

Garrett Metal Detectors

WR-1 FCC 2.1093:2016 2400-2483.5 MHz Transceiver

Report # GARR0027



TESTING

NVLAP Lab Code: 201049-0

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Last Date of Evaluation: December 22, 2016 Garrett Metal Detectors Model: WR-1

RF Exposure Evaluation

Standards

| Specification | Method |
|-----------------|---|
| FCC 2.1093:2016 | FCC KDB 447498 D01 General RF Exposure Guidance v06 |

Results

| Method Clause | Description | Applied | Results | Comments |
|------------------|--------------------------|---------|---------|----------|
| 4.3.1 | SAR Evaluation Exclusion | Yes | Pass | |

Deviations From Standards

None

Approved By:

Donald Facteau, IT Manager

Product compliance is the responsibility of the client; therefore, the Evaluations and equipment modes of operation represented in this report were agreed upon by the client, prior to Evaluationing. The results of this Evaluation pertain only to the sample(s) Evaluationed. The specific description is noted in each of the individual sections of the Evaluation report supporting this certificate of Evaluation. This report reflects only those Evaluations from the referenced standards shown in the certificate of Evaluation. It does not include inspection or verification of labels, identification, marking or user information.

REVISION HISTORY



| Revision Number | Description | Date | Page Number |
|--------------------|-------------|------|-------------|
| 00 | None | | |

ACCREDITATIONS AND AUTHORIZATIONS



United States

FCC - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

A2LA - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Northwest EMC to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with ISED.

European Union

European Commission – Validated by the European Commission as a Notified Body under the R&TTE Directive.

Australia/New Zealand

ACMA - Recognized by ACMA as a CAB for the acceptance of test data.

Korea

MSIP / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

Taiwan

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SCOPE

For details on the Scopes of our Accreditations, please visit: <u>http://www.nwemc.com/accreditations/</u> http://gsi.nist.gov/global/docs/cabs/designations.html

FACILITIES





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| NVLAP Lab Code: 200676-0 NVLAP Lab Code: 200881-0 NVLAP Lab Code: 200761-0 NVLAP Lab Code: 200630-0 NVLAP Lab Code: 201049-0 NVLAP | | | | | | | | | | | | | | |
| Innovation, Science and Economic Development Canada | | | | | | | | | | | | | | |
| 2834B-1, 2834B-3 | 2834E-1 | N/A | 2834D-1, 2834D-2 | 2834G-1 | 2834F-1 | | | | | | | | | |
| | | BS | МІ | | | | | | | | | | | |
| SL2-IN-E-1154R | SL2-IN-E-1152R | N/A | SL2-IN-E-1017 | SL2-IN-E-1158R | SL2-IN-E-1153R | | | | | | | | | |
| | | VC | CI | | | | | | | | | | | |
| A-0029 | A-0109 | N/A | A-0108 | A-0201 | A-0110 | | | | | | | | | |
| | Recognized Phase | e I CAB for ACMA, BSM | I, IDA, KCC/RRA, MIC, M | OC, NCC, OFCA | | | | | | | | | | |
| US0158 | US0175 | N/A | US0017 | US0191 | US0157 | | | | | | | | | |



PRODUCT DESCRIPTION



Client and Equipment Under Evaluation Information

| Company Name: | Garrett Metal Detectors |
|--------------------------|-------------------------|
| Address: | 1881 W. State Street |
| City, State, Zip: | Garland, TX 75042 |
| Evaluation Requested By: | Weldon Sanders |
| Model: | WR-1 |
| Date of Evaluation: | December 22, 2016 |

Information Provided by the Party Requesting the Evaluation

Functional Description of the equipment:

The Garrett Z-LYNK Wireless Digital Transmission System consists of the Model WT-1 and Model WR-1 for use with Garret metal detectors to provide wireless audio functionality. The Model WT-1 and Model WR-1 use the identical radio chip and antenna.

The Model WT-1 is a part of the Garrett Z-LYNK Wireless Digital Transmission System operating in the 2.4GHz band. It is used with Garrett Metal Detectors hand-held hobby line of metal detectors and the Garrett Model WR-1. It is powered by a rechargeable 3.7 volt battery, receives audio from the detector via a short cable plugged into the headphone jack, and transmits that audio wirelessly to the WR-1 receiver. The WT-1 is mounted on the metal detector and used greater than 20 cm from the head or torso of a user.

The Model WR-1 is a part of the Garrett Z-LYNK Wireless Digital Transmission System operating in the 2.4GHz band. It is used with Garrett Metal Detectors hand-held hobby line of metal detectors and the Garrett Model WT-1. It is powered by a rechargeable 3.7 volt battery and receives audio from the detector via a wireless link from the Garrett Model WT-1. The user plugs his headphones into the WR-1. The WR-1 transmits handshake information back to the WT-1. The WR-1 has a belt clip and used within 20 cm of the torso of a user.

Objective:

To demonstrate compliance of WR-1 with FCC RF exposure requirements for 2.1093 portable devices.



Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

| Description | Manufacturer | Model | ID | Last Cal. | Cal. Due |
|------------------------------|--------------------|------------|-----|------------|------------|
| Probe - Near Field Set | ETS Lindgren | 7405 | IPS | NCR | NCR |
| Cable | Fairview Microwave | SCK0963-60 | TXF | 10/24/2016 | 10/24/2017 |
| Block - DC | Fairview Microwave | SD3379 | AMM | 2/25/2016 | 2/25/2017 |
| Attenuator | Fairview Microwave | SA4018-20 | TQY | 2/25/2016 | 2/25/2017 |
| Analyzer - Spectrum Analyzer | Agilent | N9010A | AFL | 10/4/2016 | 10/4/2017 |
| Generator - Signal | Agilent | E4422B | TGS | 3/27/2015 | 3/27/2018 |

TEST DESCRIPTION

A near-field probe was placed near the transmitter. A low-loss coaxial cable was used to connect the near-field probe to the spectrum analyzer. The Duty Cycle (x) of the single channel operation of the radio as controlled by the provided test software was measured for each of the EUT operating modes.

There is no compliance requirement to be met by this test, so therefore no Pass / Fail criteria.

The measurements were made using a zero span on the spectrum analyzer to see the pulses in the time domain. The transmit power was set to its default maximum when operating in it's typical audio transmit/receive mode.

The reference design manufacturer of the radio technology could not confirm an actual maximum duty cycle therefore an alternative method had to be used to measure the duty cycle used by the customer. A description of the test modes used are as follows: The WT-1 and WR-1 modules function as a pair to wirelessly communicate audio from the metal detector to the headphones. Unless already paired, the audio transmitter (WT-1) module has to be triggered (button press) to look for available receiver (WR-1) modules. The WT-1 module then pairs with the WR-1 module with the strongest signal. Once paired, the WT-1 remembers its WR-1 partner even after power cycle. A previously paired WT-1 will automatically establish connection with the same WR-1 on power up as long as the WR-1 is available for connection.

Once paired, the WT-1 digitizes the metal detector audio and transmits it over the radio link to the WR-1. This is the typical usage of the system and the radio.

If not paired or if the WR-1 is not available, the WT-1 radio does nothing until pairing is initiated or the WR-1 in memory becomes available.

If not paired or if the WT-1 is not available, the WR-1 radio sends a "pairing signal" that lets potential WT-1 modules know about availability in the WR-1 module's network.

Pairing is a one-time occurrence in most cases and the typical radio operation is when both the WT-1 and WR-1 are communicating and audio is being transmitted.

Investigation was done all three described modes. The worse case duty cycle was having both the WT-1 and WR-1 paired together and transmitting audio. This data is included in the report. The duty cycle was measured on low, mid and high channels and pulse on time, pulse number, and period were all recorded.

This particular Low Energy protocol implimentation limits transmission to 18 channels. In order to determine the total duty cycle from all channels, the worse case pulse width, period length, and number of pulses in a period were used and extrapolated to determine the duty cycle across all 18 channels. The formulas used are highlighted below.

Total Period across all channels (ms) = Total Channels * Worse case period per channel (ms) = 18 * 104.9 = 1888

Total Pulse on Time across all channels (ms) = Total Channels * Worse case # of pulses per channel * Worse case pulse width (ms) = 18 * 10 *.844 = 151.9

Duty Cycle % = (Total Pulse on Time across all channels / Total Period)* 100 = (151.9 / 1888)*100 = 8%



| EUT: | WR-1 | Work Order: | GARR0027 | | |
|---|---|---|---|--|--------------------------------------|
| Serial Number: | None | Date: | 11/11/16 | | |
| Customer: | Garrett Metal Detectors | | | Temperature: | 23.5 °C |
| Attendees: | None | | | Humidity: | 41% RH |
| Project: | None | | | Barometric Pres.: | 1026 mbar |
| Tested by: | Jonathan Kiefer | Power: | Battery | Job Site: | TX02 |
| TEST SPECIFICATI | ONS | | Test Method | | |
| FCC 2.1093:2016 | | | FCC KDB 447498 D01 General RF Exp | osure Guidance v06 | |
| | | | | | |
| COMMENTS | | | | | |
| Transmitter and Re used to calculate the | ceiver paired together. The measurements were taken on the e total duty cycle across all 18 channels. Duty cycle is 8%. | Receiver unit. This See the previous pag | operating mode is the actual mode us e for the complete calculation. | sed to transmit and receive audio in a | typical operation. These results are |
| DEVIATIONS FROM | TEST STANDARD | | | | |
| None | | | | | |
| Configuration # | 9 Signature | Jonethan | Niefe | | |
| | | | | Number of Value | Limit |

| | | | Number of | Value | Limit | |
|------------------------|-------------|------------|-----------|-------|-------|---------|
| | Pulse Width | Period | Pulses | (%) | (%) | Results |
| Low Channel, 2405 MHz | 174.8 us | 209.732 ms | 3 | N/A | N/A | N/A |
| Low Channel, 2405 MHz | N/A | N/A | 6 | N/A | N/A | N/A |
| Mid Channel, 2445 MHz | 835.4 us | 104.97 ms | 10 | N/A | N/A | N/A |
| Mid Channel, 2445 MHz | N/A | N/A | 43 | N/A | N/A | N/A |
| High Channel, 2476 MHz | 844 us | 210.034 ms | 4 | N/A | N/A | N/A |
| High Channel, 2476 MHz | N/A | N/A | 15 | N/A | N/A | N/A |



| | | | Lo | w Chann | el 2405 N | 1H7 | | | |
|----------------|----------------|---------------------------|----------------------|----------------------|--------------|------------------|---|---------------------|-------|
| | | | 20 | Num | ber of | Value | Limit | | |
| | | Pulse Width | Period | Pu | lses | (%) | (%) | Results | |
| | | 174.8 us | 209 732 ms | 1 | 3 | N/A | N/A | N/A | 1 |
| | | 174.0 us | 205.702 113 | | 0 | 11/7 | | 19/7 | |
| Wagiaht Space | teurs Analicas | Nothwest EMC Inc. | | | | | | | |
| LX/ RL | RF RF | 50 Ω DC | | ENSE:INT | | ALIGN OFF | | 01:46:53 PM Nov 11. | 2016 |
| 4- | | 0012 00 | | Trig Del | ay-1.000 m | s #Avg Ty | pe: Log-Pwr | TRACE 1 2 3 | 4 5 6 |
| | | | PNO: Fast | Trig: Vic #Atten: | leo 10 dB | | | DET P P P | PPP |
| | | | IFGain:Low | #Atten. | | | | | |
| | Ref Offse | et 21.55 dB | | | | | | MKr3 210.7 I | ms |
| 10 dB/div | Ref 12. | 00 dBm | 1 | | | 1 | | -36.40 01 | 5111 |
| 2.00 | | | | | | | | | |
| 2.000 D | | | | | | | | | |
| -8.00 / | | | | | | | | | |
| -18.0 | | | | | | | | | |
| -28.0 | | | | | | | | | |
| -38.0 | | | | | | | | TRIC | EVL. |
| 30.0 | | | | | | | | | |
| -48.0 | | | | | | | 3 | | |
| -58.0 | | | | | | | Hain Daff of States & Ben all and Income Annaly States in a | | |
| -68.0 | | | | | | | | | |
| -78.0 | | | | | | | | | |
| 10.0 | | | | | | | | | |
| Center 2.4 | 0500000 | 00 GHz | | | | | | Span 0 | Hz |
| Res BW 3. | 0 MHz | | #VB\ | V 30 kHz | 2 | | Sweep | 300.3 ms (8192 p | ots) |
| MKR MODE TRO | C SCL | x | Y | F | UNCTION | FUNCTION WIDTH | FUI | NCTION VALUE | - |
| 1 N 1 | t | 975.2 µ | s -8.45 | dBm | | | | | |
| 2 N 1 3 N 1 | | <u>1.150 m</u> 210.7 m | s -55.57 s -56.40 | iBm iBm | | | | | |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | = |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 10 | ++- | | | | | | | | |
| 11 | | | | | | | | | - |
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| MSG | | | | | | STATUS | | | |
| | | | | | | | | | |
| | | | Lo | w Chann | el, 2405 N | 1Hz | | | |
| | | | | Num | ber of | Value | Limit | | |
| | | | | D | | (0/) | (0/) | D lt - | |
| | | Pulse Width | Period | Pu | ISES | (%) | (%) | Results | - |

| | | Low | / Channel, 2405 M | MHz | | | | |
|--|---|--------|-------------------|-----|-----|---------|--|--|
| | Number of Value Limit Pulse Width Period Pulses (%) (%) N(A C N(A N(A N(A | | | | | | | |
| | Pulse Width | Period | Pulses | (%) | (%) | Results | | |
| | N/A | N/A | 6 | N/A | N/A | N/A | | |

| 🗾 Ke | Keysight Spectrum Analyzer - Northwest EMC, Inc | | | | | | | | | | | | | | | |
|------------|---|----------------|---|--|---------------------------|-----------------------------|-------------------------|--------------------------|---------|---------------------------|---------------------------|--|--|--|--|--|
| LXI R | | RF | 50 Ω DC | | | SENSE:INT | | LIGN OFF | Log-Pwr | 01:47:07 PM | | | | | | |
| | | | | | PNO: Fast ↔ IFGain:Low | → Trig: Video #Atten: 10 | o dB | #Avg Type. | Logitim | | TYPE WWWWWWW DET PPPPP | | | | | |
| 10 dI | Ref Offset 21.55 dB 10 dB/div Ref 12.00 dBm | | | | | | | | | | | | | | | |
| Log | | | | | | | | | | | | | | | | |
| 2.00 | | | | | | | | | | | | | | | | |
| -8.00 | | | | | | | | | | | | | | | | |
| 40.0 | | | | | | | | | | | | | | | | |
| -18.0 | | | | | | | | | | | | | | | | |
| -28.0 | | | | | | | | | | | | | | | | |
| -38.0 | | | | | | | | | | | TRIG LVL | | | | | |
| -48.0 | | | | | | | | | | | | | | | | |
| | | | in an | | unter al articles d'un se | and the state of a state | n ti dan kasa afa di ka | allen de lander in de de | | uid hell an indication of | t detil den de daar e | | | | | |
| -58.0 | | | | | | | | | | | | | | | | |
| -68.0 | | | | | | | | | | | | | | | | |
| -78.0 | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| Cen Res | ter 2.4 BW <u>3</u> | 05000 0 MHz | 000 GHz | | #VE | 3W 30 kHz | | | Swee | p 500.2 <u>m</u> | Span 0 Hz s (8192 pts) | | | | | |
| MSG | | | | | | | | STATUS | | | | | | | | |



| LXI R | - | RF | 50 | Ω DC | | | | | | SI | ENS | E:INT | | | ALIGN OFF | | | | | | 01 | 01:50:09 PM Nov 11, 2016 | | | | | | |
|------------|------------------------------|---------------------|-------------------|----------------|---|--|--|---|----------|---------|-----|--------------|-------|--------|-------------|-------|--|------|-----|-------------|--------|--------------------------|------|---------|--------------------|----------------|----------------|-----------|
| | | | | | PNO: Fast 🛶 Trig: Video IFGain:Low #Atten: 10 dB | | | | | | | | | | #/ | vg Ty | /pe: | Log- | Pwr | | | | TR | DET | 234 VWWW PPP | 56 ₩₩ РР | | |
| 10 dE | 3/div | Ref (Ref | offset 2 21.55 | 21.55 d dBn | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.55 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -8.45 | | | | | | | | | | | - | | | | | | | | | | | | | | | | | |
| -18.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -28.5 | | | | | | | | | | | _ | | | | | | | | | | | | | | | | | |
| -38.5 | | | | | | | | | | | - | | | | | | | | | | | | | | | | TRIG | LVL |
| -48.5 | | | _ | | | | | | | | - | | | | - | - | \mid | | | | _ | | | | _ | | | |
| -58.5 | 13099 A 1819 | i i kundu | in line | | e.ll in, | | | - | tilan da | en le p | | di de caleta | يبانى | in deb | <u>dian</u> | | a de la composición de | | | decentric d | and de | | | line et | ul u | a try try | | in the |
| -68.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cen Res | ter 2.4 BW 3. | 4500 0 MH | 0000 Iz | GHz | | | | | #V | BV | V : | 30 kl | lz | | | | | | | | Sw | /eei | 5 5(| 00.2 | 2 ms | Spa 5 (81 | ın 0 92 p | Hz ts) |
| MSG | S BW JU WHZ #VBW JU KHZ SWEG | | | | | | | | | | | | | | | | | | | | | | | | | | | |



| | | Llink | Channel 0470 | 411- | | | |
|----------------------------|---|--|--|---------------------|-------------|---|--|
| | | High | Number of Value | | | | |
| | Pulse Width | Period | Pulses | (%) | (%) | Results | |
| | 844 us | 210.034 ms | ruises A | <u>(</u> /8) Ν/Δ | (/8) N/A | N/A | |
| | 044 us | 210.0341113 | 4 | IN/A | D/A | 11/7 | |
| | | | | | | | |
| Keysight Spectrum Analyzer | 50 Q DC | SENS | SE:INT | ALIGN OFF | | 01:52:43 PM Nov 11, 2016 | |
| | P IF | NO: Fast | Trig Delay-3.000 m Trig: Video #Atten: 10 dB | s #Avg Type | e: Log-Pwr | TRACE 1 2 3 4 5 6 TYPE WWWWWW DET P P P P P P | |
| Ref Offse | et 21.55 dB 5 dBm | | | | | Mkr3 212.8 ms -56.22 dBm | |
| Log | | | | | | | |
| -5.45 | | | | | | | |
| -15.5 | | | | | | | |
| -25.5 | | | | | | | |
| -35.5 | | | | | | | |
| -45.5 | | | | | | | |
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| | an an the contract of the second s | anna an tao ao amin' ao amin' ao amin' | | | | | |
| -65.5 | | | | | | | |
| -75.5 | | | | | | | |
| -85.5 | | | | | | | |
| Contor 2 4760000 | | | | | | On on A Ma | |
| Res BW 3.0 MHz | IU GHZ | #VBM | 30 kHz | | Sween 3 | Span 0 Hz 00 3 ms (8192 nts) | |
| | | | 50 MHZ | | oncep o | (0102 pts) | |
| MKR MODE TRC SCL | 2 763 ms | -56.09 dB | FUNCTION | FUNCTION WIDTH | FUNCTI | ON VALUE | |
| 2 N 1 t | 3.607 ms | -56.25 dB | m | | | | |
| 3 N 1 t | 212.8 ms | -56.22 dB | m | | | | |
| 5 | | | | | | | |
| | | | | | | | |
| 8 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | |
| | | | ш | 1 1 | | • | |
| MSG | | | | STATUS | | | |
| | | مارد (ل) | Channel 2470 | | | _ | |
| | | High | Number of | Value | Limit | | |
| | Pulse Width | Period | | (%) | (%) | Reculte | |
| | | N/A | 15 | (%) N/A | (%) N/A | N/A | |
| | IN/A | IN/A | 10 | IN/A | IN/A | IN/A | |

| Number of Value Limit | | | | | |
|-----------------------|--------|--------|-----|-----|---------|
| Pulse Width | Period | Pulses | (%) | (%) | Results |
| N/A | N/A | 15 | N/A | N/A | N/A |

| 📕 Keysight Sp | ectrum Anal | lyzer - Northwes | t EMC, Inc | | | | | | | | | | |
|------------------------|-------------------|-------------------------|------------|---------------------------|--------------------------------|-----------|--|--------------------|-----|--------------------------|---|--|--|
| LXIRL RF 50Ω DC | | | SENSE:INT | | | ALIGN OFF | | | | 01:52:59 PM Nov 11, 2016 | | | |
| | | | | PNO: Fast • IFGain:Low | → Trig: Video #Atten: 10 dB | | | #Avg Type: Log-Pwr | | | TRACE 1 2 3 4 5 6 TYPE WWWWWW DET P P P P P P | | |
| 10 dB/div Log | Ref Off Ref 4 | fset 21.55 d .55 dBm | В | | | | | | | - | | | |
| -5.45 | | | | | | | | | | | | | |
| -15.5 | | | | | | | | | | | | | |
| -25.5 | | | | | | | | | | | | | |
| -35.5 | | | | | | | | | | | TRIG LVL | | |
| -45.5 | | | | | | | | | | | | | |
| -55.5 | | | | | | | | | | | | | |
| -75.5 | | | | | | | | | | | | | |
| -85.5 | | | | | | | | | | | | | |
| Center 2.4 Res BW 3 | 476000 3.0 MHz | 000 GHz | | #\ | /BW 30 kHz | | | | Swe | eep 1.00 | Span 0 Hz 0 s (8192 pts) | | |
| MSG | | | | | | | | STATUS | | | | | |

SAR TEST EXCLUSION



OVERVIEW

Human exposure to RF emissions from portable devices (47 CFR §2.1093) used with the radiating antenna closer than 20 cm to the user requires Specific Absorption Rate (SAR) to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation.

COMPLIANCE WITH FCC 2.1093

"Portable devices that operate in the Cellular Radiotelephone Service pursuant to part 22 of this chapter; the Personal Communications Service (PCS) pursuant to part 24 of this chapter; the Satellite Communications Services pursuant to part 25 of this chapter; the Miscellaneous Wireless Communications Services pursuant to part 27 of this chapter; the Maritime Services (ship earth station devices only) pursuant to part 80 of this chapter: the Specialized Mobile Radio Service, the 4.9 GHz Band Service, and the 3650 MHz Wireless Broadband Service pursuant to part 90 of this chapter; the Wireless Medical Telemetry Service (WMTS) and the Medical Device Radiocommunication Service (MedRadio), pursuant to subparts H and I of part 95 of this chapter, respectively, unlicensed personal communication service, unlicensed NII devices and millimeter wave devices authorized under §§15.253(f), 15.255(g), 15.257(g), 15.319(i), and 15.407(f) of this chapter; and the Citizens Broadband Radio Service pursuant to part 96 of this chapter are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use. All other portable transmitting devices are categorically excluded from routine environmental evaluation for RF exposure prior to equipment authorization or use, except as specified in §§1.1307(c) and 1.1307(d) of this chapter. Applications for equipment authorization of portable transmitting devices subject to routine environmental evaluation must contain a statement confirming compliance with the limits specified in paragraph (d) of this section. Technical information showing the basis for this statement must be submitted to the Commission upon request."

The EUT will be used with a separation distance of less than 20 centimeters between the radiating antenna and the body of the user or nearby persons and must therefore be considered a portable transmitter per 47 CFR 2.1093(b).

COMPLIANCE WITH FCC KDB 447498 D01 General RF Exposure Guidance v06

"KDB 447498 D01 General RF Exposure Guidance v06" provides the procedures, requirements, and authorization policies for mobile and portable devices.

Standalone radio SAR test exclusion is covered under section 4.3.1. Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Thresholds are met as shown in the Limits section below.

Simultaneous transmission SAR test exclusion is covered under section 4.3.2. SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneously transmitting antenna. When the sum of 1-g or 10-g SAR of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit, SAR test exclusion applies to that simultaneous transmission configuration.

SAR TEST EXCLUSION



LIMITS

Limits for General Population /Uncontrolled Exposure: 47 CFR 1.1310 (c)

The SAR limits for general population/uncontrolled exposure are 0.08 W/kg, as averaged over the whole body, and a peak spatial-average SAR of 1.6 W/kg, averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the parts of the human body treated as extremities, such as hands, wrists, feet, ankles, and pinnae, where the peak spatial-average SAR limit is 4 W/kg, averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). Exposure may be averaged over a time period not to exceed 30 minutes to determine compliance with general population/uncontrolled SAR limits.

For 100 MHz to 6 GHz and test separation distances = 50 mm, the SAR test exclusion thresholds are 1-g for head and body SAR and and 10-g SAR for extremity SAR.

ASSESSMENT

For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [vf(GHz)] = 3.0 for 1-g SAR and = 7.5 for 10-g extremity SAR, where

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step b below

The test exclusions are applicable only when the minimum test separation distance is = 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 4.1f) is applied to determine SAR test exclusion.

| Radio | Transmit Frequency (MHz) | Measured Conducted Output Power (mW) | Icted Duty Cycle Highest Antenna Gain (dBi) Minimum Antenna Minimum Distan | | Minimum Separation Distance (mm) | Exclusion Threshold | Limit | Compliant | |
|--------------------------------|-----------------------------|---|--|------|-------------------------------------|------------------------|-------|-----------|-----|
| 2400-2483.5 MHz Transceiver | 2480 | 2.806 | 0.08 | 5.44 | 0 | 5 | 0.071 | 3.0 | Yes |

The SAR Test Exclusion Threshold is summarized in the following table: