



## SGS-CSTC Standards Technical Services Co., Ltd.

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Report No.: GZEM130800361001

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FCC ID: 2AA8V2013DW390

# TEST REPORT

Application No.:	GZEM1308003610RF
Applicant:	Zhongshan Kangshi Electronic Technology Co., Ltd
FCC ID:	2AA8V2013DW390
Product Name:	Digital wireless monitoring system
Product Description:	Digital wireless monitoring system with 2.4 GHz as carrier.
Model No.:	FR-DW304+FR-LW0700,FR-DW561+FR-LW0700, FR-DW563+FR-LW0700,FR-DW390+FR-LW0700, FR-DW391+FR-LW0700,FR-DW392+FR-LW0700, FR-DW393+FR-LW0700,FR-DW304+FR-LW0701, FR-DW561+FR-LW0701,FR-DW563+FR-LW0701, FR-DW390+FR-LW0701,FR-DW391+FR-LW0701, FR-DW392+FR-LW0701,FR-DW393+FR-LW0701. ♣
♣	Please refer to section 3 of this report for details
Trade mark:	FRESHCAM
Standards:	47 CFR PART 15 Subpart C: 2012 section 15.249
Date of Receipt:	2013-08-19
Date of Test:	2013-08-20 to 2013-10-14
Date of Issue:	2013-10-15
Test Result :	Pass*

\* In the configuration tested, the EUT complied with the standards specified above.



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.

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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## 2 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
00		2013-10-15		Original

Authorized for issue by:				
Tested By		 (Fred Zhu) / Project Engineer		2013-08-20 to 2013-10-14 Date
Prepared By		 (Fred Zhu) / Project Engineer		2013-10-14 Date
Checked By		 (Jeffrey Chen)/ Reviewer		2013-10-15 Date

### 3 Test Summary

TEST	TEST REQUIREMENT	TEST METHOD	RESULT
Field Strength of Fundamental	FCC PART 15 C section 15.249 (a)	ANSI C63.10: Clause 6.6	PASS
Field Strength of Unwanted Emissions	FCC PART 15 C section 15.249 (a) section 15.249 (d)	ANSI C63.10: Clause 6.4, 6.6 and 6.7	PASS**
Band Edges	FCC PART 15 C section 15.249 (d)	ANSI C63.10: Clause 6.9.2	PASS
Occupied Bandwidth	FCC PART 15 C section 15.215(c)	ANSI C63.10: Clause 6.9.1	PASS
Conducted Emissions at Mains Terminals	FCC PART 15 C section 15.207	ANSI C63.10: Clause 6.2	PASS**

**Remark:**

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 C63.10:2009 in the whole report.

♣ Model No.:

FR-DW304+FR-LW0700,FR-DW561+FR-LW0700,  
FR-DW563+FR-LW0700,FR-DW390+FR-LW0700,  
FR-DW391+FR-LW0700,FR-DW392+FR-LW0700,  
FR-DW393+FR-LW0700,FR-DW304+FR-LW0701,  
FR-DW561+FR-LW0701,FR-DW563+FR-LW0701,  
FR-DW390+FR-LW0701,FR-DW391+FR-LW0701,  
FR-DW392+FR-LW0701,FR-DW393+FR-LW0701.

According to the confirmation from the applicant, since the electrical circuit design, layout, components used and internal wiring were identical for the above items, only difference being the color and outer decoration.

Therefore only one item FR-DW391+FR-LW0700 was tested in this report.

There are two equipments in the set of Digital wireless monitoring system. One is a camera, the model is FR-DW391. Another is a screen, the model is FR-LW0700.

It only record the test data of camera on this report, others test data of Screen can refer to the report GZEM130800361002.

\*\* : The EUT passed Unwanted Emissions and Conducted Emissions test after modification.



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## 5 General Information

### 5.1 Client Information

Applicant: Zhongshan Kangshi Electronic Technology Co., Ltd  
Address of Applicant: No.19, Duxing West Rd., Dutou Industrial Park, South District, Zhongshan City Guangdong Province, China

### 5.2 General Description of E.U.T.

Product Name: Digital wireless monitoring system  
Model No.: FR-DW391+FR-LW0700

### 5.3 Details of E.U.T.

Operating Frequency 2408.625MHz to 2467.125MHz  
Type of Modulation: GFSK and FSK  
Number of Channels 19  
Channel Separation: More than 2 MHz  
Antenna Type Camera: external antenna  
Antenna gain: 2.0 dBi  
Function: The EUT is a set of equipment. 2.4GHz is used for common channel for data transfer. Camera and Screen will be hopped between 2408.625MHz and 2467.125MHz for searching. When the Screen has found the Camera, this frequency will be fixed and not be changed any more.  
Power Supply: AC 100-240V ~ 50/60Hz  
Normal Test Voltage: AC 120V 60Hz  
Adapter: Camera:  
MODEL: HL-120/0050-FA6SEE  
INPUT: 100-240V ~ 50/60Hz 200mA Max  
OUTPUT: DC 12V - 0.5A  
Power cord: 1.2 m x 2 wires unscreened DC cable for Camera  
1.0 m x 4 wires unscreened USB cable with ferrite core  
1.2 m x 2 wires unscreened AV cable



## 5.4 Description of Support Units

Another one of the set equipment.

The details of Screen:

Adapter information: MODEL: HL-5/2-8E6S

INPUT: 100-240V ~ 50/60Hz 0.3A Max

OUTPUT: DC 5V - 1A

## 5.5 Other Information Requested by the Customer

None.

## 5.6 Deviation from Standards

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

## 5.7 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou 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.

## 5.6 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.

- **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, IEC 61010-1:2006-10 and Rules of procedure IEC 61010-2:2006-10, and the relevant IEC 61010-2:2006-10 Operational documents.

## 6 Equipment Used during Test

RE in Chamber						
No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Due date	Calibration Interval
					(YYYY-MM-DD)	
EMC0525	Compact Semi-Anechoic Chamber	ChangZhou ZhongYu	N/A	N/A	2014-08-30	2Y
EMC0522	EMI Test Receiver	Rohde & Schwarz	ESIB26	100283	2014-05-06	1Y
EMC0056	EMI Test Receiver	Rohde & Schwarz	ESCI	100236	2014-03-04	1Y
EMC0528	RI High frequency Cable	SGS	20 m	N/A	2014-05-09	1Y
EMC2025	Trilog Broadband Antenna 30-3000MHz	SCHWARZBECK MESS-ELEKTRONIK	VULB 9163	9163-450	2016-08-31	3Y
EMC0524	Bi-log Type Antenna	Schaffner -Chase	CBL6112B	2966	2016-08-31	3Y
EMC0519	Bilog Type Antenna	Schaffner -Chase	CBL6143	5070	2014-06-02	2Y
EMC2026	Horn Antenna 1-18GHz	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	9120D-841	2016-08-31	3Y
EMC0518	Horn Antenna	Rohde & Schwarz	HF906	100096	2014-07-01	2Y
EMC0521	1-26.5 GHz Pre-Amplifier	Agilent	8449B	3008A01649	2014-03-04	1Y
EMC2065	Amplifier	HP	8447F	N/A	2014-08-31	1Y
EMC2063	1-26GHz Pre Amplifier	Compliance Direction System Inc.	PAP-1G26-48	6279.628	2014-07-29	1Y
EMC0075	310N Amplifier	Sonama	310N	272683	2014-03-04	1Y
EMC0523	Active Loop Antenna	EMCO	6502	42963	2014-04-07	2Y
EMC2041	Broad-Band Horn Antenna (14)15-26.5(40)GHz	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9170	9170-375	2014-06-01	3Y
EMC2069	2.4GHz filter	Micro-Tronics	BRM 50702	149	2014-06-05	1Y
EMC0530	10m Semi-Anechoic Chamber	ETS	N/A	N/A	2014-04-27	2Y





Conducted Emission						
No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Due date	Calibration Interval
					(YYYY-MM-DD)	
EMC0306	Shielding Room	Zhong Yu	8 x 3 x 3.8 m <sup>3</sup>	N/A	N/A	N/A
EMC0118	Two-line v-netwok	R&S	ENV216	100359	2014-03-04	1Y
EMC0102	LISN	SCHAFFNER CHASE	MN2050D/1	1421	2014-8-31	1Y
EMC2046	Artificial Mains Network (LISN)	AFJ Instruments	LT32C	S.N.320311201 50	2014-03-04	1Y
EMC0506	EMI Test Receiver	Rohde & Schwarz	ESCS30	100085	2014-03-04	1Y
EMC0107	Coaxial Cable	SGS	2m	N/A	2014-07-25	2Y
EMC0106	Voltage Probe	SGS	N/A	N/A	N/A	1Y
EMC0120	8 Line ISN	Fischer Custom Communications	FCC-TLISN-T8- 02	20550	2014-8-31	1Y
EMC0121	4 Line ISN	Fischer Custom Communications	FCC-TLISN-T4- 02	20549	2014-8-31	1Y
EMC0122	2 Line ISN	Fischer Custom Communications	FCC-TLISN-T2- 02	20548	2014-8-31	1Y
EMC2047	CDN	Elektronik- Feinmechanik	L-801:AF2	2793	2014-11-11	3Y
EMC2048	CDN	Elektronik- Feinmechanik	L-801:M2/M3	2738	2014-11-11	3Y
EMC2062	6dB Attenuator	HP	8491A	24487	2014-01-04	1Y
EMC167	Conical metal housing	SGS-EMC	N/A	N/A	2013-12-16	1Y

General used equipment						
No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Due date	Calibration Interval
					(YYYY-MM-DD)	
EMC0006	DMM	Fluke	73	70681569	2013-11-5	1Y
EMC0007	DMM	Fluke	73	70671122	2013-11-5	1Y

## 7 Test Results

### 7.1 E.U.T. Operation

**Test Voltage:** AC 120V, 60 Hz

**Temperature:** 20.0 -25.0 °C

**Humidity:** 38-50 % RH

**Atmospheric Pressure:** 1000 -1010 mbar

**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 device operates	Number of frequencies	Location in frequency range of operation
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 in the device	Upper frequency range of measurement
9 kHz to below 10 GHz	10th harmonic of highest fundamental frequency or to 40 GHz, whichever is lower
At or above 10 GHz to below 30 GHz	5th harmonic of highest fundamental frequency or to 100 GHz, whichever is lower
At or above 30 GHz	5th harmonic of highest fundamental frequency or to 200 GHz, whichever is lower, unless otherwise specified



EUT channels and frequencies list:

Channel	Frequency (MHz)
1	2408.625
2	2412.000
3	2414.250
4	2417.625
5	2422.125
6	2425.500
7	2427.750
8	2430.000
9	2432.250
10	2434.500
11	2436.750
12	2439.000
13	2442.375
14	2444.625
15	2448.000
16	2450.250
17	2461.500
18	2464.875
19	2467.125

Test frequencies are the lowest channel: 1 channel(2408.625MHz), middle channel: 12 channel(2439 MHz) and highest channel: 19 channel(2467.125MHz)

## 7.2 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

The antenna is an ISM Band external antenna and no consideration of replacement, and the type of antenna connector is that male body (inside threads) with female inner hole. The best case gain of the antenna is 2.0 dBi.



**Test result: The unit does meet the FCC requirements.**

### 7.3 Field Strength of Fundamental& Field Strength of Unwanted Emissions& Band Edge

Test Requirement: FCC Part15 C section 15.249

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (dBμV/m @ 3m)	Field Strength of Harmonics (dBμV/m @ 3m)
902 to 928	94.0	54.0
2400 to 2483.5	94.0	54.0
5725 to 5875	94.0	54.0
24000 to 24250	108.0	68.0

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

Limits: The fundamental frequency rang is in the frequency band of the EUT is 2408.625MHz ~ 2467.125MHz.

The limit for Average field strength dBμV/m for the fundamental frequency = 94.0 dBμV/m.

The limit for Peak field strength dBμV/m for the fundamental frequency = 114.0 dBμV/m.

No fundamental is allowed in the restricted bands.

The limit for average field strength dBμV/m for the harmonics = 54.0 dBμV/m.

The limit for peak field strength dBμV/m for the harmonics = 74.0 dBμV/m.

Emission radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or 54.0 dBμV/m in 15.209. Here the limit for the other emission is 54.0 dBμV/m.

Test Method: ANSI C63.10: Clause 6.4, 6.6 and 6.7 for Field Strength of Fundamental& Field Strength of Unwanted Emissions

ANSI C63.10: Clause 6.9.2 for Band Edge

Status Pre-test the EUT in continuous transmitting mode with setup as stand-alone in X, Y, Z threes axes, found the worst case is X axes and report the data.

Measurement Distance: 3m (Semi-Anechoic Chamber)

Frequency range 9 kHz – 25 GHz for transmitting mode.

Test instrumentation resolution bandwidth

9 kHz (9 kHz - 30 MHz), 120 kHz (30 MHz - 1000 MHz), 1 MHz (1000 MHz – 25 GHz)

### Test Procedure:

#### 1) 9 kHz to 30 MHz emissions:

For testing performed with the loop antenna, testing was performed in accordance to ANSI C63.10. The centre 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) 30 MHz to 1 GHz emissions:

For testing performed with the bi-log type antenna, testing was performed in accordance to ANSI C63.10. 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.

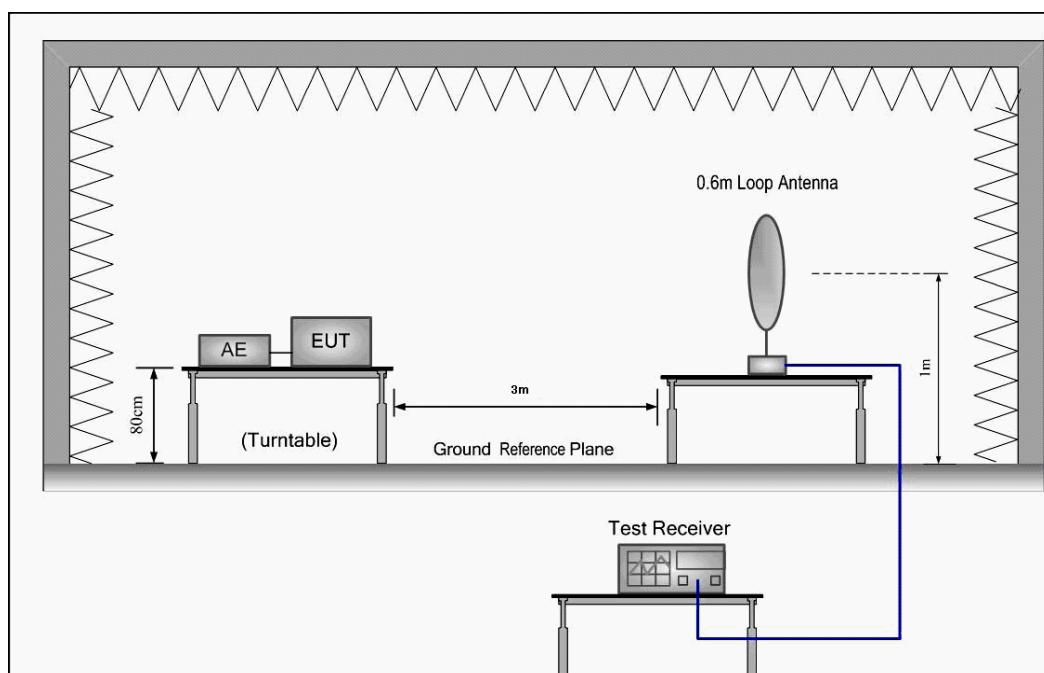
#### 3) 1 GHz to 25 GHz emissions:

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.

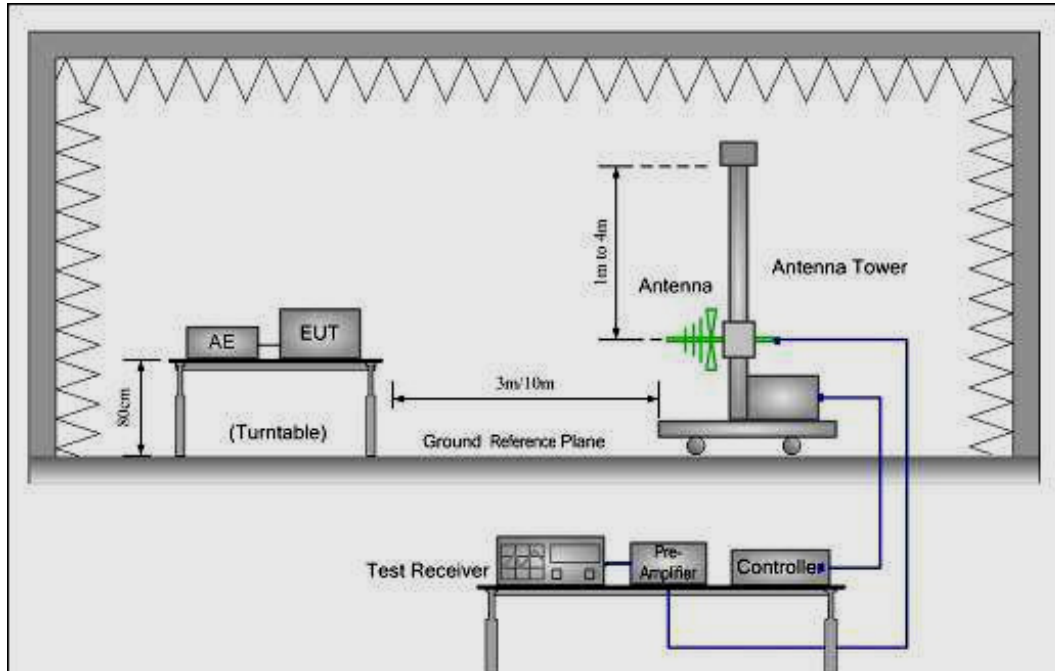
For testing performed with the horn antenna, testing was performed in accordance to ANSI C63.10. The measurement is performed with the EUT rotated 360°, the antenna height scan between 1m and 4m, and the antenna rotated to repeat the measurement for both the horizontal and vertical antenna polarizations.

### Test Configuration:

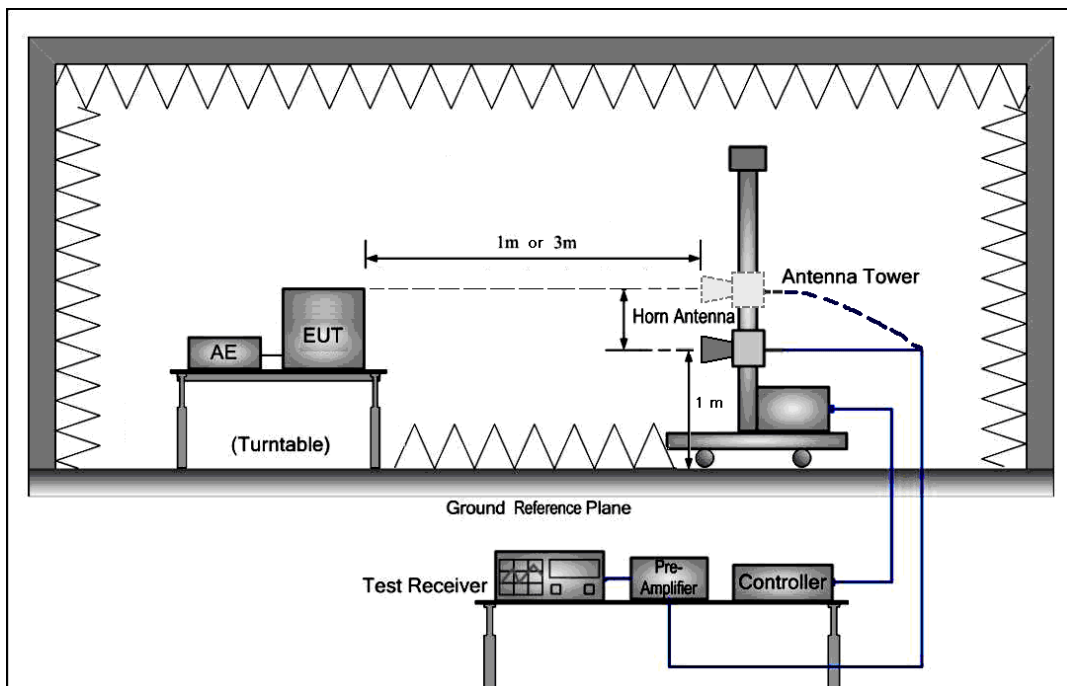
#### 1) 9 kHz to 30 MHz emissions:



2) 30 MHz to 1 GHz emissions:



3) 1 GHz to 25 GHz emissions:



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

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

### Test at low Channel in transmitting status

9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

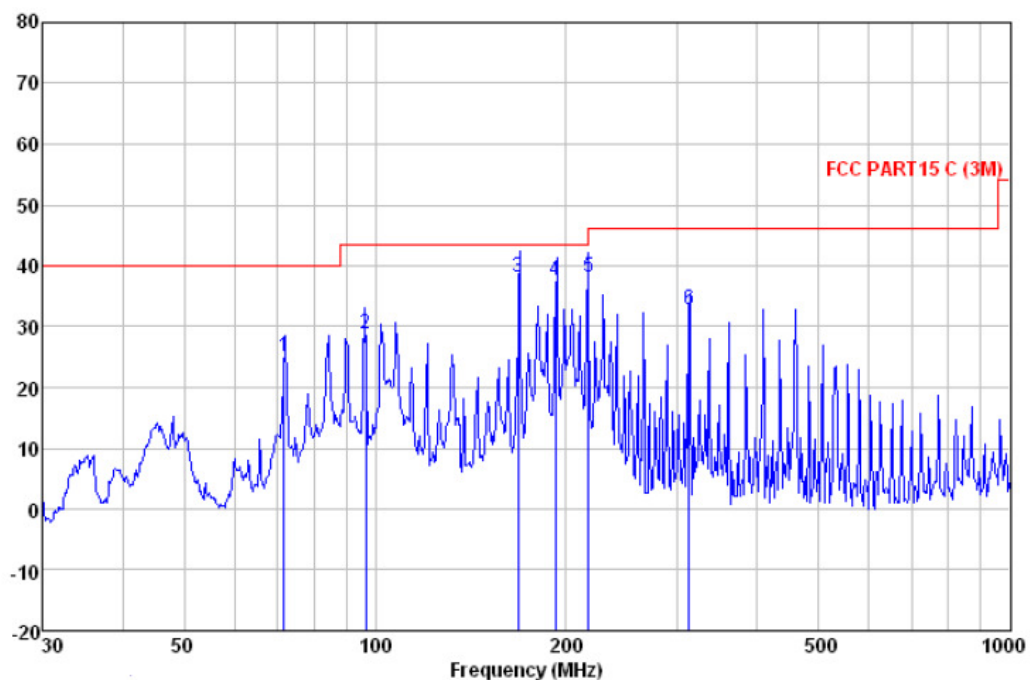
The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

30 MHz~1 GHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

Vertical:

Peak scan

Level (dBμV/m)



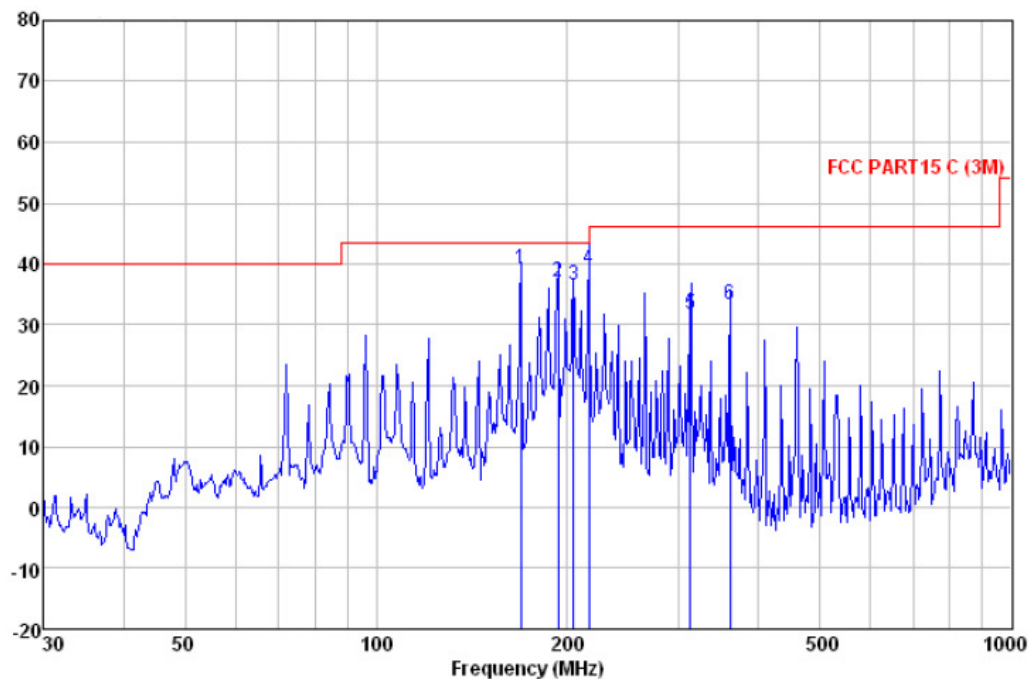
Quasi-peak measurement

Freq	ReadAntenna	Cable	Preamp		Limit	Over	
Level	Factor	Loss	Factor	Level	Line	Limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
71.832	55.55	0.00	1.24	31.60	25.19	40.00	-14.81 QP
96.775	59.01	0.00	1.40	31.60	28.81	43.50	-14.69 QP
168.008	67.76	0.00	1.78	31.35	38.19	43.50	-5.31 QP
192.419	66.92	0.00	1.86	31.31	37.47	43.50	-6.03 QP
216.783	67.33	0.00	1.98	31.30	38.01	46.00	-7.99 QP
312.179	61.68	0.00	2.40	31.27	32.81	46.00	-13.19 QP



**Horizontal:**

Peak scan

Level (dB $\mu$ V/m)

### Quasi-peak measurement

Freq	ReadAntenna Level Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
169.005	68.79	0.00	1.78	31.35	39.22	43.50	-4.28 QP
193.095	66.60	0.00	1.86	31.31	37.15	43.50	-6.35 QP
204.238	65.91	0.00	1.91	31.30	36.52	43.50	-6.98 QP
216.024	68.50	0.00	1.97	31.30	39.17	46.00	-6.83 QP
312.179	60.57	0.00	2.40	31.27	31.70	46.00	-14.30 QP
360.448	62.01	0.00	2.59	31.16	33.44	46.00	-12.56 QP



1~25 GHz Field Strength of Fundamental & Field Strength of Unwanted Emissions.

Peak & Average Measurement

Peak Measurement:							
Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization
2408.625	27.58	6.60	49.44	91.9	76.64	114.00	V
4817.250	31.54	11.14	49.3	59.65	53.03	74.00	V
7225.875	36.47	12.96	49.69	53.31	53.05	74.00	V
9634.500	38.15	15.14	49.88	53.72	57.13	74.00	V
2408.625	27.58	6.60	49.44	91.94	76.68	114.00	H
4817.250	31.54	11.14	49.3	51.9	45.28	74.00	H
7225.875	36.47	12.96	49.69	48.87	48.61	74.00	H
9634.500	38.15	15.14	49.88	47.36	50.77	74.00	H
Average Measurement:							
Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization
2408.625	27.58	6.60	49.44	76.9	61.64	94.00	V
4817.250	31.54	11.14	49.3	47.65	41.03	54.00	V
7225.875	36.47	12.96	49.69	40.31	40.05	54.00	V
9634.500	38.15	15.14	49.88	42.72	46.13	54.00	V
2408.625	27.58	6.60	49.44	76.94	61.68	94.00	H
4817.250	31.54	11.14	49.3	41.9	35.28	54.00	H
7225.875	36.47	12.96	49.69	38.87	38.61	54.00	H
9634.500	38.15	15.14	49.88	38.36	41.77	54.00	H



**Band Edge:**

Peak Measurement:							
Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamplifier factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization
2400.00	27.58	6.56	49.44	55.42	40.12	74.00	V
2483.50	27.55	6.99	49.42	56.37	41.49	74.00	V
2400.00	27.58	6.56	49.44	55.21	39.91	74.00	H
2483.50	27.55	6.99	49.42	55.59	40.71	74.00	H
Average Measurement:							
Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamplifier factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization
2400.00	27.58	6.56	49.44	47.85	32.55	54.00	V
2483.50	27.55	6.99	49.42	47.39	32.51	54.00	V
2400.00	27.58	6.56	49.44	46.53	31.23	54.00	H
2483.50	27.55	6.99	49.42	46.46	31.58	54.00	H

## Test at middle Channel in transmitting status

9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

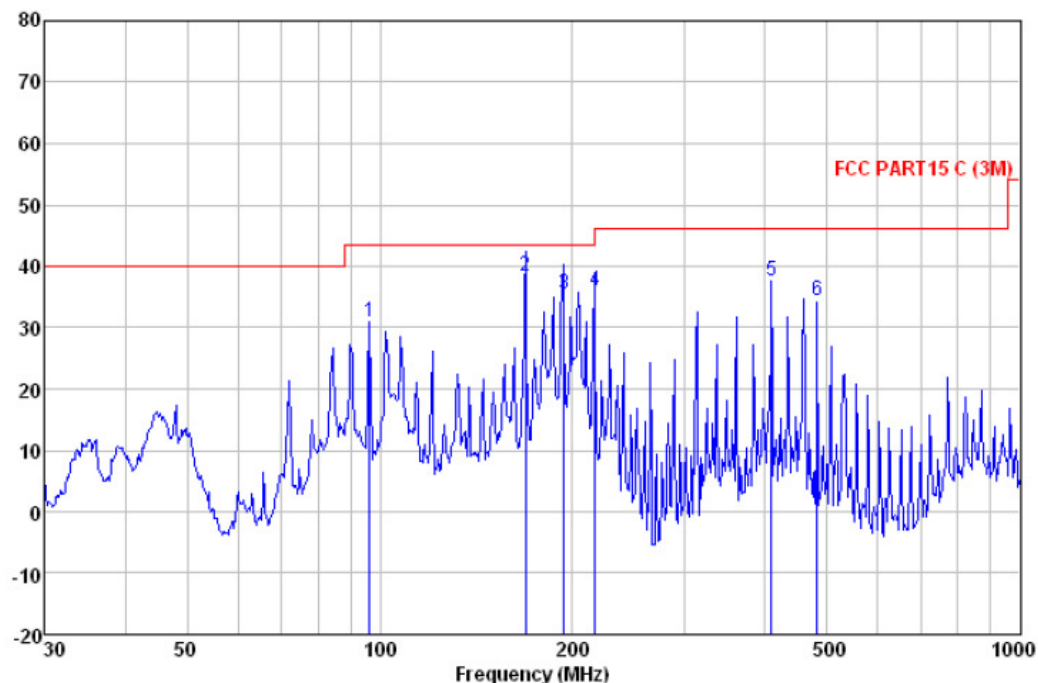
The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

30 MHz~1 GHz Field Strength of Unwanted Emissions.Quasi-Peak Measurement

Vertical:

Peak scan

Level (dBμV/m)



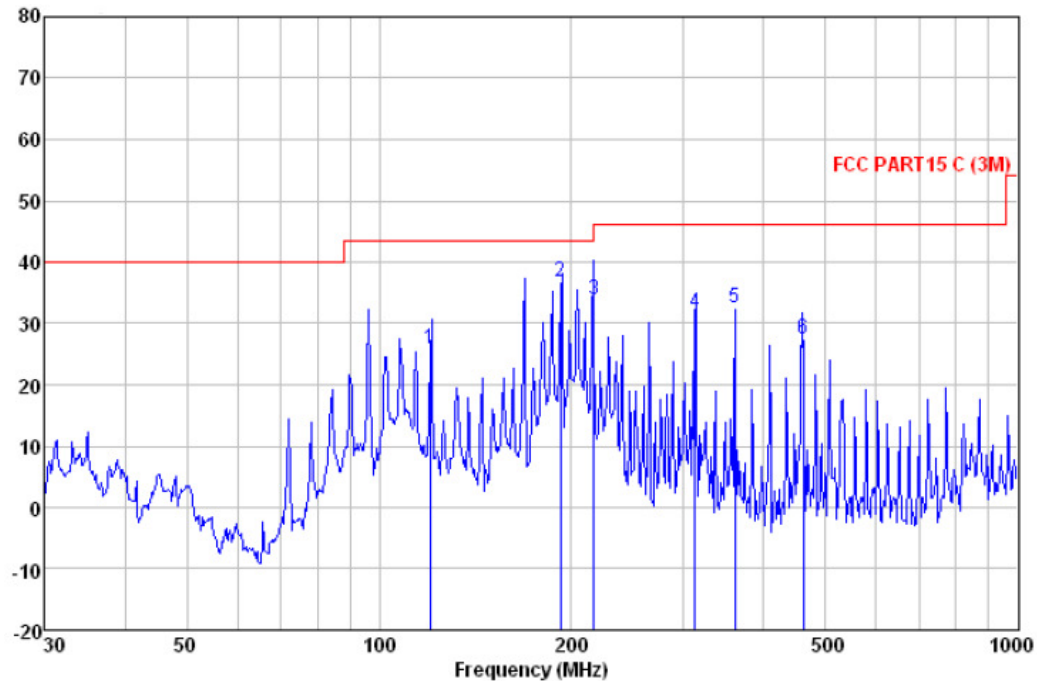
Quasi-peak measurement

Freq	ReadAntenna	Cable Preamp	Limit	Over				
Level	Factor	Loss	Factor	Level	Line	Limit	Remark	
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
96.436	61.25	0.00	1.40	31.60	31.05	43.50	-12.45 QP	
169.005	67.89	0.00	1.78	31.35	38.32	43.50	-5.18 QP	
193.773	64.96	0.00	1.86	31.31	35.51	43.50	-7.99 QP	
216.783	65.33	0.00	1.98	31.30	36.01	46.00	-9.99 QP	
408.946	66.05	0.00	2.75	31.11	37.69	46.00	-8.31 QP	
482.216	62.50	0.00	3.04	31.19	34.35	46.00	-11.65 QP	

**Horizontal:**

Peak scan

Level (dBμV/m)



**Quasi-peak measurement**

Freq	ReadAntenna	Cable	Preamp		Limit	Over	
Level	Factor	Loss	Factor	Level	Line	Limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
120.277	55.76	0.00	1.56	31.54	25.78	43.50	-17.72 QP
192.419	66.34	0.00	1.86	31.31	36.89	43.50	-6.61 QP
216.783	63.25	0.00	1.98	31.30	33.93	46.00	-12.07 QP
312.179	60.57	0.00	2.40	31.27	31.70	46.00	-14.30 QP
360.448	61.01	0.00	2.59	31.16	32.44	46.00	-13.56 QP
460.727	55.60	0.00	2.97	31.17	27.40	46.00	-18.60 QP



1~25 GHz Field Strength of Fundamental & Field Strength of Unwanted Emissions.

Peak & Average Measurement

Peak Measurement:							
Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization
2439.000	27.57	6.77	49.43	90.29	75.20	114.00	V
4878.000	31.57	11.24	49.30	58.70	52.21	74.00	V
7317.000	36.5	13.28	49.71	53.77	53.84	74.00	V
9756.000	38.46	15.05	49.89	54.45	58.07	74.00	V
2439.000	27.57	6.77	49.43	89.44	74.35	114.00	H
4878.000	31.57	11.24	49.30	55.50	49.01	74.00	H
7317.000	36.5	13.28	49.71	51.01	51.08	74.00	H
9756.000	38.46	15.05	49.89	50.75	54.37	74.00	H
Average Measurement:							
Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization
2439.000	27.57	6.77	49.43	75.29	60.20	94.00	V
4878.000	31.57	11.24	49.30	45.70	39.21	54.00	V
7317.000	36.5	13.28	49.71	41.77	41.84	54.00	V
9756.000	38.46	15.05	49.89	41.45	45.07	54.00	V
2439.000	27.57	6.77	49.43	77.44	62.35	94.00	H
4878.000	31.57	11.24	49.30	44.50	38.01	54.00	H
7317.000	36.5	13.28	49.71	40.01	40.08	54.00	H
9756.000	38.46	15.05	49.89	38.75	42.37	54.00	H



**Band Edge:**

Peak Measurement:							
Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamplifier factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization
2400.00	27.58	6.56	49.44	55.49	40.19	74.00	V
2483.50	27.55	6.99	49.42	56.25	41.37	74.00	V
2400.00	27.58	6.56	49.44	55.18	39.88	74.00	H
2483.50	27.55	6.99	49.42	55.64	40.76	74.00	H
Average Measurement:							
Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamplifier factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization
2400.00	27.58	6.56	49.44	47.79	32.49	54.00	V
2483.50	27.55	6.99	49.42	47.35	32.47	54.00	V
2400.00	27.58	6.56	49.44	46.48	31.18	54.00	H
2483.50	27.55	6.99	49.42	46.89	32.01	54.00	H

### Test at high Channel in transmitting status

9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

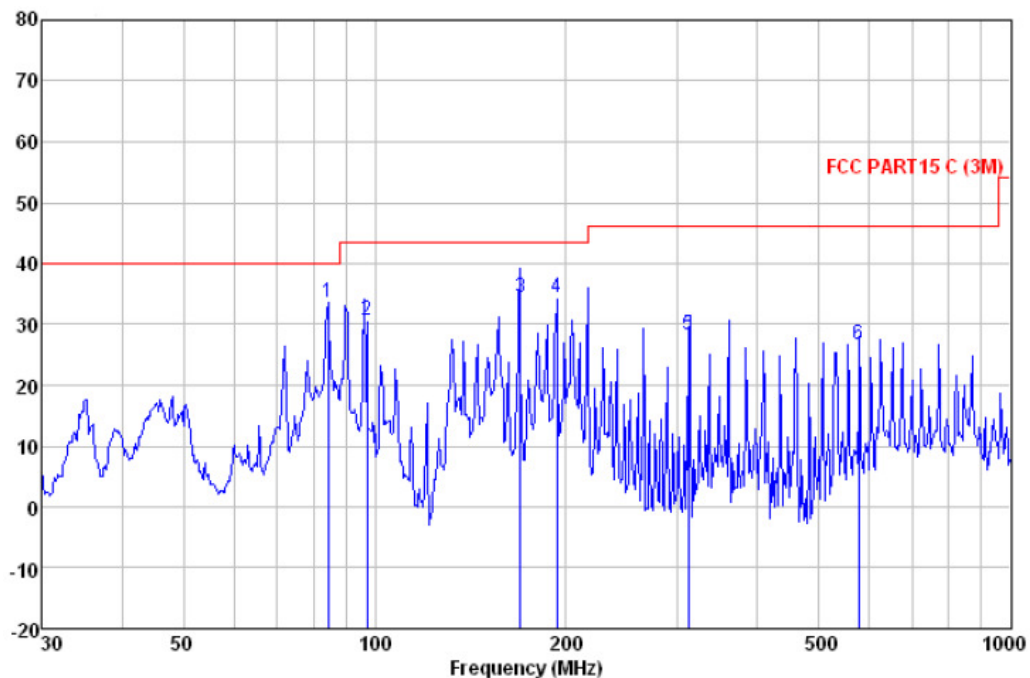
The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

30 MHz~1 GHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

Vertical:

Peak scan

Level (dBμV/m)



Quasi-peak measurement

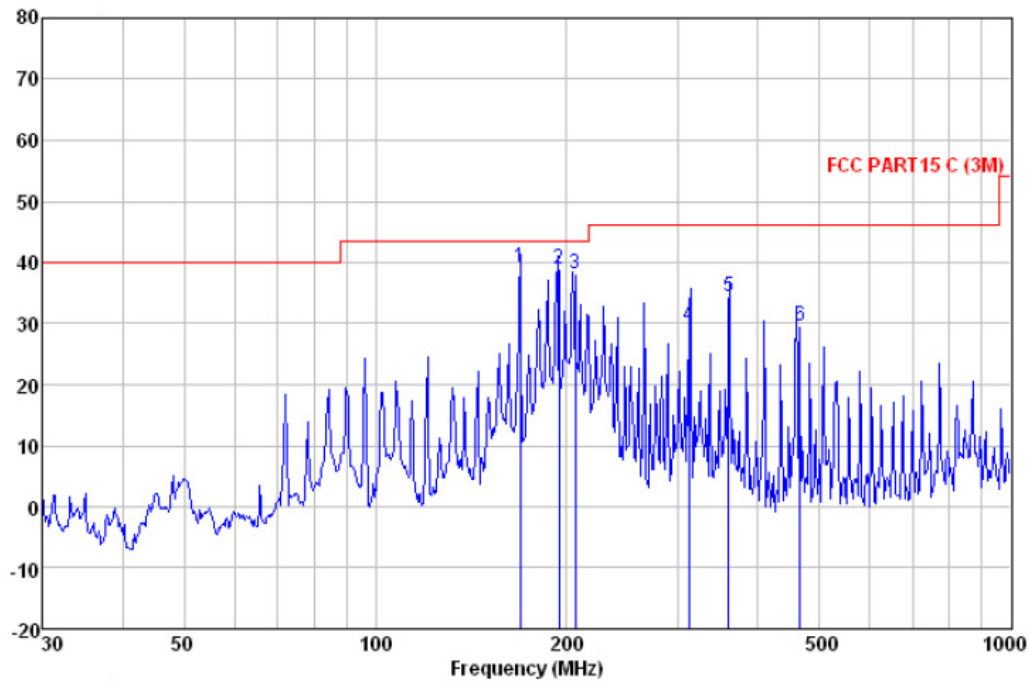
Freq	ReadAntenna	Cable	Preamp		Limit	Over	
Level	Factor	Loss	Factor	Level	Line	Limit	Remark
MHz	dBμV	dB/m	dB	dB	dBμV/m	dBμV/m	dB
84.405	63.83	0.00	1.31	31.60	33.54	40.00	-6.46 QP
97.115	60.78	0.00	1.40	31.60	30.58	43.50	-12.92 QP
169.599	64.05	0.00	1.78	31.35	34.48	43.50	-9.02 QP
193.095	63.72	0.00	1.86	31.31	34.27	43.50	-9.23 QP
311.087	57.07	0.00	2.40	31.28	28.19	46.00	-17.81 QP
576.644	54.64	0.00	3.19	31.28	26.55	46.00	-19.45 QP



**Horizontal:**

Peak scan

Level (dBμV/m)



### Quasi-peak measurement

Freq	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
169.005	68.79	0.00	1.78	31.35	39.22	43.50	-4.28	QP
194.453	68.41	0.00	1.86	31.31	38.96	43.50	-4.54	QP
206.398	67.65	0.00	1.92	31.30	38.27	43.50	-5.23	QP
311.087	58.50	0.00	2.40	31.28	29.62	46.00	-16.38	QP
359.186	62.99	0.00	2.59	31.16	34.42	46.00	-11.58	QP
465.599	57.71	0.00	2.98	31.17	29.52	46.00	-16.48	QP

**1~25 GHz Field Strength of Fundamental & Field Strength of Unwanted Emissions.****Peak & Average Measurement**

Peak Measurement:							
Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dB $\mu$ V)	Emission Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Antenna polarization
2467.125	27.56	6.95	49.42	89.50	74.59	114.00	V
4934.250	31.68	11.37	49.30	59.46	53.21	74.00	V
7401.375	36.57	13.54	49.72	53.90	54.29	74.00	V
9868.500	38.68	14.94	49.90	53.39	57.11	74.00	V
2467.125	27.56	6.95	49.42	88.21	73.30	114.00	H
4934.250	31.68	11.37	49.30	54.88	48.63	74.00	H
7401.375	36.57	13.54	49.72	51.40	51.79	74.00	H
9868.500	38.68	14.94	49.90	50.74	54.46	74.00	H
Average Measurement:							
Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dB $\mu$ V)	Emission Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Antenna polarization
2467.125	27.56	6.95	49.42	77.50	62.59	94.00	V
4934.250	31.68	11.37	49.30	47.46	41.21	54.00	V
7401.375	36.57	13.54	49.72	42.90	43.29	54.00	V
9868.500	38.68	14.94	49.90	41.39	45.11	54.00	V
2467.125	27.56	6.95	49.42	77.21	62.30	94.00	H
4934.250	31.68	11.37	49.30	44.88	38.63	54.00	H
7401.375	36.57	13.54	49.72	40.40	40.79	54.00	H
9868.500	38.68	14.94	49.90	39.74	43.46	54.00	H

**Band Edge:**

Peak Measurement:							
Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization
2400.00	27.58	6.56	49.44	55.79	40.49	74.00	V
2483.50	27.55	6.99	49.42	56.68	41.80	74.00	V
2400.00	27.58	6.56	49.44	55.54	40.24	74.00	H
2483.50	27.55	6.99	49.42	55.36	40.48	74.00	H
Average Measurement:							
Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Antenna polarization
2400.00	27.58	6.56	49.44	47.85	32.55	54.00	V
2483.50	27.55	6.99	49.42	47.62	32.74	54.00	V
2400.00	27.58	6.56	49.44	46.53	31.23	54.00	H
2483.50	27.55	6.99	49.42	46.49	31.61	54.00	H

**Remark:**

- 1). The field strength is calculated by adding the Antenna Factor. Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:  
Final Test Level = Receiver Reading + Antenna Factor + Cable Loss – Preamplifier Factor.
- 2). As shown in Section, for frequencies above 1000 MHz. the above field strength limits 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.
- 3). The test only perform the EUT in transmitting status since the test frequencies were over 1GHz only required transmitting status.
- 4). For Radiated Emissions fall in the restricted bands (2400MHz is worse case than 2390MHz and report it as above), which set out in Section 15.205 Restricted bands.

Also there is not any other emission which falls in restricted bands can be detected and reported.

**Test result: The unit does meet the FCC requirements.**

## 7.4 Occupied Bandwidth

Test Requirement: FCC Part 15 C section 15.249

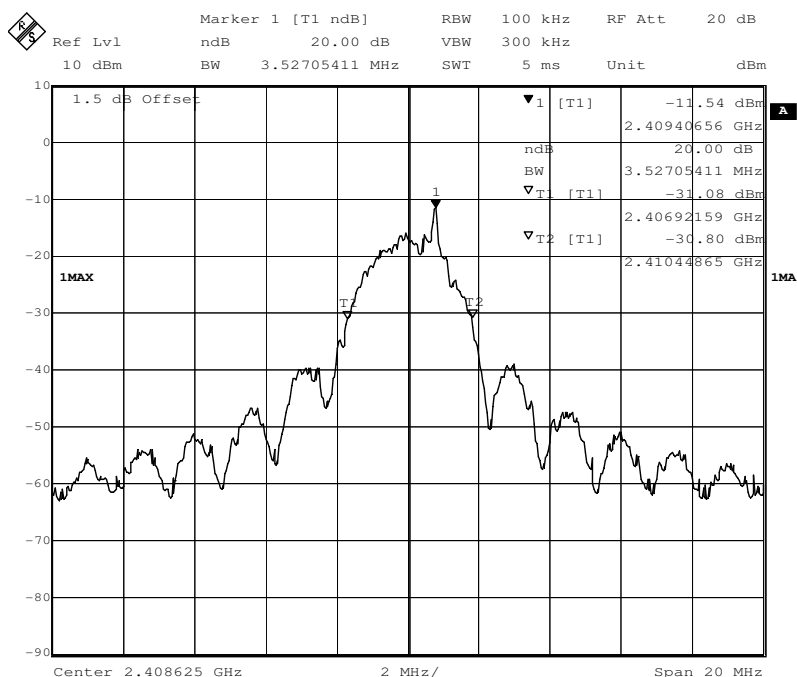
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

Test Method: ANSI C63.10: Clause 6.9.1

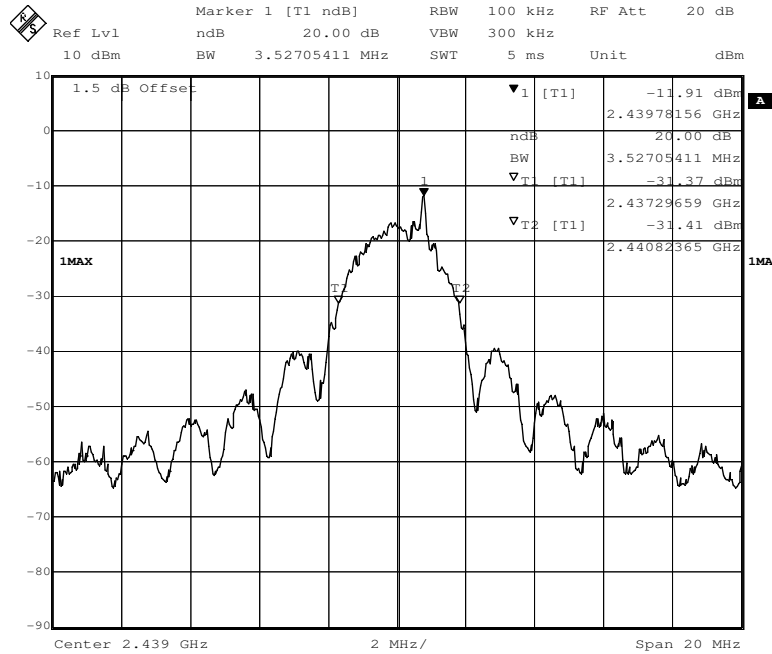
Operation within the band 2.400 to 2.4835 GHz

Method of measurement: A small sample of the transmitter output was fed into the Spectrum Analyzer and the attached plot was taken.

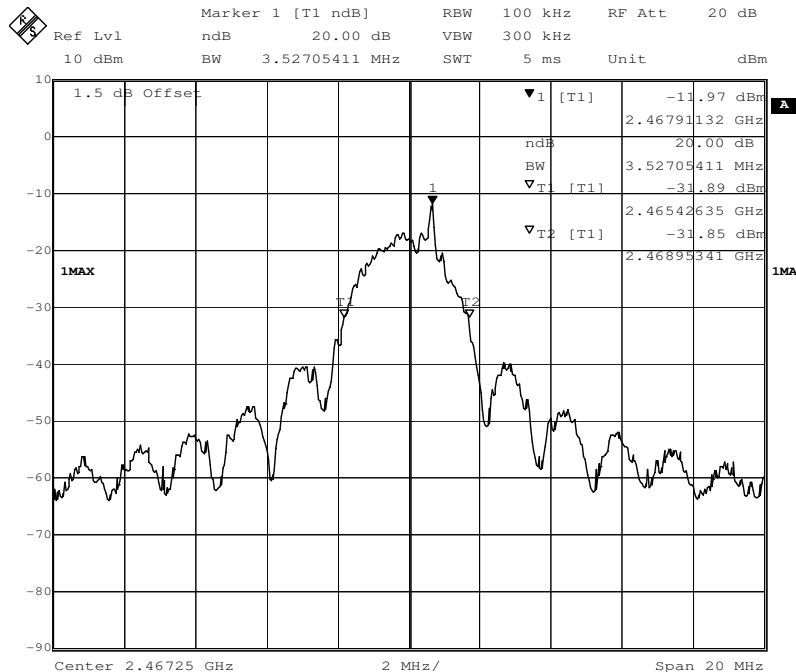
### 1.Test in the lowest frequency 2.408.625GHz



## 2. Test in the middle frequency 2.439GHz



## 3. Test in the highest frequency 2.467.125 GHz



The results: The unit does meet the FCC requirements.

## 7.5 Conducted Emissions at Mains Terminals 150 kHz to 30 MHz

**Test Requirement:** FCC Part 15 C section 15.207  
**Test Method:** ANSI C63.10: Clause 6.2  
**Frequency Range:** 150 kHz to 30 MHz  
**Detector:** Peak for pre-scan (9 kHz Resolution Bandwidth)  
**Test Limit**

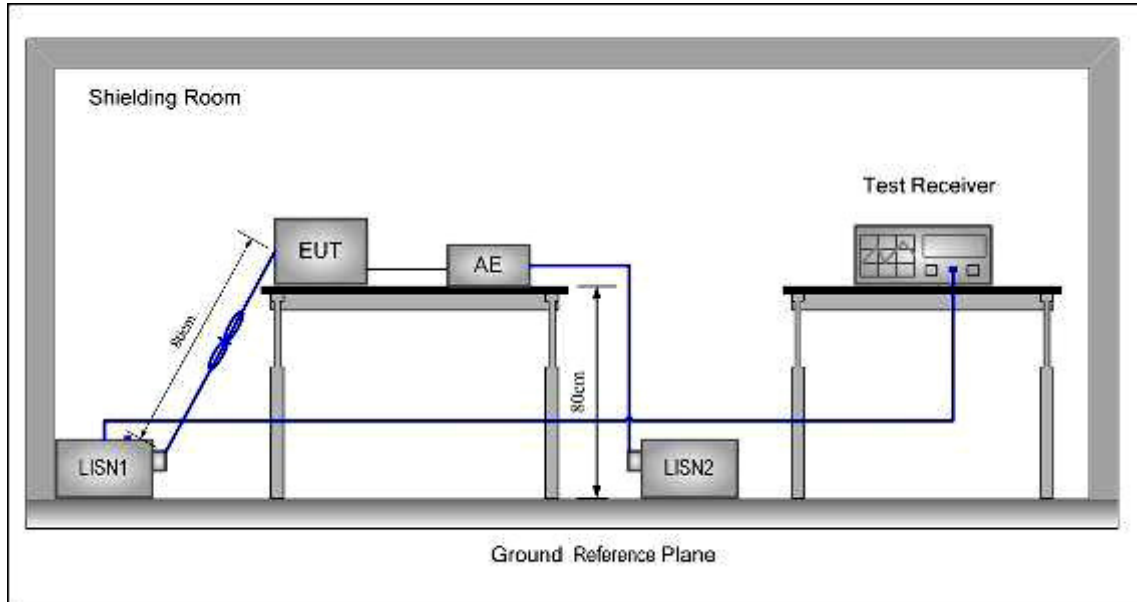
**Limits for conducted disturbance at the mains ports of class B**

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, data rates 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.

## 7.5.1 Measurement Data

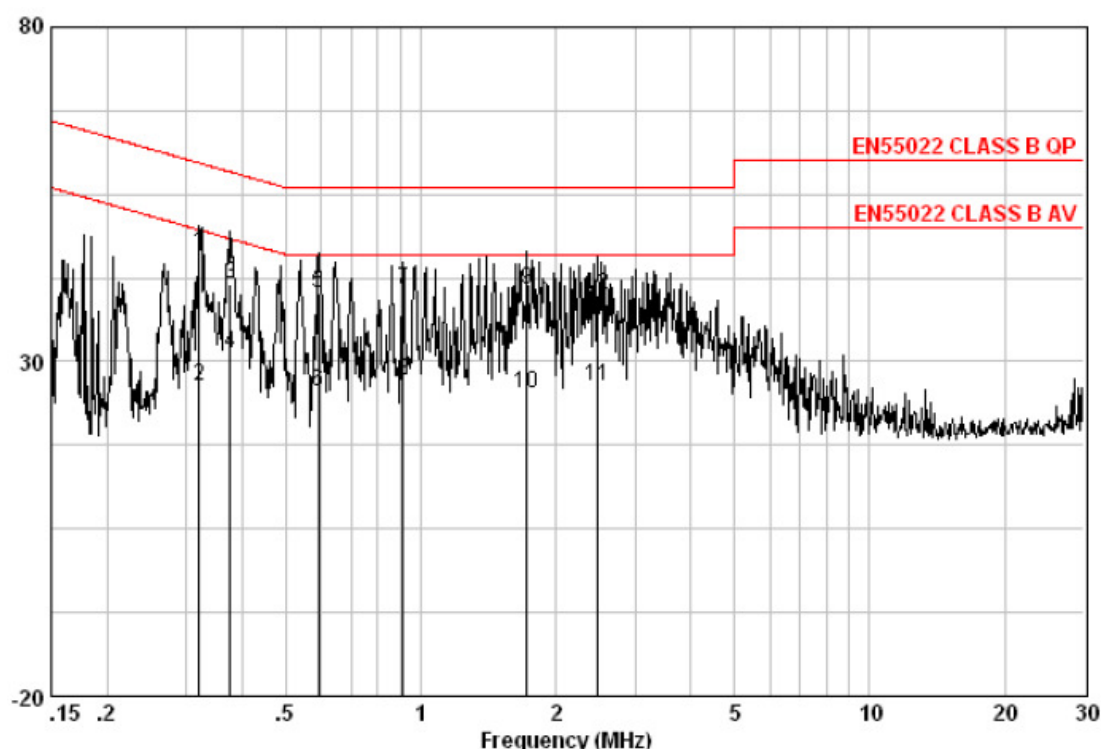
An initial pre-scan was performed on the live and neutral lines with peak detector.

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:**

Neutral Line

Level(dB  $\mu$  V)

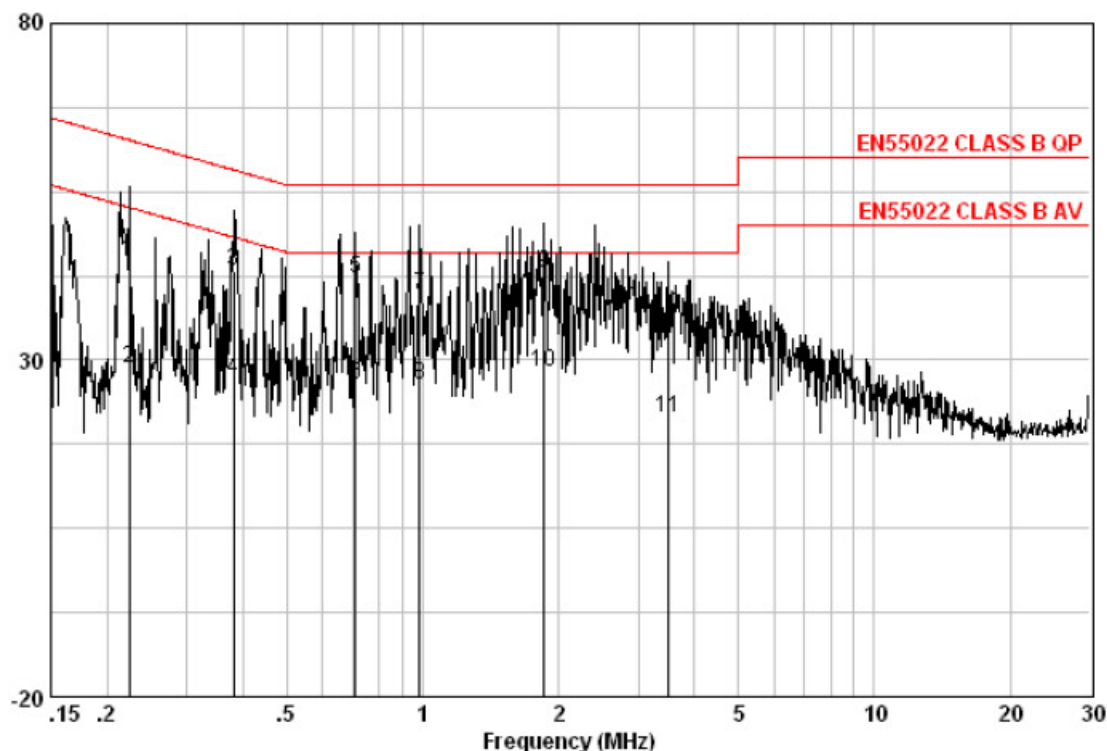


Measure data:

Freq	Read Level	Cable Loss	LISN Factor	Level	Limit Line	Over Limit	Remark
MHz	dB $\mu$ V	dB	dB	dB $\mu$ V	dB $\mu$ V	dB	
0.320	36.48	0.09	9.54	46.11	59.71	-13.59	QP
0.320	16.82	0.09	9.54	26.45	49.71	-23.25	AVERAGE
0.375	31.86	0.07	9.56	41.49	58.39	-16.90	QP
0.375	21.67	0.07	9.56	31.30	48.39	-17.09	AVERAGE
0.592	30.48	0.07	9.57	40.12	56.00	-15.88	QP
0.592	15.89	0.07	9.57	25.53	46.00	-20.47	AVERAGE
0.914	31.12	0.05	9.59	40.76	56.00	-15.24	QP
0.914	17.60	0.05	9.59	27.24	46.00	-18.76	AVERAGE
1.725	31.08	0.05	9.60	40.73	56.00	-15.27	QP
1.725	15.60	0.05	9.60	25.25	46.00	-20.75	AVERAGE
2.474	16.60	0.10	9.62	26.32	46.00	-19.68	AVERAGE
2.474	30.14	0.10	9.62	39.86	56.00	-16.14	QP



Live Line  
Level(dBμV)



Measure result:

Freq	Read	Cable	LISN	Level	Limit	Over	Remark
MHz	dBμV	dB	dB	dBμV	dBμV	dB	
0.223	35.14	0.11	9.51	44.76	62.70	-17.94	QP
0.223	19.17	0.11	9.51	28.79	52.70	-23.91	AVERAGE
0.381	33.68	0.07	9.53	43.28	58.25	-14.98	QP
0.381	17.60	0.07	9.53	27.20	48.25	-21.06	AVERAGE
0.708	32.48	0.06	9.54	42.08	56.00	-13.92	QP
0.708	16.74	0.06	9.54	26.34	46.00	-19.66	AVERAGE
0.984	29.98	0.05	9.55	39.58	56.00	-16.42	QP
0.984	16.74	0.05	9.55	26.34	46.00	-19.66	AVERAGE
1.858	33.30	0.05	9.56	42.91	56.00	-13.09	QP
1.858	18.74	0.05	9.56	28.35	46.00	-17.65	AVERAGE
3.509	11.60	0.16	9.58	21.33	46.00	-24.67	AVERAGE
3.509	26.82	0.16	9.58	36.55	56.00	-19.45	QP

-End of Report--