

Testing Tomorrow's Technology

**Application
For**

**Part 2, Subpart J, Paragraph 2.907 Equipment Authorization of Certification for an
Intentional Radiator per Part 15, Subpart C, paragraphs 15.207, 15.209 and 15.247**

For the

Okyanus Teknoloji Bilgisayar ve Yazilim San.Tic.

Model Number: FT-06FLC

FCC ID: 2AUFI-FT-06FLC

UST Project: 20-0196

Issue Date: June 25, 2020

Total Pages:46

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I certify that I am authorized to sign for the Test Agency and that all of the statements in this report and in the Exhibits attached hereto are true and correct to the best of my knowledge and belief:

US TECH (Agent Responsible For Test):

By: Alan Ghasiani

Name: Alan Ghasiani

Title: Compliance Engineer – President

Date: June 25, 2020



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MEASUREMENT TECHNICAL REPORT

COMPANY NAME: OKYANUS TEKNOLOJİ BİLGİSAYAR VE YAZILIM SAN. TİC.LTD.STİ.
MODEL: FT-06FLC
FCC ID: 2AIFI-FT-06FLC
DATE: June 25, 2020

This report concerns (check one): Original grant Class II Permissive Change

Equipment type: 2.4 GHz Transmitter Module (IEEE 802.15.4)

Transmitter details:

IEEE 802.15.4 transceiver device

Frequency of operation: 2405-2480 MHz

Type of modulation: O-QPSK

Data/Bit Rate: 250 kbps

Antenna Gain: 2.8 dBi

Maximum Output Power: +9.0 dBm

Software used to program EUT: N/A

EUT firmware number: N/A

Power setting: 22

Collocated Transmitter:

UWB radio module(x2): FCC ID: 2AIFI-UWB001 (pending approval)

IEEE 802.15.4 radio module: FCC ID: TYOJN5168M0

Summary of Test Results

FCC Rule	Description of Test	Result
15.247(b)(3)	Peak Output Power	PASS
15.247(a)(2)	6 dB Bandwidth	PASS
15.247(d)	Conducted & Radiated Spurious Emissions	PASS
15.247(e)	Power Spectral Density	PASS
15.209	Spurious Radiated Emissions	PASS
15.207	Power line Conducted Emissions	PASS

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FCC Agency Agreement	Test Configuration Photographs
FCC Application Forms	External Photographs
Letter of Confidentiality	Internal Photographs
Equipment Label(s)	Theory of Operation
Block Diagram(s)	User's Manual
Schematic(s)	RF Exposure

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1 General Information

1.1 Purpose of this Report

This report is prepared to show that the OKYANUS TEKNOLOJİ BİLGİSAYAR VE YAZILIM SAN. TIC. Model FT-06FLC complies with the FCC Rules and Regulations of Part 15.247 Subpart C, technical requirements for intentional radiators.

1.2 Characterization of Test Sample

The sample used for testing was received by US Tech on June 8, 2020 in good operating condition.

1.3 Product Description

The Equipment under Test (EUT) is the Wipelot Safezone Device, Model FT-06FLC. The EUT is a member of the Wipelot solution family. This particular member is a reader that is installed on vehicles to constantly monitor the surrounding and measure the distance between mobile devices and the vehicle to avoid collisions. If a mobile tag is detected within a safety zone, the reader sends a signal via RS-232 to the vehicle warning the operator.

The EUT incorporates four wireless radio modules. The first two are 2.4 GHz ISM band radios utilizing IEEE 802.15.4 technology and the last two are radios that utilizes Ultra-Wide Band (UWB) technology and operates at 4.4 GHz. The radio module used in location U1 is being certified along with the host device as an intentional radiator device. The radio used in location U11 is being used as a receiver only radio and is a collocated radio. The radio used in location U50 and U60 are identical radio modules. They are UWB radio's and are pending FCC certification as a modular radio. This UWB radio has been evaluated in a separate test report, see US Tech report 20-0187 for FCC ID: 2AIFI-UWB001.

Radio location	FCC ID:	Comments:
U1	2AIFI-FT-06FLC	Pending FCC approval in this test report.
U11	TYOJN5168M0	Modular Approved radio. Used per grant requirements.
U50	2AIFI-UWB001	Pending FCC Modular approval in a separate test report. Collocated radio in this test report.
U60	2AIFI-UWB001	Pending FCC Modular approval in a separate test report. Collocated radio in this test report.

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1.4 Configuration of Tested System

The Test Sample was tested per *ANSI C63.10:2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices* for the intentional radiator aspect of the device and *ANSI C63.4:2014, Methods of Measurement of Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (2014)* for the unintentional radiator aspect of the device as well as FCC subpart B and C of Part 15 and per FCC KDB Publication number 558074 v03r05 for Digital Transmission Systems Operating Under section 15.247.

Digital RF conducted and radiated emissions data below 1 GHz were taken with the measuring receiver (or spectrum analyzer's) resolution bandwidth adjusted to 9 kHz and 120 kHz, respectively. All measurements performed above 1.0 GHz were made with a RBW of 1 MHz. All measurements are peak unless stated otherwise. The video filter associated with the spectrum analyzer was set to 3 times the RBW or as required per the standard throughout the evaluation process.

A list of EUT and Peripherals is found in Table 1 below. A block diagram of the tested system is shown in Figure 1. Test configuration photographs for spurious and fundamental emissions are provided in separate Appendices.

Table 1. EUT and Peripherals

EUT/PERIPHERAL MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC/IC ID	CABLES P/D
EUT Okyanus Teknoloji Bilgisayar ve Yazılım San.Tic.	FT-06FLC	2506200001	2AUFI-FT-06FLC	P
12V Power Adapter Kuanten	SSA101F1201 00E2	1716	N/A	P
Antenna See antenna details	--	--	--	--

S= Shielded, U= Unshielded, P= Power, D= Data

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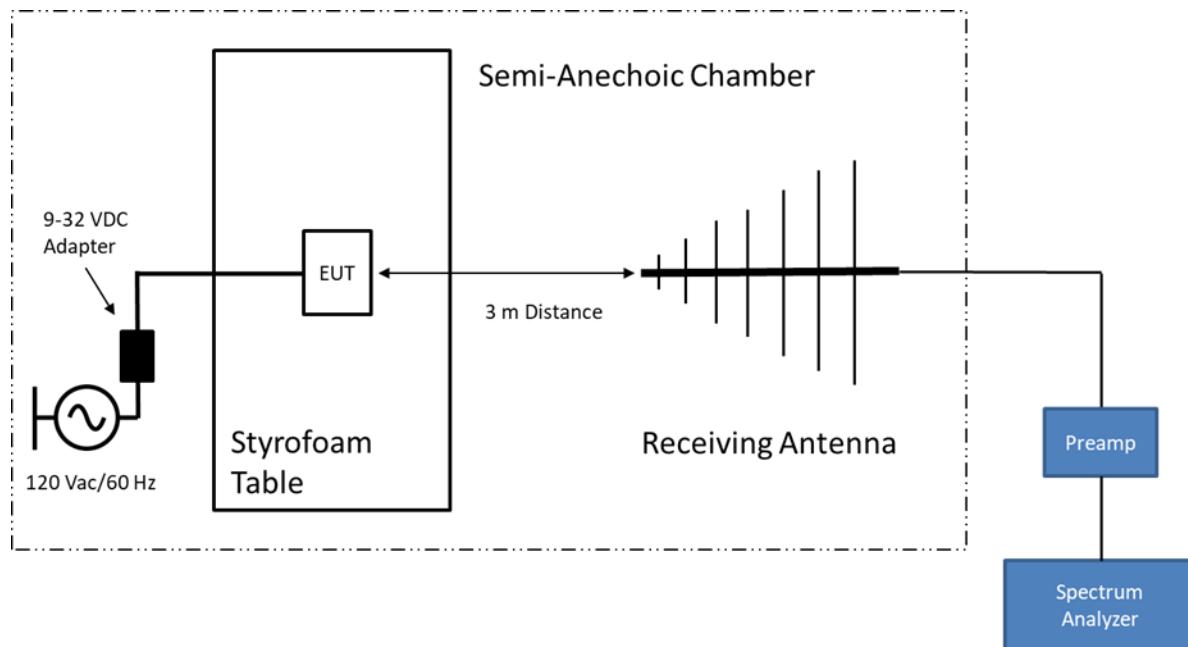


Figure 1. Block Diagram of Test Configuration

1.5 Test Facility

Testing was performed at US Tech's measurement facility at 3505 Francis Circle, Alpharetta, GA 30004. This site has been fully described and registered with the FCC. Its designation number is US5301. Additionally this site has also been fully described and submitted to Industry Canada (IC), and has been approved under file number 9900A-1.

1.6 Related Submittal(s)/Grant(s)

The EUT is subject to the following FCC Equipment Authorizations:

- a) Certification of the transmitter incorporated within the EUT, see test data presented herein.

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2 Tests and Measurements

2.1 Test Equipment

The table below lists test equipment used to evaluate this product. Model numbers, serial numbers and their calibration status are included herein.

Table 2. Test Instruments

TEST INSTRUMENT	MODEL NUMBER	MANUFACTURER	SERIAL NUMBER	CALIBRATION DUE DATE
SPECTRUM ANALYZER	E4407B	AGILENT	US41442935	8/17/2020
SPECTRUM ANALYZER	8593E	HEWLETT-PACKARD	3205A00124	1/29/2022 2 yr. cal.
RF PREAMP 100 kHz to 1.3 GHz	8447D	HEWLETT-PACKARD	1937A02980	5/13/2021
RF PREAMP 1.0 GHz to 26.0 GHz	8449B	HEWLETT-PACKARD	3008A00480	5/13/2021
LOOP ANTENNA	6502	EMCO	9810-3246	4/6/2022 2 yr. cal.
BICONICAL ANTENNA	3110B	EMCO	9307-1431	6/27/2021 2 yr. cal.
LOG PERIODIC ANTENNA	3146	EMCO	9305-3600	2/1/2021 2 yr. cal.
HORN ANTENNA	3115	EMCO	9107-3723	11/28/2020 2 yr. cal.
HIGH PASS FILTER	H3R020G2	MICROWAVE CIRCUITS	001DC9528	5/11/2021
8 dB ATTENUATOR	VAT-8 15542	MINI-CIRCUITS	30519	Verified before use
LISN x2	9247-50- TS-50-N	Solar Electronics	955824 & 955825	5/11/2021

Note: The calibration interval of the above test instruments are 12 months unless stated otherwise and all calibrations are traceable to NIST/USA.

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2.2 Modifications to EUT Hardware

No modifications were made by US Tech to bring the EUT into compliance with FCC Part 15.247 requirements.

2.3 Number of Measurements for Intentional Radiators (15.31(m))

Measurements of intentional radiators or receivers shall be performed and reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in Table 3 as follows:

Table 3. Number of Test Frequencies for Intentional Radiators

Frequency Range over which the device operates	Number of Frequencies	Location in the Range of operation
1 MHz or less	1	Middle
1 to 10 MHz	2	1 near the top 1 near the bottom
Greater than 10 MHz	3	1 near top 1 near middle 1 near bottom

Because the EUT operates over 2.4 GHz to 2.4835 GHz, 3 test frequencies will be used.

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2.4 Frequency Range of Radiated Measurements (Part 15.33)

2.4.1 Intentional Radiator

The spectrum shall be investigated for the intentional radiator from the lowest RF signal generated in the EUT without going below 9 kHz to the 10th harmonic of the highest fundamental frequency generated or 40 GHz, whichever is the lowest.

2.4.2 Unintentional Radiator

For the digital device, an unintentional radiator, the frequency range shall be investigated from 30 MHz to 1000 MHz, or to the range specified in 2.4.1 above, whichever is the higher range of investigation.

2.5 Measurement Detector Function and Bandwidth (CFR 15.35)

The radiated and conducted emissions limits shown herein are based on the following parameters:

2.5.1 Detector Function and Associated Bandwidth

On frequencies below 1000 MHz, the limits herein are based upon measurement equipment employing a CISPR quasi-peak detector function and related measurement bandwidths (i.e. 9 kHz from 150 kHz to 30 MHz and 120 kHz from 30 MHz to 1000 MHz). Alternatively, measurements may be made with equipment employing a peak detector function as long as the same bandwidths specified for the quasi-peak device are used.

2.5.2 Corresponding Peak and Average Requirements

Above 1000 MHz, radiated limits are based on measuring instrumentation employing an average detector function. When average radiated emissions are specified there is also a corresponding peak requirement, as measured using a peak detector, of 20 dB greater than the average limit. For all measurements above 1000 MHz the resolution bandwidth shall be at least 1 MHz.

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2.6 EUT Antenna Requirements (CFR 15.203)

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. Only the antenna(s) listed in Table 4 will be used with this module.

Table 4. Allowed Antenna(s)

REPORT REFERENCE	MANUFACTURER	TYPE OF ANTENNA	MODEL	GAIN dB _i	TYPE OF CONNECTOR
Flat Patch Antenna	Antenova	Flex Flat Patch	SRF2W021 -100	2.8	U.FL

2.7 Restricted Bands of Operation (Part 15.205)

Only spurious emissions can fall in the frequency bands of CFR 15.205. The field strength of these spurious emissions cannot exceed the limits of 15.209. Radiated harmonics and other spurious emissions are examined for this requirement (see paragraph 2.10).

2.8 Transmitter Duty Cycle (Part15.35 (c))

The EUT employs pulse transmission however for testing purpose the EUT was programmed to transmit at a rate >98%. The pulse transmission requirements of this subpart were acknowledged and considered during testing.

When the radiated emissions limit is expressed as an average value, and the transmitter is pulsed, the measured field strength shall be determined by applying a Duty Cycle Correction Factor based upon dividing the total ON time during the first 100 ms period by 100 ms (or by the period if less than 100 ms). The duty cycle may also be expressed logarithmically in dB.

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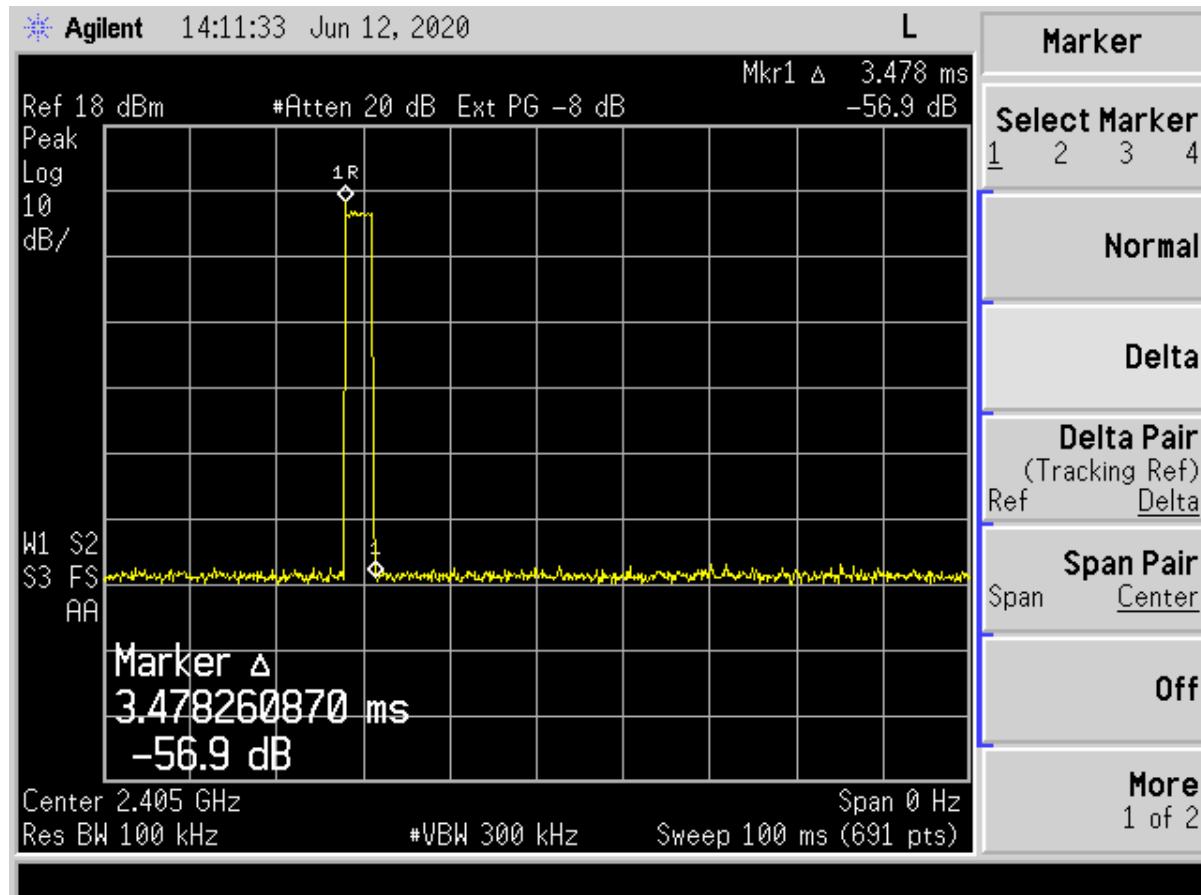


Figure 2. Duty Cycle Plots

Duty Cycle Factor= $20 \log (\text{TX on}/100 \text{ msec}) = 20 \log (3.48/100 \text{ msec}) = -29.17 \text{ dB}$

For all measurements where the Duty Cycle Factor is used, the value of -20 dB shall be used in place of the actual calculated value: -29.17 dB.

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2.9 Antenna Conducted Intentional and Spurious Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a))

The EUT does not provide access to an antenna port; therefore, the EUT was put into a continuous-transmit mode of operation and tested per ANSI C63.10-2013 for radiated out of band emissions over the frequency range of 30 MHz to 10 times the highest clock frequency generated or used. In this case, the EUT was tested up to 25 GHz. A radiated scan was performed on the EUT to identify and record spurious signals that were related to the transmitter. Antenna radiated emissions of a significant magnitude that fell within restricted bands were then maximized in a semi-anechoic chamber. The radiated emissions graphs are found in Figures 3 through 8 following. The limit for antenna radiated power is 0.0459 Watt (-41.23 dBm (EIRP)) per 15.247 (b)(3).

For radiated RF antenna tests, the RBW was set to 120 kHz and video bandwidth (VBW)> RBW over a frequency range of 30 MHz to 1 GHz. For the frequency range above 1 GHz and up to the 10th harmonic of the fundamental frequency, the RBW was set to 1 MHz and VBW>RBW. All harmonics/spurs must be at least 20 dB down from the highest emission level within the authorized band.

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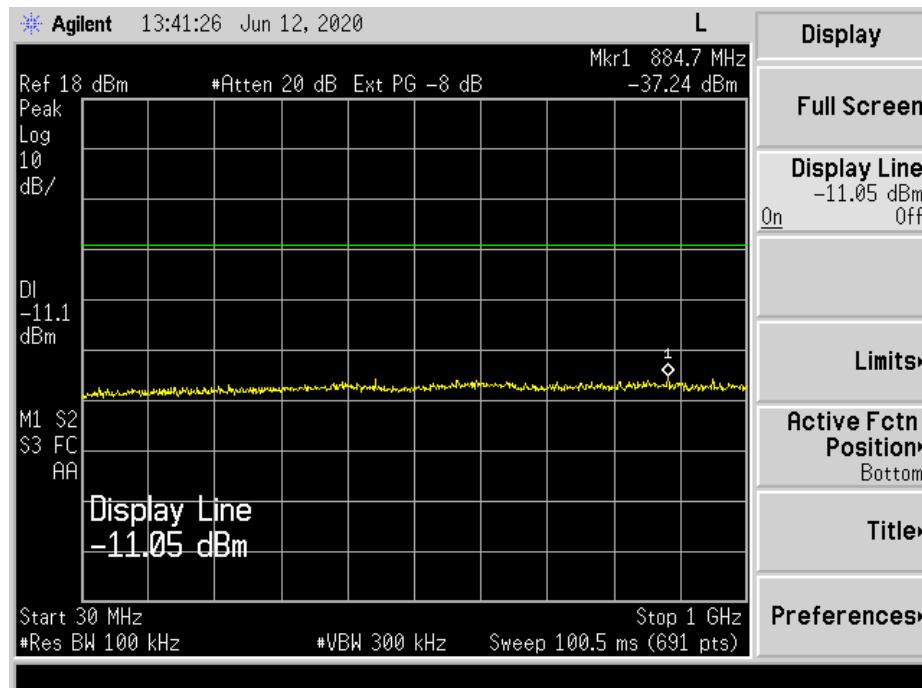


Figure 3. Low Channel, 30 - 1000 MHz

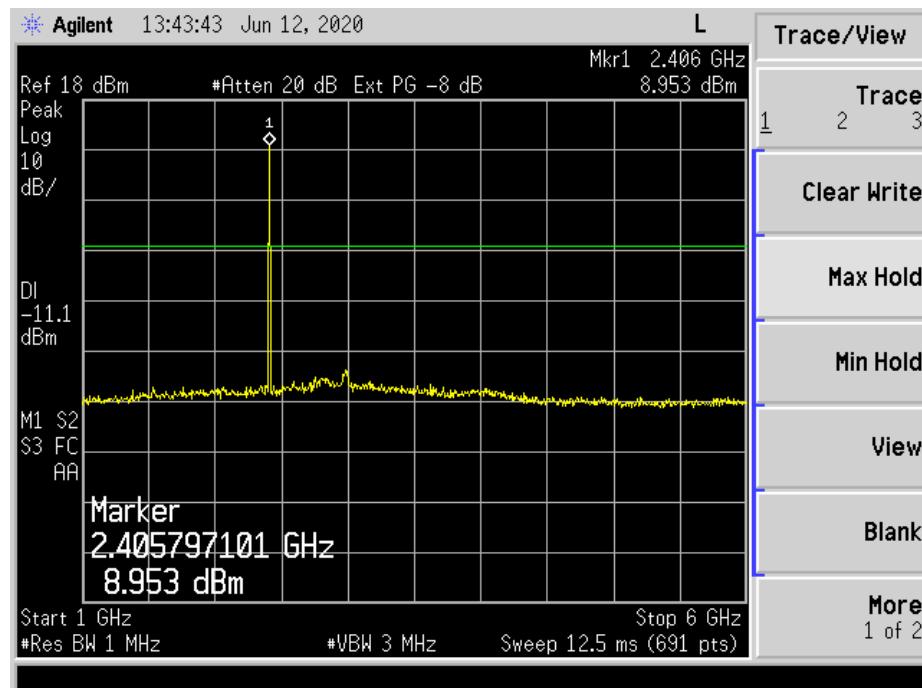


Figure 4. Low Channel, 1 GHz - 6 GHz

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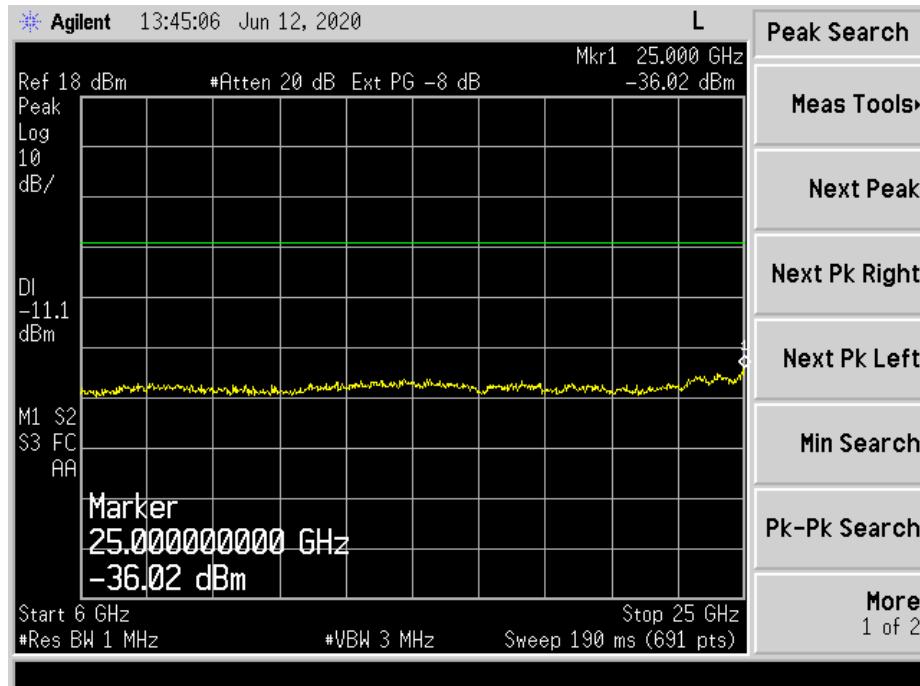


Figure 5. Low Channel, 6 GHz - 25 GHz

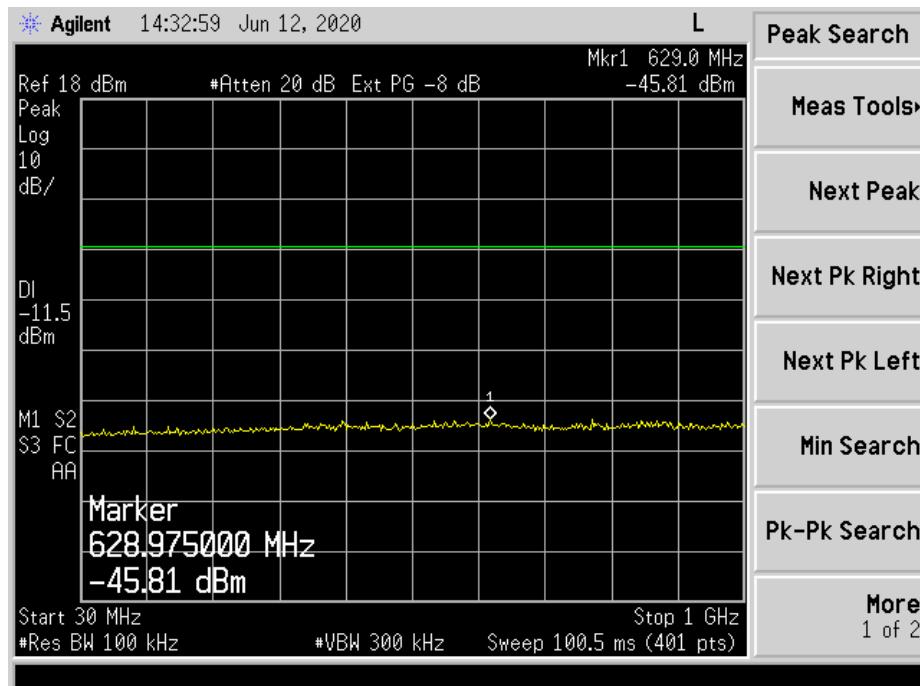


Figure 6. Mid Channel, 30 MHz - 1000 MHz

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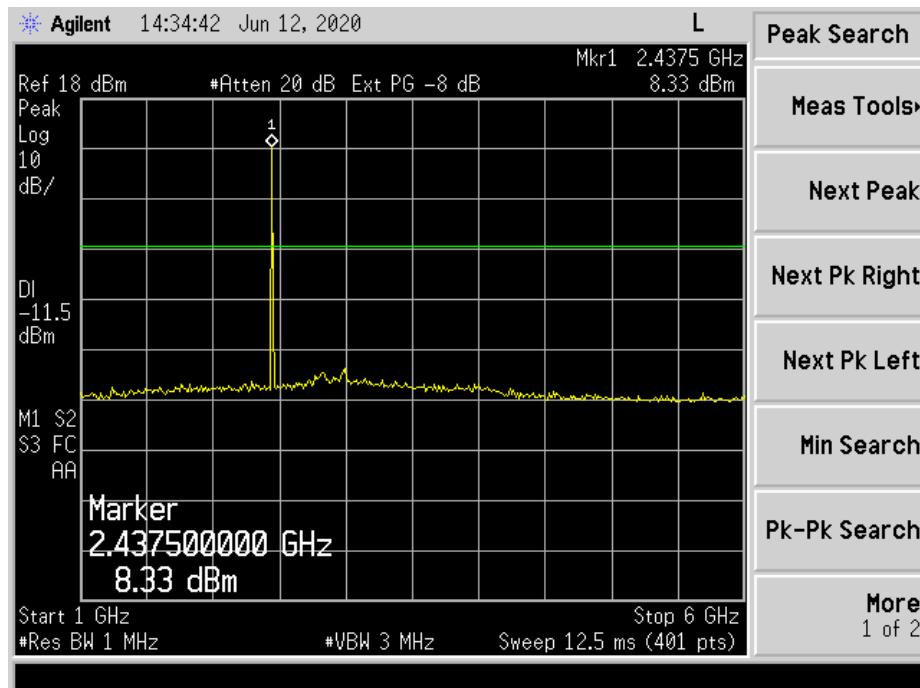


Figure 7. Mid Channel, 1 GHz - 6 GHz

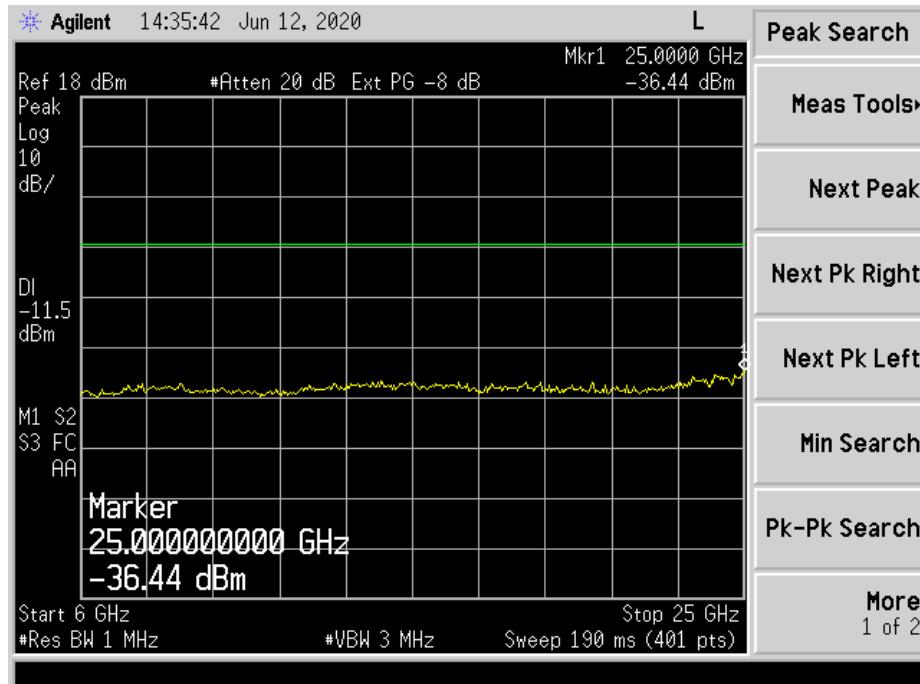


Figure 8. Mid Channel, 6 GHz - 25 GHz

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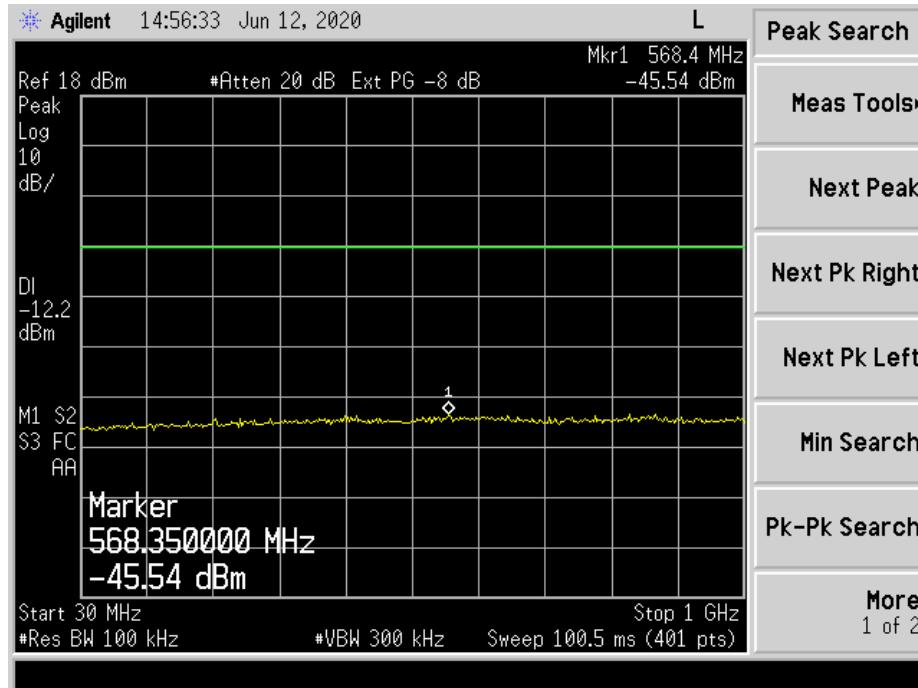


Figure 9. High Channel, 30 MHz - 1000 MHz

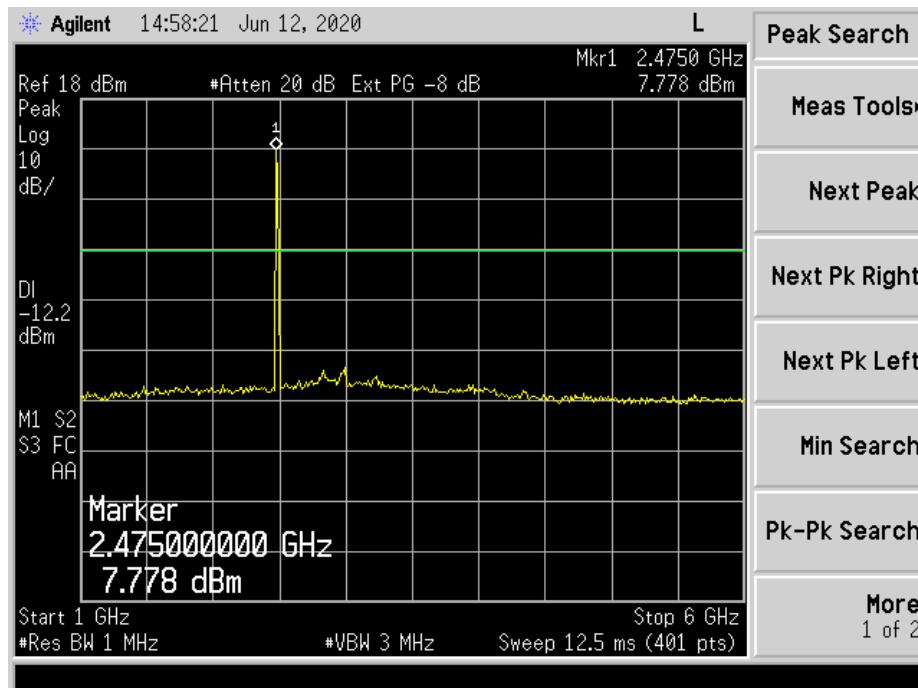


Figure 10. High Channel, 1 GHz - 6 GHz

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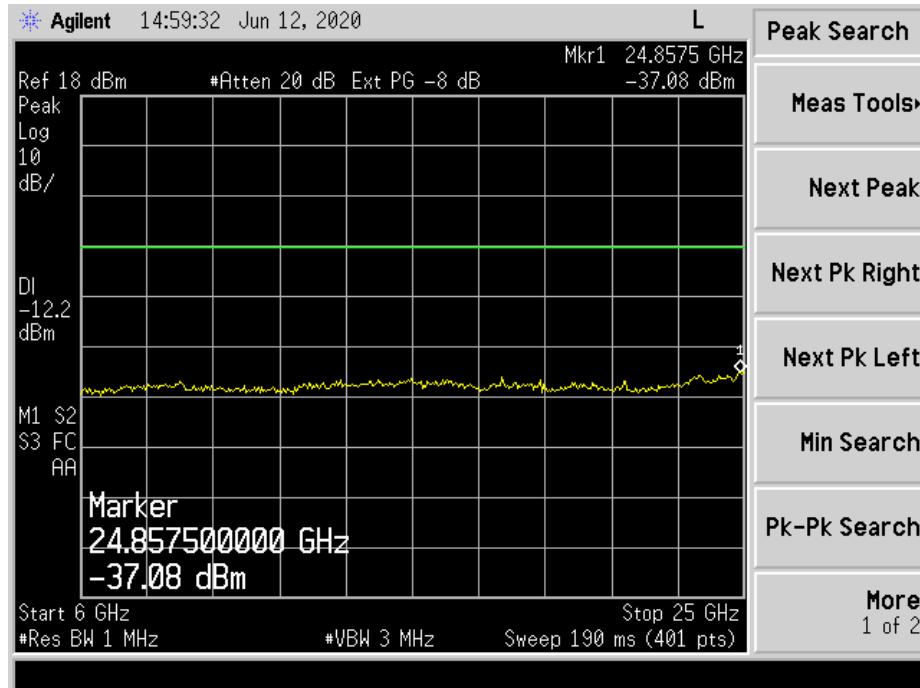


Figure 11. High Channel, 6 GHz - 25 GHz

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2.10 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d))

On the test site, the EUT was placed on top of a non-conductive table, 80 cm above the floor for measurements below 1 GHz and 150 cm above the floor for measurements > 1 GHz. The EUT was also evaluated in three orthogonal positions to determine the worst case position. The front of the EUT faced the measurement antenna located 3 meters away. Each signal measured was maximized by raising and lowering the receive antenna between 1 and 4 meters in height while monitoring the ever changing spectrum analyzer display with Trace 1 in the Clear-Write mode and Trace 2 in the Max-Hold mode for the largest signal visible. That exact antenna height where the signal was maximized was recorded for reproducibility purposes. Additionally, the EUT was rotated about its Y-axis 360 degrees clockwise and counterclockwise while monitoring the Spectrum Analyzer display for maximum. The EUT azimuth was recorded for reproducibility purposes. The emissions from the EUT were measured when both maxima were simultaneously satisfied.

For radiated measurements, the EUT was set into a continuous transmission mode. Below 1 GHz, the RBW of the measuring instrument was set equal to 120 kHz. Peak measurements above 1 GHz were measured using a RBW equal to 1 MHz, with a $VBW \geq RBW$. The results of peak radiated spurious emissions falling within restricted bands are given in Table 5 below.

For average measurements above 1 GHz, the emissions were measured using $RBW = 1 \text{ MHz}$ and $VBW = 10 \text{ Hz}$ or the duty cycle correction factor was applied to the Peak recorded value. The results of average radiated spurious emissions falling within restricted bands are given in Table 5 below.

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Table 5. Peak Radiated Fundamental & Harmonic Emissions

Tested By: AF	Test: FCC Part 15.247(d)			Client: Okyanus Teknoloji				
Frequency (MHz)	Test Data (dBuV)	Additional Factor	AF+CL-PA (dB/m)	Corrected Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Margin (dB)	Detector
Low Channel - PEAK								
2405	71.82	--	28.83	100.65	--	3.0m./HORZ	--	PK
*4810	55.75	--	4.15	59.90	74.0	3.0m./HORZ	14.1	PK
Mid Channel - PEAK								
2440	70.79	--	28.98	99.77	--	3.0m./HORZ	--	PK
*4880	50.86	--	4.27	55.13	74.0	3.0m./HORZ	18.9	PK
*7320	51.67	-9.50	9.04	51.21	74.0	3.0m./HORZ	22.8	PK
High Channel- PEAK								
2480	70.09	--	28.99	99.08	--	3.0m./HORZ	--	PK
*4960	50.56	--	4.70	55.26	74.0	3.0m./HORZ	18.7	PK
*7440	49.92	-9.50	9.50	49.92	74.0	3.0m./HORZ	24.1	PK

1. (*) Falls within the restricted bands of CFR 15.205. Limits based on CFR15.209& 15.247.
2. No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic

Sample Calculation at 2405.00 MHz:

Magnitude of Measured Frequency	71.82 dBuV
+Additional Factor	0.00 dB
<u>+Antenna Factor + Cable Loss - Amplifier Gain</u>	<u>28.83 dB/m</u>
Corrected Result	100.65 dBuV/m

Test Date: June 16, 2020

Tested By

Signature:



Name: Afzal Fazal

US Tech Test Report:
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 Customer:
 Model:

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Table 6. Average Radiated Fundamental & Harmonic Emissions

Tested By: AF	Test: FCC Part 15,247(d)				Client: Okyanus Teknoloji			
Frequency (MHz)	Test Data (dBuV)	Additional Factor	AF+CL- PA (dB/m)	Corrected Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Margin (dB)	Detector
Low Channel - PEAK								
2405	71.82	-20	28.83	80.65	--	3.0m./HORZ	--	PK
*4810	55.75	-20	4.15	39.90	54.0	3.0m./HORZ	14.1	PK
Mid Channel - PEAK								
2440	70.79	-20	28.98	79.77	--	3.0m./HORZ	--	PK
*4880	50.86	-20	4.27	35.13	54.0	3.0m./HORZ	18.9	PK
*7320	51.67	-29.50	9.04	31.21	54.0	3.0m./HORZ	22.8	PK
High Channel- PEAK								
2480	70.09	-20	28.99	79.08	--	3.0m./HORZ	--	PK
*4960	50.56	-20	4.70	35.26	54.0	3.0m./HORZ	18.7	PK
*7440	49.92	-29.50	9.50	29.92	54.0	3.0m./HORZ	24.1	PK

- 1.(*) Falls within the restricted bands of CFR 15.205. Limits based on CFR15.209 CFR 15.35.
2. No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic
3. Duty cycle applied where applicable.

Sample Calculation at 2405.00MHz:

Magnitude of Measured Frequency	71.82	dBuV
+Additional Factor (filter + duty cycle)	-20.00	dB
+Antenna Factor + Cable Loss - Amplifier Gain	28.83	dB/m
Corrected Result	80.65	dBuV/m

Test Date: June 16, 2020

Tested By

Signature: Afzal Fazal

Name: Afzal Fazal

US Tech Test Report:
FCC ID:
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Customer:
Model:

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2.11 Band Edge Measurements – (CFR 15.247 (d))

Band Edge measurements are made following the guidelines in ANSI C63.10-2013 with the EUT initially operating on the Lowest Channel and then operating on the Highest Channel within its band of operation. Antenna port conducted measurements are performed to demonstrate compliance with the requirement of 15.247(d) that all emissions outside of the band edges be attenuated by at least 20 dB when compared to its highest in-band value (contained in a 100 kHz band). Because these frequencies occur above 1000 MHz they have both a peak and average requirement.

To capture the band edge the Spectrum Analyzer's frequency span was set large enough to capture the peak level of the emission operating on the channel closest to the band edge as well as any modulation products falling outside of the authorized band of operation. Measurements were performed with RBW = 100 kHz and VBW is set \geq RBW. See figures and calculations below.

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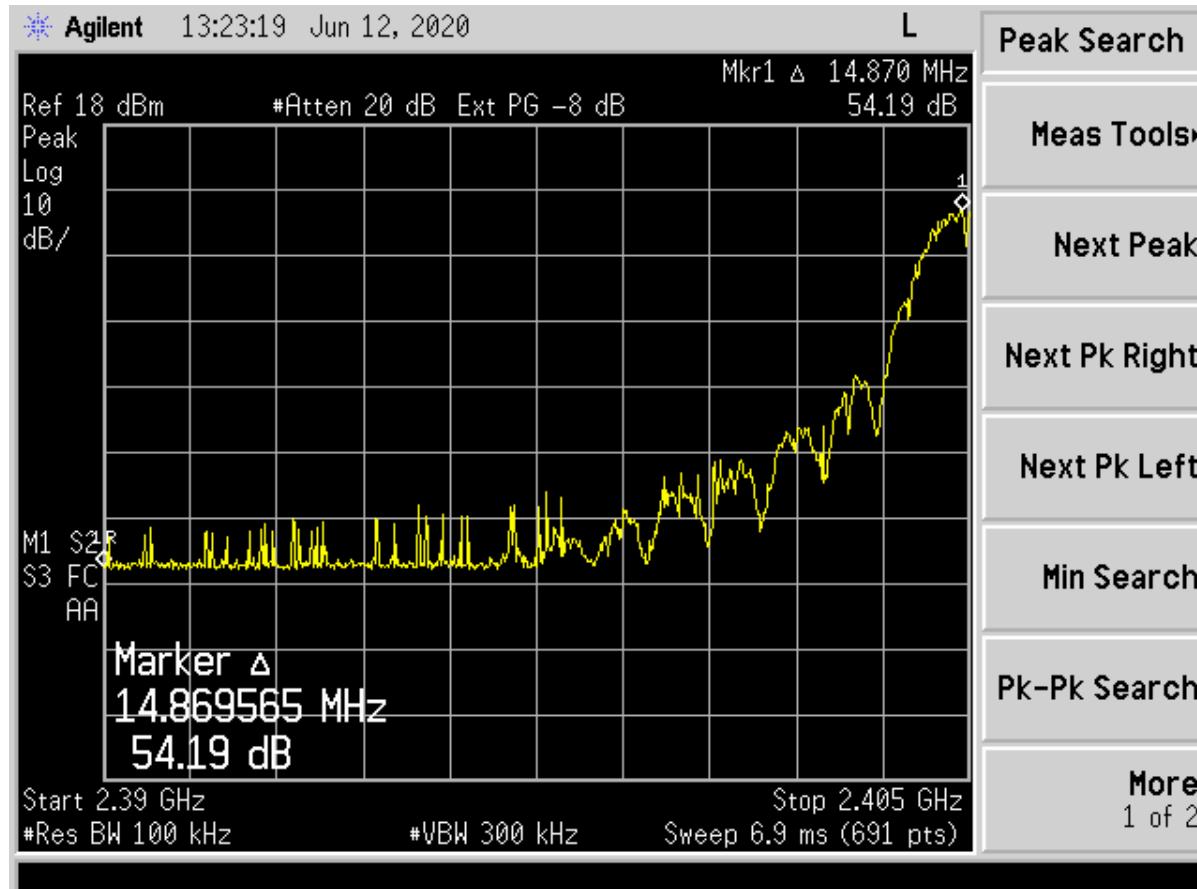


Figure 12. Band Edge Compliance, Low Channel, Delta - Peak

Lower band edge must be 20 dB below the fundamental. This requirement is met.

Measured Result	54.19	dB
Band Edge Limit	20.00	dB
Band Edge Margin	34.19	dB

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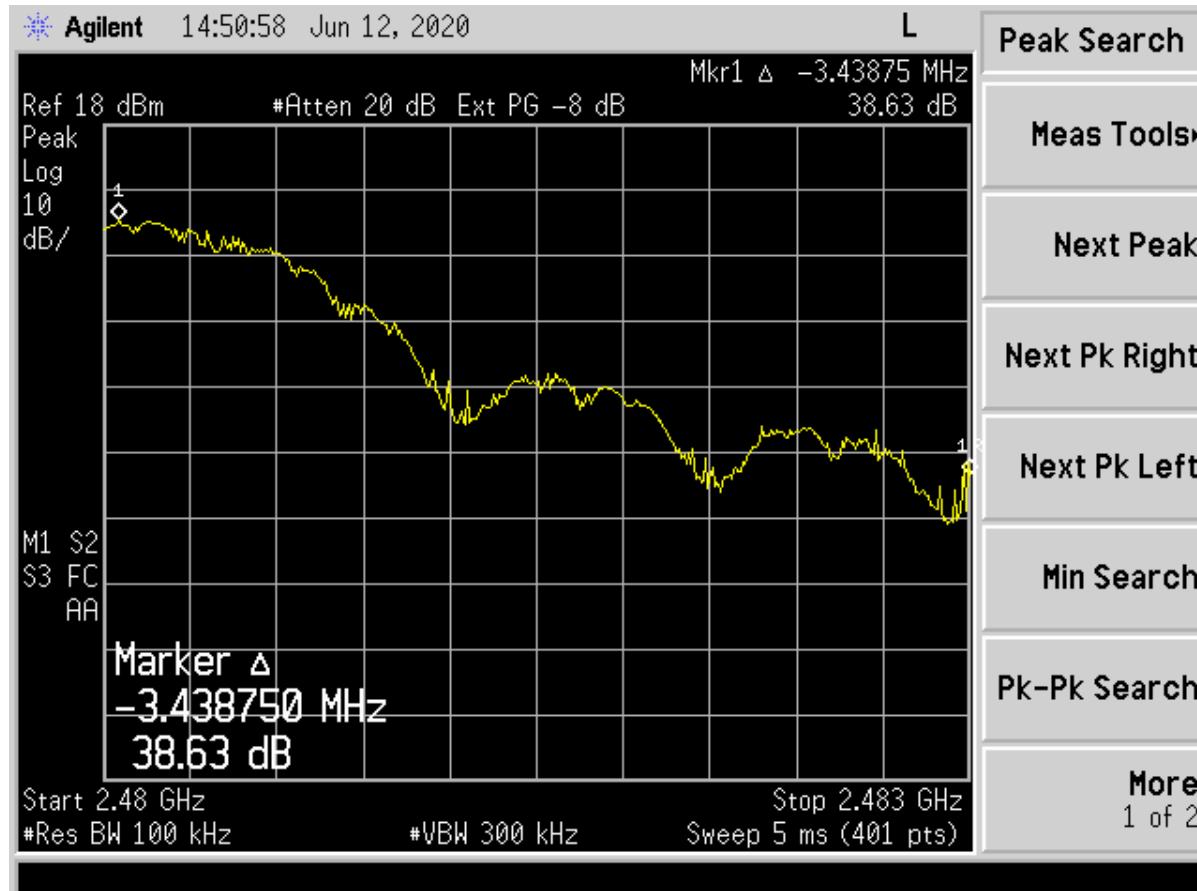


Figure 13. Band Edge Compliance, High Channel, Delta – Peak

Lower band edge must be 20 dB below the fundamental. This requirement is met.

Measured Result	38.63	dB
Band Edge Limit	20.00	dB
Band Edge Margin	18.63	dB

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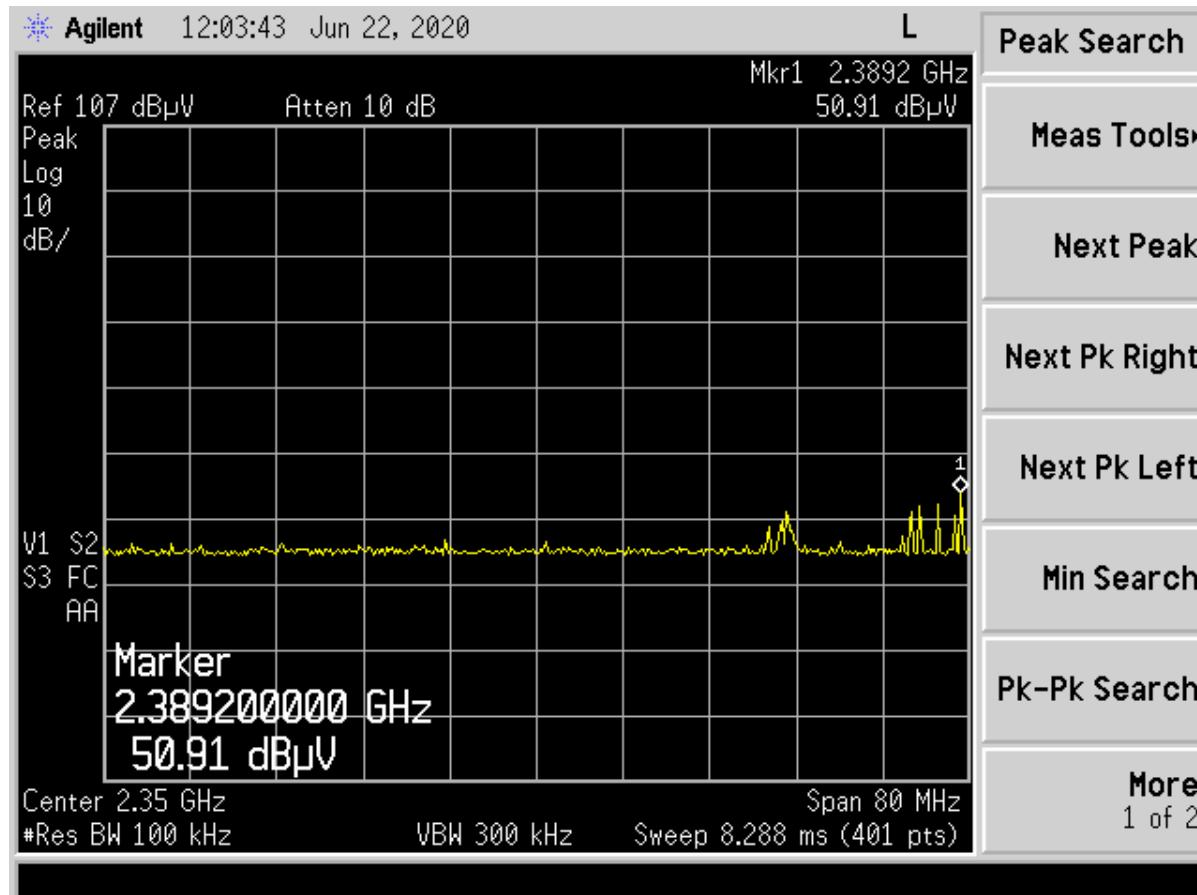


Figure 14. Restricted Band, Low Channel

Low Channel – Restricted Band Edge								
Frequency (MHz)	Test Data (dBuV)	Additional Factor	AF+CL-PA (dB/m)	Corrected Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Margin (dB)	Detector
2389.20	50.91	--	-6.07	44.84	74.0	3.0m./HORZ	29.2	PK
2389.20	50.91	-20	-6.07	24.84	54.0	3.0m./HORZ	29.2	AVG

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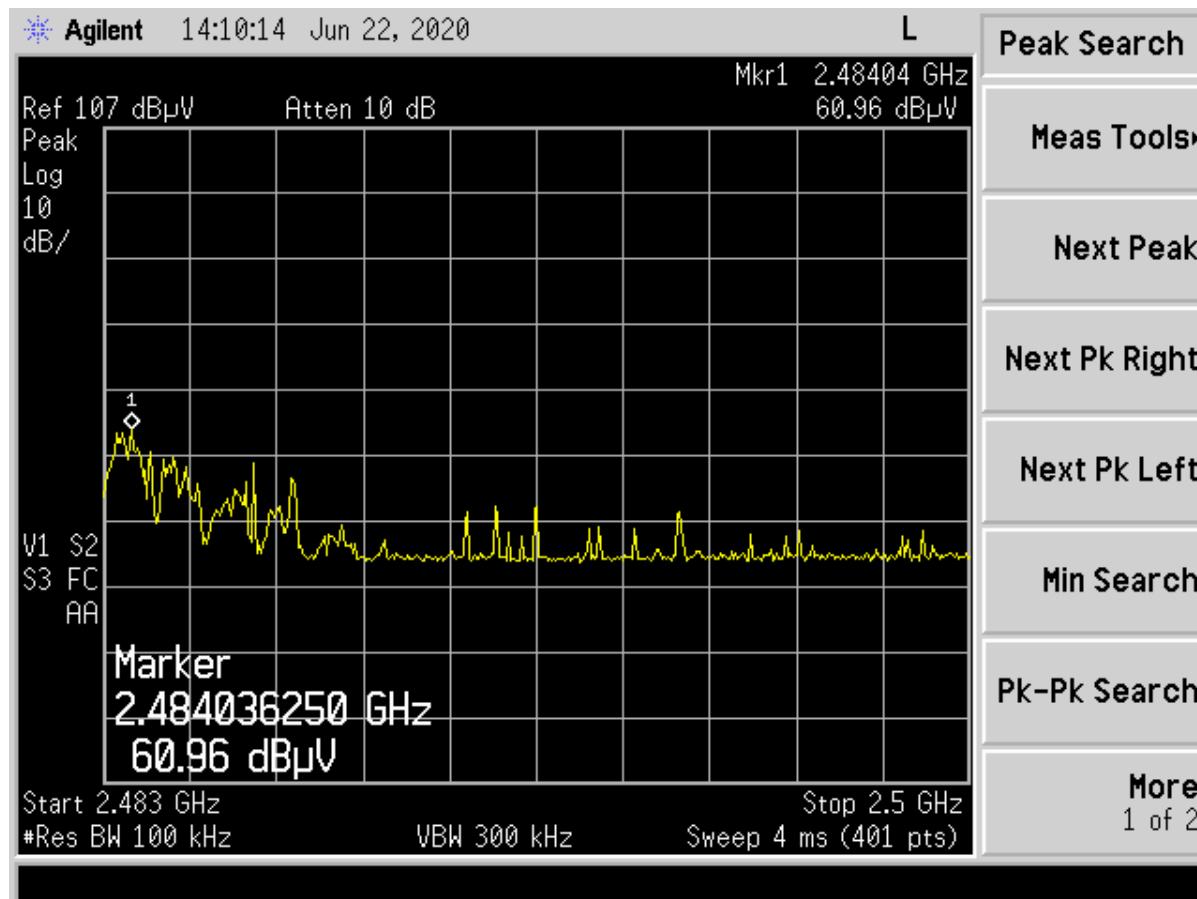


Figure 15. Restricted Band, High Channel

High Channel – Restricted Band Edge								
Frequency (MHz)	Test Data (dB μ V)	Additional Factor	AF+CL-PA (dB/m)	Corrected Results (dB μ V/m)	Limits (dB μ V/m)	Distance / Polarization	Margin (dB)	Detector
2484.04	60.96	--	-5.67	55.29	74.0	3.0m./HORZ	18.7	PK
2484.04	60.96	-20	-5.67	35.29	54.0	3.0m./HORZ	18.7	AVG

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2.12 Six (6) dB Bandwidth per CFR 15.247(a)(2)

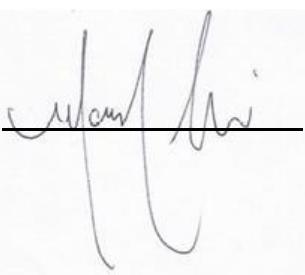
Measurements were performed per ANSI C63.10-2013, clause 11.8. The RBW was set to 100 kHz and the VBW \geq RBW. The results of this test are given in the table and figures following.

Table 7. Six (6) dB Bandwidth

Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum FCC Bandwidth (MHz)
2405	1.287	0.5
2440	1.322	0.5
2480	1.390	0.5

Test Date: June 12, 2020

Tested By
Signature:



Name: Mark Afroozi

US Tech Test Report:
FCC ID:
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Customer:
Model:

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Figure 16. 6 dB Bandwidth, Low Channel

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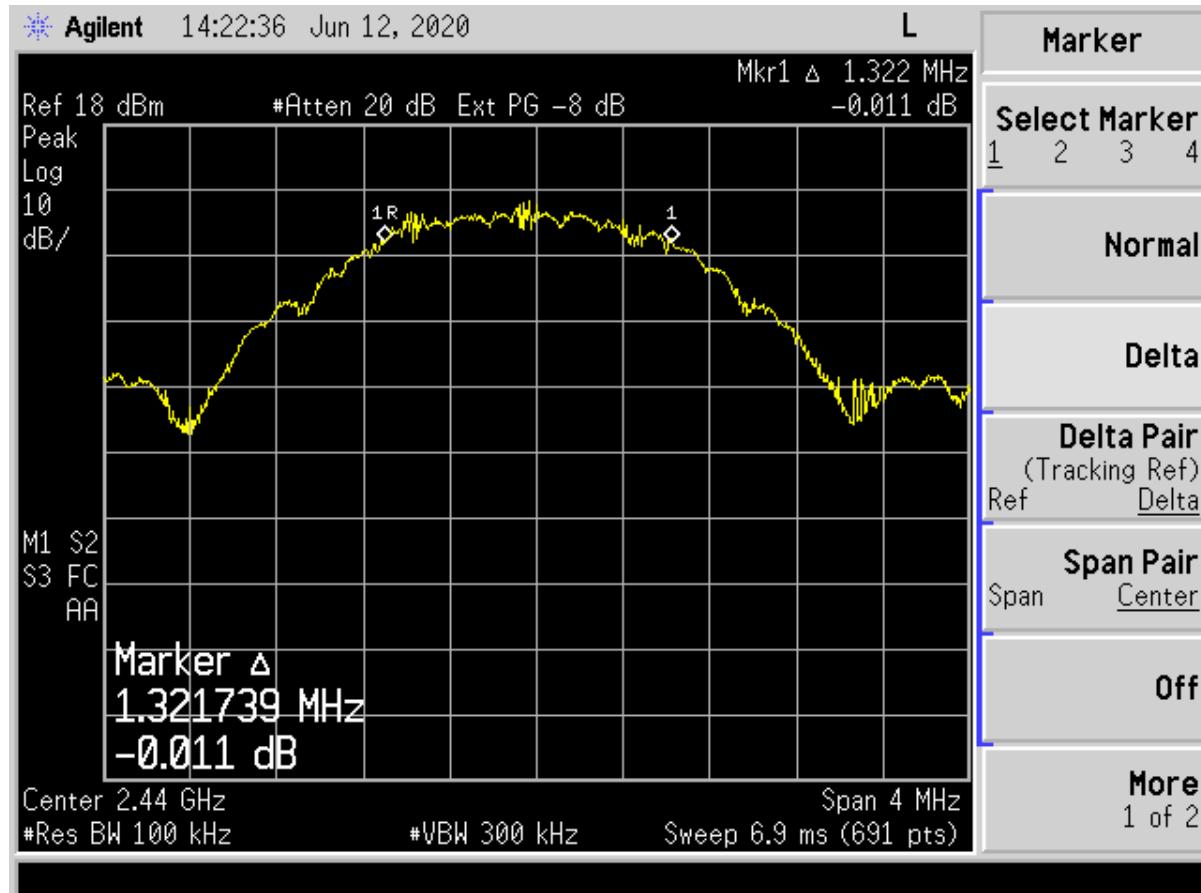


Figure 17. 6 dB Bandwidth, Mid Channel

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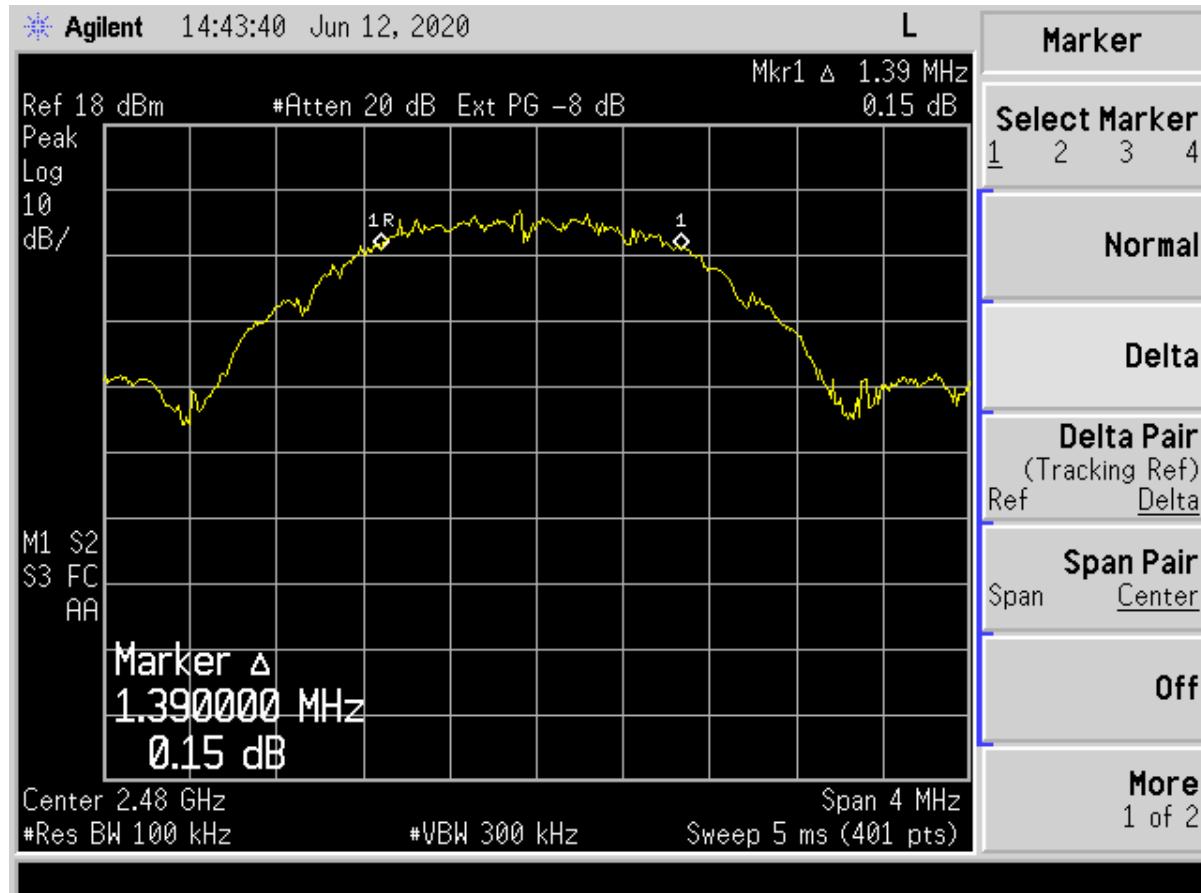


Figure 18. 6 dB Bandwidth, High Channel

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FCC ID:
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2.13 Maximum Peak Conducted Output Power (CFR 15.247 (b) (3))

The transmitter was programmed to operate at a maximum output power across the bandwidth.

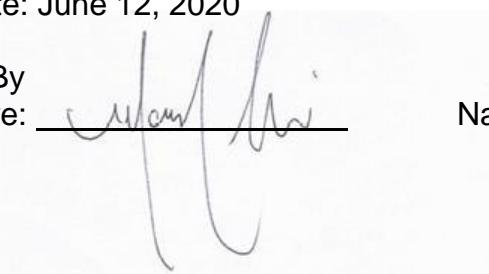
Peak power within the band 2400 MHz to 2483.5 MHz was measured per ANSI C63.10-2013 as an Antenna Conducted test with a spectrum analyzer. The antenna port was connected directly to the spectrum analyzer via a short RF cable. An 8 dB attenuator was connected to the RF input port of the spectrum analyzer and calibrated for attenuator loss. The spectrum analyzer was set to a RBW of 1 MHz, and the VBW \geq RBW. Peak antenna conducted output power is tabulated in the table below.

Table 8. Peak Antenna Conducted Output Power per Part 15.247 (b)(3)

Frequency of Fundamental (MHz)	dBm	mW	FCC Limit (mW Maximum)
2405	8.95	7.843	1000
2440	8.46	7.006	1000
2480	7.77	5.973	1000

Test Date: June 12, 2020

Tested By

Signature: 

Name: Mark Afroozi

US Tech Test Report:
FCC ID:
Test Report Number:
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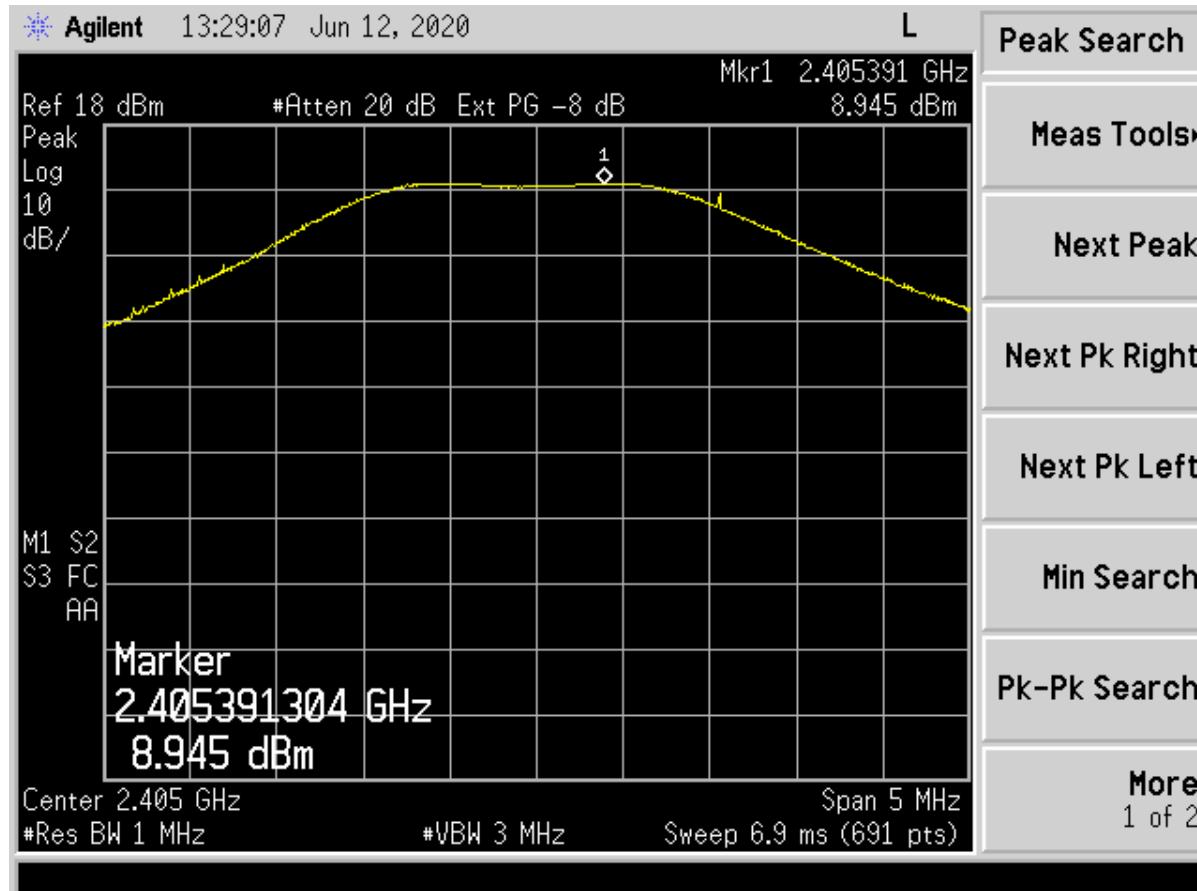


Figure 19. Peak Antenna Conducted Output Power, Low Channel

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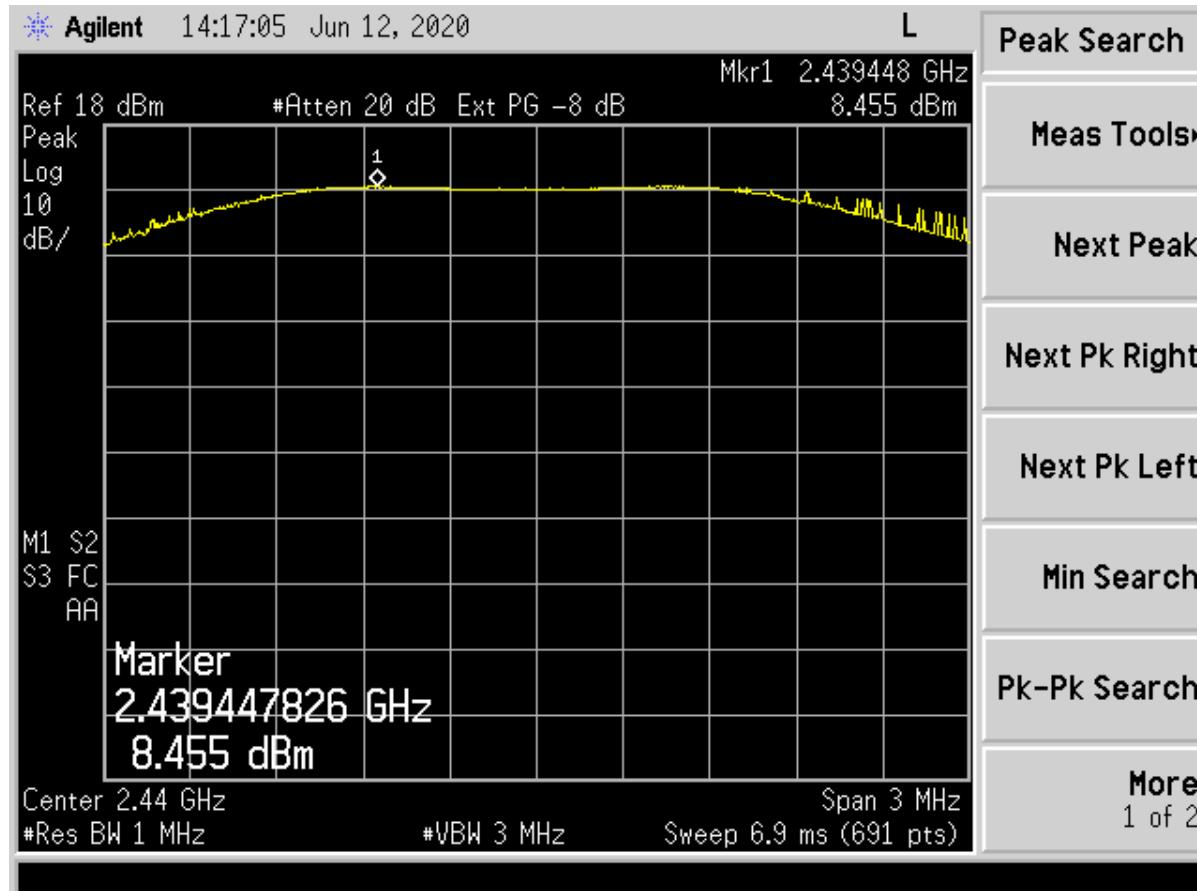


Figure 20. Peak Antenna Conducted Output Power, Mid Channel

US Tech Test Report:
FCC ID:
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Model:

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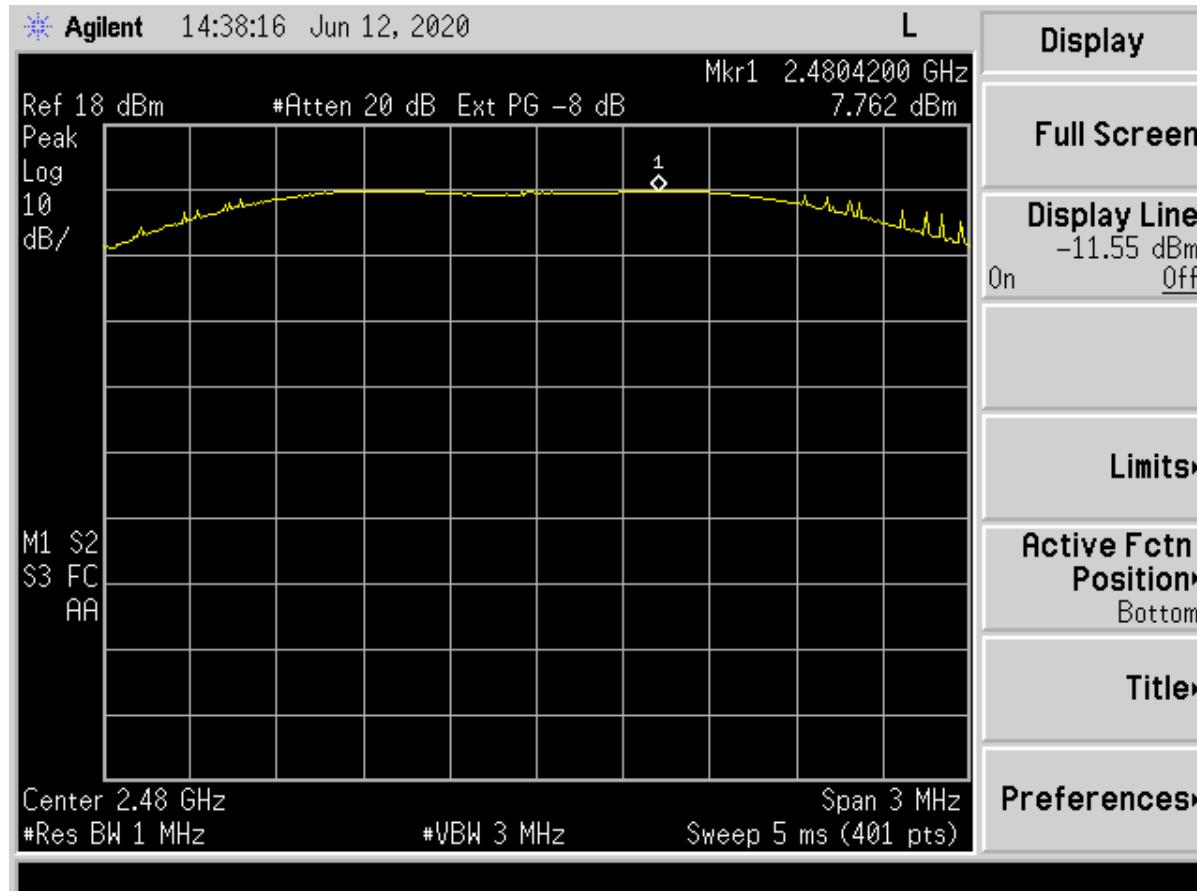


Figure 21. Peak Antenna Conducted Output Power, High Channel

US Tech Test Report:
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Customer:
Model:

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2.14 Power Spectral Density (CFR 15.247(e))

The transmitter was placed into a continuous mode of operation at all applicable frequencies. The measurements were performed per the procedures of ANSI C63.10-2013. The RBW was set to 3 kHz and the Video Bandwidth was set to \geq RBW. The trace capture time was set to (Span/3 kHz).

In accordance with 15.247 (e), the power spectral density shall be no greater than +8 dBm per any 3 kHz band.

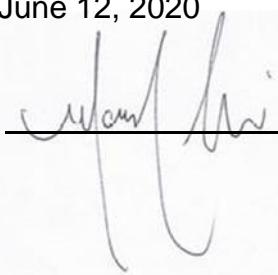
Results are shown in the table and figures below. All are less than +8 dBm per 3 kHz band.

Table 9. Power Spectral Density for Low, Mid and High Bands

Frequency (MHz)	Results (dBm/3 kHz)	FCC Limit (dBm/3 kHz)
2405	0.712	+8.0
2440	-0.426	+8.0
2480	-1.788	+8.0

Test Date: June 12, 2020

Tested By

Signature: 

Name: Mark Afrooz

US Tech Test Report:
FCC ID:
Test Report Number:
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Customer:
Model:

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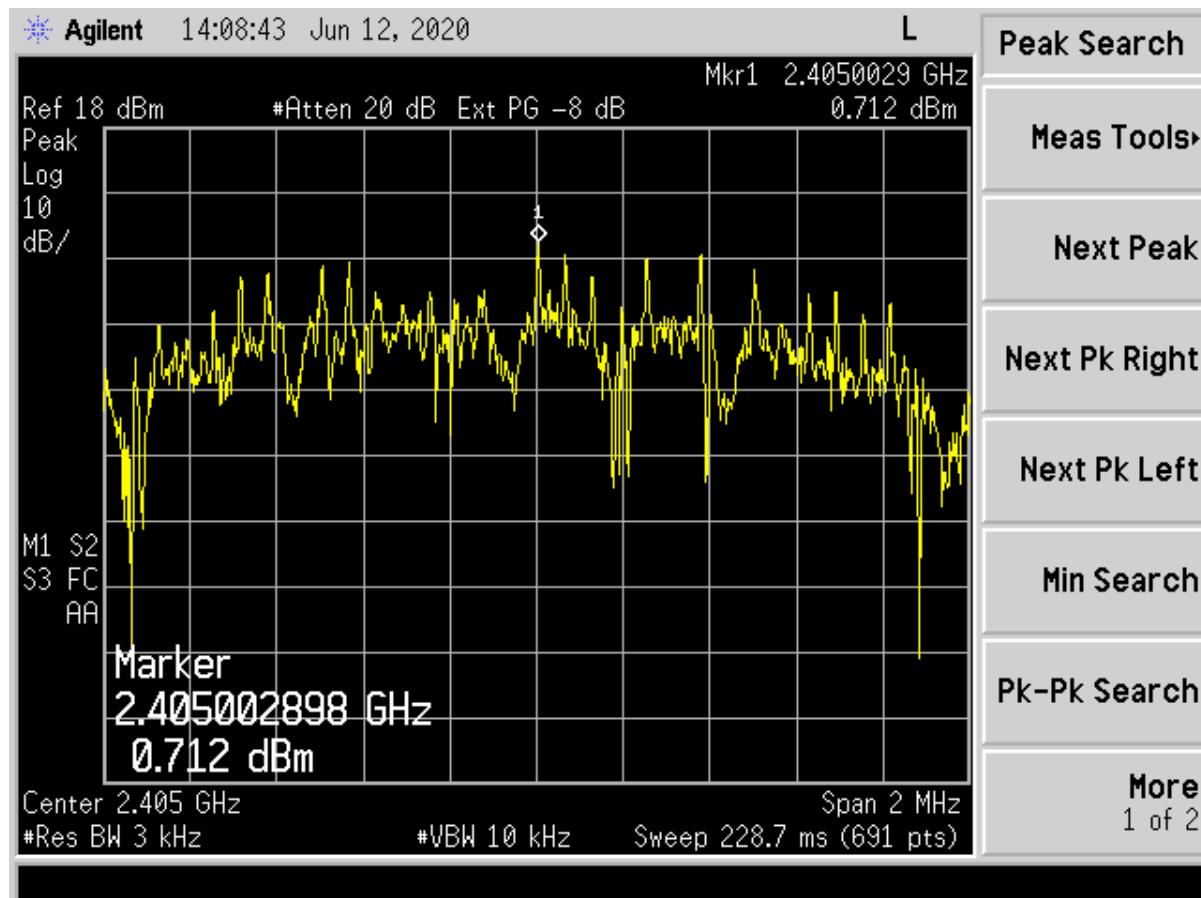


Figure 22. Peak Power Spectral Density, Low Channel

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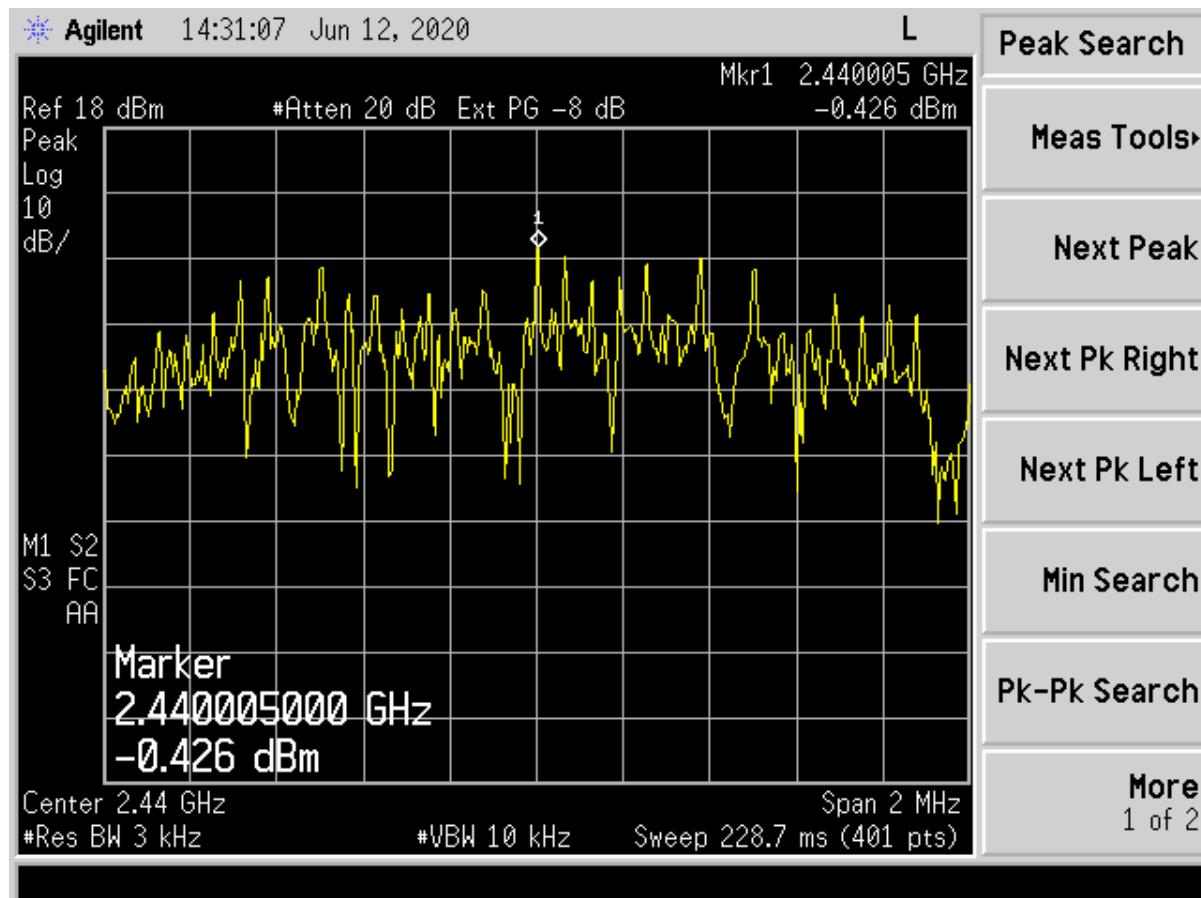


Figure 23. Peak Power Spectral Density, Mid Channel

US Tech Test Report:
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

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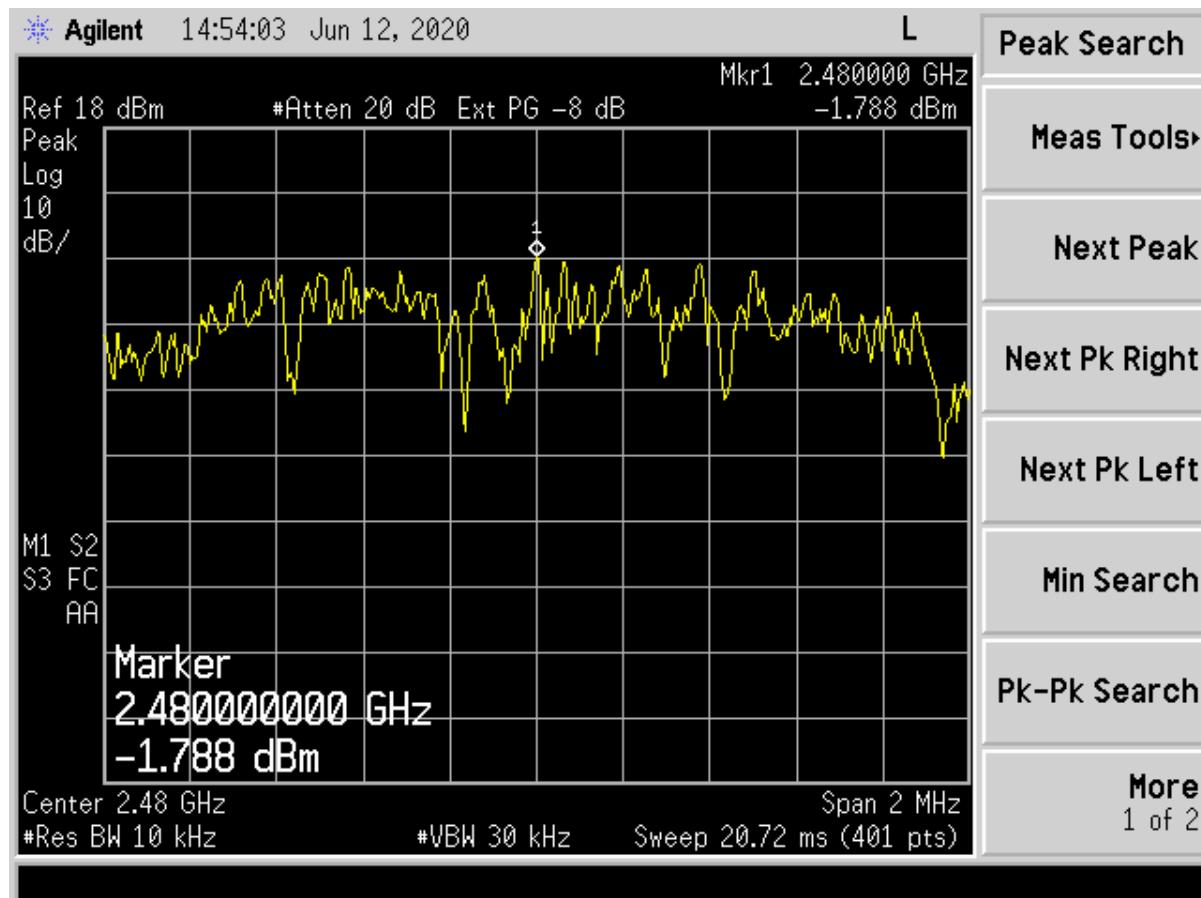


Figure 24. Peak Power Spectral Density, High Channel

US Tech Test Report:
FCC ID:
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2.15 Intentional Radiator Power Line Conducted Emissions (CFR 15.207)

The power line conducted voltage emission measurements have been carried out in accordance with CFR 15.207, per ANSI C63.10:2013, Clause 6.2, with a spectrum analyzer connected to a LISN and the EUT placed into a continuous mode of transmission.

The EUT is indirectly connected to the AC mains via approved AC/DC power supply adapters. The measurements were made with the AC side of the power supply adapter. The power supply and has no internal filters or circuits that will contribute to the EUT emissions characteristics.

The worst-case results for conducted emissions were determined to be produced when the EUT was operating under continuous transmission. The worst case measurement was 3.4 dB from the applicable limit. All other emissions were at least 6.6 dB from the limit. Those results are given in the table below.

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Table 10. Power Line Conducted Emissions

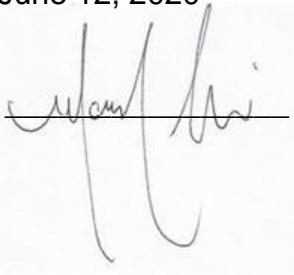
CONDUCTED EMISSIONS 150 kHz to 30 MHz						
Tested By: MA	Specification Requirement: FCC Part 15.207		Manufacturer: Okyanus Teknoloji			
Frequency (MHz)	Test Data (dBuV)	LISN+CL (dB)	Corrected Results (dBuV)	Avg Limits (dBuV)	Margin (dB)	Detector
Phase @ 120 Vac/ 60Hz						
0.1704	51.46	0.07	51.53	54.9	3.4	PK
0.5442	34.09	0.26	34.35	46.0	11.7	PK
2.2066	28.77	0.07	28.84	46.0	17.2	QP
7.7750	38.68	0.10	38.78	50.0	11.2	PK
17.2160	39.08	0.63	39.71	50.0	10.3	PK
28.9830	41.68	1.68	43.36	50.0	6.6	PK
Neutral @ 120 Vac/ 60Hz						
0.1693	47.79	0.12	47.91	55.0	7.1	PK
0.9633	35.67	0.09	35.76	46.0	10.2	PK
2.1600	34.53	0.19	34.72	46.0	11.3	PK
7.8750	36.83	0.32	37.15	50.0	12.9	PK
17.6660	39.86	1.03	40.89	50.0	9.1	PK
26.6330	39.86	1.91	41.77	50.0	8.2	QP

SAMPLE CALCULATION AT: 0.1704 MHz

Magnitude of Measured Frequency +LISN+ Cable Loss	51.46 dBuV 0.07 dB
Corrected Result	51.53 dBuV/m

Test Date: June 12, 2020

Tested By

Signature: 

Name: Mark Afroosi

US Tech Test Report:
FCC ID:
Test Report Number:
Issue Date:
Customer:
Model:

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2.16 Intentional Radiator, Radiated Emissions (CFR 15.209)

The test data provided herein is to support the verification requirement for radiated emissions coming from the EUT in a transmitting state per 15.209 and were investigated from 9kHz or the lowest operating clock frequency to 25 GHz and tested as detailed in ANSI C63.10:2013, Clause 6.4-6.6. Data is presented in the tables below.

Radiated emissions within the band of 9 kHz to 30 MHz were investigated using a calibrated loop antenna and per the requirements of ANSI C63.10:2013.

Measurements were made with the analyzer's resolution bandwidth set to 120 kHz for measurements made below 1 GHz and 1 MHz for measurements made above 1 GHz. The video bandwidth was set to three times the resolution bandwidth: 1 MHz RBW and 3 MHz VBW. The test data were maximized for magnitude by rotating the turntable 360 degrees clockwise and counterclockwise and raising and lowering the receiving antenna from 1 to 4 meters in height as a part of the measurement procedure.

The EUT was evaluated in three orthogonal positions the worst case configuration was determined to be the EUT set along its X plane. The test data is presented below.

Table 11. Spurious Radiated Emissions (9 kHz – 30 MHz)

Test By: MA	Test: FCC Part 15.209			Client: Okyanus Teknoloji			
Frequency (MHz)	Test Data (dBuV)	AF+CL-PA (dB)	Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Margin (dB)	DETECTOR PK / QP/AVG
All emissions were more than 20 dB below the limit.							

Test Date: June 22, 2020

Tested By
Signature: Afzal Fazal

Name: Afzal Fazal

US Tech Test Report:
 FCC ID:
 Test Report Number:
 Issue Date:
 Customer:
 Model:

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Table 12. Spurious Radiated Emissions (30 MHz – 1000 MHz)

Test By: MA	Test: FCC Part 15.209				Client: Okyanus Teknoloji		
Frequency (MHz)	Test Data (dBuV)	AF+CL-PA (dB)	Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Margin (dB)	DETECTOR PK/QP
197.51	44.69	-10.11	34.58	43.5	3m./HORZ	8.9	PK
223.20	47.28	-14.33	32.95	46.0	3m./HORZ	13.1	PK
208.12	46.95	-13.89	33.06	43.5	3m./HORZ	10.4	PK
900.00	40.53	-0.79	39.74	46.0	3m./HORZ	6.3	PK
31.70	45.87	-13.11	32.76	40.0	3m./VERT	7.2	QP
35.67	39.65	-14.16	25.49	40.0	3m./VERT	14.5	QP
44.97	49.26	-15.96	33.30	40.0	3m./VERT	6.7	PK
52.57	49.97	-16.92	33.05	40.0	3m./VERT	7.0	PK
207.09	46.31	-14.11	32.20	43.5	3m./VERT	11.3	PK
900.00	40.04	-1.49	38.55	46.0	3m./VERT	7.5	PK

Sample Calculation at 197.51 MHz:

Magnitude of Measured Frequency	44.69	dBuV
+Antenna Factor + Cable Loss - Amplifier Gain	-10.11	dB/m
Corrected Result	34.58	dBuV/m

Test Date: June 22, 2020

Tested By

Signature:



Name: Afzal Fazal

US Tech Test Report:
FCC ID:
Test Report Number:
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Customer:
Model:

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Table 13. Spurious Radiated Emissions (1 GHz – 25 GHz)

Test By: MA	Test: FCC Part 15.209				Client: Okyanus Teknoloji		
Frequency (MHz)	Test Data (dBuV)	AF+CL-PA (dB)	Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Margin (dB)	DETECTOR PK / QP/AVG
All emissions other than fundamental and harmonics were more than 20 dB below the applicable limit. Emissions data for fundamental and harmonics are found in Table 6 of this report.							

Test Date: June 17, 2020

Tested By

Signature:



Name: Afzal Fazal

US Tech Test Report:
FCC ID:
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2.17 Measurement Uncertainty

The measurement uncertainties given were calculated using the method detailed in CISPR 16-4-2:2011. A coverage factor of $k=2$ was used to give a level of confidence of approximately 95%.

2.17.1 Conducted Emissions Measurement Uncertainty

Measurement Uncertainty (within a 95% confidence level) for this test is ± 2.78 dB.

2.17.2 Radiated Emissions Measurement Uncertainty

For a measurement distance of 3 m the measurement uncertainty (with a 95% confidence level) for this test using a Biconical Antenna (30 MHz to 200 MHz) is ± 5.3 dB. This value includes all elements of measurement.

The measurement uncertainty (with a 95% confidence level) for this test using a Log Periodic Antenna (200 MHz to 1000 MHz) is ± 5.1 dB.

The measurement uncertainty (with a 95% confidence level) for this test using a Horn Antenna (Above 1000 MHz) is ± 5.1 dB.

3 Conclusions

The EUT is deemed to have met the requirements of the standards cited within the test report when tested as detailed in the present test report.