

TEST REPORT

Applicant:	Guangzhou Tianqi Technology Development Co., Ltd.
Address of Applicant:	A709, Hengran Creative Park, Shixin Road, Panyu District, Guangzhou, Guangdong, China
Manufacturer:	Guangzhou Tianqi Technology Development Co., Ltd.
Address of Manufacturer:	A709, Hengran Creative Park, Shixin Road, Panyu District, Guangzhou, Guangdong, China
Product name:	EMP Anti Cheater Alarm
Model:	TQ-001
Rating(s):	Input: 100-120V~ 50/60Hz, 0.35A (For Adaptor) 12Vdc 1A (For Main)
Trademark:	 Teachnology TQ.
Standards:	47 CFR PART 15 Subpart C: 2019 section 15.231
FCC ID:	2ATG7TQ-001
Date of Receipt:	2019-03-11
Date of Test:	2019-03-11~2019-03-25
Date of Issue:	2019-03-25
Test Result	Pass*

* In the configuration tested, the test item complied with the standards specified above.

Authorized for issue by:

Test by:


Eleven Liang

Mar. 25, 2019 Eleven Liang

Project Engineer



Reviewed by:


Pauler Li

Mar. 25, 2019

Project Manager

Date

Name/Position

Signature

Date

Name/Position

Signature

Possible test case verdicts:

test case does not apply to the test object ...: N/A

test object does meet the requirement: P (Pass)

test object does not meet the requirement ...: F (Fail)

Testing Laboratory information:

Testing Laboratory Name: ITL Co., Ltd

Address: No. 8 Jinqianling Street 5, Huangjiang Town Dongguan,
Guangdong, 523757 P.R.C.

Testing location : Same as above

Tel : 0086-769-39001678

Fax : 0086-20-62824387

E-mail : itl@i-testlab.com

General remarks:

The test results presented in this report relate only to the object tested.

The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

This report would be invalid test report without all the signatures of testing technician and approver.

This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

Note:

AC ADAPTOR

Model : CAP012121

Input: 100-240V~ 50/60Hz, 0.35A

Output: 12Vdc 1A

The frequency of EMP Anti Cheater Alarm is 315MHz, 390MHz and 433MHz, The signals of these three frequencies can be transmitted at the same time.

1 Test Summary

Test	Test Requirement	Test method	Result
Radiated Emission	FCC PART 15 section 15.231(b)	ANSI C 63.10: Clause 6.4, 6.5 and 6.6	PASS
Occupied Bandwidth	FCC PART 15 section 15.231(c)	ANSI C 63.10: Clause 6.9	PASS
Dwell Time	FCC PART 15 section 15.231(a)	FCC PART 15: Section 15.231(a)	PASS
Conducted Emission	FCC PART 15 section 15.207	ANSI C 63.10: Clause 6.2	PASS
Remark:			
N/A: because the device is battery operated. EUT: In this whole report EUT means Equipment Under Test. 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. ANSI C63.10: the detail version is ANSI C63.10:2013 in the whole report.			

2 Contents

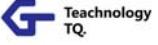
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3 General Information

3.1 Client Information

Applicant: Guangzhou Tianqi Technology Development Co., Ltd.
Address of Applicant: A709, Hengran Creative Park, Shixin Road, Panyu District, Guangzhou, Guangdong, China

3.2 General Description of E.U.T.

Name: EMP Anti Cheater Alarm
Model No.: TQ-001
Trade Mark: 
Operating Frequency: 433 MHz, 390MHz, 315MHz
Type of Modulation FSK
Function: EMP Anti Cheater Alarm
Antenna Type: SMA-reverse antenna with 2dBi gain

3.3 Details of E.U.T.

EUT Power Supply: 100-240V~ 50/60Hz
Test mode: transmitting
Power cord: 1.5m for adapter dc output line

3.4 Description of Support Units

The EUT has been tested as an independent unit for fixed frequency by testing lab.

3.5 Test Location

All tests were performed at:

ITL Co., LTD

No. 8 Jinqianling Street 5, Huangjiang Town, Dongguan, Guangdong, 523757 P.R.C.

0086-769-39001678

itl@i-testlab.com

No tests were sub-contracted.

3.6 Deviation from Standards

Biconical and log periodic antennas were used instead of dipole antennas.

3.7 Abnormalities from Standard Conditions

None.

3.8 Other Information Requested by the Customer

None.

3.9 Test Facility

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

- CNAS(Lab code:L9342)
- FCC (Registration No.: CN5035)
- IC (Registration NO.:CN0025)

3.10 Measurement Uncertainty

The below measurement uncertainties given below are based on a 95% confidence level (base on a coverage factor (k=2).)

Parameter	Uncertainty
Radio frequency	2.25%
total RF power, conducted	±1.34 dB
RF power density , conducted	±1.49 dB
All emissions, radiated	±2.72 dB
Temperature	±5.02 dB
Humidity	±0.8°C
DC and low frequency voltages	±1.5 %

4 Instruments Used during Test

No.	Test Equipment	Manufacturer	Model	Serial No.	Last Cal.	Cal. Due
DGITL-306	Spectrum Analyzer	Agilent Technologies	N9010A	MY54200334	2017.05.31	2020.05.31
DGITL-307	Test Receiver	R&S	ESVS 10	840698/013	2018.06.19	2019.06.19
DGITL-352	Pre Amplifier	Minicircuits	ZFC-1000HX	SN292801110	2018.06.19	2019.06.19
DGITL-350	Wideband Amplifier Super Ultra	Minicircuits	ZVA-183-S+	SN986401426	2018.06.19	2019.06.19
DGITL-308	Biconilog Antenna	ETS-Lindgren	3142E	156975	2017.02.21	2020.02.21
DGITL-309	Horn Antenna	ETS-Lindgren	3117	SN00152265	2017.02.21	2020.02.21
DGITL-303a	EMI Test receiver	R&S	ESCI	100910	2018.06.19	2019.06.19
DGITL-304	L.I.S.N.#1	R&S	ESH3-Z5	100272	2018.06.19	2019.06.19
DGITL-316	Pulse Limiter	R&S	ESH3-Z2	100327	2018.06.19	2019.06.19
DGITL-300	50Ω Coaxial Cable	Minicircuits	CBL	C002	2018.06.19	2019.06.19
DGITL-301	Anechoic chamber	ETS-Lindgren	9m*6m*6m	CT000874-1181	2017.05.31	2020.05.31
DGITL-363	Loop Antenna	ZHINAN	ZN30900A	002489	2017.02.21	2020.02.21
DGITL-364	Horn Antenna	Schwarzbeck	BBHA 9170	B09806543	2017.02.21	2020.02.21
DGITL-302	Shielded Room	ETS-Lindgren	8*4*3	CT09010	2018.06.19	2019.06.19

5 Test Results

5.1 E.U.T. test conditions

Test Voltage:	120V~ 60Hz
Temperature:	23.2 -25.0 °C
Humidity:	38-50 % RH
Atmospheric Pressure:	1000 -1010 mbar
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.

Test frequencies and frequency range:	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:
--	--

According to the 15.33 (a) For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in the following table:

Number of fundamental frequencies to be tested in EUT transmit band

Frequency range in which	Number of	Location in frequency range
1 MHz or less	1	Middle
1 MHz 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

Frequency range of radiated emission measurements

Lowest frequency generated	Upper frequency range of measurement
9 kHz to below 10 GHz	10th harmonic of highest fundamental frequency or to 40 GHz,
At or above 10 GHz to below	5th harmonic of highest fundamental frequency or to 100 GHz,
At or above 30 GHz	5th harmonic of highest fundamental frequency or to 200 GHz,

Remark: Test frequency is 315MHz, 390MHz and 433MHz.

5.2 Antenna requirement

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.

EUT Antenna

This product has three SMA-reverse antennas for transmit. The best case gain of the antenna is 2dBi.

Test result: The unit does meet the FCC requirements.

5.3 Radiated Emissions

Test Requirement: FCC Part 15 C section 15.231(b)
Test Method: ANSI C63.10: Clause 6.4, 6.5 and 6.6
Test Status: Test the transmitter in continuous transmitting mode.
Limit: The field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

Fundamental Frequency MHz	Field Strength of Fundamental (dB μ V/m @ 3 m)	Field Strength of Harmonics and Spurious Emissions (dB μ V/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

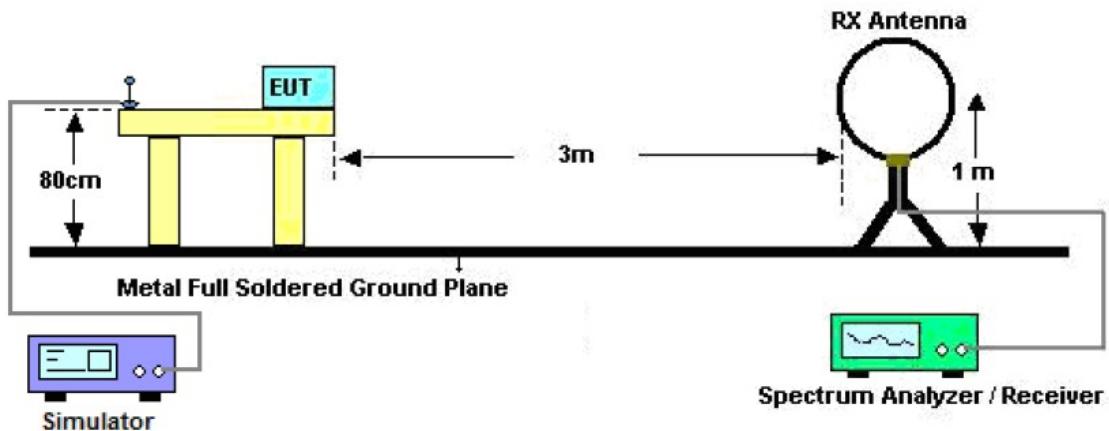
** linear interpolations
Spurious Emissions appear within the restricted bands shall not exceed the limits shown in Section 15.209.

Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector.

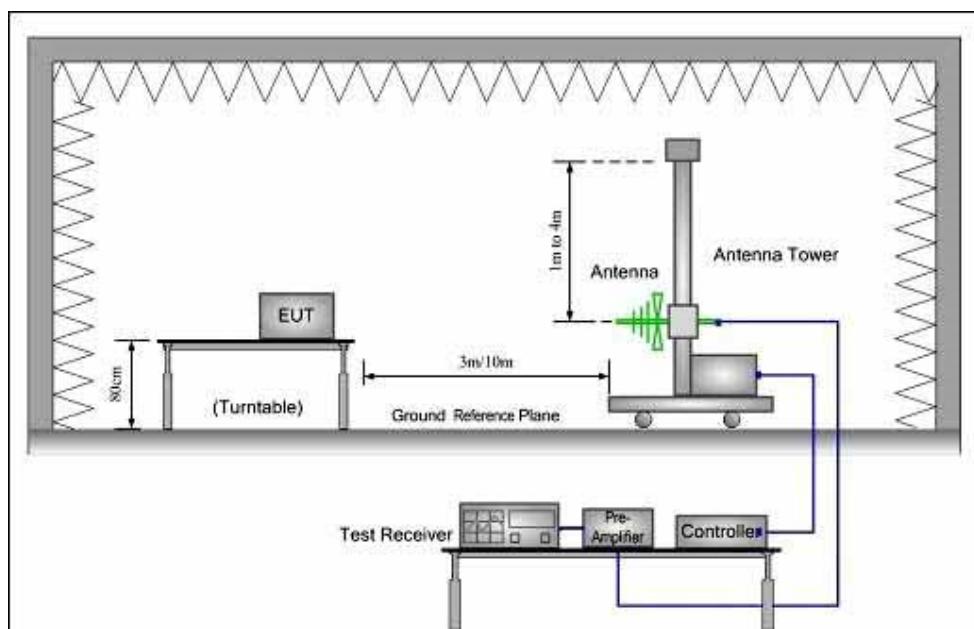
The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.

Test Configuration:

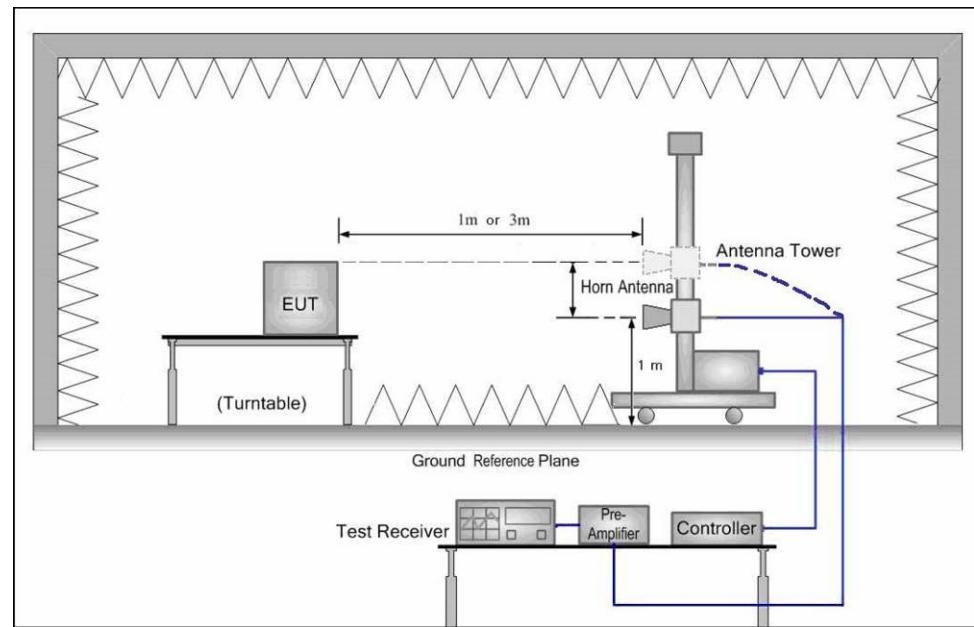
- 1) 9 kHz to 30 MHz emissions:



- 2) 30 MHz to 1 GHz emissions:



- 3) 1 GHz to 40 GHz emissions:



Test Procedure:

1) 9 kHz to 30 MHz emissions:

For testing performed with the loop antenna. The centre of the loop was positioned 1 m above the ground and positioned with its plane vertical at the special 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) 30 MHz to 1 GHz emissions:

For testing performed with the bi-log type antenna. 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) 1 GHz to 40 GHz emissions:

Test site with RF absorbing material covering the ground plane that met the site validation criterion called out in CISPR 16-1-4:2007 was used to perform radiated emission test above 1 GHz.

For testing performed with the horn antenna. 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.

The field strength of radiation emission was measured in the following position: EUT stand-up position (Y axis), lie-down position (X, Z axis). The worst case of X axis was reported.

Detector: Resolution bandwidth for Peak and Quasi-Peak value:

200 Hz for 9 kHz to 150 kHz

9 kHz for 150 kHz to 30 MHz

120 kHz for 30 MHz to 1GHz

1 MHz for above 1 GHz,

VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

For AV value:

Average = Peak value + 20log (Duty cycle)

The average correction factor is computed by analyzing the on time in one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds, therefore the average value of fundamental frequency is: Average = Peak value + 20log (Duty cycle), where the duty factor is calculated from following formula:

DCCF=20*log (Duty cycle)

Duty cycle=100%, DCCF=20*log (Duty cycle)=0

Duty Cycle Correction Factor was used in this report.

Please refer to below plots for more details.

Test mode :315MHz



Test mode : 390MHz

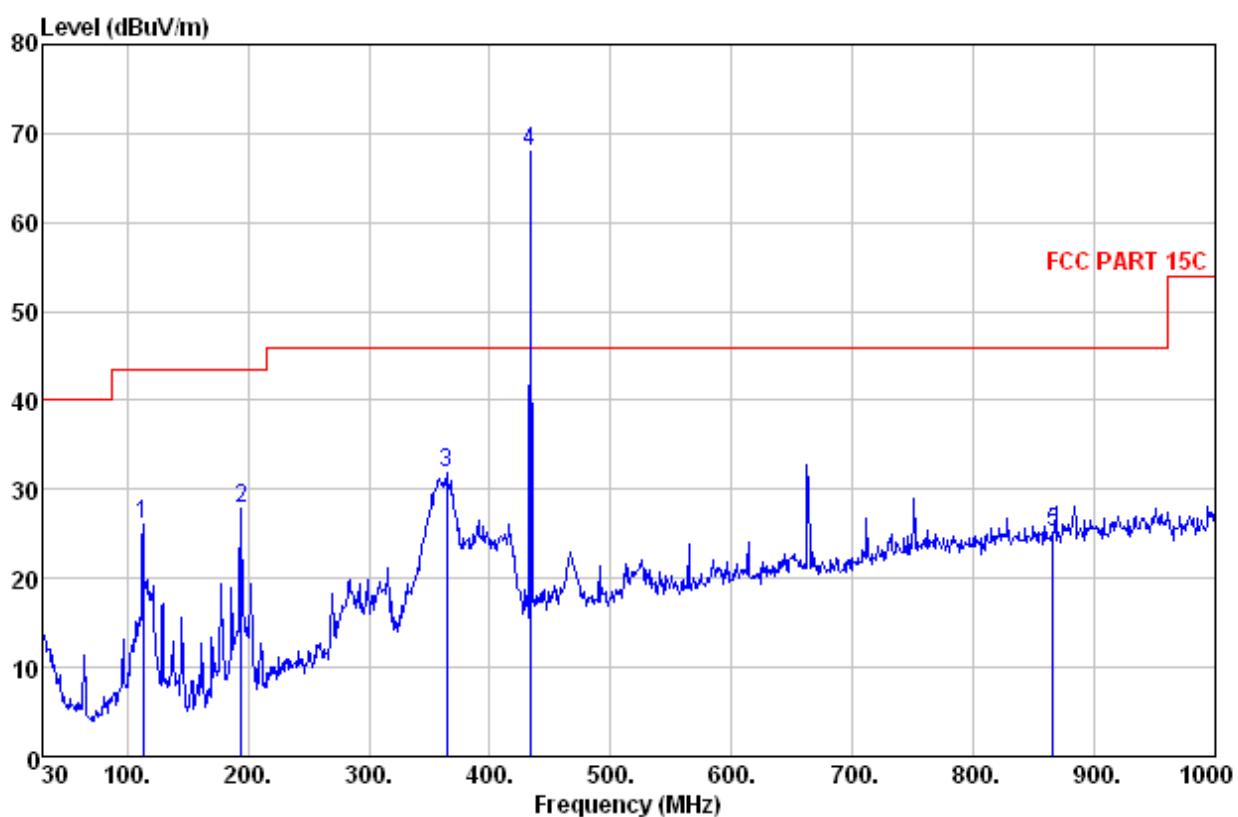


Test mode : 433MHz



Horizontal:

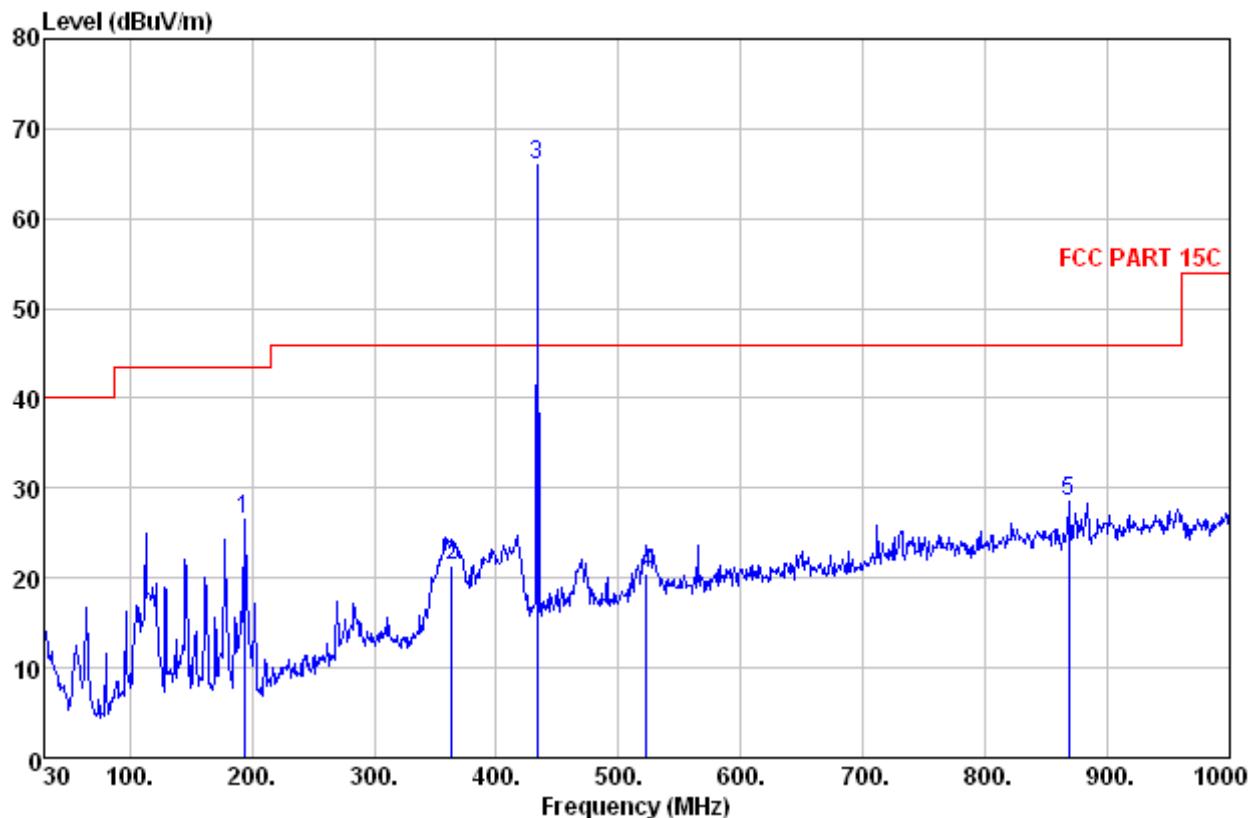
Peak scan



Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Duty cycle Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Detector
433.52	77.09	-9.23	N/A	67.86	100.81	-32.95	0	100	Peak
			0	67.86	80.81	-12.95	0	100	Average
866.14	25.54	-0.40	N/A	25.14	80.81	-55.67	0	100	Peak
			0	25.14	60.81	-35.67	0	100	Average
1300	33.82	-1.62	N/A	32.20	74.00	-41.80	0	100	Peak
			0	32.20	54.00	-21.80	0	100	Average

Vertical:

Peak scan



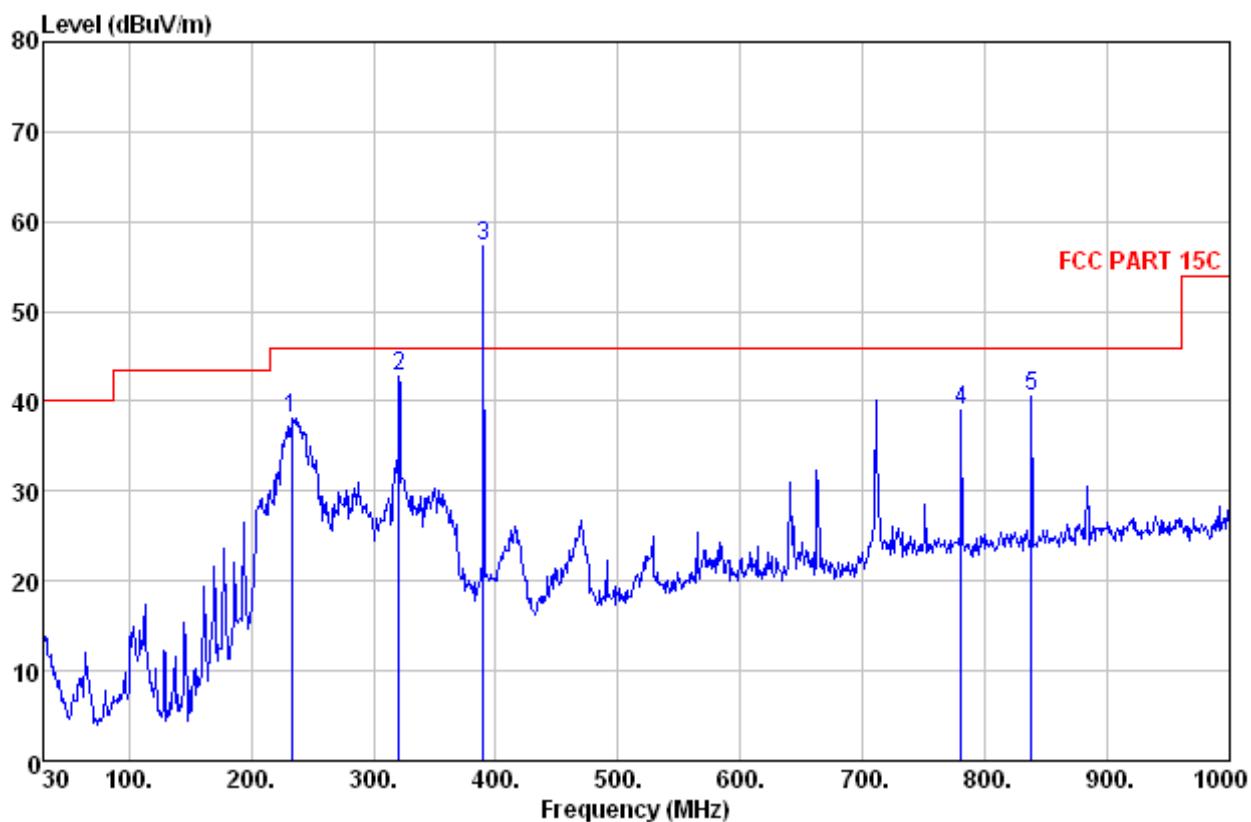
Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Duty cycle Factor	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Detector
433.52	75.18	-9.23	N/A	65.95	100.81	-35.61	0	100	Peak
			0	65.95	80.81	-15.61	0	100	Average
868.08	28.93	-0.33	N/A	28.60	80.81	-52.21	0	100	Peak
			0	28.60	60.81	-32.21	0	100	Average
1300	38.23	-1.62	N/A	36.61	74.00	-37.39	0	100	Peak
			0	36.61	54.00	-17.39	0	100	Average

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 4^h Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured. The measurements greater than 20dB below the limit from 9kHz to 30MHz.

The fundamental frequency is 433.52, the fundamental and spurious emissions radiated limit base on the operating frequency 433 MHz.

Horizontal:

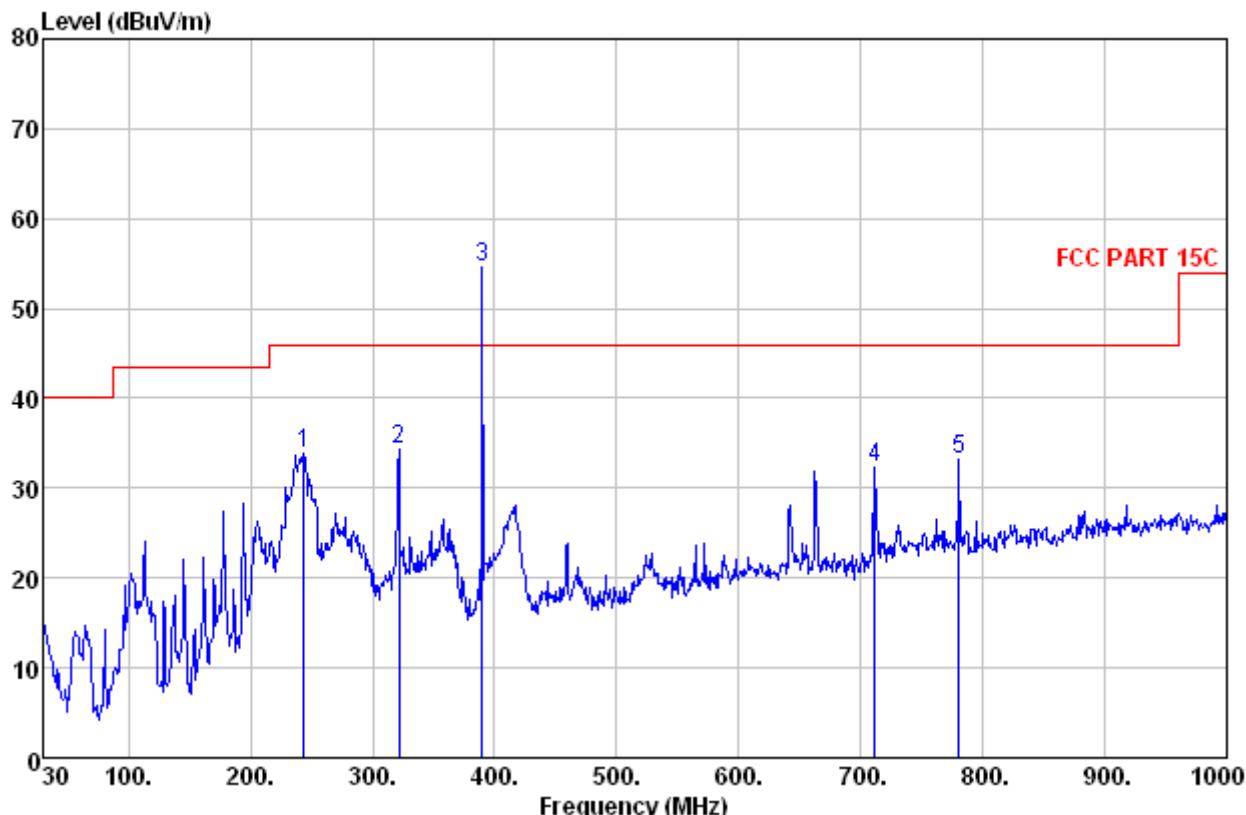
Peak scan



Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Duty cycle Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Detector
390.00	67.62	-10.38	N/A	57.24	99.24	-42.00	0	100	Peak
			0	57.24	79.24	-22.00	0	100	Average
780.00	40.88	-1.83	N/A	39.05	79.24	-40.19	0	100	Peak
			0	39.05	59.24	-20.19	0	100	Average
1170.00	43.52	1.37	N/A	46.89	74.00	-27.11	0	100	Peak
			0	46.89	54.00	-7.11	0	100	Average

Vertical:

Peak scan



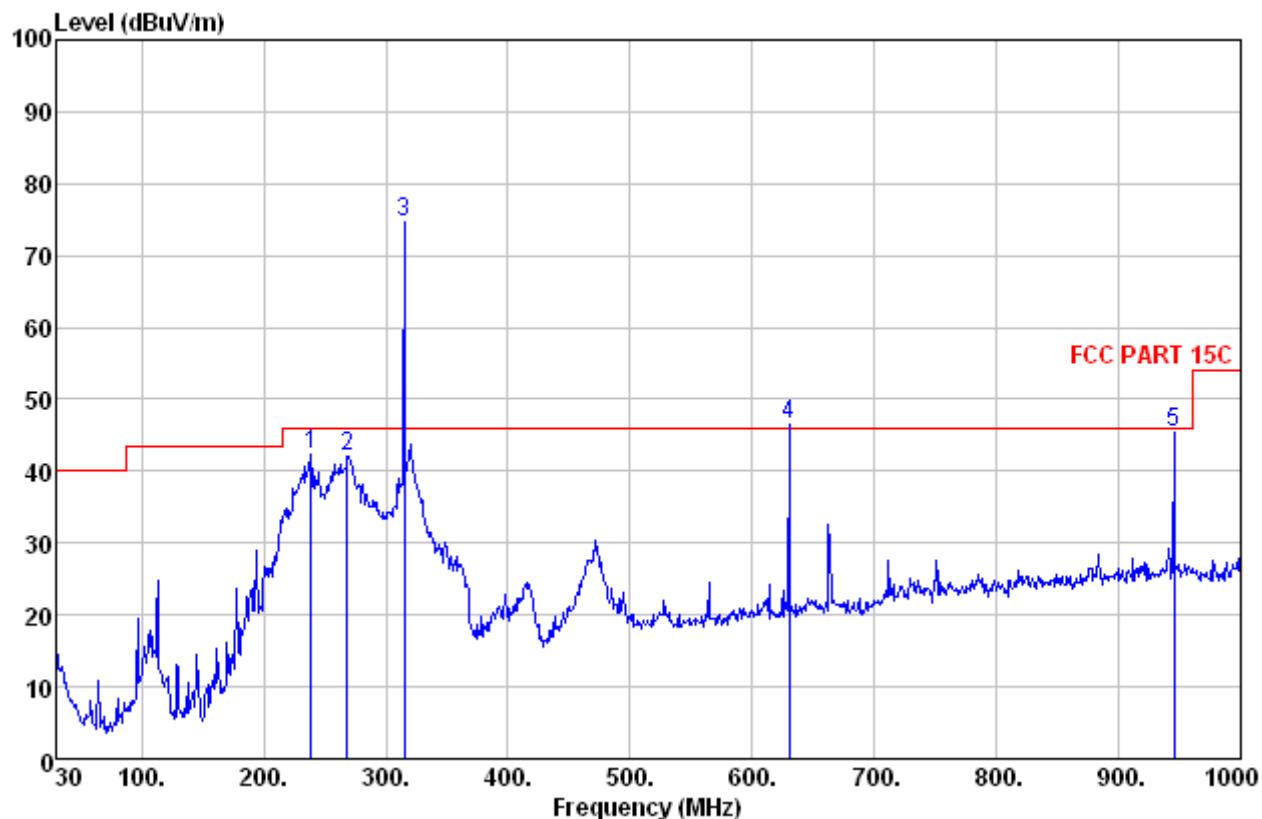
Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Duty cycle Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Detector
390.00	65.00	-10.38	N/A	54.62	99.24	-44.62	0	100	Peak
			0	54.62	79.24	-24.62	0	100	Average
780.00	35.07	-1.83	N/A	33.24	79.24	-46.00	0	100	Peak
			0	33.24	59.24	-26.00	0	100	Average
1170.00	43.39	1.38	N/A	44.77	74.00	-29.23	0	100	Peak
			0	44.77	54.00	-9.23	0	100	Average

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 4th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured. The measurements greater than 20dB below the limit from 9kHz to 30MHz.

The fundamental frequency is 390MHz the fundamental and spurious emissions radiated limit base on the operating frequency 390 MHz.

Horizontal:

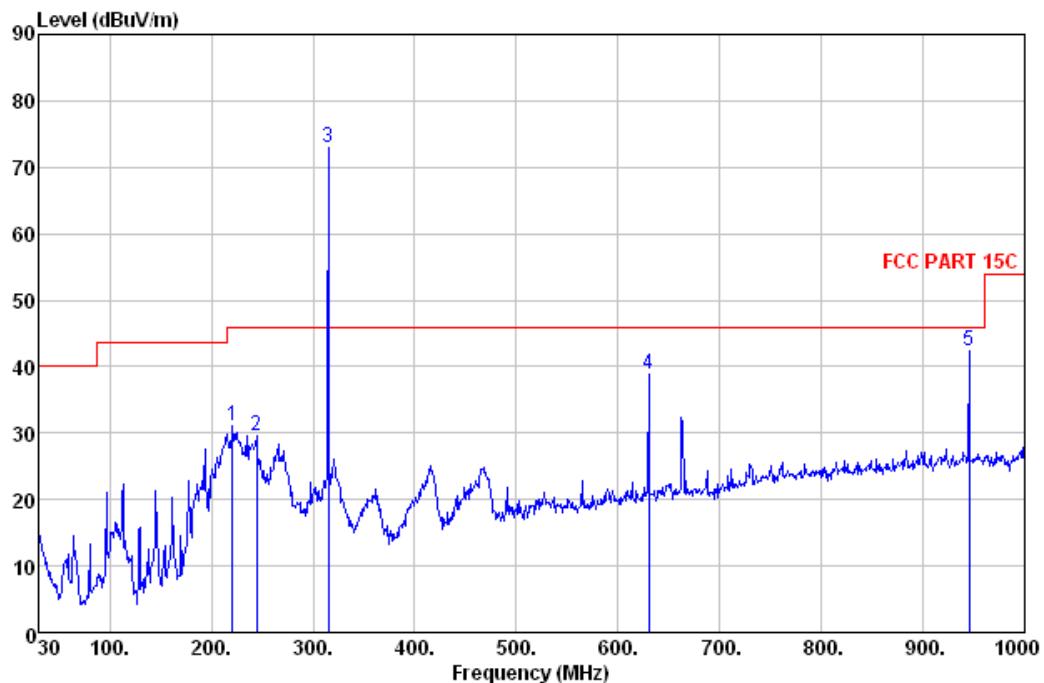
Peak scan



Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Duty cycle Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Detector
315.00	86.46	-11.7	N/A	74.76	95.62	-20.86	0	100	Peak
			0	74.76	75.62	-0.86	0	100	Average
630.00	51.84	-5.25	N/A	46.56	75.62	-29.06	0	100	Peak
			0	46.56	55.62	-9.06	0	100	Average
945.00	44.38	0.91	N/A	45.29	75.62	-30.33	0	100	Peak
			0	45.29	55.62	-10.33	0	100	Average
1260.00	43.82	1.57	N/A	45.39	74.00	-28.91	0	100	Peak
			0	45.39	54.00	-8.91	0	100	Average

Vertical:

Peak scan



Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Duty cycle Factor	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Detector
315.00	84.76	-11.7	N/A	73.06	95.62	-22.56	0	100	Peak
			0	73.06	75.62	-2.56	0	100	Average
630.00	44.03	-5.25	N/A	38.78	75.62	-36.84	0	100	Peak
			0	38.78	55.62	-16.84	0	100	Average
945.00	41.49	0.91	N/A	42.40	75.62	-33.22	0	100	Peak
			0	42.40	55.62	-12.22	0	100	Average
1260.00	45.26	1.57	N/A	46.83	74.00	-27.17	0	100	Peak
			0	46.83	54.00	-7.17	0	100	Average

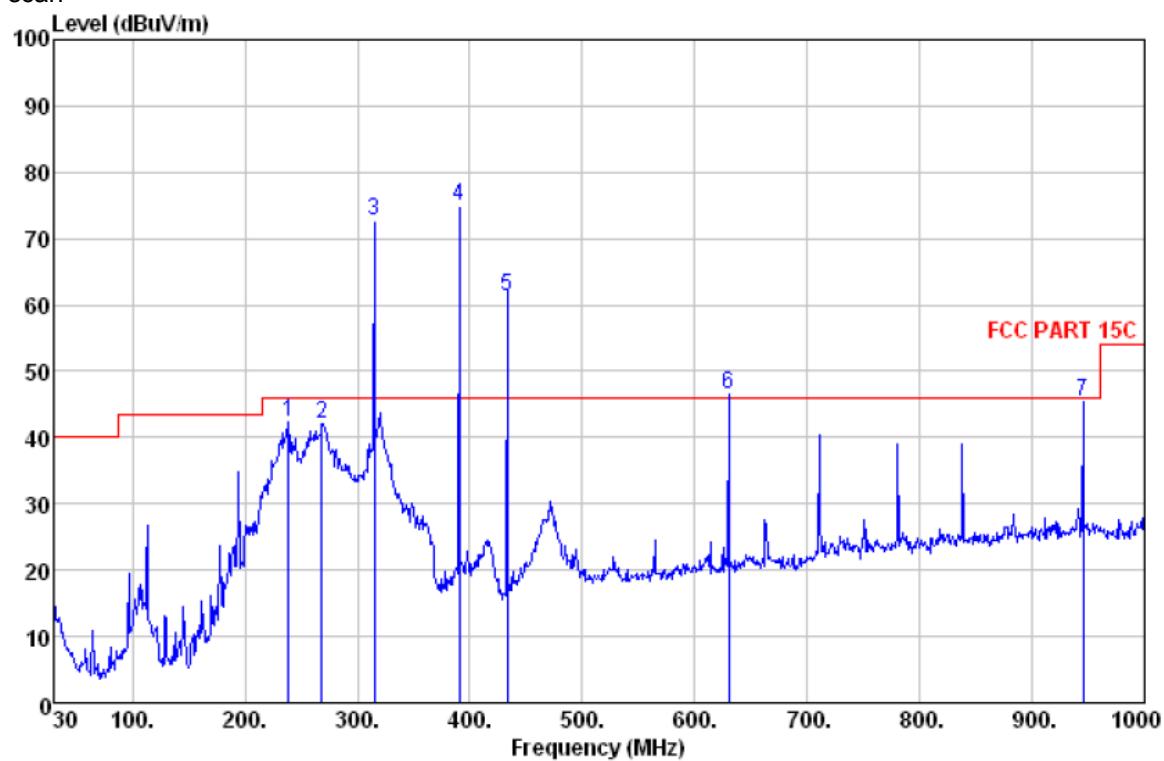
Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 4th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured. The measurements greater than 20dB below the limit from 9kHz to 30MHz.

The fundamental frequency is 315MHz the fundamental and spurious emissions radiated limit base on the operating frequency 315 MHz.

Simultaneous transmission of three signals (315MHz, 390MHz and 433MHz)

Horizontal:

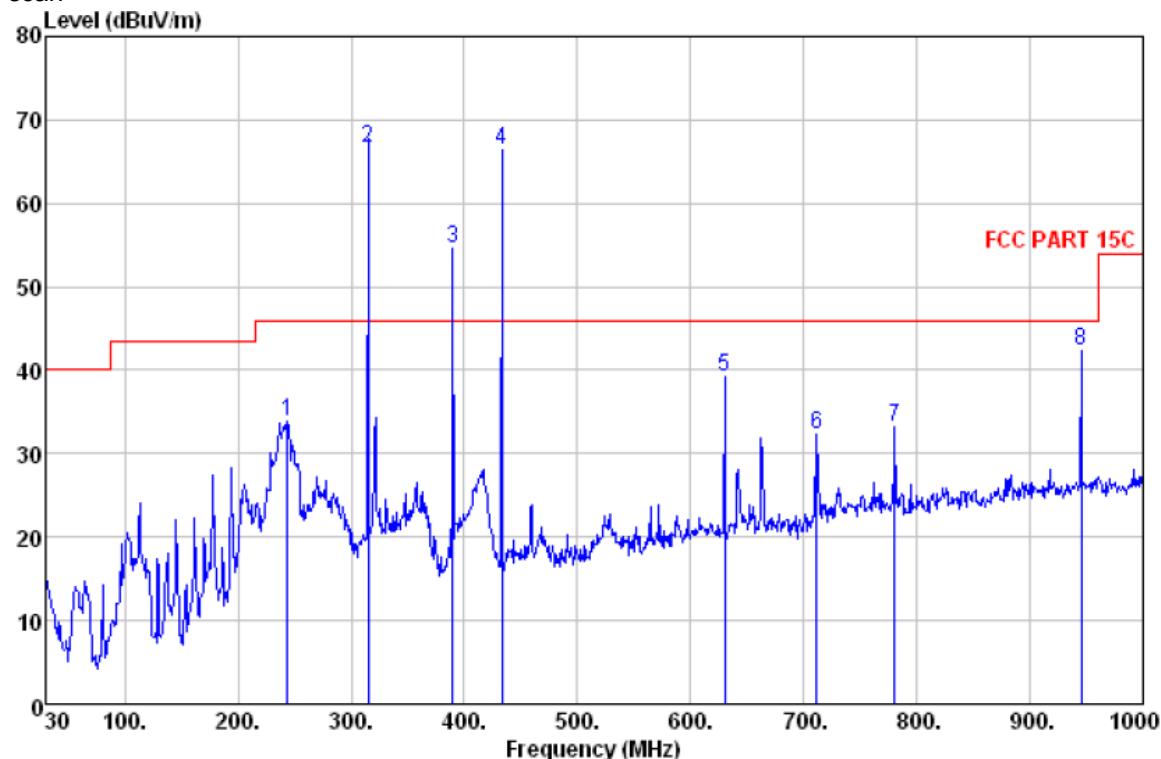
Peak scan



Frequen cy (MHz)	Reading (dBuV)	Correct (dB/m)	Duty cycle Factor (dB)	Result (dBuV/ m)	Limit (dBuV/ m)	Margin (dB)	Degree (°)	Height (cm)	Detector
315.00	84.35	-11.70	N/A	72.65	95.62	-22.97	0	100	Peak
			0	72.65	75.62	-2.97	0	100	Average
390.00	85.13	-10.32	N/A	74.81	99.24	-24.43	0	100	Peak
			0	74.81	79.24	-4.43	0	100	Average
433.52	70.53	-9.23	N/A	61.30	100.81	-39.51	0	100	Peak
			0	61.30	80.81	-19.51	0	100	Average
630.43	51.84	-5.25	N/A	46.56	75.62	-29.06	0	100	Peak
			0	46.56	55.62	-9.06	0	100	Average
1260.00	46.74	1.57	N/A	48.31	74.00	-25.69	0	100	Peak
			0	48.31	54.00	-5.69	0	100	Average

Vertical:

Peak scan



Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Duty cycle Factor	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Detector
315.00	78.38	-11.7	N/A	66.68	95.62	-28.94	0	100	Peak
			0	66.68	75.62	-8.94	0	100	Average
390.00	66.75	-10.38	N/A	56.37	99.24	-42.87	0	100	Peak
			0	56.37	79.24	-22.87	0	100	Average
433.52	75.71	-9.23	N/A	66.48	100.81	-34.33	0	100	Peak
			0	66.48	80.81	-14.33	0	100	Average
945.68	41.48	0.91	N/A	42.39	75.62	-33.23	0	100	Peak
			0	42.39	55.62	-13.23	0	100	Average
1260.00	44.23	1.57	N/A	45.80	74.00	-28.20	0	100	Peak
			0	45.80	54.00	-8.20	0	100	Average

Note: Testing is carried out with frequency range 9kHz to the tenth harmonics, which above 4th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured. The measurements greater than 20dB below the limit from 9kHz to 30MHz.

5.4 Occupied Bandwidth

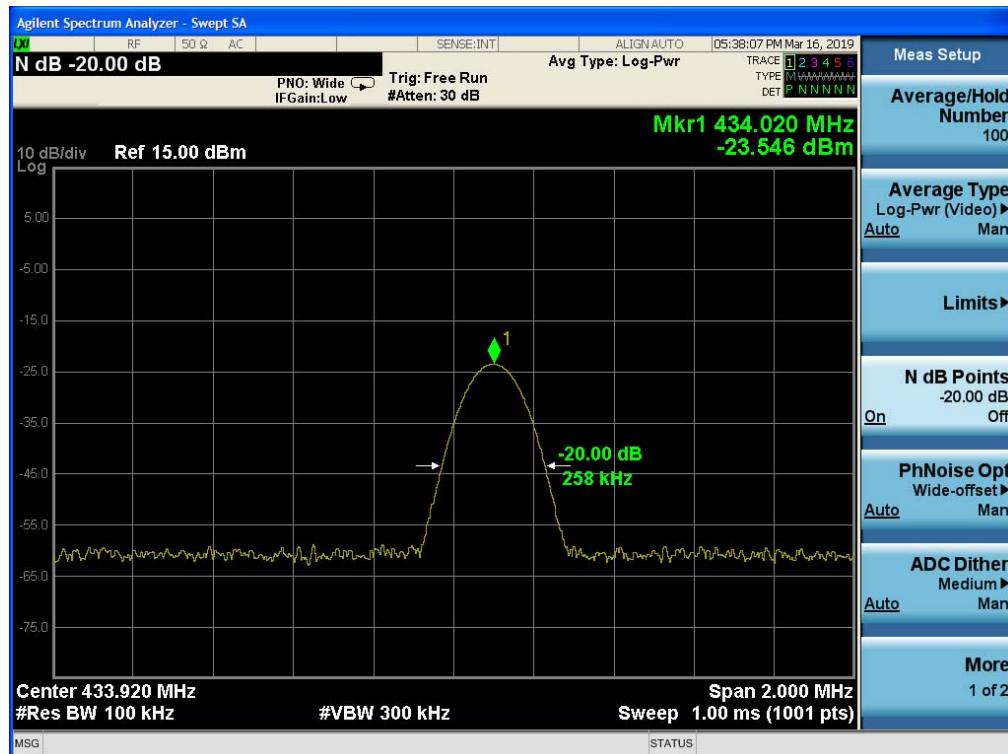
Test Requirement: FCC Part 15 C section 15.231 (c)
 Test Method: ANSI C63.10: Clause 6.9
 Test Status: Test in transmitting mode at lowest and highest channel.
 Requirements: 15.231 (c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz 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:

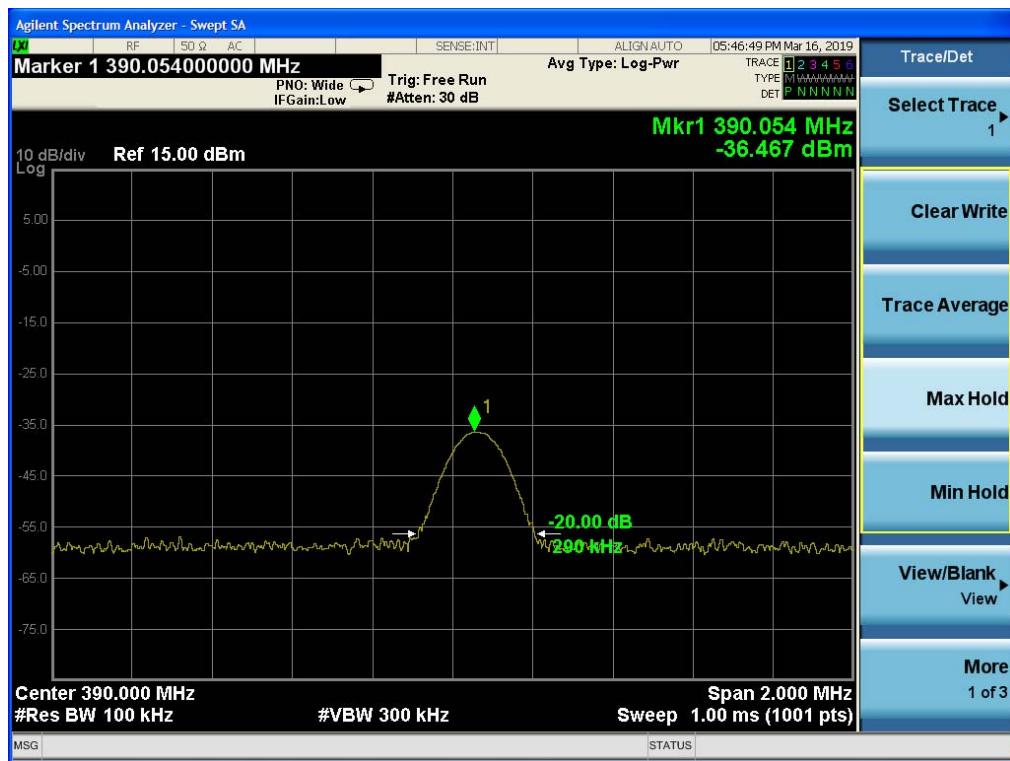
Test Frequency MHz	20dB Bandwidth kHz	Limit kHz	Result
433	258	1084	PASS
390	290	975	PASS
315	262	787.5	PASS

Limit = Fundamental Frequency X 0.25%

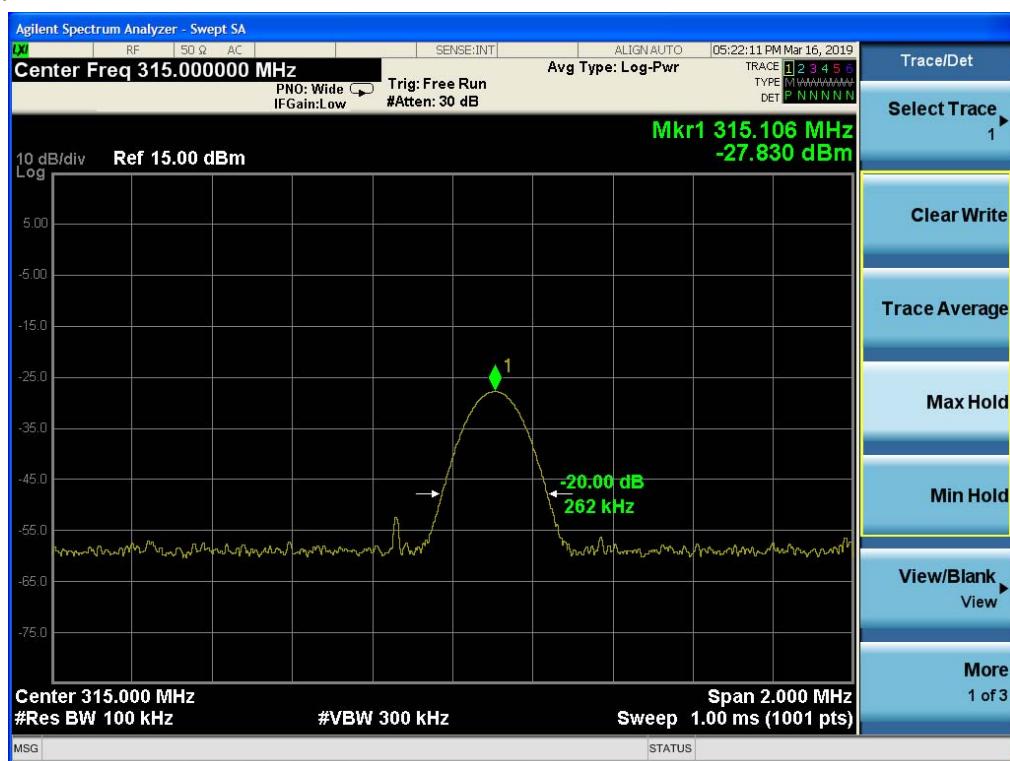
Test plot: 433.5MHz



Test plot: 390MHz



Test plot: 315MHz



5.5 Dwell Time

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

Test Method: FCC Part 15 C section 15.231(a)

Test Status: Test in normal operation mode.

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 (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.

Result:

The EUT does not have manual transmission.

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

Result:

Carrier Frequency MHz	Transmission Time (ms)	Limit s	Result
433	4.065	5	PASS
390	4.634	5	PASS
315	3.555	5	PASS

Test plot: 433.92MHz



Test plot: 390MHz



Result plot: 315MHz



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.

5.6 Conducted Emissions at Mains Terminals 150 kHz to 30MHz

Test Requirement: FCC Part 15 C section 15.207

Test Method: ANSI C63.10: Clause 6.2

Test Voltage: 120V~ 60Hz

Frequency Range: 150 kHz to 30 MHz

Detector: Peak for pre-scan (9 kHz Resolution Bandwidth)

Test Limit

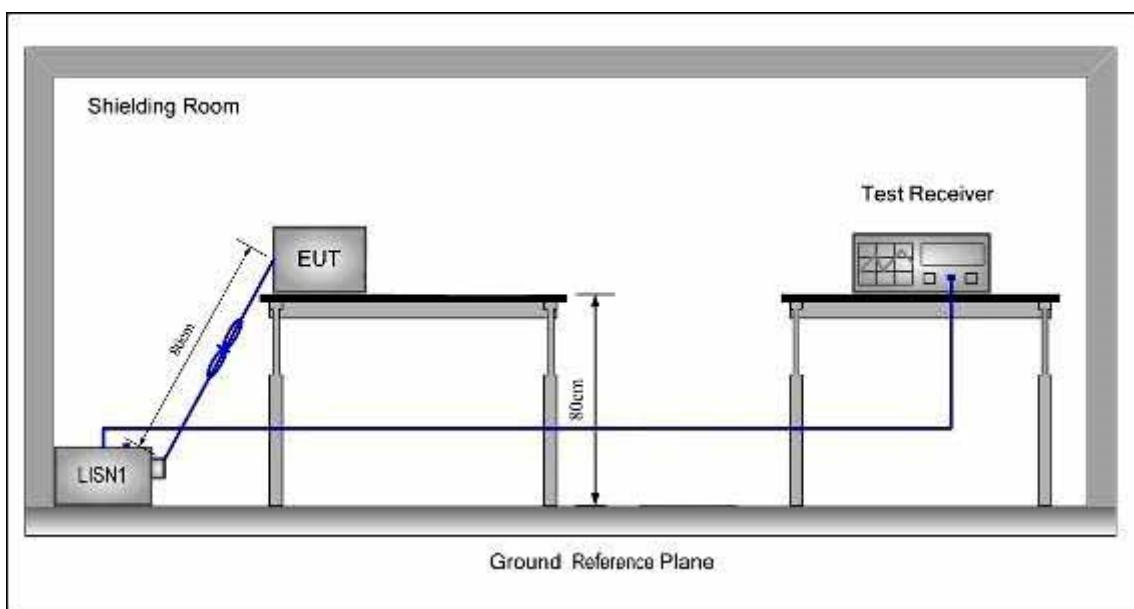
Limits for conducted disturbance at the mains ports of class B

Frequency Range (MHz)	Class B Limit 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.

EUT Operation: Test in normal operating mode. 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.
Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, channels and antenna ports (if EUT with antenna diversity architecture).

Test Configuration:



Test procedure:

1. The mains terminal disturbance voltage test was conducted in a shielded room.
2. The EUT was connected to AC power source 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.

Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected. For EUT the communicating was worst case mode.

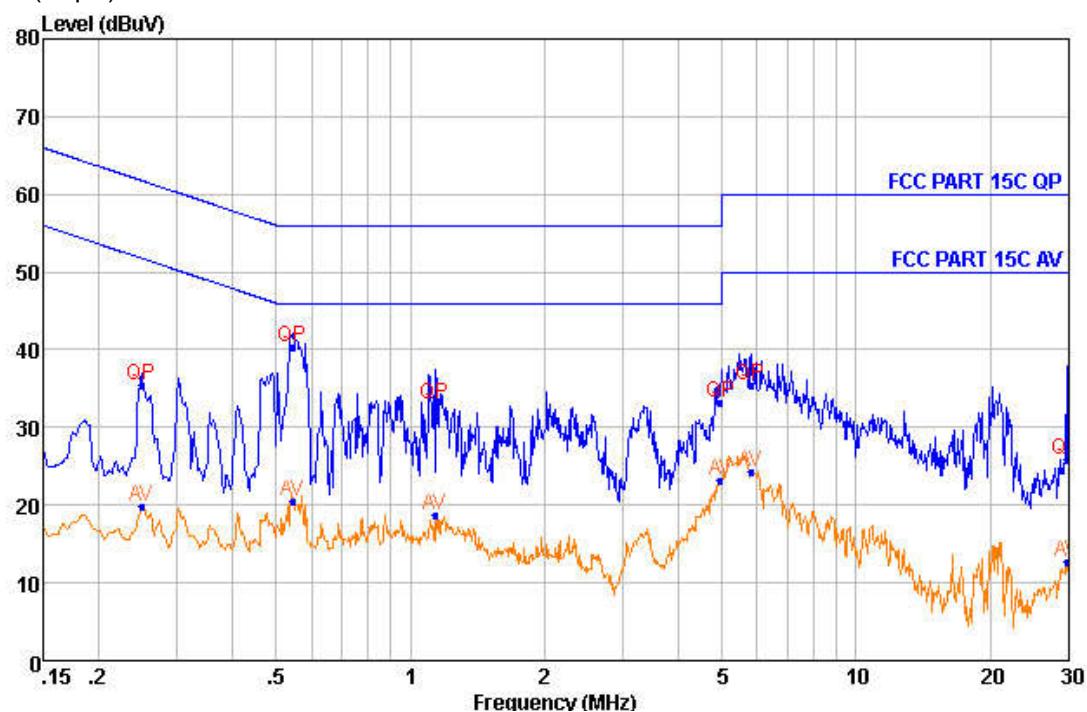
The following Quasi-Peak and Average measurements were performed on the EUT

Mode: 433MHz

Live line

Peak Scan:

Level (dB μ V)

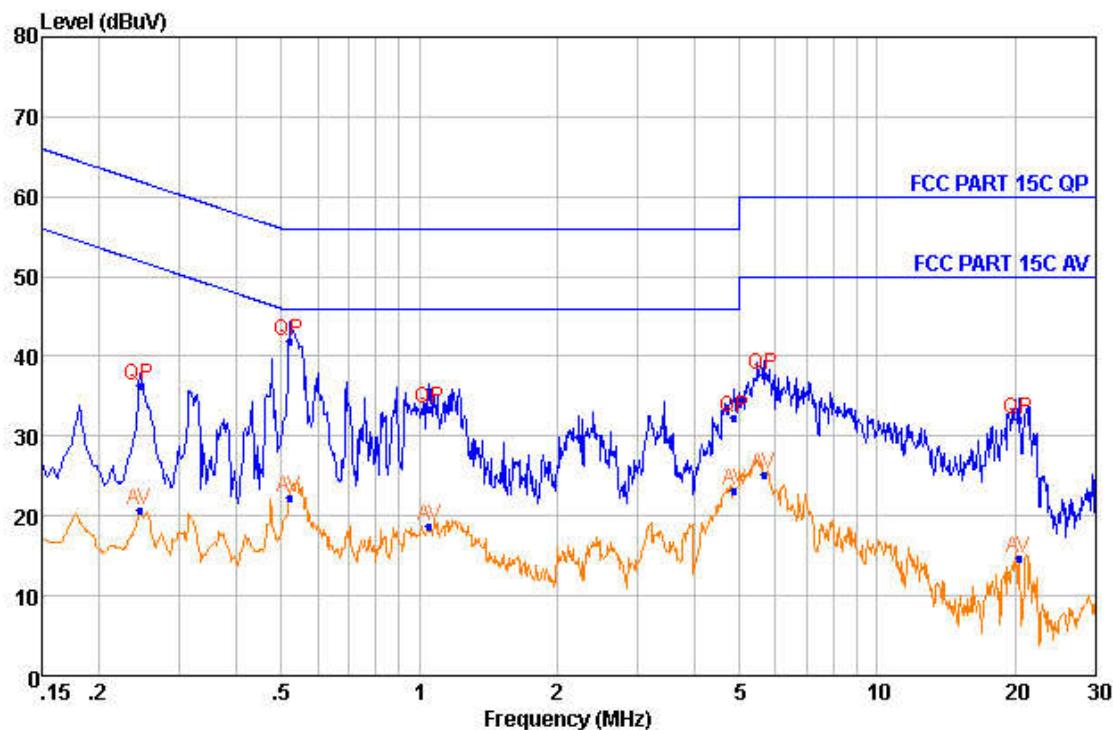


Quasi-peak and Average measurement

NO.	Freq MHz	Level dB μ V	Remark	LISM Factor dB	Cable Loss dB	Limit Line dB μ V	Margin dB
1	0.249	35.35	QP	9.50	0.23	61.78	-26.43
2	0.249	19.90	Average	9.50	0.23	51.78	-31.88
3	0.545	40.35	QP	9.31	0.27	56.00	-15.65
4	0.545	20.55	Average	9.31	0.27	46.00	-25.45
5	1.133	33.07	QP	9.28	0.31	56.00	-22.93
6	1.133	18.63	Average	9.28	0.31	46.00	-27.37
7	4.968	33.12	QP	9.29	0.40	56.00	-22.88
8	4.968	23.27	Average	9.29	0.40	46.00	-22.73
9	5.793	35.42	QP	9.29	0.41	60.00	-24.58
10	5.793	24.22	Average	9.29	0.41	50.00	-25.78
11	29.608	25.81	QP	9.73	0.50	60.00	-34.19
12	29.608	12.80	Average	9.73	0.50	50.00	-37.20

Neutral Line

Peak Scan:

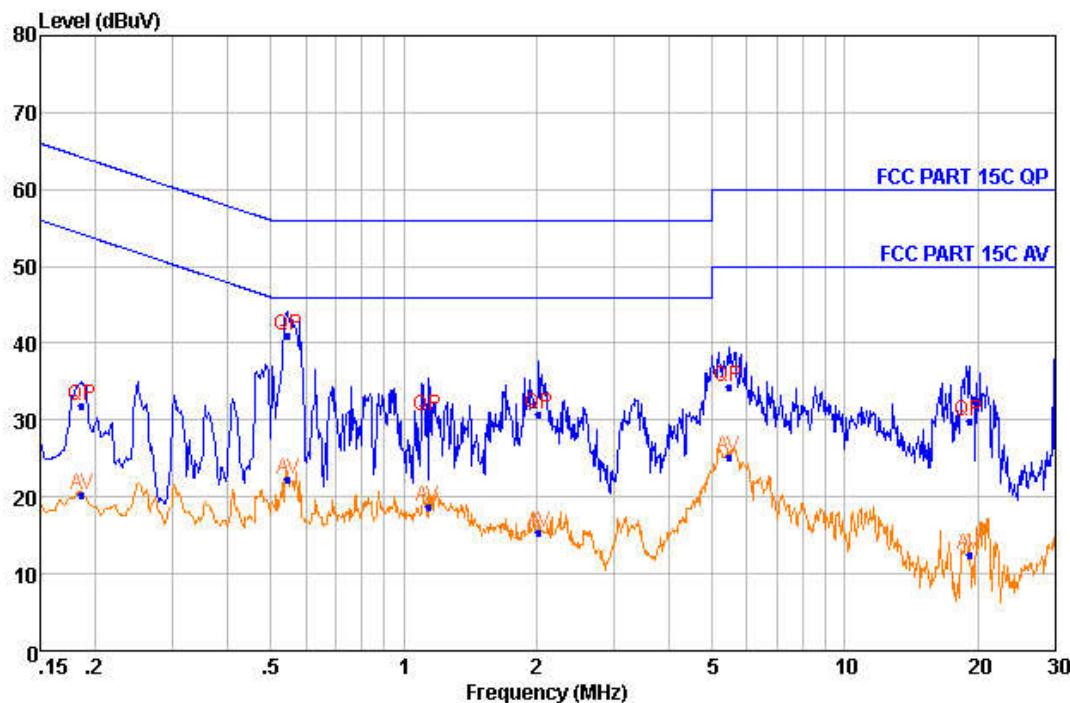
Level (dB μ V)

Quasi-peak and Average measurement

NO.	Freq MHz	Level dB μ V	Remark	LISN Factor dB	Cable Loss dB	Limit Line dB μ V	Margin dB
1	0.246	36.33	QP	9.37	0.23	61.91	-25.58
2	0.246	20.72	Average	9.37	0.23	51.91	-31.19
3	0.520	41.92	QP	9.36	0.27	56.00	-14.08
4	0.520	22.35	Average	9.36	0.27	46.00	-23.65
5	1.052	33.34	QP	9.37	0.31	56.00	-22.66
6	1.052	18.66	Average	9.37	0.31	46.00	-27.34
7	4.864	32.21	QP	9.43	0.40	56.00	-23.79
8	4.864	23.26	Average	9.43	0.40	46.00	-22.74
9	5.642	37.62	QP	9.45	0.41	60.00	-22.38
10	5.642	25.29	Average	9.45	0.41	50.00	-24.71
11	20.335	32.02	QP	9.90	0.48	60.00	-27.98
12	20.335	14.61	Average	9.90	0.48	50.00	-35.39

Mode: 390MHz**Live line**

Peak Scan:

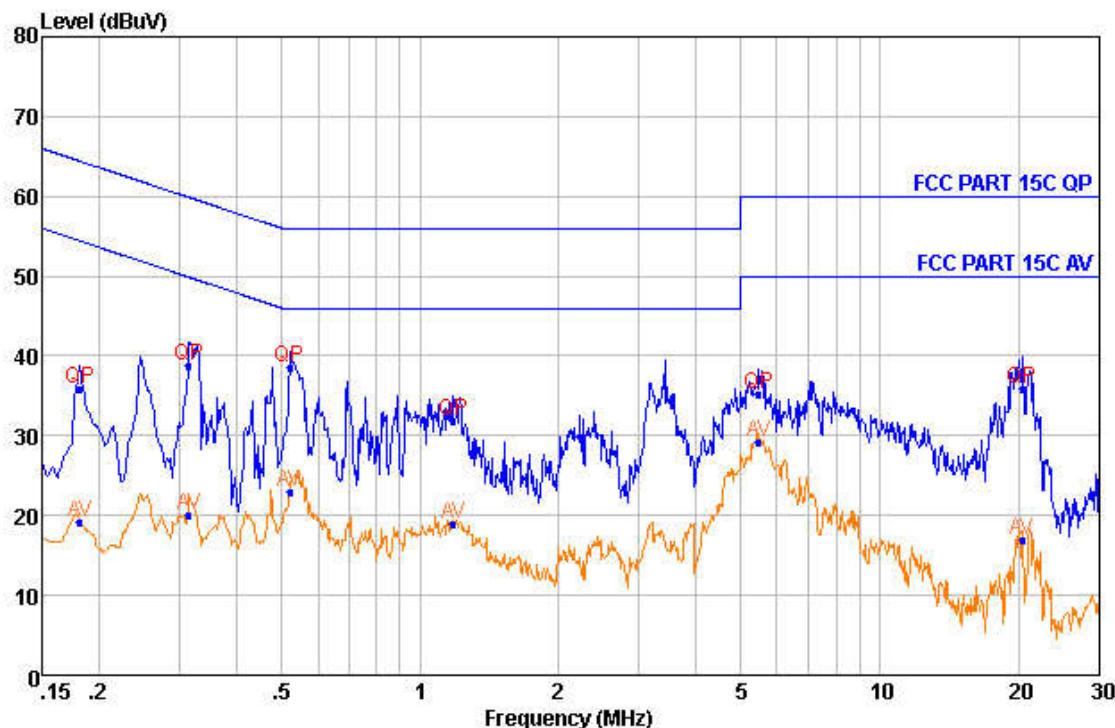
Level (dB μ V)

Quasi-peak and Average measurement

NO.	Freq MHz	Level dB μ V	Remark	LISN Factor dB	Cable Loss dB	Limit Line dB μ V	Margin dB
1	0.186	31.88	QP	9.50	0.21	64.20	-32.32
2	0.186	20.23	Average	9.50	0.21	54.20	-33.97
3	0.546	41.11	QP	9.31	0.27	56.00	-14.89
4	0.546	22.34	Average	9.31	0.27	46.00	-23.66
5	1.135	30.53	QP	9.28	0.31	56.00	-25.47
6	1.135	18.69	Average	9.28	0.31	46.00	-27.31
7	2.023	30.65	QP	9.32	0.35	56.00	-25.35
8	2.023	15.46	Average	9.32	0.35	46.00	-30.54
9	5.447	34.34	QP	9.29	0.40	60.00	-25.66
10	5.447	25.26	Average	9.29	0.40	50.00	-24.74
11	19.122	29.96	QP	9.70	0.47	60.00	-30.04
12	19.122	12.55	Average	9.70	0.47	50.00	-37.45

Neutral Line

Peak Scan:

Level (dB μ V)

Quasi-peak and Average measurement

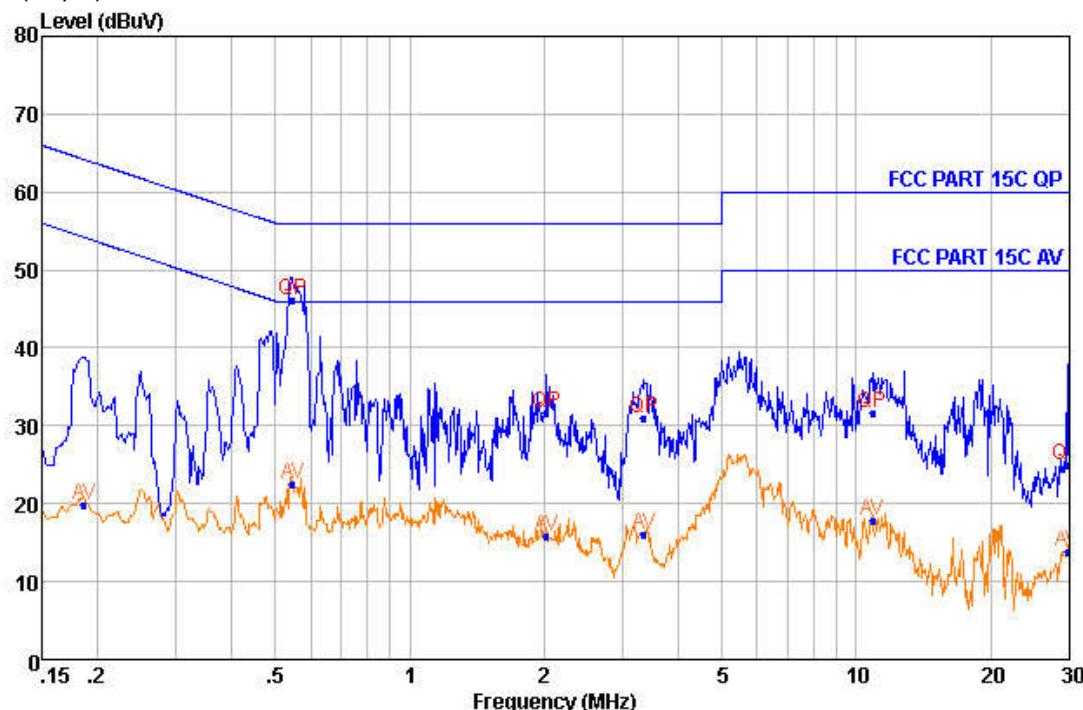
NO.	Freq MHz	Level dB μ V	Remark	LISN Factor dB	Cable Loss dB	Limit Line dB μ V	Margin dB
1	0.182	35.83	QP	9.37	0.21	64.42	-28.59
2	0.182	19.11	Average	9.37	0.21	54.42	-35.31
3	0.313	38.69	QP	9.37	0.24	59.88	-21.19
4	0.313	20.12	Average	9.37	0.24	49.88	-29.76
5	0.521	38.45	QP	9.36	0.27	56.00	-17.55
6	0.521	22.91	Average	9.36	0.27	46.00	-23.09
7	1.184	31.88	QP	9.37	0.32	56.00	-24.12
8	1.184	19.01	Average	9.37	0.32	46.00	-26.99
9	5.476	35.28	QP	9.44	0.40	60.00	-24.72
10	5.476	29.09	Average	9.44	0.40	50.00	-20.91
11	20.377	35.86	QP	9.90	0.48	60.00	-24.14
12	20.377	17.03	Average	9.90	0.48	50.00	-32.97

Mode: 315MHz

Live line

Peak Scan:

Level (dB μ V)

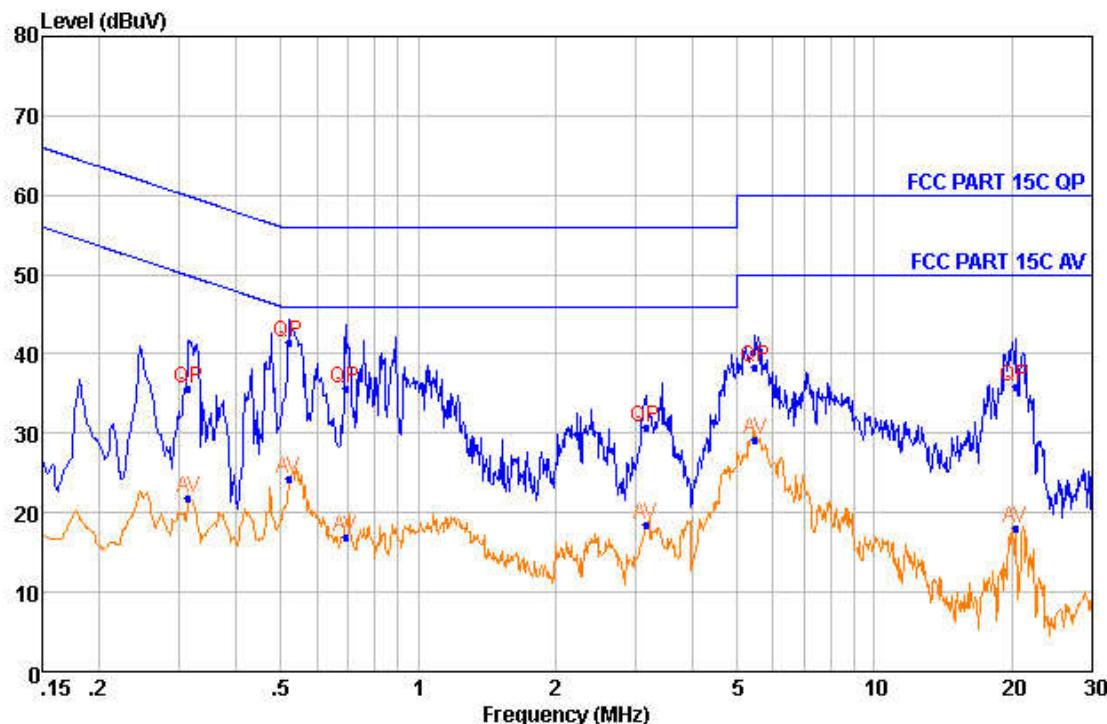


Quasi-peak and Average measurement

NO.	Freq MHz	Level dB μ V	Remark	LISN Factor dB	Cable Loss dB	Limit Line dB μ V	Margin dB
1	0.186	19.90	Average	9.50	0.21	54.20	-34.30
2	0.546	46.11	QP	9.31	0.27	56.00	-9.89
3	0.546	22.44	Average	9.31	0.27	46.00	-23.56
4	2.023	31.65	QP	9.32	0.35	56.00	-24.35
5	2.023	15.76	Average	9.32	0.35	46.00	-30.24
6	3.346	30.87	QP	9.30	0.38	56.00	-25.13
7	3.346	16.00	Average	9.30	0.38	46.00	-30.00
8	10.847	31.75	QP	9.37	0.44	60.00	-28.25
9	10.847	17.90	Average	9.37	0.44	50.00	-32.10
10	29.684	24.94	QP	9.73	0.50	60.00	-35.06
11	29.684	13.80	Average	9.73	0.50	50.00	-36.20

Neutral Line

Peak Scan:

Level (dB μ V)

Quasi-peak and Average measurement

NO.	Freq MHz	Level dB μ V	Remark	LISN Factor dB	Cable Loss dB	Limit Line dB μ V	Margin dB
1	0.313	35.69	QP	9.37	0.24	59.88	-24.19
2	0.313	21.82	Average	9.37	0.24	49.88	-28.06
3	0.521	41.45	QP	9.36	0.27	56.00	-14.55
4	0.521	24.31	Average	9.36	0.27	46.00	-21.69
5	0.694	35.68	QP	9.36	0.29	56.00	-20.32
6	0.694	16.95	Average	9.36	0.29	46.00	-29.05
7	3.156	30.83	QP	9.41	0.37	56.00	-25.17
8	3.156	18.39	Average	9.41	0.37	46.00	-27.61
9	5.476	38.28	QP	9.44	0.40	60.00	-21.72
10	5.476	29.29	Average	9.44	0.40	50.00	-20.71
11	20.377	35.86	QP	9.90	0.48	60.00	-24.14
12	20.377	18.08	Average	9.90	0.48	50.00	-31.92

-- End of test report --