PCTEST
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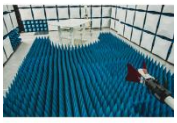


MEASUREMENT REPORT
FCC Part 15B

Applicant Name:
28 Gorilla, LLC.
12 S San Marco Pl
Chandler, AZ 85255
United States

Date of Testing:
5/13/2021 - 5/17/2021
Test Site/Location:
PCTEST. Morgan Hill, CA, USA
Test Report Serial No.:
1C2101120008-05.2AX2O-R1

Model Number:	**28-0010038**
Manufacturer:	**28 Gorilla, LLC.**

Model:	28-0010038
EUT Type:	AE Wireless Temperature Sensor
FCC Classification:	Part 15 Class B Digital Device
FCC Rule Part(s):	FCC Part 15 Subpart B
Test Procedure(s):	ANSI C63.4-2014

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and has been tested in accordance with the measurement procedures specified in ANSI C63.4-2014. These measurements were performed with no deviation from the standards. Test results reported herein relate only to the item(s) tested.

This revised Test Report (S/N: 1C2101120008-05.2AX2O-R1) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Randy Ortanez
President

ACCREDITED
CERT #2041.02

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.

1.2 PCTEST Test Location

These measurement tests were conducted at the PCTEST facility located at 18855 Adams Court, Morgan Hill, CA 95037. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

1.3 Test Facility / Accreditations

Measurements were performed at PCTEST located in Morgan Hill, CA 95037, U.S.A.

- PCTEST is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.02 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.

- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules.

- PCTEST facility is a registered (22831) test laboratory with the site description on file with ISED.

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Gorilla AE Wireless Temperature Sensor**. The test data contained in this report pertains only to the emissions due to the digital circuitry of the EUT. The wireless charging station utilizes Bluetooth (Low Energy) to pair with battery operated wireless temperature sensors that receive charge when placed on the slots of the wireless charging station's surface, and charges the wireless temperature sensors using WPT by transmitting a continuous carrier wave signal at 917.5MHz.

Max Operating Frequency [MHz]	2480
Input Voltage [V]	N/A - battery operated
Output Voltage [V]	N/A - battery operated

Table 2-1. Operating Frequency and Input/Output Power

Test Device Serial No.: 1F3F, 2A2E, 2ECC, 330F

2.2 Device Capabilities

This device contains the following capabilities:

Bluetooth (LE)

2.3 Test Support Equipment

	Description:	Model:	S/N:
1	USB-C Cable	N/A	N/A
2	AC Adapter	HNEM050200UU	N/A
3	Wireless Charging Station	28-0010366	007E

Table 2-2. Test Support Equipment Used

2.4 Test Configuration

The EUT is the wireless temperature sensor which has as its host a wireless charging station that was connected to an AC/DC adapter via a USB cable. All wireless charging station ports are populated with wireless temperature sensors. All equipment is placed on the test table top and arranged in a typical configuration in accordance with ANSI C63.4-2014.

For more information, please see Section 6.0 for test data and the test setup photos document for the test setup photographs.

2.5 Software and Firmware

The test was conducted with firmware version V1.1.0 installed on the EUT.

2.6 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedure described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C63.4-2014) was used in the measurement of the EUT**.**

Deviation from measurement procedure…….....None

3.2 Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Clause 5, Figure 5.7 of ANSI C63.4-2014. A raised turntable is used for radiated measurement. It is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. An 80cm tall test table made of Styrodur is placed on top of the turn table.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 1 x 0.8 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the polarization of the receive antenna, and performing final measurements in the direction of maximum polarization.

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014.

3.3 Environmental Conditions

The temperature is controlled within range of 15ºC to 35ºC. The relative humidity is controlled within range of 10% to 75%. The atmospheric pressure is monitored within the range 86-106kPa (860-1060mbar).

4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.23-2012. All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty (±dB)
Radiated Disturbance (30MHz - 1GHz)	4.30
Radiated Disturbance (>1GHz)	4.78

Table 4-1. Measurement Uncertainty

5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
ETS-Lindgren	3117	Double Ridged Guide Antenna (1-18 GHz)	5/3/2021	Annual	5/3/2022	205956
ETS-Lindgren	3142E	BiConiLog Antenna (30MHz - 6GHz)	9/15/2020	Annual	9/15/2021	208204
Rohde & Schwarz	TS-PR18	Pre-Amplifier (1GHz - 18GHz)	12/3/2020	Annual	12/3/2021	101648
Rohde & Schwarz	TS-PR8	Pre-Amplifier (30MHz - 8GHz)	7/15/2020	Annual	7/15/2021	102356
Rohde & Schwarz	ESW44	EMI Test Receiver	8/7/2020	Annual	8/7/2021	101668
Rohde & Schwarz	ENV216	Two-Line V-Network (LISN)	12/7/2020	Annual	12/7/2021	101364

Table 5-1. Test Equipment List

Note:

For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

6.0 TEST DATA

6.1 Summary

FCC Part 15 Section	Description	Result
15.107	AC Line Conducted Emissions	N/A
15.109	Radiated Emissions	PASS

Table 6-1. Summary of Test Results

Note:

AC line conducted emissions are exempt from regulations for equipment that is battery operated.

6.2 Radiated Emissions

§15.109

Test Overview and Limit

Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency [MHz]	Field Strength Limit [μV/m]
30 – 88	100
88 – 216	150
216 – 960	200
> 960	500

Table 6-2. Radiated Emissions Limits

Test Procedures Used

ANSI C63.4-2014

Test Settings

Quasi-Peak Field Strength Measurements

1. Analyzer frequency set to the frequency of the radiated emission of interest
2. RBW = 120kHz (for emissions from 30MHz – 1GHz)
3. Detector = quasi-peak
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

Average Field Strength Measurements

1. Analyzer frequency set to the frequency of the radiated emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = power average (RMS)
5. Number of sweep points = 1001 (Number of points must be > 2 x span/RBW)
6. Sweep time = auto
7. Trace was allowed to stabilize

Peak Field Strength Measurements

1. Analyzer frequency set to the frequency of the radiated emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = Peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown test setup photos provided.

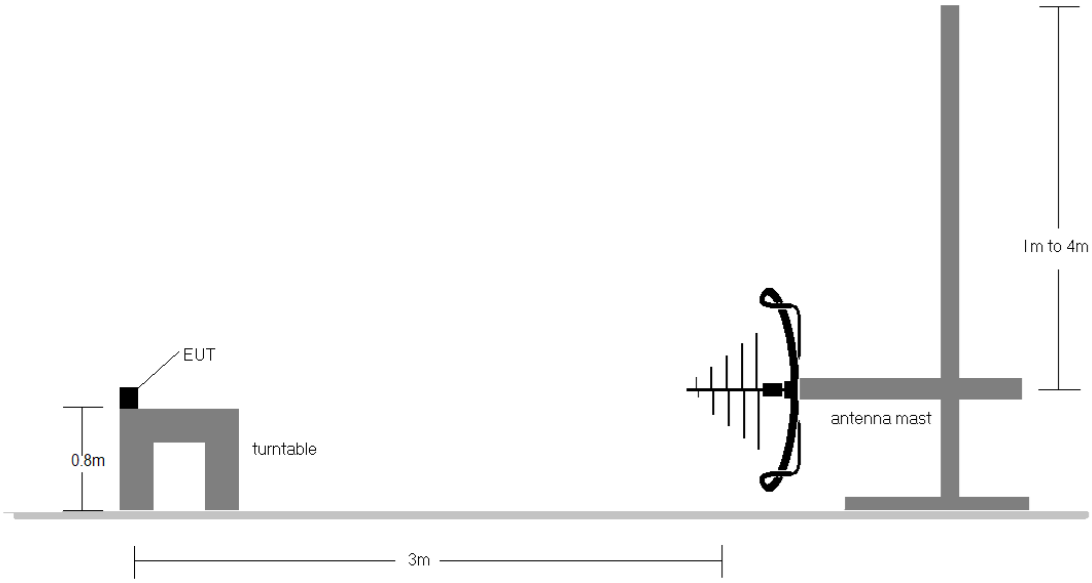


Figure 6-1: Radiated Test Setup < 1GHz

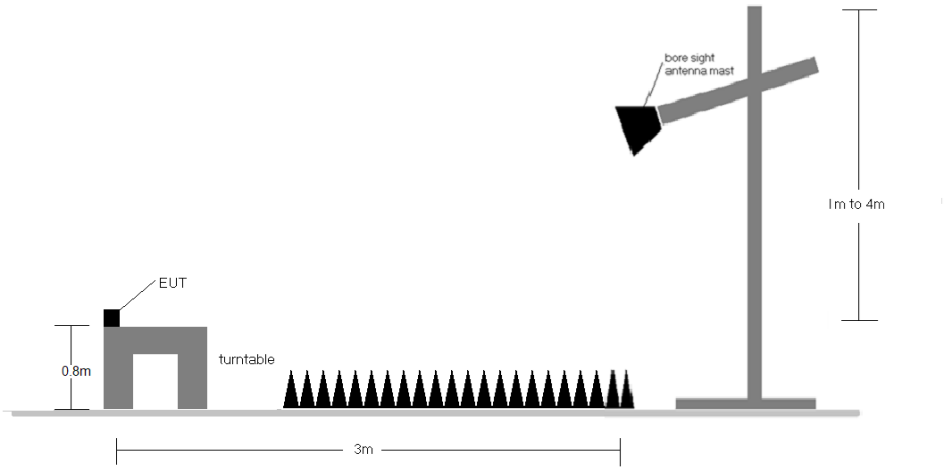


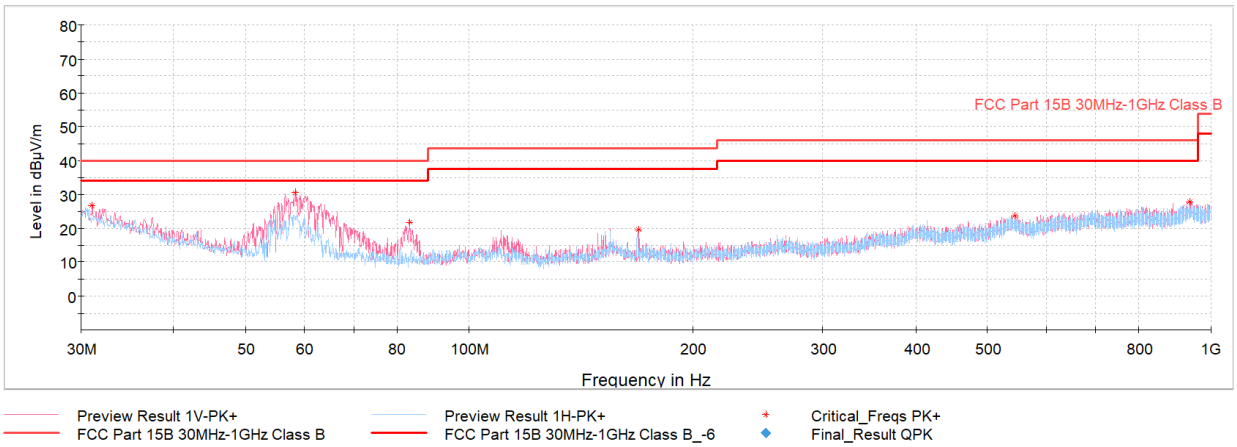
Figure 6-2: Radiated Test Setup > 1GHz

Test Notes

1. All modes of operation were investigated, and the worst-case emissions are reported.
2. Radiated emissions were measured from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes to ensure that the provisions of 15.33(b)(1) are satisfied with respect to the upper frequency scanning range.
3. The radiated limits for unintentional radiators at a distance of 3 meters are used in the table above, as specified in 15.109(a).
4. For frequency range 30MHz to 1GHz, measurements are made using a peak detector with a 120kHz resolution bandwidth. For above 1GHz, peak measurements are made using a peak detector with a resolution bandwidth of 1MHz and a video bandwidth of 3MHz and average measurements are made with a RMS detector using a resolution bandwidth of 1MHz and a video bandwidth of 3MHz.
5. Calibrated linearly polarized broadband and horn antennas were used for measurements below and above 1GHz, respectively. For measurements made below 1GHz, the results recorded using the broadband antenna are known to correlate with the results obtained by using a tuned dipole with an acceptable degree of accuracy. The VSWR for the measurement antennas was found to be less than 2.5:1.
6. Calibrated low-loss microwaves cables and broadband amplifiers are used.
7. The "-" shown in the following RSE tables are used to denote a noise floor measurement.
8. No significant emissions were observed Above 1GHz.

Sample Calculations

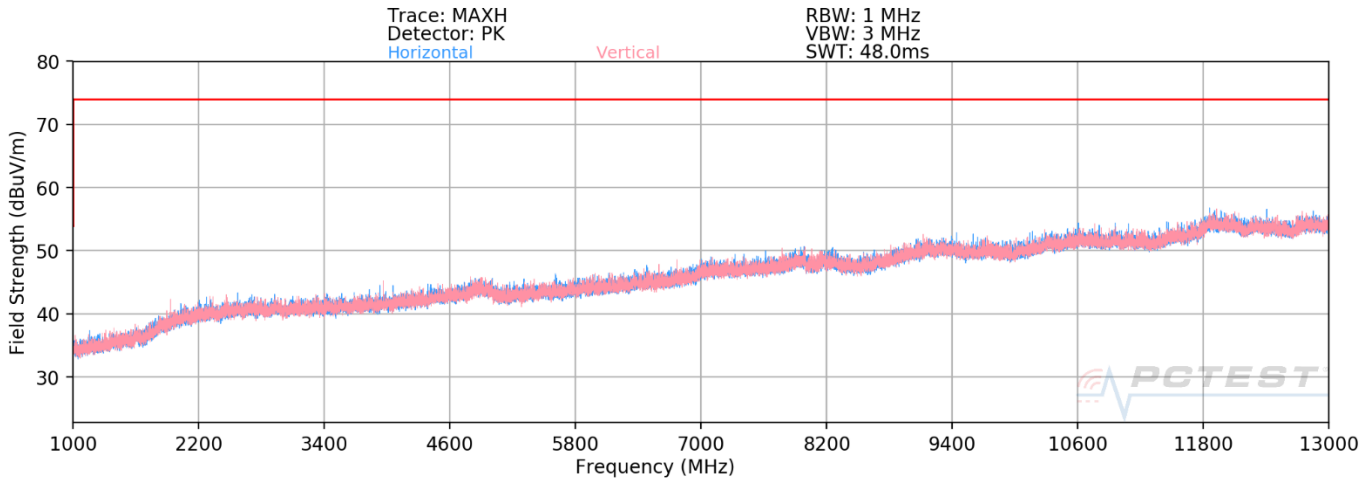
- Field Strength Level [dBµV/m] = Analyzer Level [dBm] + 107 + AFCL [dB/m]
- AFCL [dB/m] = Antenna Factor [dB/m] + Cable Loss [dB] – Preamplifier Gain [dB]
- Margin [dB] = Field Strength Level [dBµV/m] – Limit [dBµV/m]



Plot 6-1. Radiated Emissions Pre-Scan 30MHz-1GHz

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
31.067	Max Peak	V	250	202	-67.95	-12.37	26.68	40.00	-13.32
58.2755	Max Peak	V	100	277	-55.43	-21.08	30.49	40.00	-9.51
83.2045	Max Peak	V	100	52	-64.39	-20.72	21.89	40.00	-18.11
169.4375	Max Peak	V	100	132	-70.42	-17.08	19.50	43.52	-24.02
544.6335	Max Peak	V	-	-	-78.89	-4.49	23.62	46.02	-22.40
936.174	Max Peak	V	-	-	-79.93	0.74	27.81	46.02	-18.21

Table 6-3. Radiated Measurements 30MHz–1GHz



Plot 6-2. Radiated Emissions Pre-Scan 1-13GHz

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4880	Avg	H	-	-	-81.70	9.37	34.67	53.98	-19.31
4880	Peak	H	-	-	-70.75	9.37	45.62	73.98	-28.36
7320	Avg	H	-	-	-83.46	14.24	37.78	53.98	-16.20
7320	Peak	H	-	-	-71.68	14.24	49.56	73.98	-24.42
9760	Avg	H	-	-	-85.02	18.55	40.53	53.98	-13.45
9760	Peak	H	-	-	-72.71	18.55	52.84	73.98	-21.14
12010	Avg	H	-	-	-84.49	21.29	43.80	53.98	-10.17
12010	Peak	H	-	-	-72.85	21.29	55.44	73.98	-18.53
12200	Avg	H	-	-	-84.89	21.08	43.19	53.98	-10.78
12200	Peak	H	-	-	-73.20	21.08	54.88	73.98	-19.09
12400	Avg	H	-	-	-85.40	21.70	43.30	53.98	-10.68
12400	Peak	H	-	-	-73.85	21.70	54.85	73.98	-19.13

Table 6-4. Radiated Measurements 1-13GHz

7.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **28 Gorilla AE Wireless Temperature Sensor** has been tested to comply with the requirements specified in §15.107 and §15.109 of the FCC rules.