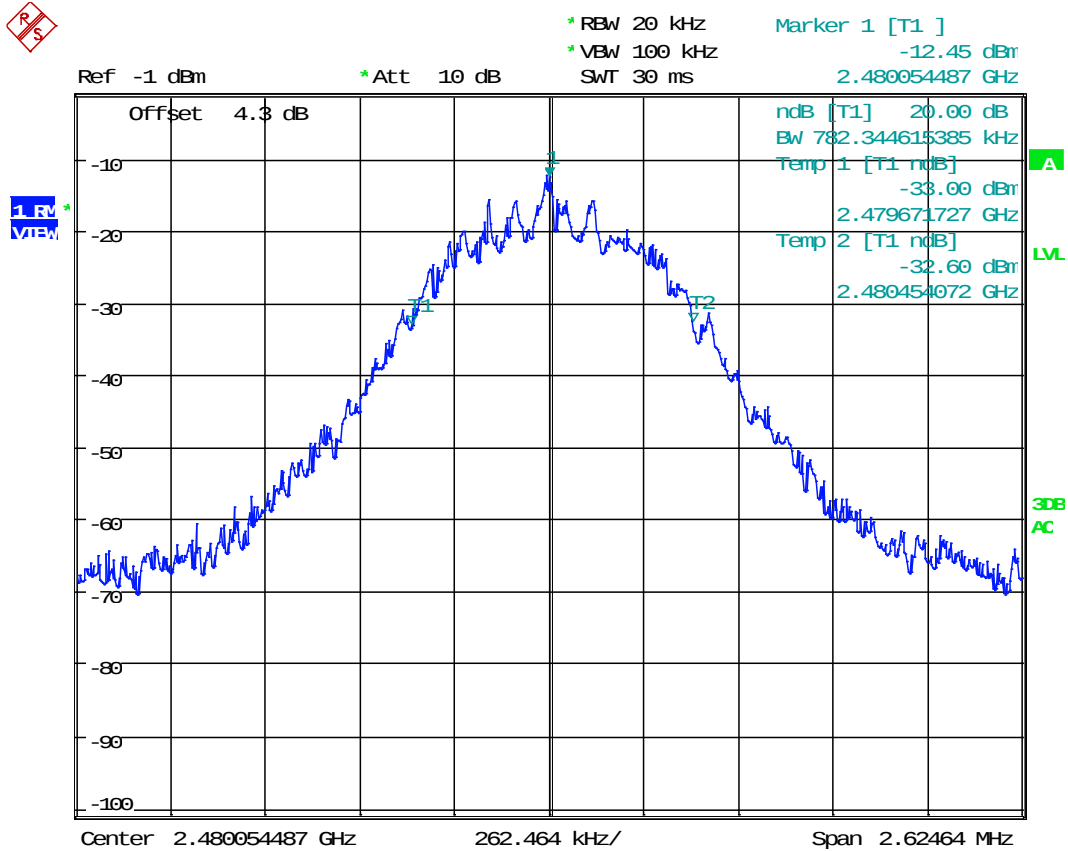
Date: 13.JUN.2018 15:06:40

RESULTS: Meets Requirements

Applicant: ONE WORLD TECHNOLOGIES, INC
FCC ID: VMZES3001
IC: 9880A-ES3001
Report: 851AUT18TestReport_Rev1

OCCUPIED BANDWIDTH

Test Data: 20 dB Bandwidth Plot High end of Band



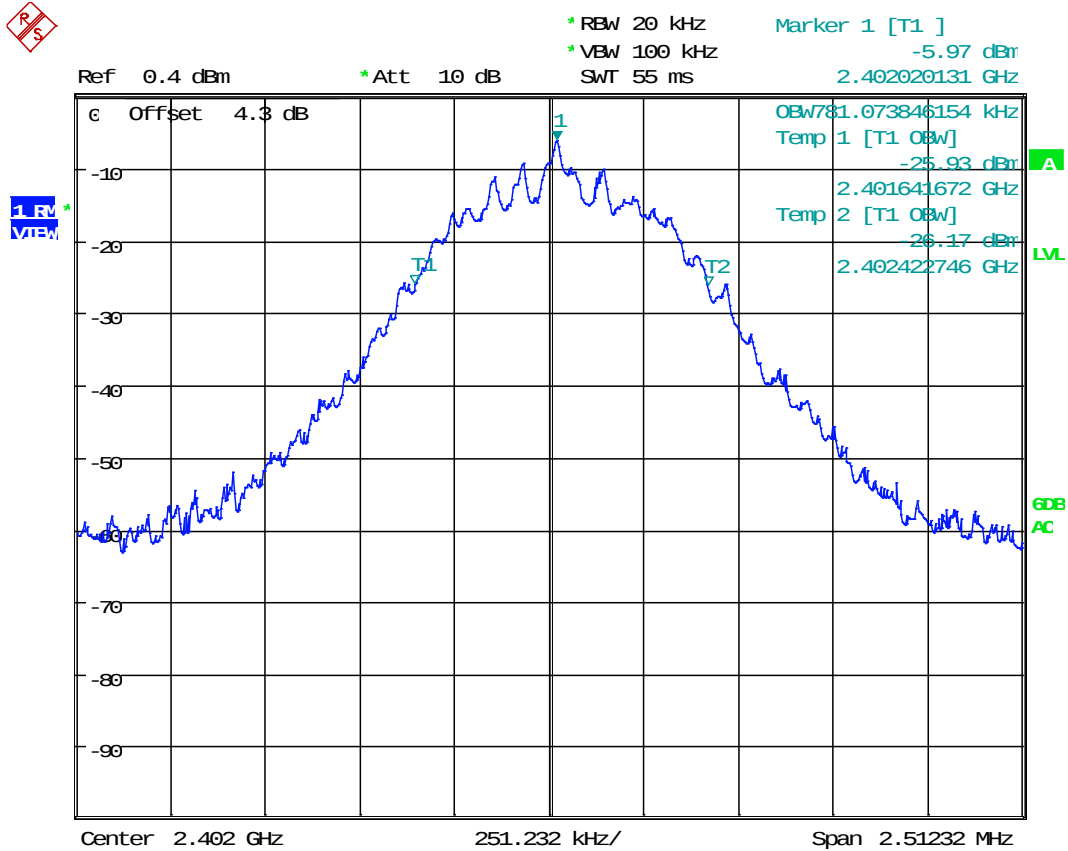
Date: 13.JUN.2018 14:48:53

RESULTS: Meets Requirements

Applicant: ONE WORLD TECHNOLOGIES, INC
FCC ID: VMZES3001
IC: 9880A-ES3001
Report: 851AUT18TestReport_Rev1

OCCUPIED BANDWIDTH

Test Data: 99 % Bandwidth Low End of Band



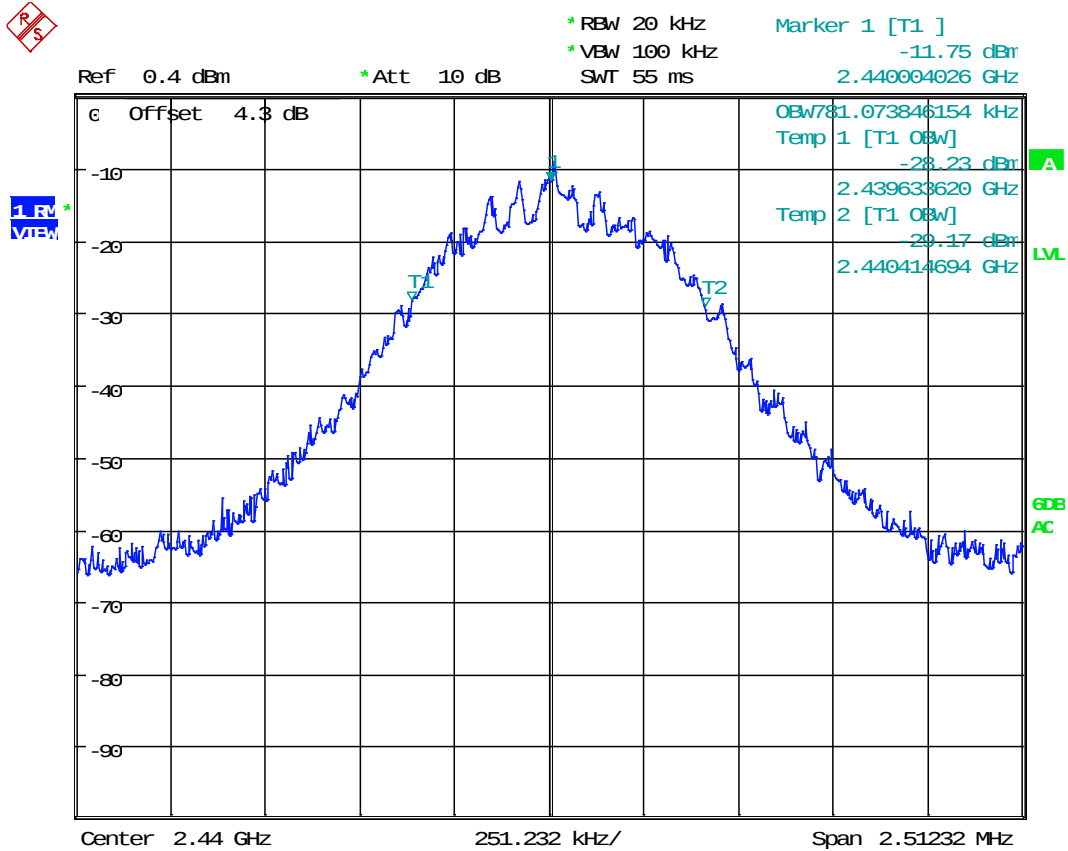
Date: 13.JUN.2018 15:00:04

RESULTS: Meets Requirements

Applicant: ONE WORLD TECHNOLOGIES, INC
 FCC ID: VMZES3001
 IC: 9880A-ES3001
 Report: 851AUT18TestReport_Rev1

OCCUPIED BANDWIDTH

Test Data: 99 % Bandwidth Middle of Band



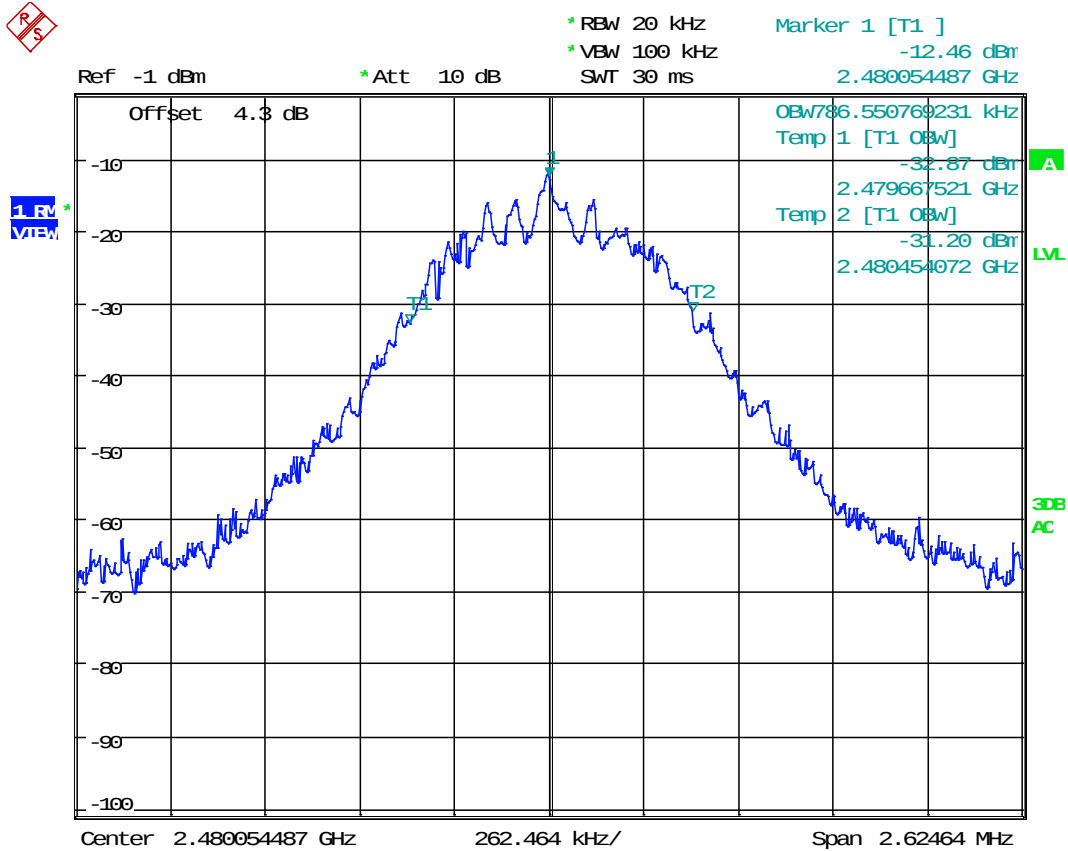
Date: 13.JUN.2018 15:07:34

RESULTS: Meets Requirements

Applicant: ONE WORLD TECHNOLOGIES, INC
 FCC ID: VMZES3001
 IC: 9880A-ES3001
 Report: 851AUT18TestReport_Rev1

OCCUPIED BANDWIDTH

Test Data: 99 % Bandwidth High end of Band



Date: 13.JUN.2018 14:48:03

RESULTS: Meets Requirements

Applicant: ONE WORLD TECHNOLOGIES, INC
 FCC ID: VMZES3001
 IC: 9880A-ES3001
 Report: 851AUT18TestReport_Rev1

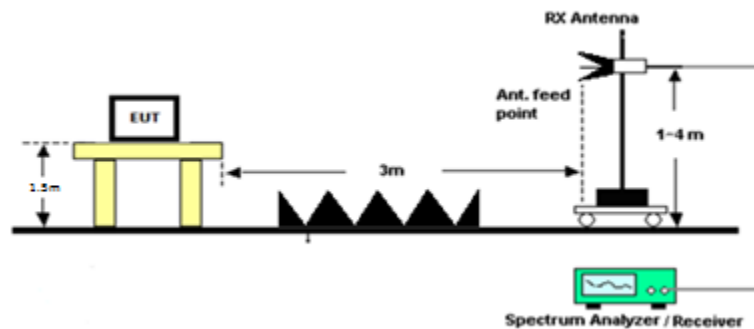
BANDEDGE

Rule Part No.: FCC 15.247(d), IC RSS 247 § 5.5

Requirements: Emissions must be at least 20dB down from the highest emission level
Within the authorized band as measured with a 100 kHz RBW.

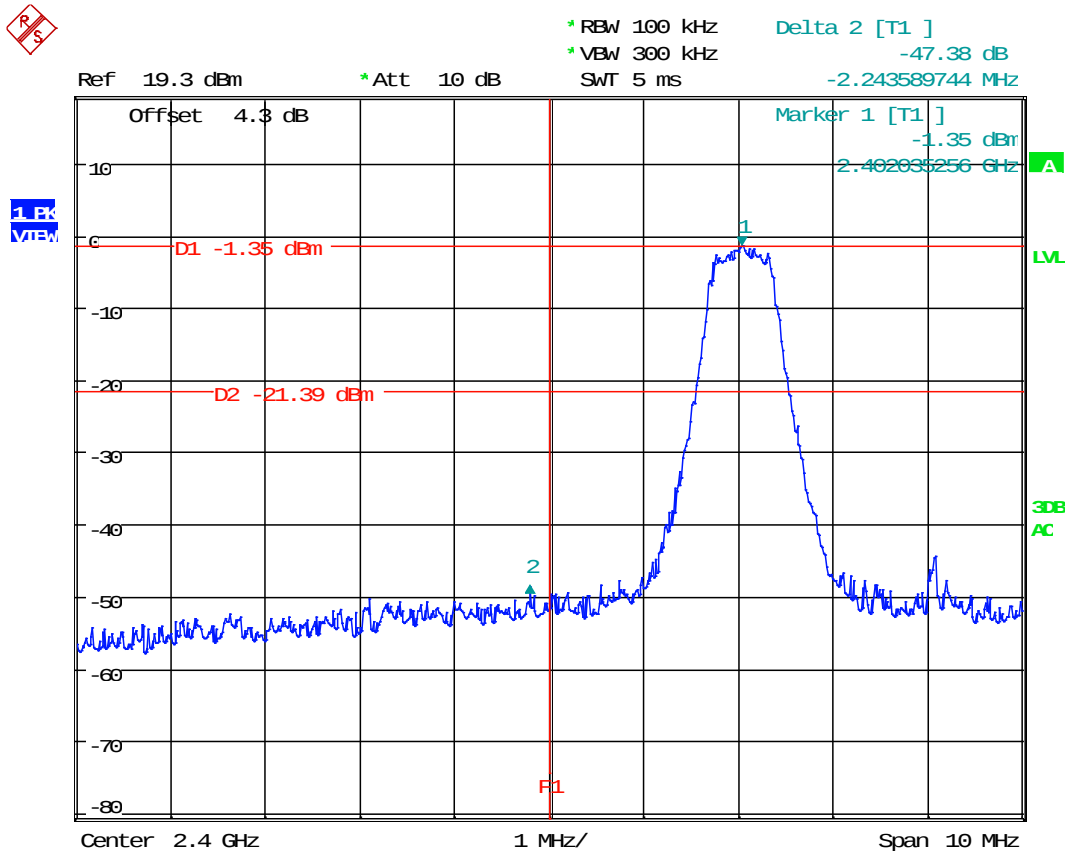
Test Method: ANSI C63.10 § 6.10.4 Authorized band-edge relative method (non-restricted
NSI C63.10 § 6.10.6 Marker Delta Method (restricted band edge)
ANSI C63.10 § 6.3 Radiated Emissions testing- Common

Setup:



BANDEDGE

Test Data: Lower Band Edge Plot



Date: 13.JUN.2018 14:39:16

RESULTS: Meets Requirements

Applicant: ONE WORLD TECHNOLOGIES, INC
 FCC ID: VMZES3001
 IC: 9880A-ES3001
 Report: 851AUT18TestReport_Rev1

RADIATED SPURIOUS EMISSIONS

Rules Part No.: FCC part 15.247 (d) & 15.209, IC RSS 247 § 5.5 & RSS GEN § 8.9

Requirements: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below

In addition, Emissions found in restricted bands the levels must comply with the general limits found in FCC part 15.209

Frequency	Limits
FCC Part 15.209, IC RSS-GEN 8.9	
9 to 490 kHz	2400/F (kHz) μ V/m @ 300 meters
490 to 1705 kHz	24000/F (kHz) μ V/m @ 30 meters
1705 kHz to 30 MHz	29.54 dB μ V/m @ 30 meters
30 – 88	40.0 dB μ V/m @ 3 meters
80 – 216	43.5 dB μ V/m @ 3 meters
216 – 960	46.0 dB μ V/m @ 3 meters
Above 960	54.0 dB μ V/m @ 3 meters

Test Method: ANSI C63.4 § Annex D Validation of radiated emissions standard test sites
 ANSI C63.10 § 6.3 Common requirements radiated emissions
 ANSI C63.10 § 6.4 Emissions below 30 MHz
 ANSI C63.10 § 6.5 Emissions between 30 & 1000 MHz
 ANSI C63.10 § 6.6 Emissions above 1 GHz

Field Strength Calculation:

The field strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dB μ V) to the antenna correction factor supplied by the antenna manufacturer plus the coax loss. The antenna correction factors are stated in terms of dB. The gain of the preselector was accounted for in the spectrum analyzer meter reading.

Example:

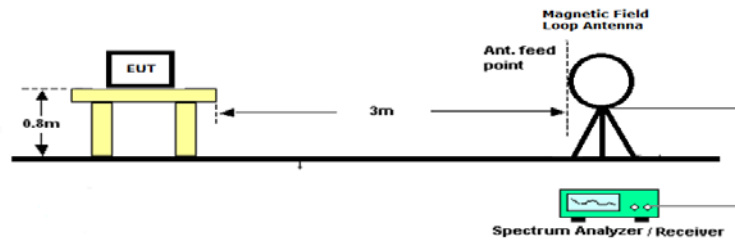
Freq (MHz)	Meter Reading	+ ACF	+ CL = FS
33	20 dB μ V	+ 10.36 dB	+ 0.5 = 30.86 dB μ V/m @ 3m

Applicant: ONE WORLD TECHNOLOGIES, INC
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 Report: 851AUT18TestReport_Rev1

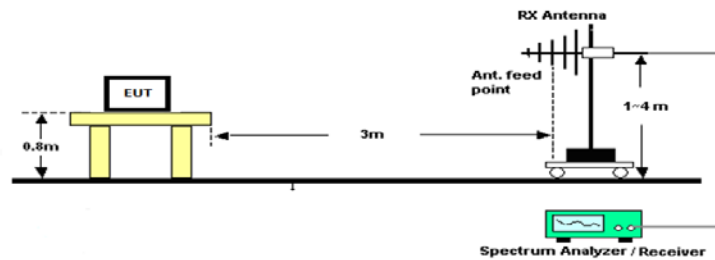
RADIATED SPURIOUS EMISSIONS

Setup:

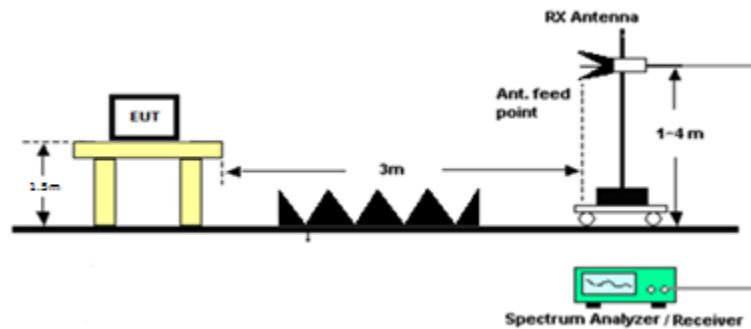
Emissions below 30 MHz



Emissions 30 – 1000 MHz



Emissions above 1 GHz



RADIATED SPURIOUS EMISSIONS

Notes: The EUT was checked in three orthogonal planes as required, a setup photo is provided to show the orientation of the worst case position.

Only the worst case data rate and Output Power which produced emissions within 20dB of the limit are reported.

The spectrum was measured from 9 KHz to 25 GHz

Test Data: Field Strength table

Tuned Freq MHz	Emission Frequency MHz	Meter Reading dBu V	Antenna Polarity	Coax Loss Db	Correction Factor dB/M	Field Strength dBu V/M	Margin
2480	2144.20	6.93	H	5.57	31.22	43.72	10.28
2480	4786.80	8.45	H	8.25	33.92	50.62	3.38
2480	4786.80	9.17	V	8.25	33.92	51.34	2.66
2480	7538.50	-2.72	H	10.38	35.88	43.54	10.46
2440	5250.00	-1.82	H	8.68	34.29	41.15	12.85
2440	4868.50	8.39	V	8.31	33.93	50.63	3.37
2400	4868.50	7.24	V	8.31	33.93	49.48	4.52
2400	4868.50	-0.28	H	8.31	33.93	41.96	12.04
Normal Sample	7127.80	-6.08	H	10.10	36.35	40.37	13.63
Normal Sample	2035.20	1.76	V	5.44	31.08	38.28	15.72

Results Meet Requirements

EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Attenuator K 6dB 2W DC-40G	Narda	4768-6	1044-2	06/25/15	06/25/18
Attenuator K 6dB 2W DC-40G	Narda	4768-6	1044-3	10/06/15	10/06/18
Antenna: Biconical 1096	Eaton	94455-1	1096	08/01/17	08/01/19
Antenna: Log- Periodic 1122	Electro-Metrics	LPA-25	1122	07/26/17	07/26/19
CHAMBER	Panashield	3M	N/A	12/31/17	12/31/19
Antenna: Double- Ridged Horn/ETS Horn 2	ETS-Lindgren	3117	00041534	03/01/17	03/01/19
Software: Field Strength Program	Timco	N/A	Version 4.10.7.0	N/A	N/A
Antenna: Active Loop	ETS-Lindgren	6502	00062529	12/11/17	12/11/19
Coaxial Cable #103 - KMKM- 0180-01 Aqua	Micro-Coax	UFB142A-0-0720- 200200	225363-002 (#103)	08/05/15	08/05/18
EMI Test Receiver R & S ESU 40 Chamber	Rohde & Schwarz	ESU 40	100320	04/01/16	04/01/19
Coaxial Cable - Chamber 3 cable set (Primary)	Micro-Coax	Chamber 3 cable set (Primary)	KMKM-0244-01; KMKM-0670-00; KFKF-0198-01	08/09/16	08/09/18
Band Reject Filter 2.4 GHz	Micro-Tronics	BRM50702-02	-G042	09/27/16	09/27/18
Attenuator K 6dB 2W DC-40G	Narda	4768-6	1044-2	06/25/15	06/25/18
Pre-amp	RF-LAMBDA	RLNA00M45GA	N/A	01/04/16	01/04/19

*EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3

STATE OF THE MEASUREMENT UNCERTAINTY

The data and results referenced in this document are true and accurate. The measurement uncertainty was calculated for all measurements listed in this test report according To CISPR 16-4 or ENTR 100-028 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: “Uncertainty in EMC Measurements” and is documented in the Timco Engineering, Inc. quality system according to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Timco Engineering, Inc. is reported:

Test Items	Measurement Uncertainty	Notes
RF Frequency Accuracy	± 49.5 Hz	(1)
RF Conducted Power	± 0.93 dB	(1)
Conducted spurious emission of transmitter valid up to 40GHz	± 1.86 dB	
Occupied Bandwidth	± 2.65 %	
Audio Frequency Response	± 1.86 dB	
Modulation limiting	± 1.88 %	
Radiated RF Power	± 1.4 dB	
Maximum frequency deviation: Within 300 Hz and 6kHz of audio freq.	± 1.88 %	
Within 6kHz and 25kHz of audio Freq.	± 2.04 %	
Rad Emissions Sub Meth up to 26.5GHz	± 2.14 dB	
Adjacent channel power	± 1.47 dB	(1)
Transient Frequency Response	± 1.88 %	
Temperature	± 1.0 °C	(1)
Humidity	± 5.0 %	

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=1.96$.

End of REPORT