

RED-Radio Test Report

For

Wireless charger

Model No.:

Prepared For :

Address :

Prepared By : Shenzhen Anbotech Compliance Laboratory Limited

Address : 1/F, Building D, Sogood Science and Technology Park, Sanwei
community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong,
China.518102

Tel: (86) 755-26066440 Fax: (86) 755-26014772

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Date of Receipt : Nov. 21, 2018

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TEST REPORT

Applicant :
Manufacturer :
Product Name : Wireless charger
Model No. :
Trade Mark : N.A.
Rating(s) : Input: DC 5V, 1.5A
Output: 5W

Test Standard(s) : ETSI EN 303 417 V1.1.1 (2017-09)

The device described above is tested by Shenzhen Anbotech Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotech Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the ETSI EN 303 417 V1.1.1 requirements.

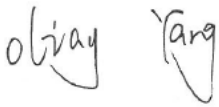
This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotech Compliance Laboratory Limited.

Date of Test


Nov. 21~Dec. 07, 2018

Prepared By





(Engineer / Oliay Yang)

Reviewer


(Supervisor / Snowy Meng)

Approved & Authorized Signer


(Manager / Sally Zhang)

1. General Information

1.1. Client Information

Applicant	:	
Address	:	
Manufacturer	:	
Address	:	
Factory	:	
Address	:	

1.2. Description of Device (EUT)

Product Name	:	Wireless charger
Model No.	:	
Trade Mark	:	N.A.
Test Power Supply	:	AC 230V, 50Hz for adapter
Test Sample No.	:	S1(Normal Sample), S2(Engineering Sample)
Product Description	Operation Frequency:	111-205KHz
	Modulation Type:	MSK
	Antenna Type:	Inductive loop coil Antenna
	Antenna Gain(Peak):	0 dBi
Remark: 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.		

1.3. Auxiliary Equipment Used During Test

Adapter	:	Manufacturer: Samsung M/N: ETA-U90CBC S/N: RT6FB17ZS/B-E Input: 100-240V~ 50-60Hz, 0.35A Output: DC 5V, 2A
Mobile Phone	:	Samsung

1.4. Description of Test Modes

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).

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

Test Items	Test Mode
Permitted range of operating frequencies	TX
Operating frequency ranges	TX
H-field requirements	TX
Transmitter spurious emissions	TX
Transmitter out of band (OOB) emissions	TX
Receiver blocking	RX

1.5. Test Conditions

	Normal Test Conditions	Extreme Test Conditions
Temperature	15°C - 35°C	-10°C ~ 45°C Note: (1)
Relative Humidity	20% - 75%	N/A
Supply Voltage	AC 230V, 50Hz for adapter	N/A
Note: (1) The HT 45°C and LT -10°C was declared by manufacturer.		

1.6. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	100055	Nov. 05, 2018	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESPI3	101604	Nov. 05, 2018	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Nov. 05, 2018	1 Year
4.	Spectrum Analysis	Agilent	E4407B	US39390582	Nov. 05, 2018	1 Year
5.	MAX Spectrum Analysis	Agilent	N9020A	MY51170037	Nov. 05, 2018	1 Year
6.	Preamplifier	SKET Electronic	BK1G18G30D	KD17503	Nov. 05, 2018	1 Year
7.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Nov. 20, 2018	1 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Nov. 19, 2018	1 Year
9.	Loop Antenna	Schwarzbeck	FMZB1519B	00053	Nov. 20, 2018	1 Year
10.	Horn Antenna	A-INFO	LB-180400-K F	J211060628	Nov. 20, 2018	1 Year
11.	Pre-amplifier	SONOMA	310N	186860	Nov. 05, 2018	1 Year
12.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
13.	RF Test Control System	YIHENG	YH3000	2017430	Nov. 05, 2018	1 Year
14.	Power Sensor	DAER	RPR3006W	15I00041SN045	Nov. 05, 2018	1 Year
15.	Power Sensor	DAER	RPR3006W	15I00041SN046	Nov. 05, 2018	1 Year
16.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Nov. 05, 2018	1 Year
17.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Nov. 05, 2018	1 Year
18.	Signal Generator	Agilent	E4421B	MY41000743	Nov. 05, 2018	1 Year
19.	DC Power Supply	IVYTECH	IV3605	1804D360510	Apr. 02, 2018	1 Year
20.	Constant Temperature Humidity Chamber	ZHONGJIAN	ZJ-KHWS80B	N/A	Nov. 01, 2018	1 Year

1.7. Measurement Uncertainty

For the test methods, according to ETSI EN 303 417 standard, the measurement uncertainty figures shall be calculated in accordance with ETR 100 028-1 [4] and shall correspond to an expansion factor (coverage factor) $k = 1,96$ or $k = 2$ (which provide confidence levels of respectively 95 % and 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Maximum measurement uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±1,5 dB
Power Spectral Density, conducted	±3 dB
Unwanted Emissions, conducted	±3 dB
All emissions, radiated	±6 dB
Temperature	±1 °C
Humidity	±5 %
DC and low frequency voltages	±3 %
Time	±5 %
Duty Cycle	±5 %

1.8. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 184111

Shenzhen Anbotech Compliance Laboratory Limited, 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 No. 184111, July 31, 2017.

ISED-Registration No.: 8058A-1

Shenzhen Anbotech Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A-1, June 13, 2016.

Test Location

Shenzhen Anbotech Compliance Laboratory Limited.

1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102

2. Summary of Test Results

List of Measurements			
No	Test Items	Clause No.	Results
1	Permitted range of operating frequencies	4.3.2	PASS
2	Operating frequency ranges	4.3.3	PASS
3	H-field requirements	4.3.4	PASS
4	Transmitter spurious emissions	4.3.5	PASS
5	Transmitter out of band (OOB) emissions	4.3.6	PASS
6	WPT system unwanted conducted emissions	4.3.7	N/A
7	Receiver blocking	4.4.2	PASS
Note: N/A is an abbreviation for Not Applicable and means this test item is not applicable for this device according to the technology characteristic of device.			

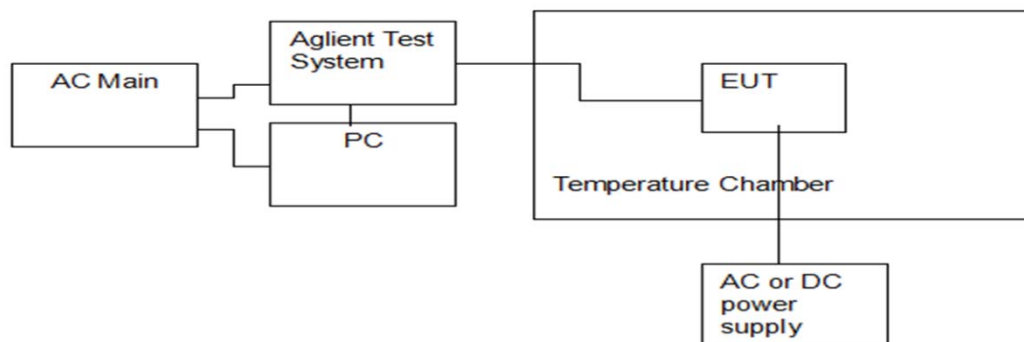
3. Permitted range of operating frequencies/ Operating frequency ranges

3.1. Limit

The permitted range of operating frequency range(s) for intentional emissions shall be within 19 - 21 kHz, 59 - 61 kHz, 79 - 90 kHz, 100 - 300 kHz, 6765 - 6 795 kHz, see Table below

	WPT frequency range	Frequency Bands	Applications
Transmit and Receive	1	19 kHz to 21 kHz	WPT systems
Transmit and Receive	2	59 kHz to 61 kHz	WPT systems
Transmit and Receive	3	79 kHz to 90 kHz	WPT systems
Transmit and Receive	4	100 kHz to 119 kHz	WPT systems
Transmit and Receive		119 kHz to 140 kHz	WPT systems
Transmit and Receive		140 kHz to 148,5 kHz	WPT systems
Transmit and Receive		148,5 kHz to 300 kHz	WPT systems
Transmit and Receive	5	6 765 kHz to 6 795 kHz	WPT systems

3.2. Test Setup



3.3. Test Procedure

Refer to chapter 4.3.2 & 4.3.3 of EN 303 417 V1.1.1.

3.4. Test Data

Please to see the following pages

Test Result: **PASS**

Temperature:	See below	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	AC 230V, 50Hz for adapter

Test Condition			Frequency (KHz)	
			Lowest	Highest
Tnom (°C)	+20	Vnom (230V)	111.12	204.27
Tmin (°C)	-10	Vmin (207V)	111.54	204.64
		Vmax (253V)	111.55	204.23
Tmax (°C)	+45	Vmin (207V)	111.22	204.45
		Vmax (253V)	111.46	204.51
Measured frequencies (lowest and highest)			FL = > 111KHz	FH = <205KHz

4. H-field requirements

4.1. Test Limit

The H-field limits are provided in Table below.

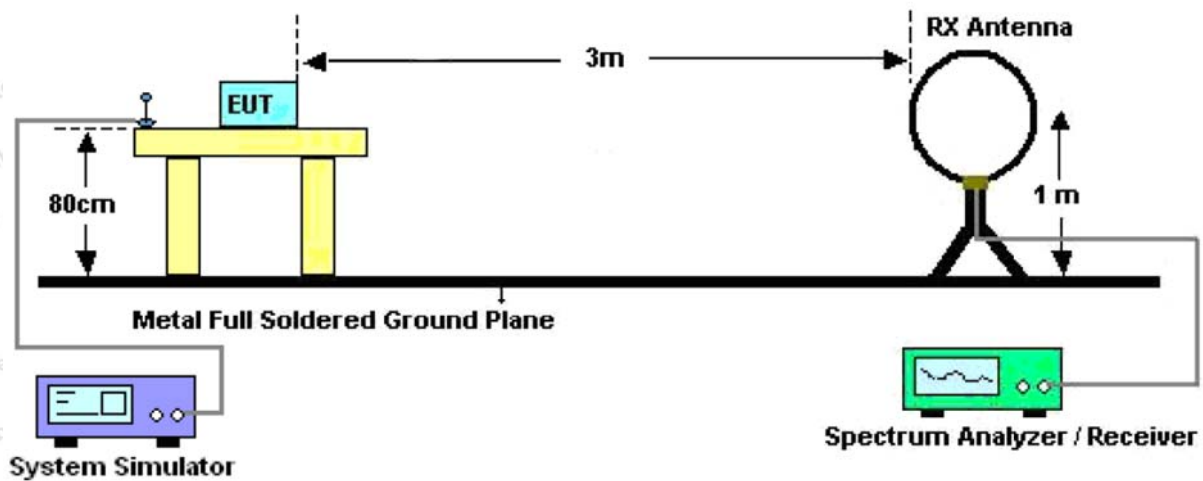
They have been specified for control of any radiated emissions within the OFR originating from the WPT system (Power transmission and accompanying data communication).

H-field limits

Frequency range [MHz]	H-field strength limit [dBμA/m at 10 m]	Comments
$0,019 \leq f < 0,021$	72	
$0,059 \leq f < 0,061$	69,1 descending 10 dB/dec above 0,059 MHz	See note 1
$0,079 \leq f < 0,090$	67,8 descending 10 dB/dec above 0,079 MHz	See note 2
$0,100 \leq f < 0,119$	42	
$0,119 \leq f < 0,135$	66 descending 10 dB/dec above 0,119 MHz	See note 1
$0,135 \leq f < 0,140$	42	
$0,140 \leq f < 0,1485$	37,7	
$0,1485 \leq f < 0,30$	-5	
$6,765 \leq f < 6,795$	42	

NOTE 1: Limit is 42 dBμA/m for the following spot frequencies: 60 kHz ± 250 Hz and 129,1 kHz ± 500 Hz.
NOTE 2: At the time of preparation of the present document the feasibility of increased limits for high power wireless power transmission systems to charge vehicles [1.4] was prepared. New specific requirements for such systems (e.g. higher H-field emission limits in the 79 - 90 kHz band) will be reflected within a future revision of the present document.

4.2. Test Setup



4.3. Test Procedure

Refer to chapter 4.3.4 of EN 303 417 V1.1.1.

The conformance test suite for H-field requirements shall be as defined in clause 6.2.1.

4.4. Test Data

Test Result: PASS

No result in this part for margin above 20dB. So didn't show test data in the report.

5. Transmitter spurious emissions

5.1. Test Limit

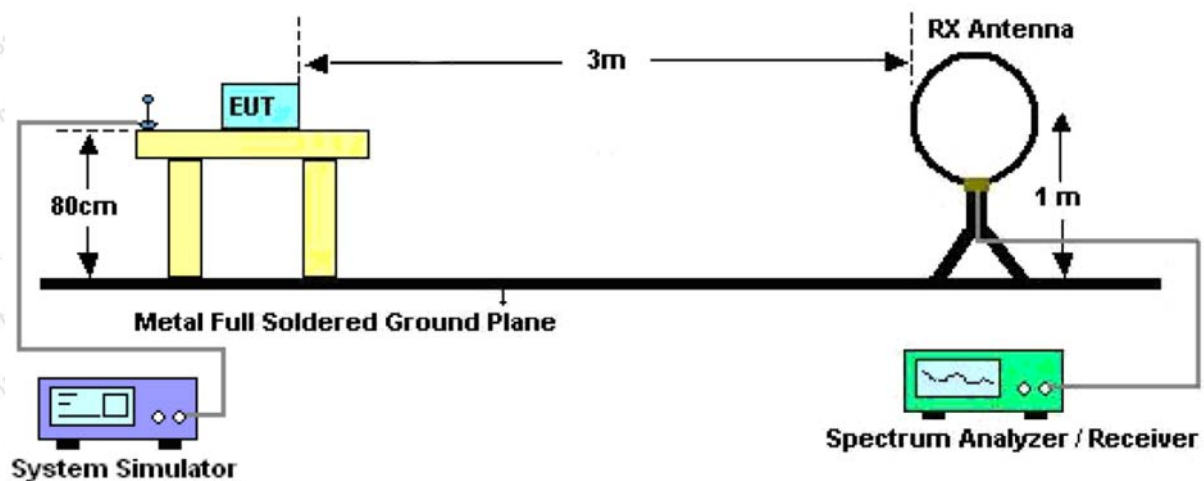
The radiated field strength of spurious emissions below 30 MHz shall not exceed the generated H-field given in Table below.

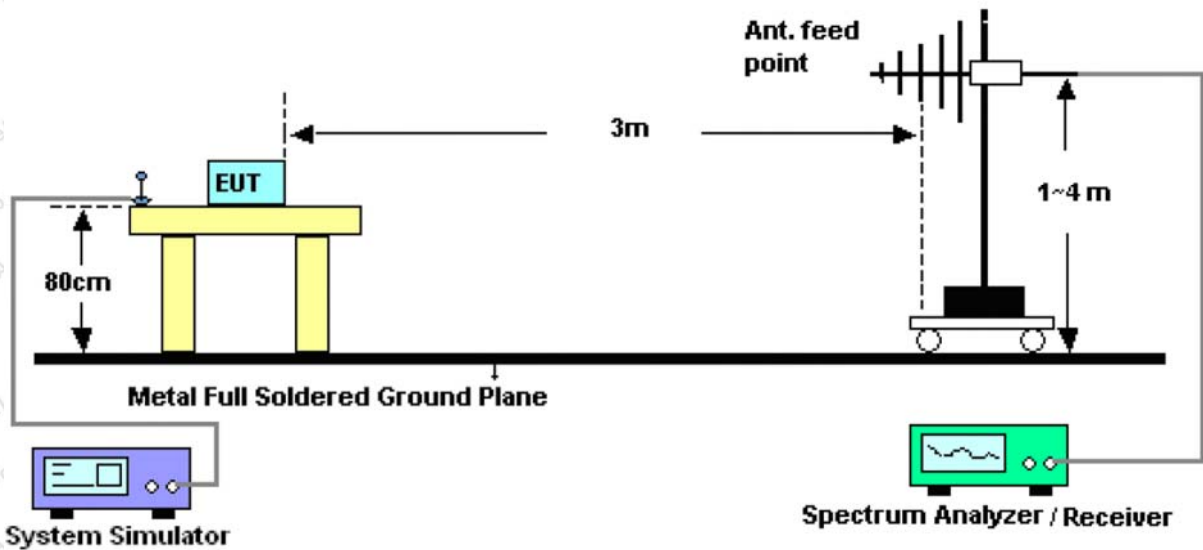
State (see note)	Frequency $9 \text{ kHz} \leq f < 10 \text{ MHz}$	Frequency $10 \text{ MHz} \leq f < 30 \text{ MHz}$
Operating	27 dB μ A/m at 9 kHz descending 10 dB/dec	-3,5 dB μ A/m
Standby	5,5 dB μ A/m at 9 kHz descending 10 dB/dec	-25 dB μ A/m
NOTE: "Operating" means mode 2, 3 and 4 according to Table 2; "standby" means mode 1 according to Table 2.		

The power of any radiated spurious emission between 30MHz and 1GHz shall not exceed the values given in Table below

State (see note)	47 MHz to 74 MHz 87,5 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 790 MHz	Other frequencies between 30 MHz to 1 000 MHz
Operating	4 nW	250 nW
Standby	2 nW	2 nW
NOTE: "Operating" means mode 2, 3 and 4 according to Table 2; "standby" means mode 1 according to Table 2.		

5.2. Test Setup





5.3. Test Procedure

Refer to chapter 4.3.5 of EN 303 417 V1.1.1.

The conformance test suite for unwanted emissions shall be as defined in clause 6.2.1.

The manufacturer shall declare all necessary information (distance, orientation) which are necessary to set-up the different alignments as defined in clause 6.1.1 for each operational mode as defined in clause 4.2.3, Table 2.

Conformance shall be established under test conditions to be declared by the manufacturer according to clause 4.1.

The interpretation of the results for the measurements uncertainty shall be as given in clause 5.11.

5.4. Test Data

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	AC 230V, 50Hz for adapter

Frequency Range	9kHz ~ 30MHz	Test Mode	Operating
------------------------	--------------	------------------	-----------

Freq. (KHz)	Reading (dBμA/m)	Correct Factor(dB)	H_f (dBμA/m)	Limit (dBμA/m)	Margin (dB)
111	4.65	7.52	12.17	23.42	-11.25
12560	-24.26	11.34	-12.92	-3.29	-9.63

Note: The limit in dBμA/m at 10 m

Frequency Range	30MHz ~ 1GHz	Test Mode	Operating
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SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
81.22	H	-65.44	-36	-29.44
298.44	H	-56.43	-36	-20.43
352.65	H	-57.23	-36	-21.23
488.16	H	-67.45	-54	-13.45
705.53	H	-57.52	-54	-3.52
95.67	V	-66.47	-54	-12.47
298.34	V	-57.65	-36	-21.65
352.56	V	-56.63	-36	-20.63
488.48	V	-67.29	-54	-13.29
705.63	V	-66.41	-54	-12.41

Note: The limit in dBμA/m at 3 m

Frequency Range	9kHz ~ 30MHz	Test Mode	Standby
------------------------	--------------	------------------	---------

Freq. (KHz)	Reading (dBμA/m)	Correct Factor(dB)	H _f (dBμA/m)	Limit (dBμA/m)	Margin (dB)
111	-18.65	7.35	-11.30	4.18	-15.48
12560	-51.25	11.34	-39.91	-25.24	-14.67

Note: The limit in dBμA/m at 10 m

Frequency Range	30MHz ~ 1GHz	Test Mode	Standby
------------------------	--------------	------------------	---------

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
30.42	H	-60.44	-57	-3.44
48.26	H	-62.43	-57	-5.43
82.34	H	-74.22	-57	-17.22
191.46	H	-82.45	-57	-25.45
324.3	H	-72.37	-57	-15.37
431.27	H	-72.55	-57	-15.55
32.1	V	-60.43	-57	-3.43
48.76	V	-70.52	-57	-13.52
97.48	V	-69.11	-57	-12.11
125.57	V	-79.61	-57	-22.61
324.33	V	-78.33	-57	-21.33
431.32	V	-70.51	-57	-13.51

Note: The limit in dBμA/m at 3 m

6. Transmitter out of band (OOB) emissions

6.1. Test Limit

The OOB limits are visualized in figures 4 and 5; they are descending from the intentional limits from Table 3 at f_H/f_L with 10 dB/decade.

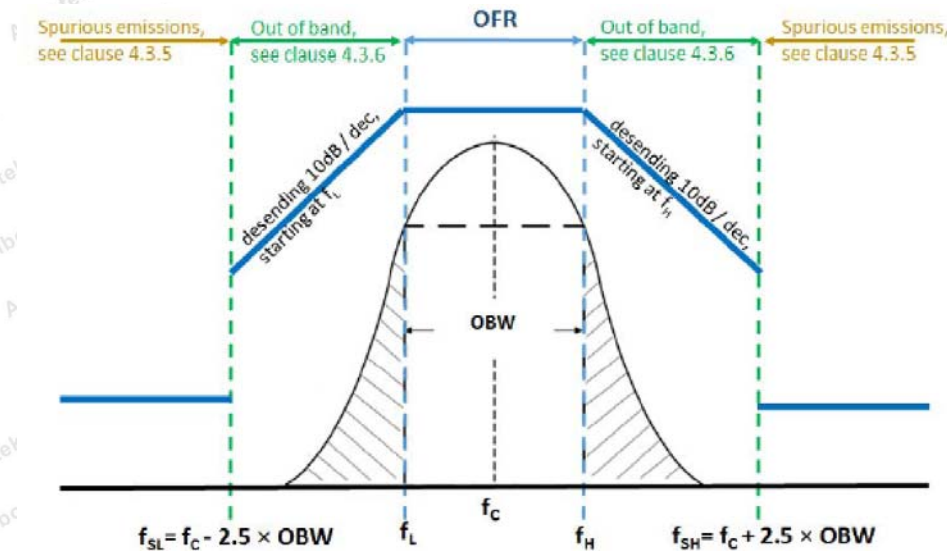
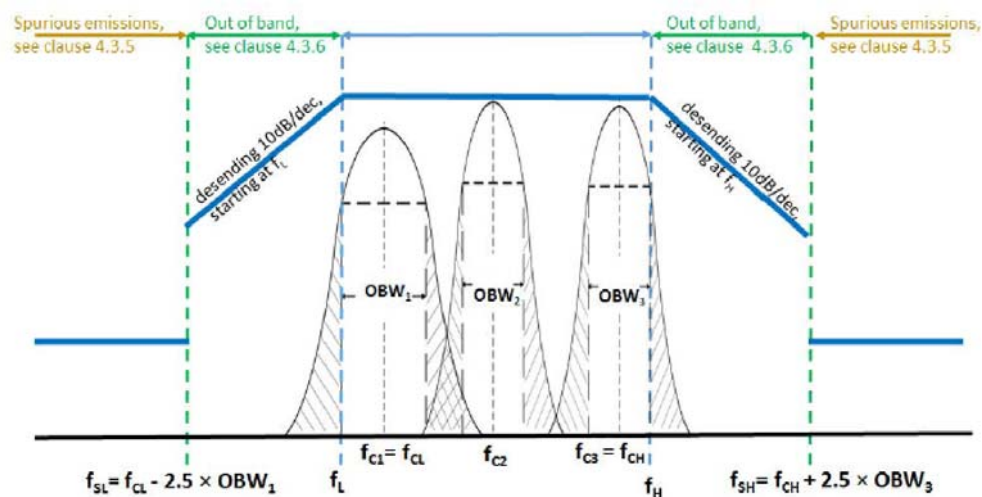


Figure 4: Out of band and spurious domain of a single frequency WPT system

The transmitter spurious emissions for a single frequency system are to be considered in frequency ranges defined in Figure 4 ($f < f_{SL}$ and $f > f_{SH}$).



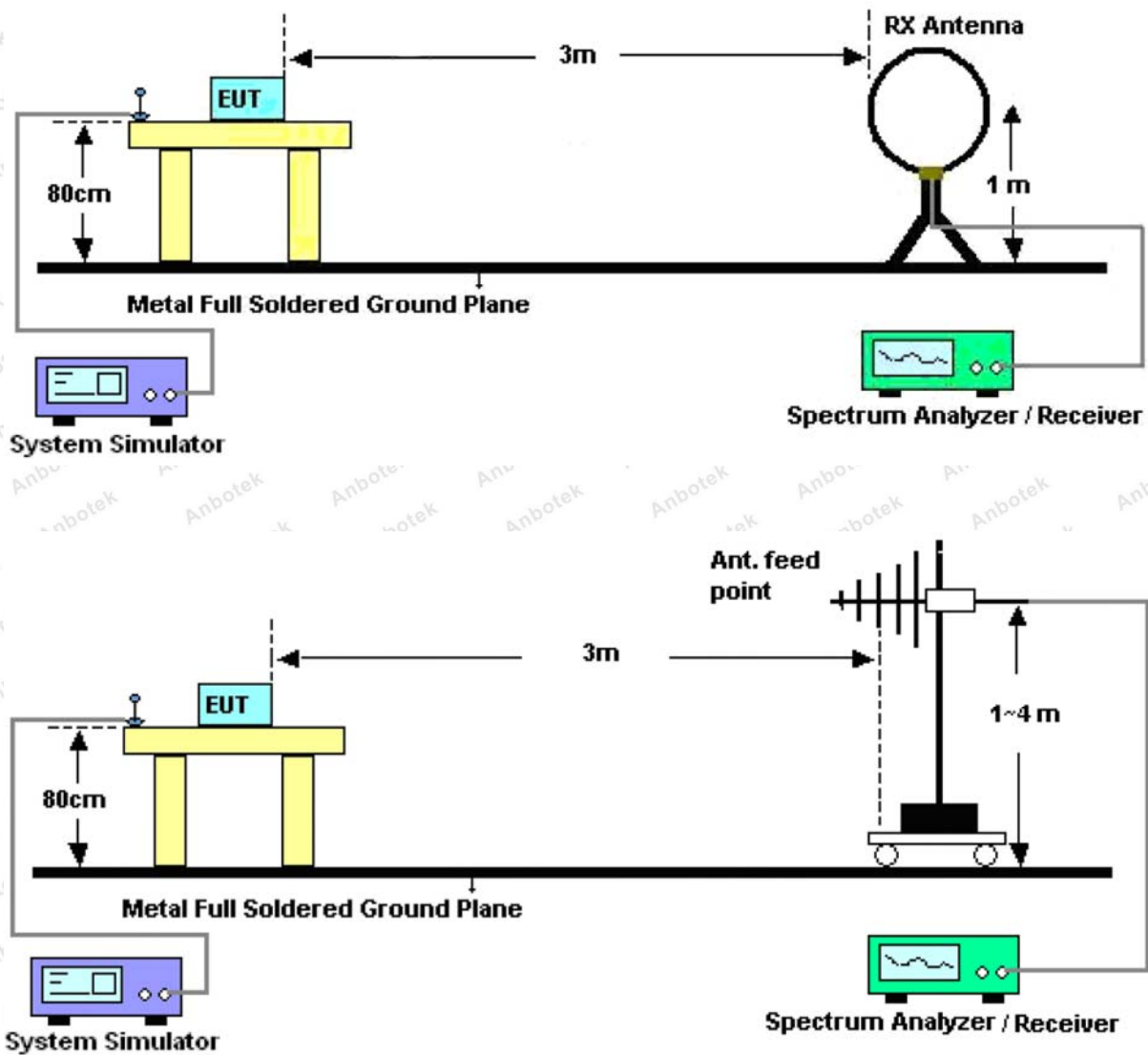
The transmitter spurious emissions for a multi frequency system (within one WPT frequency range from Table 2) are to be considered in frequency ranges defined in Figure 5 ($f < f_{SL}$ and $f > f_{SH}$).

Table 3: H-field limits

Frequency range [MHz]	H-field strength limit [dB μ A/m at 10 m]	Comments
$0,019 \leq f < 0,021$	72	
$0,059 \leq f < 0,061$	69,1 descending 10 dB/dec above 0,059 MHz	See note 1
$0,079 \leq f < 0,090$	67,8 descending 10 dB/dec above 0,079 MHz	See note 2
$0,100 \leq f < 0,119$	42	
$0,119 \leq f < 0,135$	66 descending 10 dB/dec above 0,119 MHz	See note 1
$0,135 \leq f < 0,140$	42	
$0,140 \leq f < 0,1485$	37,7	
$0,1485 \leq f < 0,30$	-5	
$6,765 \leq f < 6,795$	42	

NOTE 1: Limit is 42 dB μ A/m for the following spot frequencies: 60 kHz \pm 250 Hz and 129,1 kHz \pm 500 Hz.
NOTE 2: At the time of preparation of the present document the feasibility of increased limits for high power wireless power transmission systems to charge vehicles [1.4] was prepared. New specific requirements for such systems (e.g. higher H-field emission limits in the 79 - 90 kHz band) will be reflected within a future revision of the present document.

6.2. Test Setup



6.3. Test Procedure

Refer to chapter 4.3.6 of EN 303 417 V1.1.1.

The conformance test suite for Transmitter out of band emissions is provided in clause 6.2.1.

Conformance shall be established under test conditions to be declared by the manufacturer according to clause 4.1. The interpretation of the results for the measurements uncertainty shall be as given in clause 5.11.

6.4. Test Data

Test Result: PASS

7. WPT system unwanted conducted emissions

7.1. Test Limit

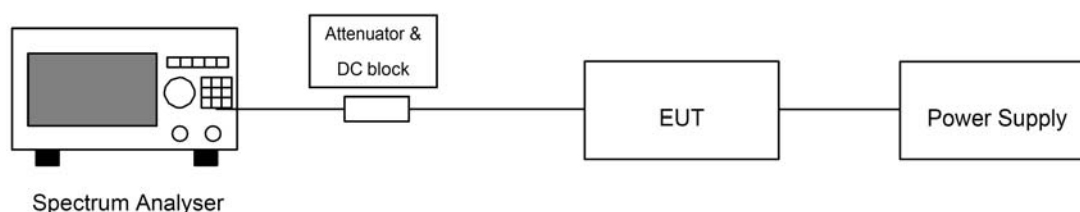
This applies to all WPT systems where the cable to the primary coil exceeds a length of 3 m and where the cable is not installed in the ground or any metallic structures.

The common mode current (I_{CM}) between 1 MHz and 30 MHz shall not exceed the following limit:

$$I_{CM} = 47 - 8 \times \log(f) \text{ dB}\mu\text{A}$$

NOTE: f is the frequency in MHz.

7.2. Test Setup



7.3. Test Procedure

Refer to chapter 4.3.7 of EN 303 417 V1.1.1.

The conformance test suite for common mode current shall be as defined in clause 6.2.4.

The manufacturer shall declare all necessary information (distance, orientation) which are necessary to set-up the different alignments as defined in clause 6.1.1 for each operational mode as defined in clause 4.2.3, Table 2.

Conformance shall be established under test conditions to be declared by the manufacturer according to clause 4.1. The interpretation of the results for the measurements uncertainty shall be as given in clause 5.11.

7.4. Test Data

N/A

The cable to the primary coil is less than 3 m

8. Receiver blocking

8.1. Test Limit

Receiver blocking limits

	In-band signal	OOB signal	Remote-band signal
Frequency	Centre frequency (f_c) of the WPT system (see clause 4.3.3)	$f = f_c \pm F$ (see note)	$f = f_c \pm 10 \times F$ (see note)
Signal level field strength at the EUT	72 dB μ A/m	72 dB μ A/m	82 dB μ A/m
NOTE: $F = \text{OFR}$ see clause 4.3.3.			

8.2. Test Setup

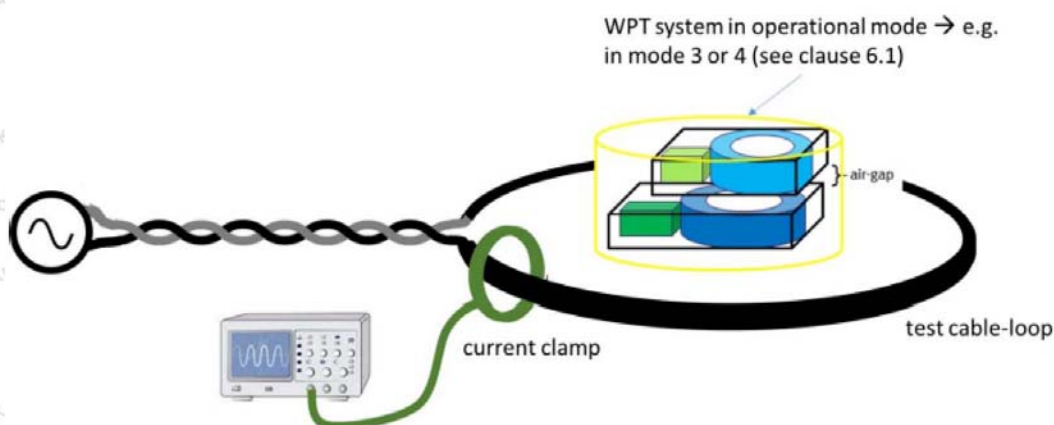


Figure 11: Schematic test set-up for the RX-blocking test

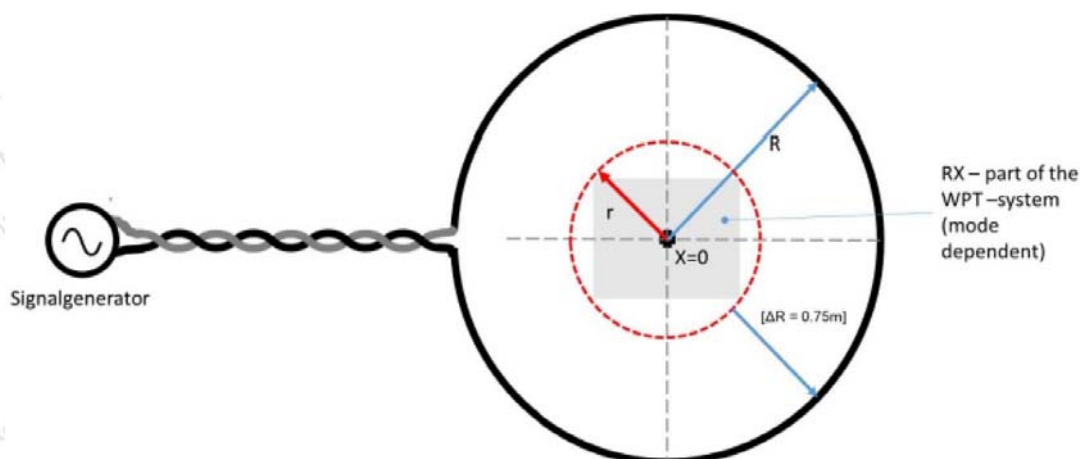


Figure 12: Schematic test set-up for the RX-blocking test

8.3. Test Procedure

Refer to chapter 4.4.2 of EN 303 417 V1.1.1.

The conformance test suite for performance criterion test shall be as defined in clause 6.3.2 and within the test-set-ups as defined in clause 6.1.

Conformance shall be established under test conditions to be declared by the manufacturer according to clause 4.1.

The interpretation of the results for the measurements uncertainty shall be as given in clause 5.11.

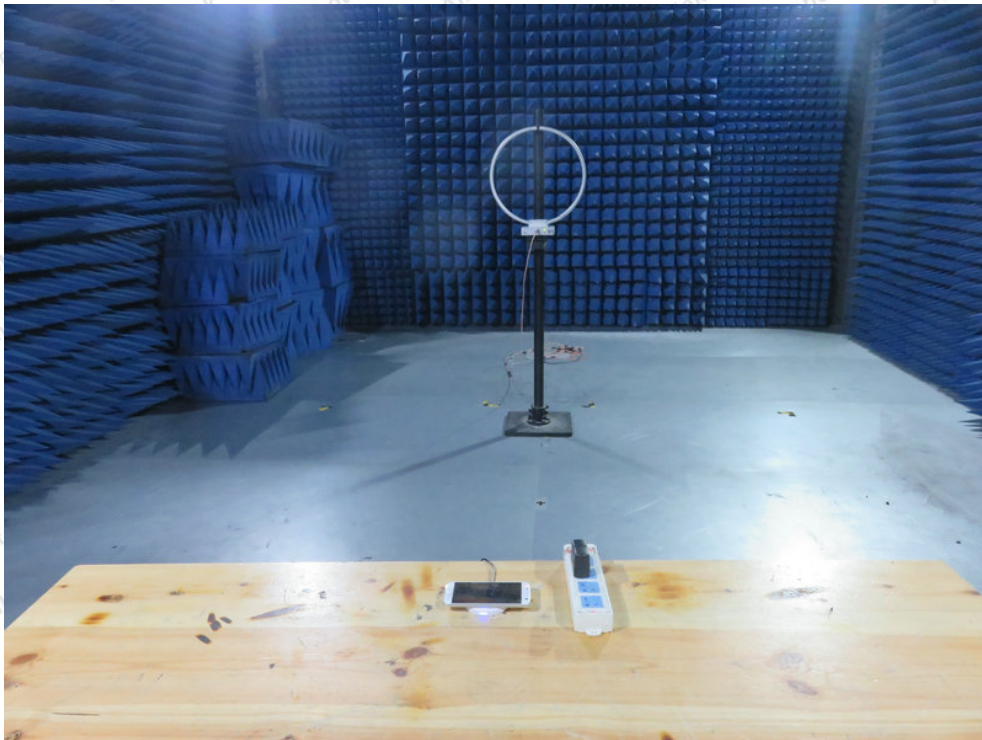
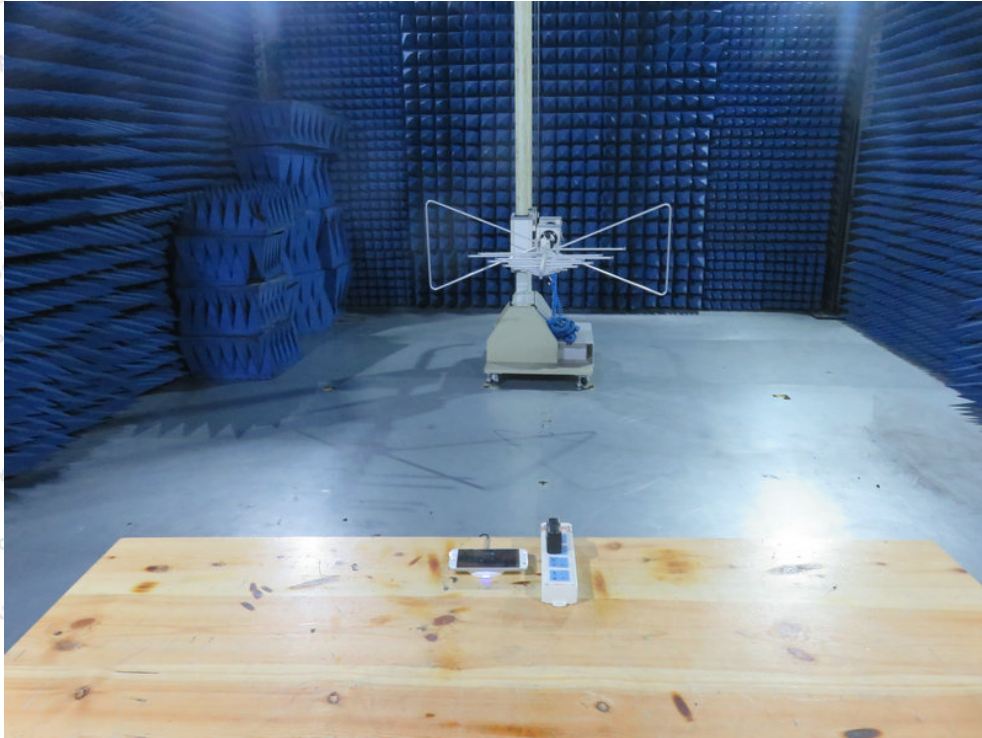
8.4. Test Data

Test Result: PASS

The product meets the wanted performance criterion at all times.

APPENDIX I-- TEST SETUP PHOTOGRAPH

Photo of Radiation Emission Test



----- End of Report -----