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Radio Test Report

FCC Part 95
MedRadio Transmitter

Model 5100 Programmer Wireless Medical Device

COMPANY:	EBR Systems 480 Oakmead Pkwy. Sunnyvale, CA 94085
TEST SITE(S):	National Technical Systems - Silicon Valley 41039 Boyce Road. Fremont, CA. 94538-2435
PROJECT NUMBER:	JD106124 / PR070534
REPORT DATE:	January 4, 2018
REISSUE DATE:	January 22, 2018
FINAL TEST DATES:	October 3, November 8 and December 21, 2017
TOTAL NUMBER OF PAGES:	44

A2LA ACCREDITED
Testing Cert #0214.26

VALIDATING SIGNATORIES

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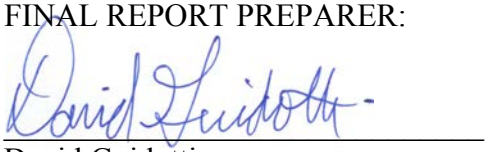

David Guidotti
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REVISION HISTORY

Rev#	Date	Comments	Modified By
-	January 4, 2018	First release	
1	January 22, 2018	Updated referenced standards	dwb

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SCOPE

Tests have been performed on the EBR Systems Model 5100 Programmer Wireless Medical Device, pursuant to the relevant requirements of the following standard(s) in order to obtain device certification against the regulatory requirements of the Federal Communications Commission and Industry Canada.

- Code of Federal Regulations (CFR) Title 47 Part 2
- CFR 47 Part 95 Subpart I (Medical Device Radio Communication Service)

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards and as outlined in National Technical Systems - Silicon Valley test procedures:

ANSI C63.26:2015
ANSI TIA-603-D

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant FCC performance and procedural standards.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

National Technical Systems - Silicon Valley is accredited by the A2LA, certificate number 0214.26, to perform the test(s) listed in this report, except where noted otherwise.

The test results recorded herein are based on a single type test of the EBR Systems Model 5100 Programmer Wireless Medical Device and therefore apply only to the tested samples. The samples were selected and prepared by Daryl Jamgotchian of EBR Systems.

OBJECTIVE

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section.

Prior to marketing in the USA, the device requires certification. Prior to marketing in Canada, Class I transmitters, receivers and transceivers require certification.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body's review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

STATEMENT OF COMPLIANCE

The tested samples of EBR Systems Model 5100 Programmer Wireless Medical Device complied with the requirements of the standards and frequency bands declared in the scope of this test report.

Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

DEVIATIONS FROM THE STANDARDS

No deviations were made from the published requirements listed in the scope of this report.

TEST RESULTS

FCC Part 95

Rule Part	Description	Measured	Limit	Result
Transmitter frequency, power, bandwidth, modulation and unwanted emissions				
§2.1033(c) (5) § 95.2563(a)	Frequency range(s)	402.15 – 404.85 MHz	402-405 MHz	Complies
§2.1033(c) (6) §2.1033(c) (7) §2.1046 §95.2567(a)(1)	EIRP (Calculated from Field Strength)	-18 dBm @ 403.65 MHz (-2.0 dB)	25µW –16dBm	Complies
§2.1033(c) (4) §2.1047 §95.2579(c)	Emission types	A1D	-	-
	Unwanted emissions within 150 kHz of the center frequency and 250 kHz from the band edge	-41.1 dBm (-5.1 dB)	-36dBm	Complies
§2.1049 §95.2573(a)	Authorized Bandwidth	225 kHz	300 kHz	Complies
Transmitter spurious emissions				
§2.1053 §2.1057 §95.2579(a)	Field strength of unwanted emissions	42.3 dBµV/m @ 288.01 MHz (-3.7 dB)	See table	Complies
Receiver spurious emissions				
15.109(a)		42.3 dBµV/m @ 288.01 MHz (-3.7 dB)	See table	Complies
Other details				
95.2559	Frequency Monitoring	LBT Threshold power level -93.8 dBm Monitoring system bandwidth > 20 dB EBW Monitoring system scan cycle time 35 ms Monitoring system Minimum Channel monitoring period 0.1 ms / 10 ms Channel access based on ambient level above PTh Correct channel selection Discontinuation of MICS session in 3 seconds	LBT Threshold power level -93.8 dBm Monitoring system bandwidth > 20 dB EBW Monitoring system scan cycle time > 10 ms Monitoring system Minimum Channel monitoring period 0.1 ms / 10 ms Channel access based on ambient level above PTh Correct channel selection Discontinuation of MICS session < 5 seconds	Complies
§2.1055 §95.2565	Frequency stability	26 ppm	100 ppm	Complies
§2.1093	RF Exposure	Refer to separate exhibit	-	Complies

Rule Part	Description	Measured	Limit	Result
§2.1033 (c) (8)	Final radio frequency amplifying circuit's dc voltages and currents for normal operation over the power range	3.3V, 11.4mA	-	-
Notes				

EXTREME CONDITIONS

Frequency stability is determined over extremes of temperature and voltage. As the device is hand carried, battery powered equipment; the supply voltage was reduced to the battery operating end point of 3.3Vdc as specified by the manufacturer.

The extremes of temperature were 0°C to +55°C as specified in FCC §95.2565 for stations in the Medical Device Radiocommunication Service.

MEASUREMENT UNCERTAINTIES

ISO Guide 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2) and were calculated in accordance with NAMAS document NIS 81 and M3003.

Measurement Type	Measurement Unit	Frequency Range	Expanded Uncertainty
RF frequency	Hz	25 to 7,000 MHz	1.7×10^{-7}
RF power, conducted	dBm	25 to 7,000 MHz	± 0.52 dB
Conducted emission of transmitter	dBm	25 to 40,000 MHz	± 0.7 dB
Conducted emission of receiver	dBm	25 to 40,000 MHz	± 0.7 dB
Radiated emission (substitution method)	dBm	25 to 40,000 MHz	± 2.5 dB
Radiated emission (field strength)	dBµV/m	25 to 1,000 MHz 1 to 40 GHz	± 3.6 dB ± 6.0 dB

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The EBR Systems Model 5100 Programmer Wireless Medical Device is a pacemaker programmer that communicates with implanted cardiac devices. Since the EUT would normally be placed on a tabletop during operation, the EUT was treated as tabletop equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 5.0 VDC, USB powered. The tablet is provided with an AC Adapter with an electrical rating of 100-240V, 50-60Hz, 1.3A.
The sample was received on August 31, 2017 and tested on October 3, November 8 and December 21, 2017. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number	FCC ID
EBR Systems Inc.	5100	Communication Module	RKT1740166	2AMRX-5100
DELL	7212	Rugged Tablet	4RYQSG2	E2K-T03H002
DELL	LA45NM140	Tablet Power Supply	CN-OKXTTW-LOC00-773-7DC4-A04	-

A second Communication Module S/N: WLX17170009 was used for antenna port testing.

OTHER EUT DETAILS

The Programmer Communications Module wakes up an implant using a 2.4 GHz ISM band transmitter and communicates with the implant with a MedRadio transceiver in the 402-405 MHz band. The two radios do not transmit simultaneously. The tablet and power supply are used to run software for communication sessions with implants and power the EUT.

ANTENNA SYSTEM

The antenna system for the MedRadio transceiver consists of a model ANT-418-HETH wound coil antenna manufactured by Linx Technologies.

ENCLOSURE

The EUT (Communication Module) measures approximately 9.5x13.5x8.0cm. It is constructed of plastic.
The Tablet measures approximately 9.5x13.5x8.0cm. It is constructed of metal and plastic.
The Tablet Power Supply measures approximately 10.0x4.0x3.0cm. It is constructed of plastic.

MODIFICATIONS

No modifications were made to the EUT during the time the product was at National Technical Systems - Silicon Valley.

SUPPORT EQUIPMENT

No local support equipment was used during testing.

The following equipment was used as remote support equipment during testing:

Manufacturer	Model	Description	Serial Number	FCC ID
EBR Systems Inc.	4100	Implantable Pulse Generator	T01000	2AMRX-4100

EUT INTERFACE PORTS

The I/O cabling configuration during testing was as follows:

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Tablet USB type A	Communication Module	USB	Shielded	3
Tablet USB type C	Not connected	-	-	-
Tablet micro-SD port	Not connected	-	-	-
Tablet Audio Jack	Not connected	-	-	-
Communication Module	Load	1MΩ termination	Shielded & Unshielded last 15cm	3

Only the Tablet USB type A port is used for the EBR system.

Additional on Support Equipment

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Implantable Cardiac Stimulator (Model: 4100)	Battery (Model: 3000)	2 wire	Unshielded	0.3

EUT OPERATION

During testing, the EUT was set to continuously transmit on the selected channel at the selected power using custom software.

TESTING

GENERAL INFORMATION

Radiated spurious emissions measurements were taken at the National Technical Systems - Silicon Valley Anechoic Chambers and/or Open Area Test Site(s) listed below. The sites conform to the requirements of ANSI C63.4: 2014 *American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz* and CISPR 16-1-4:2007 - *Specification for radio disturbance and immunity measuring apparatus and methods Part 1-4: Radio disturbance and immunity measuring apparatus Ancillary equipment Radiated disturbances*. They are on file with the FCC and industry Canada.

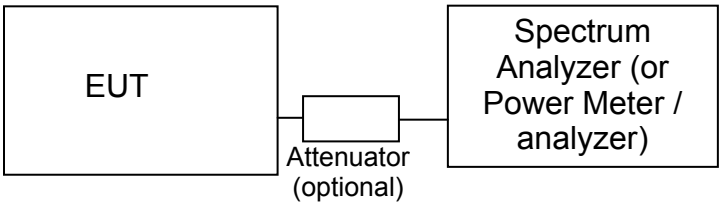
Site	Registration Numbers		Location
	FCC	Canada	
Chamber 3	769238	IC 2845B-3	41039 Boyce Road Fremont, CA 94538-2435
Chamber 4	211948	IC 2845B-4	
Chamber 5	211948	IC 2845B-5	

In the case of Open Area Test Sites, ambient levels are at least 6 dB below the specification limits with the exception of predictable local TV, radio, and mobile communications traffic.

Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements.

RF PORT MEASUREMENT PROCEDURES

Conducted measurements are performed with the EUT's rf input/output connected to the input of a spectrum analyzer, power meter or modulation analyzer. When required an attenuator, filter and/or dc block is placed between the EUT and the spectrum analyzer to avoid overloading the front end of the measurement device. Measurements are corrected for the insertion loss of the attenuators and cables inserted between the rf port of the EUT and the measurement equipment.



Test Configuration for Antenna Port Measurements

OUTPUT POWER

Output power is measured using a power meter and an average sensor head, a spectrum analyzer or a power meter and peak power sensor head as required by the relevant rule part(s). Where necessary measurements are gated to ensure power is only measured over periods that the device is transmitting.

Power measurements made directly on the rf power port are, when appropriate, converted to an EIRP by adding the gain of the highest gain antenna that can be used with the device under test, as specified by the manufacturer.

For devices with an integral antenna the output power is measured as a field strength at a test distance of (typically) 3m and then converted to an eirp using far field equations as shown in SAMPLE CALCULATIONS –RADIATED POWER.

BANDWIDTH MEASUREMENTS

The 6dB, 20dB and/or 26dB signal bandwidth is measured in using the bandwidths recommended by ANSI C63.4. When required, the 99% bandwidth is measured using the methods detailed in RSS GEN. The measurement bandwidth is set to be at least 1% of the instrument's frequency span.

FREQUENCY STABILITY

The EUT is placed inside a temperature chamber with all support and test equipment located outside of the chamber. The temperature is varied across the specified frequency range in 10 degree increments with frequency measurements made at each temperature step. The EUT is allowed enough time to stabilize at each temperature variation.

The spectrum analyzer is configured to give a 5- or 6-digit display for the marker-frequency function. The spectrum analyzer's built-in frequency counter is used to measure the maximum deviation of the fundamental frequency at each temperature. Where possible the device is set to transmit an unmodulated signal. Where this is not possible the frequency drift is determined by finding a stable point on the signal (e.g. the null at the centre of an OFDM signal) or by calculating a centre frequency based on the upper and lower XdB points (where X is typically 6dB or 10dB) on the signal's skirts.

RADIATED EMISSIONS MEASUREMENTS

Receiver radiated spurious emissions measurements are made in accordance with ANSI C63.4:2014 by measuring the field strength of the emissions from the device at a specific test distance and comparing them to a field strength limit. Where the field strength limit is specified at a longer distance than the measurement distance the measurement is extrapolated to the limit distance.

Transmitter radiated spurious emissions are initially measured as a field strength. The eirp or erp limit as specified in the relevant rule part(s) is converted to a field strength at the test distance and the emissions from the EUT are then compared to that limit. Emissions within 20dB of this limit are the subjected to a substitution measurement.

All radiated emissions measurements are performed in two phases. A preliminary scan of emissions is conducted in either an anechoic chamber or on an OATS during which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed across the complete frequency range of interest and at each operating frequency identified in the reference standard. One or more of these is with the antenna polarized vertically while the one or more of these is with the antenna polarized horizontally. Initial scans are made using a peak detector (RBW=VBW) and using scan rates to ensure that the EUT transmits before the sweep moves out of each resolution bandwidth (for transmit mode).

During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit. For transmitter spurious emissions, where the limit is expressed as an effective radiated power, the eirp or erp is converted to a field strength limit.

Final measurements are made on an OATS or in a semi-anechoic chamber at the significant frequencies observed during the preliminary scan(s) using the same process of rotating the EUT and raising/lowering the measurement antenna to find the highest level of the emission. The field strength is recorded and, for receiver spurious emissions, compared to the field strength limit. For the final measurement the appropriate detectors (average, peak, normal, sample, quasi-peak) are used. For receiver measurements below 1GHz the detector is a Quasi-Peak detector, above 1GHz a peak detector is used and the peak value (RB=VB=1MHz) and average value (RB=1MHz, VB=10Hz) are recorded.

For transmitter spurious emissions, the radiated power of all emissions within 20dB of the calculated field strength limit are determined using a substitution measurement. The substitution measurement is made by replacing the EUT with an antenna of known gain (typically a dipole antenna or a double-ridged horn antenna), connected to a signal source. The output power of the signal generator is adjusted until the maximum field strength from the substitution antenna is similar to the field strength recorded from the EUT. The erp of the EUT is then calculated.

INSTRUMENTATION

An EMI receiver as specified in CISPR 16-1-1 is used for radiated emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 7000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary.

For measurements above the frequency range of the receivers and for all conducted measurements a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis.

Measurement bandwidths for the test instruments are set in accordance with the requirements of the standards referenced in this document.

Software control is used to correct the measurements for transducer factors (e.g. antenna) and the insertion loss of cables, attenuators and other series elements to obtain the final measurement value. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are exported in a graphic and/or tabular format, as appropriate.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the EUT antenna port or receiving antenna and the test receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

ANTENNAS

A combination of biconical, log periodic or bi-log antennas are used to cover the range from 30 MHz to 1000 MHz. Broadband antennas or tuned dipole antennas are used over the entire 25 to 1000 MHz frequency range as the reference antenna for substitution measurements.

Above 1000 MHz, a dual-ridge guide horn antenna or octave horn antenna are used as reference and measurement antennas.

The antenna calibration factors are included in site factors that are programmed into the test receivers and instrument control software when measuring the radiated field strength.

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height.

Table mounted devices are placed on a non-conductive table at a height of 80 centimeters above the floor. Floor mounted equipment is placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. The EUT is positioned on a motorized turntable to allow it to be rotated during testing to determine the angel with the highest level of emissions.

SAMPLE CALCULATIONS

SAMPLE CALCULATIONS - CONDUCTED SPURIOUS EMISSIONS

Measurements are compared directly to the conducted emissions specification limit (decibel form). The calculation is as follows:

$$R_r - S = M$$

where:

R_r = Measured value in dBm
S = Specification Limit in dBm
M = Margin to Specification in +/- dB

SAMPLE CALCULATIONS –RADIATED FIELD STRENGTH

Measurements of radiated field strength are compared directly to the specification limit (decibel form). The receiver and/or control software corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

A distance factor is sued when measurements are made at a test distance that is different to the specified limit distance by using the following formula:

$$F_d = 20*LOG_{10} (D_m/D_s)$$

where:

F_d = Distance Factor in dB
D_m = Measurement Distance in meters
D_s = Specification Distance in meters

For electric field measurements below 30MHz the extrapolation factor is either determined by making measurements at multiple distances or a theoretical value is calculated using the formula:

$$F_d = 40*LOG_{10} (D_m/D_s)$$

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

R_r = Receiver Reading in dBuV/m

F_d = Distance Factor in dB

R_c = Corrected Reading in dBuV/m

L_S = Specification Limit in dBuV/m

M = Margin in dB Relative to Spec

SAMPLE CALCULATIONS –RADIATED POWER

The erp/eirp limits for transmitter spurious measurements are converted to a field strength in free space using the following formula:

$$E = \frac{\sqrt{30\ P\ G}}{d}$$

where:

E = Field Strength in V/m
P = Power in Watts
G = Gain of isotropic antenna (numeric gain) = 1
D = measurement distance in meters

The field strength limit is then converted to decibel form (dBuV/m) and the margin of a given emission peak relative to the limit is calculated (refer to *SAMPLE CALCULATIONS –RADIATED FIELD STRENGTH*).

When substitution measurements are required (all signals with less than 20dB of margin relative to the calculated field strength limit) the eirp of the spurious emission is calculated using:

$$P_{EUT} = P_S - (E_S - E_{EUT})$$

and

$$P_S = G + P_{in}$$

where:

P_S = effective isotropic radiated power of the substitution antenna (dBm)
P_{in} = power input to the substitution antenna (dBm)
G = gain of the substitution antenna (dBi)
E_S = field strength the substitution antenna (dBm) at eirp P_S
E_{EUT} = field strength measured from the EUT

Where necessary the effective isotropic radiated power is converted to effective radiated power by subtracting the gain of a dipole (2.2dBi) from the eirp value.

RECEIVER RADIATED SPURIOUS EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from receivers as detailed in FCC Part 15.109(a). Note that receivers operating outside of the frequency range 30 MHz – 960 MHz are exempt from the requirements of 15.109.

Frequency Range (MHz)	Limit (uV/m @ 3m)	Limit (dBuV/m @ 3m)
30 to 88	100	40
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

For MedRadio, the above limits also apply to the transmitter per §95.635(d).

Appendix A Test Equipment Calibration Data

LBT and Blocking, 03-Oct-17

Manufacturer	Description	Model	Asset #	Calibrated	Cal Due
National Technical Systems	NTS Capture Analyzer Software (rev 3.8)	N/A	0		N/A
National Technical Systems	NTS DFS Software (rev 4.2)	N/A	0		N/A
Tektronix	500MHz, 2CH, 5GS/s OscilloScope	TDS5052B	2118	12/7/2016	12/7/2017
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	7/31/2017	7/31/2018
Agilent Technologies	MXG Analog Signal Generator 6 GHz	N5181A	2146	3/14/2017	3/14/2018
Agilent Technologies	PSG, Vector Signal Generator, (250kHz - 20GHz)	E8267D	3011	2/25/2017	2/25/2018

Radio Antenna Port , 25-Oct-17

Agilent Technologies	3Hz -44GHz PSA Spectrum Analyzer	E4446A	2796	5/22/2017	5/22/2018

Radiated Emissions, 1,000 - 25,000 MHz, 07-Nov-17

EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	9/29/2016	9/29/2018
Hewlett Packard	Spectrum Analyzer (SA40) Blue 9 kHz - 40 GHz	8564E (84125C)	1393	4/10/2017	4/10/2018
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB 7	1538	2/11/2017	2/11/2018
Hewlett Packard	High Pass filter, 3.5 GHz (Purple System)	P/N 84300-80038 (84125C)	1768	10/6/2017	10/6/2018
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	1780	8/31/2017	8/31/2018
A. H. Systems	Purple System Horn, 18-40GHz	SAS-574, p/n: 2581	2160	8/18/2017	8/18/2018
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	2249	5/17/2017	5/17/2018

Radio Antenna Port (Power and Spurious Emissions), 07-Nov-17

Agilent Technologies	3Hz -44GHz PSA Spectrum Analyzer	E4446A	2796	5/22/2017	5/22/2018

Radiated Emissions, 30 - 1,000 MHz, 08-Nov-17

National Technical Systems	NTS EMI Software (rev 2.10)	N/A	0		N/A
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1548	10/12/2016	10/12/2018
Com-Power	Preamplifier, 30-1000 MHz	PA-103	1632	3/8/2017	3/8/2018
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB 7	1756	7/8/2017	7/8/2018

, 08-Nov-17

National Technical Systems	NTS EMI Software (rev 2.10)	N/A	0		N/A
Hewlett Packard	Spectrum Analyzer (Spare SA26) 9 KHz-26.5 GHz, Non-Program	8563E	284		3/15/2018

Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	9/8/2017	9/8/2018
EMCO	Antenna, Horn, 1-18GHz	3115	868	6/30/2016	6/30/2018
Radiated Emissions, 25 - 4,000 MHz, 22-Nov-17					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	0		N/A
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	9/8/2017	9/8/2018
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	9/29/2016	9/29/2018
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1290	10/30/2017	10/30/2018
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1548	10/12/2016	10/12/2018
Com-Power	Preamplifier, 30-1000 MHz	PA-103	1632	3/8/2017	3/8/2018
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB 7	1756	7/8/2017	7/8/2018
Compliance Design	Tuned Dipole Antenna	Roberts (180-400MHz)	1894	1/19/2016	1/19/2018
Compliance Design	Tuned Dipole Antenna	Roberts (65-180MHz)	1895	1/19/2016	1/19/2018
Compliance Design	Tuned Dipole Antenna	Roberts (400-1000MHz)	1896	1/19/2016	1/19/2018
Compliance Design	Tuned Dipole Antenna	Roberts (30-65MHz)	1897	1/19/2016	1/19/2018
Rohde & Schwarz	Power Sensor, 1 nW-20 mW, 10 MHz-18 GHz, 50ohms	NRV-Z1	2114	11/5/2017	11/5/2018
Agilent Technologies	MXG Analog Signal Generator 6 GHz	N5181A	2146	3/14/2017	3/14/2018
Hewlett Packard	Spectrum Analyzer (SA40) Purple 9 kHz - 40 GHz,	8564E (84125C)	2415	3/1/2017	3/1/2018
Conducted Emissions - AC Power Ports, 22-Nov-17					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	0		N/A
EMCO	LISN, 10 kHz-100 MHz	3825/2	1292	8/8/2017	8/8/2018
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	1401	2/3/2017	2/3/2018
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB 7	1756	7/8/2017	7/8/2018
Radio Antenna Port, 21-Dec-17					
Rohde & Schwarz	Signal Analyzer 20 Hz - 26.5 GHz	FSQ26	2327	24-Jun-17	24-Jun-18

Appendix B Test Data

T105813 Pages 23 – 32
T106196 Pages 33 – 43

Client:	EBR Systems	Job Number:	JD105788
Product	Dual band wireless medical device	T-Log Number:	T105813
System Configuration:	-	Project Manager:	Deepa Shetty
Contact:	Daryl Jamgotchian	Project Coordinator:	-
Emissions Standard(s):	FCC Part 95I, EN 301 839 v2.1.1, EN 60601-1-2:2015	Class:	N/A
Immunity Standard(s):	-	Environment:	Radio

EMC Test Data

For The

EBR Systems

Product

Dual band wireless medical device

Date of Last Test: 10/3/2017

Client:	EBR Systems	Job Number:	JD105788
Model:	Dual band wireless medical device	T-Log Number:	T105813
		Account Manager:	Deepa Shetty
Contact:	Daryl Jamgotchian		-
Standard:	FCC Part 95I, EN 301 839 v2.1.1, EN 60601-1-2:2015	Class:	N/A

LBT, FCC Part 95 and ETSI EN 301 839

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 10/3/2017
Test Engineer: Deniz Demirci
Test Location: Fremont Chamber #2
Config. Used: See each run
Config Change: None
EUT Voltage: 5 VDC USB powered

General Test Configuration

The EUT and all local support equipment were located on the table for LBT testing.

Ambient Conditions:

Temperature: 22-26 °C
Rel. Humidity: 35-40 %

Summary of Results - Device Operating in the 402-405 MHz Band

Run #	Mode	Test	Requirement / Limit	Result / Margin
1	Normal operation	LBT Threshold power level	-98.8 dBm	Pass
2	Normal operation	Monitoring system bandwidth	> 20 dB EBW	Pass
3	Normal operation	Monitoring system scan cycle time	> 10 ms	Pass
4	Normal operation	Monitoring system Minimum Channel monitoring period	0.1 ms / 10 ms	Pass
5	Normal operation	Channel access based on ambient level above PTh	Correct channel selection	Pass
6	Normal operation	Discontinuation of MICS session	< 5 seconds	Pass / 2 seconds
7	Normal operation	Use of pre-scanned alternative channel	The EUT does not use this feature	N/A

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Sample Notes

Sample S/N: WX1717009
Driver: Firmware ver 1.0.0, Build 23431

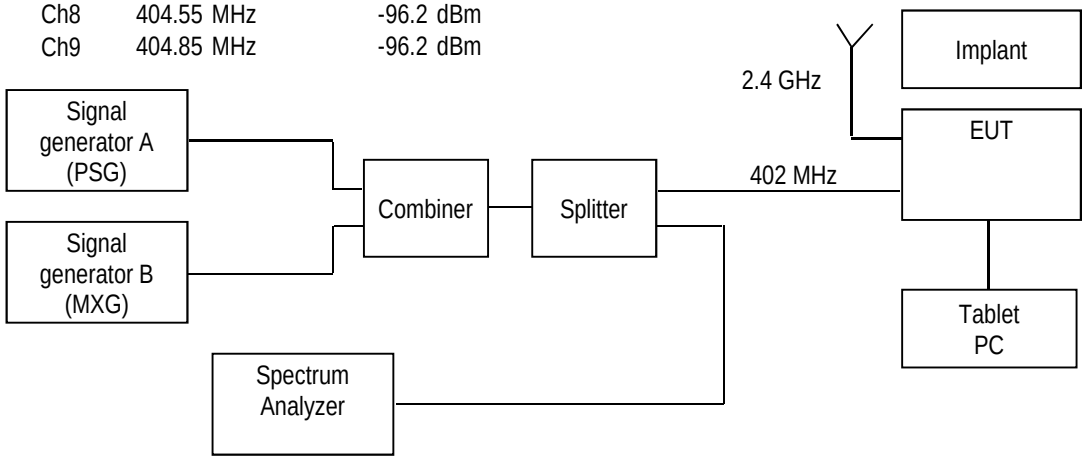
Client:	EBR Systems	Job Number:	JD105788
Model:	Dual band wireless medical device	T-Log Number:	T105813
		Account Manager:	Deepa Shetty
Contact:	Daryl Jamgotchian		-
Standard:	FCC Part 95I, EN 301 839 v2.1.1, EN 60601-1-2:2015	Class:	N/A

Run #1: LBT Threshold power level

Test Configuration Details:

The Signal Generator B was off. The Signal Generator A (PSG vector signal generator) was configured to produce 9 un-modulated carriers at 9 of the 10 channels at;

Ch0	402.15 MHz	-96.2 dBm
Ch1	402.45 MHz	-96.2 dBm
Ch2	402.75 MHz	-96.2 dBm
Ch3	403.05 MHz	-96.2 dBm
Ch4	403.35 MHz	-96.2 dBm
Ch5	403.65 MHz	Turned off
Ch6	403.95 MHz	-96.2 dBm
Ch7	404.25 MHz	-96.2 dBm
Ch8	404.55 MHz	-96.2 dBm
Ch9	404.85 MHz	-96.2 dBm



Measured Antenna Gain: -2.3 dBi

Minimum LBT threshold power = 10 Log B (Hz) - 150 + G (dBi)

When B: 225000 Hz (20 dB bandwidth)

Minimum LBT threshold power = -98.8 dBm Note: For testing -99.2 dBm was used

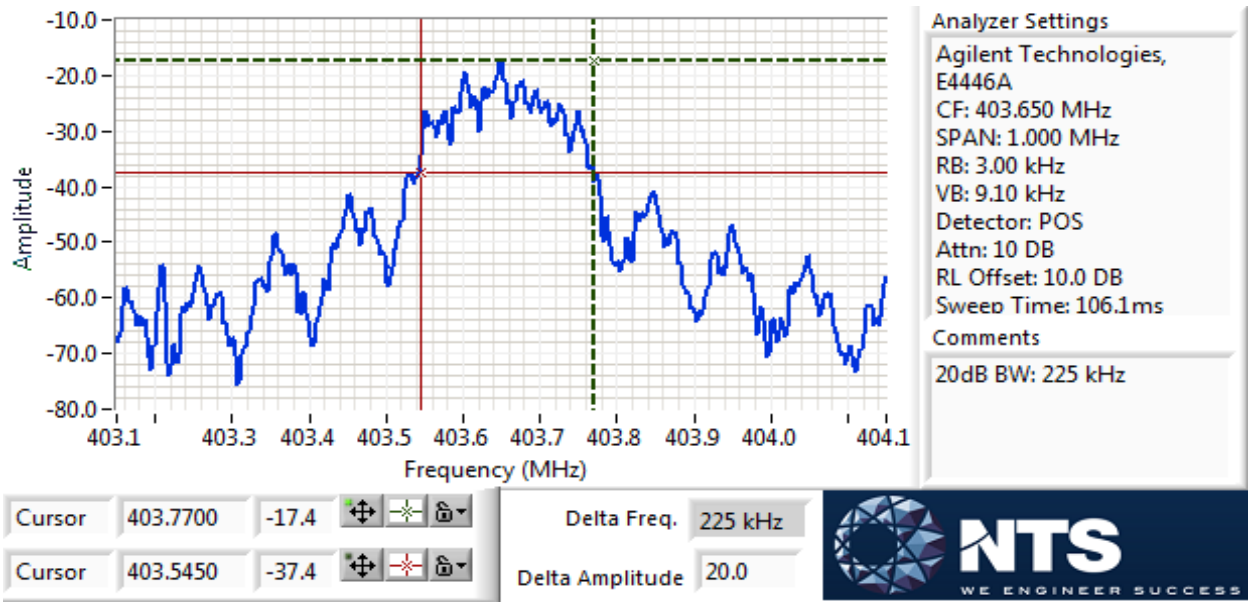
EUT Mode:

The EUT was placed in search mode looking for an implanted device. At this amplitude, the EUT must initiate communications on the channel 5 (403.65 MHz) not generated by the signal generator.

Test result:

The EUT complies with this requirement. EUT starts to initiate communication only at channel 5.

Client:	EBR Systems	Job Number:	JD105788
Model:	Dual band wireless medical device	T-Log Number:	T105813
		Account Manager:	Deepa Shetty
Contact:	Daryl Jamgotchian		-
Standard:	FCC Part 95I, EN 301 839 v2.1.1, EN 60601-1-2:2015	Class:	N/A



Based on this plot of the emissions:
The highest emission more than 150 kHz from the center frequency is 23.1 dB below highest in band level.
The highest emission in the 250 kHz band just outside the 402-205 MHz band is 23.1 dB below highest in band level when the device is set to its lowest and highest channels of 402.15 and 404.85 MHz.

Client:	EBR Systems	Job Number:	JD105788
Model:	Dual band wireless medical device	T-Log Number:	T105813
		Account Manager:	Deepa Shetty
Contact:	Daryl Jamgotchian		-
Standard:	FCC Part 95I, EN 301 839 v2.1.1, EN 60601-1-2:2015	Class:	N/A

Run #2: Monitoring system bandwidth

Test Configuration Details:

The PSG signal generator was configured to produce 9 un-modulated carriers at 9 of the 10 channels at;

Ch0	402.15 MHz	-96.2 dBm
Ch1	402.45 MHz	-96.2 dBm
Ch2	402.75 MHz	-96.2 dBm
Ch3	403.05 MHz	-96.2 dBm
Ch4	403.35 MHz	-96.2 dBm
Ch5	403.65 MHz	Turned off
Ch6	403.95 MHz	-96.2 dBm
Ch7	404.25 MHz	-96.2 dBm
Ch8	404.55 MHz	-96.2 dBm
Ch9	404.85 MHz	-96.2 dBm

Pa:	-111.5 dBm	@403.650 MHz			
Pb:	-106.5 dBm	@403.545 MHz	D1:	5.0 dB	Pass
Pc:	-105.5 dBm	@403.770 MHz	D2:	6.0 dB	Pass

Test result:

Pb – Pa = 5 dB and Pc – Pa = 6 dB, the EUT complies with the 20 dB monitoring bandwidth requirement.

Client:	EBR Systems	Job Number:	JD105788
Model:	Dual band wireless medical device	T-Log Number:	T105813
		Account Manager:	Deepa Shetty
Contact:	Daryl Jamgotchian		-
Standard:	FCC Part 95I, EN 301 839 v2.1.1, EN 60601-1-2:2015	Class:	N/A

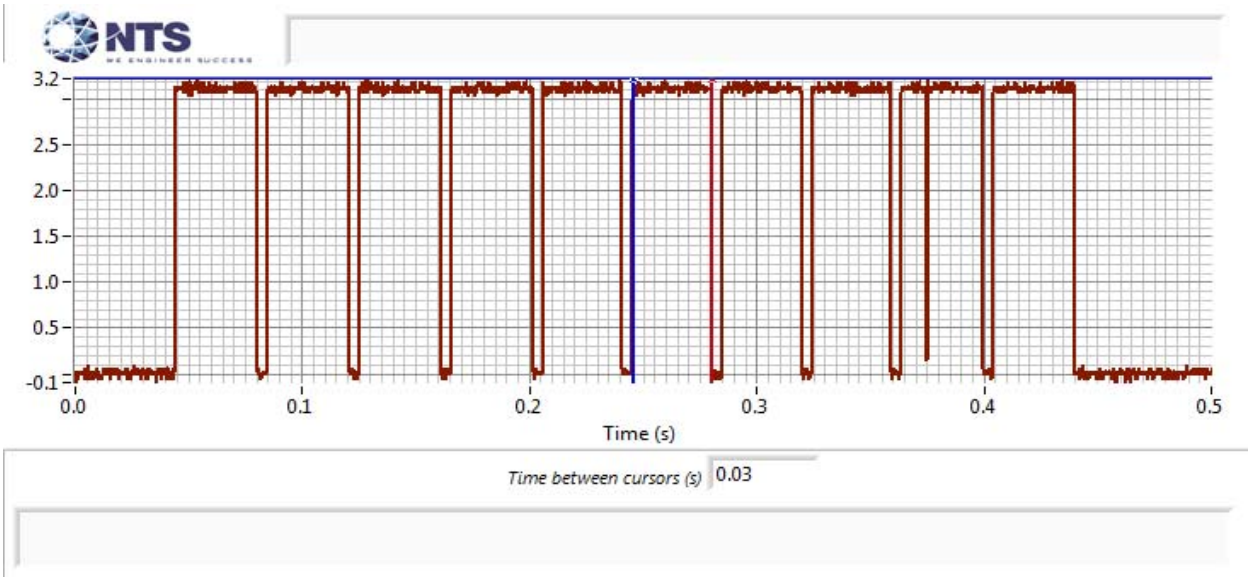
Run #3: Monitoring system scan cycle time

Note: The EUT performs a clear channel assessment prior to initiating any transmission

Test Configuration Details:

The PSG signal generator was configured to produce 9 un-modulated carriers at 9 of the 10 channels with -99+3 dBm

Ch0	402.15 MHz	-96.2 dBm
Ch1	402.45 MHz	-96.2 dBm
Ch2	402.75 MHz	-96.2 dBm
Ch3	403.05 MHz	-96.2 dBm
Ch4	403.35 MHz	-96.2 dBm
Ch5	403.65 MHz	Turned off
Ch6	403.95 MHz	-96.2 dBm
Ch7	404.25 MHz	-96.2 dBm
Ch8	404.55 MHz	-96.2 dBm
Ch9	404.85 MHz	-96.2 dBm



Test result:

The EUT performs 35 ms clear channel assessment for each channel. Ones the communication establishes, it does not stop transmitting without manual intervention. the EUT complies with this requirement.

Client:	EBR Systems	Job Number:	JD105788
Model:	Dual band wireless medical device	T-Log Number:	T105813
		Account Manager:	Deepa Shetty
Contact:	Daryl Jamgotchian		-
Standard:	FCC Part 95I, EN 301 839 v2.1.1, EN 60601-1-2:2015	Class:	N/A

Run #4: Monitoring system Minimum Channel monitoring period

Test Configuration Details:

The PSG signal generator was configured to produce 9 un-modulated carriers at 9 of the 10 channels with -99+3 dBm

Ch0	402.15 MHz	-96.2 dBm
Ch1	402.45 MHz	-96.2 dBm
Ch2	402.75 MHz	-96.2 dBm
Ch3	403.05 MHz	-96.2 dBm
Ch4	403.35 MHz	-96.2 dBm
Ch5	403.65 MHz	Turned off
Ch6	403.95 MHz	-96.2 dBm
Ch7	404.25 MHz	-96.2 dBm
Ch8	404.55 MHz	-96.2 dBm
Ch9	404.85 MHz	-96.2 dBm

The MXG signal generator was configured to produce 1 un-modulated carrier at channel (403.65 MHz). The output of the generators were combined. The amplitude of the MXG generator was adjusted to be equal to the amplitude of the PSG generator.
The output of the PSG generator was switched off and the EUT was set to initiate a transmission. The EUT did not transmit at 403.65 MHz. The output of the PSG was switched back on and the amplitude increased by 3 dB. The EUT was set to initiate a transmission. The EUT only transmitted at 403.65 MHz. The PSG generator was configured with pulse modulation on all the carriers. The modulation was 0.1 ms pulse with a repetition rate of 10 ms corresponding to a silent period between pulses of 9.9 ms. The EUT was set to initiate a transmission 10 times. In each case, the EUT only transmitted at 403.65 MHz

Test result:

The test has been repeated 10 times and the channel selection occurred only on 403.65 MHz in each test run. The EUT complies with this requirement.

Client:	EBR Systems	Job Number:	JD105788
Model:	Dual band wireless medical device	T-Log Number:	T105813
		Account Manager:	Deepa Shetty
Contact:	Daryl Jamgotchian		-
Standard:	FCC Part 95I, EN 301 839 v2.1.1, EN 60601-1-2:2015	Class:	N/A

Run #5: Channel access based on ambient level above PTh

Test Configuration Details:

The PSG signal generator was configured to produce 9 un-modulated carriers at 9 of the 10 channels

Ch0	402.15 MHz	-86.2 dBm			
Ch1	402.45 MHz	-93.2 dBm			
Ch2	402.75 MHz	-86.2 dBm			
Ch3	403.05 MHz	-86.2 dBm			
Ch4	403.35 MHz	-86.2 dBm			
Ch5	403.65 MHz	-99.2 dBm	Increased:	-90.0 dBm	(MXG)
Ch6	403.95 MHz	-86.2 dBm			
Ch7	404.25 MHz	-86.2 dBm			
Ch8	404.55 MHz	-86.2 dBm			
Ch9	404.85 MHz	-86.2 dBm			

The MXG signal generator was configured to produce 1 un-modulated carrier at channel 2 (403.65 MHz) with 9 dB below the threshold level.

The EUT was set to initiate a transmission, it only transmitted at 403.65 MHz. The amplitude of the MXG generator was increased 9 dB and the EUT was set to initiate a transmission. The EUT only selected 402.45 MHz

Test result:

The EUT complies with this requirement.

Client:	EBR Systems	Job Number:	JD105788
Model:	Dual band wireless medical device	T-Log Number:	T105813
		Account Manager:	Deepa Shetty
Contact:	Daryl Jamgotchian		-
Standard:	FCC Part 95I, EN 301 839 v2.1.1, EN 60601-1-2:2015	Class:	N/A

Run #6: Discontinuation of MICS session

MIC systems shall cease transmission in the event the communications session is interrupted for a period of 5 seconds or more. Once a MICS session is established, it may continue as long as the silent period in two-way communication between co-operating devices does not exceed 5 seconds

Test Configuration Details:

The PSG signal generator was configured to produce 9 un-modulated carriers at 9 of the 10 channels

Ch0	402.15 MHz	-96.2 dBm	
Ch1	402.45 MHz	-96.2 dBm	
Ch2	402.75 MHz	-96.2 dBm	
Ch3	403.05 MHz	-96.2 dBm	
Ch4	403.35 MHz	-96.2 dBm	
Ch5	403.65 MHz	-99.2 dBm	(MXG)
Ch6	403.95 MHz	-96.2 dBm	
Ch7	404.25 MHz	-96.2 dBm	
Ch8	404.55 MHz	-96.2 dBm	
Ch9	404.85 MHz	-96.2 dBm	

The MXG signal generator was configured to produce 1 un-modulated carrier at channel 5 (403.65 MHz)
The EUT was set to initiate a transmission to communicate with the implant. The EUT transmitted at 403.65 MHz. The Implant was removed from the test setup to block the communications.. From the point in time when the Implant was blocked to the end of transmissions from the EUT was 3 seconds. After the implant is introduced to the test setup, no transmissions were observed.

Test result:

The transmissions from the EUT has stopped in less than 5 seconds and did not re-initiate, the EUT complied with this requirement

Client:	EBR Systems	Job Number:	JD105788
Model:	Dual band wireless medical device	T-Log Number:	T105813
		Account Manager:	Deepa Shetty
Contact:	Daryl Jamgotchian		-
Standard:	FCC Part 95I, EN 301 839 v2.1.1, EN 60601-1-2:2015	Class:	N/A

Run #7: Use of pre-scanned alternative channel

The test is not applicable, The EUT does not use this feature

Test result: N/A

Client:	EBR Systems	Job Number:	JD106124
Product	5100	T-Log Number:	T106196
System Configuration:	-	Project Manager:	Christine Krebill
Contact:	Daryl Jamgotchian	Project Coordinator:	-
Emissions Standard(s):	FCC Parts 15C & 95, EN 301 839 v2.1.1, EN 300 328 v2.1.1, EN 301 489-1v2.1.1, EN301 489-27 v2.1.1	Class:	B
Immunity Standard(s):	-	Environment:	Medical , Radio

EMC Test Data

For The

EBR Systems

Product

5100

Date of Last Test: 1/15/2018

Client:	EBR Systems	Job Number:	JD106124
Model:	5100	T-Log Number:	T106196
		Project Manager:	Christine Krebill
Contact:	Daryl Jamgotchian	Project Coordinator:	-
Standard:	FCC Parts 15C & 95, EN 301 839 v2.1.1, EN 300 328 v2.1.1, EN 301 489-1v2.1.1, EN301 489-27 v2.1.1	Class:	N/A

FCC Part 95, EN 301 839
Power, Frequency Stability

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

General Test Configuration

All measurements are made with the EUT's rf port connected to the measurement instrument via an attenuator or dc-block if necessary. All amplitude measurements are adjusted to account for the attenuation between EUT and measuring instrument. For frequency stability measurements the EUT was place inside an environmental chamber.

Ambient Conditions:

Temperature: 20 °C

Rel. Humidity: 32 %

Summary of Results

Run #	-	Test Performed	Limit	Pass / Fail	Result / Margin
1	-	Antenna Gain calculation	Only needed for LBT	-	-
2	-	Frequency Stability	100 ppm	Pass	26 ppm

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	EBR Systems	Job Number:	JD106124
Model:	5100	T-Log Number:	T106196
		Project Manager:	Christine Krebill
Contact:	Daryl Jamgotchian	Project Coordinator:	-
Standard:	FCC Parts 15C & 95, EN 301 839 v2.1.1, EN 300 328 v2.1.1, EN 301 489-1v2.1.1, EN301 489-27 v2.1.1	Class:	N/A

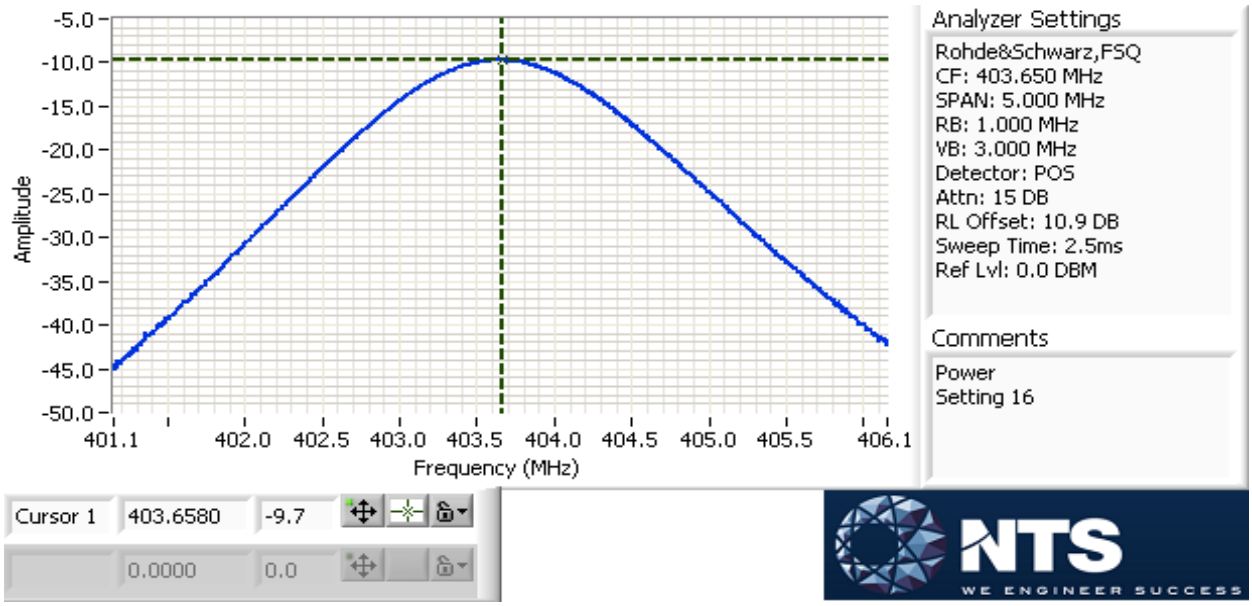
Run #1: Output Power

Date of Test: 12/21/2017
Test Engineer: David Bare
Test Location: Fremotn EMC Lab #4A

Config. Used: 1
Config Change: None
EUT Voltage: 5V from USB

Power Setting[2]	Frequency (MHz)	Output Power (dBm) [1]	Output Power mW	Antenna Gain (dBi)	Result	EIRP dBm	EIRP mW
16	403.65	-9.7	0.107	-2.3	Pass	-12.0	0.063

Note 1:	Output power measured using a spectrum analyzer (see plots below) with RBW=1 MHz, VB=3 MHz, Peak detector
Note 2:	Power setting - the software power setting used during testing, included for reference only.



Based on output power of -9.7 dBm and maximum field strength of 83.2 dBuV/m yields a calculated radiated power of -12 dBm eirp, thus antenna gain is -2.3 dBi

Client:	EBR Systems	Job Number:	JD106124
Model:	5100	T-Log Number:	T106196
		Project Manager:	Christine Krebill
Contact:	Daryl Jamgotchian	Project Coordinator:	-
Standard:	FCC Parts 15C & 95, EN 301 839 v2.1.1, EN 300 328 v2.1.1, EN 301 489-1v2.1.1, EN301 489-27 v2.1.1	Class:	N/A

Run #2: Frequency Stability

Date of Test: 12/21/2017 Config. Used: 1

Test Engineer: David Bare Config Change: None

Test Location: Fremotn EMC Lab #4A EUT Voltage: 5V from USB

Nominal Frequency: 403.65 MHz

Frequency Stability Over Temperature

The EUT was soaked at each temperature for a minimum of 30 minutes prior to making the measurements to ensure the EUT and chamber had stabilized at that temperature.

Temperature	Frequency Measured	Drift	
(Celsius)	(MHz)	(Hz)	(ppm)
0	403.648782	-1218	-3.0
10	403.649646	-354	-0.9
20	403.652564	2564	6.4
30	403.654712	4712	11.7
40	403.656795	6795	16.8
50	403.659103	9103	22.6
55	403.660474	10474	25.9
	Worst case:	9103	25.9

Frequency Stability Over Input Voltage

Nominal Voltage is 5Vdc supplied from the Tablet USB.

Voltage	Frequency Measured	Drift	
(DC)	(MHz)	(Hz)	(ppm)
85%	403.652564	2564	6.4
115%	403.652564	2564	6.4
	Worst case:	2564	25.9

Client:	EBR Systems	Job Number:	JD106124
Model:	5100	T-Log Number:	T106196
		Project Manager:	Christine Krebill
Contact:	Daryl Jamgotchian	Project Coordinator:	-
Standard:	FCC Parts 15C & 95, EN 301 839 v2.1.1, EN 300 328 v2.1.1, EN 301 489-1v2.1.1, EN301 489-27 v2.1.1	Class:	N/A

Radiated Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

General Test Configuration

The EUT was located on the turntable for radiated emissions testing. The EUT was tested on table.

The test distance and extrapolation factor (if applicable) are detailed under each run description.

Note, preliminary testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. Maximized testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

Ambient Conditions:

Temperature: 24 °C

Rel. Humidity: 38 %

Summary of Results

Run #	Test Performed	Limit	Result	Value / Margin
1	Fundamental Signal Field Strength	FCC 95	Pass	83.2 dBµV/m @ 403.65 MHz (-2.0 dB)
1	Transmitter Radiated Spurious Emissions, 30 - 4000 MHz	FCC 95	Pass	42.3 dBµV/m @ 288.01 MHz (-3.7 dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	EBR Systems	Job Number:	JD106124
Model:	5100	T-Log Number:	T106196
		Project Manager:	Christine Krebill
Contact:	Daryl Jamgotchian	Project Coordinator:	-
Standard:	FCC Parts 15C & 95, EN 301 839 v2.1.1, EN 300 328 v2.1.1, EN 301 489-1v2.1.1, EN301 489-27 v2.1.1	Class:	N/A

Run #1: Preliminary Radiated Emissions, 30-4000 MHz, Transmitter Spurious Emissions

Date of Test: 11/8/2017
Test Engineer: Joseph Cadigal
Test Location: FT Chamber#4

Config. Used: 1
Config Change: none
EUT Voltage: 120V/60Hz

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
30 - 1,000 MHz	3	3	0.0

Low Channel 1

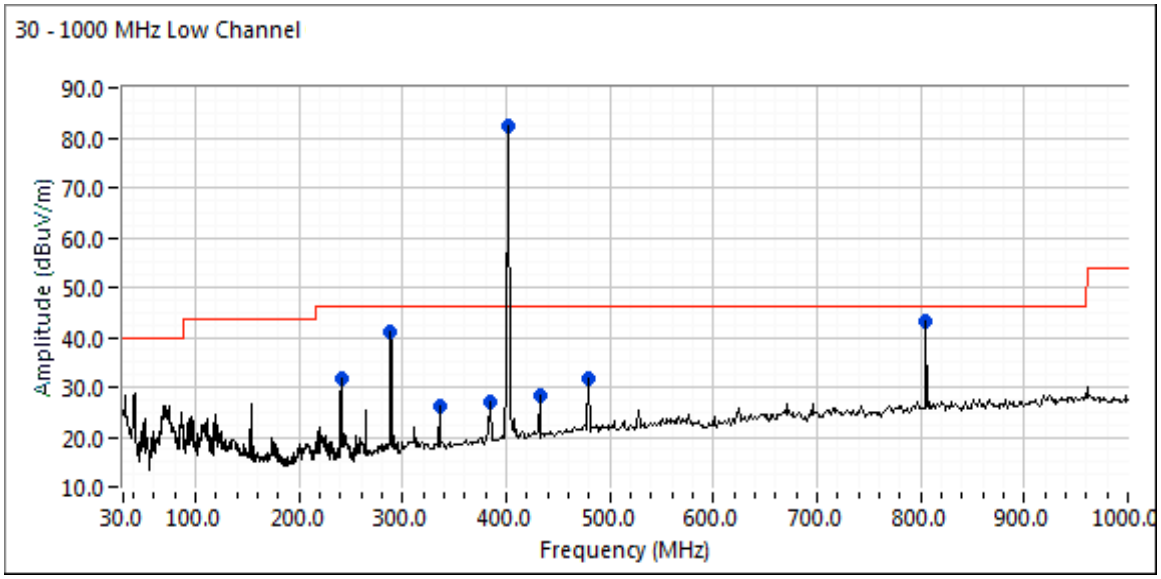
Fundamental Field Strength

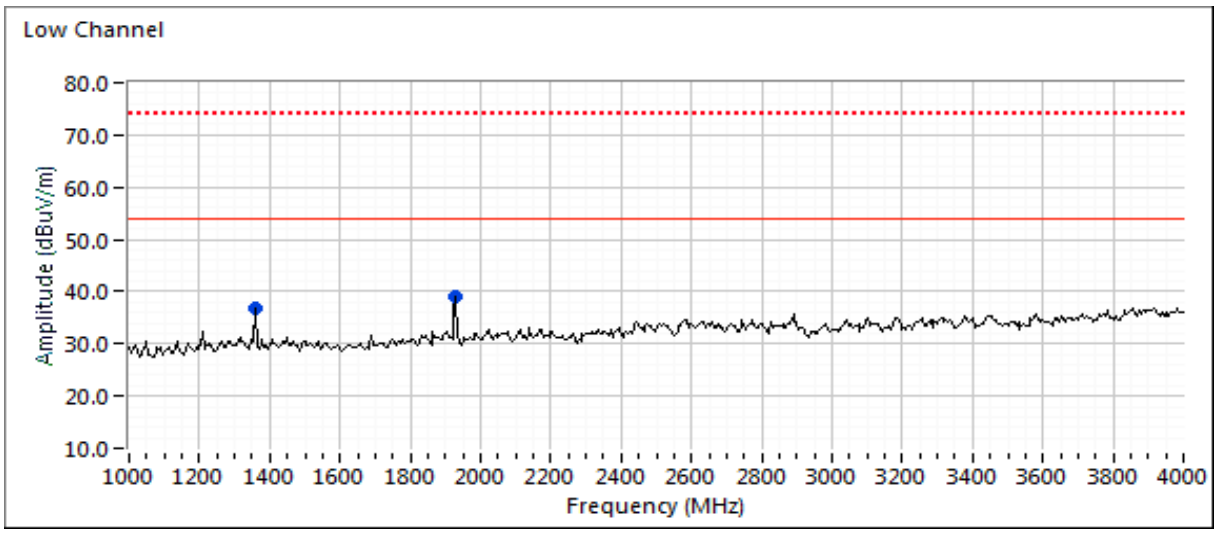
Frequency	Level	Pol	FCC 95		Detector	Azimuth	Height	Comments	Orientation
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		
402.150	80.3	V	85.2	-4.9	Pk	291	1.0	Fundamental	
402.150	82.3	H	85.2	-2.9	Pk	34	1.0	Fundamental	

Spurious Emissions

Frequency	Level	Pol	FCC 95		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1372.370	28.6	V	54.0	-25.4	AVG	205	1.9	RB 1 MHz;VB 10 Hz;Peak
1374.010	40.4	V	74.0	-33.6	PK	205	1.9	RB 1 MHz;VB 3 MHz;Peak
1919.990	37.6	H	54.0	-16.4	AVG	224	1.6	RB 1 MHz;VB 10 Hz;Peak
1919.640	45.0	H	74.0	-29.0	PK	224	1.6	RB 1 MHz;VB 3 MHz;Peak
804.306	36.4	H	46.0	-9.6	QP	245	1.0	QP (1.00s)
480.011	31.7	H	46.0	-14.3	QP	280	2.0	QP (1.00s)
432.007	17.8	V	46.0	-28.2	QP	253	1.0	QP (1.00s)
384.008	26.6	H	46.0	-19.4	QP	332	1.0	QP (1.00s)
336.010	22.6	V	46.0	-23.4	QP	116	1.0	QP (1.00s)
288.006	41.1	H	46.0	-4.9	QP	214	1.5	QP (1.00s)
240.006	31.7	H	46.0	-14.3	QP	68	1.5	QP (1.00s)

Client:	EBR Systems	Job Number:	JD106124
Model:	5100	T-Log Number:	T106196
		Project Manager:	Christine Krebill
Contact:	Daryl Jamgotchian	Project Coordinator:	-
Standard:	FCC Parts 15C & 95, EN 301 839 v2.1.1, EN 300 328 v2.1.1, EN 301 489-1v2.1.1, EN301 489-27 v2.1.1	Class:	N/A





Client:	EBR Systems	Job Number:	JD106124
Model:	5100	T-Log Number:	T106196
		Project Manager:	Christine Krebill
Contact:	Daryl Jamgotchian	Project Coordinator:	-
Standard:	FCC Parts 15C & 95, EN 301 839 v2.1.1, EN 300 328 v2.1.1, EN 301 489-1v2.1.1, EN301 489-27 v2.1.1	Class:	N/A

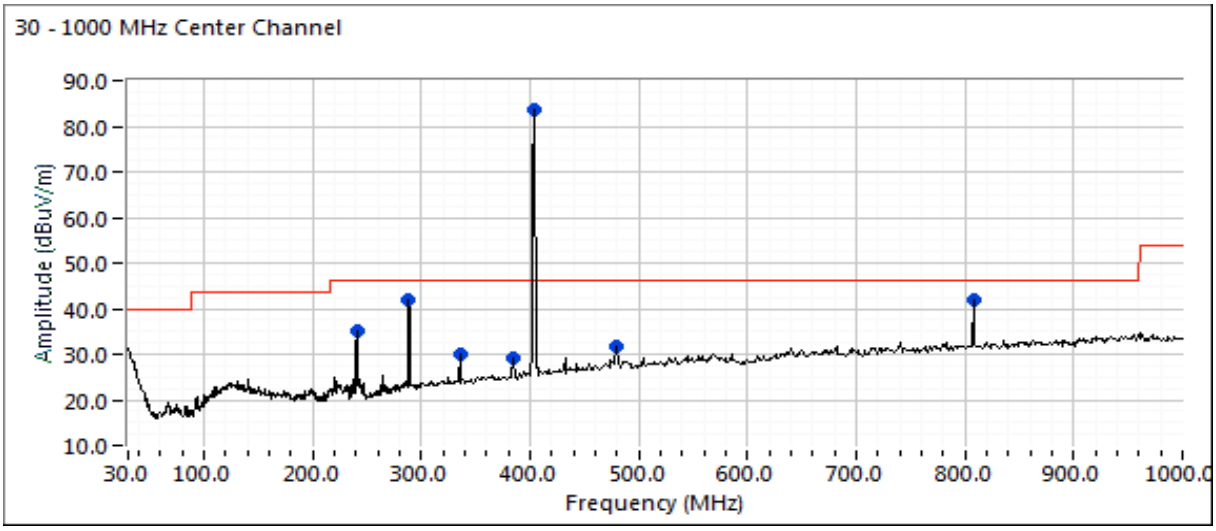
Center Channel 3

Fundamental Field Strength

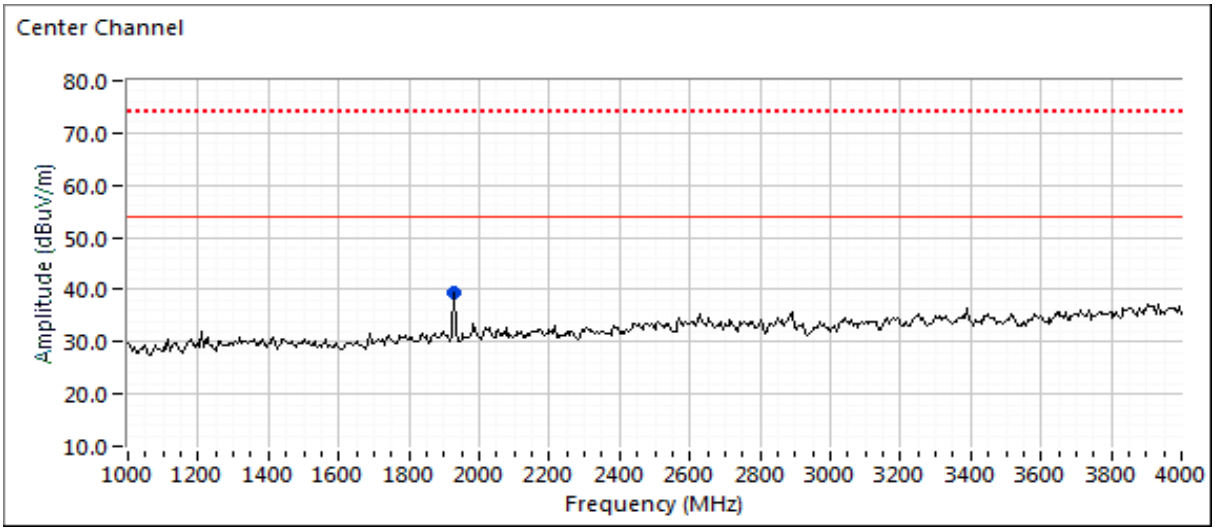
Frequency	Level	Pol	FCC 95		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
403.650	82.7	V	85.2	-2.5	Pk	194	1.2	Fundamental
403.650	83.2	H	85.2	-2.0	Pk	217	1.0	Fundamental

Spurious Emissions

Frequency	Level	Pol	FCC 95		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1919.900	37.6	H	54.0	-16.4	AVG	226	1.6	RB 1 MHz;VB 10 Hz;Peak
1919.920	45.2	H	74.0	-28.8	PK	226	1.6	RB 1 MHz;VB 3 MHz;Peak
336.004	28.4	H	46.0	-17.6	QP	72	1.0	QP (1.00s)
807.303	36.1	H	46.0	-9.9	QP	215	1.0	QP (1.00s)
384.008	28.8	H	46.0	-17.2	QP	154	1.0	QP (1.00s)
480.005	31.0	H	46.0	-15.0	QP	349	1.0	QP (1.00s)
240.010	35.6	H	46.0	-10.4	QP	211	1.5	QP (1.00s)
288.008	42.3	H	46.0	-3.7	QP	18	1.0	QP (1.00s)



Client:	EBR Systems	Job Number:	JD106124
Model:	5100	T-Log Number:	T106196
		Project Manager:	Christine Krebill
Contact:	Daryl Jamgotchian	Project Coordinator:	-
Standard:	FCC Parts 15C & 95, EN 301 839 v2.1.1, EN 300 328 v2.1.1, EN 301 489-1v2.1.1, EN301 489-27 v2.1.1	Class:	N/A



Client:	EBR Systems	Job Number:	JD106124
Model:	5100	T-Log Number:	T106196
		Project Manager:	Christine Krebill
Contact:	Daryl Jamgotchian	Project Coordinator:	-
Standard:	FCC Parts 15C & 95, EN 301 839 v2.1.1, EN 300 328 v2.1.1, EN 301 489-1v2.1.1, EN301 489-27 v2.1.1	Class:	N/A

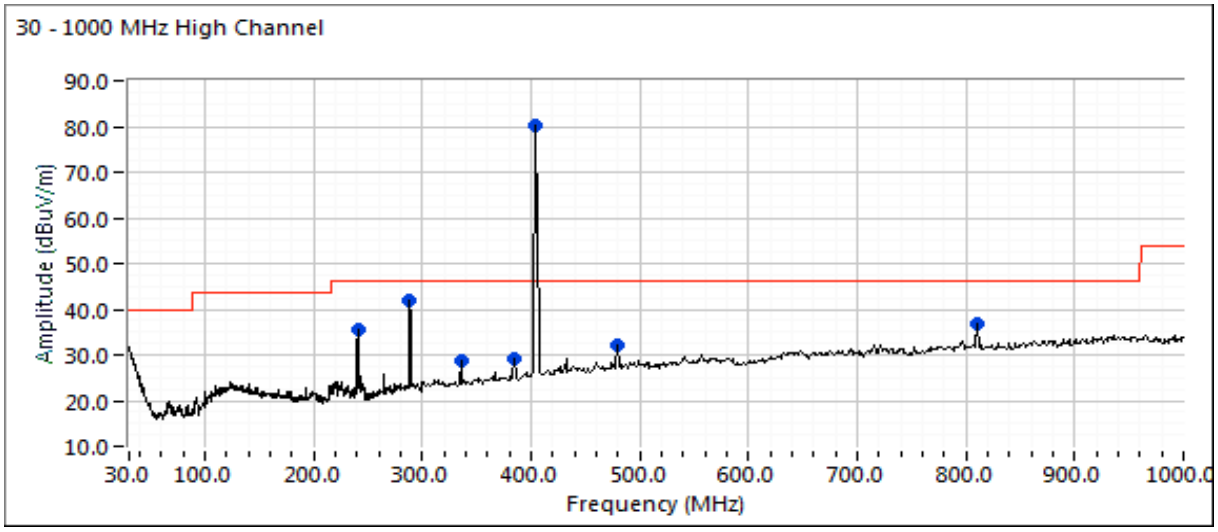
High Channel 5

Fundamental Field Strength

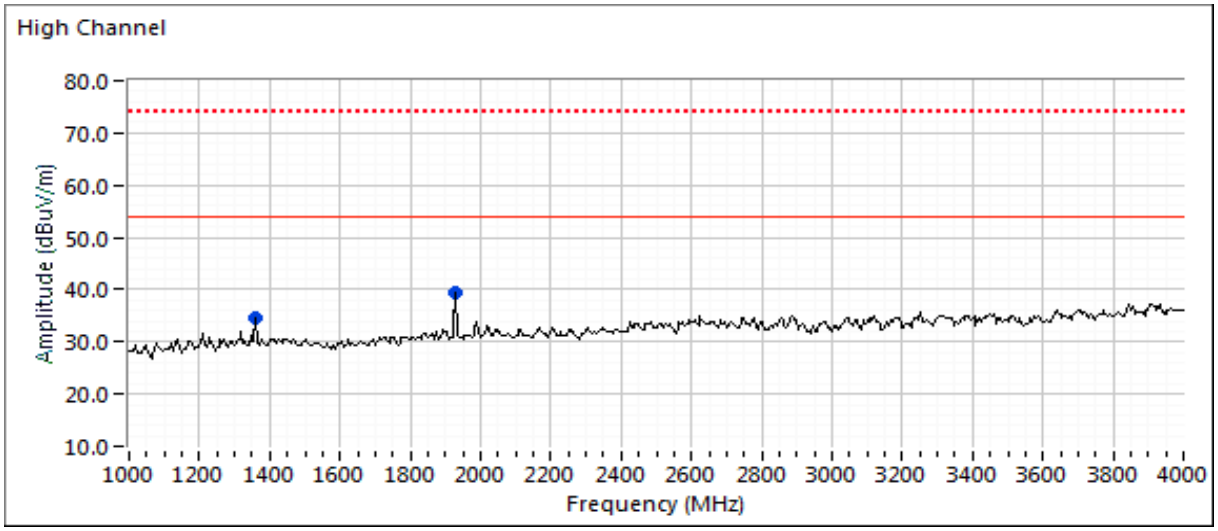
Frequency	Level	Pol	FCC 95		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
404.850	79.7	V	85.2	-5.5	Pk	192	1.2	Fundamental
404.850	80.3	H	85.2	-4.9	Pk	216	1.0	Fundamental

Spurious Emissions

Frequency	Level	Pol	FCC 95		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1919.970	37.2	H	54.0	-16.8	AVG	210	1.9	RB 1 MHz;VB 10 Hz;Peak
1920.100	45.0	H	74.0	-29.0	PK	210	1.9	RB 1 MHz;VB 3 MHz;Peak
1372.900	28.6	V	54.0	-25.4	AVG	344	2.2	RB 1 MHz;VB 10 Hz;Peak
1371.780	40.4	V	74.0	-33.6	PK	344	2.2	RB 1 MHz;VB 3 MHz;Peak
809.704	28.2	H	46.0	-17.8	QP	49	1.0	QP (1.00s)
480.013	30.6	H	46.0	-15.4	QP	287	2.0	QP (1.00s)
336.004	28.4	V	46.0	-17.6	QP	6	1.0	QP (1.00s)
384.008	28.2	H	46.0	-17.8	QP	167	1.0	QP (1.00s)
240.004	19.8	V	46.0	-26.2	QP	221	1.5	QP (1.00s)
288.008	35.9	V	46.0	-10.1	QP	21	0.9	QP (1.00s)



Client:	EBR Systems	Job Number:	JD106124
Model:	5100	T-Log Number:	T106196
		Project Manager:	Christine Krebill
Contact:	Daryl Jamgotchian	Project Coordinator:	-
Standard:	FCC Parts 15C & 95, EN 301 839 v2.1.1, EN 300 328 v2.1.1, EN 301 489-1v2.1.1, EN301 489-27 v2.1.1	Class:	N/A



End of Report

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