ITS Intertek Testing Services

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Measurement Report
In suppor of
APPLICATION FOR CERTIFICATION
AirNet Communications Corporation
Model: AirSite Remote Radio

FCCID: MZKRE3010-1900

This report is under a confidentiality agreement

TABLE OF CONTENTS

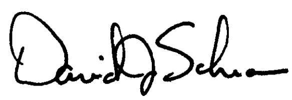
1.0 Statement of Certification

The technical data supplied with this application, having been taken under my supervision is hereby duly certified. The following is a statement of my qualifications:

1) BSEE from Auburn University, Alabama

2) 4 years of experience in the field of electromagnetic emissions testing

I certify that the above application was prepared under my direction and that to the best of my knowledge and belief, the facts set forth in the application and accompanying technical data are true and correct.



David J. Schramm
Position: Technical Supervisor
ITS Norcross, GA

Date: January 12, 1999

2.0 Identification Label

The label and label location are located in a separate exhibit.

2.1 Label Material Specification

Material:	Brady XB-302
Temperature Range:	-40 °F to +230 °F
Adhesive:	Permanent cold temperature pressure sensitive acrylic

3.0 General Information

3.1 Production plans following 2.981 (c)

Quantity Production of this device is planned.

3.2 Application References following 2.1061

Reference is made to the following:

1. PCS1900 Air Interface Specification - JCT (AIR)/94.08.04-231R4
2. Radiated emissions report #JA-1624 from Rubicom Systems, Inc.
3. Similar application: FCCID: MZKRE3000-1900

3.3 Data Submittal Procedure:

Data is supplied according to Part 2, Sub-part J of CFR 47.

3.4 General Description:

The AirNet AirSite Remote Radio (ARR) is a translating repeater intended for use in PCS1900 communications. The ARR can extend the range of large capacity basestation to remote cells. This means the expensive processing required in the basestation can be centrally located and used to control a larger coverage area. Instead of having to purchase multiple BTS units, a service provider can buy a single BTS and multiple ARRs to cover the same area. The ARR uses in-band radio frequency channels to backhaul the traffic in the coverage area to and from the serving BTS. For each ARR deployed, two downlink frequencies and two uplink frequencies are necessary. The first frequency, the ground frequency, links the mobile station and the ARR. The second frequency is the backhaul frequency which links the ARR to its serving BTS. To the mobile user, an ARR appears as a single channel basestation.

The ARR provides two low noise receive paths for each radio channel. This diversity reception helps reduce the Rayleigh Fading, which can destroy communication links. Internal processing selects and retransmits the best of these independent receive paths. Note that the ARR does no modulation or demodulation.

The ARR hardware is housed in a NEMA-4 enclosure suitable for a wall or a tower. Three antennas are external to the enclosure and are connected by low-loss RF cable. Two of these antennas are dedicated for transmit and receive of the ground frequencies in the ARR cell. These antennas are normally omnidirectional and provide two separate receive paths and one transmit path. The third antenna is a directional, line-of-sight link to the serving basestation. This third antenna provides transmit and receive of backhaul frequencies.

A block diagram of the ARR is shown below. The backhaul antenna receives one channel from its serving basestation in the frequency range of 1930-1990 MHz. It downconverts this signal to an IF, and then upconverts based on a different LO and re-transmits the channel to the mobile station at a different frequency in the same band via the diplexed ground antenna. This is the downlink path of the ARR.

Similarly, each of the two antennae receives a single channel from a mobile station in the frequency range of 1850 to 1910 MHz. Two identical paths downconvert the signal to an IF, where the diversity selection is made. The chosen signal is then upconverted based on a different LO and re-transmitted to the basestation at a different frequency in the same band via the diplexed backhaul antenna. This is the uplink path of the ARR. The uplink and downlink separation is programmable from 2.4 to 10 MHz.

This application seeks to approve an ARR with a maximum power at the downlink antenna port of 40 Watts, with a maximum uplink power of 2 Watts. It is essentially the same hardware approved in the previous MZKRE3000-1900, (40-Watts downlink; 2-Watt uplink) save for different high power amplifiers in the uplink and downlink. As the output power is increasing, a new application is being submitted.

AirNet has one manufacturer for these amplifier modules. This application will include the electrical data for all of these modules. Test data will be taken for each amplifier in the uplink and downlink paths - the worst case data for each will be submitted.

4.0 Description

4.1 Transmitter Technical Characteristics - Pursuant 2.983 (d)

RF Power Output	40 Watts, Downlink
	2 Watts, Uplink
Number of Simultaneous Channels	1 Uplink; 1 Downlink
Tunable Channels	284
Frequency Range	1930 to 1990 MHz; Downlink
	1850 to 1910 MHz; Uplink
Frequency Stability:	XX ppm
Emission Designation:	300KGXW
Spurious Emissions:	>70 dBc
AC Voltage:	120 Vac
AC Current:	3 Amps
Amplifier Voltage:	24 Vdc
Amplifier Current:	7.5 A, 40 Watt amplifier
	0.8 A, 2 Watt amplifier

4.2 Transmitter Application

Recommended Antennas	
Antenna Type, Ground - 10 dBd Low Profile Omni-directional	12.1 dBi typical gain
	< 1.5:1 VSWR
Antenna Type, Ground	16.5 dBd Directional Panel Antenna
	18.6 dBi typical gain
	65° horizontal 3 dB beamwidth
	< 1.5:1 VSWR
Antenna Type, Backhaul	27.3 dBd Directional Dish Antenna
	5° beamwidth
	< 1.20:1 VSWR

Housing	As indicated in Section 10

5.0 Tune-up Procedure

5.1 Frequency

The parameters for programming the uplink and downlink synthesizers are stored in flash memory on the AirSite Remote Radio microprocessor module. These parameters determine receive and transmit frequencies and their separation. The parameters are stored in the flash (non-volatile) during AirSite Remote Radio installation based on the frequency plan for that particular coverage area. The AirSite Remote Radio automatically tunes to these frequencies at power-up once the flash has been programmed. There is no user accessible way of re-tuning the AirSite Remote Radio.

5.2 Output Power

The rated output powers that this application is written for (40-Watt downlink and 2-Watt uplink) are the maximum achievable output powers. To get this output level, the maximum signal level is input and the attenuators in the downlink and uplink ALC circuits (see Means for Limiting Power) are set to 0 dB. This gives the maximum gain through the uplink and downlink paths. Higher output powers are not realistically achievable.

At installation, the installer (see installation manual) verifies that the correct ground and backhaul frequencies (per the RF plan) are programmed in the AirSite. Tests are then performed to ensure that the signal does indeed transmit and receive on the specified frequencies. He then insures that the highest receive signal level from the serving BTS does not exceed the rated input level. Then the ARR is brought into service. It relies on in-band signaling from the serving BTS to command it to activate and deactivate a channel.

6.0 Circuit Description

A general description of the overall circuit is covered in the installation manual for this device. This section provides the description of circuits required by CFR 47 subpart 2.983. Circuits not described in the manual are covered in this exhibit.

The following descriptions are included: (1) Means for Frequency Stabilization, (2) Means for Harmonic Suppression, and (3) Means for Limiting Power.

6.1 Means for Frequency Stabilization

The synthesizer circuitry uses a National LMX2325 frequency synthesizer. Essentially, it phase locks a Voltage Controlled Oscillator (VCO) output to a reference as shown in the simplified figure below. The 10 MHz output of the Ovenized Quartz Oscillator (OCXO) is divided by 50 to generate a 200 kHz reference. This is phase compared to a divided down VCO output. A programmable divide ratio determines the VCO frequency. The internal comparator error signal is then loop filtered and used as the control input to the VCO. Thus the VCO output signal is phase locked to the reference, giving the LO signals the same accuracy as the reference. This output is buffered and amplified to create an LO for a particular mixer. Each downconvert and upconvert circuit is essentially the same -- the synthesizer chip is just programmed for a different divide ratio, e.g., LO frequency. The stability of the transmit carrier frequency is derived from the LO frequency stability and ultimately, that of the 10 MHz OCXO.

LOCAL OSCILLATOR GENERATION

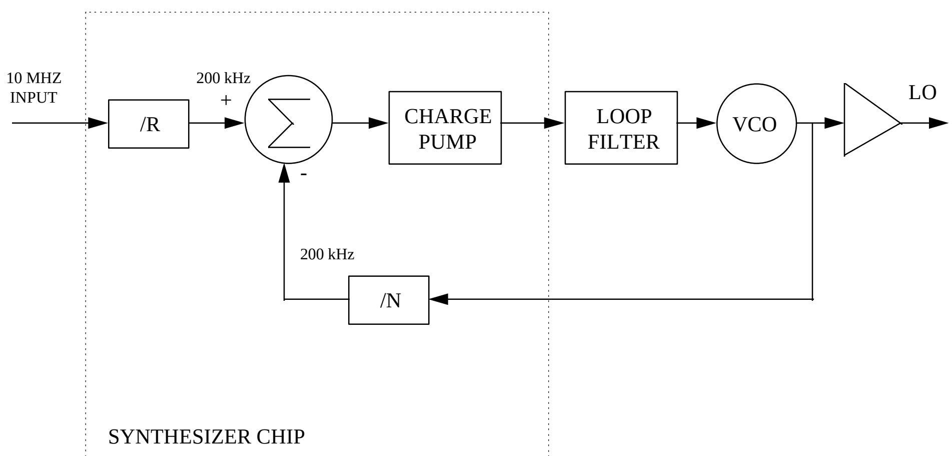


Figure 6.1

6.2 Means for Harmonic Suppression

In order to suppress conducted harmonics in, a SAW band-pass filter (BPF) immediately follows the upconverter stage. The Uplink BPF is centered at 1880 MHz with a 60 MHz bandwidth; similarly the Downlink BPF is centered at 1960 MHz with a 60 MHz bandwidth. This allows the bulk of the AirSite Remote Radio design to be used across the entire 60 MHz PCS-1900 band. The integrated filter/duplexers on both the uplink and downlink ports are cavity-based band-pass filters that are chosen based on the licensee's band of operation. For a C-band application the downlink transmit filter is centered at 1982.5 MHz with a 15 MHz bandwidth. The receive filter is centered at 1902.5 MHz with a 15 MHz bandwidth. On the uplink side, the roles are reversed. The transmit filter is at 1902.5MHz while the receive filter is at 1982.5. Likewise, each downconverter stage is preceded by a RF SAW bandpass filter device with a 60 MHz bandwidth. The combination of the SAW and the cavity filters ensures that both receiver and transmitter conducted spurious emissions are attenuated well below the required limits.

6.3 Means for Limiting Power

Both the uplink and downlink channel paths through the AirSite Remote Radio (ARR) have variable attenuation that is software programmable in 1 dB steps. This attenuation is varied automatically to keep the channels at the desired amplitude.

The downlink path rebroadcasts the basestation RF to the mobile station RF. The downlink channel uses a feedback type automatic level control (ALC) to adjust the output power level. Detector circuitry on the output of the downlink high power amplifier samples the output power level so that software resident in the ARR can calculate the necessary attenuation for the channel. The onboard microprocessor adjusts the variable attenuators in order to bring the downlink output level to some desired power level. If all variable attenuation is enabled, the gain through this downlink stage is 107 dB. If no attenuation is enabled, the gain is 137 dB. This 30 dB range is adjustable in 1 dB steps.

The uplink path rebroadcasts the mobile station RF to the serving basestation. The uplink channel uses a feed forward type automatic level control to adjust the output power level. A detector at the IF on this path samples the power level so that digital hardware resident in the AirSite can calculate the necessary attenuation for the channel. This hardware will then adjust the variable attenuators in order to bring the uplink output power level to the desired power level. If all variable attenuation is enabled, the gain through the downlink stage is 55 dB. If no attenuation is enabled then the gain is 115 dB. This 60 dB range is adjustable in 1 dB steps.

7.0 Measured Data

7.1 RF Power output data

The RF power output was measured with the indicated voltage and current applied into the final stage of the RF amplifying device. The outputs of the downlink channel were measured at the downlink antenna port using the HP 8563E Spectrum Analyzer in conjunction with a 30 dB attenuator. The outputs of the uplink channel were measured at the uplink antenna port using the HP 8563E Spectrum Analyzer in conjunction with 20 dB of external attenuation.

The following page contains the RF Output Power plot obtained using a spectrum analyzer and direct connection to the antenna. Spectrum analyzer settings for this plot are as follows:

Detection: Peak

RBW: 1 MHz

VBW: 1 MHz

For the downlink channels, the reference level offset is 30.5 dB to account for the system losses at 1.9 GHz.

For the uplink channels, the reference level offset is 22.3 dB to account for the system losses at 1.9 GHz.

Figure 7.1.1: RF Output Power Plot, Chesapeake 40 Watt Downlink

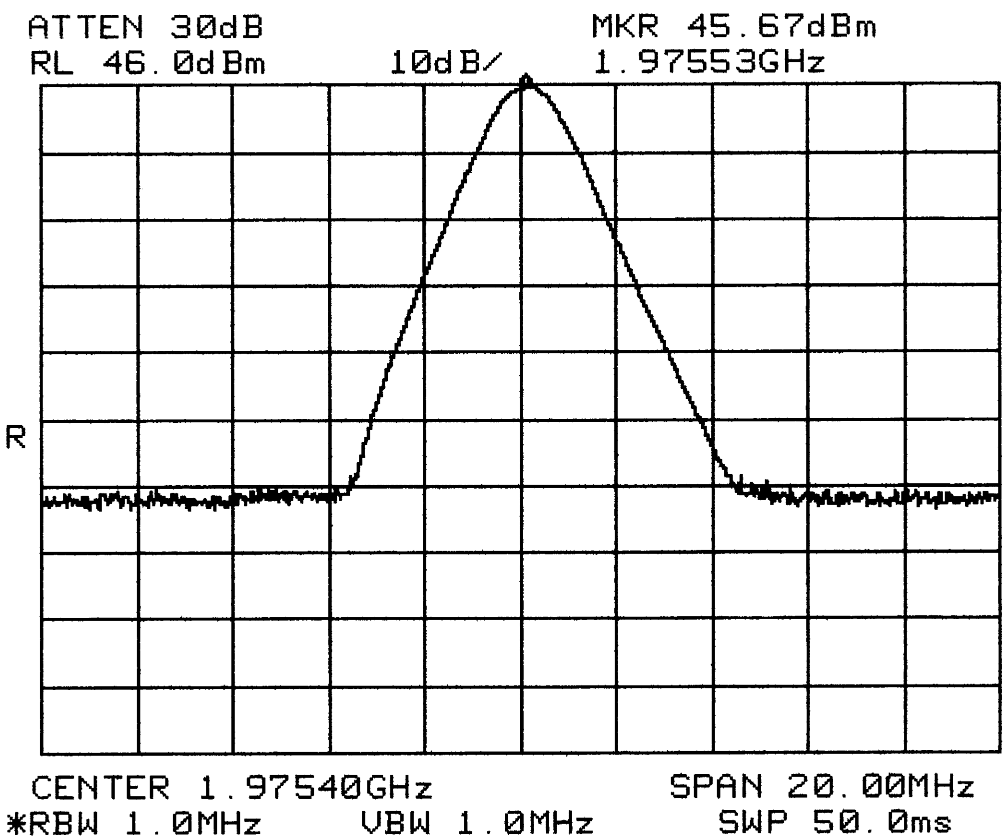
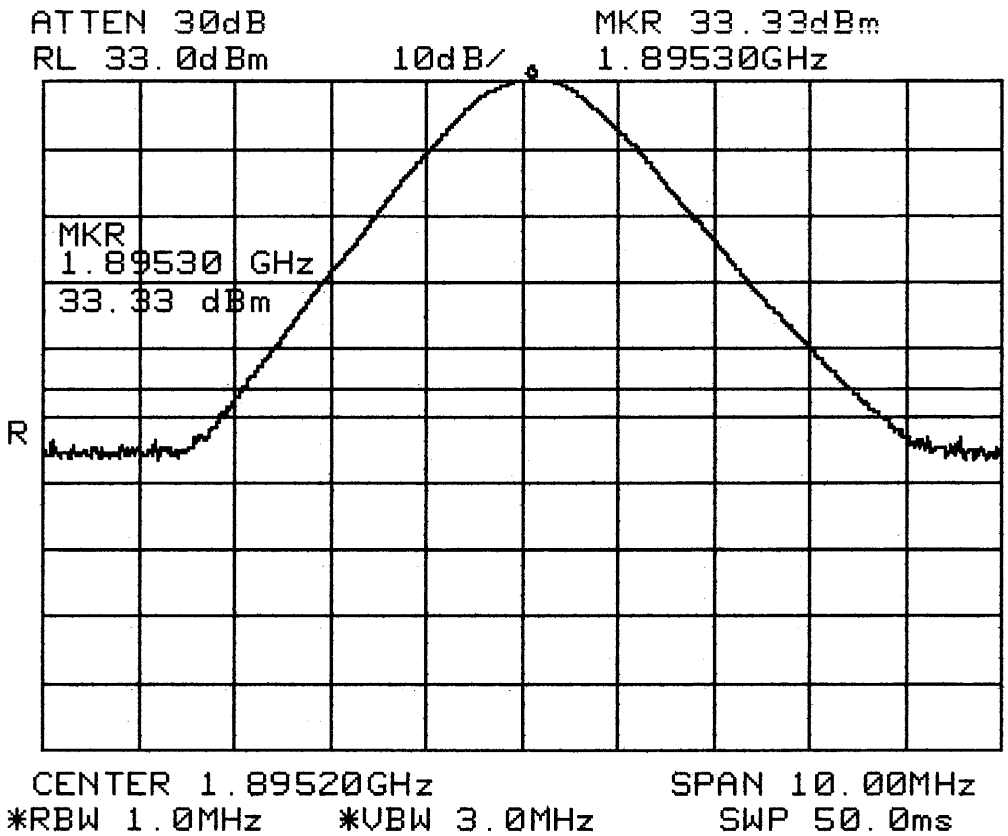
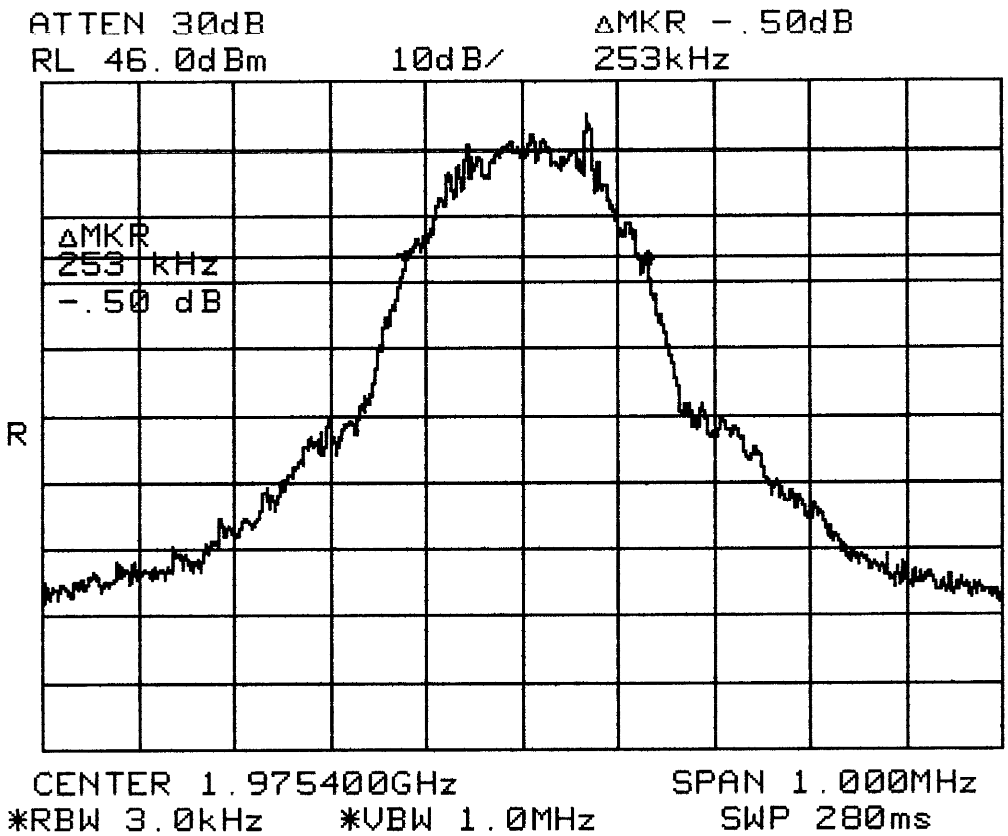


Figure 7.1.2: RF Output Power Plot, Chesapeake 2 Watt Downlink



7.2 Occupied Bandwidth

The industry accepted bandwidth for GMSK signaling is 300KGXW.



7.3 Emissions at edge of Frequency Block

7.3.1 Downlink

The downlink path (AirSite to mobile) transmit path is being qualified for a 40-Watt carrier at the antenna connection to the AirSite Remote Radio. Due to the spectral re-growth in the final amplifier stage, the AirSite Remote Radio cannot meet the FCC spurious emissions requirement of 43 + 10 log (P) at carrier frequencies adjacent to frequency block edges for output powers higher than 2 Watts. Note however, that the spectral mask still exceeds the requirements for a GMSK waveform as specified in J-STW-007, Personal Communications Services Air Interface Specification. As this relatively low power is not very useful for the downlink path, the AirSite will not use the following channels for its downlink path.

Table 7.3.1: Unused ARFCNs

Licensed Band	Unused ARFCNs
‘A’ Band: 1930-1945 MHz	512, 585, 586
‘D’ Band: 1945-1950 MHz	587, 610, 611
‘B’ Band: 1950-1965 MHz	612, 685, 686
‘E’ Band: 1965-1970 MHz	687, 710, 711
‘F’ Band: 1970-1975 MHz	712, 735, 736
‘C’ Band: 1975-1990 MHz	737, 810

Software resident at the AirSite will make it impossible for these channels to be used as downlink carriers.

7.3.2 Uplink

The uplink path (AirSite to serving basestation) is being qualified for a 2-Watt carrier at the antenna connection of the AirSite Remote Radio. As shown in the following plots, at this power level, the AirSite exceeds the FCC requirements for spurious emissions at carrier frequencies adjacent to the band edges. Therefore, no exclusion of channels will be required for AirSite uplink carriers (1850.2-1909.8 MHz).

The plots on the following pages were made with the reference level set to the output power of the particular port (40 Watt, 46 dBm, for the downlink port and 2 W, 33 dBm, for the uplink port). A reference level offset was included to account for the cable loss and attenuation before the spectrum analyzer. The resolution bandwidth was set to 3 kHz and the video bandwidth was set to 3 MHz. A maker shows the level at the band edge. The span is set to show the spectrum 1 MHz below the bandedge.

Figure 7.3.1: Lower Band Edge Plot, Chesapeake 40 Watt Downlink

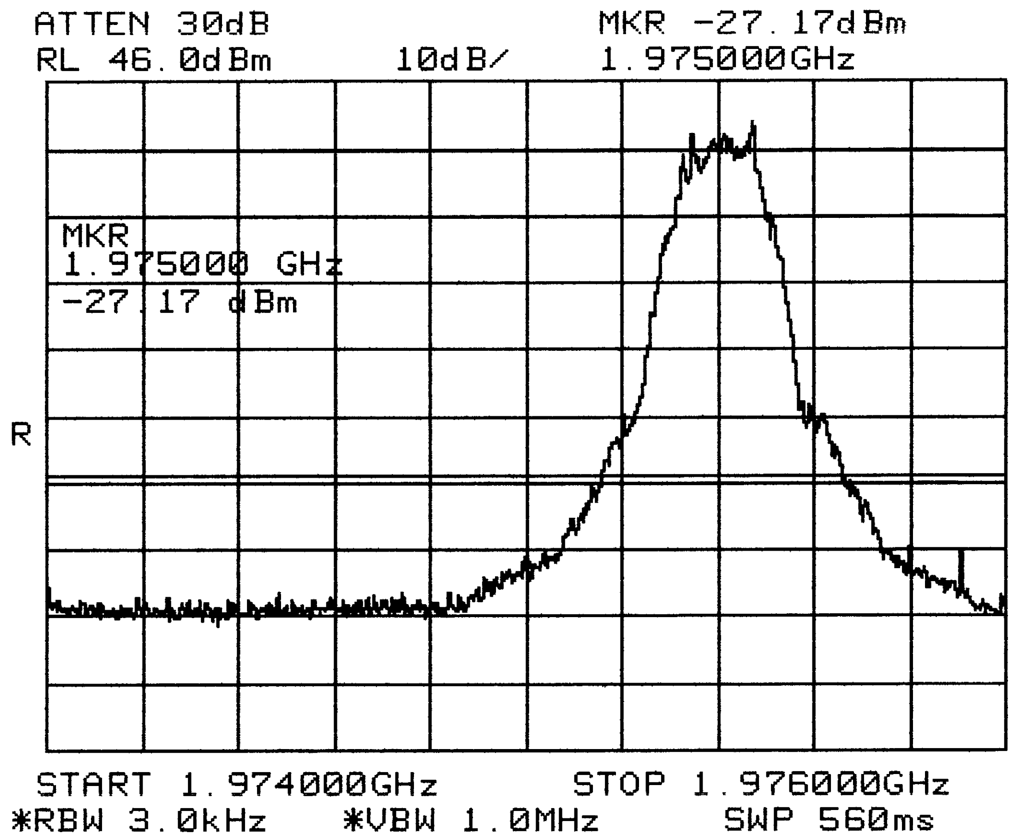


Figure 7.3.2: Upper Band Edge Plot, Chesapeake 40 Watt Downlink

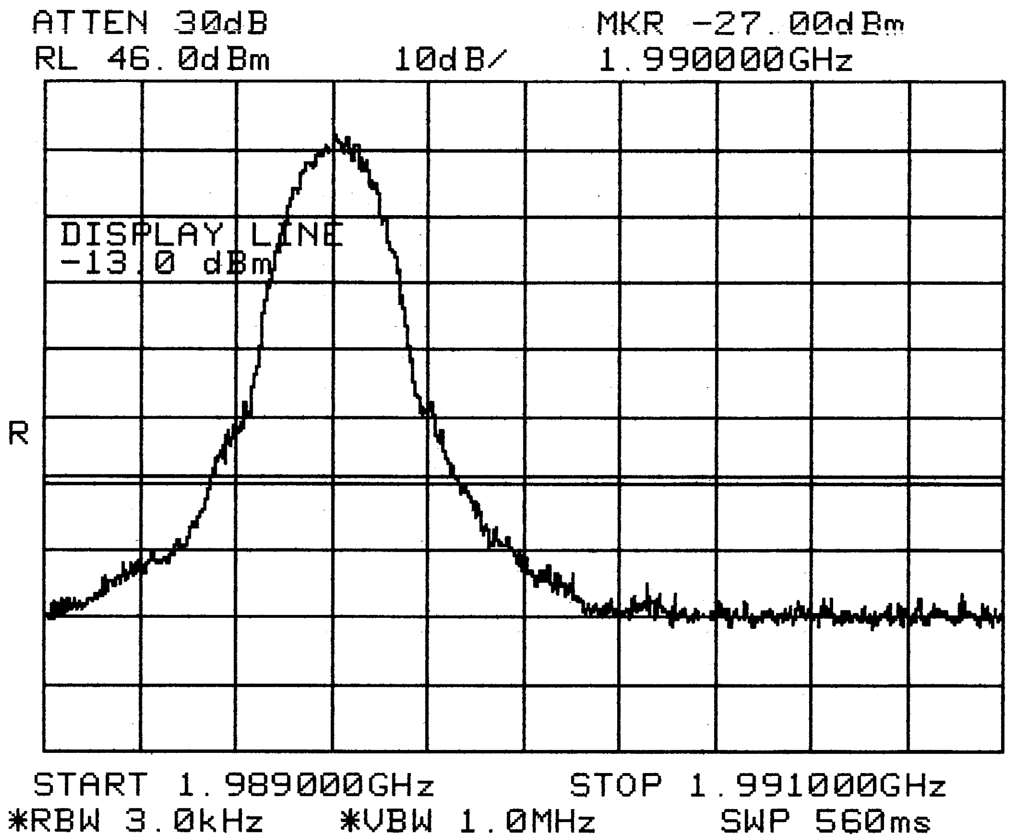


Figure 7.3.3: Lower Band Edge Plot, Chesapeake 2 Watt Downlink

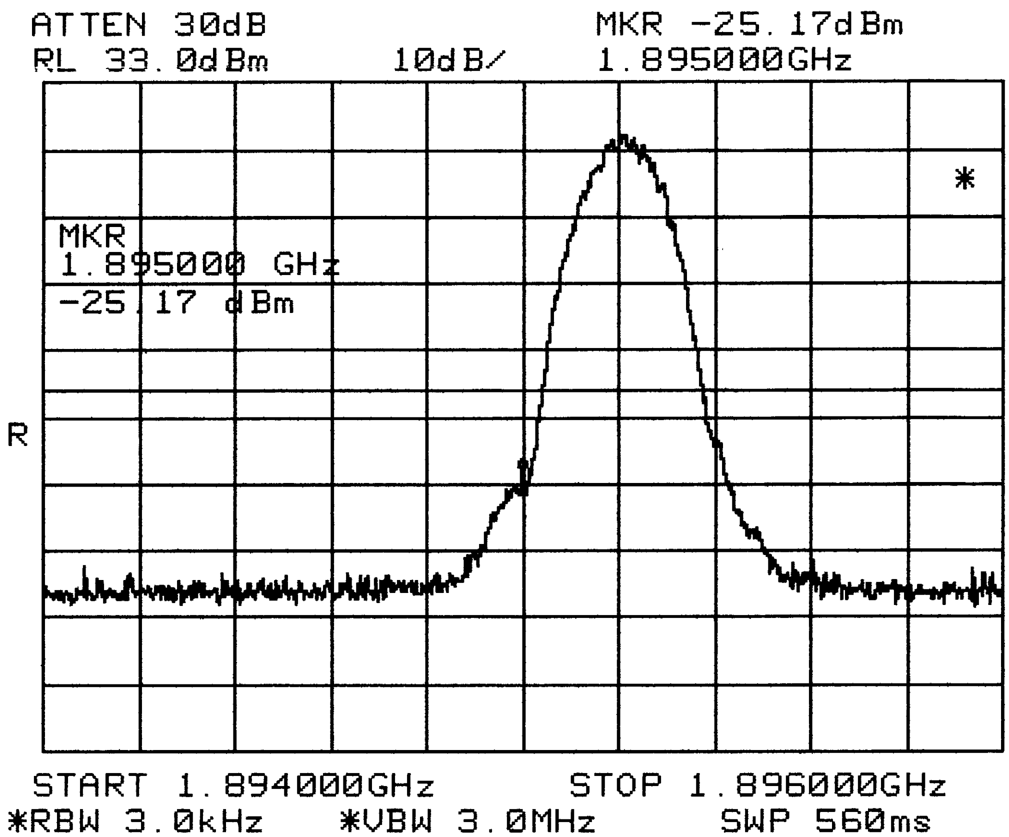
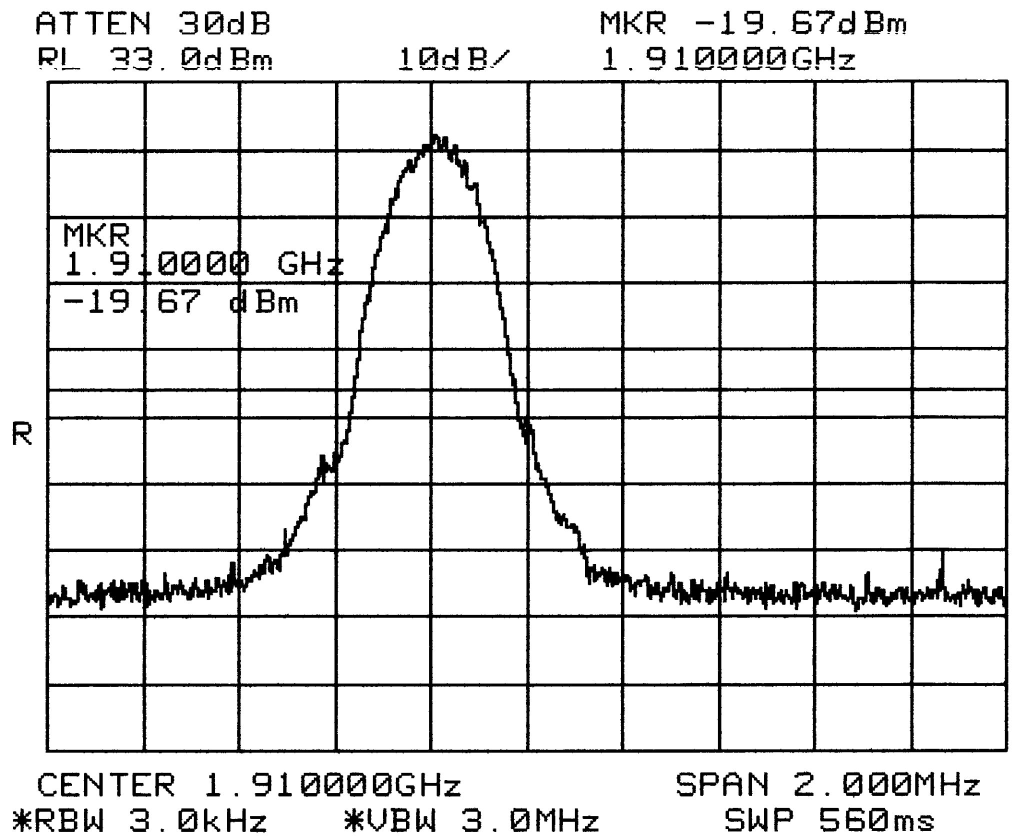


Figure 7.3.4: Upper Band Edge Plot, Chesapeake 2 Watt Downlink



7.4 Antenna Conducted Spurious Emissions

The following data tables and figures show the conducted spurious emissions for each amplifier tested in the AirSite Remote Radio. All measurements above 1 GHz were made with a RBW of 1 MHz and a VBW of at least 1 MHz. All measurements below 1 GHz were made with a quasi-peak detector, a RBW of at least 120 kHz, a VBW of at least 1 MHz.

The uplink and downlink ports were fitted with a C-Band notch filter to prevent the spectrum analyzer from overloading. For the measurement of a spurious signal, the notch filter was removed. The reference level offset was set to the worst case over the frequency range shown.

Figure 7.4.1: Conducted Spurious, Downlink, 30 to 1000 MHz

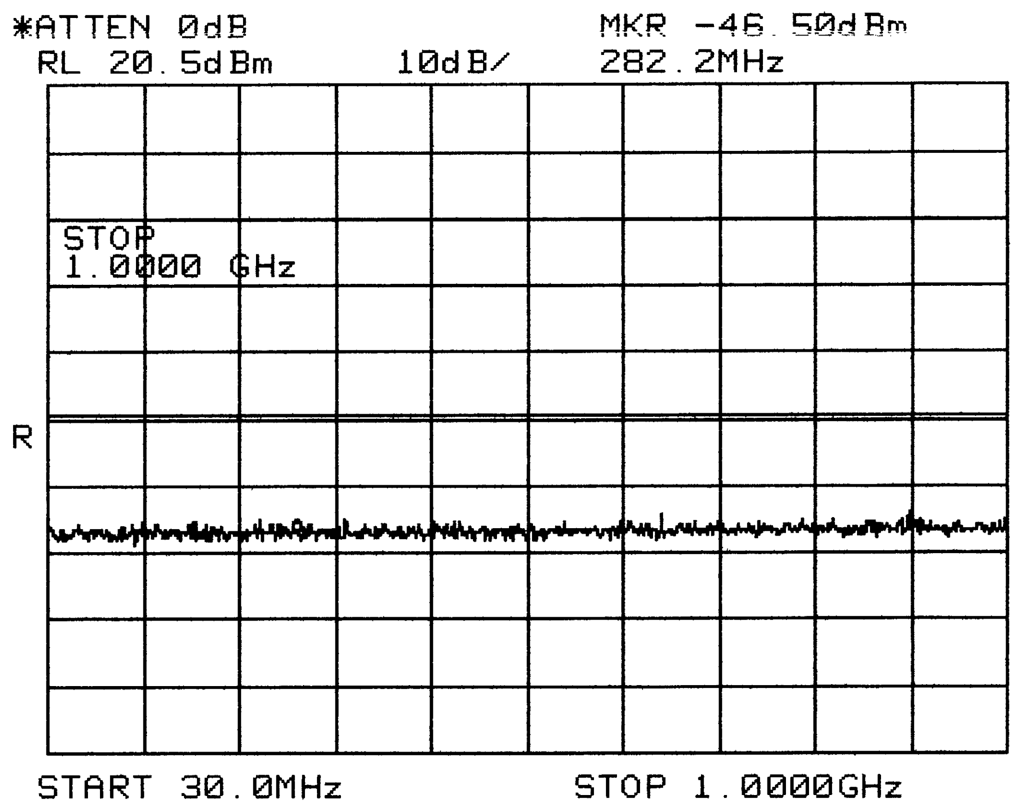


Figure 7.4.2: Conducted Spurious, Downlink, 1 to 20 GHz

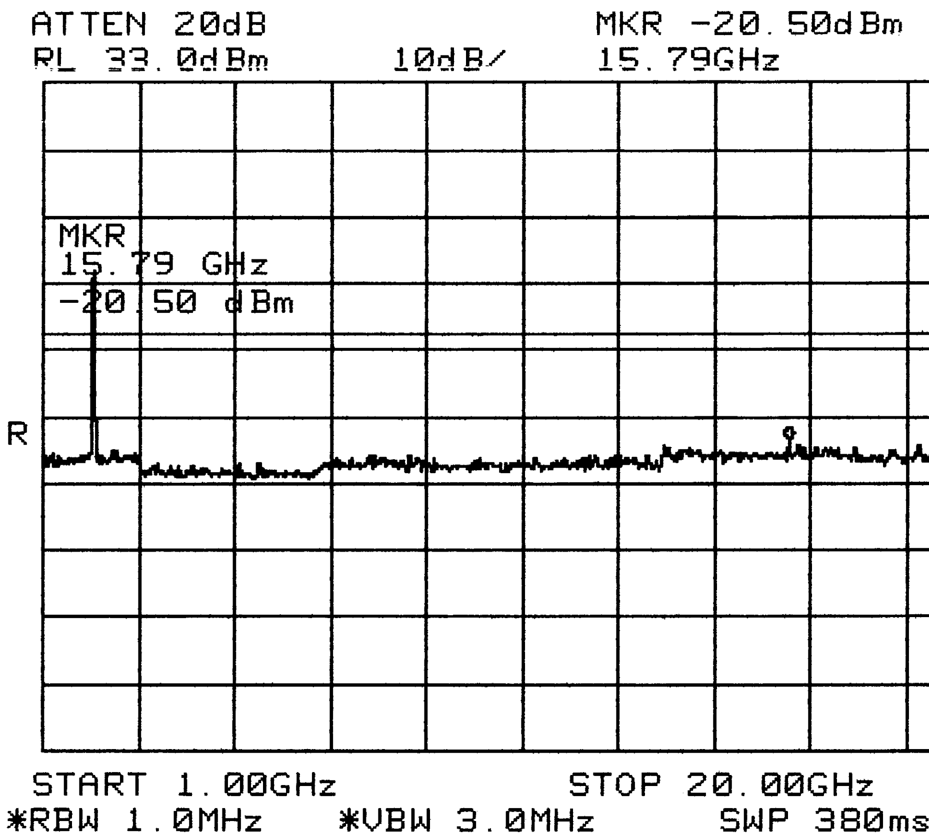


Figure 7.4.3: Conducted Spurious, Uplink, 30 to 1000 MHz

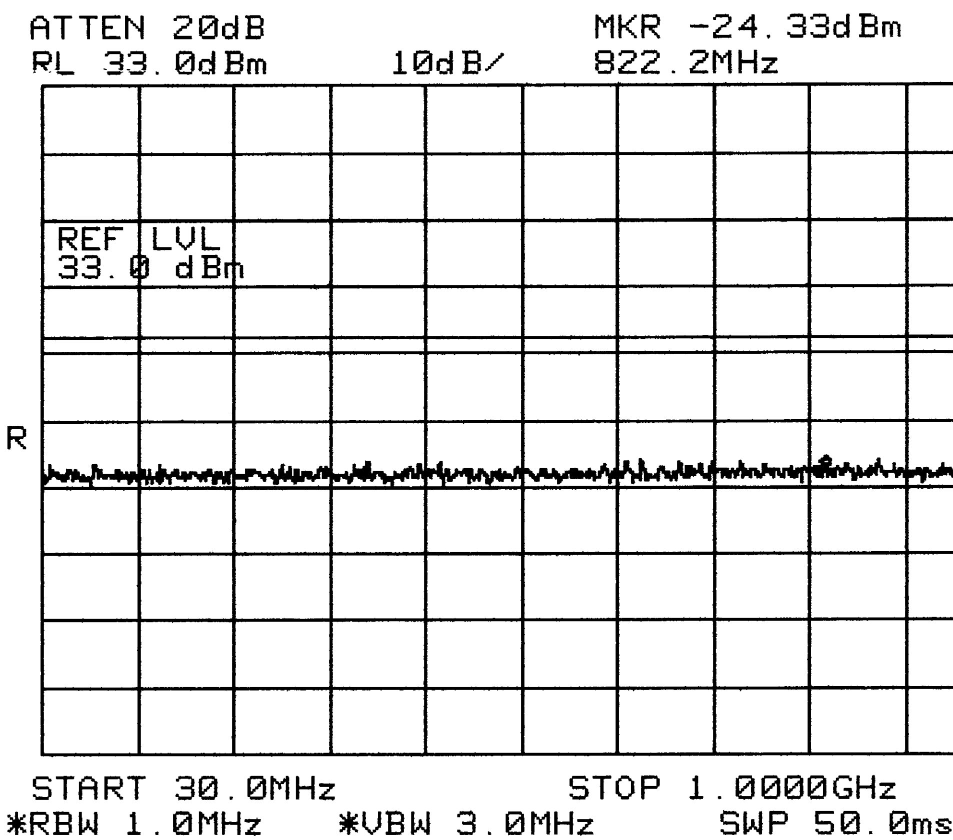
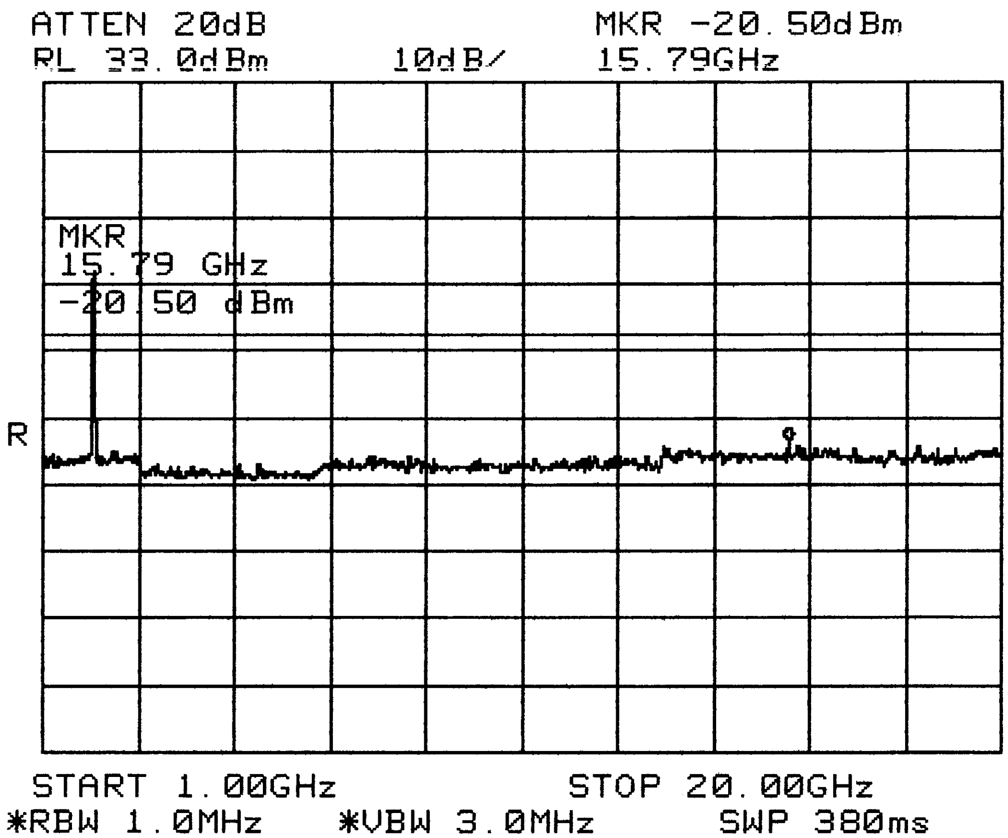


Figure 7.4.4: Conducted Spurious, Uplink, 1 to 20 GHz



7.5 Radiated Spurious Emissions

The following tables show the radiated spurious emissions for each amplifier tested in the Broadband Transceiver System (in both the outdoor and indoor enclosure). All measurements above 1 GHz were made with a RBW of 1 MHz and a VBW of at least 1 MHz. All measurements below 1 GHz were made with a quasi-peak detector, a RBW of 120 kHz, a VBW of 1 MHz. The measurement distance was 3 meters unless otherwise specified.

Net Reading is the measured field strength in dB (μV/m). Limit is calculated by subtracting 43-10LogP, in dB, from the theoretical field strength of the EUT's output power through a tuned dipole measured at 3 meters (Friss transmission formula). Margin is Net Reading minus the Limit.

Table 7.5.1: Radiated Spurious Emissions

Antenna Polarity	Frequency MHz	Net Reading dB (μV/m)	Limit dB (μV/m)	Margin dB
Horizontal	177	44	84	-40
Vertical	177	48	84	-25

There were no other emissions detected for this enclosure. Please see Cabinet Radiation Exhibit for detailed plots.

7.6 Frequency Stability

Table 7.6.1: Frequency Stability vs. Temperature, AirSite Remote Radio

Temperature, Celsius	ARR Downlink Peak frequency error, ppm	ARR Uplink Peak frequency error, ppm
-30.00	0.05	0.07
-20.00	0.06	0.06
-10.00	0.05	0.05
0.00	0.05	0.07
10.00	0.05	0.04
20.00	0.05	0.06
30.00	0.04	0.05
40.00	0.05	0.05
50.00	0.06	0.06

Figure 7.6.1: Frequency Stability vs. Temperature, AirSite Remote Radio

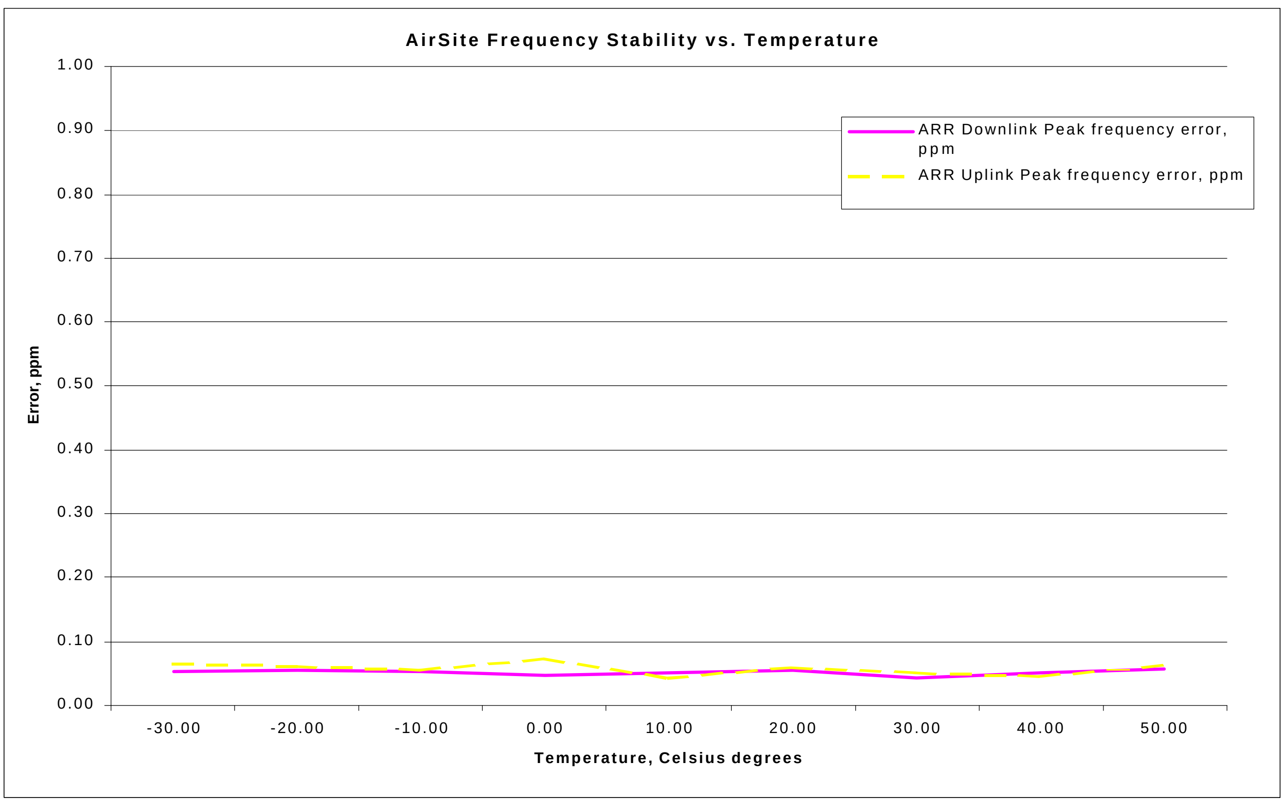
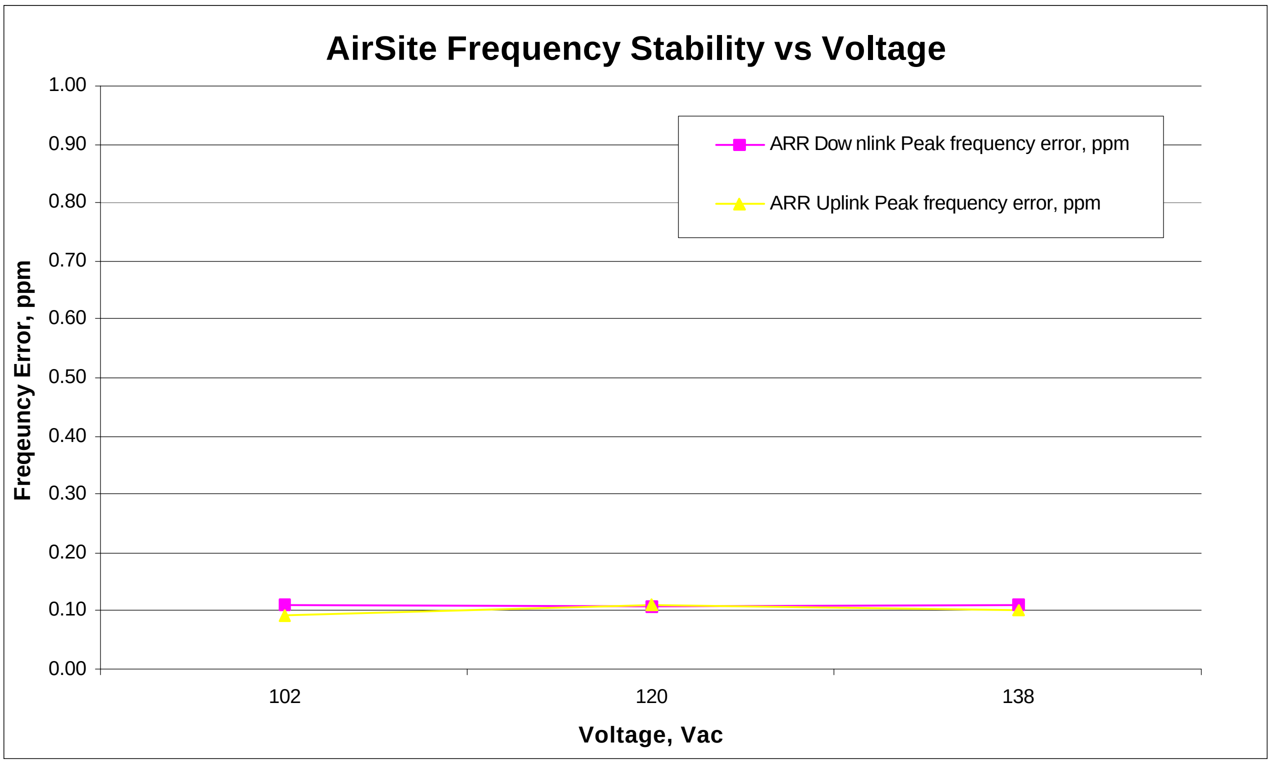


Table 7.6.2: Frequency Stability vs. Input Voltage, AirSite Remote Radio

Voltage, Vac	ARR Downlink Peak frequency error, ppm	ARR Uplink Peak frequency error, ppm
102	0.11	0.09
120	0.11	0.11
138	0.11	0.10

Figure 7.6.2: Frequency Stability vs. Input Voltage, AirSite Remote Radio



8.0 Measurement Procedure and Test Equipment

This Exhibit provides a brief summary of the methods used for the indicated measurements. A full list of all test equipment is provided.

Table 8.1: Measurement Equipment - ITS

Description	Manufacturer	Model Number
Spectrum Analyzer	Hewlett Packard	8563E
Spectrum Analyzer, with PCS Personality	Hewlett Packard	8594E
Temperature Chamber	Thermotron	F110-CHV-25-25
Signal Generator	Marconi	2031
Attenuator	Weinschel	68-30-43
Cables, 0.6 m	Pasternack	RG-142LL

Table 8.2: Measurement Equipment – Rubicom Systems Inc.

Description	Manufacturer	Model Number
Spectrum Analyzer	Advantest	R3271
Antenna	Chase	CBL6111B
Preamplifier 1-8 GHz	Pacific Microwave	W2063-01
Preamplifier 8-18 GHz	Pacific Microwave	W5053-01
Preamplifier 18-20 GHz	Hewlett-Packard	8449A

8.1 RF Output Power - CFR 47 Part 2.985 (a)

RF output power is measured with the transmitter adjusted to the specified ratings. A 50-ohm coaxial attenuator of proper power rating in conjunction with the 50-ohm input impedance of the spectrum analyzer was used as a load for making the measurements. The output power measurements were made using an HP8563E. Note that the resolution bandwidth of the spectrum analyzer was greater than the bandwidth of the signal measured to ensure that the total power level was measured. Pulse desensitization of the spectrum analyzer was not present.

8.2 Occupied Bandwidth - CFR 47 Part 2.989

Occupied bandwidth measurements were made with the HP8563E using a resolution bandwidth of 3 kHz, which is approximately 1% of the emission bandwidth. All eight time slots were exercised with pseudo random data. Diagnostic testing showed that this setting was representative of lesser duty cycle modes and produced the worst-case occupied bandwidth. The bandwidth plots show a bandwidth of approximately 253 kHz, however, there is an industry-accepted bandwidth for GMSK signaling (300 kHz) that the FCC has instructed us to use in past applications.

8.3 Radiated Spurious - CFR 47 Part 2.993

Radiated spurious measurements were made at Rubicom Systems, Inc.'s Open Area Test Site in Melbourne, FL. The characteristics of this site are filed with the FCC.

The EUT was placed on a wooden table on a flush mounted metal turntable. A 50 ohm coaxial load was connected to the transmitter output. The transmitter was set to radiate at its maximum power levels and measurements were performed. The maximum signal was detected by varying the receive antenna in height and rotating the transmitter on a turntable. Measurements were made in both horizontal and vertical polarizations of the receiving antenna.

Cabinet radiation must be at least 43 + 10 Log (P) dB below the fundamental per CFR 47 э24.238(a). For a worst case calculation, the radiated field strength at the fundamental frequency can be calculated assuming the power is radiated from a theoretical dipole antenna with a gain of 1.64. With an output power of 40 Watts and a test distance of 3 meters, the field strength can be calculated using the Friss Transmission Formula. This limit for the given power level calculated to be 84.4 dB(μV/m).

8.4 Conducted Spurious Emissions - CFR 47 Part 2.991

The transceiver was terminated into a 50-ohm input of a spectrum analyzer with appropriate attenuation. All spurious emissions greater than 20 dB below the specified value shall be recorded.

The conducted spurious emissions shall be attenuated below the maximum level of the carrier in accordance with the following formula: 43 + log (P), where P is the output power in Watts. This level is computed to be – 13 dBm.

8.5 Frequency Stability - CFR 47 Part 2.995

Frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. For the 40-watt downlink channels, center frequencies nearest the band edges are no closer than 400 kHz. For the 2-watt uplink channels, center frequencies nearest the band edges are no closer than 200 kHz. The industry accepted bandwidth of the transmitted signal is 300 kHz (150 kHz above and below the center frequency). The center frequency can deviate ±40 kHz and at all times, the emissions will be in the band.

Frequency Stability versus Temperature

The transmitter was placed in an environmental chamber and tested in the range of -30 to +50 degrees Celsius. The transmitter temperature was stabilized at each temperature setting. The power was applied to the transmitter and allowed to stabilize for 15 minutes. The frequency of the transmitter was measured. This procedure was repeated for each 10 degree step up to +50 degrees Celsius.

Frequency Stability versus Power Supply Voltage

The supply voltage was varied from 85% to 115% of the normal supply voltage. The normal supply voltage is 120 Vdc. Frequency deviation was measured at the low end with an input voltage of 102 Vac and at the high end with an input voltage of 138 Vac. The voltage was measured at the dc input to the device.

9.0 ANSI C95.1 Compliance

Table 9.1: ERP Calculations

Transmit Maximum ERP Calculation	100' Coax Omni Antenna Downlink	100' Coax Dish Antenna Uplink
Total Power for all Channels (Watts)	40.0	2.0
Maximum Antenna Gain (dBd)	10.0	27.3
Minimum TX Foam Cable Loss, 1-5/8" (dB)	1.30	1.30
Minimum TX Jumpers and Adapter Loss (dB)	1.0	1.0
AirSite Remote Radio EIRP (dBm)	55.9	58.0
AirSite Remote Radio EIRP (Watts)	386.3	1037.2
AirSite Remote Radio ERP (dBm)	53.7	60.1
AirSite Remote Radio ERP (Watts)	235.5	632.5

The AirSite Remote Radio uses 1channel at a maximum of 40 Watts.

EXAMPLE CALCULATION FOR THE OMNI ANTENNA
P is the maximum total power in Watts transmitted by the antenna.
CL is the Cable loss in dB.
JAL is the loss in dB due to jumpers and adapters.
AG is the maximum antenna gain in dBd.

$ERP(dBm) = 10 \cdot Log(P \cdot 1000) - CL - JAL + AG$
$ERP(dBm) = 10 \cdot Log(40 \cdot 1000) - 1.3 - 1.0 + 10$
$ERP(dBm) = 53.7$
$ERP(Watts) = 10^{[\{ERP(dBm) - 30\}/10]}$
$ERP(Watts) = 10^{[\{53.7 - 30\}/10]}$
$ERP(Watts) = 235.5$

$EIRP(dBm) = ERP(dBm) + 2.1$
$EIRP(dBm) = 53.7 + 2.1$
$EIRP(dBm) = 55.9$
$EIRP(Watts) = 10^{[\{EIRP(dBm) - 30\}/10]}$
$EIRP(Watts) = 10^{[\{55.8 - 30\}/10]}$
$EIRP(Watts) = 386.3$

9.1 MPE at 1.9 GHz

In typical installations, the antenna will be mounted to a tower or above a rooftop by a minimum of 10 meters. Since the total power of all channels is less than 1000W ERP (1640W EIRP), compliance testing with the MPE limits of FCC 96-326 is not required.

The limit for Maximum Permissible Exposure (MPE) at the frequency of 1.96 GHz is 6.53 mW/cm^2. For Occupational/Controlled Exposure using the equation Limit = f/300 per FCC 96-326 and 1.31 mW/cm^2 for General Population/Uncontrolled Exposure using the equation Limit = f/300 per FCC 96-326. The EIRP at 1.96 GHz for the AirSite Remote Radio's directional antenna is 1037 Watts; the transmitted power is 2 Watts.

The conversion from power to power density uses the following equation: $PD = P_r G / 4\pi r^2$

Where: PD is Power Density (in W/m^2);
P_r is radiated power (in watts);
G is the numeric gain of the antenna; and
r is the distance (in meters) from the antenna.

The conversion from W/m^2 to mW/cm^2 is: mW/cm^2 = W/m^2/10

Calculations:

The distance, r, is dependant on Occupational/Controlled Exposure or Population/Uncontrolled Exposure. The following table illustrates the power density for the antennas used on the ARR. These antennas are located at the top of the cell site tower.

At a distance of r = 10 m from the antenna, the power density is (note that this power density will only be induced on an individual if that individual was physically 10 meters in line-of-site of the antenna):

Table 9.2: Power density calculations for MPE

	Uplink Path	Downlink Path
Antenna Gain (dBi)	29.4	12.1
Numeric gain	871.0	16.2
Rated Power (Watts)	2	40
Power Density (W/m^2) @ 10 m	1.39	0.516
Power Density (mW/cm^2) @ 10 m	0.14	0.0516
Minimum distance, in m, for MPE	4.61	2.81

At this power level, an individual would need to be within 5 meters in-line with the main beam of the uplink antenna in order to be at the limit for controlled exposure.

This EUT, at 10 meters away from the transmit antennas, is well within the limits for maximum permissible exposure.