

TEST REPORT

Reference No...... : WTU24D10235214W001
FCC ID : 2AOTUKDH281
Applicant..... : Changzhou Kaidi Electrical Inc.
Address..... : Jiangcun, Henglin Town, 213101, Changzhou City , Jiangsu Province, China
Manufacturer : Changzhou Kaidi Electrical Inc.
Address..... : Jiangcun, Henglin Town, 213101, Changzhou City , Jiangsu Province, China
Product..... : Handset
Model(s) : KDH281
Standards : FCC CFR47 Part 15 Section 15.249
Date of Receipt sample : 2024-10-17
Date of Test : 2024-10-21 to 2024-11-05
Date of Issue..... : 2024-12-05
Test Result..... : **Pass**

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

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3 Revision History

Test Report No.	Date of Receipt Sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTU24D10235214W001	2024-10-17	2024-10-21 to 2024-11-05	2024-12-05	Original	-	Valid

4 General Information

4.1 General Description of E.U.T

Product: Handset
Model(s): KDH281
Model Description: N/A
Test Sample No.: 1-1/1
Hardware Version: V00
Software Version: V00

4.2 Details of E.U.T.

Frequency Range: 2440MHz
Type of Modulation: GFSK
Antenna installation: PCB Antenna
Antenna Gain: 4.07dBi

Note:

#: The antenna gain is provided by the applicant, and the applicant should be responsible for its authenticity, WALTEK lab has not verified the authenticity of its information.

Ratings: Input: DC 4.5V by 1.5V*3 batteries

4.3 Channel List

Channel No.	Frequency (MHz)
1	2440

4.4 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test mode	Channel No.
Transmitting	2440MHz

5 Equipment Used during Test

5.1 Equipments List

3m Semi-anechoic Chamber for Radiation Emissions						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	Spectrum Analyzer	R&S	FSP30	100091	2024-04-22	2025-04-21
2	Broad-band Horn Antenna(1-18GHz)	SCHWARZBECK	BBHA 9120 D	667	2024-01-23	2025-01-22
3	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2024-07-18	2025-07-17
4	Coaxial Cable (above 1GHz)	Top	1GHz-18GHz	N/A	2024-04-22	2025-04-21
3m Semi-anechoic Chamber for Radiation Emissions						
Item	Equipment	Manufacturer	Model No.	Serial No	Last Calibration Date	Calibration Due Date
1	Test Receiver	R&S	ESCI	101296	2024-04-22	2025-04-21
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2023-11-04	2024-11-03
3	Active Loop Antenna	Com-Power Corp.	AL-130R	10160007	2024-04-27	2025-04-26
4	Amplifier	ANRITSU	MH648A	M43381	2024-04-22	2025-04-21
5	Cable	HUBER+SUHNER	CBL2	525178	2024-04-22	2025-04-21
RF Conducted Testing						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	Spectrum Analyzer	R&S	FSL6	100959	2024-04-22	2025-04-21
2	Coaxial Cable	Top	10Hz-30GHz	-	2024-04-22	2025-04-21
3	Antenna Connector*	Realacc	45RSm	-	2024-04-22	2025-04-21
4	DC Block	Gwave	GDCB-3G-N-SMA	140307001	2024-04-22	2025-04-21

Test Software:

Test Item	Software name	Software version
Radiated Emission(3m)	EZ-EMC	EZ-EMC(RA-03A1-1)

5.2 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-6}$
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Radiated Spurious Emissions test	± 5.03 dB (Bilog antenna 30M~1000MHz)
	± 5.47 dB (Horn antenna 1000M~25000MHz)

5.3 Test Facility

The test facility has a test site registered with the following organizations:

ISED CAB identifier: CN0013. Test Firm Registration No.: 7760A.

Waltek Testing Group Co., Ltd. Has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration number 7760A, October 15, 2016.

FCC Designation No.: CN1201. Test Firm Registration No.: 523476.

Waltek Testing Group Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration number 523476, September 10, 2019.

5.4 Test Equipment Calibration

All the test equipments used are valid and calibrated by GUANG ZHOU GRG METROLOGY & TEST CO., LTD. address is No.163, Pingyun Rd. West of Huangpu Ave, Tianhe District, Guangzhou, Guangdong, China.

6 Test Summary

Test Items	Test Requirement	Result
Conducted Emissions	15.207	N/A
Radiated Emission	15.249(a) 15.209 15.205(a)	PASS
Periodic Operation	15.35(c)	PASS
Outside Restricted band	15.249 15.205 15.209	PASS
20dB Bandwidth	15:215(c)	PASS
Antenna Requirement	15.203	PASS

7 Radiation Emission Test

Test Requirement: FCC Part15 Paragraph 15.249&15.209&15.205

Test Method: ANSI 63.10: 2013

Measurement Distance: 3m

Test Result: PASS

15.249(a)Limit:

Fundamental frequency	Field strength of fundamental		Field strength of harmonics	
	mV/m	dBuV/m	uV/m	dBuV/m
902-928 MHz	50	94	500	54
2400-2483.5 MHz	50	94	500	54
5725-5875 MHz	50	94	500	54
24.0-24.25 GHz	250	108	2500	68

15.209 Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	$2400/F(\text{kHz})$	300	$10000 * 2400/F(\text{kHz})$	$20\log^{(2400/F(\text{kHz}))} + 80$
0.490 ~ 1.705	$24000/F(\text{kHz})$	30	$100 * 24000/F(\text{kHz})$	$20\log^{(24000/F(\text{kHz}))} + 40$
1.705 ~ 30	30	30	$100 * 30$	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

Note: RF Voltage(dBuV)= $20 \log_{10}$ RF Voltage(uV)

7.1 EUT Operation

Operating Environment :

Temperature: 226.9 °C

Humidity: 46.6 % RH

Atmospheric Pressure: 101.1kPa

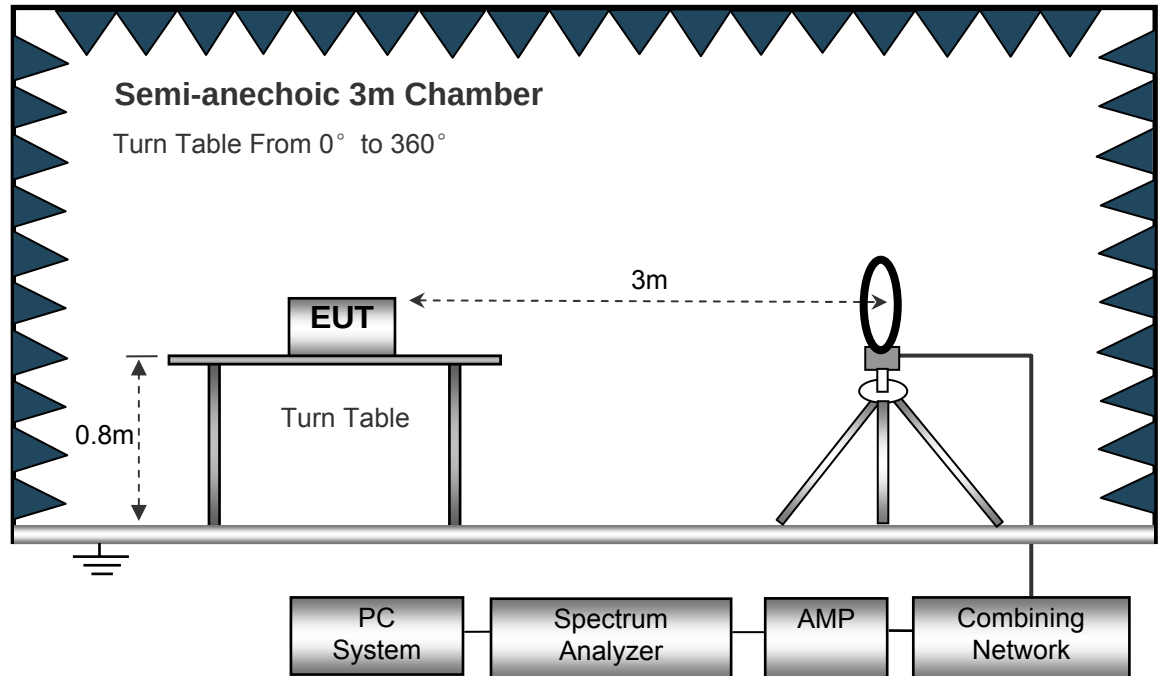
EUT Operation :

The test was performed in transmitting mode, the test data were shown in the report.

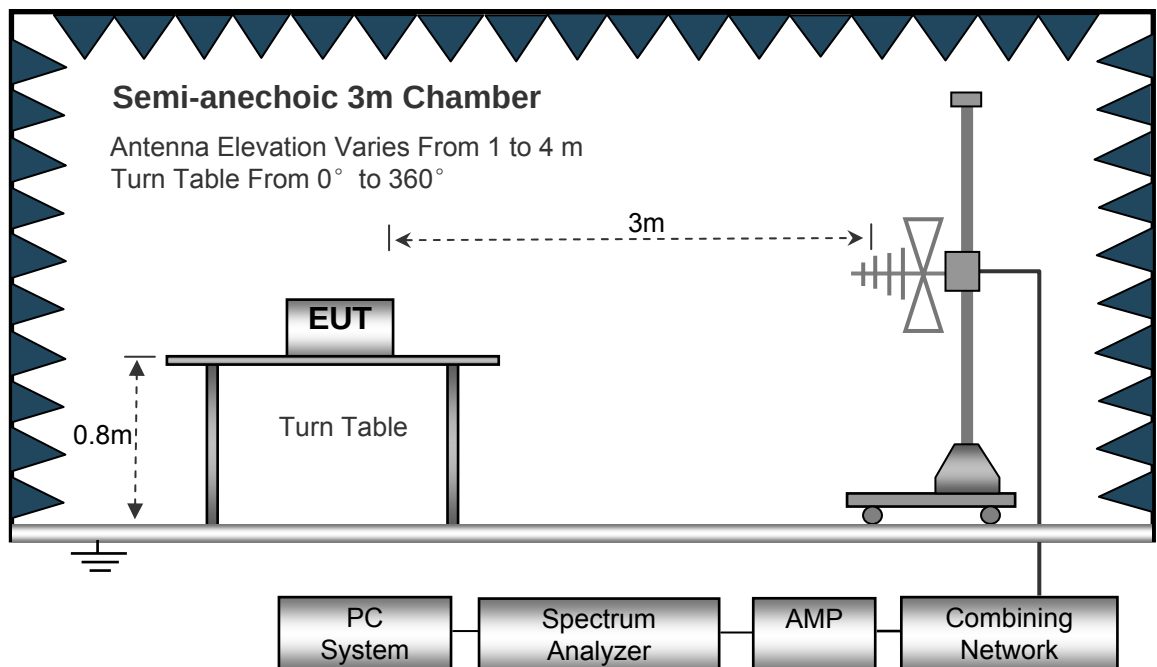
7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10.

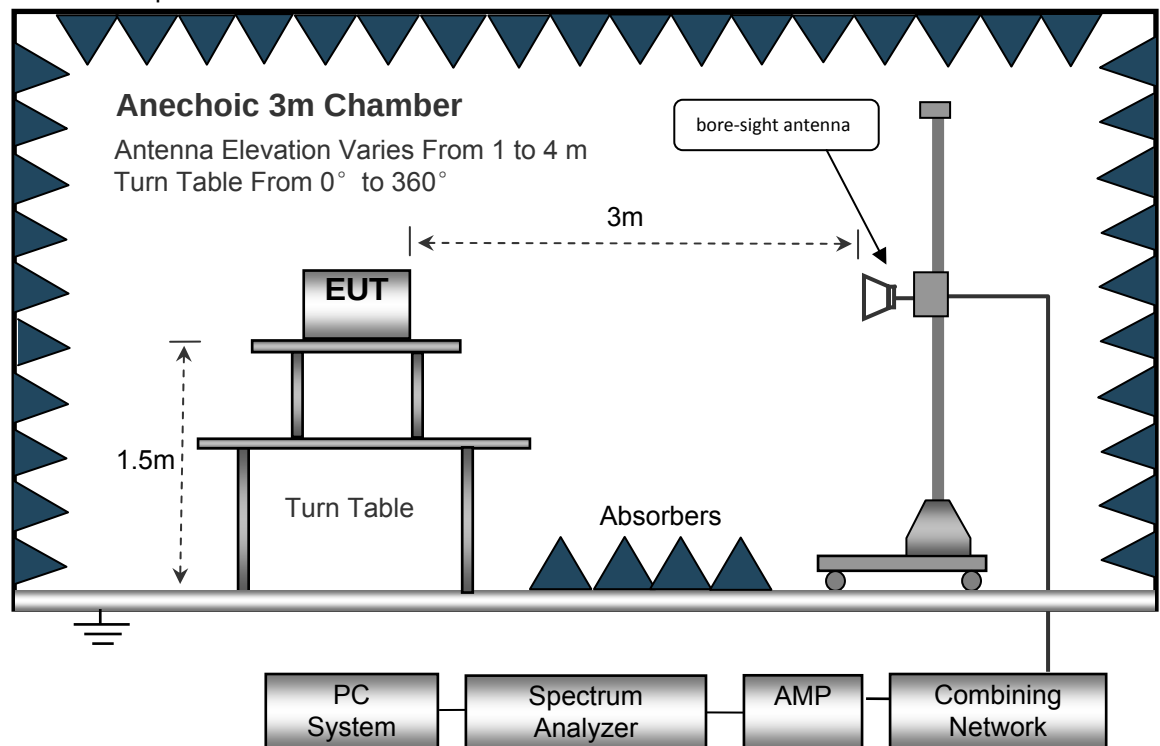
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30MHz to 1GHz.



The test setup for emission measurement above 1 GHz.



7.3 Spectrum Analyzer Setup

Below 30MHz

Sweep SpeedAuto
 IF Bandwidth.....10kHz
 Video Bandwidth10kHz
 Resolution Bandwidth10kHz

30MHz ~ 1GHz

Sweep SpeedAuto
 DetectorPK
 Resolution Bandwidth.....100kHz
 Video Bandwidth300kHz

Above 1GHz

Sweep SpeedAuto
 DetectorPK
 Resolution Bandwidth.....1MHz
 Video Bandwidth3MHz
 DetectorAve.
 Resolution Bandwidth.....1MHz
 Video Bandwidth10Hz

7.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane for below 1GHz and 1.5m above 1GHz.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

7.5 Test Result

Test Frequency : 9kHz~ 30MHz

The measurements were more than 20 dB below the limit and not reported.

Test Frequency: 30MHz ~ 18GHz

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.249/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP)	Degree	(m)	(H/V)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)
948.59	30.25	QP	14	1.8	H	4.49	34.74	46.00	-11.26
948.59	32.17	QP	166	1.6	V	4.49	36.66	46.00	-9.34
2440.00	87.27	PK	196	1.8	H	-8.34	78.93	114.00	-35.07
2440.00	100.23	PK	342	1.9	V	-8.34	91.89	114.00	-22.11
4880.00	54.79	PK	221	1.1	H	-5.39	49.40	74.00	-24.60
4880.00	60.50	PK	337	2.0	V	-5.39	55.11	74.00	-18.89
7320.00	46.83	PK	102	1.2	H	1.75	48.58	74.00	-25.42
7320.00	53.28	PK	34	1.9	V	1.75	55.03	74.00	-18.97
9760.00	45.97	PK	283	1.3	H	3.59	49.56	74.00	-24.44
9760.00	47.90	PK	332	1.7	V	3.59	51.49	74.00	-22.51
12200.00	42.96	PK	165	1.9	H	9.44	52.40	74.00	-21.60
12200.00	42.07	PK	357	1.5	V	9.44	51.51	74.00	-22.49

$AV = \text{Peak} + 20\log_{10}(\text{duty cycle}) = PK + (-14.99)$ [refer to section 8 for more detail]

Frequency	PK	RX Antenna Polar	Duty cycle Factor	AV	FCC Part 15.249/209/205	
					Limit	Margin
(MHz)	(dBμV/m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
2440.00	78.93	H	-14.99	63.94	94.00	-30.06
2440.00	91.89	V	-14.99	76.90	94.00	-17.10
4880.00	49.40	H	-14.99	34.41	54.00	-19.59
4880.00	55.11	V	-14.99	40.12	54.00	-13.88
7320.00	48.58	H	-14.99	33.59	54.00	-20.41
7320.00	55.03	V	-14.99	40.04	54.00	-13.96
9760.00	49.56	H	-14.99	34.57	54.00	-19.43
9760.00	51.49	V	-14.99	36.50	54.00	-17.50
12200.00	52.40	H	-14.99	37.41	54.00	-16.59
12200.00	51.51	V	-14.99	36.52	54.00	-17.48

Test Frequency: 18GHz ~ 25GHz

The measurements were more than 20 dB below the limit and not reported.

8 Periodic Operation

Test Requirement: 15.35(c): when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.

Test Mode: Transmitting

The duty cycle was determined by the following equation:

To calculate the actual field intensity, the duty cycle correction factor in decibel is needed for later use and can be obtained from following conversion

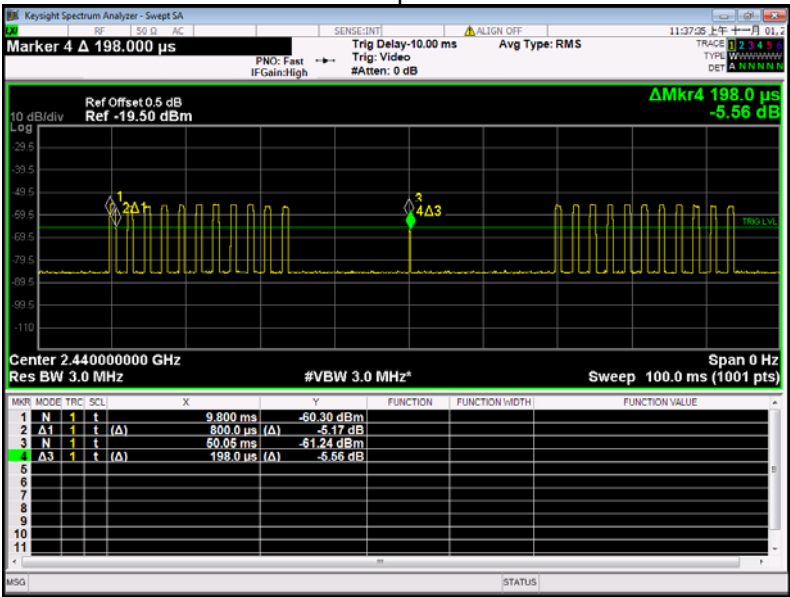
Duty Cycle(%)=Total On interval in a complete pulse train/ Length of a complete pulse train * %

Duty Cycle Correction Factor(dB)=20 * Log₁₀(Duty Cycle)

Test channel	2440MHz
Total transmission time(ms)	0.8*22+0.198=17.798
Length of a complete transmission period(ms)	100
Duty Cycle(%)	17.798
Duty Cycle Correction Factor(dB)	-14.99

Refer to the duty cycle plot (as below)

Test plots



9 Restricted band

Test Requirement: FCC Part15 Paragraph 15.205

Test Method: ANSI C63.10: 2013

Test Result: N/A

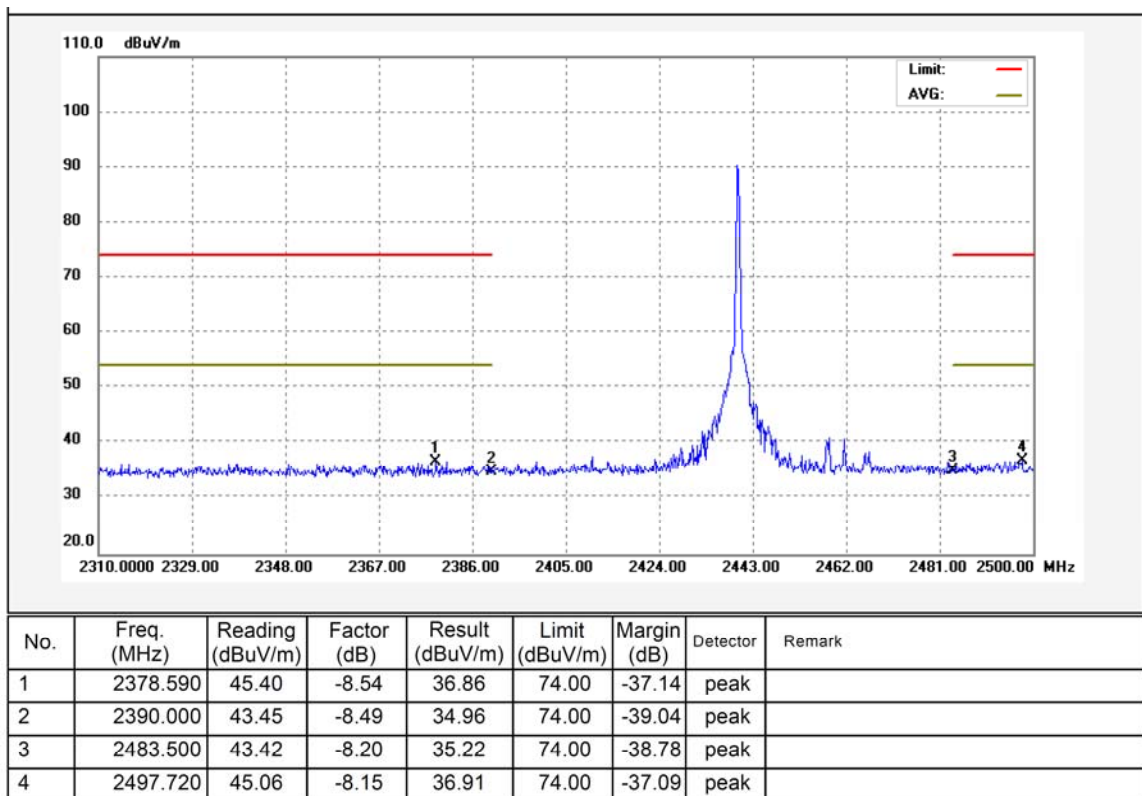
9.1 Requirments

emissions that fall in the restricted bands(15.205).Above 1000MHz, compliance with the emissions limits in section 15.209 shall be demonstrated based on the average value of the measured emissions,The provisions in section 15.35apply to these measurements.

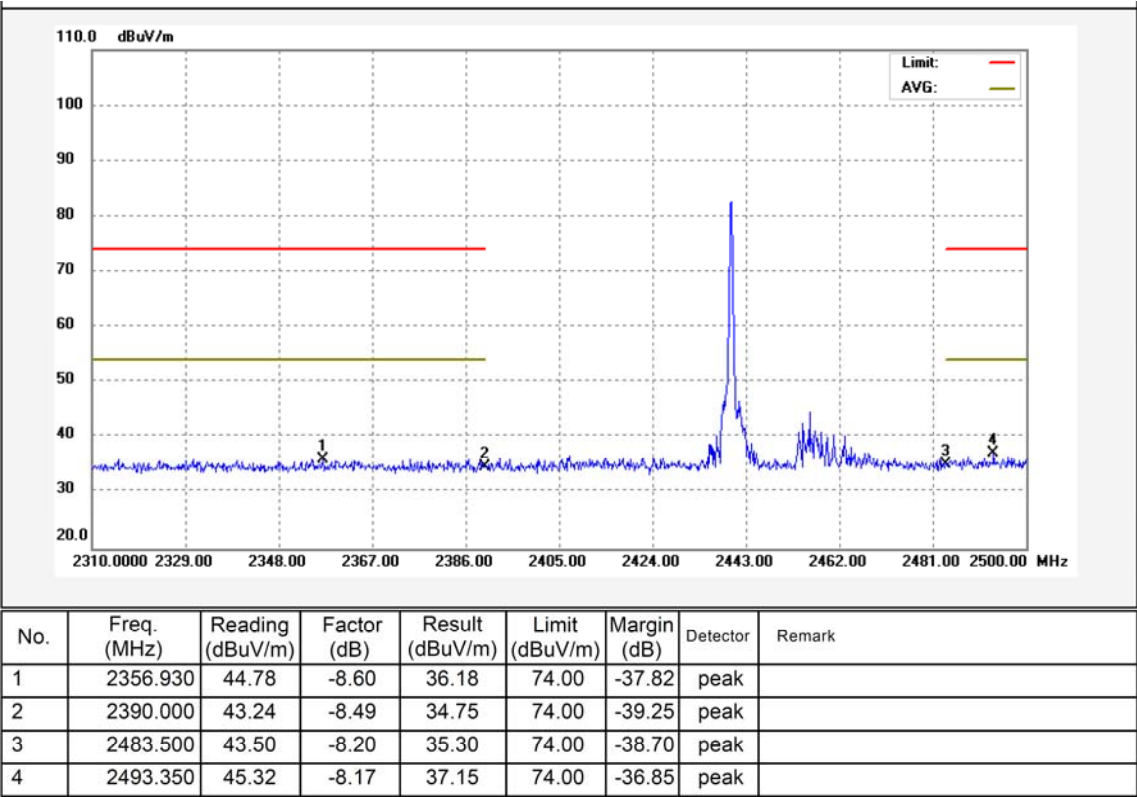
9.2 Test Result

Mode: Continuously Transmitting

Antenna Polarization: Vertical



Antenna Polarization: Horizontal



10 20 dB Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.215(c)
 Test Method: ANSI C63.10:2013
 Test Mode: Transmitting

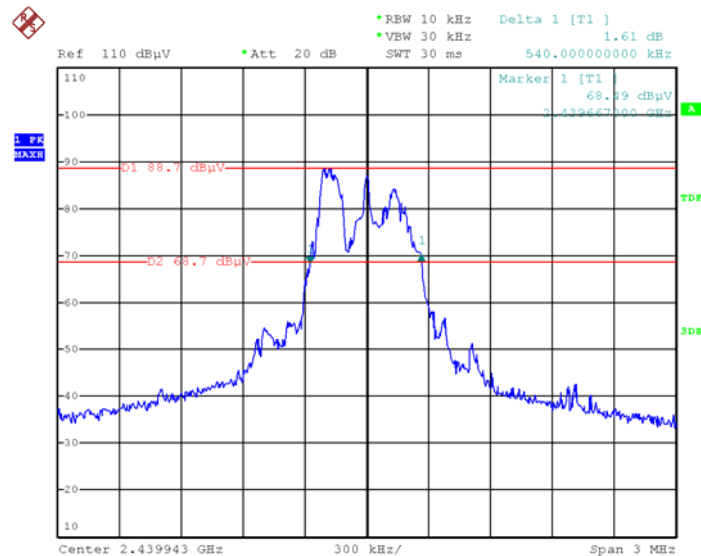
10.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 1%-5% OBW, VBW = 3RBW

10.2 Test Result

Frequency (MHz)	Bandwidth Emission (kHz)
2440	540

Low channel Test plots



Date: 31.OCT.2024 13:59:29

11 Antenna Requirement

According to the FCC Part 15 Paragraph 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. This product has a PCB Antenna , fulfil the requirement of this section.

12 RF Exposure

Remark: Please refer to MPE test report: WTU24D10235214W002

13 Photographs - Constructional Details

Note: Please refer to appendix: Appendix-KDH281-Photos.

=====End of Report=====