

Rogers Labs, a division of The Compatibility Center LLC

7915 Nieman Rd.
Lenexa, KS 66214
Phone / Fax (913) 660-0666

Class 2 Permissible Change Test Report

47CFR Parts 2, 90 and RSS-137

Location and Monitoring Service Transmitter

Transcore


Amtech Technology Center
8600 Jefferson Street, NE
Albuquerque, NM 87113

Model: 051181
FCC ID: FIH051114
IC: 1584A-051114

MRA Designation Number: US5305
IC Test Site Registration: 3041A

Test Report Number: 241119

Test Date: November 19, 2024 – February 18, 2024

Authorized Signatory: 
Patrick Powell
Rogers Labs, a division of The Compatibility Center LLC
7915 Nieman Rd.
Lenexa, KS 66214
Telephone/Facsimile: (913) 660-0666

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Rogers Labs, a division of The Compatibility Center LLC Transcore
7915 Nieman Road HVIN : 051181 PMN : 051181 SN: N/A
Lenexa, KS 66214 Test: 241119 FCC ID: FIH051114 IC: 1584A-051114
Phone: (913) 660-0666 Test to: 47CFR Parts 2, 90 and RSS-137 Date : March 10, 2025
Revision 1 File: Transcore 051181 Tag C2PC 241119 r1 Page 1 of 24

Summary

The following information is submitted as documentation of compliance with regulations supporting Class 2 (Class 3 ISED) Permissible Change of Authorized Equipment. This product was authorized under 47CFR Parts 2 and 90 and RSS-137 as Location and Monitoring Service Transmitter operating in the 902-928 MHz frequency band.

Name of Applicant: Transcore
 Amtech Technology Center
 8600 Jefferson Street, NE
 Albuquerque, NM 87113

HVIN: 051181

PMN: 051181

FVIN: ASTM: 1.05, IAG: CV.20.0.1.00.03

FCC ID: FIH051114

IC: 1584A-051114

Frequency of Operation: 915 MHz

Opinion / Interpretation of Results

Test Number	Measurement	FCC Rule	Pass/Fail
#1	Transmitter Power Output	47CFR paragraphs 2.1046 90.205, RSS-137, Issue 2	Pass
#2	Spurious Emissions	47CFR 2.1051, 2.1057, 47CFR paragraphs 90.210 and RSS-137	Pass
#3	Field Strength of Spurious Radiation	47CFR 2.1053, 2.1057, 47CFR paragraphs 90.210 and RSS-137	Pass

Change to Equipment from Original Design

The information contained in this report address modification to the original equipment as summarized below. This change added a passive (backscatter) RFID protocol to our FCC/IC approved active tag. This modification does not affect the active transmitter and the device remains electrically equivalent. This report validates that this change resulted in no substantial change to the performance shown in the original grant.

Equipment Tested

<u>Equipment</u>	<u>Model / PN</u>	<u>Serial Number</u>
EUT #1	051181	N/A

Test results in this report relate only to the items tested.

FVIN / Software Version: ASTM: 1.05, IAG: CV.20.0.1.00.03

Equipment Function and Configuration

The EUT is a mobile non-Multilateral transponder Tag Operating as location and monitoring Radio Frequency Identification (RFID) transmitter. The EUT documented in this report is an active mobile transponder operating at 915 MHz frequency band transmitting information to compatible Location and Monitoring Service equipment. The unit operates from direct current power provided from direct current power provided from battery source and provides no provision for alternative power source. The design utilizes an internal fixed antenna system and offers no provision for antenna replacement or modification. The operation of the design utilizes standardized RFID modulation schemes offering the ability to interface and respond with Industry Standard Radio Frequency Identification (RFID) interrogation systems. The test sample was modified from production equipment for testing purposes. The modifications involved the addition of slide switches used to enable the transmitter for testing purposes. The test sample transmits bursts of OOK (On/Off Keyed) modulated signal resembling actual packet data in the test mode. Activation of the switch placed the EUT in a test mode operating the transmitter at a 100% duty cycle. The testing mode of operation exceeds typical duty cycle operation of production equipment. Test results in this report relate only to the products described in this report.

Equipment Configuration

EUT

Applicable Standards & Test Procedures

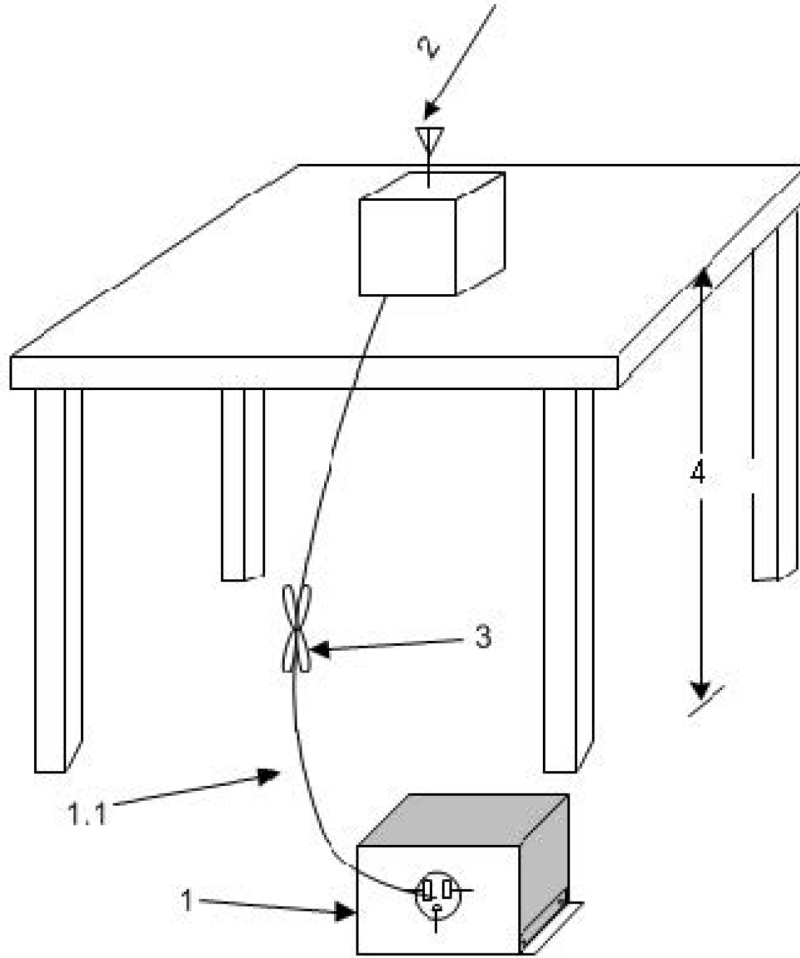
In accordance with the Federal Communications Code of Federal Regulations, 47CFR dated November 18, 2024, Part 2 Subpart J, Paragraphs 2.907, 2.911, 2.913, 2.925, 2.926, 2.1031 through 2.1057; 90.201 through 90.217, 90.350 through 90.363 and RSS-137 Issue 2 the following information is submitted. Test procedures used were the established Methods of Measurement of Radio-Noise Emissions as described in ANSI C63.26-2015 and ANSI 63.4-2014.

Test Procedures

Radiated Emission Procedure

Radiated emissions testing was performed as required in 47CFR, RSS-137, RSS-GEN and specified in ANSI C63.26-2015. The EUT was placed on a rotating 0.9 x 1.2-meter platform, elevated as required above the ground plane at a distance of 3 meters from the FSM antenna. EMI energy was maximized by equipment placement permitting orientation in three orthogonal axes, raising, and lowering the FSM antenna, changing the antenna polarization, and by rotating the turntable. Each emission was maximized before data was taken and recorded. The frequency spectrum from 9 kHz to 10,000 MHz was searched for emissions during preliminary investigation. Refer to diagrams one and two showing typical test setup. Refer to photographs in the test setup exhibits for specific EUT placement during testing.

Diagram 1 Test arrangement for radiated emissions of tabletop equipment



1—A LISN is optional for radiated measurements between 30 MHz and 1000 MHz but not allowed for measurements below 30 MHz and above 1000 MHz (see 6.3.1). If used, then connect EUT to one LISN.

Unused LISN measuring port connectors shall be terminated in 50 Ω loads. The LISN may be placed on top of, or immediately beneath, the reference ground plane (see 6.2.2 and 6.2.3.2).

1.1—LISN spaced at least 80 cm from the nearest part of the EUT chassis.

2—Antenna can be integral or detachable, depending on the EUT (see 6.3.1).

3—Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center

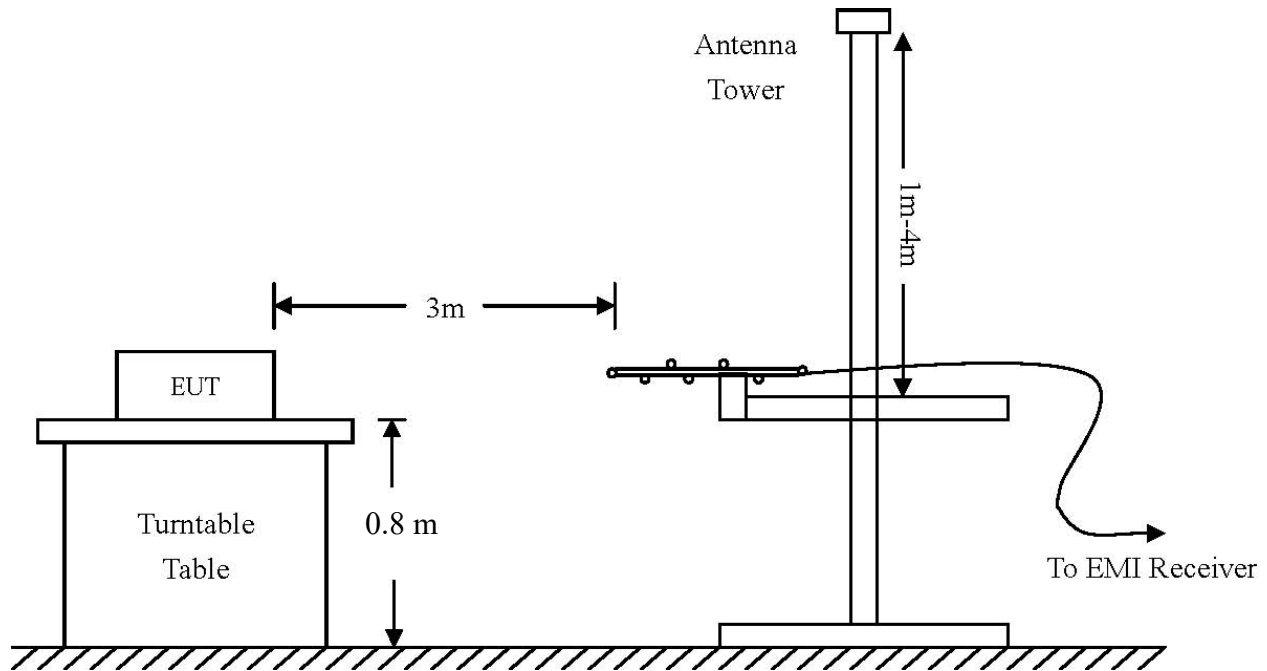
forming a bundle 30 cm to 40 cm long (see 6.3.1).

4—For emission measurements at or below 1 GHz, the table height shall be 80 cm. For emission measurements above

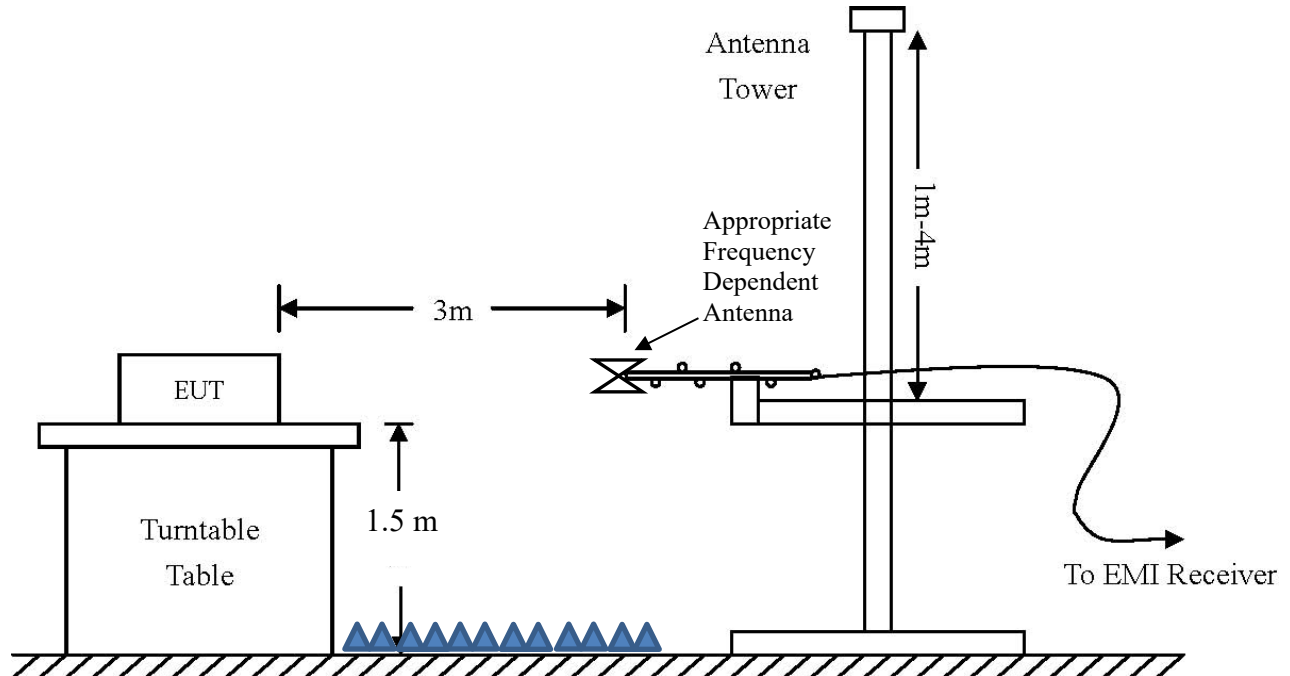
1 GHz, the table height shall be 1.5 m for measurements, except as otherwise specified (see 6.3.1 and 6.6.3.1).

Diagram 2 Test arrangement for radiated emissions tested in Semi-Anechoic Chamber (SAC) and Outdoor Area Test Site (OATS)

Below 1 GHz



Above 1 GHz:



Test Site Location

Radiated EMI The radiated emissions tests were performed at the 3 meters Semi-Anechoic Chamber (SAC) located at Rogers Labs, a division of The Compatibility Center LLC, 7915 Nieman Rd., Lenexa, KS or at the 3 meters Outdoor Area Test Site (OATS) in the satellite location.

Registered Site information: FCC Site: US5305, ISED: 3041A, CAB Identifier: US0096

NVLAP Accreditation Lab code 200087-0

Units of Measurements

Radiated EMI Data presented in dB μ V/m; dB referenced to one microvolt per meter

Note: The limit is expressed for a measurement in dB μ V/m when the measurement is taken at a distance of 3 or 10 meters. Data taken for this report was taken at distance of 3 meters. Sample calculation demonstrates corrected field strength reading for Semi-Anechoic Chamber using the measurement reading and correcting for receive antenna factor, cable losses, and amplifier gains.

Sample Calculation:

RFS = Radiated Field Strength, FSM = Field Strength Measured

A.F. = Receive antenna factor, Losses = attenuators/cable losses, Gain = amplification gains

$RFS (dB\mu V/m @ 3m) = FSM (dB\mu V) + A.F. (dB/m) + Losses (dB) - Gain (dB)$

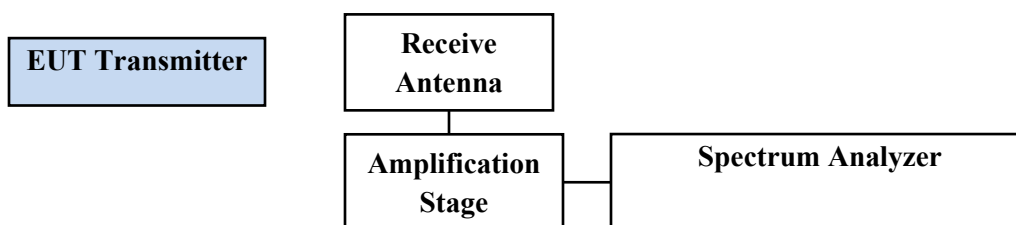
TEST #1 Transmitter Power Output

Measurements Required

Measurements shall be made to establish the radio frequency power delivered by the transmitter into the standard output termination. The power output shall be monitored and recorded, and no adjustment shall be made to the transmitter after the test has begun, except as noted below:

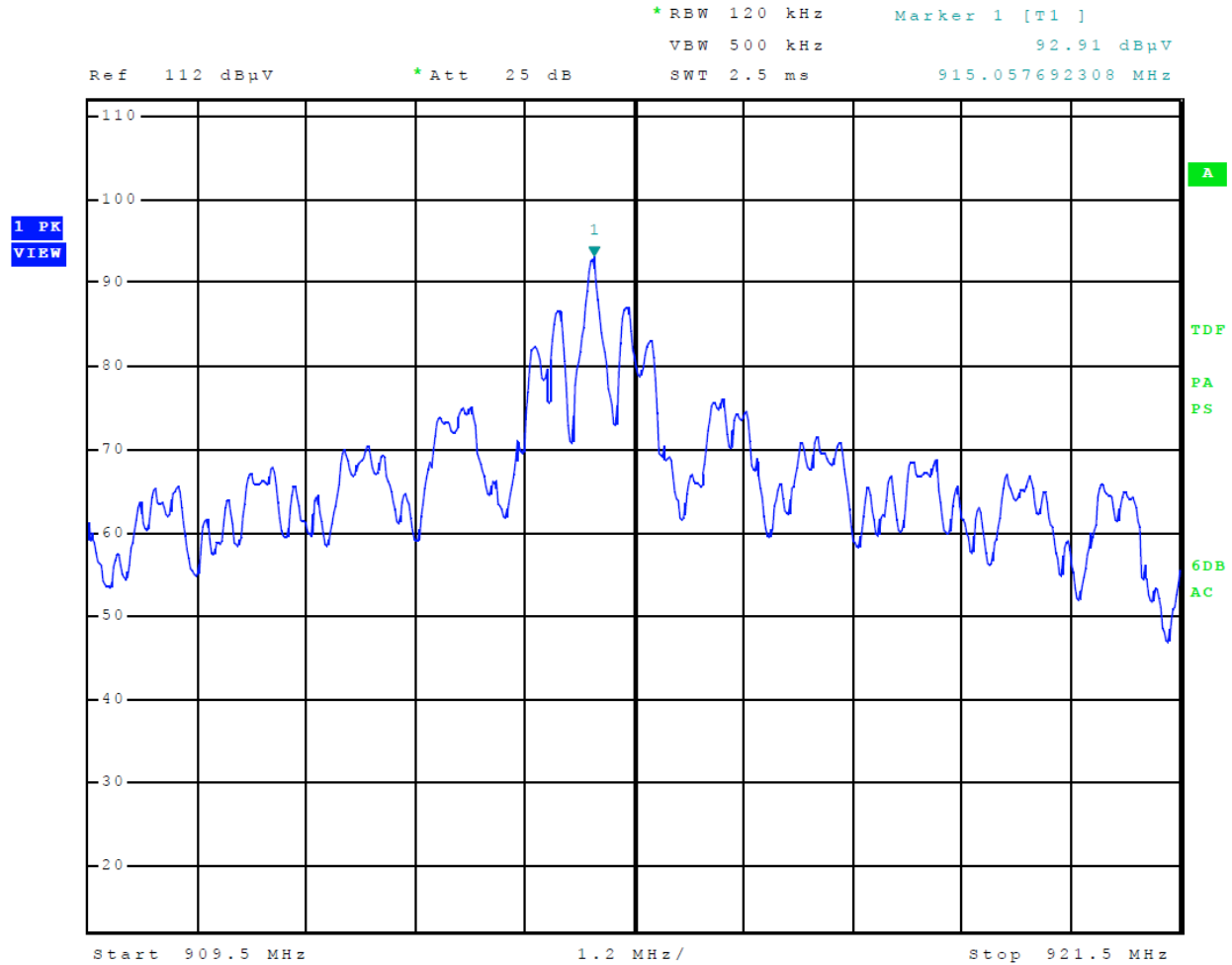
If the power output is adjustable, measurements shall be made for the highest and lowest power levels.

Test Arrangement



The radio frequency power output was measured in the Semi-Anechoic Chamber (SAC). The design offers no provision for connection to antenna port. The substitution method was used to predict the transmitter output power level. The receiver peak detector was used to record the highest emission levels. The EUT was placed on a rotatable platform elevated as required above the ground plane at a distance of 3 meters from the FSM antenna. The platform was rotated through 360 degrees to locate the position registering the highest amplitude emission. The frequency spectrum was searched for maximum emission generated. Emission level was measured and recorded for the maximum amplitude. The EUT transmitter was then removed and replaced with a substitution antenna, which was powered from a signal generator. The output signal from the generator was then adjusted such that the amplitude received was the same as that previously recorded for each frequency. This step was repeated for both horizontal and vertical polarizations. The power in dBm required to produce the desired signal level was then recorded from the signal generator. The power in dBm was then calculated by reducing the previous readings by the gain in the substitution antenna. The testing procedures used conform to the procedures stated in the ANSI C63.26-2015 document. Data was taken per 47CFR Paragraph 2.1046(a) and applicable paragraphs of Part 90 and RSS-137.

Figure 1 Transmitter Output Across Frequency Band - ASTM



Conclusion

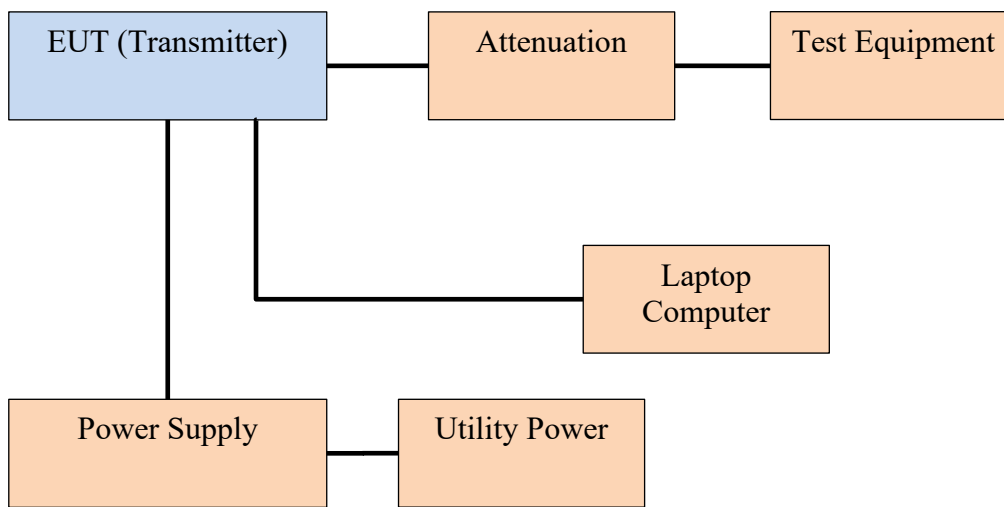
The EUT demonstrated compliance with specifications of 47CFR Paragraph 2.1046(a) and applicable Parts of 2 and 90.205 and RSS-137. There are no deviations to the specifications.

TEST #2 Spurious Emissions

Measurements Required

The radio frequency voltage or power generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. To gain dynamic range in the test equipment, a high pass filter attenuated the fundamental frequency of operation was used to observe the harmonic emissions.

Test Arrangement



The radio frequency output was coupled to a Rohde & Schwarz ESU40 Spectrum Analyzer. The spectrum analyzer was used to observe the radio frequency spectrum with the transmitter operating in its normal modes. The frequency spectrum from 9 kHz to 10 GHz was observed. Data was taken per 47CFR 2.1051 and applicable paragraphs of Part 90 and RSS-137.

Limit: Spurious emissions must be attenuated below the peak output power by at least $55 + 10 \text{ Log}(P_o)$ dB.

0.0008-watt transmitter limit requires the out of band emissions must be suppressed by at least 24.0 dBc

$$\begin{aligned}
 \text{Attenuation} &= 55 + 10 \text{ Log}_{10}(P_w) \\
 &= 55 + 10 \text{ Log}_{10}(0.004) \\
 &= 31.0 \text{ dBc}
 \end{aligned}$$

Table 2 Spurious Emissions Results (worst case = ASTM)

Channel MHz	Spurious Freq. (MHz)	Measured Level (dBm)	Level Below Carrier (dBc)
915.00	1830.0	-56.2	62.2
	2745.0	-53.5	59.5
	3660.0	-54.6	60.6
	4575.0	-53.5	59.5
	5490.0	-50.1	56.1
	6405.0	-47.7	53.7

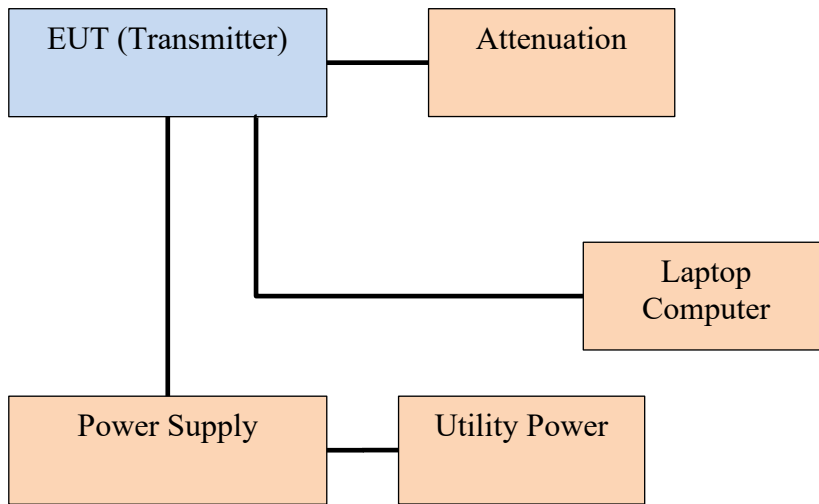
Data was taken per 2.1051 and applicable parts of 47CFR 90.210 and RSS-137. The EUT demonstrated compliance with the specifications of Paragraphs 47CFR 2.1051, 2.1057 and 90.210(k) and RSS-137 paragraph 6.5. There are no deviations to the specifications.

TEST #3 Field Strength of Spurious Radiation

Measurements Required

Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation.

Test Arrangement



Preliminary radiated emissions investigation was made in a screen room to determine frequencies of emissions for investigation in the SAC. The transmitter spurious emissions were measured in the SAC. The EUT was placed on a turntable elevated as required above the ground plane at a distance of 3 meters from the FSM antenna. The turntable was rotated through 360 degrees to locate the position registering the highest amplitude emission. The frequency spectrum was then searched for spurious emissions generated from the transmitter. Raising and lowering the FSM antenna and rotating the turntable to maximize the emission. Data was measured and recorded for the maximum amplitude of each spurious emission. A Loop antenna was used for measuring emissions from 0.009 to 30 MHz, Biconilog Antenna for 30 to 1000 MHz, Double-Ridge, and/or Pyramidal Horn Antennas above 1 GHz. Emissions were measured in dB μ V/m @ 3 meters. The substitution method was used to measure harmonic emissions. Harmonic emission levels from the EUT were measured and amplitude levels were recorded. The EUT transmitter was then removed and replaced with a substitution antenna, which was powered from a signal generator. The output signal from the generator was then adjusted such

that the amplitude received was the same as that previously recorded for each frequency. This step was repeated for both horizontal and vertical polarizations. The power in dBm required to produce the desired signal level was then recorded from the signal generator. The power in dBm was then calculated by reducing the previous readings by the gain in the substitution antenna.

The limits for the spurious radiated emissions are defined by the following equation.

Limit = Amplitude of the spurious emission must be attenuated by this amount below the level of the fundamental. On any frequency removed from the assigned frequency outside the assigned sub-band edges: at least $55 + 10 \text{ Log}(P_o)$ dB.

0.004-watt transmitter limit requires that out of band emissions must be suppressed by at least 31.0 dBc

$$\begin{aligned} \text{Attenuation} &= 55 + 10 \text{ Log}_{10}(P_w) \\ &= 55 + 10 \text{ Log}_{10}(0.004) \\ &= 31.0 \text{ dBc} \end{aligned}$$

Data was taken per 2.1053 and applicable parts of 47CFR 90. The EUT demonstrated compliance with the specifications of Paragraphs 47CFR 2.1053, 2.1057 and 90.210(k) and RSS-137 paragraph 6.5. There are no deviations to the specifications.

Table 3 Field Strength of Spurious Radiation Results (Horizontal)

Frequency MHz	Peak dB μ V/m	Q.P. dB μ V/m	Q.P dBm	Limit (31.0dBc)	Pass/Fail
744.9	39.2	30.1	-65.2	-25.0	PASS
862.8	40.6	32.4	-62.8	-25.0	PASS
980.1	42.7	34.2	-61.1	-25.0	PASS

Table 4 Field Strength of Spurious Radiation Results (Vertical)

Frequency MHz	Peak dB μ V/m	Q.P. dB μ V/m	Q.P dBm	Limit (31.0dBc)	Pass/Fail
96.0	33.6	29.9	-65.4	-25.0	PASS
109.3	37.1	34.2	-61.1	-25.0	PASS
112.0	37.8	35.2	-60.0	-25.0	PASS
741.2	29.5	20.2	-75.0	-25.0	PASS
974.9	32.6	24.0	-71.2	-25.0	PASS

Annex

- Annex A Measurement Uncertainty Calculations
- Annex B Test Equipment
- Annex C Laboratory Certificate of Accreditation

Annex A Measurement Uncertainty Calculations

The measurement uncertainty was calculated for all measurements listed in this test report according To CISPR 16-4. Result of measurement uncertainty calculations are recorded below. Component and process variability of production devices similar to those tested may result in additional deviations. The manufacturer has the sole responsibility of continued compliance.

Measurement	Expanded Measurement Uncertainty $U_{(lab)}$
3 Meter Horizontal 0.009-1000 MHz Measurements	4.16
3 Meter Vertical 0.009-1000 MHz Measurements	4.33
3 Meter Measurements 1-18 GHz	5.46
3 Meter Measurements 18-40 GHz	5.16
10 Meter Horizontal Measurements 0.009-1000 MHz	4.15
10 Meter Vertical Measurements 0.009-1000 MHz	4.32
AC Line Conducted	1.75
Antenna Port Conducted power	1.17
Frequency Stability	1.00E-11
Temperature	1.6°C
Humidity	3%

Annex B Test Equipment

<u>Equipment</u>	<u>Manufacturer</u>	<u>Model (SN)</u>	<u>Band</u>	<u>Cal Date(m/d/y)</u>	<u>Due</u>
<input checked="" type="checkbox"/> LISN	FCC	FCC-LISN-50-25-10(1PA) (160611)	.15-30MHz	3/25/2024	3/25/2025
<input type="checkbox"/> LISN: Fischer Custom Communications Model:		FCC-LISN-50-16-2-08		3/25/2024	3/25/2025
<input checked="" type="checkbox"/> Cable	Huber & Suhner Inc.	Sucoflex102ea(L10M)(303073)	9kHz-40 GHz	9/16/2024	9/16/2025
<input checked="" type="checkbox"/> Cable	Huber & Suhner Inc.	Sucoflex102ea(1.5M)(303069)	9kHz-40 GHz	9/16/2024	9/16/2025
<input checked="" type="checkbox"/> Cable	Huber & Suhner Inc.	Sucoflex102ea(1.5M)(303070)	9kHz-40 GHz	9/16/2024	9/16/2025
<input checked="" type="checkbox"/> Cable	Belden	RG-58 (L1-CAT3-11509)	9kHz-30 MHz	9/16/2024	9/16/2025
<input type="checkbox"/> Cable	Belden	RG-58 (L2-CAT3-11509)	9kHz-30 MHz	9/16/2024	9/16/2025
<input checked="" type="checkbox"/> Antenna	Com Power	AL-130 (121055)	.001-30 MHz	9/16/2024	9/16/2025
<input type="checkbox"/> Antenna:	EMCO	6509	.001-30 MHz	9/16/2024	9/16/2026
<input checked="" type="checkbox"/> Antenna	ARA	BCD-235-B (169)	20-350MHz	9/16/2024	9/16/2025
<input checked="" type="checkbox"/> Antenna	Sunol	JB-6 (A100709)	30-1000 MHz	9/16/2024	9/16/2025
<input type="checkbox"/> Antenna	ETS-Lindgren	3147 (40582)	200-1000MHz	9/16/2024	9/16/2026
<input checked="" type="checkbox"/> Antenna	ETS-Lindgren	3117 (200389)	1-18 GHz	3/25/2024	3/25/2026
<input checked="" type="checkbox"/> Antenna	Com Power	AH-118 (10110)	1-18 GHz	9/16/2024	9/16/2026
<input checked="" type="checkbox"/> Antenna	Com Power	AH-1840 (101046)	18-40 GHz	3/27/2023	3/27/2025
<input checked="" type="checkbox"/> Analyzer	Rohde & Schwarz	ESU40 (100108)	20Hz-40GHz	7/8/2024	7/8/2025
<input checked="" type="checkbox"/> Analyzer	Rohde & Schwarz	ESW44 (101534)	20Hz-44GHz	1/26/2024	1/26/2025
<input type="checkbox"/> Analyzer	Rohde & Schwarz	FS-Z60, 90, 140, and 220	40GHz-220GHz	12/22/2017	12/22/2027
<input type="checkbox"/> Amplifier	Com-Power	PA-010 (171003)	100Hz-30MHz	9/16/2024	9/16/2025
<input type="checkbox"/> Amplifier	Com-Power	CPPA-102 (01254)	1-1000 MHz	9/16/2024	9/16/2025
<input checked="" type="checkbox"/> Amplifier	Com-Power	PAM-118A (551014)	0.5-18 GHz	9/16/2024	9/16/2025
<input checked="" type="checkbox"/> Amplifier	Com-Power	PAM-840A (461328)	18-40 GHz	9/16/2024	9/16/2025
<input checked="" type="checkbox"/> Pwr Sensor	Rohde & Schwarz	NRP33T	0.05-33 GHz	9/26/2023	9/26/2025
<input checked="" type="checkbox"/> Power meter	Agilent	N1911A with N1921A	0.05-40 GHz	3/25/2024	3/25/2025
<input checked="" type="checkbox"/> Generator	Rohde & Schwarz	SMB100A6 (100150)	20Hz-6 GHz	3/25/2024	3/25/2025
<input checked="" type="checkbox"/> Generator	Rohde & Schwarz	SMBV100A6 (260771)	20Hz-6 GHz	3/25/2024	3/25/2025
<input type="checkbox"/> RF Filter	Micro-Tronics	BRC50722 (009).9G notch	30-18000 MHz	3/25/2024	3/25/2025
<input type="checkbox"/> RF Filter	Micro-Tronics	HPM50114 (017)1.5G HPF	30-18000 MHz	3/25/2024	3/25/2025
<input type="checkbox"/> RF Filter	Micro-Tronics	HPM50117 (063) 3G HPF	30-18000 MHz	3/25/2024	3/25/2025
<input type="checkbox"/> RF Filter	Micro-Tronics	HPM50105 (059) 6G HPF	30-18000 MHz	3/25/2024	3/25/2025
<input checked="" type="checkbox"/> RF Filter	Micro-Tronics	BRM50702 (172) 2G notch	30-18000 MHz	3/25/2024	3/25/2025
<input checked="" type="checkbox"/> RF Filter	Micro-Tronics	BRC50703 (G102) 5G notch	30-18000 MHz	3/25/2024	3/25/2025
<input checked="" type="checkbox"/> RF Filter	Micro-Tronics	BRC50705 (024) 5G notch	30-18000 MHz	3/25/2024	3/25/2025
<input type="checkbox"/> Attenuator	Fairview	SA6NFNF100W-40 (1625)	30-18000 MHz	3/25/2024	3/25/2025
<input checked="" type="checkbox"/> Attenuator	Mini-Circuits	VAT-3W2+ (1436)	30-6000 MHz	3/25/2024	3/25/2025
<input checked="" type="checkbox"/> Attenuator	Mini-Circuits	VAT-3W2+ (1445)	30-6000 MHz	3/25/2024	3/25/2025
<input checked="" type="checkbox"/> Attenuator	Mini-Circuits	VAT-3W2+ (1735)	30-6000 MHz	3/25/2024	3/25/2025
<input checked="" type="checkbox"/> Attenuator	Mini-Circuits	VAT-6W2+ (1438)	30-6000 MHz	3/25/2024	3/25/2025
<input type="checkbox"/> Attenuator	Mini-Circuits	VAT-6W2+ (1736)	30-6000 MHz	3/25/2024	3/25/2025
<input checked="" type="checkbox"/> Weather station	Davis	6152 (A70927D44N)		7/11/2024	7/11/2025

Rogers Labs, a division of The Compatibility Center LLC

Transcore

7915 Nieman Road HVIN : 051181

PMN : 051181

SN: N/A

Lenexa, KS 66214 Test: 241119 FCC ID: FIH051114 IC: 1584A-051114

Phone: (913) 660-0666

Test to: 47CFR Parts 2, 90 and RSS-137

Date : March 10, 2025

Revision 1

File: Transcore 051181 Tag C2PC 241119 r1

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