FCC TEST REPORT

Test report No:	**EMC- FCC- R0119**
FCC ID:	**BP9-RESARMT**
Type of equipment:	**Remote Engine Start Assembly**
Model Name:	**RESA-Remote**
Applicant:	**MOTREX CO., LTD.**
FCC Rule Part(s):	**FCC Part 15 Subpart C** **Section 15.209, Section 15.231**
Frequency Range:	**433.92 MHz**
Test result:	**Complied**

The above equipment was tested by EMC compliance Testing Laboratory for compliance with the requirements of FCC Rules and Regulations.
The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Date of test: July 10, 2013 ~ July 12, 2013

Issued date: July 15, 2013

Tested by: SON, MIN GI

Approved by: YU, SANG HOON

480-5 Shin-dong, Yeongtong-gu, Suwon-city, Gyunggi-do, 443-390, Korea,
82 31 336 9919 (Main) 82 31 336 4767 (Fax)

[Contents]

1. Client information

Applicant:	MOTREX CO., LTD.
Address:	1-1103, Ace Hi-Tech City B/D, 55-20, Mullae-dong 3-ga, Yeongdeungpo-gu, Seoul, Korea 150-972
Telephone number:	82-70-7123-1374
Facsimile number :	82-2-3439-1360
Contact person:	Hyoung-hwan Lee

Manufacturer:	PLK TECHNOLOGY
Address:	12th Floor, INNOPLEX Bldg, 57-5, Yangsan-ro, Yeongdeungpo-Gu, Seoul 150-103, Korea

2. Laboratory information

Address
EMC Compliance Ltd.
480-5 Shin-dong, Yeongtong-gu, Suwon-city, Gyunggi-do, 443-390, Korea,
Telephone Number: 82 31 336 9919 Facsimile Number: 82 31 336 4767

Certificate
CBTL Testing Laboratory, KOLAS NO.: 231
FCC Filing No.: 508758
IC Filing No.: 8035A-2
VCCI Registration No.: C-1713, R-1606, T-258

SITE MAP

3. Description of E.U.T.

3.1 Basic description

Applicant :	MOTREX CO., LTD.
Address of Applicant:	1-1103, Ace Hi-Tech City B/D, 55-20, Mullae-dong 3-ga, Yeongdeungpo-gu, Seoul, Korea 150-972
Manufacturer:	PLK TECHNOLOGY
Address of Manufacturer:	12th Floor, INNOPLEX Bldg, 57-5, Yangsan-ro, Yeongdeungpo-Gu, Seoul 150-103, Korea
Type of equipment:	Remote Engine Start Assembly
Basic Model:	RESA-Module
Serial number:	N/A

3.2 General description

Frequency Range	433.92 MHz
Type of Modulation	GFSK
Number of Channels	1 channel
Antenna Gain	-11.7 dBi
Power supply	DC 12 V
Dimension	65 x 56 x 26 mm

3.3 Test frequency

	Frequency
Low frequency	**-**
Middle frequency	**433.92 MHz**
High frequency	**-**

3.4 Test Voltage

mode	Voltage
Norminal voltage	**DC 3 V**

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4. Summary of test results

4.1 Standards & results

Section in FCC 15 Subpart C §15.209	Section in RSS-210, Issue 8 : 2010	Parameter	Test Result
15.209(a) 15.231(b)	RSS-210, Issue 8, Table B	Radiated emission, Spurious Emission and Field Strength of Fundamental	C
-	RSS-Gen, Issue 3,6	Receiver Spurious Emission (Radiated)	C
15.231(c)	RSS-210, Issue 8, A1.1.3	Bandwidth of Operation frequency	C
15.231(a)	RSS-210, Issue 8, A1.1.1	Transmission Time	C
-	RSS-Gen, Issue 3, 4.6.1	Occupied Bandwidth	C

Note: C=complies
NC= Not complies
NT=Not tested
NA=Not Applicable

*The test is not applicable since the EUT is not the device that is designed to be connected to the public utility(AC) power line.

4.2 Uncertainty

Measurement Item	Combined Standard Uncertainty Uc	Expanded Uncertainty U = KUc (K = 2)
Conducted RF power	± 0.29 dB	± 0.58 dB
Radiated disturbance	+ 2.97 dB / - 2.975 dB	+ 5.94 dB / - 5.95 dB
Conducted disturbance	9 ~ 150 ㎑: ± 1.975 [dB] 150 ㎑ ~ 30 ㎒: ± 1.775 [dB]	9 ㎑ ~ 150 ㎑: ± 3.95 [dB] 150 ㎑ ~ 30 ㎒: ± 3.55 [dB]

5. Test results

5.1 Antenna Requirement

5.1.1 Regulation

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.1.2 Result

- Complied

The transmitter has an integral Chip antenna. The directional peak gain of the antenna is -11.7 dBi.

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5.2 Field strength of Fundamental

5.2.1 Regulation

According to §15.209(a),
Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table: 83

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100 **	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241..

According to §15.231(b)
In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	2,250	225
70 - 130	1,250	125
130 - 174	1,250 to 3,750 **	125 to 375 **
174 - 260	3,750	375
260 - 470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12,500	1,250

** linear interpolations

Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, μV/m at 3 meters = 56.81818(F) - 6136.3636; for the band 260-470 MHz, μV/m at 3 meters = 41.6667(F) - 7083.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.

5.2.2 Test procedure

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.

b. During performing radiated emission below 1 ㎓, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 ㎓, the EUT was set 3 meter away from the interference-receiving antenna.

c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. It tested x,y and z – 3 axis each, mentioned only worst case data at this report.

5.2.2 Test Result

-Complied

Frequency [MHz]	Receiver Bandwidth [kHz]	Detector	Pol. [V/H]	Reading [dB(μV)]	Factor	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
433.92	120	Quasi Peak	H	88.9	-8.3	80.6	80.82	0.22

NOTE:

1. **Limit = 20log(41.6667(F)-7083.3333) = 80.82**
2. **Factor = Amp Gain + Attenuator + AF + CL**

1/PW = 1/0.683 = 1.464

1/PW < 100kHz

*PDCF is not applicable

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5.3 Spurious Emission

5.3.1 Regulation

According to §15.209(a),
Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table: 83

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100 **	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241..

According to §15.231(b)
In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	2,250	225
70 - 130	1,250	125
130 - 174	1,250 to 3,750 **	125 to 375 **
174 - 260	3,750	375
260 - 470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12,500	1,250

** linear interpolations

Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, μV/m at 3 meters = 56.81818(F) - 6136.3636; for the band 260-470 MHz, μV/m at 3 meters = 41.6667(F) - 7083.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.

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5.3.2 Measurement Procedure

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.

b. During performing radiated emission below 1 ㎓, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 ㎓, the EUT was set 3 meter away from the interference-receiving antenna.

c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. It tested x,y and z – 3 axis each, mentioned only worst case data at this report.

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5.3.3 Test Result
-complied

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Reading [dB(μV)]	Factor (Amp Gain + Attenuator + AF + CL)	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
Quasi-Peak DATA. Emissions below 30MHz							
			Not detected (In the noise floor)				
Quasi-Peak DATA. Emissions below 1GHz							
			Not detected (In the noise floor)				
Peak DATA. Emissions above 1GHz							
			Not detected (In the noise floor)				
Average DATA. Emissions above 1GHz							
			Not detected (In the noise floor)				

NOTE:

1. **Factor(dB) = ANT Factor+ Amp Gain + Cable Loss**
2. **Margin (dB) = Limit - Result**
   [Result = Reading – Factor]

H = Horizontal, V = Vertical Polarization

ATT = Attenuation (10dB pad and/or Insertion Loss of HPF), AF/CL = Antenna Factor and Cable Loss

* The spurious emission at the frequency does not fall in the restricted bands.

** The measured result is within the test standard limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95 % level of confidence. However, the result indicates that compliance is more probable than non-compliance.

All emissions not reported were more than 20 dB below the specified limit or in the noise floor.

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5.4 Receiver Spurious Emission

5.4.1 Regulation

According to §15.209(a),
Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table: 83

Frequency (MHz)	Field Strength (microvolts/m at 3 meters)
30 – 88	100
88 – 216	150
216 -960	200
Above 960	500

5.4.2 Measurement Procedure

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.

b. During performing radiated emission below 1 ㎓, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 ㎓, the EUT was set 3 meter away from the interference-receiving antenna.

c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. It tested x,y and z – 3 axis each, mentioned only worst case data at this report.

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5.4.3 Test Result

-N/A

5.5 Bandwidth of Operation Frequency

5.5.1 Regulation

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 ㎒ and below 900 ㎒. Bandwidth is determined at the points 20 dB down from the modulated carrier.

5.5.2 Measurement Procedure

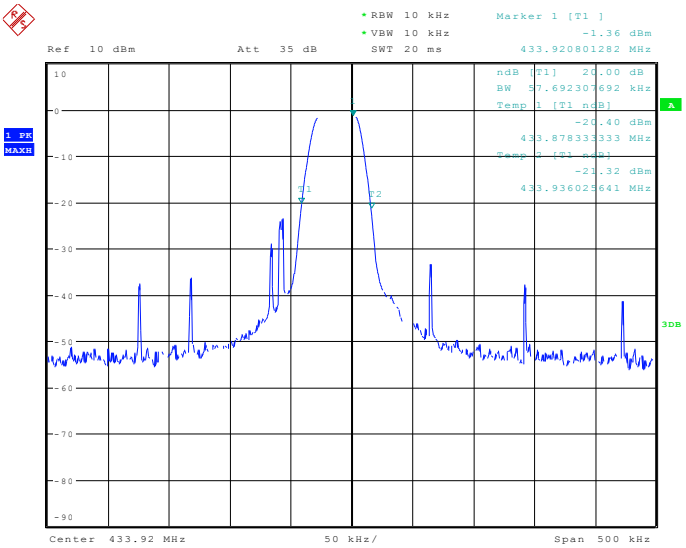
1. The transmitter output is connected to the spectrum analyzer.
2. The bandwidth of the fundamental frequencywas measured with the spectrum analyzer using RBW=10 kHz,VBW=10 kHz and Span=1 MHz.
3. The bandwidth of fundamental frequency was measured and recorded.

5.5.3 Test Result

-complied

Frequency [MHz]	Bandwidth of the emission [kHz]	Limit [kHz]
433.92	57.692	787.500

5.5.4 Test plot



5.6 Transmission Time

5.6.1 Regulation

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

5.6.2 Measurement Procedure

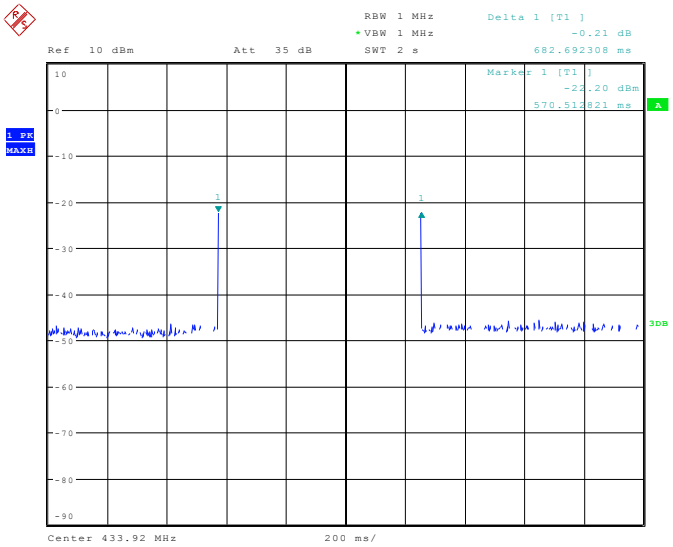
1. The transmitter output is connected to the spectrum analyzer.
2. The bandwidth of the fundamental frequencywas measured with the spectrum analyzer using RBW=1 MHz,VBW=1 MHz, Span=0 Hz, Sweep Time=10 sec
3. The bandwidth of fundamental frequency was measured and recorded.

5.6.3 Test Result

-complied

Frequency [MHz]	Transmission Time [s]	Limit [s]
433.92	0.683	5

5.6.4 Test plot



1/PW = 1/0.683 = 1.464

1/PW < 100kHz

5.7 Occupied Bandwidth

5.7.1 Regulation

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 ㎒ and below 900 ㎒. Bandwidth is determined at the points 20 dB down from the modulated carrier.

5.7.2 Measurement Procedure

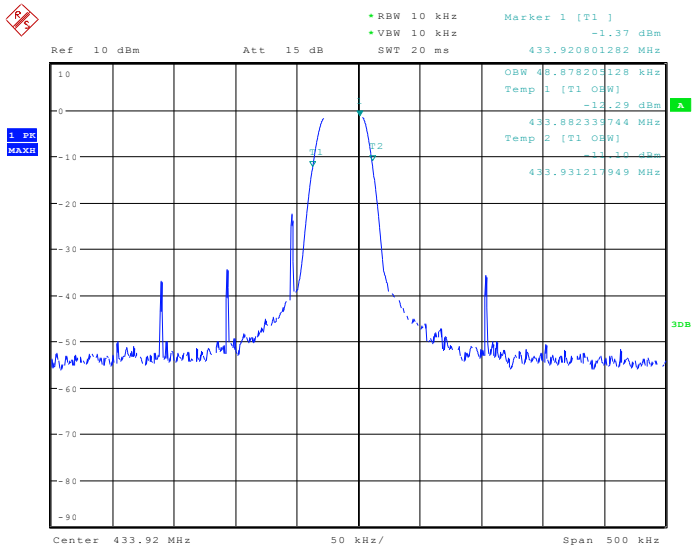
1. The transmitter output is connected to the spectrum analyzer.
2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using RBW≥1 % of Span,VBW to 3 times RBW.
3. The bandwidth of fundamental frequency was measured and recorded.

5.7.3 Test Result

-complied

Frequency [MHz]	Occupied Bandwidth [kHz]	Limit [kHz]	Remark
433.92	48.878	787.500	99% Occupied Bandwidth

5.7.3 Test plot



6. Test equipment used for test

	Description	Manufacture	Model No.	Serial No.	Next Cal Date.
☐	Temp & humidity chamber	taekwang	TK-04	TK001	13.12.07
☐	Temp & humidity chamber	taekwang	TK-500	TK002	13.09.03
☐	Frequency Counter	HP	53150A	US39250565	13.09.04
■	Spectrum Analyzer	Agilent	E4440A	MY44303500	13.06.27
☐	Spectrum Analyzer	R & S	FSP40	100209	13.10.23
■	Signal Generator	R & S	SMR40	100007	13.06.27
☐	Modulation Analyzer	HP	8901B	3538A05527	13.11.06
☐	Audio Analyzer	HP	8903B	3729A19213	14.01.06
☐	AC Power Supply	KIKUSUI	PCR2000W	GB001619	13.10.23
■	DC Power Supply	Tektronix	PS2520G	TW50517	14.03.12
☐	DC Power Supply	Tektronix	PS2521G	TW53135	13.10.23
☐	Dummy Load	BIRD	8141	7560	13.09.09
☐	Dummy Load	BIRD	8401-025	799	13.09.09
■	EMI Test Receiver	R&S	ESCI	100001	13.07.10
☐	Attenuator	HP	8494A	2631A09825	13.10.24
☐	Attenuator	HP	8496A	3308A16640	13.10.24
☐	Attenuator	R&S	RBS1000	D67079	13.10.24
☐	WIDEBAND POWER SENSOR	R & S	NRP-Z81	100677	13.05.04
☐	LOOP Antenna	EMCO	EMCO6502	9205-2745	13.05.23
■	BILOG Antenna	Schwarzbeck	VULB 9168	375	13.09.21
☐	BILOG Antenna	Schwarzbeck	VULB 9168	375	13.10.04
■	HORN Antenna	ETS	3115	00086706	13.11.21
☐	HORN Antenna	ETS	3115	00062589	13.09.06
☐	HORN Antenna	ETS	3116	00086632	13.11.15
☐	HORN Antenna	ETS	3116	00086632	13.11.15
■	Amplifier	SONOMA INSTRUMENT	310N	293004	13.11.06
☐	Power Divider	Weinschel	1580-1	NX375	12.10.26
☐	Power Divider	Weinschel	1580-1	NX380	13.09.09
☐	Power Divider	Weinschel	1594	671	13.09.09
☐	Test Receiver	R&S	ESHS30	828765/009	12.10.28
☐	LISN	R&S	ENV216	101358	12.10.26
☐	LISN	PMM	L2-16A	0000J10705	-

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Test setup photos