SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.

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1 Cover Page

FCC REPORT

Application No.:	SHEM1703001681CR
Applicant:	United Automotive Electronic Systems Co. Ltd.
FCC ID:	2AMR2BCM211216
Equipment Under Test (EUT): **NOTE:** The following sample(s) submitted was/were identified on behalf of the client as	
Product Name:	Body Control Module
Model No.(EUT):	BCM-CLEA 2.0 K
Standards:	FCC PART 15 Subpart C: 2016
Date of Receipt:	2017-03-30
Date of Test:	2017-04-21
Date of Issue:	2017-07-06
Test Result:	**Pass***

*In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Parlam Zhan
E&E Section Manager
SGS-CSTC (Shanghai) Co., Ltd.

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

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Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
00	/	2017-07-06	/	Original

Authorized for issue by:				
Tested By		Leon wu **Leon_wu /Project Engineer**		2017-04-21 **Date**
Checked By		Parlam zhan **Parlam Zhan /Reviewer**		2017-04-21 **Date**

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2 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15, Subpart C Section 15.203	-	PASS
AC Power Line Conducted Emission	47 CFR Part 15, Subpart C Section 15.207	ANSI C63.10(2013) Section 6.2	N/A
Radiated Emissions	47 CFR Part 15, Subpart C Section 15.209	ANSI C63.10(2013) Section 6.4&6.5&6.6&6.10	PASS
20dB Bandwidth	47 CFR Part 15, Subpart C Section 15.215	ANSI C63.10(2013) Section 6.9.2	PASS

N/A: Not applicable, please refer to Section 7.2 of this report for details.

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4 General Information

4.1 Client Information

Applicant:	United Automotive Electronic Systems Co. Ltd.
Address of Applicant:	No.555 Rong Qiao Road, Pudong New Area
Manufacturer:	United Automotive Electronic Systems Co. Ltd.
Address of Manufacturer:	No.555 Rong Qiao Road, Pudong New Area
Factory:	United Automotive Electronic Systems Co. Ltd.
Address of Factory:	No.555 Rong Qiao Road, Pudong New Area

4.2 General Description of E.U.T.

Product Description:	Mobile product with 134.744KHz wireless function
Power Supply:	DC 12V by battery

4.3 Technical Specifications

Operation Frequency:	134.744kHz
Modulation Type:	OOK
Antenna Type:	Loop antenna

4.4 E.U.T Operation Mode

Test Mode	Description of Test Mode
Engineering mode	Keep EUT working in continuous transmitting mode.

4.5 Description of Support Units

The EUT has been tested with support equipments as below.

Description	Manufacturer	Model No.	Supplied By
Laptop	Lenovo	ThinkPad X100e	SGS
Battery	/	/	SGS

4.6 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.

588 West Jindu Road, Xinqiao, Songjiang, 201612 Shanghai, China

Tel: +86 21 6191 5666

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4.7 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAS (No. CNAS L0599)**

  CNAS has accredited SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **FCC – Registration No.: 402683**

  SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered and fully described in a report filed with the Federal Communications Commission (FCC). The acceptance letter from the FCC is maintained in our files. Registration No.: 402683.

- **Industry Canada (IC) – IC Assigned Code: 8617A**

  The 3m Semi-anechoic chamber of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 8617A-1.

- **VCCI (Member No.: 3061)**

  The 3m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-3868 and C-4336 respectively.

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5 Equipments List

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due date
1	Spectrum Analyzer	R&S	FSP-30	2705121009	2017-01-14	2018-01-13
2	Spectrum Analyzer	Agilent	N9020A	MY51240197	2017-07-03	2018-07-02
3	Power meter	R&S	NRP	101641	2017-01-14	2018-01-13
4	Power Sensor	R&S	NRP-Z22	101096	2016-08-06	2017-08-05
5	Signal Generator	R&S	SMR40	100555	2017-07-03	2018-07-02
6	Signal Generator	Agilent	N5182A	MY50143776	2017-07-03	2018-07-02
7	Communication Tester	R&S	CMW500	1201.0002K75	2016-12-24	2017-12-23
8	Switcher	Tonscend	JS0806	JS0806-2	/	/
9	Splitter	Anritsu	MA1612A	M12265	/	/
10	Coupler	e-meca	803-S-1	900-M01	/	/
11	High-low Temperature Cabinet	Suzhou Zhihe	TL-40	50110050	2016-09-11	2017-09-10
12	AC Power Stabilizer	WOCEN	6100	51122	2017-01-14	2018-01-13
13	DC Power Supply	QJE	QJ30003SII	3573/4/3	2017-01-14	2018-01-13
14	EMI Test Receiver	R&S	ESU40	100109	2017-02-13	2018-01-15
15	Active Loop Antenna (9kHz to 30MHz)	R&S	FMZB1519	1519-034	2017-02-13	2018-01-15
16	Broadband Antenna (25MHz to 2GHz)	Schwarzbeck	VULB9168	9168-313	2017-02-13	2018-01-15
17	Broadband Antenna (25MHz to 3GHz)	R&S	HL562	100227	2016-08-30	2017-08-29
18	Horn Antenna (1 -18GHz)	R&S	HF906	100284	2017-02-13	2018-01-15
19	Horn Antenna (1 - 18GHz)	Schwarzbeck	BBHA9120D	9120D-679	2017-02-13	2018-01-15
20	Horn Antenna (14 - 40GHz)	Schwarzbeck	BBHA 9170	BBHA917-0373	2017-02-13	2018-01-15
21	Pre-amplifier (9KHz – 2GHz)	LNA6900	TESEQ	71033	2017-02-13	2018-01-15
22	Pre-amplifier (1 – 26.5GHz)	Schwarzbeck	SCU-F0118-G40-BZ4-CSS(F)	10001	2017-01-14	2018-01-13
23	Pre-amplifier (14 – 40GHz)	Schwarzbeck	SCU-F1840-G35-BZ3-CSS(F)	10001	2017-01-14	2018-01-13
24	Tunable Notch Filter	Wainwright	WRCT800.0/880.0-0.2/40-5SSK	170397 169777 169780 192507	/	/
25	High pass Filter	FSCW	HP 12/2800-5AA2	19A45-02	/	/

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6 Test results and Measurement Data

6.1 Antenna Requirement

15.203 Requirement: 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, 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.

EUT Antenna:

The antenna is loop antenna and no consideration of replacement.

Antenna Configuration:

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6.2 Conducted Emissions

Test Frequency Range: 150kHz to 30MHz

Limit:

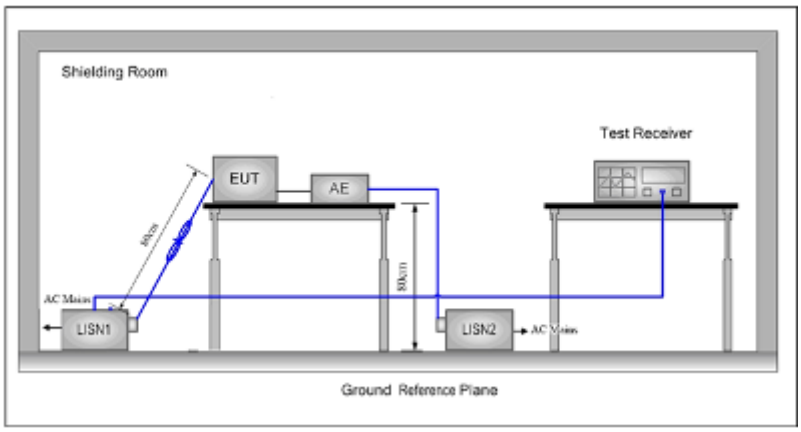
Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Test Procedure:

1) The mains terminal disturbance voltage test was conducted in a shielded room.
2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Test Setup:



Test Results: N/A

This EUT is powered by DC source; therefore the AC Conducted Emission test is not applicable.

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6.3 Radiated Emissions

Test frequency range: 9KHz – 1GHz

Test Site: Measurement Distance: 3m

Receiver Setup:

Frequency (MHz)	RBW	VBW	Detector
0.009-0.015	200Hz	1KHz	Quasi-peak
0.015-30	9kHz	30KHz	Quasi-peak
30-1000	120 kHz	300KHz	Quasi-peak

Note: The emission limits shown in the above table are based on measurement instrumentation employing a CISPR quasi-peak detector. For the frequency bands 9~90 kHz, 110~490 kHz and above 1000 MHz, the radiated emission limits are based on measurements employing an average detector.

Limit:

Frequency (MHz)	Field strength (μV/m)	Measurement distance (m)	Limit @3m (dBμV/m)
0.009-0.490	2400/F(kHz)	300	128.5 ~ 93.8
0.490-1.705	24000/F(kHz)	30	73.8 ~63.0
1.705-30	30	30	69.5
30-88	100	3	40.0
88-216	150	3	43.5
216-960	200	3	46.0
960-1000	500	3	54.0

NOTE:

(1) For test distance other than what is specified, but fulfilling the requirements of section 15.31(f) (2) the field strength is calculated by adding additionally an extrapolation factor of 40dB/decade (inverse linear distance for field strength measurements).

So the Distance Extrapolation Factor in dB is 40*log (D_{TEST} / D_{SPEC}) where D_{TEST} = Test Distance and D_{SPEC} = Specified Distance.

Field strength limit (dBμV/m)@test distance= Field strength limit (dBμV/m)@specified distance -Distance Extrapolation Factor

(2) The lower limit shall apply at the transition frequencies.

Test Procedure:

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

b. The EUT was set fixed away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

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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 10dB 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 10dB 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. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.

Test Setup:

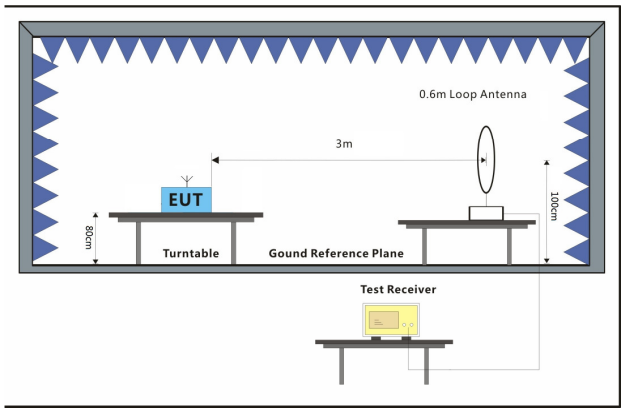

Figure 1. Below 30MHz

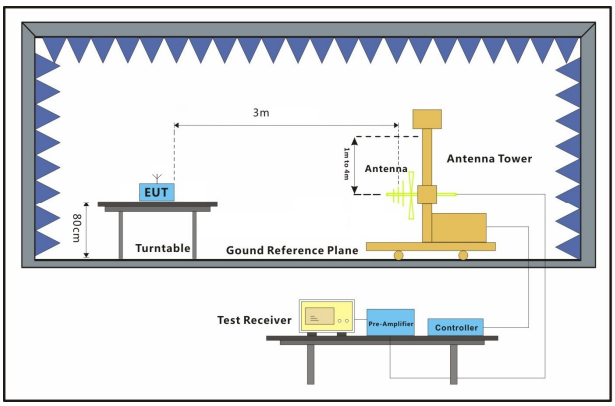

Figure 2. 30MHz to 1GHz

Test Results: Pass

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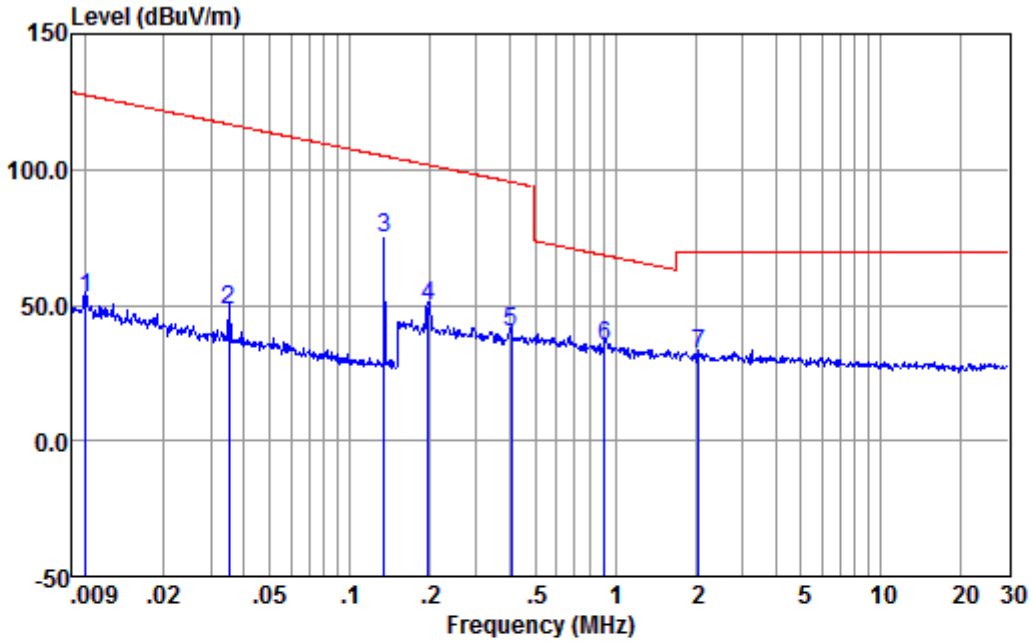
Test Data:

9kHz-30MHz:



Condition : HORIZONTAL
EUT/Project: 1681CR
Test Mode : a

	Freq	ReadAntenna Level	Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	
1	0.01	32.10	20.70	0.10	52.90	127.44	-74.54	QP
2	0.04	27.97	20.19	0.10	48.26	116.67	-68.41	QP
3 q	0.13	54.44	19.95	0.10	74.49	105.01	-30.52	QP
4	0.20	29.31	19.89	0.10	49.30	101.67	-52.37	QP
5	0.40	20.31	19.80	0.10	40.21	95.47	-55.26	QP
6	0.91	15.57	19.37	0.10	35.04	68.44	-33.40	QP
7	2.06	12.22	19.41	0.11	31.74	69.50	-37.76	QP

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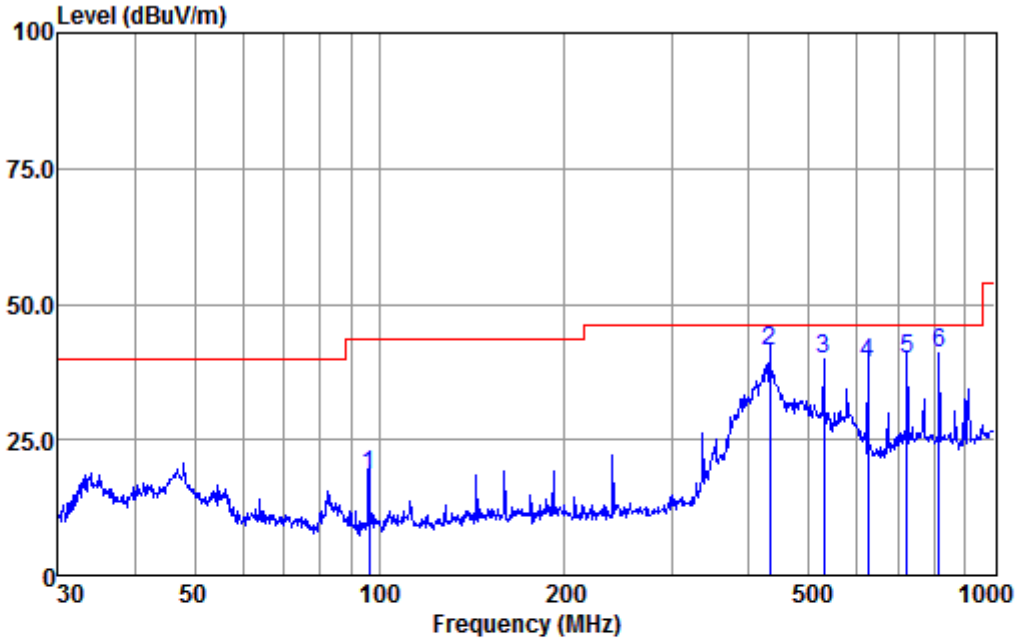
30MHz-1GHz:

Vertical



Condition : VERTICAL
EUT/Project: 1681CR
Test Mode : a

	Freq	ReadLevel	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	96.10	36.91	9.06	1.10	28.60	18.47	43.50	-25.03	QP
2 q	432.55	51.59	16.11	2.53	28.92	41.31	46.00	-4.69	QP
3	528.25	47.81	18.40	2.84	29.22	39.83	46.00	-6.17	QP
4	625.08	45.13	20.15	3.13	29.26	39.15	46.00	-6.85	QP
5	721.73	44.67	21.20	3.42	29.30	39.99	46.00	-6.01	QP
6	815.97	42.69	23.66	3.67	29.08	40.94	46.00	-5.06	QP

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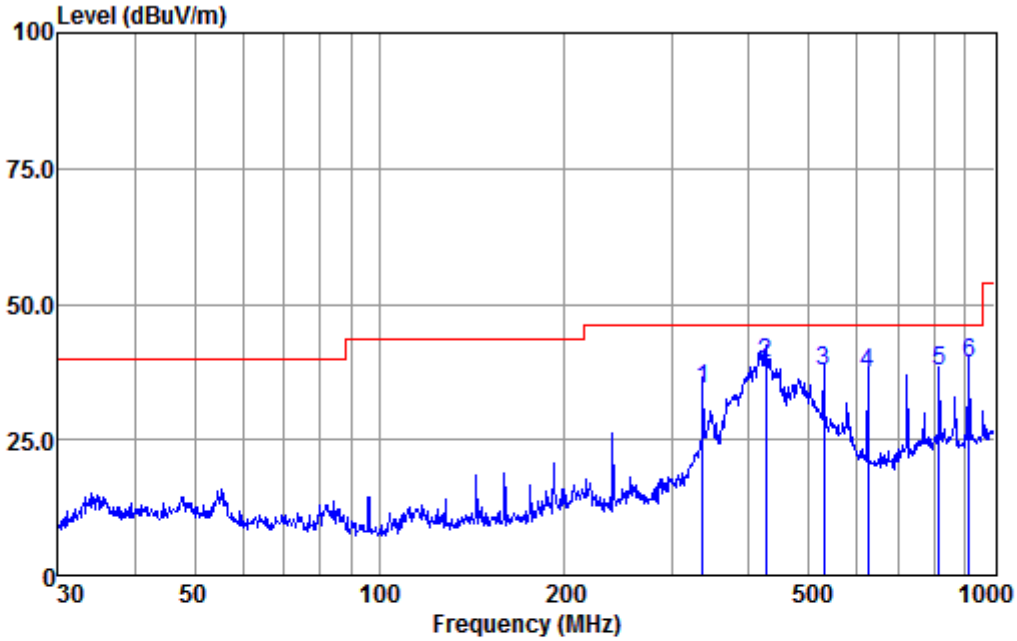
Horizontal



Condition : HORIZONTAL
EUT/Project: 1681CR
Test Mode : a

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	336.04	47.56	12.81	2.18	28.16	34.39	46.00	-11.61	QP
2 q	425.03	49.77	15.86	2.52	28.87	39.28	46.00	-6.72	QP
3	528.25	45.64	18.40	2.84	29.22	37.66	46.00	-8.34	QP
4	625.08	43.30	20.15	3.13	29.26	37.32	46.00	-8.68	QP
5	815.97	39.27	23.66	3.67	29.08	37.52	46.00	-8.48	QP
6	912.86	40.85	23.22	3.90	28.92	39.05	46.00	-6.95	QP

Remark: The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

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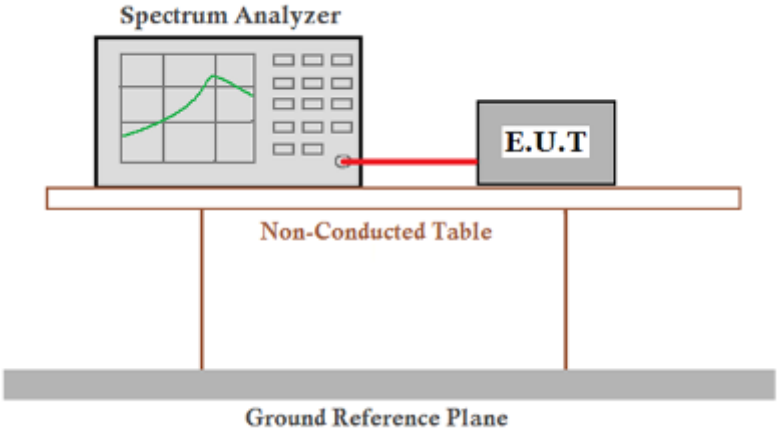
6.4 Occupied Bandwidth

Test Setup:



Requirements: Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §15.217 through §15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the 20 dB bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Test Result: Pass

Measurement Data:

20dB bandwidth (kHz)	Result
0.38	Pass

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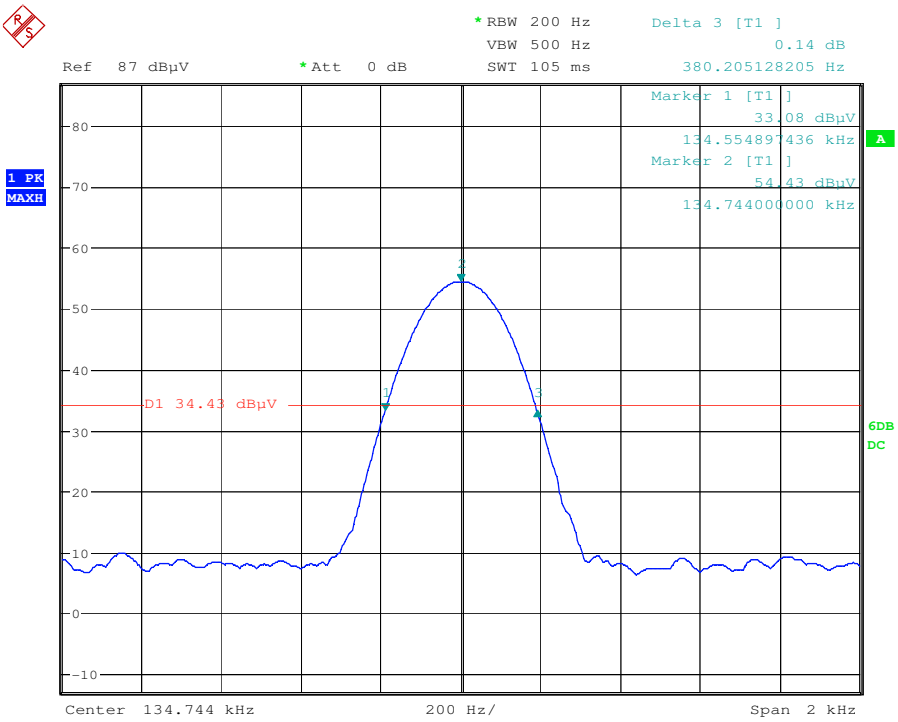
Test plot as follows:



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7 Test Setup Photographs

Refer to the < Test Setup Photos-FCC >

8 EUT Constructional Details

Refer to the < External Photos > & < Internal Photos >.

--End of the Report--

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