



Electromagnetic Compatibility Test Report

Tests Performed on a TimeKeeping Systems, Inc.

Tracking Device, Models TAG-010A, TAG-010B

Radiometrics Document RP-10002



Product Detail:

FCC ID: MTD-0010

IC: 12375A-0010

FCC Equipment type: "DSR-Part 15 Remote Control/Security Device with Transceiver"

ISED Equipment type: "Security Device / Alarm System"

Test Standards:

US CFR Title 47, Chapter I, FCC Part 15 Subpart C

FCC Part 15 CFR Title 47: 2024

Canada ISED; RSS-210, Issue 10: 2019 as required for Category I Equipment

IC RSS-GEN Issue 5: 2018 / 2021

This report concerns: Original Grant for Certification

FCC Part 15.249

Tests Performed For:

TimeKeeping Systems, Inc.

30700 Bainbridge Rd., Suite H
Solon, OH 44139

Test Facility:

Radiometrics Midwest Corporation

12 Devonwood Avenue
Romeoville, IL 60446-1349
(815) 293-0772

Test Date(s):

June 10-14 and July 24, 2024

Document RP-10002 Revisions:

Rev.	Issue Date	Revised By
0	September 4, 2024	



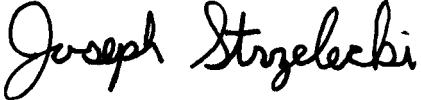
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1.0 ADMINISTRATIVE DATA

<i>Equipment Under Test:</i> A TimeKeeping Systems, Inc., Tracking Device Model: TAG-010A Serial Number: S1 This will be referred to as the EUT in this Report	
<i>Date EUT Received at Radiometrics:</i> June 10, 2024	<i>Test Date(s):</i> June 10-14 and July 24, 2024
<i>Test Report Written and Authorized By:</i> Joseph Strzelecki Senior EMC Engineer	<i>Test Witnessed By:</i> The tests were not witnessed by personnel from TimeKeeping Systems, Inc..
<i>Radiometrics' Personnel Responsible for Test:</i>  Sep 4, 2024 Date Joseph Strzelecki Senior EMC Engineer NARTE EMC-000877-NE Chris D'Alessio EMC Technician	<i>EUT Checked By:</i> Joseph Strzelecki Chris D'Alessio Radiometrics

2.0 TEST SUMMARY AND RESULTS

The EUT (Equipment Under Test) is a Tracking Device, Model TAG-010A, manufactured by TimeKeeping Systems, Inc. The detailed test results are presented in a separate section. The following is a summary of the test results.

Emissions Tests Results			
Environmental Phenomena	Frequency Range	Basic Standard	Test Result
RF Radiated Emissions	30-25,000 MHz	RSS-210 & FCC Part 15.249	Pass
Occupied Bandwidth Test	Fundamental Freq.	RSS-GEN & FCC Part 15	Pass

IEC 17025 Decision Rule:

The declaration of pass or fail is based on the specifications listed above. The declaration of pass or fail did not consider measurement uncertainty.

2.1 RF Exposure Compliance Requirements

Since the average power output is less than 10 mW, the EUT meets the FCC requirement for RF exposure, and it is exempt from RSS-102 SAR and RF exposure evaluations. There are no power level adjustments available to the end user. The antenna is permanently attached. The detailed calculations for RF Exposure are presented in a separate document.



3.0 EQUIPMENT UNDER TEST (EUT) DETAILS

3.1 EUT Description

The EUT is a Tracking Device, Model TAG-010A, manufactured by TimeKeeping Systems, Inc. The EUT was in good working condition during the tests, with no known defects.

3.1.1 FCC Section 15.203 & RSS-GEN Antenna Requirements

The antenna is permanently attached to the printed circuit board. The antenna is internal to the EUT, and it is not readily available to be modified by the end user. Therefore, it meets the 15.203 Requirements.

3.1.2 Product Family

The following table is the product family list of the readers that use the same electronics and PCB as the ones tested in this report. The untested model numbers listed below are electrically identical with the same electromagnetic emissions and electromagnetic compatibility characteristics as those tested, therefore the tests on the model numbers below are representative for the tested models.

Model Number	Description
TAG-010A	Asset tag used to track equipment within a facility
TAG-010B	Wristband tag used to track people within a facility

The only difference between the two models is the non-conductive, plastic enclosure.

4.0 TESTED SYSTEM DETAILS

4.1 Tested System Configuration

The system was configured for testing in a typical fashion. The EUT was placed on an 80-cm or 150 cm high, nonconductive test stand. The testing was performed in conditions as close as possible to installed conditions. The EUT was tested as a stand-alone device. Power was supplied with a new battery. There are no external cables

The identification for all equipment, are:

Tested System Configuration List

Item	Description	Type*	Manufacturer	Model Number	Serial Number
1	Tracking Device	E	TimeKeeping Systems, Inc.	TAG-010A	S1

* Type: E = EUT, P = Peripheral, S = Support Equipment; H = Host Computer

Type of modulation including the bit rate and symbol rate	GFSK at 1Mbps
Name and version of the test software used to exercise the device	wristband_p7_FCC_TEST.hex 20240605.1
Power settings used for the purpose of exercising the device	5
Firmware number of the transmitter	N/A

4.2 EUT Operating Modes

The transmit mode for all tests was continuous. The continuous mode produces a Duty Cycle of at least 99%.



The EUT was in its normal GFSK modulation during the tests. It was tested as a stand-alone, battery powered device since that is the configuration in the final installation.

4.3 Special Accessories

No special accessories were used during the tests in order to achieve compliance.

4.4 Equipment Modifications

No modifications were made to the EUT at Radiometrics' test facility in order to comply with the standards listed in this report.

5.0 TEST SPECIFICATIONS

Document	Date	Title
FCC CFR Title 47	2024	Code of Federal Regulations Title 47, Chapter 1, Federal Communications Commission, Part 15 - Radio Frequency Devices
IC RSS-210 Issue 10	2019	Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands) Category I Equipment
IC RSS-Gen Issue 5	2019	General Requirements and Information for the Certification of Radiocommunication Equipment (RSS-Gen)

6.0 TEST PROCEDURE DOCUMENTS

The tests were performed using the procedures from the following specifications:

Document	Date	Title
ANSI C63.4-2014	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	2013	American National Standard for Testing Unlicensed Wireless Devices

7.0 RADIOMETRICS' TEST FACILITIES

The results of these tests were obtained at Radiometrics Midwest Corp. in Romeoville, Illinois, USA. Radiometrics is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025: 2017 "General Requirements for the Competence of Calibration and Testing Laboratories". Radiometrics' Lab Code is 121191 and Certification Number is 1495.01. Radiometrics' scope of accreditation includes all of the test methods listed herein. A copy of the accreditation can be accessed on our web site (www.radiomet.com). Radiometrics accreditation status can be verified at A2LA's web site (www.a2la2.org).

The following is a list of shielded enclosures located in Romeoville, Illinois used during the tests:

Chamber E: Is a custom-made anechoic chamber that measures 52' L X 30' W X 18' H. The walls and ceiling are fully lined with RF absorbers. Pro-shield of Collinsville, Oklahoma manufactured the chamber. The floor has a 9' x 9' section of microwave absorber for testing above 1 GHz.

A separate ten-foot long, brass plated, steel ground rod attached via a 6-inch copper braid grounds the above chamber. The enclosure is also equipped with low-pass power line filters.



The FCC has accepted these sites as test site number US1065. The FCC test site Registration Number is 732175. Details of the site characteristics are on file with the Industry Canada as site number IC 3124A with a CAB ID of US0224.

A complete list of the test equipment is provided herein. The calibration due dates are indicated on the equipment list. The equipment is calibrated in accordance with ANSI/NCSL Z540-1 with traceability to the National Institute of Standards and Technology (NIST).

8.0 DEVIATIONS AND EXCLUSIONS FROM THE TEST SPECIFICATIONS

There were no deviations or exclusions from the test specifications.

9.0 CERTIFICATION

Radiometrics Midwest Corporation certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specification and the data contained herein was taken with calibrated test equipment. The results relate only to the EUT listed herein.

10.0 TEST EQUIPMENT TABLE

RMC ID	Manufacturer	Description	Model No.	Serial No.	Frequency Range	Cal Period	Cal Date
AMP-05	RMC/Celeritek	Pre-amplifier	MW110G	1001	1.0-12GHz	12 Mo.	01/31/24
AMP-20	Avantek	Pre-amplifier	SF8-0652	15221	8-18GHz	12 Mo	06/06/24
AMP-59	Amplitech	Pre-amplifier	APTMP44	AMP-59	18-26 GHz	12 Mo.	01/31/24
ANT-48	RMC	Std. Gain Horn	HW2020	1001	18-26.5 GHz	24 Mo.	11/23/22
ANT-66	ETS-Lindgren	Horn Antenna	3115	62580	1.0-18GHz	24 Mo.	03/16/23
ANT-68	EMCO	Log-Periodic Ant.	93146	9604-4456	200-1000MHz	24 Mo.	01/30/24
ANT-80	AH Systems	Bicon Antenna	SAS-540	294	20-330MHz	24 Mo.	01/26/23
REC-21	Agilent	Spectrum Analyzer	E7405A	MY45118341	9Hz-26.5 GHz	24 Mo.	04/24/24
REC-44	Agilent	Spectrum Analyzer	E4440A	US40420673	3Hz-26.5GHz	24 Mo.	07/18/24
THM-02	Fluke	Temp/Humid Meter	971	93490471	N/A	24 Mo.	11/22/22

REC-44 was only used on the July 24, 2024, test.

Note: All calibrated equipment is subject to periodic checks.

Software Company	Test Software Name	Version	Applicable Tests
Radiometrics	REREC11D	07.21.22	RF Radiated Emissions (FCC Part 15 & EN 55032)
Agilent	PSA/ESA-E/L/EMC	2.4.0.42	Bandwidth and screen shots

11.0 TEST SECTIONS

11.1 Radiated RF Emissions

Radiated emission measurements were performed with linearly polarized broadband antennas. The results obtained with these antennas can be correlated with results obtained with a tuned dipole antenna. The radiated emission measurements were performed with a spectrum analyzer. The bandwidth used from 150 kHz to 30 MHz is 9 or 10 kHz and the bandwidth from 30 MHz to 1000 MHz is 100 or 120 kHz. Above 1 GHz, a 1 MHz bandwidth is used. A 10 dB linearity check is performed prior to start of testing in order to determine if an overload condition exists. Figure 4 herein lists the details of the test equipment used during radiated emissions tests.



In addition, a high pass filter was used to reduce the fundamental emission. High pass filters were not needed above 10 GHz, since the preamplifiers attenuated the fundamental emission.

The EUT was rotated through three orthogonal axis as per 5.10.1 of ANSI C63.10 during the radiated tests.

Final radiated emissions measurements were performed inside of an anechoic chamber at a test distance of 3 meters. The anechoic chamber is designated as Chamber E. This Chamber meets the Site Attenuation requirements of ANSI C63.4. Chamber E is located at 12 Devonwood Ave. Romeoville, Illinois EMI test lab.

The entire frequency range from 30 to 25000 MHz was slowly scanned. Measurements were performed using two antenna polarizations, (vertical and horizontal). The worst case emissions were recorded. All measurements may be performed using either the peak, average or quasi-peak detector functions. If the peak detector data exceeds or is marginally close to the limits, the measurements are repeated using a quasi-peak detector or average function as required by the specification for final determination of compliance. The QP and average detectors have a linear response.

The detected emission levels were maximized by rotating the EUT, adjusting the positions of all cables, and by scanning the measurement antenna from 1 to 4 meters above the ground.

Radiated Emissions Field Strength Limits

Frequency Range (MHz)	Test Distance (meters)	Non-Fundamental Limits	
		uV/m	dB(uV/m)
30 - 88	3	100	40.0
88 - 216	3	150	43.5
216 - 960	3	200	46.0
Above 960	3	500	54.0

The emission limits shown in the above table are based on measurements using a CISPR quasi-peak detector below 1 GHz. Above 1 GHz, the radiated emission limits are based on measurements employing an average detector. Above 1 GHz peak emissions shall not be more than 20 dB above the average limits.

The fundamental limit is 94 dBuV/m for Average and 114 dBuV/m for peak detection.

11.1.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and by subtracting the Amplifier Gain from the measured reading. The basic equation is as follows:

$$FS = RA + AF + CF - AG + HPF + PKA$$

Where: FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier Gain

HPF = High pass Filter Loss

PKA = Peak to Average Factor (This is only used for average measurements above 1 GHz)

The Peak to average factor is used when average measurements are required. It is calculated by the highest duty cycle in percent over any 100mS transmission.



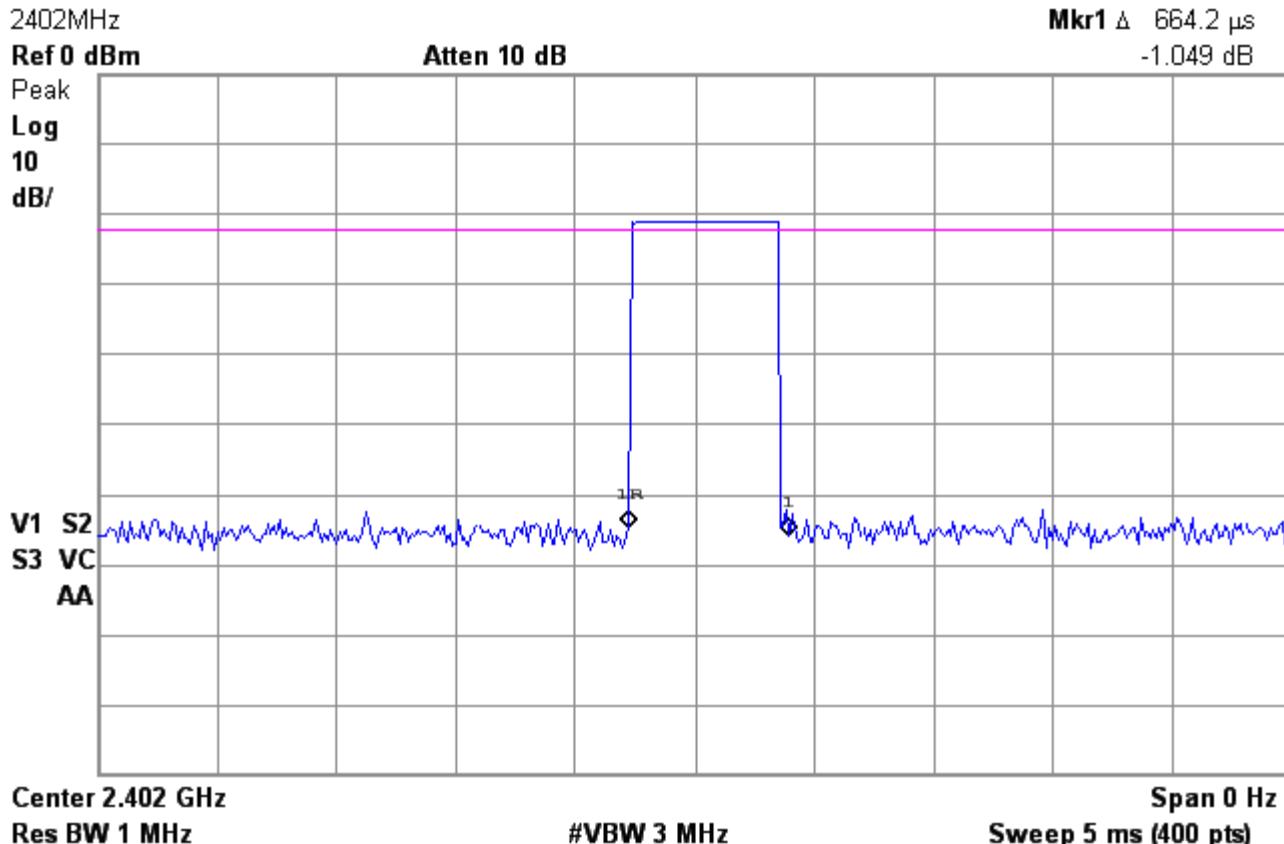
11.1.2 Duty Cycle

In accordance to 7.5 of ANSI C63.10 the following procedures were used.

- a) The EUT was set to the “worst-case” pulse ON time.
- b) The RF output was Coupled to the input of a spectrum analyzer by a “near-field” coupling method. The signal received shall be of sufficient level to trigger adequately the spectrum analyzer sweep display.
- c) The center frequency of the spectrum analyzer was set to the center of the RF signal.
- d) The spectrum analyzer was set for ZERO SPAN.
- e) The sweep time was of the analyzer was set to 100 ms and other times to show the duty cycle.
- f) Since the pulse train has a period that exceeds 100 ms, then:
 - 1) The trigger on the spectrum analyzer was set to capture the greatest amount of pulse “ON time” over 100 ms.
 - 2) The 100 ms period that contains the maximum “on time” was found.
 - 3) The duty cycle was determined by dividing the total maximum “ON time” by 100 ms (tON/100 ms).
- h) The duty cycle correction factor was used applying Equation (10) of ANSI C63.10 to the duty cycle determined in the preceding steps.

The width of each pulse is 0.664 mSeconds. There are, at most, 3 pulses per 100mS for a total of 2 mSeconds. This yields an effective duty cycle of 2%. The Peak to average factor is calculated by the highest duty cycle in percent over any 100mS transmission. The transmitter operates for a maximum duration of 2 ms in any 100 ms interval. $20 \log^*(2\text{mSec}/100\text{mSec}) = -34.0 \text{ dB}$ Peak to Average correction factor.

Since the difference between the peak and the average limits are 20 dB, there is no need to use a correction factor more than 20 dB. Therefore, a 20 dB factor was used.

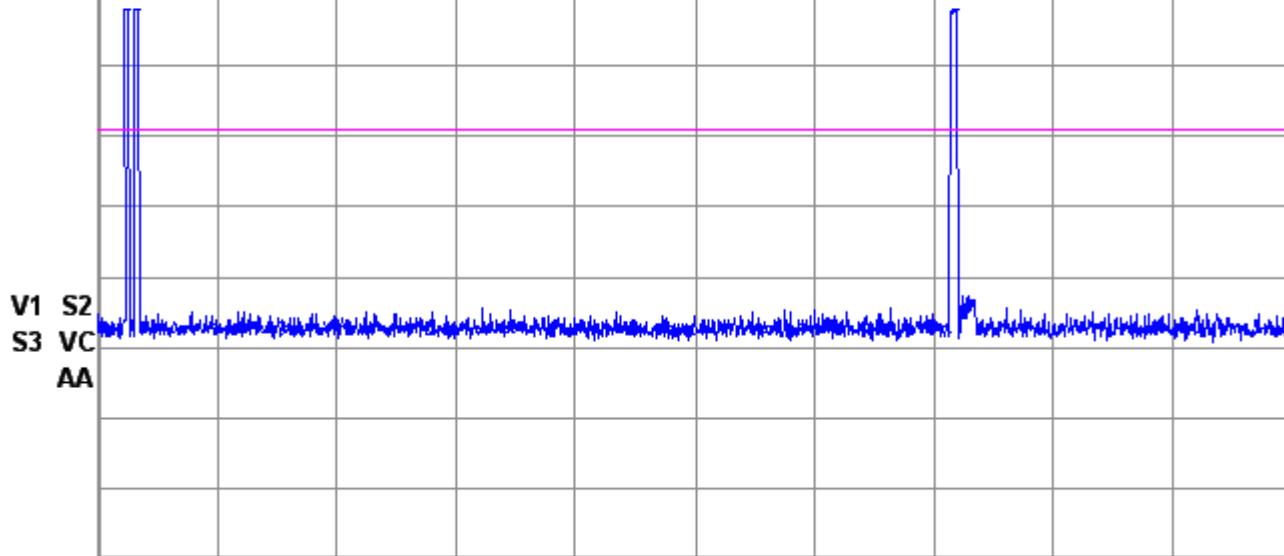




2426MHz

Ref 0 dBm

Atten 10 dB

Peak
Log
10
dB/

11.1.3 Radiated Emissions Test Results

Test Date	June 10 & 11, 2024
EUT	Model: TAG-010A, Serial #: S1
Test Distance	3 Meters
Specification	FCC Part 15 Subpart C & RSS-210 Section B.10
Notes	Corr. Factors = cable loss - preamp gain
Abbreviations	Pol = Antenna Polarization; V = Vertical; H = Horizontal; P = peak; Q = QP
Configuration	The EUT is in the transmit mode with the receiver on

This table includes all emissions except Fundamental, Band edge, and harmonics emissions.

Freq. MHz	Meter Reading dBuV	Dect.	Ant. Pol.	Ant Factor dB/m	Corr. Factors	Dist Fact dB	EUT dBuV/m	Limit dBuV/m	Margin Under Limit dB	Note
33.5	13.6	P	H	12.3	0.3	0.0	26.2	40.0	13.8	
45.3	12.6	P	H	9.9	0.4	0.0	22.9	40.0	17.1	
59.6	13.7	P	H	8.8	0.4	0.0	22.9	40.0	17.1	
69.6	12.9	P	H	8.9	0.5	0.0	22.3	40.0	17.7	
80.4	12.9	P	H	9.0	0.5	0.0	22.4	40.0	17.6	
91.9	12.6	P	H	9.6	0.5	0.0	22.7	43.5	20.8	
107.9	13.1	P	H	10.7	0.5	0.0	24.3	43.5	19.2	
129.5	13.7	P	H	11.9	0.6	0.0	26.2	43.5	17.3	
149.7	14.4	P	H	12.6	0.7	0.0	27.7	43.5	15.8	
173.1	13.9	P	H	13.2	0.7	0.0	27.8	43.5	15.7	
194.8	13.4	P	H	14.1	0.7	0.0	28.2	43.5	15.3	
216.9	15.4	P	H	14.7	0.8	0.0	30.9	46.0	15.1	
243.5	13.7	P	H	15.1	0.8	0.0	29.6	46.0	16.4	



Freq. MHz	Meter Reading dBuV	Dect.	Ant. Pol.	Ant Factor dB/m	Corr. Factors	Dist Fact dB	EUT dBuV/m	Limit dBuV/m	Margin Under Limit dB	Note
287.3	8.6	P	H	13.9	0.9	0.0	23.4	46.0	22.6	
324.4	8.9	P	H	14.2	1.0	0.0	24.1	46.0	21.9	
364.3	9.1	P	H	14.5	1.0	0.0	24.6	46.0	21.4	
389.5	10.3	P	H	15.1	1.1	0.0	26.5	46.0	19.5	
426.8	9.5	P	H	15.9	1.1	0.0	26.5	46.0	19.5	
477.5	10.2	P	H	17.1	1.2	0.0	28.5	46.0	17.5	
488.4	9.9	P	H	17.4	1.2	0.0	28.5	46.0	17.5	
575.1	8.8	P	H	18.3	1.3	0.0	28.4	46.0	17.6	
649.6	9.1	P	H	19.7	1.4	0.0	30.2	46.0	15.8	
721.7	8.7	P	H	21.1	1.4	0.0	31.2	46.0	14.8	
800.8	9.3	P	H	21.4	1.6	0.0	32.3	46.0	13.7	
877.4	9.9	P	H	22.7	1.6	0.0	34.2	46.0	11.8	
948.9	8.6	P	H	23.3	1.7	0.0	33.6	46.0	12.4	
1245.2	41.5	P	H	24.9	-34.3	0.0	32.1	74.0	41.9	1
1471.5	42.3	P	H	25.1	-34.4	0.0	33.0	74.0	41.0	1
1716.7	42.0	P	H	26.4	-34.2	0.0	34.2	74.0	39.8	1
1921.9	46.9	P	H	27.1	-34.2	0.0	39.8	74.0	34.2	1
2250.3	42.3	P	H	27.9	-34.3	0.0	35.9	74.0	38.1	1
2412.4	54.5	P	H	28.3	-33.7	0.0	49.1	74.0	24.9	1
2737.7	43.4	P	H	29.1	-33.4	0.0	39.1	74.0	34.9	1
2971.0	44.8	P	H	29.9	-33.3	0.0	41.4	74.0	32.6	1
3248.2	40.9	P	H	31.0	-32.7	0.0	39.2	74.0	34.8	1
3481.5	41.6	P	H	31.2	-32.5	0.0	40.3	74.0	33.7	1
3740.7	41.0	P	H	32.3	-32.3	0.0	41.0	74.0	33.0	1
3960.0	40.4	P	H	32.8	-31.9	0.0	41.3	74.0	32.7	1
4245.2	42.0	P	H	32.4	-31.8	0.0	42.6	74.0	31.4	1
4486.5	40.1	P	H	32.9	-31.4	0.0	41.6	74.0	32.4	1
4744.7	40.3	P	H	33.4	-31.0	0.0	42.7	74.0	31.3	1
4918.9	40.2	P	H	33.5	-30.8	0.0	42.9	74.0	31.1	1
33.1	19.6	P	V	12.3	0.3	0.0	32.2	40.0	7.8	
41.1	20.8	P	V	10.5	0.3	0.0	31.6	40.0	8.4	
62.7	18.2	P	V	9.0	0.4	0.0	27.6	40.0	12.4	
74.0	18.4	P	V	9.2	0.5	0.0	28.1	40.0	11.9	
82.4	13.7	P	V	9.3	0.5	0.0	23.5	40.0	16.5	
95.5	18.4	P	V	9.9	0.5	0.0	28.8	43.5	14.7	
109.0	13.5	P	V	10.7	0.5	0.0	24.7	43.5	18.8	
127.3	13.8	P	V	11.9	0.6	0.0	26.3	43.5	17.2	
153.4	18.2	P	V	12.7	0.7	0.0	31.6	43.5	11.9	
173.8	15.1	P	V	13.2	0.7	0.0	29.0	43.5	14.5	
196.4	14.2	P	V	14.1	0.8	0.0	29.1	43.5	14.4	
219.4	16.5	P	V	14.8	0.8	0.0	32.1	46.0	13.9	
240.2	14.8	P	V	15.1	0.8	0.0	30.7	46.0	15.3	
288.6	8.9	P	V	13.9	0.9	0.0	23.7	46.0	22.3	
325.2	9.2	P	V	14.2	1.0	0.0	24.4	46.0	21.6	
362.5	8.9	P	V	14.5	1.0	0.0	24.4	46.0	21.6	
397.8	9.6	P	V	15.3	1.1	0.0	26.0	46.0	20.0	
441.2	9.9	P	V	16.2	1.1	0.0	27.2	46.0	18.8	
476.3	10.5	P	V	17.1	1.2	0.0	28.8	46.0	17.2	
574.6	8.3	P	V	18.3	1.3	0.0	27.9	46.0	18.1	
648.1	10.3	P	V	19.7	1.4	0.0	31.4	46.0	14.6	
722.7	8.0	P	V	21.1	1.4	0.0	30.5	46.0	15.5	
794.8	8.6	P	V	21.3	1.5	0.0	31.4	46.0	14.6	
876.4	9.2	P	V	22.7	1.6	0.0	33.5	46.0	12.5	
947.9	8.5	P	V	23.3	1.7	0.0	33.5	46.0	12.5	



Freq. MHz	Meter Reading dBuV	Dect.	Ant. Pol.	Ant Factor dB/m	Corr. Factors	Dist Fact dB	EUT dBuV/m	Limit dBuV/m	Margin Under Limit dB	Note
1240.2	41.7	P	V	24.9	-34.4	0.0	32.2	74.0	41.8	1
1471.5	41.8	P	V	25.1	-34.4	0.0	32.5	74.0	41.5	1
1669.7	42.3	P	V	26.0	-34.3	0.0	34.0	74.0	40.0	1
1921.9	52.1	P	V	27.1	-34.2	0.0	45.0	74.0	29.0	1
2231.2	42.3	P	V	27.8	-34.1	0.0	36.0	74.0	38.0	1
2411.4	62.8	P	V	28.3	-33.7	0.0	57.4	74.0	16.6	1
2597.6	49.4	P	V	28.7	-33.5	0.0	44.6	74.0	29.4	1
2913.9	44.1	P	V	29.6	-33.3	0.0	40.4	74.0	33.6	1
3258.3	42.2	P	V	31.1	-32.6	0.0	40.7	74.0	33.3	1
3497.5	41.9	P	V	31.2	-32.5	0.0	40.6	74.0	33.4	1
3711.7	41.3	P	V	32.1	-32.4	0.0	41.0	74.0	33.0	1
3868.9	41.0	P	V	32.8	-32.1	0.0	41.7	74.0	32.3	1
4253.3	40.7	P	V	32.4	-31.8	0.0	41.3	74.0	32.7	1
4479.5	40.1	P	V	32.9	-31.4	0.0	41.6	74.0	32.4	1
4689.7	40.1	P	V	33.3	-31.2	0.0	42.2	74.0	31.8	1
4851.9	47.7	P	V	33.5	-31.0	0.0	50.2	74.0	23.8	1

Judgment: Passed by 7.8 dB



Fundamental and Harmonic Emissions FCC 15.249; Three axis

hrm	Tx	Spectrum Analyzer Readings dBuV								EUT	Peak	Ave	Peak	Ave	Margin	
		Peak		Ave		Peak		Ave								Under
#	MHz	Vertical Polarization				Horizontal Polarization				Fact dB/m	Freq MHz	dBuV/m		dBuV/m		Limit dB
		X	Y	Z	Max	X	Y	Z	Max			81.0	61.0	114	94	33.0
1	2402	73.3	77.6	83.9	63.9	86.5	78.8	69.4	66.5	-5.5	2402.0	81.0	61.0	114	94	33.0
BE	2402	36.9	41.4	48.1	28.1	49.0	42.5	32.8	29.0	3.5	2390.0	52.5	32.5	74	54	21.5
2	2402	46.0	51.9	48.8	31.9	52.8	50.0	55.1	35.1	2.3	4804.0	57.4	37.4	74	54	16.6
3	2402	42.9	49.5	46.7	29.5	45.6	48.3	47.2	28.3	7.1	7206.0	56.6	36.6	74	54	17.4
4	2402	41.6	43.0	42.1	23.0	39.3	42.1	43.4	23.4	10.5	9608.0	53.9	33.9	74	54	20.1
1	2426	75.2	78.3	79.8	59.8	87.0	80.5	70.6	67.0	-5.5	2426.0	81.5	61.5	114	94	32.5
2	2426	47.5	53.9	49.9	33.9	49.2	47.9	51.8	31.8	2.5	4852.0	56.4	36.4	74	54	17.6
3	2426	43.3	48.2	48.1	28.2	49.3	47.8	45.7	29.3	7.3	7278.0	56.6	36.6	74	54	17.4
4	2426	39.8	41.8	41.9	21.9	44.7	45.0	41.7	25.0	10.8	9704.0	55.8	35.8	74	54	18.2
1	2480	74.5	76.9	83.7	63.7	82.3	78.3	69.9	62.3	-5.3	2480.0	78.4	58.4	114	94	35.6
BE	2480	34.9	38.2	45.1	25.1	43.7	39.4	30.3	23.7	4.4	2483.5	49.5	29.5	74	54	24.6
2	2480	44.3	49.8	47.9	29.8	53.1	47.2	50.4	33.1	2.7	4960.0	55.8	35.8	74	54	18.2
3	2480	40.7	43.6	45.0	25.0	43.4	46.0	43.7	26.0	8.0	7440.0	54.0	34.0	74	54	20.0
4	2480	39.7	40.1	41.5	21.5	44.0	44.2	40.0	24.2	11.2	9920.0	55.4	35.4	74	54	18.6
Column numbers (see below for explanations)																
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

Column #1. hrm = Harmonic; BE = Band Edge emissions

Column #2. Frequency of Transmitter.

Column #3. Uncorrected readings from the spectrum analyzer with First Axis Rotation.

Column #4. Uncorrected readings from the spectrum analyzer with Second Axis Rotation.

Column #5. Uncorrected readings from the spectrum analyzer with Third Axis Rotation.

Column #6. Average Reading based on peak reading reduced by the Duty cycle correction

Column #7. Uncorrected readings from the spectrum analyzer with First Axis Rotation.

Column #8. Uncorrected readings from the spectrum analyzer with Second Axis Rotation.

Column #9. Uncorrected readings from the spectrum analyzer with Third Axis Rotation.

Column #10. Average Reading based on peak reading reduced by the Duty cycle correction

Column #11. Corr. Factors = Cable Loss – Preamp Gain + Antenna Factor

Column #12. Frequency of Tested Emission

Column #13. Highest peak field strength at listed frequency.

Column #14. Highest Average field strength at listed frequency.

Column #15. Peak Limit.

Column #16. Average Limit.

Column #17. The margin (last column) is the worst-case margin under the peak or average limits for that row.

Overall Judgment: Passed by at least 10 dB

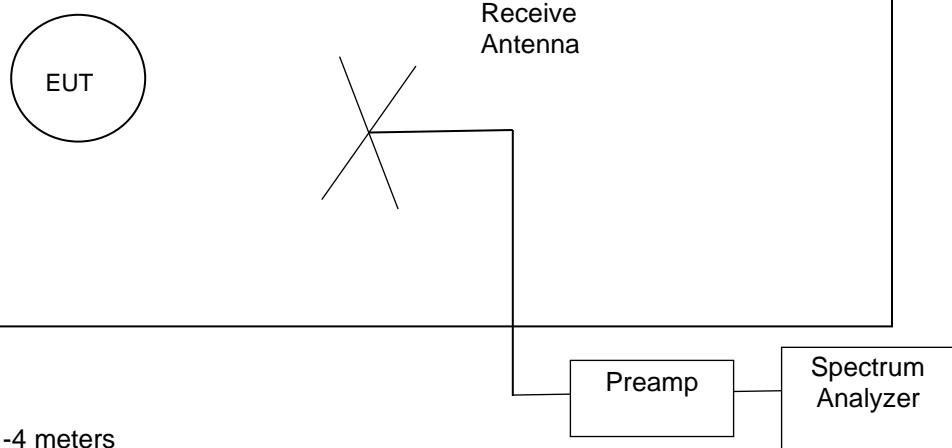
No other Emissions were detected from 30 to 25,000 MHz within 10 dB of the limits.



Figure 1. Drawings of Radiated Emissions Setup

Chamber E, anechoic

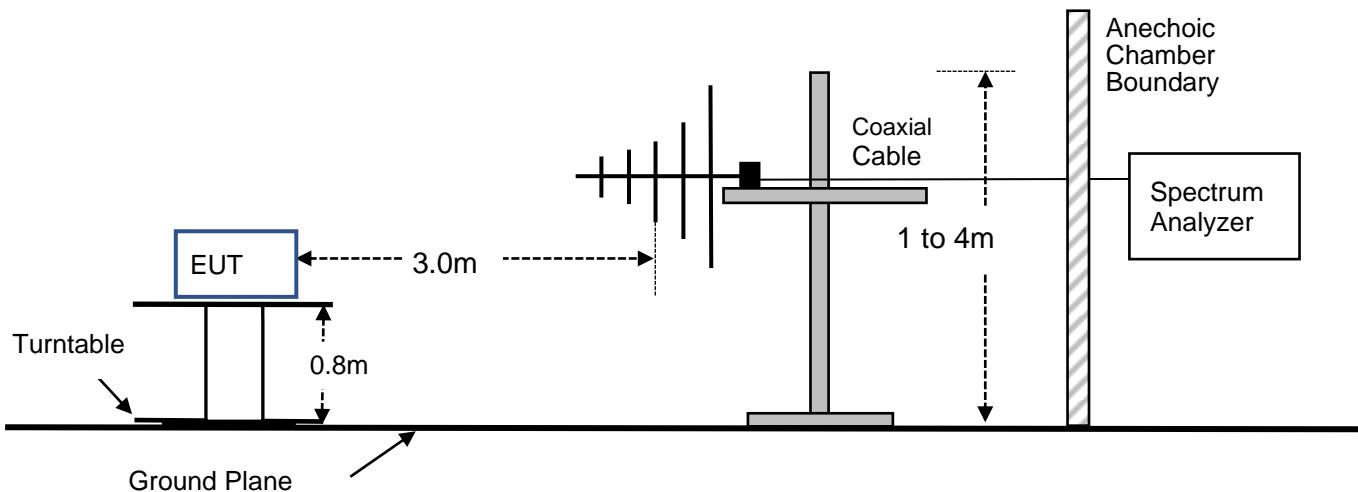
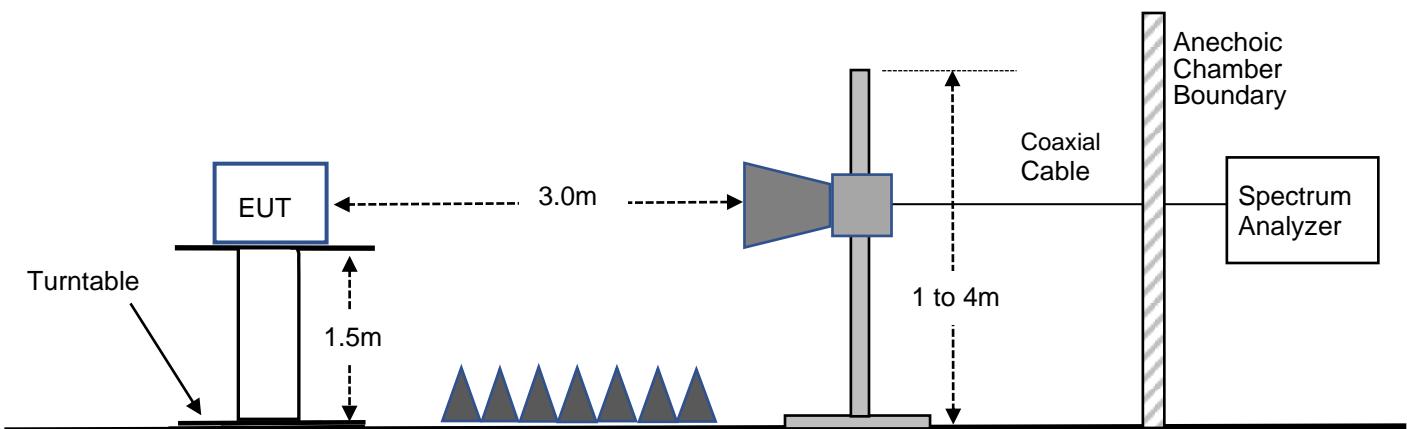
EUT was standing on an 80 cm table below 1 GHz, and a 150 cm table above 1 GHz. The table was on a flush turntable

**Notes:**

- Not to Scale
- Antenna height varied 1-4 meters
- Distance from antenna to tested system is 3 meters
- AC cords not shown. They are connected to AC outlet with low-pass filter on turntable

Frequency Range	Receive Antenna	Pre-Amplifier	Spectrum Analyzer	High Pass Filter
30 to 200 MHz	ANT-80	None	REC-21	None*
200 to 1000 MHz	ANT-68	None	REC-21	None*
1 to 10 GHz	ANT-66	AMP-05	REC-21	HPF-06
10 to 18 GHz	ANT-66	AMP-20	REC-21	None*

* A high pass filter was not needed since the fundamental frequency was outside of the amplifiers pass band.

**Radiated Emissions Test Setup for Frequencies from 30MHz to 1000MHz (Side View)****Radiated Emissions Test Setup for Frequencies over 1000MHz (Side View)**



11.2 Occupied Bandwidth Data

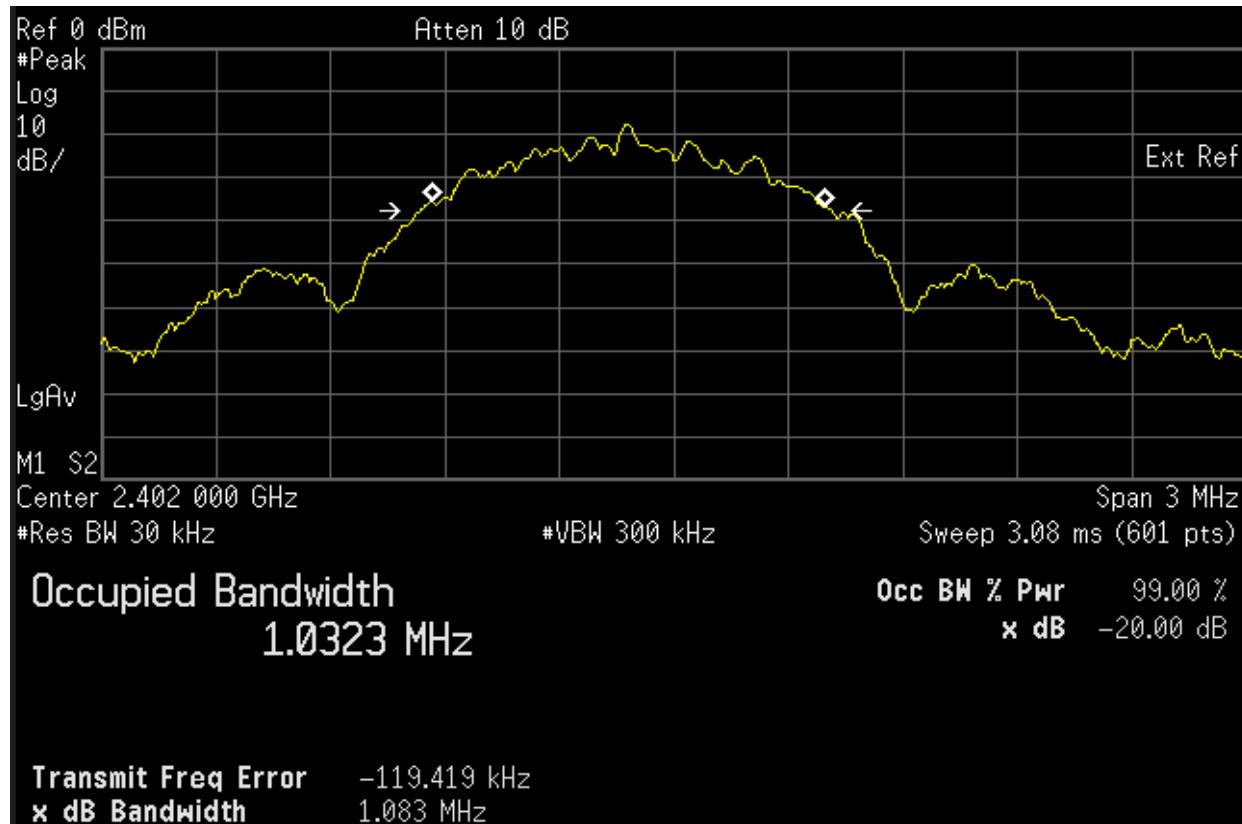
The occupied bandwidth of the RF output was measured using a spectrum analyzer. The bandwidth was measured using the peak detector function. The spectrum analyzer has a function to measure 99% OBW. It was set to the MAX HOLD mode to record the worst case of the modulation. The plots of the occupied bandwidth for the EUT are supplied on the following pages.

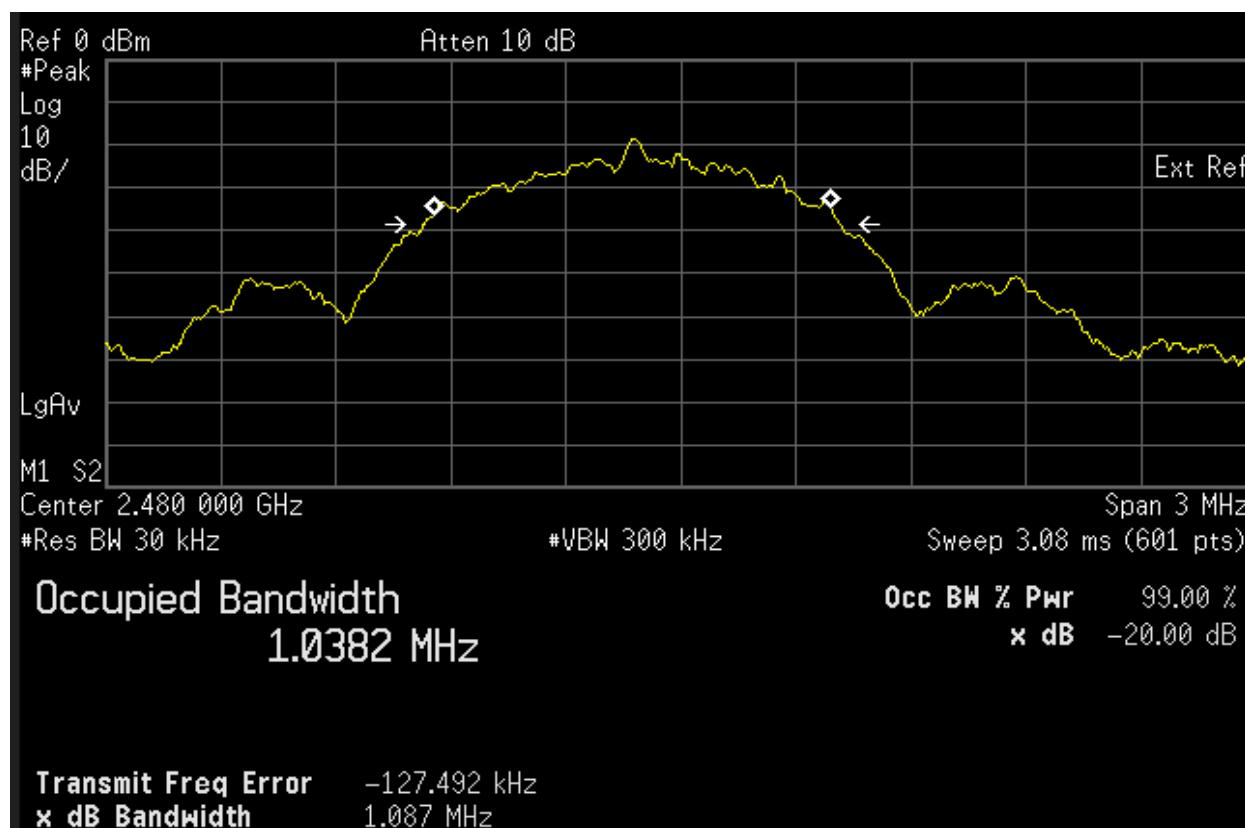
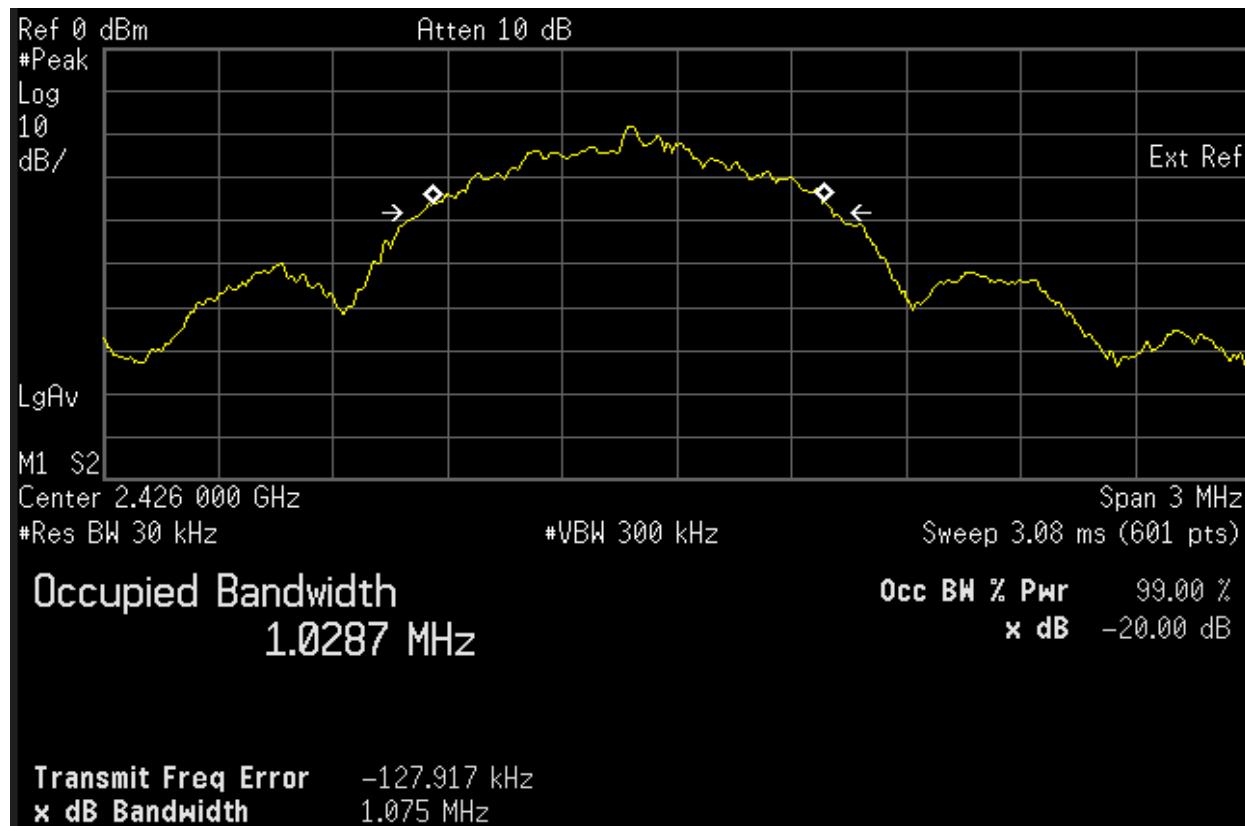
Test Date	July 24, 2024
EUT	Model: TAG-010A Serial # S1
Test Equipment	REC-44

The 99% OBW is within the allowed 2400 to 2483.5 MHz authourized band.

Channel	99% OBW MHz
2402	1.0323
2440	1.0287
2480	1.0382

Figure 2. Occupied Bandwidth Plot







11.2.1 Measurement Instrumentation Uncertainty

Measurement	Uncertainty
Radiated Emissions, E-field, 3 meters, 30 to 200 MHz	4.8 dB
Radiated Emissions, E-field, 3 meters, 200 to 1000 MHz	4.6 dB
Radiated Emissions, E-field, 3 meters, 1 to 6 GHz	5.0 dB
Radiated Emissions, E-field, 3 meters, 6 to 18 GHz	5.5 dB
Radiated Emissions, E-field, 3 meters, 18 to 26 GHz	5.9 dB
Bandwidth using marker delta method at a span of 3 MHz	4 kHz
Temperature THM-02	0.6 Deg C

The uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2 in accordance with CISPR 16-4-2.

12.0 REVISION HISTORY

Document RP-10002 Revisions:			
Rev.	Affected Sections	Description	Rationale