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 : Continental Automotive Systems Corporation
- Address : 45-29, Saeum-ro, Icheon-si, Gyeonggi-Do, 467-080, Korea
- Date of Receipt : 2017-12-18

2. Use of Report : -

3. Name of Product and Model : Smart Key ECU / IBU1.0 SMK

4. Manufacturer and Country of Origin : Continental Automotive Systems Corporation / Korea

5. FCC ID : SY5IBU10SMK

6. IC : 8325A-IBU10SMK

7. Date of Test : 2018-01-03 to 2018-01-04

8. Test Standards : FCC Part 15 Subpart C, 15.209
RSS-210 Issue 9 August 2016
RSS GEN Issue 4 November 2014

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

Affirmation	Tested by Name : Dowon Ahn (Signature)	Technical Manager Name : Jongha Choi (Signature)

2018-02-20

KCTL Inc.

REPORT REVISION HISTORY

Date	Revision	Page No
2018-01-12	Originally issued	-
2018-02-20	Added note	12, 13

[Contents]

1. Client information

Applicant:	Continental Automotive Systems Corporation
Address:	45-29, Saeum-ro, Icheon-si, Gyeonggi-Do, 467-080, Korea
Telephone number:	+82 31 645 4864
Facsimile number:	+82 31 637 0371
Contact person:	Sungmin Jang / Sungmin.Jang@continental-corporation.com

Manufacturer:	Continental Automotive Systems Corporation
Address:	45-29, Saeum-ro, Icheon-si, Gyeonggi-Do, 467-080, Korea

2. Laboratory information

Address

KCTL Inc.

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

Telephone Number: 82 31 285 0894

Facsimile Number: 82 505 299 8311

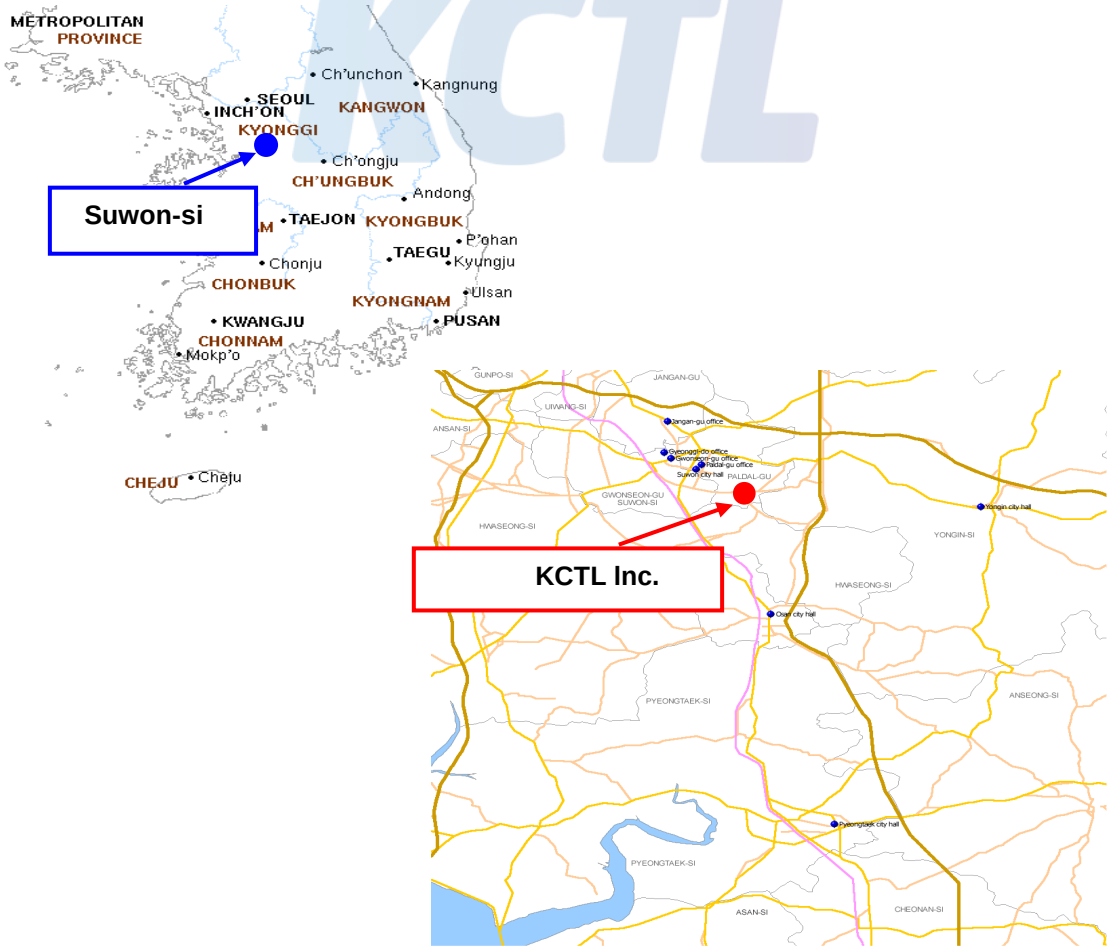
FCC Site Designation No: KR0040, FCC Site Registration No: 687132

VCCI Registration No. : R-3327, G-198, C-3706, T-1849

Industry Canada Registration No. : 8035A

KOLAS NO.: KT231

SITE MAP



3. Description of E.U.T.

3.1 Basic description

Applicant	Continental Automotive Systems Corporation
Address of Applicant	45-29, Saeum-ro, Icheon-si, Gyeonggi-Do, 467-080, Korea
Manufacturer	Continental Automotive Systems Corporation
Address of Manufacturer	45-29, Saeum-ro, Icheon-si, Gyeonggi-Do, 467-080, Korea
Type of equipment	Smart Key ECU
Basic Model	IBU1.0 SMK
Serial number	N/A

3.2 General description

Frequency Range	125 ㎑
Type of Modulation	ASK
The number of channels	1 ch
Type of Antenna	ANT 1 : IMMOBILIZER Antenna ANT 2 ~ ANT 7 : LF Antenna
Power supply	DC 12.00 V
Product SW/HW version	1.0 / 1.0
Radio SW/HW version	1.0 / 1.0
Test SW Version	N/A1)
RF power setting in TEST SW	N/A2)

Note1) : The above EUT information was declared by the manufacturer.
Note2) : N/A1) There is no test software used during the test.
N/A2) RF power setting was not able to alter during the test.

3.3 Test frequency

Test Frequency [㎑]
125 ㎑

3.4 Normal and extreme test conditions

Test condition	Temperature [℃]	Voltage [V]
NTNV	22	DC 12 V

Note 1 : N:Normal T:Temperature V:Voltage H:Highest L:Lowest

4. Summary of test results

4.1 Standards & results

FCC Rule Reference	IC Rule Reference	Parameter	Report Section	Test Result
15.203	-	Antenna Requirement	5.1	C
15.209(b)(3)	RSS-210, Issue 9	Field Strength of Fundamental	5.2	C
15.205(a),15.209(a)	RSS-210, Issue 9	Spurious Emission	5.3	C
-	RSS-GEN, 6.6	Occupied Bandwidth	5.4	C
Note : C = complies, NC = Not complies, NT = Not tested, NA = Not Applicable				

4.2 Uncertainty

Measurement Item	Expanded Uncertainty U = *k*Uc (*k* = 2)	
Conducted RF power	1.44 dB	
Conducted Spurious Emissions	1.52 dB	
Radiated Spurious Emissions	30 ㎒ ~ 300 ㎒:	+4.94 dB, -5.06 dB
		+4.93 dB, -5.05 dB
	300 ㎒ ~ 1 000 ㎒:	+4.97 dB, -5.08 dB
		+4.84 dB, -4.96 dB
	1 ㎓ ~ 25 ㎓:	+6.03 dB, -6.05 dB
Conducted Emissions	9 ㎑ ~ 150 ㎑:	3.75 dB
	150 ㎑ ~ 30 ㎒:	3.36 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.

5.1.2 Result

-Complied

The IMMOBILIZER Antenna and LF Antenna is an external antenna that uses unique antenna connector, and no antenna other than that furnished by the responsible party shall be used with the device.

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 (㎒)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2 400/F(㎑)	300
0.490 - 1.705	24 000/F(㎑)	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 ㎒, 76-88 ㎒, 174-216 ㎒ or 470-806 ㎒. 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 (㎒)	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 ㎒, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 ㎒, ㎶/m at 3 meters = 56.81818(F) - 6136.3636; for the band 260-470 ㎒, ㎶/m at 3 meters = 41.6667(F) - 7083.3333. The maximum permitted unwanted emission level is 20 ㏈ below the maximum permitted fundamental level.

5.2.2 Test procedure

The method of measurement used to test this Unlicensed Wireless device is ANSI C63.10-2013.

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 ㏈ 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 ㏈ 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.

5.2.3 Test Result

- Complied

-ANT 1

Frequency [㎒]	Resolution Bandwidth [㎑]	Pol. [V/H]	Reading [dB(㎶)]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(㎶/m)] at 3m	Result [dB(㎶/m)] at 300m	Limit [dB(㎶/m)] at 300m	Margin [dB]
0.125	9	H	69.70	32.86	-32.76	19.6	19.70	89.40	9.40 Note 2)	25.67	16.27

Note 1) : Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss
Note 2) : -80 is distance factor = 40*log(3/300)

-ANT 2

Frequency [㎒]	Resolution Bandwidth [㎑]	Pol. [V/H]	Reading [dB(㎶)]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(㎶/m)] at 3m	Result [dB(㎶/m)] at 300m	Limit [dB(㎶/m)] at 300m	Margin [dB]
0.125	9	H	76.30	32.86	-32.76	19.6	19.70	96.00	16.00 Note 2)	25.67	9.67

Note 1) : Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss
Note 2) : -80 is distance factor = 40*log(3/300)

-ANT 3

Frequency [㎒]	Resolution Bandwidth [㎑]	Pol. [V/H]	Reading [dB(㎶)]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(㎶/m)] at 3m	Result [dB(㎶/m)] at 300m	Limit [dB(㎶/m)] at 300m	Margin [dB]
0.125	9	H	70.30	32.86	-32.76	19.6	19.70	90.00	10.00 Note 2)	25.67	15.67

Note 1) : Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss
Note 2) : -80 is distance factor = 40*log(3/300)

-ANT 4

Frequency [㎒]	Resolution Bandwidth [㎑]	Pol. [V/H]	Reading [dB(㎶)]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(㎶/m)] at 3m	Result [dB(㎶/m)] at 300m	Limit [dB(㎶/m)] at 300m	Margin [dB]
0.125	9	H	81.20	32.86	-32.76	19.6	19.70	100.90	20.90 Note 2)	25.67	4.77

Note 1) : Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss
Note 2) : -80 is distance factor = 40*log(3/300)

-ANT 5

Frequency [㎒]	Resolution Bandwidth [㎑]	Pol. [V/H]	Reading [dB(㎶)]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(㎶/m)] at 3m	Result [dB(㎶/m)] at 300m	Limit [dB(㎶/m)] at 300m	Margin [dB]
0.125	9	H	72.80	32.86	-32.76	19.6	19.70	92.50	12.50 Note 2)	25.67	13.17

Note 1) : Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss
Note 2) : -80 is distance factor = 40*log(3/300)

-ANT 6

Frequency [㎒]	Resolution Bandwidth [㎑]	Pol. [V/H]	Reading [dB(㎶)]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(㎶/m)] at 3m	Result [dB(㎶/m)] at 300m	Limit [dB(㎶/m)] at 300m	Margin [dB]
0.125	9	H	81.40	32.86	-32.76	19.6	19.70	101.10	21.10 Note 2)	25.67	4.57

Note 1) : Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss
Note 2) : -80 is distance factor = 40*log(3/300)

-ANT 7

Frequency [㎒]	Resolution Bandwidth [㎑]	Pol. [V/H]	Reading [dB(㎶)]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(㎶/m)] at 3m	Result [dB(㎶/m)] at 300m	Limit [dB(㎶/m)] at 300m	Margin [dB]
0.125	9	H	79.60	32.86	-32.76	19.6	19.70	99.30	19.30 Note 2)	25.67	6.37

Note 1) : Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss
Note 2) : -80 is distance factor = 40*log(3/300)

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 (㎒)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2 400/F(㎑)	300
0.490 - 1.705	24 000/F(㎑)	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 ㎒, 76-88 ㎒, 174-216 ㎒ or 470-806 ㎒. 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 (㎒)	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

5.3.2 Measurement Procedure

The method of measurement used to test this Unlicensed Wireless device is ANSI C63.10-2013.

a. The EUT was placed on the top of a rotating table 0.8 meters, 1.5 meter 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 ㏈ 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 ㏈ 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.

5.3.3 Test Result

- Complied

- ANT 1

Frequency [㎒]	Resolution Bandwidth [㎑]	Pol. [V/H]	Reading [dB(㎶)]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(㎶/m)]	Limit [dB(㎶/m)]	Margin [dB]
Average DATA.										
0.31	9	V	24.90	32.94	-32.74	19.60	19.80	44.70	97.80	53.10

Note : Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss

Frequency [㎒]	Resolution Bandwidth [㎑]	Pol. [V/H]	Reading [dB(㎶)]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(㎶/m)]	Limit [dB(㎶/m)]	Margin [dB]
Quasi-Peak DATA.										
0.62	9	H	27.50	32.93	-32.73	19.60	19.80	47.30	71.70	24.40
7.47	9	V	10.10	33.48	-32.68	19.70	20.50	47.30	71.70	24.40
30.12	120	V	48.10	1.08	-42.11	24.93	-16.10	32.00	40.00	8.00
84.68	120	V	44.10	2.14	-15.72	-5.62	-19.20	24.90	40.00	15.10
180.11	120	H	36.40	3.99	40.57	-59.06	-14.50	21.90	43.50	21.60
888.09	120	H	29.00	6.97	-30.07	26.40	3.30	32.30	46.00	13.70
954.77	120	H	25.70	7.25	-29.49	26.94	4.70	30.40	46.00	15.60

Note : Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss

- ANT 2

Frequency [㎒]	Resolution Bandwidth [㎑]	Pol. [V/H]	Reading [dB(㎶)]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(㎶/m)]	Limit [dB(㎶/m)]	Margin [dB]
Average DATA.										
0.25	9	V	36.10	32.94	-32.74	19.60	19.80	55.90	99.80	43.90

Note : Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss

Frequency [㎒]	Resolution Bandwidth [㎑]	Pol. [V/H]	Reading [dB(㎶)]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(㎶/m)]	Limit [dB(㎶/m)]	Margin [dB]
Quasi-Peak DATA.										
0.63	9	V	23.80	32.93	-32.73	19.60	19.80	43.60	71.60	28.00
30.85	120	V	48.80	1.10	-41.62	24.52	-16.00	32.80	40.00	7.20
40.06	120	V	42.30	1.28	-35.84	19.36	-15.20	27.10	40.00	12.90
85.78	120	V	44.70	2.16	-15.23	-6.23	-19.30	25.40	40.00	14.60
184.59	120	H	39.10	2.98	-33.20	15.22	-15.00	24.10	43.50	19.40
536.34	120	V	29.20	6.12	-27.30	16.98	-4.20	25.00	46.00	21.00
888.09	120	H	29.80	9.25	-24.69	18.74	3.30	33.10	46.00	12.90

Note : Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss

- ANT 3

Frequency [㎒]	Resolution Bandwidth [㎑]	Pol. [V/H]	Reading [dB(㎶)]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(㎶/m)]	Limit [dB(㎶/m)]	Margin [dB]
Average DATA.										
0.23	9	V	37.00	32.94	-32.74	19.60	19.80	56.80	100.40	43.60
0.25	9	H	43.80	32.94	-32.74	19.60	19.80	63.60	99.50	35.90
0.39	9	H	27.40	32.94	-32.74	19.60	19.80	47.20	95.90	48.70

Note : Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss

Frequency [㎒]	Resolution Bandwidth [㎑]	Pol. [V/H]	Reading [dB(㎶)]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(㎶/m)]	Limit [dB(㎶/m)]	Margin [dB]
Quasi-Peak DATA.										
0.62	9	V	21.90	32.93	-32.73	19.60	19.80	41.70	71.80	30.10
30.12	120	V	48.10	1.08	-42.11	24.93	-16.10	32.00	40.00	8.00
51.70	120	V	37.10	1.50	-28.75	12.85	-14.40	22.70	40.00	17.30
89.29	120	V	44.00	2.23	-13.63	-8.20	-19.60	24.40	43.50	19.10
174.41	120	H	37.10	2.89	-32.14	15.45	-13.80	23.30	43.50	20.20
888.09	120	H	28.90	9.01	10.95	-16.66	3.30	32.20	46.00	13.80

Note : Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss

- ANT 4

Frequency [㎒]	Resolution Bandwidth [㎑]	Pol. [V/H]	Reading [dB(㎶)]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(㎶/m)]	Limit [dB(㎶/m)]	Margin [dB]
Average DATA.										
0.19	9	H	45.60	32.85	-32.75	19.60	19.70	65.30	102.20	36.90
0.25	9	H	40.30	32.94	-32.74	19.60	19.80	60.10	99.80	39.70
0.27	9	H	48.70	32.94	-32.74	19.60	19.80	68.50	99.00	30.50

Note : Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss

Frequency [㎒]	Resolution Bandwidth [㎑]	Pol. [V/H]	Reading [dB(㎶)]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(㎶/m)]	Limit [dB(㎶/m)]	Margin [dB]
Quasi-Peak DATA.										
0.65	9	H	21.80	32.93	-32.73	19.60	19.80	41.60	71.40	29.80
30.00	120	V	48.60	1.08	-42.18	25.00	-16.10	32.50	40.00	7.50
40.31	120	V	48.30	1.28	-35.71	19.23	-15.20	33.10	40.00	6.90
87.35	120	V	43.10	2.19	-14.57	-7.12	-19.50	23.60	40.00	16.40
189.81	120	H	39.70	3.03	-33.78	15.25	-15.50	24.20	43.50	19.30
888.09	120	H	29.90	9.25	-24.69	18.74	3.30	33.20	46.00	12.80

Note : Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss

- ANT 5

Frequency [㎒]	Resolution Bandwidth [㎑]	Pol. [V/H]	Reading [dB(㎶)]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(㎶/m)]	Limit [dB(㎶/m)]	Margin [dB]
Average DATA.										
0.20	9	V	35.80	32.95	-32.75	19.60	19.80	55.60	101.80	46.20
0.27	9	V	33.80	32.94	-32.74	19.60	19.80	53.60	99.10	45.50

Note : Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss

Frequency [㎒]	Resolution Bandwidth [㎑]	Pol. [V/H]	Reading [dB(㎶)]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(㎶/m)]	Limit [dB(㎶/m)]	Margin [dB]
Quasi-Peak DATA.										
0.64	9	H	23.00	32.93	-32.73	19.60	19.80	42.80	71.40	28.60
30.12	120	V	49.60	1.08	-42.11	24.93	-16.10	33.50	40.00	6.50
88.20	120	V	43.70	2.21	-14.22	-7.59	-19.60	24.10	43.50	19.40
159.74	120	V	36.50	3.59	30.96	-47.65	-13.10	23.40	43.50	20.10
178.65	120	H	39.20	2.93	-32.49	15.26	-14.30	24.90	43.50	18.60
888.09	120	H	29.70	9.01	10.95	-16.66	3.30	33.00	46.00	13.00

Note : Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss

- ANT 6

Frequency [㎒]	Resolution Bandwidth [㎑]	Pol. [V/H]	Reading [dB(㎶)]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(㎶/m)]	Limit [dB(㎶/m)]	Margin [dB]
Average DATA.										
0.20	9	H	38.10	32.94	-32.74	19.60	19.80	57.90	101.50	43.60
0.25	9	H	42.30	32.94	-32.74	19.60	19.80	62.10	99.60	37.50
0.37	9	H	33.70	32.94	-32.74	19.60	19.80	53.50	96.10	42.60

Note : Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss

Frequency [㎒]	Resolution Bandwidth [㎑]	Pol. [V/H]	Reading [dB(㎶)]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(㎶/m)]	Limit [dB(㎶/m)]	Margin [dB]
Quasi-Peak DATA.										
0.50	9	H	23.90	32.93	-32.73	19.60	19.80	43.70	73.70	30.00
0.61	9	V	23.60	32.93	-32.73	19.60	19.80	43.40	72.00	28.60
30.00	120	V	49.70	1.08	-42.18	25.00	-16.10	33.60	40.00	6.40
39.82	120	V	42.20	1.27	-35.97	19.50	-15.20	27.00	40.00	13.00
84.93	120	V	43.60	2.15	-15.59	-5.76	-19.20	24.40	40.00	15.60
127.73	120	H	35.60	2.44	-35.25	17.91	-14.90	20.70	43.50	22.80
181.08	120	H	40.20	2.99	-32.84	15.25	-14.60	25.60	43.50	17.90
888.09	120	V	30.00	10.35	13.05	-20.10	3.30	33.30	46.00	12.70

Note : Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss

- ANT 7

Frequency [㎒]	Resolution Bandwidth [㎑]	Pol. [V/H]	Reading [dB(㎶)]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(㎶/m)]	Limit [dB(㎶/m)]	Margin [dB]
Average DATA.										
0.25	9	H	31.10	32.94	-32.74	19.60	19.80	50.90	99.80	48.90
0.31	9	H	28.00	32.94	-32.74	19.60	19.80	47.80	97.80	50.00

Note : Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss

Frequency [㎒]	Resolution Bandwidth [㎑]	Pol. [V/H]	Reading [dB(㎶)]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(㎶/m)]	Limit [dB(㎶/m)]	Margin [dB]
Quasi-Peak DATA.										
0.62	9.00	V	23.10	32.93	-32.73	19.60	19.80	42.90	71.80	28.90
85.65	120	V	35.60	1.95	-35.31	14.06	-19.30	16.30	40.00	23.70
123.48	120	V	38.80	2.40	-38.29	20.49	-15.40	23.40	43.50	20.10
185.32	120	H	39.10	3.14	-49.14	31.00	-15.00	24.10	43.50	19.40
425.40	120	V	34.80	4.71	-34.42	22.11	-7.60	27.20	46.00	18.80
448.07	120	V	36.40	4.84	-34.21	22.47	-6.90	29.50	46.00	16.50
876.33	120	H	29.30	7.28	-33.60	29.32	3.00	32.30	46.00	13.70

Note : Factor(dB) = Antenna Factor + Amp. Gain + Cable Loss

5.4 Occupied Bandwidth

5.4.1 Regulation

The emission bandwidth (x dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated x dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth.
When the occupied bandwidth limit is not stated in the applicable RSS or reference measurement method, the transmitted signal bandwidth shall be reported as the 99% emission bandwidth, as calculated or measured.

5.4.2 Measurement procedure

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

A peak, or peak hold, may be used in place of the sampling detector as this may produce a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold may be necessary to determine the occupied bandwidth if the device is not transmitting continuously.

The trace data points are recovered and are directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded.

The difference between the two recorded frequencies is the 99% occupied bandwidth.

5.4.3 Test Result

- Complied

- ANT 1

Voltage [V]	Frequency [㎑]	Occupied Bandwidth (99 % BW) [㎐]
DC 12.00	125	209.84

- ANT 2

Voltage [V]	Frequency [㎑]	Occupied Bandwidth (99 % BW) [㎐]
DC 12.00	125	209.84

- ANT 3

Voltage [V]	Frequency [㎑]	Occupied Bandwidth (99 % BW) [㎐]
DC 12.00	125	209.84

- ANT 4

Voltage [V]	Frequency [㎑]	Occupied Bandwidth (99 % BW) [㎐]
DC 12.00	125	209.84

- ANT 5

Voltage [V]	Frequency [㎑]	Occupied Bandwidth (99 % BW) [㎐]
DC 12.00	125	209.84

- ANT 6

Voltage [V]	Frequency [㎑]	Occupied Bandwidth (99 % BW) [㎐]
DC 12.00	125	209.84

- ANT 7

Voltage [V]	Frequency [㎑]	Occupied Bandwidth (99 % BW) [㎐]
DC 12.00	125	209.84

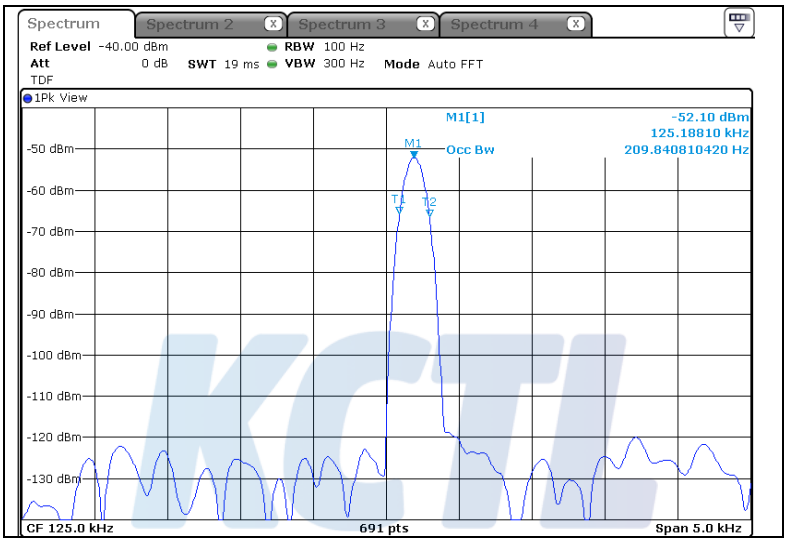
NOTE: We took the insertion loss of the cable loss into consideration within the measuring instrument.

5.4.4 Test Plot

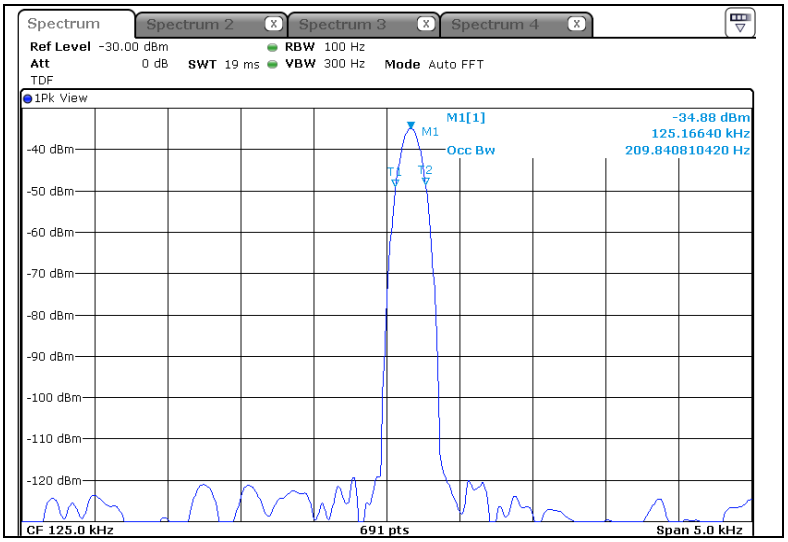
Figure 2. Plot of the Occupied Bandwidth

- Occupied Bandwidth

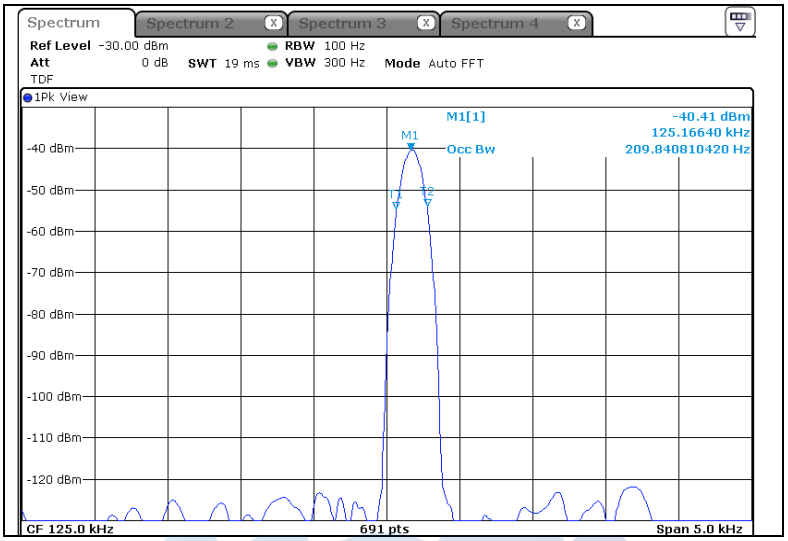
- ANT 1



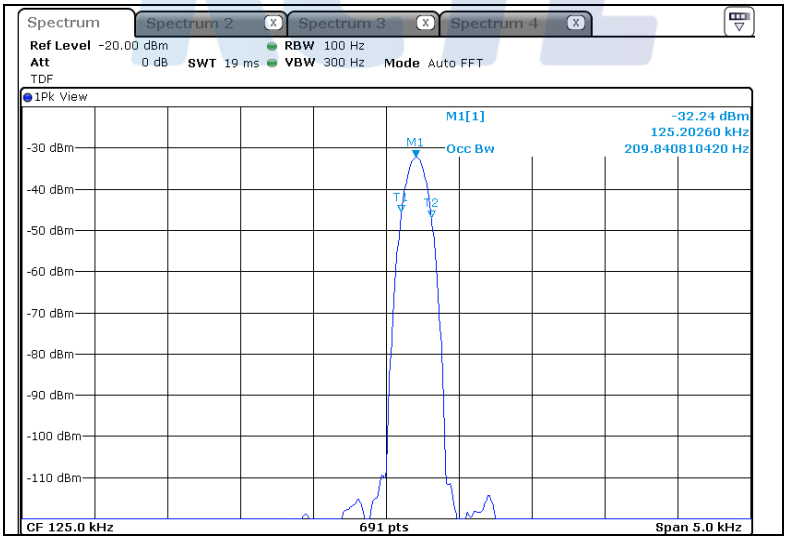
- ANT 2



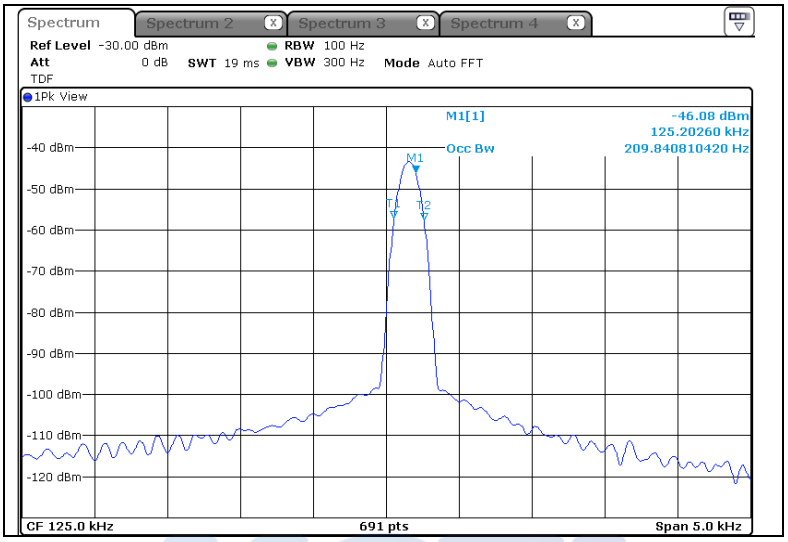
- ANT 3



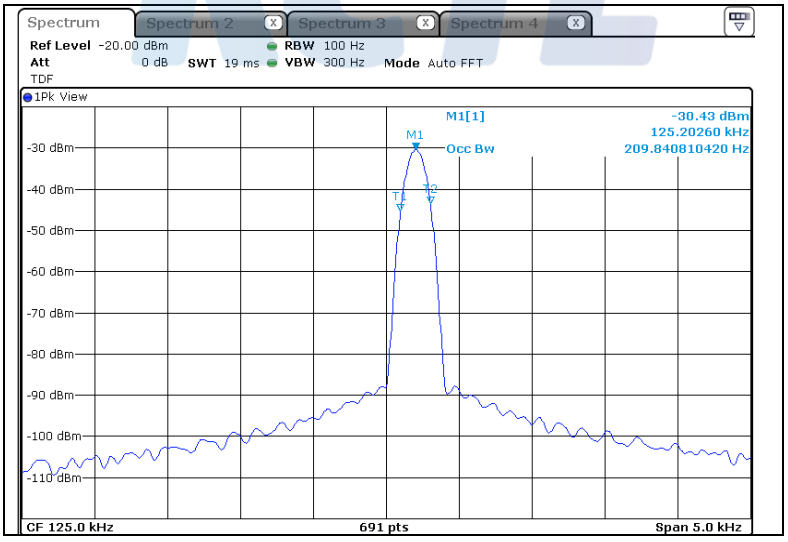
- ANT 4



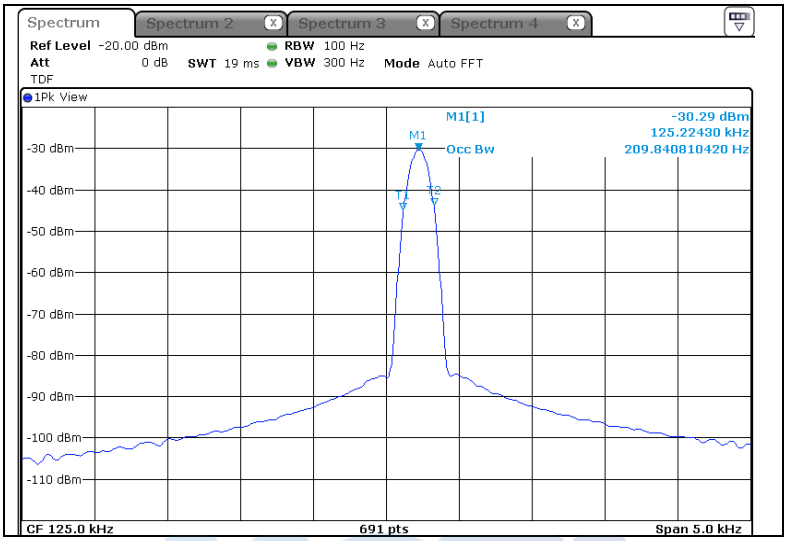
- ANT 5



- ANT 6



- ANT 7


Spectrum
Spectrum 2
Spectrum 3
Spectrum 4
Ref Level -20.00 dBm
RBW 100 Hz
Att 0 dB
SWT 19 ms
VBW 300 Hz
Mode Auto FFT
TDF
1Pk View
M1[1]
-30.29 dBm
125.22430 kHz
209.840810420 Hz
Occ Bw
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
-100 dBm
-110 dBm
CF 125.0 kHz
691 pts
Span 5.0 kHz

6. Test equipment used for test

	Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
■	DC Power Supply	Agilent	E3632A	MY40017108	18.05.15
■	Loop Antenna	R&S	HFH2-Z2	100355	18.03.03
■	Bilog Antenna	SCHWARZBECK	VULB9168	440	19.10.23
■	Attenuator	HP	8491B	22891	18.08.24
■	Amplifier	SONOMA	310N	344922	18.08.25
■	EMI Test Receiver	R&S	ESCI7	100732	18.08.24
■	Spectrum Analyzer	R&S	FSV40	100988	19.01.05
■	Vector Signal Generator	R&S	SMBV100A	257566	19.01.05
■	Signal Generator	R&S	SMR40	100007	18.05.15
■	Cable Assembly	Gigalane	RF-400	-	-
■	Cable Assembly	Radiall	2301762000PJ	1724.66	-
■	MAGNETIC FIELD TESTER	HIOKI	FT3470-52	171129500	18.12.26
■	Laser Probe Interface	AR	FI7000	343711	18.06.09
■	System Interface	AR	SI-300	6206	18.06.09