



中国认可
国际互认
检测
TESTING
CNAS L6478



TEST REPORT

Reference No..... : WTF24F09225466W002
Applicant..... : Mid Ocean Brands B.V.
Address..... : 7/F., Kings Tower, 111 King Lam Street, Cheung Sha Wan, Kowloon,
Hong Kong
Manufacturer : 118051
Address..... : ---
Product Name..... : Magnetic wireless charger
Model No..... : MO2521
Test specification..... : ETSI EN 300 330 V2.1.1 (2017-02)
Date of Receipt sample : 2024-10-24
Date of Test : 2024-11-15 to 2024-11-18
Date of Issue..... : 2024-11-21
Test Report Form No. : WEW-300330A-01B
Test Result..... : Pass

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of approver.

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1 Test Summary

Test Requirements			
Test	Test Method	Reference	Result
Permitted range of operating frequency	ETSI EN 300 330 V2.1.1	4.3.1	Pass
Operating frequency range	ETSI EN 300 330 V2.1.1	4.3.2	Pass
Modulation bandwidth	ETSI EN 300 330 V2.1.1	4.3.3	Pass ^{a)}
Radiated H-field	ETSI EN 300 330 V2.1.1	4.3.4	Pass
Radiated spurious emissions at frequencies below 30 MHz	ETSI EN 300 330 V2.1.1	4.3.8	Pass
Radiated spurious emissions at frequencies above 30 MHz	ETSI EN 300 330 V2.1.1	4.3.9	Pass
Receiver spurious emissions	ETSI EN 300 330 V2.1.1	4.4.2	N/A
Adjacent channel selectivity	ETSI EN 300 330 V2.1.1	4.4.3	N/A
Receiver blocking or desensitization	ETSI EN 300 330 V2.1.1	4.4.4	N/A

Remark:

Pass Test item meets the requirement

N/A Not Applicable

^{a)} According to standard section 4.4.1, this equipment belongs to other equipment (WPT system) and only has a single working channel, so it is not necessary to meet section 4.3.3.



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3 General Information

3.1 General Description of E.U.T.

Product Name : Magnetic wireless charger
Model No. : MO2521
Remark : ---
Rating : Input: DC 9V/3A, DC 9V/2.2A, DC 5V/2A
Output: DC 9V/1.66A, DC 5V/0.6A, DC 5V/0.5A
Wireless Output Power for:
Top: 15W Max
Middle for Apple Watch: 2.5W Max
Bottom: 3W Max
Power Adapter Model..... : ---
Battery Capacity : ---

3.2 Technical Specification

Permitted Range of Operating Frequency : 148.5 kHz to 5MHz
(Manufacturer's declared frequency of product operation: 325kHz – 330kHz)
Operating Frequency : 326.5kHz
Radiated H-Field : 19.38dBuA/m(@3m) for middle apple watch charging area
Antenna installation : Coil Antenna
Antenna Gain : 0dBi
Product Class : 1

Product Class								
Product Class	Description of transmitter	Antenna to be tested	Frequency range	Loop antenna area	Length of antenna	Customization of antenna design allowed	Transmitter carrier Output limits	Spurious emissions limits
1	Inductive loop coil transmitter	Integral antenna (antenna type 1) or dedicated antenna supplied with the equipment (antenna type 2); (see note 1)	9kHz to 30MHz	< 30m ²	< $\lambda/4$ (75metre s/f where f is in MHz)or <30m, whichever is shorter	No	H-field at 10m	H-field at 10m



2	Inductive loop coil transmitter	Two representative Antennas supplied with the equipment (see note 2)	9kHz to 30MHz	< 30m ²	< $\lambda/4$ (75metre s/f where f is in MHz)or <30m, whichever is shorter	Yes (see note 3)	H-field at 10m	H-field at 10m
3	Customize d large size loop antennas only	Test without an antenna by using an artificial antenna	9kHz to 135kHz	>30m ²	n.a	Yes	Current in artificial antenna	Current in artificial antenna
4	E-field transmitter	Each type of antenna to be used	9kHz to 30MHz	n.a	n.a	n.a	H-field at 10m	H-field at 10m

NOTE 1: Where a manufacturer provides a range of standard antennas, the equipment will be tested as Product Class 1 equipment, with the antenna(s) attached. The measurements shall be repeated for each antenna.

NOTE 2: The two antennas shall meet the manufacturer's design rules published in the equipment manual and shall have maximum and minimum loop areas respectively. Both antennas shall have the maximum magnetic dipole moment as declared by the manufacturer.

NOTE 3: Customization is only allowed according to the manufacturer's antenna design rules published in the equipment manual.

NOTE 4: On-site measurements may be required.

3.3 Standards Applicable for Testing

The tests were performed according to following standards:

ETSI EN 300 330 V2.1.1
(2017-02)

Short Range Devices (SRD); Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU.

3.4 Test Facility

The test facility has a test site registered with the following organizations:

- **ISED – Registration No.: 21895**

Waltek Testing Group (Foshan) Co., Ltd. has been registered and fully described in a report filed with the Innovation, Science and Economic Development Canada (ISED). The acceptance letter from the ISED is maintained in our files. Registration ISED number: 21895, March 12, 2019

- **FCC – Registration No.: 820106**

Waltek Testing Group (Foshan) Co., Ltd. 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 820106, August 16, 2018

- **NVLAP – Lab Code: 600191-0**

Waltek Testing Group (Foshan) Co., Ltd. EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 600191-0.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.



3.5 Subcontracted

Whether parts of tests for the product have been subcontracted to other labs:

☐ Yes ☒ No

If Yes, list the related test items and lab information:

Test items: ---

Lab information: ---

3.6 Abnormalities from Standard Conditions

None.

3.7 Disclaimer

The antenna gain information is provided by the customer. The laboratory is not responsible for the accuracy of the antenna gain information.

WALTEK



4 Equipment Used during Test

4.1 Equipment List

☒ 3m Semi-anechoic Chamber for Spurious Emission						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	3m Semi-anechoic Chamber	CHANGCHUANG	9m×6m×6m	-	2024-01-05	2025-01-04
2	EMI TEST RECEIVER	RS	ESR7	101566	2024-01-06	2025-01-05
3	Spectrum Analyzer	Agilent	N9020A	MY48011796	2024-01-04	2025-01-03
4	Trilog Broadband Antenna	SCHWARZBECK	VULB9162	9162-117	2024-01-05	2025-01-04
5	Coaxial Cable (below 1GHz)	H+S	CBL3-NN-12+3 m	214NN320	2024-01-06	2025-01-05
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	01561	2024-01-05	2025-01-04
7	Broadband Preamplifier (Above 1GHz)	Lunar E M	LNA1G18-40	20160501002	2024-01-04	2025-01-03
8	Coaxial Cable (above 1GHz)	Times-Microwave	CBL5-NN	-	2024-01-04	2025-01-03
☒ RF Conducted test						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	Environmental Chamber	GERUI	GR-HWS-1000L	GR24061818	2024-07-02	2025-07-01
2	Spectrum Analyzer	Agilent	N9020A	MY48011796	2024-01-04	2025-01-03
3	EXG Analog Signal Generator	Agilent	N5181A	MY48180720	2024-01-04	2025-01-03
4	RF Control Unit	CHANGCHUANG	JS0806-2	-	2024-01-04	2025-01-03

☐: Not Used

☒: Used



4.2 Software List

Description	Manufacturer	Model	Version
EMI Test Software (Radiated Emission)	FARATRONIC	EZ-EMC	RA-03A1-2
RF Conducted Test	TONSCEND	JS1120-2	2.6

4.3 Special Accessories and Auxiliary Equipment

Item	Equipment	Technical Data	Manufacturer	Model No.	Serial No.
1.	/	/	/	/	/

4.4 Measurement Uncertainty

Parameter	Uncertainty	Note
RF Output Power	$\pm 2.2\text{dB}$	(1)
Occupied Bandwidth	$\pm 1.5\%$	(1)
Transmitter Spurious Emission	$\pm 3.8\text{dB}$ (for 25MHz-1GHz)	(1)
	$\pm 5.0\text{dB}$ (for 1GHz-18GHz)	(1)

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

4.5 Decision Rule

Compliance or non-compliance with a disturbance limit shall be determined in the following manner.

If U_{LAB} is less than or equal to U_{cispr} then

- Compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- Non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If U_{LAB} is greater than U_{cispr} then

- Compliance is deemed to occur if no measured disturbance level, increased by $(U_{\text{LAB}} - U_{\text{cispr}})$, exceeds the disturbance limit;
- Non-compliance is deemed to occur if any measured disturbance level, increased by $(U_{\text{LAB}} - U_{\text{cispr}})$, exceeds the disturbance limit.



5 Permitted Range of Operating Frequency

5.1 Standard Applicable

1. Permitted range of operating frequencies

According to EN 300330 section 4.3.1, The permitted range of operating frequencies is the frequency range over which the equipment is authorized to operate.

2. Operating frequency range

The operating frequency range (OFR) is the frequency range over which the EUT is transmitting. The operating frequency range of the EUT is determined by the lowest (fL) and highest frequency (fH) as occupied by the power envelope.

With the centre frequency of the OFR as: $F_C = (F_H + F_L)/2$.

An EUT could have more than one operating frequency range

5.2 Test Procedure

The permitted range of operating frequencies used by the EUT shall be declared by the manufacturer. The operating frequency range(s) will be tested considered under in clause 4.3.2.

The operating frequency ranges for intentional emissions shall be entirely within the frequency bands in table 1.

Table 1: Short Range Devices within the 9 kHz to 30 MHz permitted frequency bands

	Frequency Bands/frequencies	Applications
Transmit and Receive	9 kHz to 90 kHz	Inductive devices, Generic use
Transmit and Receive	90 kHz to 119 kHz	Inductive devices, Generic use
Transmit and Receive	119 kHz to 140 kHz	Inductive devices, Generic use
Transmit and Receive	140 kHz to 148,5 kHz	Inductive devices, Generic use
Transmit and Receive	148,5 kHz to 5 MHz	Inductive devices, Generic use
Transmit and Receive	400 kHz to 600 kHz	RFID only
Transmit and Receive	5 MHz to 30 MHz	Inductive devices, Generic use
Transmit and Receive	3 155 kHz to 3 400 kHz	Inductive devices, Generic use
Transmit and Receive	984 kHz to 7 484 kHz (Note 3, Centre frequency is 4 234 kHz)	Inductive devices, Railway applications
Transmit and Receive	4 516 kHz	Inductive devices, Railway applications
Transmit and Receive	6 765 kHz to 6 795 kHz	Inductive devices, Generic use
Transmit and Receive	7 400 kHz to 8 800 kHz	Inductive devices, Generic use
Transmit and Receive	10 200 kHz to 11,000 MHz	Inductive devices, Generic use
Transmit and Receive	11,810 MHz to 15,310 MHz (Centre frequency is 13,56 MHz)	RFID only
Transmit and Receive	12,5 MHz to 20 MHz	Inductive devices, Wireless healthcare
Transmit and Receive	13,553 MHz to 13,567 MHz	Inductive devices, Generic use
Transmit and Receive	26,957 MHz to 27,283 MHz	Inductive devices, Generic use
Transmit and Receive	27,090 MHz to 27,100 MHz	Inductive devices, Railway applications



NOTE 1: In addition, it should be noted that other frequency bands may be available in a country within the frequency range 9 kHz to 30 MHz.

NOTE 2: On non-harmonised parameters, national administrations may impose certain conditions such as the type of modulation, frequency, channel/frequency separations, maximum transmitter radiated power, duty cycle, and the inclusion of an automatic transmitter shut-off facility, as a condition for the issue of an Individual Rights for use of spectrum or General Authorization, or as a condition for use under "licence exemption" as it is in most cases for Short Range Devices.

NOTE 3: Transmitting only on receipt of a Balise/Eurobalise tele-powering signal from a train.

5.3 Test Condition

Operating Mode	TX mode
Test Environment	Normal Condition, Extreme Condition
Test Voltage	DC 8.1V to 9.9V
Ambient temperature	25°C
Humidity	54%RH
Atmospheric Pressure	101.2kPa

Test Condition		Test Temperature	Test Voltage (Vdc)
Normal	NTNV	25°C	9.0
Extreme	LTLV	0°C	8.1
	LTHV	0°C	9.9
	HTLV	40°C	8.1
	HTHV	40°C	9.9

5.4 Test Result

Test Condition	Lower Frequency (kHz)	Upper Frequency (kHz)	Limit
NTNV	325.125	327.426	Low Frequency≥148.5kHz Upper Frequency:≤5000kHz
LTLV	325.113	327.413	
LTHV	325.136	327.405	
HTLV	325.138	327.415	
HTHV	325.125	327.419	
Results	Pass		



6 Radiated H-Field

6.1 Standard Applicable

The Transmitter H-field requirements only applies for equipment under product class 1 and class 2 as defined in clause 6.1.2 and clause B.2.

The frequency ranges and limits of the present document are shown in table 2. The limits are based on the European Commission Decision for SRDs [i.10], CEPT/ERC/REC 70-03 [i.1].

Table 2: H-field limits at 10 m

Frequency range (MHz)	H-field strength limit (Hf) dBμA/m at 10 m or specified in mW e.r.p.
$0,009 \leq f < 0,090$	72 descending 3 dB/oct above 0,03 MHz or according to note 1 (see note 5)
$0,09 \leq f < 0,119$	42
$0,119 \leq f < 0,135$	66 descending 3 dB/oct above 0,119 MHz or according to note 1 (see notes 3 and 5)
$0,135 \leq f < 0,140$	42
$0,140 \leq f < 0,1485$	37,7
$0,1485 \leq f < 30$	-5 (see note 4)
$0,315 \leq f < 0,600$	-5
$3,155 \leq f < 3,400$	13,5
4,234	9 (see note 9)
4,516	7
$7,400 \leq f < 8,800$	9
$10,2 \leq f < 11,00$	9
$12,5 \leq f < 20$	-7
$6,765 \leq f \leq 6,795$	42 (see notes 3 and 7)
$26,957 \leq f \leq 27,283$	42 (see note 3)
$13,410 \leq f \leq 13,553, 13,567 \leq f \leq 13,710$	9 (see note 6)
$13,110 \leq f \leq 13,410, 13,710 \leq f \leq 14,010$	-3,5 (see note 6)
$12,660 \leq f \leq 13,110, 14,010 \leq f \leq 14,460$	-10 (see note 6)
$11,810 \leq f \leq 12,660, 14,460 \leq f \leq 15,310$	-16 (see note 6)
$13,460 \leq f \leq 13,553, 13,567 \leq f \leq 13,660$	27 (see note 6)
$13,360 \leq f \leq 13,460, 13,660 \leq f \leq 13,760$	Linear transition from 27 to -3,5 (see note 6)
$13,110 \leq f \leq 13,360, 13,760 \leq f \leq 14,010$	-3,5 (see note 6)
$12,660 \leq f \leq 13,110, 14,010 \leq f \leq 14,460$	-5 (see note 6)
$13,553 \leq f \leq 13,567$	42 (see note 3) or 60 (see notes 2 and 3)
27,095	42



Frequency range (MHz)	H-field strength limit (Hf) dBμA/m at 10 m or specified in mW e.r.p.
26,995, 27,045, 27,095, 27,145, 27,195 (see note 8)	100 mW

NOTE 1: For the frequency ranges 9 kHz to 135 kHz, the following additional restrictions apply to limits above 42 dBμA/m:
 -for loop coil antennas with an area $\geq 0,16 \text{ m}^2$ this table and table B.1 with the antenna limitations apply;
 -for loop coil antennas with an area between $0,05 \text{ m}^2$ and $0,16 \text{ m}^2$ table B.1 applies with a correction factor.
 The limit is: table value + $10 \times \log(\text{area}/0,16 \text{ m}^2)$;
 -for loop coil antennas with an area $< 0,05 \text{ m}^2$ the limit is 10 dB below table B.1.
 NOTE 2: For RFID (incl. NFC) and EAS applications only.
 NOTE 3: Spectrum mask limit, see annex I.
 NOTE 4: For further information see annex G.
 NOTE 5: Limit is 42 dBμA/m for the following spot frequencies:
 60 kHz $\pm$ 250 Hz, 66,6 kHz $\pm$ 750 Hz, 75 kHz $\pm$ 250 Hz, 77,5 kHz $\pm$ 250 Hz, and 129,1 kHz $\pm$ 500 Hz.
 NOTE 6: Only in conjunction with spectrum mask, see annex I.
 NOTE 7: The frequency range 6,765 MHz - 6,795 MHz is not a harmonised ISM frequency band according article 5.138 of the ITU Radio Regulations [i.13].
 NOTE 8: Center frequencies for channelized systems by using $\leq 10 \text{ kHz}$ bandwidth.
 NOTE 9: The limit is valid in the range 984 kHz - 7 484 kHz for Transmitting only on receipt of a Balise/Eurobalise tele-powering signal from a train.

6.2 Test Procedure

The measurements of the transmitter radiated H-field shall be made on an open field test site as specified in clause C.1.3. Any measured values shall be at least 6 dB above the ambient noise level.

The H-field produced by the equipment shall be measured at standard distance of 10 m. Where this is not practical, e.g. due to physical size of the equipment including the antenna or with use of special field cancelling antenna, then other distances may be used. When another distance is used, the distance used and the field strength value measured shall be stated in the test report. In this case, the measured value at actual test distance shall be extrapolated to 10 m according to annex H and these calculations shall be stated in the test report.

The H-field is measured with a shielded loop antenna connected to a measurement receiver. The measuring bandwidth and detector type of the measurement receiver shall be in accordance with clause 5.12.

The equipment under test shall operate where possible, with modulation. Where this is not possible, it shall be stated in the test report.

For transmitters using a continuous wideband swept carrier, the measurement shall be made with the sweep off. When it is not possible to turn the sweep off the measurements shall be made with the sweep on and this shall be stated in the test report.

For measuring equipment calibrated in dBμV/m, the reading should be reduced by 51,5 dB to be converted to dBμA/m.



6.3 Test Condition

Operating Mode : TX mode
Test Environment : Normal Condition, Extreme Condition
Test Voltage : DC 8.1V to 9.9V
Ambient temperature : 25°C
Humidity : 54%RH
Atmospheric Pressure : 101.2kPa

Test Condition		Test Temperature	Test Voltage (Vdc)
Normal	NTNV (worst case)	25°C	9.0
Extreme	LTLV	0°C	8.1
	LTHV	0°C	9.9
	HTLV	40°C	8.1
	HTHV	40°C	9.9

6.4 Test Result

Frequency (kHz)	Level (dBuA/m)@3m	C3 Factor (dB)	Level (dBuA/m)@10m	Limit (dBuA/m)@10m	Result
326.5	19.38	31.65	-12.27	-5	Pass

Note 1: Pre-scan EUT X,Y,Z axis, and find the worst case at X axis.

Note 2: $H_{3m} = H_{10m} + C_3$ refer to ETSI EN300 330 Annex H.2

Note 3: All extreme conditions were considered for test, but only record the worst case.



7 Radiated Spurious Emission Below 30MHz

7.1 Standard Applicable

According to EN 300330 section 4.3.8, the radiated field strength of the spurious domain emissions below 30 MHz shall not exceed the generated H-field dB μ A/m at 10 m given in table 5.

State	Frequency 9 kHz $\leq f < 10$ MHz	Frequency 10 MHz $\leq f < 30$ MHz
Operating	27 dB μ A/m at 9 kHz descending 3 dB/oct	-3,5 dB μ A/m
Standby	5,5 dB μ A/m at 9 kHz descending 3 dB/oct	-25 dB μ A/m

7.2 Test Procedure

The field strength shall be measured for frequencies below 30 MHz. The equipment under test shall be measured at a distance of 10 m on an outdoor test site. The test antenna shall be a calibrated shielded magnetic field antenna. The equipment under test and test antenna shall be arranged as stated in clause A.1.

For Product Class 3 the transmitter antenna connector of the equipment under test shall be connected to an artificial antenna (see clause 6.2) and the output connector terminated.

The equipment under test shall be switched on with normal modulation. The characteristics of the modulation signal used shall be stated on the test report. The measuring receiver shall be tuned over the frequency range 9 kHz to 30 MHz, except for the frequency band on which the transmitter is intended to operate.

At each frequency at which a relevant spurious signal is detected the equipment under test and the test antenna shall be rotated until maximum field strength is indicated on the measuring receiver. This level shall be noted.

If the transmitter can be operated in the standby mode, then the measurements shall be repeated in the standby mode.

For measuring equipment calibrated in dB μ V/m, the reading should be reduced by 51,5 dB to be converted to dB μ A/m.

7.3 Test Condition

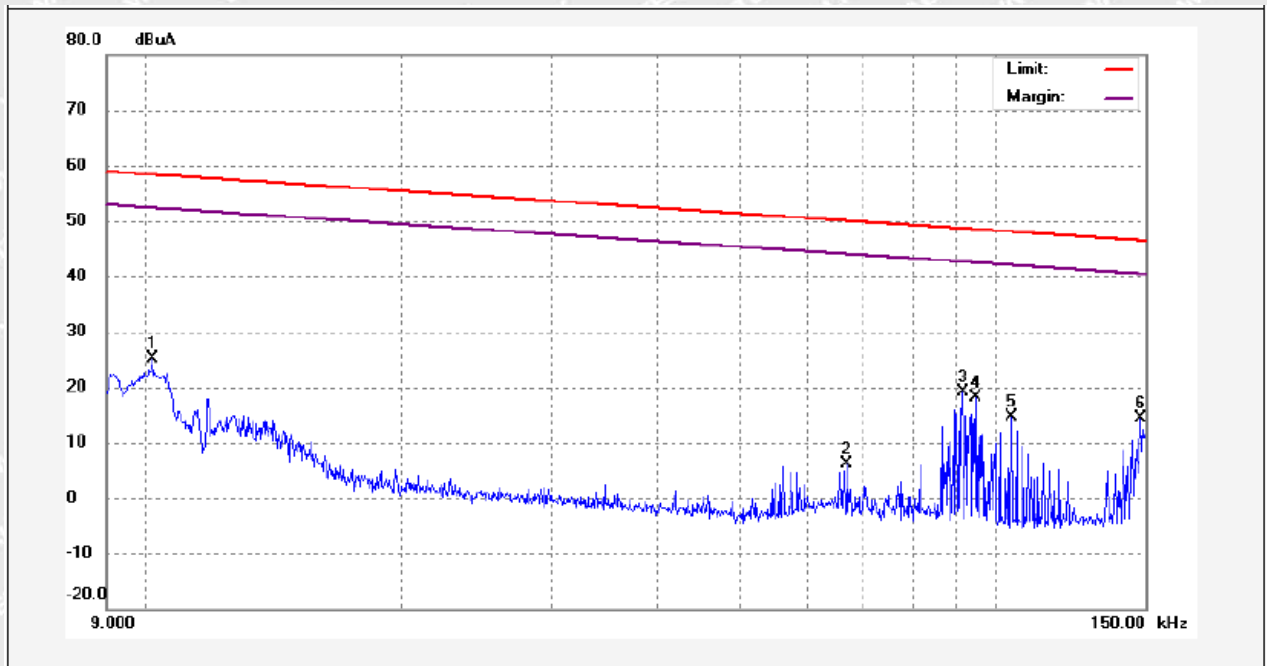
Operating Mode	: TX mode
Test Environment	: Normal Condition
Test Voltage	: DC 9V
Ambient temperature	: 25°C
Humidity	: 54%RH
Atmospheric Pressure	: 101.2kPa



7.4 Test Result

Frequency Range: 9kHz-150kHz

Polarization: Horizontal

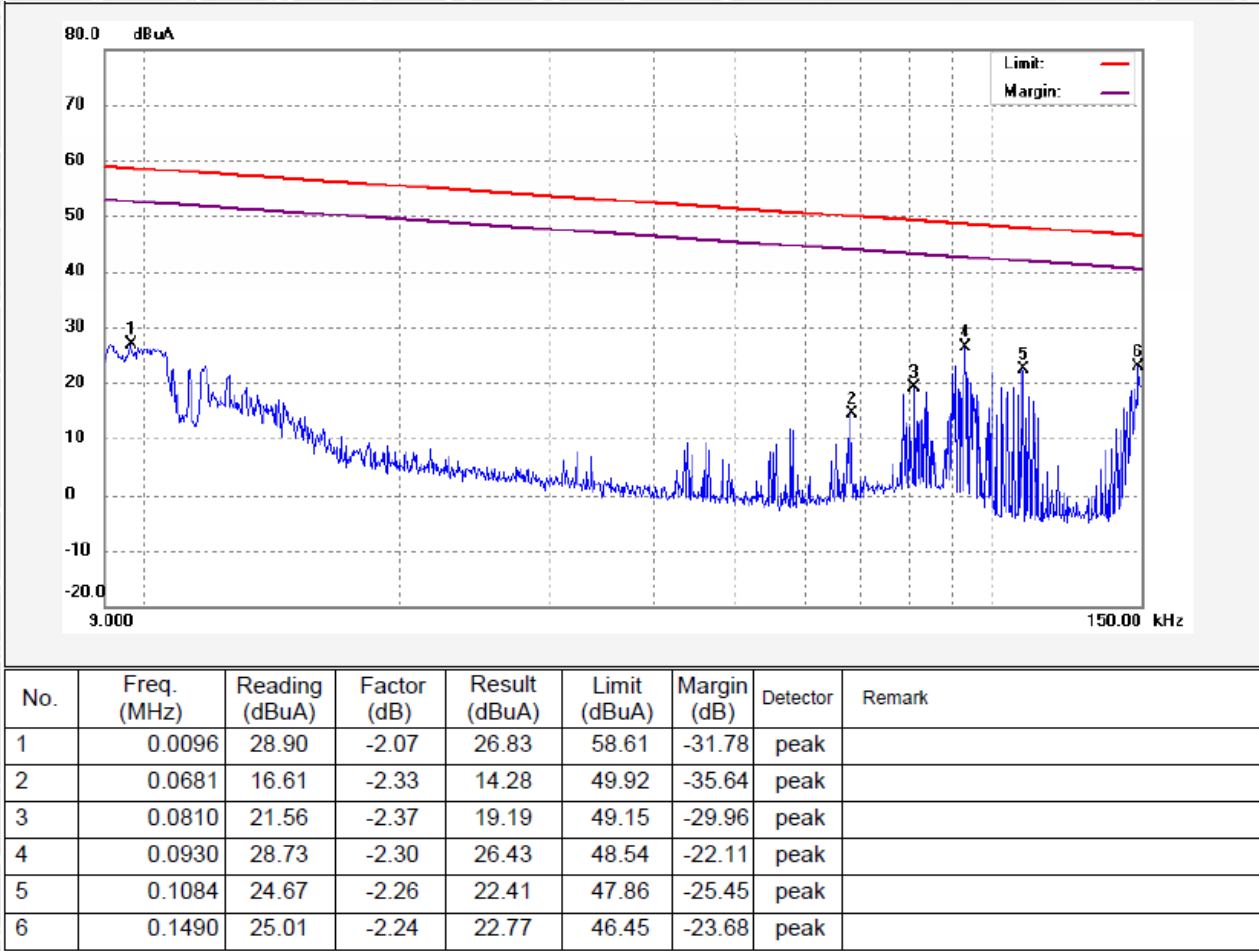


No.	Freq. (MHz)	Reading (dBuA)	Factor (dB)	Result (dBuA)	Limit (dBuA)	Margin (dB)	Detector	Remark
1	0.0102	27.23	-2.07	25.16	58.34	-33.18	peak	
2	0.0669	8.57	-2.33	6.24	50.00	-43.76	peak	
3	0.0914	21.37	-2.30	19.07	48.62	-29.55	peak	
4	0.0950	20.30	-2.29	18.01	48.44	-30.43	peak	
5	0.1045	16.95	-2.26	14.69	48.02	-33.33	peak	
6	0.1479	16.74	-2.24	14.50	46.48	-31.98	peak	



Frequency Range: 9kHz-150kHz

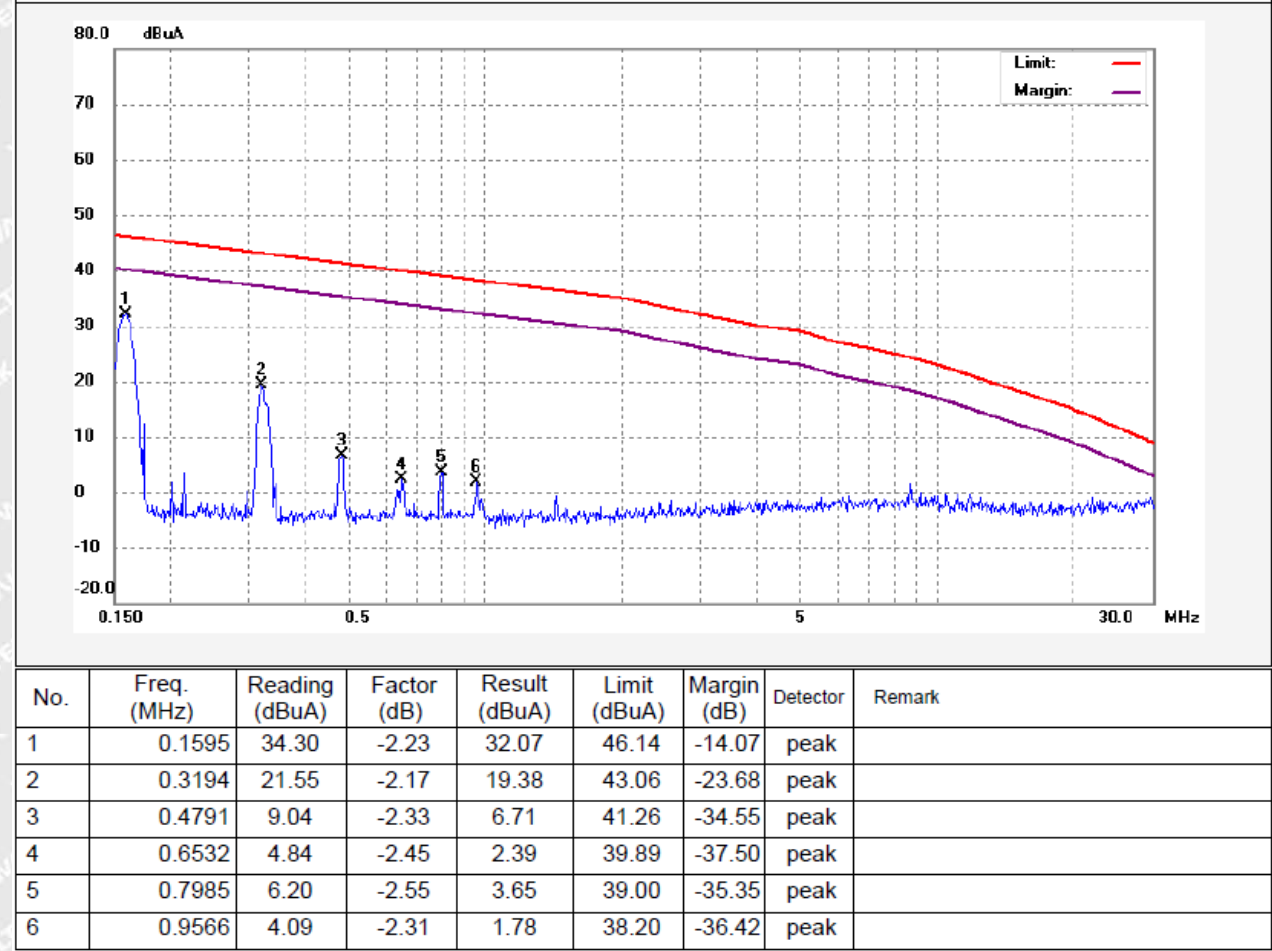
Polarization: Vertical





Frequency Range: 150kHz-30MHz

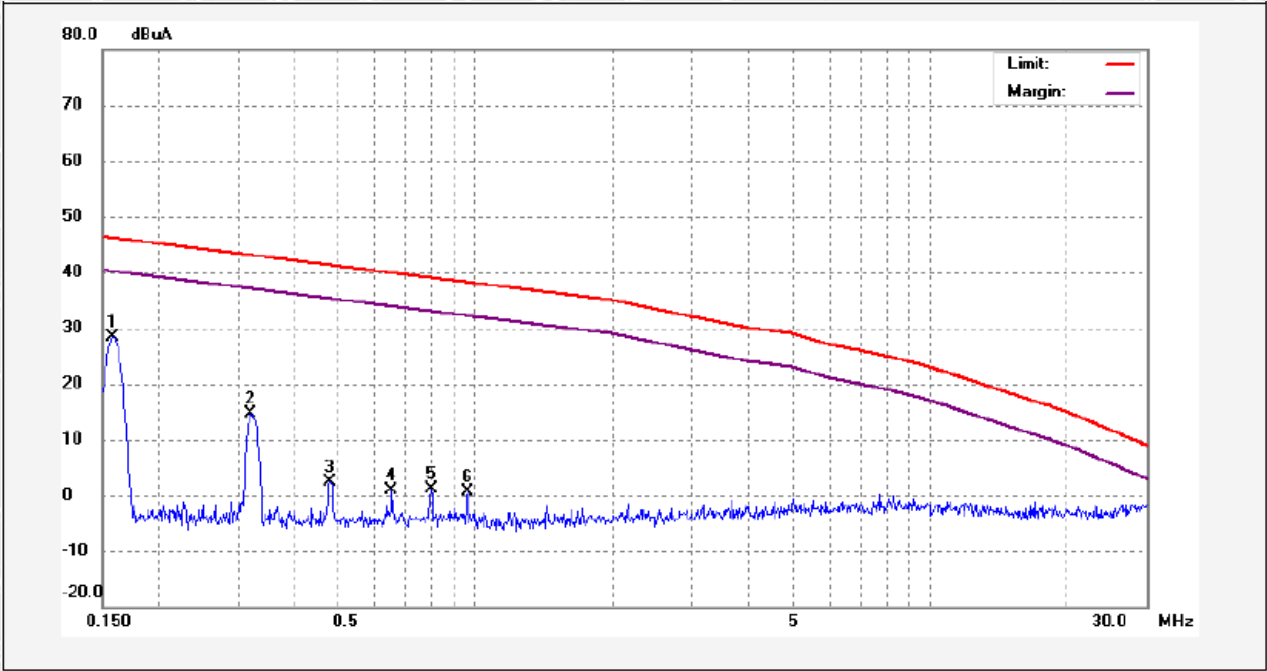
Polarization: Horizontal





Frequency Range: 150kHz-30MHz

Polarization: Vertical



No.	Freq. (MHz)	Reading (dBuA)	Factor (dB)	Result (dBuA)	Limit (dBuA)	Margin (dB)	Detector	Remark
1	0.1590	30.57	-2.23	28.34	46.16	-17.82	peak	
2	0.3198	16.87	-2.17	14.70	43.06	-28.36	peak	
3	0.4774	4.74	-2.33	2.41	41.28	-38.87	peak	
4	0.6529	3.44	-2.45	0.99	39.89	-38.90	peak	
5	0.7968	3.61	-2.55	1.06	39.01	-37.95	peak	
6	0.9582	2.96	-2.30	0.66	38.19	-37.53	peak	



8 Radiated Spurious Emission Above 30MHz

8.1 Standard Applicable

According to EN 300330 section 4.3.9, the power of any radiated emission shall not exceed the values given in table 6.

State	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

8.2 Test Procedure

EUT was placed on a nonmetal table which is 1.5 meter above the grounded reference plane and set to work in normal operation mode. Details refer to EN 300 330 subclause 6.2.9.

8.3 Test Condition

Operating Mode : TX mode

Test Environment : Normal Condition

Test Voltage : DC 9V

Ambient temperature : 25°C

Humidity : 54%RH

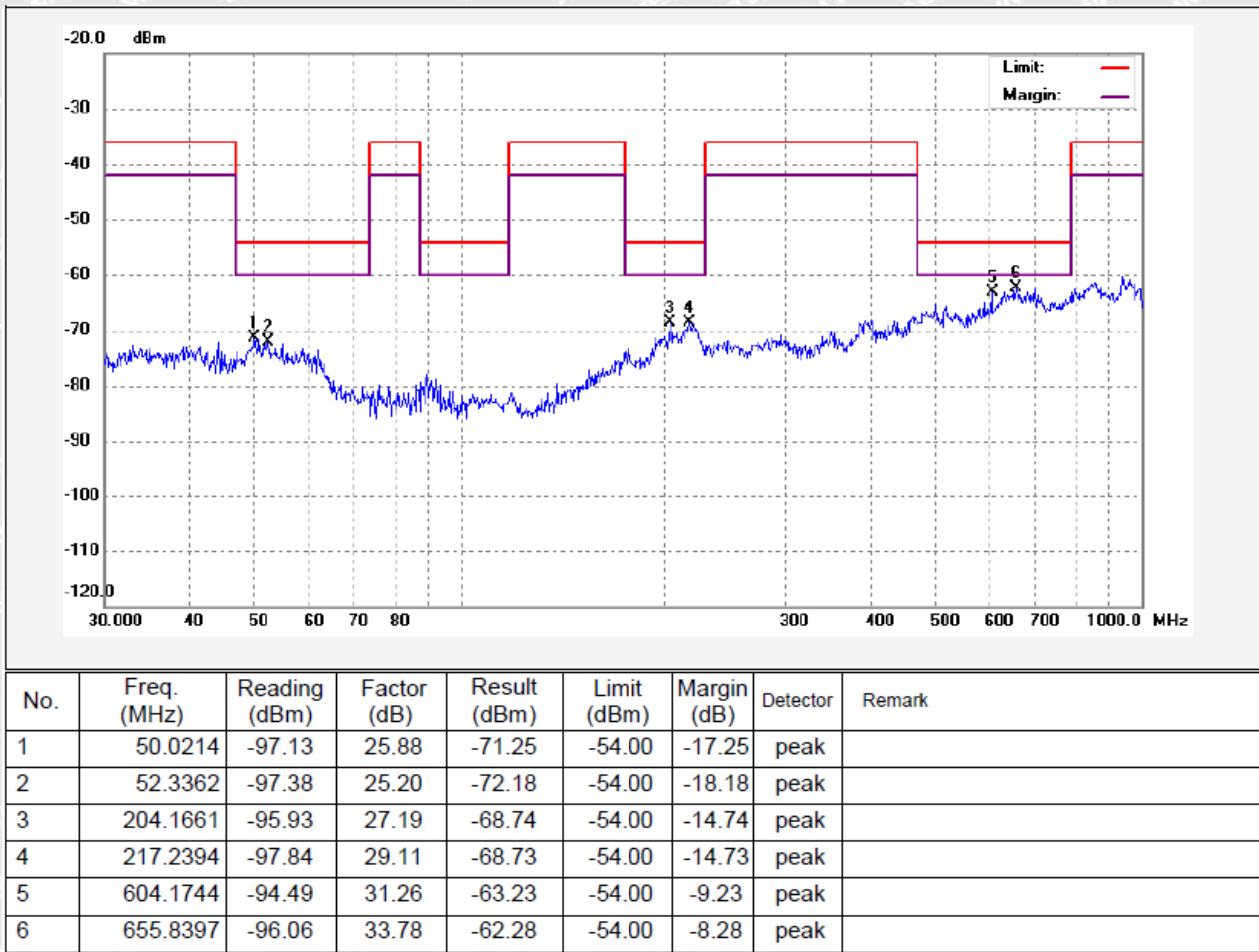
Atmospheric Pressure : 101.2kPa



8.4 Test Results

Frequency Range: 30MHz to 1GHz

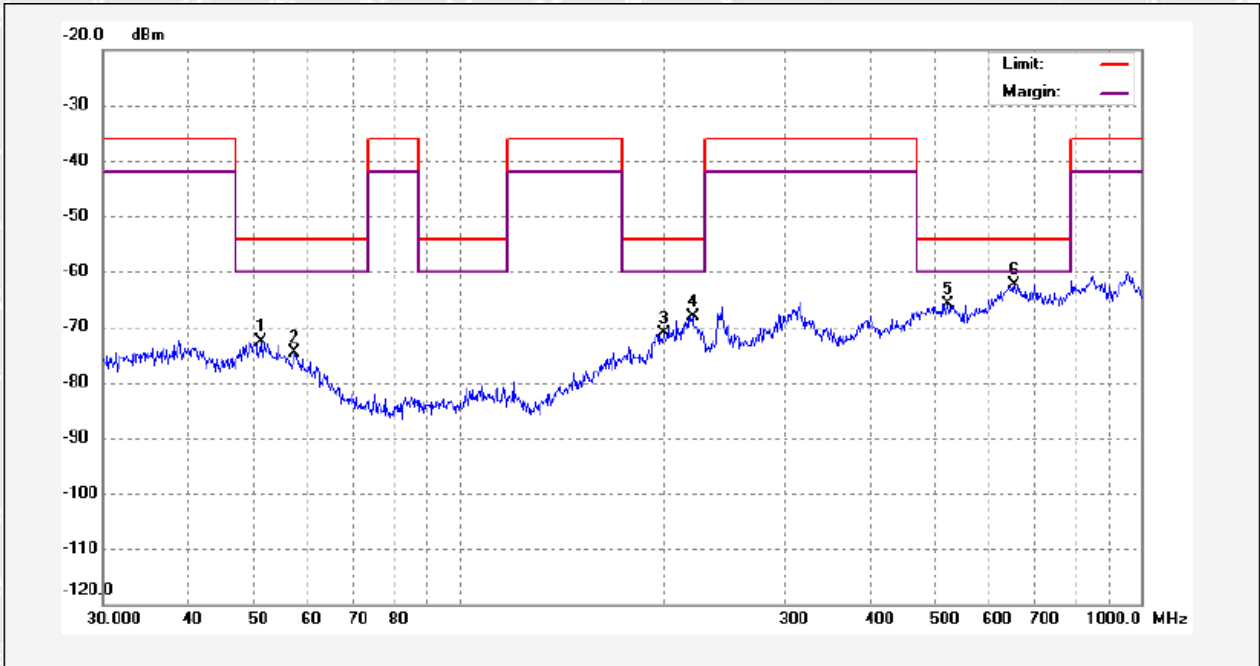
Polarization: Horizontal





Frequency Range: 30MHz to 1GHz

Polarization: Vertical



No.	Freq. (MHz)	Reading (dBm)	Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Detector	Remark
1	51.3005	-98.05	25.51	-72.54	-54.00	-18.54	peak	
2	57.5132	-97.95	23.28	-74.67	-54.00	-20.67	peak	
3	199.7753	-97.99	26.95	-71.04	-54.00	-17.04	peak	
4	220.3079	-97.78	29.57	-68.21	-54.00	-14.21	peak	
5	521.8023	-96.45	30.53	-65.92	-54.00	-11.92	peak	
6	654.0025	-96.18	33.88	-62.30	-54.00	-8.30	peak	

Note1: Standby mode does not produce any emission, which no emission been detected.



9 Photographs —Test Setup

9.1 Photograph - Spurious Emissions Radiated Test Setup

Below 1000MHz



Above 1000MHz





10 Photographs – EUT Constructional Details

Please refer to “ANNEX”.

=====End of Report=====

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检测
TESTING
CNAS L6478



TEST REPORT

Reference No...... : WTF24F09225466W001
Applicant..... : Mid Ocean Brands B.V.
Address..... : 7/F., Kings Tower, 111 King Lam Street, Cheung Sha Wan, Kowloon,
Hong Kong
Manufacturer : 118051
Address..... : ---
Product Name..... : Magnetic wireless charger
Model No...... : MO2521
Test specification..... : ETSI EN 303 417 V1.1.1 (2017-09)
Date of Receipt sample : 2024-10-24
Date of Test : 2024-11-08
Date of Issue..... : 2024-11-21
Test Report Form No. : WEW-303417A-01B
Test Result..... : **Pass**

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of approver.

Prepared By:

Waltek Testing Group (Foshan) Co., Ltd.

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E-mail:info@waltek.com.cn

Tested by:

Roy Hong

Approved by:

Danny Zhou



1 Test Summary

Radio Spectrum			
Test	Test Requirement	Reference	Result
Permitted range of operating frequencies	ETSI EN 303 417 V1.1.1	4.3.2	Pass
Operating frequency ranges	ETSI EN 303 417 V1.1.1	4.3.3	Pass
H-field requirements	ETSI EN 303 417 V1.1.1	4.3.4	Pass
Transmitter spurious emissions	ETSI EN 303 417 V1.1.1	4.3.5	Pass
Transmitter out of band (OOB) emissions	ETSI EN 303 417 V1.1.1	4.3.6	Pass
WPT system unwanted conducted emissions	ETSI EN 303 417 V1.1.1	4.3.7	N/A
Receiver blocking	ETSI EN 303 417 V1.1.1	4.4.2	Pass

Remark:

Pass The EUT complies with the essential requirements in the standard

Fail The EUT does not comply with the essential requirements in the standard

N/A Not Applicable

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3 General Information

3.1 General Description of E.U.T.

Product Name : Magnetic wireless charger
Model No. : MO2521
Remark : ---
Rating : Input: DC 9V/3A, DC 9V/2.2A, DC 5V/2A
Output: DC 9V/1.66A, DC 5V/0.6A, DC 5V/0.5A
Wireless Output Power for:
Top: 15W Max
Middle for Apple Watch: 2.5W Max
Bottom: 3W Max
Battery Capacity : ---
Adapter Model : ---

3.2 Details of E.U.T.

Frequency Bands : 110-205kHz
Radiated H-Field : 15.37 dBuA/m(@3m) for top wireless charging area
17.73 dBuA/m(@3m) for bottom wireless charging area
Antenna Type : Coil Antenna
Antenna Gain : 0dBi

Overview of operational modes within a WPT system

Operational Mode	Set-up	Function of base station	Function of mobile device	Test scenario	Conformance Requirements
Mode 1: base station in stand-by, idle mode	Single device	Transmitter	Not applicable	Single radiation test (TX) with the base station/charging pad. The test set-up as described in clause 6.1.2 shall be used.	Operating frequency range (clause 4.3.3) H-Field emission (clause 4.3.4) TX spurious (clauses 4.3.5, 4.3.6 and 4.3.7) Performance criteria test (RX test) (clause 4.4)
Mode 2: Communication before charging, adjustment charging mode / position	In combination	TX and RX	TX and RX	Specific test setup, declared by the manufacturer. Manufacturer shall declare the maximal distance between base station and mobile device the WPT system is able to communicate (distance D).The test setup- up shall	Operating frequency range (clause 4.3.3) H-Field emission (clause 4.3.4) TX spurious (clauses 4.3.5, 4.3.6 and 4.3.7) Wanted performance criteria test (RX test) (clause 4.4)



Operational Mode	Set-up	Function of base station	Function of mobile device	Test scenario	Conformance Requirements
				be performed with the largest communication distance. The test set-up as described in clause 6.1.3 shall be used.	
Mode3: Communication	WPT system alignment	TX and RX	TX and RX	Worst case alignment	Operating frequency range (clause 4.3.3) H-Field emission (clause 4.3.4) TX spurious (clauses 4.3.5, 4.3.6 and 4.3.7) Wanted Performance criteria test (RX test) (clause 4.4)
Mode 4: energy transmission	WPT system alignment	TX and RX	TX and RX	Both tests can be performed within one set-up, worst-case alignment. The test set-up as described in clause 6.1.4 shall be used.	

3.3 Standards Applicable for Testing

The tests were performed according to following standards:

ETSI EN 303 417 V1.1.1 (2017-09)	Wireless power transmission systems, using technologies other than radio frequency beam in the 19 - 21 kHz, 59 - 61 kHz, 79 - 90 kHz, 100 - 300 kHz, 6765 - 6795 kHz ranges; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU.
----------------------------------	--

3.4 Test Facility

The test facility has a test site registered with the following organizations:

- **ISED – Registration No.: 21895**

Waltek Testing Group (Foshan) Co., Ltd. has been registered and fully described in a report filed with the Innovation, Science and Economic Development Canada (ISED). The acceptance letter from the ISED is maintained in our files. Registration ISED number: 21895, March 12, 2019

- **FCC – Registration No.: 820106**

Waltek Testing Group (Foshan) Co., Ltd. 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 820106, August 16, 2018

- **NVLAP – Lab Code: 600191-0**

Waltek Testing Group (Foshan) Co., Ltd. EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 600191-0.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.



3.5 Subcontracted

Whether parts of tests for the product have been subcontracted to other labs:

☐ Yes ☒ No

If Yes, list the related test items and lab information:

Test items: ---

Lab information: ---

3.6 Abnormalities from Standard Conditions

None.

3.7 Disclaimer

The antenna gain information is provided by the customer. The laboratory is not responsible for the accuracy of the antenna gain information.

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4 Equipment Used during Test

4.1 Equipment List

☒ 3m Semi-anechoic Chamber for Spurious Emission						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	3m Semi-anechoic Chamber	CHANGCHUANG	9m×6m×6m	-	2024-01-05	2025-01-04
2	EMI TEST RECEIVER	RS	ESR7	101566	2024-01-06	2025-01-05
3	Spectrum Analyzer	Agilent	N9020A	MY48011796	2024-01-04	2025-01-03
4	Trilog Broadband Antenna	SCHWARZBECK	VULB9162	9162-117	2024-01-05	2025-01-04
5	Coaxial Cable (below 1GHz)	H+S	CBL3-NN-12+3 m	214NN320	2024-01-06	2025-01-05
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	01561	2024-01-05	2025-01-04
7	Broadband Preamplifier (Above 1GHz)	Lunar E M	LNA1G18-40	20160501002	2024-01-04	2025-01-03
8	Coaxial Cable (above 1GHz)	Times-Microwave	CBL5-NN	-	2024-01-04	2025-01-03
☒ RF Conducted test						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	Environmental Chamber	GERUI	GR-HWS-1000L	GR24061818	2024-07-02	2025-07-01
2	Spectrum Analyzer	Agilent	N9020A	MY48011796	2024-01-04	2025-01-03
3	EXG Analog Signal Generator	Agilent	N5181A	MY48180720	2024-01-04	2025-01-03
4	RF Control Unit	CHANGCHUANG	JS0806-2	-	2024-01-04	2025-01-03
5	Wideband radio communication tester	Rohde&Schwarz	CMW500	1201.0002K50-158178-Qf	2024-01-04	2025-01-03
6	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY56510008	2024-01-04	2025-01-03

☐: Not Used

☒: Used



4.2 Software List

Description	Manufacturer	Model	Version
EMI Test Software (Radiated Emission)	FARATRONIC	EZ-EMC	RA-03A1-1
RF Conducted Test	TONSCEND	JS1120-2	2.6

4.3 Special Accessories and Auxiliary Equipment

Item	Equipment	Technical Data	Manufacturer	Model No.	Serial No.
1.	/	/	/	/	/

4.4 Measurement Uncertainty

Parameter	Uncertainty	Note
RF Output Power	$\pm 2.2\text{dB}$	(1)
Occupied Bandwidth	$\pm 1.5\%$	(1)
Transmitter Spurious Emission	$\pm 3.8\text{dB}$ (for 25MHz-1GHz)	(1)
	$\pm 5.0\text{dB}$ (for 1GHz-18GHz)	(1)

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

4.5 Decision Rule

Compliance or non-compliance with a disturbance limit shall be determined in the following manner.

If U_{LAB} is less than or equal to U_{Cispr1} then

- Compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- Non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If U_{LAB} is greater than U_{Cispr1} then

- Compliance is deemed to occur if no measured disturbance level, increased by $(U_{\text{LAB}} - U_{\text{Cispr1}})$, exceeds the disturbance limit;
- Non-compliance is deemed to occur if any measured disturbance level, increased by $(U_{\text{LAB}} - U_{\text{Cispr1}})$, exceeds the disturbance limit.



5 Permitted Range of Operating Frequency

5.1 Standard Applicable

1. This applies to all WPT systems.

2. The permitted range of operating frequencies denotes the frequency ranges set out in Table 1. It likewise denotes the respective frequency range for accommodation of the fundamental WPT frequency of the EUT within its operating frequency range (OFR).

3. Limits

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, 6 765 - 6 795 kHz, see Table 2.

5.2 Test Procedure

Please refer to ETSI EN 303 417 subclause 6.2.2.

5.3 Test Condition

Operating Mode : TX mode

Test Environment : Normal Condition

Test Voltage : DC 9V

Ambient temperature : 25°C

Humidity : 54%RH

Atmospheric Pressure : 101.2kPa

5.4 Test Result

For Top Wireless Charging Area

Permitted range of operating frequencies				
F_L (kHz)	F_H (kHz)	Limit (kHz)		Result
110	205	$F_L \geq 100$	$F_H \leq 300$	Pass

For Bottom Wireless Charging Area

Permitted range of operating frequencies				
F_L (kHz)	F_H (kHz)	Limit (kHz)		Result
110	205	$F_L \geq 100$	$F_H \leq 300$	Pass



6 Operating Frequency Ranges

6.1 Standard Applicable

The operating frequency range is the frequency range over which the WPT system is intentionally transmitting (all operational modes, see clause 4.2.3, Table 2).

The operating frequency range(s) of the WPT system are determined by the lowest (f_L) and highest frequency (f_H) as occupied by the power envelope.

The WPT system could have more than one operating frequency range.

For a single frequency systems the OFR is equal to the occupied bandwidth (OBW) of the WPT system.

For multi-frequency systems the OFR is described in Figures 2 and 3.

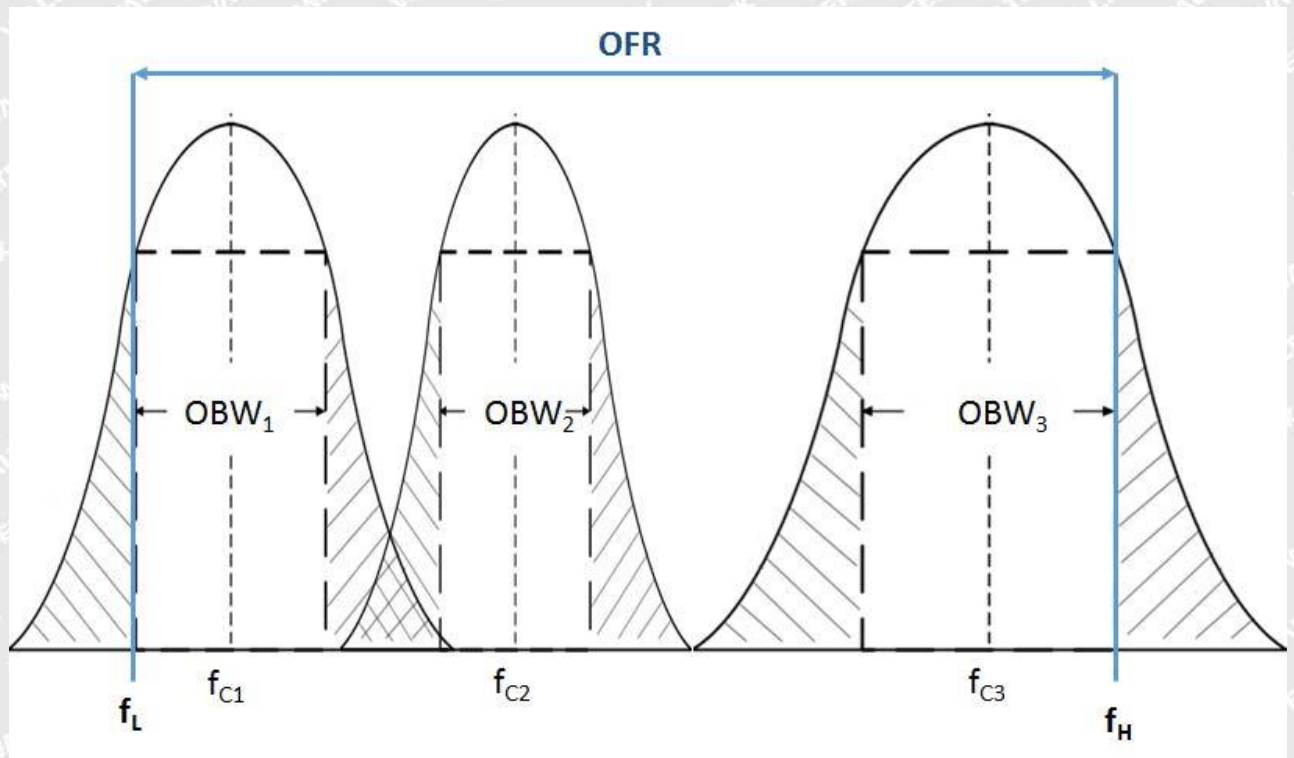


Figure 2: OFR of a multi - frequency WPT system within one frequency range of Table 2 and within one WPT system cycle time

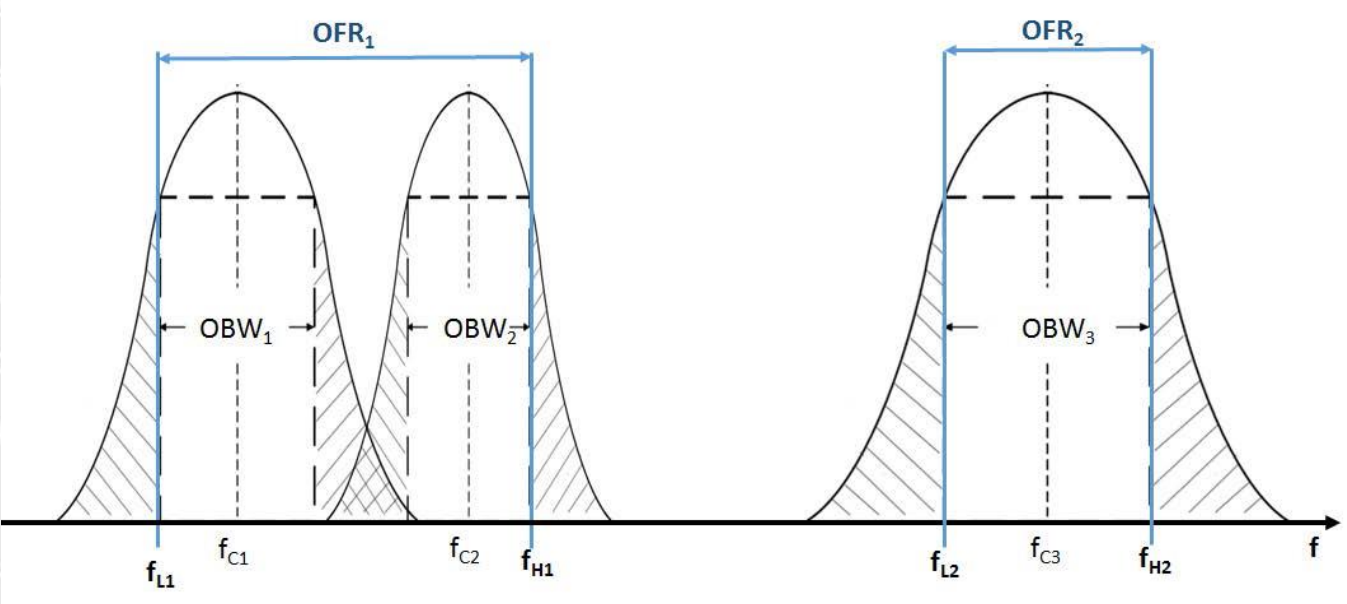


Figure 3: OFR of a multi - frequency WPT system within two frequency ranges of Table 2 and within one WPT system cycle time

Limits

The operating frequency range for emissions shall be within one of the following limits: 19 - 21 kHz, 59 - 61 kHz, 79 - 90 kHz, 100 - 300 kHz, 6 765 - 6 795 kHz.

6.2 Test Procedure

Please refer to ETSI EN 303 417 subclause 6.2.2.

6.3 Test Condition

Operating Mode	TX mode
Test Environment	Normal Condition
Test Voltage	DC 9V
Ambient temperature	25°C
Humidity	54%RH
Atmospheric Pressure	101.2kPa



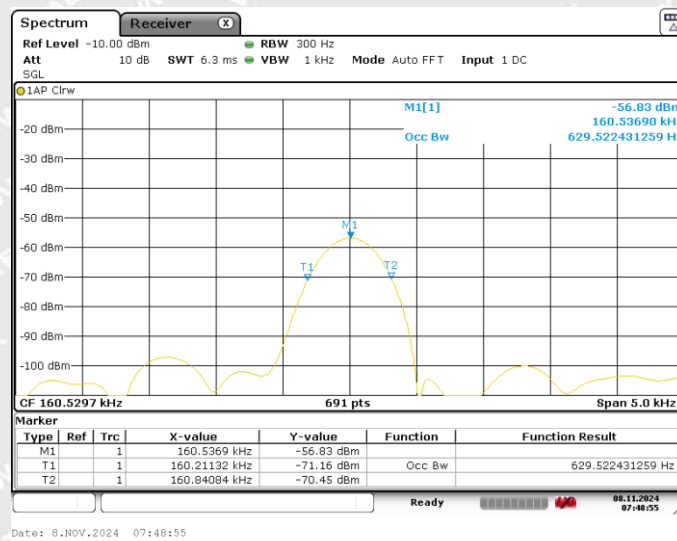
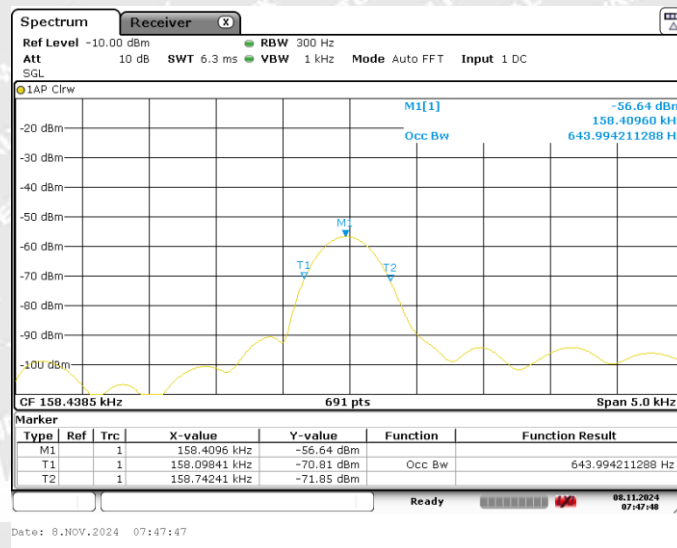
6.4 Test Result

For Top Wireless Charging Area

Operating frequency range(s) (OFR)				
F_L (kHz)	F_H (kHz)	Limit (kHz)		Result
158.41	160.84	$F_L \geq 100$	$F_H \leq 300$	Pass

Test Plots:

Operating frequency range(s) (OFR)



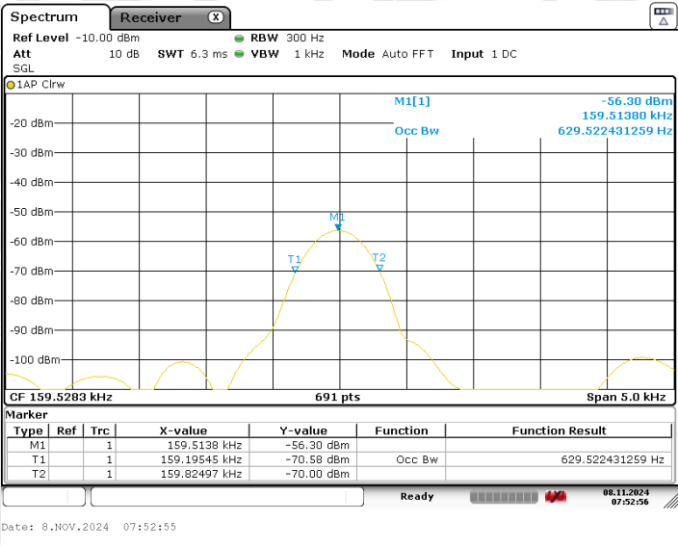
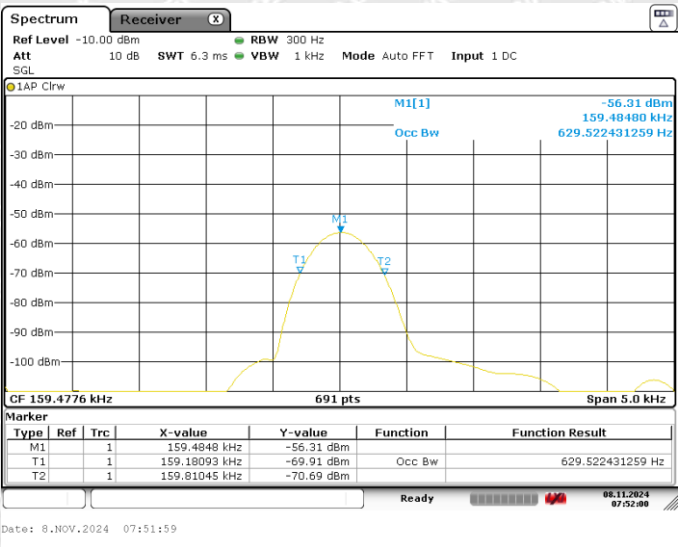


For Bottom Wireless Charging Area

Operating frequency range(s) (OFR)				
F _L (kHz)	F _H (kHz)	Limit (kHz)		Result
159.18	159.82	F _L ≥ 100	F _H ≤ 300	Pass

Test Plots:

Operating frequency range(s) (OFR)





7 Transmitter H-field Requirements

7.1 Standard Applicable

The radiated H-field is defined in the direction of maximum field strength under specified conditions of measurement.

The H-field limits are provided in Table 3.

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

The H-field limits in Table 3 are EU wide harmonised according to EC Decision 2013/752/EU [i.2]. Further information is available in CEPT/ERC/REC 70-03 [i.1].

Table 3: 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 [i.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.

7.2 Test Procedure

Please refer to ETSI EN 303 417 subclause 6.2.2

7.3 Test Condition

Operating Mode	TX mode
Test Environment	Normal Condition
Test Voltage	DC 9V
Ambient temperature	25°C
Humidity	54%RH
Atmospheric Pressure	101.2kPa



7.4 Test Result

For Top Wireless Charging Area

Frequency (MHz)	Level (dBuA/m)@3m	C ₃ Factor (dB)	Level (dBuA/m)@10m	Limit (dBuA/m)@10m	Result
0.15	15.37	31.2	-15.83	-5	Pass

Note 1: Pre-scan EUT X,Y,Z axis, and find the worst case at X axis.

Note 2: $H_{3m}=H_{10m}+C_3$ refer to ETSI EN 300 330 Annex H.2

For Bottom Wireless Charging Area

Frequency (MHz)	Level (dBuA/m)@3m	C ₃ Factor (dB)	Level (dBuA/m)@10m	Limit (dBuA/m)@10m	Result
0.16	17.73	31.2	-13.47	-5	Pass

Note 1: Pre-scan EUT X,Y,Z axis, and find the worst case at X axis.

Note 2: $H_{3m}=H_{10m}+C_3$ refer to ETSI EN 300 330 Annex H.2

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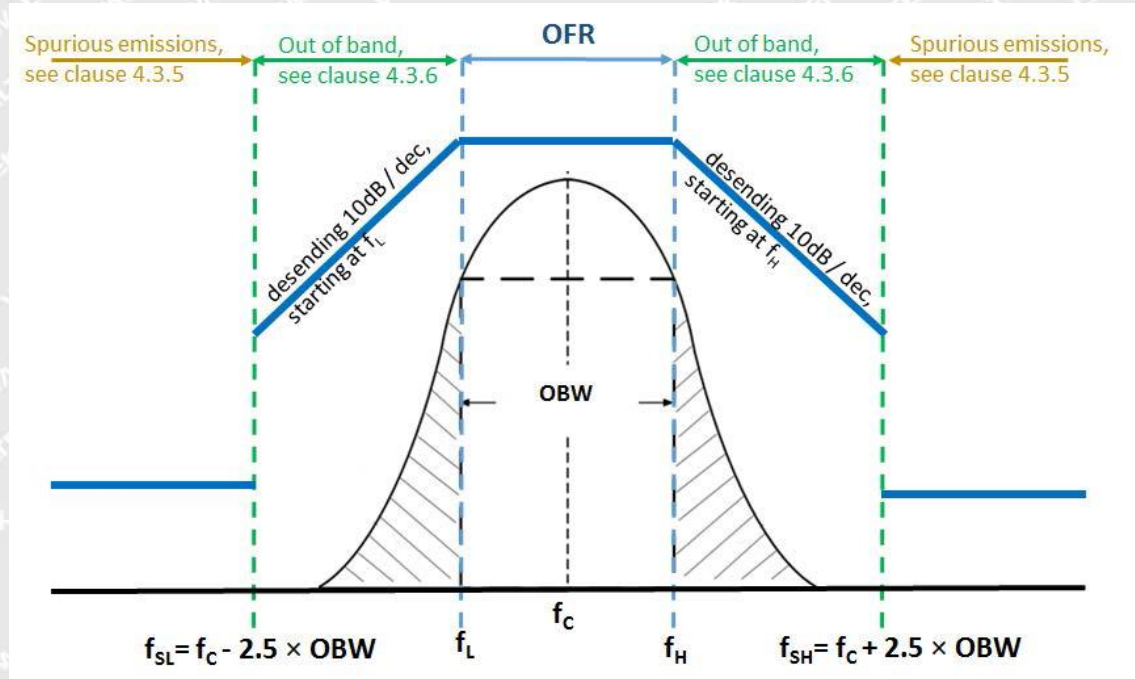


8 Transmitter Spurious Emissions

8.1 Standard Applicable

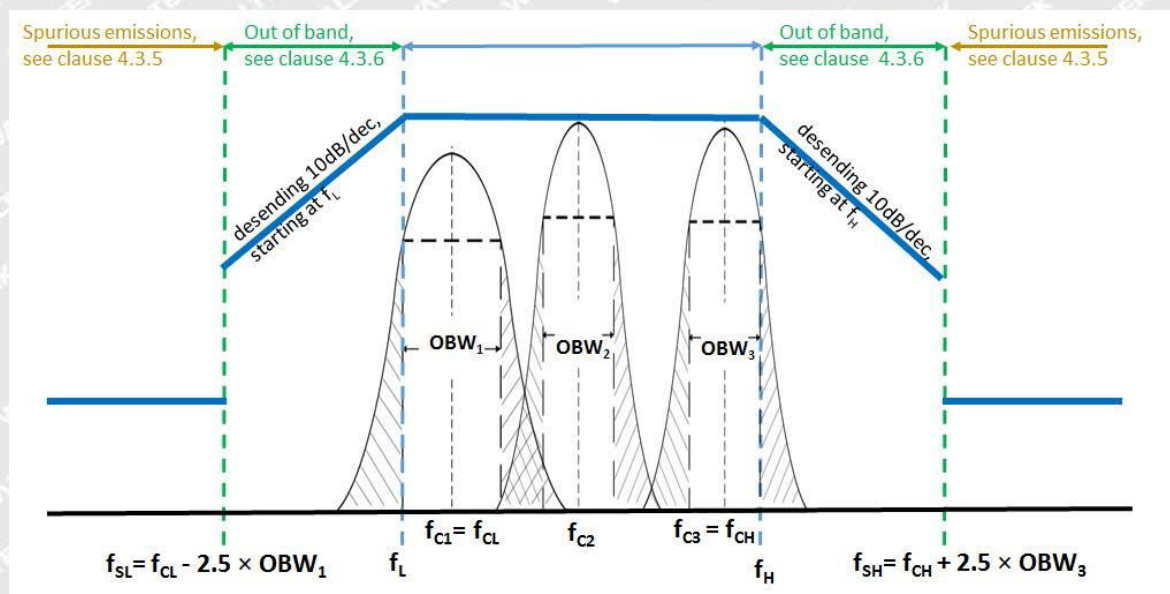
The transmitter spurious emissions for a single frequency system are to be considered in frequency ranges defined in Figure 4 ($f < f_{SL}$ and $f > f_{SH}$).

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



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 $f > f_{SH}$).

Figure 5: Out of band and spurious domain of a multi - frequency system (during one WPT system cycle time).





Limit

The radiated field strength of spurious emissions below 30 MHz shall not exceed the generated H-field given in Table 4.

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 30 MHz and 1 GHz shall not exceed the values given in Table 5.

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.

8.2 Test Procedure

Please refer to ETSI EN 303 417 subclause 6.2.2 and subclause 6.2.3 for the measurement method

8.3 Test Condition

Operating Mode	TX mode, RX mode
Test Environment	Normal Condition
Test Voltage	DC 9V
Ambient temperature	25°C
Humidity	54%RH
Atmospheric Pressure	101.2kPa

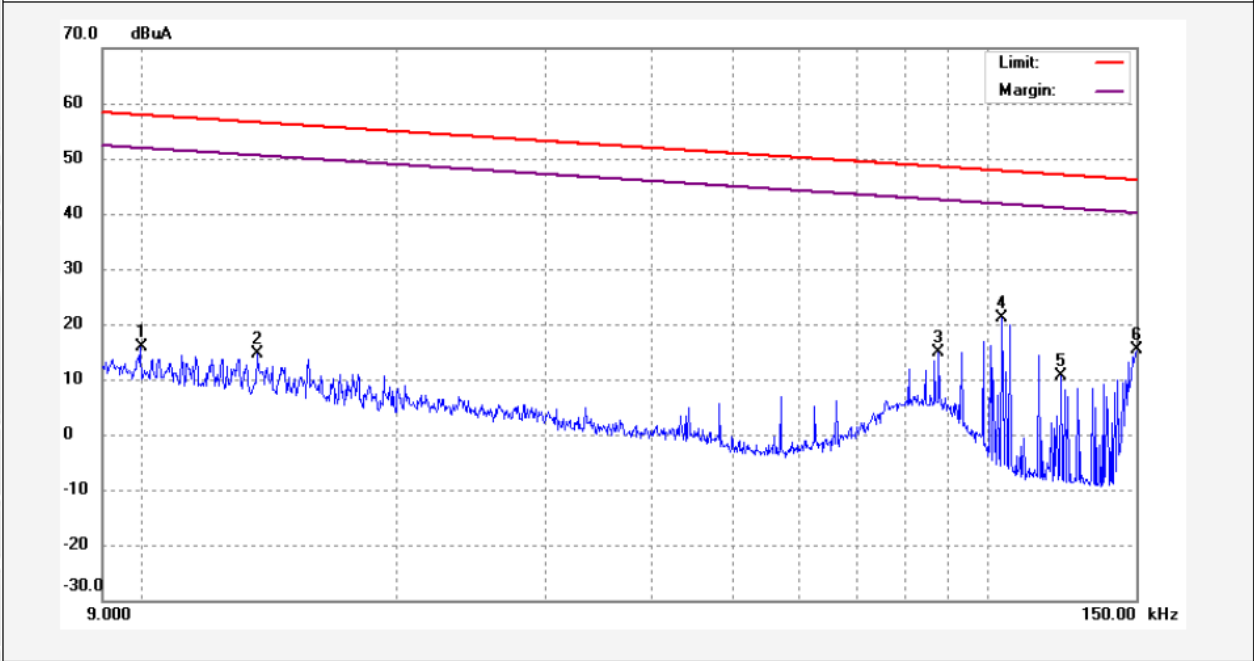


8.4 Test Result

Area: Top

Frequency Range: 9kHz-150kHz Emission @3m

Vertical Polarization



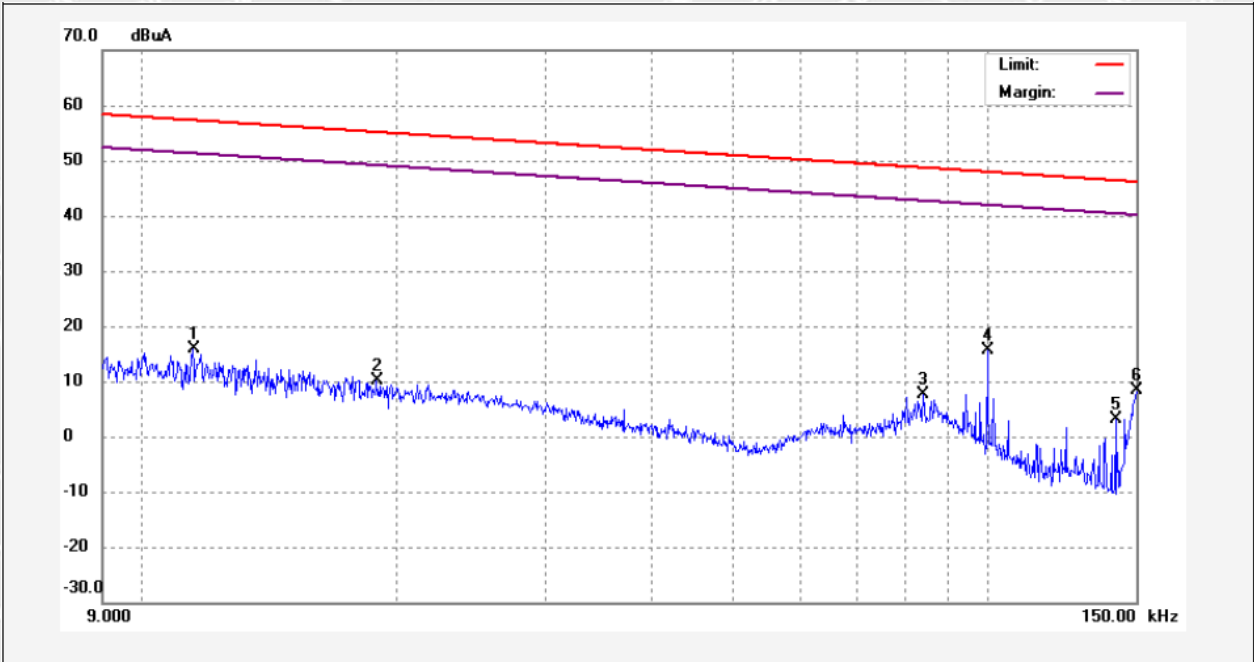
No.	Freq. (MHz)	Reading (dBuA)	Factor (dB)	Result (dBuA)	Limit (dBuA)	Margin (dB)	Detector	Remark
1	0.0100	17.95	-2.07	15.88	57.90	-42.02	peak	
2	0.0137	16.72	-2.03	14.69	56.53	-41.84	peak	
3	0.0875	17.32	-2.33	14.99	48.52	-33.53	peak	
4	0.1041	23.48	-2.26	21.22	47.75	-26.53	peak	
5	0.1222	12.84	-2.25	10.59	47.04	-36.45	peak	
6	0.1500	17.61	-2.24	15.37	46.13	-30.76	peak	

Note 1: $H_{3m}=H_{10m}+C_3$ refer to ETSI EN 300 330 Annex H.2



Area: Top
Horizontal Polarization

Frequency Range: 9kHz-150kHz Emission @3m



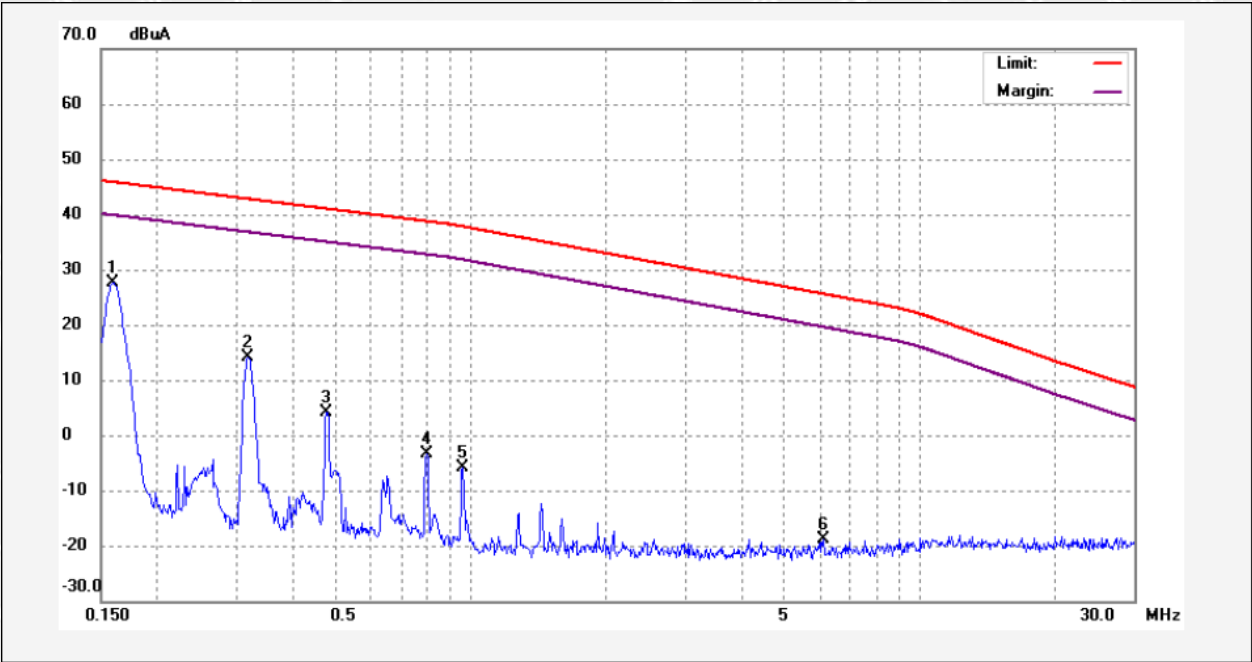
No.	Freq. (MHz)	Reading (dBuA)	Factor (dB)	Result (dBuA)	Limit (dBuA)	Margin (dB)	Detector	Remark
1	0.0115	17.90	-2.06	15.84	57.29	-41.45	peak	
2	0.0190	12.02	-1.98	10.04	55.12	-45.08	peak	
3	0.0840	9.95	-2.35	7.60	48.69	-41.09	peak	
4	0.1000	17.91	-2.26	15.65	47.93	-32.28	peak	
5	0.1418	5.30	-2.24	3.06	46.38	-43.32	peak	
6	0.1500	10.57	-2.24	8.33	46.13	-37.80	peak	

Note 1: $H_{3m}=H_{10m}+C_3$ refer to ETSI EN 300 330 Annex H.2



Area: Top
Vertical Polarization

Frequency Range: 150kHz-30MHz Emission @3m



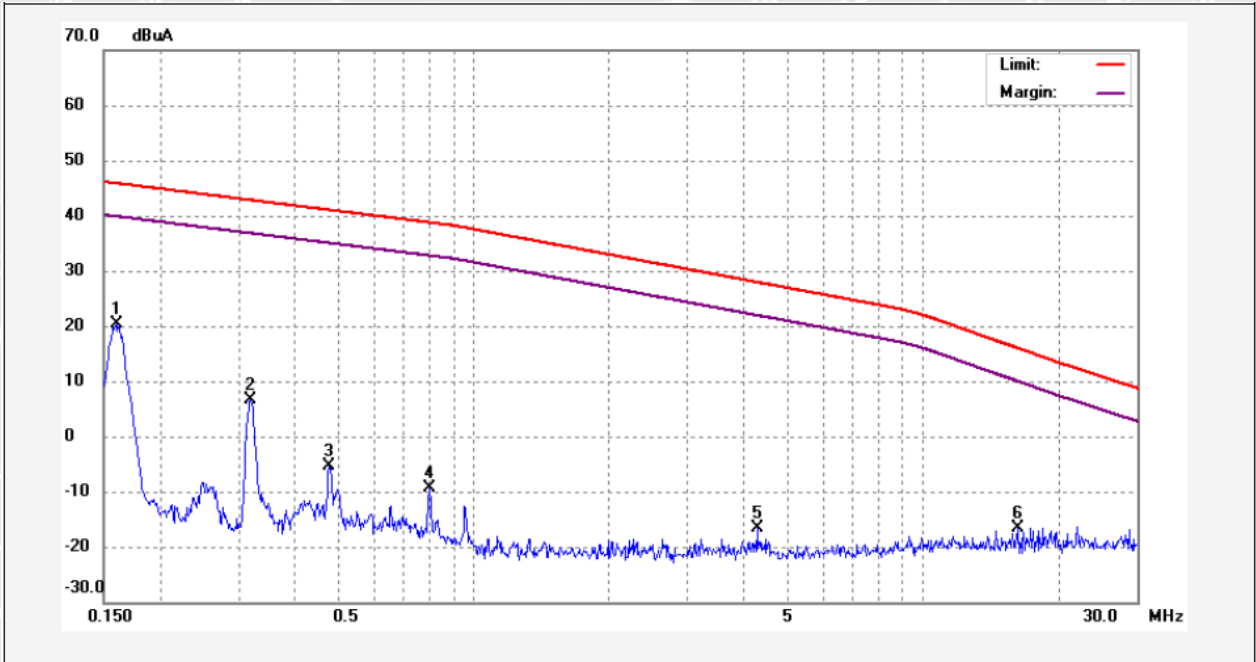
No.	Freq. (MHz)	Reading (dBuA)	Factor (dB)	Result (dBuA)	Limit (dBuA)	Margin (dB)	Detector	Remark
1	0.1590	29.85	-2.23	27.62	45.88	-18.26	peak	
2	0.3183	16.41	-2.17	14.24	42.80	-28.56	peak	
3	0.4761	6.38	-2.33	4.05	41.02	-36.97	peak	
4	0.7960	-0.77	-2.55	-3.32	38.74	-42.06	peak	
5	0.9582	-3.46	-2.30	-5.76	37.79	-43.55	peak	
6	6.0885	-16.54	-2.35	-18.89	25.58	-44.47	peak	

Note 1: $H_{3m}=H_{10m}+C_3$ refer to ETSI EN 300 330 Annex H.2



Area: Top
Horizontal Polarization

Frequency Range: 150kHz-30MHz Emission @3m



No.	Freq. (MHz)	Reading (dBuA)	Factor (dB)	Result (dBuA)	Limit (dBuA)	Margin (dB)	Detector	Remark
1	0.1598	22.55	-2.23	20.32	45.85	-25.53	peak	
2	0.3183	8.70	-2.17	6.53	42.80	-36.27	peak	
3	0.4761	-3.11	-2.33	-5.44	41.02	-46.46	peak	
4	0.7960	-6.81	-2.55	-9.36	38.74	-48.10	peak	
5	4.2692	-14.22	-2.47	-16.69	27.92	-44.61	peak	
6	16.3118	-14.11	-2.39	-16.50	15.93	-32.43	peak	

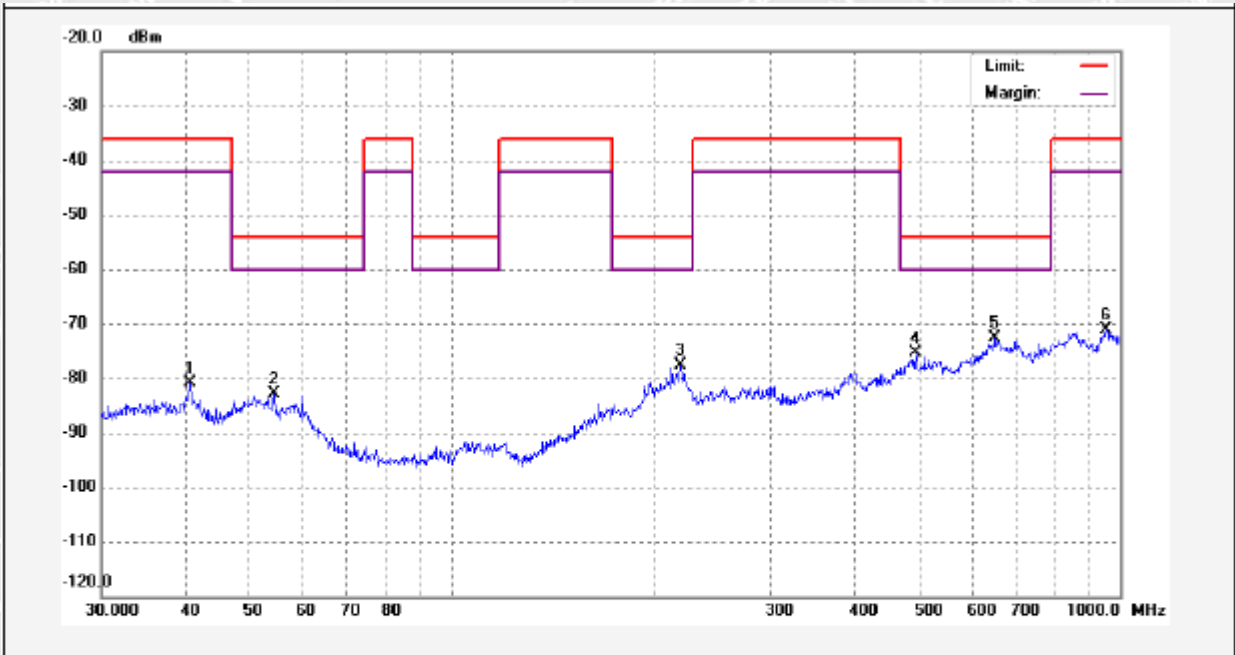
Note 1: $H_{3m}=H_{10m}+C_3$ refer to ETSI EN 300 330 Annex H.2



Area: Top

Frequency Range: 30MHz-1GHz Emission For TX

Vertical Polarization

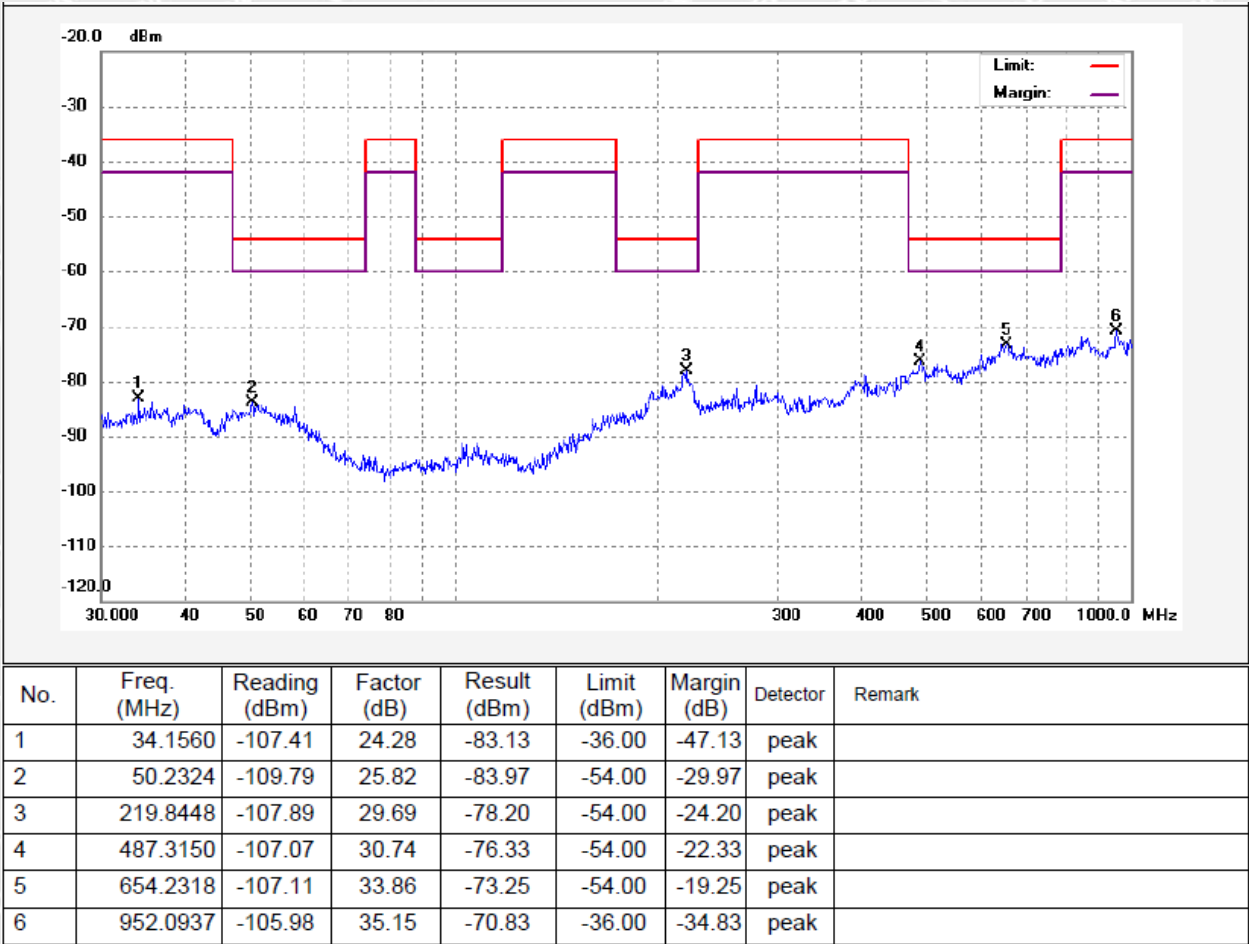


No.	Freq. (MHz)	Reading (dBm)	Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Detector	Remark
1	40.7016	-105.83	25.02	-80.81	-36.00	-44.81	peak	
2	54.4516	-107.46	24.58	-82.88	-54.00	-28.88	peak	
3	220.6171	-106.96	29.43	-77.53	-54.00	-23.53	peak	
4	494.1984	-105.92	30.54	-75.38	-54.00	-21.38	peak	
5	649.6597	-106.72	34.08	-72.64	-54.00	-18.64	peak	
6	952.0937	-106.28	35.15	-71.13	-36.00	-35.13	peak	



Area: Top
Horizontal Polarization

Frequency Range: 30MHz-1GHz Emission For TX





Area: Top

Frequency Range: 30MHz-1GHz Emission For RX

Vertical Polarization

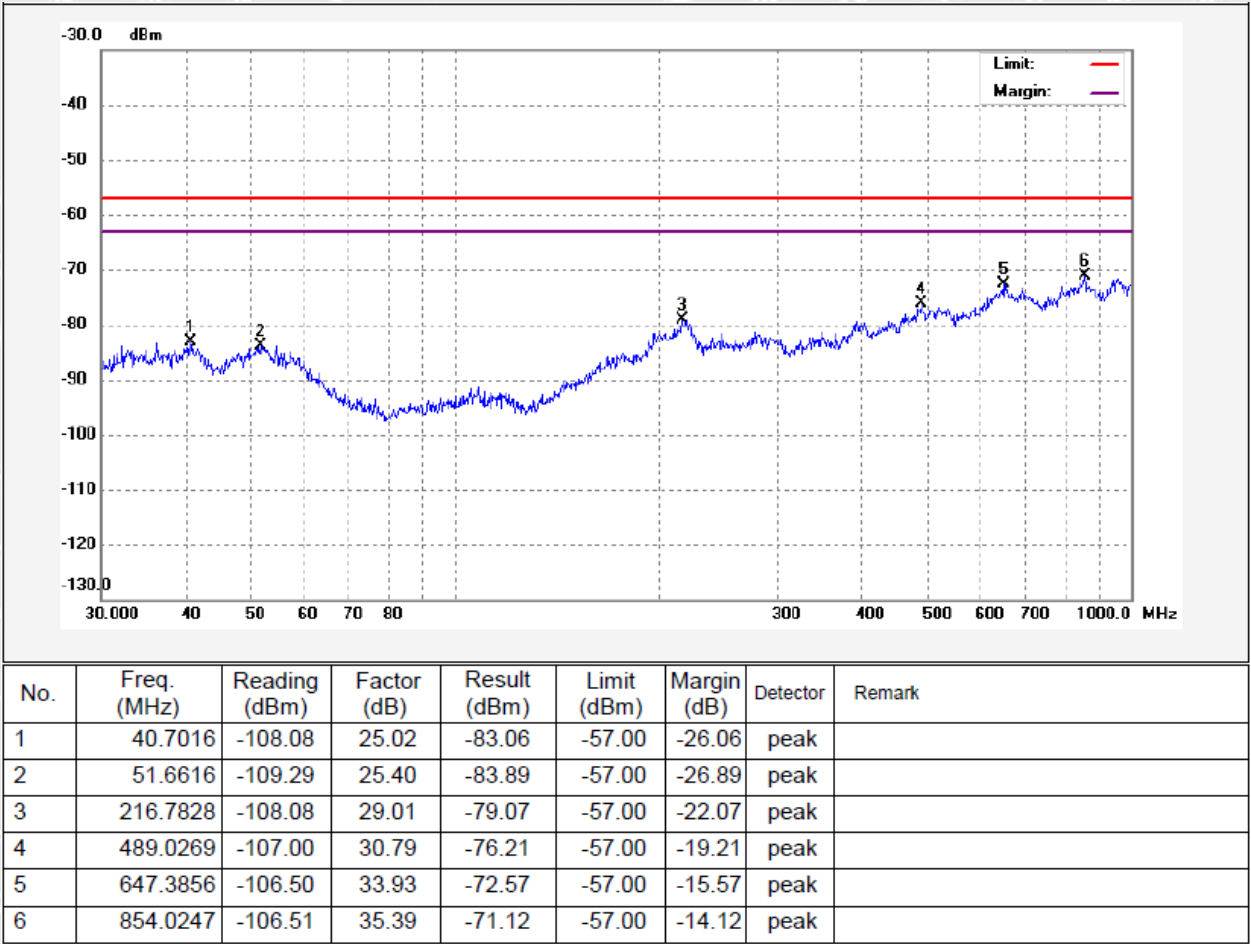


No.	Freq. (MHz)	Reading (dBm)	Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Detector	Remark
1	47.9940	-106.84	24.54	-82.30	-57.00	-25.30	peak	
2	217.5443	-107.03	29.17	-77.86	-57.00	-20.86	peak	
3	392.0951	-107.58	28.51	-79.07	-57.00	-22.07	peak	
4	492.4685	-106.37	30.65	-75.72	-57.00	-18.72	peak	
5	661.1505	-106.56	33.48	-73.08	-57.00	-16.08	peak	
6	952.0937	-105.91	35.15	-70.76	-57.00	-13.76	peak	



Area: Top
Horizontal Polarization

Frequency Range: 30MHz-1GHz Emission For RX



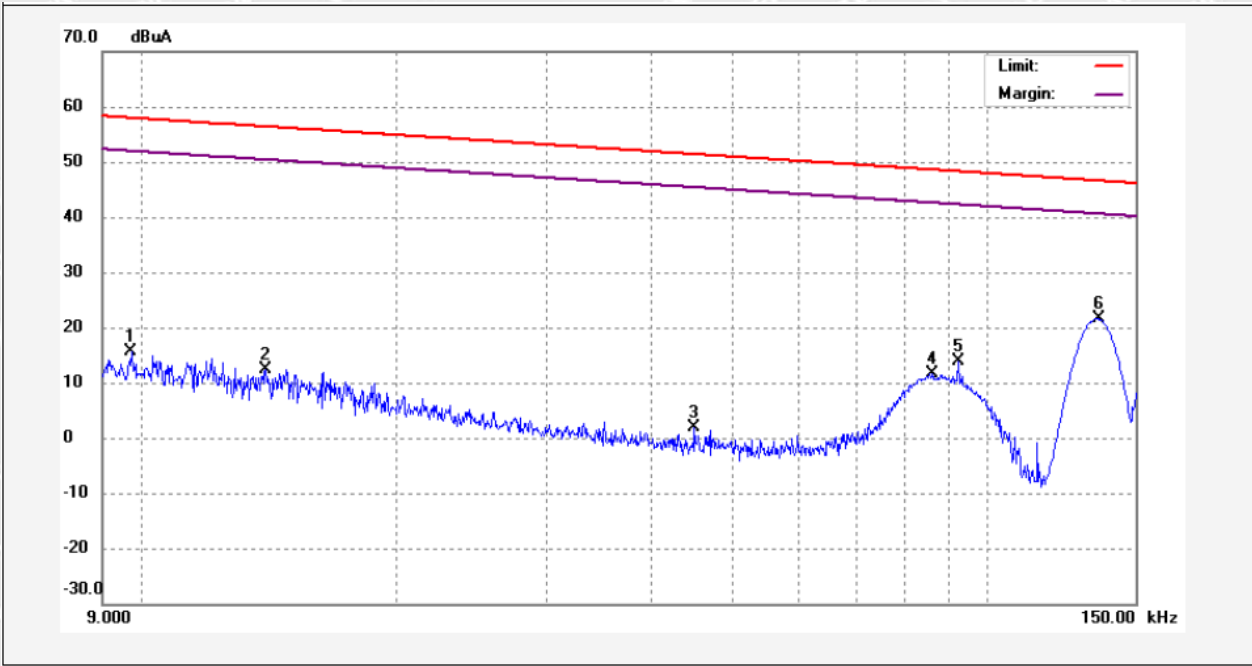
Note1: Standby mode dose not produce any emission, which no emission been detected.



Area: Bottom

Frequency Range: 9kHz-150kHz Emission @3m

Vertical Polarization



No.	Freq. (MHz)	Reading (dBuA)	Factor (dB)	Result (dBuA)	Limit (dBuA)	Margin (dB)	Detector	Remark
1	0.0097	17.63	-2.07	15.56	57.98	-42.42	peak	
2	0.0140	14.39	-2.03	12.36	56.40	-44.04	peak	
3	0.0451	3.98	-2.17	1.81	51.37	-49.56	peak	
4	0.0861	13.97	-2.34	11.63	48.59	-36.96	peak	
5	0.0924	16.21	-2.30	13.91	48.28	-34.37	peak	
6	0.1355	23.91	-2.24	21.67	46.58	-24.91	peak	

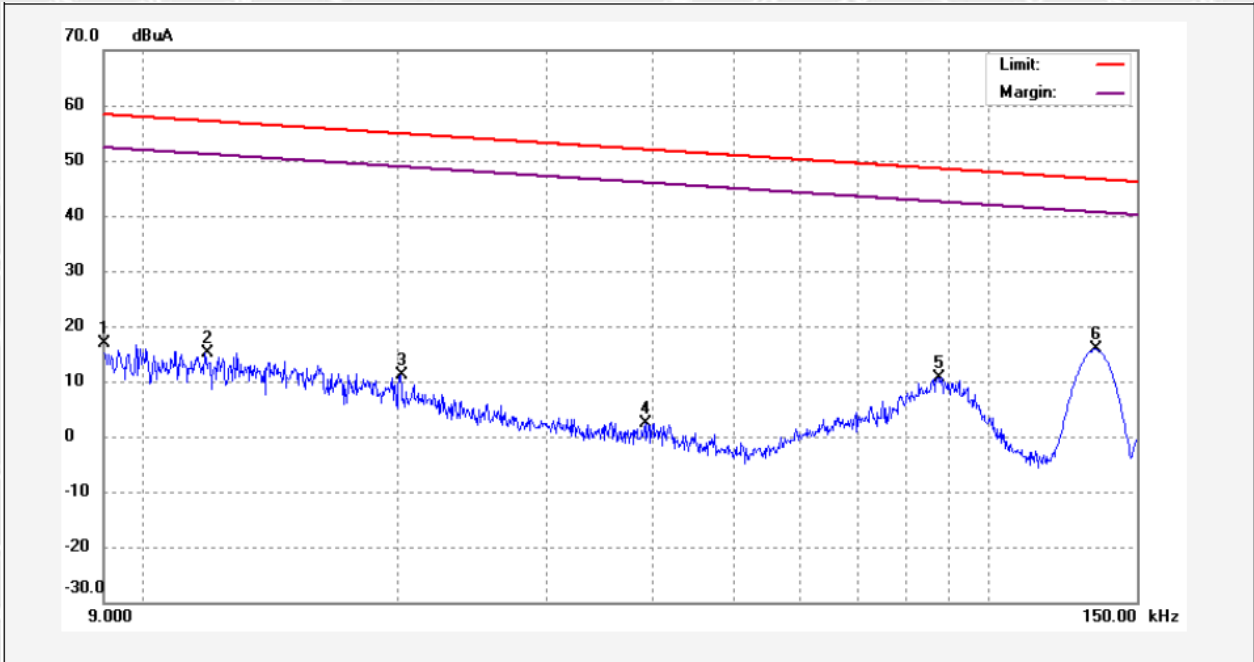
Note 1: $H_{3m}=H_{10m}+C_3$ refer to ETSI EN 300 330 Annex H.2



Area: Bottom

Frequency Range: 9kHz-150kHz Emission @3m

Horizontal Polarization



No.	Freq. (MHz)	Reading (dBuA)	Factor (dB)	Result (dBuA)	Limit (dBuA)	Margin (dB)	Detector	Remark
1	0.0090	19.00	-2.08	16.92	58.35	-41.43	peak	
2	0.0119	17.13	-2.05	15.08	57.14	-42.06	peak	
3	0.0202	13.10	-1.97	11.13	54.86	-43.73	peak	
4	0.0393	4.55	-2.06	2.49	51.98	-49.49	peak	
5	0.0874	13.01	-2.33	10.68	48.52	-37.84	peak	
6	0.1337	18.11	-2.24	15.87	46.64	-30.77	peak	

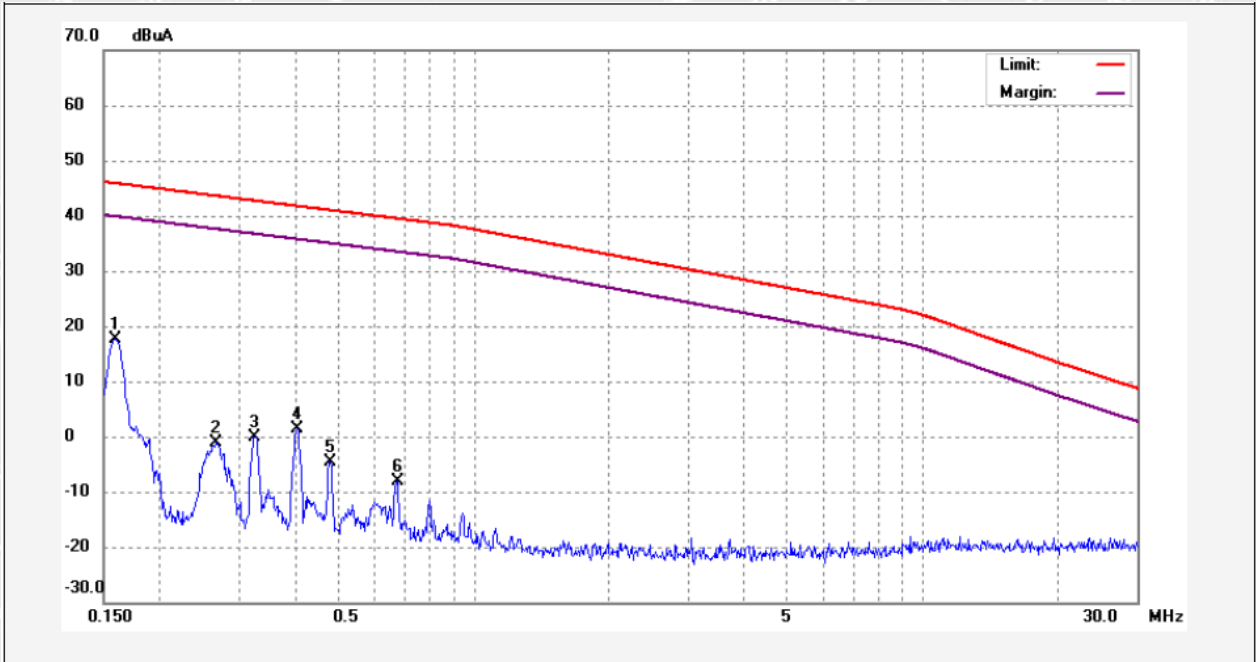
Note 1: $H_{3m}=H_{10m}+C_3$ refer to ETSI EN 300 330 Annex H.2



Area: Bottom

Frequency Range: 150kHz-30MHz Emission @3m

Vertical Polarization



No.	Freq. (MHz)	Reading (dBuA)	Factor (dB)	Result (dBuA)	Limit (dBuA)	Margin (dB)	Detector	Remark
1	0.1590	19.96	-2.23	17.73	45.88	-28.15	peak	
2	0.2672	0.98	-2.18	-1.20	43.58	-44.78	peak	
3	0.3251	2.12	-2.18	-0.06	42.71	-42.77	peak	
4	0.4040	3.70	-2.25	1.45	41.75	-40.30	peak	
5	0.4786	-2.17	-2.33	-4.50	41.00	-45.50	peak	
6	0.6753	-5.58	-2.47	-8.05	39.47	-47.52	peak	

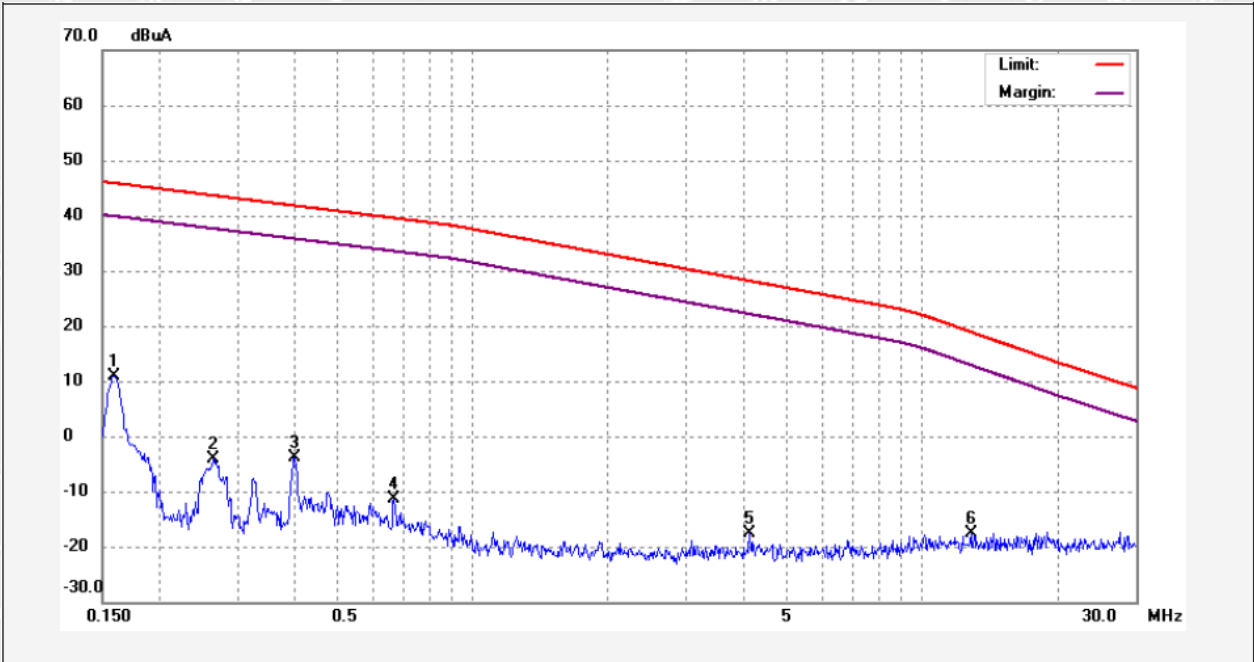
Note 1: $H_{3m}=H_{10m}+C_3$ refer to ETSI EN 300 330 Annex H.2



Area: Bottom

Frequency Range: 150kHz-30MHz Emission @3m

Horizontal Polarization



No.	Freq. (MHz)	Reading (dBuA)	Factor (dB)	Result (dBuA)	Limit (dBuA)	Margin (dB)	Detector	Remark
1	0.1590	13.07	-2.23	10.84	45.87	-35.03	peak	
2	0.2644	-2.02	-2.18	-4.20	43.62	-47.82	peak	
3	0.4018	-1.50	-2.25	-3.75	41.77	-45.52	peak	
4	0.6683	-8.92	-2.46	-11.38	39.52	-50.90	peak	
5	4.1354	-15.12	-2.48	-17.60	28.13	-45.73	peak	
6	12.8515	-15.40	-2.22	-17.62	18.89	-36.51	peak	

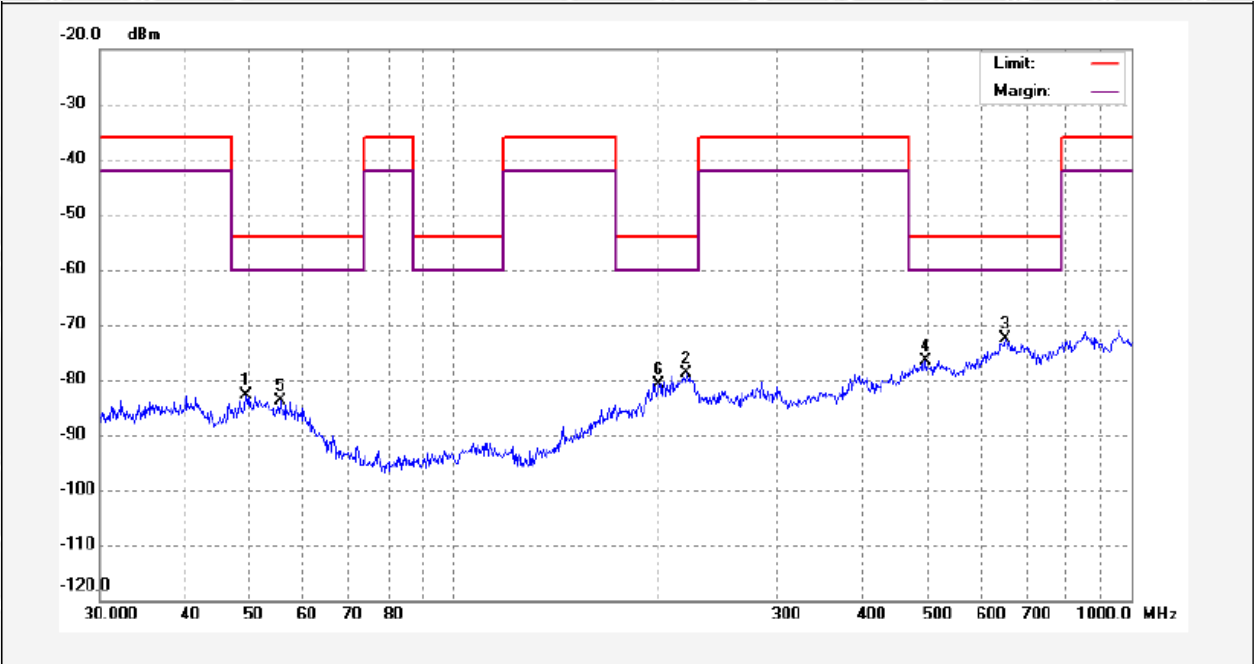
Note 1: $H_{3m}=H_{10m}+C_3$ refer to ETSI EN 300 330 Annex H.2



Area: Bottom

Frequency Range: 30MHz-1GHz Emission For TX

Vertical Polarization



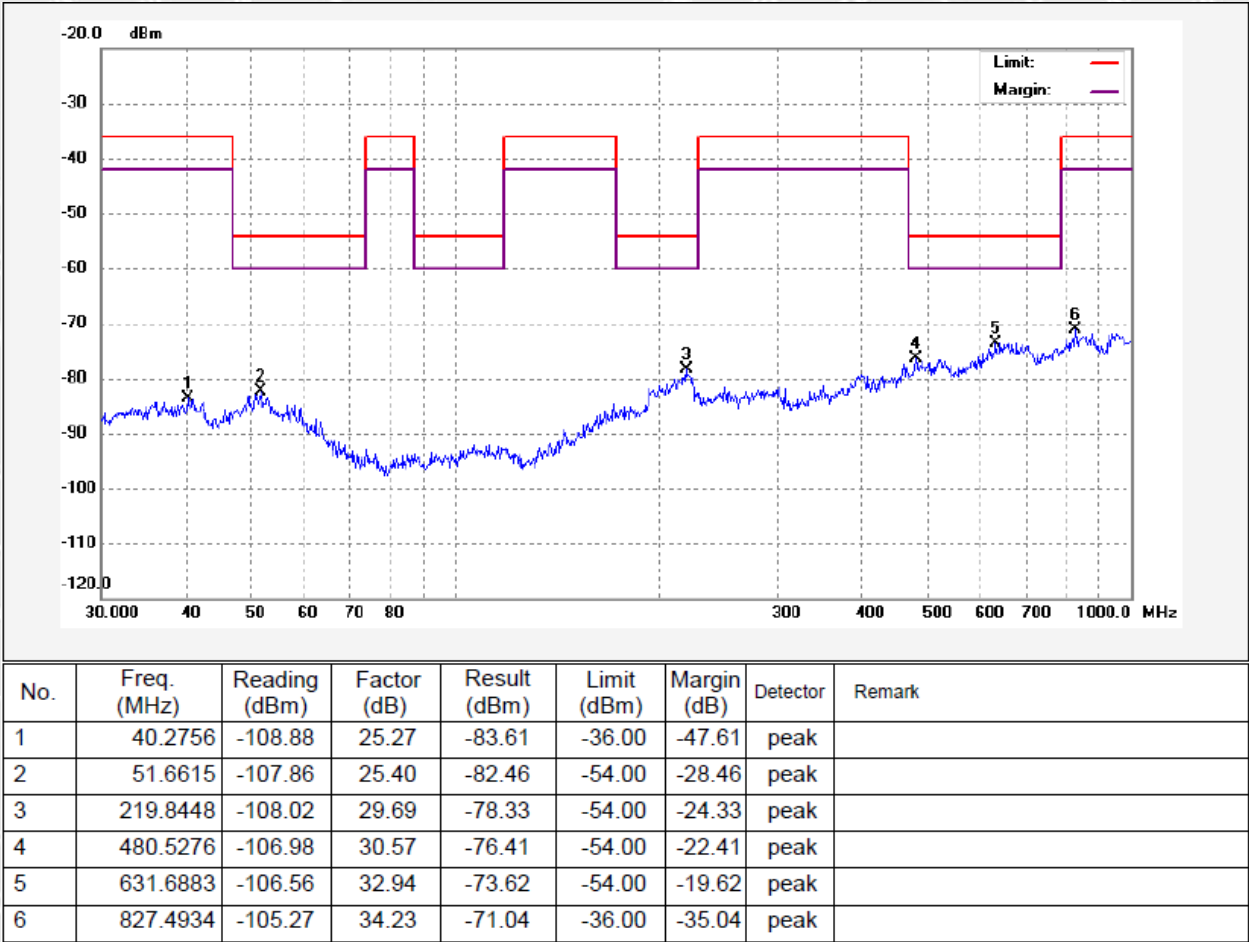
No.	Freq. (MHz)	Reading (dBm)	Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Detector	Remark
1	49.3594	-108.33	25.46	-82.87	-54.00	-28.87	peak	
2	220.6171	-108.39	29.43	-78.96	-54.00	-24.96	peak	
3	651.9417	-106.58	33.99	-72.59	-54.00	-18.59	peak	
4	497.6764	-106.86	30.31	-76.55	-54.00	-22.55	peak	
5	55.4147	-108.16	24.23	-83.93	-54.00	-29.93	peak	
6	200.6880	-107.79	27.01	-80.78	-54.00	-26.78	peak	



Area: Bottom

Frequency Range: 30MHz-1GHz Emission For TX

Horizontal Polarization





Area: Bottom

Frequency Range: 30MHz-1GHz Emission For RX

Vertical Polarization

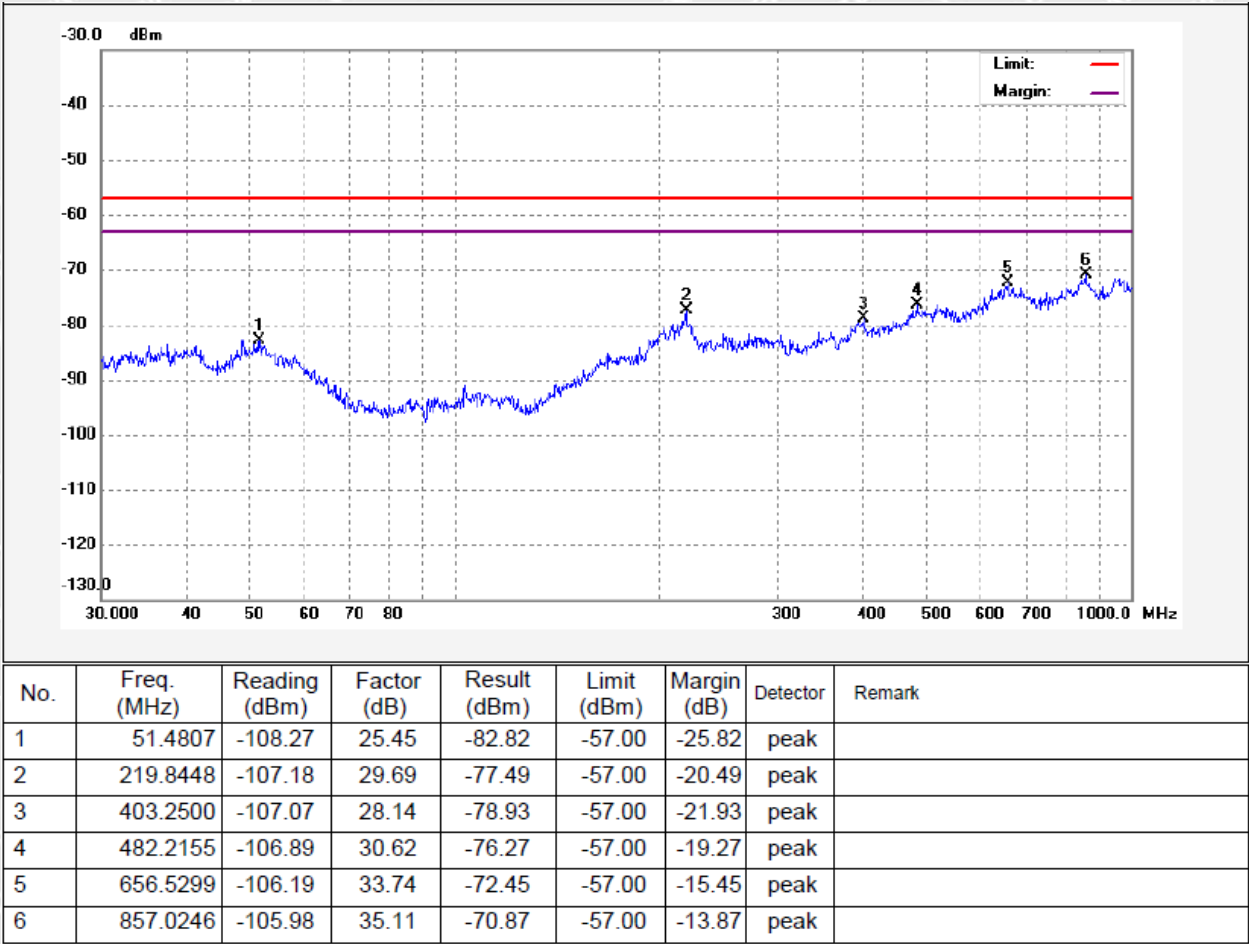


No.	Freq. (MHz)	Reading (dBm)	Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Detector	Remark
1	51.8430	-107.55	25.35	-82.20	-57.00	-25.20	peak	
2	221.3921	-107.51	29.06	-78.45	-57.00	-21.45	peak	
3	482.2156	-107.04	30.62	-76.42	-57.00	-19.42	peak	
4	530.1014	-106.35	30.28	-76.07	-57.00	-19.07	peak	
5	848.0563	-106.47	35.63	-70.84	-57.00	-13.84	peak	
6	955.4381	-105.45	35.01	-70.44	-57.00	-13.44	peak	



Area: Bottom
Horizontal Polarization

Frequency Range: 30MHz-1GHz Emission For RX



Note1: Standby mode dose not produce any emission, which no emission been detected.



9 Transmitter Out of Band(OOB) Emissions

9.1 Standard Applicable

The WPT system out of band emissions are to be considered in frequency ranges defined in Figure 4 and Figure 5 (between f_{SL} and f_L and between f_H and f_{SH}).

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.

9.2 Test Procedure

Please refer to ETSI EN 303 417 subclause 6.2.2 for the measurement method

9.3 Test Condition

Operating Mode : TX mode
 Test Environment : Normal Condition
 Test Voltage : DC 9V
 Ambient temperature : 25°C
 Humidity : 54%RH
 Atmospheric Pressure : 101.2kPa

9.4 Test Result

For Top Wireless Charging Area

No.	Frequency	Result@3m	C_3	Result@10	Limit@10	Margin	Remark
	(MHz)	(dBuA/m)	(dB)	(dBuA/m)	(dBuA/m)	(dB)	
1	$F_{cL}-2.5 \times OBW_1$	13.57	31.2	-17.63	-5	-12.63	peak
2	F_L	15.12	31.2	-16.08	-5	-11.08	peak
3	F_H	15.37	31.2	-15.83	-5	-10.83	peak
4	$F_{cH}+2.5 \times OBW_3$	13.48	31.2	-17.72	-5	-12.72	peak

Note 1: $H_{3m}=H_{10m}+C_3$ refer to ETSI EN300 330 Annex H.2

**For Bottom Wireless Charging Area**

No.	Frequency	Result@3m	C ₃	Result@10	Limit@10	Margin	Remark
	(MHz)	(dBuA/m)	(dB)	(dBuA/m)	(dBuA/m)	(dB)	
1	F _{CL} -2.5 × OBW ₁	15.94	31.2	-15.26	-5	-10.26	peak
2	F _L	17.15	31.2	-14.05	-5	-9.05	peak
3	F _H	17.13	31.2	-14.07	-5	-9.07	peak
4	F _{CH} +2.5 × OBW ₃	15.83	31.2	-15.37	-5	-10.37	peak

Note 1: H_{3m}=H_{10m}+C₃ refer to ETSI EN300 330 Annex H.2

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10 Receiver Blocking

10.1 Standard Applicable

This requirement applies to all WPT systems operation in Mode 1, Mode 2 and Mode 3.

Blocking is a measure of the capability of the receiver to receive a wanted signal without exceeding a given degradation due to the presence of an unwanted input signal at any frequencies other than those of the receiver spurious responses.

The test shall be performed in the relevant operational modes (see clause 4.2.3).

The wanted performance criteria from clause 4.2.2 shall be used as criterion for the receiver blocking tests.

Limit

Table 6: 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 = OFR see clause 4.3.3.			

The EUT shall achieve the wanted performance criterion, see clause 4.2.2, in the presence of the blocking signal.

10.2 Test Procedure

Please refer to ETSI EN 303 417 Sub-clause 6.2.3 for the measurement method

10.3 Test Condition

Operating Mode : RX mode

Test Environment : Normal Condition

Test Voltage : DC 9V

Ambient temperature : 25°C

Humidity : 54%RH

Atmospheric Pressure : 101.2kPa



10.4 Test Result

For Top Wireless Charging Area

Test Frequency	Blocking Signal(dBuA/m)	Performance Criterion	Result
fc -10 ×OFR	82	without degradation of performance	Pass
Fc+OFR	72	without degradation of performance	Pass
Fc	72	without degradation of performance	Pass
Fc+OFR	72	without degradation of performance	Pass
fc +10 ×OFR	82	without degradation of performance	Pass

For Bottom Wireless Charging Area

Test Frequency	Blocking Signal(dBuA/m)	Performance Criterion	Result
fc -10 ×OFR	82	without degradation of performance	Pass
Fc+OFR	72	without degradation of performance	Pass
Fc	72	without degradation of performance	Pass
Fc+OFR	72	without degradation of performance	Pass
fc +10 ×OFR	82	without degradation of performance	Pass



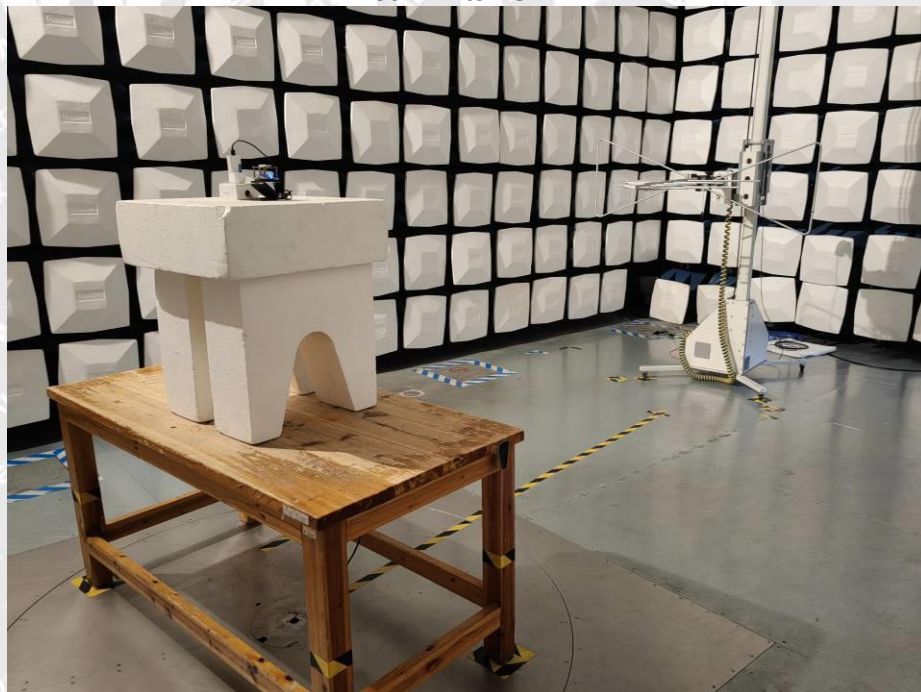
11 Photographs – Test Setup

11.1 Photograph – Spurious Emissions Test Setup

9kHz to 30MHz



30MHz to 1GHz





12 Photographs – EUT Constructional Details

Please refer to “ANNEX”.

=====End of Report=====

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检测
TESTING
CNAS L6478



TEST REPORT

Reference No. : WTF24F09225466W003
Applicant : Mid Ocean Brands B.V.
Address : 7/F., Kings Tower, 111 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong
Manufacturer : 118051
Address : ---
Product Name : Magnetic wireless charger
Model No. : MO2521
Test specification : EN IEC 62311:2020
EN 50665:2017
Date of Receipt sample : 2024-10-28
Date of Test : 2024-11-08 to 2024-11-18
Date of Issue : 2024-11-21
Test Report Form No. : WEW-62311A-01B
Test Result : Pass

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of approver.

Prepared By:

Waltek Testing Group (Foshan) Co., Ltd.

Address: 1/F., Building 19, Sunlink Machinery City, Xingye 4 Road,
Guanglong Industrial Park, Chihua Neighborhood Committee, Chencun Town,
Shunde District, Foshan, Guangdong, China

Tel: +86-757-23811398

Fax: +86-757-23811381

E-mail: info@waltek.com.cn

Tested by:

Approved by:

Roy Hong

Danny Zhou



1 Test Summary

HEALTH			
Test	Test Method	Class / Severity	Result
RF Exposure	EN IEC 62311:2020 EN 50665:2017	-	Pass

Remark:

Pass Test item meets the requirement

N/A Not Applicable

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2 Contents

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1 TEST SUMMARY.....	2
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3 GENERAL INFORMATION	4
3.1 GENERAL DESCRIPTION OF E.U.T.	4
3.2 TECHNICAL SPECIFICATION	4
3.3 STANDARDS APPLICABLE.....	4
4 HEALTH REQUIREMENTS.....	5
4.1 TEST RESULT OF RF EXPOSURE EVALUATION.....	6
5 PHOTOGRAPHS – EUT CONSTRUCTIONAL DETAILS.....	7

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3 General Information

3.1 General Description of E.U.T.

Product Name : Magnetic wireless charger

Model No. : MO2521

Remark : ---

Rating : Input: DC 9V/3A, DC 9V/2.2A, DC 5V/2A
Output: DC 9V/1.66A, DC 5V/0.6A, DC 5V/0.5A
Wireless Output Power for:
Top: 15W Max
Middle for Apple Watch: 2.5W Max
Bottom: 3W Max

Battery Capacity : ---

Adapter Model : ---

3.2 Technical Specification

- For wireless charging area

Frequency Bands : 110-205kHz

Radiated H-Field : 15.37 dBuA/m(@3m) for top wireless charging area
17.73 dBuA/m(@3m) for bottom wireless charging area

Antenna installation : Coil Antenna

Antenna Gain : 0dBi

- For Apple watch charging area

Permitted Range of Operating Frequency : 148.5 kHz to 5MHz
(Manufacturer's declared frequency of product operation: 325kHz – 330kHz)

Operating Frequency : 326.5kHz

Radiated H-Field : 19.38dBuA/m(@3m) for middle apple watch charging area

Antenna installation : Coil Antenna

Antenna Gain : 0dBi

3.3 Standards Applicable

The tests were performed according to following standards:

EN IEC 62311:2020	Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)
EN 50665:2017	Generic standard for assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz).



4 Health Requirements

According to Council Recommendation: the criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation.

Reference levels for electric, magnetic and electromagnetic fields (0Hz to 300GHz, unperturbed RMS values)

Frequency range	E-field strength (V/m)	H-field strength (A/m)	B-field (μT)	Equivalent plane wave power density Seq (W/m ²)
0-1 Hz	-	3.2×10^4	4×10^4	-
1-8 Hz	10000	$3.2 \times 10^4 / f^2$	$4 \times 10^4 / f^2$	-
8-25 Hz	10000	$4000 / f$	$5000 / f$	-
0.025-0.8 kHz	$250 / f$	$4 / f$	$5 / f$	-
0.8-3 kHz	$250 / f$	5	6.25	-
3-150 kHz	87	5	6.25	-
0.15-1 MHz	87	$0.73 / f$	$0.92 / f$	-
1-10 MHz	$87 / f^{1/2}$	$0.73 / f$	$0.92 / f$	-
10-400 MHz	28	0.073	0.095	2
400-2000 MHz	$1.375 f^{1/2}$	$0.0037 f^{1/2}$	$0.0046 f^{1/2}$	$f / 200$
2-300 GHz	61	0.16	0.2	10

Note:

1. f as indicated in the frequency range column.
2. For frequencies between 100 kHz and 10 GHz, Seq, E2, H2 and B2 are to be averaged over any six-minute period.
3. For frequencies exceeding 10 GHz, Seq, E2, H2 and B2 are to be averaged over any 68 / f1.05 minute period (f in GHz).
4. No E-field value is provided for frequencies < 1 Hz, which are effectively static electric fields. For most people the annoying perception of surface electric charges will not occur at field strengths less than 25 kV/m. Spark discharges causing stress or annoyance should be avoided.



4.1 Test Result of RF Exposure Evaluation

The antenna of the product, under normal use condition is at least 20 cm away from the body of the user. Warning statement to the user to keeping at least 20 cm separation distance and the prohibition of operating to a person has been printed on the user's manual. So, this product under normal use is located on electromagnetic far field between the human body.

Test Area	Frequency (kHz)	Radiated H-Field (dB μ A/m)	Radiated H-Field (A/m)	Limit (A/m)	Result
Top	120	15.37	0.000005868	5	Pass
Middle	326.5	19.38	0.000009311	5	Pass
Bottom	120	17.73	0.000007700	5	Pass
Remark: 1) For details of Radiated H-Field refer to report No. WTF24F09225466W001 and WTF24F09225466W002. 2) Radiated H-Field (A/m)= $10^{[(\text{dB}\mu\text{A/m})/20]}/10^6$					

Since average output power at worst case is: 0.000009311A/m which cannot exceed the exempt condition, 5A/m specified in EN IEC 62311. It is deemed to full fit the requirement of RF exposure basic restriction specified in EC Council Recommendation (1999/519/EC).

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5 Photographs – EUT Constructional Details

Please refer to “ANNEX”.

=====End of Report=====

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