



Engineering Test Services

FCC Part 15.231(e) / RSS-119 Sec. 6.1.1(e)
transmitter
952MHz - 960MHz

Device Model: FC200

Device Description: Magnum 900MHz raptor handheld

Rule	Description	Max. Reading	Pass/Fail
FCC 15.203	Antenna Requirement	N/A	Pass
15.207	Powerline Conducted Emissions	40.74 dBuV	Pass
15.231(e) / RSS-119 Sec. 6.1.1(e)	Transmitter Field Strength Limits	73.8 dBuV/m	Pass
15.231(c) / RSS-119 Sec. 6.1.1(c)	20dB Bandwidth	3.047 kHz	Pass
15.231(e) / RSS-119 Sec. 6.1.1(e)	Periodic Operation (with waiver)	1.5 seconds	Pass

Cognizant Personnel	
_____ Drew Rosenberg Name	_____ Regulatory Engineer Title
_____ Mark Kvamme Name	_____ Senior Technician Title

Test 1: FCC Part 15.203
Antenna Requirements

What is done to ensure that no antenna other than the one furnished by the responsible part will be used with the device?

The device has a reverse SMA connector.

Test 2: FCC Part 15.207

Powerline Conducted Emissions

Measure the AC powerline conducted emissions from 150kHz to 30 MHz using a 50μH/50Ω line impedance stabilization network (LISN). Verify that no emissions exceed the following limits:

Frequency (MHz)	Quasi-Peak (dBuV)	Average (dBuV)
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

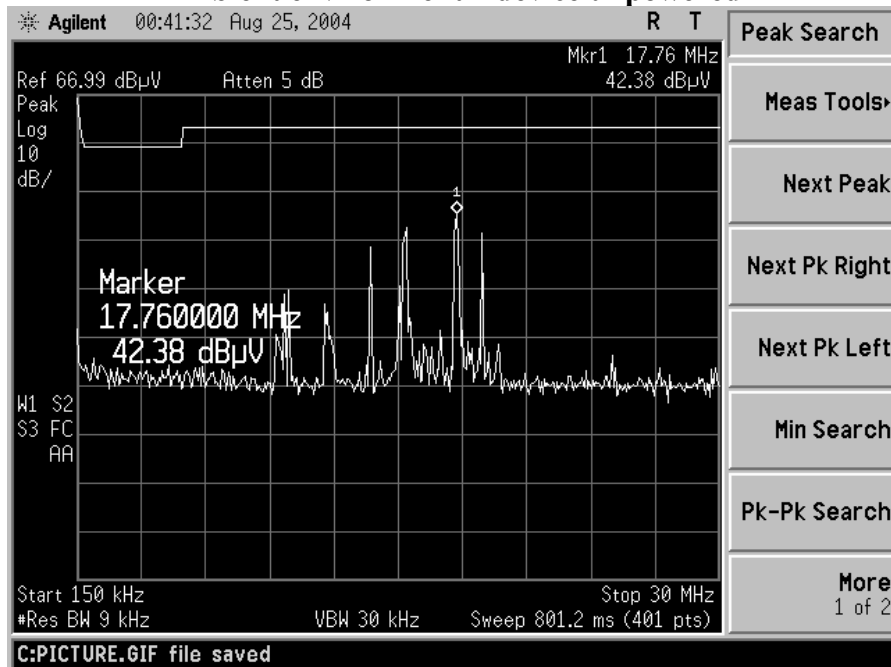
*Decreases with the logarithm of frequency

Equipment Used	Asset Number
LISN	8921
Spectrum Analyzer	2064147

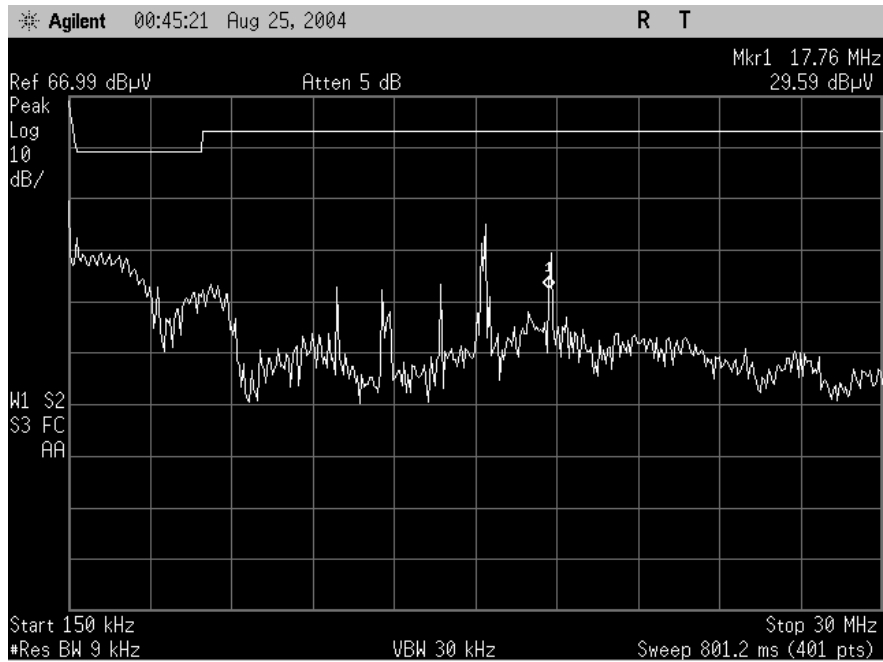
Date	Temp/Humidity °F / %	Tested by
08/27/2004	78 / 74	Drew Rosenberg

Place screen captures of the powerline conducted measurements below:

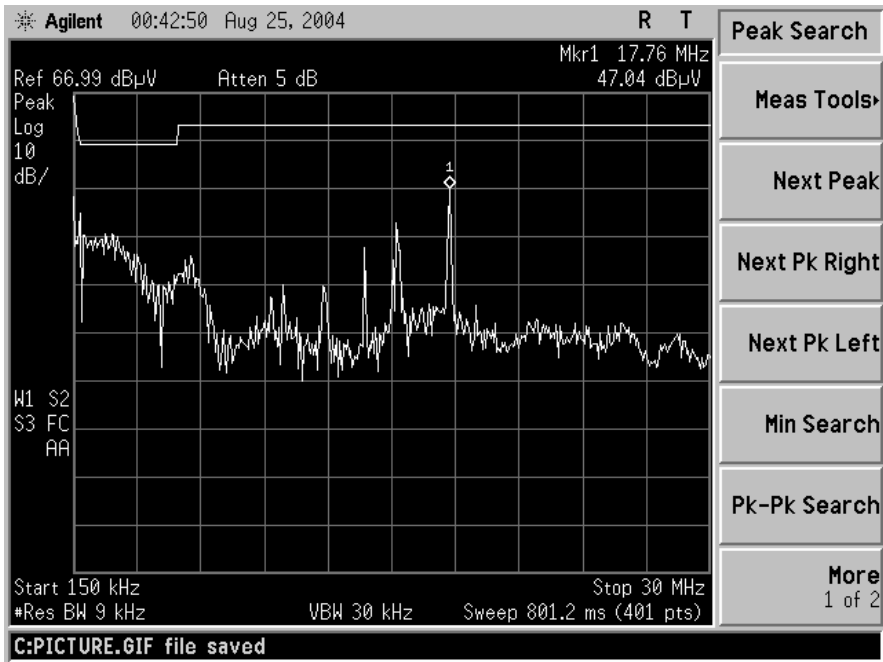
Ambient environment – device unpowered



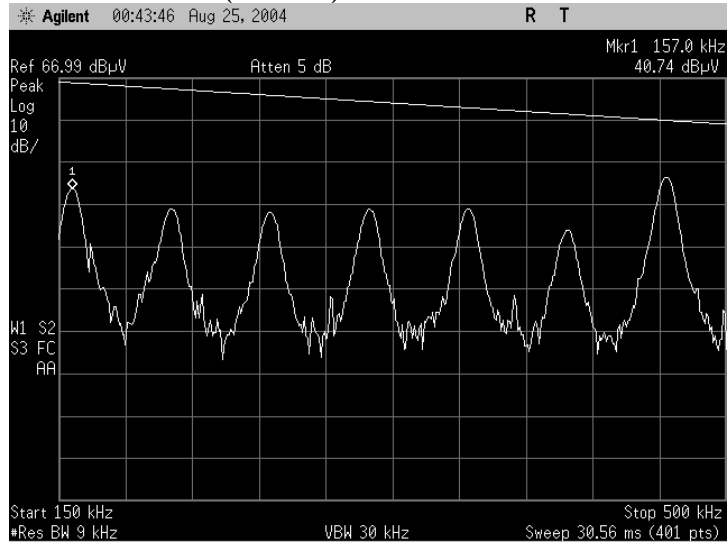
L1 – No transmit:



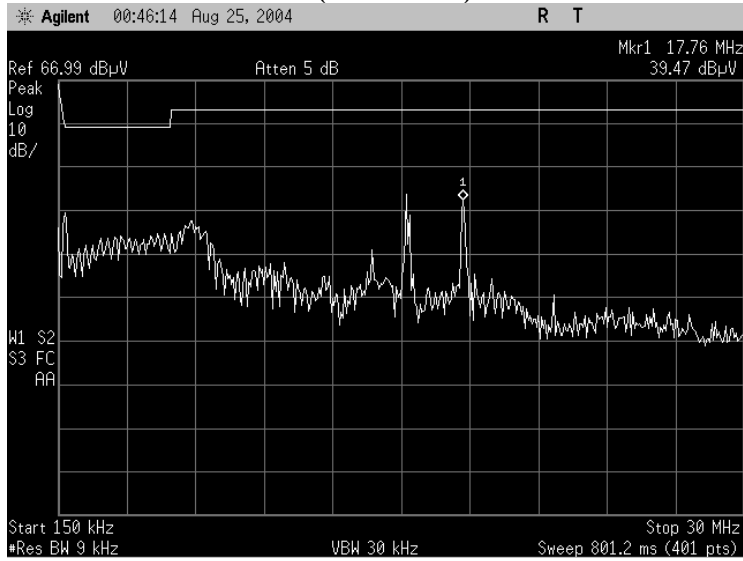
L1 – Transmit:



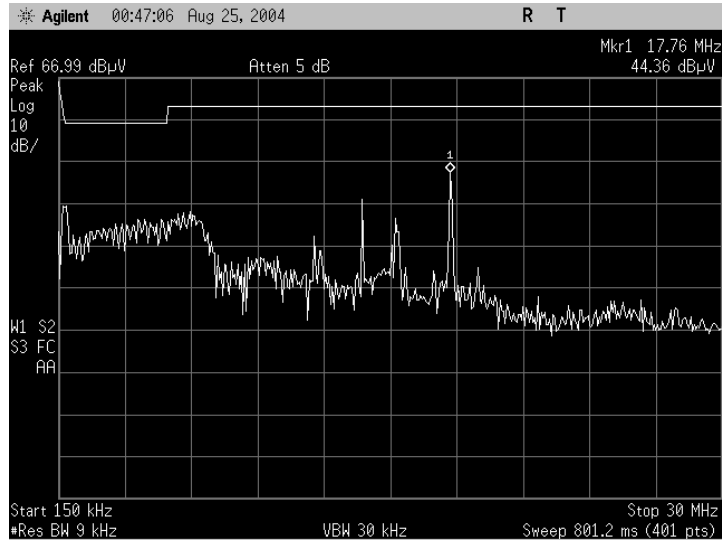
L1 (transmit) – 150kHz-500kHz



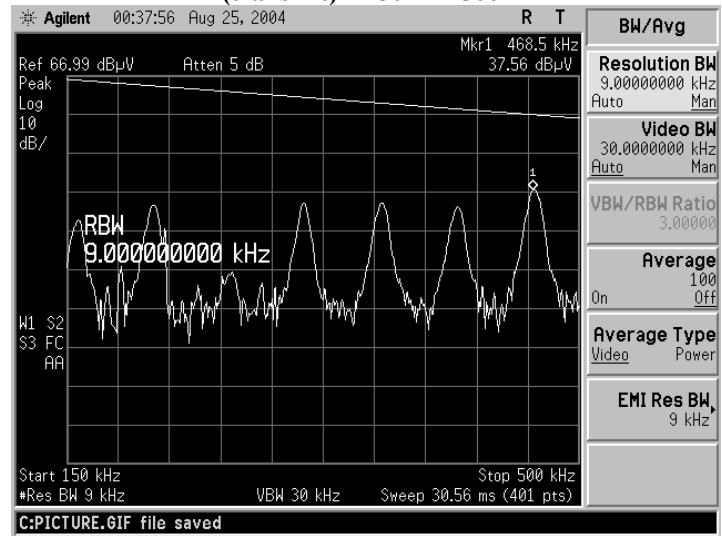
L2 (No transmit)



L2 (Transmit)



L2 (transmit) – 150kHz-500kHz



Test 3: FCC Part 15.231(e) / RSS-210 Sec. 6.1.1(e)

Transmitter Field Strength Limits

Measure the field strength of all transmitter emissions according to the procedure in appendix A. The maximum field strength of emissions may not exceed:

Field Strength of Fundamental ($\mu\text{V/m}$)	Field Strength of Spurious emissions ($\mu\text{V/m}$)
5,000	500

Equipment Used	Asset Number
Roberts Dipole Ant.	6294
Horn Antenna (>1GHz)	6412
Spectrum Analyzer	2064147
Amplifier (< 2GHz)	MiniCircuits D021000-23
Amplifier (>2GHz)	JCA 103

Date	Temp/Humidity °F / %	Tested by
08/20/2004	64 / 57	Mark Kvamme
08/31/2004	73 / 72	Drew Rosenberg

Frequency (MHz)	Polarity	P QP NF*	Reading (dBm)	Reading (dB μV)	ACF	Cable Loss	Amp. Gain	Corrected level (dB $\mu\text{V/m}$)	Limit	Margin
954.5	V	P	-63.3	43.7	28.5	1.6	0.0	73.8	74.0	0.2
1909	V	P	-87.4	19.6	35.8	2.5	30.1	27.8	54.0	26.2
2863.5	-	NF	-78.4	28.6	39.3	3.5	41.6	29.8	54.0	24.2
3818	-	NF	-78.9	28.1	41.8	3.8	43.1	30.6	54.0	23.4
4772.5	-	NF	-78.8	28.2	43.8	4.7	42.5	34.2	54.0	19.8

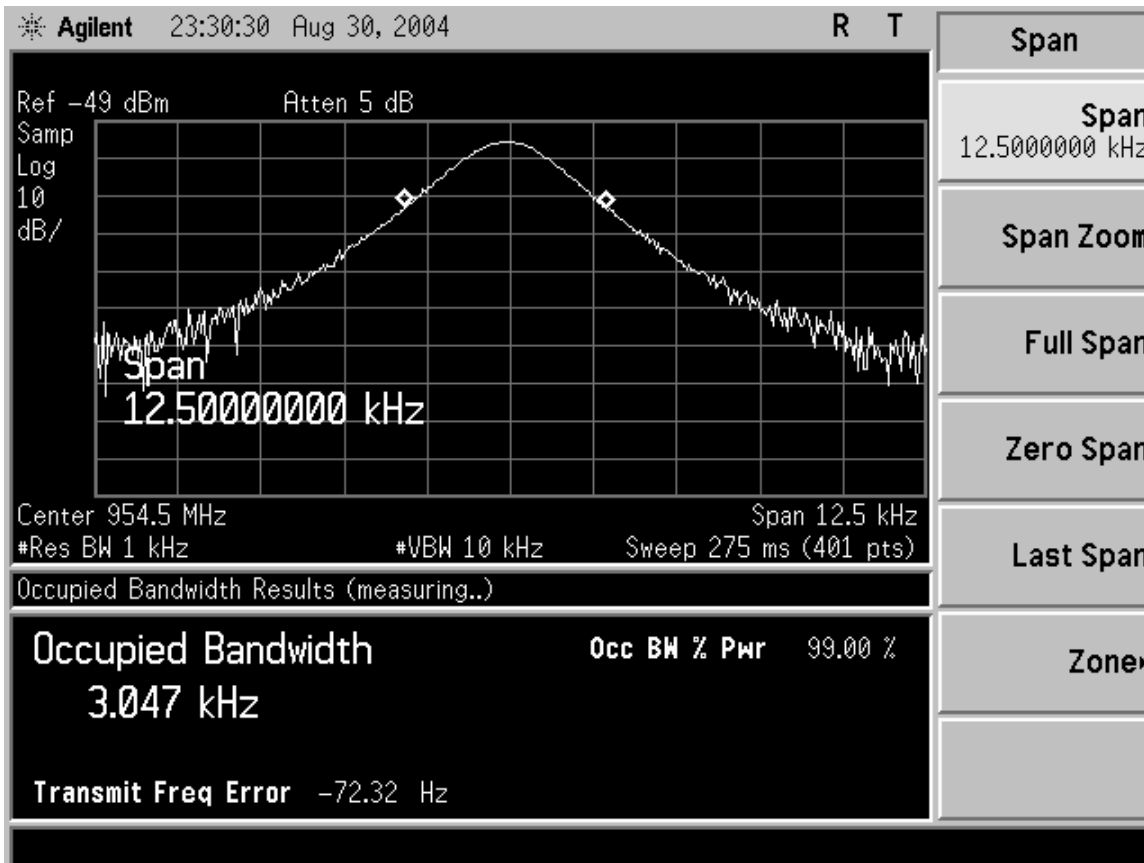
*NF=Noise floor, QP=Quasi Peak, P=Peak

**Test 4: FCC Part 15.231(c) /
RSS-210 Sec. 6.1 (c)**
20dB Bandwidth

Equipment Used	Asset Number
Antenna	6294
Spectrum Analyzer	2064147

Measure the 20dB bandwidth. The 20dB bandwidth may not exceed 0.5% of the center frequency.

Date	Temp/Humidity °F / %	Tested by
8/30/2004	73 / 55	Drew Rosenberg





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**Test 5: FCC Part 15.231(e) /
RSS-210 Sec. 6.1(e)**
Periodic Operation

Verify that the maximum transmission length does not exceed 1.5 seconds.

Maximum message length has been extended for this product family from 1 second to 1.5 seconds per FCC waivers dated September 23, 2002 and November 5, 1990. The 2002 waiver was specifically for the raptor radio, which is the same radio that is used in this device. The message length has not changed since the waiver was written.

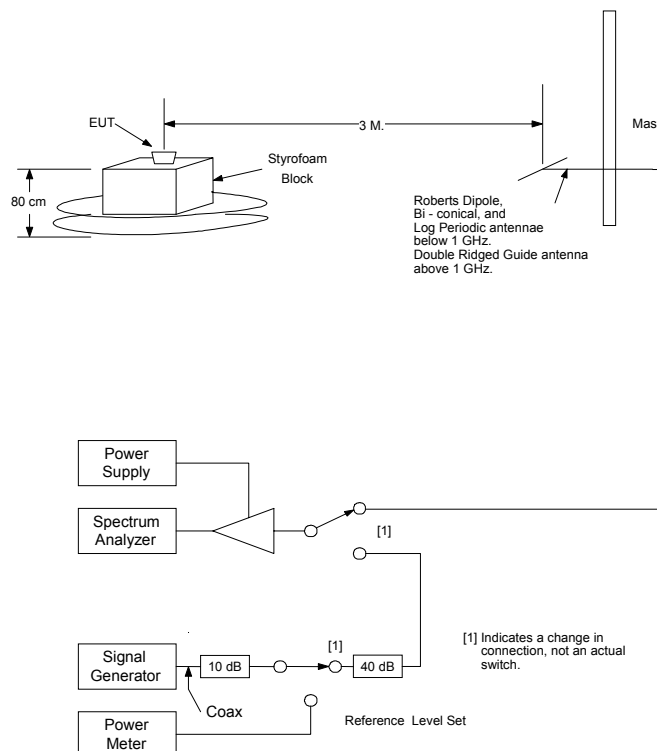
The FCC has granted these waivers in order to avoid requiring a 30 second delay in the middle of each transmission. The FCC has acknowledged that such a requirement would be burdensome to meter installers as well as increase interference potential.

Copies of both waivers are provided in appendix B of this document.

Appendix A – Field Strength Measurement Procedure

This test measures the field strength of radiated emissions using a spectrum analyzer and a receiving antenna in accordance with ANSI C63.4-2003. During the test, the EUT is to be placed on a non-conducting support at 80 cm above the horizontal ground plane of the OATS. The horizontal distance between the antenna and the DUT is to be exactly 3 meters. Levels below 1 GHz are to be measured with the spectrum analyzer resolution bandwidth at 120 kHz and levels at or above 1 GHz are to be measured with the spectrum analyzer resolution bandwidth at 1 MHz.

- 1) Monitor the frequency range of interest at a fixed antenna height and EUT azimuth.
- 2) If appropriate, manipulate the system cables to produce the highest amplitude signal relative to the limit. Note the amplitude and frequency of the suspect signal.
- 3) Rotate the EUT 360° to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more, go back to the azimuth and repeat step b). Otherwise, orient the EUT azimuth to repeat the highest amplitude observation and proceed.
- 4) Move the antenna over its fully allowed range of travel to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more, return to step b) with the antenna fixed at this height. Otherwise, move the antenna to the height that repeats the highest amplitude observation and proceed.
- 5) Change the polarity of the antenna and repeat step b), step c), and step d). Compare the resulting suspected highest amplitude signal with that found for the other polarity. Select and note the higher of the two signals. This signal is termed the highest observed signal with respect to the limit for this EUT operational mode.



Appendix B – FCC part 15.231(e) waivers



original waiver.pdf



2nd waiver.pdf