

APPLICANT: ADCON TELEMETRY, INC.

FCC ID: MQXB900SS-20

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TEST PROCEDURES

GENERAL: This report shall NOT be reproduced except in full without the written approval of TIMCO ENGINEERING, INC. The UUT was transmitting a test signal during the testing.

15.247(a)(1) CARRIER FREQUENCY SEPARATION & NUMBER OF CHANNELS: A near field probe was used to sense the signal of the UUT. The UUT was made to hop its full range. The spectrum analyzer was set to view the frequency range from 902 to 910MHz and placed in the memory mode. A plot (Exhibit #9) was then made of the display showing the number of channels, 50 and the separation of the channels, 154kHz.

15.247(a)(1)(i) CARRIER FREQUENCY DWELL TIME: A near field probe was used to sense the signal of the UUT. The UUT was made to hop its full range. The spectrum analyzer was set to view the frequency range from 902 to 928MHz and the center of the HOPPING RANGE was centered on the Spectrum Analyzer. The SPAN was then set to ZERO(0) and the SWEEP TIME was set to 20 seconds. Then by analyzing the plot of the total ON TIME of the UUT during the 20 seconds it was determined the dwell time on any frequency was less than 0.4Seconds, 23.70mseconds. See exhibit #11.

15.247(b)(2) POWER OUTPUT: The RF power output was measured at the antenna feed point by removing the permanent antenna and connecting the UUT to a peak power meter, HP Model No. 8900C.

15.247(c) ANTENNA CONDUCTED EMISSIONS: The RBW=100kHz, VBW =1.0MHz up to 1000MHz and RBW=1.0MHz & VBW=3.0MHz above 1.0GHz. The spectrum was scanned from 30MHz to the 10th Harmonic of the fundamental.

RADIATION INTERFERENCE: The test procedure used was ANSI STANDARD C63.4-1992 using a HEWLETT PACKARD spectrum analyzer with a preselector. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100kHz and the video bandwidth was 300kHz up to 1.0GHz and 1.0MHz with a video BW of 3.0MHz above 1.0GHz. The ambient temperature of the UUT was 72.2Deg F with a humidity of 54.2%. The hopping was stopped at the low end, middle and high end of the band in order to test the radiated emissions.

POWER LINE CONDUCTED INTERFERENCE: The procedure used was ANSI STANDARD C63.4-1992 using a 50uH LISN. Both lines were observed. The bandwidth of the spectrum analyzer was 10kHz with an appropriate sweep speed. The ambient temperature of the UUT was 74Deg F with a humidity of 54%.

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TEST PROCEDURES CONTINUED

FORMULA OF CONVERSION FACTORS: The Field Strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the Preselector was accounted for in the Spectrum Analyzer Meter Reading.

Example:

Freq (MHz)	METER READING + ACF = FS
33	20 dBuV + 10.36 dB = 30.36 dBuV/m @ 3m

TEST EQUIPMENT LIST

1. ☒ Spectrum Analyzer: HP 8566B-Opt 462, S/N 3138A07786, w/ preselector HP 85685A, S/N 3221A01400, Quasi-Peak Adapter HP 85650A, S/N 3303A01690 & Preamplifier HP 8449B-OPT H02, S/N 3008A00372 Cal. 10/17/00
2. ☒ Biconnical Antenna: Eaton Model 94455-1, S/N 1057
3. ☐ Biconnical Antenna: Electro-Metrics Model BIA-25, S/N 1171
4. ☒ Log-Periodic Antenna: Electro-Metrics Model EM-6950, S/N 632
5. ☐ Log-Periodic Antenna: Electro-Metrics Model LPA-30, S/N 409
6. ☒ Double-Ridged Horn Antenna: Electro-Metrics Model RGA-180, 1-18 GHz, S/N 2319
7. ☐ 18-26.3GHz Systron Donner Standard Gain Horn #DBE-520-20
8. ☐ Horn 40-60GHz: ATM Part #19-443-6R
9. ☐ Line Impedance Stabilization Network: Electro-Metrics Model ANS-25/2, S/N 2604 Cal. 2/9/00
10. ☐ Temperature Chamber: Tenney Engineering Model TTRC, S/N 11717-7
11. ☐ Frequency Counter: HP Model 5385A, S/N 3242A07460 Cal 10/6/00
12. ☐ Peak Power Meter: HP Model 8900C, S/N 2131A00545
13. ☒ Open Area Test Site #1-3meters Cal. 12/22/99
14. ☐ Signal Generator: HP 8640B, S/N 2308A21464 Cal. 9/23/00
15. ☐ Signal Generator: HP 8614A, S/N 2015A07428
16. ☐ Passive Loop Antenna: EMC0 Model 6512, 9KHz to 30MHz, S/N 9706-1211 Cal. 6/10/00
17. ☐ Dipole Antenna Kit: Electro-Metrics Model TDA-30/1-4, S/N 153 Cal. 11/24/00
18. ☐ AC Voltmeter: HP Model 400FL, S/N 2213A14499 Cal. 9/21/00
19. ☐ Digital Multimeter: Fluke Model 8012A, S/N 4810047 Cal 9/21/00
20. ☐ Digital Multimeter: Fluke Model 77, S/N 43850817 Cal 9/21/00
21. ☐ Oscilloscope: Tektronix Model 2230, S/N 300572 Cal 9/23/00

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THIS DEVICE CONFORMS TO DA 00-1407, RELEASED JUNE 26, 2000 AS BELOW:

1. This FCC ID: MQXB900SS-20 has it's own RF Shielding. Exhibit #4A shows the top view of the module with shielding. Exhibit # 4B shows the bottom view of the module. Several lower and the bottom layers of the PC board are a ground plane/shield as seen in the layout drawings in Exhibits 7A-7C.
2. To show that this module complies with part 15 requirements under conditions of excessive data rates, the Atmel processor data sheets show that the lines brought out to the interface connector are buffered. See Exhibits 8A-8B.
3. The schematics in Exhibits 6A-6C show the power supply regulators. This shows that the module complies with Part 15 requirements regardless of the design of the power supplying circuitry into which the module is installed.
4. This device has a permanently attached coax cable and antenna.
5. This device was tested in a stand-alone configuration. Please refer to the test set up photos. The module does not contain ferrites on any of it's leads.
6. The label sample is included as Exhibit 2.
7. This modular transmitter complies with the rules. Please see the data in the following report. You will also find enclosed a copy of the instructions which will be included with the modular transmitter.
8. This modular transmitter only has an output power of 20 mW. Therefore, there are no RF Exposure requirements.

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INTRODUCTION: GENERAL INFORMATION AND DATA

ANTENNA: The MQXB900SS-20 incorporates a permanent antenna having less than 1 dBi gain. The antenna is permanently epoxied in place. This antenna is the only antenna to be used with this unit.

PRODUCT DESCRIPTION The MQXB900SS-20 is a frequency hopping radio, and interface to be used as a development tool. It consists of several separate blocks. The controller is responsible for all interfacing and receives and responds to all incoming events.

15.247(a): Definition: This EUT uses a pseudo random algorithm to hop over the frequency range of 902.87 to 910.23MHz in 50 hops.

15.247(a)(1): The number of hops is 50 hops at a separation of 150kHz, the requirement in the 902-928MHz band is a minimum of 50.

15.247(a) Channel Frequency Separation: See exhibit #10, the channel frequency separation is 150kHz.

15.247(a)(1)(i) Dwell Time of Hop: The Dwell time of any hopping frequency cannot be greater than 0.4 seconds in any 20 second period. The Dwell time in 20 seconds is .396 seconds.

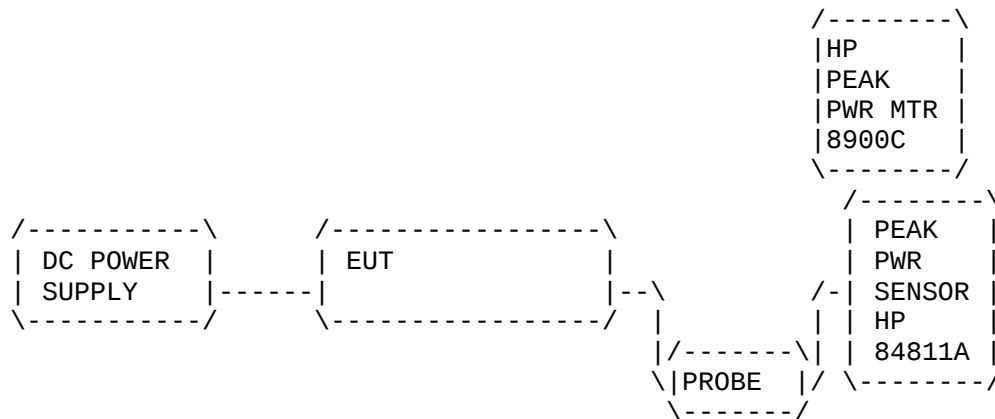
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15.247(b)(2): POWER OUTPUT

The maximum peak output power shall not exceed 1 watt (30 dBm). If directional transmitting antennas with a gain of more than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum power output was less than +30 dBm. Power was measured by disconnecting the antennas and measuring across a 50 ohm load as recommended by the manufacturer using a HP peak power meter Model 8900C. The antennas are non directional and do not exceed 6 dBi gain. The power output was measured at three places in the band highest is reported below.

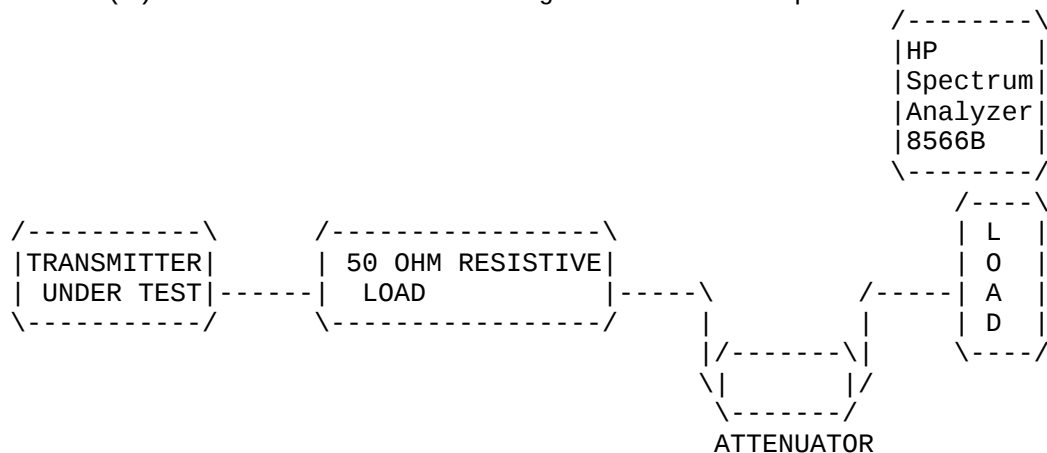
MEASUREMENT: 20 mWATTS



POWER OUTPUT: The RF power output was measured at the antenna feed point by removing the permanent antenna and connecting the UUT to a peak power meter, HP Model No. 8900C.

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15.247(c) Method of Measuring RF Conducted Spurious Emissions



NAME OF TEST: SPURIOUS EMISSIONS AT ANTENNA TERMINALS

REQUIREMENTS: Emissions must be at least 20dB down from the highest emission level within the authorized band as measured with a 100KHz RBW.

EMISSION FREQUENCY ____MHz____	dB BELOW CARRIER _____
906.00	0.0
1812.0	-52.5
2718.0 R	-45.2
915.00	0.0
1830.00	47.8
2745.00R	-49.5
924.60	0.0
1849.20	-47.8
2773.80R	-53.5

NOTE: THE SPECTRUM WAS SCANNED TO THE TENTH HARMONIC.

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NAME OF TEST: RADIATION INTERFERENCE

RULES PART NUMBER: 15.247, 15.209

REQUIREMENTS:

FIELD STRENGTH of Fundamental:	FIELD STRENGTH of Harmonics	S15.209 30 - 88 MHz 40 dBuV/m @3M 88 -216 MHz 43.5 216 -960 MHz 46 ABOVE 960 MHz 54dBuV/m
902-928MHz 127.38dBuV/m @3m	54 dBuV/m @3m	

EMISSIONS RADIATED OUTSIDE OF THE SPECIFIED FREQUENCY BANDS, EXCEPT FOR HARMONICS, SHALL BE ATTENUATED BY AT LEAST 50 dB BELOW THE LEVEL OF THE FUNDAMENTAL OR TO THE GENERAL RADIATED EMISSION LIMITS IN 15.209, WHICHEVER IS THE LESSER ATTENUATION.

TEST RESULTS: This unit DOES meet the FCC requirements.

TEST DATA:

EMISSION FREQ. MHz	METER READING @ 3m dBuV	COAX LOSS dB	ACF dB	FIELD STRENGTH dBuV/m	FCC LIMIT dBuV/m	MARGIN dB	ANT ANT.
903.00	73.90	2.90	24.19	100.99	127.38	26.39	V
1806.00	13.90	1.00	27.22	42.12	20.00	22.12	V
2709.00R	12.00	1.14	29.77	42.91	54.00	11.09	V
4515.00R	9.30	1.41	33.58	44.29	54.00	9.71	V
5418.00R	0.40	1.54	34.60	36.54	54.00	17.46	V
6321.00	4.30	1.68	35.61	41.59	20.00	21.59	V
906.40	76.30	2.90	24.17	103.37	127.38	24.01	H
1809.80	19.80	1.00	27.24	48.04	54.00	5.96	V
2725.50R	12.10	1.14	29.81	43.05	54.00	10.95	H
3635.00R	-0.50	1.28	32.09	32.86	54.00	21.91	H
4541.00R	10.10	1.41	33.61	45.12	54.00	8.88	V
5444.00R	6.10	1.55	34.62	42.27	54.00	11.73	H
6350.00	0.30	1.68	35.64	37.63	54.00	16.37	V
909.00	73.30	2.90	24.16	100.36	127.38	27.02	V
1818.00	13.50	1.00	27.27	41.77	20.00	21.77	V
2727.00R	10.50	1.14	29.82	41.46	54.00	12.54	H
4545.00R	6.50	1.41	33.61	41.53	54.00	12.47	V
5454.00R	5.40	1.55	34.64	41.58	54.00	12.42	V
6363.00	0.70	1.69	35.66	38.04	54.00	15.96	V

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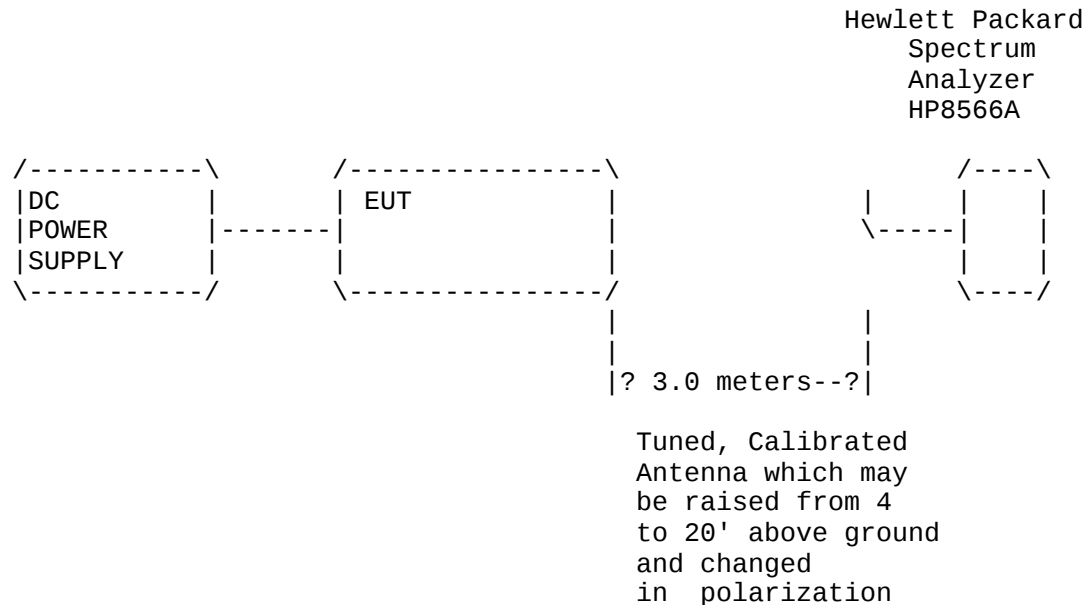
NAME OF TEST: RADIATION INTERFERENCE CONTINUED

RULES PART NUMBER: 15.247, 15.209

TEST PROCEDURE: ANSI STANDARD C63.4-1992 as described on previous page.

2.993(a)(b) Continued Field_strength_of_spurious_emissions:

Method of Measuring Radiated Spurious Emissions



Equipment placed 80 cm above ground on a rotatable platform.

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