

FCC Test Report

Report No.: ADC-ESH-P21112630B-7

FCC ID: 2ATJC-FCAARWPC

Product: Wireless Charger

Test Model: AR 15W WIRELESS CHARGER

Received Date: Nov.30, 2021

Test Date: Nov.30 to Dec.27,2021

Issued Date: Dec.27,2021

Applicant: Aptiv Electrical Centers (Shanghai) Co.,Ltd.

Address: Zone A, Building 7, No.60, Yuanguo Road, Anting Town, Jiading District

Manufacturer: Aptiv Electrical Centers (Shanghai) Co.,Ltd.

Address: Zone A, Building 7, No.60, Yuanguo Road, Anting Town, Jiading District

Issued By: BUREAU VERITAS ADT (Shanghai) Corporation

Lab Address: No. 829, Xinzhuang Road, Shanghai, P.R.China (201612)



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Release Control Record

Issue No.	Description	Date Issued
ADC-ESH-P21112630B-7	Original release	Dec.27,2021



1 Certificate of Conformity

Product: Wireless Charger

Brand: APTIV

Test Model: AR 15W WIRELESS CHARGER

Applicant: Aptiv Electrical Centers (Shanghai) Co.,Ltd.

Test Date: Nov.30 to Dec.27,2021

Standards: 47 CFR FCC Part 15, Subpart C
ANSI C63.10:2013

The above equipment has been tested by **BUREAU VERITAS ADT (Shanghai) Corporation**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by :

, Date:

Dec.27,2021

Yan ZHOU

Project Engineer

Approved by :

, Date:

Dec.27,2021

Daniel SUN

EMC Lab Manager



2 Summary of Test Results

The EUT has been tested according to the following specifications:

47 CFR FCC Part 15, Subpart C			
Standard Section	Test Type and Limit	Result	REMARK
§15.203	Antenna Requirement	PASS	No antenna connector is used.
§15.207	AC Power Conducted Emission	NA	The EUT is powered by DC source.
§15.209	Radiated Emission	PASS	Meet the requirement of limit.
§15.215 (c)	20dB Bandwidth	PASS	Meet the requirement of limit.

2.1 Test Instruments

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Hybrid Antenna(25MHz-1.5GHz)	Schwarzbeck	VULB9168	E1A1012	Jul.29, 20	Jul.28, 22
Horn Antenna(1GHz -18GHz)	Schwarzbeck	BBHA9120D	E1A1017	Aug.25, 20	Aug.24, 22
Double Ridge Horn Antenna(18G-40G)	COM-POWER	AH-840	E1A1040	Jul.15, 20	Jul.14, 22
Pre-Amplifier(100kHz-1.3GHz)	Agilent	8447D	E1A2001	Apr.19, 21	Apr.18, 22
Pre-Amplifier(0.5GHz-18GHz)	EMCI	EMC184045SE	E1A2009	Jul.05, 21	Jul.04, 22
Pre-Amplifier(18GHz-40GHz)	EMCI	EMC051845SE	E1A2008	Jul.05, 21	Jul.04, 22
EMI test receiver	R&S	ESR7	E1R1005	Apr.19, 21	Apr.18, 22
Spectrum Analyzer	Keysight	N9030B	E1S1003	Jul.22, 21	Jul.21, 22
Spectrum Analyzer	Keysight	N9020A	E1S1004	Mar.02, 21	Mar.01, 22
EMI test receiver	R&S	ESCS30	E1R1001	May.11, 21	May.10, 22
LISN	R&S	ENV216	E1L1011	May.11, 21	May.10, 22
Humidity&Temp Tester	Baolima	WS508	E1H1011	Apr. 02, 21	Apr. 01, 22
RF Control Unit	Toscend	JS0806-2	E1C5003	N/A	N/A
Test Software	ADT	ADT_COND_V7 .3.1	N/A	N/A	N/A
Test Software	Toscend	JS32-RE	N/A	N/A	N/A
Test Software	Toscend	JS1120	N/A	N/A	N/A
Test Software	Toscend	JS1120-3	N/A	N/A	N/A

2.2 Measurement Uncertainty

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

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

Measurement	Frequency	Expanded Uncertainty ($k=2$) ($\pm$)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.83 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.36 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	3.47 dB
	6GHz ~ 18GHz	3.75 dB
	18GHz ~ 40GHz	3.30 dB

2.3 Modification Record

There were no modifications required for compliance.

2.4 Support Units

Description	Manufacturer	Model No.	Serial No.
Dummy Load	N/A	N/A	N/A

3 General Information

3.1 General Description of EUT

Product	Wireless Charger
Brand	APTIV
Test Model	AR 15W WIRELESS CHARGER
Power Rating	12Vdc
Modulation Type	ASK
Modulation Technology	Qi
Operating Frequency	127.7 kHz
Antenna Type	Coil Antenna
Antenna Connector	--

Note:

1. For more details, please refer to the User's manual of the EUT.
2. All these models are same except appearance.
3. Wireless maximum transmitted power of the EUT is 15W , it also supports power output below 15W such as 5W/7.5W/10W ;

3.1.1 Test Mode Applicability:

EUT Configure Mode	Applicable to				Description
	RE (9 kHz~30MHz)	RE (30MHz~1GHz)	PLC	BW	
-	√	√	-	-	-

Where **RE≥1G**: Radiated Emission above 1GHz **RE< 1G**: Radiated Emission below 1GHz

PLC: Power Line Conducted Emission **BW**: 20dB Spectrum Bandwidth

Radiated Emission Test RE (9 kHz~30MHz):

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	Charging	127.7 kHz	127.7 kHz	ASK

Radiated Emission Test RE (30MHz~1GHz):

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	Charging	127.7 kHz	127.7 kHz	ASK

Power Line Conducted Emission Test:

☐ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	Charging	127.7 kHz	127.7 kHz	ASK

3.1.2 Test Condition:

Applicable to	Normal Environmental Conditions	Normal Input Power
RE (9 kHz~30MHz)	23deg. C, 58%RH	DC 12V
RE (30MHz~1GHz)	23deg. C, 58%RH	DC 12V
PLC	--	--

3.2 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units.

3.3 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standard:

FCC Part 15, Subpart C (15.207, 15.209)

ANSI C63.10:2013

All relaxed test items have been performed and recorded as per the above standard.

4 Test Procedure and Results

4.1 AC Power Conducted Emission

4.1.1 Limits

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.1.2 Test Procedures

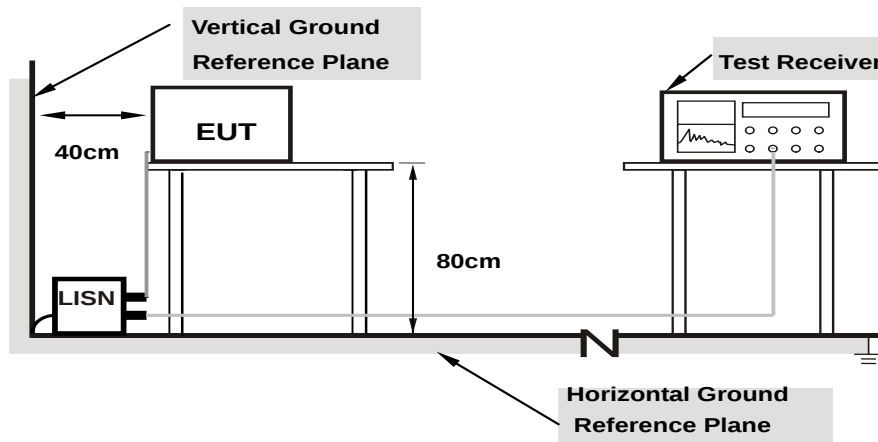
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.1.3 Deviation from Test Standard

No deviation.

4.1.4 Test Setup



Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.5 EUT Operating Conditions

Same as 4.1.6.

4.1.6 Test Results

Not applicable. The EUT is powered by DC source.

4.2 Radiated Emissions Measurement

For 15.205 requirement:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part15, must also comply with the radiated emission limits specified in Section 15.209(a).

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
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 - 156.525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(2)
13.36 - 13.41	--	--	--

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15C 15.209

Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

4.2.1 Test Procedure Reference

ANSI C63.10 Section 6.3 (General Requirements)

4.2.2 Test Procedures

For Radiated emission below 30MHz

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degree to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- Both X and Y axes of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and the rotate table was turned from 0 degree to 360 degree to find the maximum reading.
- The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

For Radiated emission above 30MHz

- The EUT was placed on the top of a rotating table 0.8 meters (for below 1 GHz) / 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The height of antenna 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.

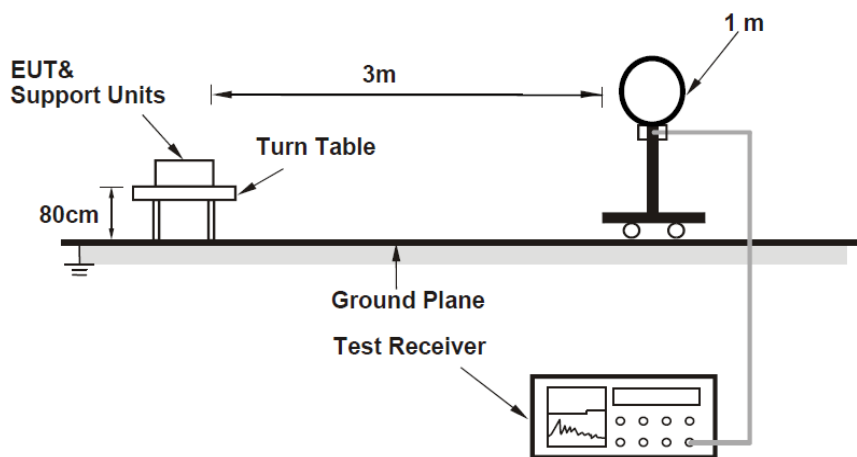
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

4.2.3 Deviation from Test Standard

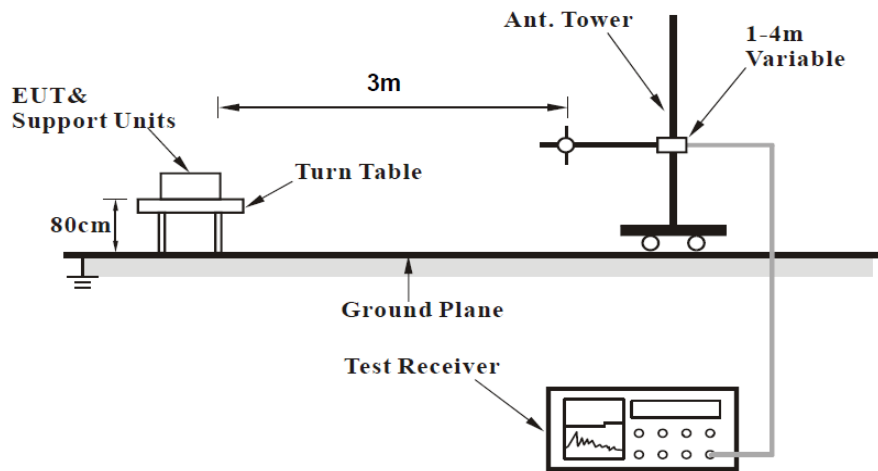
No deviation.

4.2.4 Test Setup

For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz

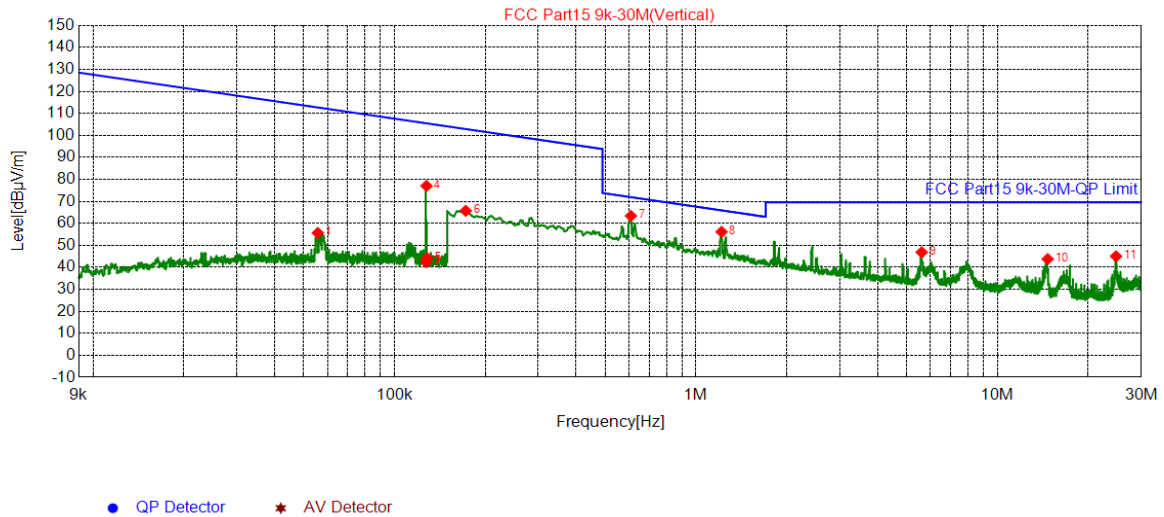


For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.5 Test Results

Radiated Emissions Range 9kHz~30MHz

Channel	127.7kHz	Detector Function	Quasi-Peak (QP)
Frequency Range	9kHz ~ 30MHz		



Final Data List

NO.	Freq. [MHz]	QP Reading [dBμV/m]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height[c m]	Angle [°]
1	0.0557	35.45	20.19	55.64	112.69	57.05	100	275
2	0.1724	45.70	20.01	65.71	102.87	37.16	100	198
3	0.6089	43.38	20.01	63.39	71.91	8.52	100	198
4	1.2171	36.11	20.01	56.12	65.90	9.78	100	198
5	5.6126	26.85	20.01	46.86	69.54	22.68	100	198
6	14.683	23.67	20.10	43.77	69.54	25.77	100	198

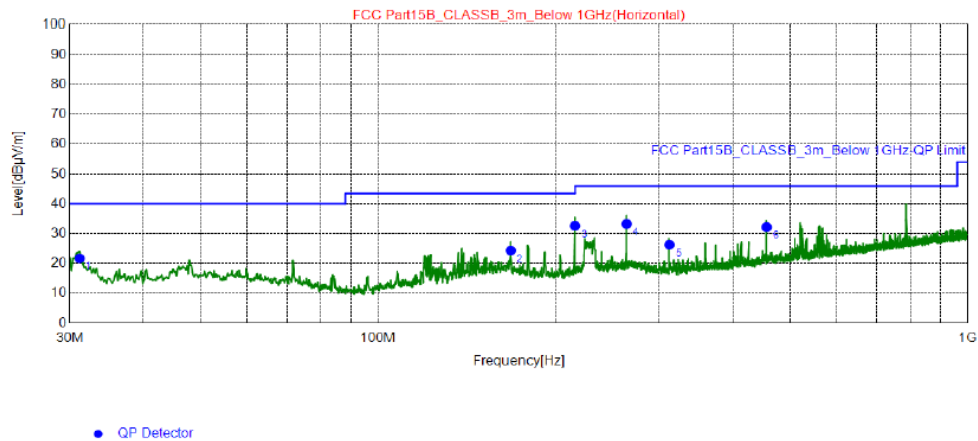
Radiated Emissions Range 30MHz~1GHz

Below is the worst test data

Channel	127.7kHz	Detector Function	Quasi-Peak (QP)
Frequency Range	30MHz ~ 1GHz	Antenna Polarity	Horizontal

Test Plot:

Test Graph



Final Data List

NO.	Freq. [MHz]	QP Reading [dB μV/m]	Factor [dB]	QP Value [dB μV/m]	QP Limit [dB μV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	31.16	33.54	-11.82	21.72	40.00	18.28	100	259	Horizontal
2	167.9	34.62	-10.26	24.36	43.50	19.14	200	280	Horizontal
3	215.8	45.42	-12.77	32.65	43.50	10.85	100	72	Horizontal
4	263.9	43.03	-9.76	33.27	46.00	12.73	100	39	Horizontal
5	311.8	34.38	-8.08	26.30	46.00	19.70	100	69	Horizontal
6	456.0	37.44	-5.23	32.21	46.00	13.79	100	39	Horizontal

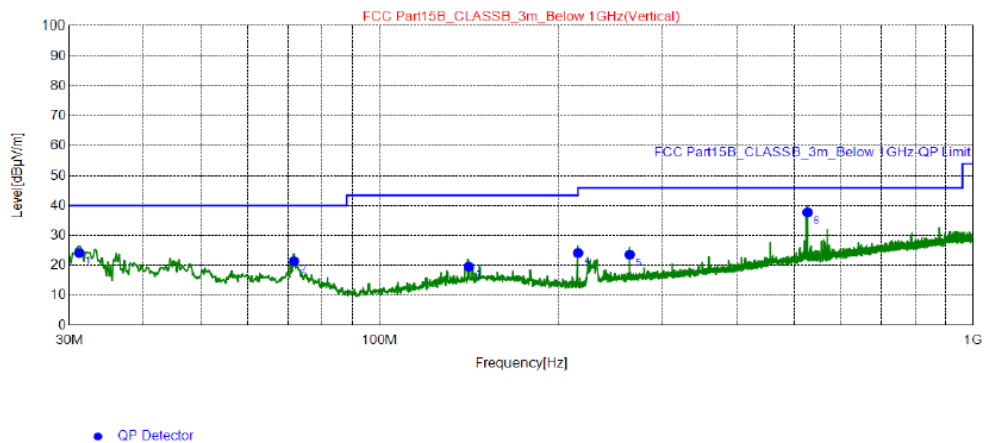
REMARKS:

- Emission Level(dBuV/m) = Spectrum reading (dBuV) + Correction Factor(dB/m)
- Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
- The other emission levels were very low against the limit.
- Margin value = Limit value – Emission Level

Channel	127.7kHz	Detector Function	Quasi-Peak (QP)
Frequency Range	30MHz ~ 1GHz	Antenna Polarity	Vertical

Test Plot:

Test Graph



Final Data List

NO.	Freq. [MHz]	QP Reading [dB µ V/m]	Factor [dB]	QP Value [dB µ V/m]	QP Limit [dB µ V/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	31.16	36.06	-11.82	24.24	40.00	15.76	100	38	Vertical
2	71.71	33.94	-12.48	21.46	40.00	18.54	100	32	Vertical
3	141.3	29.98	-10.38	19.60	43.50	23.90	100	360	Vertical
4	216.0	36.98	-12.77	24.21	46.00	21.79	200	39	Vertical
5	263.9	33.4	-9.76	23.64	46.00	22.36	200	217	Vertical
6	526.4	41.81	-4.01	37.80	46.00	8.20	100	224	Vertical

REMARKS:

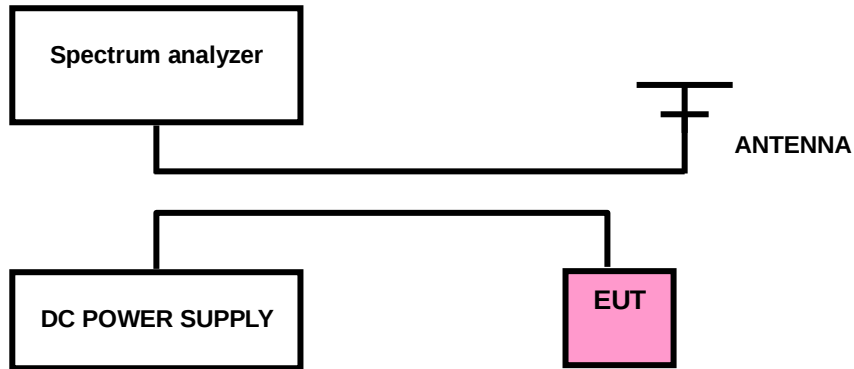
1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Limit value – Emission Level

4.3 20dB Spectrum Bandwidth Measurement

4.3.1 Limit

Reporting only

4.3.2 Test Setup



4.3.3 Test Procedures

1. The resolution bandwidth of 20 Hz and the video bandwidth of 62 Hz were used.
2. EUT in peak Max hold mode.
3. Measured the spectrum width with power higher than 20dB below carrier.
4. Measured the 99% OBW.

4.3.4 Deviation of Test Standard

No deviation.

5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

--- END ---