FCC PART 15.231

TEST REPORT

For

NEO MATERIALS & CONSULTING Inc.

9386 Boulevard Viau, Saint Leonard, Canada

FCC ID: 2ALM6-CBR3E32

Report Type:	**Product Type:**
Original Report	Neo Smart Blinds Controller

Report Number:	SZNS210617-23893E-RF
Report Date:	2021-09-18
Reviewed By:	Candy Li RF Engineer
Prepared By:	Shenzhen Accurate Technology Co., Ltd. 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China Tel: (0755) 26503290 Fax: (0755) 26503396 Http://www.atc-lab.com

Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "★".

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Neo Smart Blinds Controller
Tested Model	C-BR300
Multiple Models	C-BR300-E, C-BR300-L
Model Difference*	Refer to the DoS letter
Frequency Range	433.9157MHz
Modulation Technique	OOK
Antenna Specification*	2.15dBi(It is provided by the applicant)
Voltage Range	DC 5V from adapter
Date of Test	2021-09-01 to 2021-09-17
Sample serial number	SZNS210617-23893E-RF -S1
Received date	2021-06-17
Sample/EUT Status	Good condition
Adapter information	Model: RH-050100US Input: AC 100-240V, 50/60Hz, 0.2A Max Output: DC 5V, 1A

Objective

All the test measurements were performed according to the measurement procedure described in ANSI C63.10 - 2013.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.207, 15.205, 15.209, 15.35(c) and 15.231 rules.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10 - 2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed at Shenzhen Accurate Technology Co., Ltd. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Each test item follows test standards and with no deviation.

Measurement Uncertainty

Parameter		Uncertainty
AC Power Lines Conducted Emissions		2.72dB
Occupied Channel Bandwidth		5%
RF output power, conducted		0.73dB
Unwanted Emission, conducted		1.6dB
Emissions, Radiated	30MHz - 1GHz	4.28dB
	1GHz- 18GHz	4.98dB
Temperature		1℃
Humidity		6%
Supply voltages		0.4%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The test site used by Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189. Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 4297.01.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0016.

SYSTEM TEST CONFIGURATION

Justification

The system was configured for testing by manufacturer.

Operating frequency: 433.9157MHz

Special Accessories

No special accessories was used

Equipment Modifications

No modification was made to the EUT.

Support Equipment List and Details

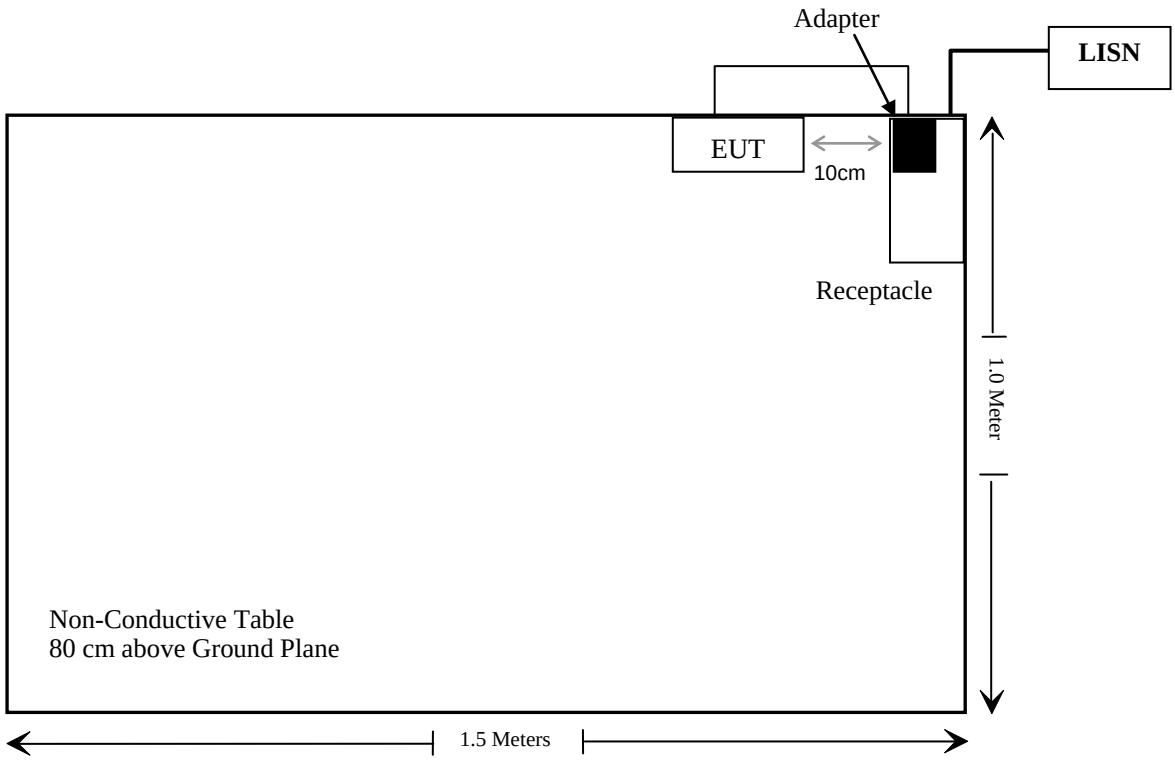
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

Cable Description	Length (m)	From / Port	To
Unshielded Detachable USB Cable	1.0	Adapter	EUT

Block Diagram of Test Setup

For conducted emission:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliant
§15.207 (a)	Conducted Emissions	Compliant
§15.205, §15.209, §15.231(b)	Radiated Emissions	Compliant
§15.231 (c)	20dB Emission Bandwidth	Compliant
§15.231 (a) (1)	Deactivation	Compliant

TEST EQUIPMENT LIST AND DETAILS

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde& Schwarz	Test Receiver	ESPI3	100396	2020/12/24	2021/12/23
R & S	L.I.S.N.	ENV216	101314	2020/12/25	2021/12/24
Anritsu Corp	50Ω Coaxial Switch	MP59B	6200506474	2020/12/25	2021/12/24
Unknown	RF Coaxial Cable	N-2m	No.2	2020/12/25	2021/12/24
Radiated Emissions Test					
Rohde&Schwarz	Test Receiver	ESR	101817	2020/12/24	2021/12/23
Rohde & Schwarz	Spectrum Analyzer	FSV-40	101495	2020/12/24	2021/12/23
A.H. Systems, inc.	Preamplifier	PAM-0118P	531	2021/07/08	2022/07/07
SONOMA INSTRUMENT	Amplifier	310 N	186131	2020/12/25	2021/12/24
Anritsu Corp	50 Coaxial Switch	MP59B	6100237248	2020/12/25	2021/12/24
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2020/01/05	2023/01/04
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2020/01/05	2023/01/04
Unknown	RF Coaxial Cable	N-5m	No.3	2020/12/25	2021/12/24
Unknown	RF Coaxial Cable	N-5m	No.4	2020/12/25	2021/12/24
Unknown	RF Coaxial Cable	N-1m	No.5	2020/12/25	2021/12/24
Unknown	RF Coaxial Cable	N-1m	No.6	2020/12/25	2021/12/24
RF Conducted Test					
Rohde & Schwarz	Spectrum Analyzer	FSV-40	101495	2020/12/24	2021/12/23
WEINSCHEL	6dB Attenuator	WA59-6-33	A329	Each time	

*** Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

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.

Antenna Connector Construction

The EUT has one internal antenna arrangement which was permanently attached. And the antenna gain is 2.15dBi; fulfill the requirement of this section. Please refer to EUT photos.

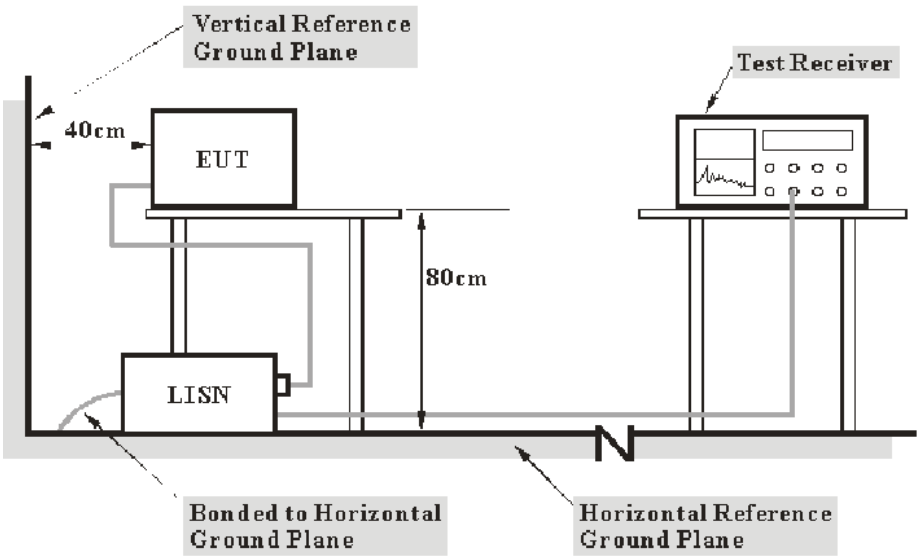
Result: Compliant.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

Transd Factor & Margin Calculation

The Transd factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Transd Factor = LISN VDF + Cable Loss

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – level
Level= reading level+ Transd Factor

Test Data

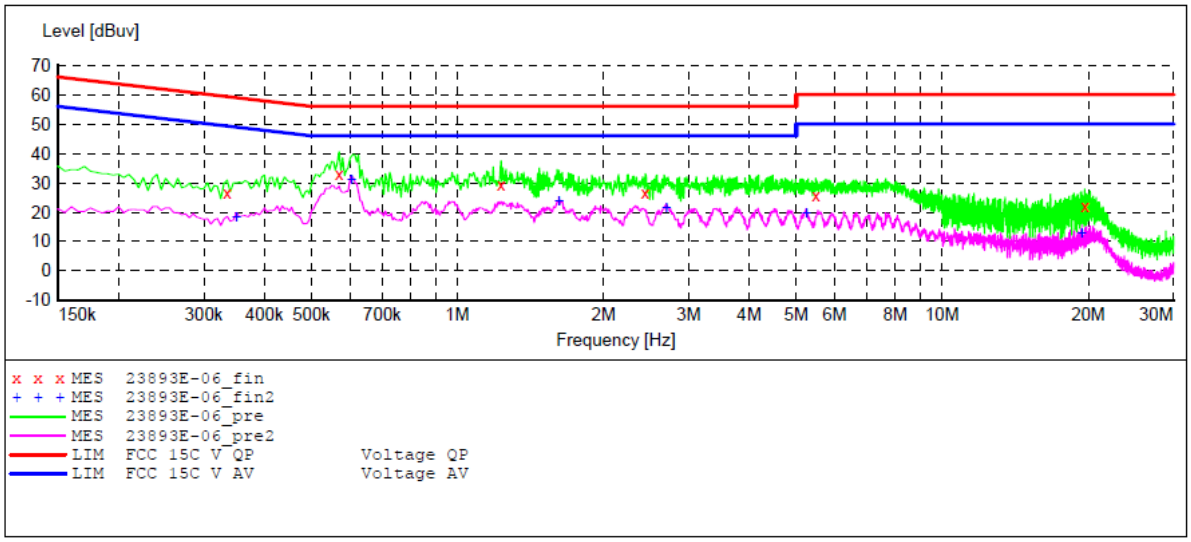
Environmental Conditions

Temperature:	24 ℃
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

The testing was performed by Fan Yang on 2021-09-02.

EUT operation mode: Transmitting

AC 120V/60 Hz, Line



MEASUREMENT RESULT: "23893E-06_fin"

2021-9-2 02:29

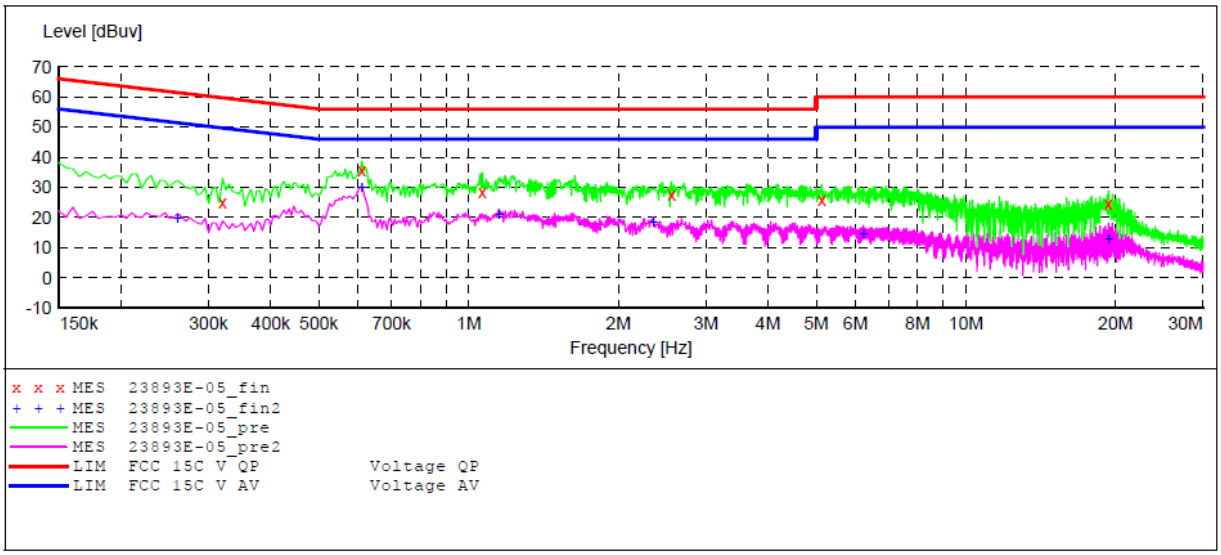
Frequency MHz	Level dBuv	Transd dB	Limit dBuv	Margin dB	Detector	Line	PE
0.335000	26.10	10.9	59	32.9	QP	L1	GND
0.570000	33.10	11.0	56	22.9	QP	L1	GND
1.230000	29.20	11.2	56	26.8	QP	L1	GND
2.440000	26.70	11.3	56	29.3	QP	L1	GND
5.480000	25.60	11.5	60	34.4	QP	L1	GND
19.675000	22.10	11.7	60	37.9	QP	L1	GND

MEASUREMENT RESULT: "23893E-06_fin2"

2021-9-2 02:29

Frequency MHz	Level dBuv	Transd dB	Limit dBuv	Margin dB	Detector	Line	PE
0.350000	18.20	10.9	49	30.8	AV	L1	GND
0.605000	31.20	11.0	46	14.8	AV	L1	GND
1.620000	23.90	11.2	46	22.1	AV	L1	GND
2.700000	21.70	11.3	46	24.3	AV	L1	GND
5.240000	19.80	11.4	50	30.2	AV	L1	GND
19.375000	13.10	11.7	50	36.9	AV	L1	GND

AC 120V/60 Hz, Neutral



MEASUREMENT RESULT: "23893E-05_fin"

2021-9-2 02:26

Frequency MHz	Level dBuv	Transd dB	Limit dBuv	Margin dB	Detector	Line	PE
0.320000	25.20	10.9	60	34.8	QP	N	GND
0.610000	35.50	11.0	56	20.5	QP	N	GND
1.065000	28.40	11.1	56	27.6	QP	N	GND
2.560000	27.60	11.3	56	28.4	QP	N	GND
5.130000	25.80	11.4	60	34.2	QP	N	GND
19.350000	24.50	11.7	60	35.5	QP	N	GND

MEASUREMENT RESULT: "23893E-05_fin2"

2021-9-2 02:26

Frequency MHz	Level dBuv	Transd dB	Limit dBuv	Margin dB	Detector	Line	PE
0.260000	19.40	10.9	51	31.6	AV	N	GND
0.610000	30.20	11.0	46	15.8	AV	N	GND
1.150000	21.20	11.2	46	24.8	AV	N	GND
2.350000	18.70	11.3	46	27.3	AV	N	GND
6.220000	14.90	11.5	50	35.1	AV	N	GND
19.350000	13.10	11.7	50	36.9	AV	N	GND

FCC §15.205, §15.209, §15.231 (b) - RADIATED EMISSIONS

Applicable Standard

FCC §15.205, §15.209, §15.231 (b)

According to FCC §15.231(b), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

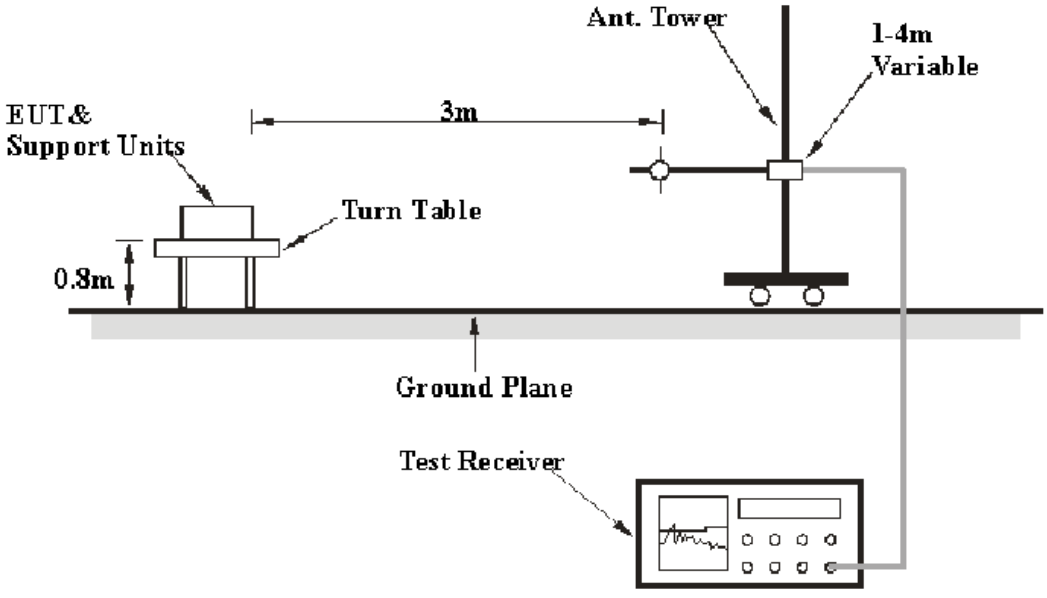
Fundamental frequency (MHz)	Field Strength of Fundamental (Microvolts /meter)	Field Strength of spurious emissions ((Microvolts /meter)
40.66-40.70	2250	225
70-130	1250	125
130-174	1250 to 3750**	125 to 375**
174-260	3750	375
260-470	3750 to 12500**	375 to 1250**
Above 470	12500	1250

*Linear interpolations.

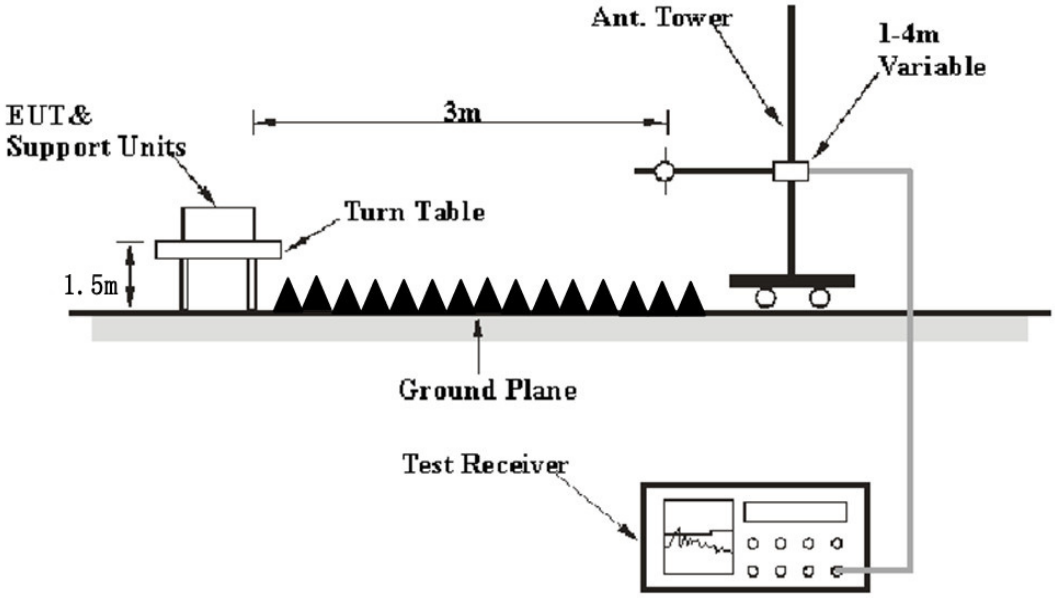
The above field strength limits are specified at a distance of 3-meters the tighter limits apply at the band edges.

EUT Setup

Below 1 GHz:



Above 1 GHz:



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10 - 2013. The specification used was the FCC 15 § 15.209, 15.205 and 15.231.

EMI Test Receiver Setup

The system was investigated from 30 MHz to 5 GHz.

During the radiated emission test, the test receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	PK
Above 1 GHz	1 MHz	3 MHz	/	PK

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All final data was recorded in the Quasi-peak detection mode from 30MHz to 1GHz, Peak and average detection mode above 1 GHz.

Factor & Margin Calculation

The Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Factor = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Result-Limit
Result = Reading + Factor

Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

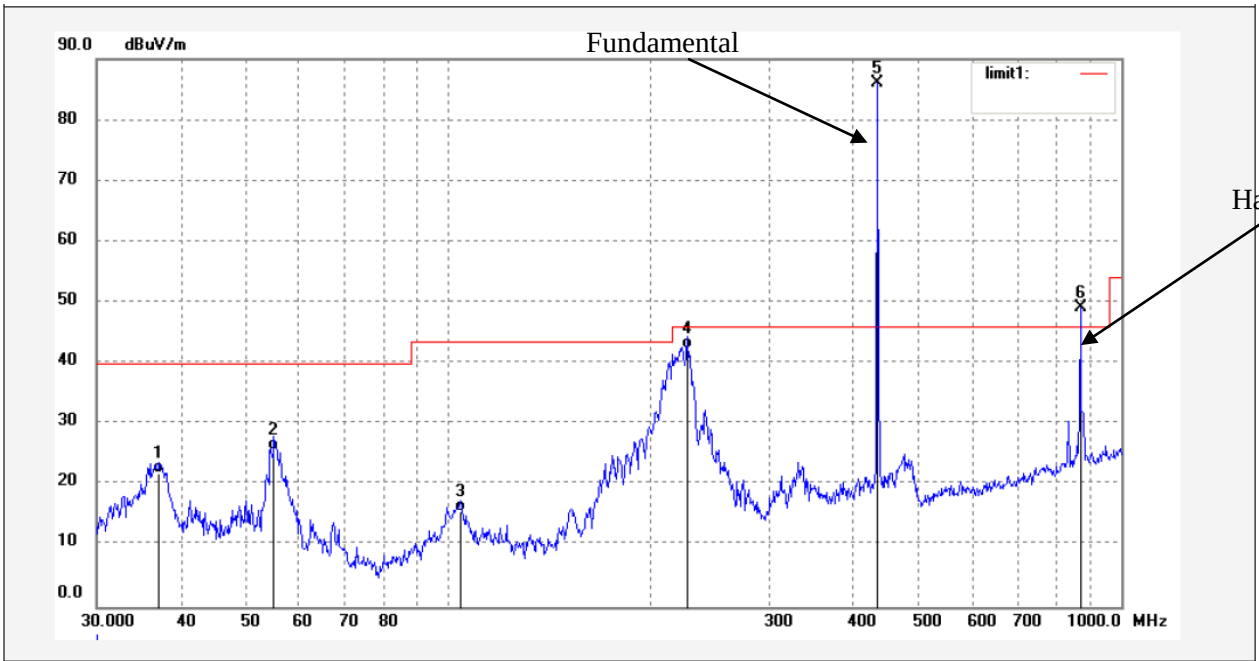
The testing was performed by Fan Yang from 2021-09-01 to 2021-9-17.

EUT operation mode: Transmitting

*All models were tested, and the worst models(*C-BR300*) were recorded*

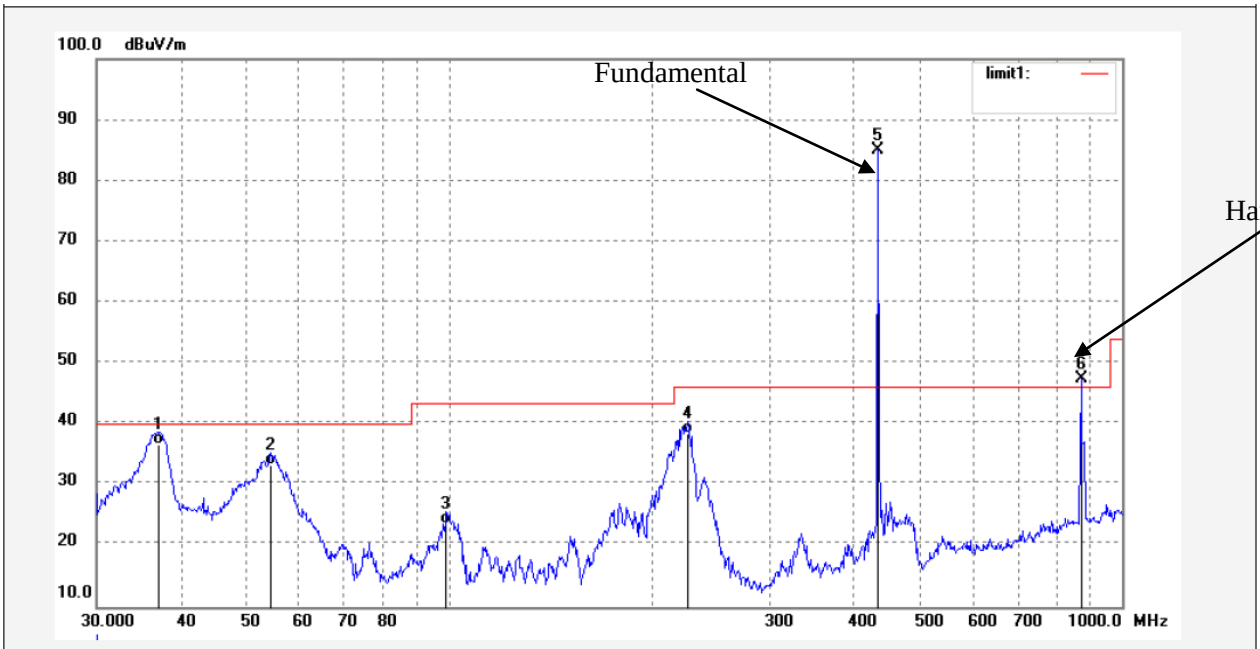
30MHz – 1 GHz:

Horizontal



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	37.1550	37.52	-15.55	21.97	40.00	-18.03	QP			
2	55.0274	43.46	-17.69	25.77	40.00	-14.23	QP			
3	104.1701	34.32	-18.78	15.54	43.50	-27.96	QP			
4	226.0994	59.33	-16.85	42.48	46.00	-3.52	QP			
5	433.9157	97.12	-11.06	86.06	100.83	-14.77	peak			
6	867.8314	53.15	-4.06	49.09	80.83	-31.74	peak			

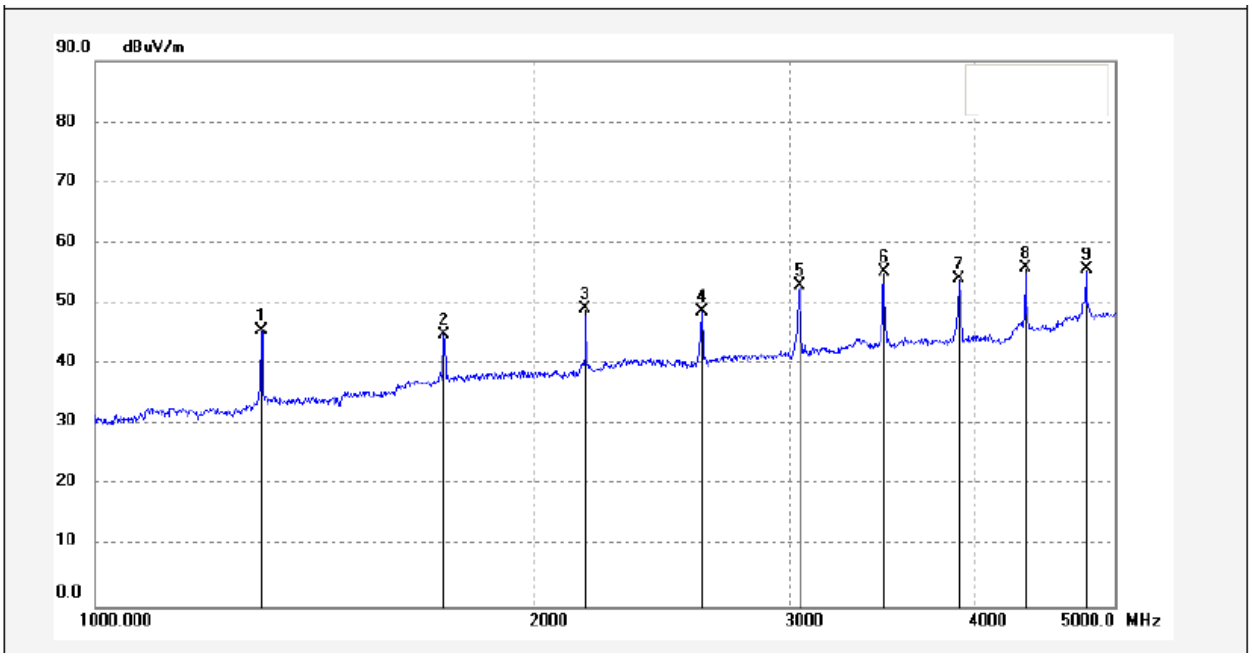
Vertical



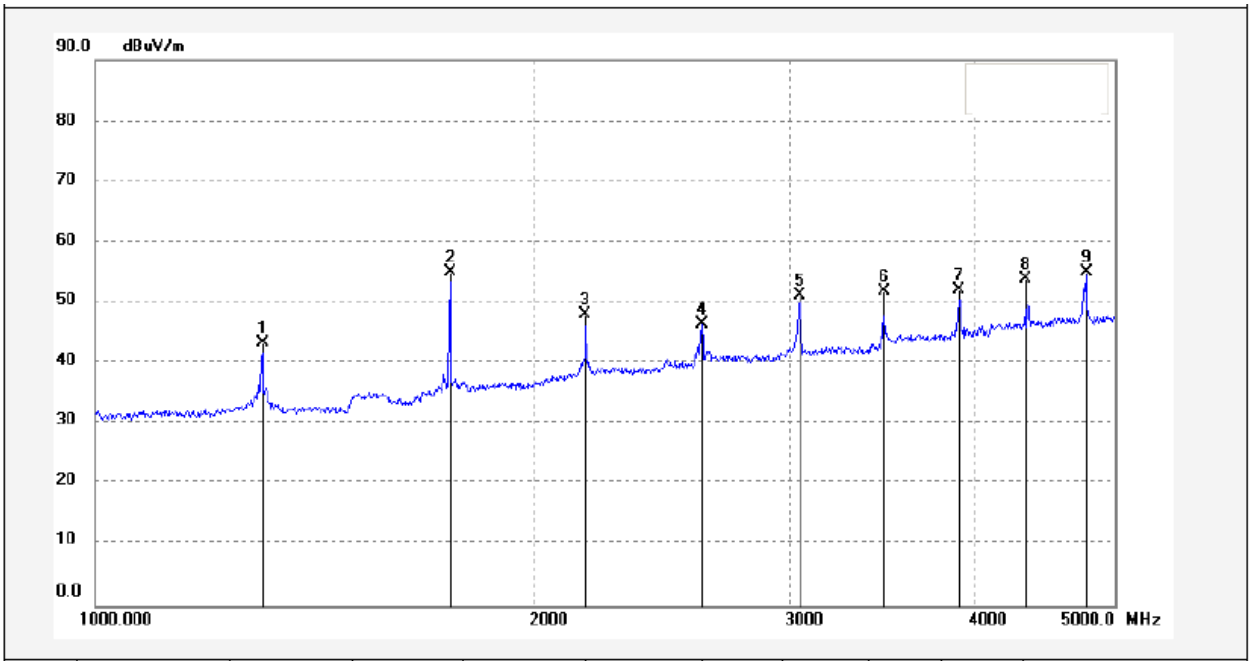
No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	37.1550	52.23	-15.55	36.68	40.00	-3.32	QP			
2	54.4516	50.87	-17.64	33.23	40.00	-6.77	QP			
3	99.1797	41.95	-18.38	23.57	43.50	-19.93	QP			
4	226.8936	55.41	-16.84	38.57	46.00	-7.43	QP			
5	433.9157	96.77	-11.06	85.71	100.83	-15.12	peak			
6	867.8314	51.57	-4.06	47.51	80.83	-33.32	peak			

1 GHz – 5 GHz

Horizontal for Peak



Vertical for Peak



Horizontal

Frequency (MHz)	Reading (dBμV)	Factor Corr.	Average Factor	Result (dBμV/m)		Limit (dBμV/m)		Margin (dB)	
	Peak	(dB/m)	(dB)	AV	Peak	AV	Peak	AV	Peak
433.9157	**97.12**	**-11.06**	**-6.56**	**79.50**	**86.06**	**80.83**	**100.83**	**-1.33**	**-14.77**
867.8314	53.15	-4.06	-6.56	42.53	49.09	60.83	80.83	-18.30	-31.74
1301.7471	57.23	-11.74	-6.56	38.93	45.49	54	74	-15.07	-28.51
1735.6628	54.73	-9.79	-6.56	38.38	44.94	60.83	80.83	-22.45	-35.89
2169.5785	56.69	-7.56	-6.56	42.57	49.13	60.83	80.83	-18.26	-31.70
2603.4924	54.17	-5.4	-6.56	42.21	48.77	60.83	80.83	-18.62	-32.06
3037.4099	56.41	-3.39	-6.56	46.46	53.02	60.83	80.83	-14.37	-27.81
3471.3256	55.45	-0.22	-6.56	48.67	55.23	60.83	80.83	-12.16	-25.60
3905.2413	51.81	2.38	-6.56	47.63	54.19	54	74	-6.37	-19.81
4339.1570	53.73	2.22	-6.56	49.39	55.95	54	74	-4.61	-18.05
4773.0727	52.95	2.74	-6.56	49.13	55.69	54	74	-4.87	-18.31

Vertical

Frequency (MHz)	Reading (dBμV)	Factor Corr.	Average Factor	Result (dBμV/m)		Limit (dBμV/m)		Margin (dB)	
	Peak	(dB/m)	(dB)	AV	Peak	AV	Peak	AV	Peak
433.9157	**96.77**	**-11.06**	**-6.56**	**79.15**	**85.71**	**80.83**	**100.83**	**-1.68**	**-15.12**
867.8314	51.57	-4.06	-6.56	40.95	47.51	60.83	80.83	-19.88	-33.32
1301.7471	54.97	-11.74	-6.56	36.67	43.23	54	74	-17.33	-30.77
1735.6628	64.75	-9.79	-6.56	48.40	54.96	60.83	80.83	-12.43	-25.87
2169.5785	55.69	-7.56	-6.56	41.57	48.13	60.83	80.83	-19.26	-32.70
2603.4924	51.85	-5.4	-6.56	39.89	46.45	60.83	80.83	-20.94	-34.38
3037.4099	54.51	-3.35	-6.56	44.6	51.16	60.83	80.83	-16.23	-29.67
3471.3256	52.09	-0.22	-6.56	45.31	51.87	60.83	80.83	-15.52	-28.96
3905.2413	49.68	2.38	-6.56	45.5	52.06	54	74	-8.5	-21.94
4339.1570	51.64	2.22	-6.56	47.3	53.86	54	74	-6.7	-20.14
4773.0727	52.23	2.74	-6.56	48.41	54.97	54	74	-5.59	-19.03

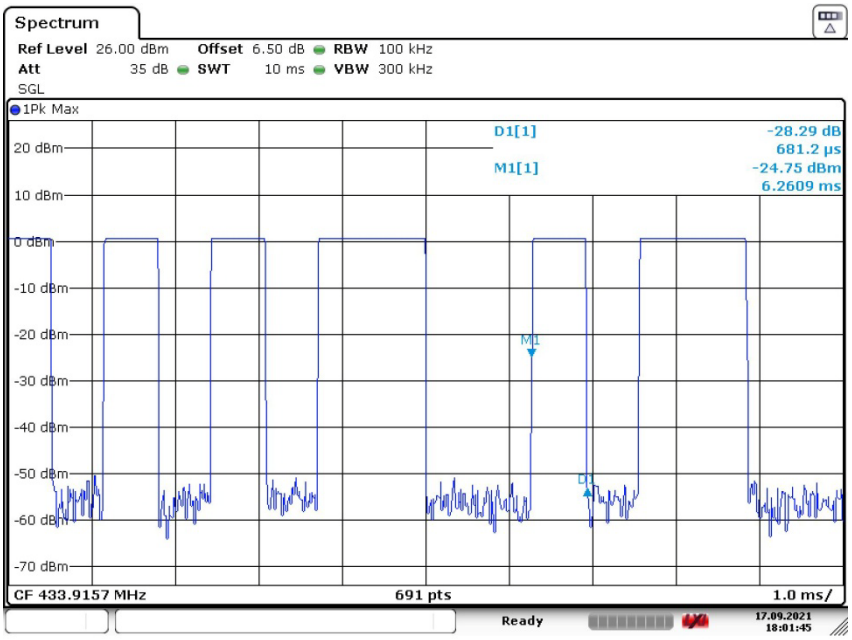
Note:

1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is as follows:

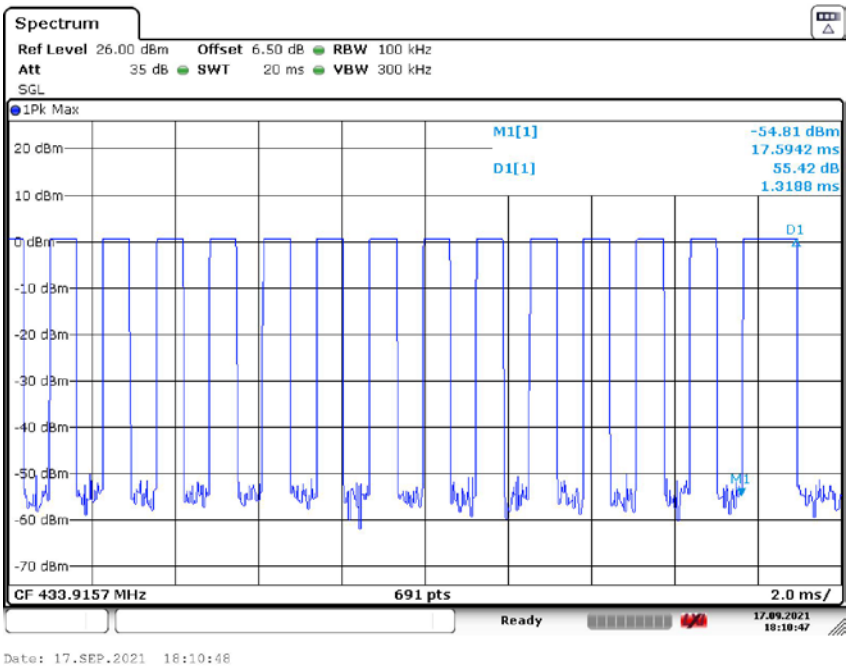
Result = Reading + Corrected Factor

Where Corrected Factor = Antenna Factor + Cable Loss + High Pass Filter Loss – Amplifier Gain

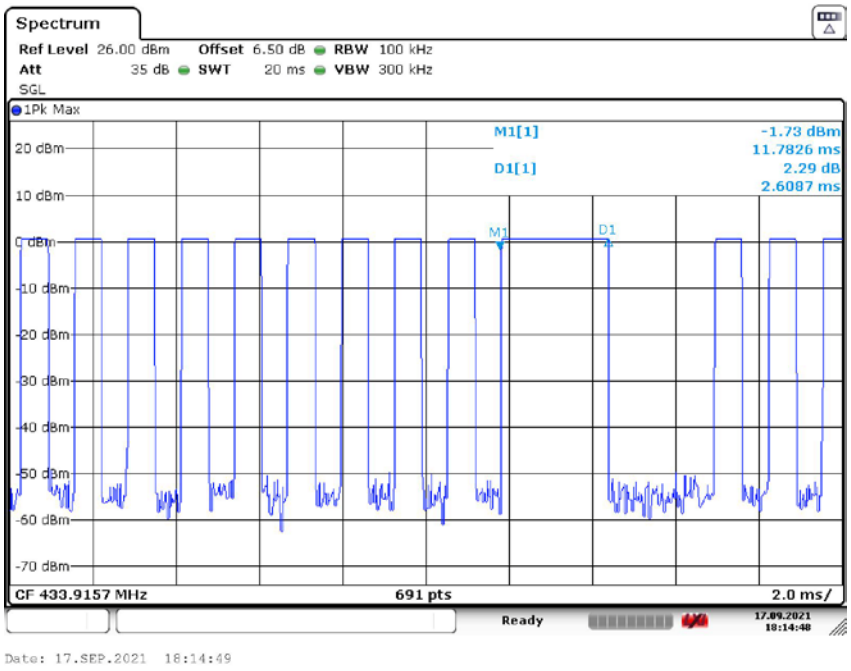
3. Average value= PK value + Average Factor (duty factor)
4. If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.
5. The EUT is tested radiation emission in three axes(X,Y,Z). The worst emissions are reported in three axes.



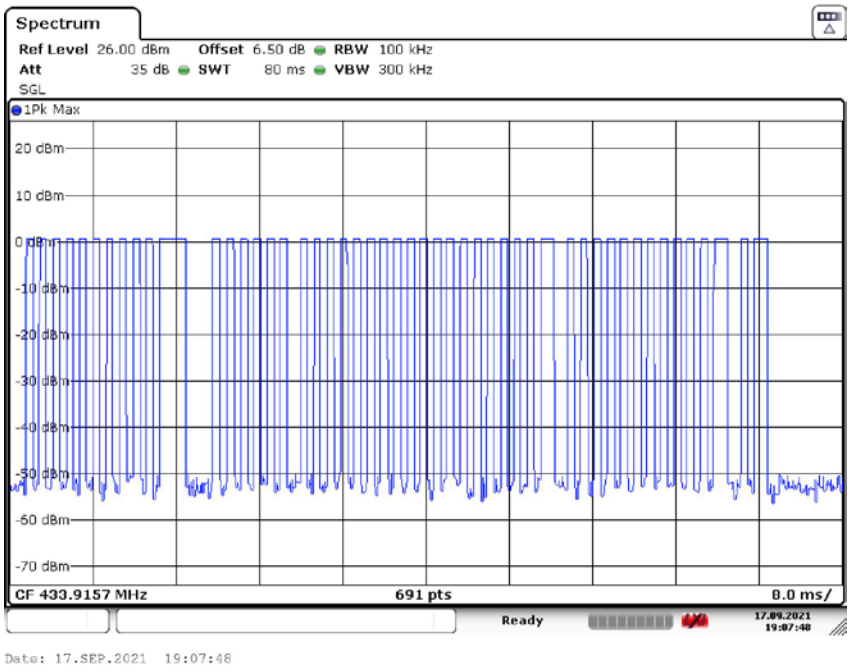
The graph shows the duration of ‘on’ signal. From Marker 1 to Delta 1, duration is 0.681ms.



The graph shows the duration of ‘on’ signal. From Marker 1 to Delta 1, duration is 1.319ms.



The graph shows the duration of ‘on’ signal. From Marker 1 to Delta 1, duration is 2.609ms.



The duty cycle is simply the on time divided by the period:

Effective period of one cycle = (46×0.681) + (3×1.319)+(1×2.609) ms =37.892 ms
One cycle = 80.29ms
Duty cycle =37.892ms/80.29ms=0.47

Therefore, the average factor is found by 20*log(0.47)= -6.56dB

FCC §15.231(a) (1) - DEACTIVATION TESTING

Applicable Standard

Per FCC §15.231(a) (1), A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

Test Procedure

1. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set center frequency of spectrum analyzer=operating frequency.
3. Set the spectrum analyzer as RBW=100kHz/ VBW=300kHz/ Span=0Hz.
4. Repeat above procedures until all frequency measured was complete.

Test Data

Environmental Conditions

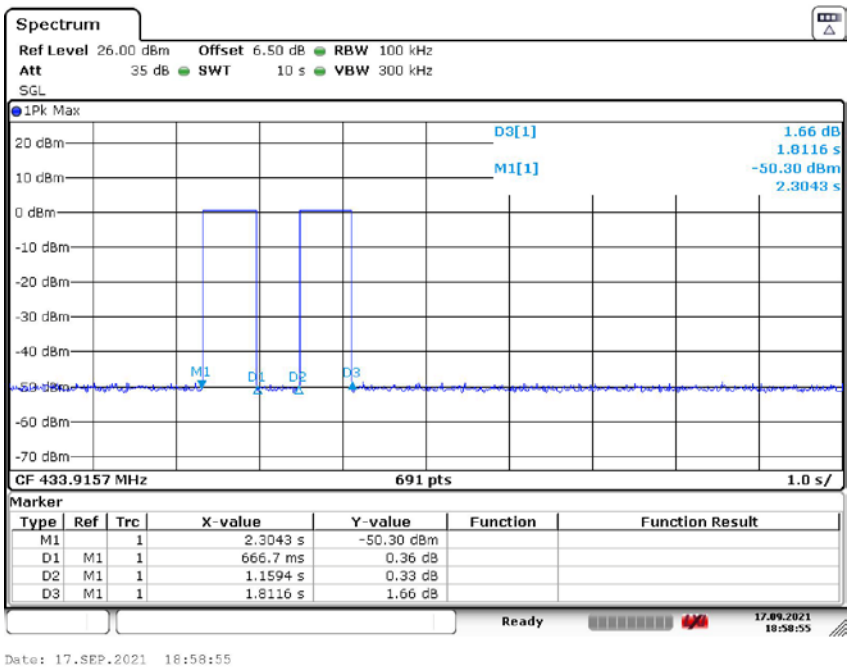
Temperature:	26 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Fan Yang on 2021-09-17.

Test mode: Transmitting

Test Result: Compliant.

Transmitting time is Less than 5ms.



FCC §15.231(c) – 20 dB EMISSION BANDWIDTH TESTING

Applicable Standard

Per 15.231(c), The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Procedure

The EUT is setting to the transmit mode, the waveform was received by the test antenna which was connected to the spectrum analyzer, plot the 20 dB bandwidth.

Test Data

Environmental Conditions

Temperature:	26℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

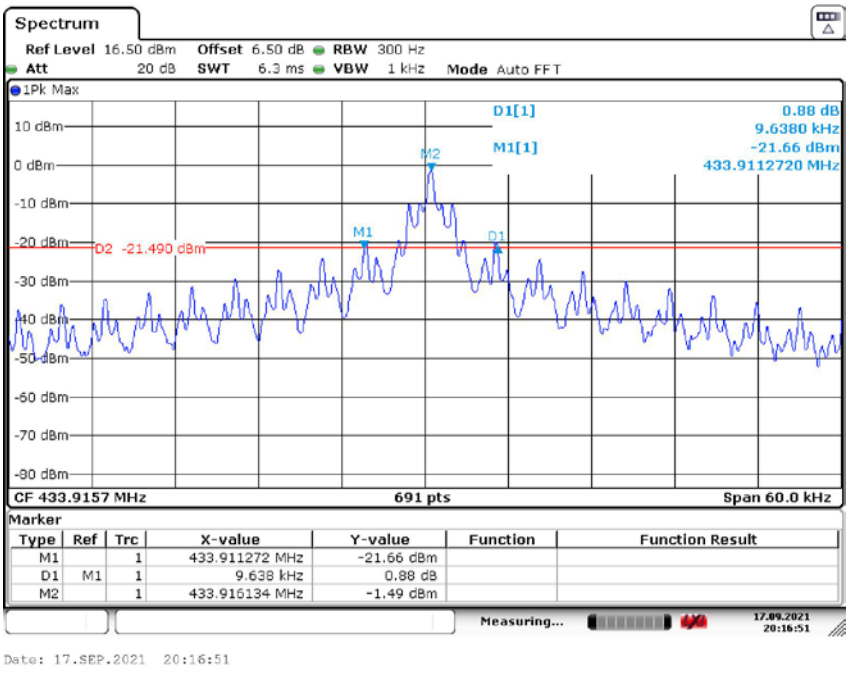
The testing was performed by Fan Yang on 2021-09-17.

Test Mode: Transmitting

Please refer to following table and plots.

Channel Frequency (MHz)	20 dB Emission Bandwidth (kHz)	Limit (kHz)	Result
433.9157	9.638	<1084.8	Pass

20 dB Emission Bandwidth



******* END OF REPORT *******