166 South Carter, Genoa City, WI 53128

Company:	RF Technologies
Model Tested:	9450-6262
Report Number:	23685a
Project Number:	9618

Code of Federal Regulations 47 Part 15 – Radio Frequency Devices

Subpart C – Intentional Radiators
Section 15.231
Periodic operation in the band 40.66 - 40.70 MHz
and above 70 MHz

THE FOLLOWING **MEETS** THE ABOVE TEST SPECIFICATION

FCC ID: KXU-CBTX3

Formal Name:	Smart Sense Infant Transmitter
Kind of Equipment:	Wireless Infant Security Device
Frequency Range:	318 MHz and 262 kHz
Test Configuration:	Body-worn, battery operated device tested in three orthogonal positions.
Model Number(s):	9450-6262
Model(s) Tested:	9450-6262
Serial Number(s):	Test Sample 1A – normal operation Test Sample 262A – FCC test firmware
Date of Tests:	April 25th through 27th, 2018
Test Conducted For:	RF Technologies, Inc. 3125 N. 126th Street Brookfield, WI 53005

NOTICE: "This test report relates only to the items tested and must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government". Please see the "Description of Test Sample" page listed inside of this report.

© Copyright 1983 - 2018 D.L.S. Electronic Systems, Inc.

COPYRIGHT NOTICE
This report must not be reproduced (except in full), without the approval of D.L.S. Electronic Systems, Inc.

SIGNATURE PAGE

Report By:

Craig Brandt
Test Engineer

Reviewed By:

William Stumpf
OATS Manager

Approved By:

Brian Mattson
General Manager

Table of Contents

i. Cover Page 1
ii. Signature Page 2
iii. Table of Contents 3
iv. NVLAP Certificate of Accreditation 4
1.0 Summary of Test Report 5
2.0 Introduction 5
3.0 Test Facilities 6
4.0 Description of Test Sample 6
5.0 Test Equipment 8
6.0 Test Arrangements 9
7.0 Test Conditions 9
8.0 Modifications Made To EUT For Compliance 9
9.0 Additional Descriptions 10
10.0 FCC 15.31 (e) Supply Voltage Requirement statement 10
11.0 FCC 15.203 Antenna Requirement statement 11
12.0 Results 11
13.0 Conclusion 11
Appendix A – Test Setup Photos 12
Appendix B – Measurement Data 16
1.0 Emission Bandwidth – 20 dB 16
2.0 Automatic Deactivation 18
3.0 Periodic Transmissions 20
4.0 Field Strength of Emissions – Fundamental and Spurious (318 MHz) 23
5.0 Duty Cycle Correction (318 MHz) 25
Appendix C – Measurement Uncertainty 29

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 100276-0

D.L.S. Electronic Systems, Inc.
Wheeling, IL

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Electromagnetic Compatibility & Telecommunications

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2017-09-29 through 2018-09-30
Effective Dates

For the National Voluntary Laboratory Accreditation Program

ELECTROMAGNETIC COMPATIBILITY & TELECOMMUNICATIONS

NVLAP LAB CODE 100276-0

Emissions

Designation	***Description***
Off-site test location	D.L.S. Electronics performs radiated emissions testing at an additional location, 166 South Carter Street, Genoa City, WI 53128.

1.0 Summary of Test Report

It was determined that the Smart Sense Infant Transmitter, Model 9450-6262, complies with the requirements of CFR 47 Part 15 Subpart C Section 15.231.

Subpart C Applicable Technical Requirements Tested:

Section	Description	Procedure	Note	Compliant?
15.231(c)	20 dB Emission Bandwidth	ANSI C63.10-2013	2	Yes
15.231(a)(2)	Transmission Deactivation	ANSI C63.10-2013	2	Yes
15.231(a)(3)	Periodic Transmissions	ANSI C63.10-2013	2	Yes
15.231(b)	Field Strength of Emissions - Fundamental and Spurious -	ANSI C63.10-2013	1,2	Yes
15.35(c)	Duty Cycle Correction for Pulsed operation	ANSI C63.10-2013	2	Informative

Note 1: Tested in 3 orthogonal planes.
Note 2: Radiated emission measurement.

2.0 Introduction

On April 25th through 27th, 2018 the Smart Sense Infant Transmitter, Model 9450-6262, as provided from RF Technologies Inc. was tested to the requirements of CFR 47 Part 15 Subpart C Section 15.231. To meet these requirements, the procedures contained within this report were performed by personnel of D.L.S Electronic Systems, Inc.

3.0 Test Facilities

D.L.S. Electronic Systems, Inc. is a full service EMC/Safety Testing Laboratory accredited to ISO 17025. NVLAP Certificate and Scope can be viewed at http://www.dlsemc.com/certificate. Our facilities are registered with the FCC, Innovation Science and Economic Development Canada, and VCCI.

Wisconsin Test Facility:
D.L.S. Electronic Systems, Inc.
166 S. Carter Street
Genoa City, Wisconsin 53128

Wheeling Test Facility:
D.L.S. Electronic Systems, Inc.
1250 Peterson Drive
Wheeling, IL 60090

FCC Registration #90531

4.0 Description of Test Sample

Description:

The device is a wireless security device intended to prevent the abduction of an infant from a healthcare facility. The device is attached to the ankle of an infant with a stretchable band material, and it is this attachment which enables the monitoring features. Once enabled, the device will periodically send status OK messages wirelessly on a 318 MHz signal to a central computer server which means the infant is within the safe boundary at the healthcare facility. The device can sense security breaches using one or more of the following features: physical cutting of the stretchy band material, a change in resistance of the band material, or a change in capacitive patient proximity measurement. Once a security breach is expreienced, the device sends a special alarm signal wirelessly on a 318 MHz RF signal to a central computer server thereby notifying the facility staff. The device also transmits wirelessly periodically at 262 kHz which will cause wireless receivers mounted, for example, at doors to indicate a security breach in the event the device is brought in close proximity to those receivers. The transmitters do not transmit simultaneously on the 318 MHz and 262 kHz.

Type of Equipment / Frequency Range:

Body-Worn / 318 MHz and 262 kHz

Physical Dimensions of Equipment Under Test:

Length: 1.6 in. x Width: 1.2 in. x Height: 0.675 in.

4.0 Description of Test Sample (continued)

Power Source:

3.6 VDC battery

Internal Frequencies:

16.777216 MHz

Transmit Frequencies Used For Test Purpose:

318 MHz

Type of Modulation(s) / Antenna Type:

OOK / 318 MHz transmitter uses a short non-resonant strip on the circuit board.

Description of Circuit Board(s) / Part Number:

PCB Assembly, Smart Sense Tx, 262 kHz	0830-0202

5.0 Test Equipment

A list of the equipment used can be found in the table below. All primary equipment was calibrated against known reference standards with a verified traceable path to NIST.

D.L.S. Wisconsin – OATS Site 2 - Test Equipment:

Description	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Dates	Cal Due Dates
Receiver	Rohde & Schwarz	ESI 40	837808/006	20 Hz – 40 GHz	4-11-18	4-11-19
Antenna	EMCO	3104C	9701-4785	20 MHz – 200 MHz	3-1-18	3-1-20
Antenna	EMCO	3146	1604	200 MHz – 1 GHz	9-12-16	9-12-18
Horn Antenna	EMCO	3115	6204	1-18GHz	8-23-17	8-23-19
Cable	Micro-Coax	UFB311A-1	CBL-095	30 MHz – 18 GHz	5-5-17	5-5-18
High Pass Filter	Q-Microwave	100460	2	1-18GHz	7-7-17	7-7-18
Preamplifier	Miteq	AMF-7D-01001800-22-10P	1777990	1-18GHz	1-8-18	1-8-19
Cable	Beldin	9914	CBL-005	9 kHz – 1 GHz	11-27-17	11-27-18
Cable	Beldin	9273	CBL-028	9 kHz – 1 GHz	11-27-17	11-27-18
Cable	Manhattan/CDT	RG-223/U	CBL-051	9 kHz – 1 GHz	11-27-17	11-27-18
Test Software	Rohde & Schwarz	ESK1	V1.7.1	N/A	N/A	N/A
Signal Generator	Rohde & Schwarz	SMT 03	DE23762	5 kHz – 3 GHz	4-11-18	4-11-19
Tuned Dipole	Com-Power	AD-100	40139	118 MHz	N/A	N/A

6.0 Test Arrangements

Radiated Emissions Measurement Arrangement:

All radiated emission measurements were performed at D.L.S. Electronic Systems, Inc. and set up according to ANSI C63.10-2013, unless otherwise noted. Description of procedures and measurements can be found in Appendix B – Measurement Data. See Appendix A for additional photos of the test set up. See Appendix C for measurement uncertainty.

Unless otherwise noted, the bandwidth of the measuring receiver / analyzer used during testing is shown below.

Frequency Range	Bandwidth (-6 dB)
10 to 150 kHz	200 Hz
150 kHz to 30 MHz	9 kHz
30 MHz to 1 GHz	120 kHz
Above 1 GHz	1 MHz

7.0 Test Conditions

Temperature and Humidity:

70°F at 29% RH

Battery Voltage:

3.6 VDC

8.0 Modifications Made To EUT For Compliance

None noted at time of test.

9.0 Additional Descriptions

This device uses periodic transmissions for security or safety application as defined in FCC Part 15.231(a) (3) and does not exceed a total transmission time of two seconds per hour. Appendix B of this report shows data to confirm compliance with this rule section.

The EUT was programmed to transmit in a special test mode that allowed it to stay transmitting for one second, then off for three seconds, and then repeat that sequence continuously. For testing done in "normal operation mode" the EUT was programmed to use the largest duty cycle possible during normal operation.

10.0 FCC 15.31 (e) Supply Voltage Requirement statement

FCC 15.31 (e) - For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage.

Compliance Statement: This device complies with the requirements of Part 15.31(e):

☒ This device is battery operated. All tests were performed using a new (or fully charged) battery.

☐ This device provides a constant regulated voltage to the RF circuitry regardless of supply voltage (see schematic diagrams).

☐ This device does not provide a constant regulated voltage to the RF circuitry regardless of supply voltage. Data has been supplied in this test report that supports compliance. Details:

11.0 FCC 15.203 Antenna Requirement statement

SECTION 15.203 ANTENNA 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…. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221.

Statement: This wireless device (Intentional Radiator) meets the requirements of FCC Part 15.203:

☒ The antenna is permanently attached

☐ The antenna has a unique coupling to the intentional radiator.
Description of coupling:

☐ This intentional radiator is professionally installed

☐ This intentional radiator, in accordance with Section 15.31(d), must be measured at the installation site.

12.0 Results

Measurements were performed in accordance with ANSI C63.10-2013. Graphical and tabular data can be found in Appendix B at the end of this report.

13.0 Conclusion

The Smart Sense Infant Transmitter, Model 9450-6262 as provided from RF Technologies, Inc., tested on April 25th through 27th, 2018 **meets** the requirements of CFR 47 Part 15 Subpart C Section 15.231.

Appendix A – Test Setup Photos

Photo Information and Test Setup:

Item: EUT – Smart Sense Infant Transmitter

Radiated X Position

Appendix A

Radiated Y Position

Appendix A

Radiated Z Position

Appendix A

Radiated above 1 GHz

Appendix B – Measurement Data

1.0 Emission Bandwidth – 20 dB

Rule Part:

Section 15.231 (c)

Test Procedure:

ANSI C63.10-2013

Limit:

Section 15.231 (c):

318 MHz x 0.25% = 795 kHz

Results:

Compliant
20 dB bandwidth: **26.1 kHz**

Sample Equation(s):

None

Notes:

This was a radiated emissions measurement. The maximum field strength of the emission was determined and the bandwidth was measured from the points at 20 dB down from the modulated carrier.

166 South Carter, Genoa City, WI 53128

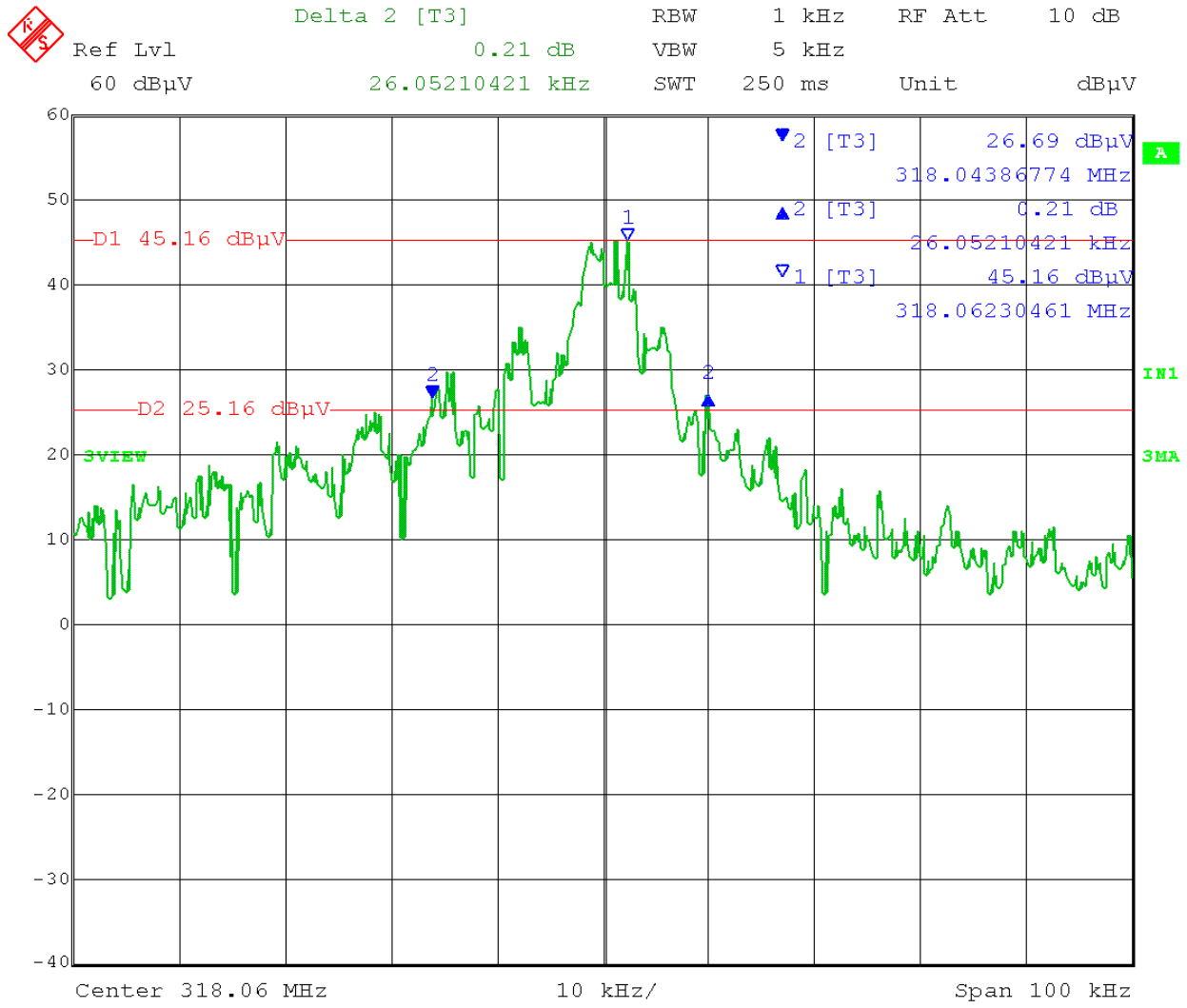
Company:	RF Technologies
Model Tested:	9450-6262
Report Number:	23685a
Project Number:	9618

Appendix B

Test Date:	04-25-2018
Company:	RF Technologies
EUT:	9450-6262 Smart Sense Infant Transmitter
Test:	20 dB Bandwidth
Operator:	Craig B

Comment: SPAN 2 to 5 times occupied bandwidth
RBW between 1% and 5% of occupied bandwidth

20 dB Bandwidth = 26.1 kHz



Date: 25.APR.2018 10:08:19

Appendix B

2.0 Automatic Deactivation

Rule Part:

15.231 (a) (2)

Test Procedure:

ANSI C63.10-2013

Limit:

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

Results:

Compliant

Sample Equation(s):

None

Notes:

No transmission for five seconds after deactivation.

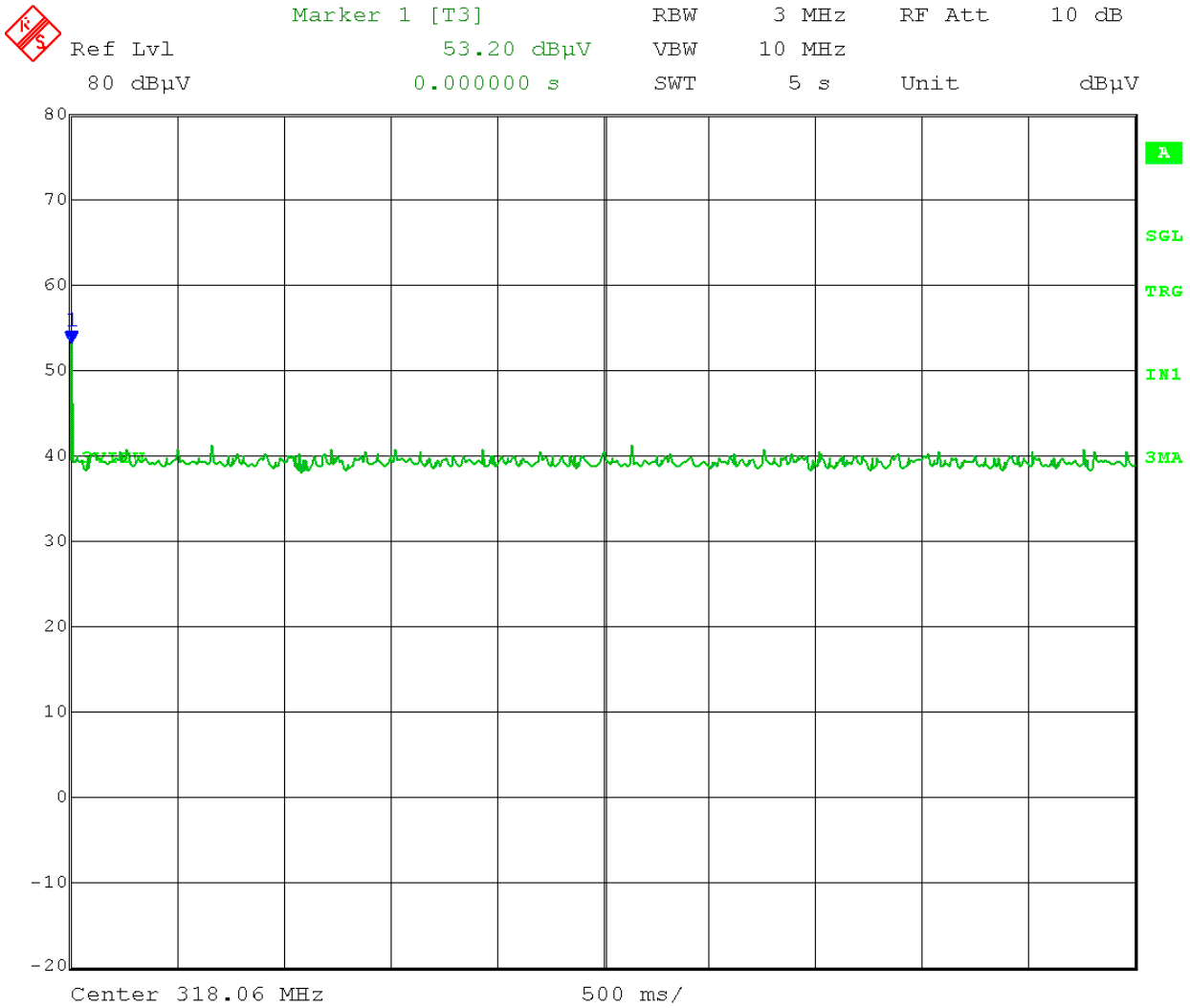
166 South Carter, Genoa City, WI 53128

Company:	RF Technologies
Model Tested:	9450-6262
Report Number:	23685a
Project Number:	9618

Appendix B

Test Date:	04-25-2018
Company:	RF Technologies
EUT:	9450-6262 Smart Sense Infant Transmitter
Test:	Dwell Time
Operator:	Craig B

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



Date: 25.APR.2018 10:15:04

Appendix B

3.0 Periodic Transmissions

Rule Part:

15.231 (a) (3)

Test Procedure:

ANSI C63.10-2013

Limit:

Total transmission time does not exceed two seconds per hour.

Results:

Compliant
Total time of transmission in an hour: 1.99 seconds

Sample Equation(s):

None

Notes:

Worst case predetermined transmissions observed.

166 South Carter, Genoa City, WI 53128

Company:	RF Technologies
Model Tested:	9450-6262
Report Number:	23685a
Project Number:	9618

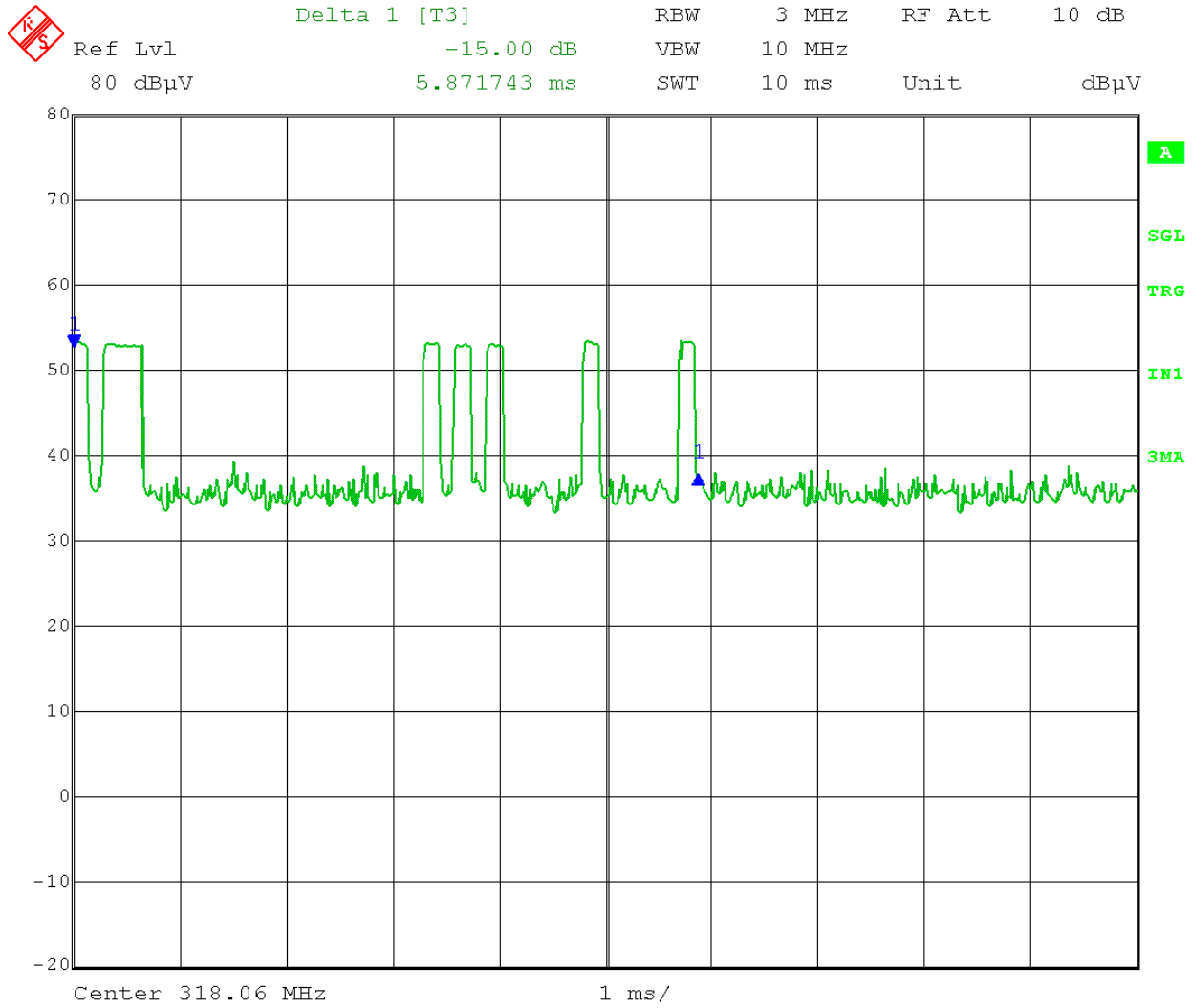
Appendix B

Test Date:	04-25-2018
Company:	RF Technologies
EUT:	9450-6262 Smart Sense Infant Transmitter
Test:	Periodic transmissions over one hour
Operator:	Craig B

Comment: EUT transmits at regular predetermined intervals for supervision purposes.
Total transmission time must not exceed two seconds per hour.

Transmission time = 5.9 ms.
Transmission every 10.67 seconds = 337 transmissions per hour.
Total transmission time for one hour = 337 x 5.9 ms = **1.99 seconds**.

Transmission Time:



Date: 25.APR.2018 10:17:27

166 South Carter, Genoa City, WI 53128

Company:	RF Technologies
Model Tested:	9450-6262
Report Number:	23685a
Project Number:	9618

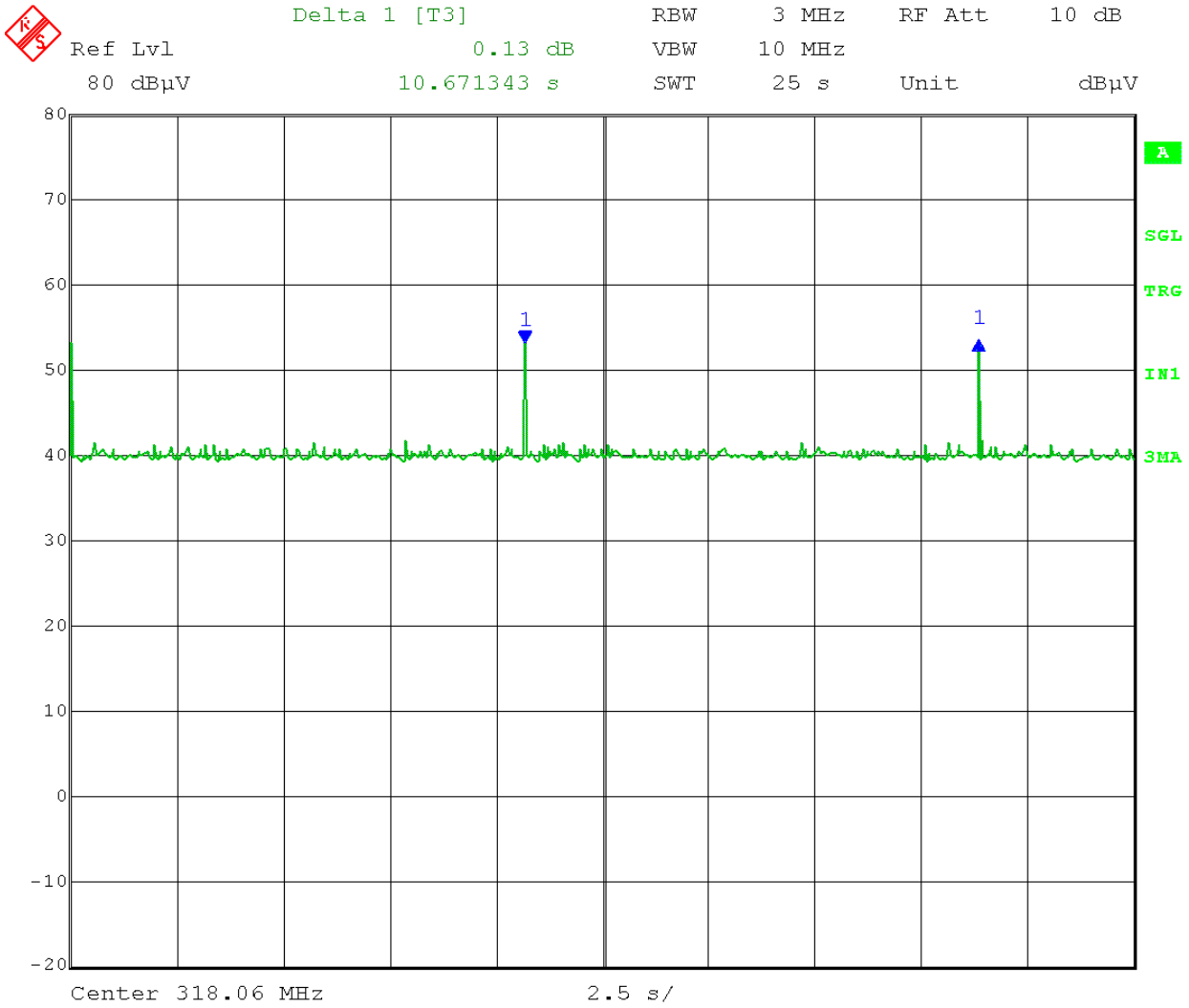
Appendix B

Test Date:	04-25-2018
Company:	RF Technologies
EUT:	9450-6262 Smart Sense Infant Transmitter
Test:	Periodic transmissions over one hour
Operator:	Craig B

Comment: EUT transmits at regular predetermined intervals for supervision purposes.
Total transmission time must not exceed two seconds per hour.

Transmission time = 5.9 ms.
Transmission every 10.67 seconds = 337 transmissions per hour.
Total transmission time for one hour = 337 x 5.9 ms = **1.99 seconds**.

Time between transmissions:



Date: 25.APR.2018 10:19:16

Appendix B

4.0 Field Strength of Emissions – Fundamental and Spurious (318 MHz)

Rule Part:

15.231 (b) including 15.205

Test Procedure:

ANSI C63.10-2013

Limit:

Fundamental (F) µV/m at 3 meters: 41.6667(F) – 7083.3333
The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.

Results:

Compliant

Sample Equation(s):

41.6667(F) – 7083.3333 = 6166.67 µV/m at 3 meters

20*log (6166.67) = 75.80 dB µV/m at 3 meters

Final Corrected = Total Level - Duty Cycle Correction
Margin = Limit - Final Corrected
Total Level = Level + System Loss + Antenna Factor

Notes:

The emissions were measured of the fundamental and spurious at a distance of three meters between the EUT and the measuring antenna. The EUT was rotated in 3 orthogonal planes and the highest emission was recorded. Since the unit was not able to transmit continuously at a 100 % duty cycle, compliance is determined by comparing peak data, minus duty cycle correction, to the average limit.

DLS ELECTRONIC SYSTEMS, INC.
166 South Carter, Genoa City, WI 53128

Company:	RF Technologies
Model Tested:	9450-6262
Report Number:	23685a
Project Number:	9618

Appendix B

Radiated Fundamental and Spurious Emissions – 30 MHz to 3.2 GHz

Tested at a 3 Meter Distance

EUT:	9450-6262: Smart Sense Infant Transmitter
Manufacturer:	RF Technologies
Operating Condition:	70 deg F; 29% R.H.
Test Site:	Site 2
Operator:	Craig B
Test Specification:	FCC Part 15.231(b)
Comment:	Battery Operated
Date:	04-25-2018

Notes: All other emissions at least 20 dB under the limit.
Since unit was not able to transmit continuously, all measurements were made with a peak detector.

Frequency (MHz)	Measurement Type	Antenna Polarization	Level (dBuV)	Antenna Factor (dB/m)	System Loss (dB)	Total Level (dBuV/m)	Duty Cycle Correction	Final Corrected (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	EUT Angle (deg)	Comment
318.040	Max Peak	Vertical	49.29	14.72	3.6	67.61	0	67.61	95.80	28.2	1.4	90	F
	Average						20	47.61	75.80				
	Max Peak	Horizontal	51.10	14.72	3.6	69.42	0	69.42	95.80	26.4	1.0	270	F
	Average						20	49.42	75.80				
636.080	Max Peak	Vertical	31.91	19.54	5.2	56.65	0	56.65	75.80	19.2	1.4	270	H
	Average						20	36.65	55.80				
	Max Peak	Horizontal	32.63	19.54	5.2	57.37	0	57.37	75.80	18.4	1.2	270	H
	Average						20	37.37	55.80				
954.120	Max Peak	Vertical	26.25	24.06	6.5	56.81	0	56.81	75.80	19.0	1.1	270	H
	Average						20	36.81	55.80				
	Max Peak	Horizontal	27.89	24.06	6.5	58.45	0	58.45	75.80	17.4	1.6	180	H
	Average						20	38.45	55.80				
1272.160	Max Peak	Vertical	87.65	25.03	-54.7	57.98	0	57.98	74.00	16.0	1.7	135	H / RB
	Average						20	37.98	54.00				
	Max Peak	Horizontal	86.75	25.03	-54.7	57.08	0	57.08	74.00	16.9	1.6	90	H / RB
	Average						20	37.08	54.00				
1590.200	Max Peak	Vertical	76.23	25.49	-54.2	47.52	0	47.52	74.00	26.5	1.9	270	H / RB
	Average						20	27.52	54.00				
	Max Peak	Horizontal	77.42	25.49	-54.2	48.71	0	48.71	74.00	25.3	1.8	295	H / RB
	Average						20	28.71	54.00				
1908.240	Max Peak	Vertical	78.62	27.42	-54.2	51.84	0	51.84	75.80	24.0	1.7	160	H
	Average						20	31.84	55.80				
	Max Peak	Horizontal	77.83	27.42	-54.2	51.05	0	51.05	75.80	24.8	1.5	45	H
	Average						20	31.05	55.80				
2226.280	Max Peak	Vertical	71.33	27.70	-54.2	44.83	0	44.83	74.00	29.2	1.9	170	H / RB
	Average						20	24.83	54.00				
	Max Peak	Horizontal	71.46	27.70	-54.2	44.96	0	44.96	74.00	29.0	1.4	180	H / RB
	Average						20	24.96	54.00				

Legend: H=Harmonic ; RB=Restricted Band ; F=Fundamental
Level = Total Level - System Loss - Antenna Factor
Final Corrected = Total Level - Duty Cycle Correction
Margin = Limit - Final Corrected

Appendix B

5.0 Duty Cycle Correction (318 MHz)

Rule Part:

15.35 (c)

Test Procedure:

ANSI C63.10-2013

Limit:

Informative

Results:

Duty Cycle Correction Factor = -24.4 dB

Sample Equation(s):

Duration of one transmit time: 6.012024 ms
Number of transmit times during 100 ms period: 1
Total ON time in 100 ms = 6.012024 ms
Duty Cycle correction = 20 Log (6.012024/100) = -24.4 dB

Notes:

Since the unit was not able to transmit continuously, compliance is determined by comparing peak data, minus duty cycle correction, to the average limit.

Since there is a limit of Peak emission that is only 20 dB above the limit of Average emission, a duty cycle correction factor greater than 20 dB would not be beneficial. Therefore, a duty cycle correction of 20 dB was applied to the Peak detector measurement level to show compliance to the average limits.

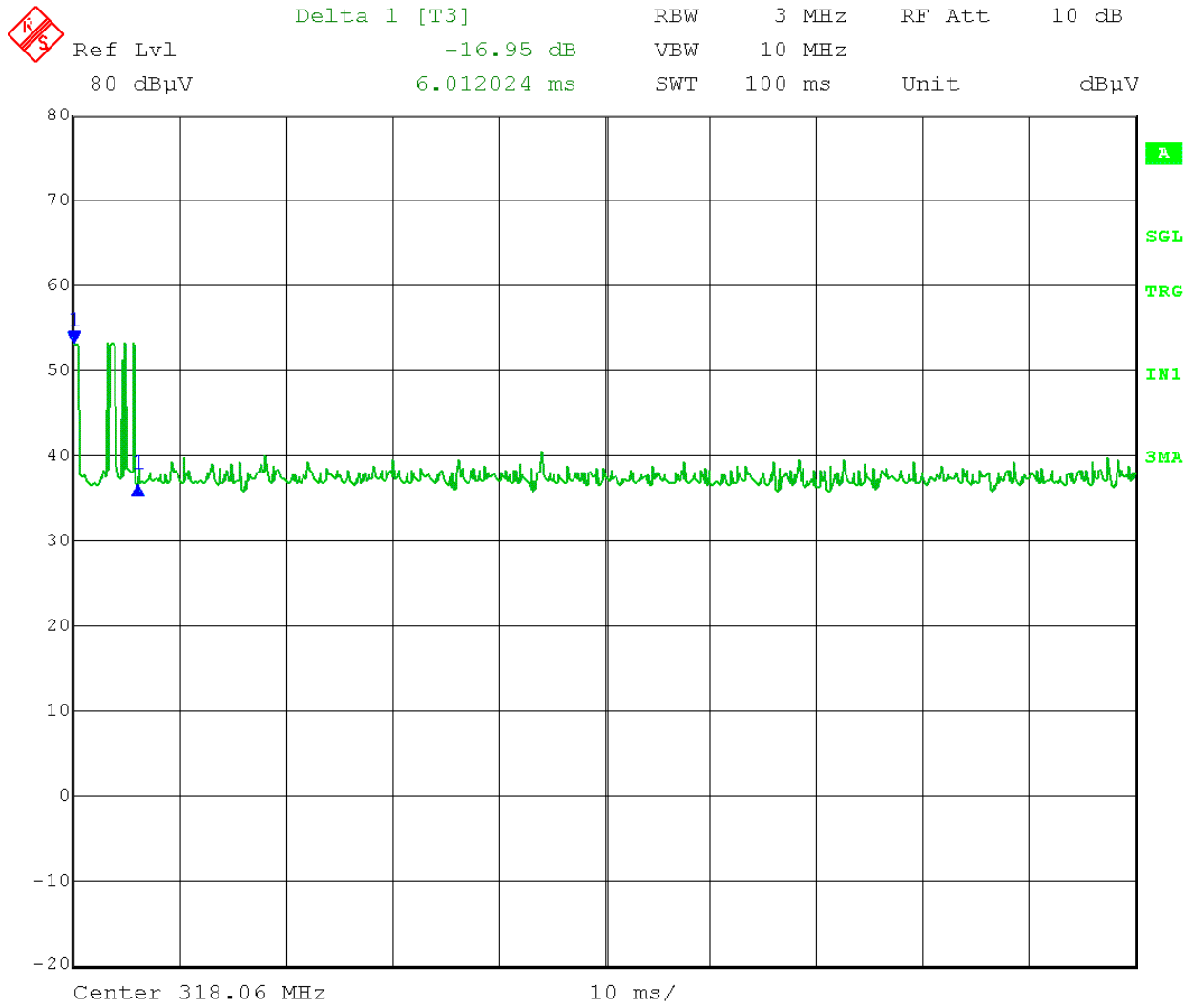
Appendix B

Normal Operation

Test Date: 04-25-2018
Company: RF Technologies
EUT: 9450-6262 Smart Sense Infant Transmitter
Test: Duty Cycle – worst case for normal operation
Operator: Craig B

Comment: Duration of one transmit time: 6.012024 ms
Number of transmit times during 100 ms period: 1
Total ON time in 100 ms = 6.012024 ms
Duty Cycle correction = 20 Log (6.012024/100) = -24.4 dB

100 ms sweep:



Date: 25.APR.2018 10:24:41

Appendix B

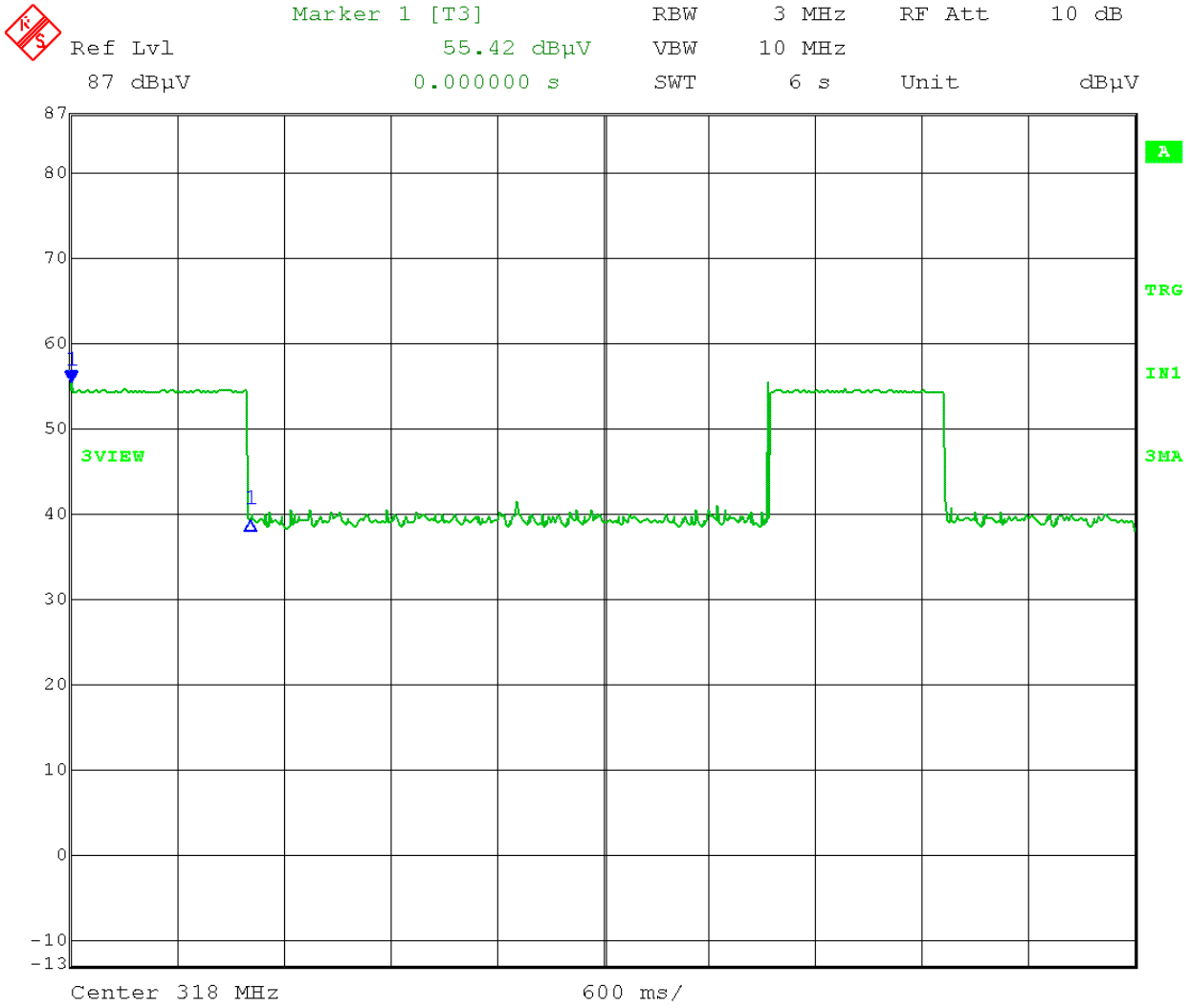
Test Mode

Test Date: 04-25-2018
Company: RF Technologies
EUT: 9450-6262 Smart Sense Infant Transmitter
Test: Duty Cycle – special mode for testing purposes
Operator: Craig B

Comment: One wide pulse: 1 second
Total ON time in 100 ms = 100 ms

166 South Carter, Genoa City, WI 53128

Company:	RF Technologies
Model Tested:	9450-6262
Report Number:	23685a
Project Number:	9618



Date: 25.APR.2018 09:10:14

Appendix C – Measurement Uncertainty

Compliance with the limits in this standard are based on the results of the compliance measurement. Our calculated measurement uncertainty including the measurement instrumentation, associated connections between the various instruments in the measurement chain, and other contributions, are provided in this section of the test report.

Radiated Emission 30 MHz to 18 GHz Uncertainty

		Uncertainty (+ / - dB)	Uncertainty (+ / - dB)	Uncertainty (+ / - dB)	Uncertainty (+ / - dB)	Uncertainty (+ / - dB)	Uncertainty (+ / - dB)	Uncertainty (+ / - dB)	Uncertainty (+ / - dB)	Uncertainty (+ / - dB)
Contribution	Probability Distribution	3M	3M	3M	3M	3M	3M	10M	10M	10M
		30-100MHz.	100-700MHz	700-1000MHz.	1- 4.5Ghz	4.5 - 7Ghz	7 - 18Ghz	30-100MHz.	100-700MHz.	700-1000MHz.
Combined Standard Uncertainty	Normal	1.70	1.62	1.66	2.13	2.48	2.85	1.64	1.58	1.66
Expanded Uncertainty	**Normal (k=2)**	**3.40**	**3.23**	**3.33**	**4.26**	**4.95**	**5.69**	**3.29**	**3.16**	**3.31**

END OF REPORT

Revision #	Date	Comments	By
1.0	05-03-2018	Initial Release	CB
2.0	05-21-2018	Removed 262 kHz transmitter data	CB