COMPLIANCE WORLDWIDE INC.
TEST REPORT 295-20R1

In Accordance with the Requirements of

FCC PART 90:2015 Subpart J, Section 90.241
Operation in the 72 to 76 MHz Bands

Issued to

Kingfisher Company, Inc.
81 Old Ferry Road
Lowell, Massachusetts 01854
(978) 596-0214

for

STAR-ELT
Radio Alarm Transmitter

FCC ID: AGJKCISTARELT0001

Original Report Issued on November 6, 2020
Revision R1 Issued on February 1, 2021

Tested by

Brian F. Breault

Reviewed by

Larry K. Stillings

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1. Scope

This test report certifies that the Kingfisher Company, Inc. STAR-ELT, as tested, meets the FCC Part 90 Subpart J requirements. The scope of this test report is limited to the test sample provided by the client, only in as much as that sample represents other production units. If any significant changes are made to the unit, the changes shall be evaluated, and a retest may be required. Revision R1 updates the RF Exposure to General Population / Uncontrolled Exposure limits.

2. Product Details

2.1. Manufacturer: Kingfisher Company, Inc.

2.2. Model Numbers: STAR-ELT

2.3. Serial Number: 20086301

2.4. Description: Entry level radio alarm transmitter handling up to 4 zones.

2.5. Power Source: 120 VAC, 60 Hz

2.6. Hardware Version: 4

2.7. Modifications: None

3. Product Configuration

3.1. Support Equipment

Device	Manufacturer	Model	Serial No.	Comment
Phone	Apple	iPhone 5S	DX3NTBKCFNJJ	Loading transmitter parameters

3.2. Cables

Cable Type	Length	Shield	From	To
Power	2M	No	EUT	120 VAC, 60 Hz

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3. Product Configuration (continued)

3.3. Operational Characteristics & Software

Software: KCI Cordless Terminal (proprietary)

Product Operation for Test:

App KCI

Star Series

Pair iPhone to STAR-ELT - press SW1 on panel module and hold until LED turns red.

Available cordless interfaces Select ELT Box #:01010 RSSI: -41

Terminal Mode

Press Enter for Menu

F - Set Carrier Frequency - 72.02 or 75.98 (MHz)

FCC <Enter> Set FCC mode

Select C - Carrier Wave

Enter Tone Length: 2

Enter # of Repeats: 1000 or however long you need

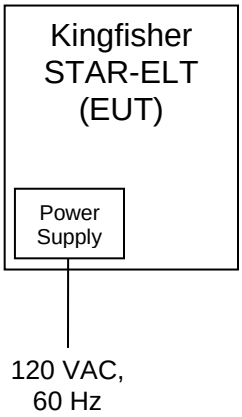
Enter Delay Length: 2

When the LED is green, the device is transmitting.

SW2 will reset the system.

On will reset the system.

3.4. Block Diagram



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4. Measurements Parameters

4.1. Measurement Equipment Used to Perform Test

Device	Manufacturer	Model No.	Serial No.	Cal Due	Interval
EMI Test Receiver, 9kHz - 7GHz [1]	Rohde & Schwarz	ESR7	101156	10/16/2022	2 Years
Spectrum Analyzer 20 Hz – 40 GHz [2]	Rohde & Schwarz	FSV40	100899	8/12/2022	2 Years
Biconilog Antenna, 30 MHz to 2 GHz	Sunol Sciences Corp	JB1	A050913	6/5/2021	3 Years
Attenuator, DC to 18 GHz, 10 dB	Aeroflex / Weinschel	41-10-12	75411	1/13/2021	1 Year
Digital Barometer	Control Company	4195	ID236	4/3/2021	2 Years

[1] ESR7 Firmware revision: V3.48 SP3, Date installed: 09/30/2020 Previous V3.48 SP2, installed 07/23/2020.
[2] FSV40 Firmware revision: V2.30 SP4 Date installed: 05/04/2016 Previous V2.30 SP1, installed 10/22/2014.
[3] FSVR40 Firmware revision: V2.23 SP1, Date installed: 08/19/2016 Previous V2.23, installed 10/20/2014.

4.2. Measurement & Equipment Setup

Test Dates:	10/26/2020 - 11/6/2020
Test Engineer:	Brian Breault
Normal Site Temperature (15 – 35°C):	24
Relative Humidity (20 -75%RH):	33

4.3. Test Procedure

The test measurements contained in this report are based on the requirements detailed in FCC Part 90, Subpart J.

The test methods used to generate the data is this test report are in accordance with ANSI C63.26-2015, American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services.

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5. Measurement Summary

Section Description or Test Requirement	Rule Part / Standard Reference	Test Report Section	Result	Comment
Maximum Transmitter Power	Part 2.1046 C63.26: 5.4.4	6.1	Compliant	
Occupied Bandwidth	Part 2.1049 C63.26: 5.2.3.3	6.2	Compliant	
Transmitter Frequency Tolerance	90.241 (a)(6)	6.3	Compliant	
Transmission Length, Interval and Cycle	90.241 (a)(7)	6.4	Compliant	
Spurious Emissions at Antenna Terminals	90.241 FCC Part 2.1051 C63.26 6.7	6.5	Compliant	
Field Strength of Spurious Radiation	90.241 FCC Part 2.1053 C63.26 5.4.4	6.6	Compliant	
Emission Mask	90.210 (c)	6.7	Compliant	
Public Exposure to Radio Frequency Energy Levels	Section 1.1307 (b)(1)	6.8	Compliant	

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6. Measurement Data

6.1. Maximum Transmitter Power FCC 90.241, FCC 2.1046, ANSI C63.26-2015

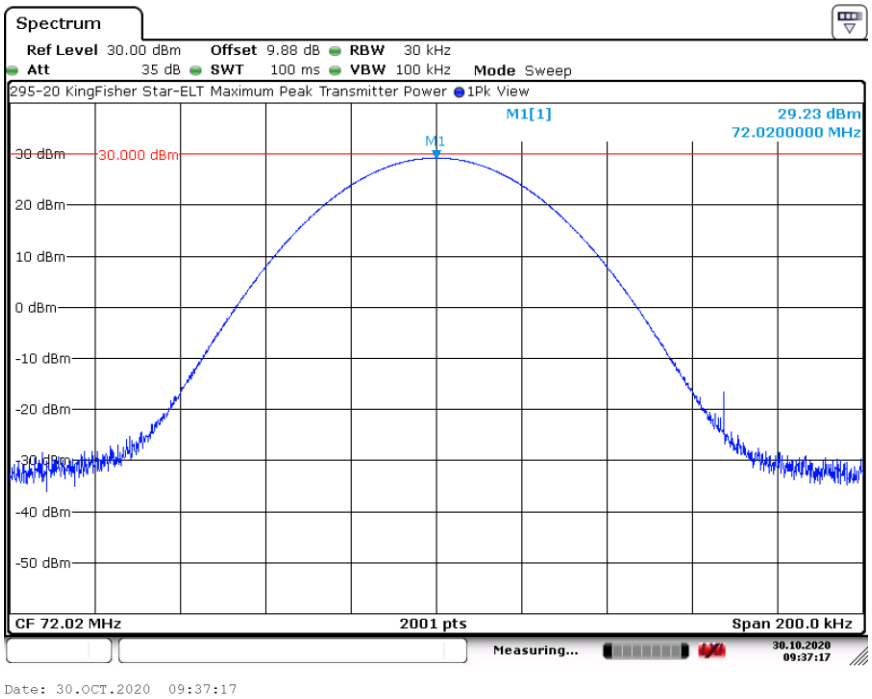
Requirement: Maximum transmitter power will be either 2.5 watts plate input to the final stage or 1-watt output.

Test Method: ANSI C63.26-2015 Section 5.2.3.3

Mean Transmitter Output Power

Frequency (MHz)	Maximum Transmitter Power		
	Actual	Pt 90.241	Result
72.02	29.23 dBm	≤30 dBm	Compliant
75.98	28.60 dBm	≤30 dBm	Compliant

6.1.1. Maximum Transmitter Power, Low Channel



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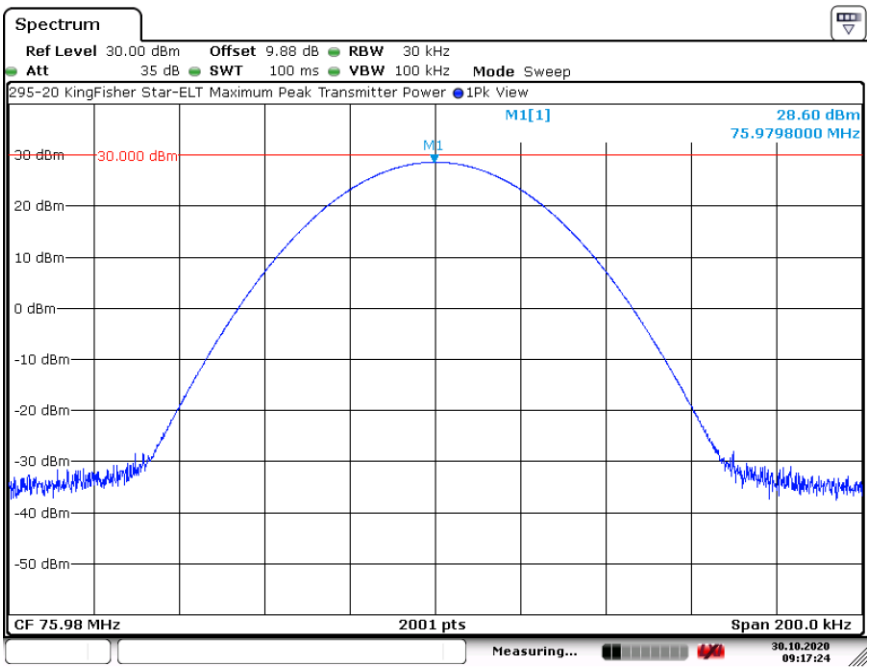
6. Measurement Data

6.1. Maximum Transmitter Power FCC 90.241, FCC 2.1046, ANSI C63.26-2015 (cont'd)

6.1.2. Maximum Transmitter Power, High Channel



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6. Measurement Data

6.2. Occupied Bandwidth FCC 90.241, FCC 2.1049, ANSI C63.26-2015

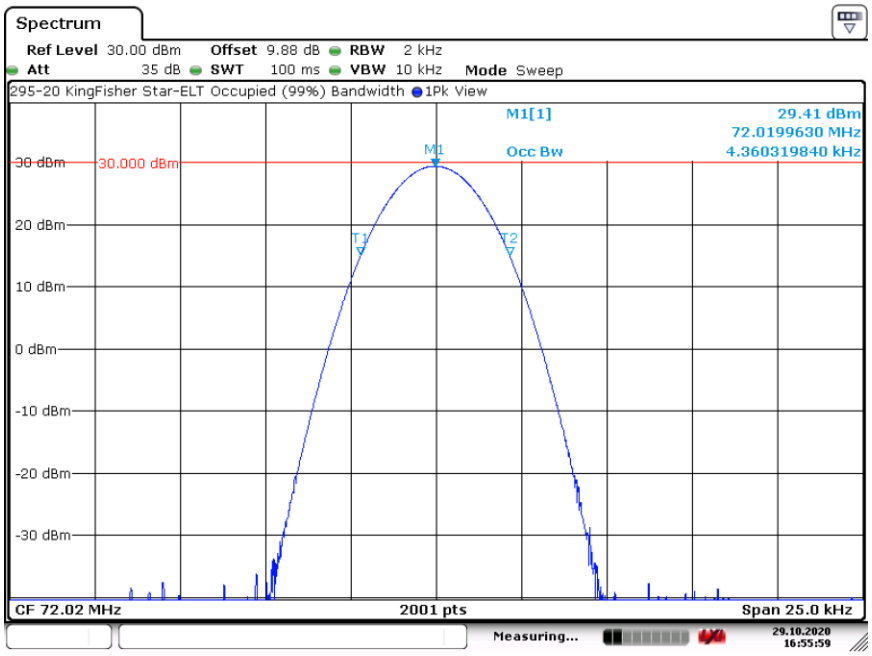
Requirement: The frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

Test Method: ANSI C63.26-2015 Section 5.4.4

Occupied (99%) Bandwidth

Frequency (MHz)	Occupied (99%) Bandwidth		
	Actual	Pt 90.241	Result
72.02	4.360 kHz	≤6.25 kHz	Compliant
75.98	4.373 kHz	≤6.25 kHz	Compliant

6.2.1. Occupied (99%) Bandwidth, Low Channel



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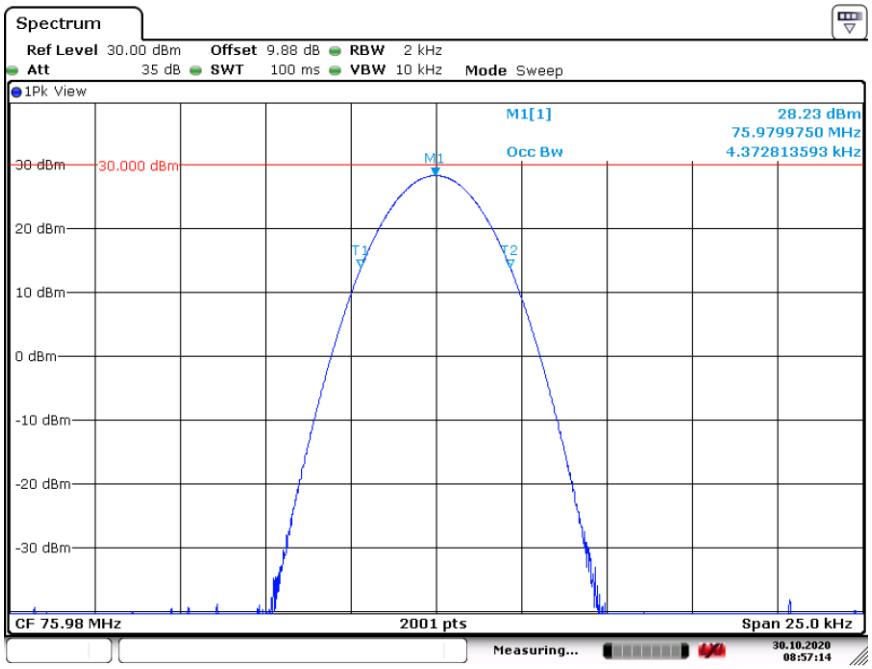
6. Measurement Data

6.2. Occupied Bandwidth FCC 90.241, FCC 2.1049, ANSI C63.26-2015

6.2.2. Occupied (99%) Bandwidth, Low Channel



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6. Measurement Data

6.3. Transmitter Frequency Tolerance FCC 90.241 (a)(6), ANSI C63.26-2015

Requirement: The transmitter frequency tolerance shall be 0.005 percent.

Test Method: ANSI C63.26-2015 Section 5.6.3

6.3.1. Transmitter Frequency Tolerance (Frequency Stability), 72.02 MHz

Temp (°C)	Supply Voltage	Meas Freq. (MHz)	Limit			Offset (%)	Result
			F_{MIN} (MHz)	F_{MAX} (MHz)	%		
Ambient	120 VAC	72.0199525	N/A			N/A	Reference
-30		72.0200000	72.0163515	72.0235535	±0.005	0.00006595	Compliant
-20		72.0199850	72.0163515	72.0235535	±0.005	0.00004513	Compliant
-10		72.0199725	72.0163515	72.0235535	±0.005	0.00002777	Compliant
0		72.0199700	72.0163515	72.0235535	±0.005	0.00002430	Compliant
10		72.0199700	72.0163515	72.0235535	±0.005	0.00002430	Compliant
20		72.0199625	72.0163515	72.0235535	±0.005	0.00001389	Compliant
30		72.0199525	72.0163515	72.0235535	±0.005	0.00000000	Compliant
40		72.0199500	72.0163515	72.0235535	±0.005	0.00000347	Compliant
50		72.0199400	72.0163515	72.0235535	±0.005	0.00001736	Compliant
20	102 VAC	72.0199550	72.0163515	72.0235535	±0.005	0.00000347	Compliant
	138 VAC	72.0199575	72.0163515	72.0235535	±0.005	0.00000694	Compliant

6.3.1. Transmitter Frequency Tolerance (Frequency Stability), 75.98 MHz

Temp (°C)	Supply Voltage	Meas Freq. (MHz)	Limit			Offset (%)	Result
			F_{MIN} (MHz)	F_{MAX} (MHz)	%		
Ambient	120 VAC	75.9799600	N/A			N/A	Reference
-30		75.9800100	75.976161	75.983759	±0.005	0.00006581	Compliant
-20		75.9799950	75.976161	75.983759	±0.005	0.00004606	Compliant
-10		75.9799800	75.976161	75.983759	±0.005	0.00002632	Compliant
0		75.9799725	75.976161	75.983759	±0.005	0.00001645	Compliant
10		75.9799700	75.976161	75.983759	±0.005	0.00001316	Compliant
20		75.9799625	75.976161	75.983759	±0.005	0.00000329	Compliant
30		75.9799600	75.976161	75.983759	±0.005	0.00000000	Compliant
40		75.9799525	75.976161	75.983759	±0.005	0.00000987	Compliant
50		75.9799350	75.976161	75.983759	±0.005	0.00003290	Compliant
20	102 VAC	75.9799600	75.976161	75.983759	±0.005	0.00000000	Compliant
	138 VAC	75.9799600	75.976161	75.983759	±0.005	0.00000000	Compliant

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6. Measurement Data

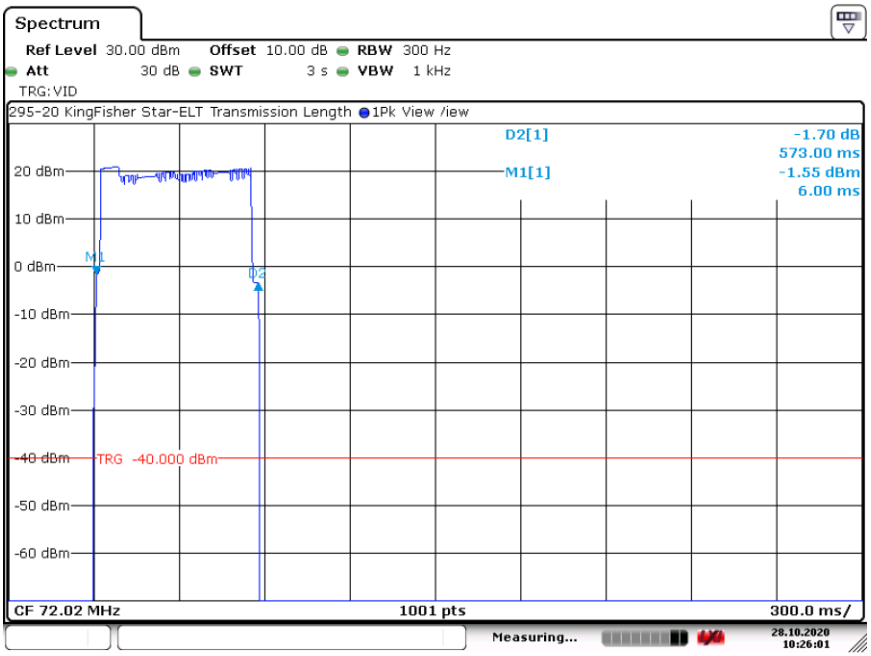
6.4. Transmission Length, Interval and Cycle FCC 90.241 (a)(7)

Requirement: Each transmission must be limited to a maximum of 2 seconds and shall not be automatically repeated more than two times at spaced intervals within the following 30 seconds. Thereafter, the authorized cycle may not be reactivated for one minute.

Transmission Length, Interval and Cycle

Frequency (MHz)	Transmission Length			Transmission Interval			Transmission Cycle		
	Actual 6.4.1/6.4.2	Pt 90.241	Result	Actual M1 to D2	Pt 90.241	Result	Actual D2 to D3	Pt 90.241	Result
72.02	573 mS	≤2000 mS	Compliant	22.32 Sec.	≤30 Sec.	Compliant	62.28 Sec.	>60 Sec.	Compliant
75.98	582 mS	≤2000 mS	Compliant	21.96 Sec.	≤30 Sec.	Compliant	62.46 Sec	>60 Sec.	Compliant

6.4.1. Transmission Length, 72.02 MHz



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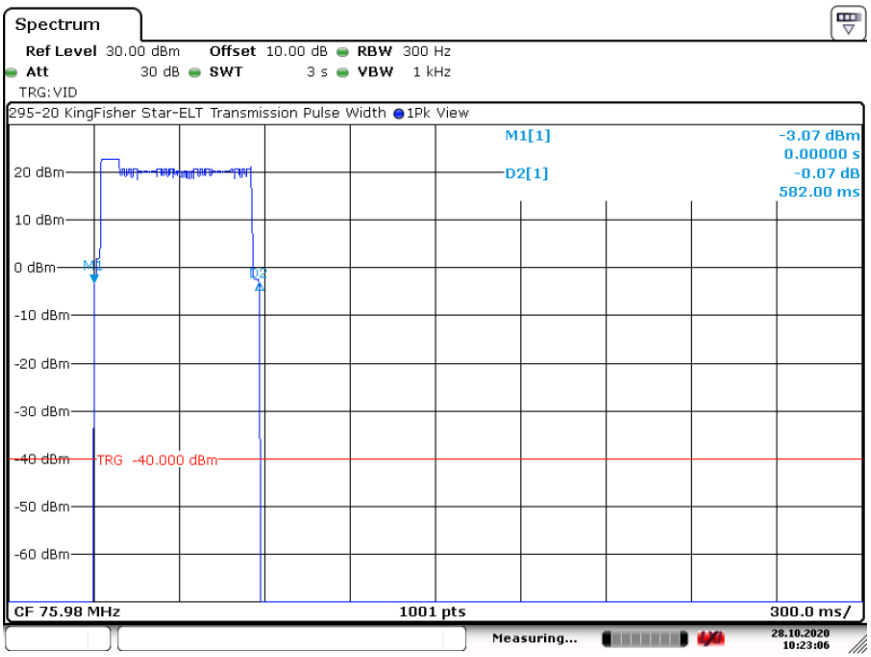
6. Measurement Data

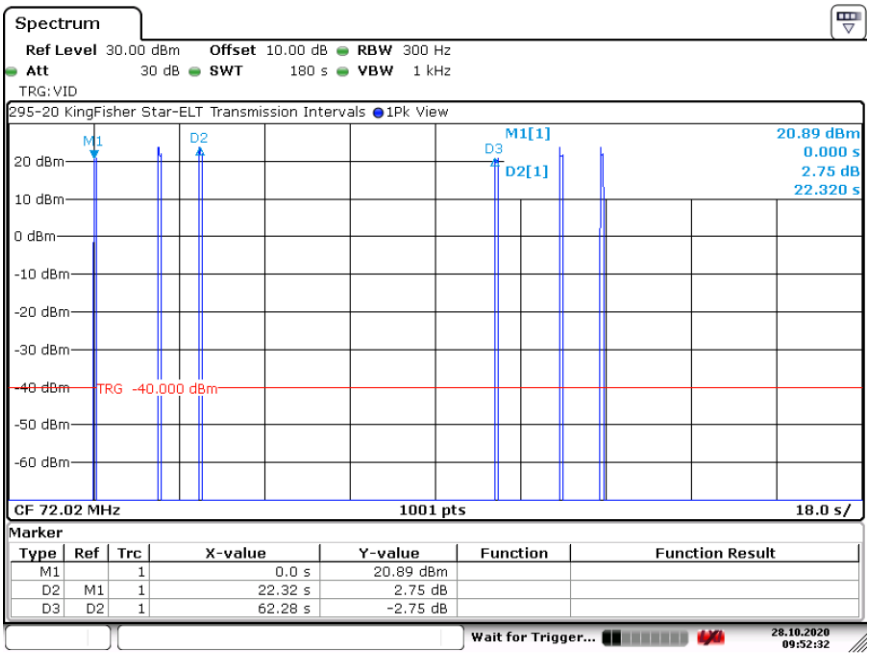
6.4. Transmission Length, Interval and Cycle FCC 90.241 (a)(7)

6.4.2. Transmission Length, 75.98 MHz



Date: 28.OCT.2020 10:23:06

6.4.3. Transmission Interval and Cycle, 72.02 MHz



Date: 28.OCT.2020 09:52:32

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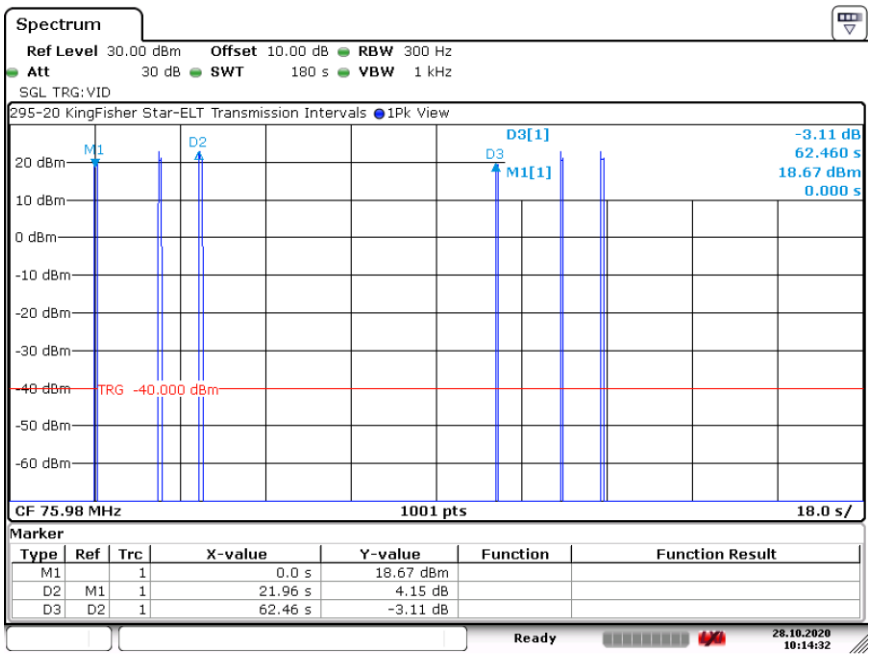
6. Measurement Data

6.4. Transmission Length, Interval and Cycle, FCC 90.241 (a)(7)

6.4.4. Transmission Interval and Cycle, 75.98 MHz



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6. Measurement Data

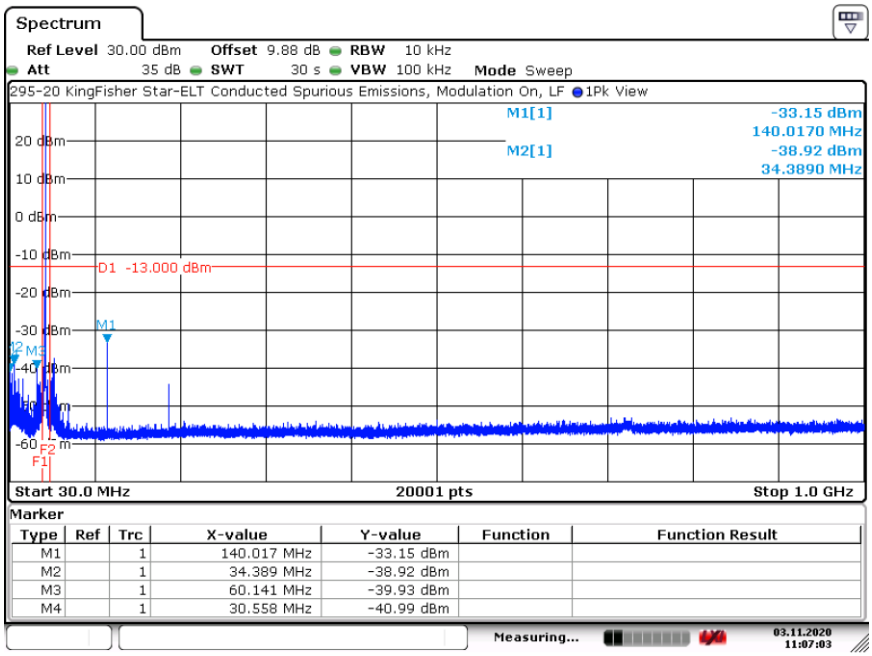
6.5. Spurious Emissions at Antenna Terminals FCC 2.1051, 90.241

Requirement: Spurious emissions at the antenna terminal is limited to an attenuation of 43 + 10 Log_{10}(p), where p is the power in dBW or -13 dBm.

1 Watt = 0 dBW

Test Method: ANSI C63.26-2015 Section 5.7

6.5.1. Spurious Emissions at Antenna Terminals, 72.02 MHz



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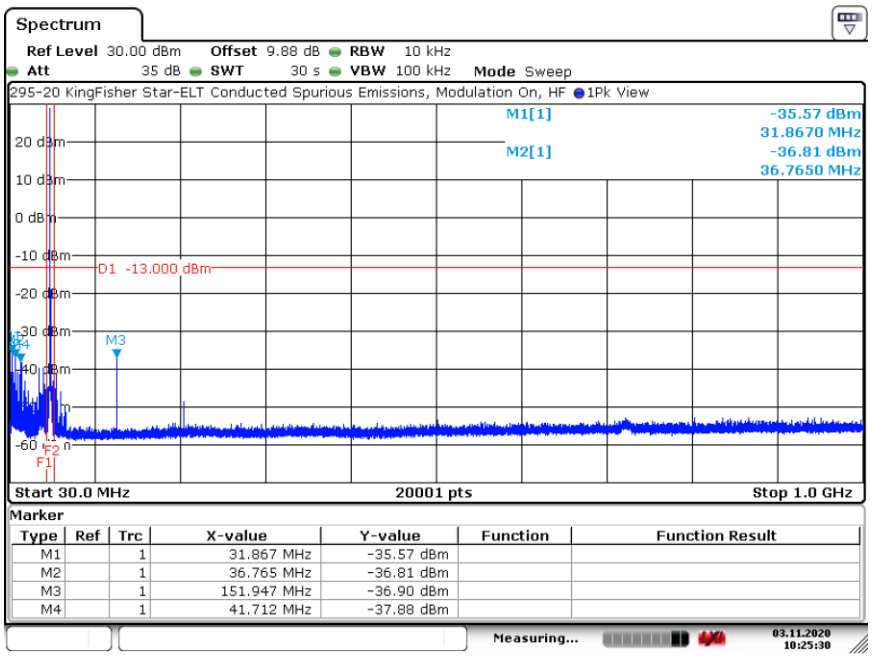
6. Measurement Data

6.5. Spurious Emissions at Antenna Terminals FCC 2.1051, FCC 90.241

6.5.2. Spurious Emissions at Antenna Terminals, 75.98 MHz



Date: 3.NOV.2020 10:25:30

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6. Measurement Data

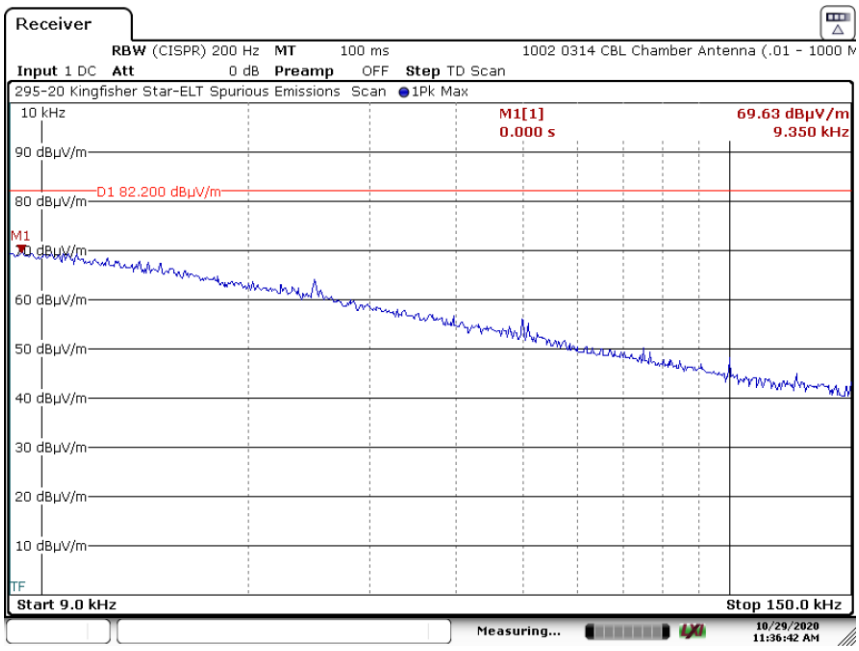
6.6. Field Strength of Spurious Radiation, FCC 2.1053, FCC 90.241

Requirement: Spurious emissions at the antenna terminal is limited to an attenuation of 43 + 10 Log_{10}(p), where p is the power in dBW or -13 dBm.

1 Watt = 0 dBW

Test Method: ANSI C63.26-2015 Section 5.5.4

6.6.1. Spurious Radiated Emissions, 72.02 MHz, 9 kHz to 150 kHz, Parallel Antenna



Date: 29.OCT.2020 11:36:42

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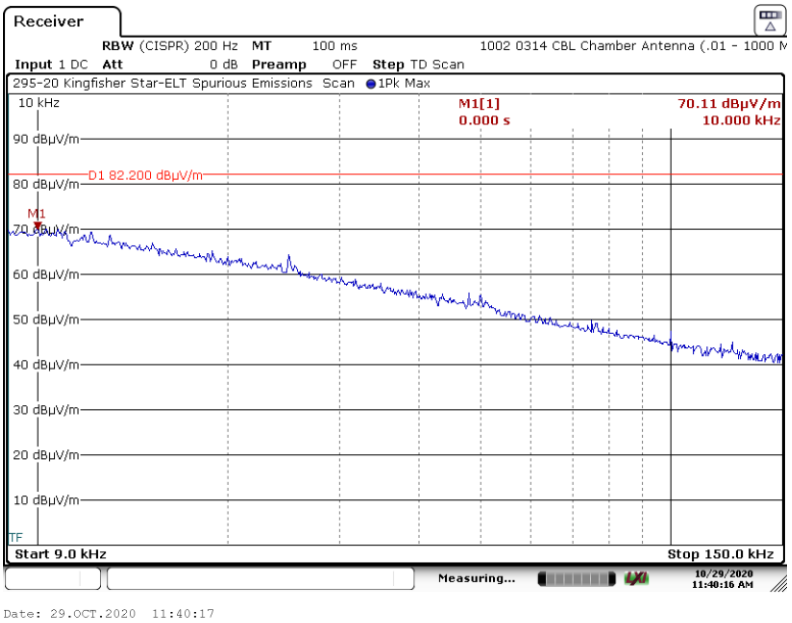
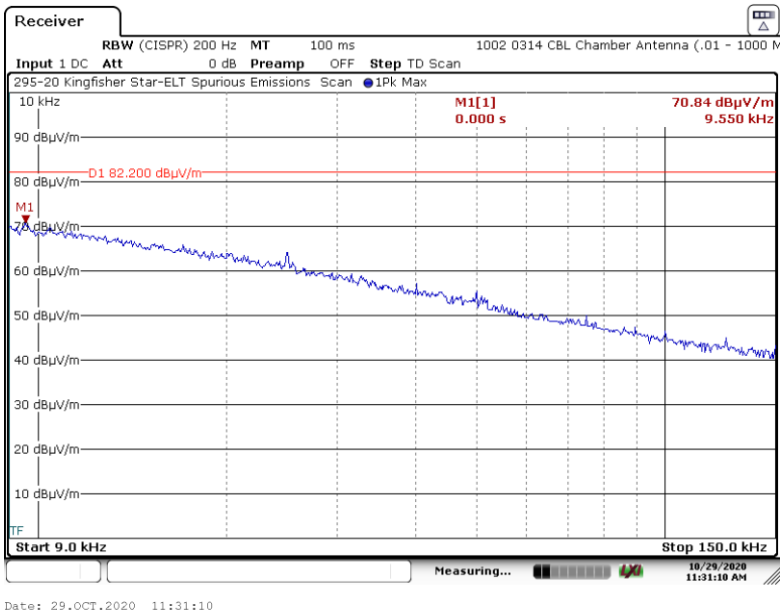
6. Measurement Data

6.6. Field Strength of Spurious Radiation, FCC 2.1053, FCC 90.241

6.6.2. Spurious Radiated Emissions, 72.02 MHz, 9 kHz to 150 kHz, Perpendicular Antenna



6.6.3. Spurious Radiated Emissions, 72.02 MHz, 9 kHz to 150 kHz, Ground Parallel Antenna



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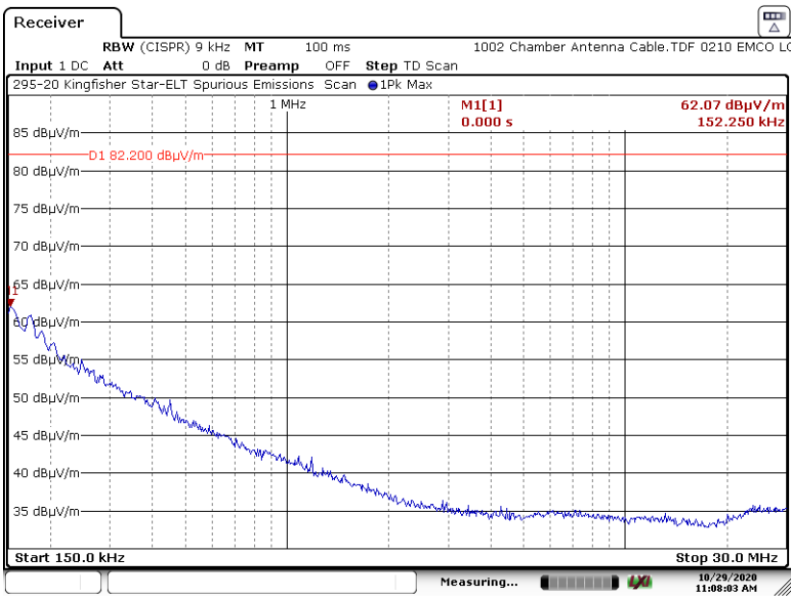
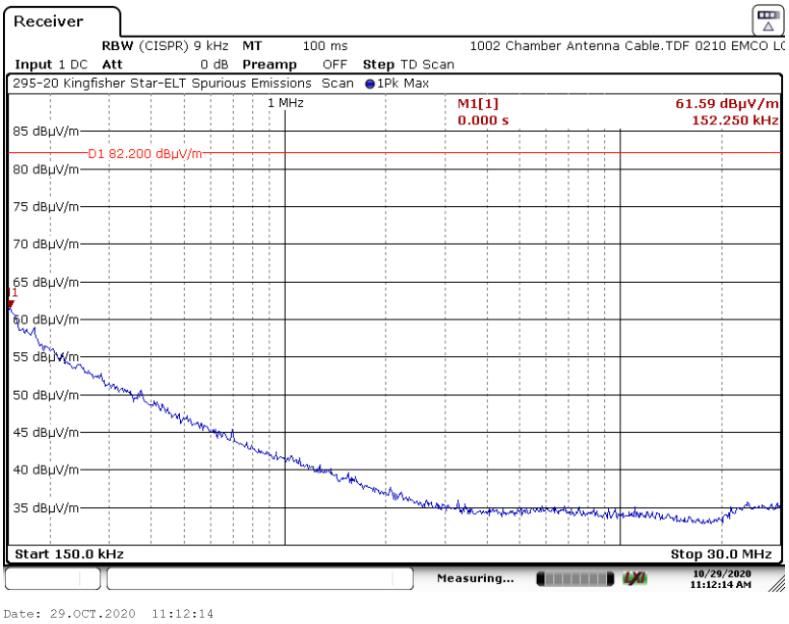
6. Measurement Data

6.6. Field Strength of Spurious Radiation, FCC 2.1053, FCC 90.241

6.6.4. Spurious Radiated Emissions, 72.02 MHz, 150 kHz to 30 MHz, Parallel Antenna



6.6.5. Spurious Radiated Emissions, 72.02 MHz, 150 kHz to 30 MHz, Perpendicular Antenna



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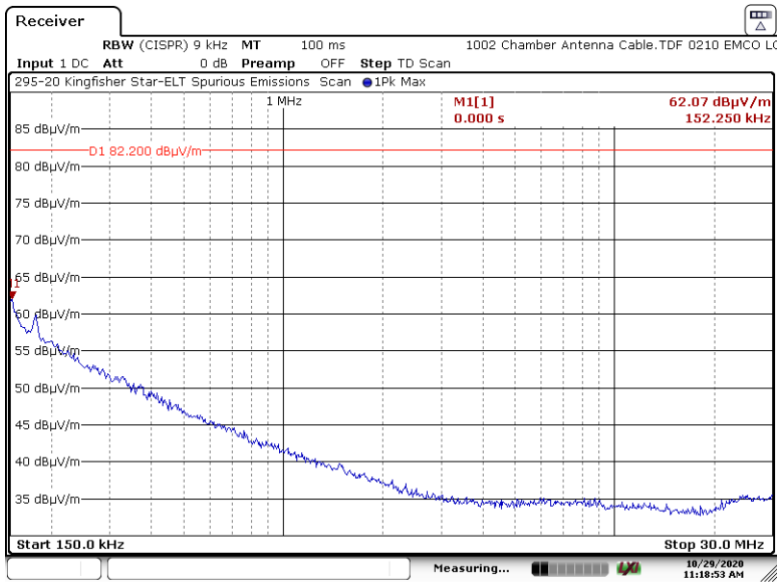
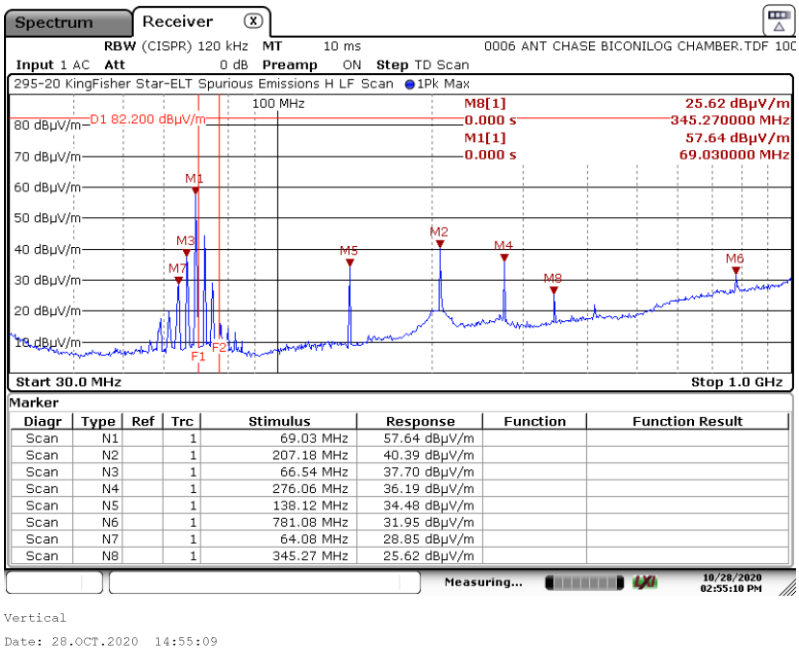
6. Measurement Data

6.6. Field Strength of Spurious Radiation, FCC 2.1053, FCC 90.241

6.6.6. Spurious Radiated Emissions, 72.02 MHz, 150 kHz to 30 MHz, Ground Parallel Antenna



6.6.7. Spurious Radiated Emissions, 72.02 MHz, 30 MHz to 1 GHz, Horizontal Antenna



Diagr	Type	Ref	Trc	Stimulus	Response	Function	Function Result
Scan	N1		1	69.03 MHz	57.64 dBµV/m		
Scan	N2		1	207.18 MHz	40.39 dBµV/m		
Scan	N3		1	66.54 MHz	37.70 dBµV/m		
Scan	N4		1	276.06 MHz	36.19 dBµV/m		
Scan	N5		1	138.12 MHz	34.48 dBµV/m		
Scan	N6		1	781.08 MHz	31.95 dBµV/m		
Scan	N7		1	64.08 MHz	28.85 dBµV/m		
Scan	N8		1	345.27 MHz	25.62 dBµV/m		

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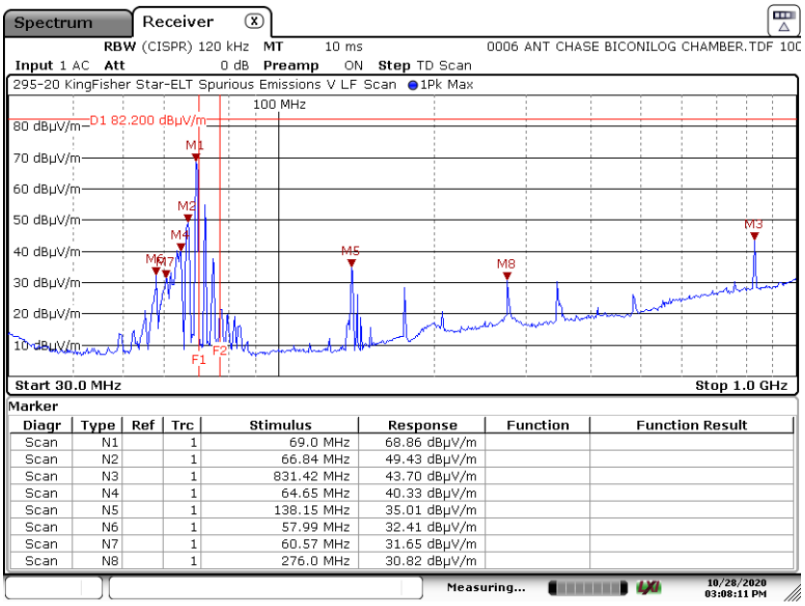
6. Measurement Data

6.6. Field Strength of Spurious Radiation, FCC 2.1053, FCC 90.241

6.6.8. Spurious Radiated Emissions, 72.02 MHz, 30 MHz to 1 GHz, Vertical Antenna



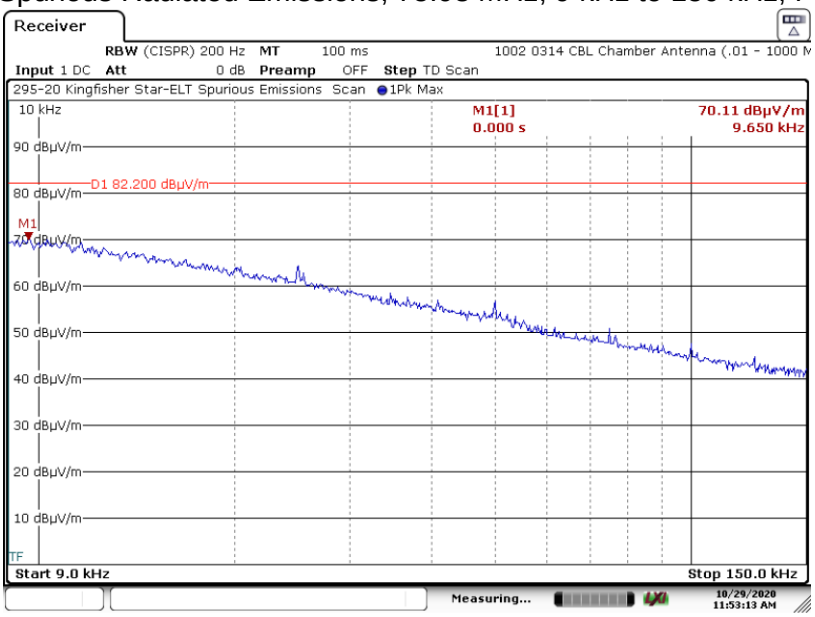
Marker

Diagr	Type	Ref	Trc	Stimulus	Response	Function	Function Result
Scan	N1		1	69.0 MHz	68.86 dBµV/m		
Scan	N2		1	66.84 MHz	49.43 dBµV/m		
Scan	N3		1	831.42 MHz	43.70 dBµV/m		
Scan	N4		1	64.65 MHz	40.33 dBµV/m		
Scan	N5		1	138.15 MHz	35.01 dBµV/m		
Scan	N6		1	57.99 MHz	32.41 dBµV/m		
Scan	N7		1	60.57 MHz	31.65 dBµV/m		
Scan	N8		1	276.0 MHz	30.82 dBµV/m		

Vertical

Date: 28.OCT.2020 15:08:10

6.6.9. Spurious Radiated Emissions, 75.98 MHz, 9 kHz to 150 kHz, Parallel Antenna



Date: 29.OCT.2020 11:53:13

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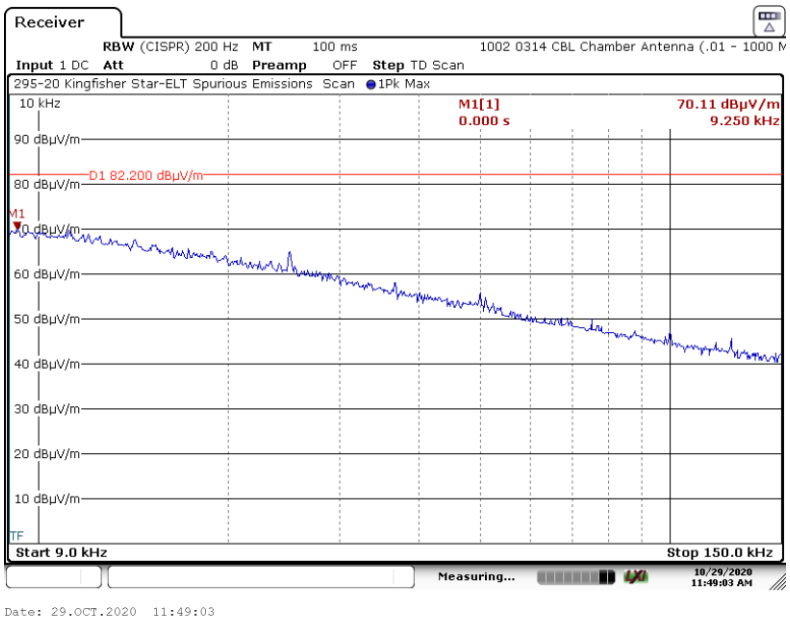
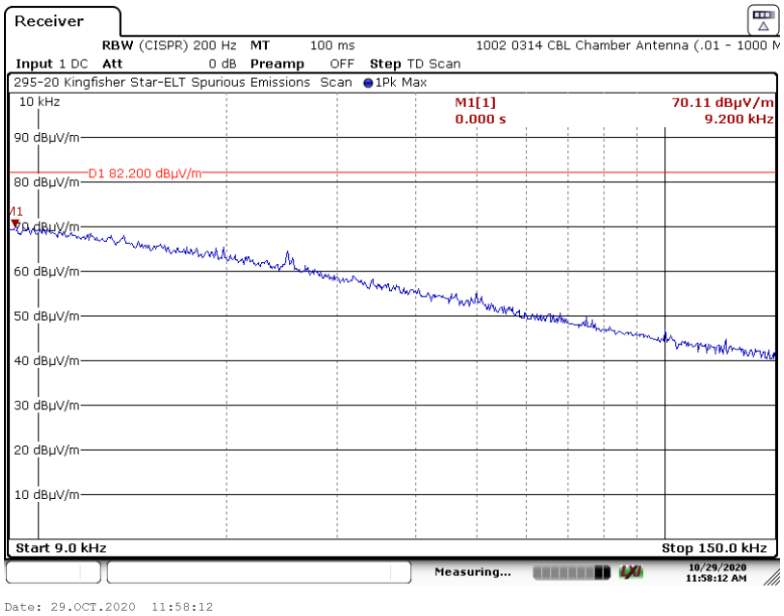
6. Measurement Data

6.6. Field Strength of Spurious Radiation, FCC 2.1053, FCC 90.241

6.6.10. Spurious Radiated Emissions, 75.98 MHz, 9 kHz to 150 kHz, Perpendicular Antenna



6.6.11. Spurious Radiated Emissions, 75.98 MHz, 9 kHz to 150 kHz, Ground Parallel Antenna



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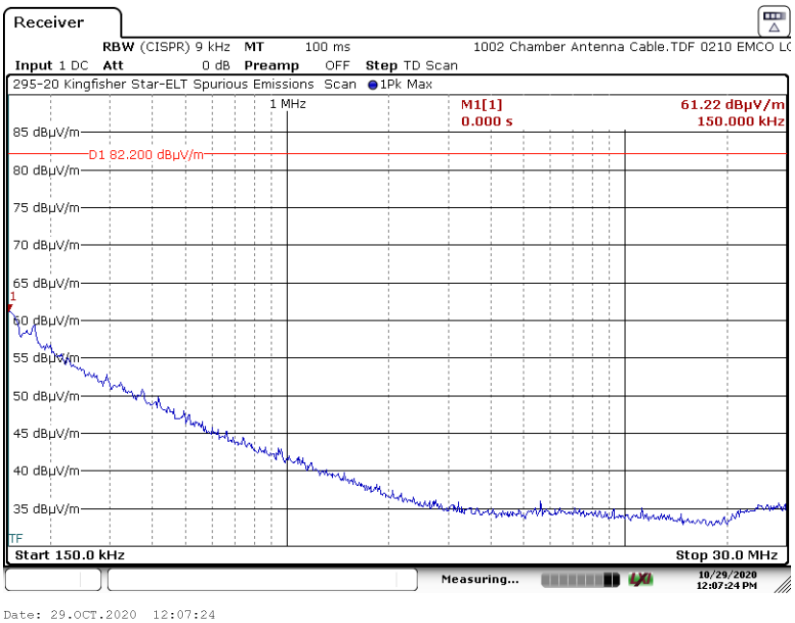
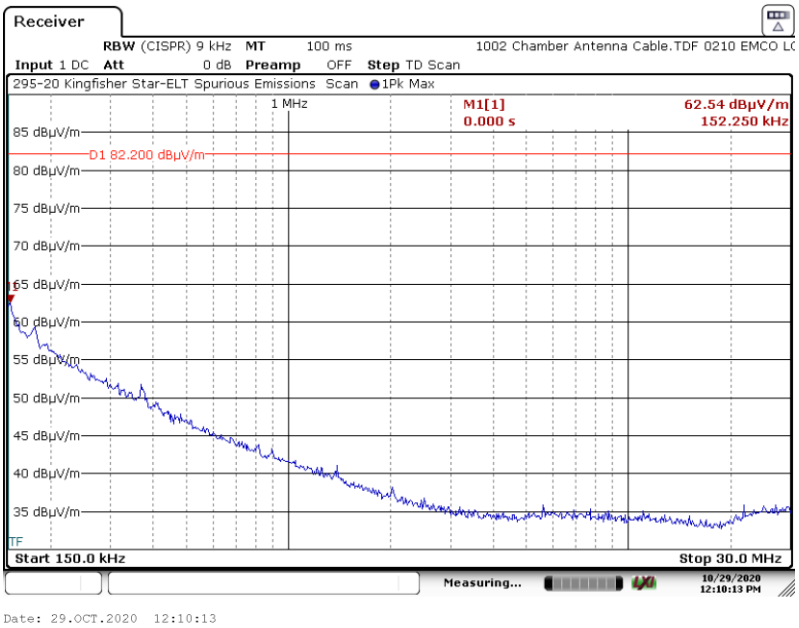
6. Measurement Data

6.6. Field Strength of Spurious Radiation, FCC 2.1053, FCC 90.241

6.6.12. Spurious Radiated Emissions, 75.98 MHz, 150 kHz to 30 MHz, Parallel Antenna



6.6.13. Spurious Radiated Emissions, 75.98 MHz, 150 kHz to 30 MHz, Perpendicular Antenna



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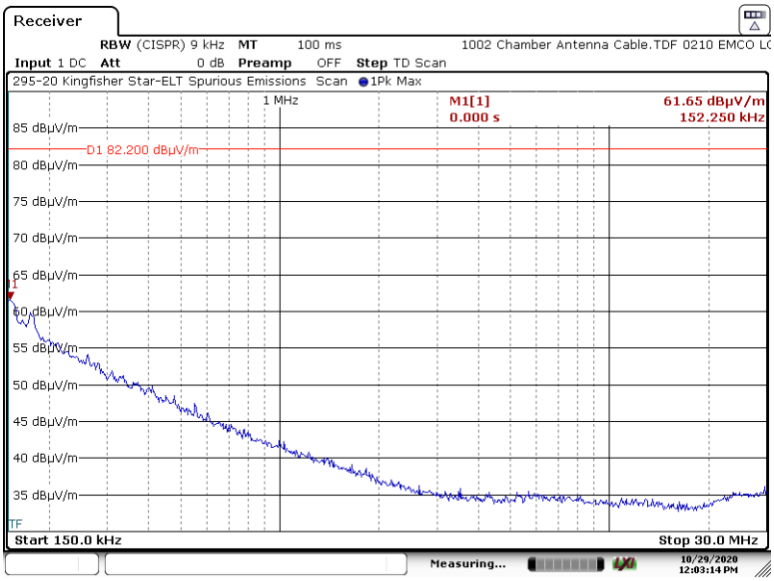
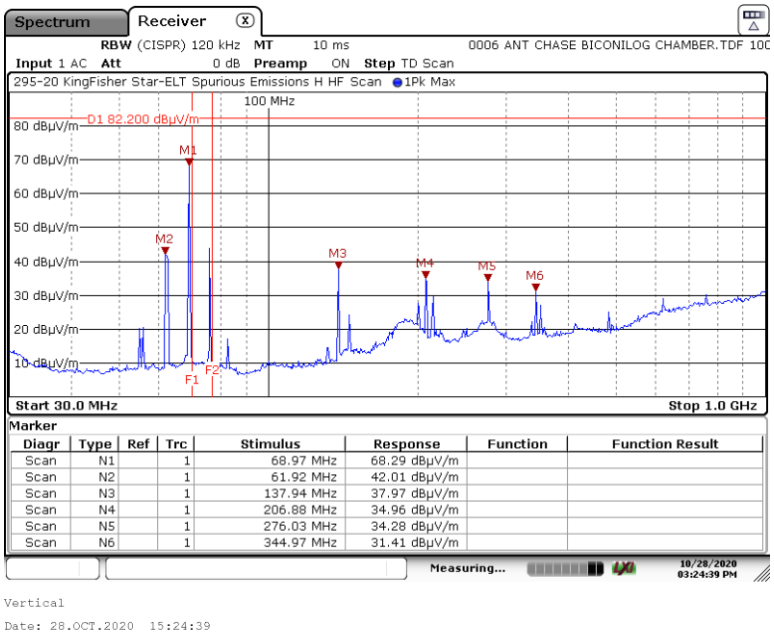
6. Measurement Data

6.6. Field Strength of Spurious Radiation, FCC 2.1053, FCC 90.241

6.6.14. Spurious Radiated Emissions, 75.98 MHz, 150 kHz to 30 MHz, Ground Parallel Antenna



6.6.15. Spurious Radiated Emissions, 75.98 MHz, 150 kHz to 30 MHz, Horizontal Antenna



Marker

Diagr	Type	Ref	Trc	Stimulus	Response	Function	Function Result
Scan	N1		1	68.97 MHz	68.29 dBµV/m		
Scan	N2		1	61.92 MHz	42.01 dBµV/m		
Scan	N3		1	137.94 MHz	37.97 dBµV/m		
Scan	N4		1	206.88 MHz	34.96 dBµV/m		
Scan	N5		1	276.03 MHz	34.28 dBµV/m		
Scan	N6		1	344.97 MHz	31.41 dBµV/m		

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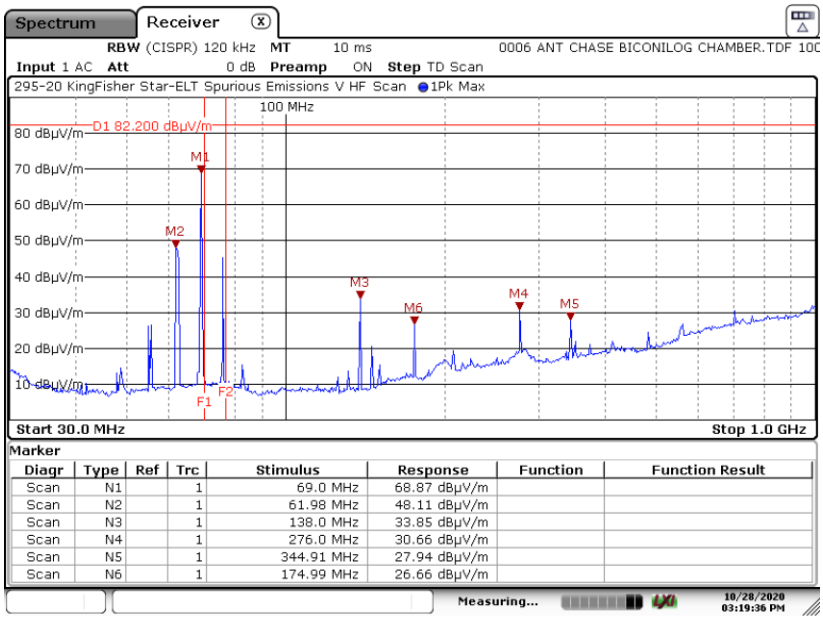
6. Measurement Data

6.6. Field Strength of Spurious Radiation, FCC 2.1053, FCC 90.241

6.6.16. Spurious Radiated Emissions, 75.98 MHz, 150 kHz to 30 MHz, Vertical Antenna



Vertical

Date: 28.OCT.2020 15:19:37

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6. Measurement Data

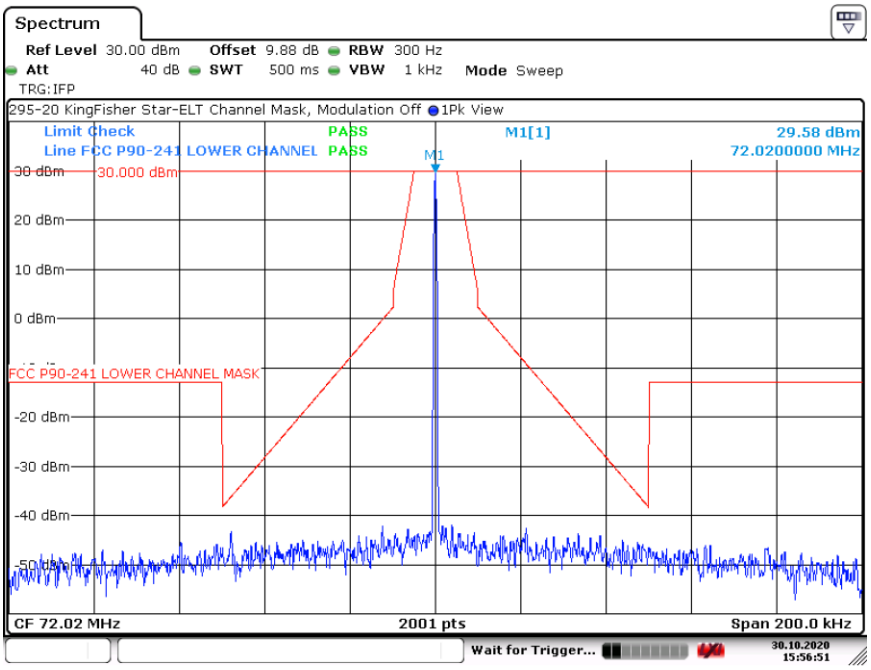
6.7. Emission Mask, 90.210 (c)

Requirement:

1. On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5 kHz, but not more than 10 kHz: At least 83 log (f_d/5) dB; The transmitter frequency tolerance shall be 0.005 percent.
2. On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 10 kHz, but not more than 250 percent of the authorized bandwidth: At least 29 log (f_d ^{2}/11) dB or 50 dB, whichever is the lesser attenuation;
3. On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

Test Method: ANSI C63.26-2015 Section 5.7.3

6.7.1. Emission Mask, 72.02 MHz, Modulation Off



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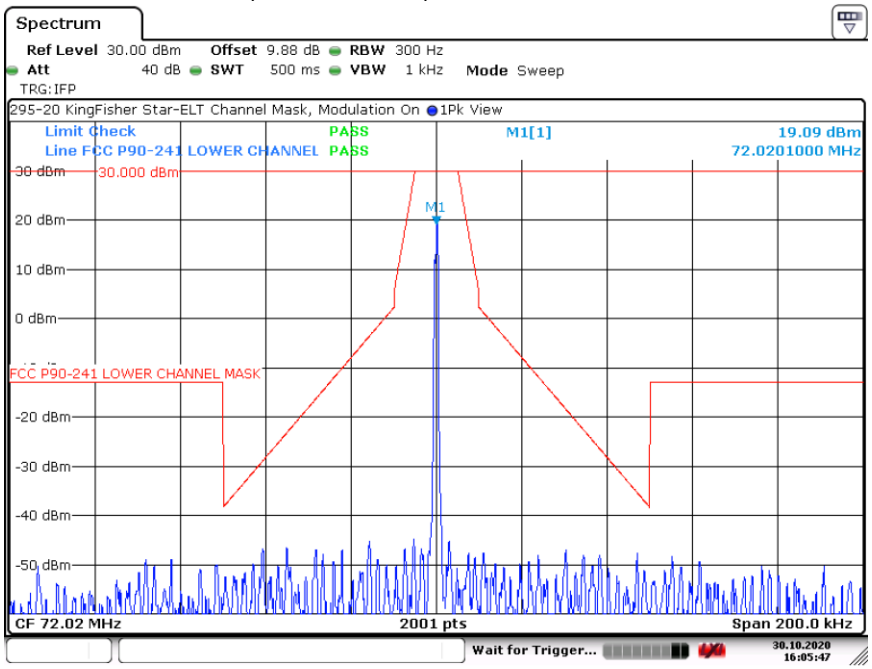
6. Measurement Data

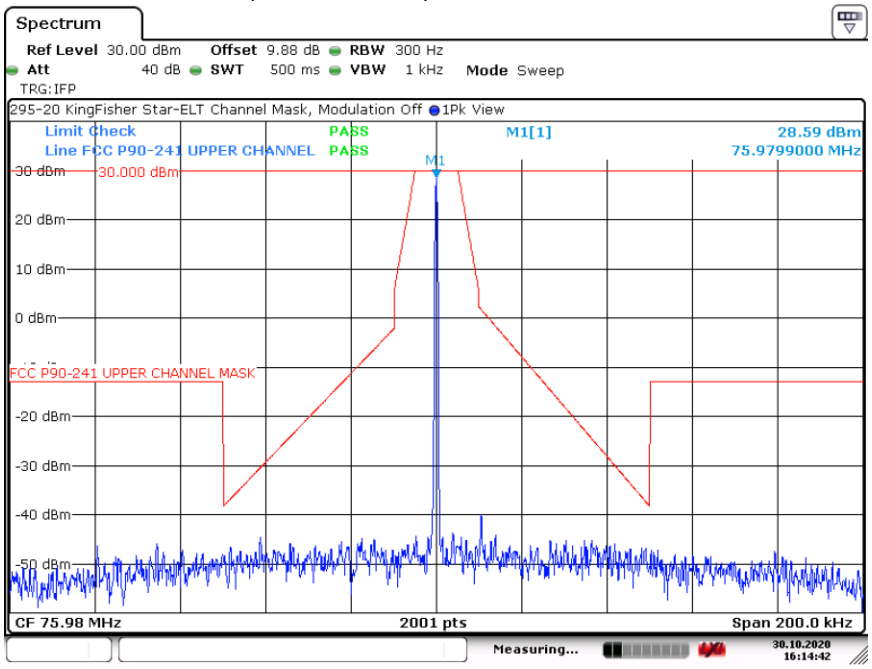
6.7. Emission Mask, 90.210(c),

6.7.2. Emission Mask, 72.02 MHz, Modulation On



Date: 30.OCT.2020 16:05:47

6.7.3. Emission Mask, 75.98 MHz, Modulation Off



Date: 30.OCT.2020 16:14:42

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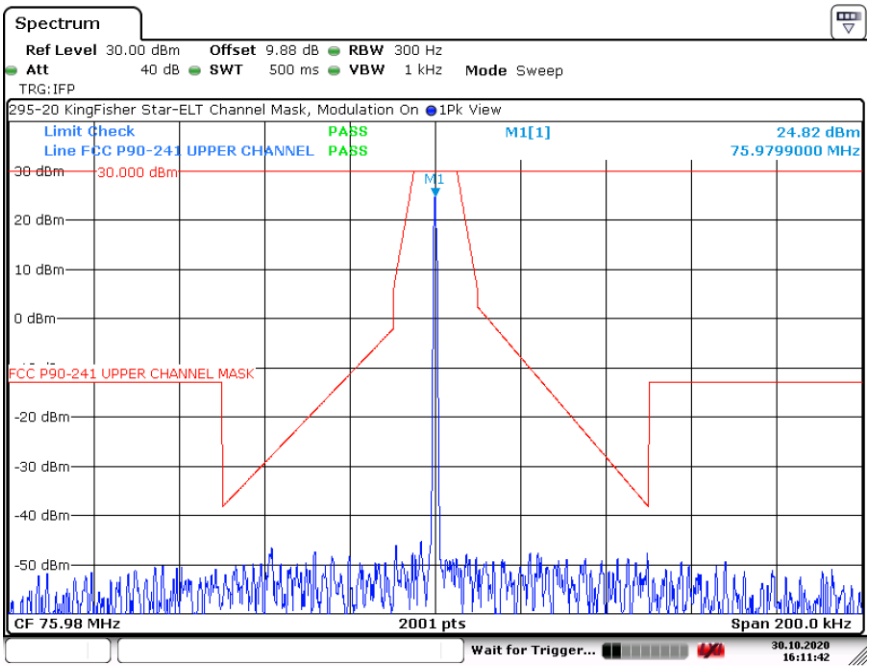
6. Measurement Data

6.7. Emission Mask, 90.210(c),

6.7.4. Emission Mask, 75.98 MHz, Modulation On



Date: 30.OCT.2020 16:11:42

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6. Measurement Data (continued)

6.8. Public Exposure to Radio Frequency Energy Levels 1.1307 (b)(1)

Center Frequency (MHz)	MPE Distance (cm)	DUT Output Power (dBm)	DUT Antenna Gain (dBi)	Power Density		Limit (mW/cm^2)	Result
				(mW/cm^2)	(W/m^2)		
	(1)	(2)	(3)	(4)		(5)	
72.02	20.0	29.23	0.00	0.1666212	1.6662116	0.2	Compliant
75.98	20.0	28.60	0.00	0.1441220	1.4412195	0.2	Compliant

$$PD = \frac{OP + AG}{(4 \times \pi \times d^2)}$$

1. Reference CFR 2.1091(b): For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. In this context, the term ''fixed location'' means that the device is physically secured at one location and is not able to be easily moved to another location.
2. Section 6.1 of this test report.
3. Data supplied by the client for combination of cable loss and antenna gain.
4. Power density is calculated from field strength measurement and antenna gain.
5. Reference CFR 1.1310, Table 1: Limits for Maximum Permissible Exposure (MPE), Section (B): Limits for General Population / Uncontrolled Exposure. 30 to 300 MHz is 0.2 mW/cm^2.

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7. Test Site Description

Compliance Worldwide is located at 357 Main Street in Sandown, New Hampshire. The test sites at Compliance Worldwide are used for conducted and radiated emissions testing in accordance with the Federal Communications Commission (FCC) and Industry Canada standards. Through our American Association for Laboratory Accreditation (A2LA) ISO Guide 17025 Accreditation our test sites are designated with the FCC (designation number **US1091**), Industry Canada (file number **IC 3023A-1)** and VCCI (Member number 3168) under registration number A-0274.

Compliance Worldwide is also designated as a Phase 1 CAB under APEC-MRA (US0132) for Australia/New Zealand AS/NZS CISPR 22, Chinese-Taipei (Taiwan) BSMI CNS 13438 and Korea (RRA) KN 11, KN 13, KN 14-1, KN 22, KN 32, KN 61000-6-3, KN 61000-6-4.

The radiated emissions test site is a 3 and 10 meter enclosed open area test site (OATS). Personnel, support equipment and test equipment are located in the basement beneath the OATS ground plane.

The conducted emissions site is part of a 16' x 20' x 12' ferrite tile chamber and uses one of the walls for the vertical ground plane. A second conducted emissions site is also located in the basement of the OATS site with a 2.3 x 2.5 meter ground plane and a 2.4 x 2.4 meter vertical wall.

The radiated emissions test site for measurements above 1GHz is a 3 Meter open area test site (OATS) with a 3.6 by 3.6 meter anechoic absorber floor patch to achieve a quasi-free space measurement environment per ANSI C63.4/C63.10 and CISPR 16-1-4 standards.

The sites are designed to test products or systems 1.5 meters W x 1.5 meters L x 2.0 meters H, floor standing or table top.

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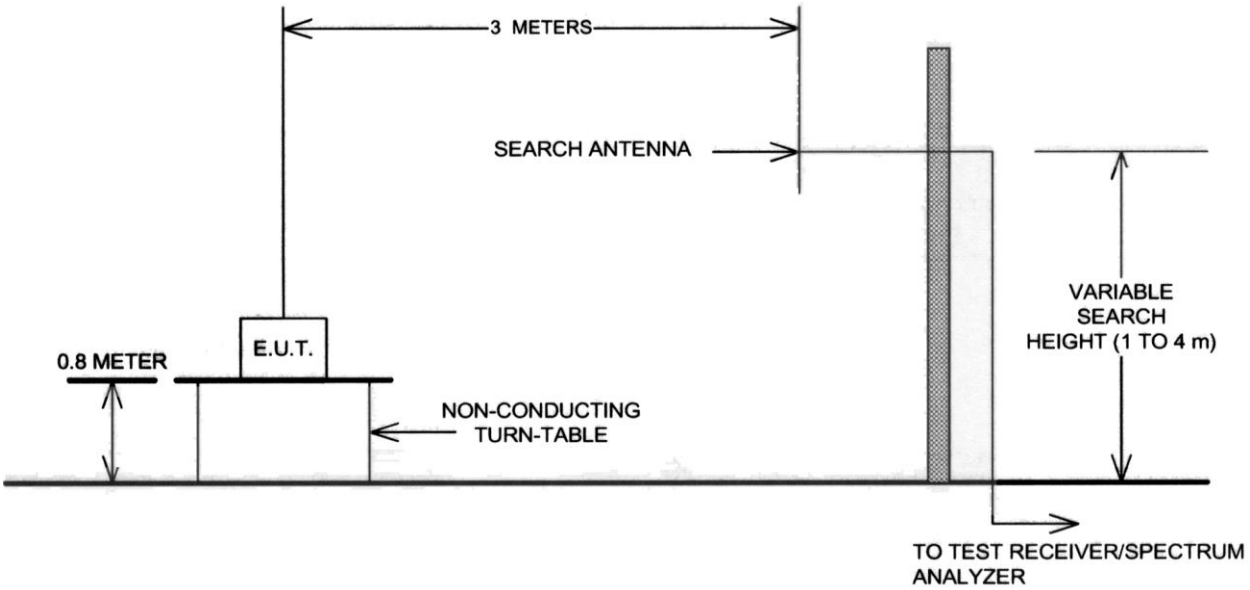
Appendix A

Field Strength of Spurious Radiation



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