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Report On

Radio Testing of the
KABA GmbH
KABA 91 25 Remote Reader

FCC Part 15 Subpart C §15.225

Report No. SD72119117-0816G **October 2016**

REPORT ON	Radio Testing of the KABA GmbH Remote Reader
TEST REPORT NUMBER	SD72119117-0816G
REPORT DATE	October 2016
PREPARED FOR	Mr. Markus Jäckle
PREPARED BY	Juan Manuel Gonzalez **Name** Title: EMC Service Line Manager Western region
APPROVED BY	Chip R. Fleury **Name** Authorized Signatory Title: Regional EMC manager
DATED	October 05, 2016

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

Revision History

SD72119117-0816G KABA GmbH KABA 91 25 Remote Reader					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
10/05/2016	Initial Release				Chip Fleury

CONTENTS

SECTION 1

REPORT SUMMARY

Radio Testing of the
KABA 91 25
KABA GmbH
Remote Reader

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the KABA GmbH Remote Reader to the requirements of FCC Part 15 Subpart C §15.225.

Objective	To perform Radio Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	KABA GmbH
Model Number(s)	KABA 91 25
FCC ID Number	NVI-KRR9125-K5
IC Number	11038A-KRR9125K5
Serial Number(s)	Engineering Sample
Number of Samples Tested	1
Test Specification/Issue/Date	• FCC Part 15 Subpart C §15.225 (October 1, 2015).
Start of Test	July 16, 2016
Finish of Test	October 05, 2016
Name of Engineer(s)	Juan Manuel Gonzalez Kathy Mackenzie
Related Document(s)	None. Supporting documents for EUT certification are separate exhibits.

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC Part 15 Subpart C §15.225.

Section	FCC Part 15	§15.225 Spec Clause	Test Description	Result	Comments/Base Standard
	§15.31(e)		Voltage Requirement	Compliant	§15.225(e)
	§15.203 and 204		Antenna Requirements	Compliant	See Test Note
2.1		§15.225(e)	Frequency Tolerance	Compliant	
2.2	§15.215(c)		20dB Bandwidth	Compliant	
2.3		§15.225(a)(b)(c)	Emission Mask	Compliant	
2.4	§15.209	§15.225(d)	Spurious Radiated Emissions	Compliant	
2.5		§15.207(a)	Conducted Emissions	Compliant	

Test Note: This requirement does not apply to intentional radiators that are professionally installed.

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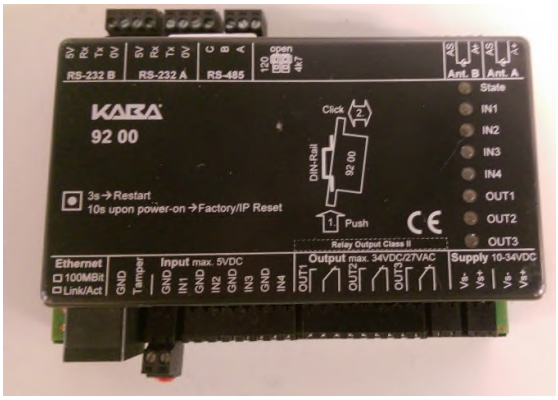
1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a KABA GmbH Remote Reader KABA 91 25 as shown in the photograph below. The EUT has 2 antenna ports (for diversity communication) and at the time of the test 4 different antennas were evaluated:

-Kaba registration unit 90 00
-Kone registration unit 90 00
-Kone registration unit 90 01
-Kone registration unit 90 02



Equipment Under Test

Antenna: Kaba registration unit 90 00

Antenna: KONE registration unit 90 00

Antenna: Kaba registration unit 90 01 / KONE registration unit

Antenna: Kaba registration unit 90 02 / KONE registration unit

Antennas

1.3.2 EUT General Description

EUT Description	Remote Reader
Model Number(s)	KABA 91 25
Rated Voltage	10-34 VDC (Nominal Voltage 24VDC)
EUT RFID Field Strength	**69.65** dBµV/m @ 3 meters
Frequency Range	13.56 MHz in the 13.110 to 14.0101 MHz band
Number of Operating Frequencies	1
Modulation Used	ASK
Antenna(s) Dimension	Kaba 90 00: 4,0 cm x 4,0 cm Kone 90 00: 4,2 cm x 3,5 cm Kone 90 01: 7,5 cm x 7,5 cm Kaba 90 02: 7,5 cm x 7,5 cm

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
A	Antennas Kaba registration unit 90 00 and Kone registration unit 90 01 connected to EUT.
B	Antennas Kone registration unit 90 00 and Kone registration unit 90 02 connected to EUT.
C	Antenna ports terminated with 50 Ohms loads for Conducted emissions test.

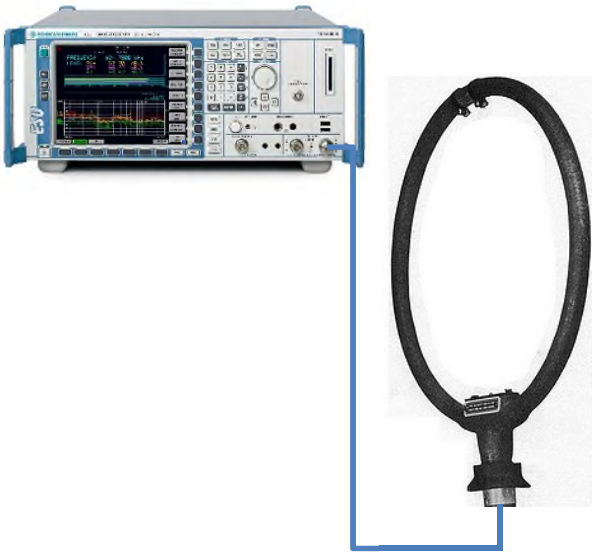
1.4.2 EUT Exercise Software

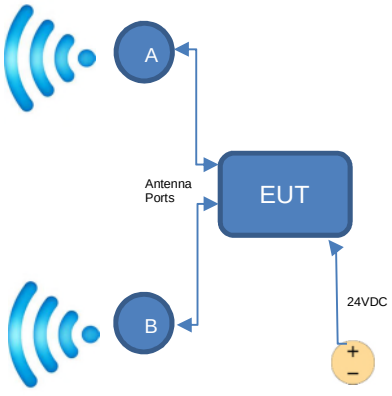
None. No special software was used during evaluation. The EUT was transmitting continuously after start-up.

1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description
N/A	N/A	-

1.4.4 Simplified Test Configuration Diagrams





1.5 DEVIATIONS FROM THE STANDARD

All deviations made during testing from the applicable test standards or test plan are detailed under Section 1.2 of this test report.

1.6 MODIFICATION RECORD

Description of Modification	Modification Fitted By	Date Modification Fitted
Serial Number: Engineering Sample		
N/A		

The table above details modifications made to the EUT during the test programme. The modifications incorporated during each test (if relevant) are recorded on the appropriate test pages.

1.7 TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

1.8 TEST FACILITY LOCATION

1.8.1 TÜV SÜD America Inc. (Mira Mesa)

10040 Mesa Rim Road, San Diego, CA 92121-2912 (32.901268,-117.177681). Phone: 858 678 1400 FAX: 858-546 0364

1.8.2 TÜV SÜD America Inc. (Rancho Bernardo)

16936 Via Del Campo, San Diego, CA 92127-1708 (33.018644,-117.092409). Phone: 858 678 1400 FAX: 858-546 0364

1.9 TEST FACILITY REGISTRATION

1.9.1 FCC – Registration No.: US1146

TUV SUD America Inc. (San Diego), is an accredited test facility with the site description report on file and has met all the requirements specified in §2.498 of the FCC rules. The acceptance letter from the FCC is maintained in our files and the Registration is US1146.

1.9.2 Industry Canada (IC) Registration No.: 3067A

The Semi-anechoic chamber of TUV SUD America Inc. (San Diego) has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No. 3067A.

1.9.3 BSMI – Laboratory Code: SL2-IN-E-028R (US0102)

TUV Product Service Inc. (San Diego) is a recognized EMC testing laboratory by the BSMI under the MRA (Mutual Recognition Arrangement) with the United States. Accreditation includes CNS 13438 up to 6GHz.

1.9.4 VCCI – Registration No. A-0132

TUV SUD America Inc. (San Diego) is a VCCI registered measurement facility which includes radiated field strength measurement, radiated field strength measurement above 1GHz, mains port interference measurement and telecommunication port interference measurement.

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SECTION 2

TEST DETAILS

Radio Testing of the
KABA 91 25
KABA GmbH
Remote Reader

2.1 FREQUENCY STABILITY

2.1.1 Specification Reference

Part 15 Subpart C §15.225(e)

2.1.2 Standard Applicable

(e) The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of −20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

2.1.3 Equipment Under Test and Modification State

Serial No: Engineering Sample / Test was performed at Model KABA 9200 transmitting with antenna Kone registration unit 90 01. Report # SD72119117-0816C (Data representative for this model)

2.1.4 Date of Test/Initial of test personnel who performed the test

August 4 , 2016 /JMG

2.1.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Mira Mesa Laboratory

Ambient Temperature	24.2°C
Relative Humidity	45.9%
ATM Pressure	99.1 kPa

2.1.7 Additional Observations

- The temperature was varied from −20°C to +50°C in 10 degree increments with a nominal voltage of 24VDC, then the voltage was changed from 10VDC to 34VDC (Max. and Min. rated voltage) mantaining a temperature of 20 °C.

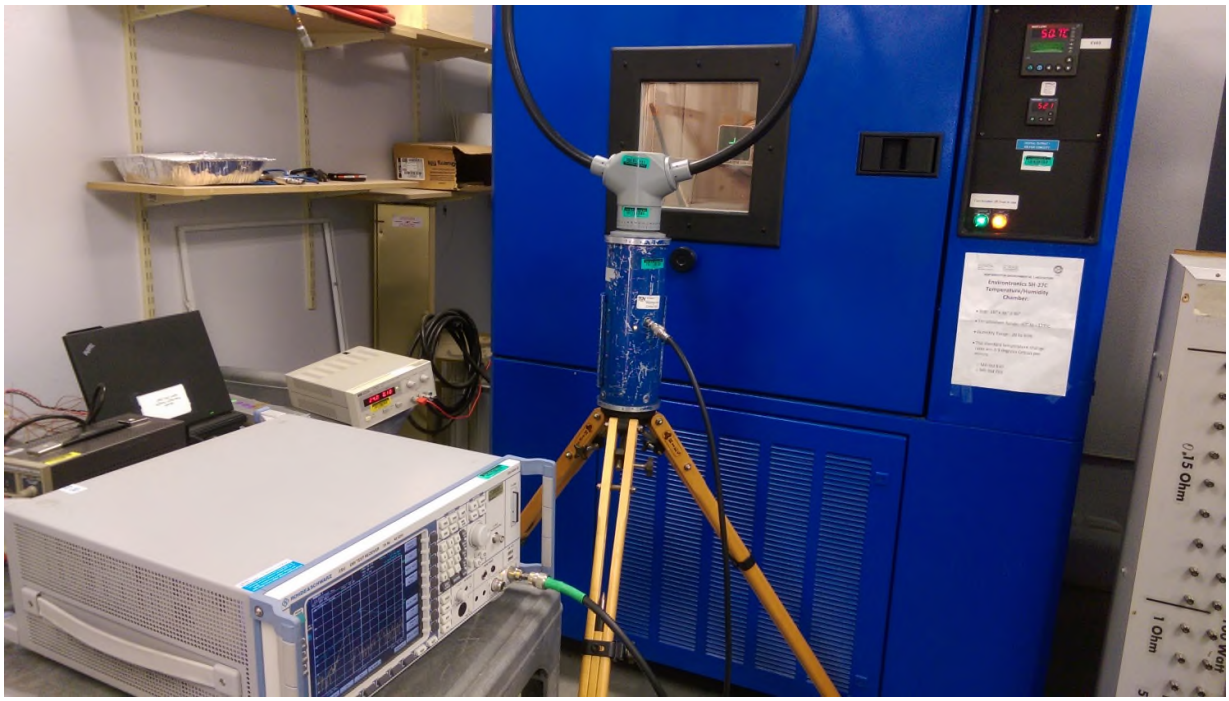
2.1.8 Test Results

RFID @ 13.56MHz					
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Frequency Deviation	Deviation (%)
100	24.0	-20	13.559879808	0.000120192	0.000886372
100		-10	13.559639423	0.000360577	0.002659122
100		0	13.559879808	0.000120192	0.000886372
100		+10	13.559639923	0.000360077	0.002655435
100		+20	13.559879808	0.000120192	0.000886372
100		+30	13.559879808	0.000120192	0.000886372
100		+40	13.559569802	0.000430198	0.003172552
100		+50	**13.559278846**	**0.000721154**	0.005318245
41.66	10.0	+20	13.559879808	0.000120192	0.000886372
62.5	15.0	+20	13.559399038	0.000600962	0.004431873
83.33	20.0	+20	13.559879808	0.000120192	0.000886372
100	24.0	+20	13.559879808	0.000120192	0.000886372
116.66	28.0	+20	13.559879808	0.000120192	0.000886372
133.33	32.0	+20	13.559879808	0.000120192	0.000886372
141.66	34.0	+20	13.559879808	0.000120192	0.000886372

Maximum Deviation Allowed = 0.001356MHz< 0.01% (13.558644MHz to 13.561356MHz)

Maximum Deviation Recorded = 0.000721154 (Complies)

2.1.9 Test Set Up Pictures



2.2 20 dB BANDWIDTH

2.2.1 Specification Reference

Part 15 Subpart C §15.215(c)

2.2.2 Standard Applicable

(c) 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, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated 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 a 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.

2.2.3 Equipment Under Test and Modification State

Serial No: Engineering Sample / Test Configuration A and B

2.2.4 Date of Test/Initial of test personnel who performed the test

July 16, 2016 /JMG

2.2.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Mira Mesa laboratory

Ambient Temperature	24.0°C
Relative Humidity	46.0%
ATM Pressure	98.4 kPa

2.2.7 Additional Observations

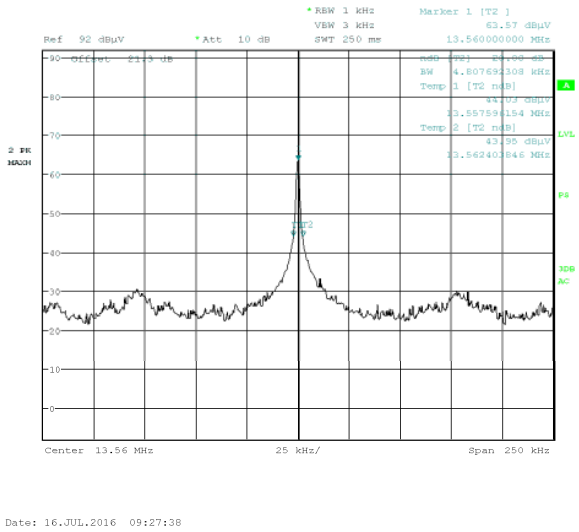
- This is a conducted test.
- A transducer factor (TDF) was added to compensate for the external attenuator and cable used.
- Span is wide enough to capture the channel transmission.
- RBW is set to 1 kHz.
- VBW is 3X RBW.
- Sweep is auto.
- Detector is peak.

- The “n” dB down marker function of the spectrum analyzer was used for this test.

2.2.8 Test Results

Frequency	20dB bandwidth
13.56 MHz	5.21 kHz

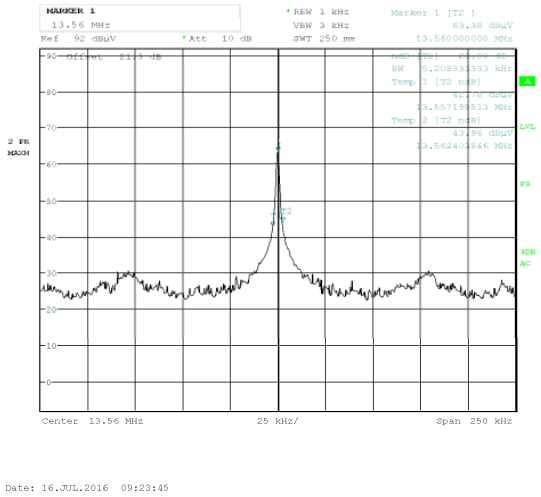
KABA 90 00



Measured 20dB Bandwidth: 4.8 kHz
Frequency Band: 13.110 to 14.010 MHz

13.56 MHz – (20dB BW/2) = 13.5576MHz (within the frequency band - **Compliant**)
13.56 MHz + (20dB BW/2) = 13.5624MHz (within the frequency band - **Compliant**)

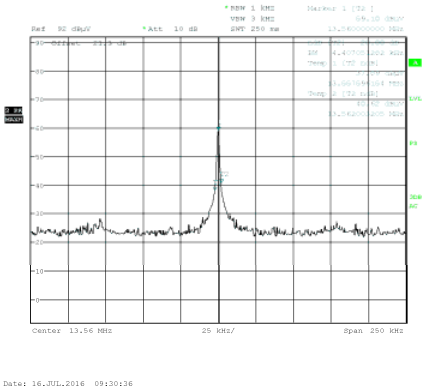
KONE 90 00



Measured 20dB Bandwidth: 5.21 kHz
Frequency Band: 13.110 to 14.010 MHz

13.56 MHz – (20dB BW/2) = 13.557395MHz (within the frequency band - **Compliant**)
13.56 MHz + (20dB BW/2) = 13.562605MHz (within the frequency band - **Compliant**)

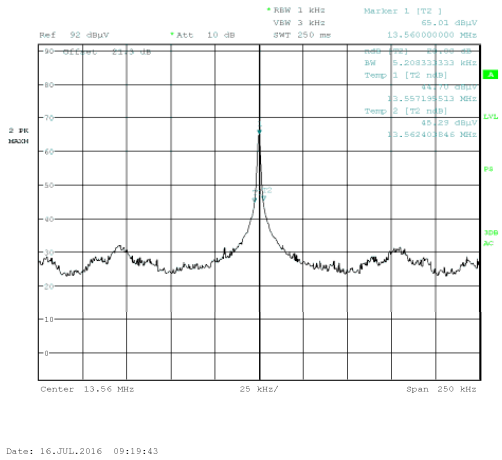
KONE 90 01



Measured 20dB Bandwidth: 4.4 kHz
Frequency Band: 13.110 to 14.010 MHz

13.56 MHz – (20dB BW/2) = 13.5578 MHz (within the frequency band - **Compliant**)
13.56 MHz + (20dB BW/2) = 13.5622MHz (within the frequency band - **Compliant**)

KONE 90 02

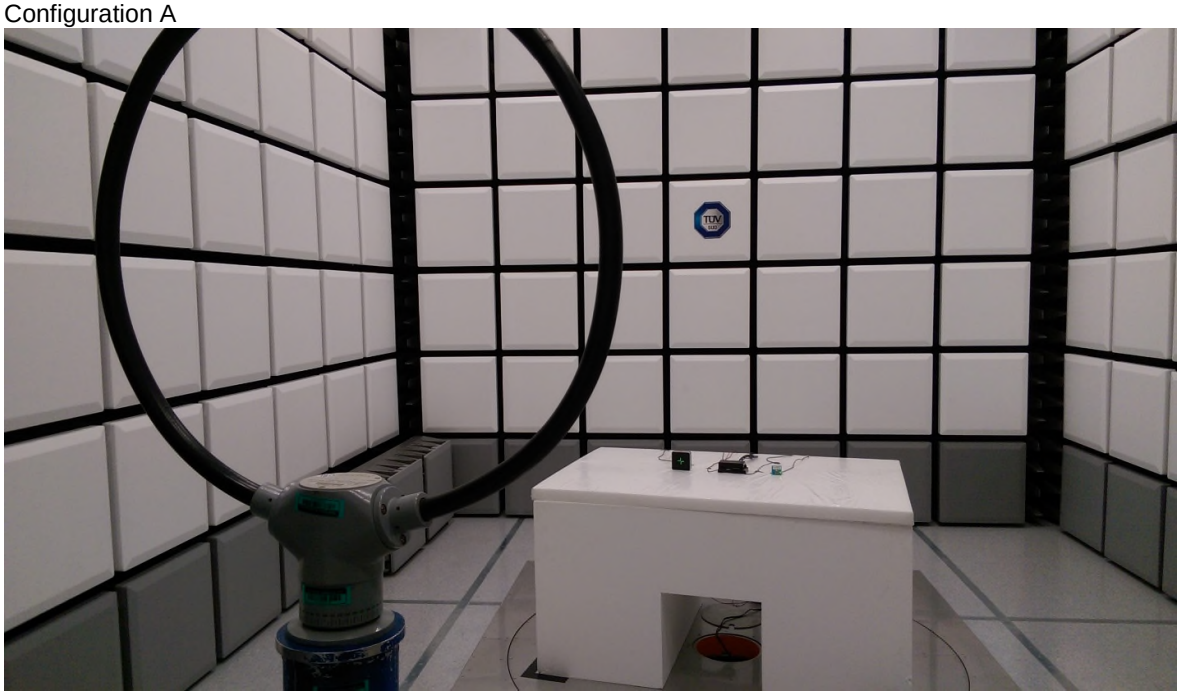


Measured 20dB Bandwidth: 5.21 kHz
Frequency Band: 13.110 to 14.010 MHz

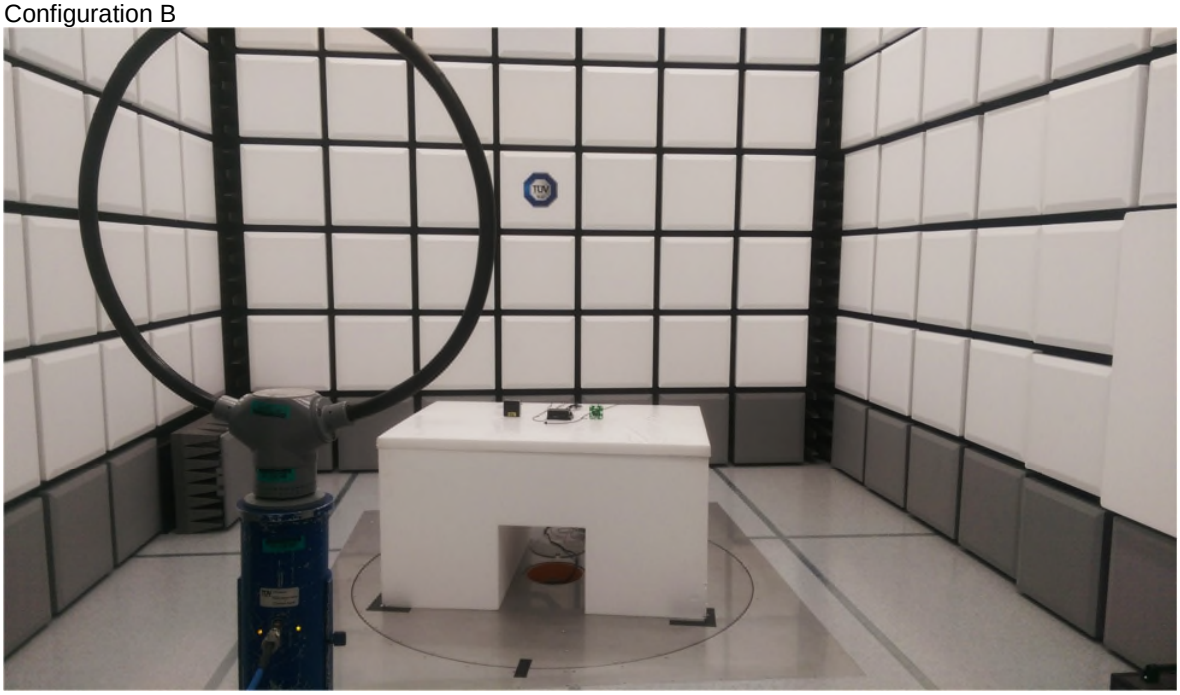
13.56 MHz – (20dB BW/2) = 13.557395MHz (within the frequency band - **Compliant**)
13.56 MHz + (20dB BW/2) = 13.562605MHz (within the frequency band - **Compliant**)

2.2.9 Test Set up Pictures

Configuration A



Configuration B



2.3 EMISSION MASK

2.3.1 Specification Reference

Part 15 Subpart C §15.225(a)(b)(c)

2.3.2 Standard Applicable

(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

2.3.3 Equipment Under Test and Modification State

Serial No: Engineering Sample / Test Configuration A & B

2.3.4 Date of Test/Initial of test personnel who performed the test

August 03, 2016 /JMG

2.3.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Mira Messa Laboratory

Ambient Temperature	25.0°C
Relative Humidity	46.6%
ATM Pressure	99.0 kPa

2.3.7 Additional Observations

- This is a radiated test. The spectrum was searched from 9kHz to 30MHz. Only 13.110 MHz to 14.010 MHz presented. There are no significant emissions observed other than the fundamental frequency (13.56 MHz) measured at 3 meters.
- Limits were converted from 30 meters to 3 meters using worst case 20 dB/decade extrapolation rules. Measurement was focused on the RFID system and not the host.
- Measurement was done using EMC32 V9.26.0 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.3.1 for sample computation.

2.3.1 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (dbµV) @ 13.56MHz			15.0
Correction Factor (dB)	Asset# 1026 (cable)	0.6	21.5
	Asset# 1057 3m (cable)	0.7	
	Asset# 6628 (antenna)	19.9	
	Asset# 1187(cable)	0.3	
Reported QuasiPeak Final Measurement (dbµV/m) @ 30MHz			**36.5**

2.3.2 Sample Computation (Limits)

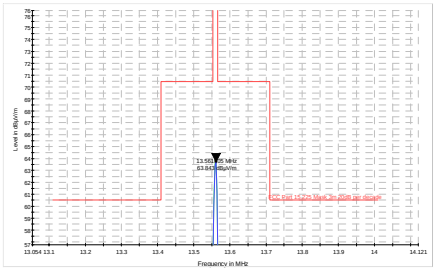
Limit @ 13.553–13.567 MHz:	= 15,848 µV/m @30 meters
	= 20 log(15,848 µV/m)
	= 84 dB µV/m @30 meters
Using 20dB/decade extrapolation rule:	= 20 log (30m/3m)
Measuring distance correction factor:	= 20 dB
Calculated limit @ 3 meters:	= 84 dB µV/m + 20 dB
	= 104 dB µV/m

2.3.3 Test Results

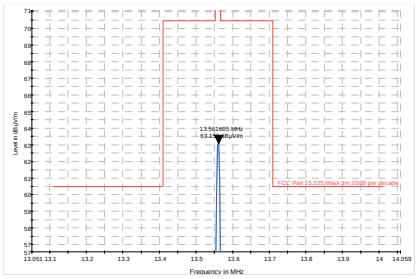
See attached plots.

2.3.4 Test Results Pre Scans Individual antennas

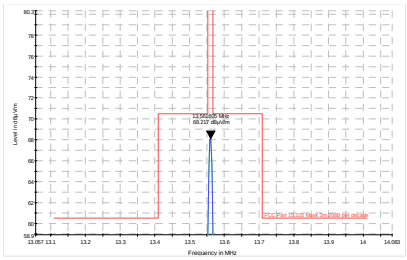
KABA 9000 13-14MHz



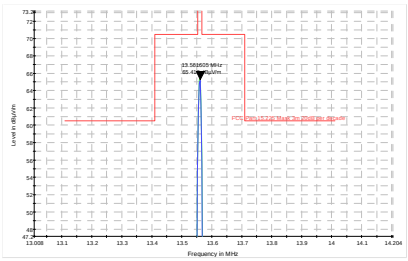
KONE 9000 13-14MHz



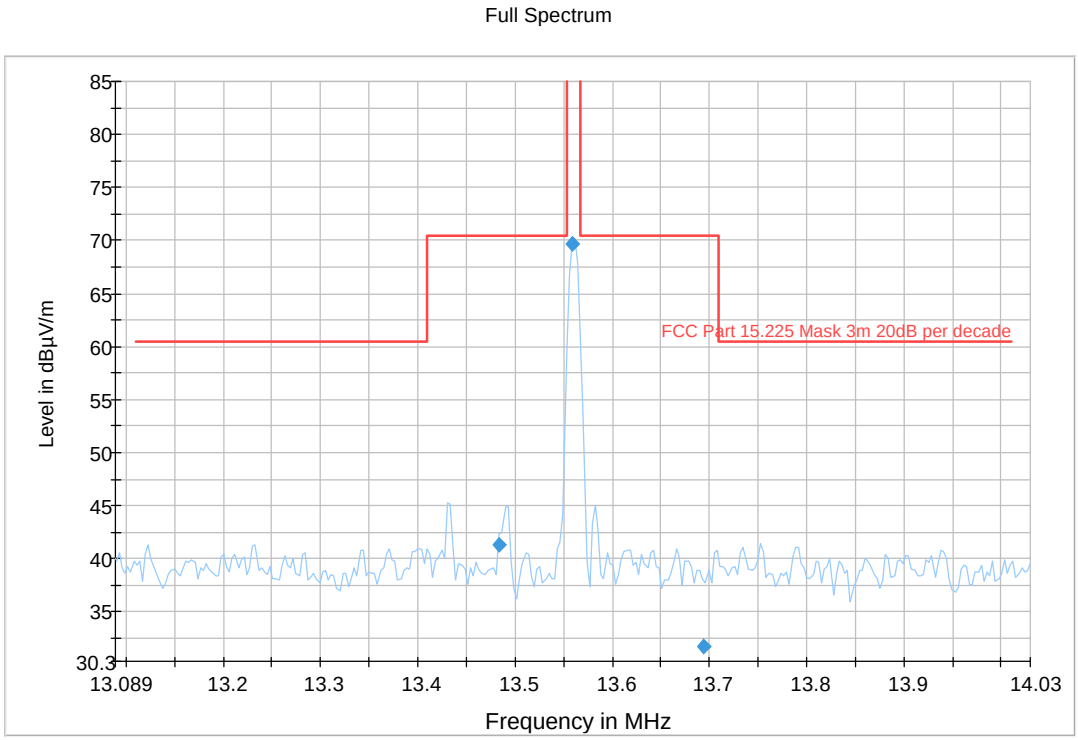
KONE 9001 13-14MHz



KONE 9002 13-14MHz



2.3.5 Test Results TEST MODE A (Worst Case presented only)

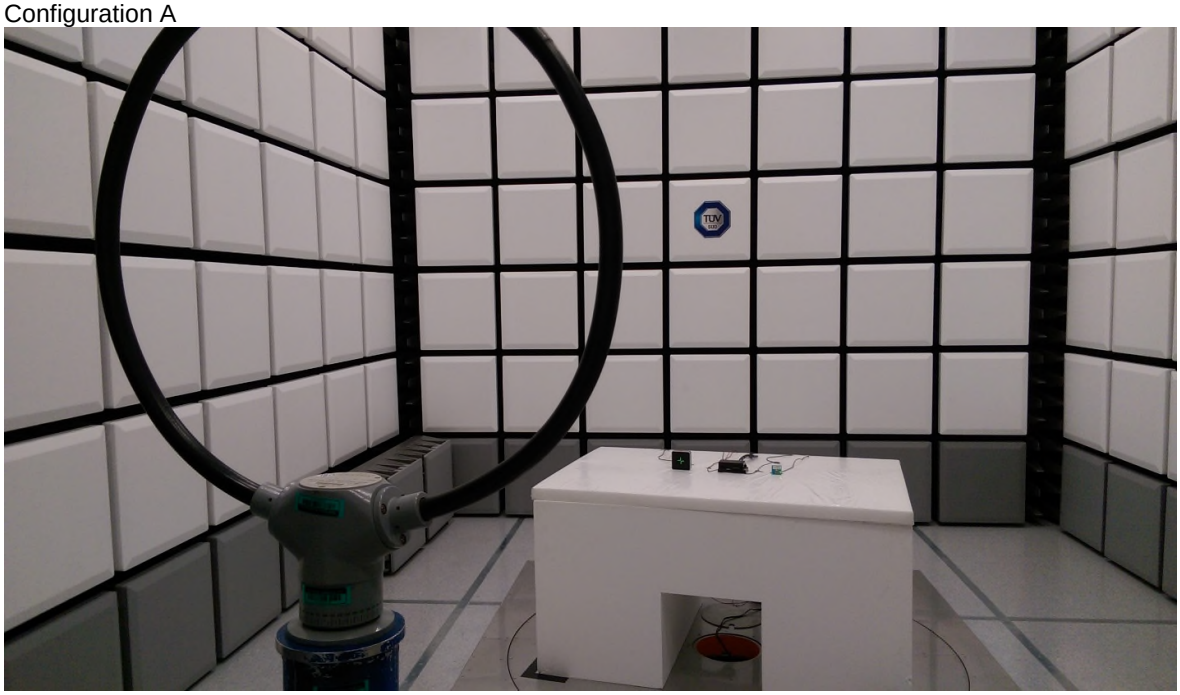


Final Result

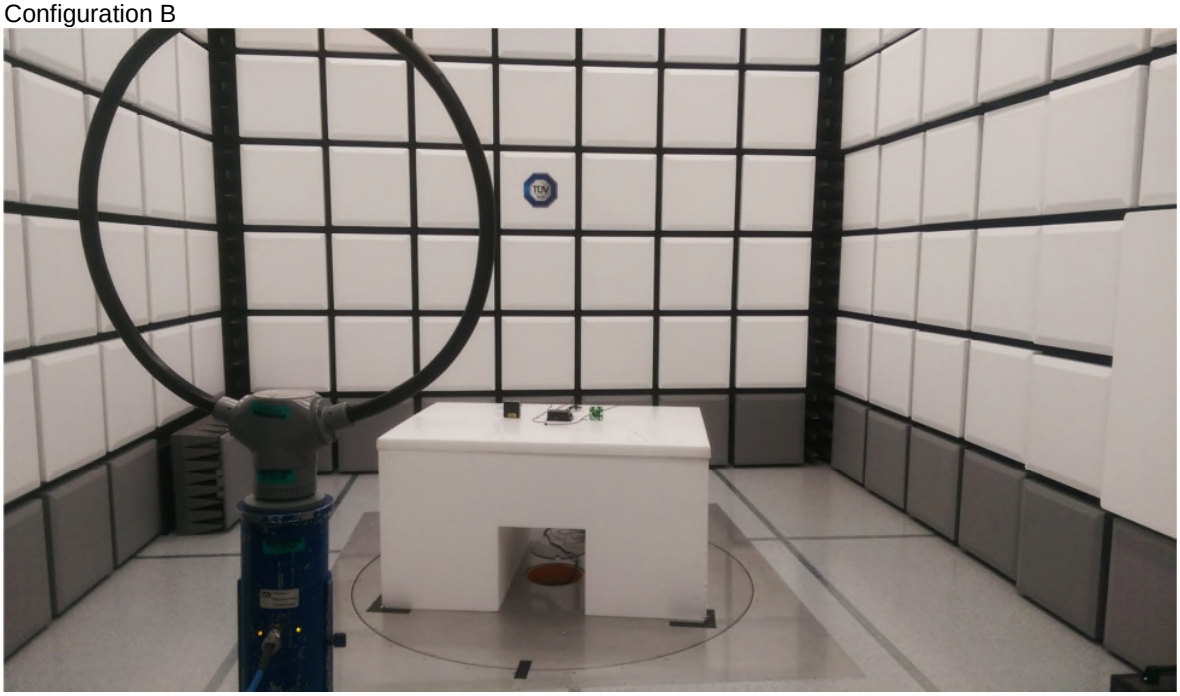
Frequency (MHz)	QP (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Azimuth (deg)	Corr. (dB)	Comment
13.483265	41.38	70.47	29.09	1000.0	9.000	H	300.0	21.2	
13.558605	69.65	104.00	34.35	1000.0	9.000	H	322.0	21.3	FUNDAMENTAL
13.693645	31.77	70.47	38.70	1000.0	9.000	H	39.0	21.3	

2.3.6 Test Set Up Pictures

Configuration A



Configuration B



2.4 SPURIOUS RADIATED EMISSIONS

2.4.1 Specification Reference

Part 15 Subpart C §15.225(d)

2.4.2 Standard Applicable

(d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

2.4.3 Equipment Under Test and Modification State

Serial No: Engineering Sample / Test Configuration A

2.4.4 Date of Test/Initial of test personnel who performed the test

August 03, 2016 /JMG

2.4.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Mira Mesa Laboratory

Ambient Temperature	25.0°C
Relative Humidity	46.6%
ATM Pressure	99.0 kPa

2.4.7 Additional Observations

- This is a radiated test. The spectrum was searched from 9KHz to 1GHz.
- Measurement was done using EMC32 V9.26.0 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.4.8 for sample computation.

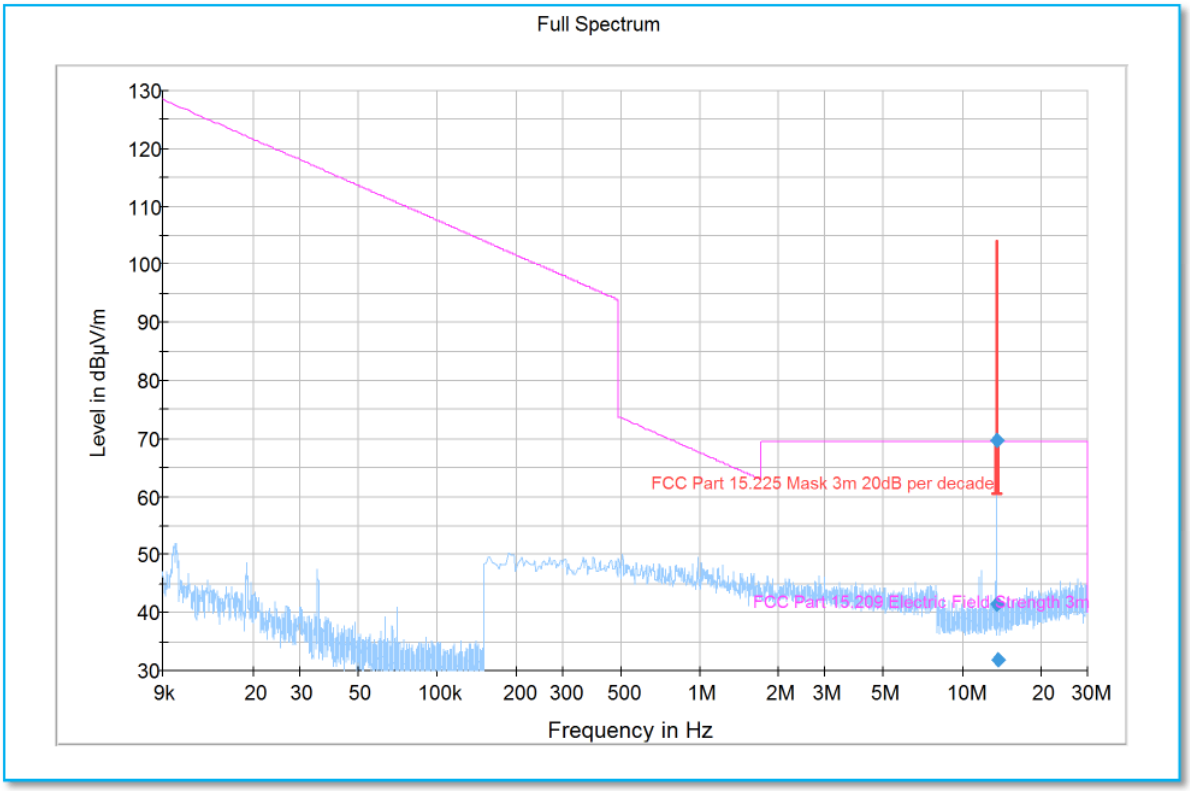
2.4.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (dbµV) @ 30 MHz			24.4
Correction Factor (dB)	Asset# 1066 (cable)	0.3	-12.6
	Asset# 1172 (cable)	0.3	
	Asset# 1016 (preamplifier)	-30.7	
	Asset# 1175(cable)	0.3	
	Asset# 1002 (antenna)	17.2	
Reported QuasiPeak Final Measurement (dbµV/m) @ 30MHz			**11.8**

2.4.9 Test Results

See attached plots.

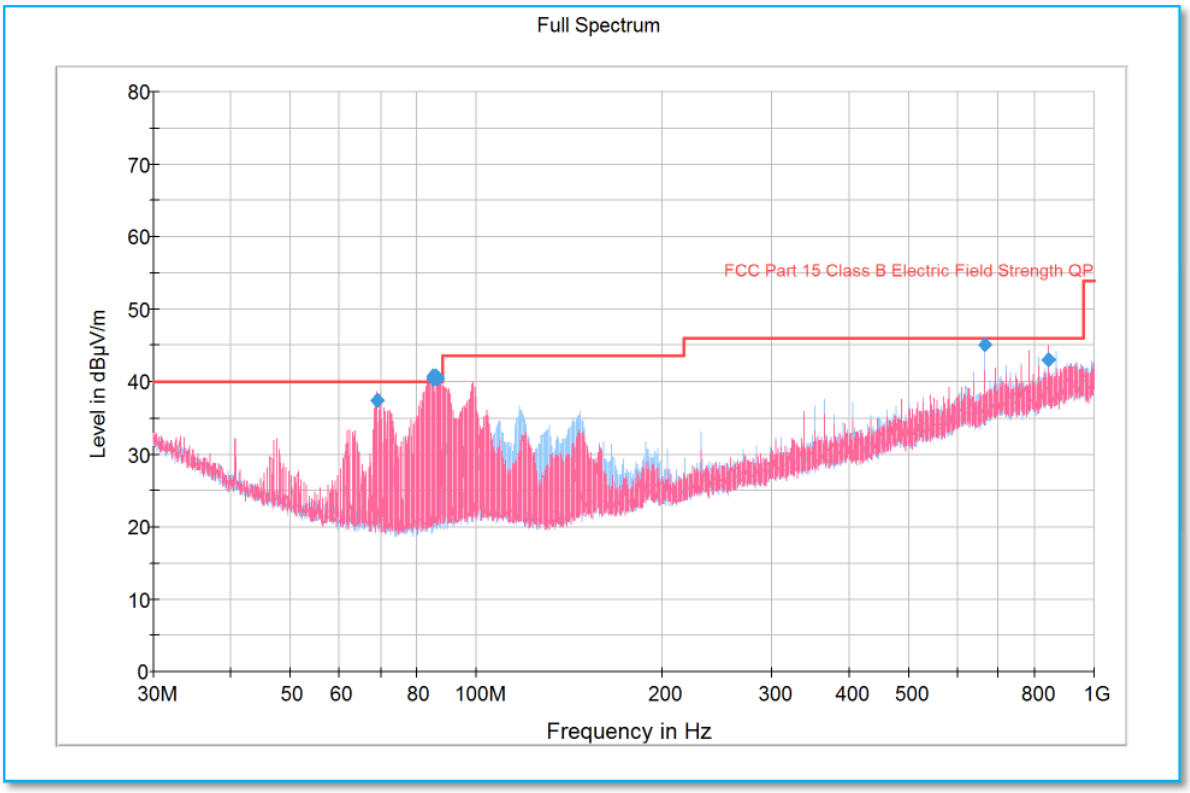
2.4.10 Test Results 9KHz-30 MHz Test mode A (Worst case)



Final Result

Frequency (MHz)	Quasi Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Azimuth (deg)	Corr. (dB)	Comment
13.483265	41.38	70.47	29.09	1000.0	9.000	H	300.0	21.2	
13.558605	69.65	104.00	34.35	1000.0	9.000	H	322.0	21.3	
13.693645	31.77	70.47	38.70	1000.0	9.000	H	39.0	21.3	

2.4.11 Test Results 30MHz-1GHz Test mode A (Worst case)

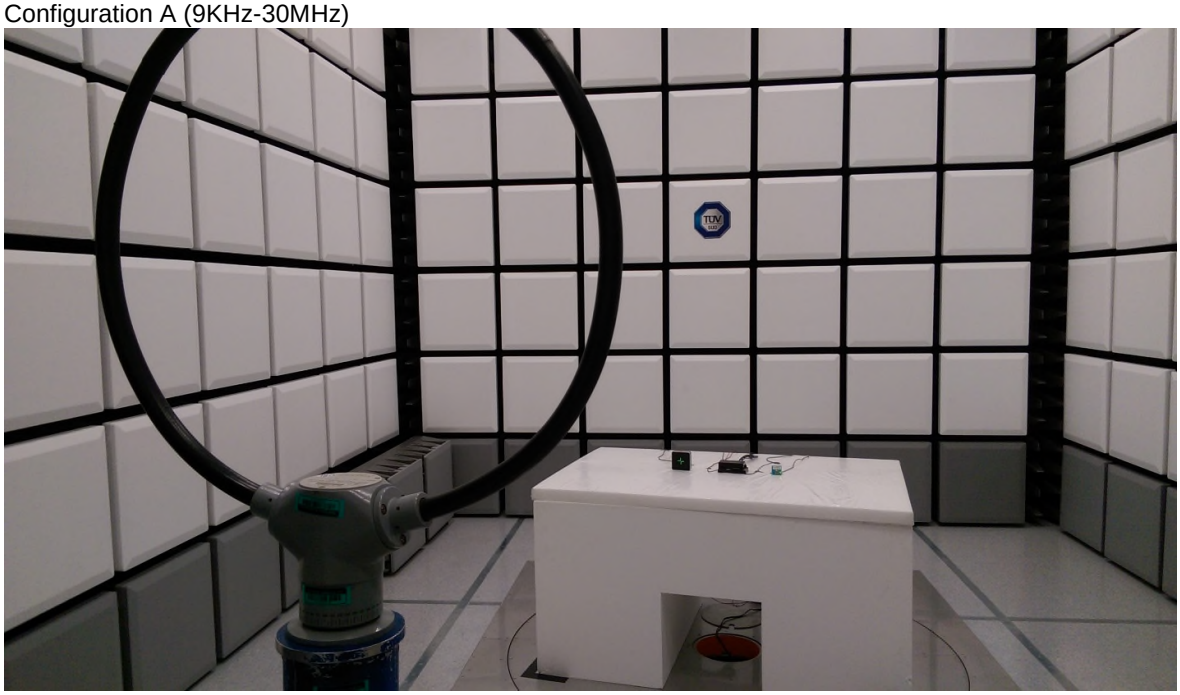


Final_Result

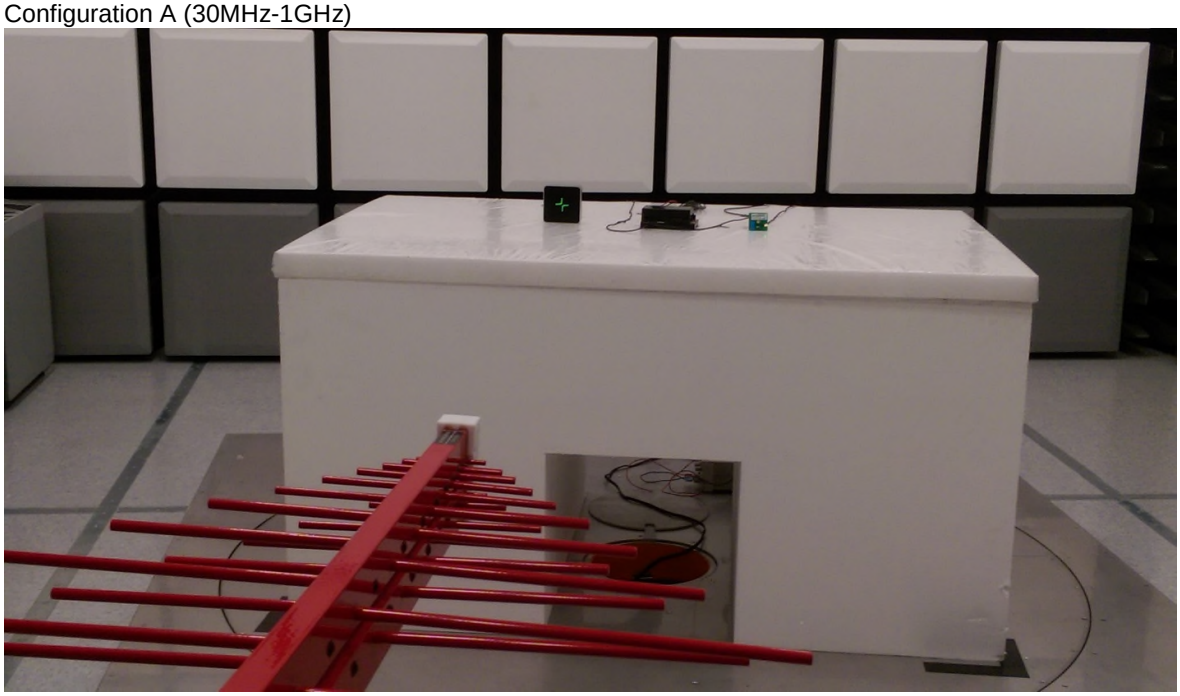
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
69.091000	37.31	40.00	2.69	1000.0	120.000	207.5	V	120.0	13.8	
85.138667	39.50	40.00	0.50	1000.0	120.000	103.5	V	189.0	14.3	
85.149000	39.50	40.00	0.50	1000.0	120.000	102.8	V	177.0	14.3	
85.678000	39.42	40.00	0.58	1000.0	120.000	97.7	V	198.0	14.3	
85.687000	39.40	40.00	0.60	1000.0	120.000	104.2	V	203.0	14.3	
85.688333	39.31	40.00	0.69	1000.0	120.000	105.2	V	188.0	14.3	
86.227667	39.80	40.00	0.20	1000.0	120.000	107.1	V	209.0	14.4	
86.257333	39.91	40.00	0.09	1000.0	120.000	102.7	V	222.0	14.4	
664.444667	45.01	46.00	0.99	1000.0	120.000	117.8	H	161.0	29.7	
840.718333	43.06	46.00	2.94	1000.0	120.000	102.8	V	197.0	32.1	

2.4.12 Test Set Up Pictures

Configuration A (9KHz-30MHz)



Configuration A (30MHz-1GHz)



2.5 CONDUCTED EMISSIONS

2.5.1 Specification Reference

Part 15 Subpart C §15.207(a)

2.5.2 Standard Applicable

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 µH/50 ohms line impedance stabilization network (LISN).

Frequency of emission (MHz)	Conducted limit (dBµV)	
	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.*

2.5.3 Equipment Under Test and Modification State

Serial No: Engineering Sample / Test Configuration C

2.5.4 Date of Test/Initial of test personnel who performed the test

October 05, 2016 /KM

2.5.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.0°C
Relative Humidity	44.2%
ATM Pressure	99.1 kPa

2.5.7 Additional Observations

- The RFID module was configured as per specification.

- The antenna was replaced by a 50Ω load for this test.
- The EUT was powered by a DC Protek 35010M Power Supply and measured trough the AC lines of the power supply as per test plan.
- Measurement was done using EMC32 V8.53 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.5.8 for sample computation.

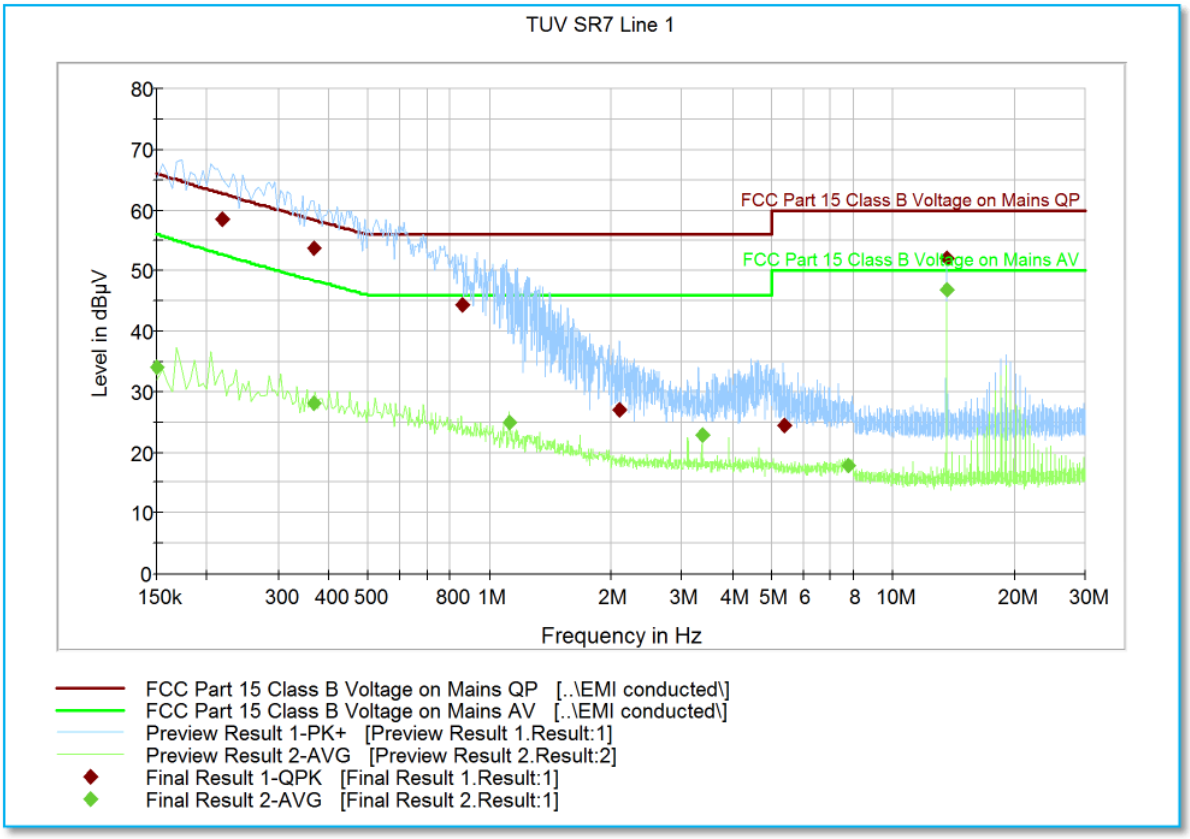
2.5.8 Sample Computation (Conducted Emission – Quasi Peak)

Measuring equipment raw measurement (dbµV) @ 150kHz			5.5
Correction Factor (dB)	Asset# 8607 (20 dB attenuator)	19.9	20.7
	Asset# 1177 (cable)	0.15	
	Asset# 1176 (cable)	0.35	
	Asset# 7568 (LISN)	0.30	
Reported QuasiPeak Final Measurement (dbµV) @ 150kHz			**26.2**

2.5.9 Test Results

Compliant. See attached plots and tables.

2.5.10 Line 1 (With Antenna port Terminated)



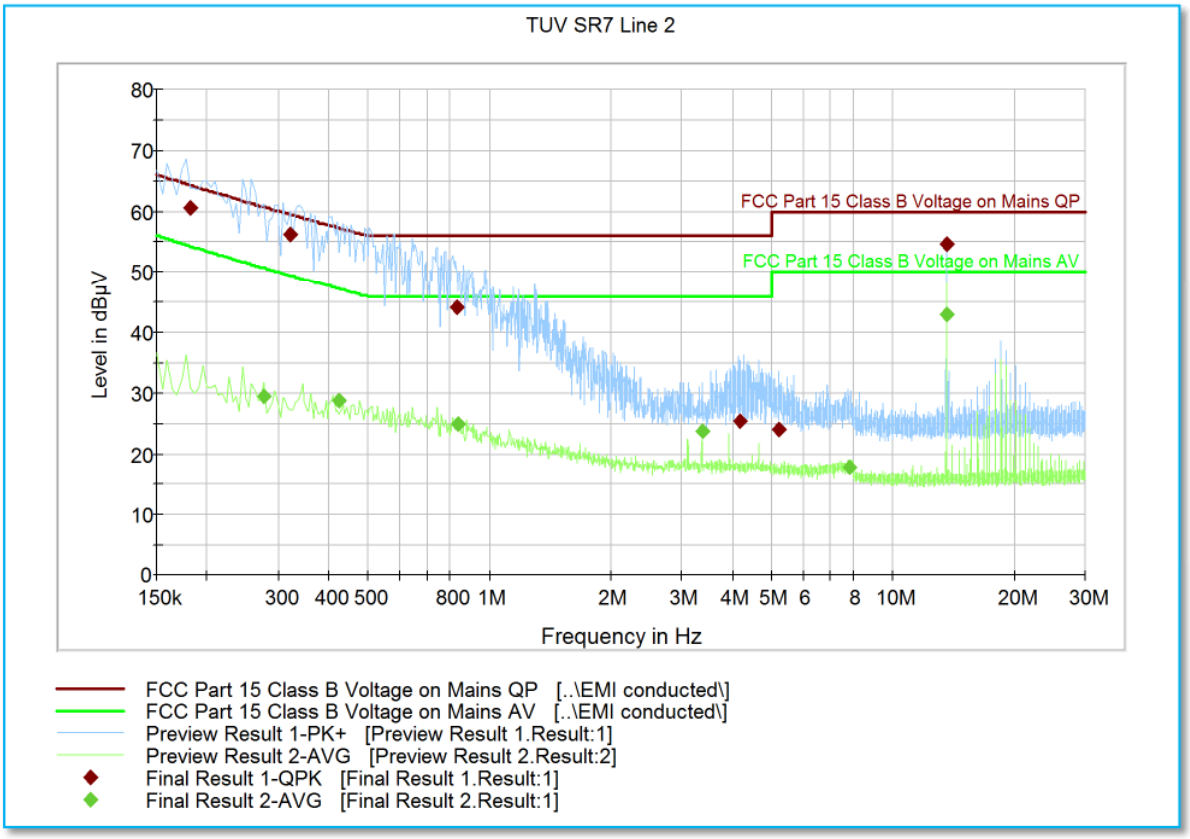
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.217500	58.6	1000.0	9.000	Off	L1	20.1	4.2	62.7	
0.366000	53.8	1000.0	9.000	Off	L1	20.0	4.6	58.4	
0.856500	44.4	1000.0	9.000	Off	L1	20.0	11.6	56.0	
2.098500	27.0	1000.0	9.000	Off	L1	20.0	29.0	56.0	
5.365500	24.4	1000.0	9.000	Off	L1	20.1	35.6	60.0	
13.560000	52.1	1000.0	9.000	Off	L1	20.2	7.9	60.0	

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	34.1	1000.0	9.000	Off	L1	20.2	21.9	56.0	
0.366000	28.2	1000.0	9.000	Off	L1	20.0	20.2	48.4	
1.117500	25.0	1000.0	9.000	Off	L1	20.0	21.0	46.0	
3.358500	23.0	1000.0	9.000	Off	L1	20.1	23.0	46.0	
7.714500	17.8	1000.0	9.000	Off	L1	20.1	32.2	50.0	
13.560000	46.9	1000.0	9.000	Off	L1	20.2	3.1	50.0	

2.5.11 Line 2 (With Antenna port Terminated)



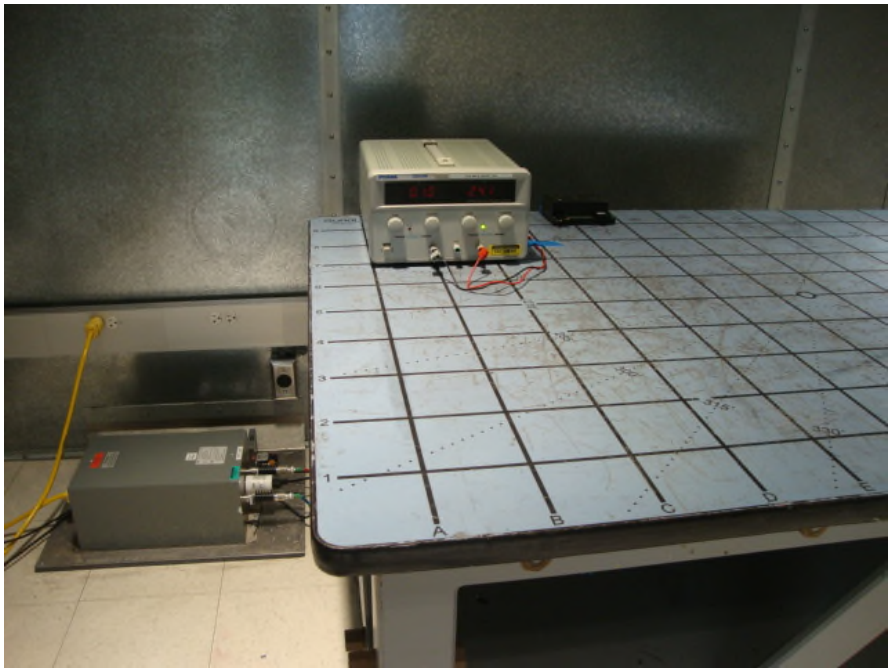
Final Result 1

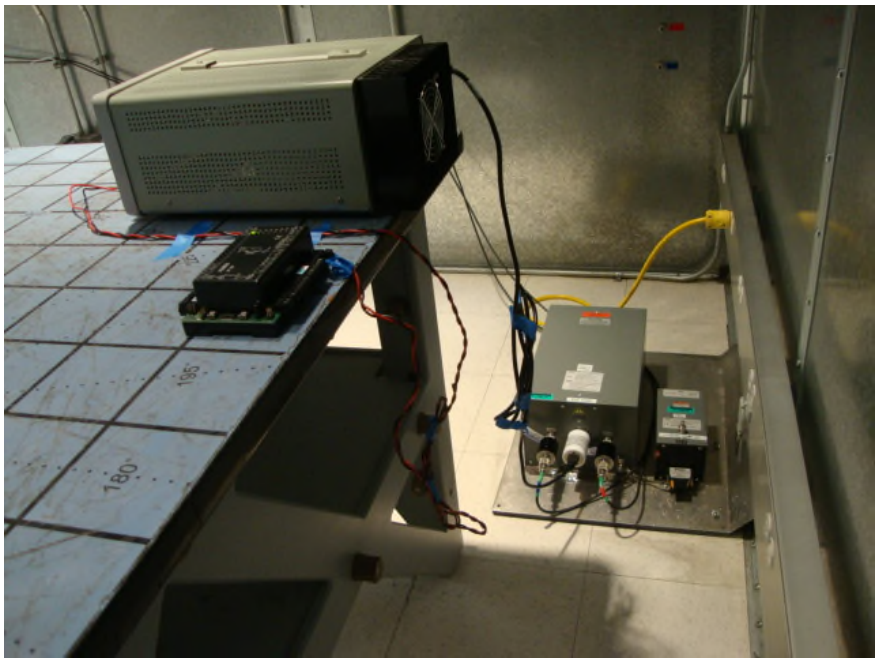
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.181500	60.5	1000.0	9.000	Off	N	20.1	3.8	64.3	
0.321000	56.2	1000.0	9.000	Off	N	20.0	3.2	59.5	
0.829500	44.0	1000.0	9.000	Off	N	20.0	12.0	56.0	
4.186500	25.4	1000.0	9.000	Off	N	20.1	30.6	56.0	
5.221500	24.0	1000.0	9.000	Off	N	20.1	36.0	60.0	
13.560000	54.6	1000.0	9.000	Off	N	20.2	5.4	60.0	

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.276000	29.5	1000.0	9.000	Off	N	20.0	21.2	50.7	
0.424500	28.8	1000.0	9.000	Off	N	20.0	18.4	47.2	
0.834000	24.9	1000.0	9.000	Off	N	20.0	21.1	46.0	
3.358500	23.8	1000.0	9.000	Off	N	20.1	22.2	46.0	
7.822500	17.9	1000.0	9.000	Off	N	20.1	32.1	50.0	
13.555500	43.0	1000.0	9.000	Off	N	20.2	7.0	50.0	

2.5.12 Test Set up Pictures (Anttena ports terminated with 50 Ohm Loads)





SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

ID Number (SDGE/SDRB)	Test Equipment	Type	Serial Number	Manufacturer	Cal Date	Cal Due Date
Radiated Test Setup						
1002	Bilog Antenna	3142C	00058717	ETS-Lindgren	11/06/15	11/06/17
7620	EMI Test Receiver	ESU	100399	Rhode & Schwarz	08/24/15	08/24/16
6628	Loop Antrenna	HFH2-Z2	880.458/25	Rhode & Schwarz	10/28/15	10/28/16
Frequency Stability						
6610	Temperature chamber	SH-27C	9963481-S1074	Rhode & Schwarz	01/20/16	01/20/17
Conducted Test Setup						
7620	EMI Test Receiver	ESU40	100399	Rhode & Schwarz	09/09/16	09/09/17
8822	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	02/29/16	02/28/17
8824	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	02/29/16	02/28/17
7568	LISN	FCC-LISN-50-25-2-10	120305	Fischer Custom Comm.	10/28/15	10/28/16
Miscellaneous						
-	Test Software	EMC32	V9.26.0	Rhode & Schwarz	N/A	
-	Test Software	EMC32	V8.5.3	Rhode & Schwarz	N/A	
6455	DC Power Supply	E3611A	2529	HP	N/A	
09075	DC Power Supply	35010M	10226075	Protek	N/A	

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:

3.2.1 Conducted Emissions (AC) Measurements

	Contribution	Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.36	0.21	0.04
2	Cables	Rectangular	0.50	0.29	0.08
3	LISN	Rectangular	0.66	0.38	0.15
4	Attenuator	Rectangular	0.30	0.17	0.03
5	EUT Setup	Rectangular	1.00	0.58	0.33
				Combined Uncertainty (u_c):	0.80
				Coverage Factor (k):	2
				Expanded Uncertainty:	1.59

3.2.2 Radiated Emission Measurements (Below 1GHz)

	Contribution	Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.45	0.26	0.07
2	Cables	Rectangular	0.50	0.29	0.08
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.75	0.43	0.19
5	Site	Rectangular	3.55	2.05	4.20
6	EUT Setup	Rectangular	1.00	0.58	0.33
				Combined Uncertainty (u_c):	2.23
				Coverage Factor (k):	2
				Expanded Uncertainty:	4.45

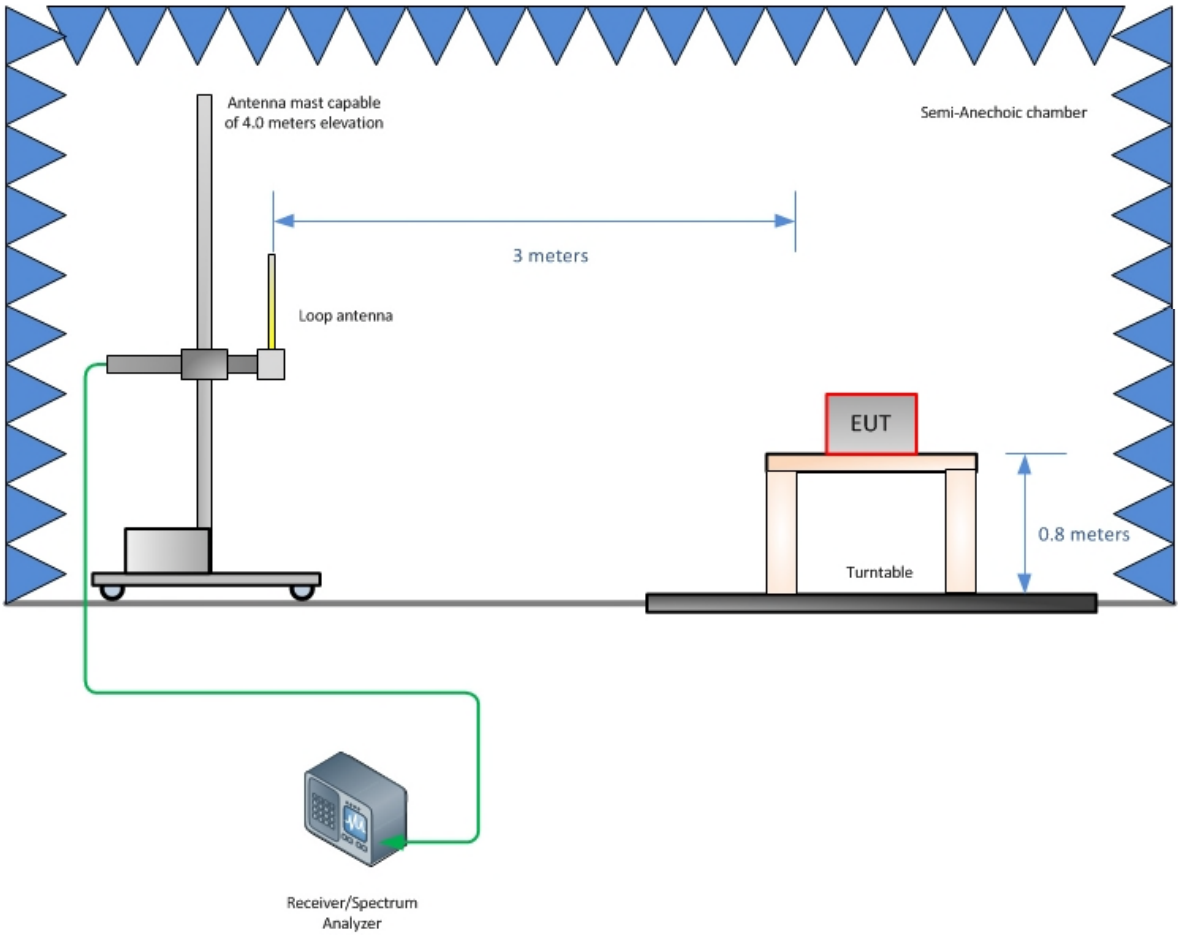
3.2.3 Radiated Emission Measurements (Above 1GHz)

	Contribution	Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.57	0.33	0.11
2	Cables	Rectangular	0.70	0.40	0.16
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.37	0.21	0.05
5	Site	Rectangular	3.55	2.05	4.20
6	EUT Setup	Rectangular	1.00	0.58	0.33
				Combined Uncertainty (u_c):	2.22
				Coverage Factor (k):	2
				Expanded Uncertainty:	4.44

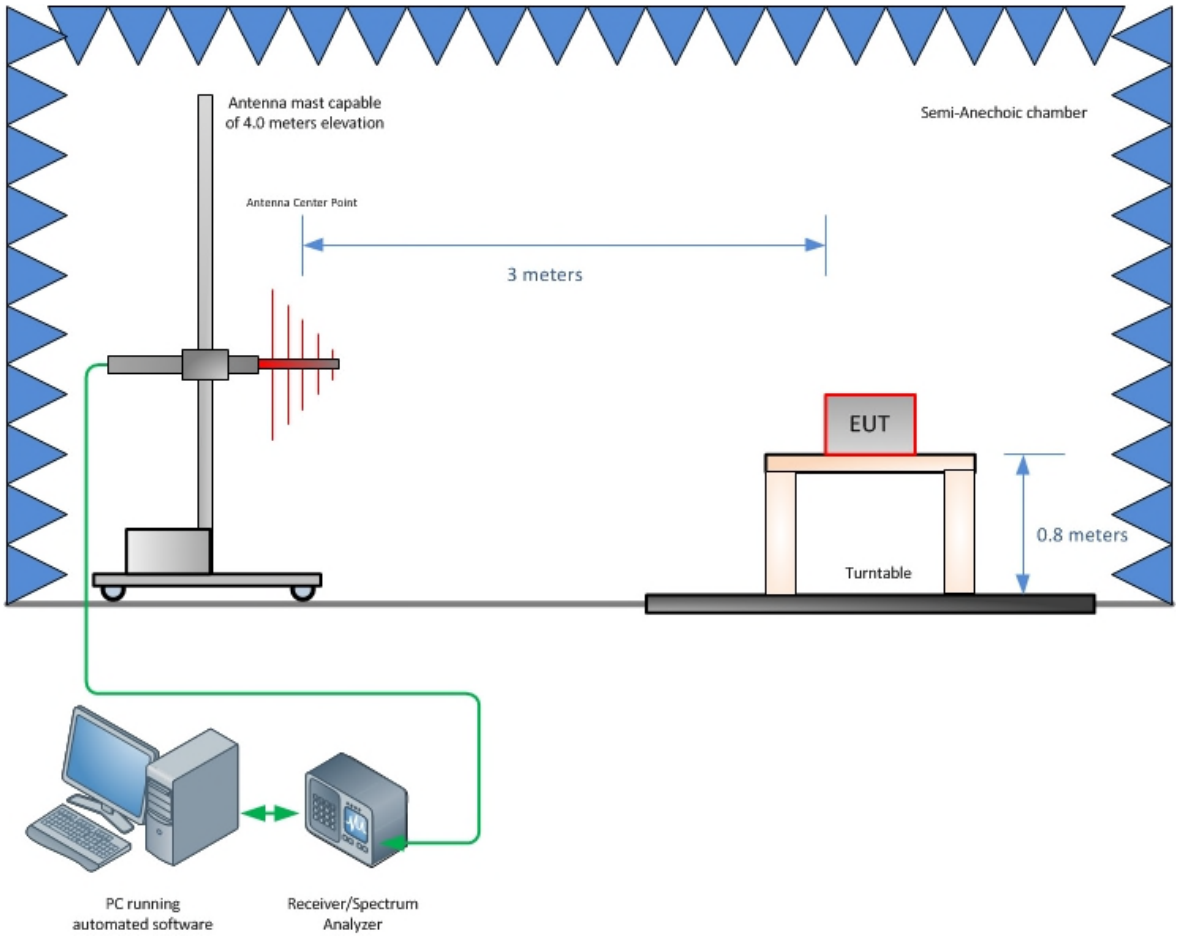
SECTION 4

DIAGRAM OF TEST SETUP

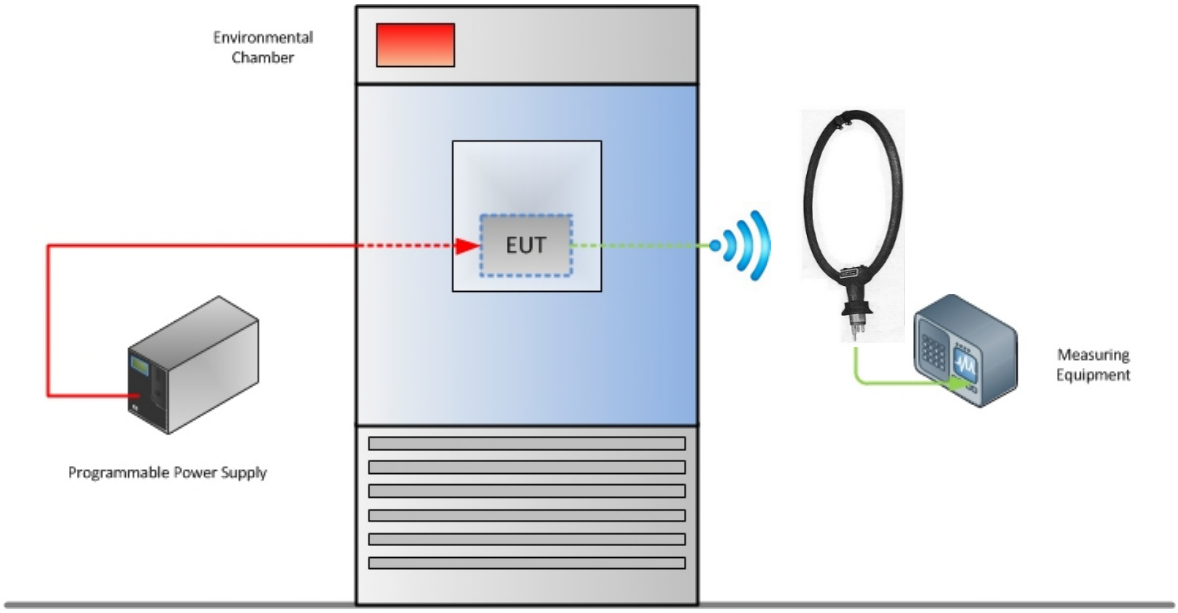
4.1 TEST SETUP DIAGRAM (EMISSION MASK)



4.2 TEST SETUP DIAGRAM (RADIATED EMISSIONS 30 TO 1000MHZ)

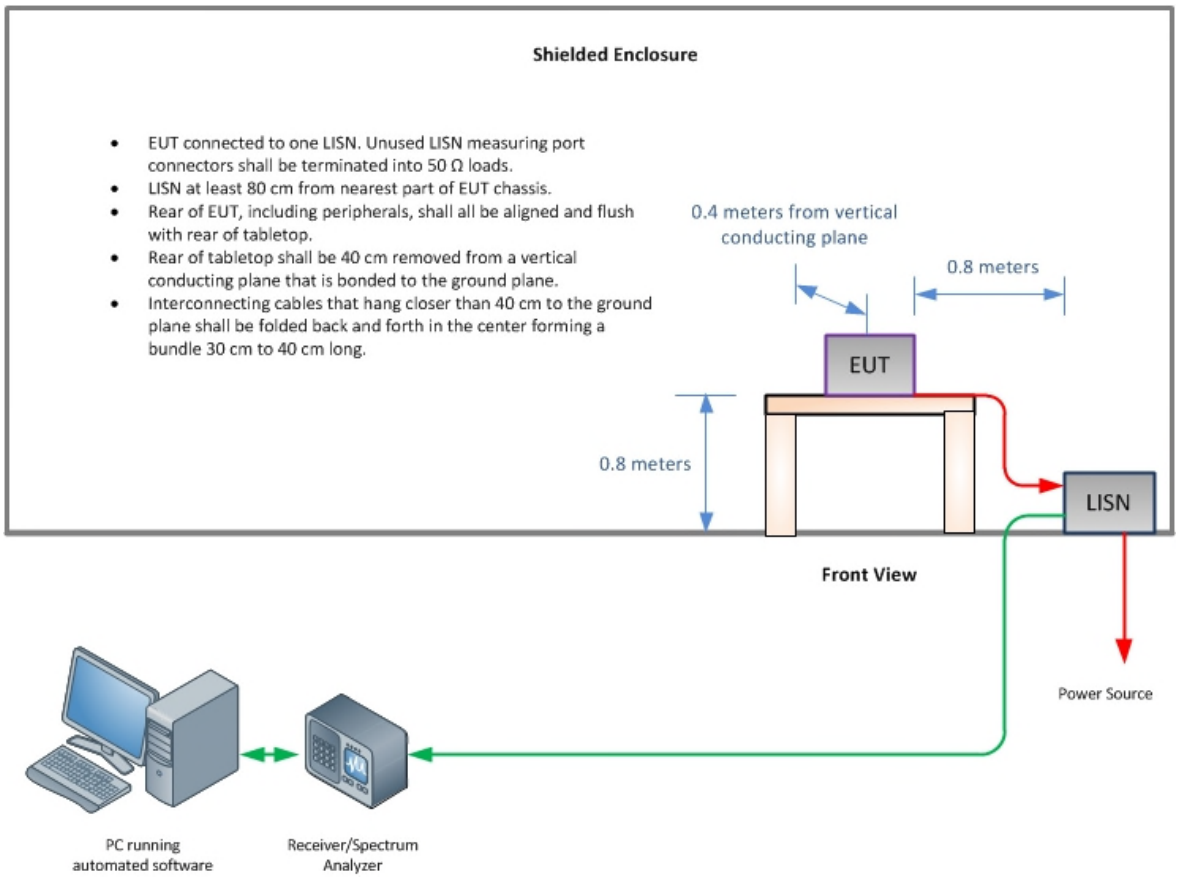


4.3 TEST SETUP DIAGRAM (FREQUENCY STABILITY)



Frequency Stability Test Comfiguration

4.4 TEST SETUP DIAGRAM (CONDUCTED EMISSIONS)



SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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