



FCC 47 CFR PART 15 SUBPART C

TEST REPORT

For

XRS

Model: XRS-1

Trade Name: Tru-Test

Issued to

Tru-Test Limited

25 Carbine Road Mt Wellington Auckland 1060 New Zealand

Issued by

Compliance Certification Services Inc.

**No. 81-1, Lane 210, Pa-De 2nd Rd., Luchu Hsiang,
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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	August 27, 2009	Initial Issue	ALL	Jill Shiao



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1 TEST RESULT CERTIFICATION

Applicant: Tru-Test Limited
25 Carbine Road Mt Wellington Auckland 1060 New Zealand

Manufacturer: ACA Digital Corporation
17F, No. 866-7, Zhongzheng Rd., Zhonghe City,
Taipei County 235, Taiwan, R.O.C.

Equipment Under Test: XRS

Trade Name: Tru-Test

Model: XRS-1

Date of Test: August 2, 2009

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 15 Subpart C	No non-compliance noted

We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4: 2003 and the energy emitted by the sample tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209..

The test results of this report relate only to the tested sample identified in this report.

Approved by:

David Wang
Director

Reviewed by:

Ethan Huang
Section Manager



2 EUT DESCRIPTION

Product	XRS		
Trade Name	Tru-Test		
Model Number	XRS-1		
Power Supply	13VDC		
Power Adapter	FranMar	Model	FRA030E-S15-1
Power Adapter Power Rating	I/P: 100-240VAC, 50-60Hz, 0.7A O/P: 13Vdc, 2.3A		
DC Power Cable Type	Unshielded, 1.8m (Non-detachable) with a core		
Operating Frequency Range	134.2KHz		
Modulation Technique	ASK		
Antenna Specification	Ferrite rod		

Remark:

1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.
2. This submittal(s) (test report) is intended for FCC ID: **XOQXRS-1** filing to comply with Section 15.209 of the FCC Part 15, Subpart C Rules.



3 TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4 (2003) and FCC CFR 47 Part 2, 15.207, 15.209.

3.1. EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

3.2. EUT EXERCISE

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

3.3. GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4 (2003). Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4 (2003).



3.4. FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

- (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	(²)
13.36 - 13.41	322 - 335.4		

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

- (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

3.5. DESCRIPTION OF TEST MODES

The EUT (model: XRS-1) had been tested under operating condition.

Test program used to control the EUT for staying in continuous transmitting mode was programmed. After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz, which worst case was in normal link mode only.

RF ID: Channel 134.2KHz was chosen for full testing.

The field strength of spurious emission was measured in the following position: EUT stand-up position (Y mode), lie-down position (X, Y mode) and docking mode. The worst emission was found in lie-down position (Y axis) and the worst case was recorded.



4 INSTRUMENT CALIBRATION

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

4.2. MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

Remark: Each piece of equipment is scheduled for calibration once a year.

3M Chamber Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilnet	E4446A	MY48250064	10/28/2009
Spectrum Analyzer	R&S	FSEB	825829/011	10/29/2009
Pre-Amplifier	HP	8447D	2944A06530	12/31/2009
Pre-Amplifier	HP	8449B	3008A01738	04/17/2010
EMI Test Receiver	SCHAFFNER	SCR 3501	436	01/21/2010
Loop Antenna	EMCO	6502	2356	05/28/2010
Bilog Antenna	SCHWAZBECK	VULB9160	3084	09/08/2009
Horn Antenna	EMCO	3115	00022250	05/08/2010
Turn Table	CCS	CC-T-1F	N/A	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R
Test S/W	LabVIEW 6.1 (Wugu Chamber EMI Teat V1_4.5.3)			

Powerline Conducted Emissions Test Site #4				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCI	100782	06/01/2010
LISN	R&S	ENV216	100066	05/06/2010
LISN	R&S	ENV 4200	830326/016	04/15/2010
Test S/W	CCS-3A1-CE-Luchu			



4.3. MEASUREMENT UNCERTAINTY

Parameter	Uncertainty
Powerline Conducted Emission	± 1.7983
3M Semi Anechoic Chamber / 30MHz ~ 1GHz	± 3.9154
3M Semi Anechoic Chamber / Above 1GHz	± 3.9095

Remark: *This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.*



5 FACILITIES AND ACCREDITATIONS

5.1. FACILITIES

All measurement facilities used to collect the measurement data are located at

- ☐ No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.
Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029
- ☐ No.11, Wugong 6th Rd., Wugu Industrial Park, Taipei Hsien 248, Taiwan
Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045
- ☒ No. 81-1, Lane 210, Pa-De 2nd Rd., Luchu Hsiang, Taoyuan Shien, (338) Taiwan, R.O.C.
Tel: 886-3-324-0332 / Fax: 886-3-324-5235

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 (2003) and CISPR Publication 22.

5.2. EQUIPMENT





Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

5.3. TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	A2LA	CFR 47, FCC Part15/18, CISPR 22, EN 55022, ICES-003, AS/NZS CISPR 22, VCCI V-3, EN 55011, CISPR 11, IEC/EN 61000-4-2/3/4/5/6/8/11, EN 61000-6-1/2/3/4, EN 55024, CISPR 24, AS/NZS CISPR 24, AS/NZS 61000.6.2, EN 55014-1/-2, ETSI EN 300 386 v1.3.2/v1.3.3, IEC/EN 61000-3-2, AS/NZS 61000.3.2, IEC/EN 61000-3-3, AS/NZS 61000.3.3	 ACCREDITED No. 0824-01
USA	FCC MRA	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	 TW1026
Japan	VCCI	3/10 meter Open Area Test Sites and conducted test sites to perform radiated/conducted measurements	VCCI R-2882/2541/2798/725/1868 C-402/747/912 T-321/325
Taiwan	TAF	EN 55014-1, CISPR 14, CNS 13781-1, EN 55013, CISPR 13, CNS 13439, EN 55011, CISPR 11, CNS 13803, PLMN09, IS2045-0, LP0002 FCC Part 27/90, Part 15B/C/D/E, RSS-192/193/210/310 ETSI EN 300 328/ 300 220-1/ 300 220-2/ 301 893/ 301 489-01/ 301 489-03/ 301 489-07 / 301 489-17/ 300 440-1/ 300 440-2 AS/NZS 4268, AS/NZS 4771 CISPR 22, EN 55022, CNS 13438, AS/NZS CISPR 22, VCCI, IEC/EN 61000-4-2/3/4/5/6/8/11, CNS 14676-2/3/4/5/6/8, CNS 14934-2/3, CNS 13783-1, CNS 13439, CNS 13803	 ilac-MRA TAF Testing Laboratory 0363
Taiwan	BSMI	CNS 13438, CNS 13783-1, CNS 13439, CNS 14115	SL2-IS-E-0014 / IN-E-0014 /A1-E-0014 /R1-E-0014 /R2-E-0014 /L1-E-0014
Canada	Industry Canada	RSS212, Issue 1	 IC 2324C-3 IC 2324C-5

Note: No part of this report may be used to claim or imply product endorsement by A2LA, TAF or other government agency.



6 SETUP OF EQUIPMENT UNDER TEST

6.1. SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

6.2. SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
	N/A						

*****No any support equipment during the test.***

Remark: *Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*



7 FCC PART 15.209 REQUIREMENTS

7.1. RADIATED EMISSIONS

LIMIT

1. According to §15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

Remark: Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

2. In the emission table above, the tighter limit applies at the band edges.

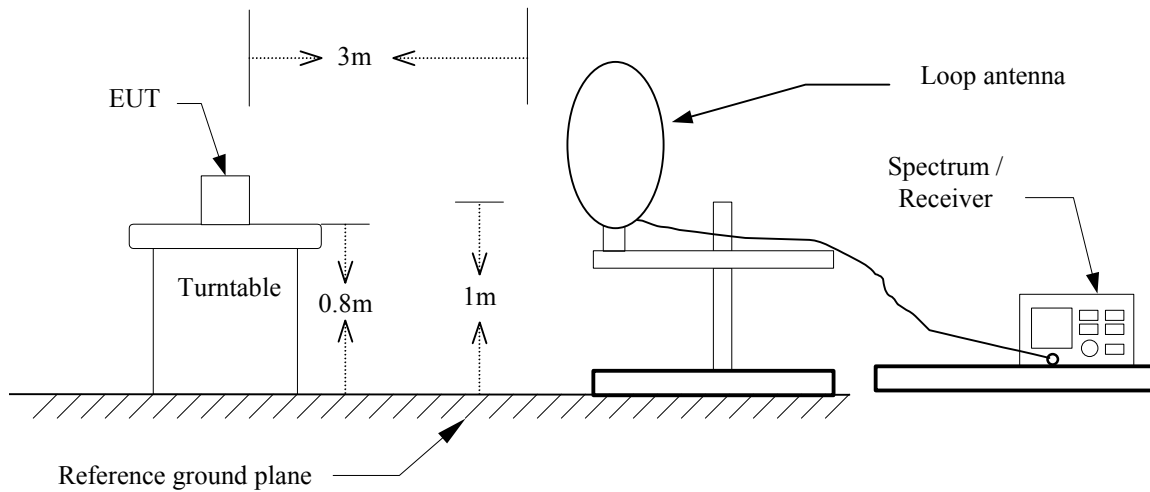
Frequency (Hz)	Field Strength (μV/m at 3-meter)	Field Strength (dBμV/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

According to §15.225,

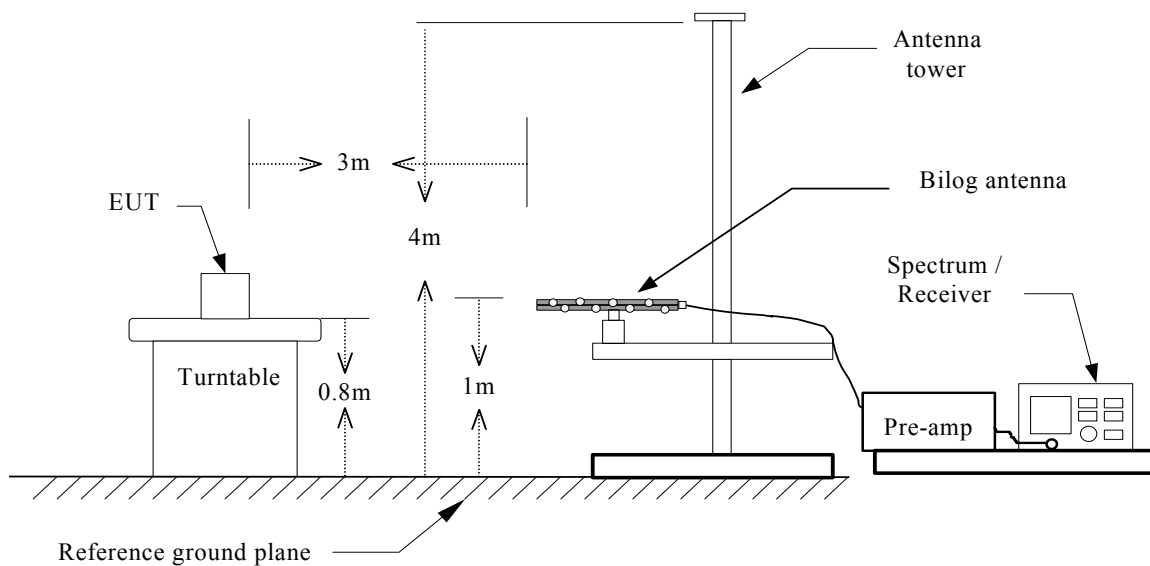
- (a) The field strength of any emissions within the band 13.553 – 13.567 MHz shall not exceed 15,848 microvolts / meter at 30 meters.
- (b) Within the bands 13.410 – 13.553 MHz and 13.567 -13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts / meter at 30 meters.
- (c) Within the bands 13.110 – 13.410 MHz and 13.710 – 14.010 MHz the field strength of any emissions shall not exceed 106 microvolts / meter at 30 meters.
- (d) The field strength of any emissions appearing outside of the 13.110 – 14.010 MHz and shall not exceed the general radiated emission limits in §15.209.

TEST CONFIGURATION

9kHz ~ 30MHz



30MHz ~ 1 GHz





TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:
RBW=100kHz / VBW=300kHz / Sweep=AUTO
7. Repeat above procedures until the measurements for all frequencies are complete.

TEST RESULTS

No non-compliance noted.



TEST DATA

Operation Mode: TX mode**Test Date:** August 2, 2009**Temperature:** 18°C**Tested by:** Stan Lin**Humidity:** 60 % RH**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Detector Mode (PK/QP/AVG)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit 3m (dBuV/m)	Margin (dB)
0.1340	V	AVG	91.21	10.43	101.64	105.00	-3.36
73.6500	V	QP	46.58	-17.01	29.57	40.00	-10.43
88.2000	V	QP	55.62	-18.87	36.75	43.50	-6.75
102.7500	V	QP	49.03	-16.66	32.37	43.50	-11.13
160.9500	V	QP	42.54	-12.34	30.20	43.50	-13.30
192.4750	V	QP	45.38	-14.55	30.83	43.50	-12.67
289.4750	V	QP	44.51	-12.10	32.41	46.00	-13.59
384.0500	V	QP	40.49	-11.21	29.28	46.00	-16.72
672.6250	V	QP	34.69	-5.12	29.57	46.00	-16.43
0.1358	H	AVG	92.71	10.43	103.14	105.00	-1.86
88.2000	H	QP	43.54	-18.87	24.67	43.50	-18.83
192.4750	H	QP	45.38	-14.55	30.83	43.50	-12.67
289.4750	H	QP	54.01	-12.10	41.91	46.00	-4.09
384.0500	H	QP	43.29	-11.21	32.08	46.00	-13.92
481.0500	H	QP	37.56	-8.67	28.89	46.00	-17.11
672.6250	H	QP	39.52	-5.12	34.40	46.00	-11.60
769.6250	H	QP	35.88	-2.71	33.17	46.00	-12.83
997.5750	H	QP	33.24	0.40	33.64	53.90	-20.26

Remark: 1. Measuring frequencies from 9kHz to the 1GHz.

2. Radiated emissions measured in frequency range from 9kHz to 1000MHz were made with an instrument using peak/quasi-peak/average detector mode.

3. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "N/A" remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

4. Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).



7.2. POWERLINE CONDUCTED EMISSIONS

LIMIT

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dB μ V)	
	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

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

TEST CONFIGURATION

See test photographs attached in Appendix I for the actual connections between EUT and support equipment.

TEST PROCEDURE

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

TEST RESULTS

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.



TEST DATA

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

Operation Mode: Charging

Test Date: August 2, 2009

Temperature: 20°C

Tested by: Stan Lin

Humidity: 58% RH

Freq. (MHz)	QP Reading (dBuV)	AV Reading (dBuV)	Corr. factor (dB)	QP Result (dBuV)	AV Result (dBuV)	QP Limit (dBuV)	AV Limit (dBuV)	QP Margin (dB)	AV Margin (dB)	Note
0.1560	27.20	19.17	9.73	36.93	28.90	65.67	55.67	-28.74	-26.77	L1
0.1844	24.34	14.79	9.72	34.06	24.51	64.29	54.29	-30.23	-29.78	L1
0.4978	15.24	14.14	9.62	24.86	23.76	56.04	46.04	-31.18	-22.28	L1
1.0253	11.96	8.77	9.63	21.59	18.40	56.00	46.00	-34.41	-27.60	L1
3.1878	10.30	5.37	9.75	20.05	15.12	56.00	46.00	-35.95	-30.88	L1
5.1633	10.22	5.71	9.87	20.09	15.58	60.00	50.00	-39.91	-34.42	L1
9.5172	10.70	5.88	10.16	20.86	16.04	60.00	50.00	-39.14	-33.96	L1
0.1549	28.40	23.27	9.72	38.12	32.99	65.73	55.73	-27.61	-22.74	L2
0.1870	25.92	20.40	9.71	35.63	30.11	64.17	54.17	-28.54	-24.06	L2
0.4660	19.00	17.99	9.64	28.64	27.63	56.58	46.58	-27.94	-18.95	L2
1.2231	4.42	-0.79	9.63	14.05	8.84	56.00	46.00	-41.95	-37.16	L2
1.9654	7.04	2.06	9.73	16.77	11.79	56.00	46.00	-39.23	-34.21	L2
7.8390	3.48	-2.15	9.98	13.46	7.83	60.00	50.00	-46.54	-42.17	L2

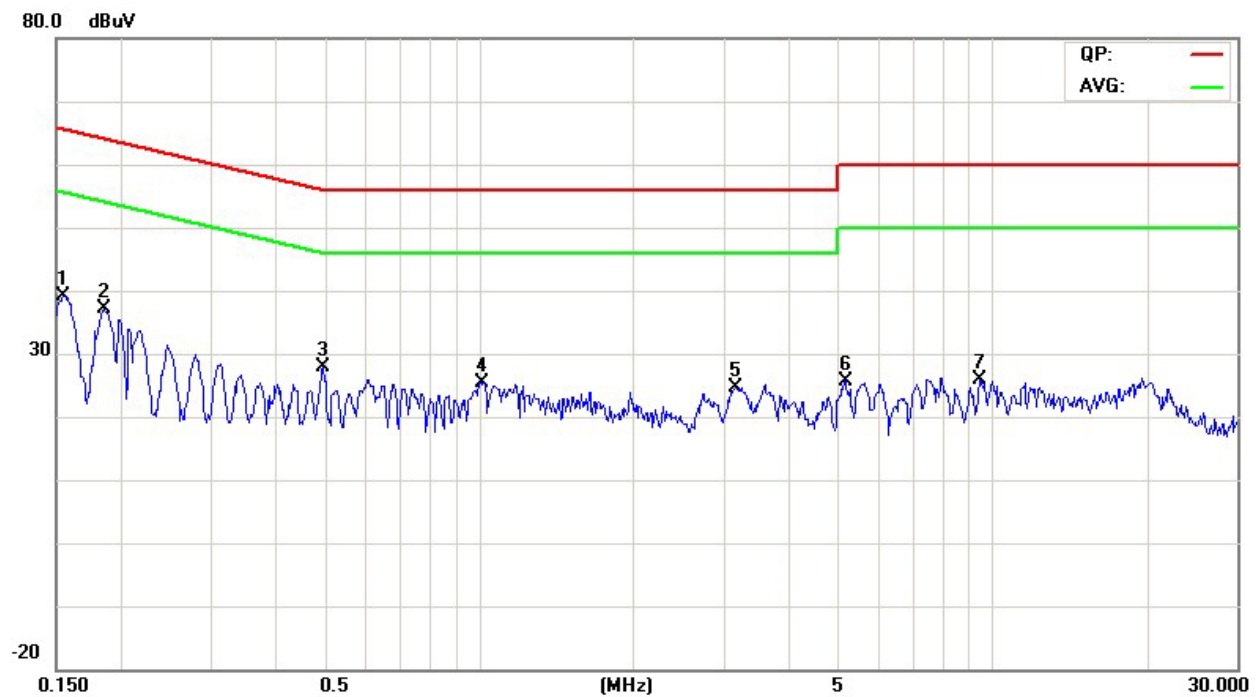
Remark:

1. Measuring frequencies from 0.15 MHz to 30MHz.
2. The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-peak detector and average detector.
3. The IF bandwidth of SPA between 0.15MHz and 30MHz was 10kHz; the IF bandwidth of Test Receiver between 0.15MHz and 30MHz was 9kHz;
4. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)



Test Plots

Conducted emissions (Line 1)



Conducted emissions (Line 2)

