RF TEST REPORT

Report No.:	EZT20240802012E-2
Product:	Jump Starter
Model No.:	FJS-800
Other Model:	FJS-700
Trade Name:	FOXSUR
Applicant:	DongGuan Foxsur Electronic Equipment Co., Ltd.
Address:	No.5,Hengjiangxia Industrial Zone, ChangPin Tower, DongGuan City, GuangDong Province
Test date:	July 25,2024-Aug.02,2024
Issued by:	Aug.02,2024

Test Report

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Applicant……...:	DongGuan Foxsur Electronic Equipment Co., Ltd.
Applicant Address…….:	No.5,Hengjiangxia Industrial Zone, ChangPin Tower, DongGuan City, GuangDong Province
Manufacturer……...:	DongGuan Foxsur Electronic Equipment Co., Ltd.
Manufacturer Address..:	No.5,Hengjiangxia Industrial Zone, ChangPin Tower, DongGuan City, GuangDong Province
Test 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,6 765 - 6 795 kHz ranges; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU
Test Result……:	Pass
Tested by ……..…:	Mark Dan
Approved by……:	Steven

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1. General Information

1.1. Description of EUT

EUT Type	Jump Starter
Power Supply	Start Current:600A Input:5V ⎓2A Wireless Output: 10W USB Output: 5V⎓2A
Frequency Range	111.15KHz-190.15KHz
Modulation Type	CW(continuous Wave)

1.2. Test Standards and Results

The objective of the report is to perform testing according to following standards for CE marking:

No.	Identity	Document Title
1	ETSI EN 303 417 V1.1.1 (2017-09)	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,6 765 - 6 795 kHz ranges; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

Test items and the results are as bellow:

No.	Sub clause in EN 303 417V1.1.1	Test Item	Result
Transmitter requirements			
1	4.3.2	Permitted range of operating frequencies	PASS
2	4.3.3	Operating frequency range(s) (OFR)	PASS
3	4.3.4	H-field requirements	PASS
4	4.3.5	Transmitter spurious emissions	PASS
5	4.3.6	Transmitter out of band (OOB) emissions	PASS
6	4.3.7	WPT system unwanted conducted emissions	N/A[note1]
Receiver requirement			
7	4.4.2	Receiver blocking	PASS

Note1: This test item only 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.
Note2: This test item only applied to mode 1 mode 2 mode 3. The EUT operation mode is mode 4.

1.3. List of Equipments Used

Description	Manufacturer	Model No.	Serial No.	Cal. Due Date
ESD Simulator	Schaffner	NSG 435	2023.08.11	2024.08.10
HCP	EZT	--	2023.08.11	2024.08.10
VCP	EZT	--	2023.08.11	2024.08.10
Signal Generator	R&S	SML03	2023.08.11	2024.08.10
Power meter	R&S	URVD	2023.08.11	2024.08.10
Power probe	R&S	URV5-Z4	2023.08.11	2024.08.10
Power Amplifier	KALMUS	7100C	2023.08.11	2024.08.10
Biconilog Antenna	EMCO	3142C	2023.08.11	2024.08.10

1.4. Measurement Uncertainty

PARAMETER	UNCERTAINTY
RF frequency	±5.1kHz
Total RF Power conducted	±1.3dB
RF Power density, conducted	±1.9dB
Spurious emissions, conducted	±1.4dB
All emissions, radiated	±3.3dB
Humidity	±3.1%
Temperature	±0.8°C
DC and low frequency voltages	±2.9%

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated in according with TR 100 028-1[2] and shall correspond to an expansion to 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)).

1.5. Test Facility

2. Transmitter Parameters

2.1. EN 303 417 §4.3.2 - Permitted range of operating frequencies

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).

2.1.1. Test 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,

Table 1: WPT systems within the permitted frequency bands below 30 MHz

	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

2.1.2. Test Result

Test Method	Modulation	Test Conditions		Operating Frequency(KHz)	Limit note 1
☒ Radiated ☐ Conducted	☒ NO ☐ OFF	20°C	5V	110-205KHz (Note)	100 kHz to 300 KHz
Test Result				PASS	
Measurement Uncertainty				±25Hz	
Note: The manufacturer declared the WPT system is designed to operate within110-205KHz					

2.2. EN 303 417 §4.3.3 - Operating frequency range(s) (OFR)

2.2.1. Description

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 (fL) and highest frequency (fH) 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.

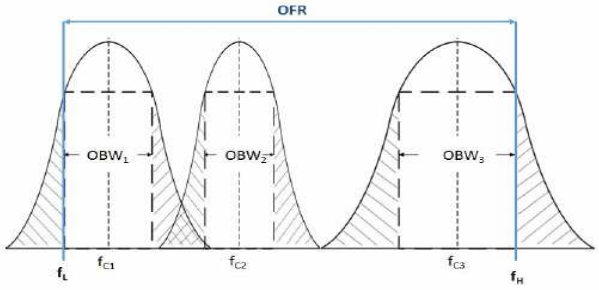


Figure 2: OFR of a multi - frequency WPT system within one frequency range of Table 2 and within one WPT system cycle time

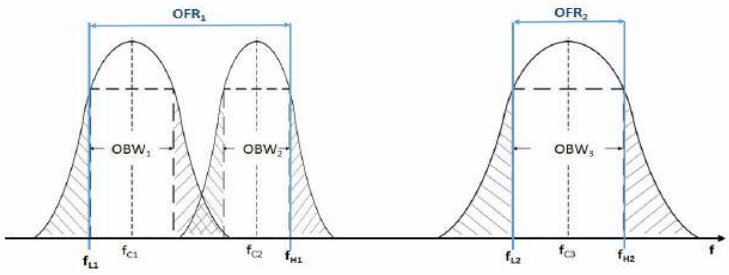


Figure 3: OFR of a multi - frequency WPT system within two frequency ranges of Table 2 and within one WPT system cycle time

2.2.2. Test Limit

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.

2.2.3. Test Result

Test Method	Modulation	Test Conditions		Frequency band		
				Measured(KHz)		limit
				Low. Fre	High. Fre	
☒ Radiated ☐ Conducted	☒ NO ☐ OFF	20°C	5V	120	195.4	100KHz to 300KHz
Test Result		PASS				
Measurement Uncertainty		±25Hz				

2.3. EN 303 417 §4.3.4 - Transmitter H-field requirements

2.3.1. Description

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

2.3.2. Test Limits

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 ≤ f < 0,021	72	
0,059 ≤ f < 0,061	69,1 descending 10 dB/dec above 0,059 MHz	See note 1
0,079 ≤ f < 0,090	67,8 descending 10 dB/dec above 0,079 MHz	See note 2
0,100 ≤ f < 0,119	42	
0,119 ≤ f < 0,135	66 descending 10 dB/dec above 0,119 MHz	See note 1
0,135 ≤ f < 0,140	42	
0,140 ≤ f < 0,1485	37,7	
0,1485 ≤ f < 0,30	-5	
6,765 ≤ 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.

2.3.3. Test Result

NO.	Antenna Polarity	Frequency (kHz)	Measurement Bandwidth (Hz)	Detector Type	Level (dBµA/m) @10m
1	H	127	300	Quasi Peak	12.09
2	V	127	300	Quasi Peak	11.18
Note: The max H-field value reported only					

2.4. EN 303 417 §4.3.5 - Transmitter spurious emissions

2.4.1. Description

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

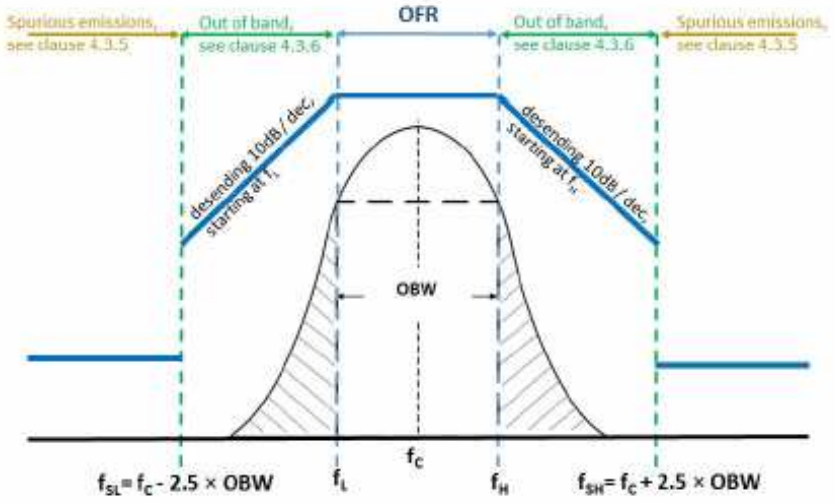


Figure 4: Out of band and spurious domain of a single frequency WPT system

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 $f > f_{SH}$).

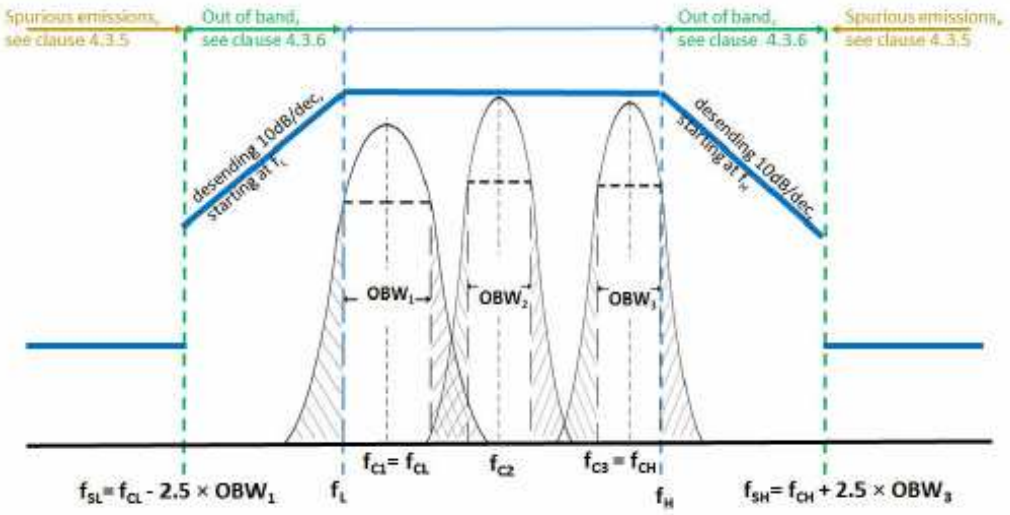


Figure 5: Out of band and spurious domain of a multi - frequency system (during one WPT system cycle time)

2.4.2. Test Limit

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

Table 4

State (see note)	Frequency 9 kHz ≤ f < 10 MHz	Frequency 10 MHz ≤ f < 30 MHz
Operating	27 dBμA/m at 9 kHz descending 10 dB/dec	-3,5 dBμA/m
Standby	5,5 dBμA/m at 9 kHz descending 10 dB/dec	-25 dBμA/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.

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.		

2.4.3. Test Result

9K-30MHz

Operating mode

No.	Frequency (kHz)	Measurement Bandwidth (kHz)	Detector Type	Level (dBμA/m)	Verdict
1	127.45	0.3	Quasi Peak	10.55	Pass

Standby mode

No.	Frequency (kHz)	Measurement Bandwidth (kHz)	Detector Type	Level (dBμA/m)	Verdict
1	9-10000	0.3	Quasi Peak	(n.a)	Pass
2	10000-30000	10	Quasi Peak	(n.a)	Pass
Measurement uncertainty: ±1.3dB					

Note:

a) Both radiated measurement method and conducted measurement method were used. For the radiated method, the antenna polarization was set to vertical and horizontal respectively.

b) The measurement was performed at the operating frequency.

c) "(n.a)" in the table above means that the emissions are too small to be measured and are at least 10 dB below the limit.

30M-1GHz

Operating mode

No.	Frequency (MHz)	Measurement Bandwidth (kHz)	Level (dBm)	Limit (dBm)	Verdict	Margin (dB)
Polarization: Vertical						
1	30-1000	120	(n.a)	-54.00	Pass	>10
Polarization: Horizontal						
1	30-1000	120	(n.a)	-54.00	Pass	>10
Measurement uncertainty: ±1.3dB						

Standby mode

No.	Frequency (MHz)	Measurement Bandwidth (kHz)	Level (dBm)	Limit (dBm)	Verdict	Margin (dB)
Standby Antenna Polarization: Vertical						
1	30-1000	120	(n.a)	-57.00	Pass	>10
Standby Antenna Polarization: Horizontal						
1	30-1000	120	(n.a)	-57.00	Pass	>10
Measurement uncertainty: ±1.3dB						

Note:

(1) Both radiated measurement method and conducted measurement method were used. For the radiated method, the antenna polarization was set to vertical and horizontal respectively.

(2) The measurement was performed at the operating frequency.

(3) "(n.a)" in the table above means that the emissions are too small to be measured and are at least 10 dB below the limit.

2.5. EN 303 417 §4.3.6 - Transmitter out of band (OOB) emissions

2.5.1. Description

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}).

2.5.2. 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.

2.5.3. Test Result

No.	Frequency (kHz)	Measurement Bandwidth (kHz)	Level (dBμA/m)	Limit (dBμA/m)	Verdict	Margin (dB)
1	f_l-f_{sl}	0.3	(n.a)	Refer to §2.5.2	Pass	>10
2	f_h-f_{sh}	10	(n.a)	Refer to §2.5.2	Pass	>10
Measurement uncertainty: ±1.3dB						

a) Both radiated measurement method and conducted measurement method were used. For the radiated method, the antenna polarization was set to vertical and horizontal respectively.
b) The measurement was performed at the operating frequency.
c) "(n.a)" in the table above means that the emissions are too small to be measured and are at least 10 dB below the limit.

2.6. EN 303 417 §4.3.7 - WPT system unwanted conducted emissions

2.6.1. Description

WPT system unwanted conducted emissions are based on the emissions of the unwanted common mode current on the cable between the off board power supply and the primary coil seen as a monopole radiator driven against the power supply.

2.6.2. Test Limit

The common mode current (ICM) between 1 MHz and 30 MHz shall not exceed the following limit:
ICM = 47 – 8 × log(f) dBμA
NOTE: f is the frequency in MHz

2.6.3. Test Result

N/A, The EUT of the primary coil not exceeds a length of 3 m.

3. Receiver Parameters

3.1. EN 303 417 §4.4.2 - Receiver blocking

3.1.1. Description

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.

3.1.2. Test Limit

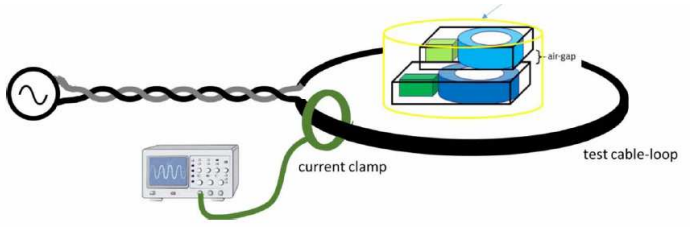
The receiver blocking limits in Table 6 shall be fulfilled

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 dBµA/m	72 dBµA/m	82 dBµA/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.

3.1.3. Test Setup



3.1.4. Test Result

Frequency (kHz)	Receiver blocking signal			Test Result
	In-band signal (dBμA/m)	OOB signal (dBμA/m)	Remote-band signal (dBμA/m)	
129.33	72.00	72.00	82.00	Pass
180.47	72.00	72.00	82.00	
Note: Conform manufacturer declare the wanted performance criterion.				

4.0 Photo of EUT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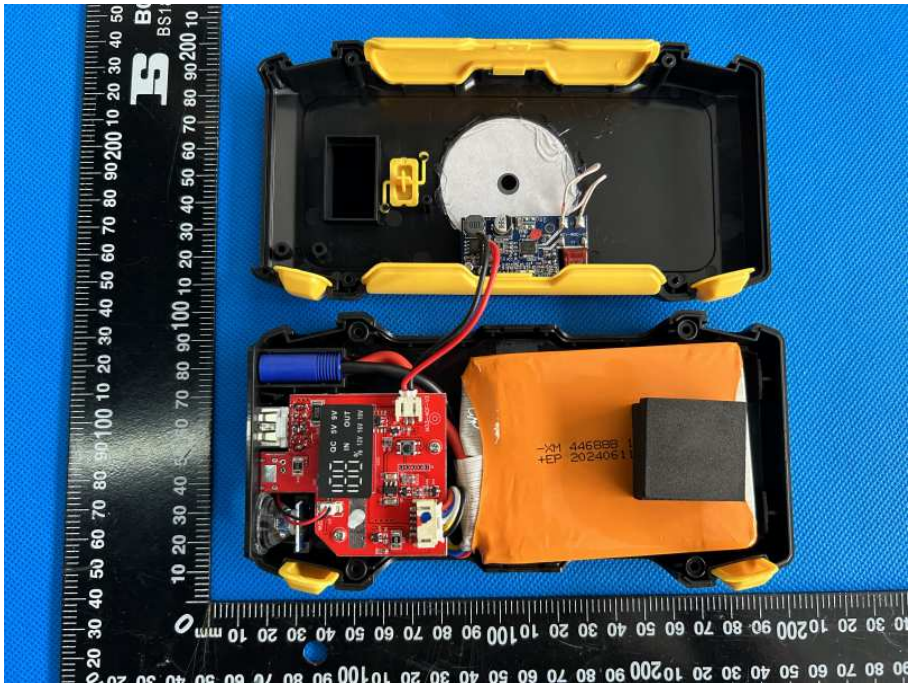
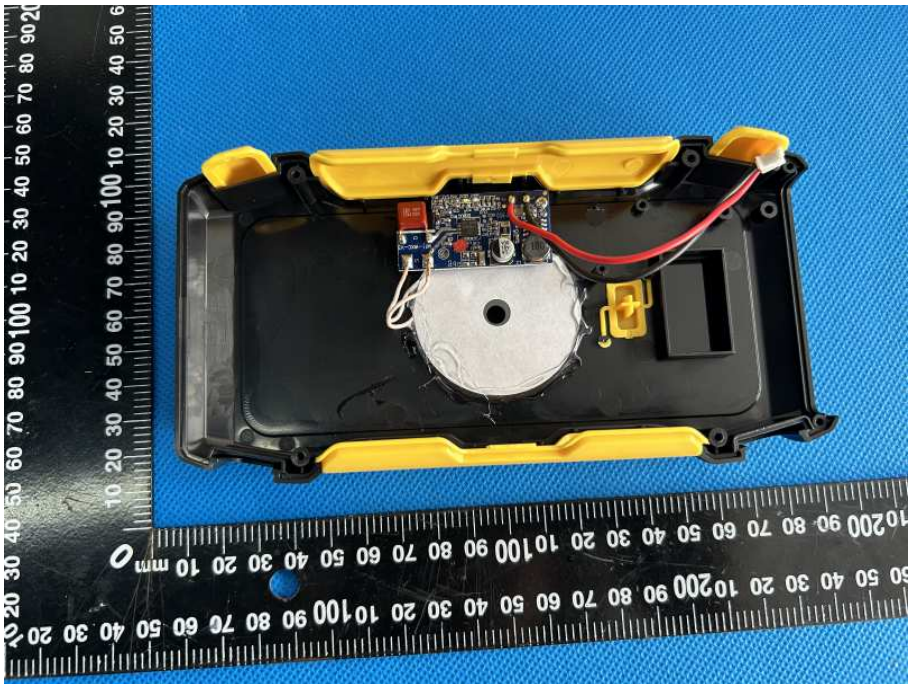
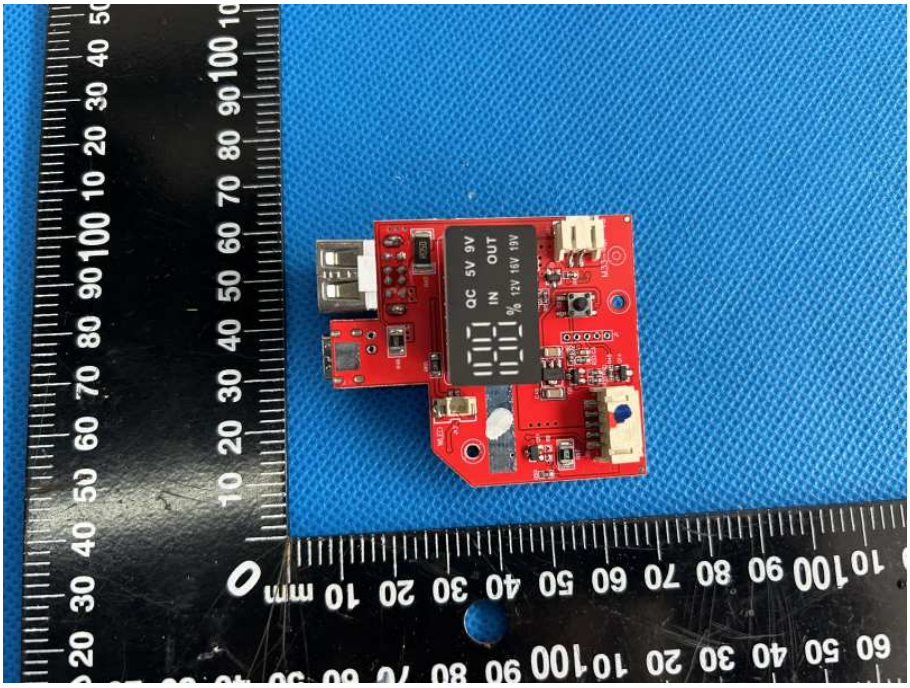
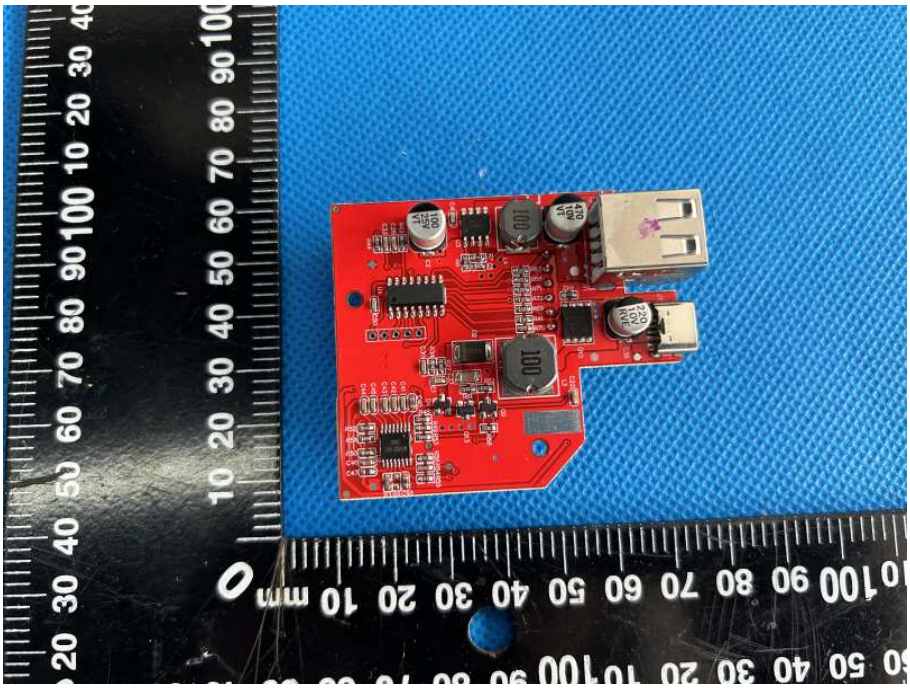
FOXSUR
FJS-800
Multi-Function Jump Starter









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