

2.5 Antenna Description (Paragraph 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

Previously Approved Antennas as Listed in Original Submittal

Cirronet Corporation will sell the WIT2410 with one of the following antennas.

MANUFACTURER	TYPE OF ANTENNA	MODEL	GAIN dBi	Type of Connector
ACE	Dipole	ACE-2400NF	2 dBi	Reverse SMA to MMCX via adapter cable
Cushcraft	Yagi	PC2415-RTNF	15 dBi	Reverse TNC to MMCX via adapter cable
Mobile Mark	Omni-Directional	OD6-2400-RTNC	6 dBi	Reverse TNC to MMCX via adapter cable
Mobile Mark	Omni-Directional	OD12-2400PTA-RTNC	12 dBi	Reverse TNC to MMCX via adapter cable
Mobile Mark	Corner Reflector	SCR14-2400PTA-RTNC	14 dBi	Reverse TNC to MMCX via adapter cable
Mobile Mark	Patch	P7-2400RTNC	7 dBi	Reverse SMA to MMCX via adapter cable
Cirronet Corporation.	Patch	PA2410	Appx. 3 dBi	Non-standard MMCX

To ensure compliance with 15.203, Cirronet Corporation attaches reverse-sex TNC connectors to the 15dBi Yagi, the 14dBi corner reflector, and the 9dBi and 12dBi omni-directional. The 2dBi dipole is fitted with a reverse sex SMA as the TNC is too large to fit onto the antenna body.

Cirronet Corporation. has arranged for the manufacturers of the 14 dBi corner reflector, the 15 dBi Yagi, the 6 dBi and 12 dBi omni-directional antennas to provide reverse-sex TNC connectors for these antennas. They have also arranged with the manufacturer of the 2dBi dipole to place a reverse sex SMA connector on that antenna. OEM customers wanting to use one of these antennas in their product will first need to obtain a special part number from Cirronet Corporation to give to the antenna manufacturer. The manufacturer, upon receipt of this number, will know to attach the reverse-sex TNC connector (or SMA in the case of the dipole) to the end of the antenna cable before shipping.

The customer then purchases an adapter cable from Cirronet Corporation that will connect the MMCX port on the module to the reverse-sex connector on the antenna. No other type of commercially available antenna will attach to this reverse-sex TNC (or SMA for the case of the dipole). Given the nonstandard nature of the interconnect between module and antenna and the difficulty involved in circumventing that connection, Cirronet Corporation feel that this procedure meets the requirements called out in 15.203.

The sixth antenna included in their application, the DWC patch, already has a nonstandard MMCX mating connector attached to it. It cannot be connected to anything else but a MMCX connector. No adapter cable is needed when using this antenna – the antenna snaps directly to the module. Cirronet Corporation has no official data sheet for this antenna. Lab measurements show an approximate antenna gain of 3 dBi for the device.

New Additional Antennas

Cirronet Corporation will sell the WIT2410 with one of the following antennas.

MANUFACTURER	TYPE OF ANTENNA	MODEL	GAIN dB	Type of Connector
Mobile Mark	Vehicle Mount	RM3-2400-RTNC	2.5 dBi	Reverse TNC to MMCX via adapter cable
Mobile Mark	Corner Reflector	SCR9-2400-RN	9 dBi	Reverse N to MMCX via adapter cable
MaxRad	Whip	MUF24005-RTNC	5 dBi	Reverse TNC to MMCX via adapter cable
Andrews	Parabolic Dish	26T-2400 A	24 dBi	Reverse N to MMCX via adapter cable
Andrews	Parabolic Dish	18T-2400 A	18 dBi	Reverse N to MMCX via adapter cable

*For more specific antenna specifications, please see the following pages.

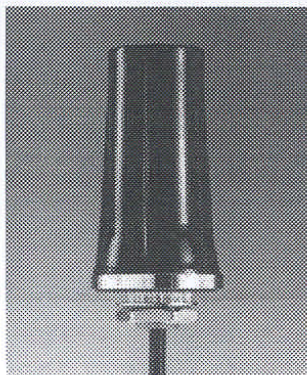
To ensure compliance with 15.203, Cirronet Corporation proposes to attach reverse-sex TNC connectors to the 2.5 dBi vehicle mount and the 5 dBi whip antennas. The 2 parabolic dish antennas and the corner reflector will be fitted with a reverse N connector. Cirronet Corporation has arranged for the manufacturers of these antennas to provide non-standard connectors for these antennas. OEM customers wanting to use one of these antennas in their product will first need to obtain a special part number from Cirronet Corporation to give to the antenna manufacturer. The manufacturer, upon receipt of this number, will know to attach the non-standard connector to the end of the antenna before shipping.

The customer then purchases an adapter cable from Cirronet Corporation that will connect the MMCX port on our module to the non-standard connector on the antenna. Given the nonstandard nature of the interconnect between module and antenna and the difficulty involved in circumventing that connection, Cirronet Corporation believes that this procedure meets the requirements called out in 15.203.

Product Specifications

MOBILE MARK[®]

COMMUNICATIONS ANTENNAS



RM Body Mount Antenna

Body Mount 2.4 GHz Antenna WLAN, ISM & Video Systems

- Mounts easily to roof, trunk or bulkhead
- 2.5 dBi dipole omnidirectional configuration
- Rugged ABS radome , mounts to 5/8" hole
- "O"ring seal provides watertight use

Now Available in white or black!

This new antenna compliments Mobile Mark's 2.4 GHz antenna product line with a new mounting option. The body mount style antenna can be mounted to any vehicle, container or bulkhead. The rugged style is excellent for industrial applications, yet attractive for consumer use.

The design uses a 5/8" feed thru for securing to the vehicle. Access to the underside of the body surface is required to complete the installation. The antennas are outfitted with 1 foot of LMR-200 cable & TNC female connector. Jumper cables for completing the installation are supplied separately, and use LMR-195 low loss cable.

Antenna performance is 2.5 dBi, with no ground plane required for proper operation. The antenna can even be mounted on fiberglass or plastic housing and meet all specifications.

The antenna radome consists of Black ABS UV resistant plastic, with a chrome plated mounting plate and threaded feed thru. The bottom mounting plate is outfitted with an "O" ring for complete sealing. A mounting lock nut and washer are also supplied for securing the antenna.

The antenna can also be used as mini-base station or access point. An optional mounting bracket kit is available for this purpose. It allows mounting the antenna to any vertical surface.

Model Number

Model	Description
RM3-2400	Antenna with TNC coax pigtail and mounting hardware

Installation Jumper Cable Model Numbers

LMXXX-YYY-MTN	Connector Type
	MTN=Male TNC
	FTN=Female TNC
	MSA=Male SMA
	FSA=Female SMA
	MBC=Male BNC
	FBC=Female BNC
	MMU=Male Mini-UHF
	FMU=Female Mini-UHF
	MCN=Male N
	FCN=Female N

Example
LM096-MTN-MTN is a jumper with 096 inches of LMR-195, a male TNC to connect to the receiver, and the male TNC to connect to the antenna.

Specifications

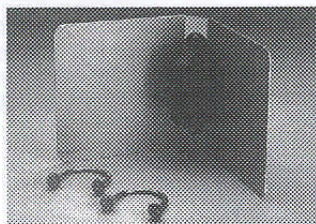
Frequency:	2400-2485 MHz	Mounting:	5/8" diameter feed thru, 1/2" long thread for up to 1/4" thick metal
Gain:	2.3 dBi max	Hardware:	Nut, lockwasher and gasket included
VSWR:	2:1 max over range	Pigtail Cable :	LMR-200, 1 foot, exits at bottom
Operating Temp:	-40° to +85° C	Pigtail Connector:	TNC female, use jumpers for longer installation
Nominal Impedance:	50 ohms	Jumper Cable:	Male TNC with LMR-195 cable and choice of connector for receiver interface, see above
Maximum Power:	10 watts		
Radome/Mount	2" diameter x 3" high		
Case Material:	ABS plastic, UV Resistant		

US Office & Headquarters: 3900-B River Road, Schiller Park, IL 60176 Tel: 800-648-2800 or 847-671-6690 Fax: 847-671-6715
UK Office: 106 Anglesey Business Park, Hednesford, Staffs. WS12 5NR UK Tel: (+44) 1543-878343 Fax: (+44) 1543-871714

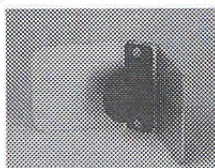
Visit our web page at www.mobilemark.com. Specifications subject to change without notice (10/2000).

Product Specifications

MOBILE MARK[®]
COMMUNICATIONS ANTENNAS



14 dBi Corner Reflector



9 dBi Mini Corner Reflector

Corner Reflector Antenna (Pat.Pend.)

For PCS, ISM & High
Frequency Applications

- 14 dBi models for 1.7 - 2.6 GHz
- 9 dBi Mini model for 2.4 GHz applications
- Small aperture; minimizes windloading
- Split balun feed provides superior bandwidth & gain performance

Mobile Mark's high frequency Corner Reflector antennas are useful for many applications including surveillance work, PCS, LAN/WAN and other high frequency applications. Its unique design features allow the antenna to overcome many of the problems normally associated with higher frequency systems.

These corner reflectors utilize a half-wavelength element configuration. A unique balun fed design provides high

efficiency radiation without skewing of the radiation pattern. The resultant performance provides excellent bandwidth, gain and match over the frequency range.

These antennas are very small in design and appearance. The connector mechanism exits at the rear of the antenna, allowing easy installation. The mounting bracket (supplied) allows both horizontal and vertical mounting of the antenna. Surface mount can also be accommodated. Each reflector panel on the 14 dBi models measure 7" x 7", providing very low aperture and windloading. The 9 dBi Mini-Corner Reflector has 3" x 3" panels, with total aperture of only 3" x 5.5".

The reflectors are made of aluminum, and irridited for weather protection. The radiating elements are weather protected within an ABS radome. This maintains integrity of the antenna without sacrificing looks or windloading.

Model Numbers

Frequency Range	Gain	Model
1700 - 1900 MHz	14 dBi	SCR14-1800
1800 - 2000 MHz	14 dBi	SCR14-1900
2300 - 2600 MHz	14 dBi	SCR14-2400
2300 - 2600 MHz	9 dBi	SCR9-2400

Please confirm desired operating frequency at time of order. Other special configurations are available upon request. Operation subject to bandwidth restrictions.

Specifications

Frequency:	See above	SCR14 Panel Size:	7" x 7" each
Gain:	See above	Max Wind Velocity:	100+ mph
Bandwidth @2:1 SWR:	200 MHz or better	Material:	Irridited aluminum, ABS plastic radome material
Impedance:	50 Ohm nominal	Weight:	
Maximum Power:	100 Watts	SCR9	<1 lbs
SCR9 Beamwidth:	65° vertical, 75° horizontal	SCR14	<2 lbs
SCR14 Beamwidth:	44° vertical, 35° horizontal	Mounting:	Pole, surface, & corner mount, hardware included.
Front-to-Back ratio:	22 dB or better	Mounting Dimension:	Mounts up to 2" outside diameter mast
Lightning Protection:	DC grounded, external protection recommended	Connector:	N female, attached at rear of antenna
SCR9 Aperture:	3" x 5.5" front face		
SCR9 Panel Size:	3" x 3" each		
SCR14 Aperture:	7" x 10.5" front face		

3900-B River Road, Schiller Park, IL 60176 Tel: 800-648-2800 or 847-671-6690 Fax: 847-671-6715

Visit our web page at www.mobilemark.com. Specifications subject to change without notice (11/98).

Data/Spec Sheet**ORDER (800) 323-9122 FAX (630) 372-8077****2.4 GHz ISM Mobile Antennas**

The 2.4 GHz ISM mobile antennas cover frequencies from 2.400 to 2.4835 GHz. The (B)MAXC models feature MAXRAD's popular BMAX molded polymer base, a plated spring-loaded contact pin, and a .100" diameter stainless steel whip for long lasting, trouble free service. The MUF model is a chrome nut antenna with a .062" stainless steel whip. Various mount and connector options provide low-loss mounting for a variety of metal surfaces.

General Specifications:

2.4 GHz ISM mobile antennas

Radiator Material:

.100" dia. stainless steel; bright (MAXC) or black finish (BMAXC)

.062" dia. stainless steel; bright finish - MUF model

Antenna Base:

Molded polymer with a plated brass insert ring and a spring-loaded, brass contact pin - (B)MAXC models

Brass mount nut with bright chrome finish - MUF model

Maximum Power:

100 Watts - all models

VSWR:

<1.5:1

Nominal Impedance:

50 Ohms

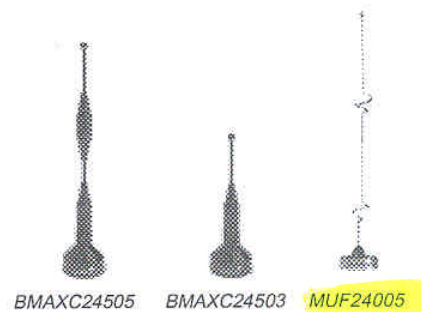
Antenna Type:

Collinear array - (B)MAXC models

Dual open coil chrome nut - MUF model

Rod Ferrule:

5/16" - 24 thread; bright or black chrome plated brass - (B)MAXC models

**Electrical Specifications****2.4 GHz ISM Mobile Antennas**

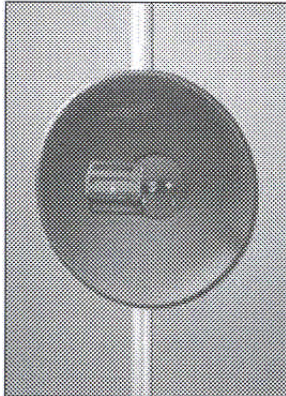
Model #	Frequency Range	Factory Tuned Frequency	Coil Type	Gain
(B)MAXC24503	2.400 - 2.4835 GHz	2.45 GHz	Closed	3 dBi
(B)MAXC24505	2.400 - 2.4835 GHz	2.45 GHz	Closed	5 dBi
MUF24005	2.400 - 2.4835 GHz	2.45 GHz	Open	5 dBi

* Prefix "B" indicates black

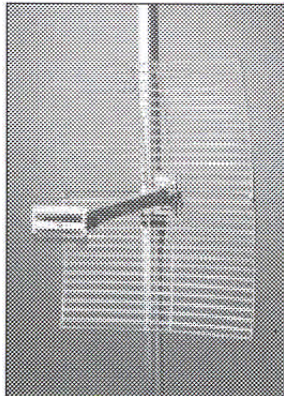
Mechanical Specifications**2.4 GHz ISM Mobile Antennas**

Model #	Antenna Height	Weight
(B)MAXC24503	5-1/4"	0.12 lbs.
(B)MAXC24505	7-1/2"	0.16 lbs.
MUF24005	8-3/4"	0.10 lbs.

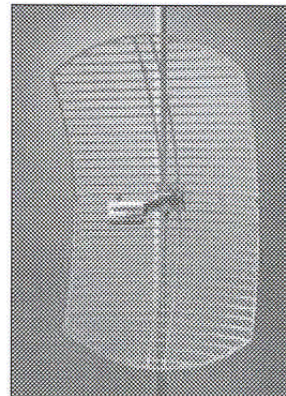
* Prefix "B" indicates black



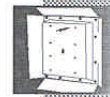
23T-5800



18T-2400



26T-2400



PD Series Parabolic Dish Antennas

- Durable antenna offers excellent performance at low cost.
- Spun aluminum reflector.
- Lightweight, stacked packaging minimizes freight and handling costs.
- RG8 pigtail, 13 in (330 mm) long.
- Up to 60° tilt adjustment.

MAG GRID Antennas

- Patented grid reflector design provides excellent reliability plus easy handling and installation.
- Lightweight and durable. Materials include magnesium alloy, aluminum, and stainless steel.
- RG8 pigtail, 24 in (610 mm) long.
- Up to 60° tilt adjustment.
- Antenna ships disassembled for minimum freight costs. Factory assembly is available as an option.

Ordering Information

Frequency Band MHz	Type Number*	Gain dBi	3 dB Beamwidth Degrees	VSWR, MAX (R.L., dB)
PD Series Antennas				
1700-2100	19T-1940	19	16	1.5
2100-2700	19T-2127	19	16	1.5
2400-2500	19T-2440	19	16	1.5
5725-5850	23T-5800	23	6	1.5
MAG GRID Antennas				
1700-2100	18T-1900	18	14	1.5
1700-2100	26T-1900	24	8	1.5
2100-2700	18T-2127	18	14	1.5
2100-2700	26T-2127	24	8	1.5
2400-2500	18T-2400	18	14	1.5
2400-2500	26T-2400	24	8	1.5

* N male connector is standard. To order optional N female connector, add F to end of Type Number.

2.6 Peak Radiated Spurious Emission in the Frequency Range 30-25000 MHz (FCC Section 15.247(c))

The EUT was hop-stopped and when possible placed into a continuous transmit mode of operation. A preliminary scan was performed on the EUT to determine frequencies that were caused by the transmitter portion of the product. Significant emissions that fell within restricted bands were then measured on an OAT's site. Radiated measurements below 1 GHz were tested with a RBW = 120 kHz. Radiated measurements above 1 GHz were measured using a RBW = VBW = 1 MHz. The results of peak radiated spurious emissions falling within restricted bands are given in Table 3a –3d and Figure 5a – Figure 5x.

Table 3a. PEAK RADIATED SPURIOUS EMISSIONS (Low)
Mobile Mark 2.5 dBi Vehicle Mount Antenna

Freq. (GHz)	Test Data* (dBm) @ 3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) 3m	FCC Limits (uV/m)
4.803	-56.95	33.9	34.5	3.4	508.1	5000.0
7.205	-46.79	33.7	37.4	4.7	2689.1	5000.0

Table 3a. PEAK RADIATED SPURIOUS EMISSIONS (Middle)
Mobile Mark 2.5 dBi Vehicle Mount Antenna

Freq. (GHz)	Test Data* (dBm) @ 3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) 3m	FCC Limits (uV/m)
4.871	-60.12	33.9	34.7	3.4	361.7	5000.0
7.307	-50.89	33.7	37.4	4.7	1685.2	5000.0

Table 3a. PEAK RADIATED SPURIOUS EMISSIONS (High)
Mobile Mark 2.5 dBi Vehicle Mount Antenna

Freq. (GHz)	Test Data* (dBm) @3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) 3m	FCC Limits (uV/m)
4.939	-55.86	33.9	34.9	3.5	605.7	5000.0
7.410	-45.66	33.7	37.5	4.7	3091.7	5000.0

* - Data corrected by 1 dB for loss of high pass filter

SAMPLE CALCULATION:

RESULTS (uV/m @ 3m) = Antilog $((-56.95 - 33.9 + 34.9 + 3.5 + 107)/20)$ = 508.1

CONVERSION FROM dBm TO dBuV = 107 dB

Tester

Signature: 

Name: Sam Wismer

Table 3b. PEAK RADIATED SPURIOUS EMISSIONS (Low)**Mobile Mark 9 dBi Corner Reflector Antenna**

Freq. (GHz)	Test Data* (dBm) @ 3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) 3m	FCC Limits (uV/m)
4.803	-56.71	33.9	34.5	3.4	522.4	5000.0
7.205	-50.35	33.7	37.4	4.7	1784.8	5000.0

Table 3b. PEAK RADIATED SPURIOUS EMISSIONS (Middle)**Mobile Mark 9 dBi Corner Reflector Antenna**

Freq. (GHz)	Test Data* (dBm) @ 3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) 3m	FCC Limits (uV/m)
4.871	-59.69	33.9	34.7	3.4	380.1	5000.0
7.307	-51.52	33.7	37.4	4.7	1567.3	5000.0

Table 3b. PEAK RADIATED SPURIOUS EMISSIONS (High)**Mobile Mark 9 dBi Corner Reflector Antenna**

Freq. (GHz)	Test Data* (dBm) @3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) 3m	FCC Limits (uV/m)
4.939	-53.55	33.9	34.9	3.5	790.2	5000.0
7.410	-46.97	33.7	37.5	4.7	2658.9	5000.0

* - Data corrected by 1 dB for loss of high pass filter

SAMPLE CALCULATION:

RESULTS (uV/m @ 3m) = Antilog ((-56.71- 33.9 + 34.5 + 3.4 + 107)/20) = 522.4

CONVERSION FROM dBm TO dBuV = 107 dB

Tester

Signature: Name: Sam Wismer

Table 3c. PEAK RADIATED SPURIOUS EMISSIONS (Low)**MaxRad 5 dBi Whip Antenna**

Freq. (GHz)	Test Data* (dBm) @ 3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) 3m	FCC Limits (uV/m)
4.803	-56.66	33.9	34.5	3.4	525.4	5000.0
7.205	-48.72	33.7	37.4	4.7	2153.3	5000.0

Table 3c. PEAK RADIATED SPURIOUS EMISSIONS (Middle)**MaxRad 5 dBi Whip Antenna**

Freq. (GHz)	Test Data* (dBm) @ 3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) 3m	FCC Limits (uV/m)
4.871	-59.31	33.9	34.7	3.4	397.1	5000.0
7.307	-53.16	33.7	37.4	4.7	1297.6	5000.0

Table 3c. PEAK RADIATED SPURIOUS EMISSIONS (High)**MaxRad 5 dBi Whip Antenna**

Freq. (GHz)	Test Data* (dBm) @3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) 3m	FCC Limits (uV/m)
4.939	-55.33	33.9	34.9	3.5	629.1	5000.0
7.410	-47.53	33.7	37.5	4.7	2492.9	5000.0

* - Data corrected by 1 dB for loss of high pass filter

SAMPLE CALCULATION:

RESULTS (uV/m @ 3m) = Antilog ((-56.66 - 33.9 + 34.5 + 3.4 + 107)/20) = 525.4

CONVERSION FROM dBm TO dBuV = 107 dB

Tester

Signature:  Name: Sam Wismer

Table 3d. PEAK RADIATED SPURIOUS EMISSIONS (Low)
Andrews 24 dBi Parabolic Dish Antenna

Freq. (GHz)	Test Data* (dBm) @ 3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) 3m	FCC Limits (uV/m)
4.803	-60.44	33.9	34.5	3.4	340.0	5000.0
7.205	-50.98	33.7	37.4	4.7	1660.0	5000.0

Table 3d. PEAK RADIATED SPURIOUS EMISSIONS (Middle)
Andrews 24 dBi Parabolic Dish Antenna

Freq. (GHz)	Test Data* (dBm) @ 3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) 3m	FCC Limits (uV/m)
4.871	-63.16	33.9	34.7	3.4	254.9	5000.0
7.307	-51.75	33.7	37.4	4.7	1526.3	5000.0

Table 3d. PEAK RADIATED SPURIOUS EMISSIONS (High)
Andrews 24 dBi Parabolic Dish Antenna

Freq. (GHz)	Test Data* (dBm) @ 3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) 3m	FCC Limits (uV/m)
4.939	-49.74	33.9	34.9	3.5	1225.3	5000.0
7.410	-45.23	33.7	37.5	4.7	3248.6	5000.0

* - Data corrected by 1 dB for loss of high pass filter

SAMPLE CALCULATION:

RESULTS (uV/m @ 3m) = Antilog ((-60.44 - 33.9 + 34.5 + 3.4 + 107)/20) = 340.0

CONVERSION FROM dBm TO dBuV = 107 dB

Tester Signature:  Name: Sam Wismer

Figure 3a
Peak Radiated Spurious Emission 15.247(c) Low – Mobile Mark 2.5 dBi Vehicle Mount

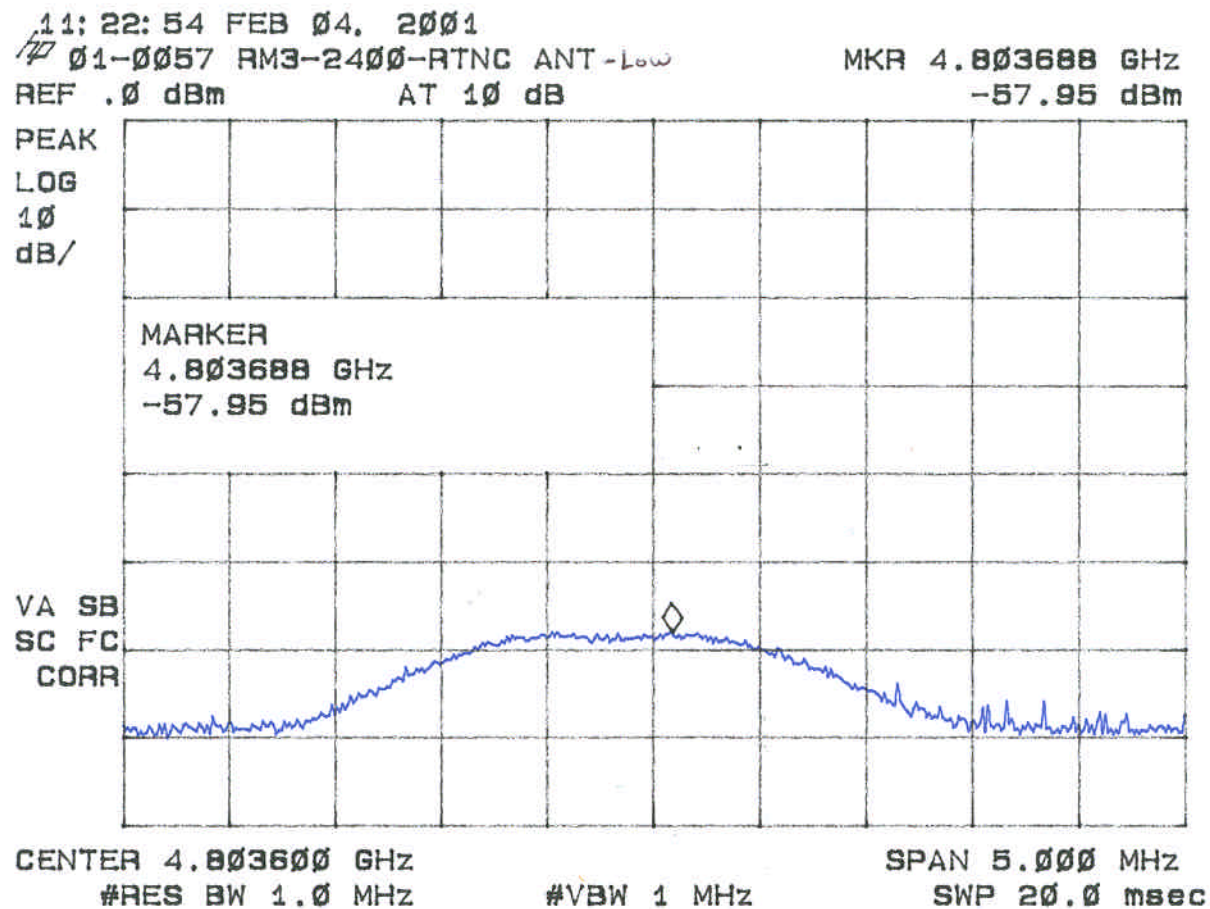


Figure 3b

Peak Radiated Spurious Emission 15.247(c) Low – Mobile Mark 2.5 dBi Vehicle Mount

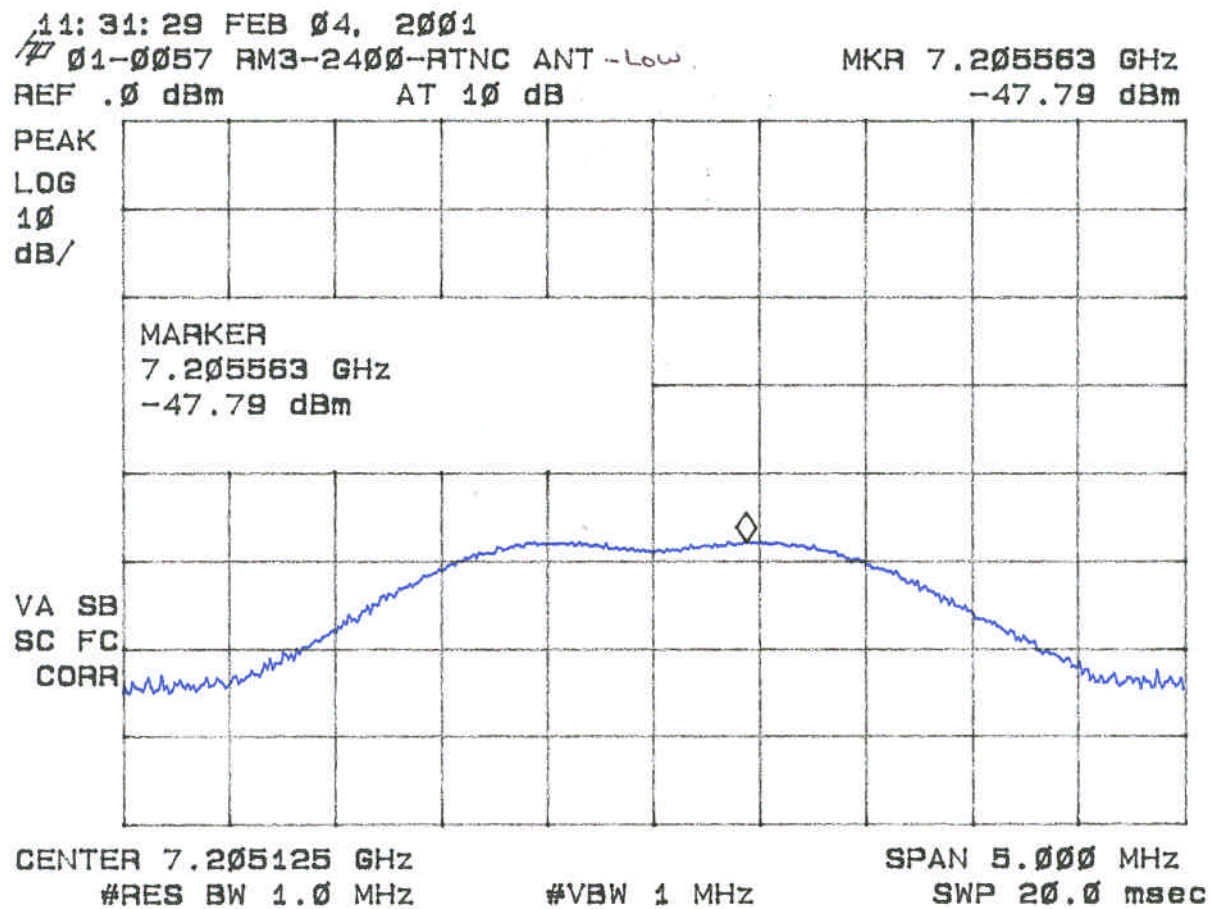


Figure 3c
Peak Radiated Spurious Emission 15.247(c) Mid – Mobile Mark 2.5 dBi Vehicle Mount

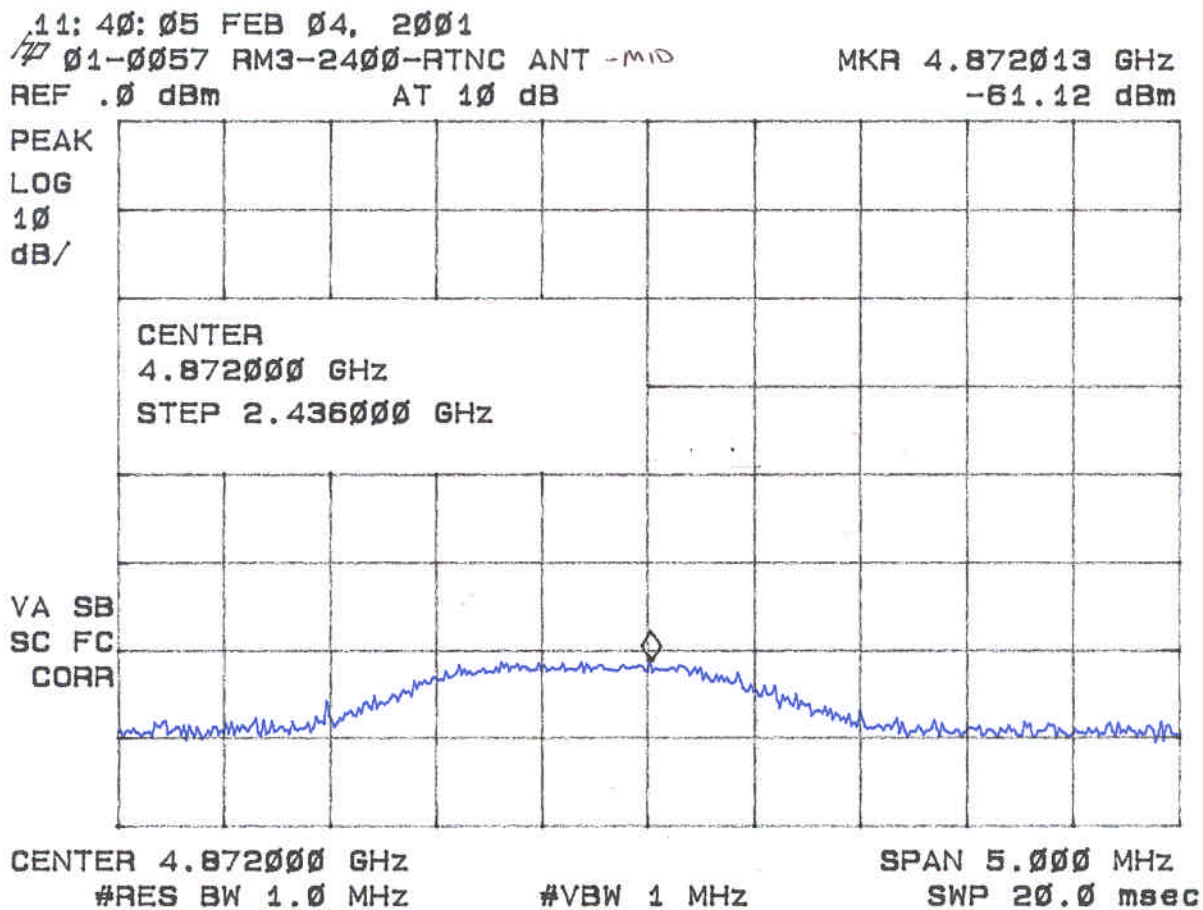


Figure 3d
Peak Radiated Spurious Emission 15.247(c) Mid – Mobile Mark 2.5 dBi Vehicle Mount

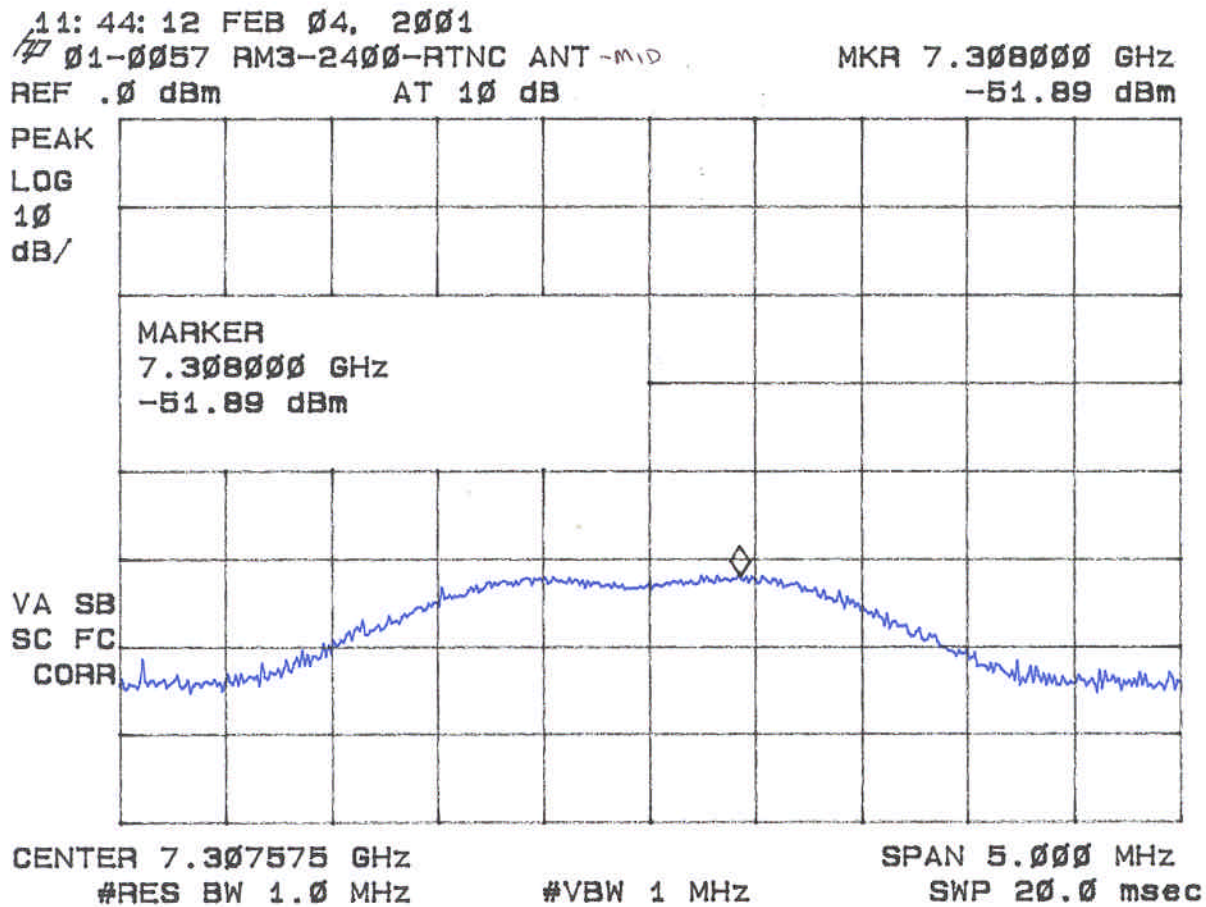


Figure 3e
Peak Radiated Spurious Emission 15.247(c) High- Mobile Mark 2.5 dBi Vehicle Mount

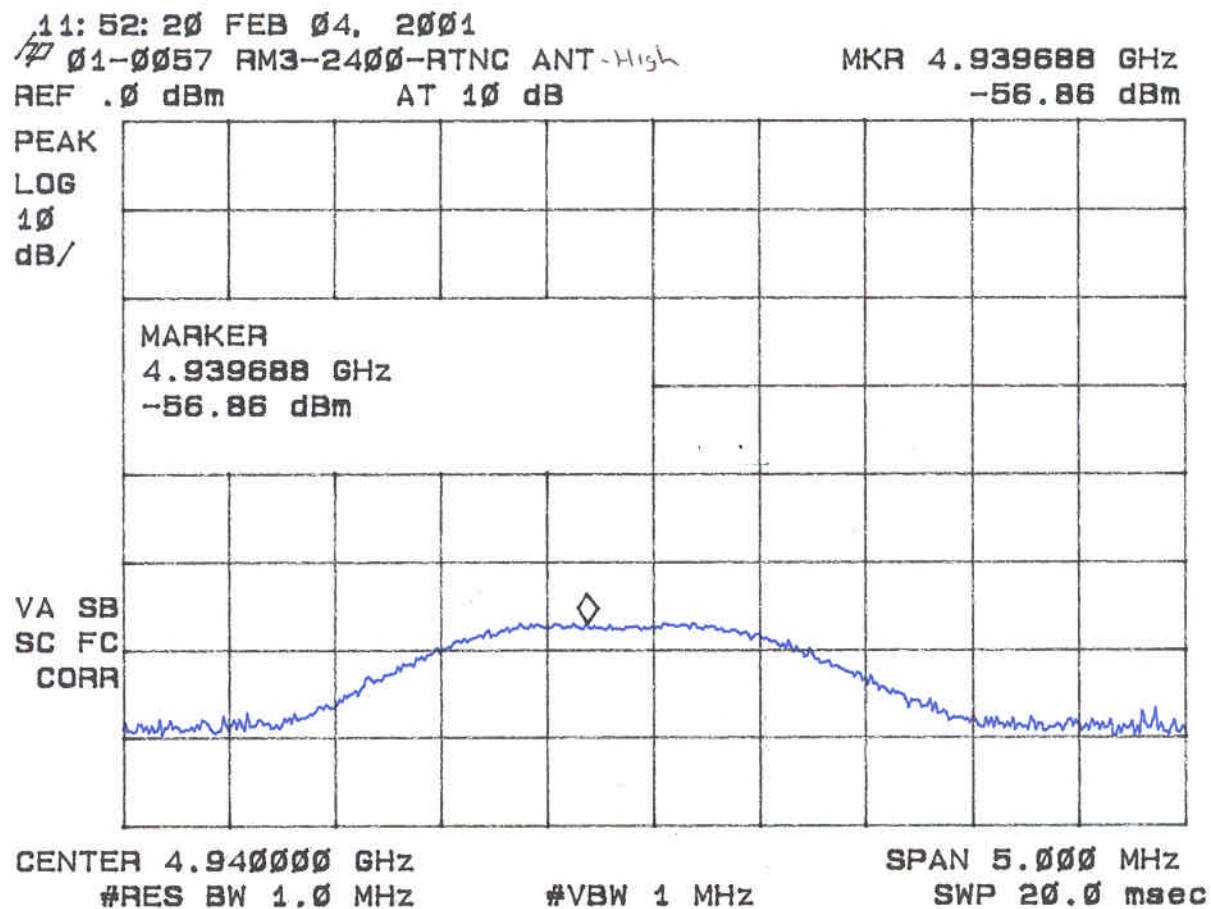


Figure 3f
Peak Radiated Spurious Emission 15.247(c) High- Mobile Mark 2.5 dBi Vehicle Mount

