

TEST REPORT

OF

FCC Part 15 Subpart C §15.209 / IC RSS-210 Issue 8, RSS-Gen Issue 3
FCC ID/IC Certification: SY5SMK27RESA / 8325A-SMK27RESA

Equipment Under Test : Smart Key ECU
Model Name : SMK 2.7 RESA
Serial No. : N/A
Applicant : Continental Automotive Systems Corporation
Manufacturer : Continental Automotive Systems Corporation
Date of Test(s) : 2012. 12. 03 ~ 2012. 12. 07
Date of Issue : 2012. 12. 11

In the configuration tested, the EUT complied with the standards specified above.

Tested By:



Date

2012. 12. 11

Hyunchaeh You

Approved By



Date

2012. 12. 11

Feel Jeong

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SGS Korea Co., Ltd. (Gunpo Laboratory) 8-34, Sanbon-dong, Gunpo-si, Gyeonggi-do, Korea, 435-040

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www.ee.sgs.com/korea

1. General Information

1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

- 400-2, Gomae-Dong, Giheung-Gu, Yongin-Shi, Kyungki-Do, South Korea 446-901
- Wireless Div. 3FL, 18-34, Sanbon-dong, Gunpo-si, Gyeonggi-do, Korea 435-040

All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>.

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1.2. Details of Applicant

Applicant : Continental Automotive Systems Corporation
 Address : 45-29, Saeum-ro, Icheon-si, Gyeonggi-do 467-080 Republic of Korea
 Contact Person : Shin Sun-Moo
 Phone No. : +82 31 465 4572
 Fax No. : +82 31 637 0371

1.3. Description of EUT

Kind of Product	Smart Key ECU
Model Name	SMK 2.7 RESA
Serial Number	N/A
Power Supply	DC 12 V (Vehicle Battery)
Frequency Range	Tx : 125 kHz, Rx : 125 kHz (Only IMMO ANT)
Modulation Technique	ASK
Number of Channels	1
Operating Conditions	-20 °C ~ 60 °C
Antenna Type	Fixed Type (Coil Antenna)

1.4. Declarations by the manufacturer

- Int1 and Int2 Antenna transmit at the same time.
- LF antennas do not have Rx function except for IMMO antenna

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1.5. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal Date	Cal Interval	Cal Due.
Spectrum Analyzer	R&S	FSV30	101004	Jul. 05, 2012	Annual	Jul. 05, 2013
DC Power Supply	Agilent	U8002A	MY50020026	Mar. 29, 2012	Annual	Mar. 29, 2013
Preamplifier	R & S	8447D	1726A01265	Sep. 17, 2012	Annual	Sep. 17, 2013
Loop Antenna	R & S	HFH2-Z2	100118	Aug. 24, 2011	Biennial	Aug. 24, 2013
Test Receiver	R & S	ESU40	100075	Feb. 13, 2012	Annual	Feb. 13, 2013
Trilog Antenna	SCHWARZBECK	VULB9163	9163-390	Apr. 19, 2012	Biennial	Apr. 19, 2014
Antenna Master	INN-CO	MA4000-EP	N/A	N.C.R.	N.C.R.	N.C.R.
Turn Table	INN-CO	DT-3000S	N/A	N.C.R.	N.C.R.	N.C.R.
Anechoic Chamber	SY Corporation	L × W × H (21.5 m × 13.0 m × 9.0 m)	N/A	N.C.R.	N.C.R.	N.C.R.

1.6. Test Report Revision

Revision	Report number	Description
0	F690501/RF-RTL006054	Initial

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1.7. Summary of Test Results

The EUT has been tested according to the following specifications:

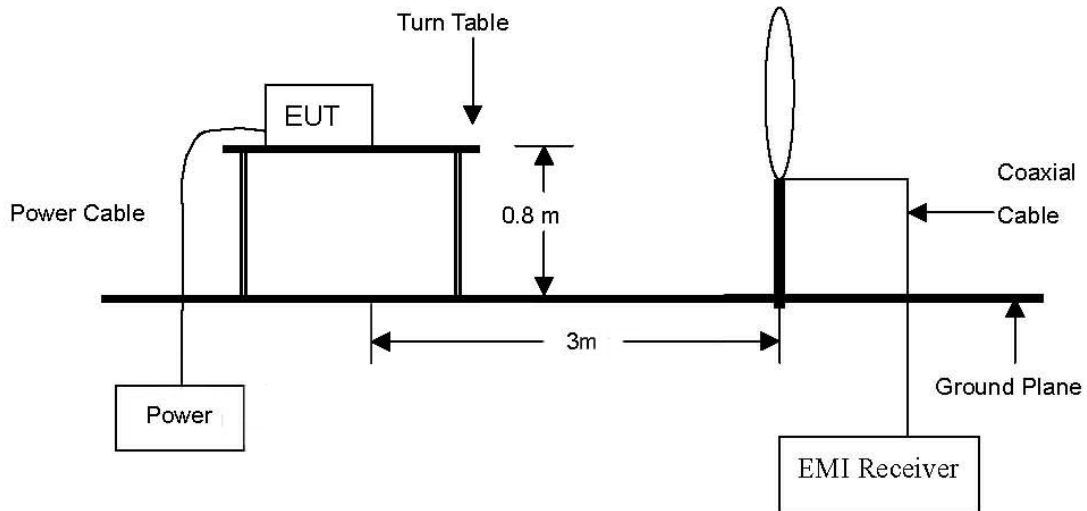
APPLIED STANDARD: FCC Part 15 Subpart C 15.209/ IC RSS-210 Issue8, RSS-Gen Issue3			
Section in FCC 15 Subpart C §15.209	Section in RSS-210, Issue	Test Item	Result
15.209(a)	RSS-210, Issue8 Table 3	Radiated emission, Spurious Emission and Field Strength of Fundamental	Complied
-	RSS-Gen, Issue3, 4.6.1	Occupied Bandwidth	Complied

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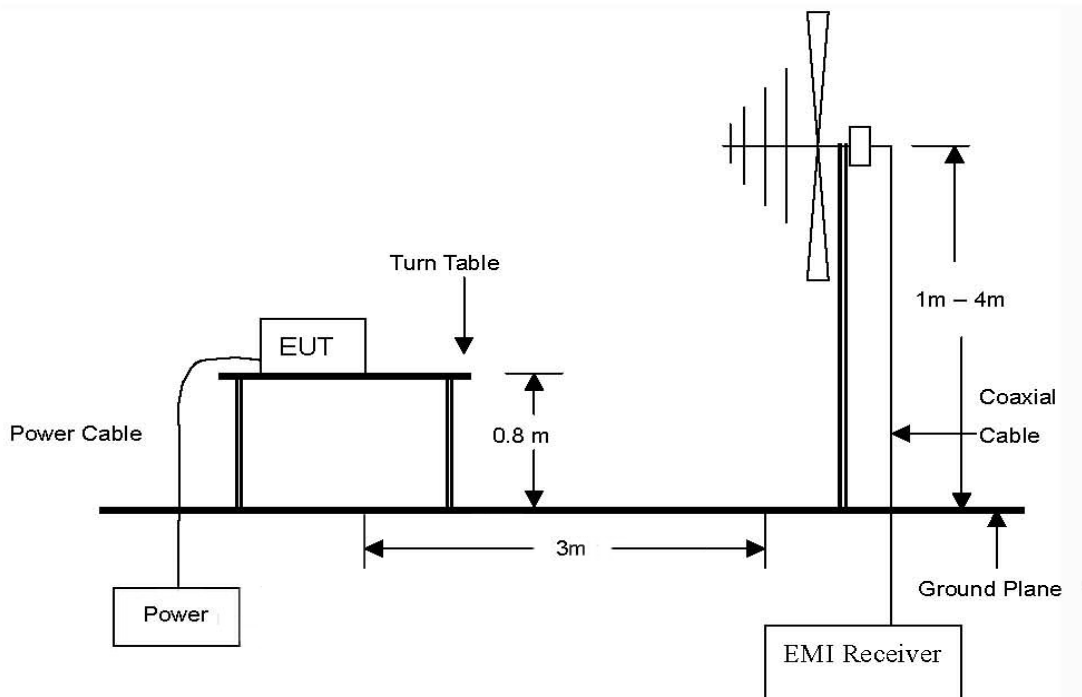
2. Field Strength of Fundamental

2.1. Test Setup

The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz Emissions.



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2.2. Limit

2.2.1. Radiated emission limits, general requirements

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:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meter)
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

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2.3. Test Procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.4:2003

2.3.1. Test Procedures for emission from 9 kHz to 30 MHz

- 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. Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement.
- c. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- d. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

2.3.2. Test Procedures for emission from 30 MHz to 1000 MHz

- 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 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.
- 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.

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2.4. Test Result

Ambient temperature : (23 ± 2) °C
 Relative humidity : 47 % R.H.

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical. The field strength of spurious emission was measured in three orthogonal EUT position (x-axis, y-axis and z-axis). Worst case is x-axis.

- DRV ANT

Radiated Emissions			Ant	Correction Factors		Total		FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 300 m	Limit (dB μ V/m)	Margin (dB)
0.125	63.10	Average	H	18.18	0.01	81.29	1.28	25.67	24.39

- AST ANT

Radiated Emissions			Ant	Correction Factors		Total		FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 300 m	Limit (dB μ V/m)	Margin (dB)
0.125	61.10	Average	H	18.18	0.01	79.29	-0.71	25.67	26.38

- Bumper ANT

Radiated Emissions			Ant	Correction Factors		Total		FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 300 m	Limit (dB μ V/m)	Margin (dB)
0.125	61.50	Average	H	18.18	0.01	79.69	-0.31	25.67	25.98

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- Int1 & Int2 ANT

Radiated Emissions			Ant	Correction Factors		Total		FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 300 m	Limit (dB μ V/m)	Margin (dB)
0.125	69.10	Average	H	18.18	0.01	87.29	7.29	25.67	18.38

- Hatshelf ANT

Radiated Emissions			Ant	Correction Factors		Total		FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 300 m	Limit (dB μ V/m)	Margin (dB)
0.125	63.00	Average	H	18.18	0.01	81.29	1.29	25.67	24.38

- Trunk ANT

Radiated Emissions			Ant	Correction Factors		Total		FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 300 m	Limit (dB μ V/m)	Margin (dB)
0.125	56.80	Average	H	18.18	0.01	74.99	-5.01	25.67	30.68

- IMMO ANT

Radiated Emissions			Ant	Correction Factors		Total		FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 300 m	Limit (dB μ V/m)	Margin (dB)
0.125	56.80	Average	H	18.18	0.01	74.99	-5.01	25.67	30.68

Note:

1. 300 m Result(dB μ V/m) = 3 m Result(dB μ V/m) – 40log(300/3) (dB μ V/m)

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3. Spurious Emission

3.1. Test Setup

Same as section 2.1 of this report

3.2. Limit

Same as section 2.2 of this report

3.3. Test Procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.4:2003

3.3.1. Test Procedures for emission from 9 kHz to 30 MHz

- 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. Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement.
- c. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- d. The test-receiver system was set to quasi-peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

3.3.2. Test Procedures for emission from 30 MHz to 1000 MHz

- 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 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.
- 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.

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3.4. Test Result

Ambient temperature : (24 ± 2) °C
 Relative humidity : 47 % R.H.

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

- DRV ANT

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Freq. (MHz)	Reading (dB uV)	Detect Mode	Pol.	Ant. (dB/m)	Amp+CL (dB)	Actual (dB uV/m) at 3 m	Limit (dB uV/m) at 3 m	Margin (dB)
76.56	28.64	Quasi	V	8.58	-24.12	13.10	40.00	26.90
149.52	29.73	Quasi	V	8.42	-23.25	14.90	43.50	28.60
888.64	27.70	Quasi	V	20.97	-20.97	27.70	46.00	18.30
Above 900	Not detected	-	-			-	-	-

- AST ANT

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Freq. (MHz)	Reading (dB uV)	Detect Mode	Pol.	Ant. (dB/m)	Amp+CL (dB)	Actual (dB uV/m) at 3 m	Limit (dB uV/m) at 3 m	Margin (dB)
150.32	31.51	Quasi	V	8.44	-23.25	16.70	43.50	26.80
887.88	23.20	Quasi	V	20.97	-20.97	23.20	46.00	22.80
Above 900	Not detected	-	-			-	-	-

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- Bumper ANT

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Freq. (MHz)	Reading (dB uV)	Detect Mode	Pol.	Ant. (dB/m)	Amp+CL (dB)	Actual (dB uV/m) at 3 m	Limit (dB uV/m) at 3 m	Margin (dB)
68.04	26.62	Quasi	V	9.44	-24.12	11.80	40.00	28.20
148.36	29.18	Quasi	V	8.39	-23.25	14.30	43.50	29.20
888.64	26.80	Quasi	H	20.97	-20.97	26.80	46.00	19.20
Above 900	Not detected	-	-			-	-	-

- Int1 & Int2 ANT

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Freq. (MHz)	Reading (dB uV)	Detect Mode	Pol.	Ant. (dB/m)	Amp+CL (dB)	Actual (dB uV/m) at 3 m	Limit (dB uV/m) at 3 m	Margin (dB)
46.68	31.03	Quasi	V	13.45	-24.38	20.10	40.00	19.90
153.00	34.51	Quasi	V	8.50	-23.21	19.80	43.50	23.70
886.72	26.33	Quasi	H	20.95	-20.97	26.30	46.00	19.70
Above 900	Not detected	-	-			-	-	-

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- Hatshelf ANT

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Freq. (MHz)	Reading (dB uV)	Detect Mode	Pol.	Ant. (dB/m)	Amp+CL (dB)	Actual (dB uV/m) at 3 m	Limit (dB uV/m) at 3 m	Margin (dB)
85.88	27.55	Quasi	V	10.52	-23.97	14.10	40.00	25.90
150.68	28.09	Quasi	V	8.45	-23.24	13.30	43.50	30.20
888.64	25.30	Quasi	H	20.97	-20.97	25.30	46.00	20.70
Above 900	Not detected	-	-			-	-	-

- Trunk ANT

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Freq. (MHz)	Reading (dB uV)	Detect Mode	Pol.	Ant. (dB/m)	Amp+CL (dB)	Actual (dB uV/m) at 3 m	Limit (dB uV/m) at 3 m	Margin (dB)
48.24	31.23	Quasi	V	13.36	-24.39	20.20	40.00	19.80
130.88	32.53	Quasi	H	9.23	-23.46	18.30	43.50	25.20
887.88	26.50	Quasi	H	20.97	-20.97	26.50	46.00	19.50
Above 900	Not detected	-	-			-	-	-

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- Immo ANT

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Freq. (MHz)	Reading (dB uV)	Detect Mode	Pol.	Ant. (dB/m)	Amp+CL (dB)	Actual (dB uV/m) at 3 m	Limit (dB uV/m) at 3 m	Margin (dB)
46.28	31.41	Quasi	V	13.47	-23.97	20.50	40.0	19.50
136.72	31.94	Quasi	H	8.57	-23.41	17.10	43.5	26.40
888.64	36.10	Quasi	H	20.97	-20.97	36.10	46.0	9.90
Above 900	Not detected	-	-			-	-	-

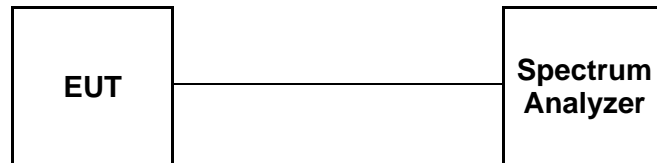
Note:

- 300 m Result(dB μ V/m) = 3 m Result(dB μ V/m) – 40log(300/3) (dB μ V/m)
- 30 m Result(dB μ V/m) = 3 m Result(dB μ V/m) – 40log(30/3) (dB μ V/m)

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4. Occupied Bandwidth

4.1. Test Setup



4.2. Limit

None; for reporting purposed only

4.3. Test 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 $RBW \geq 1\%$ of Span, VBW to 3 times RBW.
3. The bandwidth of fundamental frequency was measured and recorded.

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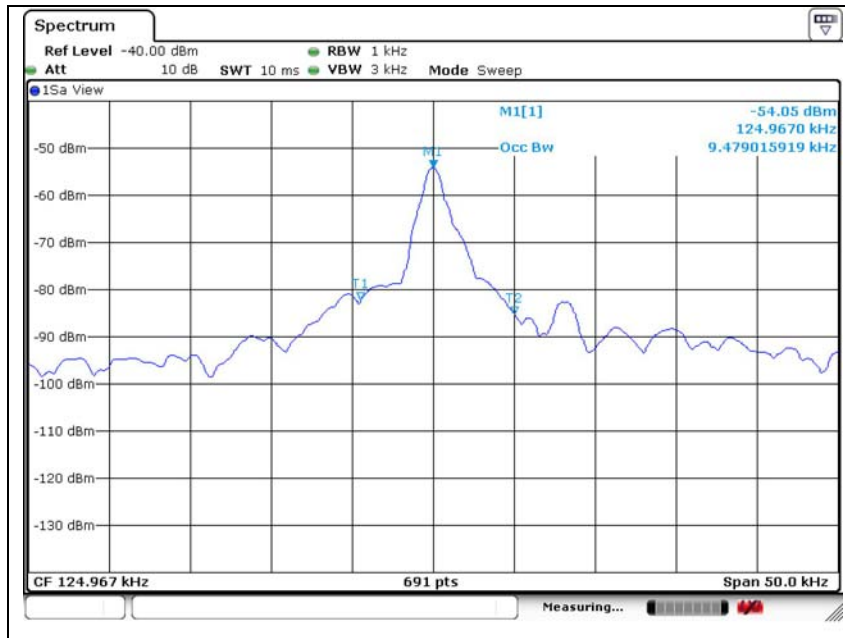
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4.4. Test Result

Ambient temperature : (24 ± 2) °C
 Relative humidity : 47 % R.H.

- DRV ANT

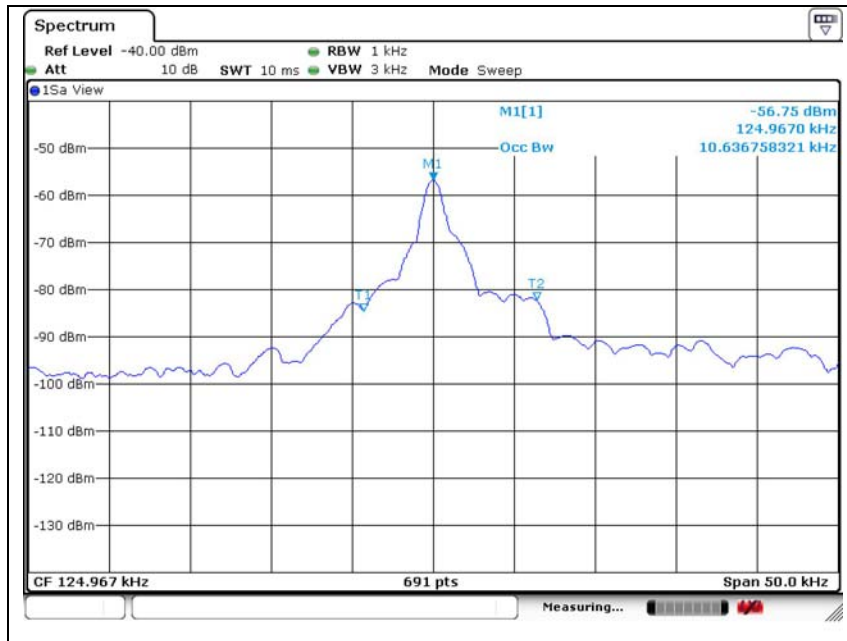
Carrier Frequency (MHz)	Occupied Bandwidth (kHz)	Limit (kHz)	Remark
0.125	9.48	-	99 % Occupied bandwidth



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- AST ANT

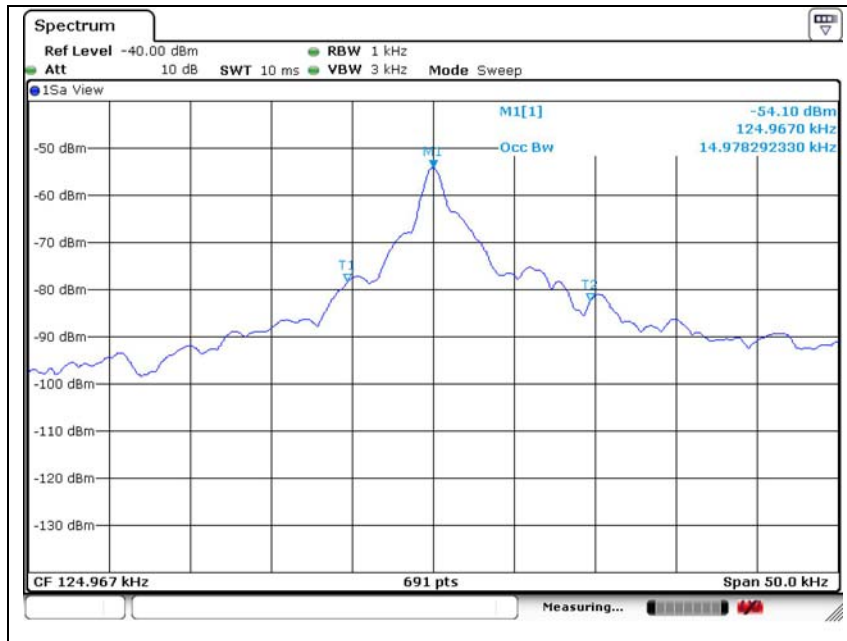
Carrier Frequency (MHz)	Occupied Bandwidth (kHz)	Limit (kHz)	Remark
0.125	10.64	-	99 % Occupied bandwidth



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- Bumper ANT

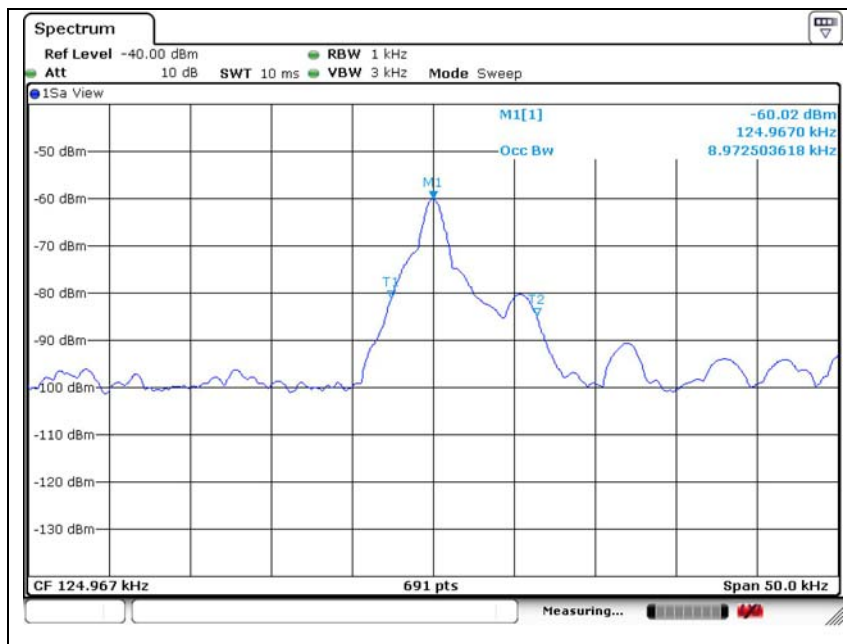
Carrier Frequency (MHz)	Occupied Bandwidth (kHz)	Limit (kHz)	Remark
0.125	14.98	-	99 % Occupied bandwidth



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- Int1 & Int2 ANT

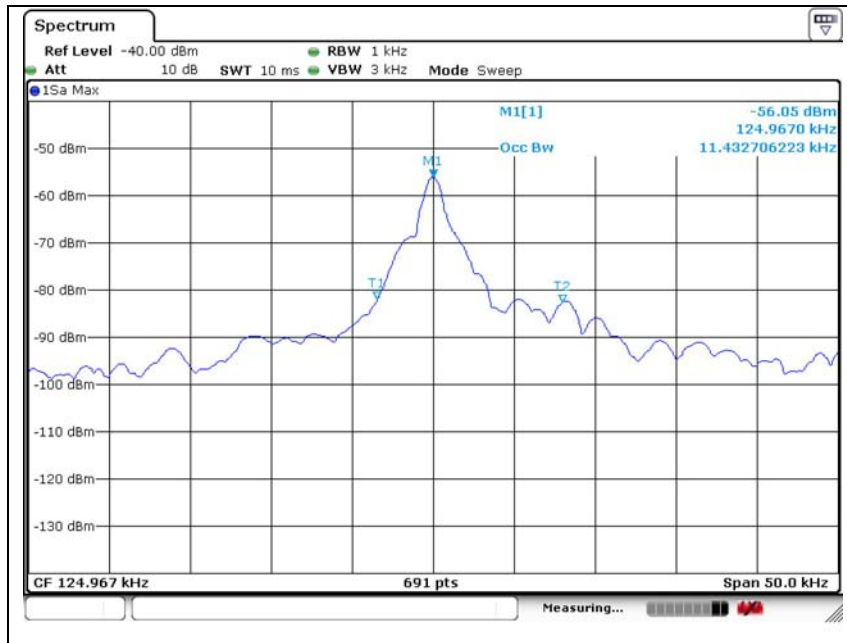
Carrier Frequency (MHz)	Occupied Bandwidth (kHz)	Limit (kHz)	Remark
0.125	8.97	-	99 % Occupied bandwidth



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- Hatshelf ANT

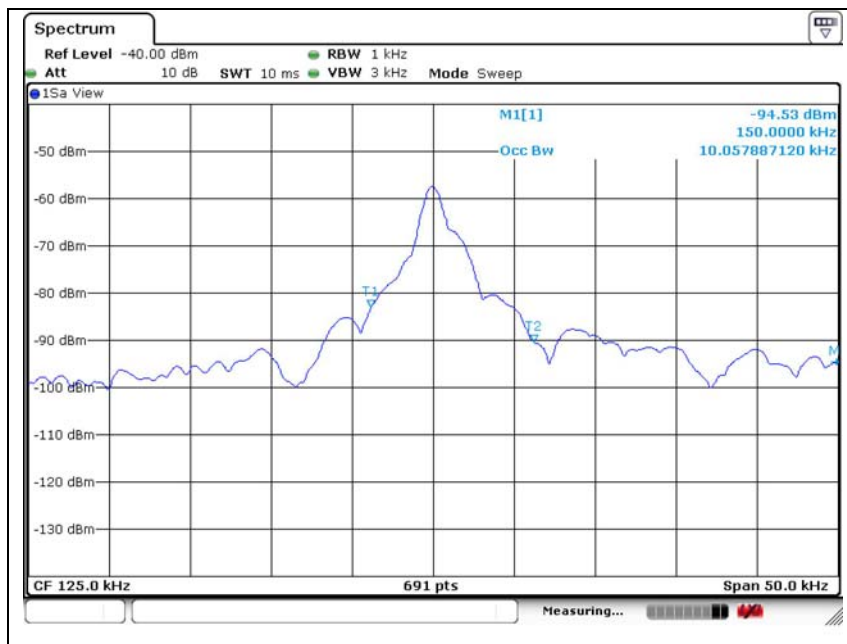
Carrier Frequency (MHz)	Occupied Bandwidth (kHz)	Limit (kHz)	Remark
0.125	11.43	-	99 % Occupied bandwidth



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- Trunk ANT

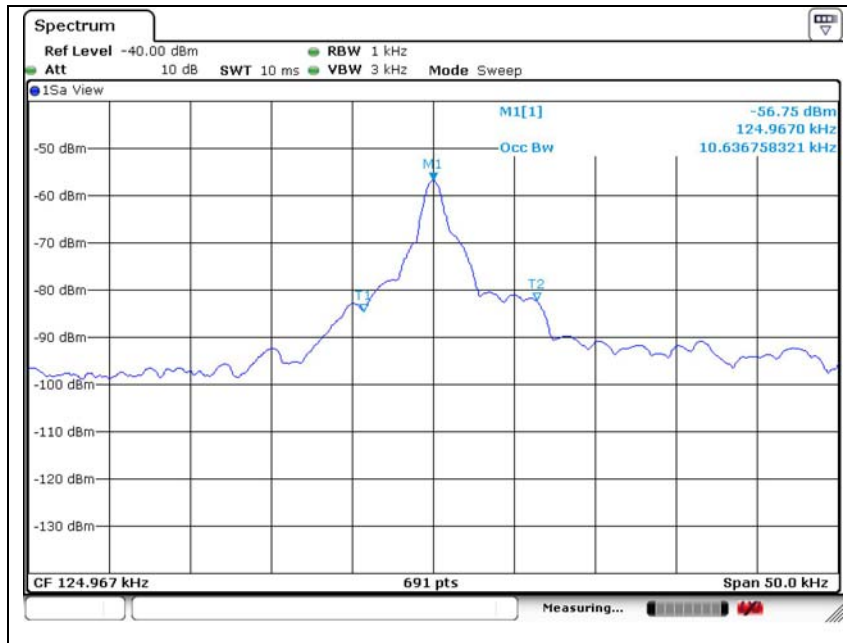
Carrier Frequency (MHz)	Occupied Bandwidth (kHz)	Limit (kHz)	Remark
0.125	10.56	-	99 % Occupied bandwidth



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- Immo ANT

Carrier Frequency (MHz)	Occupied Bandwidth (kHz)	Limit (kHz)	Remark
0.125	10.64	-	99 % Occupied bandwidth



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