

TEST REPORT

of

FCC Part 15 Subpart C §15.209
IC RSS-216 Issue 2, RSS-Gen Issue 5

FCC ID: A3LSMT870
IC Certification: 649E-SMT870

1. Equipment Under Test : Portable Tablet
2. Model Name : SM-T870
3. Variant Model Name(s) : -
4. Applicant : Samsung Electronics Co., Ltd.
5. Date of Receipt : 2020.06.12
6. Date of Test(s) : 2020.06.05 ~ 2020.07.16
7. Date of Issue : 2020.07.27

In the configuration tested, the EUT complied with the standards specified above. This test report does not assure KOLAS accreditation.

- 1) The results of this test report are effective only to the items tested.
- 2) The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received.

Tested by:



Jinhyoung Cho

Technical
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Jungmin Yang

SGS Korea Co., Ltd. Gunpo Laboratory

INDEX

Table of Contents

1. General Information -----	3
2. Field Strength of Fundamental and Spurious Emission -----	7
3. 20 dB Bandwidth & 99 % Bandwidth -----	29
4. AC Power Line Conducted Emission -----	35

1. General Information

1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

- 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- Designation number: KR0150

All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>.

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1.2. Details of Applicant

Applicant : Samsung Electronics Co., Ltd.

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Contact Person : Seo, Deok-ho

Phone No. : +82 10 3955 6246

1.3. Description of EUT

Kind of Product	Portable Tablet
Model Name	SM-T870
Serial Number	R32N60011ZB, R32N60012YN
Power Supply	DC 3.86 V
Operation Mode	S-Pen WPT Digitizer Mode 1 Digitizer Mode 2
Frequency Range	530 kHz ~ 593 kHz
Antenna Type	Flat Coil Antenna
H/W Version	REV1.0
S/W Version	T870.001
Test S/W Version	T870XXE0ATF7

1.4. Introduction of Test Data Reuse

This report referenced from the FCC ID: A3LSMT875 WPT.

The applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID.

1.5. Difference

The FCC ID: A3LSMT870 shares the same enclosure and circuit board as FCC ID: A3LSMT875.
The BT antennas and surrounding circuitry and layout are identical between these two units.

After confirming through preliminary radiated emissions and conducted power that the performance of the FCC ID: A3LSMT875 remains representative of FCC ID: A3LSMT870.
The test data of FCC ID: A3LSMT875 being submitted for this application to cover WPT features.

1.6. Spot Check Data

Band	Test item	Mode	Frequency (kHz)	Limit	Original model	Spot check model	Deviation (dB)	Remark
					SM-T875	SM-T870		
					FCC ID: A3LSMT875	FCC ID: A3LSMT870 IC Certification: 649E-SMT870		
WPT	Field strength	Digitizer 1	562	32.61 dB μ V/m at 30 m	20.78 dB μ V/m at 30 m	20.77 dB μ V/m at 30 m	-0.01	-
	Spurious	S-Pen WPT	530	46 dB μ V/m	32.89 dB μ V/m	34.16 dB μ V/m	1.27	Noise floor level

Note;

Comparison of two models, upper deviation is within 3 dB range and all test results are under FCC/IC technical limits.

1.7. Reference Detail

Reference applicant that contains the reused reference data in the individual test reports:

Equipment class	Reference FCC ID	Application type	Reference test report number	Exhibit type	Variant test report number	Data reuse
DSS	A3LSMT875	Original grant	F690501-RF-RTL000913 (BT)	Test report	F690501-RF-RTL000959	All
DTS			F690501-RF-RTL000914 (LE)		F690501-RF-RTL000960	
			F690501-RF-RTL000916 (802.11b/g/n/ac)		F690501-RF-RTL000961	
			F690501-RF-RTL000917 (802.11ax)		F690501-RF-RTL000962	
			F690501-RF-RTL000919 (802.11a/n/ac)		F690501-RF-RTL000963	
NII			F690501-RF-RTL000921 (802.11ax)		F690501-RF-RTL000964	
			F690501-RF-RTL000922 (802.11a/n/ac/ax_DFS)		F690501-RF-RTL000965	
			F690501-RF-RTL000925 (WPT)		F690501-RF-RTL000966	
DCD						

1.8. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Spectrum Analyzer	R&S	FSV30	103210	Dec. 05, 2019	Annual	Dec. 05, 2020
Signal Generator	R&S	SMBV100A	255834	Jun. 03, 2020	Annual	Jun. 03, 2021
Amplifier	H.P.	8447F	2944A03909	Aug. 07, 2019	Annual	Aug. 07, 2020
Loop Antenna	Schwarzbeck Mess-Elektronik	FMZB 1519	1519-039	Aug. 22, 2019	Biennial	Aug. 22, 2021
Bilog Antenna	Schwarzbeck Mess-Elektronik	VULB9163	396	Mar. 21, 2019	Biennial	Mar. 21, 2021
Test Receiver	R&S	ESU26	100109	Feb. 18, 2020	Annual	Feb. 18, 2021
Turn Table	Innco systems GmbH	DS 1200 S	N/A	N.C.R.	N/A	N.C.R.
Controller	Innco systems GmbH	CONTROLLER CO3000-4P	CO3000/963/38 330516/L	N.C.R.	N/A	N.C.R.
Anechoic Chamber	SY Corporation	L × W × H (9.6 m × 6.4 m × 6.6 m)	N/A	N.C.R.	N/A	N.C.R.
Test Receiver	R&S	ESCI 7	100911	Feb. 19, 2020	Annual	Feb. 19, 2021
Two-Line V-Network	R&S	ENV216	100190	May 08, 2020	Annual	May 08, 2021
Shield Room	SY Corporation	L × W × H (6.5 m × 3.5 m × 3.5 m)	N/A	N.C.R.	N/A	N.C.R.
Coaxial Cable	RFONE	PL520-NMNM-4M (4 m)	20200324001	May 06, 2020	Semi-annual	Nov. 06, 2020
Coaxial Cable	RFONE	PL520-NMNM-10M (10 m)	20200324001	May 06, 2020	Semi-annual	Nov. 06, 2020

► Support Equipment

Description	Manufacturer	Model	FCC ID
Samsung Stylus Pen	Samsung Electronics Co., Ltd.	EJ-PT870	A3LEJPT870

1.9. Sample Calculation

Where relevant, the following sample calculation is provided:

Field strength level (dB μ V/m) = Measured level (dB μ V) + Antenna factor (dB/m) + Cable loss (dB) + AMP (dB)

1.10. Summary of Test Results

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15 Subpart C, IC RSS-216 Issue 2, RSS-Gen Issue 5			
Section in FCC	Section in IC	Test Item(s)	Result
15.209	RSS-216 Issue 2 6.2.2.2	Radiated Emission, Spurious Emission and Field Strength of Fundamental	Complied
2.1049	RSS-Gen Issue 5 6.7	20 dB Bandwidth & 99 % Bandwidth	Complied
15.207	RSS-216 Issue 2 6.2.2.1	AC Power Line Conducted Emission	Complied

1.11. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Parameter	Uncertainty
Conducted Disturbance	± 3.45 dB
Radiated Disturbance, 9 kHz to 30 MHz	± 3.59 dB
Radiated Disturbance, below 1 GHz	± 5.88 dB

Uncertainty figures are valid to a confidence level of 95 %.

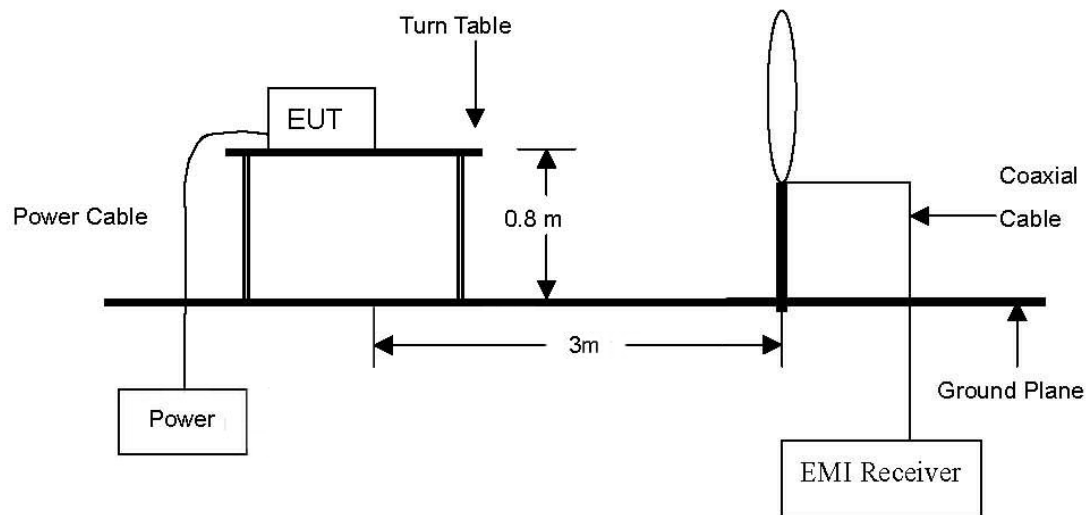
1.12. Test Report Revision

Revision	Report Number	Date of Issue	Description
0	F690501-RF-RTL000966	2020.07.17	Initial
1	F690501-RF-RTL000966-1	2020.07.27	Modified reference test report number of 1.7. reference detail.

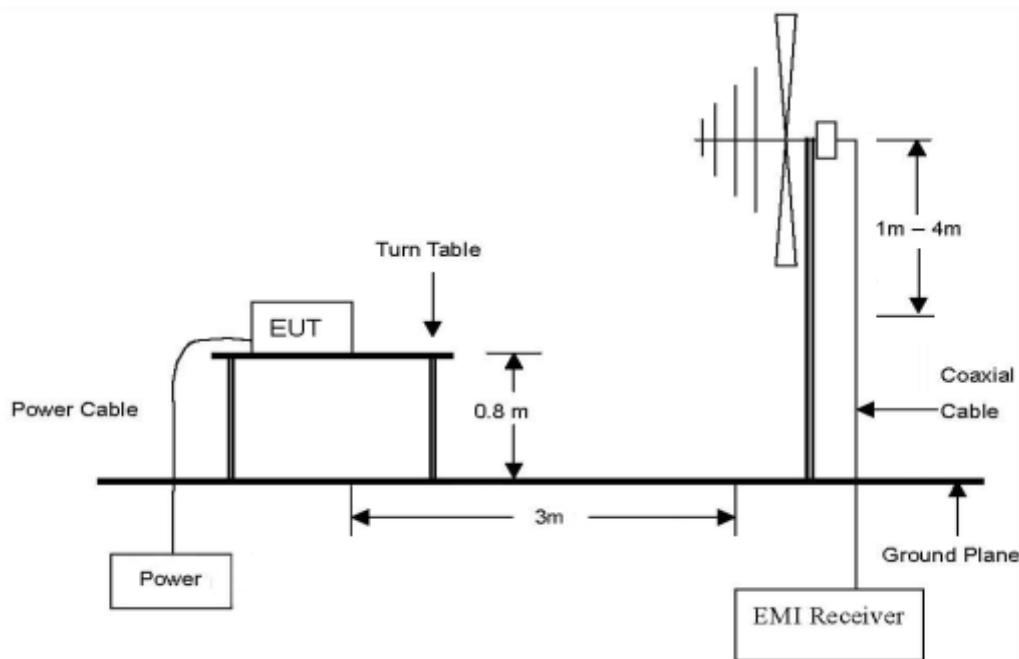
2. Field Strength of Fundamental and Spurious Emission

2.1. Test Setup

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



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



2.2. Limit

2.2.1. FCC

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 (microvolts/meter)	Measurement Distance (meter)
0.009-0.490	2 400/F(kHz)	300
0.490-1.705	24 000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

** 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., §§15.231 and 15.241

2.2.2. IC

According to RSS-216 Issue 2, 6.2.2.2,

The magnetic field radiated emissions within 9 kHz - 30 MHz from the WPT subassembly of WPT source and client devices and WPT systems shall comply with the limits for induction cooking (group 2) equipment, as set out in the CISPR 11 standard referenced in ICES-001. The preferred test method for WPT devices that may be used in residential environments and that have a maximum dimension of less than or equal to 1.6 m is the test method using the van Veen loop antenna system, as per the CISPR 11 standard referenced in ICES-001. However, it is acceptable to use the alternate 60 cm loop test method and corresponding limit for these small residential WPT devices (the same as for commercial / industrial and large residential devices).

Table 3b - Limits of the magnetic field strength

Frequency range (MHz)	Limits in dB(μA/m) at 3 m distance Quasi-peak
0.009 to 0.070	69
0.070 to 0.148 5	69 Decreasing linearly with logarithm of frequency to 39
0.148 5 to 4.0	39 Decreasing linearly with logarithm of frequency to 3
4.0 to 30	3
NOTE: The limits of Table 3b apply to induction cooking appliances for commercial use and those for domestic use with a diagonal diameter of more than 1.6 m. Measurements are performed at 3 m distance with a 0.6 m loop antenna as described in 5.5.2.1 of CISPR 16-1. The antenna shall be vertically installed, with the lower edge of the loop at 1 m height above the floor.	

The electric field radiated emissions within 30 - 1 000 MHz from the WPT subassembly of WPT source and client devices and WPT systems shall comply with the Class B limits for group 2 equipment, as set out in the CISPR 11 standard referenced in ICES-001.

**Table 4 - Electromagnetic radiation disturbance limits for group 2,
 class B equipment measured on a test site**

Frequency band (MHz)	Electric field Measurement distance 10 m		Magnetic field Measurement distance 10 m Quasi-peak limits dB(μ V/m)
	Quasi-peak limits dB(μ V/m)	Average limits ^a dB(μ V/m)	
0.15 to 30	-	-	39 Decreasing linearly with logarithm of frequency to 3
30 to 80.872	<u>30</u>	25	-
80.872 to 81.848	<u>50</u>	45	-
81.848 to 134.786	<u>30</u>	25	-
134.786 to 136.414	<u>50</u>	45	-
136.414 to 230	<u>30</u>	25	-
230 to 1 000	<u>37</u>	32	-

^a The average limits apply to magnetron driven equipment only. If magnetron driven equipment exceeds the quasi-peak limit at certain frequencies, then the measurement shall be repeated at these frequencies with the average detector and the average limits specified in this table apply.

2.3. Test Procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.10:2013.

2.3.1. Test Procedures for emission from 9 kHz to 30 MHz

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Quasi Peak and Average Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note;

Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 meter open field test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788 D01 Radiated Test Site v01r01.

2.3.2. Test Procedures for emission from 30 MHz to 1 000 MHz

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 3 meter away from the interference-receiving antenna.
- The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

2.4. Field Strength of Fundamental Test Result

Ambient temperature : $(23 \pm 1) ^\circ\text{C}$
Relative humidity : 47 % R.H.

The following table shows the highest levels of radiated emissions on between polarizations of horizontal and vertical.

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 30 m	Limit (dB μ V/m) at 30 m	Margin (dB)
S-Pen WPT (530 kHz)									
0.531	38.00	Quasi peak	H	17.72	0.02	55.74	15.74	33.10	17.36
Digitizer Mode 1 (562 kHz)									
0.562	43.01	Quasi peak	H	17.75	0.02	60.78	20.78	32.61	11.83
Digitizer Mode 2 (593 kHz)									
0.593	39.00	Quasi peak	H	17.77	0.02	56.79	16.79	32.14	15.35

Remark;

- According to §15.31(f)(2),
- 30 m Result (dB μ V/m) = 3 m Result (dB μ V/m) - $40\log(30/3)$ (dB μ V/m).
- According to field strength table of general requirement in §15.209(a), field strength limits below 1.705 MHz were calculated as below.
- 9 kHz to 490 kHz: $20\log(2400/F)$ (kHz) at 300 m (dB μ V/m)
- 490 kHz to 1.705 MHz: $20\log(24000/F)$ (kHz) at 30 m (dB μ V/m)
- According to §15.209(d), the measurements were tested by using Quasi peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1 GHz in these three bands on measurements employing an average detector.
- The limit above was calculated based on table of §15.209(a).

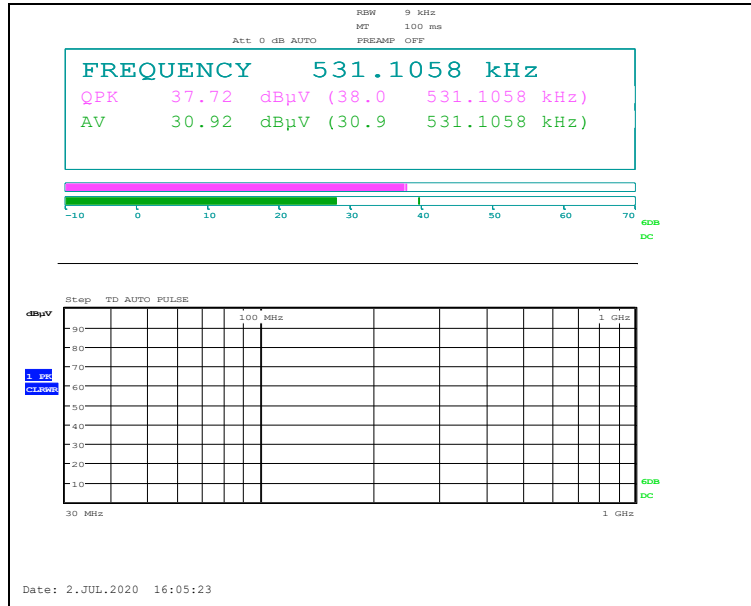
Radiated Emissions			Ant.	Correction Factors			Total	IC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Conversion factor (dB)	Actual (dB μ A/m) at 3 m	Limit (dB μ A/m) at 3 m	Margin (dB)
S-Pen WPT (530 kHz)									
0.531	38.00	Quasi Peak	H	17.72	0.02	-51.50	4.24	35.42	31.18
Digitizer Mode 1 (562 kHz)									
0.562	43.01	Quasi Peak	H	17.75	0.02	-51.50	9.28	35.14	25.86
Digitizer Mode 2 (593 kHz)									
0.593	39.00	Quasi Peak	H	17.77	0.02	-51.50	5.29	34.85	29.56

Remark;

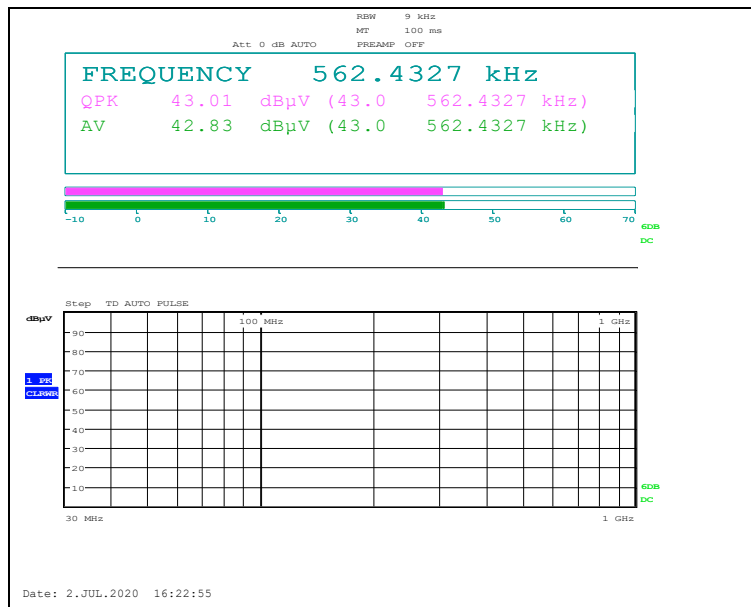
1. According to ANSI C63.10: 2013,
conversion factor from E-field to H-field is considered as free-space impedance [$1 \mu\text{V/m} = (1/377 \Omega) \times 1 \mu\text{A/m}$]
2. According to CISPR 11, the measurements were tested by using quasi peak detector.
3. Actual (dB μ A/m) at 3 m = Reading (dB μ V) + AF (dB/m) + CL (dB) + Conversion factor (dB)

- Test plots

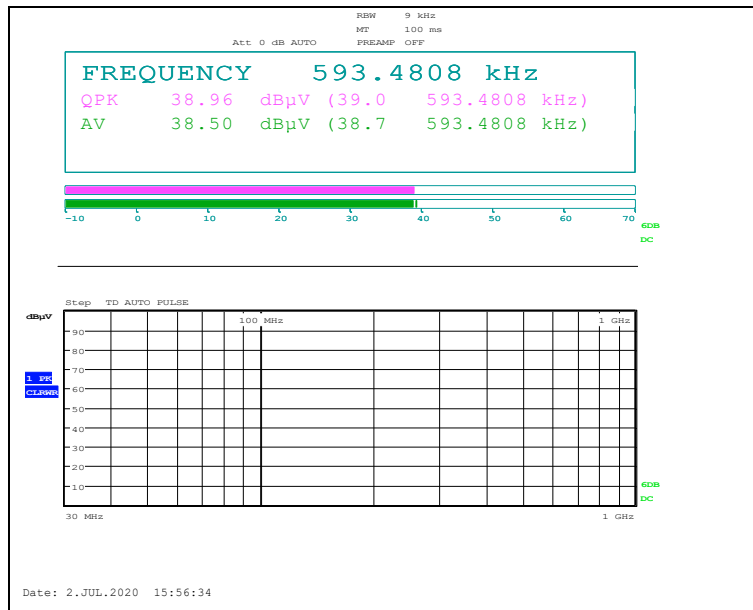
S-Pen WPT (530 kHz)



Digitizer Mode 1 (562 kHz)



Digitizer Mode 2 (593 kHz)



2.5. Spurious Emission Test Result

Ambient temperature : (23 ± 1) °C
Relative humidity : 47 % R.H.

The following table shows the highest levels of radiated emissions on between polarizations of horizontal and vertical.

S-Pen WPT (530 kHz)

Below 30 MHz

Radiated Emissions			Ant.	Correction Factors		Total		FCC Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dBμV/m) at 3 m	Actual (dBμV/m) at 300 m or 30 m	Limit (dBμV/m) at 300 m or 30 m	Margin (dB)
0.019	32.90	Average	H	18.23	0.01	51.14	-28.86	42.03	70.89
0.035	32.80	Average	H	17.89	0.01	50.70	-29.30	36.72	66.02
2.287	7.90	Quasi Peak	H	18.23	0.03	26.16	-13.84	30.00	43.84

Above 30 MHz

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
596.12	29.00	Peak	V	25.22	-25.87	28.35	46.00	17.65
911.08	29.10	Peak	H	28.30	-24.51	32.89	46.00	13.11

Digitizer Mode 1 (562 kHz)

Below 30 MHz

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 300 m or 30 m	Limit (dB μ V/m) at 300 m or 30 m	Margin (dB)
0.019	31.20	Average	H	18.23	0.01	49.44	-30.56	42.03	72.59
0.035	32.40	Average	H	17.89	0.01	50.30	-29.70	36.72	66.42
2.392	8.30	Quasi Peak	H	18.24	0.03	26.57	-13.43	30.00	43.43

Above 30 MHz

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
44.83	27.70	Peak	H	20.58	-27.47	20.81	40.00	19.19
50.25	28.60	Peak	V	20.25	-27.46	21.39	40.00	18.61
848.68	29.60	Peak	V	27.45	-24.79	32.26	46.00	13.74
Above 900.00	Not detected	-	-	-	-	-	-	-

Digitizer Mode 2 (593 kHz)

Below 30 MHz

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dBμV/m) at 3 m	Actual (dBμV/m) at 300 m or 30 m	Limit (dBμV/m) at 300 m or 30 m	Margin (dB)
0.019	32.00	Average	H	18.23	0.01	50.24	-29.76	42.03	71.79
0.035	33.00	Average	H	17.89	0.01	50.90	-29.10	36.72	65.82
0.859	12.00	Quasi Peak	H	17.99	0.03	30.02	-9.98	28.92	38.90
2.365	8.30	Quasi Peak	H	18.24	0.03	26.57	-13.43	30.00	43.43

Above 30 MHz

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
612.28	29.30	Peak	V	25.15	-25.91	28.54	46.00	17.46
873.17	29.50	Peak	V	27.70	-24.64	32.56	46.00	13.44
Above 900.00	Not detected	-	-	-	-	-	-	-

Remark;

- According to §15.31 (f)(2),
- 300 m Result (dBμV/m) = 3 m Result (dBμV/m) - 40log (300/3) (dBμV/m)
- 30 m Result (dBμV/m) = 3 m Result (dBμV/m) - 40log (30/3) (dBμV/m)
- According to field strength table of general requirement in §15.209 (a), field strength limits below 1.705 MHz were calculated as below.
- 9 kHz to 490 kHz: 20log (2 400 / F (kHz)) at 300 m (dBμV/m)
- 490 kHz to 1.705 MHz: 20log (24 000 / F (kHz)) at 30 m (dBμV/m)
- According to §15.209 (d), the measurements were tested by using Quasi peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1 GHz in these three bands on measurements employing an average detector.
- The limit above was calculated based on table of §15.209 (a).
- Radiated spurious emission measurement at below 30 MHz.
(Actual (dBμV/m) at 3m = Reading (dBμV) + AF (dB/m) + CL (dB))
- Radiated spurious emission measurement at above 30 MHz.
(Actual (dBμV/m) = Reading (dBμV) + AF (dB/m) + CL (dB) + AMP (dB))
- According to §15.31(o), emission levels are not report much lower than the limits by over 20 dB.

S-Pen WPT (530 kHz)
Below 30 MHz

Radiated Emissions			Ant.	Correction Factors			Total	IC Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Conversion factor (dB)	Actual (dBμA/m) at 3 m	Limit (dBμA/m) at 3 m	Margin (dB)
0.019	33.60	Quasi Peak	H	18.23	0.01	-51.50	0.34	69.00	68.66
0.035	32.60	Quasi Peak	H	17.89	0.01	-51.50	-1.00	69.00	70.00
2.287	7.90	Quasi Peak	H	18.23	0.03	-51.50	-25.34	19.01	44.35

Above 30 MHz

Radiated Emissions			Ant.	Correction Factors		Total		IC Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dBμV/m) at 3 m	Actual (dBμV/m) at 10 m	Limit (dBμV/m) at 10 m	Margin (dB)
596.12	29.00	Peak	V	25.22	-25.87	28.35	17.89	37.00	19.11
911.08	29.10	Peak	H	28.30	-24.51	32.89	22.43	37.00	14.57

Digitizer Mode 1 (562 kHz)
Below 30 MHz

Radiated Emissions			Ant.	Correction Factors			Total	IC Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Conversion factor (dB)	Actual (dBμA/m) at 3 m	Limit (dBμA/m) at 3 m	Margin (dB)
0.019	32.40	Quasi Peak	H	18.23	0.01	-51.50	-0.86	69.00	69.86
0.035	32.10	Quasi Peak	H	17.89	0.01	-51.50	-1.50	69.00	70.50
2.392	8.30	Quasi Peak	H	18.24	0.03	-51.50	-24.93	18.03	42.96

Above 30 MHz

Radiated Emissions			Ant.	Correction Factors		Total		IC Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dBμV/m) at 3 m	Actual (dBμV/m) at 10 m	Limit (dBμV/m) at 10 m	Margin (dB)
44.83	27.70	Peak	H	20.58	-27.47	20.81	10.35	30.00	19.65
50.25	28.60	Peak	V	20.25	-27.46	21.39	10.93	30.00	19.07
848.68	29.60	Peak	V	27.45	-24.79	32.26	21.80	37.00	15.20
Above 900.00	Not detected	-	-	-	-	-	-	-	-

Digitizer Mode 2 (593 kHz)

Below 30 MHz

Radiated Emissions			Ant.	Correction Factors			Total	IC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Conversion factor (dB)	Actual (dB μ A/m) at 3 m	Limit (dB μ A/m) at 3 m	Margin (dB)
0.019	32.70	Quasi Peak	H	18.23	0.01	-51.50	-0.56	69.00	69.56
0.035	32.60	Quasi Peak	H	17.89	0.01	-51.50	-1.00	69.00	70.00
0.859	12.00	Quasi Peak	H	17.99	0.03	-51.50	-21.48	32.36	53.84
2.365	8.30	Quasi Peak	H	18.24	0.03	-51.50	-24.93	18.28	43.21

Above 30 MHz

Radiated Emissions			Ant.	Correction Factors		Total		IC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 10 m	Limit (dB μ V/m) at 10 m	Margin (dB)
612.28	29.30	Peak	V	25.15	-25.91	28.54	18.08	37.00	18.92
873.17	29.50	Peak	V	27.70	-24.64	32.56	22.10	37.00	14.90
Above 900.00	Not detected	-	-	-	-	-	-	-	-

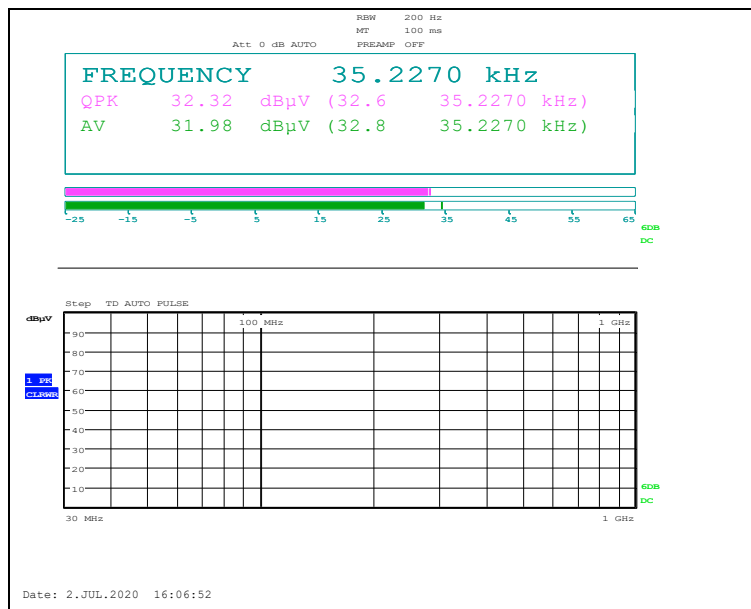
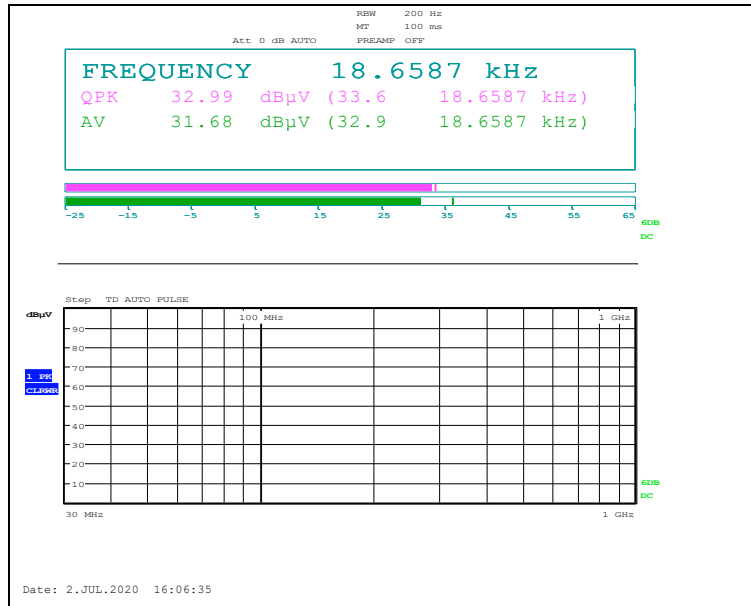
Remark;

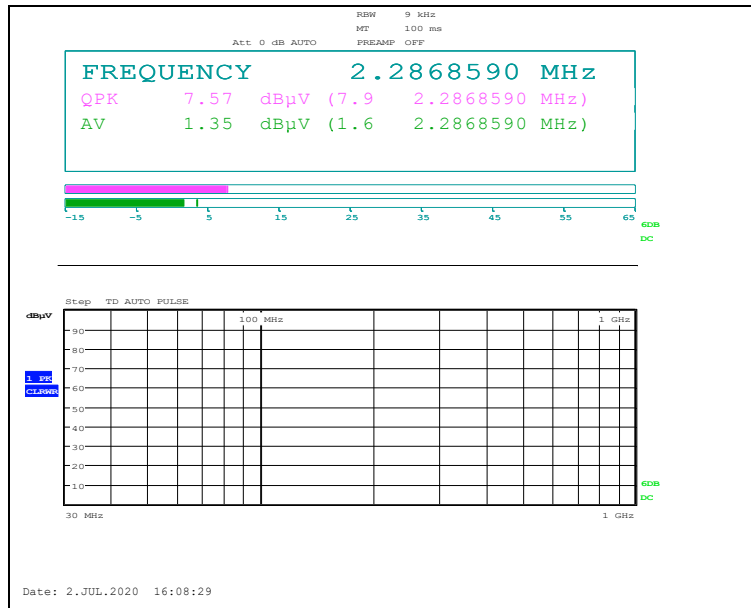
- According to ANSI C63.10: 2013, For measurement below 30 MHz.
conversion factor from E-field to H-field is considered as free-space impedance $[1 \mu\text{V/m} = (1/377 \Omega) \times 1 \mu\text{A/m}]$
- Actual (dB μ A/m) at 3 m = Reading (dB μ V) + AF (dB/m) + CL (dB) + Conversion factor (dB)
- Actual (dB μ V/m) at 3 m = Reading (dB μ V) + AF (dB/m) + CL (dB) + AMP (dB)
- According to 7.2.3 of CISPR 11:2004,
Actual (dB μ V/m) at 10 m = Actual (dB μ V/m) at 3 m - 20log (10/3) (dB μ V/m).
- According to RSS-Gen, emission levels are not report much lower than the limits by over 20 dB.

- Test plots

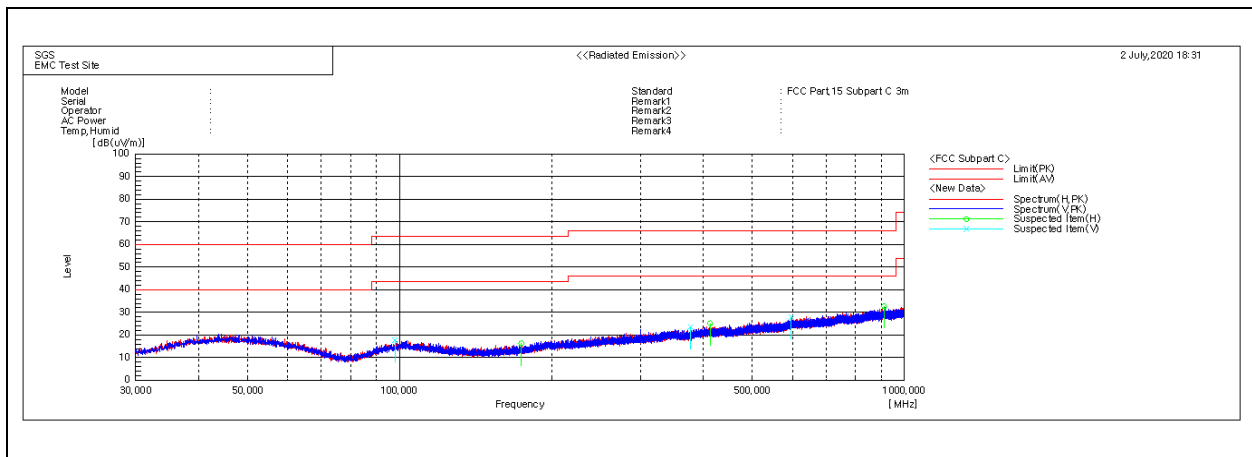
S-Pen WPT (530 kHz)

Below 30 MHz





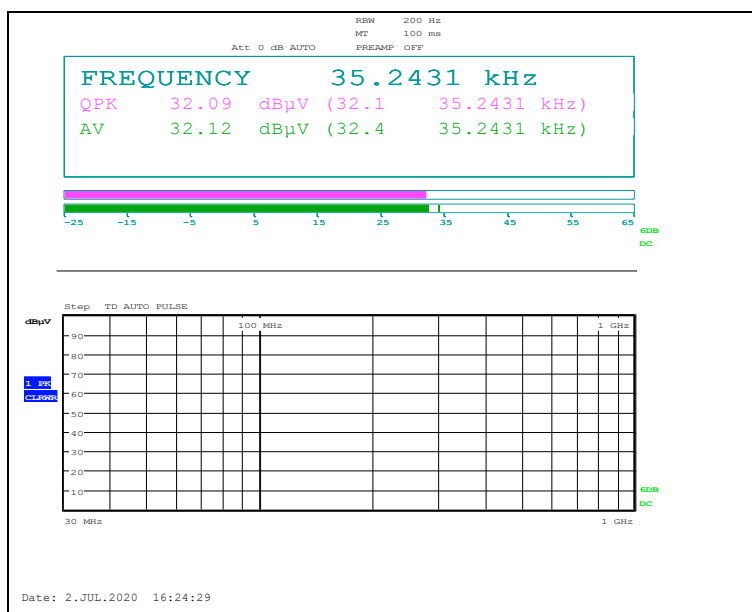
Above 30 MHz

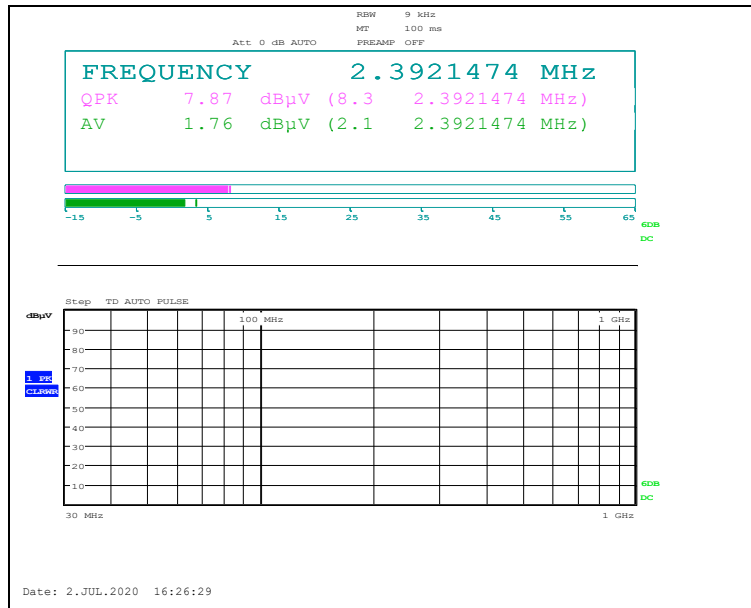


Remark;

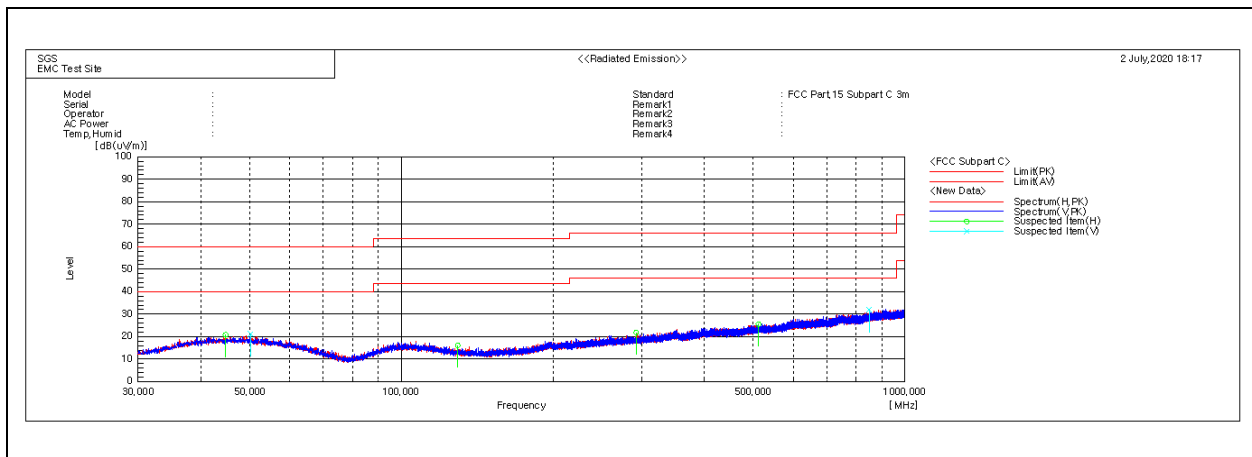
- Traces shown in the plot were made by using a peak detector.

Below 30 MHz





Above 30 MHz

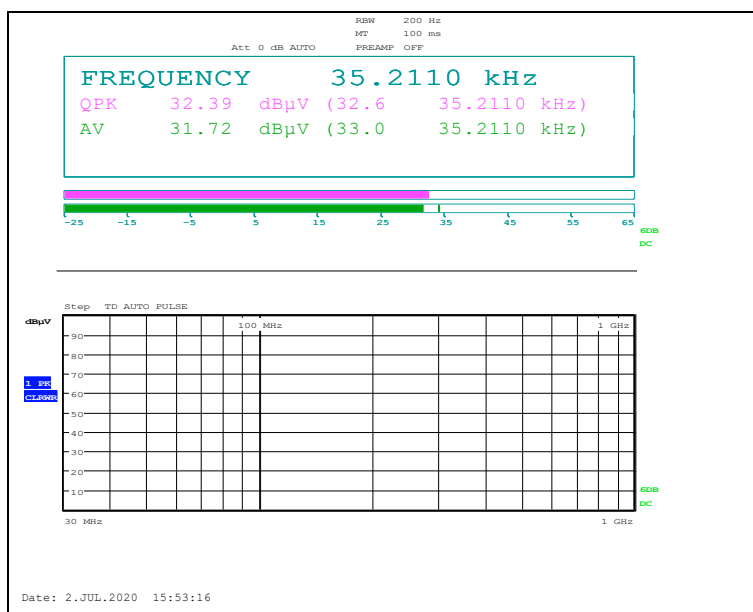
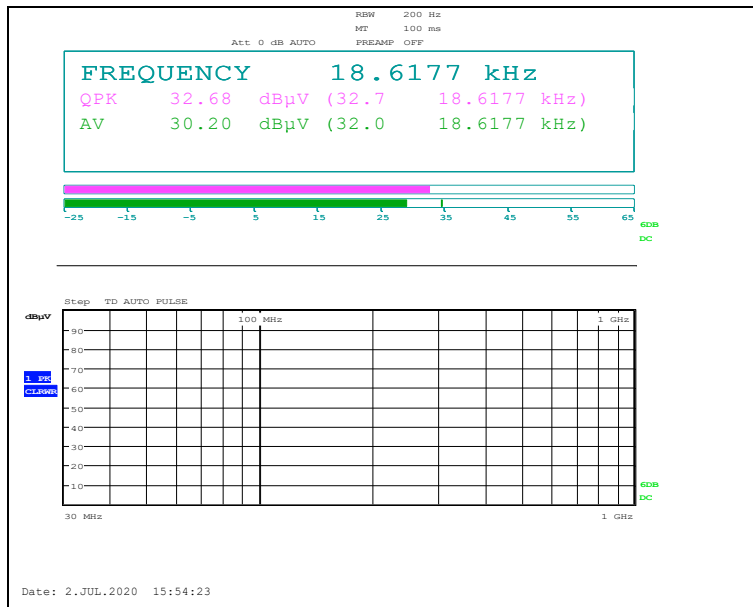


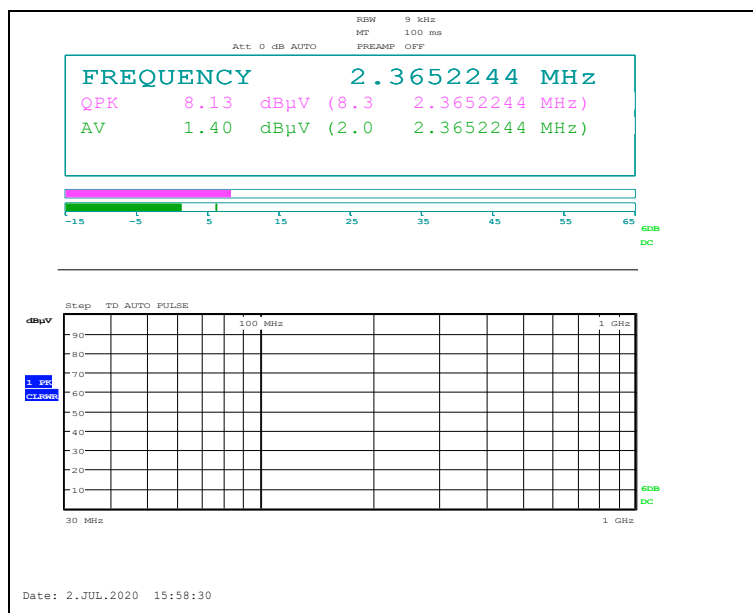
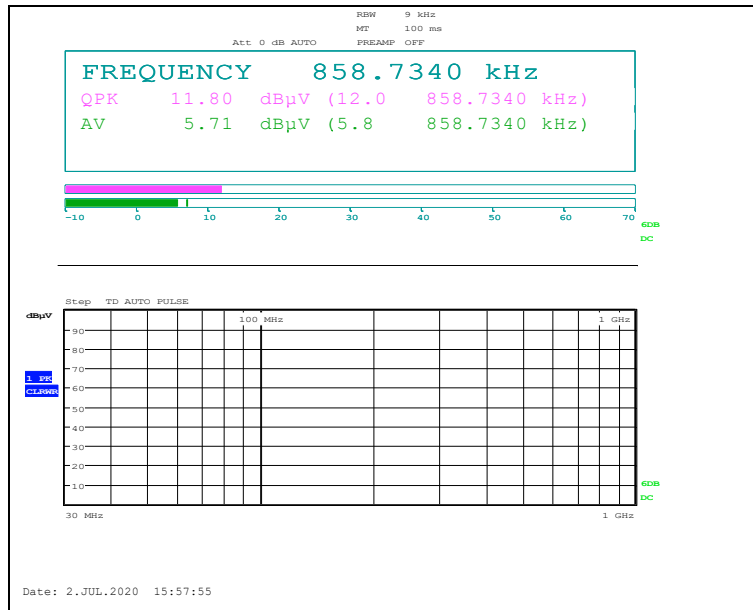
Remark;

- Traces shown in the plot were made by using a peak detector.

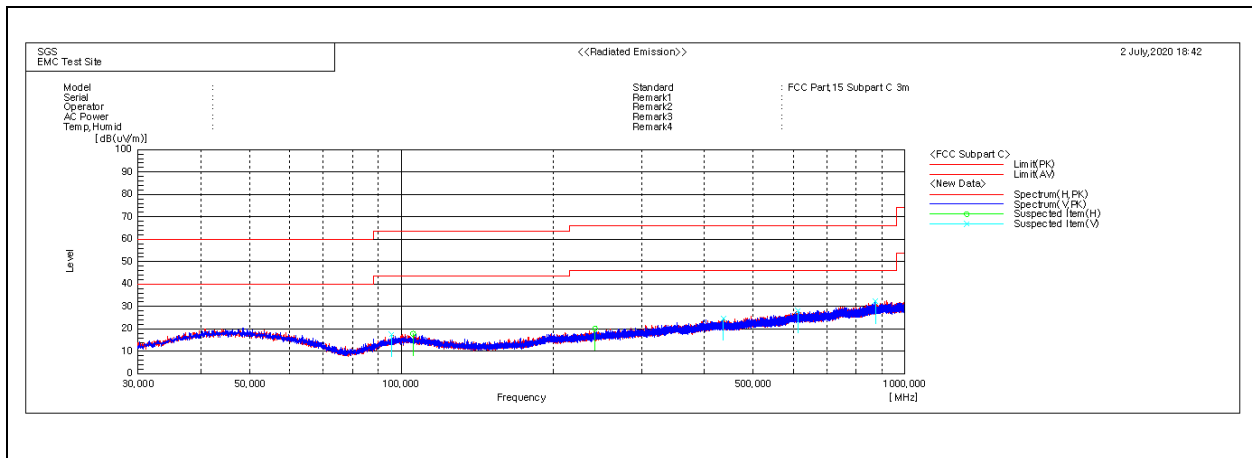
Digitizer Mode 2 (593 kHz)

Below 30 MHz





Above 30 MHz

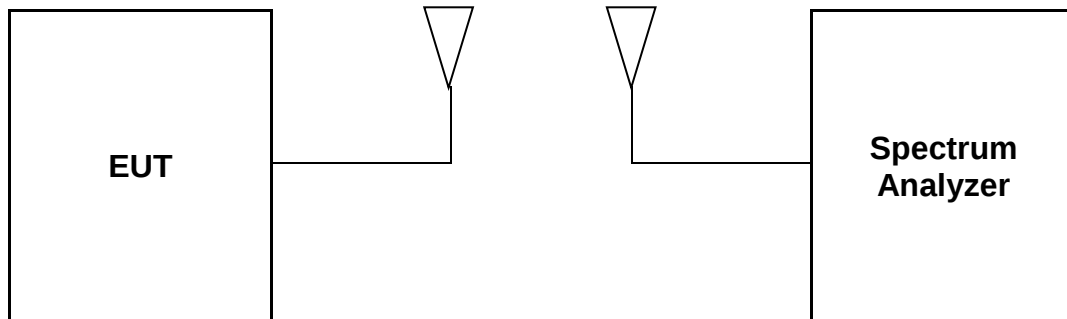


Remark;

- Traces shown in the plot were made by using a peak detector.

3. 20 dB Bandwidth & 99 % Bandwidth

3.1. Test Setup



3.2. Limit

None; for reporting purposed only

3.3. Test Procedure

3.3.1. 20 dB Bandwidth

- Span = set to capture all products of the modulation process, including the emission skirts.
RBW = 200 Hz, VBW = 200 Hz, Sweep = auto, Detector = peak, Trace = max hold.
- The marker-to-peak function to set the mark to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is 20 dB bandwidth of the emission.

3.3.1. 99 % Bandwidth

- Set the spectrum analyzer as Span = set to capture all products of the modulation process, including the emission skirts, RBW = 200 Hz, VBW = 200 Hz, Detector = peak, Trace mode = max hold.
- Measure lowest and highest frequencies are placed in a running sum until 0.5 % and 99.5 % of the total is reached.
- Record the SPAN between the lowest and the highest frequencies for the 99 % occupied bandwidth.

3.4. Test Result

Ambient temperature : (23 ± 1) °C

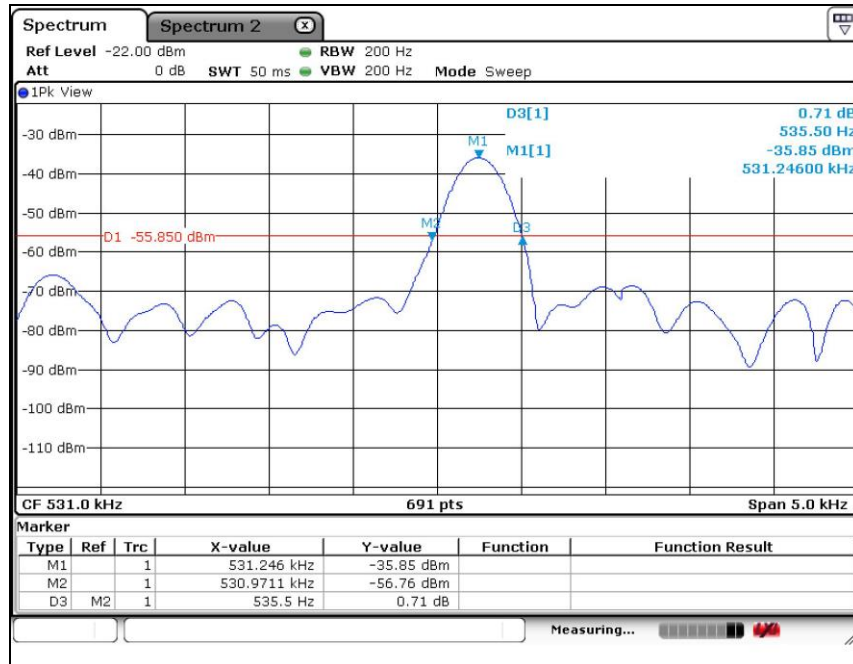
Relative humidity : 47 % R.H.

Test Condition	Frequency (kHz)	20 dB Bandwidth (kHz)	99 % Bandwidth (kHz)
S-Pen WPT	530	0.536	2.221
Digitizer Mode 1	562	0.536	2.200
Digitizer Mode 2	593	0.528	2.627

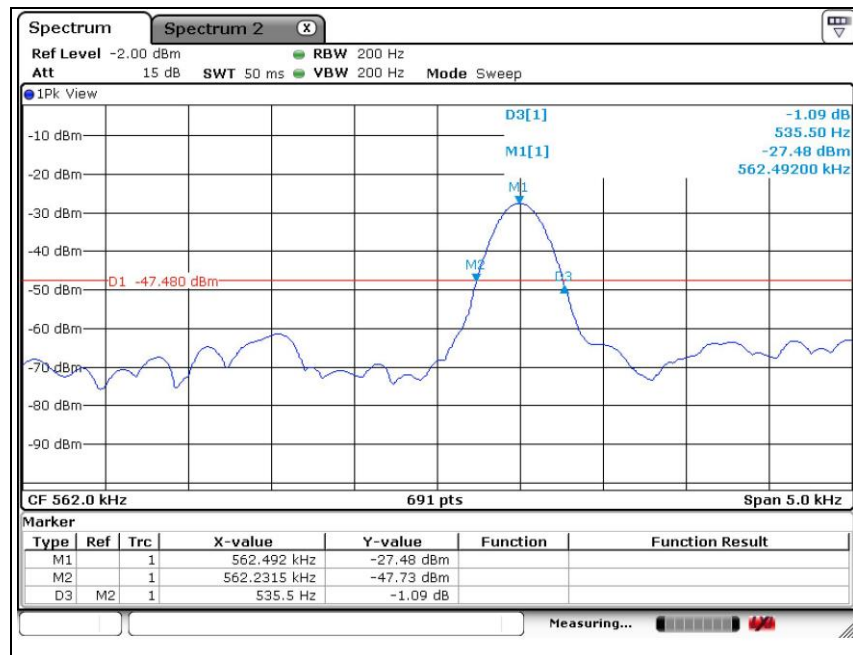
- Test plots

20 dB Bandwidth

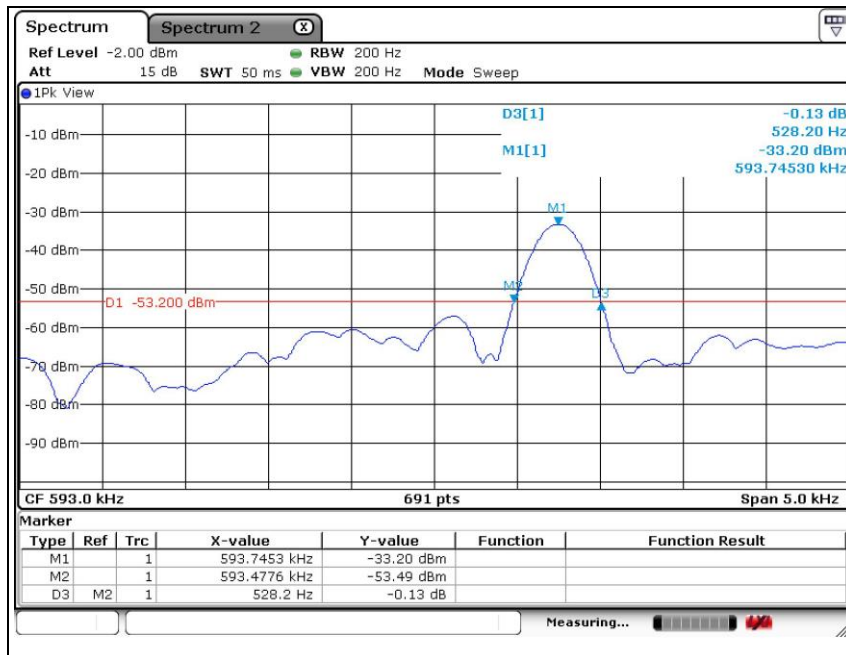
S-Pen WPT (530 kHz)



Digitizer Mode 1 (562 kHz)

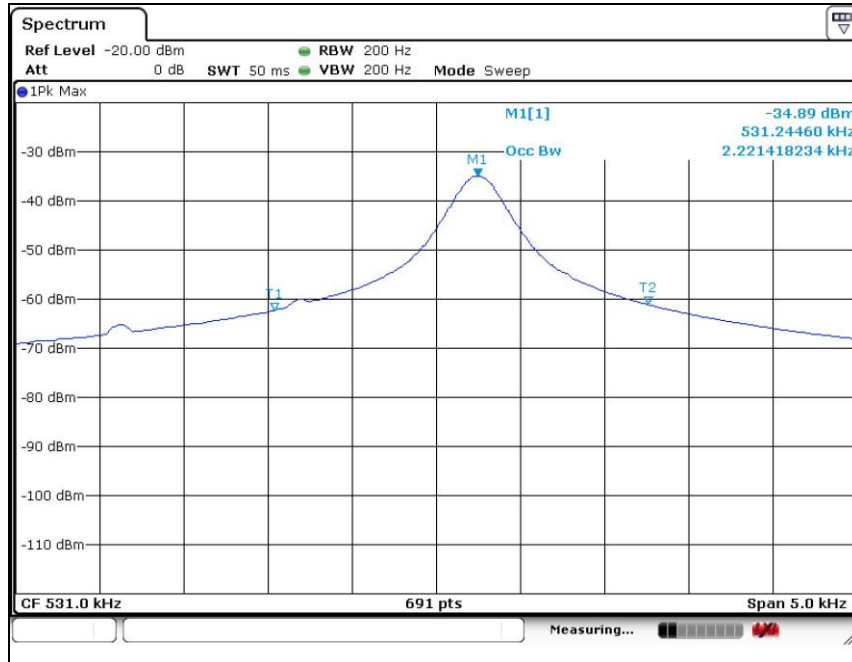


Digitizer Mode 2 (593 kHz)

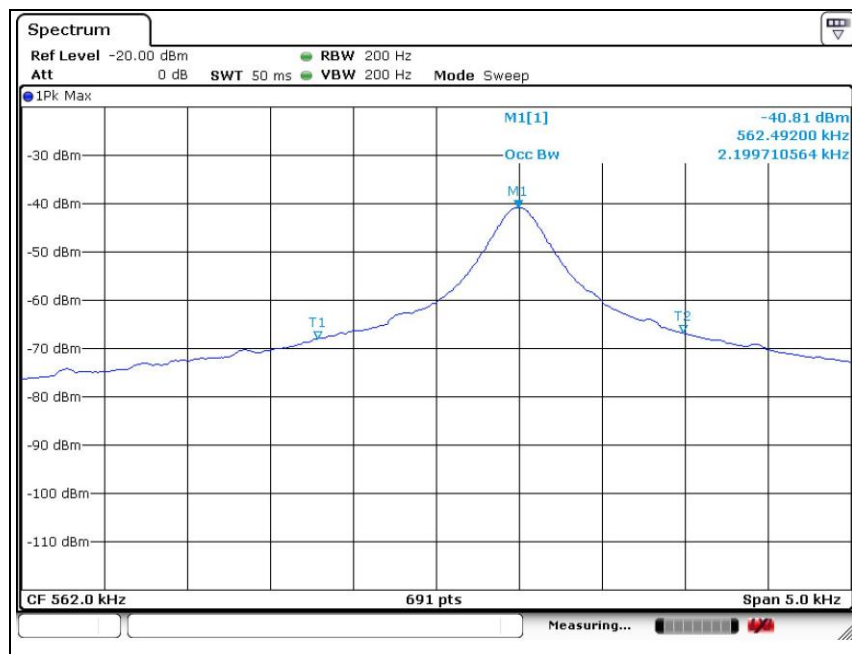


99 % Bandwidth

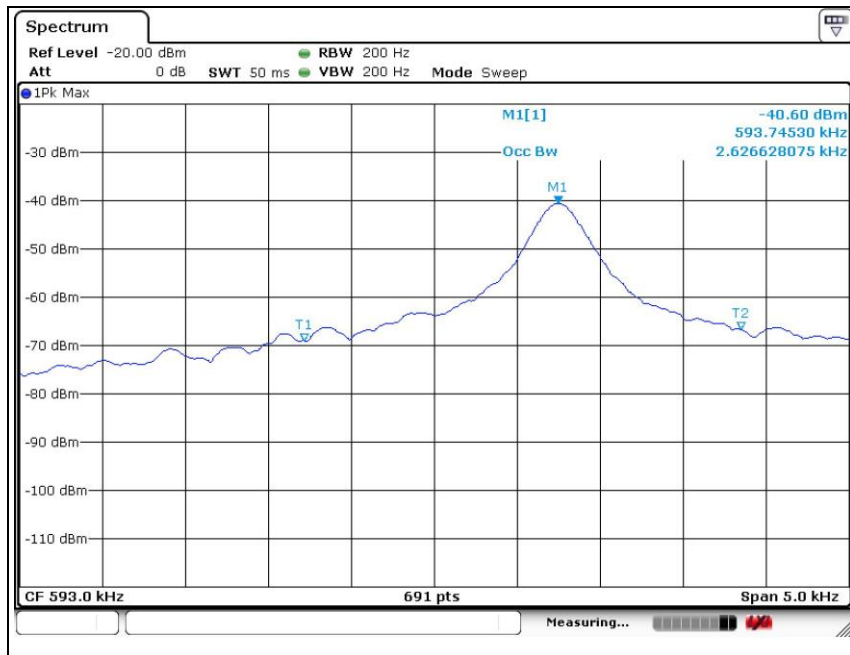
S-Pen WPT (530 kHz)



Digitizer Mode 1 (562 kHz)

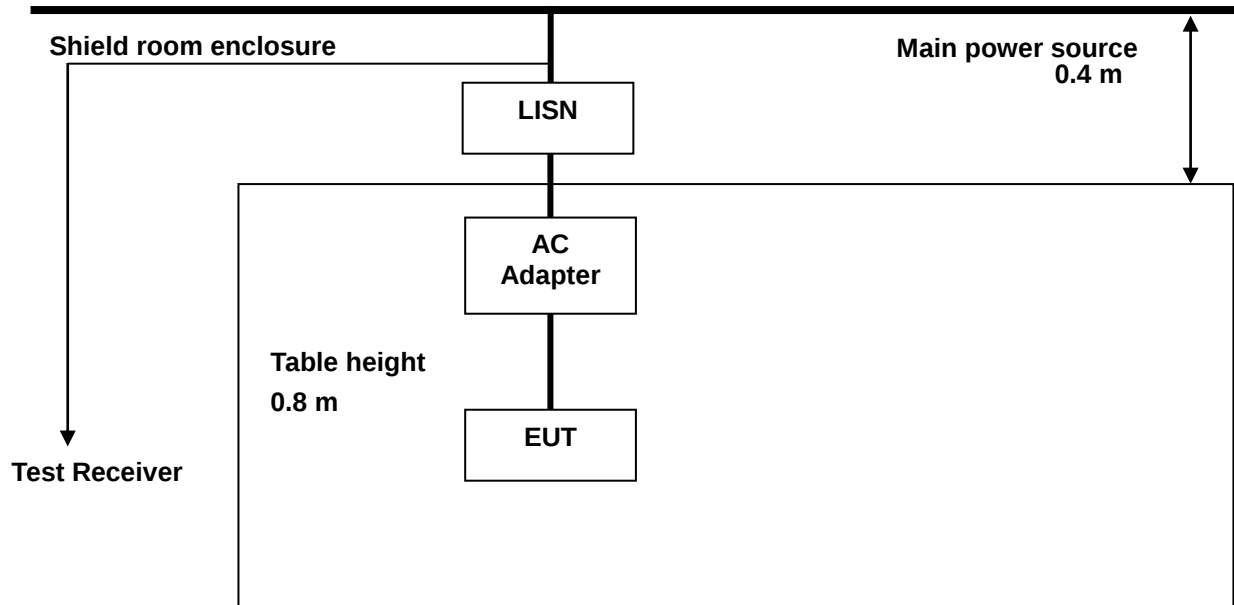


Digitizer Mode 2 (593 kHz)



4. AC Power Line Conducted Emission

4.1. Test Setup



4.2. Limit

4.2.1. FCC

According to §15.207(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 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H / 50 ohms line impedance stabilization network (LISN).

Compliance with the provision of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

4.2.2. IC

WPT subassemblies of WPT source devices shall comply with the mains terminals disturbance voltage limits for induction cooking (group 2) equipment, as set out in the CISPR 11 standard referenced in ICES-001.

Table 2c – Mains terminal disturbance voltage for induction cooking appliances

Frequency range (MHz)	Induction cooking appliance limits dB(μ V)	
	Quasi-peak	Average
0.009 to 0.050	110	-
0.050 to 0.148 5	90 Decreasing linearly with logarithm of frequency to 80	-
0.148 5 to 0.50	66 Decreasing linearly with logarithm of frequency to 56	56 Decreasing linearly with logarithm of frequency to 46
0.50 to 5	56	46
5 to 30	60	50
NOTE: The mains terminal disturbance voltage limits for a 100/110 V rated system are under consideration.		

4.3. Test Procedures

AC conducted emissions from the EUT were measured according to the dictates of ANSI C63.10:2013

1. The test procedure is performed in a 6.5 m × 3.5 m × 3.5 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.
2. 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.
3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
4. 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.

4.4. Test Results

The following table shows the highest levels of conducted emissions on both phase of Hot and Neutral line.

Ambient temperature : $(23 \pm 1) ^\circ\text{C}$
Relative humidity : 47 % R.H.

Frequency range : 0.15 MHz - 30 MHz
Measured Bandwidth : 9 kHz

S-Pen WPT (530 kHz)

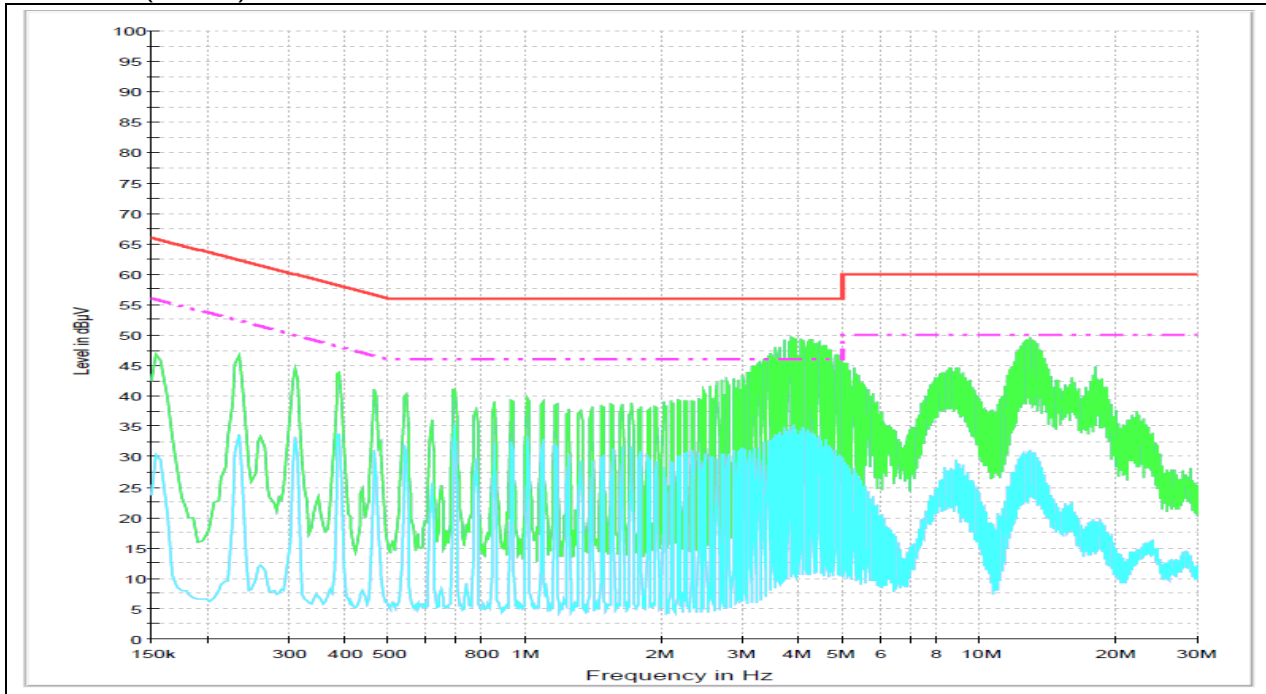
FREQ. (MHz)	LEVEL (dB μ V)		LINE	LIMIT (dB μ V)		MARGIN (dB)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.31	12.80	6.80	N	59.97	49.97	47.17	43.17
0.70	9.70	6.10	N	56.00	46.00	46.30	39.90
1.55	20.90	9.90	N	56.00	46.00	35.10	36.10
3.94	36.20	27.90	N	56.00	46.00	19.80	18.10
8.48	38.40	26.20	N	60.00	50.00	21.60	23.80
12.89	45.30	30.60	N	60.00	50.00	14.70	19.40
0.31	39.30	24.00	H	59.97	49.97	20.67	25.97
0.77	35.20	18.30	H	56.00	46.00	20.80	27.70
1.93	32.30	13.50	H	56.00	46.00	23.70	32.50
3.95	38.80	27.20	H	56.00	46.00	17.20	18.80
8.40	31.30	18.10	H	60.00	50.00	28.70	31.90
12.80	35.20	22.00	H	60.00	50.00	24.80	28.00

Remark;

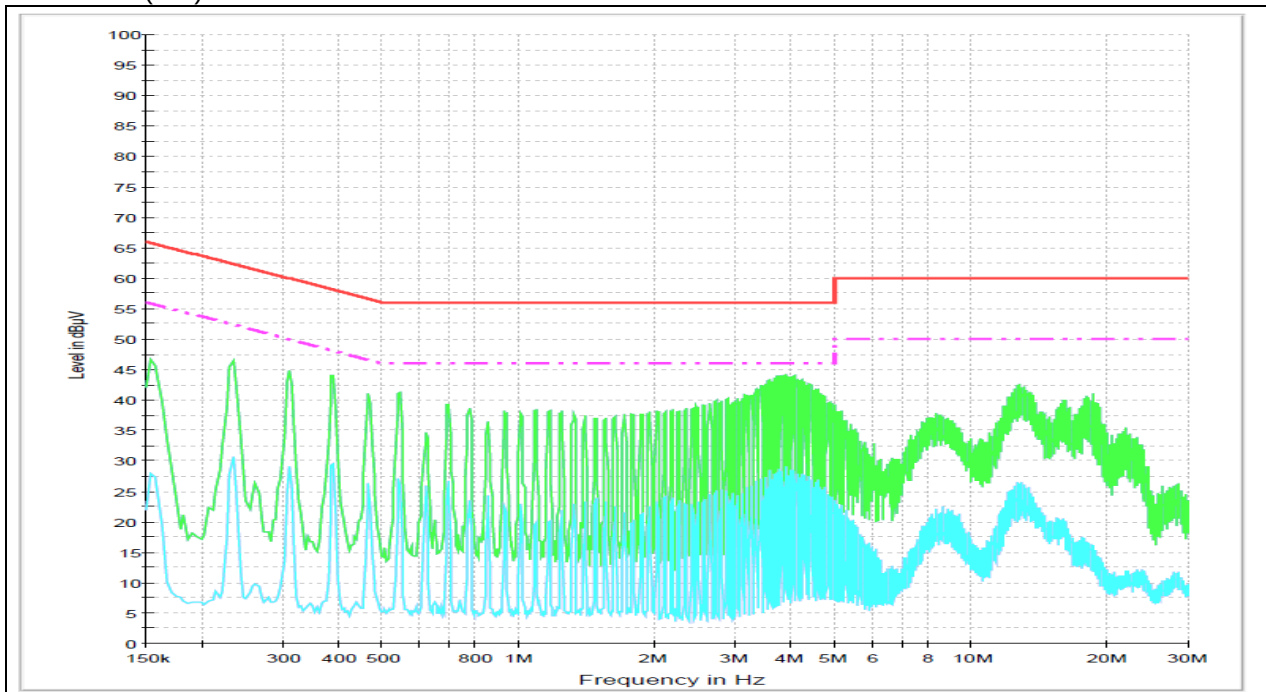
- Line (H): Hot, Line (N): Neutral
- All modes of operation were investigated and the worst-case emissions were reported using **S-Pen WPT**.
- The limit for Class B device(s) from 150 kHz to 30 MHz are specified in section of the Title 47 CFR.
- Traces shown in plot were made by using a peak detector and average detector.
- Deviations to the Specifications: None.

- Test plots

Test mode: (Neutral)



Test mode: (Hot)



- End of the Test Report -