

TEST REPORT



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1. Report No : DRTFCC1702-0020(1)

2. Customer

• Name : MOTOTECH Co., Ltd.

• Address : #68-26, Mannyeon-ro, Jeongnam-myeon, Hwasong-si, Gyeonggi-do, South Korea

3. Use of Report : FCC Original Grant

4. Product Name / Model Name : Unit Assy-Body Control / MT BCM 04

FCC ID : DEO-MT-BCM04

5. Test Method Used : ANSI C63.10-2013

Test Specification : FCC Part 15 Subpart C

6. Date of Test : 2016-11-24 ~ 2016-12-23

7. Testing Environment : See appended test report.

8. Test Result : Refer to the attached test result.

Affirmation	Tested by	Technical Manager
	Name : KwiCheol, Yeom (Signature)	Name : HyunSu Son (Signature)

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Test Report Version

Test Report No.	Date	Description
DRTFCC1702-0020	Feb. 16, 2017	Initial issue
DRTFCC1702-0020(1)	Mar. 02, 2017	Updated description of EUT(Antenna type)

CONTENTS

1. EUT information.....	4
1.1 Description of EUT	4
1.2 Support equipment.....	4
2. Information about test items.....	5
2.1 Operating mode	5
2.2 Tested frequency	5
2.3 Auxiliary equipment	5
2.4 Tested environment	5
2.5 EMI Suppression Device(s)/Modifications	5
3. Facilities and Accreditations	6
3.1 Facilities	6
3.2 Equipment.....	6
4. Test Report.....	7
4.1 Summary of tests	7
4.2 Transmitter requirements.....	8
4.2.1 20 dB Bandwidth.....	8
4.2.2 Radiated Emissions	9
4.2.3 AC Line Conducted Emissions	11
5. Antenna Requirements.....	12
APPENDIX I	13

1. EUT information

1.1 Description of EUT

FCC Equipment Class	Part 15 Low Power Transmitter Below 1705 kHz (DCD)
Equipment type	Unit Assy-Body Control
Equipment model name	MT BCM 04
Equipment add model name	MT BCM 05
Equipment serial no.	Identical prototype
Frequency	134.2kHz
Power	DC 12 V(Car Battery)
Antenna type	Connector type (Low frequency Antenna)

1.2 Support equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

Note: The above equipment was supported by manufacturer.

2. Information about test items

2.1 Operating mode

Operating Mode	Continuous transmitting mode
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2.2 Tested frequency

Item	TX
Frequency	134.2 kHz

2.3 Auxiliary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-

2.4 Tested environment

Temperature	:	22 ~ 25 °C
Relative humidity content	:	37 ~ 53 % R.H.
Details of power supply	:	DC 12 V(Car Battery)

2.5 EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing
→ None

3. Facilities and Accreditations

3.1 Facilities

The semi anechoic chamber and conducted measurement facility used to collect the radiated and conducted test data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 449-935. The site is constructed in conformance with the requirements.

- Semi anechoic chamber registration Number: 804488

3.2 Equipment

Radiated emissions are measured with one or more of the following types of antennas: loop, tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide horn. Spectrum analyzers with pre-selectors and peak, quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

4. Test Report

4.1 Summary of tests

FCC Part Section(s)	RSS Section(s)	Parameter	Limit	Test Condition	Status Note 1
Test Items					
2.1049	N/A	20 dB Bandwidth	N/A	Radiated	C
15.209	RSS-Gen [8.5]	Radiated Emission	FCC 15.209 limits		C
15.207	RSS-Gen [8.8]	AC Conducted Emissions	FCC 15.207 limits	AC Line Conducted	NA ^{Note2}
15.203	RSS-Gen [8.3]	Antenna Requirements	FCC 15.203	-	C
Note 1: C =Comply NC =Not Comply NT =Not Tested NA =Not Applicable Note 2: This device is installed in a car. Therefore the power source is a battery of car.					

The sample was tested according to the following specification:
ANSI C-63.10 2013

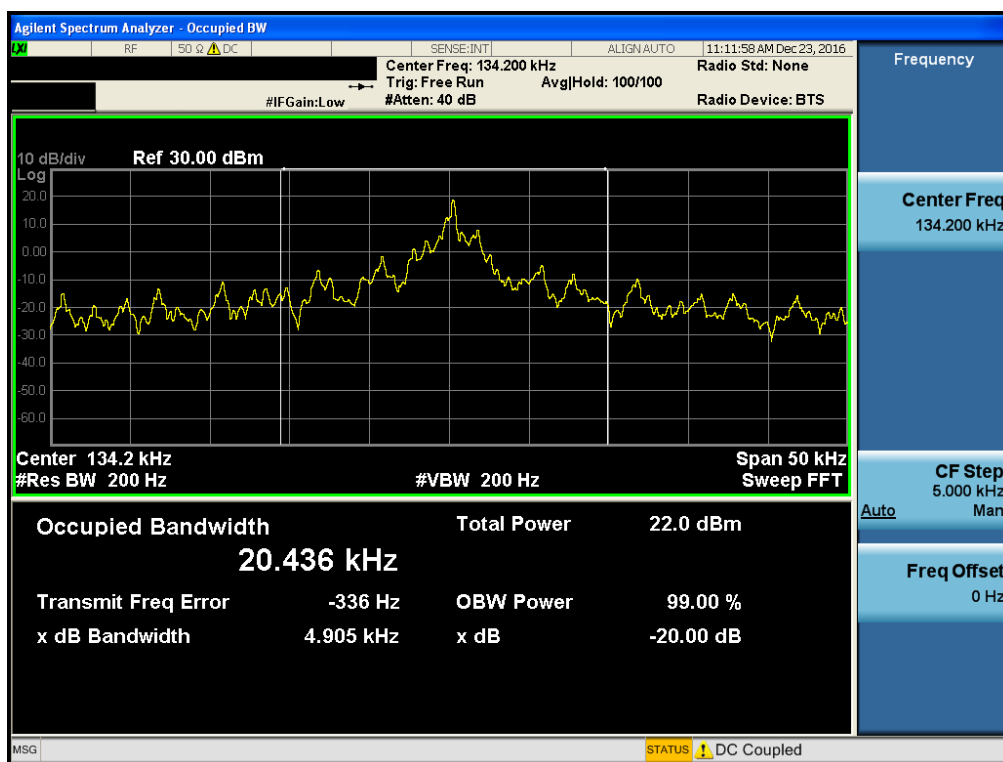
4.2 Transmitter requirements

4.2.1 20 dB Bandwidth

- Procedure:

The 20 dB bandwidth is measured with a spectrum analyzer connected via a receiving antenna placed near the EUT while the EUT is operating.

Tested Frequency(kHz)	Test Results(kHz)
134.200	4.905



4.2.2 Radiated Emissions

- Limit: FCC Part 15.209(a) & RSS-GEN 8.5

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

** Except as provided in 15.209(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. 15.231 and 15.241.

- Procedure:

1. 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.
2. During performing radiated emission below 1 GHz, 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 GHz, the EUT was set 3 meter away from the interference-receiving antenna.
3. 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.
4. 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.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. 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.

- Measurement Data: **Comply** (refer to the next page)

- Measurement Data:

Measurement Distance : 3 Meters

Tested Mode	Emissions (Note 1)	Freq. [MHz]	Det. Mode	Worst case ANT pol (Note 2)	Reading [dBuV]	T.F [dB/m]	D.C.F.	Field Strength [dBuV/m]	Limit [dBuV/m]	Margin [dB]
transmitting mode	S	0.020	PK	F	36.80	19.60	80	-23.60	41.58	65.18
	S	0.106	PK	F	44.50	19.20	80	-16.30	27.10	43.40
	F	0.134	PK	F	58.00	19.20	80	-2.80	25.06	27.86
	S	0.402	PK	F	32.80	19.10	80	-28.10	15.52	43.62
	S	0.587	PK	F	24.10	19.10	40	3.20	32.23	29.03
	S	1.207	PK	F	19.90	19.30	40	-0.80	25.97	26.77
	S	2.148	PK	F	12.70	19.40	40	-7.90	29.54	37.44
	S	9.925	PK	F	12.80	20.00	40	-7.20	29.54	36.74
	S	12.000	PK	F	14.10	20.00	40	-5.90	29.54	35.44
	S	21.920	PK	F	11.30	20.40	40	-8.30	29.54	37.84
	S	51.219	PK	V	24.60	-16.90	0	7.70	40.00	32.30
	S	79.955	PK	H	29.20	-20.60	0	8.60	40.00	31.40
	S	127.968	PK	H	42.70	-16.20	0	26.50	43.50	17.00
	S	127.968	PK	V	40.00	-16.20	0	23.80	43.50	19.70
	S	240.000	PK	H	35.70	-15.70	0	20.00	46.00	26.00
	S	949.401	PK	V	24.80	0.90	0	25.70	46.00	20.30
	S	983.722	PK	V	24.80	0.80	0	25.60	54.00	28.40
	S	988.573	PK	H	24.90	0.80	0	25.70	54.00	28.30
	-	-	-	-	-	-	-	-	-	-

Note 1. "F" = Fundamental emission / "S" = Spurious emission / "*" = Noise Floor

Note 2. "F": = Facing the antenna / "T" = antenna shifted / turned 90s degrees [Loop antenna]
"H": = Horizontal / "V" = Vertical [Bilog antenna]

Note 3. The worst case data were reported.
And no other spurious and harmonic emissions were reported greater than listed emissions above table.

Note 4. Distance Correction Factor(D.C.F.)
For 300m: $40 \cdot \log(300/3) = 80 \text{ dB}$ & For 30m: $40 \cdot \log(30/3) = 40 \text{ dB}$

Note 5. Sample calculation
 $T.F = AF + CL - AG$ / $\text{Field Strength} = \text{Reading} + T.F - D.C.F.$
 $\text{Margin} = \text{Limit} - \text{Field Strength}$
Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain
D.C.F = Distance Correction Factor

4.2.3 AC Line Conducted Emissions

- Minimum Standard: FCC Part 15.207 & RSS-GEN 8.8

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

- Procedure:

1. The test procedure is performed in a 6.5 m × 3.5 m × 3.5 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) × 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

- Measurement Data: NA

Note: The supplying power of this device is DC 12V from a Car Battery.

5. Antenna Requirements

■ According to FCC 47 CFR §15.203 & RSS-Gen [8.3]

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 external antennas of this E.U.T are permanently attached using the unique connectors.

APPENDIX I

TEST EQUIPMENT FOR TESTS

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Signal Analyzer	Agilent Technologies	N9020A	16/02/24	17/02/24	MY50200816
DIGITAL MULTIMETER	Agilent	34401A	16/01/05	17/01/05	US36099541
DC Power Supply	SM techno	SDP30-5D	16/01/05	17/01/05	305DLJ204
Thermohygrometer	BODYCOM	BJ5478	16/01/06	17/01/06	090205-4
Vector Signal Generator	Rohde Schwarz	SMBV100A	16/01/05	17/01/05	255571
EMI TEST RECEIVER	R&S	ESR7	16/10/18	17/10/18	101109
Loop Antenna	Schwarzbeck	FMZB1513	16/04/22	18/04/22	1513-128
Bilog Antenna	Schwarzbeck	VULB 9160	16/08/05	18/08/05	9160-3362
Low Noise Pre Amplifier	tsj	MLA-010K01-B01-27	16/03/10	17/03/10	1844538