FCC Part 15 Subpart C §15.209

Test Report

Equipment Under Test	**Wireless Charger Tx Pad**
Model Name	**SWP-TT100**
Applicant	**Samsung Electro Mechanics**
FCC ID	**E2XSWP-TT100**
Manufacturer	**Samsung Electro Mechanics**
Date of Test(s)	**2015. 07. 01 ~ 2015.07.02**
Date of Issue	**2015. 07. 02**

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

Issue to	Issue by
Samsung Electro Mechanics 314 Maetan-3 Dong Pal Dal-Ku Suwon Kyungki-Do, Korea Tel.: +82-31-300-4239 Fax: +82-31-300-7900	**MOVON CORPORATION** 498-2, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 449-812 Tel.: +82-31-338-8837 Fax: +82-31-338-8847

Revision history

Revision	Date of issue	Description	Revised by
--	July 2, 2015	Initial	--

Table of contents

1. Attestation of test results

1.1. Details of applicant

Applicant	:	Samsung Electro Mechanics
Address	:	314 Maetan-3 Dong Pal Dal-Ku Suwon Kyungki-Do, Korea
Contact Person	:	Jinhwan Lim
Telephone	:	+82-31-300-4239
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1.2. Summary of test results

The EUT has been tested according to the following specifications;

FCC part 15 Section in	Description	Result
§15.207	Transmitter radiated spurious emissions,	C
§15.209	Conducted spurious emission	C

The sample was tested according to the following specification:
FCC Parts 15; ANSI C-63.4-2009
FCC Public Notice KDB 680106 D01 V2
TEST SITE REGISTRATION NUMBER:
*FCC(*287786)

※ Abbreviation

C Complied
N/A Not applicable
F Fail

Approval Signatories

Test and Report Completed by :	Report Approval by :
	
Kin Son Test Engineer MOVON CORPORATION	Issac Jin Technical Manager MOVON CORPORATION

2. EUT Description

Kind of product	Wireless Charger Tx Pad
Model Name	SWP-TT100
Serial Number	N/A
Power supply	DC 5 V
Frequency range	110 ㎑ ~205 ㎑
TEST SITE REGISTRATION NUMBER	FCC(287786)

2.1. Declarations by the manufacturer

None

2.2. Details of modification

Test mode

This device has been tested in the worst-case mode of charging mode as below conditions:

Test Mode	Support Equipment	Charging Current Condition
TM1	Client Device	100 ㎃
TM2	Client Device	400 ㎃
TM3	Client Device	800 ㎃
TM4	Mobile Phone	< 1% battery status
TM5	Mobile Phone	50% battery status

3. Measurement equipment

Equipment	Manufacturer	Model	Serial number	Calibration Interval	Calibration due.
Test Receiver	ESPI	ROHDE & SCHWARZ	100063	1 year	2016.01.12
LISN	ENV216	ROHDE & SCHWARZ	100324	1 year	2016.01.12
Impuls-Begrenzer Pulse Limiter	ESH3-Z2	ROHDE & SCHWARZ	100092	1 year	2016.01.12
Bilog Antenna	VULB 9160	SCHWARZBECK	9160-3122	1 year	2016.04.02
EMI Receiver	ESVN30	ROHDE & SCHWARZ	832854/010	1 year	2016.01.12
AMPLIFIER	8447E	H.P	2945A02712	1 year	2016.01.12
Loop Antenna	HEH2-Z2	ROHDE & SCHWARZ	881056/6	2 year	2017.01.06
Antenna Master	N/A	AUDIX	N/A	N/A	N/A
Antenna Turntable Controller	ACT	AUDIX	N/A	N/A	N/A

※ Remark;
Support equipment

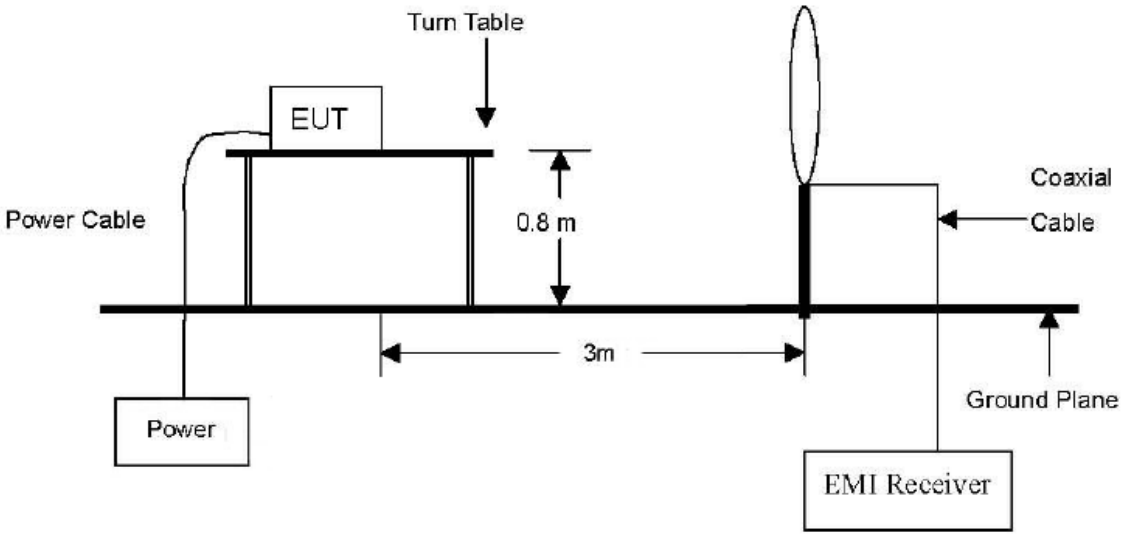
Description	Manufacturer	Model	Serial number
Smartphone	Samsung	SHV-E300S	-

4. Transmitter radiated spurious emissions and conducted spurious emissions

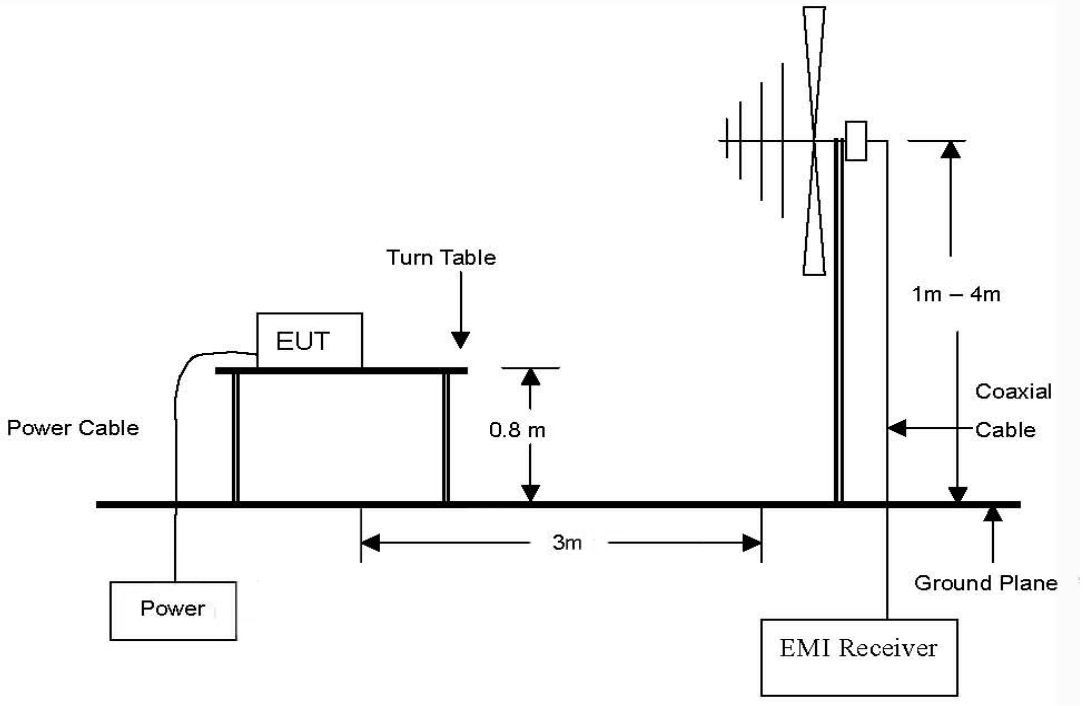
4.1. Test setup

4.1.1. Transmitter radiated spurious emissions

The diagram below shows the test setup that is utilized to make the measurements for emission from 9kHz to 30MHz Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.



4.2. Limit

According to §15.209, in any 100 ㎑ bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 ㏈ below that in the 100 ㎑ bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement , provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval , as permitted under paragraph(b)(3) of this section , the attenuation required under this paragraph shall be 30 ㏈ instead of 20 ㏈. Attenuation below the general limits specified in section §15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section §15.205(a), must also comply the radiated emission limits specified in section §15.209(a) (see section §15.205(c))

According to § 15.109(a), for an intentional radiator devices, the general required of field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values：

Frequency (㎒)	Distance (Meters)	Radiated at 3M (㏈㎶/m)	Radiated (㎶/m)
0.009–0.490	300	See the remark	2400/F(㎑)
0.490–1.705	30		24000/F(㎑)
1.705–30.0	30		30
30 - 88	3	40.0	100
88 – 216	3	43.5	150
216 – 960	3	46.0	200
Above 960	3	54.0	500

*Remark

1. “F” = Fundamental
   “S” = Spurious
   “*” = Noise Floor
2. Distance Correction Factor(D.C.F.)
   For 300m: 40*log(300/3) = 80dB
   For 30m: 40*log(30/3) = 40dB
3. No other spurious and harmonic emissions were reportedgreater than listed emissions above table.
4. Sample calculation
   T.F = AF + CL – AG / Field Strength = Reading + T.F - D.C.F.
   Margin = Limit – Field Strength
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain
   D.C.F = Distance Correction Factor

4.3. Test procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.4:2003

In case of the air temperature of the test site is out of the range is 10 to 40°C before the testing proceeds the warm-up time of EUT maintain adequately

4.3.1. Test procedures for radiated spurious emissions

1. The EUT is placed on a turntable, which is 0.8 m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m 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. Repeat above procedures until the measurements for all frequencies are complete.

※ Remark;

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 10 ㎑ for Peak detection (PK) at frequency below 30 ㎒
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 ㎑ for Peak detection (PK) or Quasi-peak detection (QP) at frequency below 1 ㎓.

4.3.2. Test procedures for conducted spurious emissions

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using RBW = 100 ㎑, VBW = 100 ㎑.

4.4. Test result

Ambient temperature: 23℃
Relative humidity: 49 % R.H.

4.4.1. Spurious radiated emission

Measurement Distance : 3 Meters

Operation mode

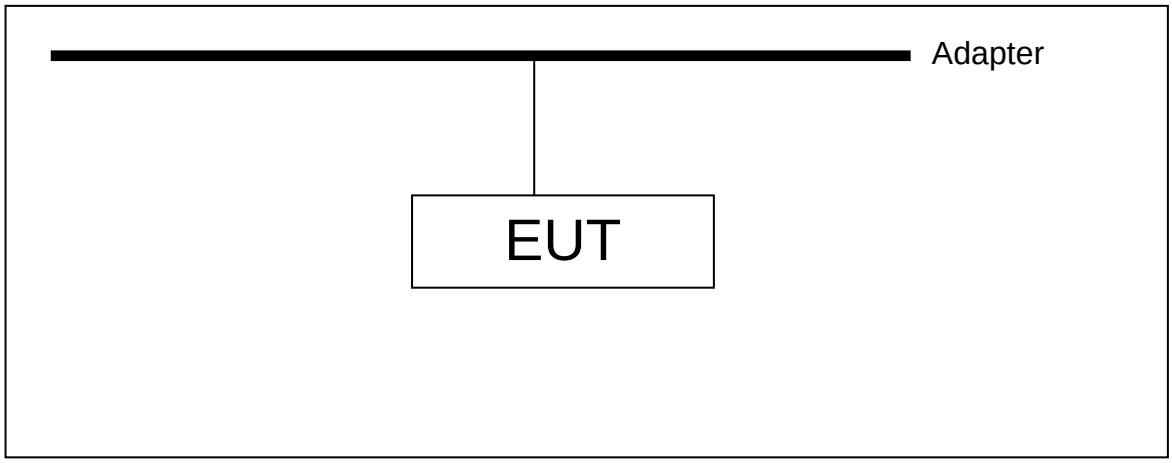
Test Mode	Note.1	Freq [㎒]	Det Mode	ANT Pol.	Reading [㏈ uV]	T.F [㏈/m]	D.C.F	Field Strength [㏈ uV/3m]	Limit [㏈ uV/3m]	Margin [㏈]
TM1	F*	0.133	Peak	V	41.21	19.99	80	-18.80	18.05	36.85
	S	0.623	Peak	V	17.36	19.84	40	-2.80	38.52	41.32
	S	0.642	Peak	H	19.25	19.85	40	-0.90	37.38	38.28
	S	0.936	Peak	V	18.34	19.86	40	-1.80	25.64	27.44
TM2	F*	0.134	Peak	V	41.11	19.99	80	-18.90	17.91	36.81
	S	0.395	Peak	H	27.27	19.94	80	-32.79	6.08	38.87
	S	0.667	Peak	V	20.75	19.85	40	0.60	35.98	35.38
	S	0.925	Peak	V	17.44	19.86	40	-2.70	25.95	28.65
TM3	F*	0.133	Peak	V	41.21	19.99	80	-18.80	18.05	36.85
	S	0.384	Peak	H	29.36	19.95	80	-30.69	6.25	36.94
	S	0.642	Peak	V	22.65	19.85	40	2.50	37.38	34.88
	S	0.897	Peak	H	15.74	19.86	40	-4.40	26.76	31.16
TM4	F*	0.133	Peak	V	41.11	19.99	80	-18.90	18.05	36.95
	S	0.175	Peak	H	29.81	20.00	80	-30.19	13.71	43.90
	S	0.516	Peak	H	21.36	19.84	40	1.20	46.51	45.31
	S	0.867	Peak	H	11.75	19.85	40	-8.40	27.68	36.08
TM5	F*	0.133	Peak	V	41.31	19.99	80	-18.70	18.05	36.75
	S	0.407	Peak	H	32.21	19.99	80	-27.80	13.95	41.75
	S	0.669	Peak	H	21.36	19.84	40	1.20	46.51	45.31
	S	4.416	Peak	H	11.85	19.86	40	-8.29	27.43	35.72

*Remark

1. “F” = Fundamental
   “S” = Spurious
   “*” = Noise Floor
2. Distance Correction Factor (D.C.F.)
   For 300m: 40*log(300/3) = 80dB
   For 30m: 40*log(30/3) = 40dB
3. No other spurious and harmonic emissions were reported greater than listed emissions above table.
4. Sample calculation
   T.F = AF + CL – AG / Field Strength = Reading + T.F + D.C.F.
   Margin = Limit – Field Strength
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain
D.C.F = Distance Correction Factor

5. Conducted power line test

5.1. Test setup



5.2. Limit

According to §15.107(a) for an intentional radiator that 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 ㎑ to 30 ㎒, shall not exceed the limits in the following table, as measured using a 50 uH/ 50 ohm line impedance stabilization network (LISN).
Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequencies ranges.

Frequency of Emission (㎒)	Conducted limit (dB㎶/m)	
	Quasi-peak	Average
0.15 – 0.50	66 - 56*	56 - 46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

※ Remark

Decreases with the logarithm of the frequency.

5.3. Test procedures

The test procedure is performed in a 6.5 m × 3.6 m × 3.6 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m(W) × 1.5 m(L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

5.4. Test results

Ambient temperature: 23 ℃
Relative humidity: 49 % R.H.
Frequency range: 0.15 ㎒ ~ 30 ㎒
Measured bandwidth: 9 ㎑

Test mode: TM1

Freq. (㎒)	Line	Q-Peak		
		Level(dB㎶/m)	Limit(dB㎶/m)	Margin(dB)
0.47	N	44.25	56.44	12.19
2.40	N	38.67	56.00	17.33
19.68	N	49.74	60.00	10.26
21.20	L	47.32	60.00	12.68
21.44	N	50.30	60.00	9.70
28.27	L	48.67	60.00	11.33

Test mode: TM2

Freq. (㎒)	Line	Q-Peak		
		Level(dB㎶/m)	Limit(dB㎶/m)	Margin(dB)
0.15	N	42.51	65.78	23.27
0.46	N	43.69	56.66	12.97
0.47	L	35.45	56.44	20.99
21.02	N	52.34	60.00	7.66
22.44	N	52.88	60.00	7.12
23.92	N	52.39	60.00	7.61

Test mode: TM3

Freq. (㎒)	Line	Q-Peak		
		Level(dB㎶/m)	Limit(dB㎶/m)	Margin(dB)
0.478	N	44.49	56.37	11.88
20.908	N	52.25	60.00	7.75
20.096	L	49.85	60.00	10.15
21.736	N	52.10	60.00	7.90
28.076	L	51.84	60.00	8.16
28.336	N	49.07	60.00	10.93

Test mode: TM4

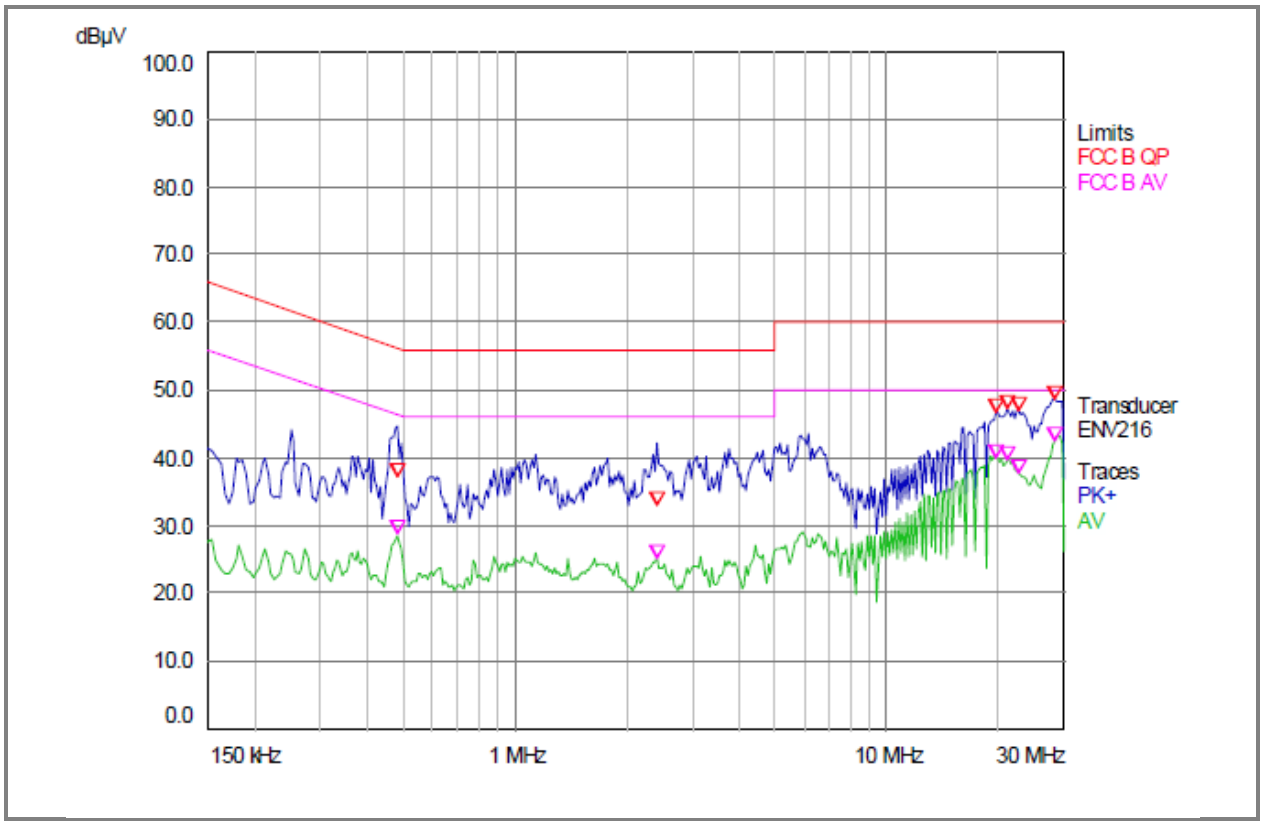
Freq. (㎒)	Line	Q-Peak		
		Level(dB㎶/m)	Limit(dB㎶/m)	Margin(dB)
0.482	N	43.70	56.30	12.60
1.112	N	41.03	56.00	14.97
2.76	N	30.90	46.00	15.10
4.76	N	41.10	56.00	14.90
17.37	N	51.65	60.00	8.35
24.58	N	51.66	60.00	8.34

Test mode: TM5

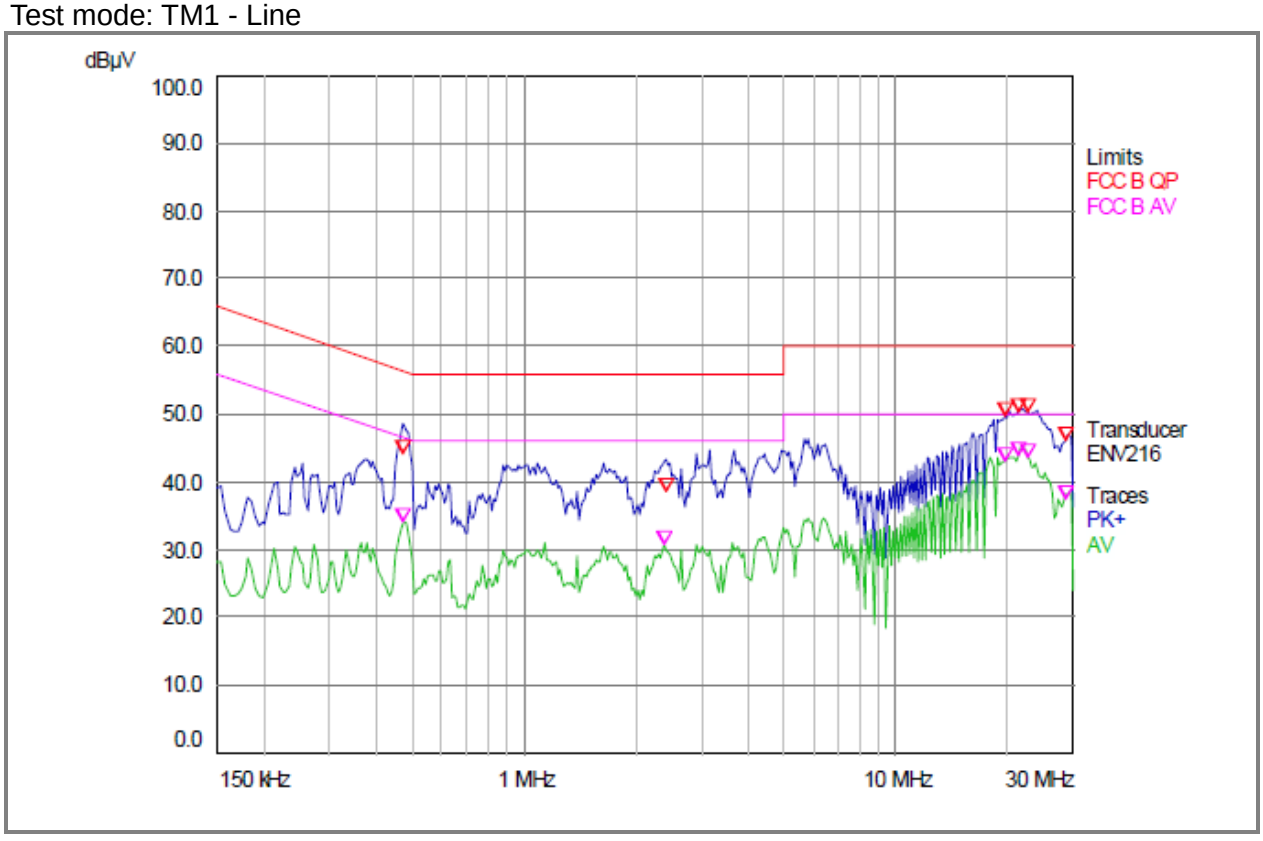
Freq. (㎒)	Line	Q-Peak		
		Level(dB㎶/m)	Limit(dB㎶/m)	Margin(dB)
0.16	L	45.21	65.36	20.15
0.46	N	44.87	56.73	11.86
1.30	N	39.51	56.00	16.49
2.08	N	39.77	56.00	16.23
21.00	N	53.90	60.00	6.10
23.25	N	53.76	60.00	6.24

Plot of conducted power line

Test mode: TM1 - Neutral

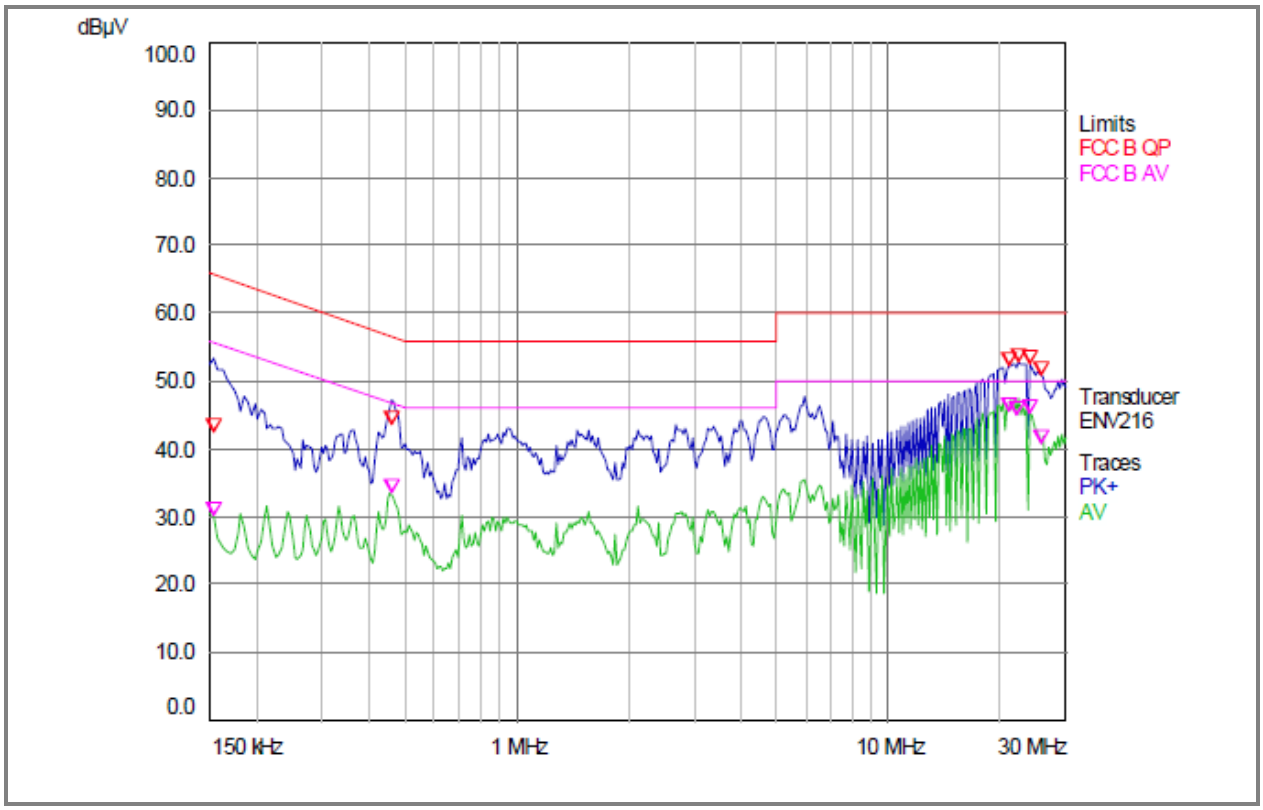


Test mode: TM1 - Line

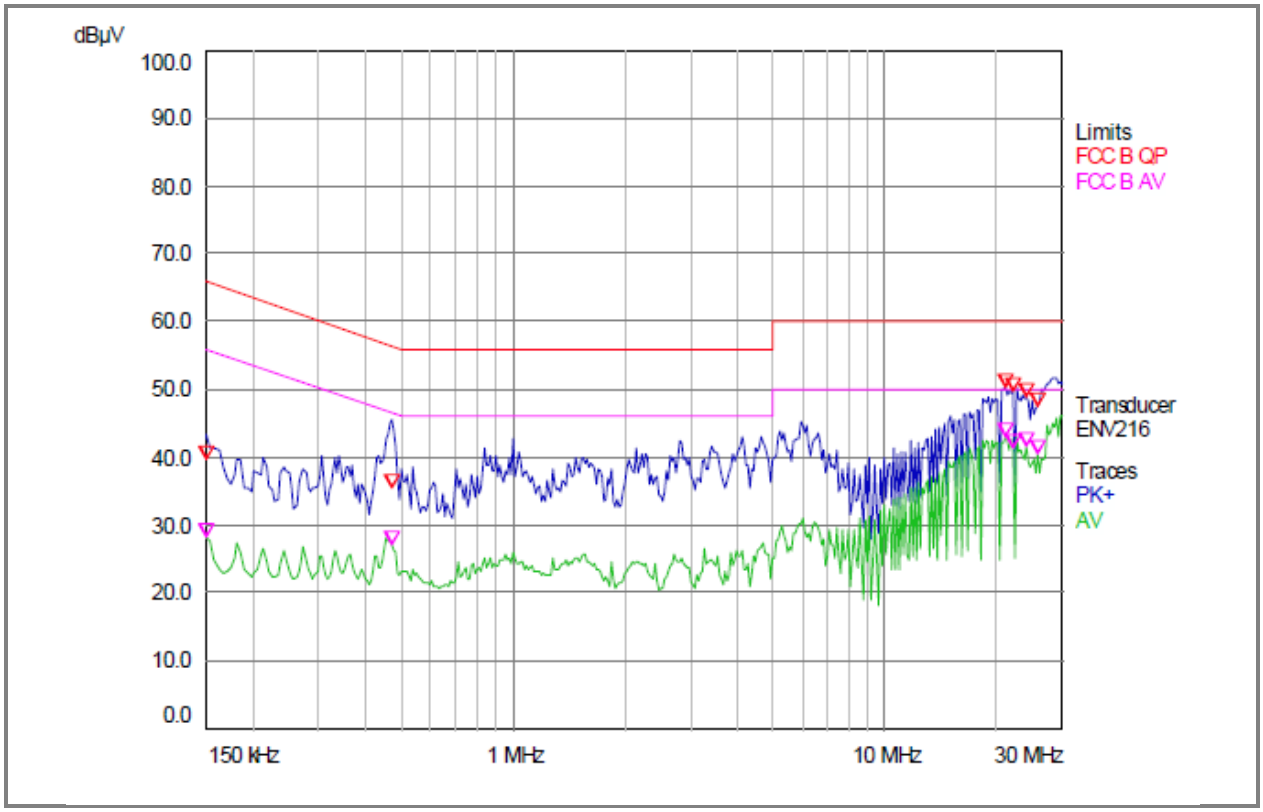


Plot of conducted power line

Test mode: TM2 - Neutral

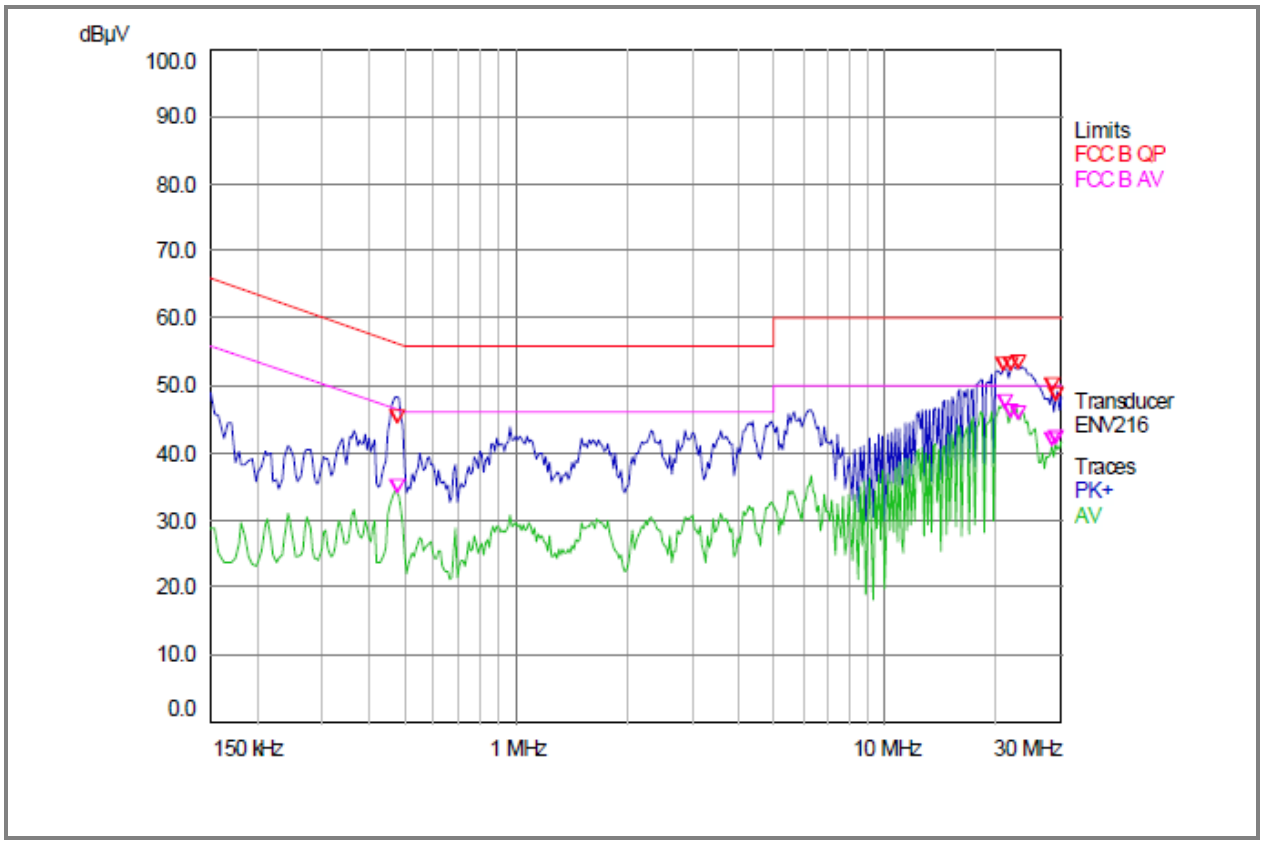


Test mode: TM2 - Line

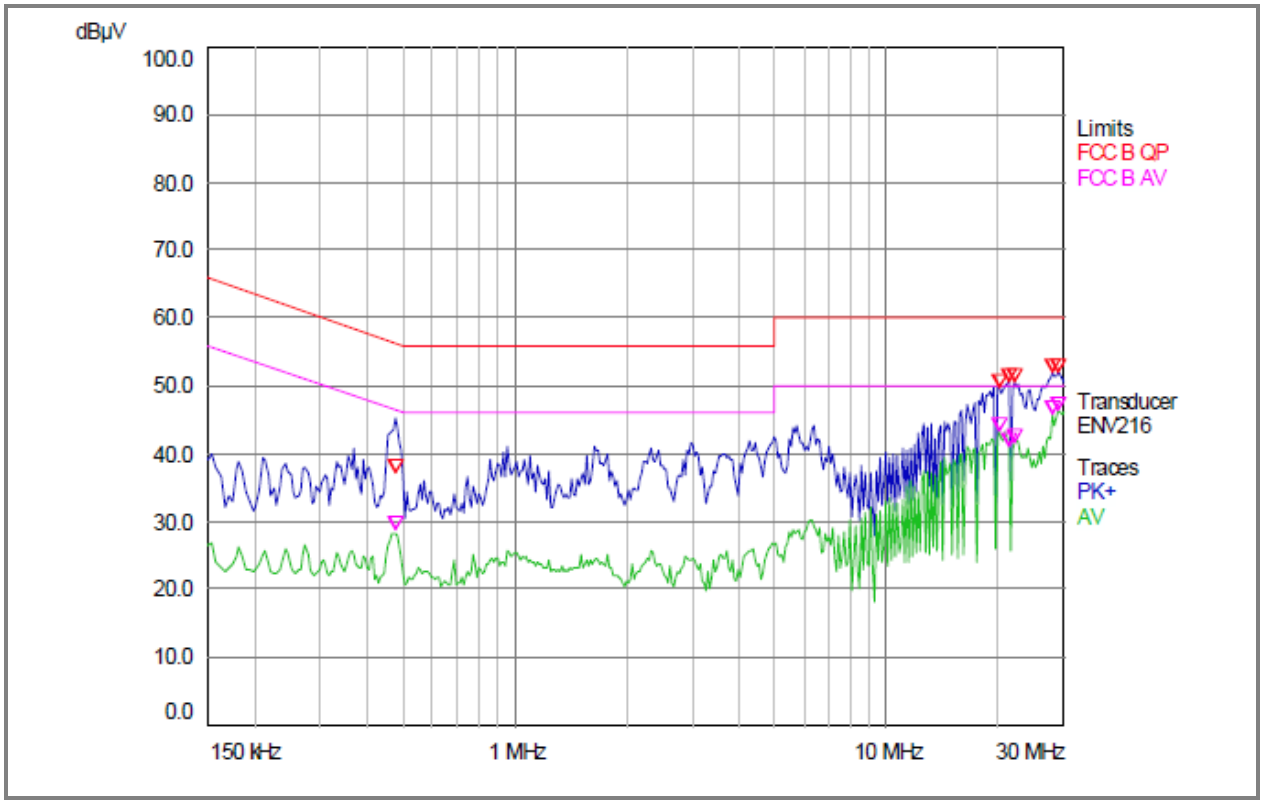


Plot of conducted power line

Test mode: TM3 - Neutral

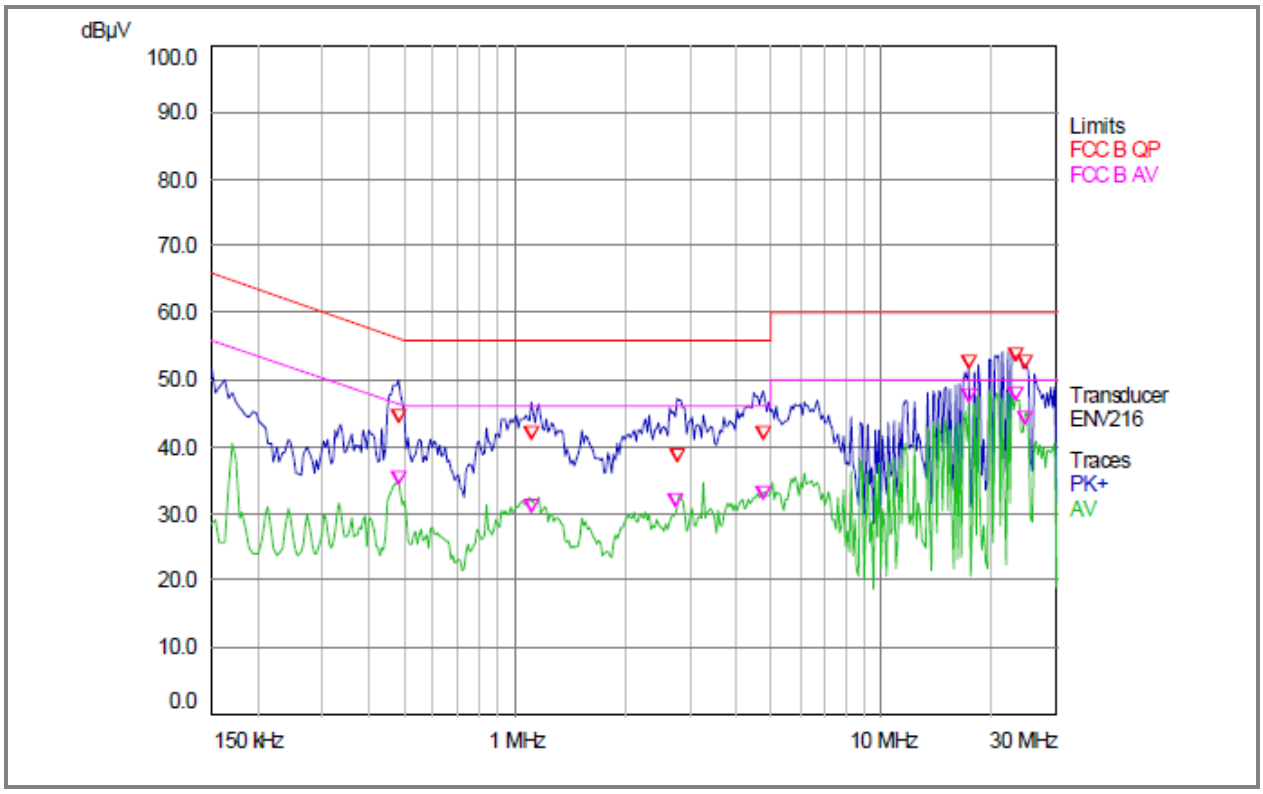


Test mode: TM3 - Line

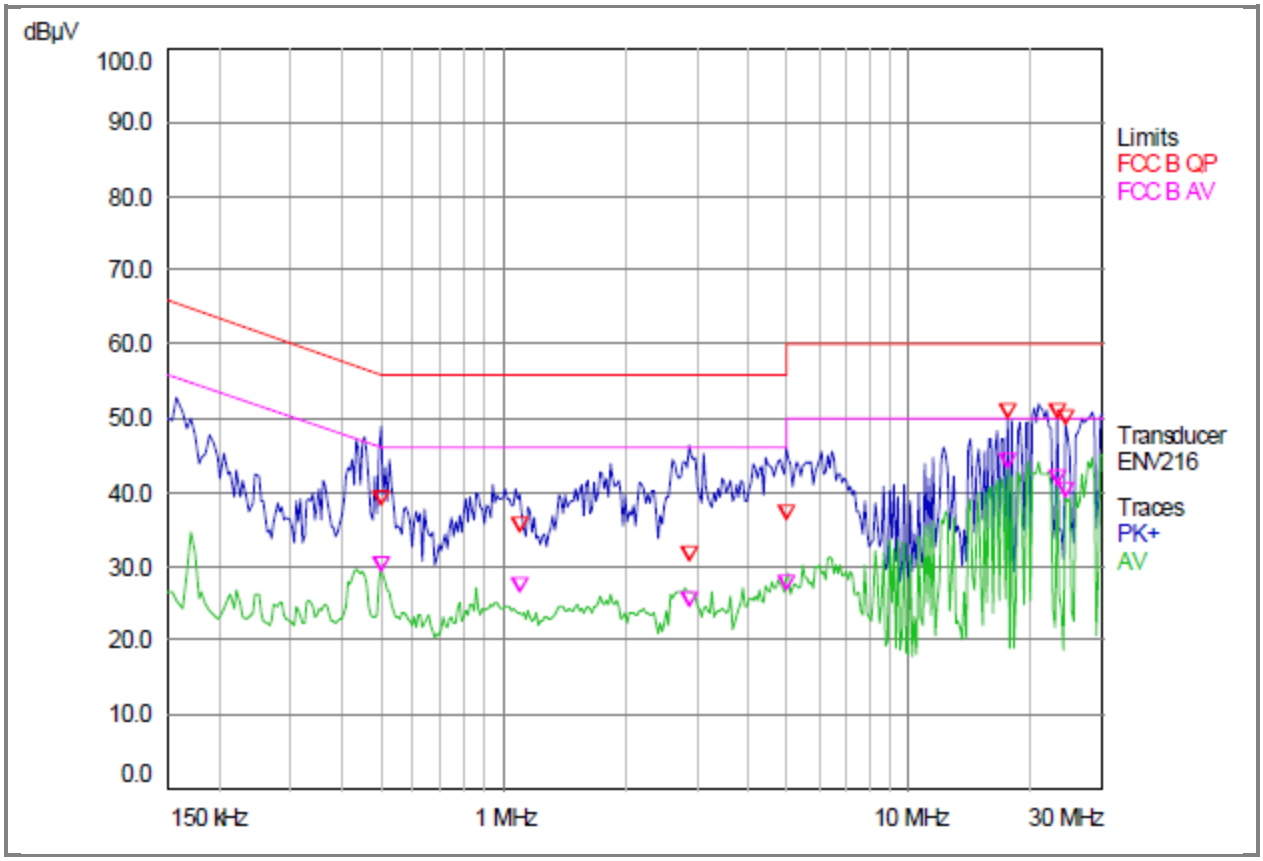


Plot of conducted power line

Test mode: TM4 - Neutral

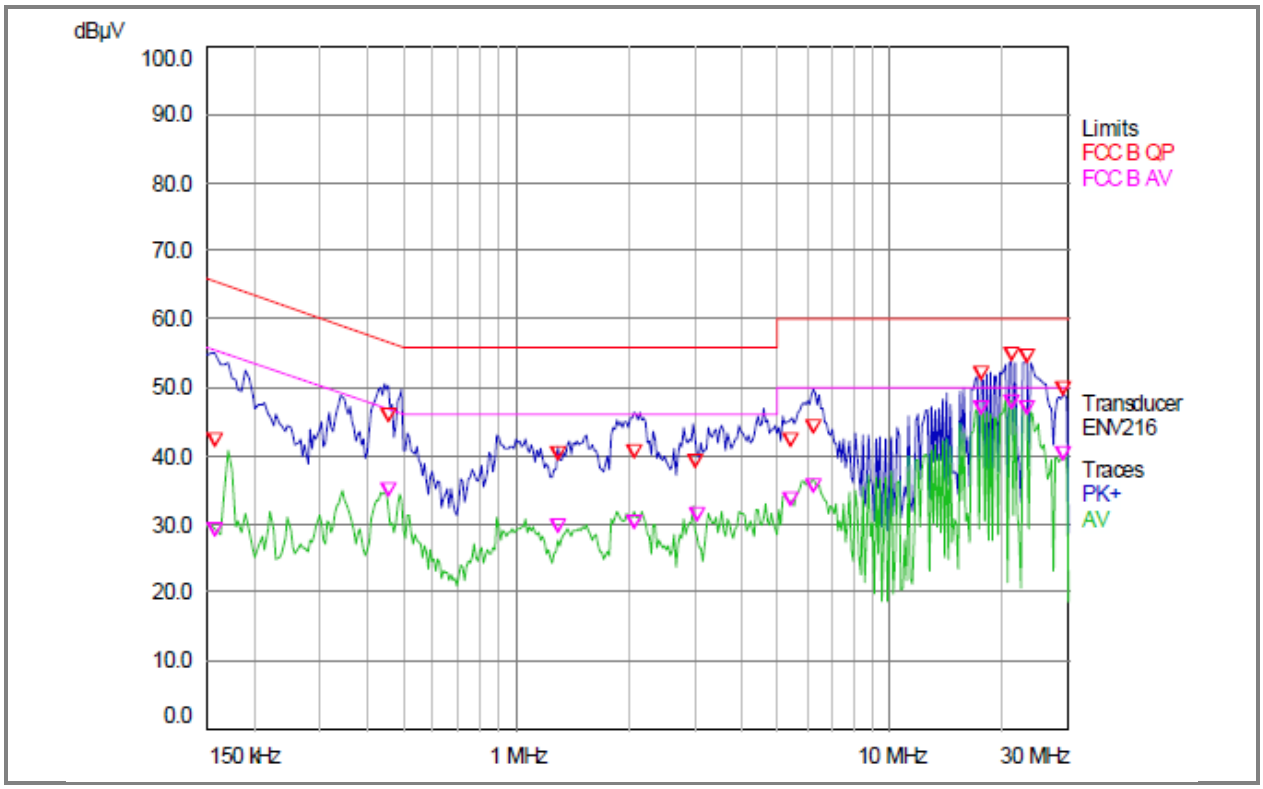


Test mode: TM4 - Line



Plot of conducted power line

Test mode: TM5 - Neutral



Test mode: TM5 - Line