

**FCC 47 CFR PART 15 SUBPART C AND ANSI C63.10:2013
TEST REPORT**

For

Transceiver Module

Model : RKE213E1

Trade Name : Kathrein

Issued for

Kathrein Automotive GmbH & Co KG

Römerring 1, 31137 Hildesheim ,Germany

Issued by

**Compliance Certification Services Inc.
Hsinchu Lab.**

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Issued Date: December 11, 2015



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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	12/11/2015	Initial Issue	All Page 38	Michelle Chiu

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1. TEST REPORT CERTIFICATION

Applicant : Kathrein Automotive GmbH & Co KG
Address : Römerring 1, 31137 Hildesheim ,Germany
Equipment Under Test : Transceiver Module
Model : RKE213E1
Trade Name : Kathrein
Tested Date : July 20 ~ August 28, 2015

APPLICABLE STANDARD	
Standard	Test Result
FCC Part 15 Subpart C AND ANSI C63.10:2013	PASS

WE HEREBY CERTIFY THAT: The above equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved by:



Sb. Lu
Sr. Engineer

Reviewed by:



Gundam Lin
Sr. Engineer

2. EUT DESCRIPTION

Product Name	Transceiver Module
Model Number	RKE213E1
Identify Number	T151209L01
Received Date	July 20, 2015
Frequency Range	433.47 MHz ~ 434.37 MHz
Transmit Power	99.21 dBuV/m
Channel Number	3 Channels
Type of Modulation	2FSK
Antenna Type	Screen Antenna, Antenna Gain : -6 dBi
Power Rating	12Vdc (From Battery)
Test Voltage	12Vdc
I/O Port	Power Port × 1, Single Port × 2

Remark :

1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.
2. For more details, please refer to the User's manual of the EUT.
3. This submittal(s) (test report) is intended for FCC ID: 2ACC7RKE213E1 filing to comply with Section 15.207, 15.209 and 15.231 of the FCC Part 15, Subpart C Rules.

3. DESCRIPTION OF TEST MODES

Radiated Emission (Below 1 GHz) Test:

1. The following test modes were scanned during the preliminary test:

No.	Pre-Test Mode
1	TX Mode

2. After the preliminary scan, the following test mode was found to produce the highest emission level.

Final Test Mode		
Emission	Radiated Emission	TX Mode
	Conducted Emission	N/A

Remark : Then, the above highest emission mode of the configuration of the EUT and cable was chosen for all final test items.

Radiated Emission Test (Above 1 GHz) and Antenna Port Conducted Measurement :

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

TX Mode :

Channel	Frequency (MHz)
CH Low	433.47
CH Middle	433.92
CH High	434.37

Remark : The field strength of spurious emission was measured in the following position: EUT upright position(Z axis), lie-down position(X, Z axis). The worst emission was found in upright position(Z axis) and the worst case was recorded.

4. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10:2013 and FCC CFR 47, 15.207, 15.209 and 15.231.

5. FACILITIES AND ACCREDITATION

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

No.989-1, Wenshan Rd., Shangshan Village,
Qionglin Township, Hsinchu County 30741, Taiwan (R.O.C.)

The sites are constructed in conformance with the requirements of ANSI C63.10:2013 and CISPR 22. All receiving equipment conforms to CISPR 16-1-1, CISPR 16-1-2, CISPR 16-1-3, CISPR 16-1-4, CISPR 16-1-5.

5.2 ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

Taiwan	TAF
---------------	-----

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada	INDUSTRY CANADA
Japan	VCCI
Taiwan	BSMI
USA	FCC MRA

Copies of granted accreditation certificates are available for downloading from our web site, <http://www.ccsrf.com>

Remark: FCC Designation Number TW1027.

5.3 MEASUREMENT UNCERTAINTY

The following table is for the measurement uncertainty, which is calculated as per the document CISPR 16-4-2.

PARAMETER	UNCERTAINTY
Semi Anechoic Chamber (966 Chamber_A) / Radiated Emission, 30 to 1000 MHz	+/- 3.59
Semi Anechoic Chamber (966 Chamber_A) / Radiated Emission, 1 to 18GHz	+/- 3.59
Semi Anechoic Chamber (966 Chamber_A) / Radiated Emission, 18 to 26 GHz	+/- 3.59
Semi Anechoic Chamber (966 Chamber_A) / Radiated Emission, 26 to 40 GHz	+/- 3.82
Conducted Emission (Mains Terminals), 9kHz to 30MHz	+/- 2.48

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Consistent with industry standard (e.g. CISPR 22, clause 11, Measurement Uncertainty) determining compliance with the limits shall be based on the results of the compliance measurement. Consequently the measured emissions being less than the maximum allowed emission result in this being a compliant test or passing test.

The acceptable measurement uncertainty value without requiring revision of the compliance statement is based on conducted and radiated emissions being less than U_{CISPR} which is 3.6dB and 5.2dB respectively. CCS values (called U_{Lab} in CISPR 16-4-2) is less than U_{CISPR} as shown in the table above. Therefore, MU need not be considered for compliance.

6. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

No.	Product	Manufacturer	Model No.	Serial No.
1	Test Box	---	---	---

No.	Signal Cable Description
1	Non-shielded cable, 1.1m × 1 (Detachable)

SETUP DIAGRAM FOR TESTS

EUT & peripherals setup diagram is shown in appendix setup photos.

EUT OPERATING CONDITION

1. EUT & peripherals setup diagram is shown in appendix setup photos.
2. Turn on the power of all equipments.
3. TX Mode: Frequency: 433.47MHz, 433.92MHz, 434.37MHz.
4. All of the functions are under run.
5. Start test.

7. FCC PART 15.231 REQUIREMENTS

7.1 20dB BANDWIDTH

LIMITS

§15.231(c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

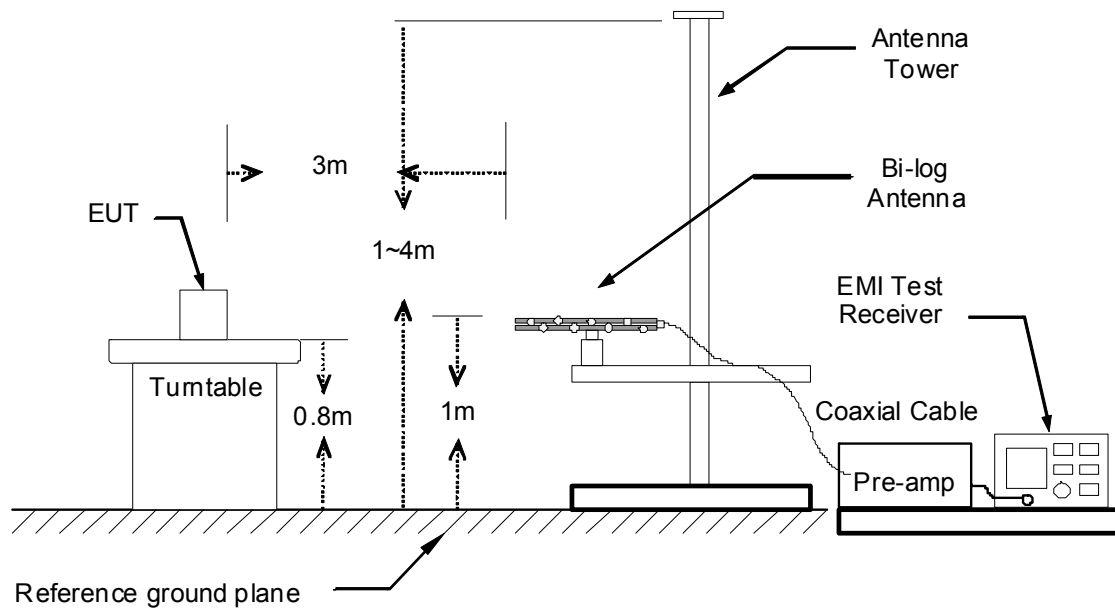
TEST EQUIPMENT

966Chamber_A

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY43360132	06/04/2016
EMI Test Receiver	Rohde & Schwarz	ESCI	100221	04/22/2016
Bi-log Antenna	TESEQ	CBL 6112D	35409	08/02/2016
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-778	08/09/2016
Horn Antenna	COM-POWER	AH-840	03077	12/17/2015
Pre-Amplifier	Agilent	8449B	3008A01471	07/14/2016
Pre-Amplifier	HP	8447F	2944A03748	07/14/2016
LOOP Antenna	COM-POWER	AL-130	121060	05/24/2016

Remark: Each piece of equipment is scheduled for calibration once a year.

TEST SETUP

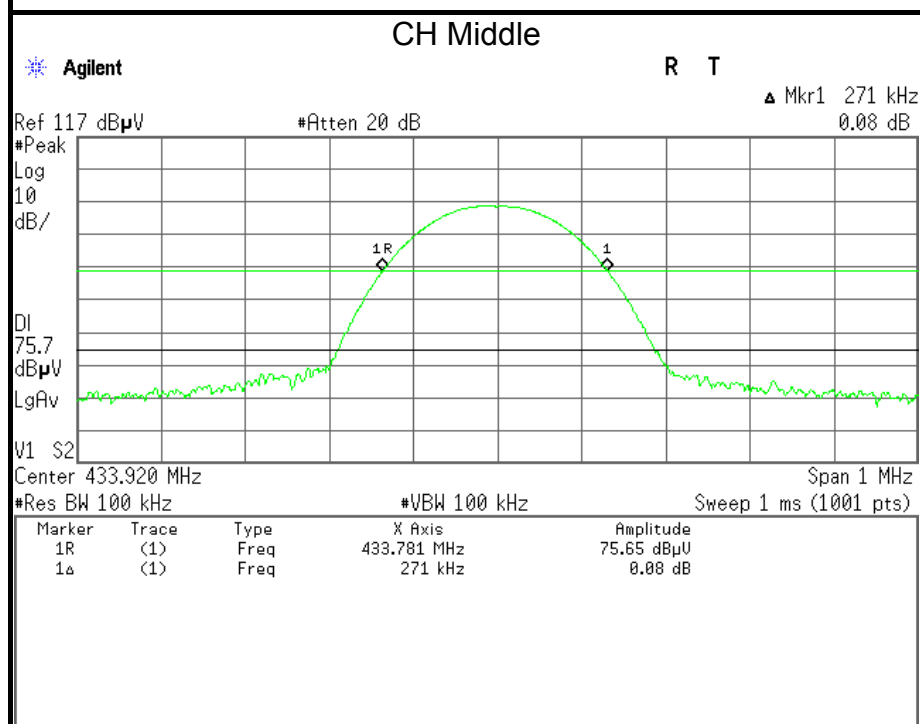
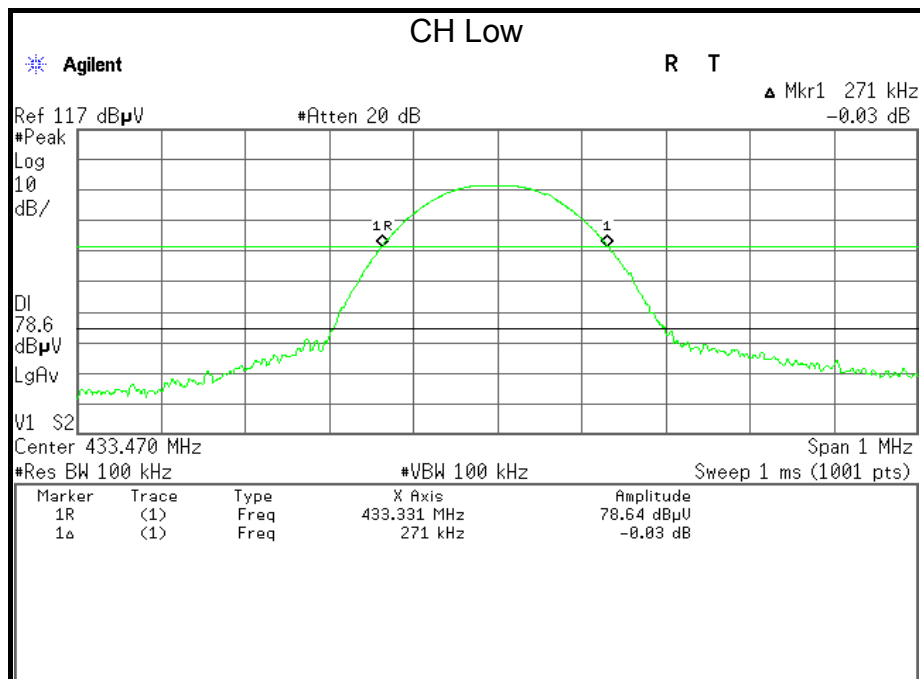


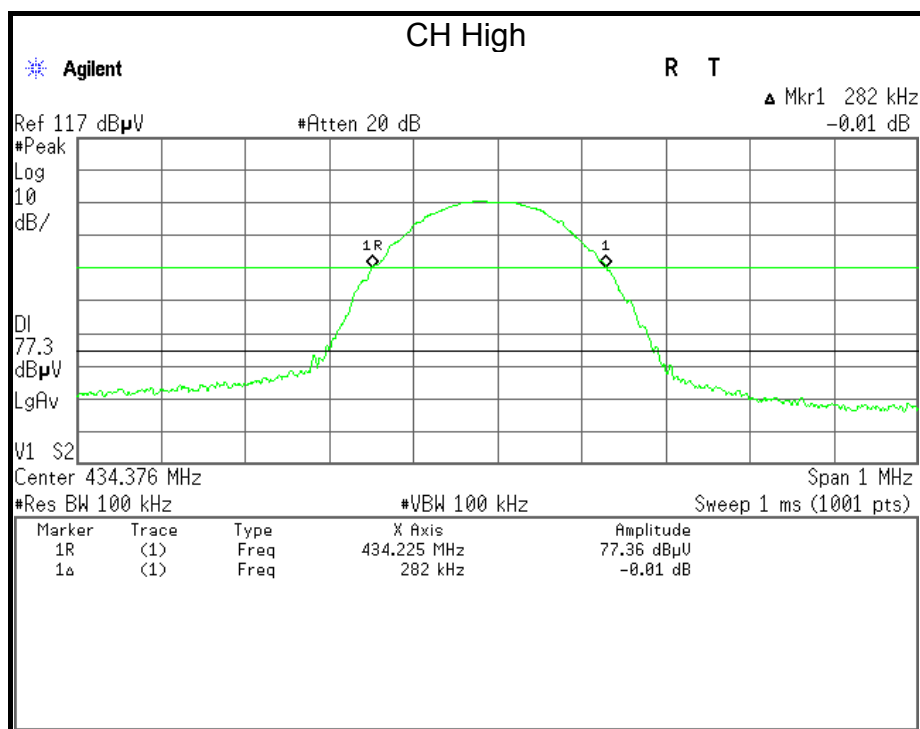
TEST PROCEDURE

The analyzer center frequency was set to the EUT carrier frequency, using the analyzer. Display Line and Marker Delta functions, the 20dB band width of the emission was determined.

TEST RESULTS

Frequency (MHz)	20dB Bandwidth (kHz)	Minimum Limit (kHz)	Result
433.47	271	1083.7	PASS
433.92	271	1084.8	PASS
434.37	282	1085.9	PASS





7.2 LIMIT OF TRANSMISSION TIME

LIMITS

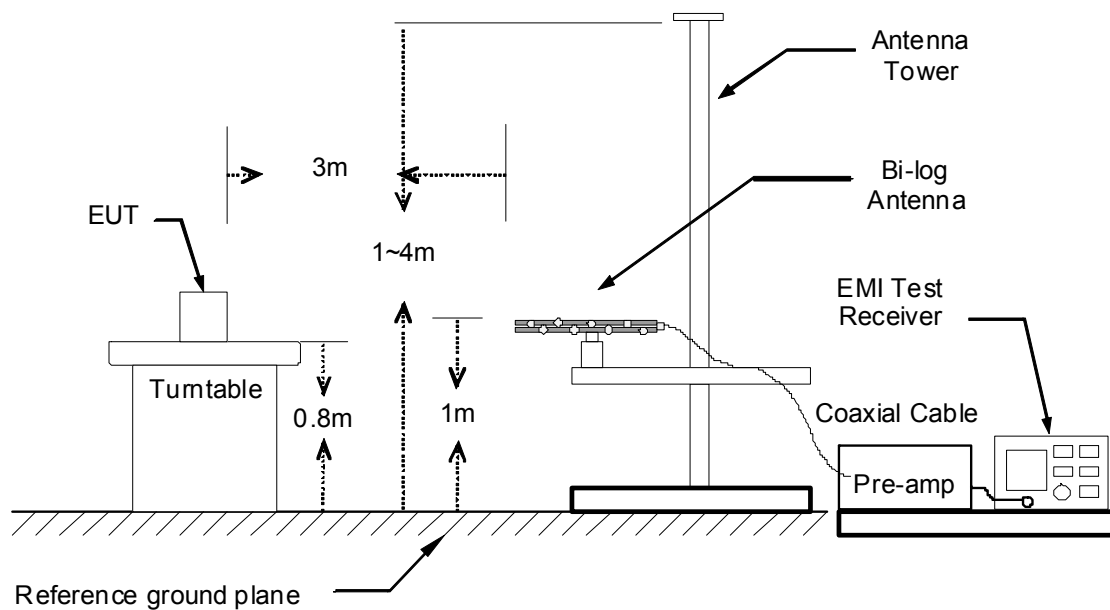
According to § 15.231(a)(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

TEST EQUIPMENT

966Chamber_A

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY43360132	06/04/2016
EMI Test Receiver	Rohde & Schwarz	ESCI	100221	04/22/2016
Bi-log Antenna	TESEQ	CBL 6112D	35409	08/02/2016
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-778	08/09/2016
Horn Antenna	COM-POWER	AH-840	03077	12/17/2015
Pre-Amplifier	Agilent	8449B	3008A01471	07/14/2016
Pre-Amplifier	HP	8447F	2944A03748	07/14/2016
LOOP Antenna	COM-POWER	AL-130	121060	05/24/2016

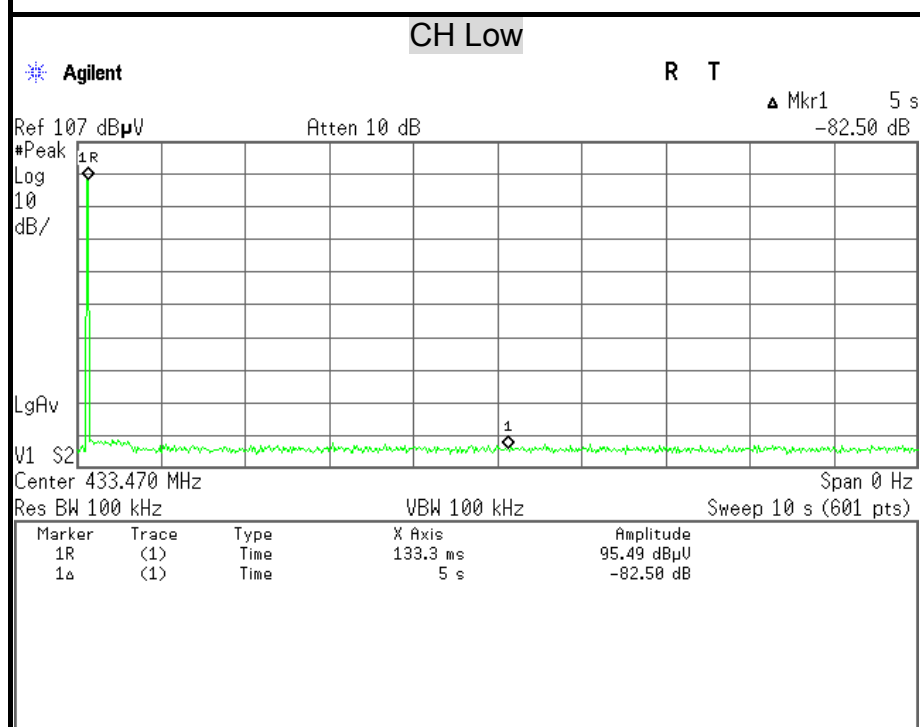
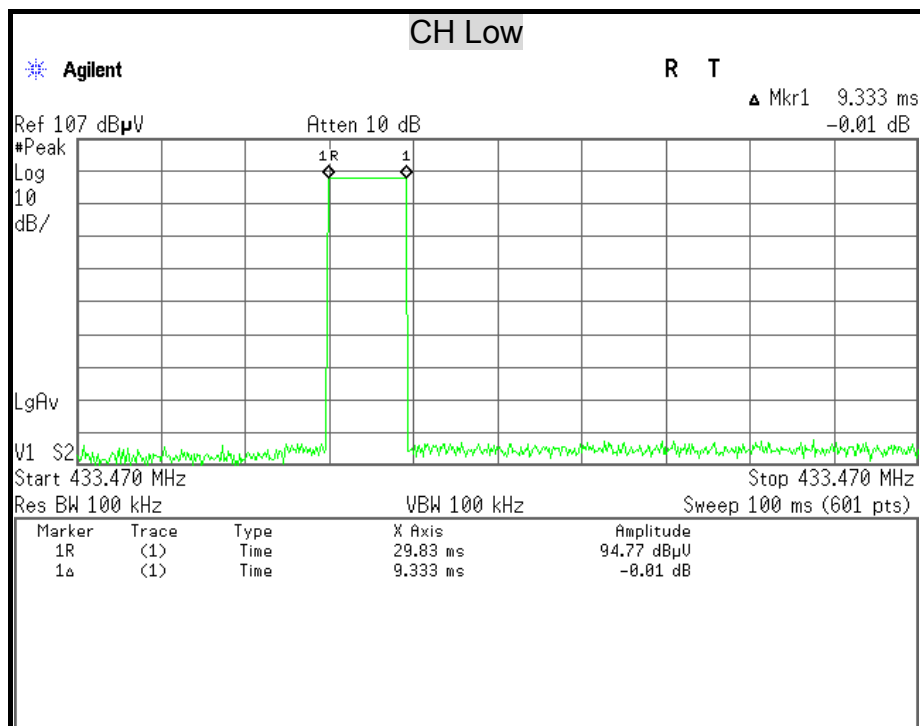
Remark: Each piece of equipment is scheduled for calibration once a year.

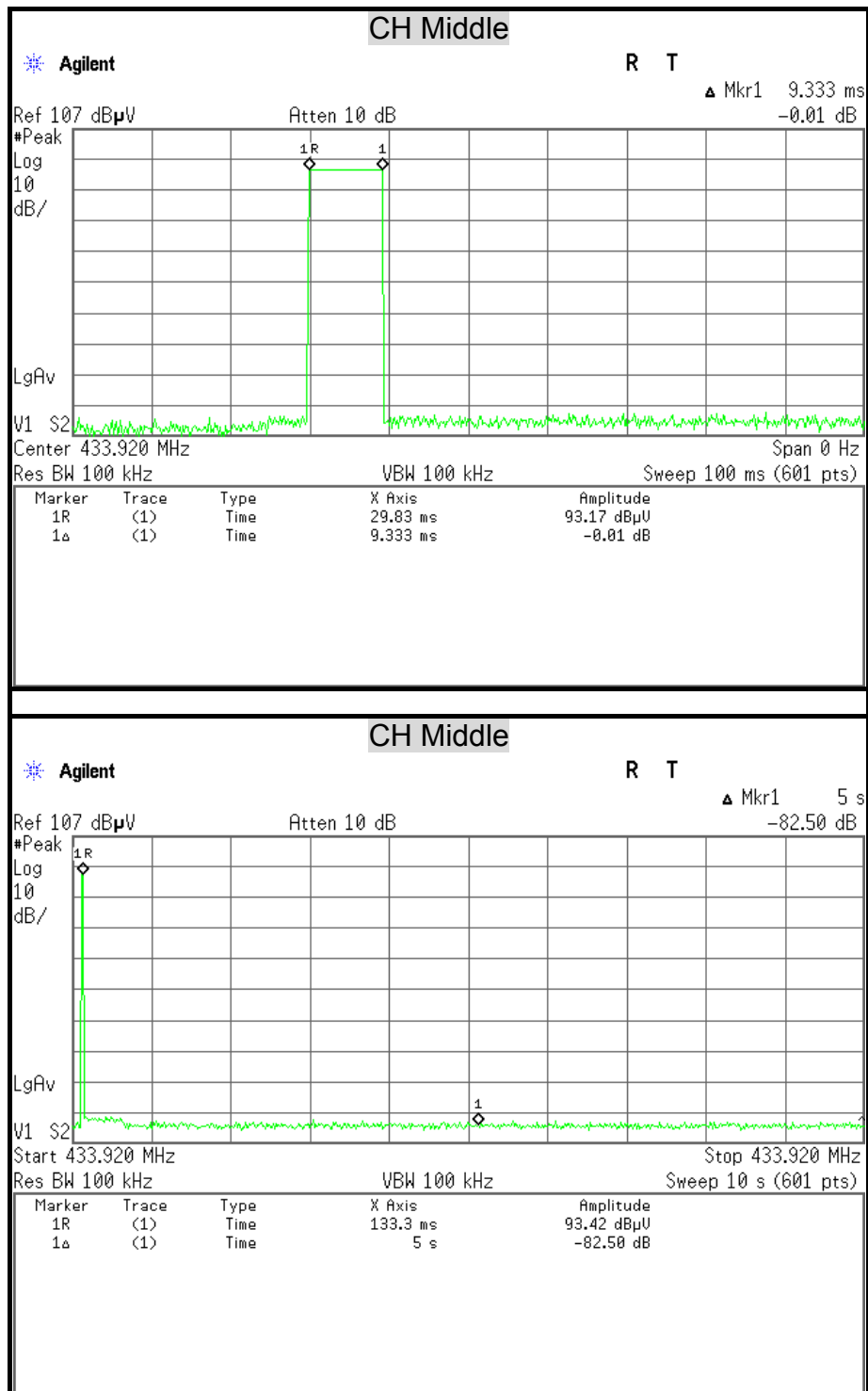
TEST SETUP**TEST PROCEDURE**

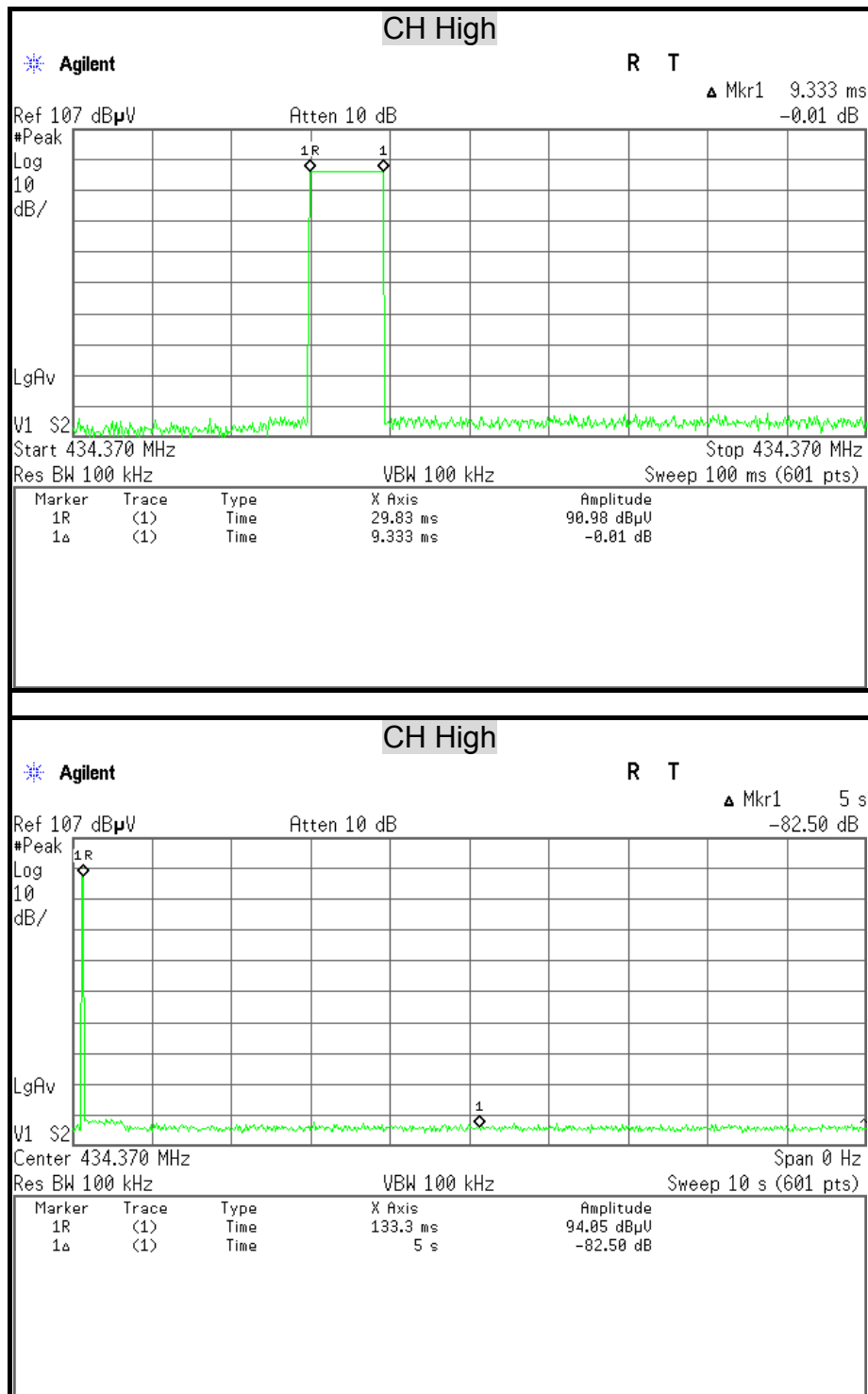
The analyzer center frequency is set to the transmitter frequency. The RBW and VBW are set to 100kHz.

TEST RESULTS

Frequency (MHz)	Transmission Time (Second)	Limit (Second)	Pass / Fail
433.47	0.0093	5.00	PASS
433.92	0.0093	5.00	PASS
434.37	0.0093	5.00	PASS







7.3 DUTY CYCLE CORRECTION FACTOR

LIMITS

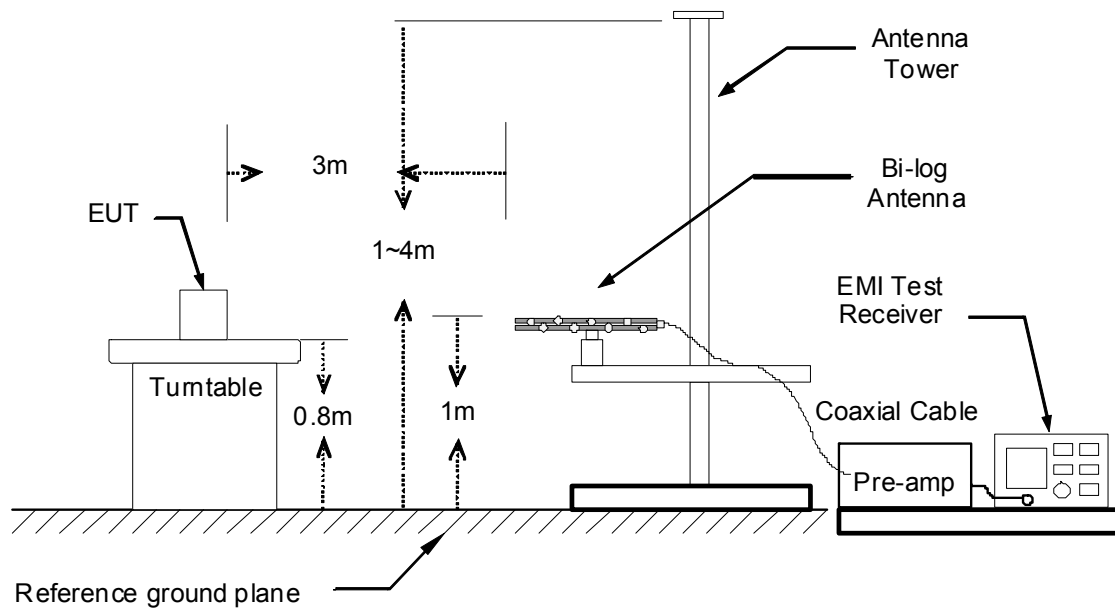
Nil (No dedicated limit specified in the Rules).

TEST EQUIPMENT

966Chamber_A

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY43360132	06/04/2016
EMI Test Receiver	Rohde & Schwarz	ESCI	100221	04/22/2016
Bi-log Antenna	TESEQ	CBL 6112D	35409	08/02/2016
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-778	08/09/2016
Horn Antenna	COM-POWER	AH-840	03077	12/17/2015
Pre-Amplifier	Agilent	8449B	3008A01471	07/14/2016
Pre-Amplifier	HP	8447F	2944A03748	07/14/2016
LOOP Antenna	COM-POWER	AL-130	121060	05/24/2016

Remark: Each piece of equipment is scheduled for calibration once a year.

TEST SETUP**TEST PROCEDURE**

1. Place the EUT on the table and set it in transmitting mode.
2. Set center frequency of spectrum analyzer = operating frequency.
3. Set the spectrum analyzer as RBW, VBW=100KHz, Span = 0Hz.
4. Repeat above procedures until all frequency measured were complete.

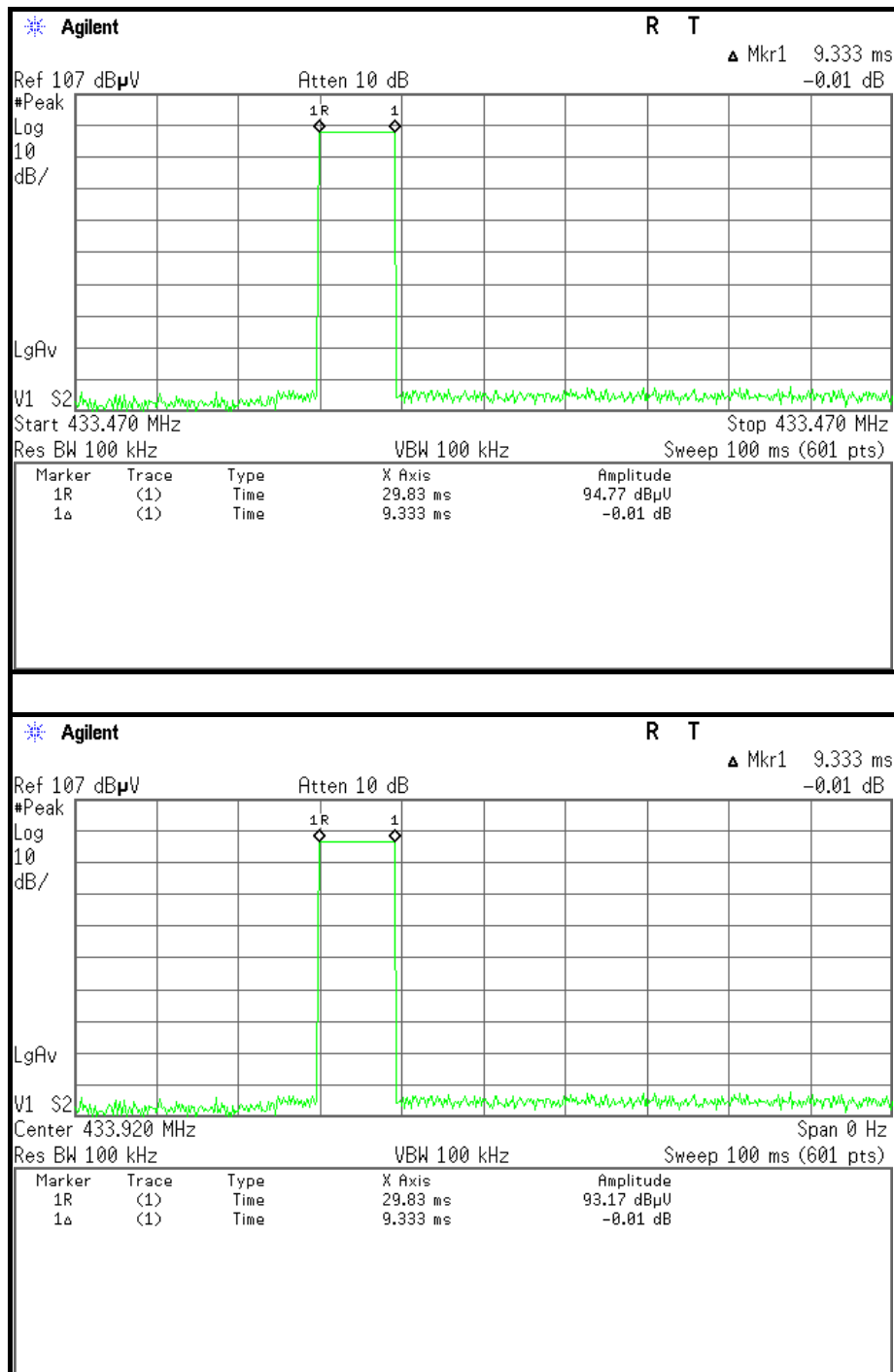
TEST RESULTS

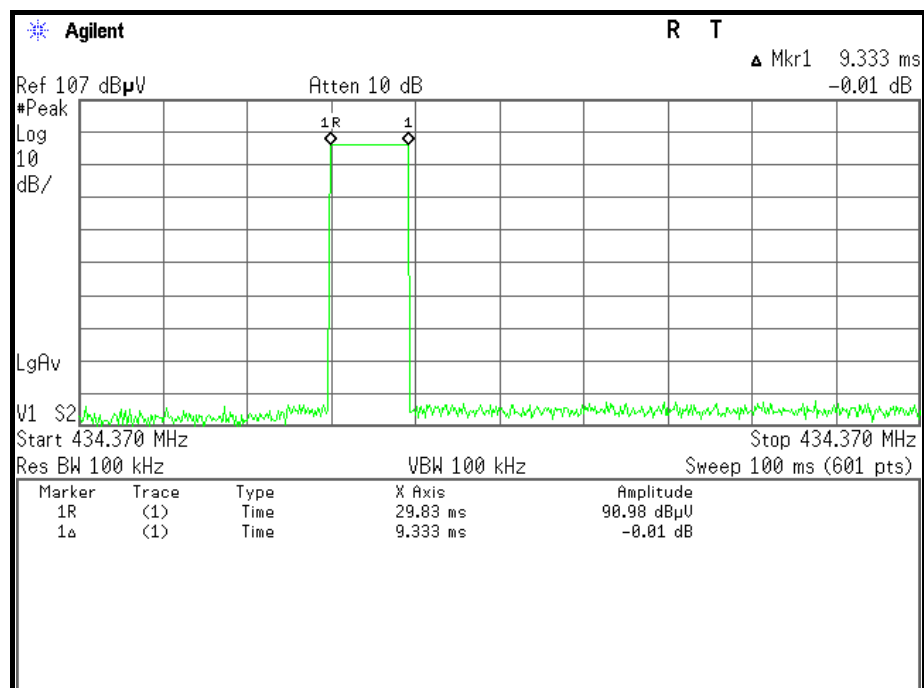
$T_p = 100 \text{ (ms)}$

$T_{on} = 9.333 \text{ (ms)}$

Duty Cycle Correction Factor = $20 \times \log(T_{on} / T_p) = 20 \times \log(9.333 / 100) = -20.6 \text{ dB}$

Because -20.6 less than -20, so the Duty Cycle Correction Factor = -20





7.4 RADIATED EMISSION

LIMITS

(1) According to § 15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3338	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

Remark:

1. ¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
2. ² Above 38.6

(2) According to § 15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

- (3) 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 (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 – 40.70	2250	225
70 – 130	1250	125
130 – 174	1250 to 3750 **	125 to 375 **
174 – 260	3750	375
260 – 470	3750 to 12500 **	375 to 1250 **
Above 470	12500	1250

Remark: ** linear interpolations

- (4) 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 :

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

Remark: **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.

- (5) According to § 15.209 (b) In the emission table above, the tighter limit applies at the band edges.

TEST EQUIPMENT**966Chamber_A**

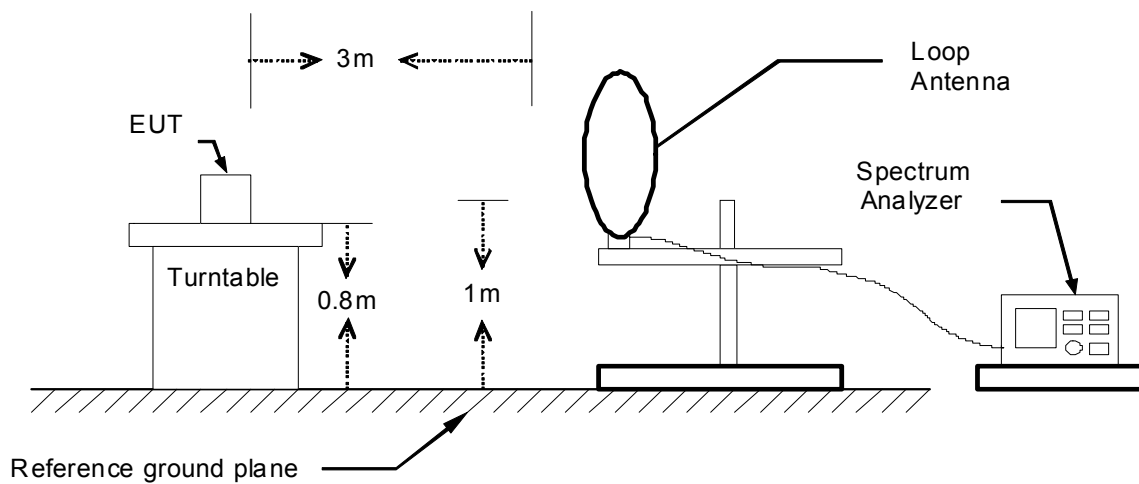
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY43360132	06/04/2016
EMI Test Receiver	Rohde & Schwarz	ESCI	100221	04/22/2016
Bi-log Antenna	TESEQ	CBL 6112D	35409	08/02/2016
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-778	08/09/2016
Horn Antenna	COM-POWER	AH-840	03077	12/17/2015
Pre-Amplifier	Agilent	8449B	3008A01471	07/14/2016
Pre-Amplifier	HP	8447F	2944A03748	07/14/2016
LOOP Antenna	COM-POWER	AL-130	121060	05/24/2016

Remark: Each piece of equipment is scheduled for calibration once a year.

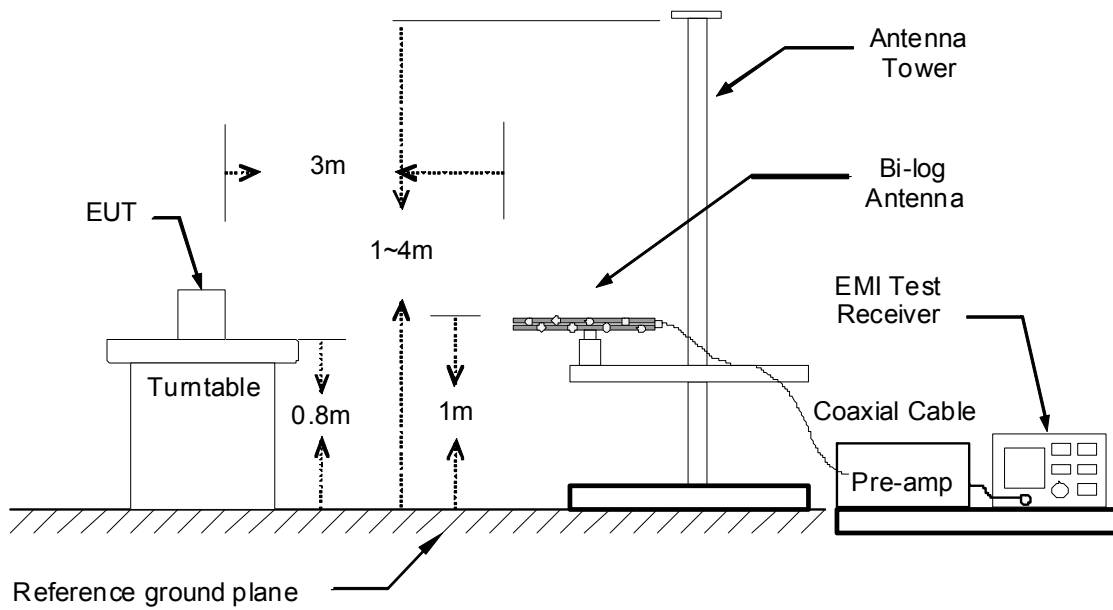
TEST SETUP

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

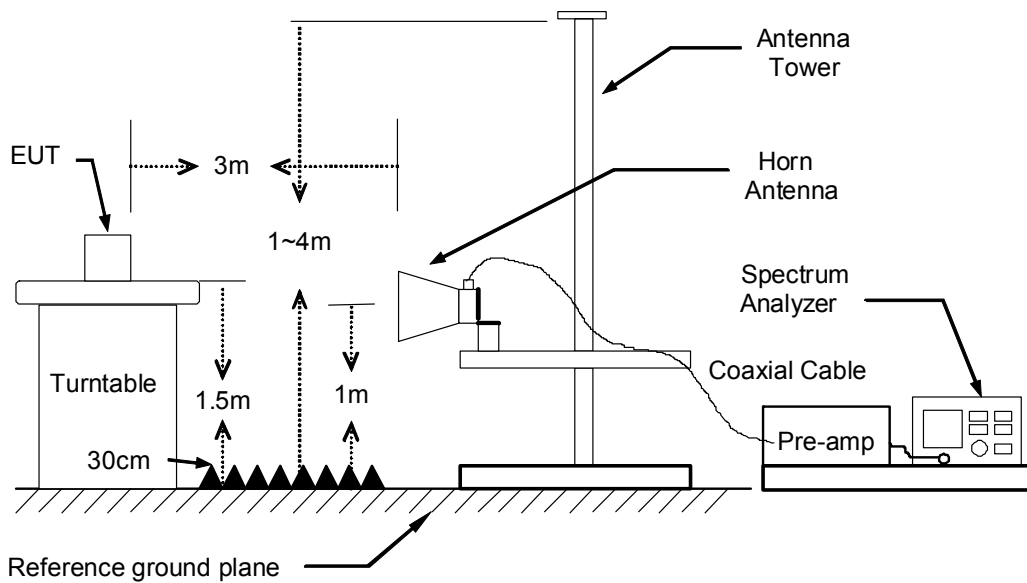
9kHz ~ 30MHz



30MHz ~ 1GHz



The diagram below shows the test setup that is utilized to make the measurements for emission above 1GHz.



TEST PROCEDURE

1. The EUT was placed on the top of a rotating table 0.8 and 1.5 meters above the ground. The table was rotated 360 degrees to determine the position of the highest radiation.
2. While measuring the radiated emission below 1GHz, the EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. While measuring the radiated emission above 1GHz, the EUT was set 3 meters 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 polarization 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.

Remark :

1. *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.*
2. *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1GHz.*
3. *The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.*

TEST RESULTS**Below 1 GHz (9kHz ~ 30MHz)**

No emission found between lowest internal used/generated frequency to 30MHz.

Below 1 GHz (30MHz ~ 1GHz)

Product Name	Transceiver Module	Test By	Audi Chang
Test Model	RKE213E1	Test Date	2015/07/22
Test Mode	Mode 1 / CH Low	Temp. & Humidity	30°C, 50%

966 Chamber_A at 3Meter / Horizontal								
Frequency (MHz)	Reading (dBμV)	Correction Factor (dB/m)	Result (dBuV/m)	Duty Cycle Correction Factor (dB)	Result (dBuV/m)	Limit (dBμV/m)	Margin (dB)	Remark
*433.47	103.87	-5.65	98.22	-20	78.22	80.81	-2.59	AVG
144.46	54.99	-11.95	43.04		---	43.50	-0.46	Peak
159.98	53.05	-12.99	40.06		---	43.50	-3.44	Peak
352.04	42.44	-7.63	34.81		---	46.00	-11.19	Peak
384.05	41.27	-6.65	34.62		---	46.00	-11.38	Peak
*867.11	55.17	0.66	55.83	-20	35.83	60.81	-24.98	AVG
966 Chamber_A at 3Meter / Vertical								
Frequency (MHz)	Reading (dBμV)	Correction Factor (dB/m)	Result (dBuV/m)	Duty Cycle Correction Factor (dB)	Result (dBuV/m)	Limit (dBμV/m)	Margin (dB)	Remark
*433.47	104.86	-5.65	99.21	-20	79.21	80.81	-1.60	AVG
48.43	51.10	-14.59	36.51		---	40.00	-3.49	Peak
144.46	50.89	-11.95	38.94		---	43.50	-4.56	Peak
159.98	46.40	-12.99	33.41		---	43.50	-10.09	Peak
352.04	42.12	-7.63	34.49		---	46.00	-11.51	Peak
*867.11	57.19	0.66	57.85	-20	37.85	60.81	-22.96	AVG

Remark:

1. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit.
2. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
3. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) – PreAmp.Gain (dB).
4. Result (dBuV/m) = Reading (dBuV) + Correction Factor (dB/m).
5. Margin (dB) = Remark result (dBuV/m) - limit (dBuV/m).
6. (*) For Fundamental & Harmonics: Average Level = Peak Level + Duty Cycle Factor.

Product Name	Transceiver Module	Test By	Audi Chang
Test Model	RKE213E1	Test Date	2015/07/22
Test Mode	Mode 1 / CH Middle	Temp. & Humidity	30°C, 50%

966 Chamber_A at 3Meter / Horizontal								
Frequency (MHz)	Reading (dBμV)	Correction Factor (dB/m)	Result (dBuV/m)	Duty Cycle Correction Factor (dB)	Result (dBuV/m)	Limit (dBμV/m)	Margin (dB)	Remark
*433.92	102.35	-5.65	96.70	-20	76.70	80.82	-4.12	AVG
144.46	55.44	-11.95	43.49		---	43.50	-0.01	Peak
159.98	54.35	-12.99	41.36		---	43.50	-2.14	Peak
352.04	42.38	-7.63	34.75		---	46.00	-11.25	Peak
384.05	41.44	-6.65	34.79		---	46.00	-11.21	Peak
*868.08	51.94	0.68	52.62	-20	32.62	60.82	-28.20	AVG
966 Chamber_A at 3Meter / Vertical								
Frequency (MHz)	Reading (dBμV)	Correction Factor (dB/m)	Result (dBuV/m)	Duty Cycle Correction Factor (dB)	Result (dBuV/m)	Limit (dBμV/m)	Margin (dB)	Remark
*433.92	103.61	-5.65	97.96	-20	77.96	80.82	-2.86	AVG
48.43	48.84	-14.59	34.25		---	40.00	-5.75	Peak
144.46	49.7	-11.95	37.75		---	43.50	-5.75	Peak
352.04	42.87	-7.63	35.24		---	46.00	-10.76	Peak
384.05	42.31	-6.65	35.66		---	46.00	-10.34	Peak
*868.08	54.72	0.68	55.4	-20	35.40	60.82	-25.42	AVG

Remark:

1. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit.
2. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
3. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) – PreAmp.Gain (dB).
4. Result (dBuV/m) = Reading (dBuV) + Correction Factor (dB/m).
5. Margin (dB) = Remark result (dBuV/m) - limit (dBuV/m).
6. (*) For Fundamental & Harmonics: Average Level = Peak Level + Duty Cycle Factor.

Product Name	Transceiver Module	Test By	Audi Chang
Test Model	RKE213E1	Test Date	2015/07/22
Test Mode	Mode 1 / CH High	Temp. & Humidity	30°C, 50%

966 Chamber_A at 3Meter / Horizontal								
Frequency (MHz)	Reading (dBμV)	Correction Factor (dB/m)	Result (dBuV/m)	Duty Cycle Correction Factor (dB)	Result (dBuV/m)	Limit (dBμV/m)	Margin (dB)	Remark
*434.49	104.57	-5.64	98.93	-20	78.93	80.84	-1.91	AVG
144.46	53.89	-11.95	41.94		---	43.50	-1.56	Peak
159.98	53.21	-12.99	40.22		---	43.50	-3.28	Peak
352.04	43.16	-7.63	35.53		---	46.00	-10.47	Peak
384.05	42.15	-6.65	35.50		---	46.00	-10.50	Peak
*869.05	56.45	0.69	57.14	-20	37.14	60.84	-23.70	AVG
966 Chamber_A at 3Meter / Vertical								
Frequency (MHz)	Reading (dBμV)	Correction Factor (dB/m)	Result (dBuV/m)	Duty Cycle Correction Factor (dB)	Result (dBuV/m)	Limit (dBμV/m)	Margin (dB)	Remark
*434.49	102.15	-5.64	96.51	-20	76.51	80.84	-4.33	AVG
48.43	52.72	-14.59	38.13		---	40.00	-1.87	Peak
144.46	48.53	-11.95	36.58		---	43.50	-6.92	Peak
159.98	46.73	-12.99	33.74		---	43.50	-9.76	Peak
352.04	42.00	-7.63	34.37		---	46.00	-11.63	Peak
*869.05	51.70	0.69	52.39	-20	32.39	60.84	-28.45	AVG

Remark:

1. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit.
2. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
3. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) – PreAmp.Gain (dB).
4. Result (dBuV/m) = Reading (dBuV) + Correction Factor (dB/m).
5. Margin (dB) = Remark result (dBuV/m) - limit (dBuV/m).
6. (*) For Fundamental & Harmonics: Average Level = Peak Level + Duty Cycle Factor.

Above 1 GHz

Product Name	Transceiver Module	Test By	Jey Li
Test Model	RKE213E1	Test Date	2015/08/25
Test Mode	Mode 1 / CH Low	Temp. & Humidity	30°C, 50%

966 Chamber A at 3Meter / Horizontal

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
1300.00	43.61	-5.51	38.10	74.00	-35.90	297	200	Peak
2585.00	40.84	-0.47	40.37	74.00	-33.63	79	200	Peak
2910.00	41.06	0.52	41.58	74.00	-32.42	99	200	Peak
3220.00	40.41	1.17	41.58	74.00	-32.42	334	100	Peak
3610.00	39.65	2.02	41.67	74.00	-32.33	114	100	Peak
4455.00	38.47	5.04	43.51	74.00	-30.49	258	100	Peak

966 Chamber A at 3Meter / Vertical

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
1275.00	42.88	-5.64	37.24	74.00	-36.76	272	200	Peak
1780.00	41.31	-3.41	37.90	74.00	-36.10	101	200	Peak
2490.00	40.58	-0.77	39.81	74.00	-34.19	144	200	Peak
2965.00	41.12	0.69	41.81	74.00	-32.19	112	200	Peak
3410.00	40.04	1.50	41.54	74.00	-32.46	111	100	Peak
4045.00	38.42	3.48	41.90	74.00	-32.10	171	200	Peak

Remark:

1. Average test would be performed if the peak result were greater than the average limit.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Result = Reading + Correction Factor
Margin = Result - Limit
Remark Peak = Result(PK) - Limit(PK)
Remark AVG = Result(AV) - Limit(AV)

Product Name	Transceiver Module	Test By	Jey Li
Test Model	RKE213E1	Test Date	2015/08/25
Test Mode	Mode 1 / CH Middle	Temp. & Humidity	30°C, 50%

966 Chamber A at 3Meter / Horizontal

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
1420.00	42.61	-4.91	37.70	74.00	-36.30	67	100	Peak
1700.00	42.24	-3.72	38.52	74.00	-35.48	186	100	Peak
2050.00	40.59	-2.36	38.23	74.00	-35.77	138	200	Peak
2765.00	40.25	0.08	40.33	74.00	-33.67	227	100	Peak
3230.00	39.97	1.19	41.16	74.00	-32.84	303	100	Peak
4250.00	38.47	4.26	42.73	74.00	-31.27	164	100	Peak

966 Chamber A at 3Meter / Vertical

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
1440.00	42.25	-4.81	37.44	74.00	-36.56	0	100	Peak
2315.00	40.42	-1.40	39.02	74.00	-34.98	340	100	Peak
2605.00	40.66	-0.41	40.25	74.00	-33.75	258	200	Peak
3085.00	40.28	0.94	41.22	74.00	-32.78	241	100	Peak
4200.00	39.58	4.07	43.65	74.00	-30.35	356	100	Peak
5330.00	38.98	7.02	46.00	74.00	-28.00	248	100	Peak

Remark:

1. Average test would be performed if the peak result were greater than the average limit.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Result = Reading + Correction Factor
Margin = Result - Limit
Remark Peak = Result(PK) - Limit(PK)
Remark AVG = Result(AV) - Limit(AV)

Product Name	Transceiver Module	Test By	Jey Li
Test Model	RKE213E1	Test Date	2015/08/25
Test Mode	Mode 1 / CH High	Temp. & Humidity	30°C, 50%

966 Chamber A at 3Meter / Horizontal

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
=====								
1305.00	42.20	-5.49	36.71	74.00	-37.29	291	200	Peak
1695.00	40.99	-3.74	37.25	74.00	-36.75	23	200	Peak
2255.00	41.76	-1.62	40.14	74.00	-33.86	20	100	Peak
2545.00	40.30	-0.59	39.71	74.00	-34.29	347	200	Peak
2985.00	40.99	0.75	41.74	74.00	-32.26	245	100	Peak
3905.00	39.04	2.99	42.03	74.00	-31.97	146	100	Peak

966 Chamber A at 3Meter / Vertical

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
=====								
1305.00	42.74	-5.49	37.25	74.00	-36.75	301	200	Peak
1625.00	41.96	-4.02	37.94	74.00	-36.06	57	100	Peak
2180.00	40.78	-1.89	38.89	74.00	-35.11	339	200	Peak
2695.00	39.88	-0.13	39.75	74.00	-34.25	173	200	Peak
3050.00	40.15	0.88	41.03	74.00	-32.97	246	100	Peak
3425.00	40.16	1.52	41.68	74.00	-32.32	154	100	Peak

Remark:

1. Average test would be performed if the peak result were greater than the average limit.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Result = Reading + Correction Factor
Margin = Result – Limit
Remark Peak = Result(PK) – Limit(PK)
Remark AVG = Result(AV) – Limit(AV)

7.5 CONDUCTED EMISSION

LIMITS

§ 15.207 (a) Except as shown in paragraph (b) and (c) this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

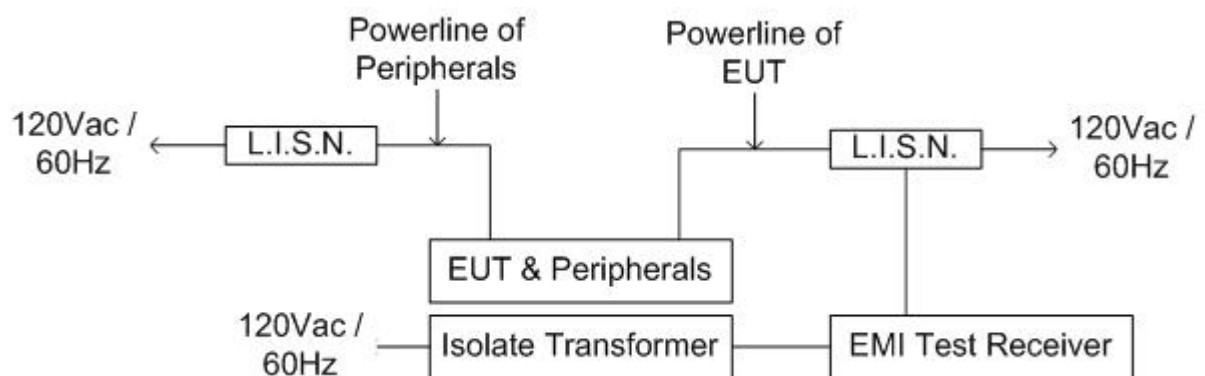
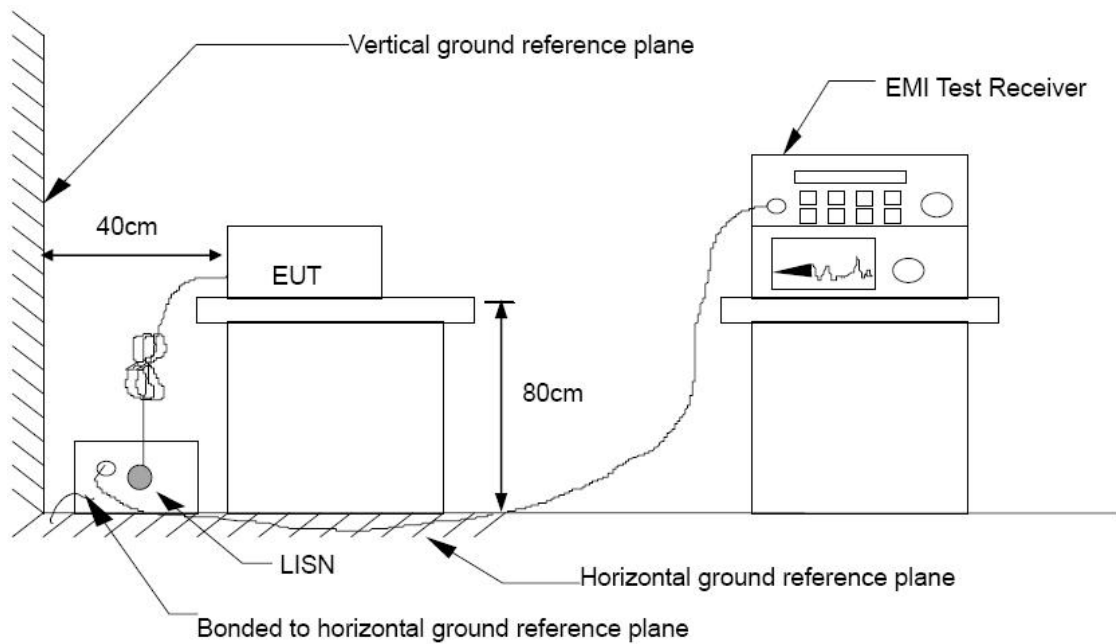
Frequency Range (MHz)	Conducted Limit (dB μ v)	
	Quasi-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5.00	56	46
5.00 - 30.0	60	50

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
L.I.S.N	Schwarzbeck	NSLK 8127	8127465	08/05/2016
L.I.S.N	Schwarzbeck	NSLK 8127	8127473	03/09/2016
EMI Test Receiver	Rohde & Schwarz	ESHS 30	838550/003	10/31/2016
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100111	06/28/2016

Remark: Each piece of equipment is scheduled for calibration once a year.

TEST SETUP



TEST PROCEDURE

The basic test procedure was in accordance with ANSI C63.10:2013.

The test procedure is performed in a 4m × 3m × 2.4m (L×W×H) shielded room.

The EUT along with its peripherals were placed on a 1.0m (W) × 1.5m (L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.

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. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.

The EUT was located so that the distance between the boundary of the EUT and the closest surface of the LISN is 0.8 m. Where a mains flexible cord was provided by the manufacturer shall be 1 m long, or if in excess of 1 m, the excess cable was folded back and forth as far as possible so as to form a bundle not exceeding 0.4 m in length.

TEST RESULTS

Since the EUT is powered by battery powered, this test item is not applicable.