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Guangzhou Branch**

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Report No.: GZEM180400189902
Page: 1 of 28
FCC ID: 2APJX-TY1001

TEST REPORT

Application No.: GZEM1804001899CR
Applicant: DBT Auto Electrical Products Limited
Address of Applicant: Rm.19016, 20F, Tower 535, 535 Jaffe Road, Causeway Bay, Hong Kong
Manufacturer: DBT Auto Electrical Products Limited
Address of Manufacturer: Rm.19016, 20F, Tower 535, 535 Jaffe Road, Causeway Bay, Hong Kong
Factory: Shenzhen Shenyongtong Industry Co., LTD
Address of Factory: Rm501, Building B, Yufeng Industrial Park, Yangguang Industrial Area, Xili Town, Nanshan District, Shenzhen, China

Equipment Under Test (EUT):

EUT Name: TPMS
Model No.: TY1001
FCC ID: 2APJX-TY1001
Standard(s) : 47 CFR Part 15, Subpart C 15.231
Date of Receipt: 2018-04-04
Date of Test: 2018-04-08 to 2018-04-08
Date of Issue: 2018-04-11

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.



Kobe Jian
Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.

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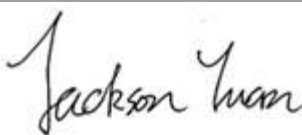


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2 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
00		2018-04-11		Original Report

Authorized for issue by:			
Tested By	 (Jackson Yuan) / Project Engineer	2018-04-04 to 2018-04-08 Date	
Checked By	 (Ricky Liu) / Reviewer	2018-04-11 Date	



3 Test Summary

Test	Test Requirement	Test method	Result
Radiated Emission	FCC PART 15 section 15.231(e)	ANSI C 63.10: Clasue 6.4, 6.5 and 6.6	PASS
20dB Bandwidth	FCC PART 15 section 15.231(c)	ANSI C 63.10: Clasue 6.9	PASS
Dwell Time (15.231(e))	FCC PART 15 section 15.231(a)	FCC PART 15: Section 15.231(e)	PASS
Field Strength of the Fundamental Signal (15.231(e))	FCC PART 15 section 15.231(e)	ANSI C 63.10: Clasue 6.5	PASS
Remark: EUT: In this whole report EUT means Equipment Under Test. N/A: not applicable. Refer to the relative section for the details. Tx: In this whole report Tx (or tx) means Transmitter. Rx: In this whole report Rx (or rx) means Receiver. RF: In this whole report RF means Radio Frequency.			



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5 General Information

5.1 Client Information

Applicant: DBT Auto Electrical Products Limited
Address of Applicant: Rm.19016, 20F, Tower 535, 535 Jaffe Road, Causeway Bay, Hong Kong
Manufacturer: DBT Auto Electrical Products Limited
Address of Manufacturer: Rm.19016, 20F, Tower 535, 535 Jaffe Road, Causeway Bay, Hong Kong
Factory: Shenzhen Shenyongtong Industry Co., LTD
Address of Factory: Rm501, Building B, Yufeng Industrial Park, Yangguang Industrial Area, Xili Town, Nanshan District, Shenzhen, China

5.2 General Description of E.U.T.

Product Description: TPMS
Model No.: TY1001

5.3 Details of E.U.T.

Modulation and Antenna Type: The Tx is a FSK modulation by internal signal with an integral Monopole antenna.
Power Supply: DC 3V (CR1632*1)
Power cord: N/A

5.4 Description of Support Units

The EUT has been tested as an independent unit.

5.5 Deviation from Standards

None.

5.6 Abnormalities from Standard Conditions

None.

5.7 Other Information Requested by the Customer

None.

5.8 Test Location

All tests were performed at:
SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,
198 Kezhu Road, Sciencetech Park, Guangzhou Economic & Technology Development District,
Guangzhou, China 510663
Tel: +86 20 82155555 Fax: +86 20 82075059
No tests were sub-contracted.



5.9 Measurement Uncertainty

No.	Item	Measurement uncertainty
1	Conducted Emission	1.02dB(9kHz to 150kHz)
		1.05dB(150kHz to 30MHz)
2	Radiated emission	5.06dB(30MHz to 1GHz)
		5.06dB(1GHz to 26GHz)



5.10 Test Facility

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

- **NVLAP (Lab Code: 200611-0)**

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

- **ACMA**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our NVLAP accreditation.

- **SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO**

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

- **CNAS (Lab Code: L0167)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2006 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:2005 General Requirements) for the Competence of Testing Laboratories.

- **FCC (Registration No.: 282399)**

SGS-CSTC Standards Technical Services 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 282399, May 31, 2002.

- **Industry Canada (Registration No.: 4620B-1)**

The 3m/10m Alternate Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Certification and Engineering of Industry Canada for radio equipment testing with Registration No. 4620B-1.

- **VCCI (Registration No.: R-2460, C-2584, G-449 and T-1179)**

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co. Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2460, C-2584, G-449 and T-1179 respectively.

- **CBTL (Lab Code: TL129)**

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2005, the Basic Rules, IECEE 01:2006-10 and Rules of procedure IECEE 02:2006-10, and the relevant IECEE CB-Scheme Operational documents.



6 Equipment List

No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. date	Cal.Due date
					(YYYY-MM-DD)	(YYYY-MM-DD)
EMC0039	Temperature Chamber	GZ GongWen Co.Ltd.	GDJW-100	118	2017-07-17	2018-07-16
EMC2022	DC Power Supply	KIKUSUI ELECTRONICS CORP.	PAN60-20A	HH000269	2017-11-02	2018-11-01
EMC0007	DMM	Fluke	73	70671122	2017-07-26	2018-07-25
EMC0006	DMM	Fluke	73	70681569	2017-07-26	2018-07-25
EMC0525	Compact Semi-Anechoic Chamber	ChangZhou ZhongYu	N/A	N/A	2016-12-04	2019-12-03
EMC0530	10m Semi- Anechoic Chamber	ETS	N/A	N/A	2016-04-30	2018-04-29
EMC2026	Horn Antenna (Rx)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	9120D-84	2016-09-09	2019-09-08
EMC0519	Bilog Type Antenna	Schaffner Chase	CBL6143	5070	2017-05-04	2020-05-03
EMC0521	1-26.5GHz Pre Amplifier	Agilent	8449B	3008A01649	2018-01-08	2019-01-07
EMC2065	Amplifier 9kHz-1300MHz	HP	8447F	3113AU6624	2017-06-19	2018-06-18
EMC0507	Antenna Mask (Tx)	HD-GmbH	AS620M	620/408	N/A	N/A
EMC0508	Antenna Mask (Rx)	HD-GmbH	MA240	240/619	N/A	N/A
EMC0509	Turntable	HD-GmbH	DT430	N/A	N/A	N/A
EMC0510	Turntable & Antenna Mask Controller	HD-GmbH	HD100	N/A	N/A	N/A
EMC0512	EMI Test Software	Rohde & Schwarz	ES-K1	N/A	N/A	N/A
EMC0522	EMI Test Receiver	Rohde & Schwarz	ESIB26	100283	2018-01-19	2019-01-18
EMC0516	Signal Generator	Rohde & Schwarz	SMR20	100416	2018-01-08	2019-01-07
EMC0032	Radio Communication Monitor	Rohde & Schwarz	CMS54	100137	2017-06-19	2018-06-18
EMC0904	Power Meter	Rohde & Schwarz	NRVS	825770/074	2017-11-29	2018-11-28
EMC0906	Dual Directional Coupler	Werlatone Inc.	C1795	6634	2017-06-26	2018-06-25
EMC2055	Oscilloscope 500MHz	Tektronix	TDS3052C	C011815	2018-01-08	2019-01-07
EMC0523	Active Loop Antenna	EMCO	6502	42963	2018-03-05	2020-03-05
EMC0069	Signal Analyzer (20Hz ~ 26.5Ghz)	R&S	FSIQ26	100312	2017-11-20	2018-11-19
SEM003-18	Trilog Broadband Antenna 25-2000MHz	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	665	2016-06-29	2019-06-28
EMC2025	Trilog Broadband Antenna 30-1000MHz	SCHWARZBECK MESS-ELEKTRONIK	VULB 9160	9160-3372	2016-09-08	2019-09-07
EMC2142	966 Anechoic Chamber	C.R.T	9mX6mX6m	NA	2017-11-29	2018-11-28



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EMC2139	MXE EMI Receiver	Keysight	N9038A	MY57290121	2017-11-15	2018-11-14
EMC2138	EXA Signal Analyzer	KEYSIGHT	N9010A	MY57120105	2017-11-15	2018-11-14
EMC0078	Temperature, & Humidity	Shanghai Meteorological Instrument factory Co., Ltd.	ZJ1-2B	709131	2017-07-19	2018-07-18
EMC0068	Modulation Analyzer	HP	8901B	3438B05310	2018-03-15	2019-03-14



7 Radio Spectrum Technical Requirement

7.1 Antenna Requirement

7.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203

7.1.2 Conclusion

Standard Requirement:

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 antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit permanently attached antenna or of an so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement.

8 Radio Spectrum Matter Test Results

8.1 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.231(c)
Test Method: ANSI C63.10 (2013) Section 6.9
Limit:

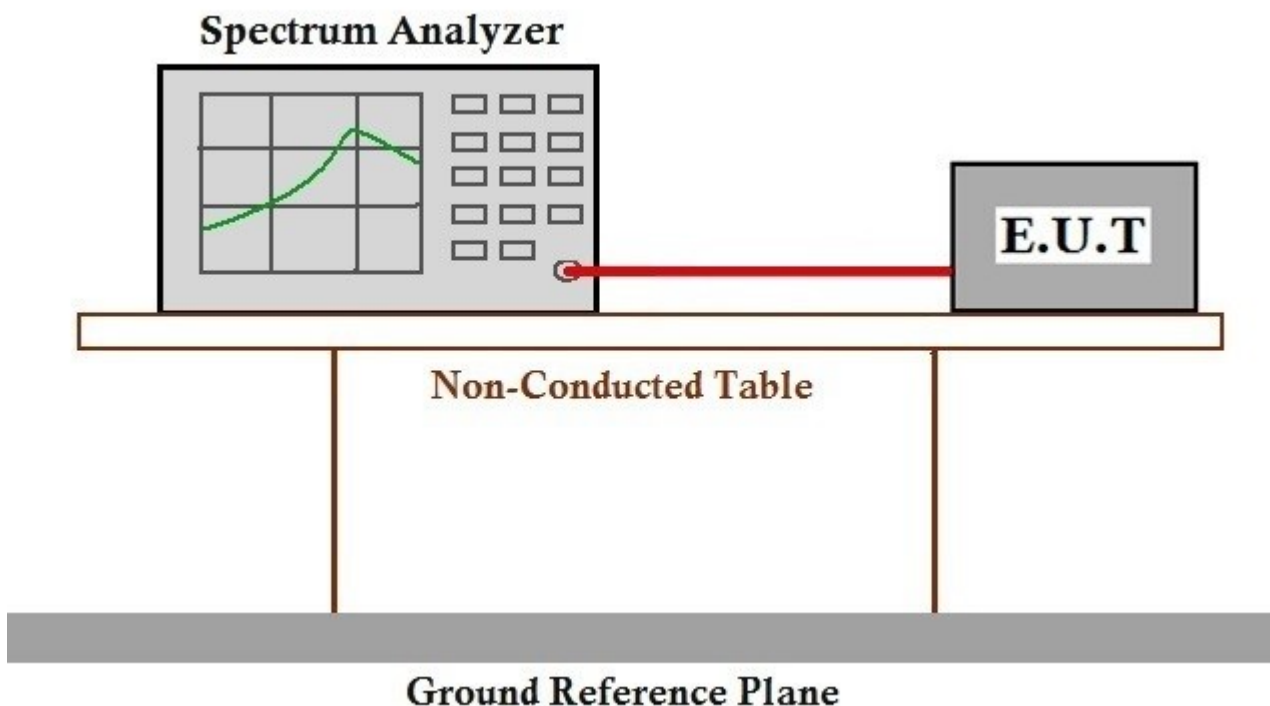
Frequency range(MHz)	Limit
70-900	No wider than 0.25% of the center frequency
Above 900	No wider than 0.5% of the center frequency

8.1.1 E.U.T. Operation

Operating Environment:

Temperature: 23.7 °C Humidity: 45.5 % RH Atmospheric Pressure: 1015 mbar
Test mode a:TX mode_Keep the EUT in transmitting with modulation mode.

8.1.2 Test Setup Diagram



8.1.3 Measurement Procedure and Data



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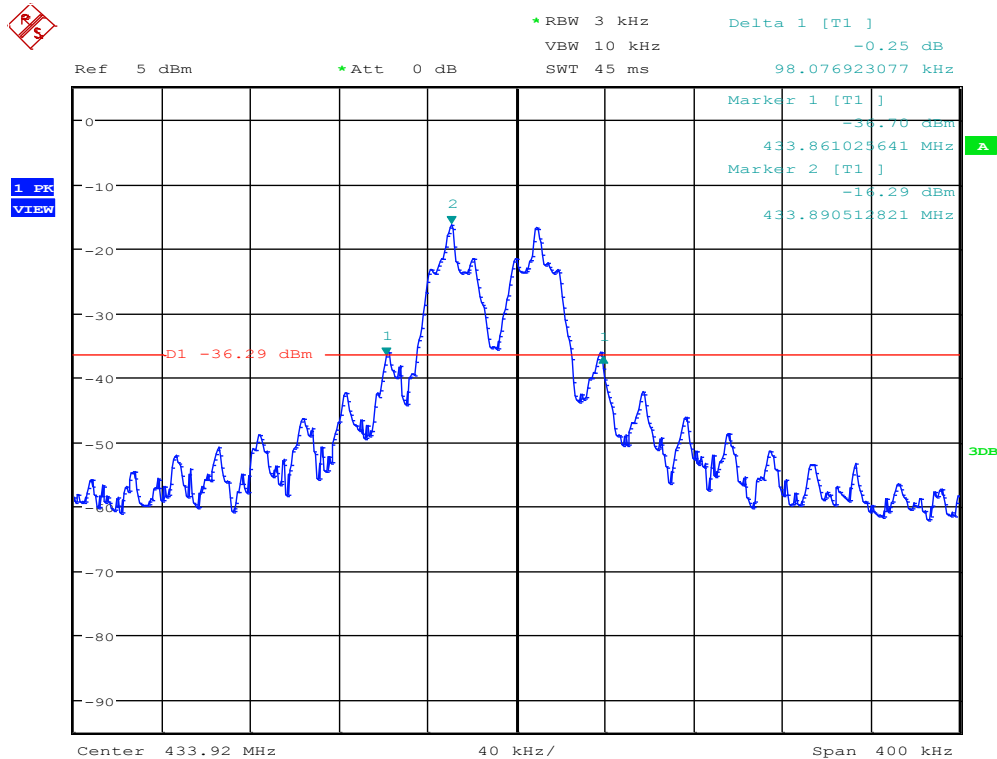
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Test result:

Test Channel	Bandwidth(MHz)	Limit(MHz)	Result
433.92MHz	0.098	1.08MHz	Pass

Test plot as follows:



8.2 Dwell Time (15.231(e))

Test Requirement 47 CFR Part 15, Subpart C 15.231(e)
Test Method: ANSI C63.10 (2013) Section 7.8.4
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 $\geq 10\text{S}$

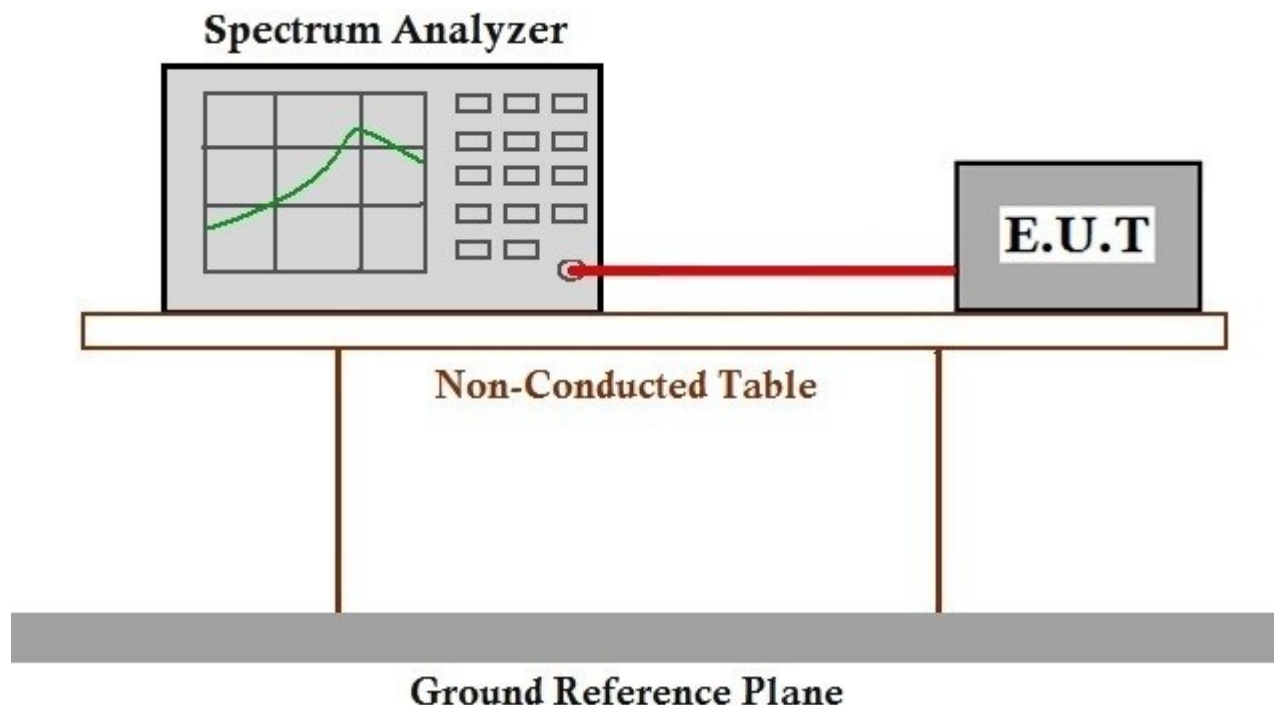
8.2.1 E.U.T. Operation

Operating Environment:

Temperature: 23.7 °C Humidity: 45.5 % RH Atmospheric Pressure: 1015 mbar

Test mode a:TX mode_Keep the EUT in transmitting with modulation mode.

8.2.2 Test Setup Diagram



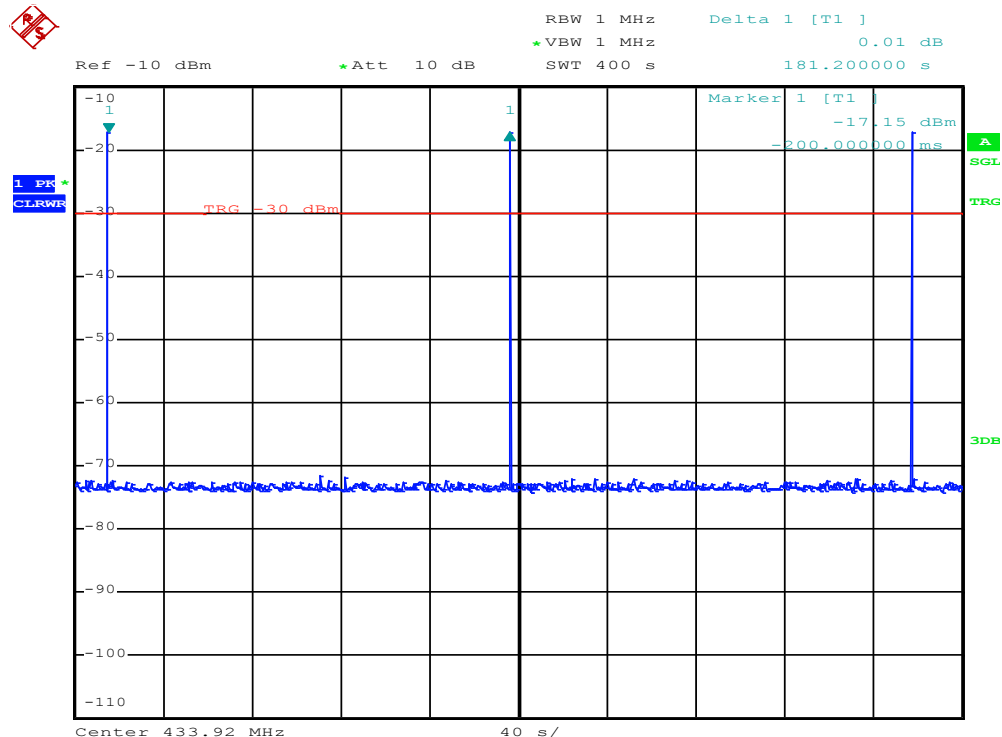
8.2.3 Measurement Procedure and Data

Measurement Data

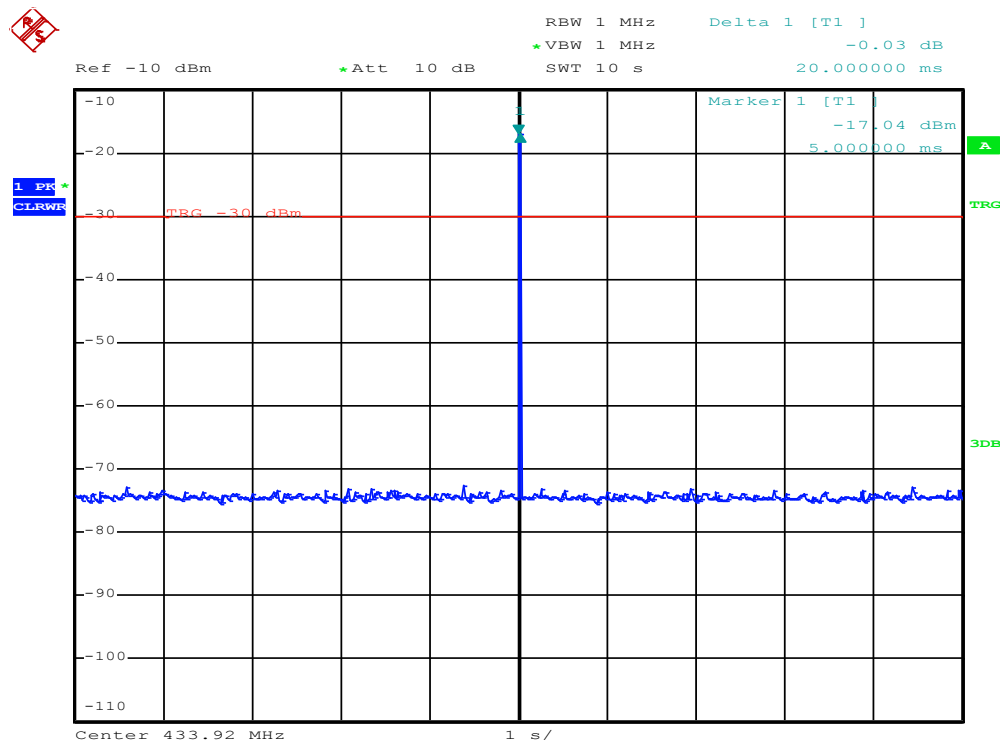
Test item	Limit	Results
Transmitting time:0.029s	$\leq 1\text{s}$	Pass
Cycle: 181.2s	$>10\text{s}$	Pass



1. 2 Cycles

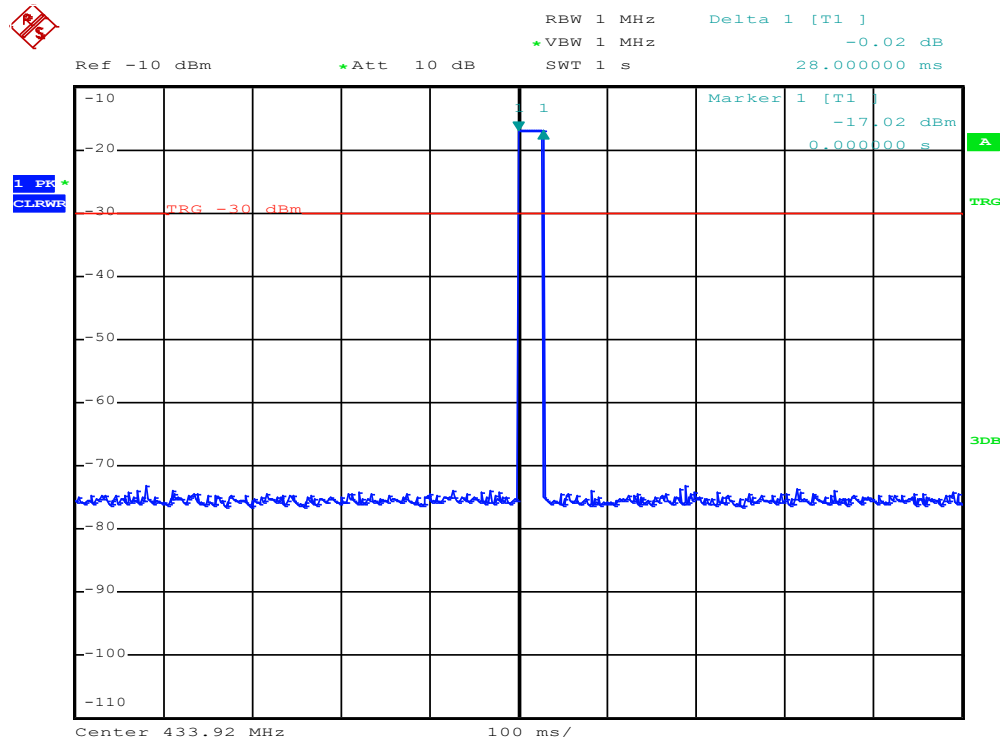


2. Transmission in 10s

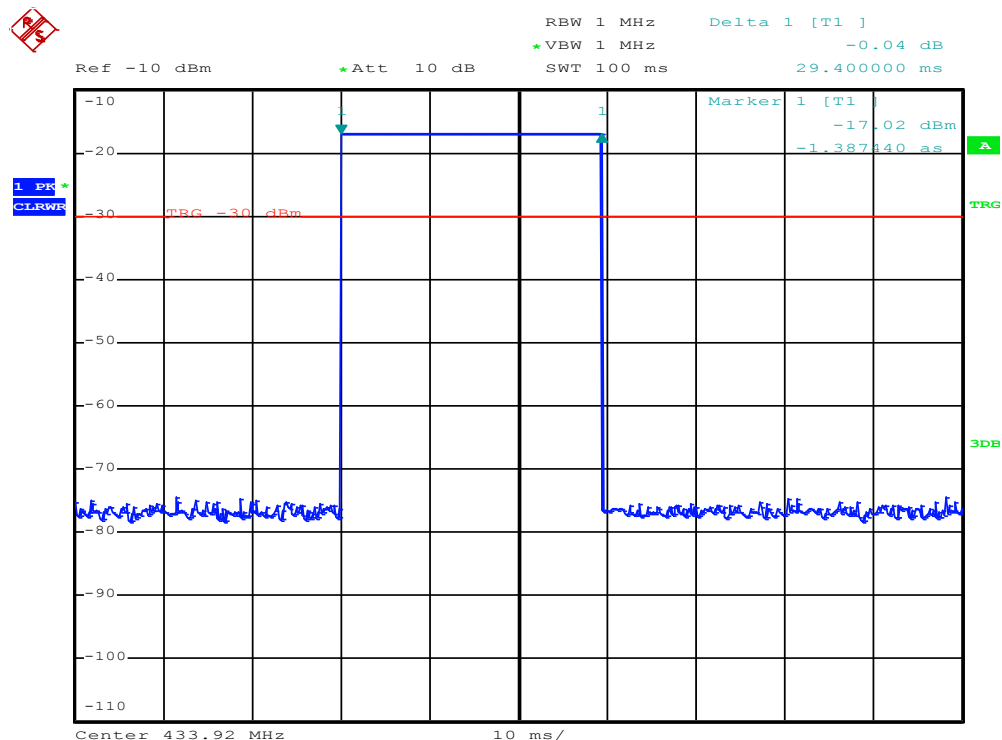




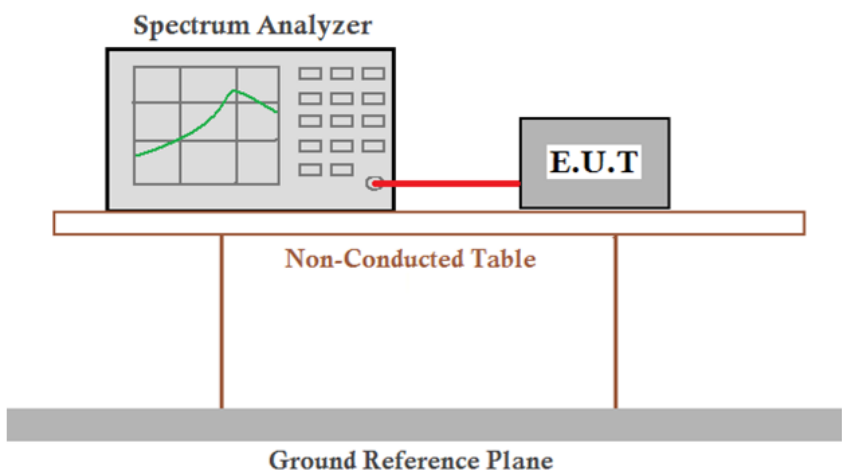
3. Transmission in 1s



4. Transmission in 0.1s

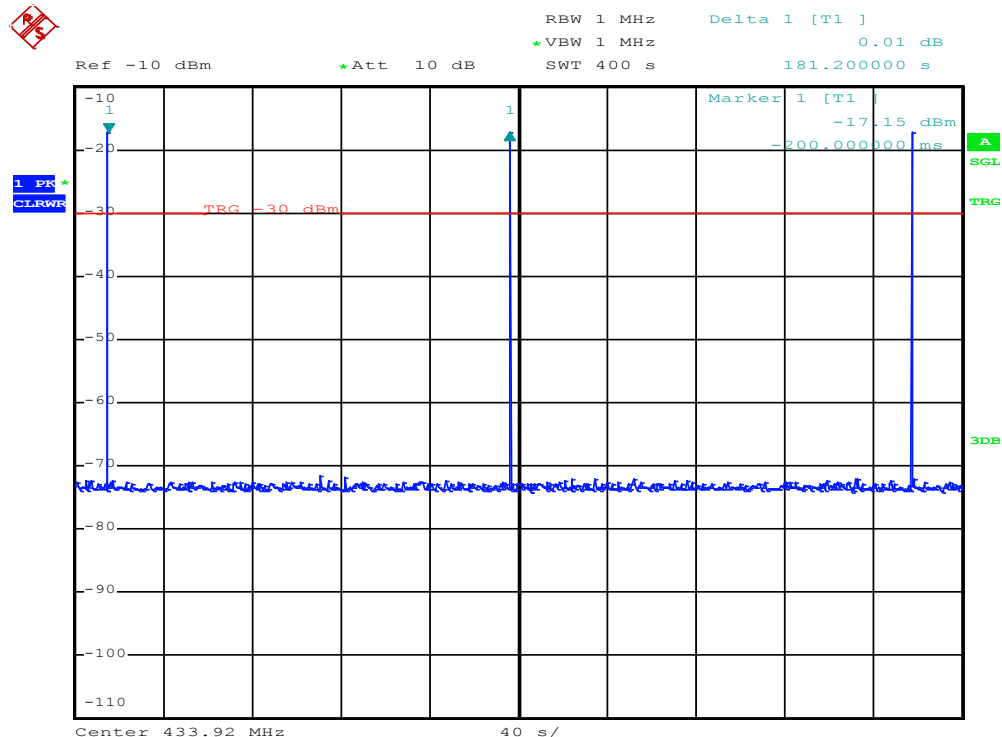


8.3 Duty Cycle

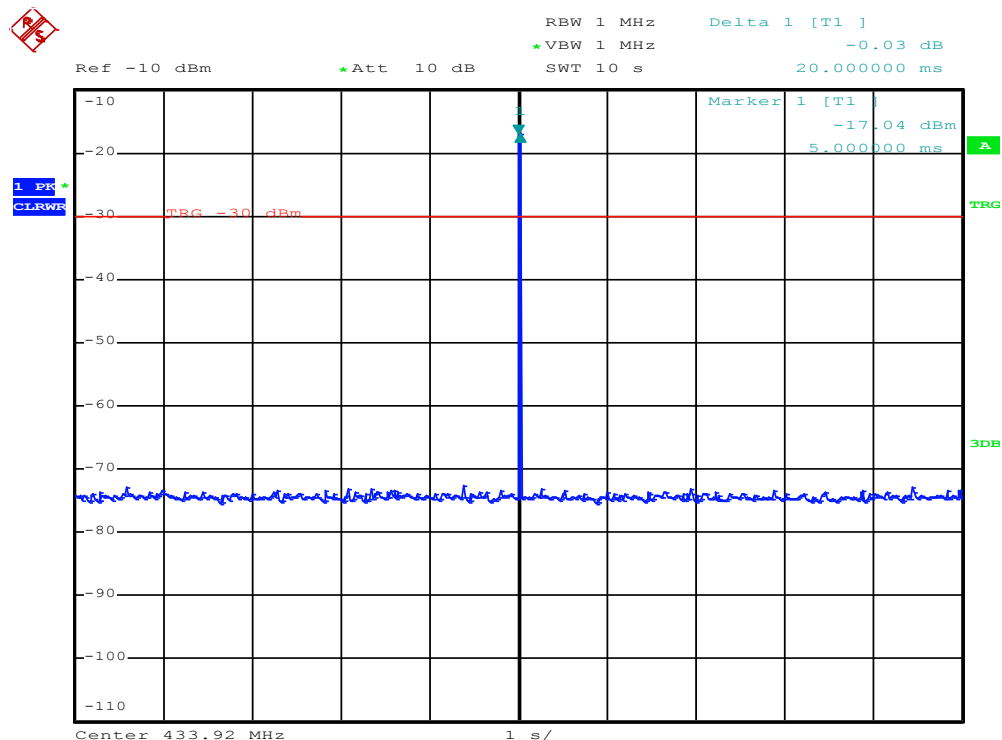
Test Requirement:	47 CFR Part 15C Section 15.35 (c)
Test Method:	ANSI C63.10:2013
Test Setup:	
Limit:	N/A
Test Mode:	Transmitting mode
Instruments Used:	Refer to section 5 for details
Test Results:	The average correction factor is computed by analyzing the on time in 100ms over one complete pulse train. Analysis of the remote transmitter on time in one complete pulse train, therefore the average value of fundamental frequency is: Average = Peak value + 20*log (Duty cycle), where the duty factor is calculated from following formula: $20 \cdot \log (\text{Duty cycle}) = 20 \cdot \log (29.4/100) = 20 \cdot \log (0.294) = -10.63$ Please refer to below plots for more details.



1. 2 Cycles

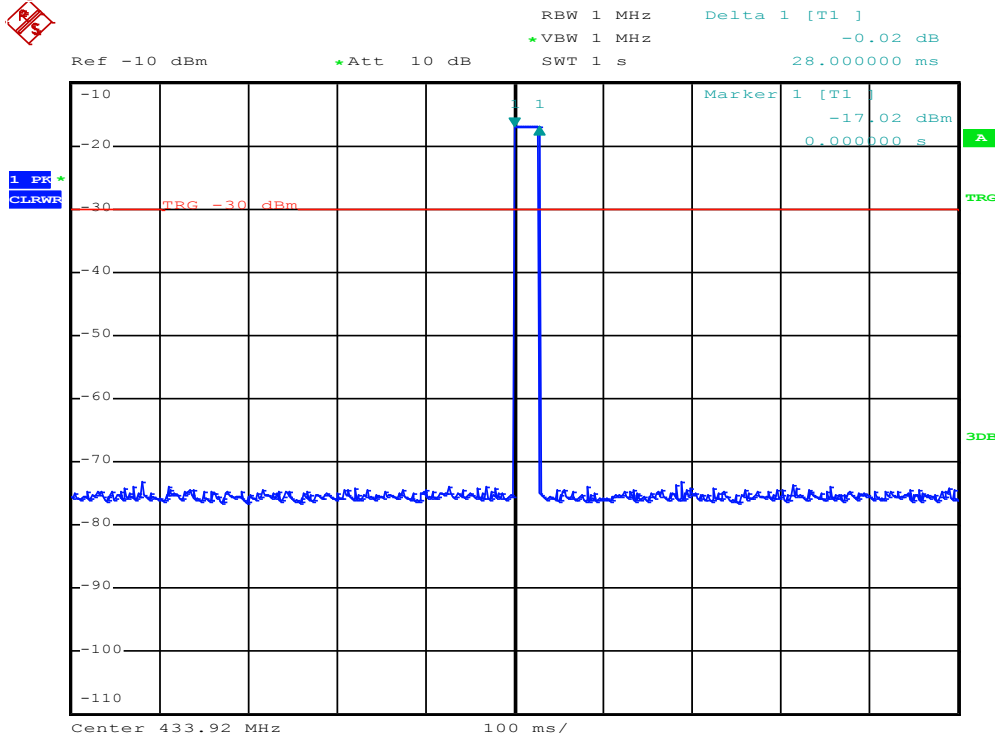


2. Transmission in 10s

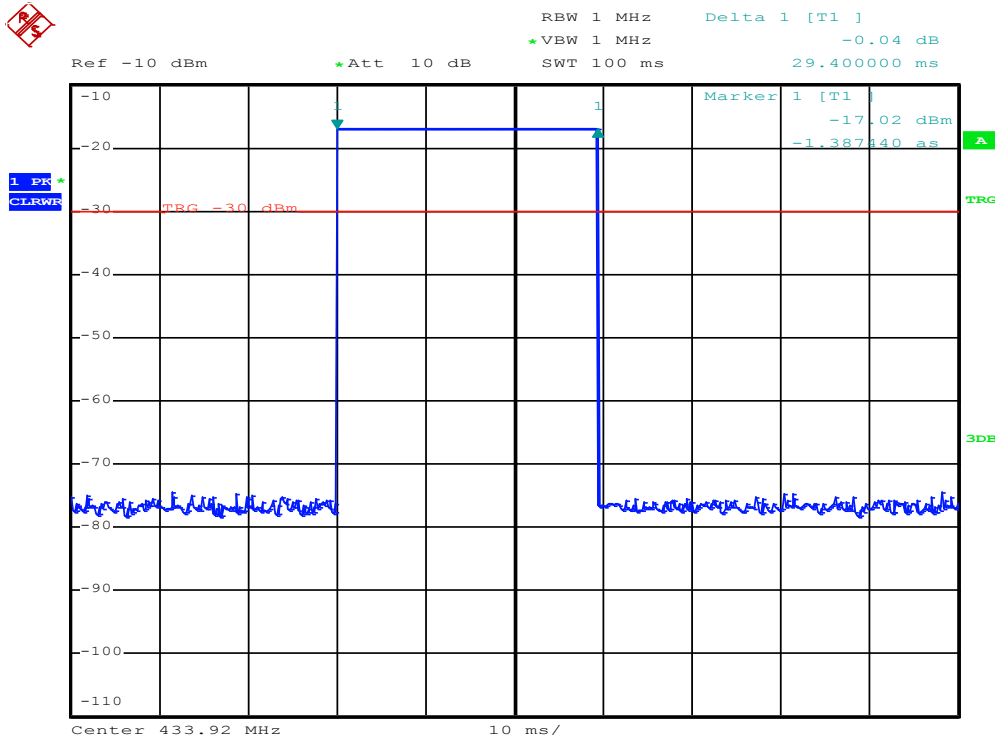




3. Transmission in 1s



4. Transmission in 0.1s





8.4 Field Strength of the Fundamental Signal (15.231(e))

Test Requirement: N/A
Test Method: ANSI C63.10 (2013) Section 6.5
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.		

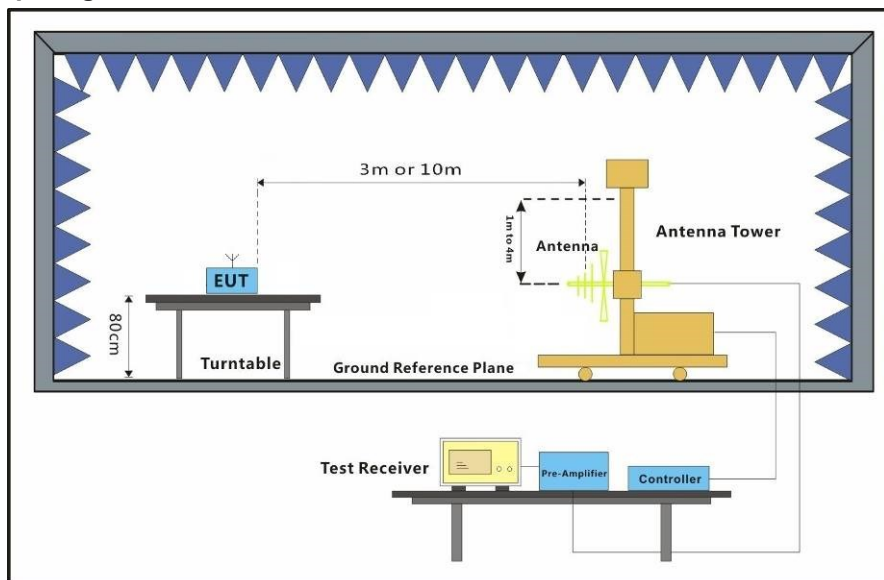
8.4.1 E.U.T. Operation

Operating Environment:

Temperature: 22.8 °C Humidity: 34.7 % RH Atmospheric Pressure: 1015 mbar

Test mode a:TX mode_Keep the EUT in transmitting with modulation mode.

8.4.2 Test Setup Diagram



8.4.3 Measurement Procedure and Data

- For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height 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.
- 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.

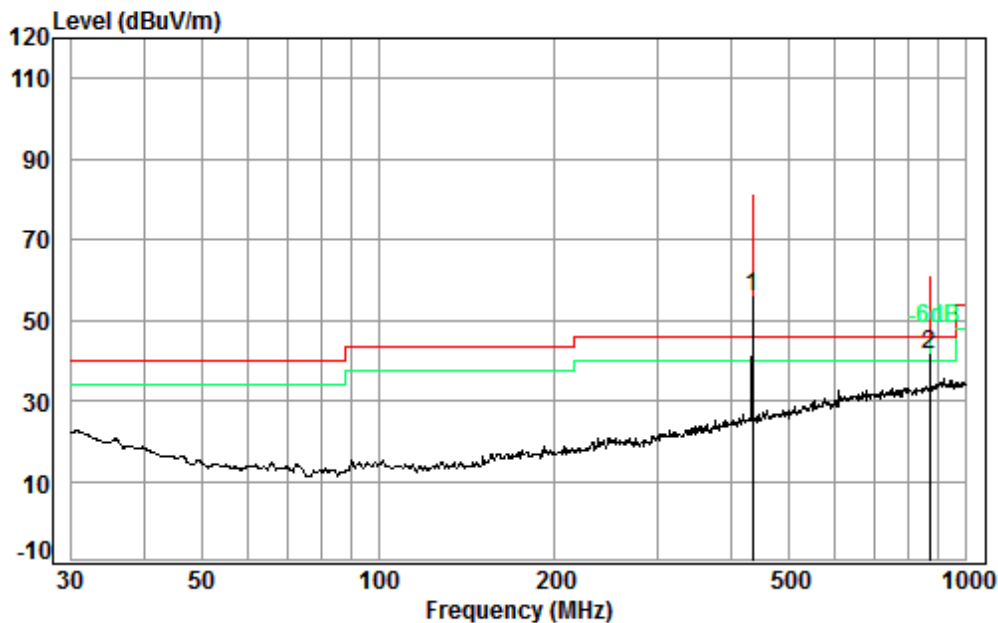
Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor



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Mode:a; Polarization:Horizontal



Condition: 3m HORIZONTAL

Job No. : 02598CR

Test mode: a

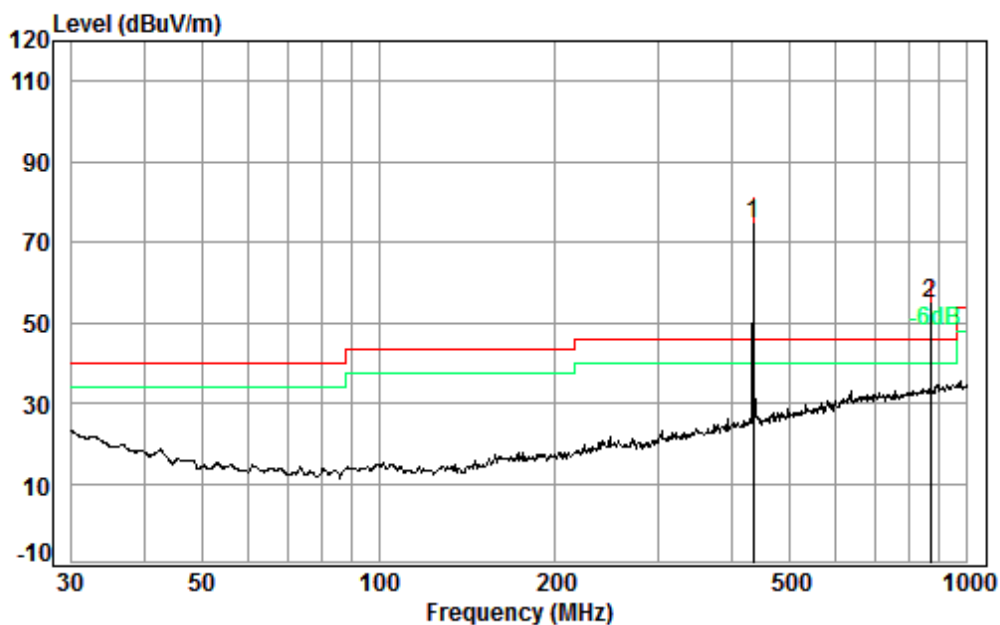
Frequency (MHz)	Cable Loss(dB)	Ant Factor (dB/m)	Preamplifier Factor (dB)	Read Level (dBuV/m)	Average factor (dB)	Level @ 3m (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Remark
433.92	2.35	23.2	27.79	58.13		55.89	92.87	-36.98	Peak
433.92	2.35	23.2	27.79	58.13	-10.63	45.26	72.87	-27.61	Average



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Mode:a; Polarization:Vertical



Condition: 3m VERTICAL
Job No. : 02598CR
Test mode: a

Frequency (MHz)	Cable Loss(dB)	Ant Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV/m)	Average factor (dB)	Level @ 3m (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Remark
433.92	2.35	23.2	27.33	76.80		75.02	92.87	-17.85	Peak
433.92	2.35	23.2	27.33	76.80	-10.63	64.39	72.87	-8.48	Average



8.5 Radiated Emissions

Test Requirement: N/A
Test Method: ANSI C63.10 (2013) Section 6.4&6.5&6.6
Measurement Distance: 3m
Limit:

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.

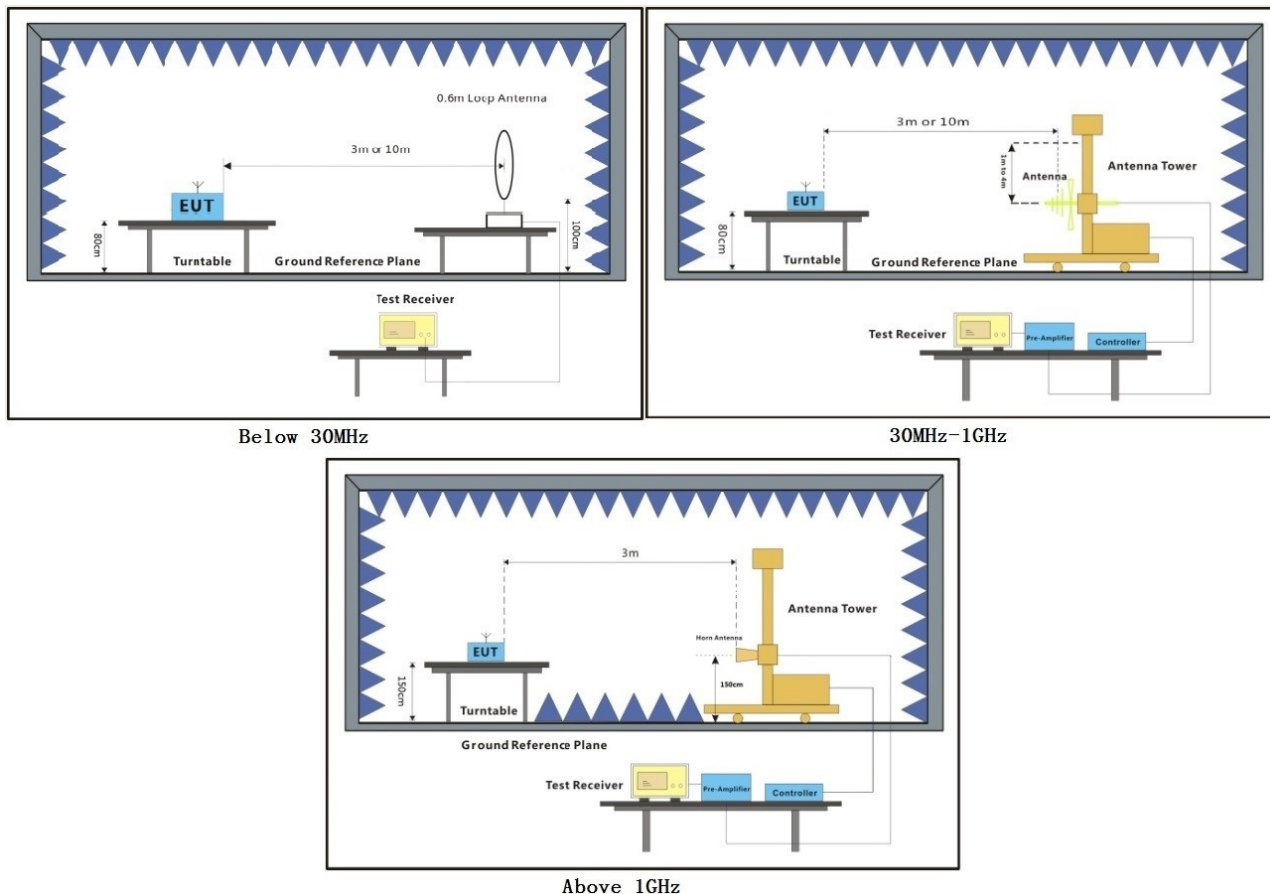
8.5.1 E.U.T. Operation

Operating Environment:

Temperature: 23.5 °C Humidity: 39.1 % RH Atmospheric Pressure: 1015 mbar

Test mode a:TX mode_Keep the EUT in transmitting with modulation mode.

8.5.2 Test Setup Diagram



8.5.3 Measurement Procedure and Data

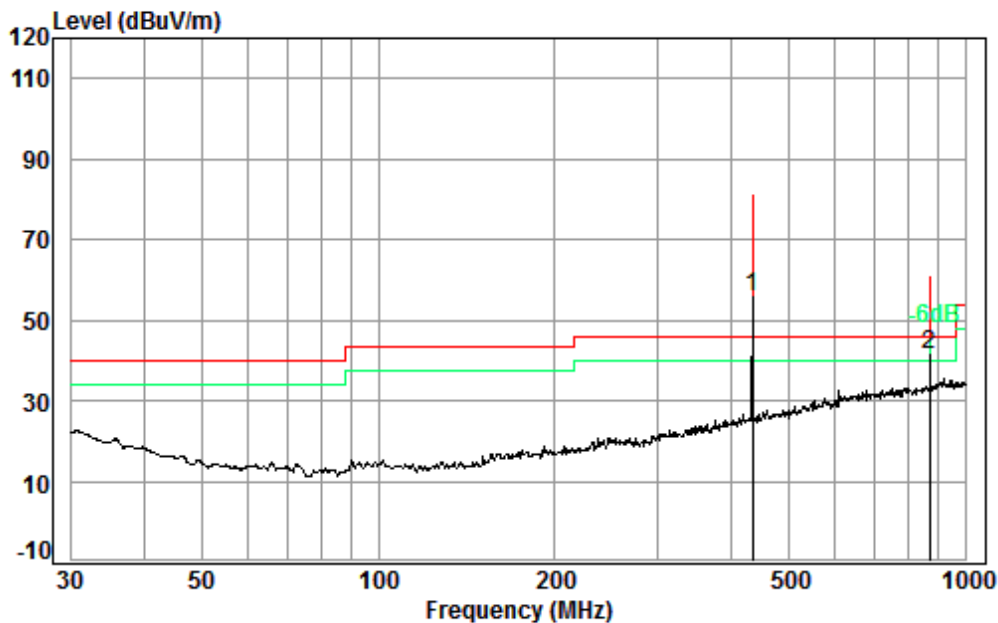
For testing performed with the loop antenna, the center of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane. Only the worst position of vertical was shown in the report.



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Mode:a; Polarization:Horizontal



Condition: 3m HORIZONTAL

Job No. : 02598CR

Test mode: a

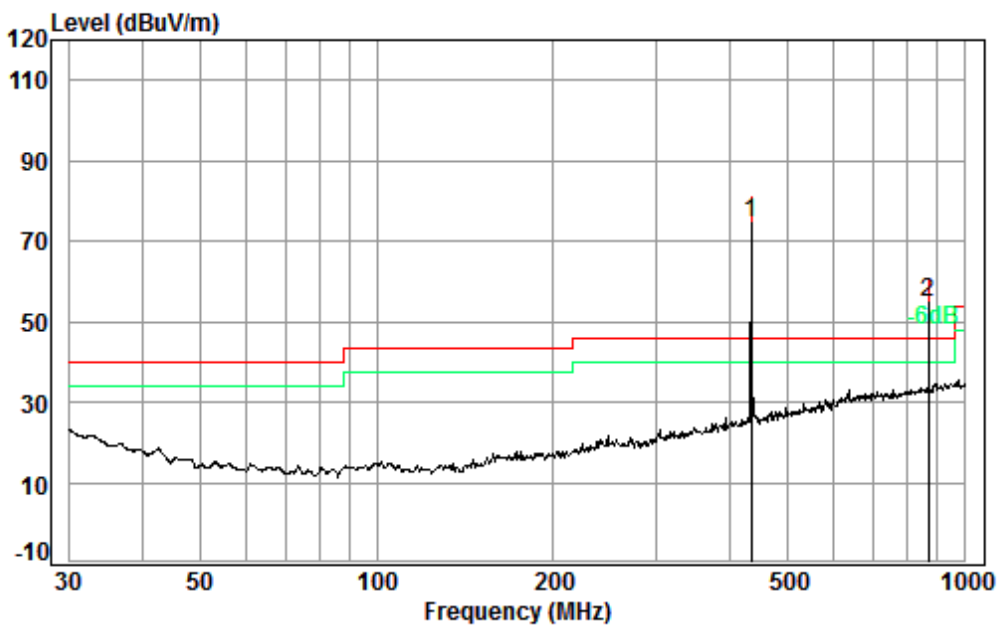
Frequency (MHz)	Cable Loss(dB)	Ant Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV/m)	Average factor (dB)	Level @ 3m (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Remark
867.84	3.48	29.4	26.92	35.53		41.49	72.87	-31.38	Peak
867.84	3.48	29.4	26.92	35.53	-10.63	30.86	52.87	-22.01	Average



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Mode:a; Polarization:Vertical



Condition: 3m VERTICAL

Job No. : 02598CR

Test mode: a

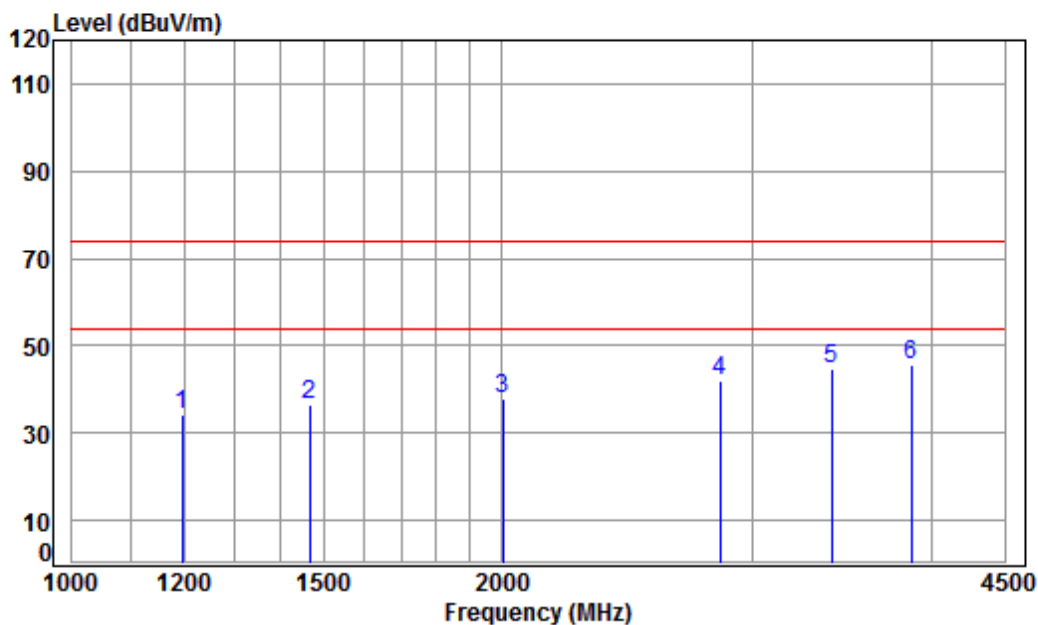
Frequency (MHz)	Cable Loss(dB)	Ant Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV/m)	Average factor (dB)	Level @ 3m (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Remark
867.84	3.48	29.4	26.92	48.82		54.78	72.87	-18.09	Peak
867.84	3.48	29.4	26.92	48.82	-10.63	44.15	52.87	-8.72	Average



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Mode:a; Polarization:Horizontal



Condition: 3m HORIZONTAL

Job No : 02598CR

Mode : 433 TX SE

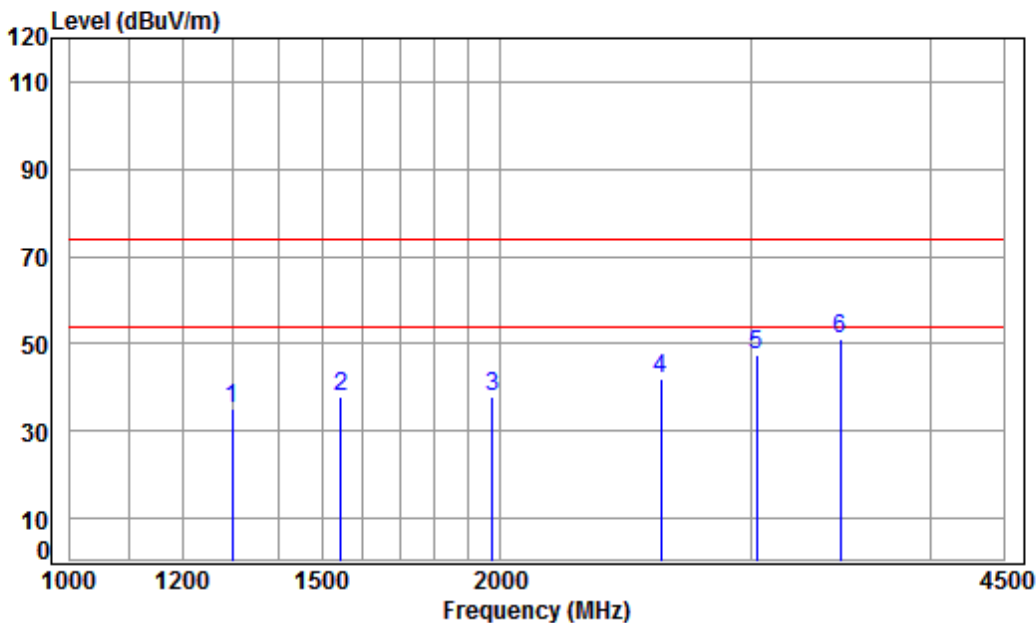
	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Level	Limit	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1195.599	4.40	24.46	41.18	46.54	34.22	74.00	-39.78	Peak
2	1466.746	5.37	25.67	41.38	46.62	36.28	74.00	-37.72	Peak
3	2004.265	4.91	27.82	41.70	46.81	37.84	74.00	-36.16	Peak
4	2842.049	5.87	30.74	42.05	47.55	42.11	74.00	-31.89	Peak
5	3403.425	6.37	32.04	42.20	48.43	44.64	74.00	-29.36	Peak
6 pp	3871.094	6.85	33.26	42.30	47.62	45.43	74.00	-28.57	Peak



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Mode:a; Polarization:Vertical



Condition: 3m VERTICAL

Job No : 02598CR

Mode : 433 TX SE

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit	Over	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1297.876	4.79	24.94	41.26	46.67	35.14	74.00	-38.86	Peak
2	1546.753	5.42	26.01	41.44	47.69	37.68	74.00	-36.32	Peak
3	1975.442	4.92	27.71	41.68	47.04	37.99	74.00	-36.01	Peak
4	2592.927	5.69	29.78	41.95	48.34	41.86	74.00	-32.14	Peak
5	3021.290	6.00	31.34	42.11	52.16	47.39	74.00	-26.61	Peak
6 pp	3458.644	6.42	32.13	42.21	54.64	50.98	74.00	-23.02	Peak

- End of the Report -