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FEDERAL COMMUNICATIONS COMMISSION
Registration number: 282399

Report No.: GZEM100900201601
Page: 1 of 27
FCC ID: ONFC1012A

TEST REPORT

Application No.:	GZEM1009002016RF
Applicant:	TELE RADIO AB
FCC ID:	ONFC1012A
Equipment under Test (EUT)	
Name:	TRANSMITTER
Model No.:	T00008-60, T00008-61, T00008-62, T00008-63, T00008-70, T00008-71, T00008-72, T00008-73 ♣
♣	Please refer to section 3 of this report which indicates which Item was actually tested and which were electrically identical.
Standards:	FCC PART 15: 2009
Date of Test:	2010-09-16 to 2010-09-26
Date of Issue:	2010-10-25
Test Result :	PASS

* In the configuration tested, the EUT detailed in this report complied with the standards specified above. Please refer to section 3 of this report for further details.



Stephen Guo

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.

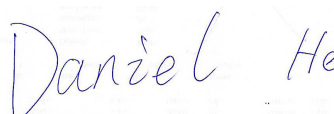
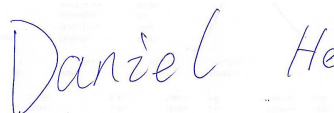
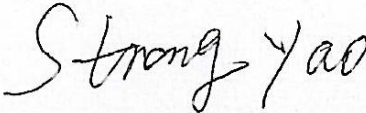
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2 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
00		2010-10-25		Original

Authorized for issue by:			
Tested By	 <u>(Daniel He) /Project Engineer</u>	2010-09-16 to 2010-09-26 <u>Date</u>	
Prepared By	 <u>(Daniel He) /Clerk</u>	2010-10-22 <u>Date</u>	
Checked By	 <u>(Strong Yao)/Reviewer</u>	2010-10-25 <u>Date</u>	



3 Test Summary

Test	Test Requirement	Standard Paragraph	Result
Radiated Emission (30 MHz to 5000MHz)	FCC PART 15 :2009	Section 15.231(a)	PASS
Occupied Bandwidth	FCC PART 15 :2009	Section 15.231(a)	PASS
Dwell Time	FCC PART 15 :2009	Section 15.231(a)	PASS
Label Requirement	FCC PART 15 :2009	Section 15.19	N/A

Item No.: T00008-60,T00008-61,T00008-62,T00008-63,T00008-70,T00008-71,T00008-72,T00008-73

✦: According to the declaration of the applicant, the electrical circuit design, layout, components used and internal wiring were identical for all models, with only difference being as show as below:

Model	Product description
T00008-60	8 buttons and with membrane
T00008-61	6 buttons and with membrane
T00008-62	3 buttons and with membrane
T00008-63	1 buttons and with membrane
T00008-70	8 buttons and no membrane
T00008-71	6 buttons and no membrane
T00008-72	3 buttons and no membrane
T00008-73	1 buttons and no membrane

Therefore T00008-60 was tested in this report.



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5 General Information

5.1 Client Information

Applicant: TELE RADIO AB
Address of Applicant: Datavägen 21, SE-436 32 Askim, Sweden

5.2 Details of E.U.T.

EUT Name: TRANSMITTER
Item No.: T00008-60, T00008-61, T00008-62, T00008-63, T00008-70, T00008-71, T00008-72, T00008-73
Function: The EUT is a transmitter.
Frequency: 433.920MHz
Modulation type: FSK
Power Supply: DC 3.0V (Size "AAA" x 2 batteries)
Power Cord: N/A

5.3 Standards Applicable for Testing

The customer requested FCC tests for the EUT.
The standard used was FCC PART 15, SUBPART C:2009 ,Section 15.231

5.4 Test Location

All tests were performed at:
SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory,
198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District,
Guangzhou, China 510663
Tel: +86 20 82155555 Fax: +86 20 82075059

No tests were sub-contracted.

5.5 Other Information Requested by the Customer

None.

5.6 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 recognized under the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.
- **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.

6 Equipment Used during Test

RE in Chamber						
No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due date
					(YYYY-MM-DD)	(YYYY-MM-DD)
EMC0525	Compact Semi-Anechoic Chamber	ChangZhou ZhongYu	N/A	N/A	2010-09-06	2011-09-06
EMC0522	EMI Test Receiver	Rohde & Schwarz	ESIB26	100283	2010-01-25	2011-01-25
EMC0056	EMI Test Receiver	Rohde & Schwarz	ESCI	10036	2010-06-02	2011-06-02
N/A	EMI Test Software	Audix	E3	N/A	N/A	N/A
EMC0514	Coaxial cable	SGS	N/A	N/A	2009-12-09	2010-12-09
EMC0524	Bi-log Type Antenna	Schaffner -Chase	CBL6112B	2966	2009-12-20	2010-12-20
EMC0519	Bilog Type Antenna	Schaffner -Chase	CBL6143	5070	2009-12-20	2010-12-20
EMC0518	Horn Antenna	Rohde & Schwarz	HF906	100096	2010-09-11	2011-09-11
EMC0040	Spectrum Analyzer	Rohde & Schwarz	FSP30	100324	2009-12-05	2010-12-05
EMC0521	1-26.5 GHz Pre-Amplifier	Agilent	8449B	3008A01649	2010-01-25	2011-01-25
EMC0049	Amplifier	Agilent	8447D	2944A10862	2010-04-21	2011-04-21
EMC0075	310N Amplifier	Sonama	310N	272683	2009-10-26	2010-10-26
EMC0523	Active Loop Antenna	EMCO	6502	42963	2009-11-17	2010-11-17
EMC0530	10m Semi- Anechoic Chamber	ETS	N/A	N/A	2010-05-17	2011-05-17

General used equipment						
No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due date
					(YYYY-MM-DD)	(YYYY-MM-DD)
EMC0006	DMM	Fluke	73	70681569	2009-12-16	2010-12-16
EMC0007	DMM	Fluke	73	70671122	2009-12-16	2010-12-16

7 Test Results

7.1 E.U.T. test conditions

Power supply:	DC 3.0V (Size “AAA” x 2 batteries)
Requirements:	15.31(e) : For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.
Type of antenna:	Integral
Operating Environment:	
Temperature:	22-25.0 °C
Humidity:	48-55% RH
Atmospheric Pressure:	1001-1010 mbar
Test frequencies:	According to the 15.31(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:

Frequency range over which device operates	Number of frequencies	Location in the range of operation
1 MHz or less	1	Middle
1 to 10 MHz	2	1 near top and 1 near bottom
More than 10 MHz	3	1 near top, 1 near middle and 1 near bottom

EUT working frequency:433.920MHz

7.2 Radiated Emissions

Test Requirement:	FCC Part15 C Section 15.231(b)
Test Method:	ANSI C63.4:2003 section 8 & 13
Measurement Distance:	3 m (Semi-Anechoic Chamber)
Test Status:	Test in transmitting mode at 433.920MHz.
Requirements:	the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

Fundamental Frequency MHz	Field Strength of Fundamental (dBμV/m @ 3 m)	Field Strength of Harmonics and Spurious Emissions (dBμV/m @ 3 m)
40.66 to 40.70	67.04	47.04
70 to 130	61.94	41.94
*130 to 174	61.94 to 71.48	41.94 to 51.48
174 to 260	71.48	51.48
*260 to 470	71.48 to 81.94	51.48 to 61.94
Above 470	81.94	61.94
Detector:	Peak for pre-scan QP for 30MHz to1000 MHz:120 kHz resolution bandwidth Peak for Above 1 GHz: 1 MHz resolution bandwidth	

* linear interpolations

[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, $\mu\text{V/m}$ at 3 meters = $56.81818(F) - 6136.3636$; for the band 260-470 MHz, $\mu\text{V/m}$ at 3 meters = $41.6667(F) - 7083.3333$. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

The fundamental frequency of the EUT is 433.920 MHz

The limit for average or QP field strength dBuV/m for the fundamental emission= 80.8 dBμV/m

No fundamental is allowed in the restricted bands.

The limit for average field strength dBuV/m for the spurious emission=60.8 dBuV/m.Spurious in the restricted bands must be less than 60.8 dBuV/m or 15.209

And according 15.35(a)

15.35(a) On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified. The specifications for the measuring instrument using the CISPR quasi-peak detector can be found in Publication 16 of the International Special Committee on Radio Interference (CISPR) of the International Electrotechnical Commission. As an alternative to CISPR quasi-peak measurements, the responsible party, at its option, may demonstrate compliance with the emission limits using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, as long as the same bandwidths as indicated for CISPR quasi-peak measurements are employed.

Note: For pulse modulated devices with a pulse-repetition frequency of 20 Hz or less and for which CISPR quasi-peak measurements are specified, compliance with the regulations shall be demonstrated using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, using the same measurement bandwidths that are indicated for CISPR quasi-peak measurements.

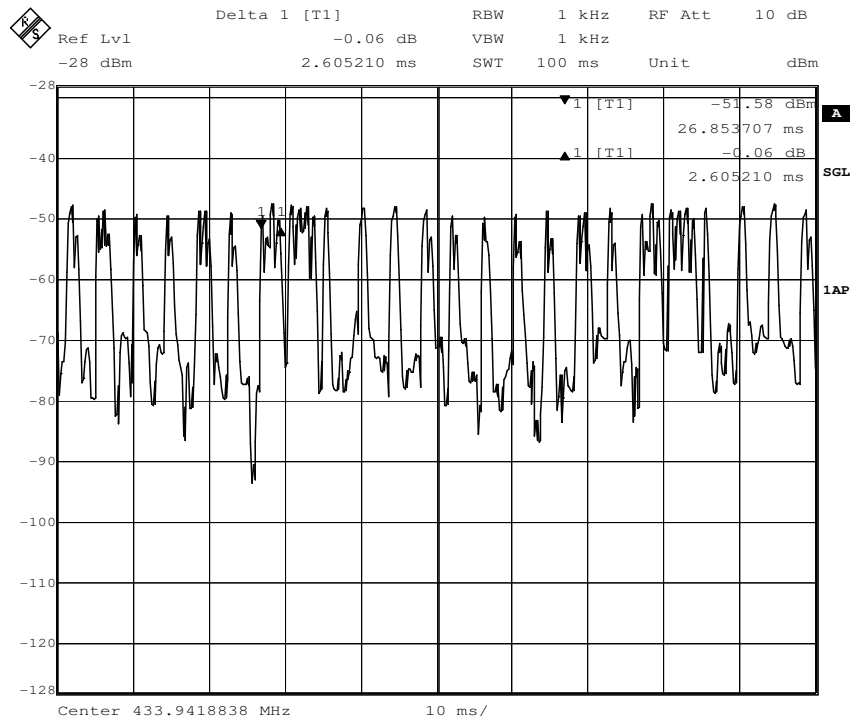
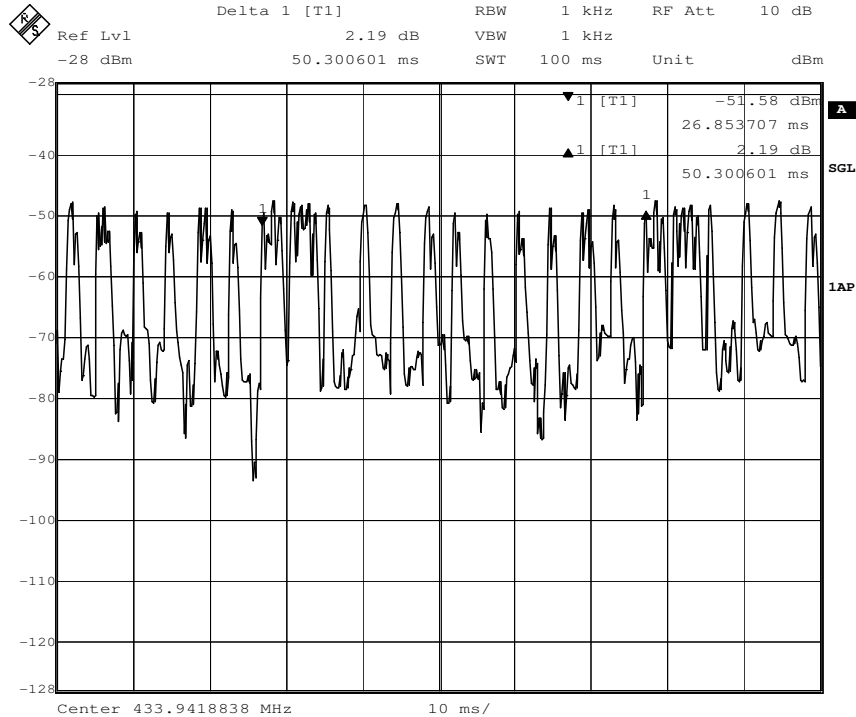
According to 15.35 (b) Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz. When average radiated emission measurements are specified in this part, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. Unless otherwise specified, e.g., see §§ 15.250, 15.252, 15.255, and 15.509-15.519 of this part, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device, e.g., the total peak power level. Note that the use of a pulse desensitization correction factor may be needed to determine the total peak emission level. The instruction manual or application note for the measurement instrument should be consulted for determining pulse desensitization factors, as necessary.

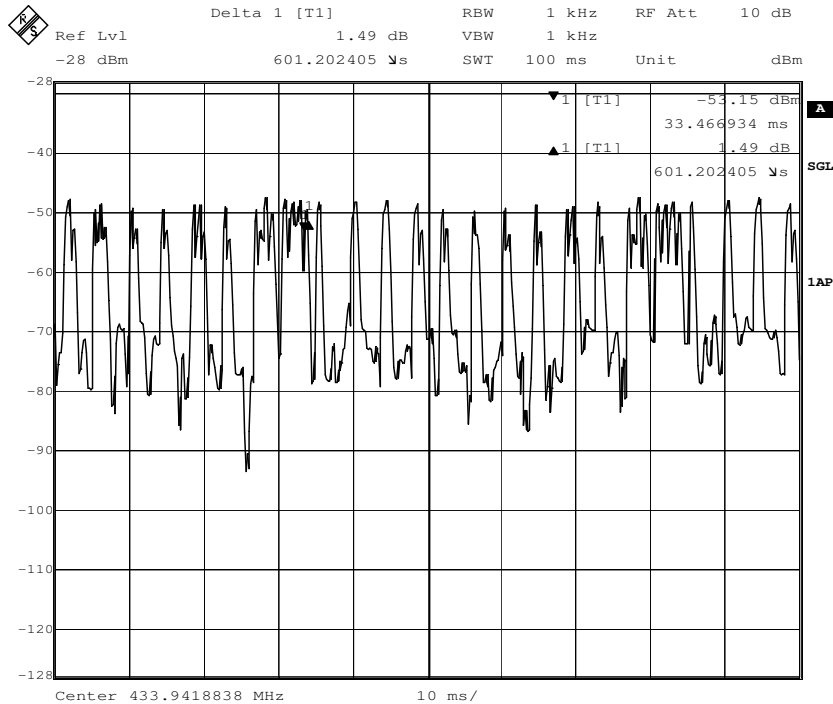
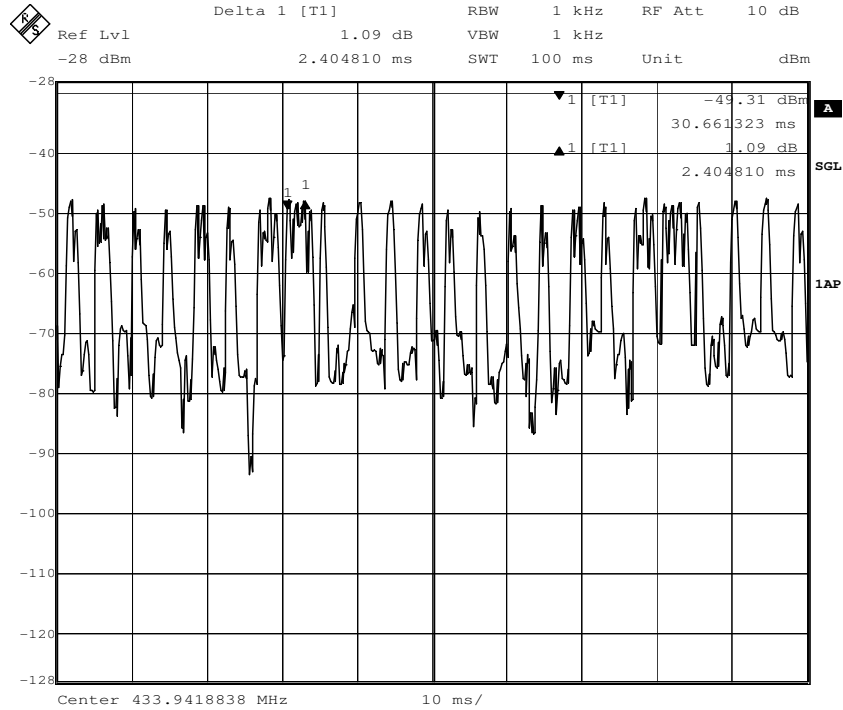
The average correction factor is computed by analyzing the on time in 100ms over one complete pulse train. Analysis of the remote transmitter on time in one complete pulse train, therefore the average value of fundamental frequency is: Average = Peak value + 20log (Duty cycle), where the duty factor is calculated from following formula:

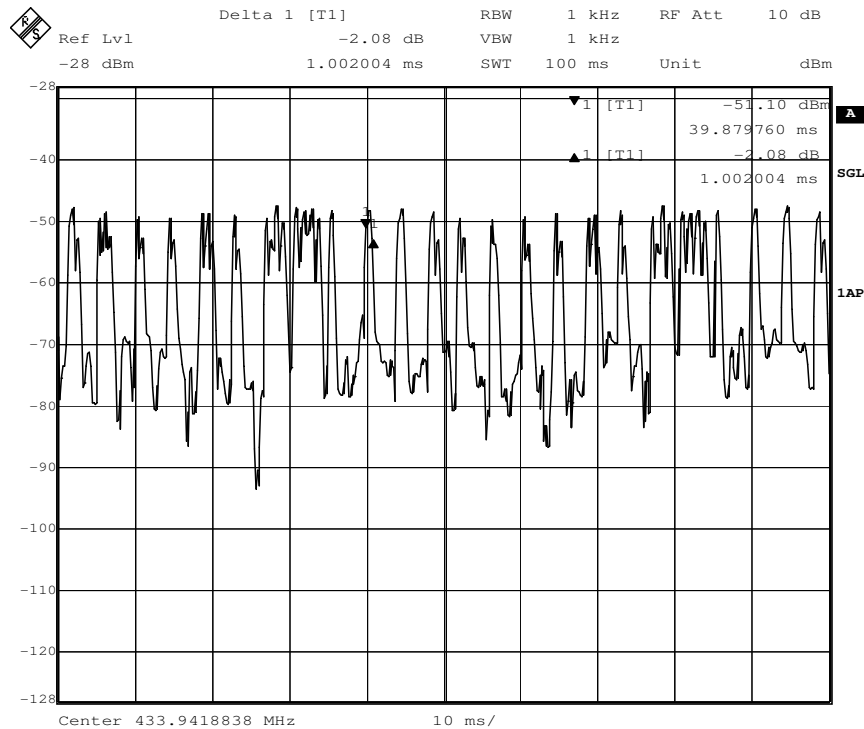
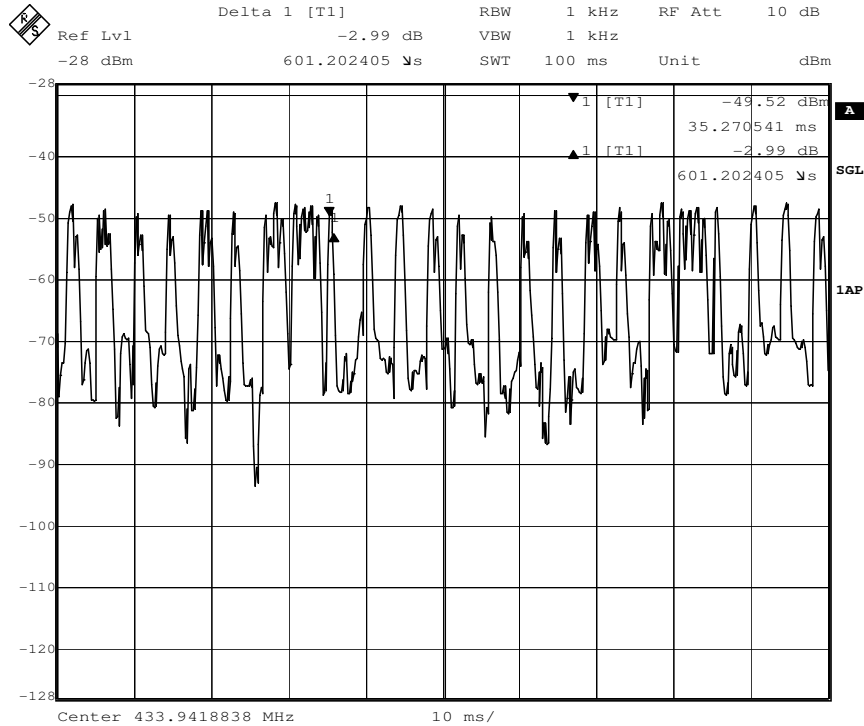
$$20\log (\text{Duty cycle}) = 20\log(T_{pulse} (13.6272/50.3006)) = 20\log(0.2709) = -11.3433\text{dB}$$

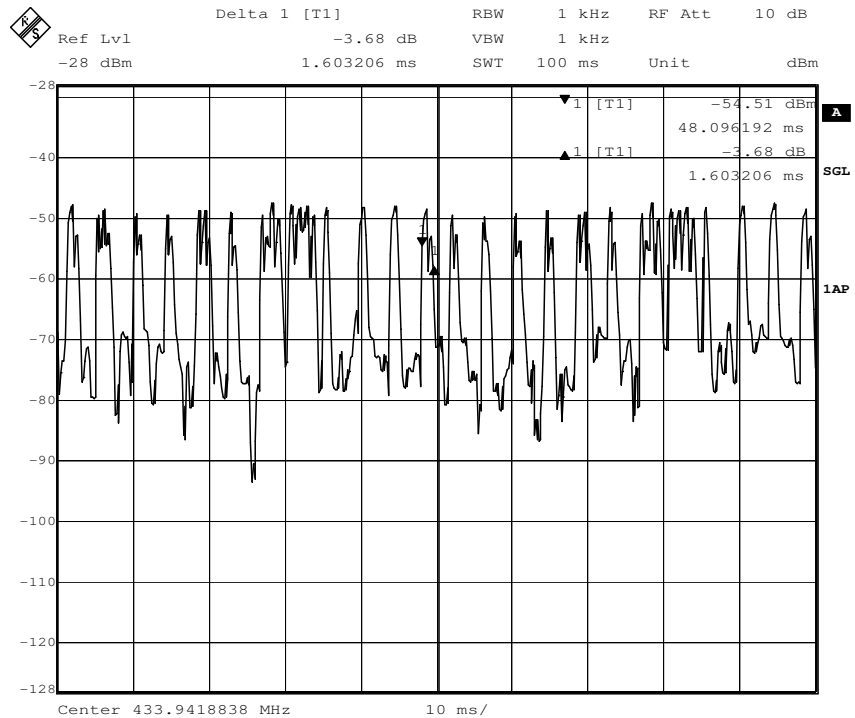
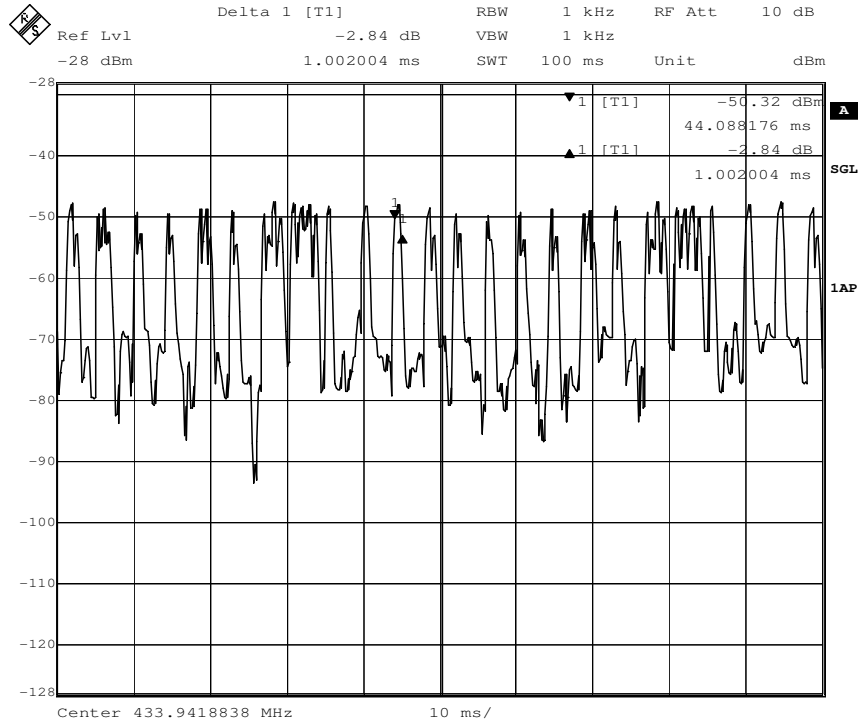
$$\text{Here } T_{pulse} = (2.6052 + 2.4048 + 0.6012 \times 4 + 1.0020 \times 3 + 1.6032 + 0.8016 + 0.2004 \times 2 + 0.4008) = 13.6272 \text{ (ms)}$$

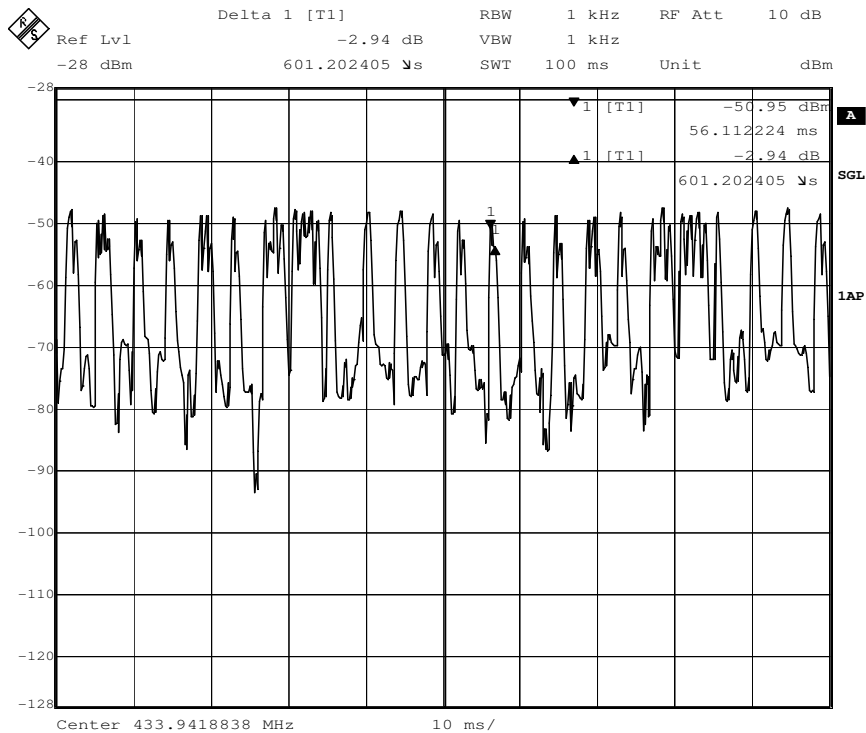
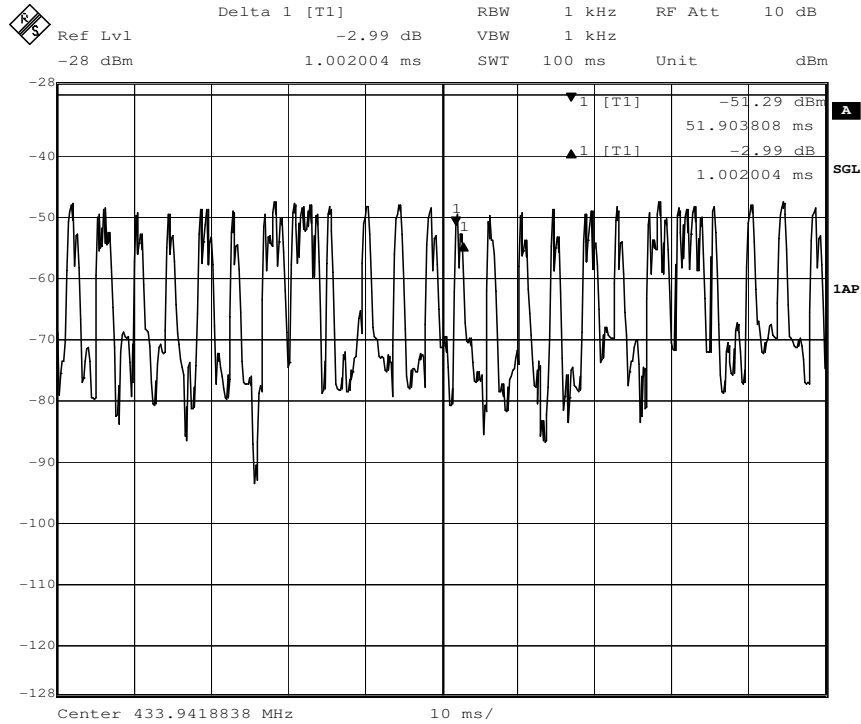
Please refer to below pictures for more details.

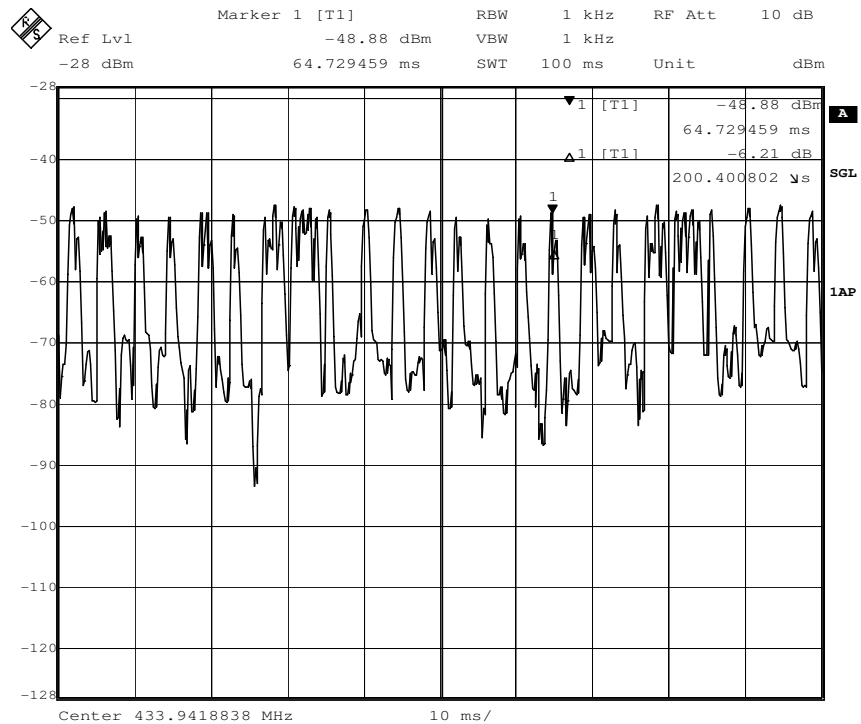
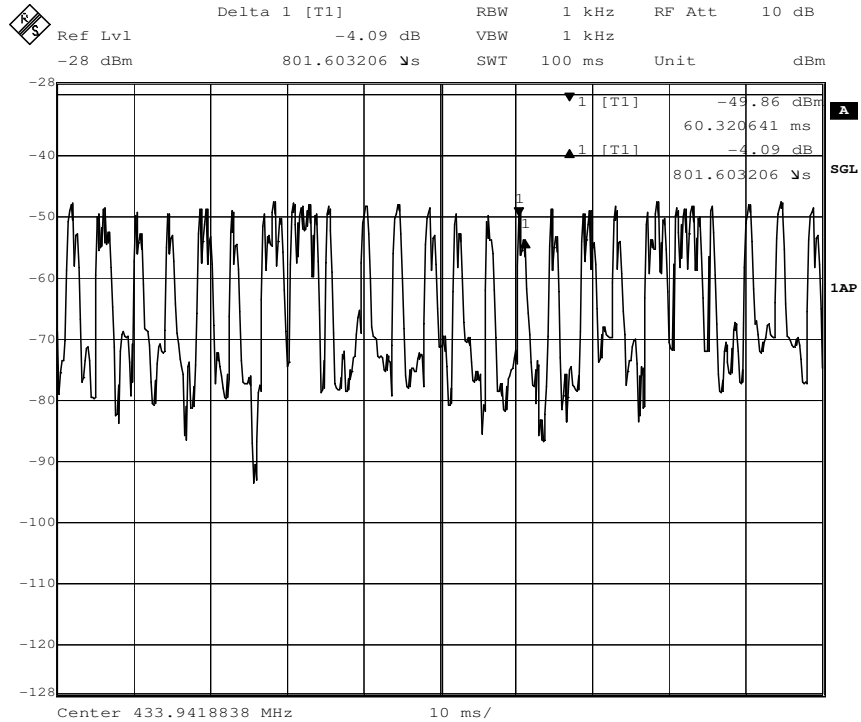


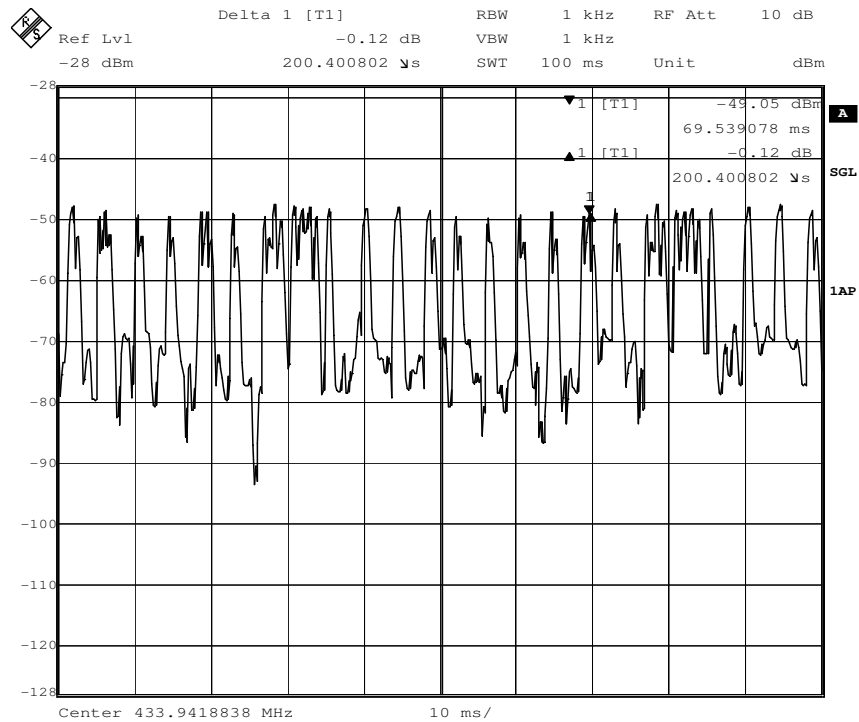
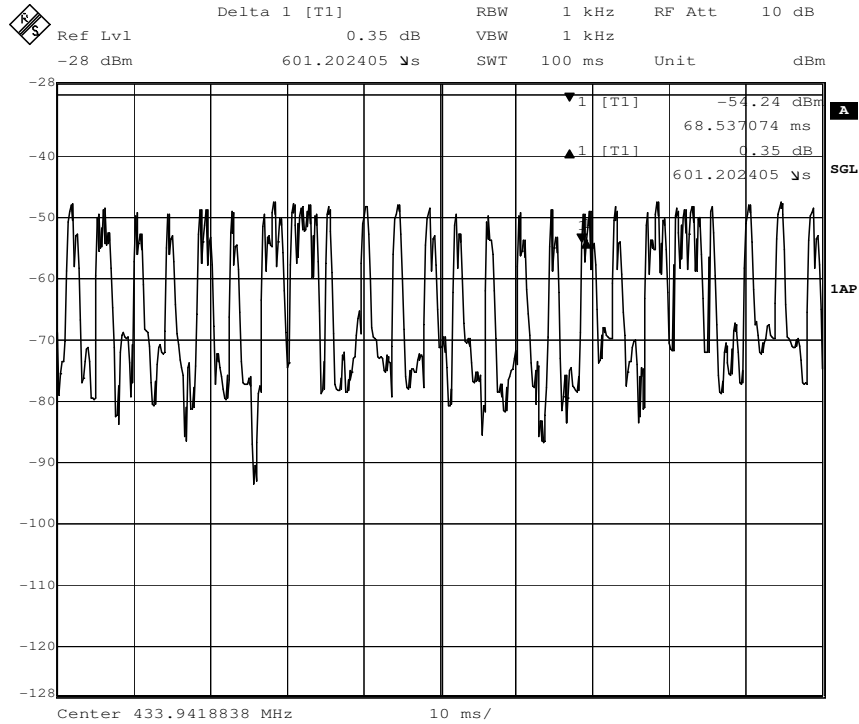


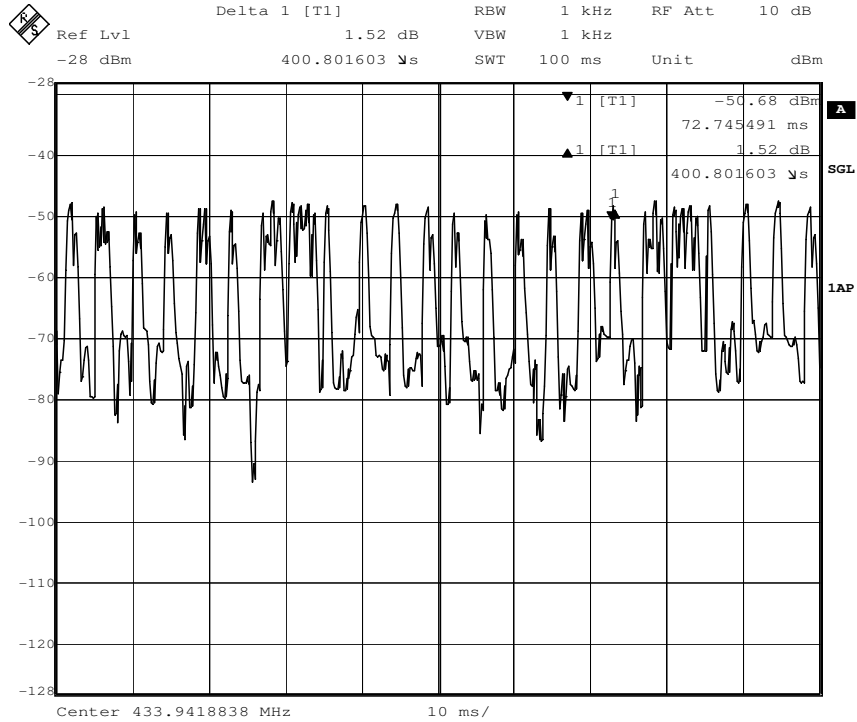












Test Procedure:

1)9K to 30MHz emissions:

For testing performed with the loop antenna, testing was performed in accordance to ANSI C63.4:2003 section 8.2.1. 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.

2)30MHz to 1GHz emissions:

For testing performed with the bi-log type antenna, testing was performed in accordance to ANSI C63.4:2003. The measurement is performed with the EUT rotated 360°, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurement for both the horizontal and vertical antenna polarizations.

3)1GHz to 40GHz emissions:

For testing performed with the horn antenna, testing was performed in accordance to ANSI C63.4:2003. The measurement is performed with the EUT rotated 360°, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurement for both the horizontal and vertical antenna polarizations.

Detector:

For PK value:

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

For AV value:

For harmonic emissions:

Average = Peak value + 20log (Duty cycle),

For other unwanted emissions:

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW = 10Hz

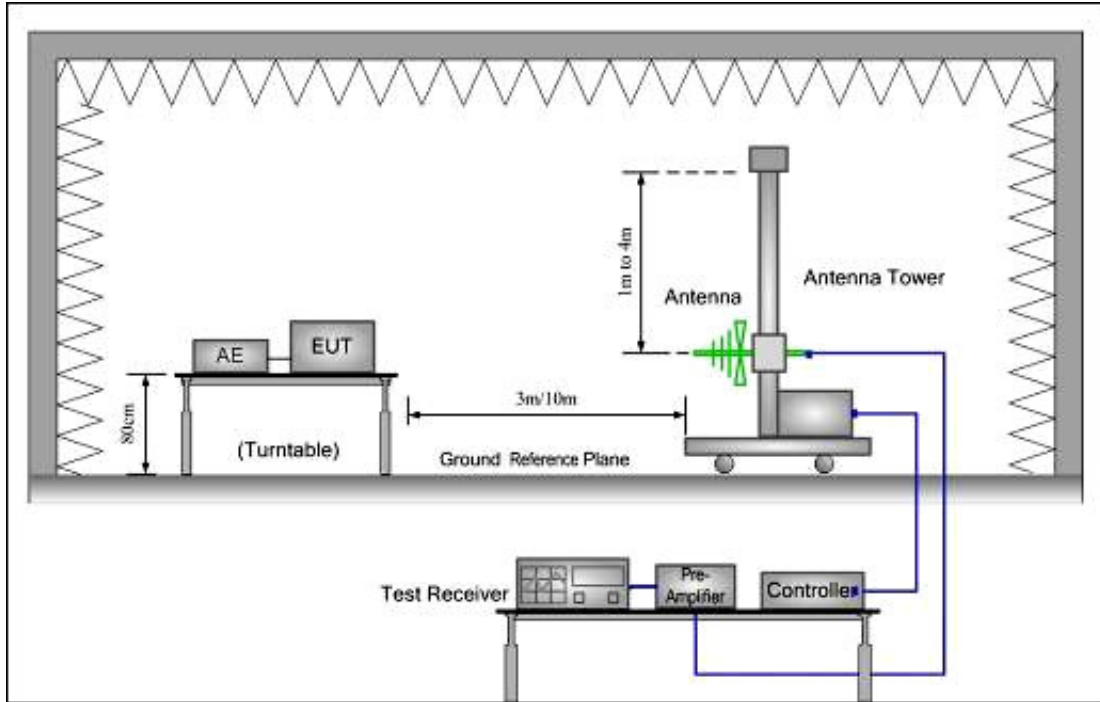
Sweep = auto

Detector function = peak

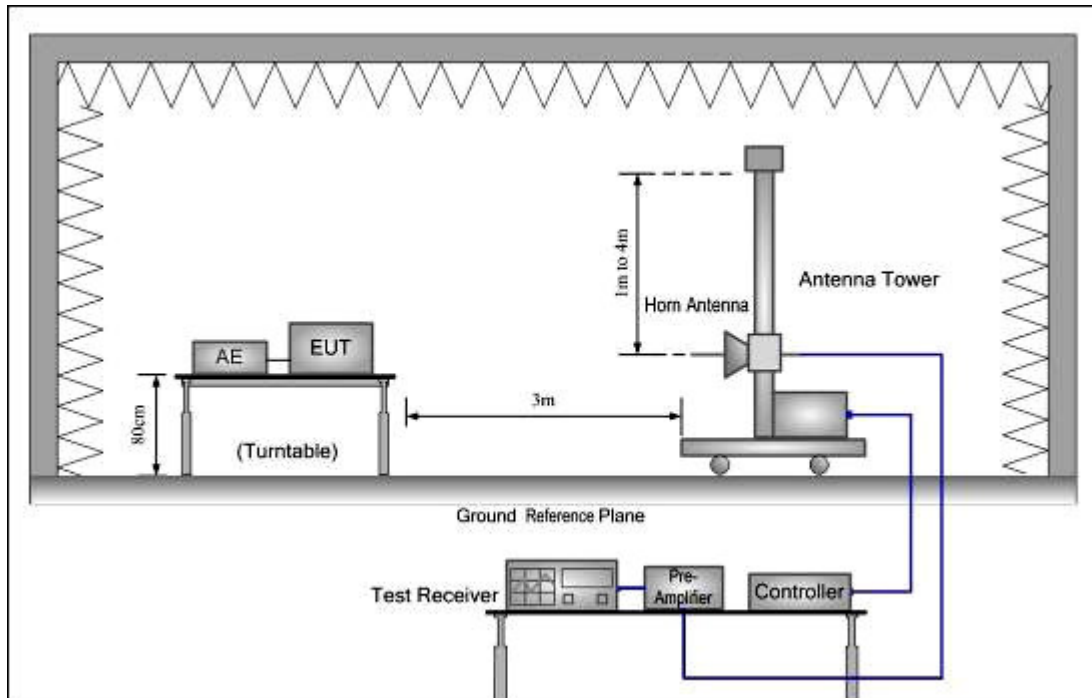
Trace = max hold

Test Configuration:

- 1) 30MHz to 1GHz emissions:



- 2) 1GHz to 40GHz emissions:





1) Fundamental emission:

Antenna polarization: Horizontal:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark
433.920	94.69	15.96	1.90	29.56	82.98	100.8	-17.82	Peak
433.920	-	-	-	-	71.64	80.8	-9.16	Average

Antenna polarization: Vertical

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark
433.920	87.15	15.96	1.90	29.56	75.45	100.8	-25.35	Peak
433.920	-	-	-	-	64.11	80.8	-16.69	Average

Antenna polarization: Vertical

Y: rotate EUT by 90° vertically.

X: rotate EUT by 90° clockwise.

Z: EUT as Radiated Emission test setup photograph in section 6 of this report.

Remark: Radiated Emission test setup photograph in section 6 of this report is the worst case and reported.

2) other emissions:

Test Procedure: The procedure used was ANSI Standard C63.4-2003. The receive was scanned from 30 MHz to 5000 MHz. When an emission was found, the table was rotated to produce the maximum signal strength. An initial pre-scan was performed for in peak detection mode using the receiver. The EUT was measured for both the Horizontal and Vertical polarities and performed a pre-test three orthogonal planes. The worst case emissions were reported.

An initial pre-scan was performed in the 3 m chamber using the spectrum analyzer in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by Bilog antenna with 2 orthogonal polarities

The field strength is calculated by adding the Antenna Factor, Cable Factor & Peramplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Peramplifier Factor.

The following test results were performed on the EUT.

Since the peak emission level is lower than the average limit, the average emission level does not need to show.

Test the EUT in transmitting mode.

Frequency :433.920MHz

Horizontal.

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark
125.07	41.04	12.38	0.9	24.46	29.86	43.5	-13.64	QP
866.15	41.78	20.3	2.6	25	39.68	80.8	-41.12	QP
877.78	42.47	20.3	2.6	25.08	40.29	46	-5.71	QP
1428	49.28	25.17	5.26	35.36	44.35	74	-29.65	Peak
1728	48.84	26.6	5.83	35.49	45.78	74	-28.22	Peak
1888	55.06	27.03	6.08	35.56	52.61	74	-21.39	Peak
2708	46.58	29.15	7.32	35.56	47.49	74	-26.51	Peak
3924	45.05	32.23	8.94	35.5	50.72	74	-23.28	Peak
4604	44.51	31.66	9.8	35.46	50.51	74	-23.49	Peak

Vertical.

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark
144.48	41.16	11.4	1.0	24.4	32.16	43.5	-11.34	QP
866.15	38.47	20.3	2.6	25	36.37	80.8	-44.43	QP
877.78	38.31	20.3	2.6	25.08	36.13	46	-9.87	QP
1728	51.77	26.6	5.83	35.49	48.71	74	-25.29	Peak
1888	55.71	27.03	6.08	35.56	53.26	74	-20.74	Peak
2832	46.59	29.44	7.57	35.55	48.05	74	-25.95	Peak
3844	45.03	32.25	8.9	35.51	50.67	74	-23.33	Peak
4720	44.93	32.15	10.0	35.46	51.62	74	-22.38	Peak



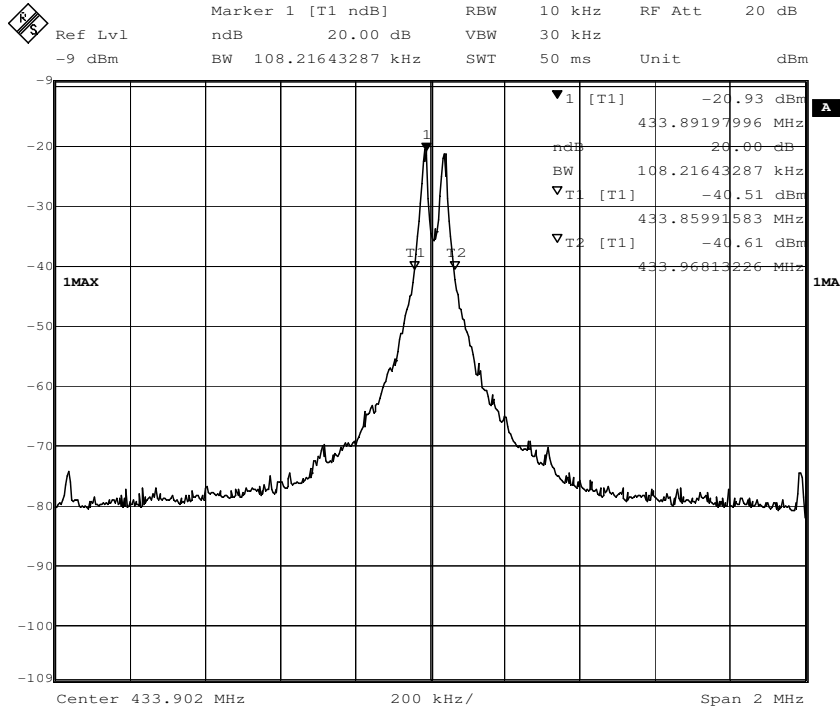
7.3 Occupied Bandwidth

Test Requirement: FCC Part 15 C Section 15.231 (C)
Test Method: ANSI C63.4:2003 section 13 & FCC Part 2.1049
Test Status: Test in transmitting mode at lowest and highest channel.
Requirements: 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. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.
Method of measurement: The useful radiated emission from the EUT was detected by the spectrum analyzer with peak detector. Record the 20 dB bandwidth of the carrier.

Test result:

Test frequency	bandwidth	Limit
433.920MHz	108.22KHz	1.08 MHz

frequency :433.920MHz



The results: The unit does meet the FCC Part 15 C Section 15.231 requirements.



7.4 Dwell Time:

Test Requirement: FCC Part 15 C Section 15.231(a)

Test Method: FCC Part15 C Section 15.231(a)

Test Status: Test in 433.920MHz

Requirements:

1. Regulation 15.231 (a) The provisions of this Section are restricted to periodic operation within the band 40.66 40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this Section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Radio control of toys is not permitted. Continuous transmissions, such as voice or video, and data transmissions are not permitted. The prohibition against data transmissions does not preclude the use of recognition codes. Those codes are used to identify the sensor that is activated or to identify the particular component as being part of the system.

Result:

The EUT is a remote switch without audio or video transmitted.

The EUT meets the requirements of this section.

2. Regulation 15.231 (a1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

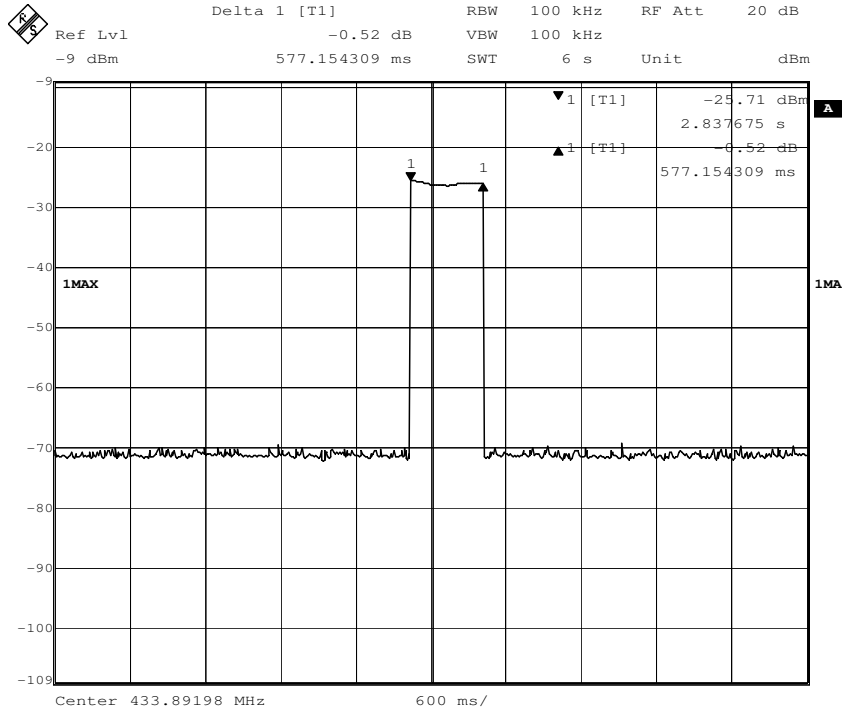
Result:

Carrier Frequency	Shutdown Time	Limit
433.920MHz	0.58s	≤5s

Result polt as follows:



frequency :433.920MHz



The EUT meets the requirements of this section.

3. Regulation 15.231 (a2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

Result:

The EUT does not have automatic transmission.

4. Regulation 15.231 (a3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions to determine system integrity of transmitters used in security or safety applications are allowed if the periodic rate of transmission does not exceed one transmission of not more than one second duration per hour for each transmitter.

Result:

The EUT does not employ periodic transmission.

5. Regulation 15.231 (a4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

Result:

This section is not applicable to the EUT.

The results: The unit does meet the FCC Part 15 C Section 15.231 requirements.

7.5 Label Requirement

Label requirement: FCC Part 15 C Section 15.19

Base standard: FCC Part 2, § 2.925 & § 2.926

For Certification:

FCC identifier: Identifier consists of the two elements. It shall be preceded by the term FCC ID in capital letters on a single line, and shall be of a type size large enough to be legible without the aid of magnification.

Example:

FCC ID: XXX123

Here, XXX means Grantee Code, and 123 means Equipment Product Code. Grantee Code is issued by FCC, A grantee code will have three characters consisting of Arabic numerals, capital letters, or combination thereof.

while Equipment Product code be defined by the applicant.

The use of "wild card" characters, such as @, (), !, &, \$ or / , in the Product Code is not allowed.

Whole the FCC ID numbers are no more than 14.

Compliance statement:

The FCC identifier shall be of a type size large enough to be legible without the aid of magnification.

All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules.Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

But it is allowed to put it in the user manual for the device's size smaller than 8cm*10cm.

Location:

The label shall be located in a conspicuous location on the device.

Label text and information should be in a size of type large enough to be readily legible, consistent with the dimensions of the equipment and the label. However, the type size for the text is not required to be larger than eight point.

-The End of Report--