



SGS-CSTC Standards Technical Services Co., Ltd.
Shenzhen Branch



Report No.: HKEM190700073801

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TEST REPORT

Application No.: HKEM1907000738AV
Applicant: Contin Technology Limited
Product Name: Adaptor Transmitter
Model No.: TL-4015A
FCC ID: 2AROF TL-4015A
Standards: 47 CFR Part 15, Subpart C 15.231(e):2019
Date of Receipt: 2019-08-12
Date of Test: 2019-08-12 to 2019-10-11
Date of Issue: 2019-10-14
Test Result : **Pass***

* In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Keny Xu

Keny Xu
EMC Laboratory Manager



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2 Test Summary

Test	Test Requirement	Test Method	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.203:2019	N/A	PASS
Conducted Emissions at Mains Terminals (150 KHz to 30 MHz)	47 CFR Part 15, Subpart C 15.209:2019	ANSI C63.10 (2013) Section 6.2	PASS
Occupied Bandwidth	47 CFR Part 15, Subpart C 15.231(c):2019	ANSI C63.10 (2013) Section 6.9	PASS
Dwell Time	47 CFR Part 15, Subpart C 15.231(e):2019	ANSI C63.10 (2013) Section 7.6.3	PASS
Field Strength of the Fundamental Signal	47 CFR Part 15, Subpart C 15.231(e):2019	ANSI C 63.10: Clause 6.4, 6.5 and 6.6	PASS
Radiated Emission	47 CFR Part 15, Subpart C 15.231(e):2019	ANSI C63.10 (2013) Section 6.4,6.5,6.6	PASS
Remark : 1) N/A: Not applicable 2) ANSI C 63.10 is version ANSI C 63.10:2013			



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4 General Information

4.1 General Description of EUT

Type of modification: OOK
Operating frequency: 433.92 MHz
Antenna type: RP-SMA
Antenna Gain: 0 dBi

4.2 Details of EUT

Power Supply: For TL-4015
AC 110V 60Hz to DC 12V 500mA
DC 6V (size "c" battery *4, 1.5V *4)
The EUT will be powered by TL-4015.
Power Cord: AC 170cm unshielded cable

4.3 Description of Support Units

The EUT has been tested with TL-4015 and TL-4015 110V adaptor provided by client.

4.4 Deviation from Standards

None

4.5 Abnormalities from Standard Conditions

None.

4.6 Other Information Requested by the Customer

None.

4.7 Test Location

All tests were performed at:

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4.8 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

- **VCCI**

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

- **FCC –Designation Number: CN1178**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

- **Innovation, Science and Economic Development Canada**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISCED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.



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4.9 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Radio frequency	7.25×10^{-8}
2	RF power (conducted)	0.75dB
3	Radiated Spurious emission	5.26dB (30MHz-1GHz)
		5.11dB (1GHz-25GHz)
4	Temperature test	1 °C
5	Humidity test	3%
6	DC and low frequency voltages test	0.5%

Remark:

The Ulab (lab Uncertainty) is less than Ucispr (CISPR Uncertainty), so the test results

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.



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5 Equipments Used during Test

Conducted Emissions at AC Power Line (150kHz-30MHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	ZhongYu Electron	GB-88	SEM001-06	2019-06-13	2024-06-12
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM024-01	2019-07-11	2020-07-10
LISN	Rohde & Schwarz	ENV216	SEM007-01	2018-09-25	2020-09-23
LISN	ETS-LINDGREN	3816/2	SEM007-02	2019-04-01	2020-03-31
EMI Test Receiver	Rohde & Schwarz	ESCI	SEM004-02	2019-04-01	2020-03-31

RF Conducted Test					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	SAEMC	MSR733	SEM001-09	2019-06-13	2024-06-12
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2018-09-25	2020-09-23
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2019-04-01	2020-03-31
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-01	2019-07-11	2020-07-10
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2019-09-28	2020-09-27
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2019-09-25	2020-09-24
Electric and Magnetic Field Analyzer	Narda	NBM- 550/EHP-50F	EMC2143	2018-02-07	2020-02-06
Electric Field Probe (100KHz-3GHz)	WANDEL & GOLTERMANN	EMR-20	EMC0907	2019-05-21	2020-05-20
EMF Tester	Narda	ELT-400	SZE039-4	2019-07-08	2020-07-07

Radiated Emissions which fall in the restricted bands



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Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2018-03-13	2021-03-12
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2019-07-11	2020-07-10
EXA Spectrum Analyzer	AgilentTechnologies Inc	N9010A	SEM004-12	2019-04-12	2020-04-11
Horn Antenna (1-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2018-04-13	2021-04-12
Horn Antenna (15GHz-40GHz)	Schwarzbeck	BBHA 9170	SEM003-15	2017-10-17	2020-10-16
Pre-Amplifier (0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	SEM004-11	2019-09-24	2020-09-23
Pre-amplifier (18-26GHz)	Rohde & Schwarz	CH14-H052	SEM005-17	2019-04-01	2020-03-31
Pre-amplifier (26GHz-40GHz)	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2019-04-01	2020-03-31
DC Power Supply	Zhao Xin	RXN-305D	SEM011-02	2019-09-24	2020-09-23
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2017-08-22	2020-08-21

Radiated Spurious Emissions

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2018-03-13	2021-03-12
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2019-07-11	2020-07-10
EXA Spectrum Analyzer	AgilentTechnologies Inc	N9010A	SEM004-12	2019-04-12	2020-04-11



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Horn Antenna (1-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2018-04-13	2021-04-12
Horn Antenna (15GHz-40GHz)	Schwarzbeck	BBHA 9170	SEM003-15	2017-10-17	2020-10-16
Pre-Amplifier (0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	SEM004-11	2019-09-24	2020-09-23
Pre-amplifier (18-26GHz)	Rohde & Schwarz	CH14-H052	SEM005-17	2019-04-01	2020-03-31
Pre-amplifier (26GHz-40GHz)	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2019-04-01	2020-03-31
DC Power Supply	Zhao Xin	RXN-305D	SEM011-02	2019-09-24	2020-09-23
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2017-08-22	2020-08-21

RE in Chamber					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date	Cal. Due date
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2017-08-05	2020-08-04
MXE EMI Receiver (20Hz-8.4GHz)	Agilent Technologies	N9038A	SEM004-05	2019-09-24	2020-09-23
BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEM003-01	2017-06-27	2020-06-26
Pre-amplifier (0.1-1300MHz)	Agilent Technologies	8447D	SEM005-01	2019-04-01	2020-03-31
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2019-07-11	2020-07-10



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6 Test Results

6.1 Antenna Requirement

6.1.1 Standard Requirement

15.203 requirement:

For intentional device. According to 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.

6.1.2 EUT Antenna

The antenna is dedicated antenna with Female RP-SMA unique connector. The maximum gain of the antenna is 0 dBi.

Photos of the antenna refer to Section 5: Photograph of this report.

Test result: The unit does meet the FCC requirements.



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6.2 Conducted Emissions Mains Terminals, 150 KHz to 30MHz

Test Requirement: FCC Part15 C
Test Method: ANSI C63.10
Test Voltage: AC 120V 60Hz
Frequency Range: 150kHz to 30MHz
Detector: Peak for pre-scan
Quasi-Peak and Average at frequency with maximum peak
(9 kHz resolution bandwidth)
Class / Limit: Class B

Frequency range MHz	Class B Limits	
	dB (μV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

NOTE 1: The limit decreases linearly with the logarithm of the frequency in the range
0.15 MHz to 0.50 MHz.
NOTE 2: The lower limit is applicable at the transition frequency.

6.2.1 E.U.T. Operation

Operating Environment:

Temperature: 21 °C Humidity: 51 %RH

EUT Operation: Pre-test with Peak detector with the following mode(s):

1. Normal Operation

Final test with Quasi-Peak and Average detector with the following mode(s):

1. Normal Operation

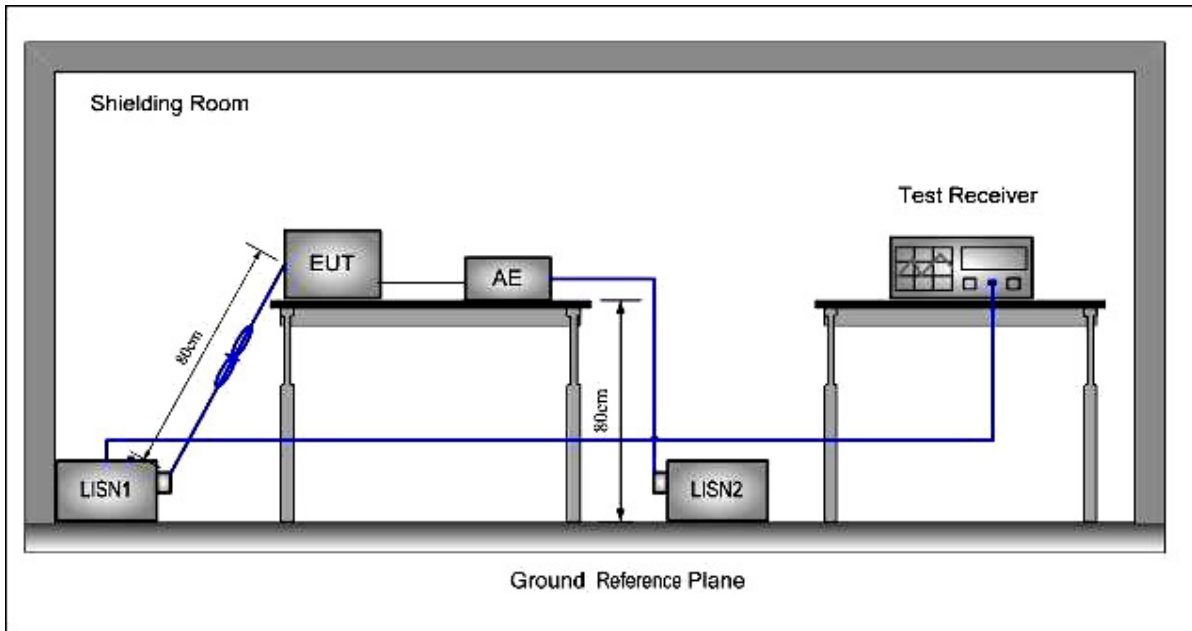


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6.2.2 Test Setup and Procedure



1. The mains terminal disturbance voltage test was conducted in a shielded room.
2. The EUT was connected to nominal power supply through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu\text{H} + 5\Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
3. The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation.
4. The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

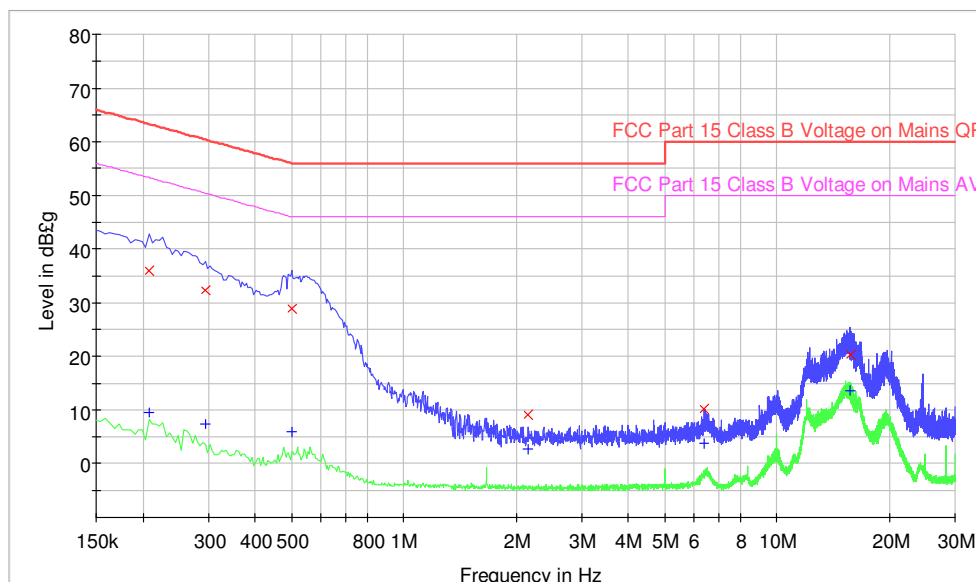


6.2.3 Measurement Data

Live line:

Peak Scan:

Quasi-peak and Average measurement:



Frequency (MHz)	QuasiPeak (dBuV)	Average (dBuV)	Corr. (dB)	Overlimit-QPK (dB)	Limit - QPK (dBuV)	Margin - AVG (dB)	Limit - AVG (dBuV)	Result
0.208500	36.0	9.6	9.9	-27.3	63.3	53.6	63.3	Pass
0.294000	32.4	7.4	9.9	-28.0	60.4	53.0	60.4	Pass
0.501000	29.0	5.8	9.9	-27.0	56.0	50.2	56.0	Pass
2.152000	9.2	2.7	10.0	-46.8	56.0	53.3	56.0	Pass
6.369000	10.1	3.8	10.0	-49.9	60.0	56.3	60.0	Pass
15.769500	20.4	13.7	10.1	-39.6	60.0	46.3	60.0	Pass

Level = Read Level + LISN Factor + Cable Loss.



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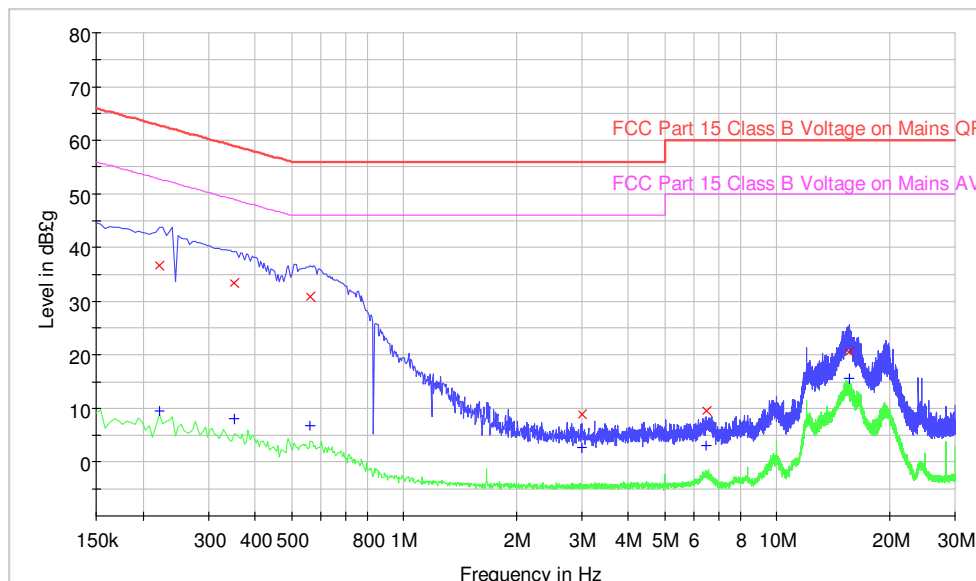
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Neutral line:

Peak Scan:

Quasi-peak and Average measurement:



Frequency (MHz)	QuasiPeak (dBuV)	Average (dBuV)	Corr. (dB)	Overlimit-QPK (dB)	Limit - QPK (dBuV)	Margin - AVG (dB)	Limit - AVG (dBuV)	Result
0.222000	36.6	9.5	9.9	-26.7	63.3	53.6	63.3	Pass
0.352500	33.5	8.1	9.9	-26.9	60.4	53.0	60.4	Pass
0.564000	30.8	6.9	9.9	-25.2	56.0	50.2	56.0	Pass
3.000000	9.0	2.6	10.0	-47.0	56.0	53.3	56.0	Pass
6.490500	9.6	3.2	10.0	-50.4	60.0	56.3	60.0	Pass
15.612000	20.5	15.7	10.1	-39.5	60.0	46.3	60.0	Pass

Level = Read Level + LISN Factor + Cable Loss.



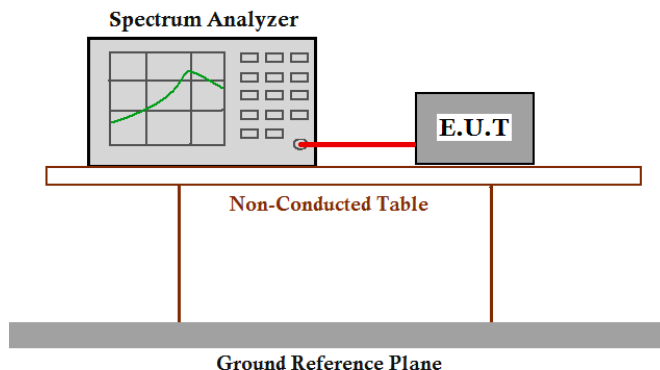
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6.3 Occupied Bandwidth

Test Requirement: FCC Part 15 C section 15.231(c)
Test Method: ANSI C63.10 (2013): Clause 6.9
Test Status: Transmitting mode with modulation.
Test Configuration:



Test result:

Test Channel	Bandwidth(kHz)	limit (kHz)
433.92MHz	4.34	1084.8

Limit:

$$F_{\text{center}} * 0.25\% = 1084.8 \text{ kHz}$$

Where F_{center} is the operation frequency.

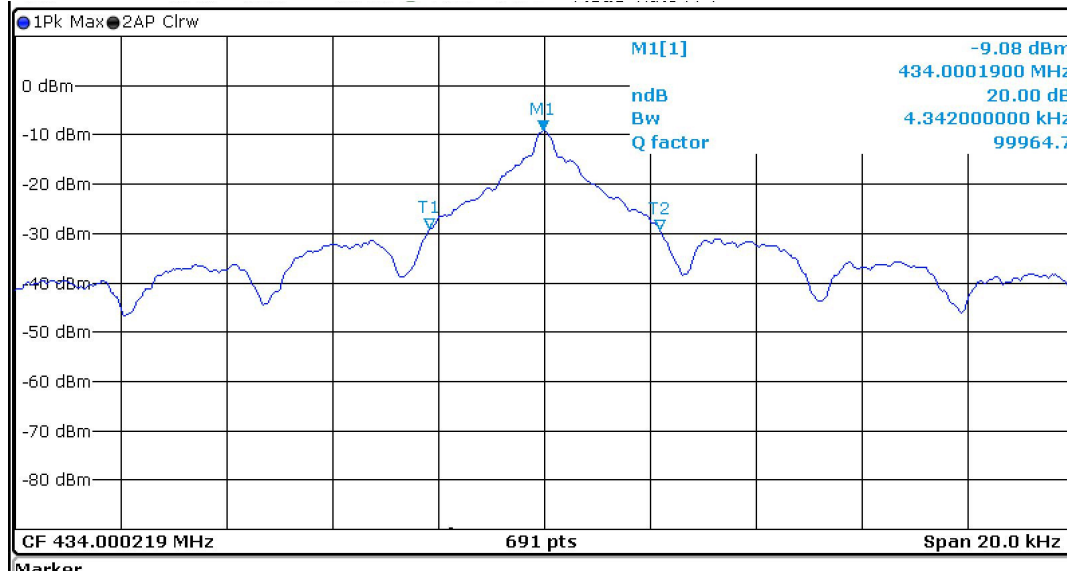


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Test Plot:



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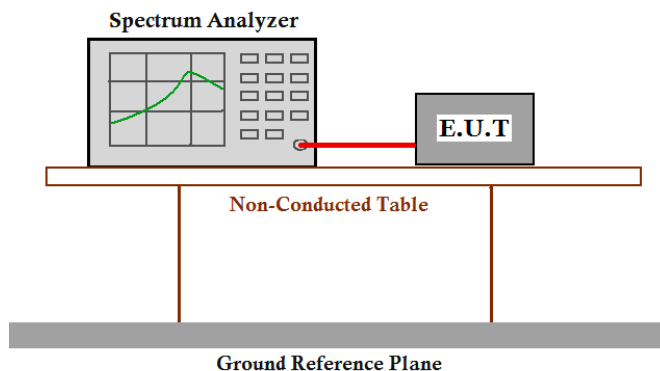


6.4 Dwell Time

Test Requirement: FCC Part 15 C section 15.231(e)
Test Method: ANSI C63.10 (2013): Clause 7.6.3
Test Status: Transmitting mode with modulation.
Limit:

Device type	Limit
Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) 15.231 and may be employed for any type of operation, including operation prohibited in paragraph (a) 15.231	The duration of each transmission $\leq 1\text{S}$
	Silent period >30 times the duration of the transmission and $\geq 10\text{S}$

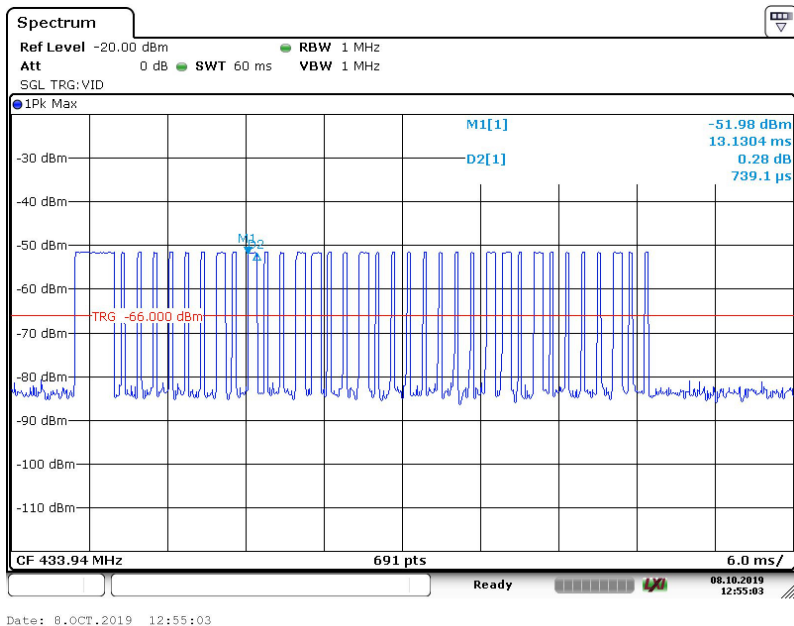
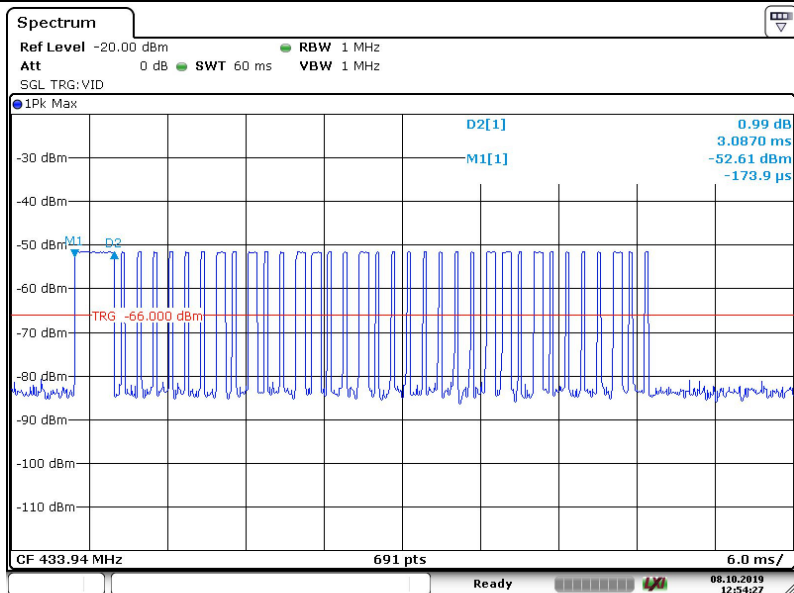
Test Configuration:



Test result:



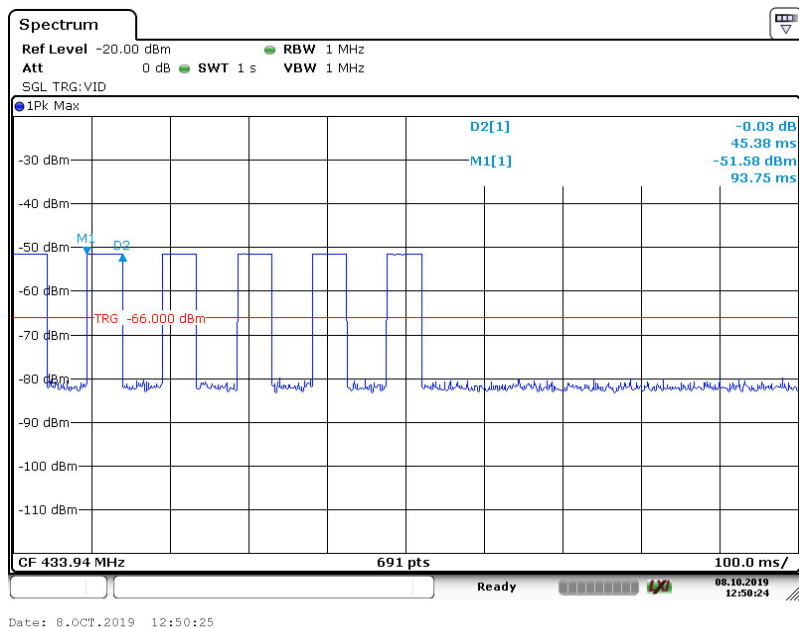
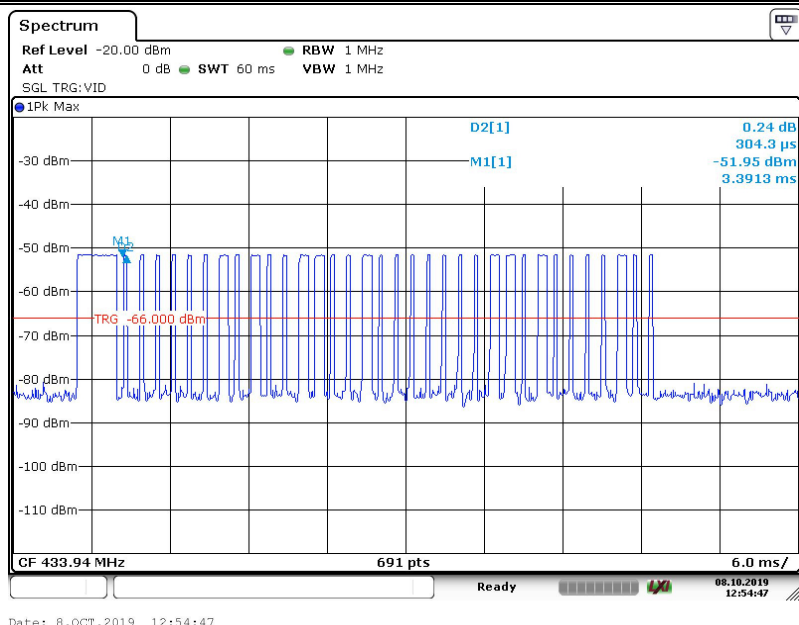
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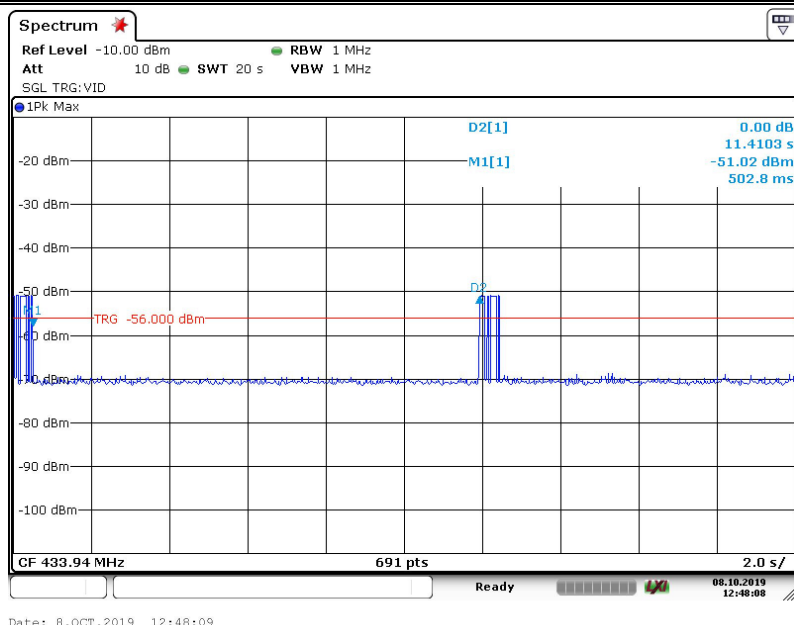
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Test Item	Test Data	limit	Result
Transmitting Time	104.3 ms	< 1s	Pass
Silent Period	11.4s	>30 time the transmitting time and ≥ 10s	Pass

Remark: 104.3 ms is derived from: $(3.087 \times 1 + 0.7391 \times 9 + 0.3043) \times 6$



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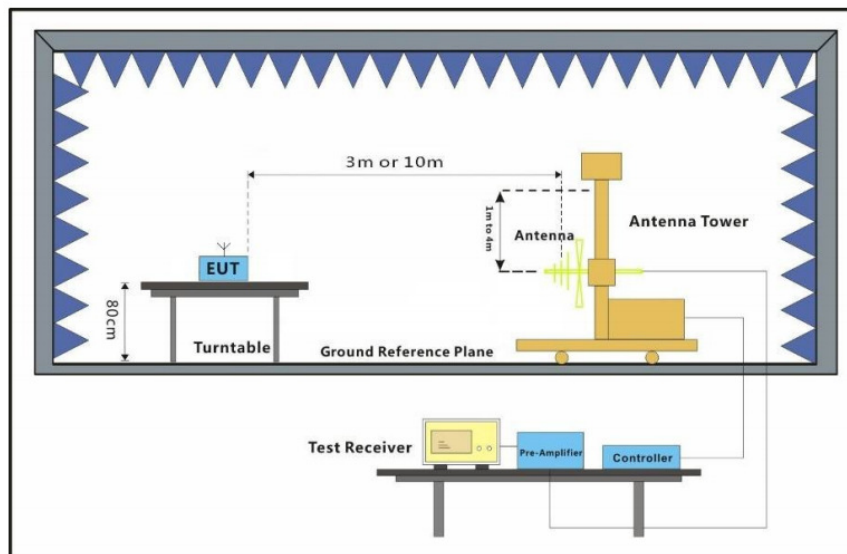
6.5 Field Strength of the Fundamental Signal

Test Requirement: FCC Part 15 C section 15.231(e)
Test Method: ANSI C63.10 (2013): Clause 6.5
Test Status: Transmitting mode with modulation.
Measurement Distance: 3m
Limit

Fundamental frequency(MHz)	Field strength of fundamental(microvolts/meter)	Field strength of spurious emissions(microvolts/meter)
40.66-40.70	1000	100
70-130	500	50
130-174	500 to 1500	50 to 150
174-260	1500	150
260-470	1500 to 5000	150 to 500
Above 470	5000	500

Remark: the emission limit is based on measurement instrumentation employing an average detector at a distance of 3 meters. The frequencies above 1000MHz are based on average limits. 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.

Test Configuration:



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Frequency (MHz)	Level (dBuV/m)	Pol	Corr. (dB)	Over Limit (dB)	Limit (dBuV/m)	Result	Remark
433.92	82.90	H	14.50	-9.97	92.87	Pass	Peak
433.92	81.70	V	11.00	-11.17	92.87	Pass	Peak
433.92	68.25	H	14.50	-4.62	72.87	Pass	Average
433.92	67.05	V	11.00	-5.82	72.87	Pass	Average

Analysis of the remote transmitter on time in one complete pulse train, therefore the average value of fundamental frequency is: Average = Peak value + 20log (Duty cycle), where the duty factor is calculated from following formula:

$$20\log (\text{Duty cycle}) = 20\log (T_{\text{pulse}} (17.35/93.75)) = 20\log (0.1851) = -14.65\text{dB}$$

$$\text{Here } T_{\text{pulse}} = (3.087 \times 1 + 0.7391 \times 9 + 0.3043) = 17.35(\text{ms})$$

Remark:

1. The filed strength is calculated by adding Antenna Factor, Cable Factor and Preamplifier. The basic equation with s sample calculation is as follows:

$$\text{Final Test Level} = \text{Receiver Reading} - \text{Antenna Factor} + \text{Cable Factor} - \text{Preamplifier Factor}$$

Remark:

2. According to 15.35 (b) When average radiated emission measurements are specified in the regulations, including emission measurements below 1000 MHz, there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules, e.g., see Section 15.255.



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6.6 Radiated Emissions

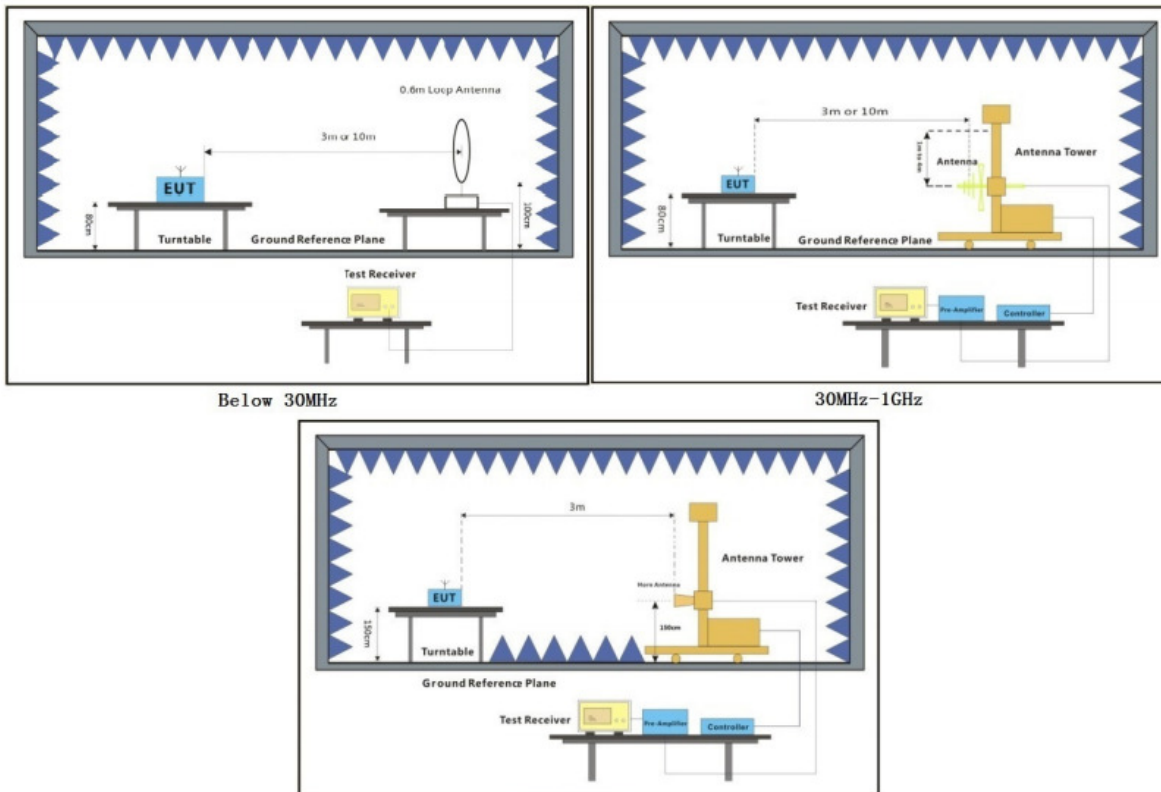
Test Requirement: FCC Part15 Subpart C Section 15.231(e), 15.209
Test Method: ANSI C63.10 (2013): Clause 6.4&6.5&6.6
Measurement Distance: 3m
Limit: The limits on the filed strength of th spurious emissions in the above table are based on the fundamental frequency of the international radiator. Spuriopus emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shoed in this table or to the general limits shown in 15.209, whichever limit permits a higher filed strength.

Fundamental frequency(MHz)	Field strength of fundamental(microvolts/meter)	Field strength of spurious emissions(microvolts/meter)
40.66-40.70	1000	100
70-130	500	50
130-174	500 to 1500	50 to 150
174-260	1500	150
260-470	1500 to 5000	150 to 500
Above 470	5000	500
Remark: the emission limit is based on measurement instrumentation employing an average detector at a distance of 3 meters. The frequencies above 1000MHz are based on average limits. 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.		
Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
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
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, 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.		



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Test Configuration:





Test result:

Below 1GHz

Frequency (MHz)	QuasiPeak (dBuV/m)	Pol	Corr. (dB)	Over Limit (dB)	Limit - QPK (dBuV/m)	Result
36.400000	12.7	H	14.5	-27.3	40.0	Pass
73.660000	13.5	H	11.0	-26.5	40.0	Pass
150.460000	11.6	H	14.5	-31.9	43.5	Pass
345.820000	12.1	H	16.1	-33.9	46.0	Pass
719.380000	21.5	H	23.9	-24.5	46.0	Pass
867.970000	32.8	H	26.3	-13.2	46.0	Pass

Above 1GHz

Frequency (MHz)	Antenna Polarization	Emission Level (dBμV/m)		Limit (dBμV/m)		Remark
		Peak	Average	Peak	Average	
1056.0	V	66.4	18.7	74.0	54.0	Pass
1301.9	H	38.2	-	74.0	54.0	Pass
1588.0	H	52.2	-	74.0	54.0	Pass
1736.0	H	50.2	-	74.0	54.0	Pass
2112.0	H	61.2	20.4	74.0	54.0	Pass
2169.9	V	44.4	-	74.0	54.0	Pass

Remark:

1. The filed strength is calculated by adding Antenna Factor, Cable Factor and Preamplifier. The basic equation with s sample calculation is as follows:
Final Test Level = Receiver Reading - Antenna Factor + Calble Factor – Preamplifier Factor
2. The peak field strength of any emission shall not exceed the maximum permitted average limits apecified above by more than 20 dB under any condition of modulation. So, only the above measurement data were shown in the report.



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7 Photographs

7.1 Radiated Emissions Test Setup

Remark: Photos refer to Setuo photo.

7.2 EUT Constructional Details

Remark: Photos refer to Appendix:External photo and nternal photo.

End of the Report



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