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Test Report with Amendment

(R030906-03)

Company:	MetroTel Corp 26 First Ave SE New London, MN 56273
Contact:	Doug Ferguson
Product:	MT-9100R-AC, MT-9100R-ACO Wesroc RMS Repeater
FCC ID: IC:	RWB-MT9100R 115A-MT9100R
Test Report No:	R030906-03B
APPROVED BY:	Doug Kramer Senior Test Engineer
DATE:	29 August 2006
Total Pages:	39

1.0 Summary of test results

1.1 Test Results

The EUT has been tested according to the following specifications:

APPLIED STANDARDS: FCC Part 15, Subpart C			
Standard Section	**Test Type and Limit**	**Result**	**Remark**
15.203 RSS-Gen	Unique Antenna Requirement	Pass	PCB Antenna
15.207 RSS-Gen	Conducted Emissions	Pass	Meets the requirement of the limit.
15.209 RSS-Gen	Radiated Emissions	Pass	Meets the requirement of the limit.
15.247(a)(2) RSS-210 Issue 6	Minimum Bandwidth, Limit: Min. 500kHz	Pass	Meets the requirement of the limit.
15.247(b) RSS-210 Issue 6	Maximum Peak Output Power, Limit: Max. 30dBm	Pass	Meets the requirement of the limit.
15.247(c) RSS-210 Issue 6	Transmitter Radiated Emissions, Limit: Table 15.209	Pass	Meets the requirement of the limit.
15.247(d) RSS-210 Issue 6	Power Spectral Density, Limit: Max. 8dBm	Pass	Meets the requirement of the limit.
15.247(c) RSS-210 Issue 6	Band Edge Measurement, Limit: 20dB less than the peak value of fundamental frequency	Pass	Meets the requirement of the limit.

1.2 Test Methods

1.2.1 Conducted Emissions

The EUT was powered by an AC adapter that converted 120VAC/60Hz to 9VDC. Conducted emissions measurements were made according to ANSI/IEEE C63.4: 2003 and compared to the limits as found in 47 CFR Part 15.207. Both models MT-9100R-AC and MT-9100R-ACO were tested, the difference being the length of the power supply cable.

1.2.2 Radiated Emissions

Compliance to 47 CFR Parts 15.209 and 15.247 was tested in accordance with the methods of ANSI/IEEE C63.4: 2003. Several configurations were examined and the results presented represent a worst-case scenario. The EUT was placed on a wooden table approximately 80cm high and centered on a 4m diameter turntable. The table was rotated to find the angles of maximum emissions and the receiving antenna was moved from 1m to 4m in both vertical and horizontal positions. The EUT was tested while sitting both vertically and horizontally. The horizontal configuration produced the highest emissions, and that position was used for all radiated testing. All measurements were taken at a distance of 3m from the EUT for Part 15.209 intentional radiator measurements, and 3m for 15.247 measurements of the fundamental frequency in the 902MHz to 928MHz band and subsequent harmonics.

1.3 Reason for amendment

This test report has been amended to correct details on the output power of the transmitter as shown on page 5 and details regarding measurements above 1GHz.

2.0 Description

2.1 Equipment under test

The Equipment Under Test (EUT) was a Wesroc RMS repeater (MT9100R), which is designed to communicate directly with any WESROC remote telemetry system. Any number of repeaters can be "daisy-chained" together to extend the effective range further. All functions are automatic and no user configuration is required. The EUT is only capable of transmitting at 916.48MHz. This frequency will be referred to as Channel 1.

EUT Received Date: 25 July 2006
EUT Tested Date: 25 July 2006

PRODUCT	Wesroc RMS Repeater
MODEL	MT-9100R-AC, MT-9100R-ACO
POWER SUPPLY	AC adapter, 9VDC
MODULATION TYPE	QFSK
RADIO TECHNOLOGY	Half-duplex RF Link
TRANSFER RATE	2400 bit per second, transmit and receive
FREQUENCY RANGE	916.48 MHz
NUMBER OF CHANNELS	1
MAXIMUM OUTPUT POWER	5.38mW; 7.3dBm
ANTENNA TYPE	Internal, PCB mounted
DATA CABLE	N/A
I/O PORTS	N/A
ASSOCIATED DEVICES	N/A

NOTE:
1. For more detailed features description, please refer to the manufacturer's specifications or User's Manual.

2.2 Laboratory description

All testing was performed at the NCEE Lincoln facility, which is a FCC and IC registered lab. This site has been fully described in previously submitted reports. Laboratory environmental conditions varied slightly throughout the tests:

Relative humidity of 45 ± 4%
Temperature of 20 ± 3° Celsius

2.3 Description of test modes

Channel	Frequency
1	916.48 MHz

2.4 Applied standards

The EUT is a digital transmission device operating between 902 MHz and 928 MHz. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.247) using ANSI/IEEE C63.4: 2003
Industry Canada, RSS 210, Issue 6, Category I Equipment

All test items have been performed and recorded as per the above standards.

2.5 Description of support units

The power AC power adapter used was a Condor 9VDC unregulated power supply. P/N D9300-205IP-RA, 120VAC/60Hz input.

2.6 Configuration of system under test

The EUT was powered by a 9VDC power supply and had no auxiliary devices, so it was tested by itself. The EUT was programmed by the manufacturer to transmit continually for testing purposes only.

3.0 Test equipment used

DESCRIPTION AND MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CALIBRATION DATE
Rohde & Schwarz Test Receiver	ESIB26	100037	10-Aug-05
Rohde & Schwarz Test Receiver	ESIB7	100007	28-Dec-05
EMCO Biconilog Antenna	3142B	1654	13-Mar-06
EMCO Horn Antenna	3115	6416	12-Oct-05

4.0 Detailed results

4.1 Unique antenna requirement

4.1.1 Standard applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

4.1.2 Antenna description

The antenna supplied with the EUT is an internal PCB mounted antenna and not interchangeable.

4.2 Radiated emissions

4.2.1 Limits for radiated emissions measurements

Emissions radiated outside of the specified bands shall be applied to the limits in 15.209 as followed:

FREQUENCIES (MHz)	FIELD STRENGTH (μV/m)	MEASUREMENT DISTANCE (m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	3
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

NOTE:
1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 * log * Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits by more than 20dB under any condition of modulation.

4.2.2 Test procedures

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground plane in a 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna was a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are used to make the measurement.

d. For each suspected emission, the EUT was arranged to maximize its emissions and then the antenna height was varied from 1 meter to 4 meters and the rotating table was turned from 0 degrees to 360 degrees to find the maximum emission reading.

e. The test-receiver system was set to use a peak detector with a specified resolution bandwidth. For spectrum analyzer measurements, the composite maximum of several analyzer sweeps was used for final measurements.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE:
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequencies below 1GHz.

2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for peak and average detectors at frequencies above 1GHz.

4.2.3 Deviations from test standard

No deviation.

4.2.4 Test setup

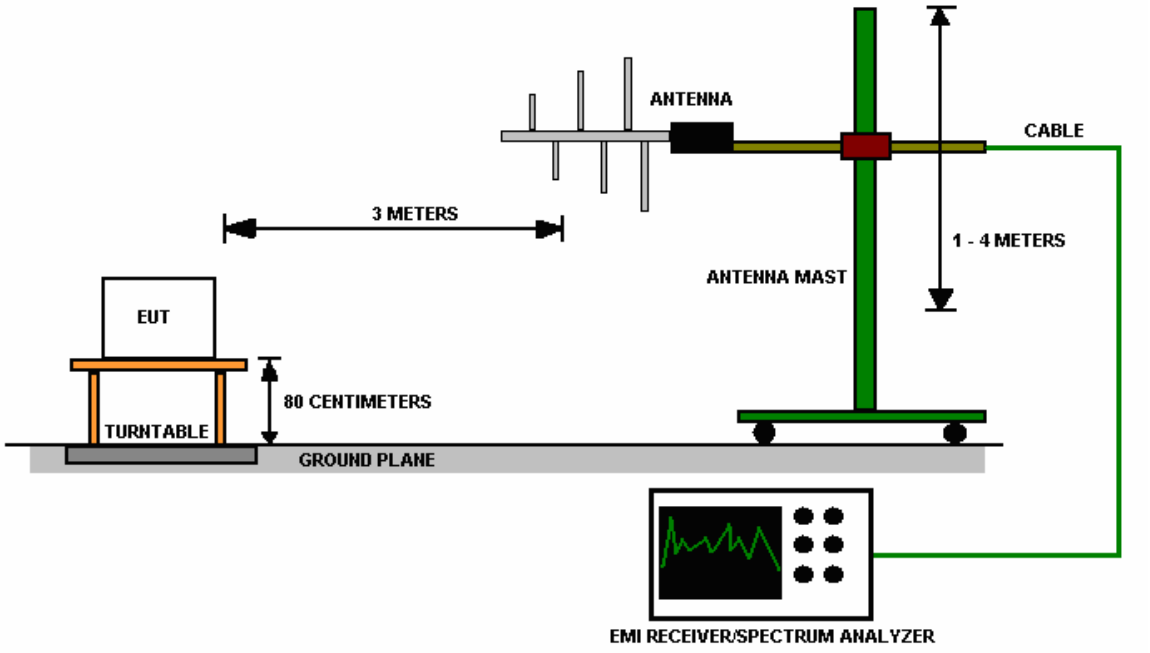


Figure 1 - Radiated Emissions Test Setup

For the actual test configuration, please refer to Appendix A for photographs of the test configuration.

4.2.5 EUT operating conditions

The EUT was powered by a 9VDC power supply and had no auxiliary devices, so it was tested by itself. The EUT was programmed by the manufacturer to transmit continually for testing purposes only.

4.2.6 Test results

EUT	Wesroc RMS Repeater	Model	MT-9100R-AC MT-9100R-ACO
MODE	Transmit	FREQUENCY RANGE	30MHz – 1GHz
INPUT POWER (SYSTEM)	9VDC	ORIENTATION	Vertical/Horizontal
ENVIRONMENTAL CONDITIONS	45% ± 5% RH 20 ± 3ºC	TECHNICIAN	NJohnson

Quasi-peak Measurements

Frequency MHz	Level dBµV/m	Limit dBµV/m	Margin dB	Height cm	Angle deg	Pol.
39.000000	25.02	40.0	15.0	109.0	159	VERT
100.020000	24.39	43.5	19.1	100.0	114	VERT
106.260000	28.00	43.5	15.5	150.0	23	HORI
107.280000	31.38	43.5	12.1	156.0	153	VERT
225.000000	31.68	46.0	14.3	142.0	284	VERT
375.000000	33.73	46.0	12.3	99.0	280	VERT
693.960000	28.92	46.0	17.1	98.0	40	HORI
697.620000	24.17	46.0	21.8	101.0	359	VERT
722.280000	29.60	46.0	16.4	399.0	118	VERT
912.840000	43.89	*N/A	N/A	112.0	273	VERT
915.060000	67.54	*N/A	N/A	112.0	80	VERT
916.440000	101.27	*N/A	N/A	115.0	82	VERT
916.500000	109.58	*N/A	N/A	181.0	119	VERT
918.240000	60.96	*N/A	N/A	100.0	81	VERT
920.640000	33.56	*N/A	N/A	109.0	256	VERT
944.700000	27.54	46.0	18.5	323.0	348	VERT

REMARKS:
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. *Radiated limits do not apply within the 902MHz to 928MHz band.

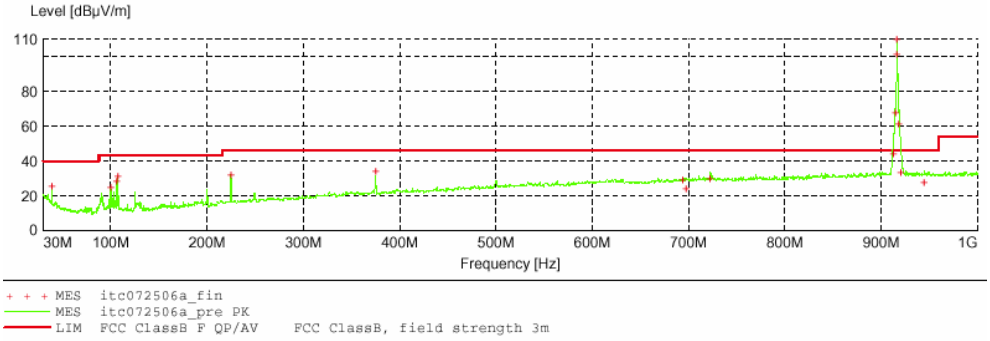


Figure 2 - Radiated Emissions Plot, Transmit

EUT	Wesroc RMS Repeater	Model	MT-9100R
MODE	Receive continuously	FREQUENCY RANGE	30MHz – 1GHz
INPUT POWER (SYSTEM)	9VDC	ORIENTATION	Vertical/Horizontal
ENVIRONMENTAL CONDITIONS	45% ± 5% RH 20 ± 3ºC	TECHNICIAN	NJohnson

**No quasi-peak data measured. All peak measurements 10dB or more below limit.*

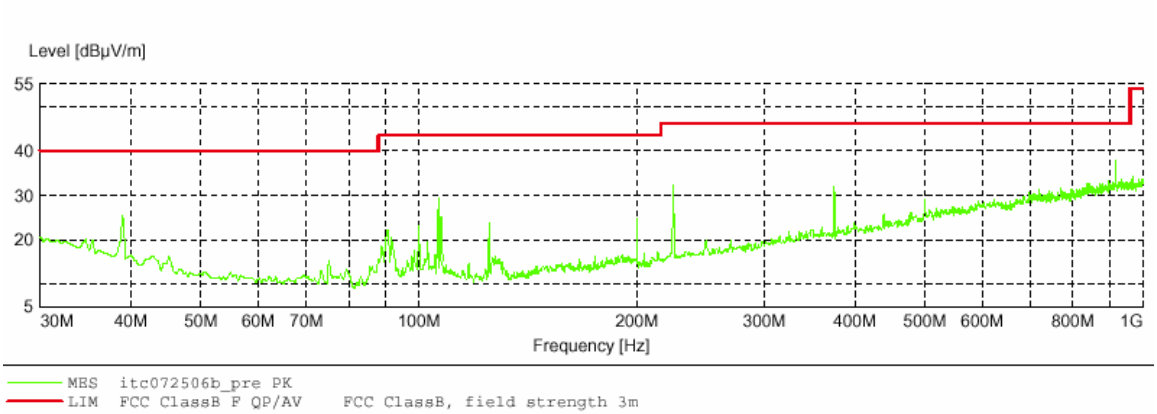


Figure 3 - Radiated Emissions Plot, Radiated

EUT	Wesroc RMS Repeater	Model	MT-9100R
MODE	Transmit	FREQUENCY RANGE	1MHz – 10GHz
INPUT POWER (SYSTEM)	9VDC	ORIENTATION	Vertical/Horizontal
ENVIRONMENTAL CONDITIONS	45% ± 5% RH 20 ± 3ºC	TECHNICIAN	NJohnson

Average Measurements

Frequency	Average Level	Average Limit	Average Margin	Height	Angle	Pol.
MHz	dBµV/m	dBµV/m	dB	cm	deg	
1825.000000	48.11	*89.58	41.47	249.0	73	HORI
1832.500000	59.94	*89.58	29.64	119.0	310	VERT
1835.000000	35.20	*89.58	54.38	214.0	164	HORI
2739.000000	39.27	54.00	14.73	383.0	161	VERT
2748.000000	39.42	54.00	14.58	388.0	164	HORI
2749.500000	51.11	54.00	2.89	119.0	311	VERT
3677.500000	43.12	54.00	10.88	389.0	190	VERT
4576.000000	44.82	54.00	9.18	100.0	351	VERT
5488.000000	49.91	*89.58	39.67	129.0	299	VERT
6424.000000	51.77	*89.58	34.81	156.0	0	VERT

Peak Measurements

Frequency	Peak Level	Peak Limit	Peak Margin	Height	Angle	Pol.
MHz	dBµV/m	dBµV/m	dB	cm	deg	
1825.000000	48.62	*89.58	40.96	249.0	73	HORI
1832.500000	66.71	*89.58	22.87	119.0	310	VERT
1835.000000	48.81	*89.58	40.77	214.0	164	HORI
2739.000000	53.12	74.00	20.88	383.0	161	VERT
2748.000000	53.18	74.00	20.82	388.0	164	HORI
2749.500000	59.82	74.00	14.18	119.0	311	VERT
3677.500000	56.93	74.00	17.07	389.0	190	VERT
4576.000000	58.13	74.00	15.87	100.0	351	VERT
5488.000000	63.22	*89.58	26.36	129.0	299	VERT
6424.000000	65.97	*89.58	23.61	156.0	0	VERT

REMARKS:

1. Emission level (dBuV/m) = Measured Value (dBuV) + Antenna Factor (dB/m) + Cable Factor (dB)
2. The other emission levels were very low against the limit.
3. Margin value = Emission level – Limit value.
4. "*" These measurements fall in unrestricted bands. Spurious emissions are then required to be 20dB below the value of the peak emission at the fundamental frequency. In this case, the peak emissions is 109.58dBµV/m, so the limit is 89.58 dBµV/m. In restricted bands, the 15.209 limits were applied.
5. Because the measurements of the noise floor was significantly lower than the limits (10dB or greater), a pre-amp was not used for testing. The absence of a pre-amp during testing accounts for the 13dB of difference between the peak and average measurements when measuring signals in the noise floor. A preamp was used in examining frequencies above 7GHz; no emissions were detected within 12dB of the limit.

4.3 Conducted AC Mains Emissions

4.3.1 Limits for conducted emissions measurements

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

NOTE: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.3.2 Test Procedures

a. The EUT was placed 0.8m above a ground reference plane and 0.4 meters from the conducting wall of a shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). The LISN provides 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference as well as the ground.

c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels over 10dB under the prescribed limits could not be reported

d. Results of testing a PC alone and with the EUT connected were compared to verify that the EUT does not cause the emissions of the PC to go over the 15.207 limits.

4.3.3 Deviation from the test standard

No deviation

4.3.4 Test setup

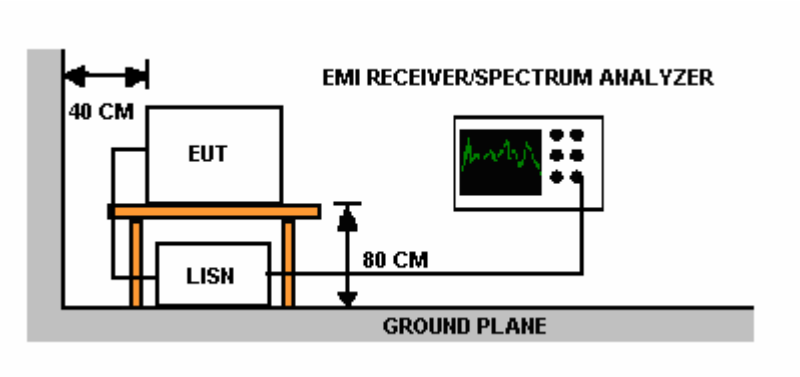


Figure 4 - Conducted Emissions Test Setup

For actual test configuration, see photographs in Appendix A

4.3.5 EUT operating conditions

The EUT was powered by a 9VDC power supply and had no auxiliary devices, so it was tested by itself. The EUT was programmed by the manufacturer to transmit continually for testing purposes only.

4.3.6 Test Results

EUT	Wesroc RMS Repeater	Model	MT-9100R-AC
MODE	AC Adapter, 6V	FREQUENCY RANGE	150kHz – 30MHz
INPUT POWER (SYSTEM)	120VAC/60 to adapter	PHASE	Line, Neutral
ENVIRONMENTAL CONDITIONS	45% ± 5% RH 20 ± 3ºC	TECHNICIAN	NJohnson

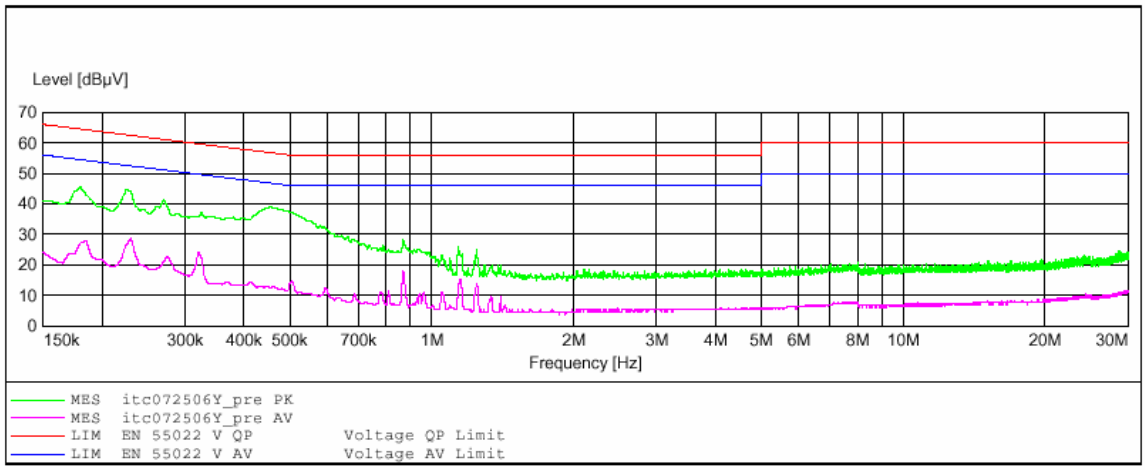


Figure 5 - Conducted Emissions Plot, MT-9100R-AC

REMARKS:
1. Q.P. and AV. Are abbreviations for quasi-peak and average respectively.
2.All emission levels were very low against the limit.
3. The MT-9100R-ACO was the same as the MT-9100R-AC but with a longer DC supply cable from the AC adapter

EUT	Wesroc RMS Repeater	Model	MT-9100R-ACO
MODE	AC Adapter, 9V	FREQUENCY RANGE	150kHz – 30MHz
INPUT POWER (SYSTEM)	120VAC/60 to adapter	PHASE	Line, Neutral
ENVIRONMENTAL CONDITIONS	45% ± 5% RH 20 ± 3ºC	TECHNICIAN	NJohnson

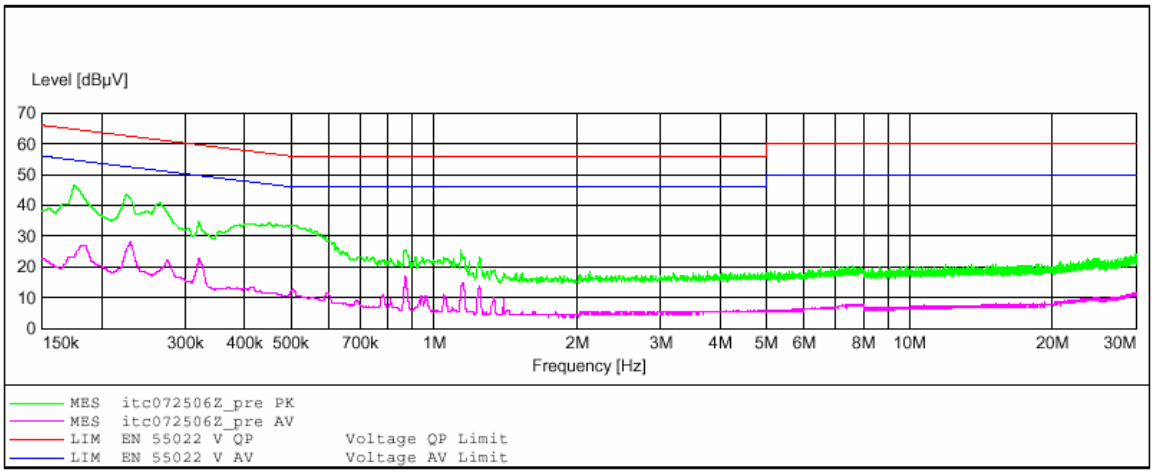


Figure 6 - Conducted Emissions Plot, MT-9100R-ACO

REMARKS:
1. Q.P. and AV. Are abbreviations for quasi-peak and average respectively.
2. All emission levels were very low against the limit
3. The MT-9100R-ACO was the same as the MT-9100R-AC but with a longer DC supply cable from the AC adapter

4.4 Bandwidth

4.4.1 Limits of bandwidth measurements

The 6dB bandwidth of the signal must be greater than 0.50MHz

4.4.2 Test procedures

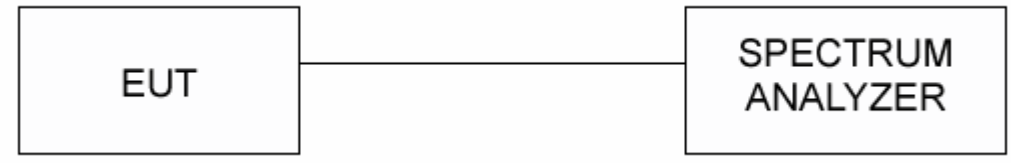
The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 kHz RBW and 100 kHz VBW. The 6 dB bandwidth is defined as the bandwidth of which is higher than peak power minus 6dB.

The 99% occupied is defined as the bandwidth at which 99% of the signal power is found. This corresponds to 20dB down from the maximum power level. The maximum power was measured with the largest resolution bandwidth possible (10MHz) and this value was recorded. The signal was then captured with a 100kHz resolution bandwidth and the frequencies where the measurements were 20dB below the maximum power were marked. The bandwidth between these frequencies was recorded as the 99% occupied bandwidth.

4.4.3 Deviations from test standard

No deviation.

4.4.4 Test setup



4.4.5 EUT operating conditions

The EUT was powered by a 9VDC power supply and had no auxiliary devices, so it was tested by itself. The EUT was programmed by the manufacturer to transmit continually for testing purposes only.

4.4.6 Test results

EUT	Wesroc RMS Repeater	MODEL	MT-9100R
INPUT POWER (SYSTEM)	AC adapter, 9VDC	ENVIRONMENTAL CONDITIONS	45% ± 5% RH 20 ± 3ºC
TECHNICIAN	NJohnson	MODE	Continuous Transmit

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BW (kHz)	6dB MINIMUM LIMIT (MHz)	99% Occupied BW (kHz)	RESULT
1	916.48	686.39	0.500	866	Pass

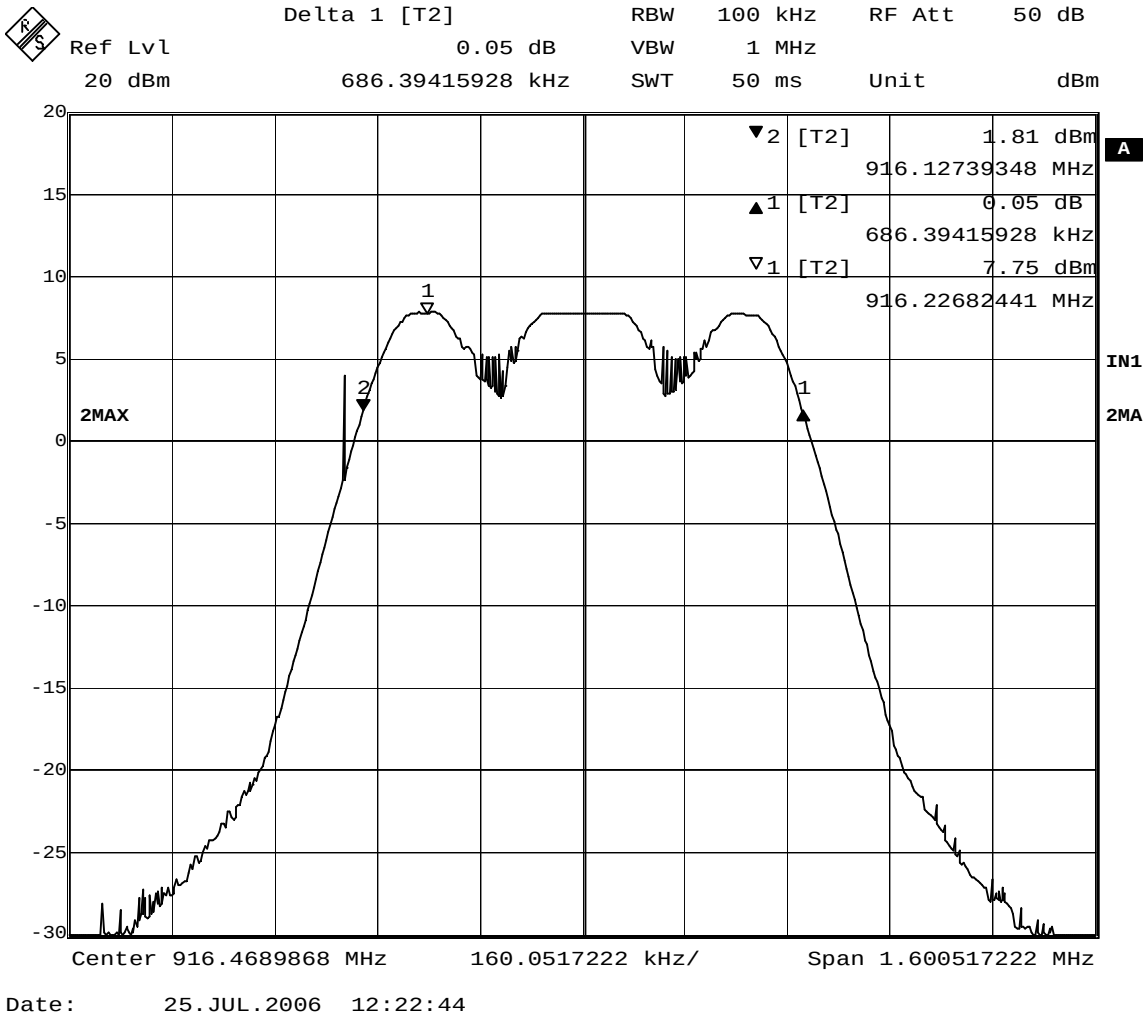


Figure 7 - 6dB Bandwidth, 686.39kHz

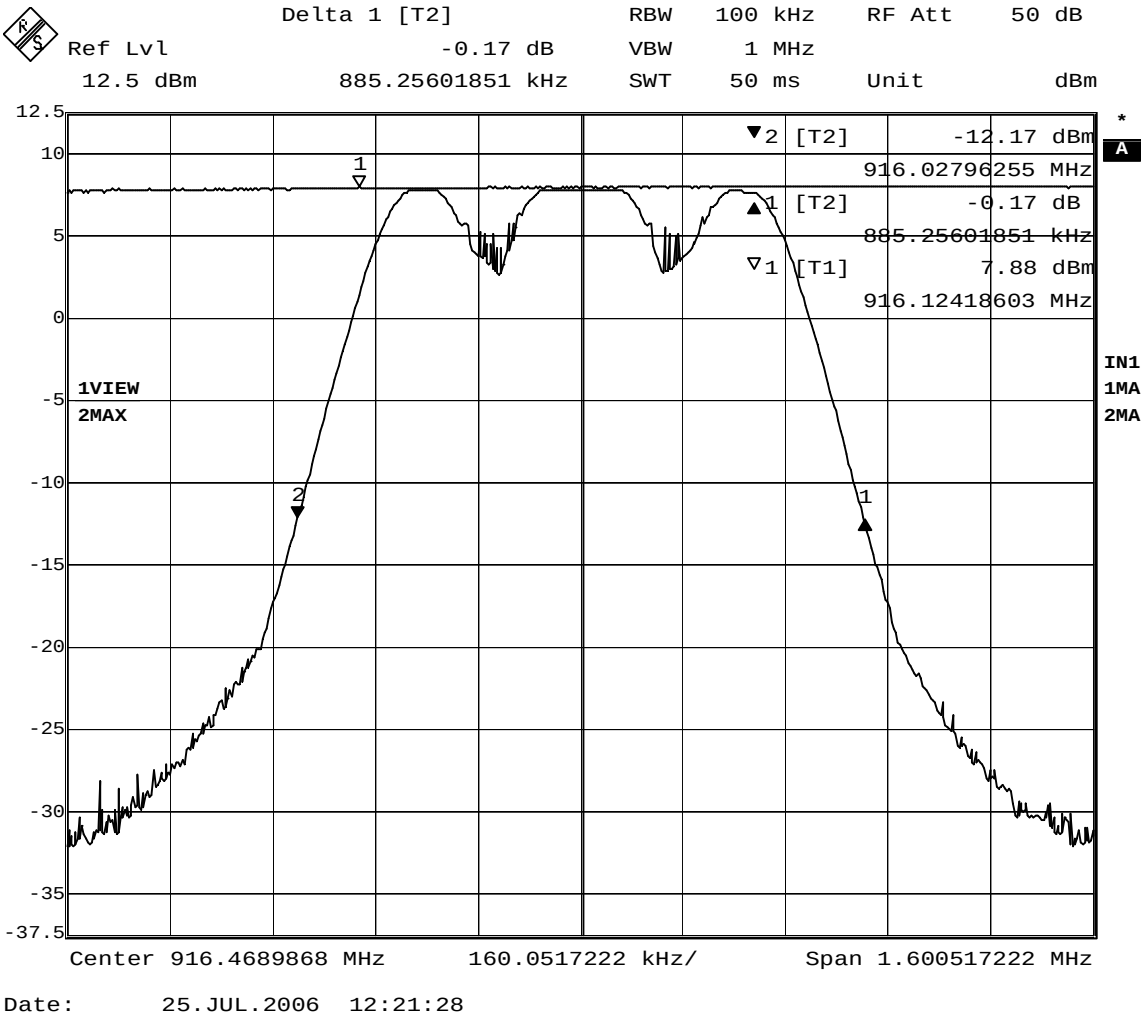


Figure 8 - 99% Occupied channel bandwidth, 866kHz

4.5 Maximum peak output power

4.5.1 Limits of power measurements

The maximum peak output power allowed is 30dBm.

4.5.2 Test procedures

1. The EUT was connected to the spectrum analyzer directly with a low-loss shielded coaxial cable.

2. The channel power function of the spectrum analyzer was used to calculate the cumulative power output per MHz over the range of the set channel bandwidth. The channel bandwidth was set to 30MHz.

3. The resolution bandwidth was set to 10MHz and the video bandwidth was set to 10MHz to capture the maximum amount of signal. The analyzer used a peak detector in max hold mode. This represented the maximum output power.

4.5.3 Deviations from test standard

No deviation.

4.5.4 Test setup

4.5.5 EUT operating conditions

The EUT was powered by a 9VDC power supply and had no auxiliary devices, so it was tested by itself. The EUT was programmed by the manufacturer to transmit continually for testing purposes only.

4.5.6 Test results

Maximum peak output power

EUT	Wesroc RMS Repeater	MODEL	MT-9100R
INPUT POWER (SYSTEM)	AC adapter, 9VDC	ENVIRONMENTAL CONDITIONS	45% ± 5% RH 20 ± 3ºC
TECHNICIAN	NJohnson	MODE	Continuous transmit

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	RESULT
1	916.48	7.31	30	Pass

4.6 Power spectral density (PSD)

4.6.1 Limits of PSD measurements

The maximum power spectral density allowed is 8dBm.

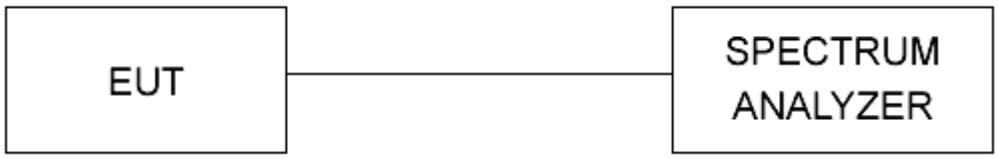
4.6.2 Test procedures

The transmitter output was connected directly to the spectrum analyzer. the bandwidth of the fundamental frequency was measured with the spectrum analyzer using 3 kHz RBW and 30 kHz VBW, the sweep time was 500s. The power spectral density was measured and recorded at the frequency with the highest emission. The sweep time is allowed to be longer than span/3KHz for a full response of the mixer in the spectrum analyzer.

4.6.3 Deviations from test standard

No deviation.

4.6.4 Test setup



4.6.5 EUT operating conditions

The EUT was powered by a 9VDC power supply and had no auxiliary devices, so it was tested by itself. The EUT was programmed by the manufacturer to transmit continually for testing purposes only.

4.6.6 Test results

Power Spectral Density

EUT	Wesroc RMS Repeater	MODEL	MT-9100R
INPUT POWER (SYSTEM)	AC adapter, 9VDC	ENVIRONMENTAL CONDITIONS	45% ± 5% RH 20 ± 3ºC
TECHNICIAN	NJohnson	MODE	Continuous transmit

CHANNEL	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL IN # KHz BW (dBm)	MAXIMUM POWER LIMIT (dBm)	RESULT
1	916.48	7.12	8	Pass

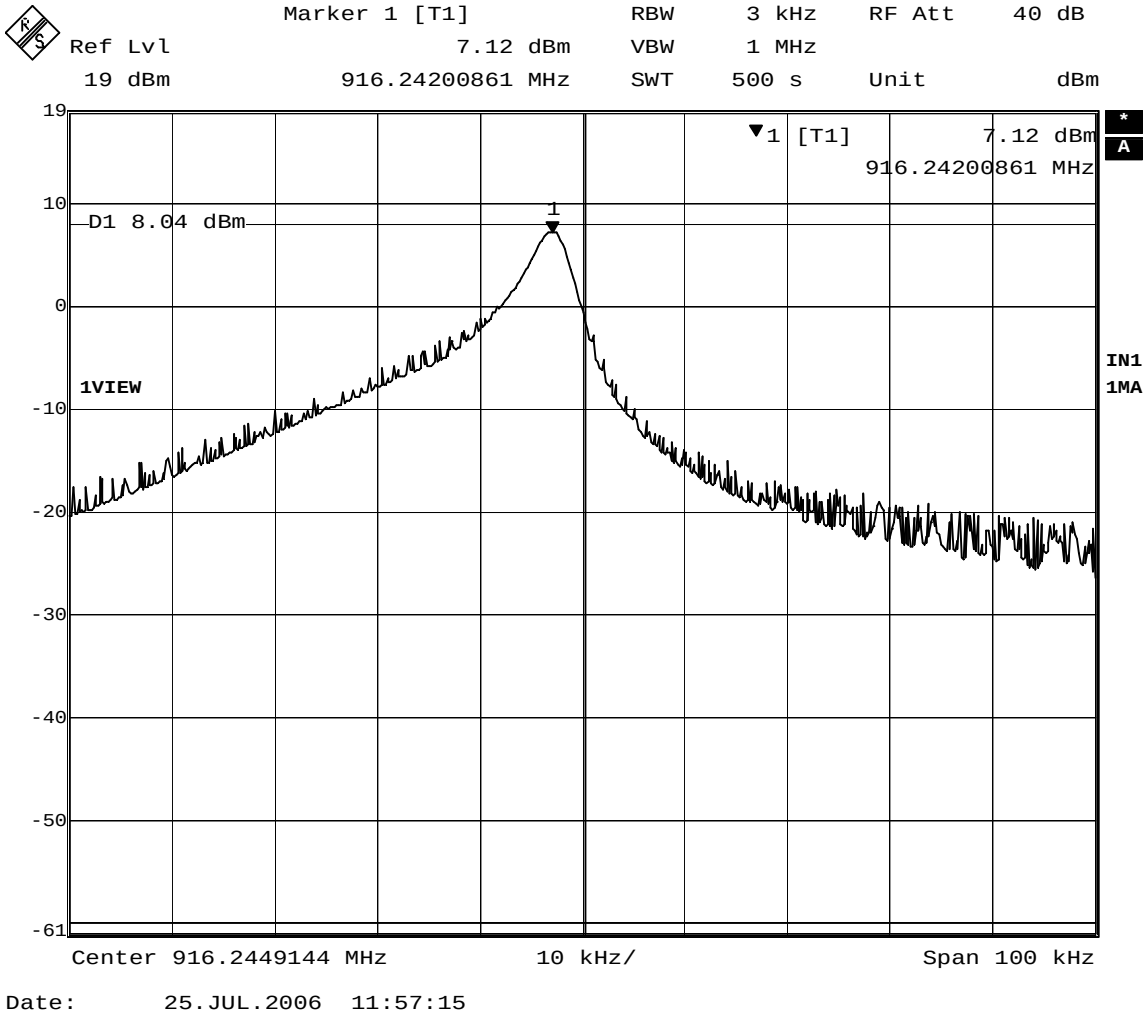


Figure 9 - Power Spectral Density, 7.12dBm

4.7 Bandedges

4.7.1 Limits of bandedge measurements

For emissions outside of the allowed band of operation (902MHz – 928MHz), the emission level needs to be 20dB under the maximum fundamental field strength. However, if the emissions fall within one of the restricted bands from 15.205 the field strength levels need to be under that of the limits in 15.209.

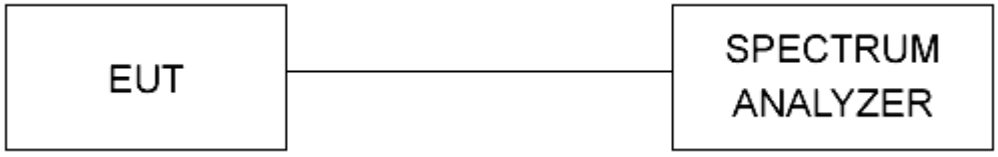
4.7.2 Test procedures

The EUT was tested in the same method as described in section *4.2 - Radiated emissions.* The EUT was oriented as to produce the maximum emission levels. The resolution bandwidth was set to 120kHz and the EMI receiver was used to scan from the bandedge to the fundamental frequency with a quasi-peak detector. The highest emissions level beyond the bandedge was measured and recorded. If the out of band emissions do not fall within a restricted band from 15.205, then it is required that the out of band emission be 20dB below that of the fundamental emission level. If the out of band emission falls with a restricted band from 15.205, then it is required that the emission be below the limits from 15.209.

4.7.3 Deviations from test standard

No deviation.

4.7.4 Test setup



4.7.5 EUT operating conditions

The EUT was powered by a 9VDC power supply and had no auxiliary devices, so it was tested by itself. The EUT was programmed by the manufacturer to transmit continually for testing purposes only.

4.7.6 Test results

EUT	Wesroc RMS Repeater	MODEL	MT-9100R-AC
INPUT POWER (SYSTEM)	AC adapter, 9VDC	ENVIRONMENTAL CONDITIONS	45% ± 5% RH 20 ± 3ºC
TECHNICIAN	NJohnson	MODE	Continuous transmit

Highest Out of Band Emissions

CHANNEL	Bandedge/Measurement Frequency (MHz)	QP Level (dBµV/m)	Fund. QP Level	Delta
1	902 MHz	63.85	110.65	46.80
1	928 MHz	63.48	110.65	47.17

NOTE:
The plots show corrected measurements. All values listed include all transducer and cable loss factors and reflect actual field strength levels.

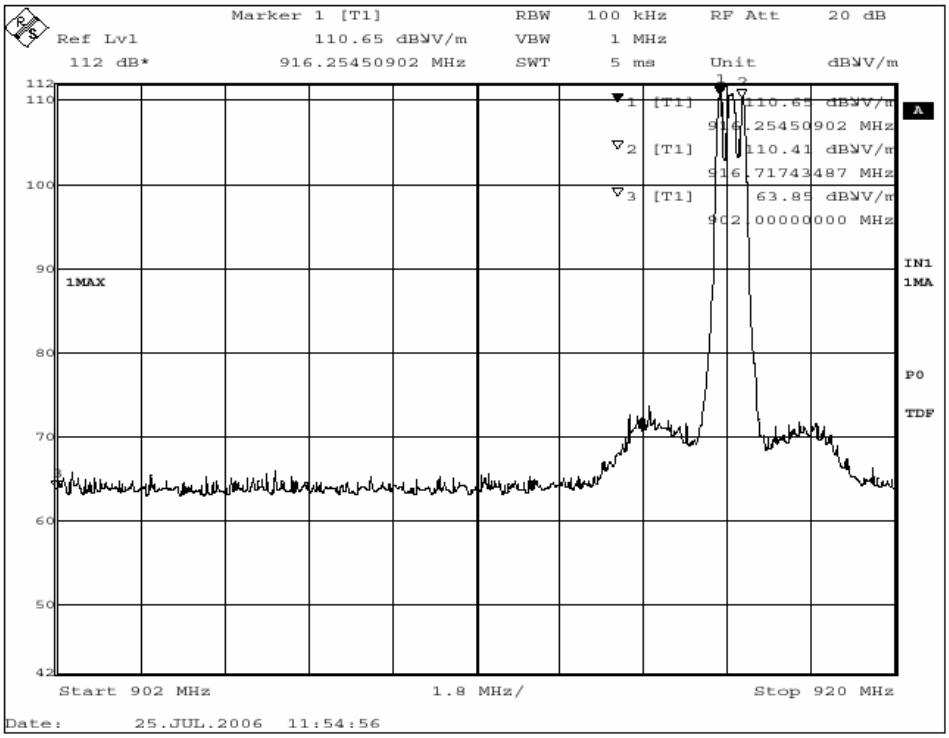


Figure 10 - Bandedge Measurement, 902MHz, 63.85dBµV/m

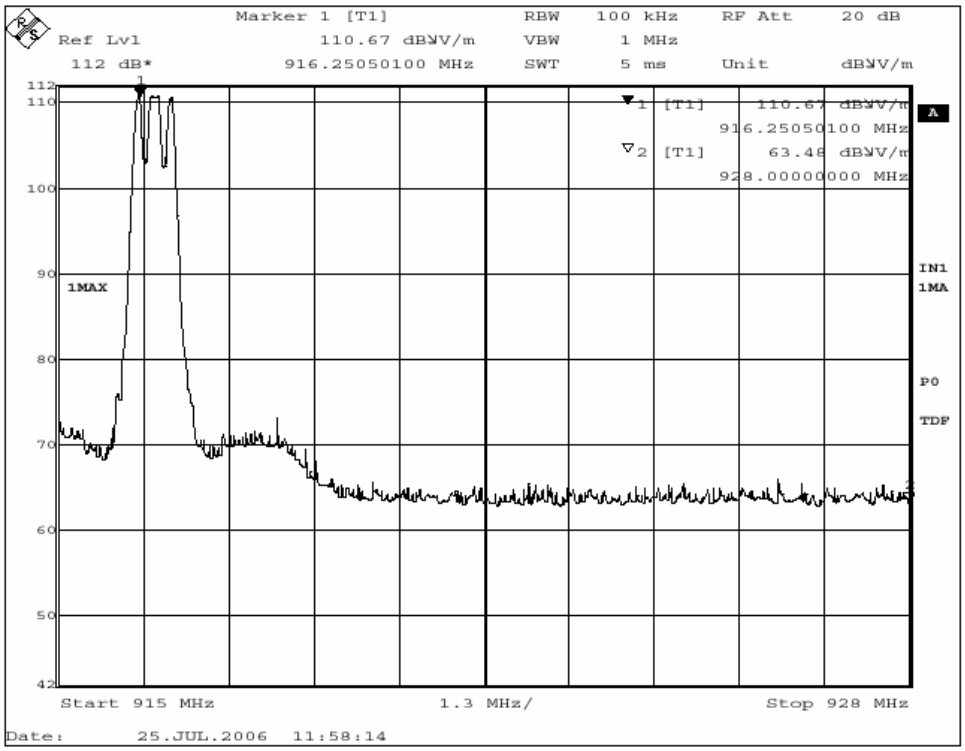


Figure 11 - Bandedge Measurement, 928MHz, 63.48dBµV/m

Appendix A: Test Photos

Figure 12 - MT9100R

Figure 13 - Conducted Emissions Test Setup, MT-9100R-ACO

Figure 14 - Conducted Emissions Test Setup

Figure 15 - Conducted Emissions Test Setup, MT-9100R-AC

Figure 16 - Radiated Emissions Test Setup

Figure 17 - Radiated Emissions Test Setup

Figure 18 - Radiated Emissions Test Setup

Appendix B: Sample Calculation

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:
FS = RA + AF – (-CF + AG) + AV

where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier Gain

AV = Averaging Factor (if applicable)

Assume a receiver reading of 55 dBμV is obtained. The Antenna Factor of 12 and a Cable Factor of 1.1 is added. The Amplifier Gain of 20 dB is subtracted, giving a field strength of 48.1 dBμV/m.

FS = 55 + 12 – (-1.1 + 20) + 0 = 48.1 dBμV/m

The 48.1 dBμV/m value can be mathematically converted to its corresponding level in μV/m.

Level in μV/m = Common Antilogarithm [(48.1 dBμV/m)/20]= 254.1 μV/m

AV is calculated by the taking the 20*log(T_{on}/100) where T_{on} is the maximum transmission time in any 100ms window.

Appendix C: RF Exposure Evaluation

FCC ID: RWB-MT9100R
RF Exposure Statement for MT9100R:

Notice in Installation Manual:
FCC Radiation Exposure Statement
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 1.88cm (0.75 inches) between the radiator and your body.

RF Exposure Calculations:

The following information provides the minimum separation distances for the two major antenna types used in this system.

Directional Antenna:
The 8dBi antenna is the maximum gain antenna certified for use with the product. The minimum separation distance is calculated from **FCC OET 65 Appendix B, Table 1B** Guidelines for General Population/Uncontrolled Exposure. This calculation is based on the highest EIRP possible from the system, considering maximum power and antenna gain. The exposure limit for a transmitter operating at 905.5MHz is found in mW/cm^2 using the equations f/1200. Since the operating frequency in channel DA produced the lowest limit, that limit will be used in calculation. (905.5/1200 = 0.75mW/cm^2)

S = (Po * G) / (4 * Pi * r^2) or r = SQRT [(Po * G) / (4 * Pi * S)]

Where S = 0.75 mW/cm^2 for 915 MHz
Where Po = 5.38 mW (Peak RF, 7.31dBm)
Where G = 6.31 (numeric equivalent to 8dBi antenna gain with 0.0 dB cable loss)
Where r = Minimum Safe Distance from antenna (cm)

For Po = 5.38mW, r = 1.88cm (0.75 inches)

For a distance [r] of 20cm from this antenna, the field density S = 0.0068 mW/cm^2

Notes:
1. The minimum safe distance is based on a conservative “worst case” prediction, i.e. using the formula shown above and no duty factor. In practice the minimum distance will be much shorter. (Ref. 2)
2. The minimum safe distance has been calculated for the maximum allowed Power Density (S) limit of 0.75 mW/cm^2 for the frequency 915 MHz for uncontrolled environments (Ref. 2).

References:
1. FCC Part 15, sub-clause 15.247 (b) (4) (i)
2. FCC OET Bulletin 65, Edition 97-01
3. FCC Supplement C to OET Bulletin 65, edition 01-01

Appendix D: Table of Figures

Figure **Page Number**