

05/19/2025

Amarillo Technologies
4218 Erik Ave
Amarillo, TX, 79106 USA

Dear Jerry Harder,

Enclosed is the EMC test report for testing of the Amarillo Technologies, AT-5 tested to the requirements of FCC 2.1091

Thank you for using the services of Eurofins E&E North America. If you have any questions regarding these results or if MET can be of further service to you, please do feel free to contact me.

Sincerely,



Nancy LaBrecque
Documentation Department
Eurofins Electrical and Electronic Testing NA, Inc.

Reference: WIRA135463-MPE_R1



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**RF Exposure Criteria
Test Report
Using Maximum Permissible Exposure (MPE) Calculations**

for the

Amarillo Technologies
AT-5

Tested under

FCC 2.1091

Report: WIRA135463-MPE_R1

05/19/2025



Bryan Taylor, Wireless Team Lead
Electromagnetic Compatibility Lab



Nancy LaBrecque
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules Part 15.247 under normal use and maintenance.



Matthew Hinojosa
EMC Manager, Austin Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
0	04/28/2025	Initial Issue.
1	05/19/2025	Addressing TCB review comments

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List of Terms and Abbreviations

AC	Alternating Current
ACF	Antenna Correction Factor
Cal	Calibration
d	Measurement Distance
dB	Decibels
dBμA	Decibels above one microamp
dBμV	Decibels above one microvolt
dBμA/m	Decibels above one microamp per meter
dBμV/m	Decibels above one microvolt per meter
DC	Direct Current
E	Electric Field
DSL	Digital Subscriber Line
ESD	Electrostatic Discharge
EUT	Equipment Under Test
f	Frequency
CISPR	Comite International Special des Perturbations Radioelectriques (International Special Committee on Radio Interference)
GRP	Ground Reference Plane
H	Magnetic Field
HCP	Horizontal Coupling Plane
Hz	Hertz
IEC	International Electrotechnical Commission
kHz	kiloHertz
kPa	kiloPascal
kV	kilovolt
LISN	Line Impedance Stabilization Network
MHz	MegaHertz
μH	microHenry
μF	microFarad
μs	microseconds
PRF	Pulse Repetition Frequency
RF	Radio Frequency
RMS	Root-Mean-Square
V/m	Volts per meter
VCP	Vertical Coupling Plane

1.0 Requirements Summary

Page Number	Test Name	Result
12	FCC Part 2.1091 MPE Limits (For General Public Exposure)	Compliant

Table 1. Summary of Test Results

2.0 Equipment Configuration

2.1 Overview

Eurofins MET Labs was contracted by Amarillo Technologies to perform testing on the AT-5, under Amarillo Technologies's purchase order number 21025-A.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Amarillo Technologies AT-5.

The results obtained relate only to the item(s) tested.

Product Name:	AT-5 Intelligent Lock	
Model(s) Tested:	AT-5	
FCCID:	2BOPUAT5	
Equipment Specifications:	Primary Power:	3VDC Battery Powered
	Type of Modulations:	CSS
	Equipment Code:	FHSS and DTS
	Peak RF Output Power:	14 dBm typical (as high as 20 dBm)
	EUT Frequency Ranges:	902MHz to 928 MHz
	Antenna Gain ¹ :	-1 dBi
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35° C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Bryan Taylor	
Report Date(s):	04/22/2025	

Table 2. EUT Summary Table

¹ The antenna gain information was provided by Amarillo Technologies and may affect compliance.

2.2 Test Site

All testing was performed at Eurofins E&E North America, Austin, TX. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

2.3 References

RSS-102: Issue 5	Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
FCC Part 2.1091	Radiofrequency radiation exposure evaluation: mobile devices.

Table 3. References

2.4 Description of Test Sample

The AT-5 is a Bluetooth Controlled lock that includes various sensors to detect the occurrence of certain lock events (e.g., battery removed, shackle cut, and so on). Upon the occurrence of a lock event, the event is logged internally, handled, and reported out via a LoRa transmission. The AT-5 is used in connection with a broader software system that automates and enforces rules connected with lockout tagout procedures for industrial facilities.

2.5 Modifications

2.5.1 Modifications to EUT

No modifications were made to the EUT.

2.5.2 Modifications to Test Standard

No modifications were made to the test standard.

2.6 Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Amarillo Technologies upon completion of testing.

Ref. ID	Name/Description	Manufacturer	Model Number	Customer Supplied Calibration Data
Test Laptop	Dell	Latitude 5411	BPN66D3	n/a

Table 4. Support Equipment

3.0 Maximum Permissible Exposure Results

3.1 FCC Exposure Limits

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(i) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*(100)	≥6
3.0-30	1842/f	4.89/f	*(900/f ²)	<6
30-300	61.4	0.163	1.0	<6
300-1,500			f/300	<6
1,500-100,000			5	<6
(ii) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	<30
1.34-30	824/f	2.19/f	*(180/f ²)	<30
30-300	27.5	0.073	0.2	<30
300-1,500			f/1500	<30
1,500-100,000			1.0	<30

f = frequency in MHz. * = Plane-wave equivalent power density.

Test Procedure:

An MPE evaluation for was performed in order to show that the device was compliant with the general population exposure limits. The maximum power density was calculated for each transmitter band at a separation distance of 20cm using the maximum declared output power including tune up tolerance.

For each transmitter the maximum RF exposure at a 20 cm distance using the formula:

$$ConductedPower_{mW} = 10^{ConductedPower(dBm)/10}$$

$$PowerDensity = \frac{ConductedPower_{mW} \times Ant.Gain}{4\pi \times (20_{cm})^2}$$

For transmitters that could operate simultaneously, the MPE to limit ratio for each was calculated and then summed. If the sum of the MPE to limit ratios was less than 1, that specific combination of transmitters was deemed to comply.

Test Results:

The AT-5 Intelligent Lock was **compliant** with FCC 2.1091 . The calculated maximum power density at 20cm distance was equal to or less than the required limits for general population exposure for FCC 2.1091 . The sum of all of the MPE to limit ratios was less than 1 indicating that simultaneous transmission is acceptable for this device.

Test Data:

Duty Cycle	100 (%)							
Separation Dist.	20 (cm)							
Operating Mode	Frequency (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Duty Cycle Adjusted Cond. Output Power (dBm)	Antenna Gain (dB)	MPE Value (mW/cm ²)	MPE Limit (mW/cm ²)	Margin to Limit (mW/cm ²)	MPE / Limit Ratio (for Co-Location)
FHSS	902	20	20.00	-1	0.0158	0.6013	0.5855	0.0263
DTS	902	20	20.00	-1	0.0158	0.6013	0.5855	0.0263
BLE	2402	0.934	0.93	1.69	0.0004	1.0000	0.9996	0.0004
							Sum:	0.0529

FCC MPE Data

Test Engineer(s): Bryan Taylor

Test Date(s): 3/26/2025