RF TEST REPORT

Report No.:	SET2022-01415
Product Name:	Dry Eye Analyzer
Model No. :	DEA
FCC ID:	2A422DEA
Applicant:	Shenzhen CERTAINN Technology Co., Ltd.
Applicant Address:	Bldg.2-C,Zone 2, GOTO Digital Technology Park, No.137Bulan Rd., Longgang District, 518112 Shenzhen, P.R.China
Dates of Testing:	01/08/2022 — 03/11/2022
Issued by:	CCIC Southern Testing Co., Ltd.
Lab Location:	Electronic Testing Building, No. 43 Shahe Road, Xili Street, Nanshan District, Shenzhen, Guangdong, China.
	Tel: 86 755 26627338 **Fax:** 86 755 26627238

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Test Report

Product Name.....:	Dry Eye Analyzer
Trade Name.....:	Moptim
Applicant.....:	Shenzhen CERTAINN Technology Co., Ltd.
Applicant Address.....:	Bldg.2-C,Zone 2, GOTO Digital Technology Park, No.137Bulan Rd., Longgang District, 518112 Shenzhen, P.R.China
Manufacturer.....:	Shenzhen CERTAINN Technology Co., Ltd.
Manufacturer Address .....:	Bldg.2-C,Zone 2, GOTO Digital Technology Park, No.137Bulan Rd., Longgang District, 518112 Shenzhen, P.R.China
Test Standards.....:	47 CFR Part 15 Subpart C Section 15.231 RSS-210 Issue 8 2010
Test Result .....:	PASS
Tested by .....:	Sun 2022.03.11 Sun, Test Engineer
Reviewed by .....:	Chris You 2022.03.11 Chris You, Senior Engineer
Approved by .....:	Shuangwen Zhang 2022.03.11 Shuangwen Zhang, Manager

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Change History		
Issue	Date	Reason for change
1.0	2022.03.11	First edition

1. General Information

1.1. EUT Description

EUT Type	Dry Eye Analyzer
Hardware Version	V1.1
Software Version	V 1.0
Power Supply	DC 5.0V supplied by the battery
Operation Frequency	433.86MHz
Channel Number	1 channel
Modulation Type	ASK
Antenna Type	Internal antenna
Antenna Gain	0dBi

1.2. Test Standards and Results

The purpose of the report is to conduct testing according to the following FCC/IC certification standards:

No.	Identity	Document Title
1	47 CFR Part 15 Subpart C	Radio Frequency Devices
2	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
3	RSS-210 Issue 8 2010	License - exempt Radio Apparatus (All Frequency Bands): Category I Equipment
4	RSS-Gen (Issue 5, April 2018) Amendment2 (February 2021)	General Requirements for Compliance of Radio Apparatus

Test detailed items/section required by FCC/IC rules and results are as below:

No.	FCC Rules	IC Rules	Description	Result
1	§15.207	RSS-Gen, 8.8	AC Power Line Conducted Emission	N/A
2	§15.231	RSS-210 A1.1	Radiated Spurious Emissions	PASS
3	§ 15.231(c)	RSS-210 A1.1.3	20dB & 99% Occupied Bandwidth	PASS
4	§15.231	RSS-Gen, 6.10	Duty Cycle	PASS
5	§15.231(a)	RSS-210 A1.1.1(b)	Deactivation Time	PASS

1.3. EUT operation mode

The EUT has been tested under typical operating condition. The Applicant provides software to control the EUT for staying in continuous transmitting mode for testing.

1.4. Facilities and Accreditations

1.4.1. Facilities

CNAS-Lab Code: L1659

CCIC-SET is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L1659.

FCC-Registration No.: 406086

CCIC Southern Testing 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. Designation Number: CN1283, valid time is until April 19th, 2023.

ISED Registration: 11185A-1

CAB identifier: CN0064

CCIC Southern Testing Co., Ltd. EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 11185A-1 on Aug. 04, 2016, valid time is until Jun. 30th, 2023.

A2LA Code: 5721.01

CCIC-SET is a third party testing organization accredited by A2LA according to ISO/IEC 17025. The accreditation certificate number is 5721.01.

1.4.2. Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15°C - 35°C
Relative Humidity (%):	30% -60%
Atmospheric Pressure (kPa):	86KPa-106KPa

2. 47 CFR Part 15C Requirements

2.1. Antenna requirement

2.1.1. Applicable Standard

According to FCC 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.

And according to FCC 47 CFR Section 15.247(c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

2.1.2. Antenna Information

Antenna Category: Internal Antenna

A internal Antenna was soldered to the antenna port of EUT via an adaptor cable, can't be removed.

Antenna General Information:

No.	EUT	Ant. Type	Ant. Gain
1	Dry Eye Analyzer	Internal	0dBi

2.1.3. Result: comply

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

2.2. AC Power Line Conducted Emission

2.2.1. Limit of AC Power Line Conducted Emission

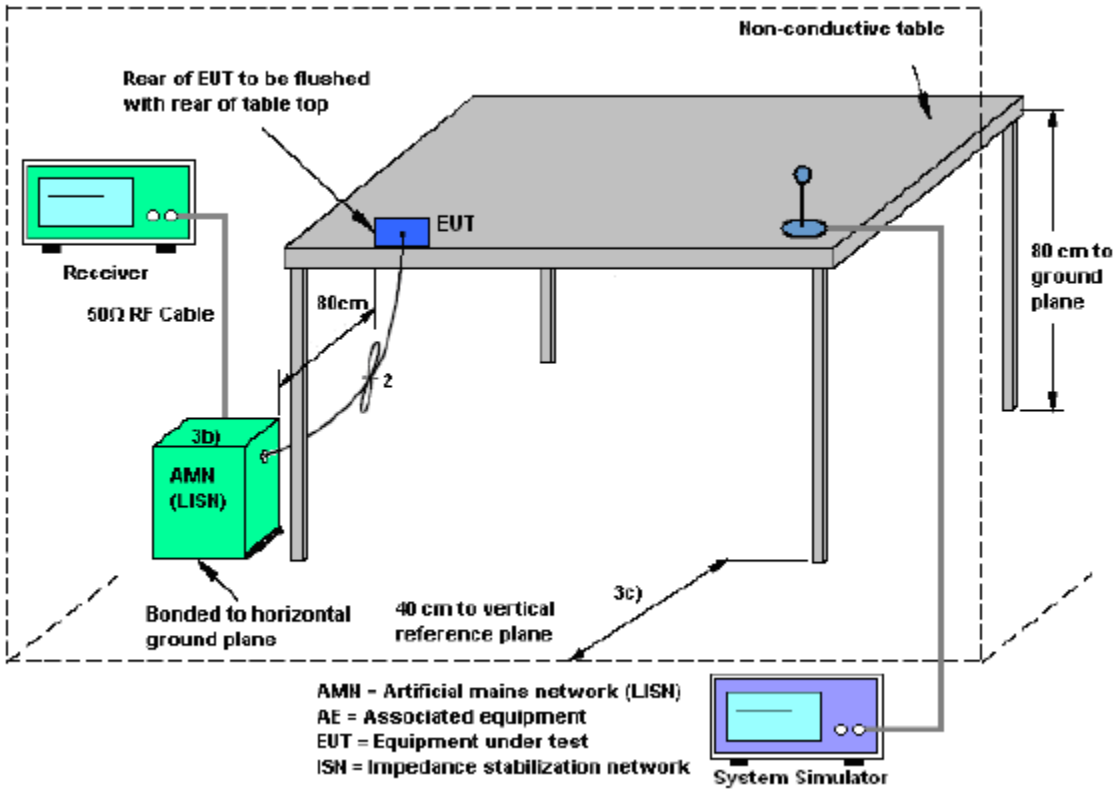
For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency range (MHz)	Conducted Limit (dBμV)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

2.2.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

2.2.3. Test Setup



2.2.4. Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 micrometry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

2.2.5. Test Results of Conducted Emission

N/A, EUT Power By 3V DC Battery.

2.3. Radiated Spurious Emission

2.3.1. Limit of Radiated Spurious Emission

According to 15.231 the field strength of emissions from intentional radiators operated under these frequencies bands shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental		Field Strength of Spurious	
	μV/m	dBμV/m	μV/m	dBμV/m
40.66 ~ 40.70	2250	67.04	225	47.04
70 ~ 130	1250	61.94	125	41.94
130 ~ 174	1250 ~ 3750	61.94 ~ 71.48	125 ~ 375	41.94 ~ 51.48
174 ~ 260	3750	71.48	75	37.50
260 ~ 470	3750 ~ 12500	71.48 ~ 81.94	375 ~ 1250	51.48 ~ 61.94
Above 470	12500	81.94	1250	61.94

Emission radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Note:

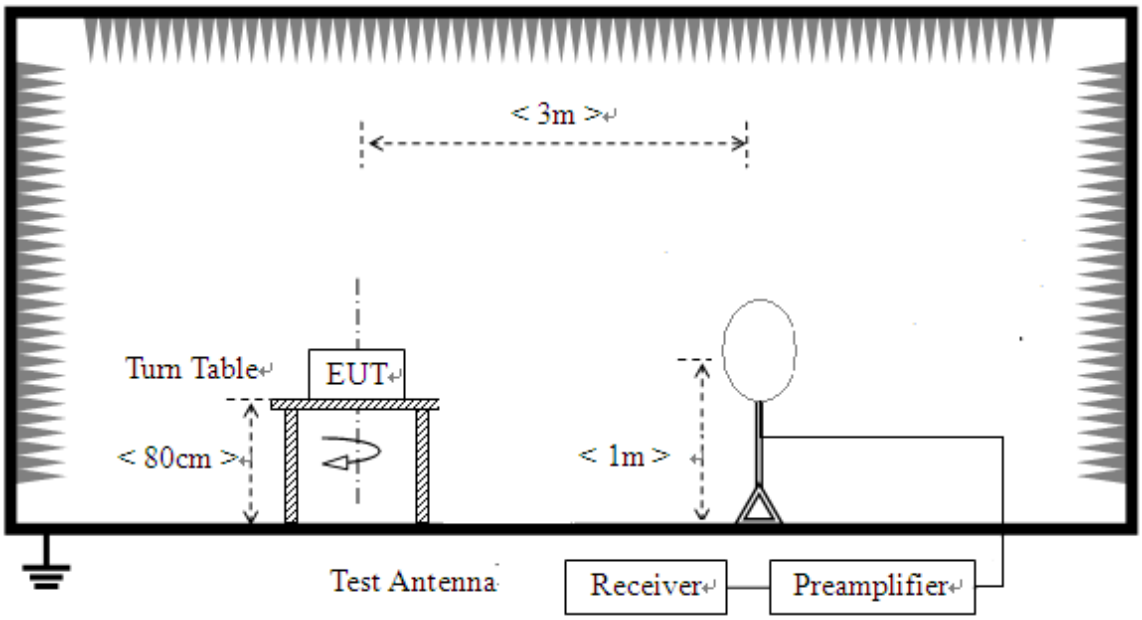
1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBμV/m) = 20 log Emission lever (μV/m)
3. As shown in 15.35(b), for frequencies above 1GHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

2.3.2. Measuring Instruments

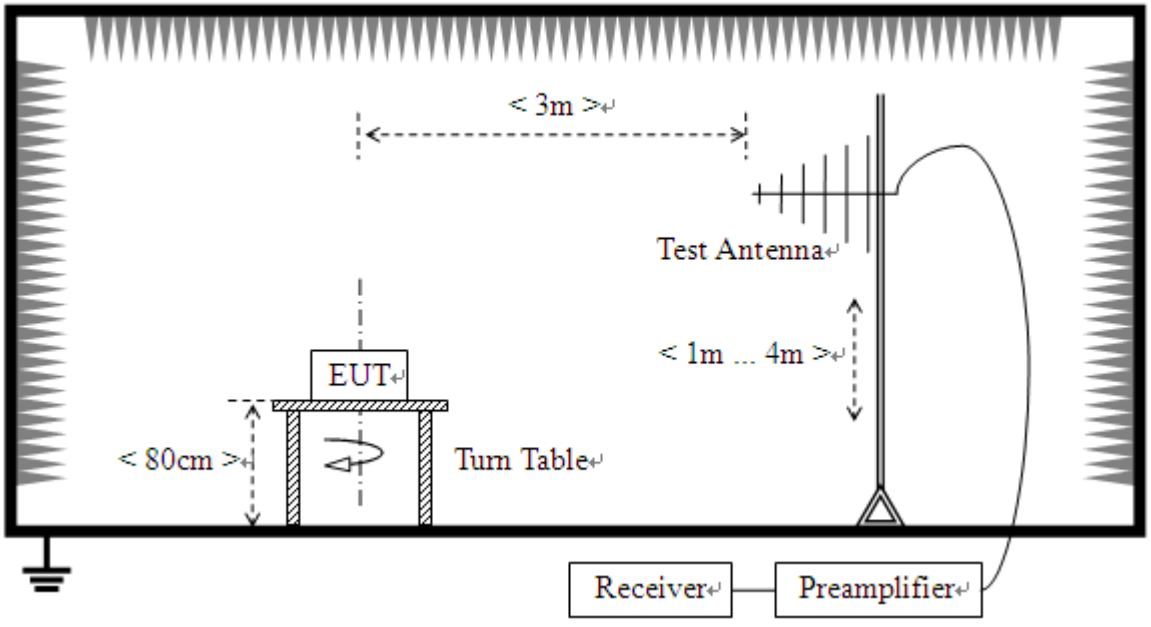
The measuring equipment is listed in the section 3 of this test report.

2.3.3. Test Setup

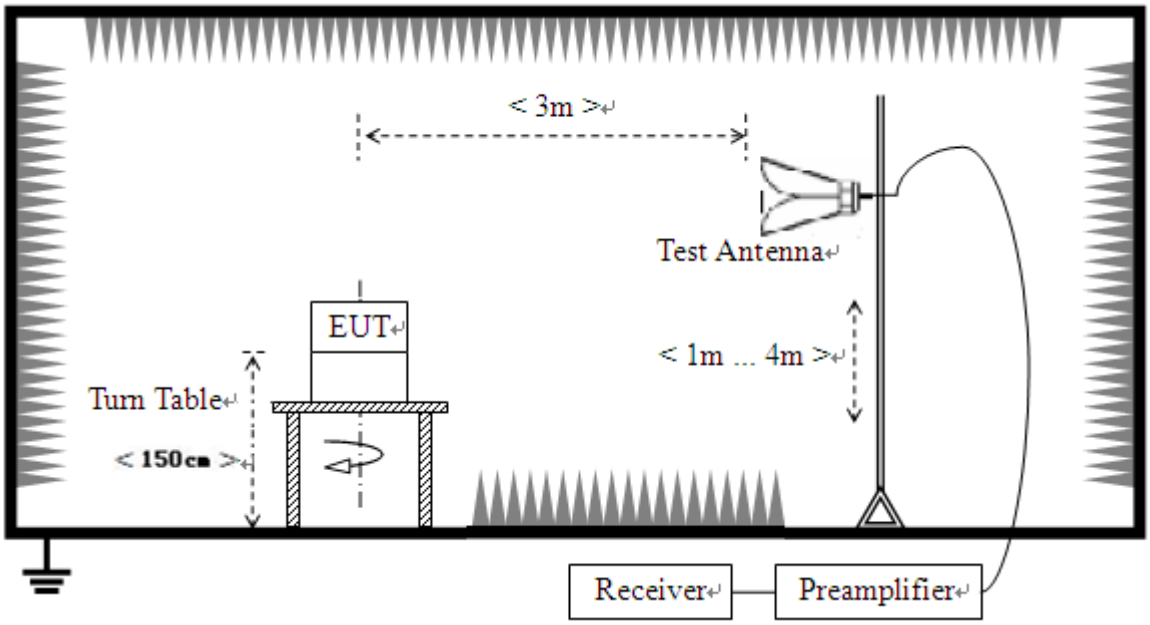
For radiated emissions from 9kHz to 30MHz



For radiated emissions from 30MHz to1GHz



For radiated emissions above 1GHz



2.3.4. Test Procedure

1. The EUT was placed on the top of a rotating table 0.8m for below 1GHz and 1.5m for above 1GHz above the ground at a 3 meters semi-anechoic chamber.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on thetop of a variable height antenna tower.
3. Height of receiving antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured.
   (2) Set RBW = 100kHz for f < 1GHz, RBW = 1MHz for f > 1GHz ; VBW ≥ RBW; Sweep = Auto; Detector function = Peak; Trace = Max hold.

(3) For average measurement: use duty cycle correction factor method per 15.35(c).

Duty cycle = On time/100 milliseconds.

On time = N_1*L_1+N_2*L_2+...+N_{n-1}*LN_{n-1}+Nn*Ln.

Where N_1 is number of type 1 pulses, L1 is length of type 1 pulses, etc.

Average Emission Level = Peak Emission Level + 20*log(Duty cycle).

7. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

2.3.5. Test Results of Radiated Spurious Emission

For 9 kHz to 30MHz

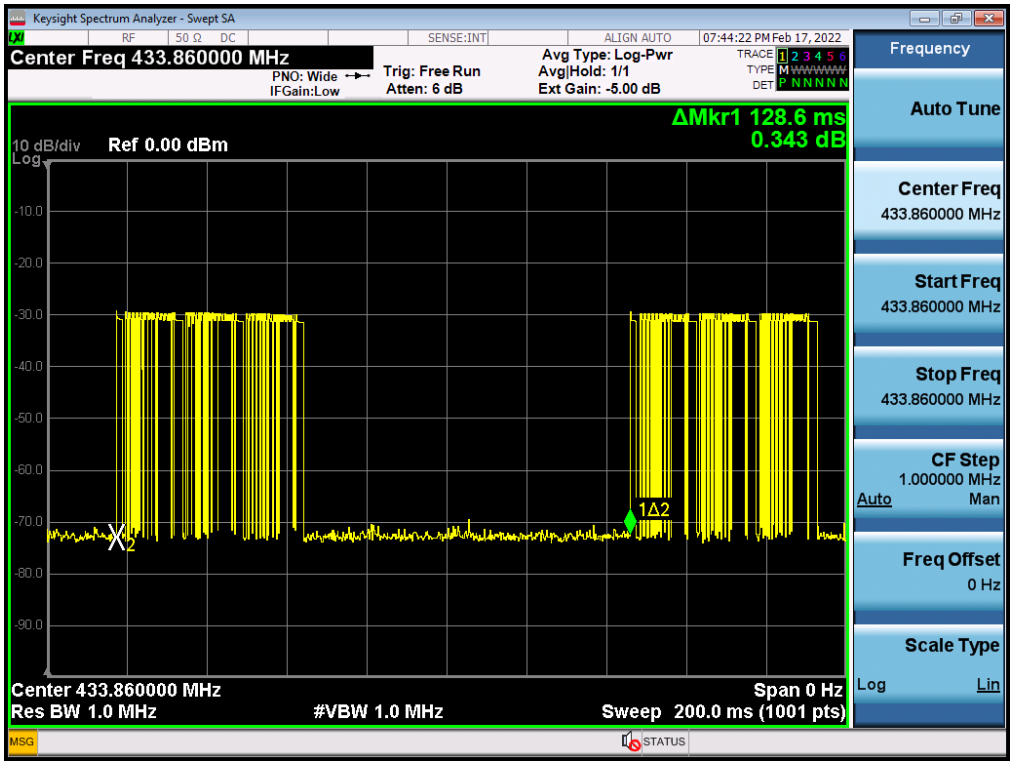
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Frequency (MHz)	Average Factor (dB)	Field Strength dBμV/m (PK)	Field Strength dBμV/m (AV)	Limit dBμV/m (PK)	Limit dBμV/m (AV)	Polarization
433.86	-7.91	69.86	61.95	100.82	80.82	Horizontal
433.86	-7.91	66.31	58.40	100.82	80.82	Vertical
867.72	-7.91	34.93	27.02	80.82	60.82	Horizontal
867.72	-7.91	31.90	23.99	80.82	60.82	Vertical
1301.58	-7.91	34.45	20.82	74.00	54.00	Horizontal
1301.58	-7.91	37.19	25.06	74.00	54.00	Vertical
1735.44	-7.91	35.81	19.29	74.00	54.00	Horizontal
1735.44	-7.91	37.31	20.91	74.00	54.00	Vertical
2169.30	-7.91	38.03	20.49	74.00	54.00	Horizontal
2169.30	-7.91	38.32	20.53	74.00	54.00	Vertical
2603.16	-7.91	40.72	23.25	74.00	54.00	Horizontal
2603.16	-7.91	40.05	23.65	74.00	54.00	Vertical

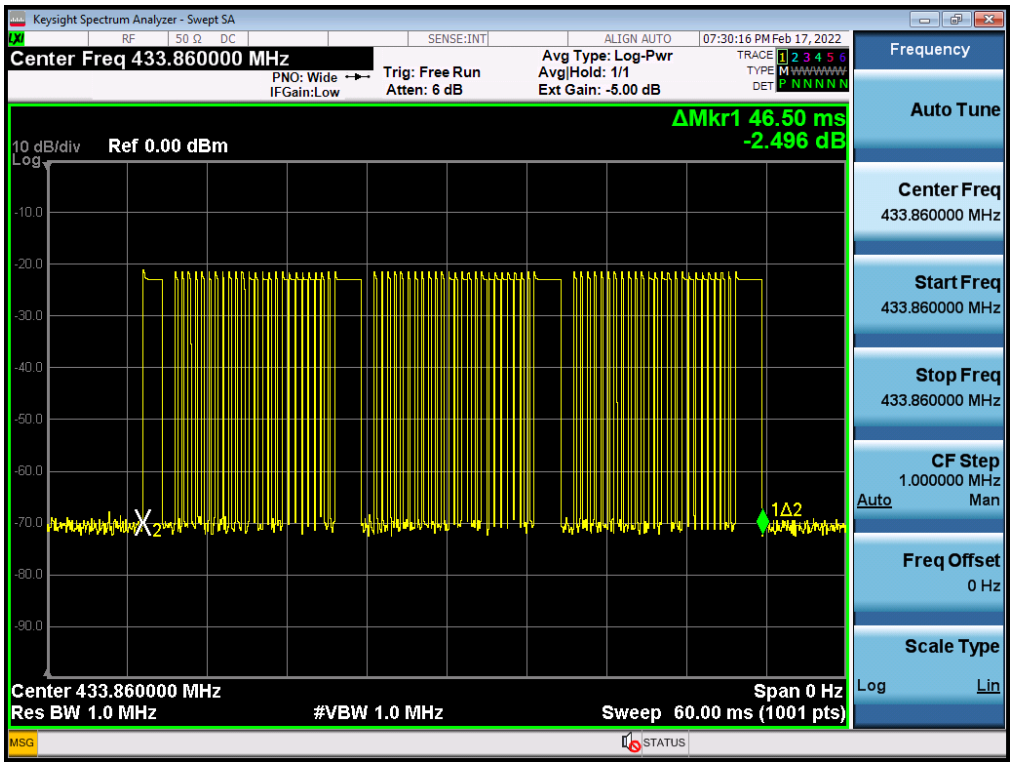
Note:

1. EUT Pre-scan X/Y/Z orientation, only worst case is presented in the report (Y orientation).
2. Calculate Average value based on Duty Cycle correction factor:
   Average Field Strength = Peak Field Strength + Duty Cycle Correction Factor
   Duty Cycle = on time / 100 milliseconds or period, whichever is less
   Period = 128.6(ms)>100(ms)
   Duty Cycle = Ton / Period * 100% = (2.14ms*4 + 0.44ms * 72)/100ms * 100% = 40.24%
   Duty Cycle Correction Factor = 20log (Duty Cycle) = -7.91

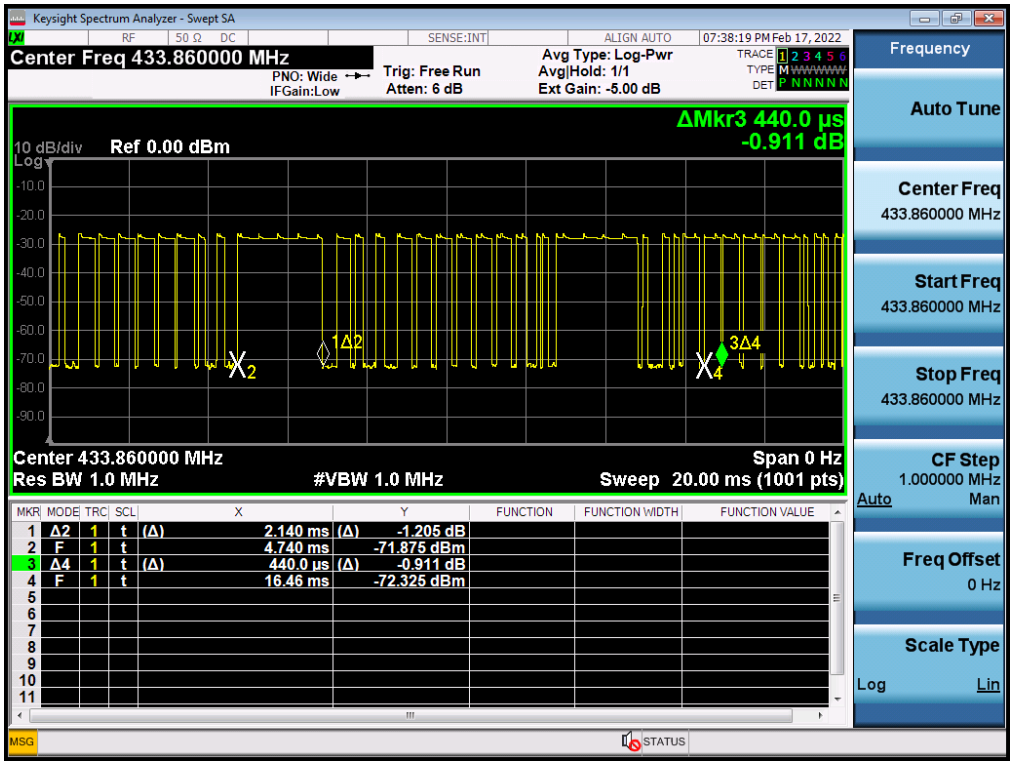
Period



T 60ms



Pulse Width


Keysight Spectrum Analyzer - Swept SA
Center Freq 433.860000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 6 dB
Avg Type: Log-Pwr
Avg|Hold: 1/1
Ext Gain: -5.00 dB
07:38:19 PM Feb 17, 2022
ΔMkr3 440.0 µs
-0.911 dB
10 dB/div
Ref 0.00 dBm
Log
Center 433.860000 MHz
Res BW 1.0 MHz
#VBW 1.0 MHz
Span 0 Hz
Sweep 20.00 ms (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 Δ2 1 t (Δ) 2.140 ms (Δ) -1.205 dB
2 F 1 t 4.740 ms -71.875 dBm
3 Δ4 1 t (Δ) 440.0 µs (Δ) -0.911 dB
4 F 1 t 16.46 ms -72.325 dBm
Frequency
Auto Tune
Center Freq
433.860000 MHz
Start Freq
433.860000 MHz
Stop Freq
433.860000 MHz
CF Step
1.000000 MHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin
MSG
STATUS

2.4. 20dB & 99% Occupied Bandwidth

2.4.1. Limit of Occupied Bandwidth

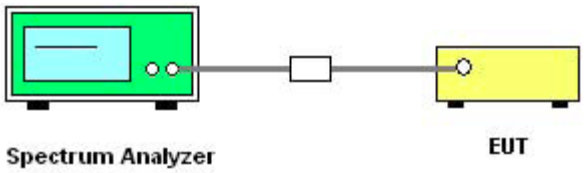
The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. For devices operating above 900MHz, the emission shall no wider than 0.5% of the center frequency.

Limit: 433.86MHz * 0.25% = 1084.65kHz

2.4.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

2.4.3. Test Setup

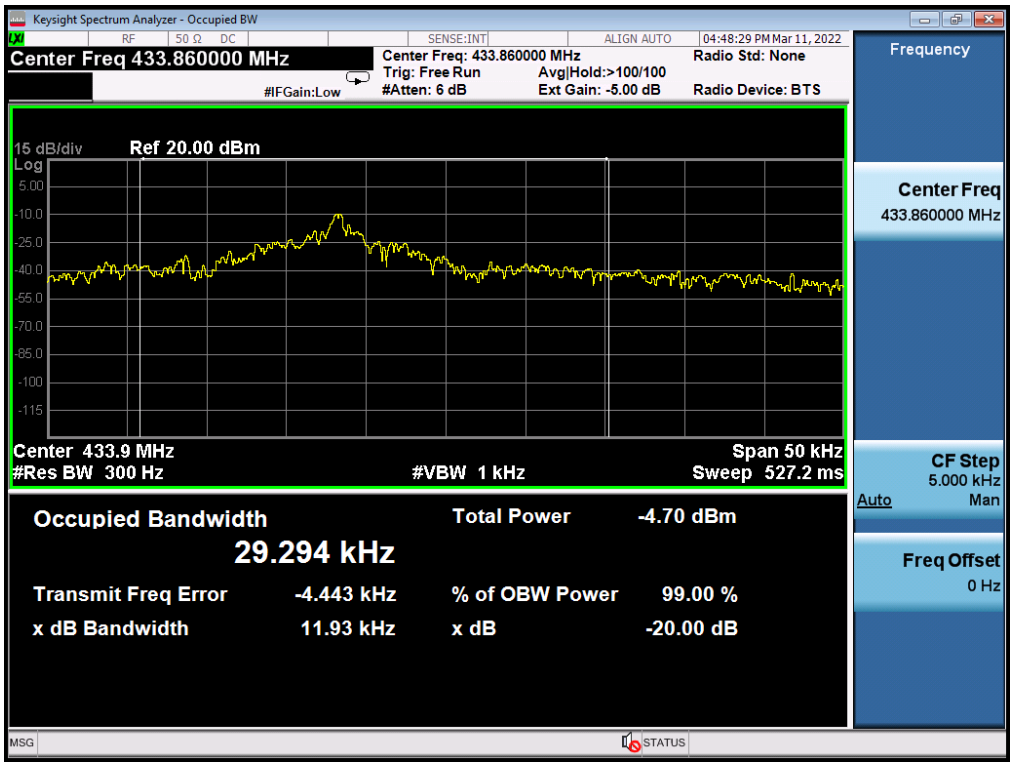


2.4.4. Test Procedure

1. Customer provided a test mode internal to the EUT to control the RF modulation.
2. The EUT antenna was attached and the waveform was receiver by the test antenna which was connected to the spectrum analyzer was operated in linear scale and zero span mode after tuning to the transmitter carrier frequency.
3. Bandwidth is determined at the points 20 dB down from the modulated carrier.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 1~5%OBW. Set the Video bandwidth (VBW) = 3*RBW. Span=50kHz.

2.4.5. Test Results of Occupied Bandwidth

Frequency(MHz)	20dB Bandwidth(kHz)	99% Bandwidth(kHz)	Limit (kHz)	Result
433.86	11.93	29.294	1084.65	PASS



2.5. Deactivation Time

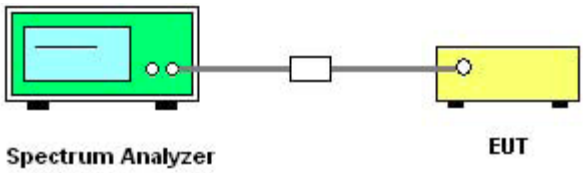
2.5.1. Limit of Deactivation Time

According to 15.231, a manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

2.5.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

2.5.3. Test Setup

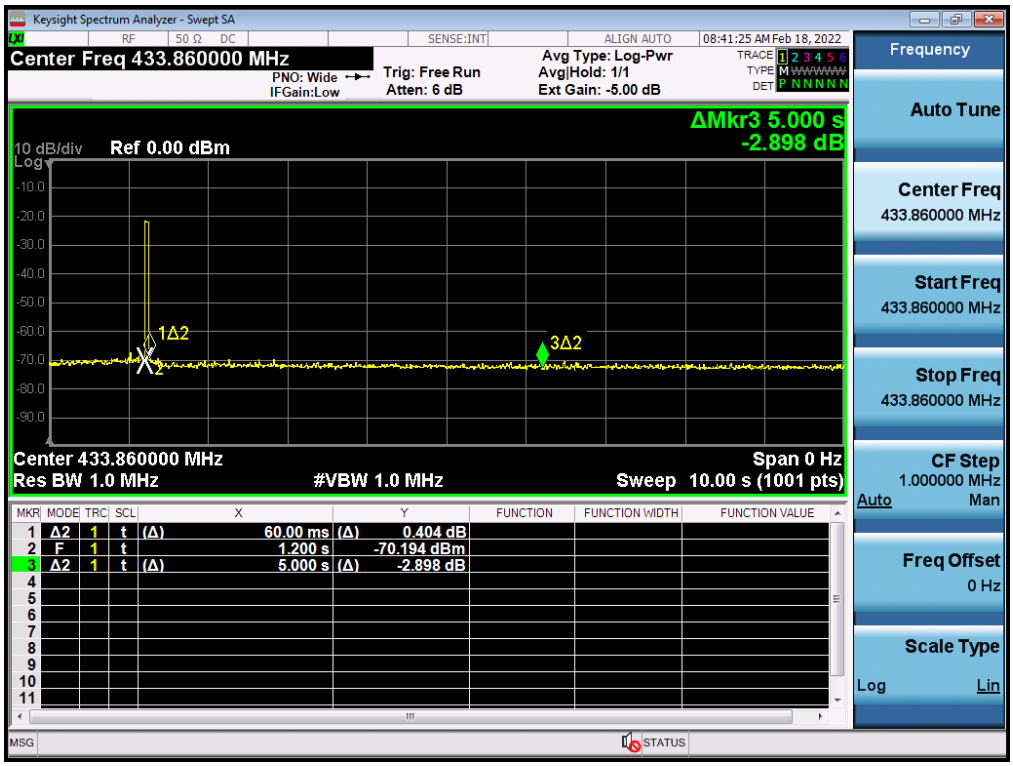


2.5.4. Test Procedure

1. The EUT was placed on the turning table.
2. The signal was coupled to the spectrum analyzer through an antenna.
3. Set the resolution bandwidth to 1MHz and video bandwidth to 1MHz. The spectrum analyzer was turned to the centre frequency of the transmitters and the analyzers marker function was used to determine the duration of transmission.
4. The transmission duration was measured and recorded.

2.5.5. Test Results of Transmitter Timeout

Frequency(MHz)	One transmission timet (s)	Limit (s)	Result
433.86	0.06	5	PASS



3. List of measuring equipment

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	EMI TEST RECEIVER	KEYSIGHT	N9038A	A141202036	2021.04.26	2022.04.25
2	Power Meter	R&S	NRP-Z31	102872	2021.04.26	2022.04.25
3	TURNTABLE	ETS	2088	2149	N/A	N/A
4	ANTENNA MAST	ETS	2075	2346	N/A	N/A
5	EMI TEST Software	R&S	ESK1	N/A	N/A	N/A
6	Horn antenna (18GHz~26.5GHz)	AR	AT4003A	325306	2020.09.16	2022.09.15
7	Amplifier 1G~18GHz	MILMEGA	AS0104R-800/400	A160302517	2022.01.01	2030.12.31
8	High pass filter	Compliance Direction systems	BSU-6	34202	2021.11.09	2022.11.08
9	Horn Antenna	R&S	HF906	A0304225	2019.04.17	2022.04.16
10	Horn Antenna	R&S	ESIB7	A0501375	2020.06.24	2022.06.22
11	ULTRA-BROADBAND ANTENNA	SCHWARZBECK	VULB9160	A0805560	2019.05.24	2022.05.23
12	Passive Loop Antenna	R&S	HFH2-Z2	100047	2019.04.26	2022.04.25
13	Temperature chamber	TABAI	PS-232	A8708054	2021.09.24	2022.09.23
14	Spectrum Analyzer	KEYSIGHT	N9030A	A160702554	2021.04.26	2022.04.25
15	Power Supply	R&S	ESIB26	A0304218	2022.01.04	2023.01.04
16	LISN	ROHDE&SCHWARZ	ENV216	A140701847	2021.08.11	2022.08.10
17	Test software	ECIT	Eagle	V2.0	N/A	N/A

4. Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence . The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

Uncertainty of AC Power Line Conducted Emission Measurement (150KHz~30MHz)

Measuring Uncertainty for a level of confidence of 95%(U=2Uc(y))	2.8dB

Uncertainty of Radiated Emission Measurement (9KHz~30MHz)

Measuring Uncertainty for a level of confidence of 95%(U=2Uc(y))	3.5dB

Uncertainty of Radiated Emission Measurement (30MHz~1GHz)

Measuring Uncertainty for a level of confidence of 95%(U=2Uc(y))	3.91dB

Uncertainty of Radiated Emission Measurement (1GHz~18GHz)

Measuring Uncertainty for a level of confidence of 95%(U=2Uc(y))	4.5dB

Uncertainty of Radiated Emission Measurement (18GHz~40GHz)

Measuring Uncertainty for a level of confidence of 95%(U=2Uc(y))	4.9dB

Uncertainty of RF Conducted Measurement (9KHz~40GHz)

Measuring Uncertainty for a level of confidence of 95%(U=2Uc(y))	1.3dB

** END OF REPORT **