TEST REPORT

KCTL Inc.
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

1. Client

- Name : ATTOWAVE Co., Ltd.
- Address : 1005, 10F Leader's Tower, 60-15 Gasan-dong, Gumchun-gu, Seoul, 153-801 Korea
- Date of Receipt : 2019-11-21

2. Use of Report : -

3. Name of Product and Model : RADAR DETECTOR / LNA REMOTE

4. Manufacturer and Country of Origin : ATTOWAVE Co., Ltd. / Korea

5. Date of Test : 2019-11-26

6. Test method used : ANSI C63.4:2014, FCC02-211
FCC Part 15 Subpart B, Class B

7. FCC ID : W75-M2K-Y25

8. Test Results : Refer to the test result in the test report

Affirmation	Tested by Name : Junggil Ryu (Signature)	Technical Manager Name : Gunsu Park (Signature)

2019-12-13

KCTL Inc.

REPORT REVISION HISTORY

Date	Revision	Page No
2019-12-04	Originally issued	-
2019-12-11	Added comment for Note[1)]	13
2019-12-12	Revised frequency of operation	9
2019-12-13	Revised frequency of operation	12

Note. The report No. KR19-SEF0194-B is superseded by the report No. KR19-SEF0194-C

Contents

1. Applicant information

Applicant:	ATTOWAVE Co., Ltd.
Address:	1005, 10F Leader's Tower, 60-15 Gasan-dong, Gumchun-gu, Seoul, 153-801 Korea
Telephone:	+82-2-864-9173
Fax:	+82-2-2026-6565
E-mail:	ksharp@attowave.com
Contact name:	Jeonghan Kim

Manufacturer:	ATTOWAVE Co., Ltd.
Address:	1005, 10F Leader's Tower, 60-15 Gasan-dong, Gumchun-gu, Seoul, 153-801 Korea
Telephone:	+82-2-864-9173
Fax:	+82-2-2026-6565
E-mail:	ksharp@attowave.com
Contact name:	Jeonghan Kim

2. Laboratory information

Address

KCTL Inc. (Suwon Lab.)

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea

Telephone Number: 82 31 285 0894

Facsimile Number: 82 505 299 8311

FCC Site Designation No: KR0040

VCCI Registration No. : R-20080, G-20078, C-20059, T-20056

Industry Canada Registration No. : 8035A

KOLAS NO.: KT231

SITE MAP

3. Test system configuration

3.1 Operation environment

	Temperature	Humidity	Pressure
Chamber 10 m(RE)	20.4 °C	25.3 % R.H.	-

Test site

These testing items were performed following locations;

Test item	Test site
Conducted Emission	Shielded Room
Radiated Emission	10 m Chamber

3.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC.
The factors contributing to uncertainties are test receiver, cable loss, antenna factor calibration, Antenna directivity, antenna factor variation with height, antenna phase center variation, antenna frequency interpolation, measurement distance variation, site imperfection, mismatch, and system repeatability. Based on CISPR 16-4-2, the measurement uncertainty level with a 95 % confidence level was applied.

Conducted Emission measurement (Confidence level about 95 %, k = 2)		
Shielded Room (CE#1)	9 kHz ~ 150 kHz: 3.66 dB	
	150 kHz ~ 30 MHz: 3.26 dB	
Shielded Room (CE#2)	9 kHz ~ 150 kHz: 3.48 dB	
	150 kHz ~ 30 MHz: 3.06 dB	
Radiated Emission measurement (Confidence level about 95 %, k = 2)		
10 m Chamber (4F)	30 MHz ~ 300 MHz	3 m: 5.32 dB
		10 m: 5.32 dB
	300 MHz ~ 1 000 MHz	3 m: 5.46 dB
		10 m: 5.34 dB
	1 GHz ~ 6 GHz	3 m: 6.32 dB
	6 GHz ~ 18 GHz	3 m: 6.66 dB
	18 GHz ~ 40 GHz	3 m: 6.74 dB
10 m Chamber (2F)	30 MHz ~ 300 MHz	3 m: 4.98 dB
		10 m: 4.96 dB
	300 MHz ~ 1 000 MHz	3 m: 5.14 dB
		10 m: 5.00 dB
	1 GHz ~ 6 GHz	3 m: 6.34 dB
	6 GHz ~ 18 GHz	3 m: 6.68 dB
3 m Chamber (3F)	30 MHz ~ 300 MHz	3 m: 4.90 dB
	300 MHz ~ 1 000 MHz	3 m: 5.06 dB
	1 GHz ~ 6 GHz	3 m: 6.70 dB
	6 GHz ~ 18 GHz	3 m: 6.60 dB

3.3 Measurement Program

These test items were performed by software programs;

Test item	Measurement Program		Used
Conducted Emission	EP5CE_V 5.4.0(TOYO)		☐
Radiated Emission	2F	EP5RE_V 4.6.0(TOYO)	☒
	4F	EP5RE_V 5.11.10(TOYO)	

4. Description of EUT

4.1 General information

General

- Dimensions: 102.5(L) x 71.4(W) x 44.1(H)mm
- Weight: 115g
- Power requirement: 12V DC
- Temperature Range –10 to 75 degree(Operating)

Radar Detector

- Receiver Type: Dual Conversion Superheterodyne Self-Contained Antenna
- Detector Type: Scanning Frequency Discriminator
- Frequency of Operation

  X Band: 10.475 – 10.575GHz

  K Band: 24.050 – 24.250GHz

  Ka Band: 33.400 – 36.000GHz

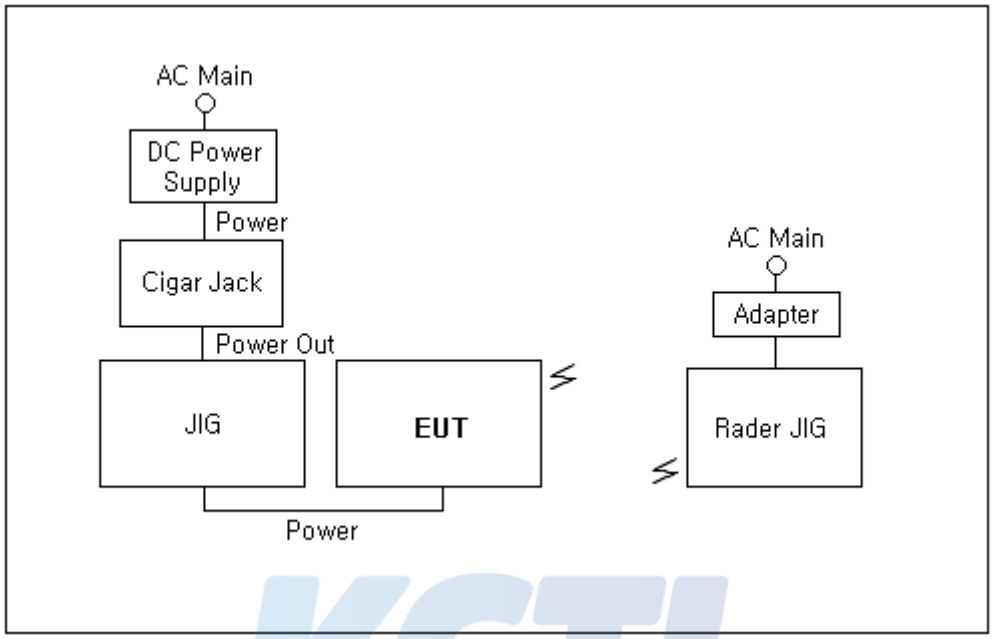
4.2 Product description

Type of product	RADAR DETECTOR
Model name (Basic)	LNA REMOTE
Model name (Variant)	-
Difference	-
Serial no	-
Testing voltage	DC 12 V
Input rating	DC 12 V
Internal clock frequency	22 MHz
FCC ID	W75-M2K-Y25
Note	-

4.3 Auxiliary equipments

Type	Model / Part #	S/N	Manufacturer
DC Power Supply	E3632A	MY40004594	Agilent
Cigar Jack	-	-	-
Rader JIG	-	-	-
Adapter	ANY1239C-1	-	Wendeng Any Electronics Co., Ltd.
JIG	-	-	-

4.4 Test configuration



	Start		End		Cable	
	Name	I/O port	Name	I/O port	Length (m)	Spec.
1	**EUT**	Power	JIG	-	5.0	Unshield
2	Cigar Jack	Power	DC Power Supply	-	1.2	Unshield
3		Power Out	JIG	-	3.0	Shield
4	Rader JIG	Power	Adapter	-	1.5	Unshield

4.5 Operating conditions

The EUT was configured as normal intended use.

Test Mode	Normal operating
Test #1	The EUT was connected as user's guide. And during the test executed EUT is operating on the following: Stand-by mode X Band: (10.475 - 10.575) GHz K Band: (24.050 - 24.250) GHz Ka Band(Super-wide band): (33.400 - 36.000) GHz Laser:(905 ± 50) nm

5. Summary of test results

5.1 Summary of EMI emission test results

Applied	Test items	Test method	Result
☐	Conducted Emission	ANSI C63.4:2014, FCC02-211 FCC Part 15 Subpart B, Class B	Note 1)
☒	Radiated Emission	ANSI C63.4:2014, FCC02-211 FCC Part 15 Subpart B, Class B	Pass

The data collected shows that EUT the complied with technical requirements of above rules part 15.109(h).

Note 1): This test item is not applicable because the product is supplied DC power from vehicular battery.

6. Test results

6.1 Radiated Emission

Test specification	ANSI C63.4:2014, FCC02-211 FCC Part 15 Subpart B, Class B		
Testing voltage	DC 12 V		
Test facility	10 m Chamber (4F)		
Test distance	3 m		
Date	2019-11-26		
Temperature (°C)	20.4 °C	Humidity (% R.H.)	25.3 % R.H.
Remarks	Pass		

6.1.1 Limits of radiated emission measurement

Frequency [MHz]	Class A (dB(μV/m)) @ 10 m	Class B (dB(μV/m)) @ 3 m
30-88	39	40
88-216	43.5	43.5
216-960	46.4	46
Above 960	49.5	54

Note- Alternative standard: CISPR, Pub. 22

6.1.2 Measurement procedure

The test was done at a 10 m chamber with a quasi-peak detector. EUT was placed on a non-metallic table height of 0.8 m above the reference ground plane. Cables were folded back and forth forming a bundle 0.3 m to 0.4 m long and were hanged at a 0.4 m height to the ground plane.

Cables connected to EUT were fixed to cause maximum emission. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

6.1.3 Used equipments

Equipment	Model no.	Serial no.	Makers	Next Cal. Date	Used
EMI TEST RECEIVER	ESR7	101078	R&S	2020.08.22	☒
Antenna Mast	MA4640-XP-ET	-	Innco Systems	-	☒
Turn Table	TT 3.0-3t	-	MATURO	-	☒
DOUBLE RIDGED HORN ANTENNA	3117-PA	00161083	ETS-LINDGREN	2020.09.18	☒
Spectrum Analyzer	FSV40	100988	R&S	2020.01.04	☒

6.1.4 Sample calculation

The field strength is calculated adding the antenna Factor, cable loss and, Antenna pad adding, subtracting the amplifier gain from the measured reading.

The sample calculation is as follow:

Result = M.R + C.F(A.F + C.L + 6 dB Att – A.G)

M.R = Meter Reading

C.F = Correction Factor

A.F = Antenna Factor

C.L = Cable Loss

A.G = Amplifier Gain

6 dB Att = 6 dB Attenuator

If M.R is 30 dB, A.F 12 dB, C.L 5 dB, 6 dB, A.G 35 dB

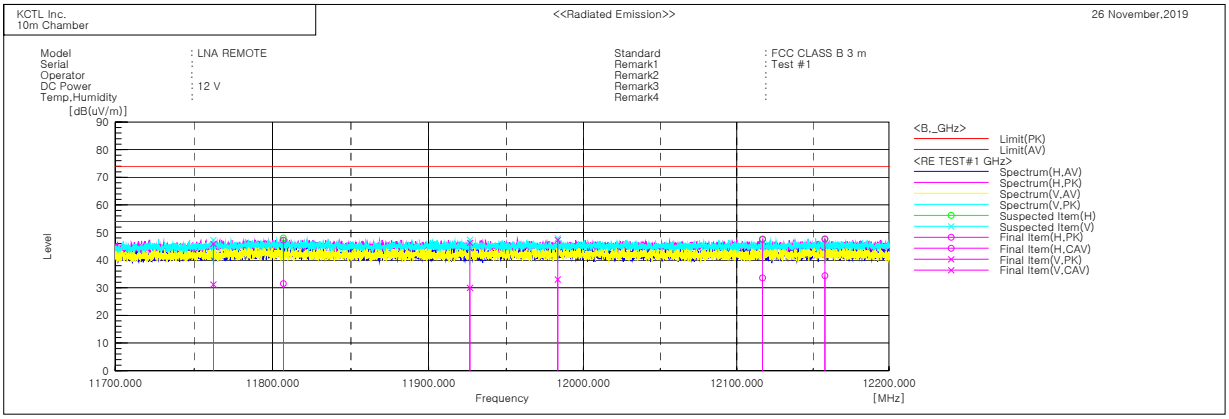
The result is 30 + 12 + 5 + 6 – 35 = 18 dB (μN/m)

Bilog Antenna and ATTENUATOR (6 dB) were calibrated together.

AV = CAV : Abbreviation of CISPR Average

6.1.4 Radiated emission measurement result

11.7 GHz ~ 12.2 GHz



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Result CAV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]
1	11762.240	V	45.6	30.9	0.3	45.9	31.2	74.0	54.0	28.1	22.8	182.0	51.0
2	11806.840	H	46.9	31.2	0.3	47.2	31.5	74.0	54.0	26.8	22.5	117.0	7.0
3	11926.550	V	45.9	29.6	0.4	46.3	30.0	74.0	54.0	27.7	24.0	279.0	354.0
4	11983.350	V	46.8	32.5	0.5	47.3	33.0	74.0	54.0	26.7	21.0	386.0	235.0
5	12116.860	H	47.0	33.1	0.5	47.5	33.6	74.0	54.0	26.5	20.4	109.0	334.0
6	12157.860	H	47.0	33.8	0.6	47.6	34.4	74.0	54.0	26.4	19.6	110.0	334.0