America

Choose certainty.
Add value.

Report On

Radio Testing of
Kidde Residential and Commercial
CDX-135Z

FCC Part 15 Subpart C §15.231
IC RSS-210, Issue 9, August 2016

Report No. TP72121497.200 **April 2017**

REPORT ON	Radio Testing of the Kidde Residential and Commercial CDX-135Z
TEST REPORT NUMBER	TP72121497.200
REPORT DATE	14. April 2017
PREPARED FOR	Kidde Residential and Commercial 1394 S. 3rd Street Mebane, NC 27302
CONTACT PERSON	Michael Richards Michael.Richards@KiddeUS.com
PREPARED BY	 Steven Hoke Title: Senior EMC Engineer
APPROVED BY	 Pete Walsh Authorized Signatory Title: Tampa Service Line Manager
DATED	14. April 2017

TÜV SÜD AMERICA INC 5610 W. Sligh Ave., Suite 100, Tampa, FL 33634 Phone: 813-284-2715 FAX: 813-413-3813

Revision History

TP72121497.200 Kidde Residential and Commercial CDX-135Z					
DATE	**OLD REVISION**	**NEW REVISION**	**REASON**	**PAGES AFFECTED**	**APPROVED BY**
24. April 2017	Initial Release				P. Walsh

TABLE OF CONTENTS

TÜV SÜD AMERICA INC 5610 W. Sligh Ave., Suite 100, Tampa, FL 33634 Phone: 813-284-2715 FAX: 813-413-3813

SECTION 1

REPORT SUMMARY

Radio Testing of
Kidde Residential and Commercial
CDX-135Z

TÜV SÜD AMERICA INC 5610 W. Sligh Ave., Suite 100, Tampa, FL 33634 Phone: 813-284-2715 FAX: 813-413-3813

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Kidde Residential and Commercial Model CDX-135Z to the requirements of FCC Part 15 Subpart C §15.231 and IC RSS-210, Issue 9, August 2016.

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	Kidde Residential and Commercial
Model Number(s)	CDX-135Z & SDX-135Z
FCC ID Number	SAK25609702
IC Number	7145A-25609702
Serial Number(s)	None
Number of Samples Tested	3
Test Specification/Issue/Date	• FCC Part 15 Subpart C §15.231 • IC RSS-210, Issue 9, August 2016.
Start of Test	02. March 2017
Finish of Test	19. April 2017
Name of Engineer(s)	David Foerstner
Related Document(s)	None. Supporting documents for EUT certification are separate exhibits.

TÜV SÜD AMERICA INC 5610 W. Sligh Ave., Suite 100, Tampa, FL 33634 Phone: 813-284-2715 FAX: 813-413-3813

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC Part 15 Subpart C §15.231 with cross-reference to the corresponding ISED RSS standard shown below.

Section	FCC Part 15	§15.231 Spec Clause	RSS	Test Description	Result	Comments/ Base Standard
-	§15.207 (a)		RSS-Gen 8.8	Conducted Emissions	N/A[1]	
-		§15.231(a)(3)	RSS-210 A1.1 (c)	Polling Or Supervision Transmissions, Including Data, To Determine System Integrity Of Transmitters Used In Security Or Safety Applications	Compliant	
2.1		§15.231(c)	RSS-210 A1.3	Bandwidth Requirement	Compliant	
2.2		§15.231(b)	RSS-210 A1.2	Field Strength Of Emissions	Compliant	
-		§15.231(d)	-	Frequency tolerance	N/A[3]	
-		§15.231(e)	RSS-210 A1.4	Field Strength Of Emissions	N/A[2]	
2.3		§15.231(a)(2)	RSS-210 A1.1 (b)	Transmission Verification For Transmitter Activated Automatically	Compliant	

N/A[1] *Not applicable. EUT is battery powered.*
N/A[2] *Not applicable.* Requirements of 15.231(b) were used.
N/A[3] *Not applicable. EUT does not transmit in the 40.60 – 40.70 MHz band.*

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) is a Kidde Residential and Commercial, Model CDX-135Z as shown in the photograph below. It is a wireless Smoke/CO Detector with Heat and Freeze Sensor.

Equipment Under Test

1.3.2 EUT General Description

EUT Description	Wireless Smoke/CO Detector with Heat and Freeze Sensor
Model Number(s)	CDX-135Z
Power Source	3.0VDC lithium battery
EUT Field Strength	76.84 dBµV/m @ 3meters
Frequency Range	319.5 MHz
Modulation	FSK
Antenna Type	Integral Antenna
RFID Antenna Connector	N/A

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
A	EUT in test mode transmitting continually modulated signal. Configuration used for radiated emissions measurements.
B	EUT in Alarm mode. Configuration used for Duty Cycle Factor verification.

1.4.2 EUT Exercise Software

The manufacturer provided the samples configured below.

UUT2: 319MHz CW continuous TX
UUT4: 319MHz Modulated continuous TX
UUT5: 319/915 No TX, RX only.
UUT6: 319/915 normal operation at 4min 319 supervision, cease TX after 5sec

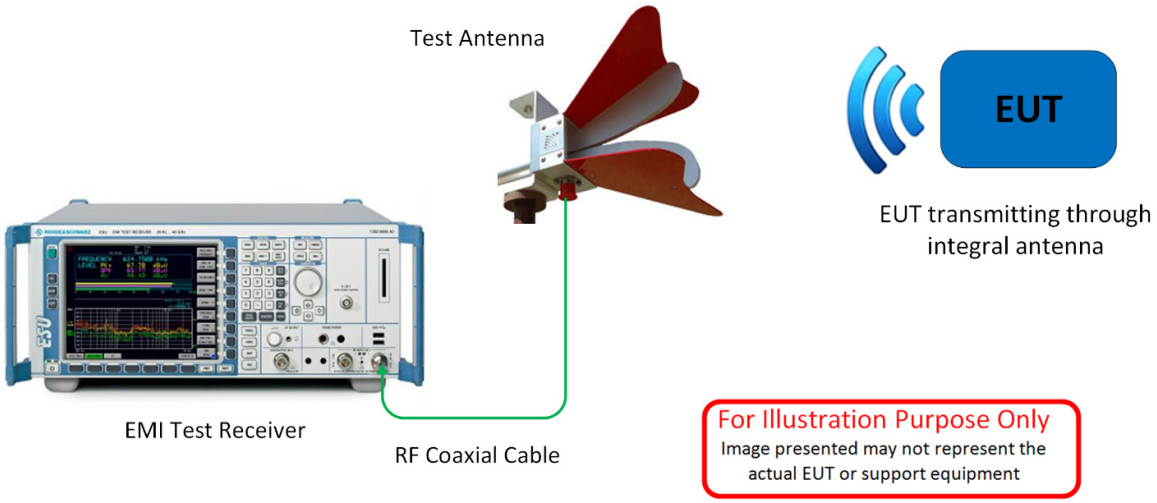
1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description

1.4.4 Worst Case Configuration

For radiated measurements, the EUT was investigated in all orthogonal directions. Testing was completed with the EUT in a horizontal position, which was the worst case.

1.4.5 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 N/A		
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.
For conducted and radiated emissions the equipment under test (EUT) was configured to measure its highest possible emission level. This level was based on the maximized cable configuration from exploratory testing per ANSI C63.10-2013. The test modes were adapted according to the Operating Instructions provided by the manufacturer/client.

1.8 TEST FACILITY LOCATION

1.8.1 TÜV SÜD America Inc. (Tampa)

5610 W. Sligh Ave., Suite 100 Tampa, FL 33634 Phone: 813 284 2715 FAX: 813-413 3813

1.9 TEST FACILITY REGISTRATION

1.9.1 FCC – Registration No

The TUV SUD America Inc. (Tampa), test facility has been registered with the Federal Communication Commission as an ISO/IEC 17025 accredited test laboratory and assigned the designation number US1063.

1.9.2 Innovation, Science and Economic Development Canada Registration

The TUV SUD America Inc. (Tampa), test facility has been registered with Innovation, Science and Economic Development Canada and assigned the site number 2087A-2.

SECTION 2

TEST DETAILS

Radio Testing of
Kidde Residential and Commercial
CDX-135Z

2.1 BANDWIDTH REQUIREMENT

2.1.1 Specification Reference

Part 15 Subpart C §15.231(c), RSS-210 Issue A1.3

2.1.2 Standard Applicable

(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.

2.1.3 Equipment Under Test and Modification State

Serial No: None/Test Configuration A

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

19. April 2017/DF

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

Ambient Temperature	22 °C
Relative Humidity	42 %

2.1.7 Additional Observations

- This is a radiated test.
- Span is set to encompass the whole emission
- RBW is 1% of the span while VBW is greater than 3X RBW.
- Sweep is auto.
- Detector is peak.
- Max hold function activated.
- "x dB" function (20dB) under Occupied Bandwidth measurement of the spectrum analyzer was used for FCC Part 15.231 requirement.
- Occupied bandwidth % power set to 99% for ISED RSS-210 requirement.

2.1.8 Test Results

Transmitter Frequency (MHz)	Modulation	0.25% of the center frequency requirement	Measured 20dB Bandwidth (MHz)	99% Bandwidth (MHz)
319.5	FSK	<798.8 kHz	368 kHz	440 kHz

2.1.9 Test Results Plots

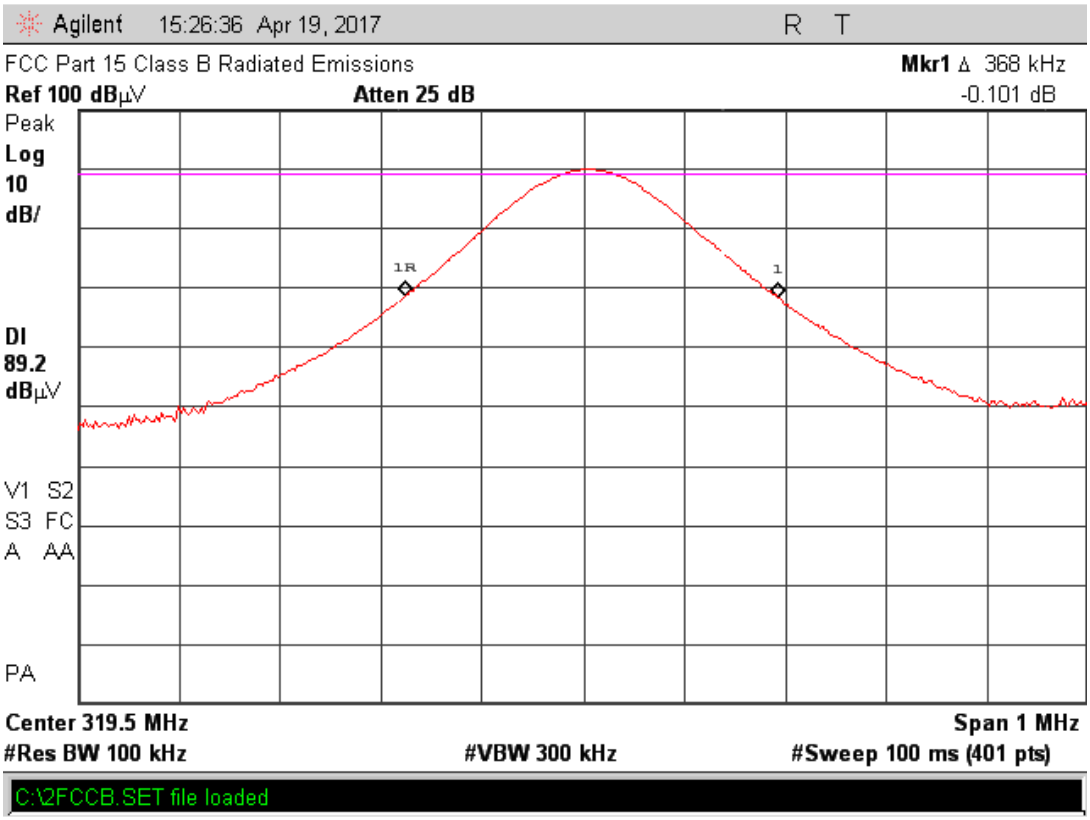


Figure 2.1.9-1 - 20 dB Occupied Bandwidth

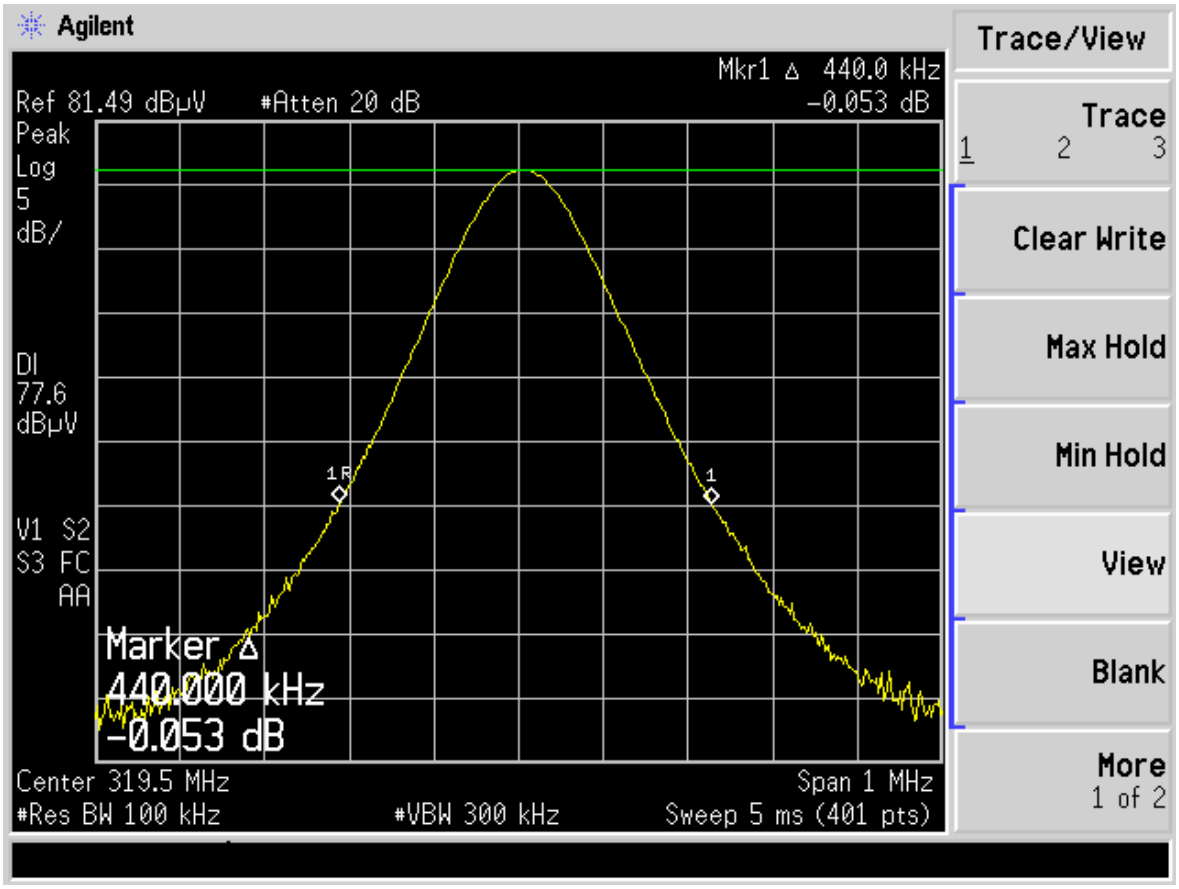


Figure 2.1.9-2 - 99% Occupied Bandwidth

2.2 FIELD STRENGTH OF EMISSIONS

2.2.1 Specification Reference

Part 15 Subpart C §15.231(b), RSS-210 Issue 9 A1.4

2.2.2 Standard Applicable

(b) In addition to the provisions of §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	2,250	225
70-130	1,250	125
130-174	[1] 1,250 – 3,750	[1] 125 - 375
174-260	3,750	375
260-470	[1] 3,750 – 12,500	[1] 375 – 1,250
Above 470	1,250	500

[1]Linear Interpolations

2.2.3 Equipment Under Test and Modification State

Serial No: None / Test Configuration A and B

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

02. & 03. March 2017 / DF

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. Tampa facility.

Ambient Temperature	23.9-24.3°C
Relative Humidity	44.1-48.6%

2.2.7 Additional Observations

- This is a radiated test. The spectrum was searched from 30MHz to the 10th harmonic, 3.2 GHz.
- There were no emissions found that did not comply with the restricted bands defined in FCC Part 15 Subpart C, 15.205.

- Measurement was done using EMC32 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.

2.2.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (dBµV) @ 30 MHz			20.0
Correction Factor (dB)	Cable 2	0.24	18.94
	TEMC00011 (antenna)	18.70	
Reported QuasiPeak Final Measurement (dBµV/m) @ 30MHz			**38.94**

2.2.9 Test Results

See attached plots.

2.2.10 Fundamental Emissions (315 MHz)

Calculated Average Limit

(12,500 – 3750) / (470-260) = limit change per MHz
(8,750) / (210) = limit change per MHz
41.67 = limit change per MHz

470 MHz – 319.5 MHz = 150.5 MHz delta
150.5 * 41.67 = 6,271
12,500 – 6,271 = 6,229 = limit at 319.5 MHz
Average limit = (20 log 6,229) = 75.89 dBuV/m

Peak Limit = Average limit +20 dB
Peak Limit = 95.89 dBuV/m

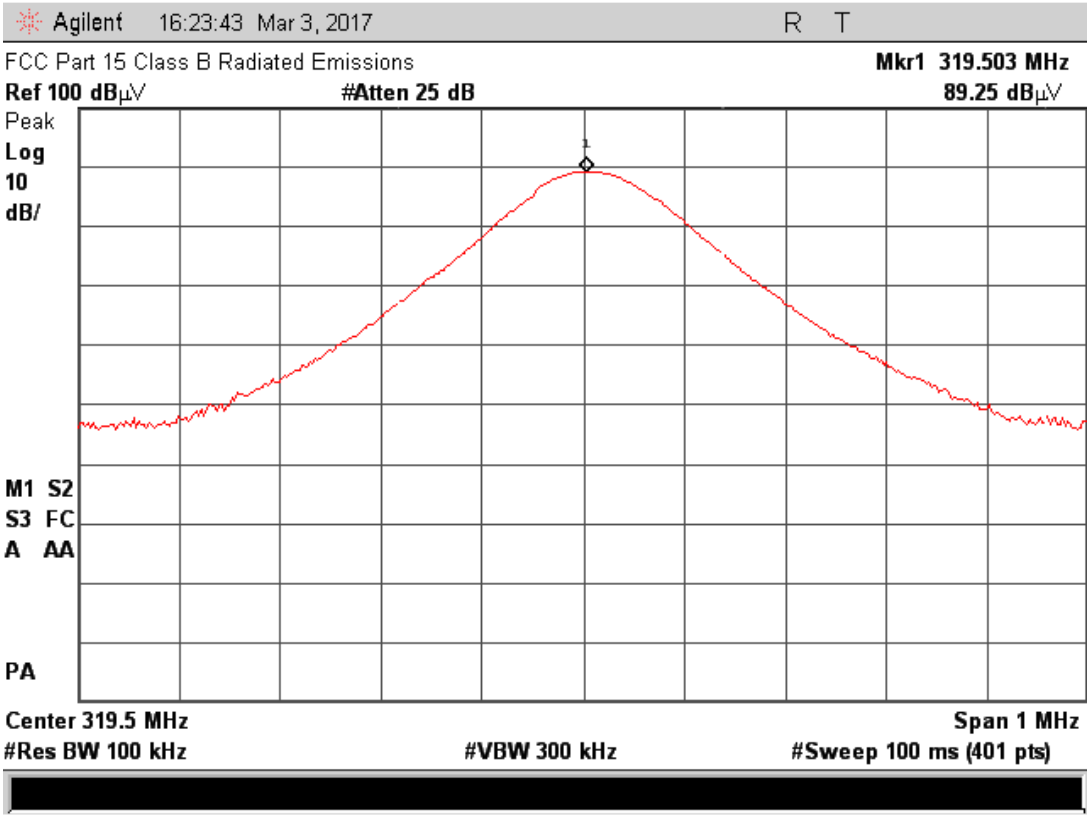


Figure 2.2.10-1 – Peak Field Strength Measurement

Table 2.2.10-1 – Peak Data

Frequency (MHz)	Peak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
319.5	89.25	105	H	182.0	6.4	95.9

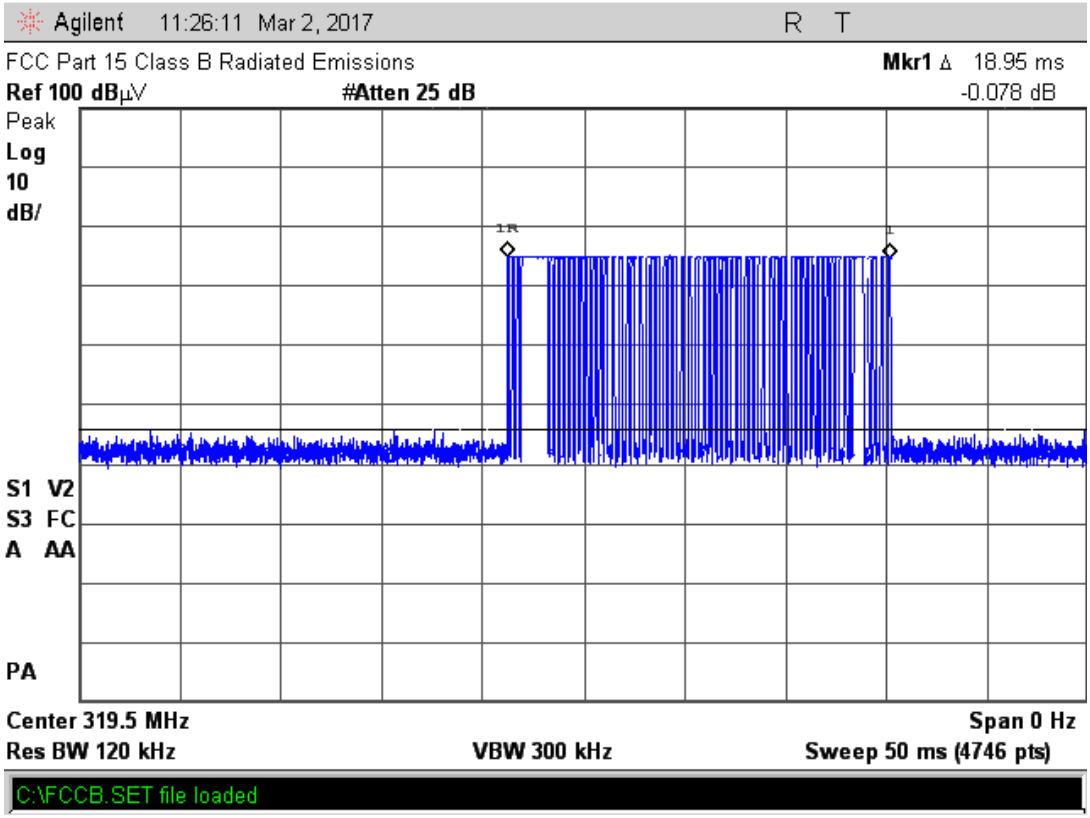


Figure 2.2.10-2 – DUTY CYCLE – WORST CASE

Duty cycle correction factor is calculated by (20 log duty cycle) where duty cycle is on/off period within (100) mS transmission period.

From above, duty cycle = (18.96/100) = (0.1896)

(20 log 0.1896) = (-14.44)

Duty cycle adjusted Average level = peak level – 14.44 dB

Duty cycle adjusted Average level = 89.25 – 14.44 = 74.81 dBuV/m

Table 2.2.10-2 – Average Data

Frequency (MHz)	Peak level without DCF (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Average with DCF (dBµV/m)	Margin (dB)	Limit (dBµV/m)
319.5	89.3	105.2	H	182.0	74.8	1.1	75.9

Test Notes:
Duty cycle correction factor of 14.44 dB was used for average emissions calculation.

2.2.11 Spurious Emissions (30 MHz to 1 GHz)

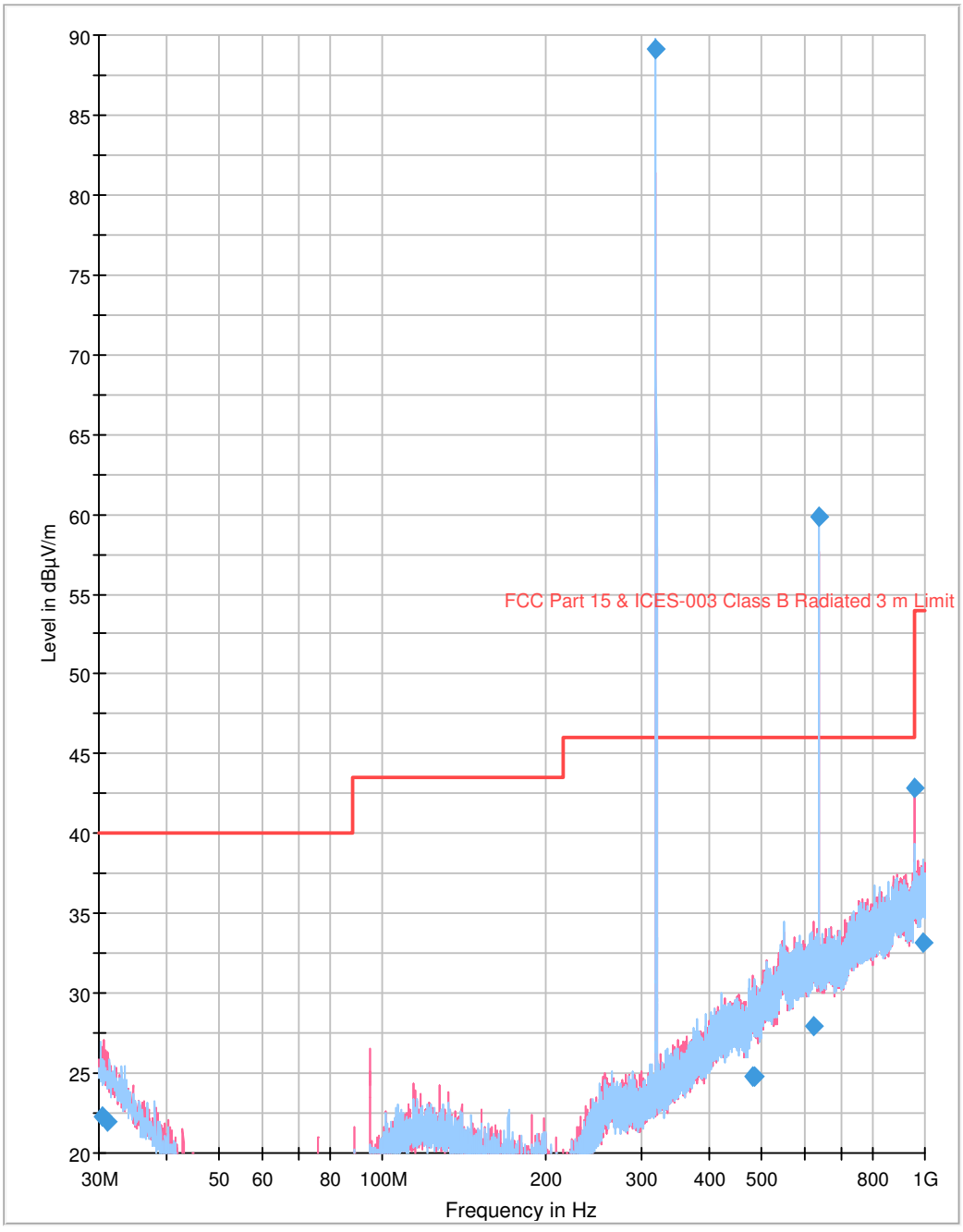


Figure 2.2.11-1 – Radiated Emissions Plot 30 MHz – 1000 MHz

Table 2.2.11-1 - Peak Detector Data

Frequency (MHz)	Peak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
30.400000	22.3	228.0	H	329.0	24.7	17.7	40.0
31.160000	22.0	400.0	V	0.0	24.2	18.0	40.0
319.520000	89.2	100.0	H	326.0	21.4	Fundamental	
482.240000	24.8	299.0	H	47.0	25.9	21.2	46.0
485.400000	24.8	199.0	V	60.0	25.8	21.2	46.0
621.920000	28.0	134.0	V	312.0	28.3	18.0	46.0
639.000000	59.9	100.0	H	319.0	28.1	16.0	75.9
958.520000	42.8	134.0	H	159.0	31.5	33.1	75.9
990.840000	33.2	134.0	V	227.0	31.6	20.7	54.0

Notes:

The second and third harmonics were measured while the transmitter was in CW mode, therefore the quasi-peak amplitude above is equal to the peak detector level. The average limit for spurious emissions is (20) dB lower than the fundamental limit. The average limit is 55.9 dBuV/m at 639.0 MHz. The peak amplitude measured at 639.0 MHz was 59.9 dBuV/m. Adjusting for duty cycle correction, the average amplitude at 639.0 MHz is 59.9 – 14.4 = 45.5.

Average limit (55.9) – (45.5) = 10.4 dB margin at 639.0 MHz.

Table 2.2.11-1 - Average Detector Data

Frequency (MHz)	Average Duty Cycle Adj. (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
639.000000	45.5	100.0	H	319.0	28.1	10.4	55.9
958.520000	28.4	134.0	H	159.0	31.5	27.5	55.9

2.2.12 Test Results Above 1 GHz

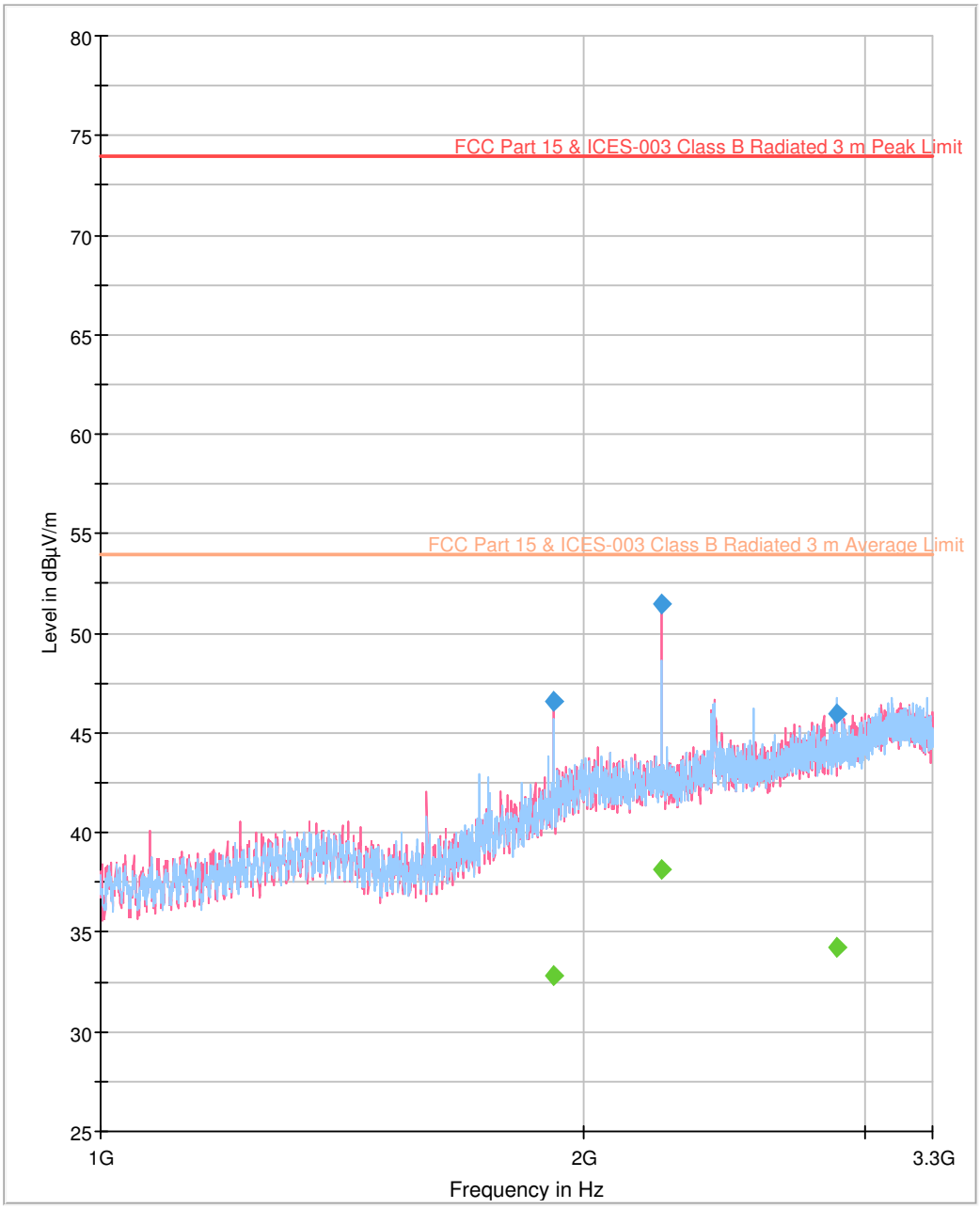


Figure 2.2.12-1 – Radiated Emissions Plot above 1 GHz

Table 2.2.12-1 - Peak Detector Data above 1 GHz

Frequency (MHz)	MaxPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1917.00000	46.6	235.0	V	15.0	0.2	27.4	74.0
2236.60000	51.5	215.0	V	0.0	1.2	22.5	74.0
2875.40000	46.0	258.0	H	313.0	2.8	28.0	74.0

Table 2.2.12-2 - Average Detector Data above 1 GHz

Frequency (MHz)	Average without DCF (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1917.00000	32.8	235.0	V	15.0	0.2	21.2	54.0
2236.60000	38.2	215.0	V	0.0	1.2	15.8	54.0
2875.40000	34.2	258.0	H	313.0	2.8	19.8	54.0

2.3 TRANSMISSION VERIFICATION FOR TRANSMITTER ACTIVATED AUTOMATICALLY

2.3.1 Specification Reference

Part 15 Subpart C §15.231(a)(2), RSS-210 Issue 9 A1.1 (b)

2.3.2 Standard Applicable

A transmitter activated automatically shall cease transmission within 5 seconds after activation

2.3.3 Equipment Under Test and Modification State

Serial No: None / Test Configuration A

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

03. March 2017 / DF

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. Tampa facility.

Ambient Temperature	23 °C
Relative Humidity	36 %

2.3.7 Additional Observations

- This is a radiated test.
- Span was set to zero
- Sweep time set to (5) seconds
- EUT is set to transmit mode and observed for (5) seconds

2.3.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (dBµV) @ 30 MHz			20.0
Correction Factor (dB)	Cable 2	0.24	18.94
	TEMC00011 (antenna)	18.70	
Reported QuasiPeak Final Measurement (dBµV/m) @ 30MHz			**38.94**

See attached plots.

2.3.9 Test Results

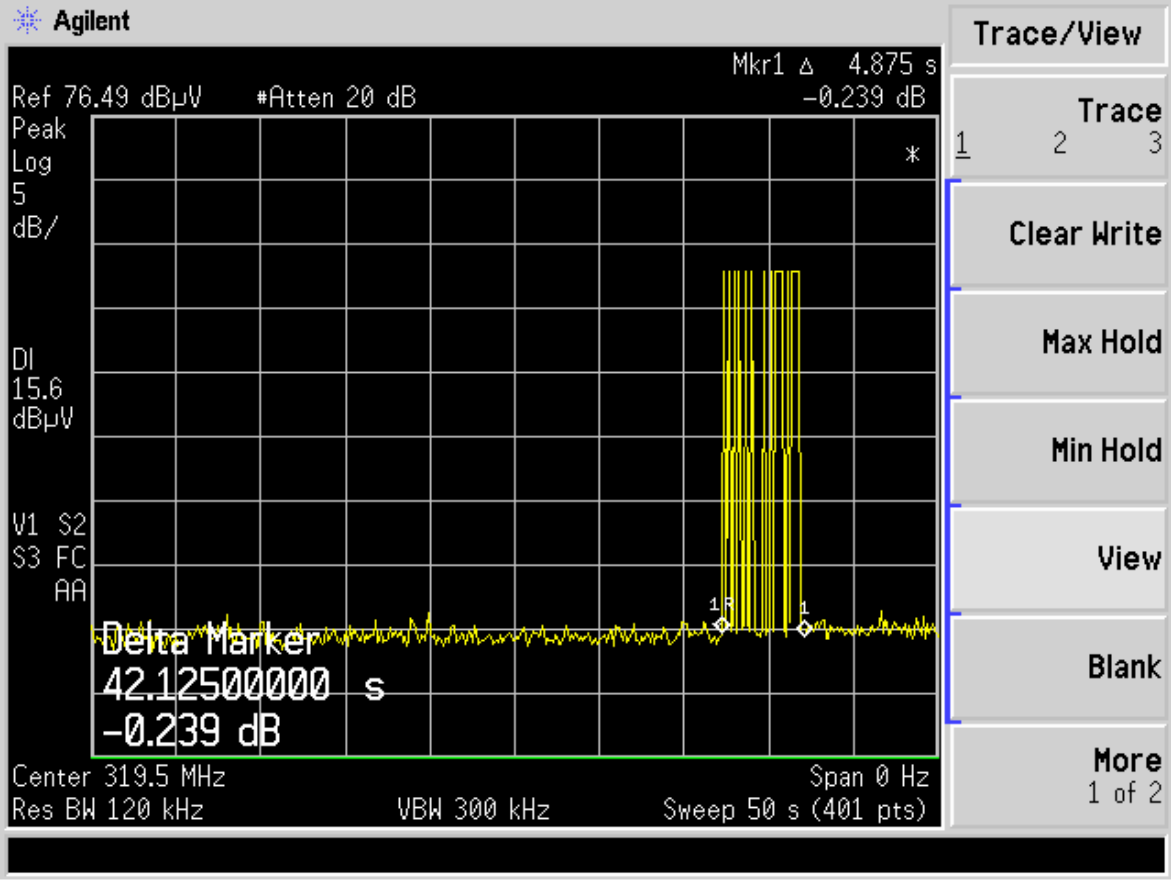


Figure 2.3.9-1 – Time to Cease Transmission

Notes:

Automatically turns off within (4.875) seconds

SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT USED

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

ID Number	Test Equipment	Type	Serial Number	Manufacturer	Cal Date	Cal Due Date
Antenna Conducted Port Setup						
Radiated Test Setup						
TEMC00005	Bilog Antenna	6112B	2579	Chase EMC	12/17/2015	12/17/2017
TEMC00061	Double-ridged waveguide horn antenna	3117	00109296	ETS Lindgren	2/3/2016	2/3/2018
TEMC00128	EMI Test Receiver	ESIB 40	100255/040	Rhode & Schwarz	11/7/2016	11/7/2017
TEMC00012	Spectrum Analyzer	E7404A	MY42000055	Agilent	4/10/2015	4/10/2017
TEMC00013	Pre-amplifier	PA-122	181925	Compower	10/3/2016	10/3/2017
TEMC00091	Spectrum Analyzer	E7402A	US39150137	Agilent	4/4/2017	2/4/2018
	High-frequency cable					
	High-frequency cable					
Conducted Emissions						
Miscellaneous						

3.2 MEASUREMENT UNCERTAINTY

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

3.2.1 Radiated Emission Measurements (Below 1GHz)

Radiated Measurement 30 - 1000 MHz at a distance of 3 m

	Input Quantity (Contribution) X_i	Value		Prob. Dist.	Divisor	$u_i(x)$	$u_i(x)^2$
1	Receiver reading	0.10	dB	Normal, k=1	1.000	0.10	0.01
2	Attenuation: antenna-receiver	0.20	dB	Normal, k=2	2.000	0.10	0.01
3	Antenna factor AF	0.58	dB	Normal, k=2	2.000	0.29	0.08
4	Receiver sinewave accuracy	0.40	dB	Normal, k=2	2.000	0.20	0.04
5	Receiver pulse amplitude	1.50	dB	Rectangular	1.732	0.87	0.75
6	Receiver pulse repetition rate	1.50	dB	Rectangular	1.732	0.87	0.75
7	Noise floor proximity	0.50	dB	Rectangular	1.732	0.29	0.08
8	Mismatch: antenna-receiver	0.95	dB	U-shaped	1.414	0.67	0.45
9	AF frequency interpolation	0.30	dB	Rectangular	1.732	0.17	0.03
10	AF height deviations	0.10	dB	Rectangular	1.732	0.06	0.00
11	Directivity difference at 3 m	3.12	dB	Rectangular	1.732	1.80	3.24
12	Phase center location at 3 m	1.00	dB	Rectangular	1.732	0.58	0.33
13	Cross-polarisation	0.90	dB	Rectangular	1.732	0.52	0.27
14	Balance	0.00	dB	Rectangular	1.732	0.00	0.00
15	Site imperfections	3.85	dB	Triangular	2.449	1.57	2.47
16	Separation distance at 3 m	0.30	dB	Rectangular	1.732	0.17	0.03
17	Effect of setup table material	0.77	dB	Rectangular	1.732	0.44	0.20
18	Table height at 3 m	0.10	dB	Normal, k=2	2.000	0.05	0.00
19	Near-field effects	0.00	dB	Triangular	2.449	0.00	0.00
20	Effect of ambient noise on OATS	0.00	dB				0.00
	Combined standard uncertainty			Normal	2.96	dB	
	Expanded uncertainty			Normal, k=2	**5.92**	**dB**	

3.2.2 Radiated Emission Measurements (Above 1GHz)

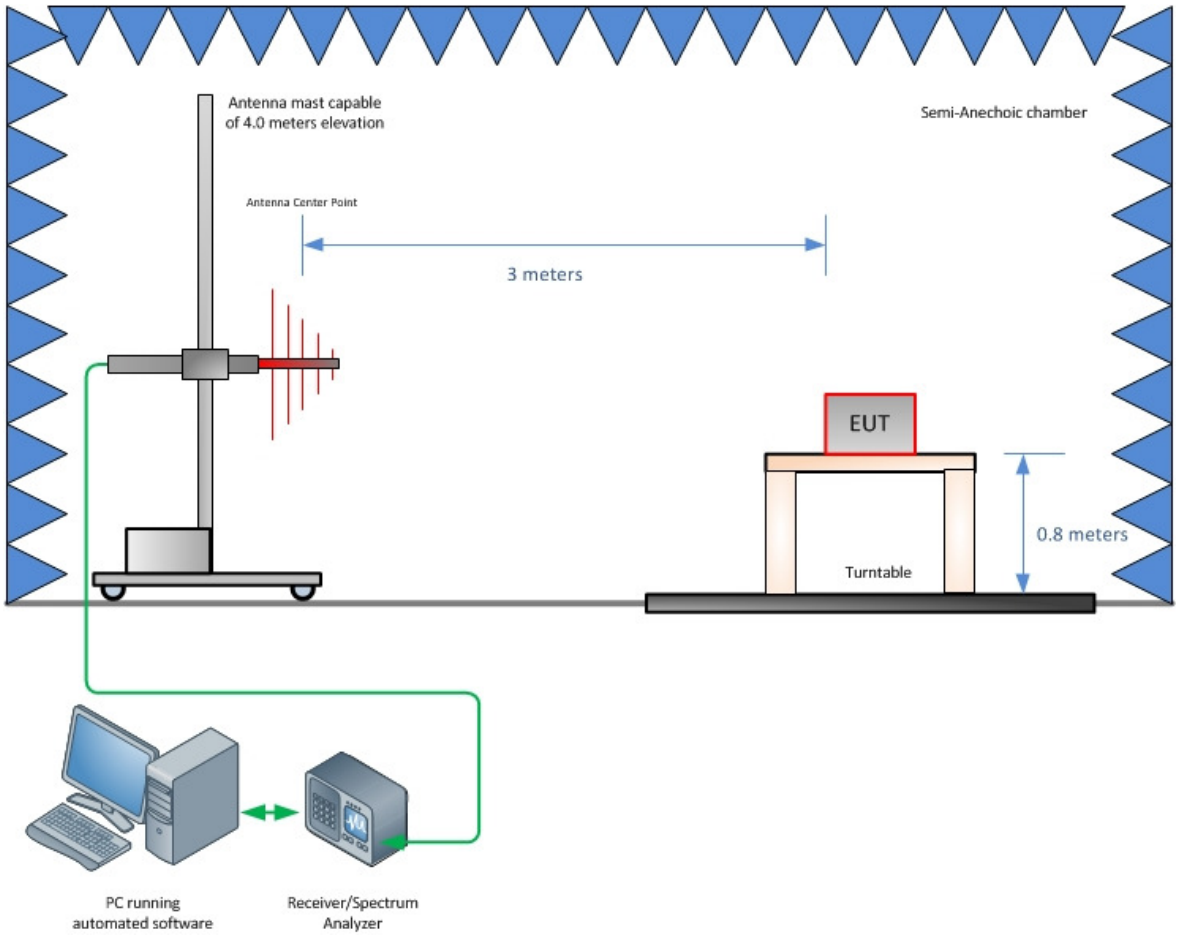
Radiated Measurement Above 1 GHz at a distance of 3 m

	Input Quantity (Contribution) X_i	Value		Prob. Dist.	Divisor	$u_i(x)$	$u_i(x)^2$
1	Receiver reading	0.10	dB	Normal, k=1	1.000	0.10	0.01
2	Attenuation: antenna-receiver	0.30	dB	Normal, k=2	2.000	0.15	0.02
3	Preamplifier Gain	0.20	dB	Normal, k=2	2.000	0.10	0.01
4	Antenna factor AF	0.75	dB	Normal, k=2	2.000	0.38	0.14
5	Sinewave accuracy	0.20	dB	Normal, k=2	2.000	0.10	0.01
6	Instability of preamp gain	1.21	dB	Rectangular	1.732	0.70	0.49
7	Noise floor proximity	0.70	dB	Rectangular	1.732	0.40	0.16
8	Mismatch: antenna-preamplifier	1.41	dB	U-shaped	1.414	1.00	0.99
9	Mismatch: preamplifier-receiver	1.30	dB	U-shaped	1.414	0.92	0.85
10	AF frequency interpolation	0.30	dB	Rectangular	1.732	0.17	0.03
11	Directivity difference at 3 m	1.50	dB	Rectangular	1.732	0.87	0.75
12	Phase center location at 3 m	0.30	dB	Rectangular	1.732	0.17	0.03
13	Cross-polarisation	0.90	dB	Rectangular	1.732	0.52	0.27
14	Site imperfections VSWR (Method 2)	2.25	dB	Triangular	2.449	0.92	0.84
15	Effect of setup table material	2.90	dB	Rectangular	1.732	1.67	2.80
16	Separation distance at 3 m	0.30	dB	Rectangular	1.732	0.17	0.03
17	Table height at 3 m	0.00	dB	Normal, k=2	2.000	0.00	0.00
	Combined standard uncertainty			Normal	2.73	dB	
	Expanded uncertainty			Normal, k=2	**5.46**	**dB**	

SECTION 4

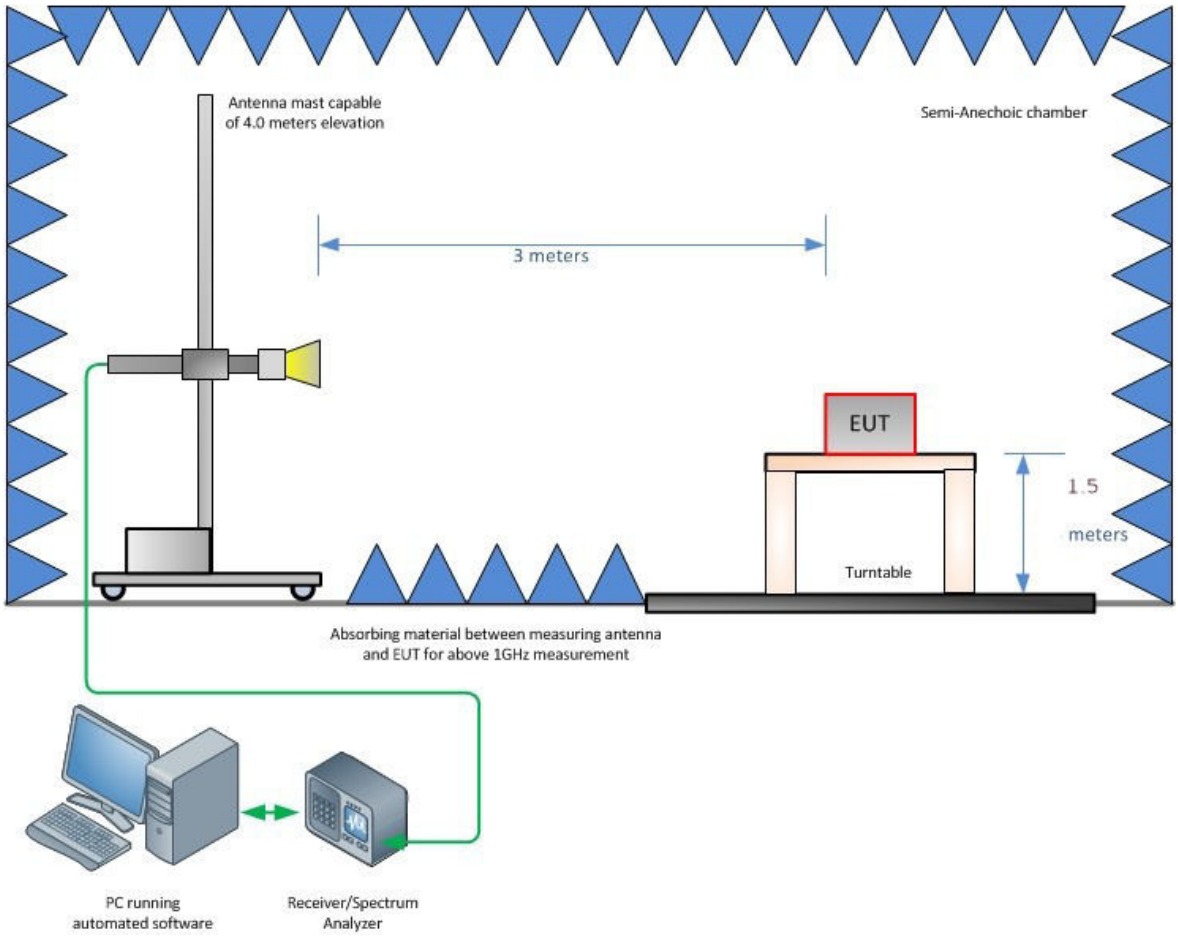
DIAGRAM OF TEST SETUP

4.1 RADIATED EMISSION TEST SETUP (BELOW 1GHZ)



Radiated Emission Test Setup (Below 1GHz)

4.2 RADIATED EMISSION TEST SETUP (ABOVE 1GHZ)



Radiated Emission Test Setup (Above 1GHz)

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

TÜV SÜD America Inc.'s reports apply only to the specific sample tested under stated test conditions. It is the manufacturer's responsibility to assure the continued compliance of production units of this model. TÜV SÜD America, Inc. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD America, Inc.'s issued reports.

This report is the confidential property of the client. As a mutual protection to our clients, the public and TÜV SÜD America, Inc., extracts from the test report shall not be reproduced, except in full without TÜV SÜD America, Inc.'s written approval.

This report must not be used to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the federal government.

TÜV SÜD America, Inc. and its professional staff hold government and professional organization certifications for A2LA, AAMI, ACIL, AEA, ANSI, IEEE, and iNARTE.

A2LA Cert. No. 2955.15

TÜV SÜD AMERICA INC 5610 W. Sligh Ave., Suite 100, Tampa, FL 33634 Phone: 813-284-2715 FAX: 813-413-3813