EMI Test Report

Tested in accordance with

Federal Communications Commission (FCC)
Personal Communications Services
CFR 47, Parts 2 and 90
and
Industry Canada, RSS-119

Research In Motion Limited

REPORT NO.: RIM-0057-0308-02

PRODUCT MODEL NO: RAL10IN
TYPE NAME: BlackBerry Wireless Handheld
FCC ID: L6ARAL10IN
IC: 2503A-RAL10IN

Date: 10 September 2003

Declaration

Statement of Performance:

The BlackBerry Wireless Handheld, model RAL10IN tested with the following accessories: with the following accessories: Travel Charger model number PSM05R-050Q part number ASY-04078-001, USB data cable model number HDW-04162-001 and Audio Headset part number HDW-03458-001 when configured and operated per RIM's operation instructions, performs within the requirements of the test standards.

Declaration:

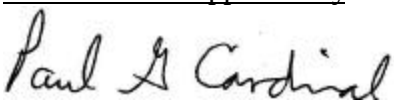
We hereby certify that:
The test data reported herein is an accurate record of the performance of the sample(s) tested.
The test equipment used was suitable for the tests performed and within the manufacturers published specifications and operating parameters.
The test methods were consistent with the methods described in the relevant standards.

Tested by

Maurice Battler
Compliance Specialist Date: 10 September 2003

Masud S. Attayi, P.Eng.
Senior Compliance Engineer Date: 10 September 2003

Reviewed and Approved by:



Paul G. Cardinal, Ph.D.
Manager, Compliance and Certification Date: 16 September 2003

Table of Contents

A) Scope

This report details the results of compliance tests which were performed in accordance to the requirements of:

FCC CFR 47 Part 2, Oct. 1, 2000
FCC CFR 47 Part 90, Oct. 1, 2000
Industry Canada, RSS-119 Issue 6, March 25, 2000, Land Mobile and Fixed Radio Transmitters and Receivers, 27.41 to 960 MHz.

B) Associated Document

1. Test report number RIMB-RAL10IN-4043

C) Product Identification

The equipment under test (EUT) was tested at the Research In Motion Limited (RIM) EMI test facilities, located at:

305 Phillip Street	50 Northside Road
Waterloo, Ontario	Ottawa, Ontario
Canada, N2L 3W8	Canada, K2H 5Z6
Phone: 519 888 7465	Phone: 613 829 7465
Fax: 519 888 6906	Fax: 613 829 0800
Web Site: www.rim.com	

The testing began on August 07, 2003 and completed on September 03, 2003. The Ottawa facility performed the frequency stability measurements.

The sample equipment under test (EUT) included:

1) BlackBerry Wireless Handheld, model number RAL10IN, serial number B2P11-009, with part number 06543-001 Rev. B Daughter Card, FCC ID L6ARAL10IN, IC: 2503A-RAL10IN.
2) Travel Charger, model number PSM05R-050Q, part number ASY-04078-001 with an output voltage of 5.0 volts dc.
3) USB data cable, model number HDW-04162-001, 1.45 metres long.
4) Headset, model number HDW-03458-001. The lead length was 1.25 metres long.

The BlackBerry Wireless Handheld operates on the 800 MHz band and uses two digital technologies: Quad 16QAM and Time Division Multiple Access (TDMA).

D) Support Equipment Used for the Testing of the EUT

1) PC System, Myraid, model EN-P3B-7, serial number CCC0004078
2) Monitor, ViewSonic, model number VCDTS23103-2M, serial number 24B022952648
3) Printer, H/P, model number C5884A, serial number US8251W0VQ

E) Test Voltage

The ac input voltage was 120 volts, 60 Hz. This configuration was per RIM's specifications.

F) Test Results Chart

SPECIFICATION	Test Type	MEETS REQUIREMENTS	Performed By
FCC CFR 47 Part 2, Subpart L IC RSS-119	Radiated Spurious/harmonic Emissions, ERP	Yes	See test report number RIMB-RAL10IN-4043
FCC CFR 47 Part 2, Subpart L, Part 90, Subpart I IC RSS-119	Conducted Emissions, Occupied Bandwidth	Yes	Maurice Battler
FCC CFR 47, Part 2.947, 2.1055 and 90.213 IC RSS-119	Frequency Stability	Yes	Kevin Rush

G) Modifications to EUT

No modifications were required to the EUT.

H) **Summary of Results**

1) The EUT passed the Conducted Spurious Emissions requirements as per 47 CFR 2.1051. The EUT was measured on the low, middle and high channels. The frequency range investigated was from 10 MHz to 10 GHz.
See APPENDIX 1 for the test data.

2) The EUT passed the Occupied Bandwidth/Bandwidth Limitation requirements per 47 CFR 2.1049, 47 CFR 90.210 (j) and RSS-119. The channels measured were low, middle and high.
See APPENDIX 1 for the test data.

3) The EUT passed the Conducted RF Output Power requirements as per 47 CFR 2.1046. The channels measured were low, middle and high.
See APPENDIX 2 for the test data.

4) The EUT passed the Frequency Stability vs. Temperature and Voltage requirements as per 2.1055 and RSS-119.
The maximum frequency error measured was less than 0.1 ppm.
The temperature range was from -30°C to +60°C in 10° temperature steps. The EUT was measured at 806.0125, 813.5125, 820.9875 and 824.9875 MHz at each temperature step. The EUT was measured at low (3.5 volts), nominal (3.8 volts) and high (4.2 volts) dc input voltage at each temperature step and channel at maximum output power.
See APPENDIX 3 for the test data.

5) The radiated spurious emissions/harmonics and ERP test results can be viewed in test report number RIMB-RAL10IN-4043.

l) Compliance Test Equipment Used

UNIT	MANUFACTURER	MODEL / SERIAL NUMBER		CAL DUE DATE (YY MO DD)	USE
Spectrum Analyzer	HP	8563E	3745A08112	04-07-31	Conducted Emissions
DC Power Supply	HP	66321D	GB40180110	04-08-19	Conducted Emissions Frequency Stability
Temperature Probe	Hart Scientific	61161-302	21352860	03-09-10	Frequency Stability
Environmental Chamber	ESPEC Corp.	SH-241	92000147	N/R	Frequency Stability
Vector Signal Generator	HP	89441A	US39312360	04-08-20	Frequency Stability
ESG-D Series Signal Generator	Agilent	E4433B	US38440638	04-02-14	Frequency Stability
Calibration Kit	HP	HP85032B	3217A13134	04-01-04	Frequency Stability
Network Analyzer	HP	8720D	IS36140834	04-08-05	Frequency Stability
Power Meter	Giga-Tronics	8541C	1837762	03-10-30	Conducted RF Power
Power Sensor	Giga-Tronics	80401A	1835838	03-10-30	Conducted RF Power

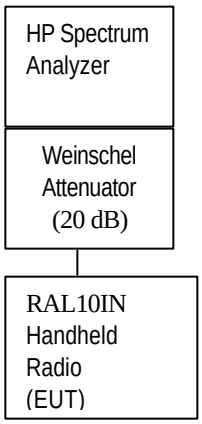
APPENDIX 1

CONDUCTED EMISSIONS TEST DATA/PLOTS

Conducted Emission Test Results

This appendix contains measurement data pertaining to the RF Power at maximum for Masks 47 CFR 90.210(g), 90.691(a), and Occupied Bandwidth 47 CFR 2.1049(h), along with 99% power bandwidth, –26 dBc bandwidth.

Test Setup Diagram



Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer	HP	8563E	374A08112	30 Hz – 26.5 GHz
Attenuator	Weinschel	33-20-33	BL8170	DC – 18 GHz

The TDM Transmission Slot Multiplex Factor was set to 2 /6 with the RF power output at maximum for all the recorded measurements shown below.

Conducted Emission Test Results con't

The conducted spurious emissions – Pursuant to 47 CFR 2.1051 were measured from 10 MHz to 10 GHz. No emissions could be seen above the noise floor of the spectrum analyzer.

Test Data for TDM selected Frequencies

TDM-MF 2/6 Frequency (MHz)	QPSK_4 Occupied Bandwidth (kHz)	QAM_16 Occupied Bandwidth (kHz)	QAM_64 Occupied Bandwidth (kHz)	QPSK_4 - 26dBc Bandwidth (kHz)	QAM_16 - 26dBc Bandwidth (kHz)	QAM_64 - 26dBc Bandwidth (kHz)
806.0125	21.33	21.42	21.67	24.58	25.17	25.33
815.5000	21.42	21.25	21.42	25.33	24.83	25.00
824.9880	21.33	21.33	21.25	24.83	25.08	25.17

Measurement Plots for TDMA, QPSK_4, QAM-16, QAM_64.

Refer to the following figures for the measurement plots.

See Figures 1 to 18 for the plots of the Spurious Emission 47 CFR 2.1051 results.

See Figures 19 to 27 for plots of the 99% Occupied Bandwidth results 47 CFR 2.1049(h).

See Figures 28 to 35 for the plots of the –26 dBc Bandwidth results.
Carrier Reference at 0.0 dB

See Figures 36 to 30 for plots of the EA Mask 47 CFR 90.691(a) measured data.

See Figures 31 to 36 for plots of the G Mask. 47 CFR 90.210(g) measured data.

Conducted Emission Test Data Con't

Figure 1: Spurious Conducted Emissions 2.1051

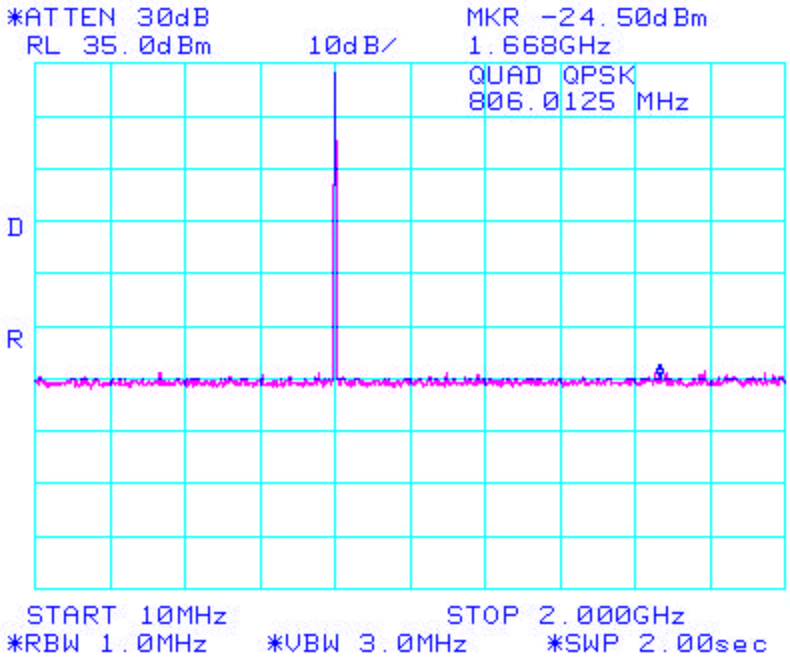
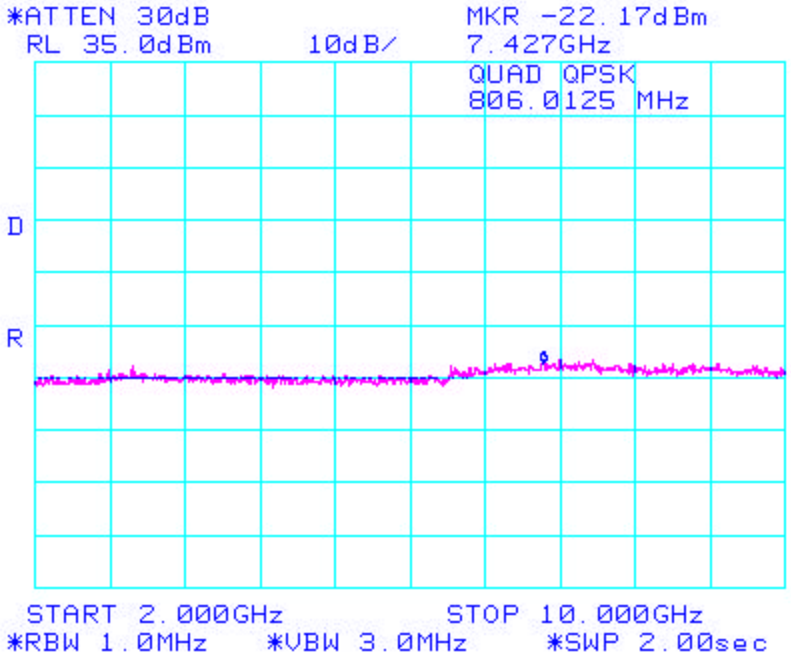


Figure 2: Spurious Conducted Emissions 2.1051



Conducted Emission Test Data Con't

Figure 3: Spurious Conducted Emissions 2.1051

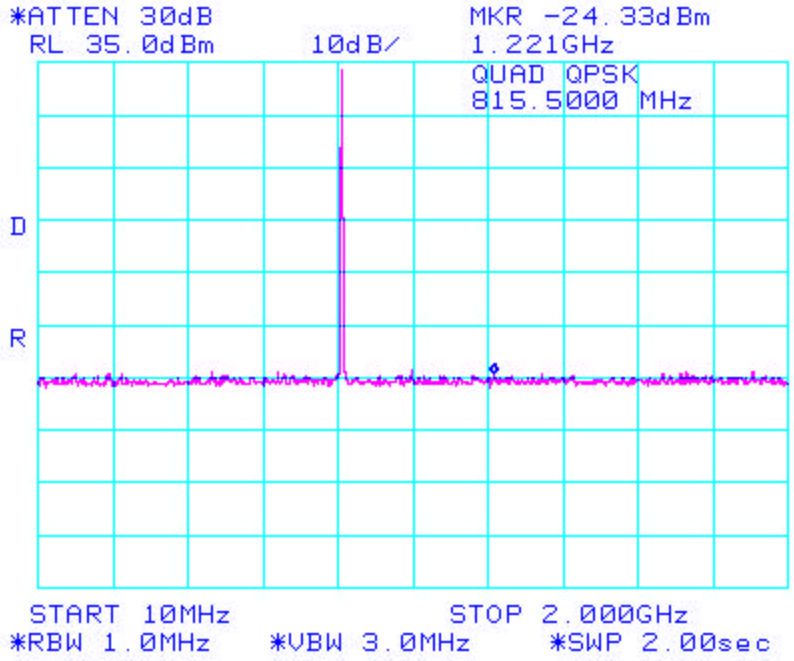
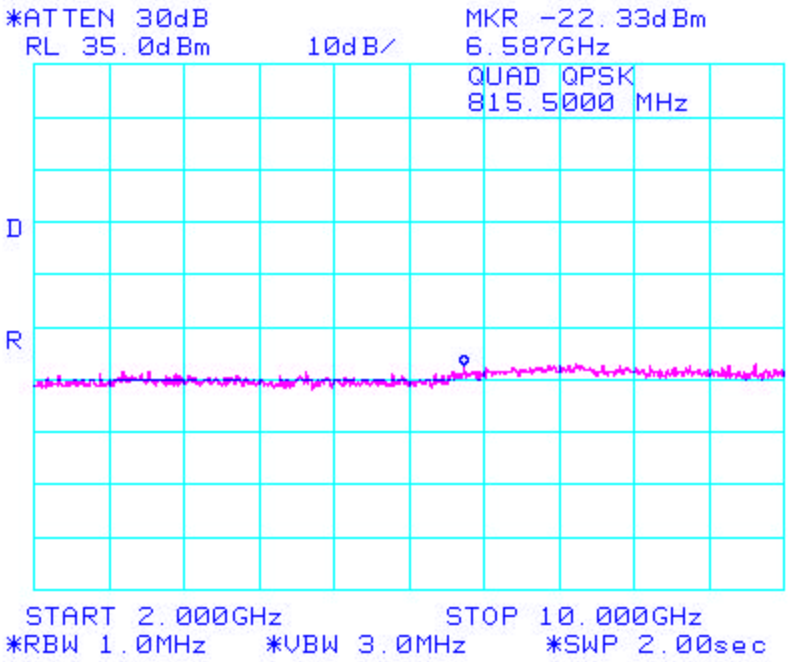


Figure 4: Spurious Conducted Emissions 2.1051



Conducted Emission Test Data Con't

Figure 5: Spurious Conducted Emissions 2.1051

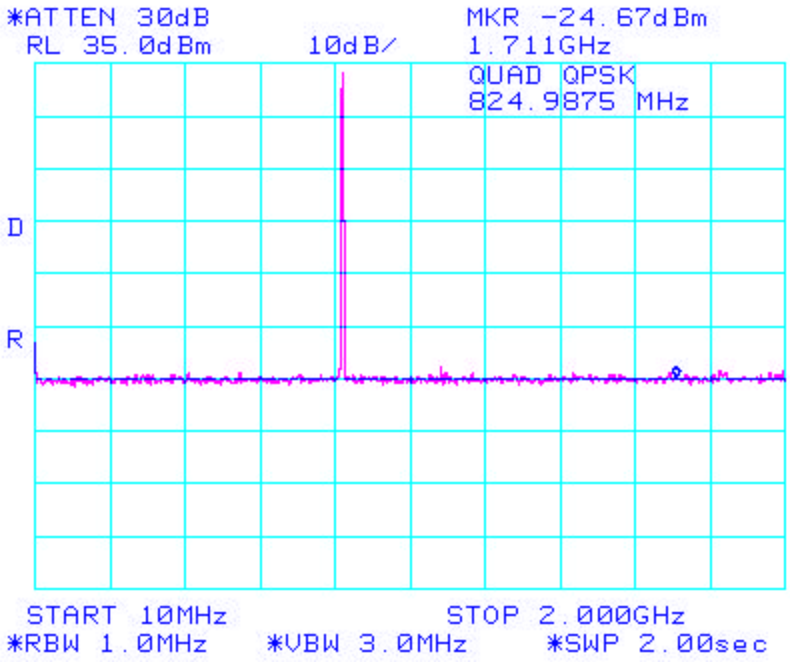
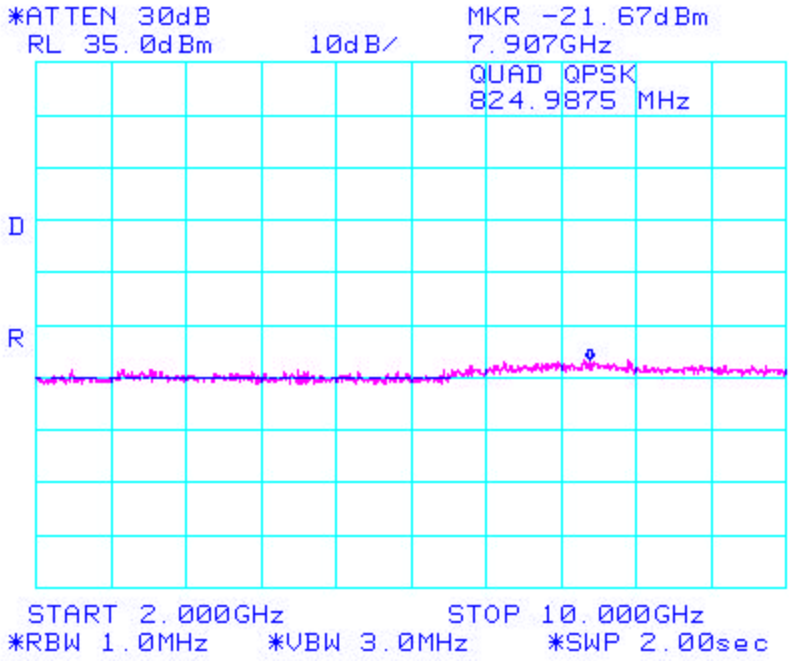


Figure 6: Spurious Conducted Emissions 2.1051



Conducted Emission Test Data Con't

Figure 7: Spurious Conducted Emissions 2.1051

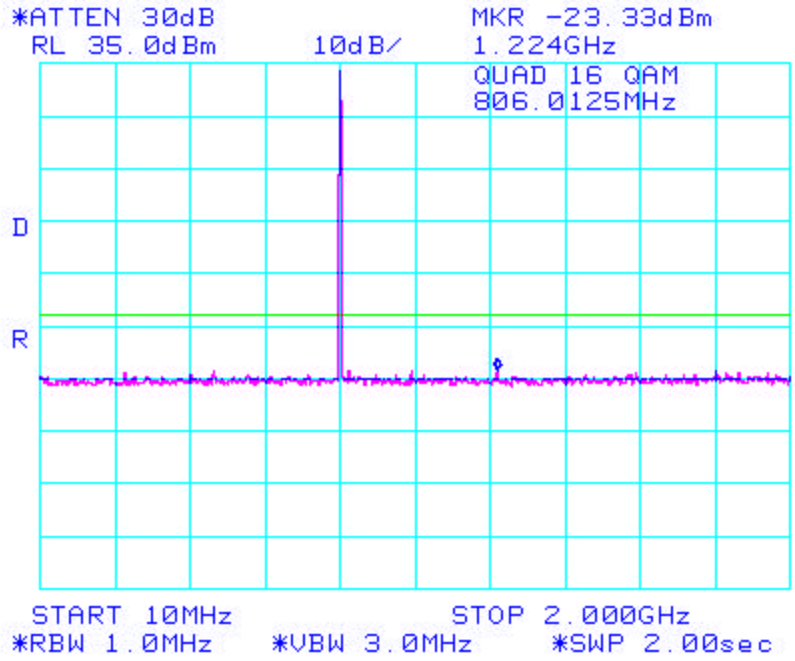
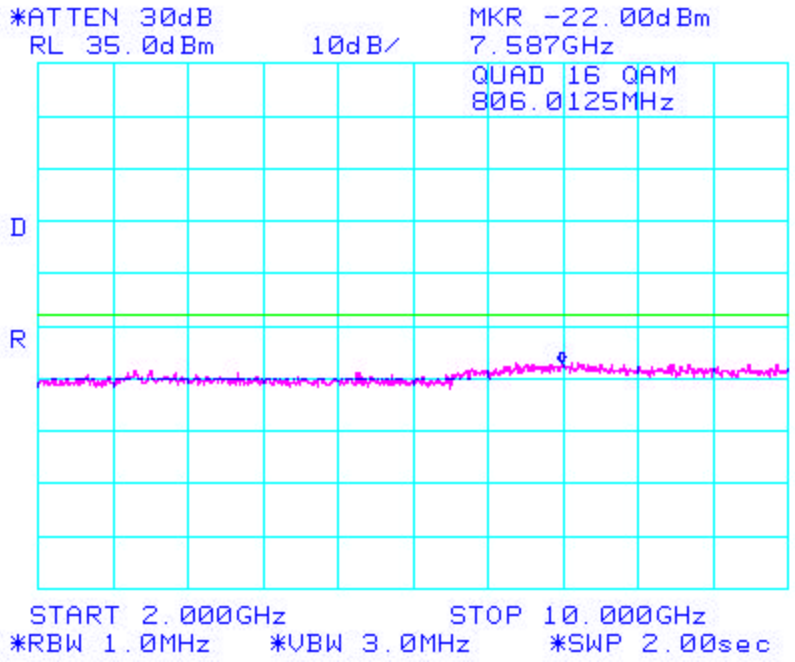


Figure 8: Spurious Conducted Emissions 2.1051



Conducted Emission Test Data Con't

Figure 9: Spurious Conducted Emissions 2.1051

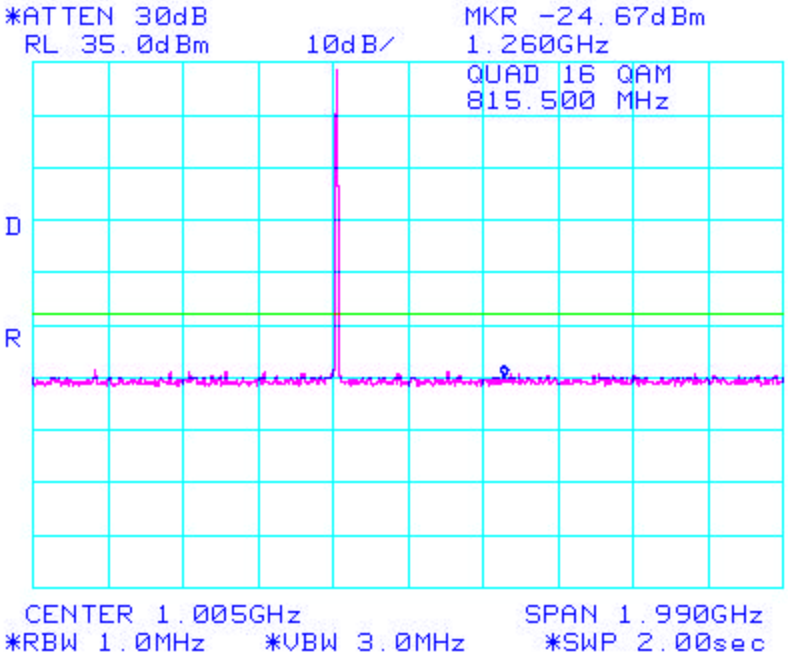
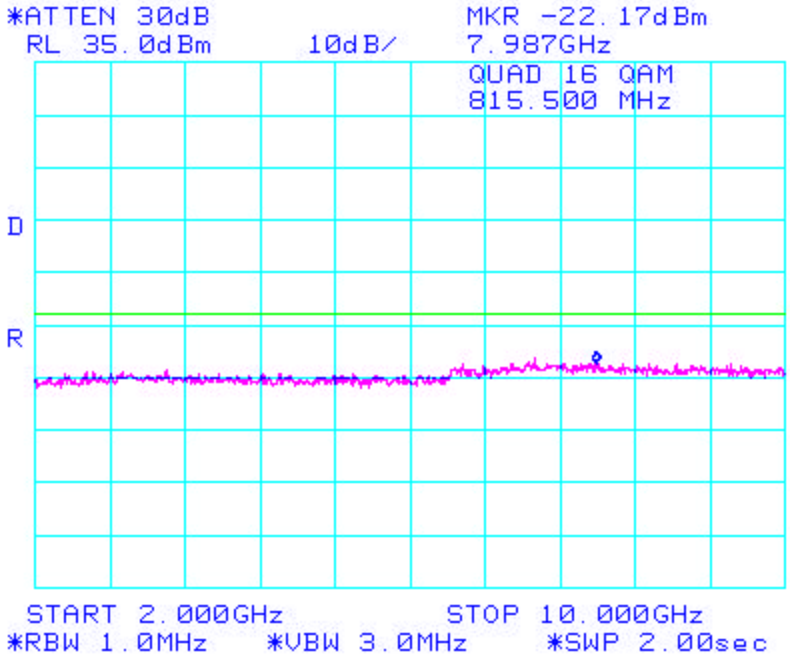


Figure 10: Spurious Conducted Emissions 2.1051



Conducted Emission Test Data Con't

Figure 11: Spurious Conducted Emissions 2.1051

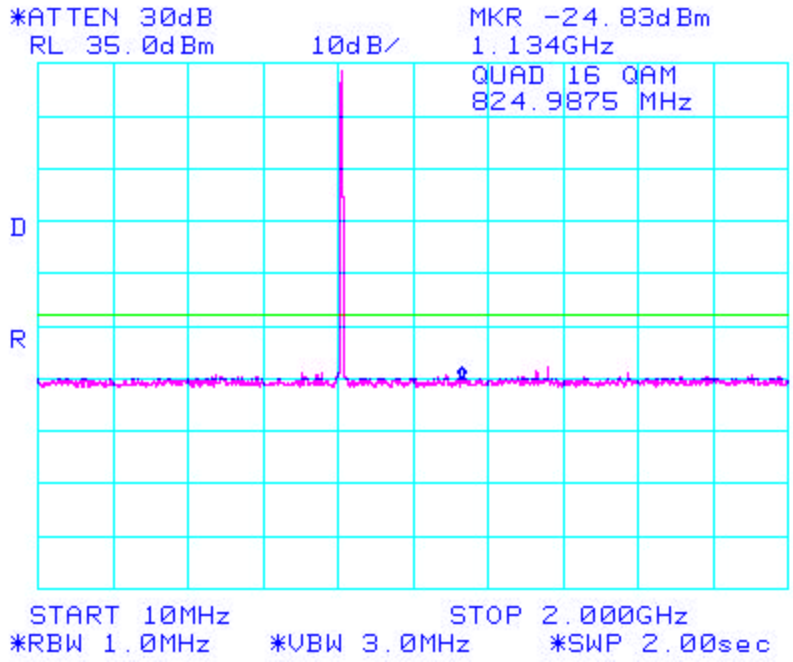
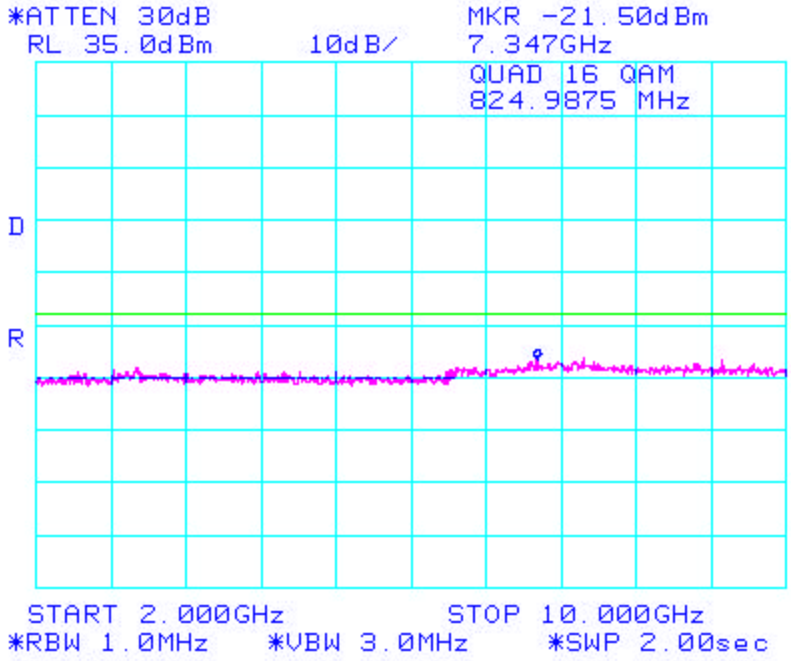


Figure 12: – Spurious Conducted Emissions 2.1051



Conducted Emission Test Data Con't

Figure 13: Spurious Conducted Emissions 2.1051

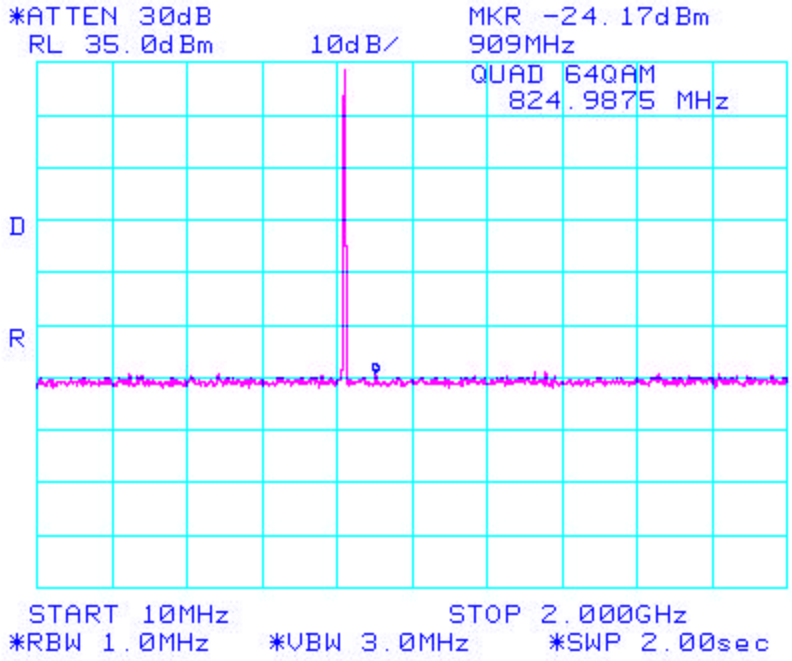
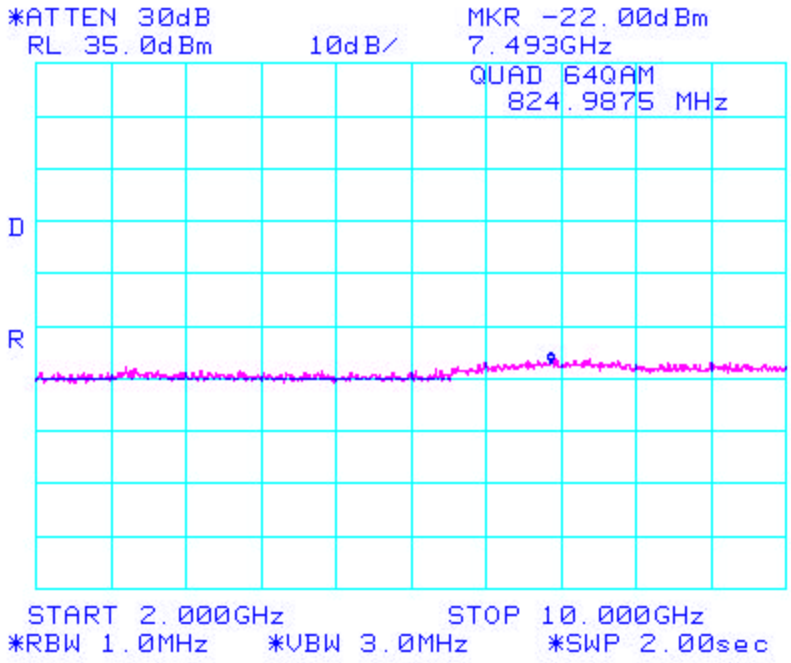


Figure 14: Spurious Conducted Emissions 2.1051



Conducted Emission Test Data Con't

Figure 15: Spurious Conducted Emissions 2.1051

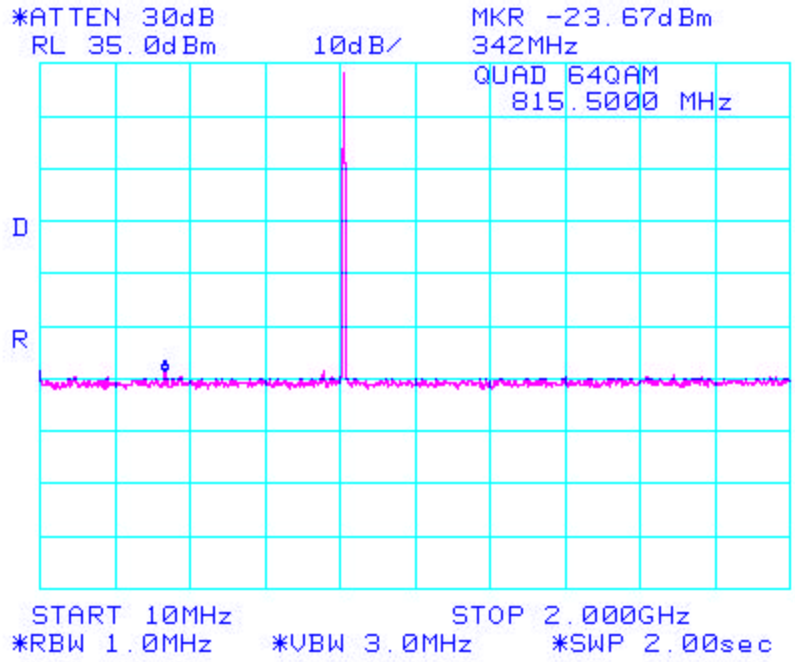
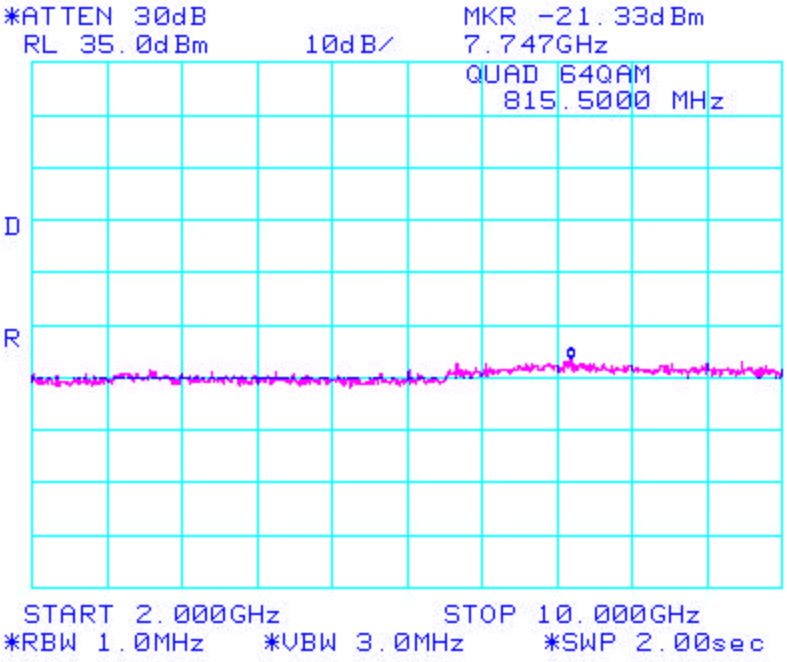


Figure 16: Spurious Conducted Emissions 2.1051



Conducted Emission Test Data Con't

Figure 17: Spurious Conducted Emissions 2.1051

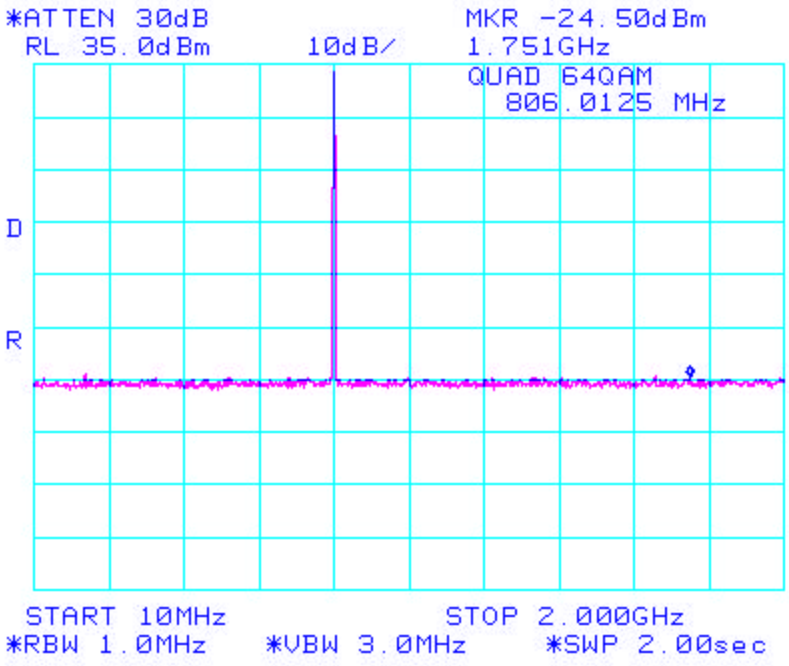
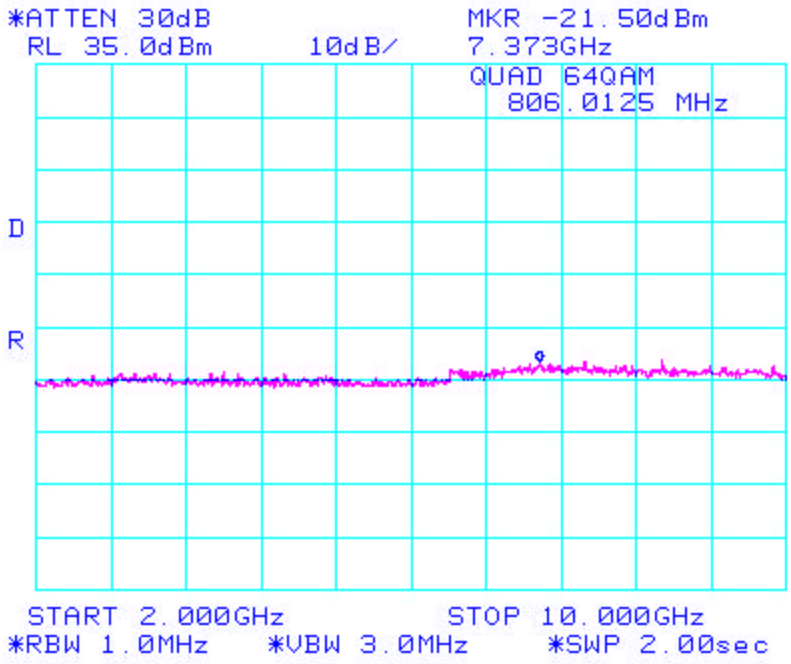


Figure 18: Spurious Conducted Emissions 2.1051



Conducted Emission Test Data Con't

Figure 19: Occupied Bandwidth (99%)

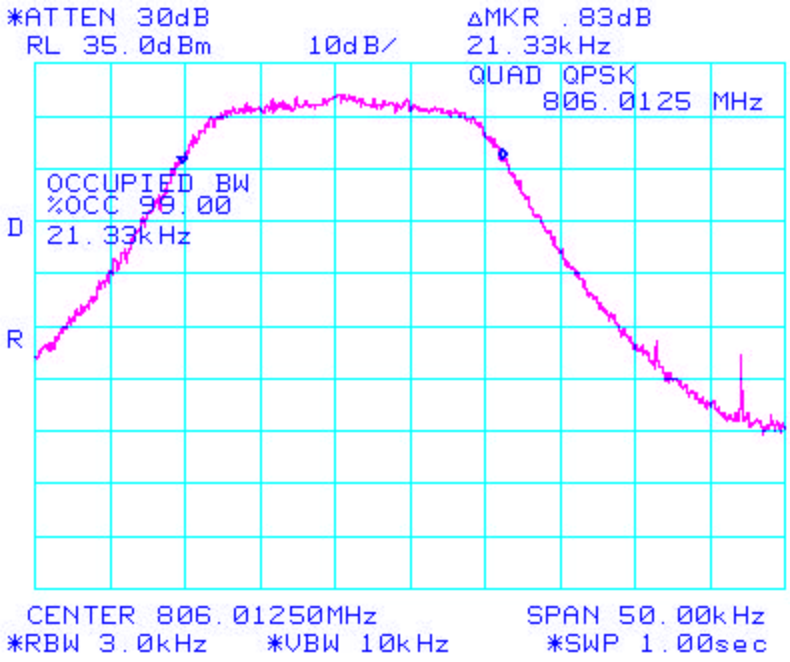
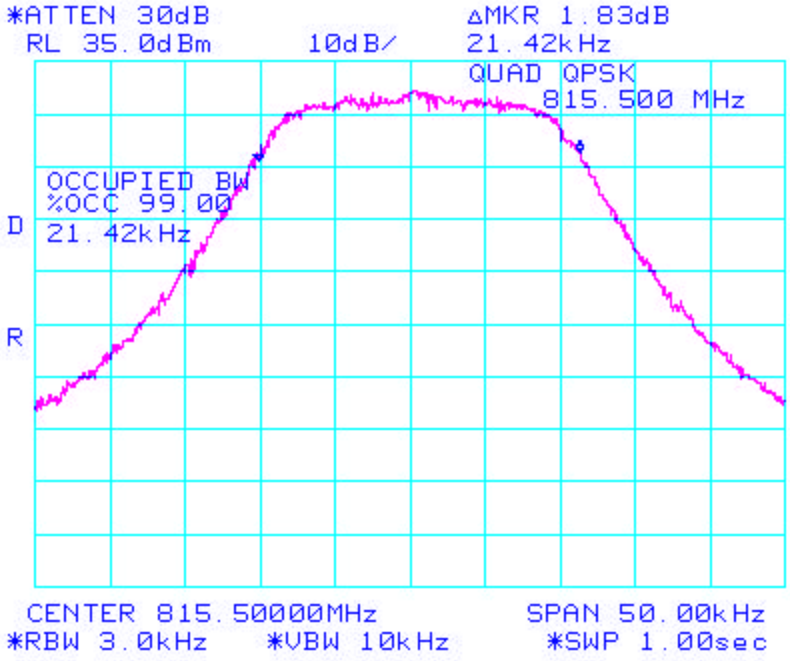


Figure 20: Occupied Bandwidth (99%)



Conducted Emission Test Data Con't

Figure 21: Occupied Bandwidth (99%)

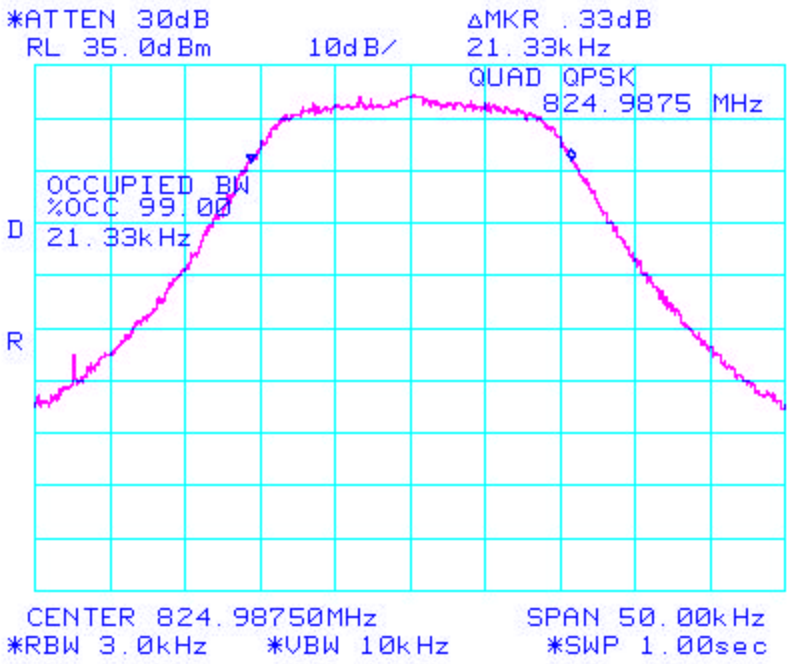
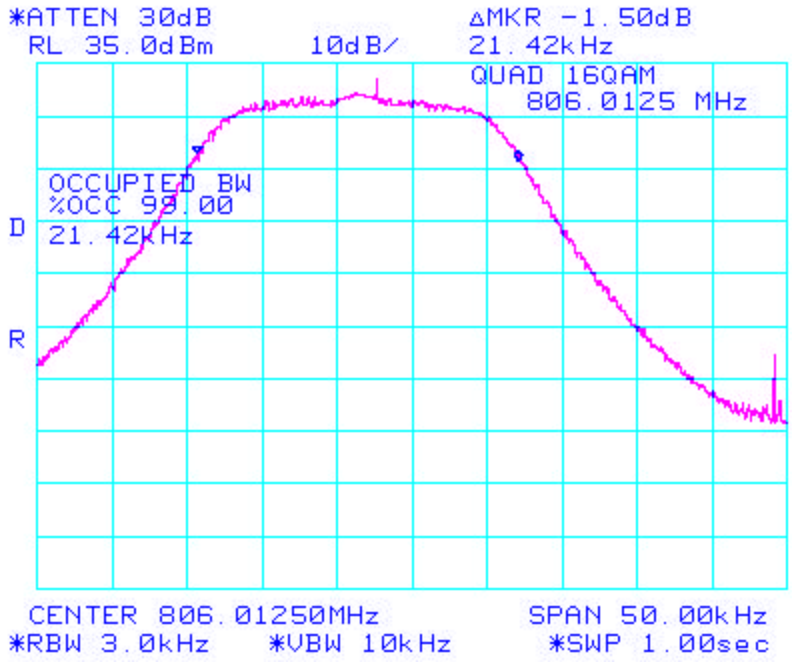


Figure 22: Occupied Bandwidth (99%)



Conducted Emission Test Data Con't

Figure 23: Occupied Bandwidth (99%)

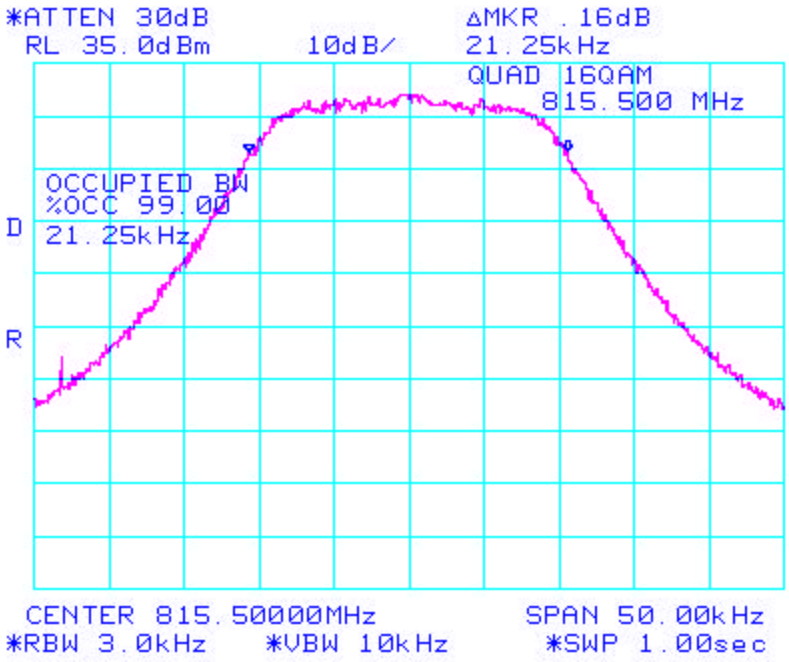
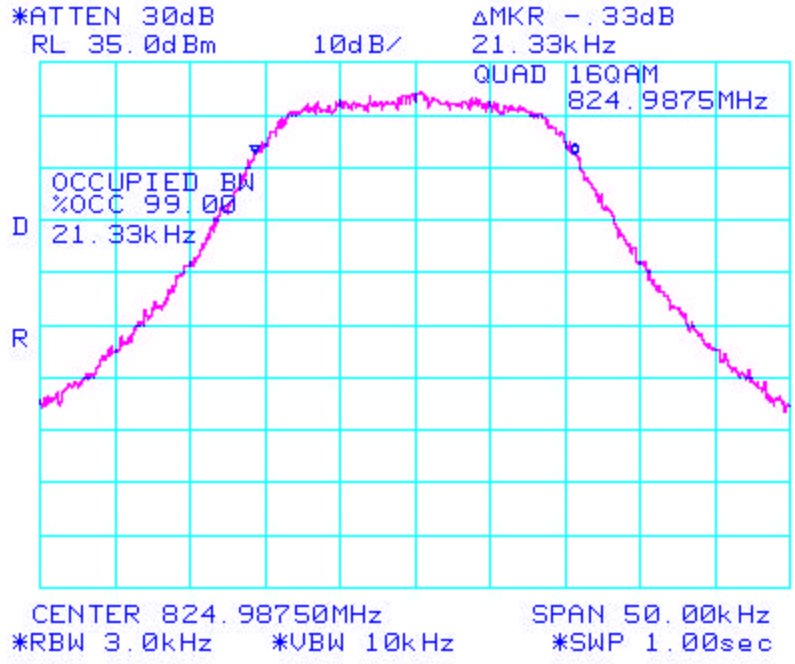


Figure 24: Occupied Bandwidth (99%)



Conducted Emission Test Data Con't

Figure 25: Occupied Bandwidth (99%)

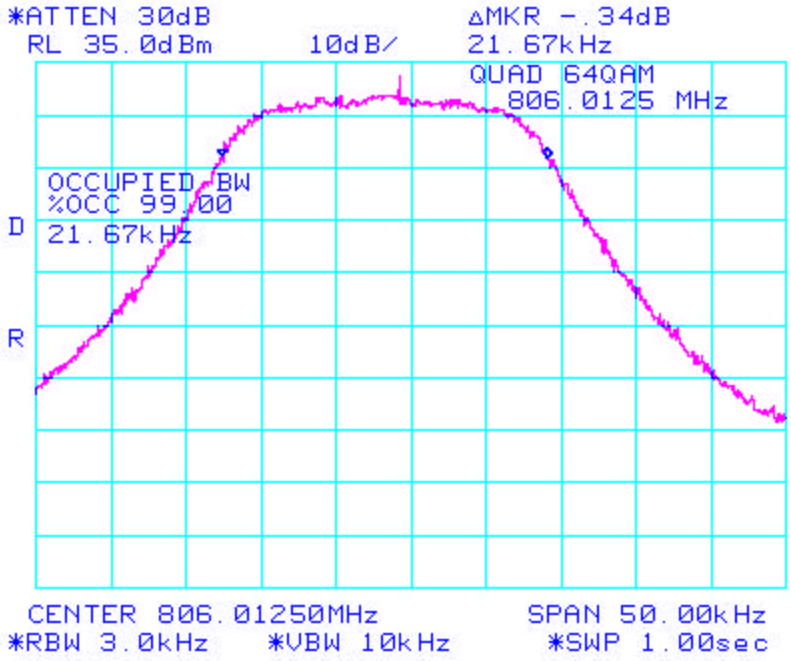
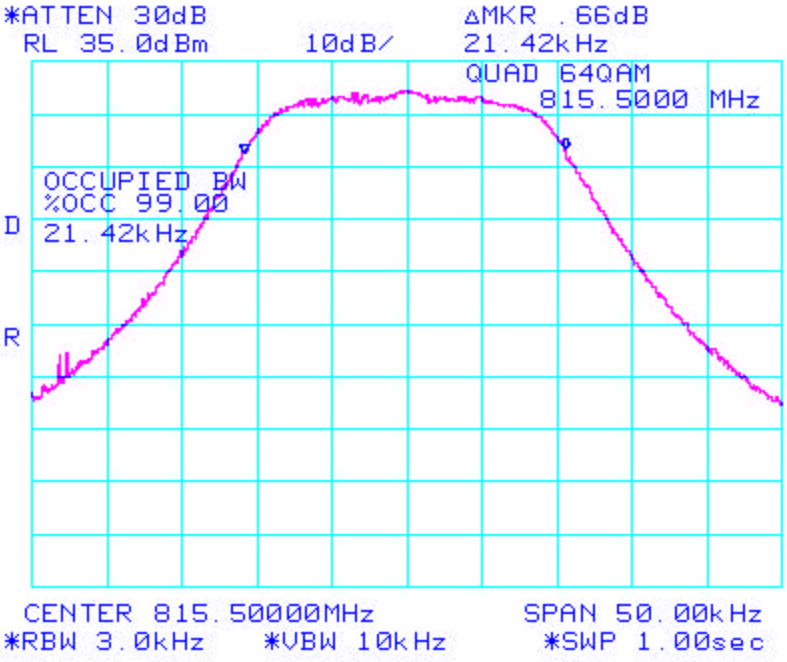


Figure 26: Occupied Bandwidth (99%)



Conducted Emission Test Data Con't

Figure 27: Occupied Bandwidth (99%)

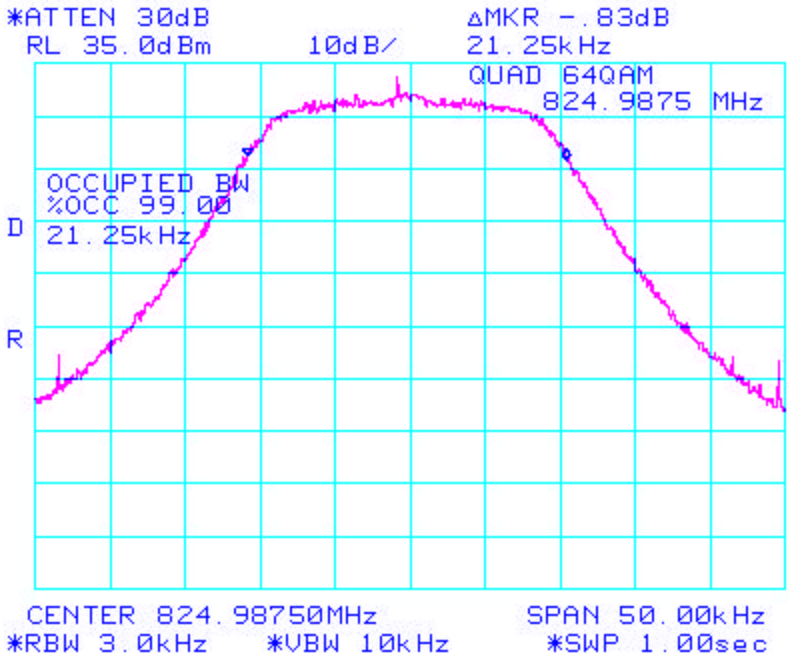
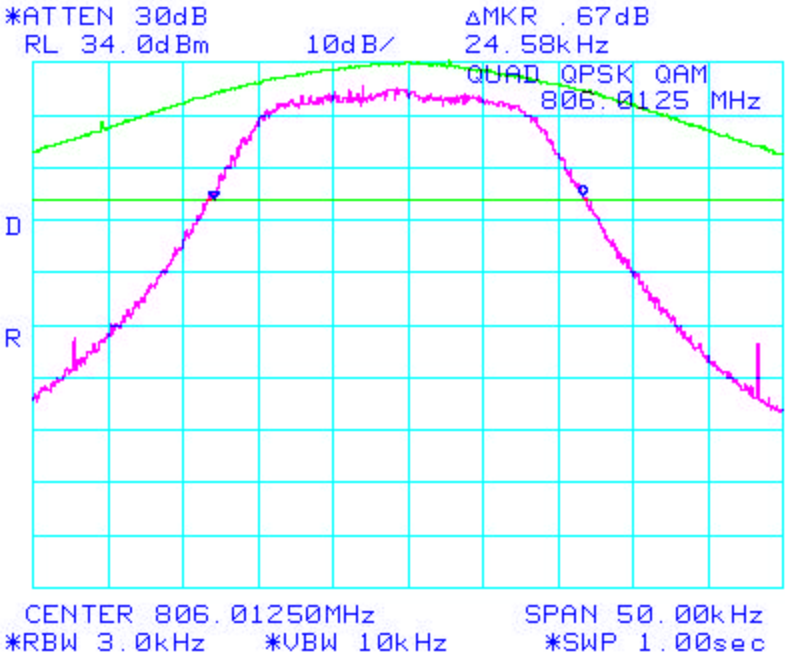


Figure 28: –26 dBc Bandwidth



Conducted Emission Test Data Con't

Figure 29: –26 dBc Bandwidth

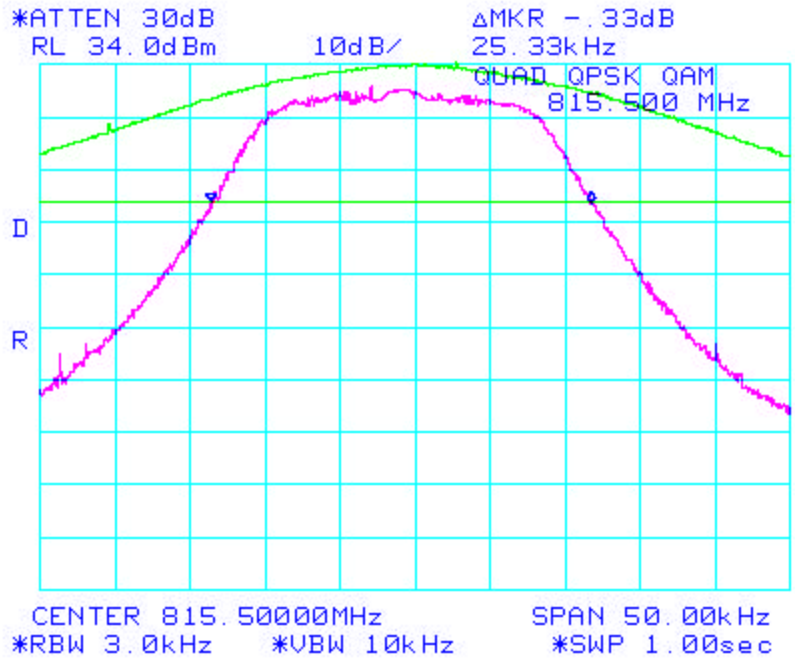
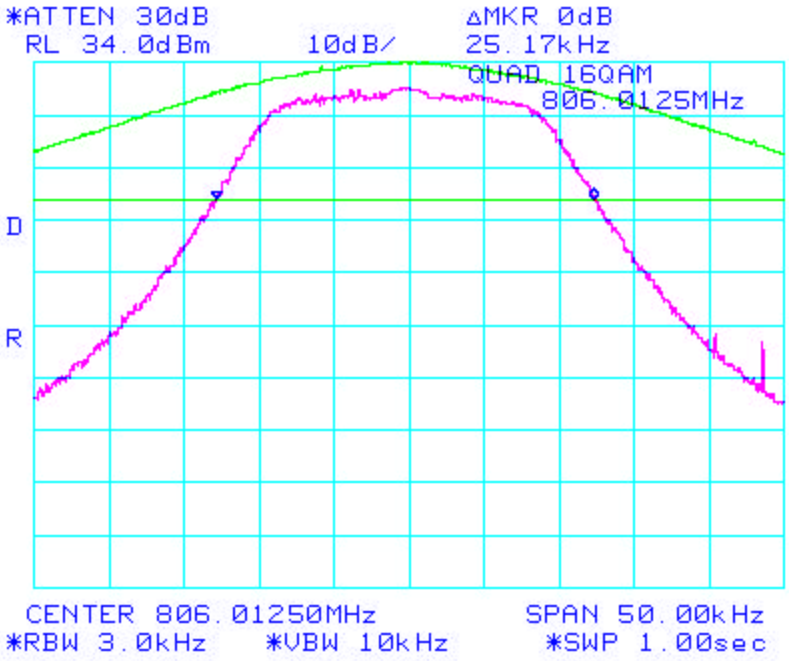


Figure 30: –26 dBc Bandwidth



Conducted Emission Test Data Con't

Figure 31: –26 dBc Bandwidth

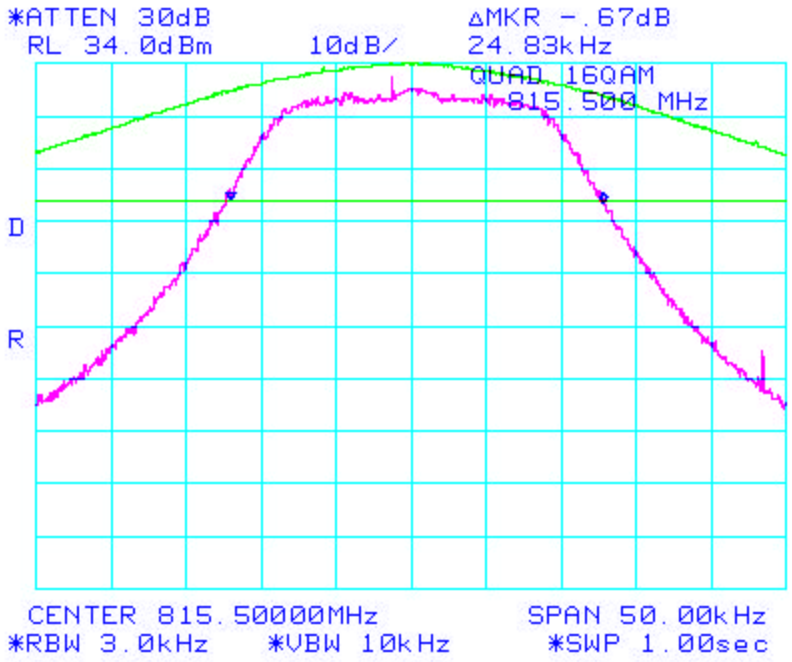
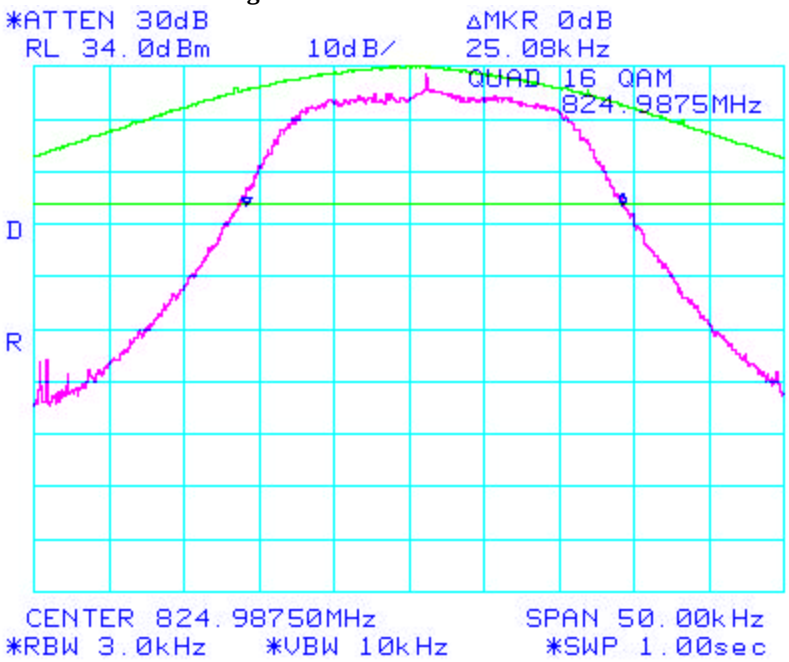


Figure 32: –26 dBc Bandwidth



Conducted Emission Test Data Con't

Figure 33: –26 dBc Bandwidth

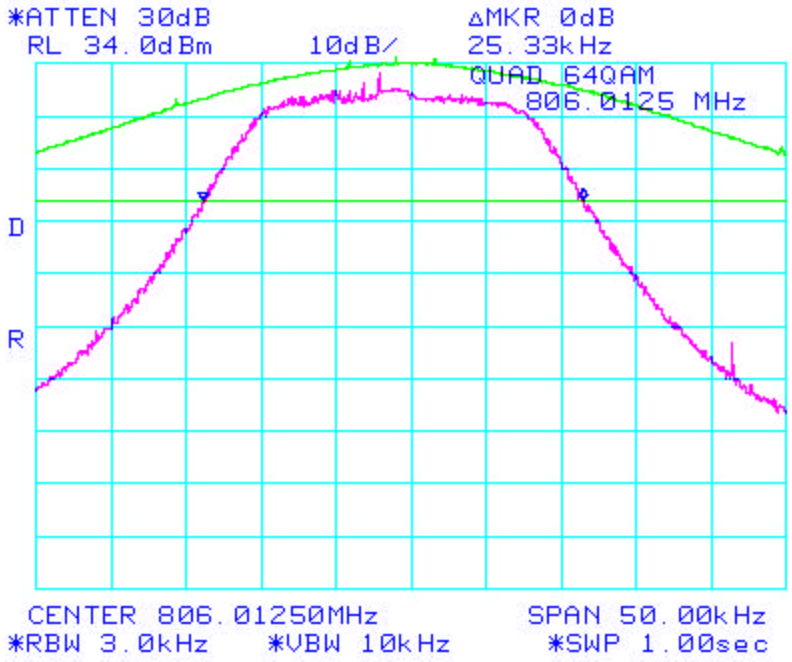
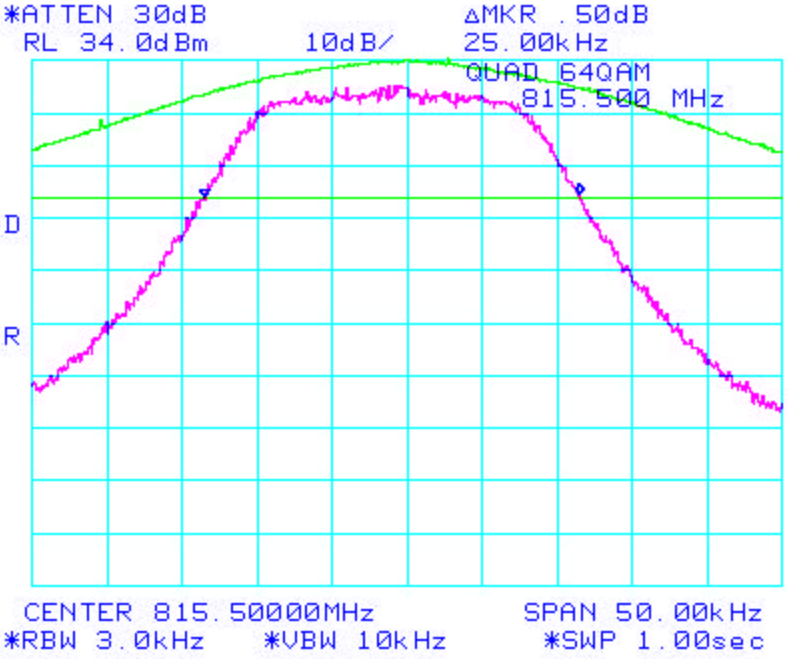


Figure 34: –26 dBc Bandwidth



Conducted Emission Test Data Con't

Figure 35: –26 dBc Bandwidth

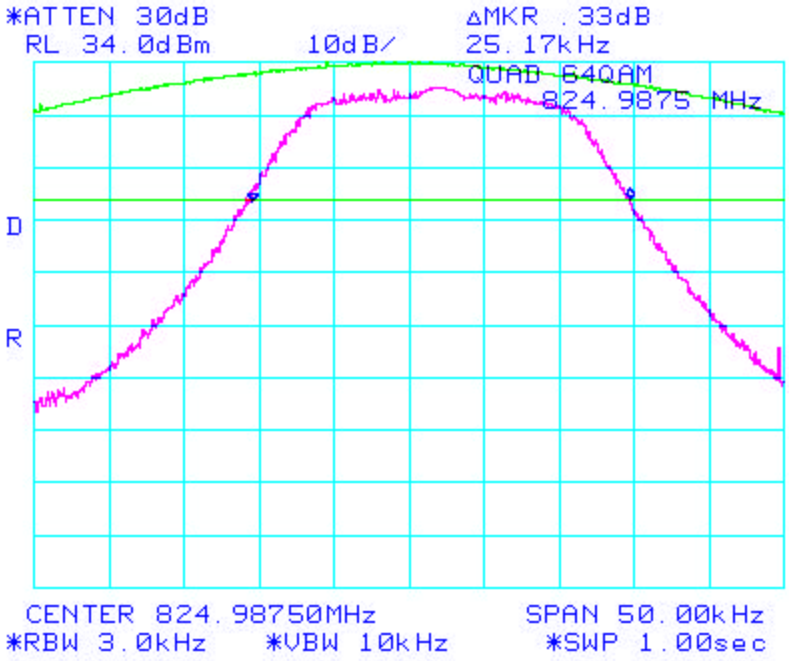
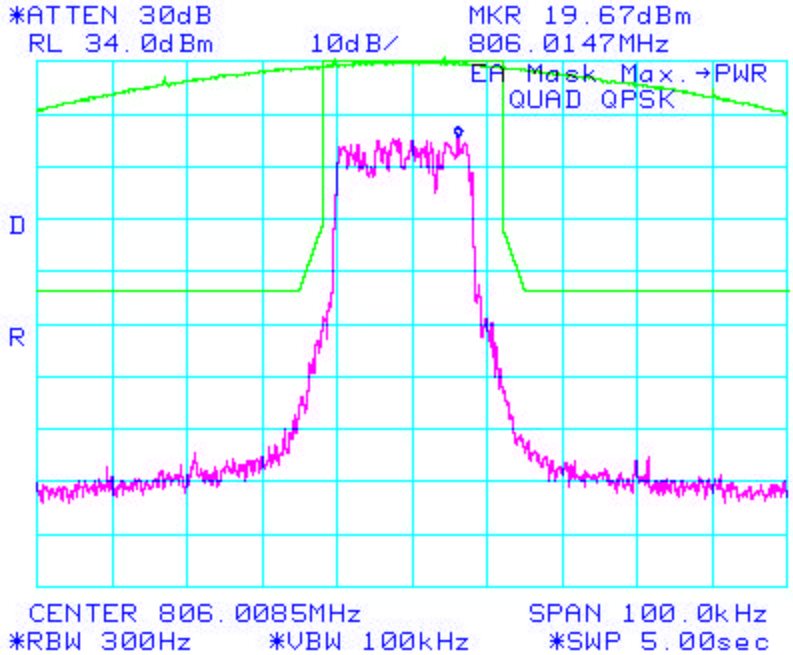


Figure 36: QUAD_QPSK_EA Mask 90.691(a)



Conducted Emission Test Data Con't

Figure 37: QUAD_QPSK_EA Mask 90.691(a)

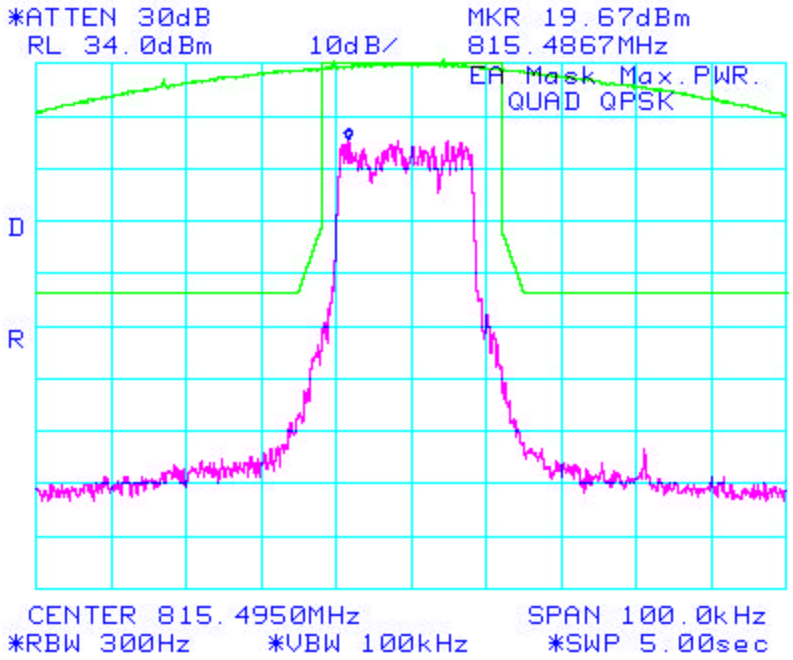
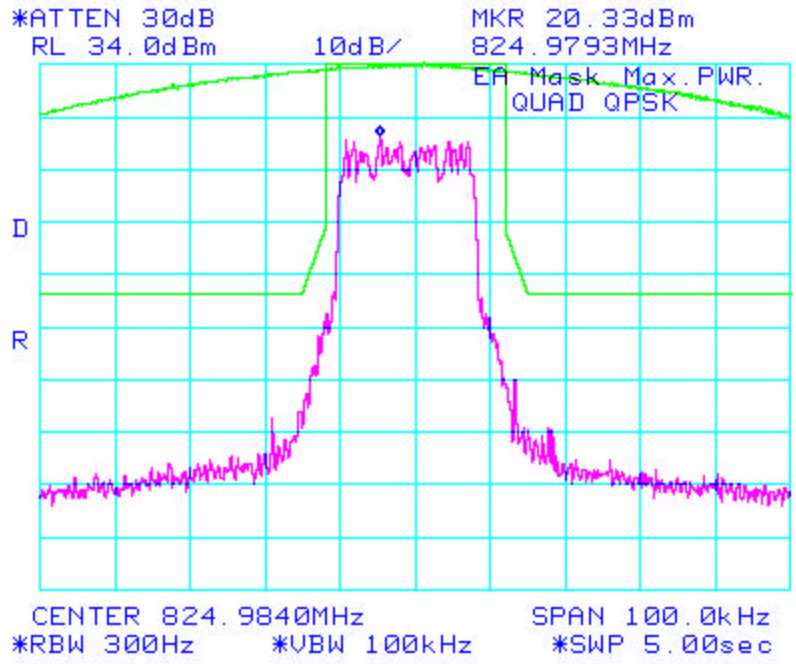


Figure38: QUAD_QPSK_EA Mask 90.691(a)



Conducted Emission Test Data Con't

Figure 39: QUAD_16QAM_EA Mask 90.691(a)

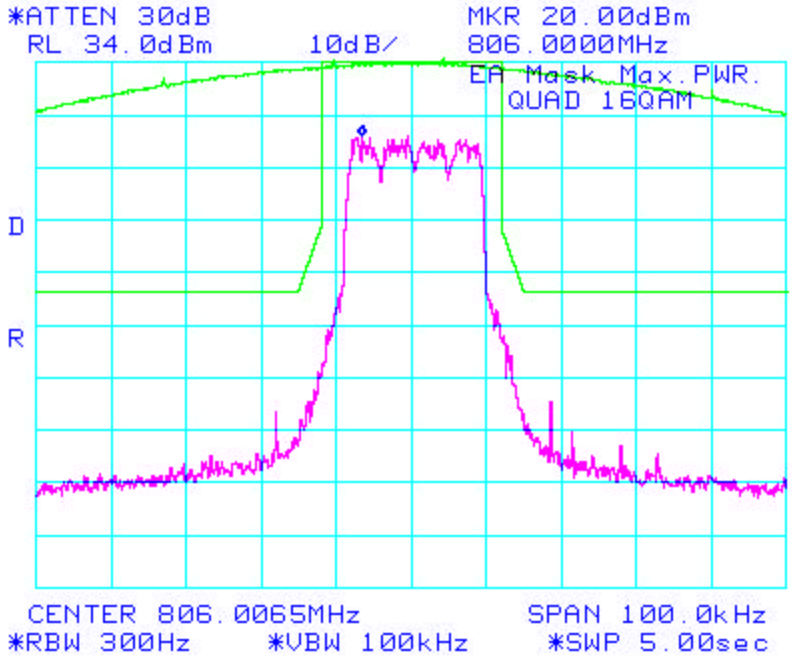
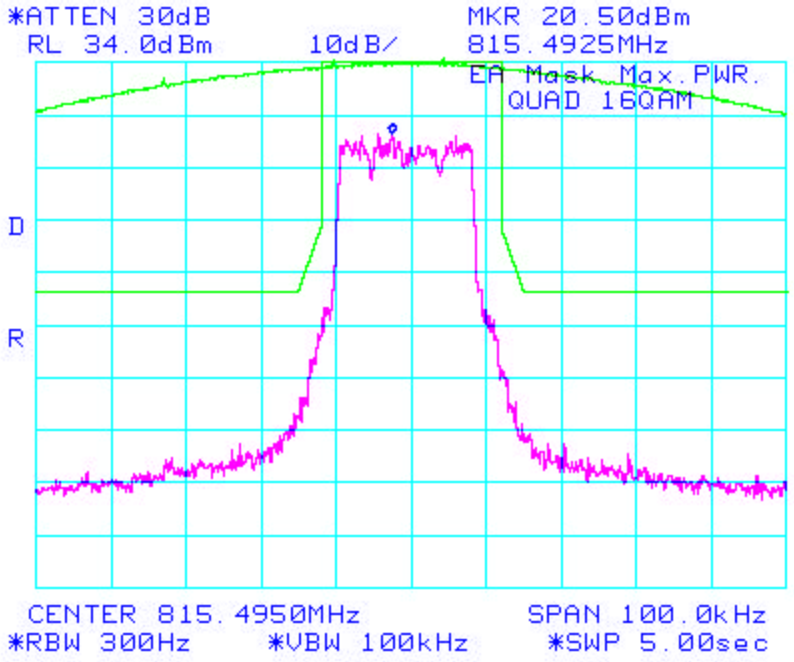


Figure 40: QUAD_16QAM_EA Mask 90.691(a)



Conducted Emission Test Data Con't

Figure 41: QUAD_16QAM_EA Mask 90.691(a)

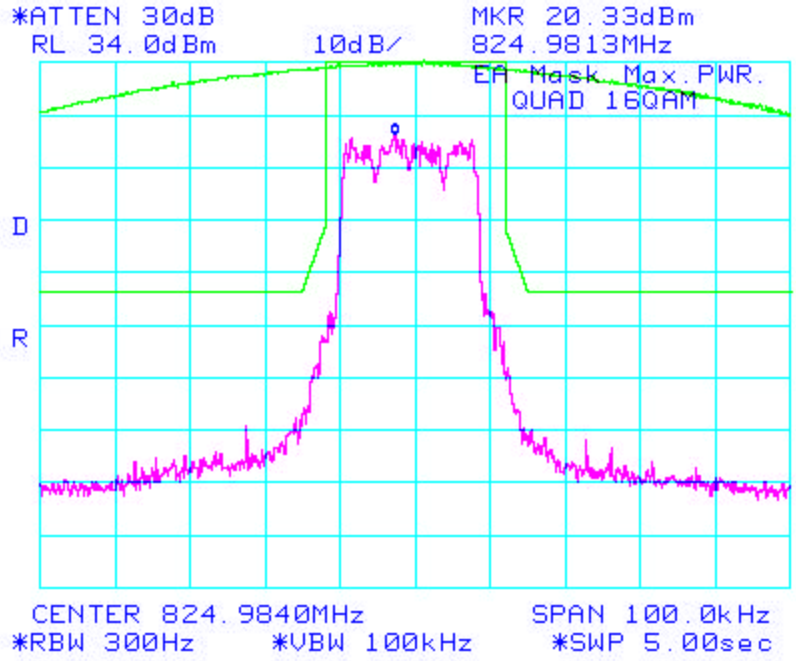
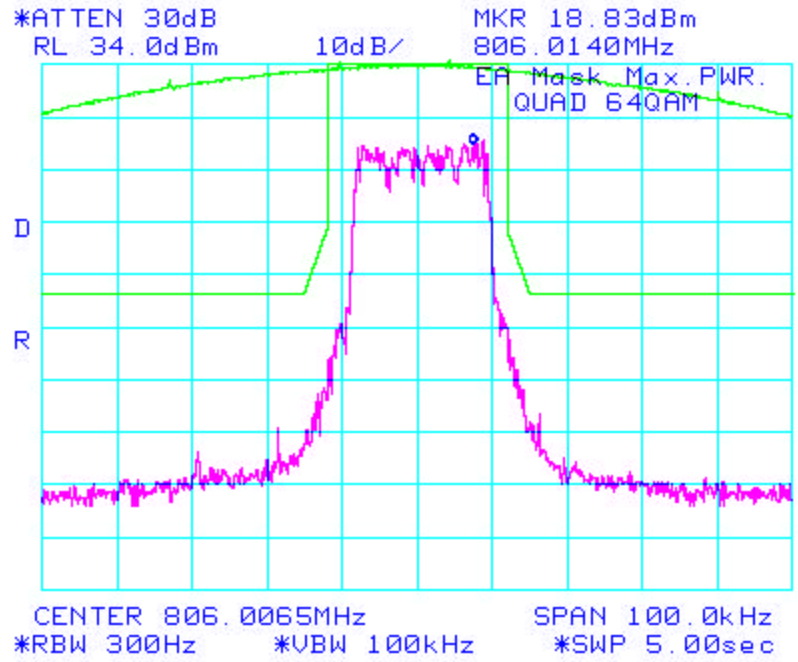


Figure 42: QUAD_64QAM_EA Mask 90.691(a)



Conducted Emission Test Data Con't

Figure 43: QUAD_64QAM_EA Mask 90.691(a)

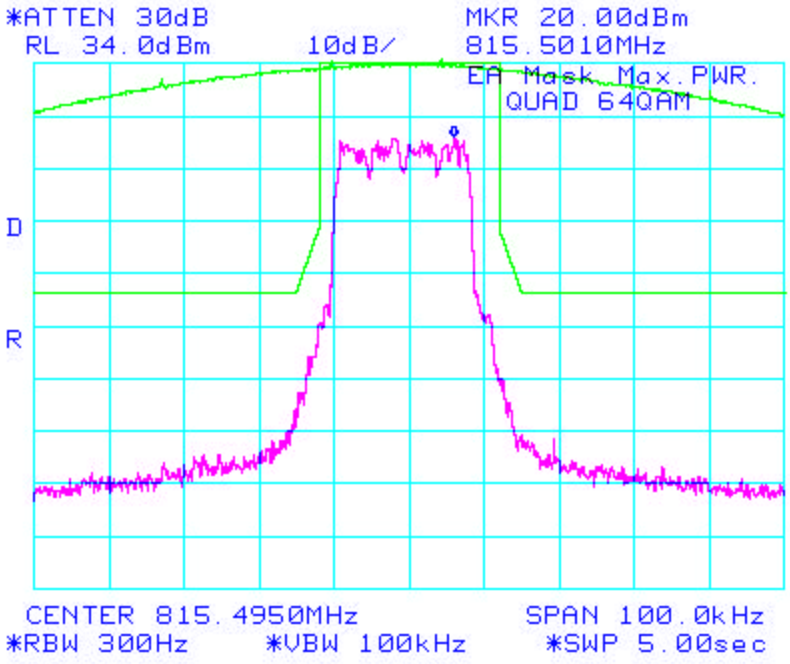
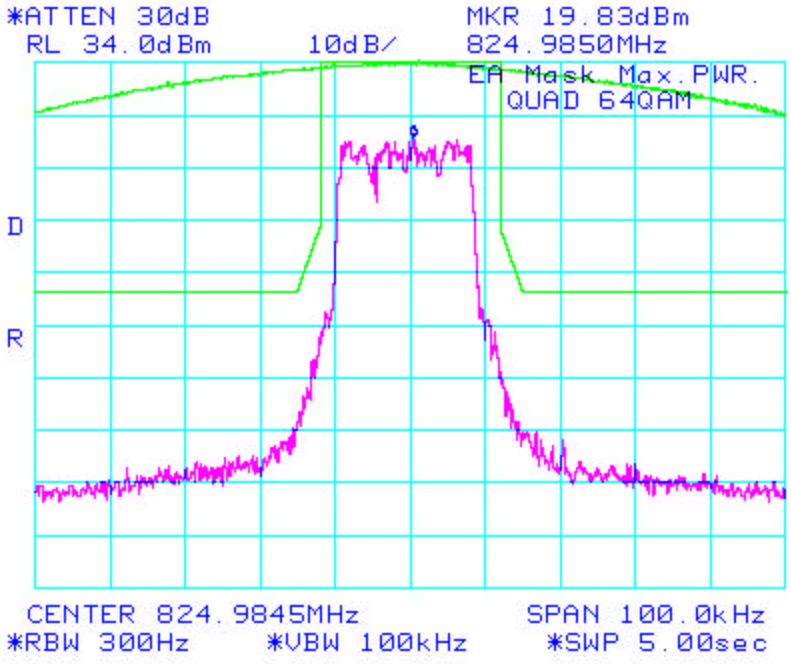


Figure 44: QUAD_64QAM_EA Mask 90.691(a)



Conducted Emission Test Data Con't

Figure 45: QUAD_QPSK_G Mask 90.210(g)

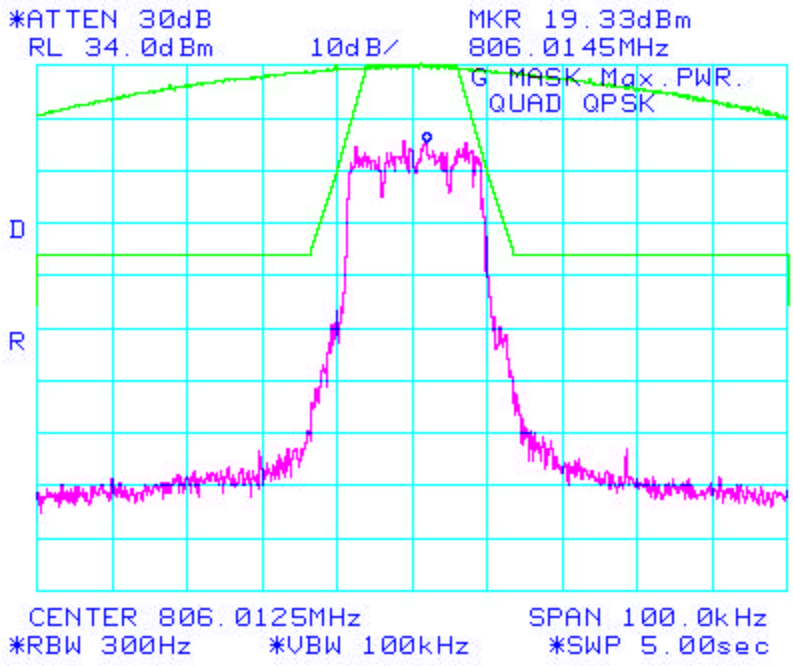
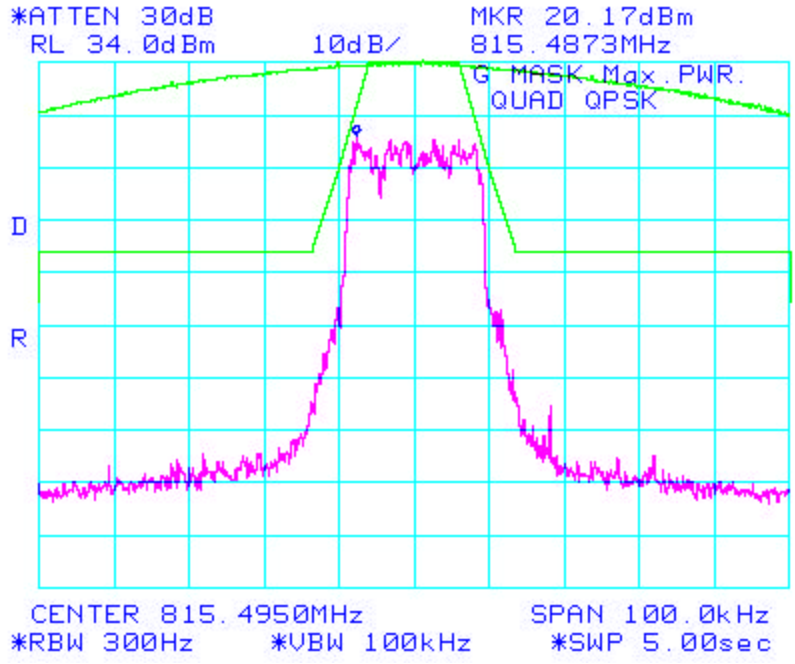


Figure 46: QUAD_QPSK_G Mask 90.210(g)



Conducted Emission Test Data Con't

Figure 47: QUAD_QPSK_G Mask 90.210(g)

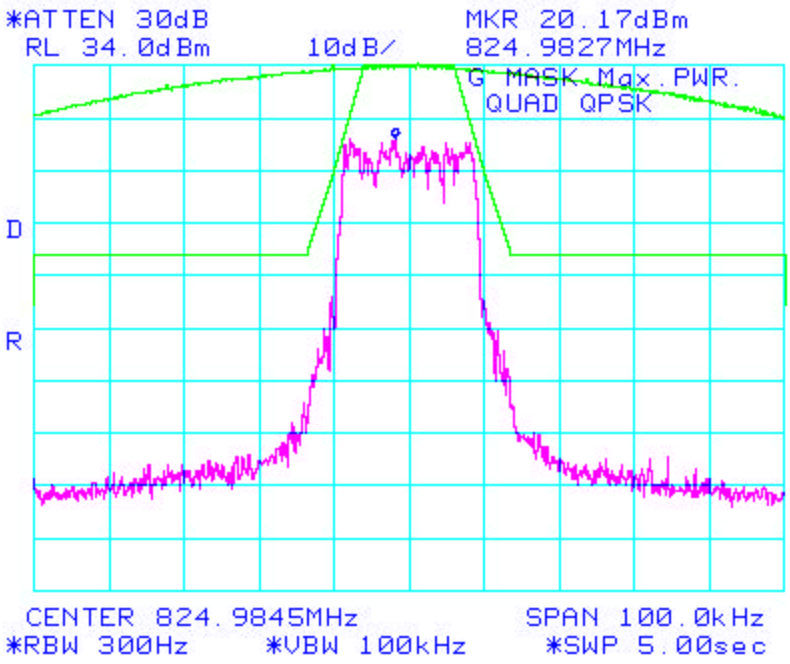
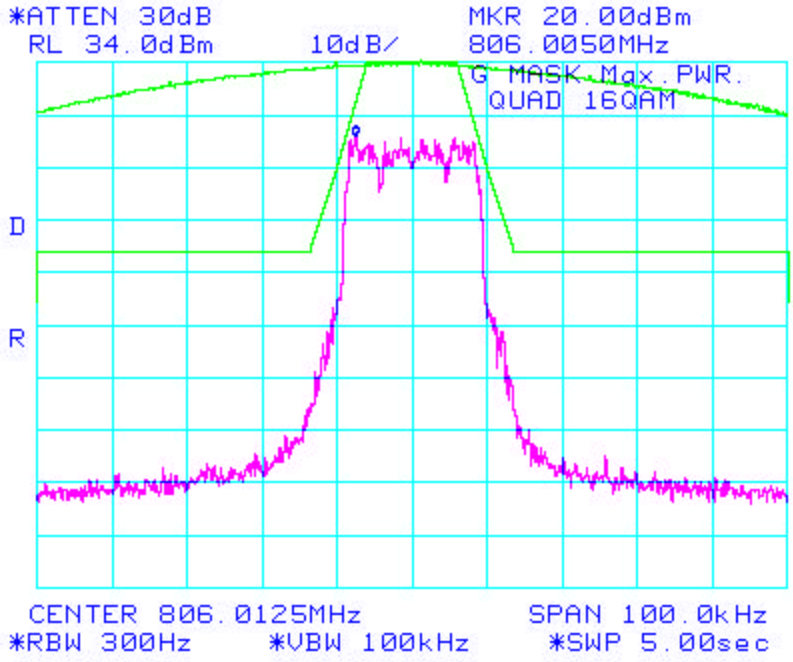


Figure 48: QUAD_16QAM_G Mask 90.210(g)



Conducted Emission Test Data Con't

Figure 49: QUAD_16QAM_G Mask 90.210(g)

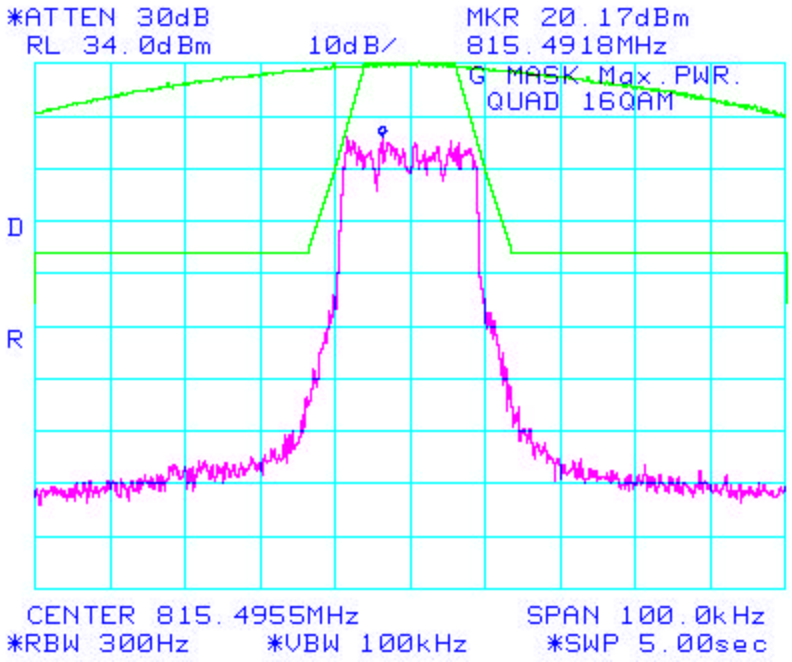
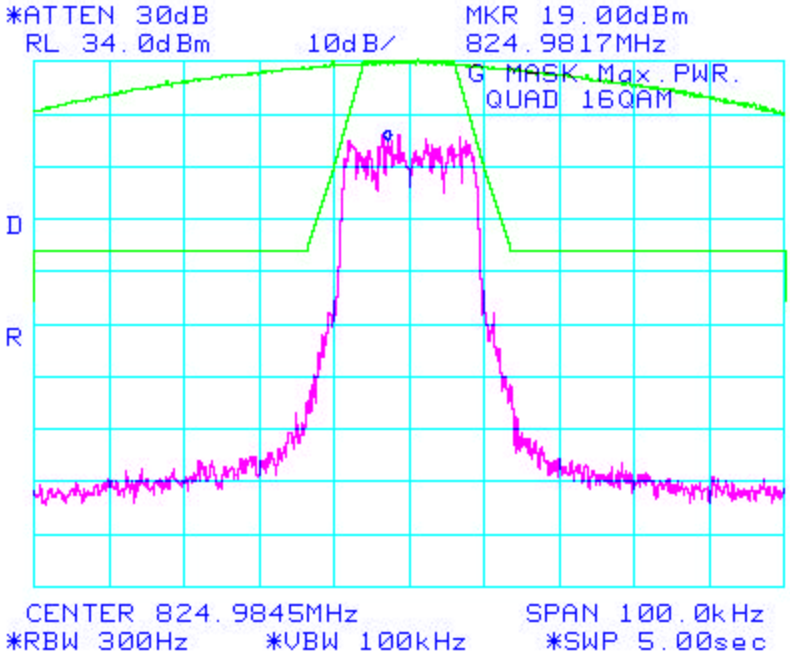


Figure 50: QUAD_16QAM_G Mask 90.210(g)



Conducted Emission Test Data Con't

Figure 51: QUAD_64QAM_G Mask 90.210(g)

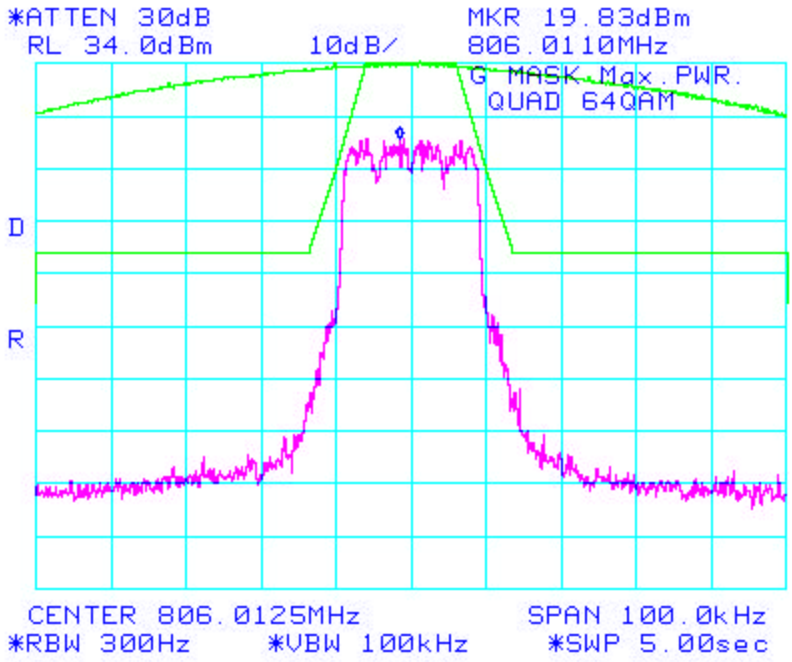
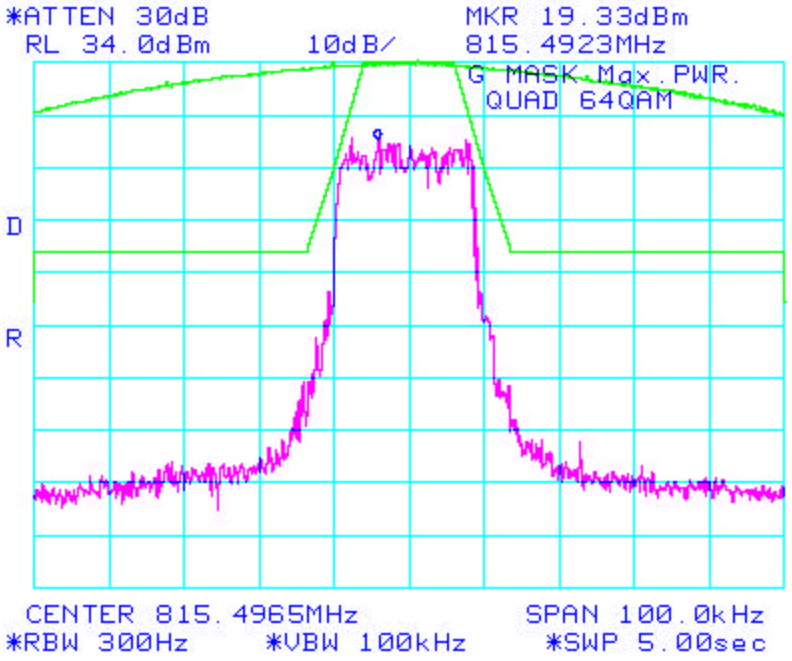
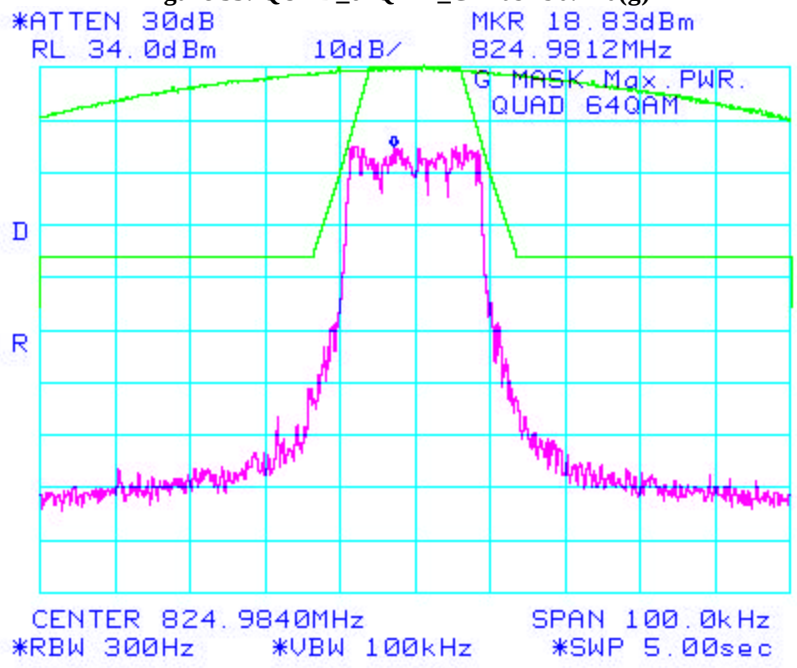


Figure 52: QUAD_64QAM_G Mask 90.210(g)

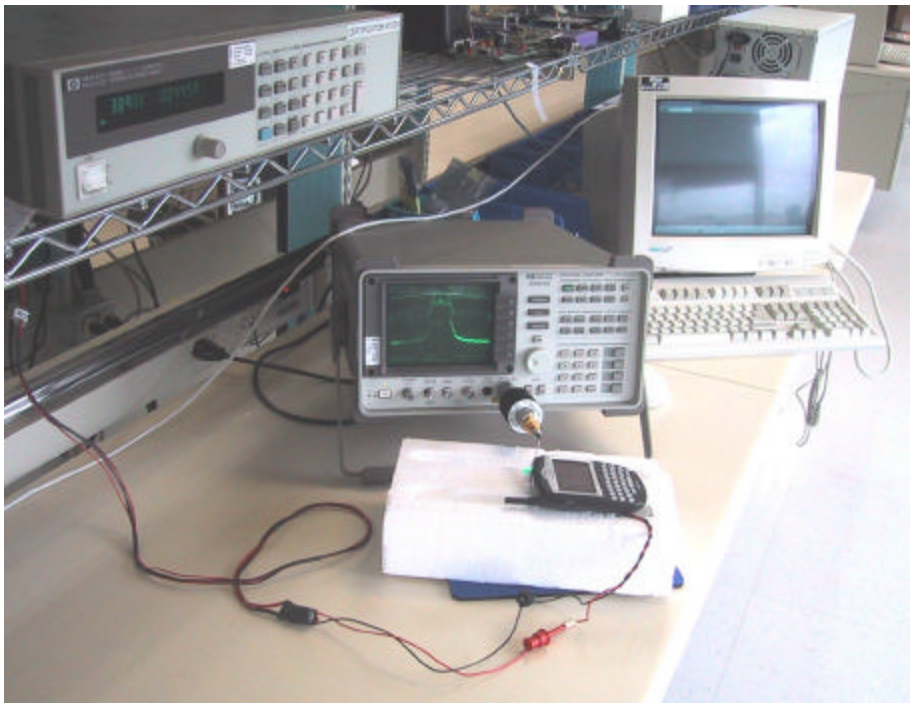


Conducted Emission Test Data Con't

Figure 53: QUAD_64QAM_G Mask 90.210(g)



Test Setup Photo

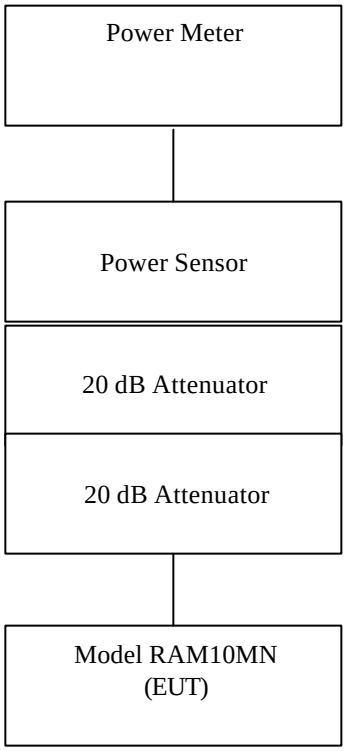


APPENDIX 2

CONDUCTED RF OUTPUT POWER TEST DATA

Conducted RF Output Power Test Data

Test Setup Diagram



Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Power Meter	Giga-Tronics	8541C	1837762	.01 – 18.0 GHz
Power Sensor	Giga-Tronics	80401A	1835838	.01 – 18.0 GHz
Attenuator, 20 dB, 25 W	Weinschel	33-20-33	BL8170	DC – 18 GHz
Attenuator, 20 dB, 25 W	Weinschel	33-20-34	BM0697	DC – 18 GHz

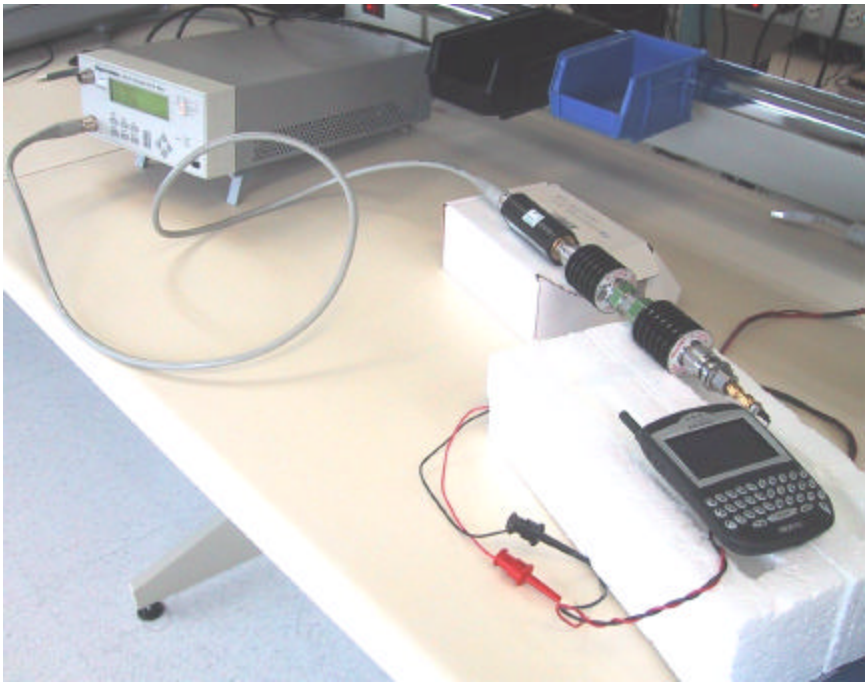
RF Power Output at Maximum

At three transmit frequencies the maximum radio output power level with a duty cycle of 33% was measured using the power meter. The calibrated insertion loss measured for the attenuator and cable assembly was added to the power measurements that produced the following results.

Test Data

	Frequency (MHz)	Measured Pulse Average Conducted Power (dBm)	Total Correction Factor (dB)	Corrected Pulse Average Conducted Power (dBm)
QPSK_4	806.0125	-12.70	40.4	27.70
QPSK_4	815.500	-12.55	40.4	27.85
QPSK_4	824.9875	-12.55	40.4	27.85
QAM_16	806.0125	-12.85	40.4	27.55
QAM_16	815.500	-12.45	40.4	27.95
QAM_16	824.9875	-12.65	40.4	27.75
QAM_64	806.0125	-12.70	40.4	27.70
QAM_64	815.500	-12.45	40.4	27.95
QAM_64	824.9875	-12.65	40.4	27.55

Conducted RF Output Power Test Data Photo

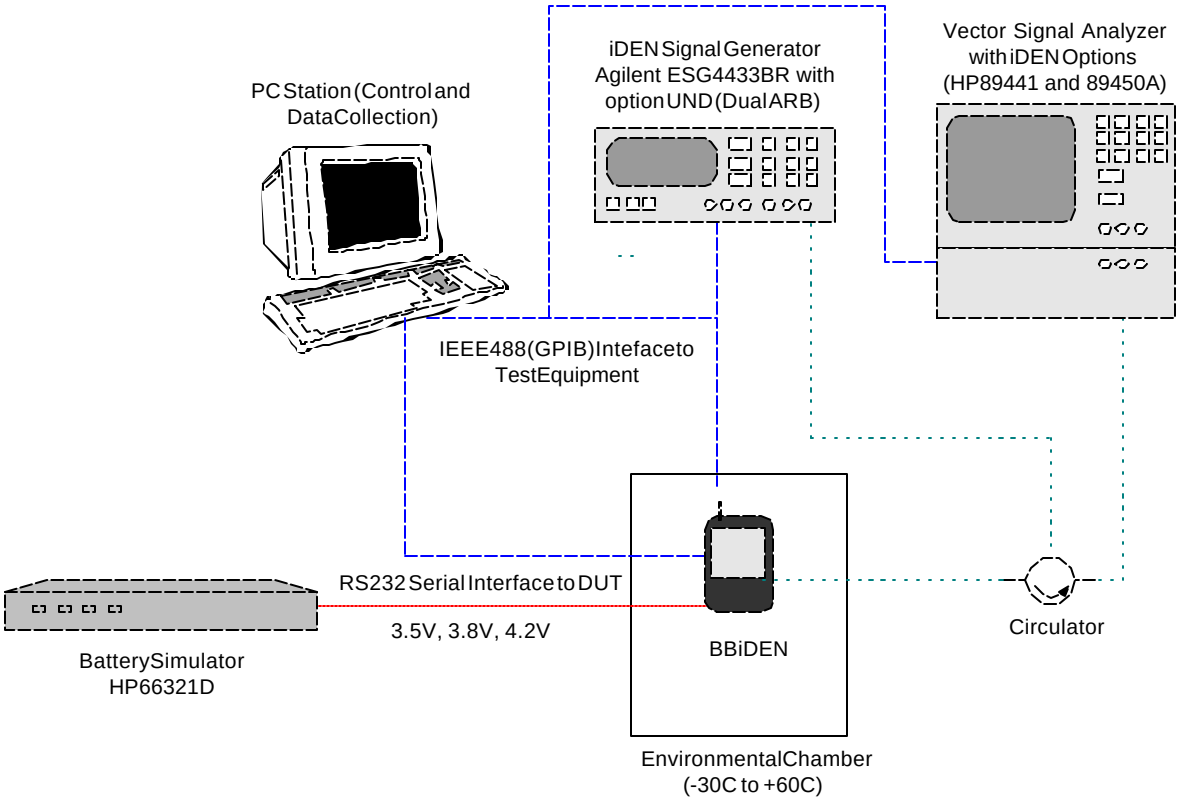


APPENDIX 3

FREQUENCY STABILITY TEST DATA

Frequency Stability Test Data

The following document contains measurement data pertaining to Frequency Stability.



SYSTEM	*Model*	*Serial Number*	*Calibration Date.*
Agilent Vector Signal Analyzer	HP89441 with HP89450A	US39313988 and US39312360	2004-08-20
HP Battery Simulator	HP66321D	GB40180110	2004-08-19
Signal Generator	HP ESG4433BR	US38440638	2004-02-14
Network Analyzer (Calibration)	8720D	IS3614083457	2004-08-05
Calibration Kit	HP85032B	3217A13134	2004-01-04
Espec Environmental Chamber	SH241	92000147	N/A
Temperature Probe	61161-302	21352860	2003-09-10

CFR 47 Chapter 1 - Federal Communications Commission Rules

Part 2.947, 2.1055 and 90.213

Required Measurements for Frequency Stability

Procedures
Temperature Variation
Voltage Variation

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

The BlackBerry iDEN Handheld's (referred to as EUT from hereinafter) transmitted frequency stability is less than 0.1 ppm of the ideal transmit frequency. The frequency accuracy is measured by the HP89441 Vector Signal Analyzer.

The BlackBerry iDEN Handheld meets the requirements as stated in CFR 47 chapter 1, Section 2.947, 2.1055 and 90.213, Frequency Stability.

Frequency Stability measurement devices were configured as presented in the block diagram recording frequency, temperatures, and stepped voltages which were controlled via GPIB interfaces linked to the Environmental chamber, a Battery Simulator, a Signal Generator and the Vector Signal Analyzer. The test set was calibrated to characterize the insertion loss for the transmitted frequencies between the RF input of the Vector Signal Analyzer and the EUT antenna port. The EUT is located inside the environmental chamber.
Calibration for the cable loss was performed in the Ottawa RF Laboratory on August 06, 2003.

Procedure:
Full two-port calibration of 8753ES using the 85032B was completed. The test set calibration was made over the transmitter band from 806 MHz to 825 MHz using 1601 points. The calibration data was linearly interpolated where the test frequency did not land on an exact calibration point.

Procedure:

The EUT was placed in the temperature chamber and connected to the test set. The EUT was kept in idle mode at all times except when the measurements were to be made.

The chamber was switched on, and the temperature was set to –30º C.

After the chamber stabilized at -30º C there was a soak period of 30 minutes. A period of thirty minutes soak was maintained between each ascending temperature step prior to the start of the next measurement test cycle.
A computer system controlled the automated software. All the test equipment intrinsic to the temperature and voltage tests was controlled via the GPIB Bus. The EUT communication was passed through a RS232 serial connection.

The frequency accuracy was averaged over 16 transmit bursts for each combination temperature, voltage and frequency. Four frequencies were selected: 806.0125, 813.5125, 820.9875 and 824.9875 MHz.

The power supply was cycled from minimum voltage of 3.5 volts to 3.8 volts nominal and 4.2V maximum operating voltage under load. The frequency error was measured at the maximum output power of 28 dBm and recorded by the automated system test software. The frequency was recorded in MHz and deviation from nominal, in Parts Per Million.

Procedure:

The test system software for commencing the Frequency Stability Tests carried through the following cycle.

1. Switch on the HP66321D battery simulator, The ESG4433BR signal generator, the HP89441 Vector Signal Analyzer.
2. Start system test program
3. Set the Temperature to –30 degrees Celsius and maintain a period of thirty minutes soak time, with the EUT supply voltage disabled.
4. Set power supply voltage to 3.5 volts
5. Set up HP89441 Vector Signal Analyzer.
6. Set the VSA to 806.0125 MHz.
7. Enable the voltage to the EUT, and connect a link to the VSA.
8. Set the transmit frequency of the EUT to 806.0125MHz and put the EUT in RTR (receive/transmit) mode.
9. Capture 16 bursts with the VSA and record the average frequency error over the 16 bursts.
10. Put the EUT back into IDLE mode, change the frequency on the VSA and the EUT to 813.5125 MHz and repeat steps 7, to 9. Repeat again for 820.9875 and 824.9875 MHz.
11. Repeat steps 5, to 10 changing the supply voltage to 3.8 volts. Then repeat with the supply voltage at 4.2 volts.
12. Increase temperature by 10?C and soak for 1/2 hour.
13. Repeat steps 4 - 12 for temperatures –30 degrees to 60 degrees Celsius.

Channel results: 806.0125, 813.5125, 820.9875 and 824.9875 MHz @ 20?C and maximum transmitted power

Frequency (MHz)	Tx Power (dBm)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
806.0125	28	3.5	20	4.26	0.0053
813.5125	28	3.5	20	22.60	0.0278
820.9875	28	3.5	20	27.68	0.0337
824.9875	28	3.5	20	-5.19	-0.0063

Frequency (MHz)	Tx Power (dBm)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
806.0125	28	3.8	20	-74.73	-0.0927
813.5125	28	3.8	20	1.94	0.0024
820.9875	28	3.8	20	2.80	0.0034
824.9875	28	3.8	20	2.92	0.0035

Frequency (MHz)	Tx Power (dBm)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
806.0125	28	4.2	20	-1.68	-0.0021
813.5125	28	4.2	20	-12.62	-0.0155
820.9875	28	4,2	20	1.60	0.0019
824.9875	28	3.8	20	-5.52	-0.067

Channel Results: 806.0125 @ maximum transmitted power

Frequency (MHz)	Tx Power (dBm)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
806.0125	28	3.5	-30	-2.30	-0.0029
806.0125	28	3.5	-20	-3.24	-0.0040
806.0125	28	3.5	-10	6.14	0.0076
806.0125	28	3.5	0	22.60	0.0280
806.0125	28	3.5	10	66.12	0.0820
806.0125	28	3.5	20	4.26	0.0053
806.0125	28	3.5	30	22.09	0.0274
806.0125	28	3.5	40	-43.89	0.0545
806.0125	28	3.5	50	32.49	0.0403
806.0125	28	3.5	60	55.56	0.0689

Frequency (MHz)	Tx Power (dBm)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
806.0125	28	3.8	-30	-0.63	-0.0008
806.0125	28	3.8	-20	-3.51	-0.0044
806.0125	28	3.8	-10	33.38	0.0414
806.0125	28	3.8	0	4.11	0.0051
806.0125	28	3.8	10	4.61	0.0057
806.0125	28	3.8	20	-74.73	0.0927
806.0125	28	3.8	30	3.32	0.0041
806.0125	28	3.8	40	-17.94	-0.0223
806.0125	28	3.8	50	0.44	0.0005
806.0125	28	3.8	60	-6.62	-0.0082

Frequency (MHz)	Tx Power (dBm)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
806.0125	28	4.2	-30	-0.96	-0.0012
806.0125	28	4.2	-20	-10.78	-0.0134
806.0125	28	4.2	-10	-7.87	-0.0098
806.0125	28	4.2	0	-2.06	-0.026
806.0125	28	4.2	10	25.81	0.0320
806.0125	28	4.2	20	-1.68	-0.0021
806.0125	28	4.2	30	0.44	0.0006
806.0125	28	4.2	40	-2.84	-0.0035
806.0125	28	4.2	50	-12.82	-0.0159
806.0125	28	4.2	60	-13.92	-0.0173

Channel Results: 813.5125 @ maximum transmitted power

Frequency (MHz)	Tx Power (dBm)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
813.5125	28	3.5	-30	66.23	0.0814
813.5125	28	3.5	-20	20.16	0.0248
813.5125	28	3.5	-10	9.05	0.0111
813.5125	28	3.5	0	27.41	0.0337
813.5125	28	3.5	10	26.07	0.0320
813.5125	28	3.5	20	22.60	0.0278
813.5125	28	3.5	30	-5.64	-0.0069
813.5125	28	3.5	40	20.73	0.0255
813.5125	28	3.5	50	47.58	0.0585
813.5125	28	3.5	60	35.48	0.0436

Frequency (MHz)	Tx Power (dBm)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
813.5125	28	3.8	-30	-3.80	-0.0047
813.5125	28	3.8	-20	-5.42	-0.0067
813.5125	28	3.8	-10	2.51	0.0031
813.5125	28	3.8	0	5.91	0.0073
813.5125	28	3.8	10	-6.42	-0.0079
813.5125	28	3.8	20	1.94	-0.0024
813.5125	28	3.8	30	-0.65	-0.0008
813.5125	28	3.8	40	-2.49	0.0031
813.5125	28	3.8	50	-14.36	-0.0177
813.5125	28	3.8	60	-3.85	-0.0047

Frequency (MHz)	Tx Power (dBm)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
813.5125	28	4.2	-30	0.41	0.0005
813.5125	28	4.2	-20	-3.50	-0.0043
813.5125	28	4.2	-10	-2.16	-0.0027
813.5125	28	4.2	0	-1.32	-0.016
813.5125	28	4.2	10	-0.70	-0.0009
813.5125	28	4.2	20	-12.62	-0.0155
813.5125	28	4.2	30	-27.07	-0.0333
813.5125	28	4.2	40	-18.41	-0.0226
813.5125	28	4.2	50	-1.91	-0.0024
813.5125	28	4.2	60	-23.24	-0.0286

Channel Results: 820.9875 @ maximum transmitted power

Frequency (MHz)	Tx Power (dBm)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
820.9875	28	3.5	-30	9.94	0.0121
820.9875	28	3.5	-20	-14.67	-0.0179
820.9875	28	3.5	-10	34.04	0.0415
820.9875	28	3.5	0	27.88	0.0340
820.9875	28	3.5	10	30.03	0.0366
820.9875	28	3.5	20	27.68	0.0337
820.9875	28	3.5	30	18.72	0.0228
820.9875	28	3.5	40	29.91	0.0364
820.9875	28	3.5	50	34.59	0.0421
820.9875	28	3.5	60	-4.53	-0.0055

Frequency (MHz)	Tx Power (dBm)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
820.9875	28	3.8	-30	13.54	0.0165
820.9875	28	3.8	-20	4.81	0.0059
820.9875	28	3.8	-10	12.21	0.0149
820.9875	28	3.8	0	4.47	0.0055
820.9875	28	3.8	10	9.34	0.0114
820.9875	28	3.8	20	2.80	0.0034
820.9875	28	3.8	30	-0.41	-0.0005
820.9875	28	3.8	40	-0.63	-0.0008
820.9875	28	3.8	50	0.60	0.0007
820.9875	28	3.8	60	-11.19	-0.0136

Frequency (MHz)	Tx Power (dBm)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
820.9875	28	4.2	-30	-4.85	-0.0059
820.9875	28	4.2	-20	34.04	0.0415
820.9875	28	4.2	-10	-11.84	-0.0144
820.9875	28	4.2	0	-14.93	-0.0182
820.9875	28	4.2	10	-5.52	-0.0067
820.9875	28	4.2	20	1.60	0.0019
820.9875	28	4.2	30	1.88	0.0023
820.9875	28	4.2	40	-22.14	-0.0270
820.9875	28	4.2	50	-9.64	-0.0117
820.9875	28	4.2	60	-0.34	-0.0004

Channel Results: 824.9875 @ maximum transmitted power

Frequency (MHz)	Tx Power (dBm)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
824.9875	28	3.5	-30	4.36	0.0053
824.9875	28	3.5	-20	16.31	0.0198
824.9875	28	3.5	-10	21.22	0.0257
824.9875	28	3.5	0	19.07	0.0231
824.9875	28	3.5	10	27.16	0.0329
824.9875	28	3.5	20	-5.19	-0.0063
824.9875	28	3.5	30	9.01	0.0109
824.9875	28	3.5	40	24.78	0.0300
824.9875	28	3.5	50	39.45	0.0478
824.9875	28	3.5	60	19.00	0.0230

Frequency (MHz)	Tx Power (dBm)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
824.9875	28	3.8	-30	6.93	0.0084
824.9875	28	3.8	-20	11.80	0.0143
824.9875	28	3.8	-10	-15.72	-0.0191
824.9875	28	3.8	0	-11.74	-0.0142
824.9875	28	3.8	10	4.52	0.0055
824.9875	28	3.8	20	2.92	0.0035
824.9875	28	3.8	30	-4.06	-0.0049
824.9875	28	3.8	40	-10.07	-0.0122
824.9875	28	3.8	50	-15.94	-0.0193
824.9875	28	3.8	60	-27.15	-0.0329

Frequency (MHz)	Tx Power (dBm)	Voltage (Volts)	Temperature (Celsius)	Frequency Error (Hz)	PPM
824.9875	28	4.2	-30	-31.90	-0.0387
824.9875	28	4.2	-20	5.08	0.0062
824.9875	28	4.2	-10	1.09	0.0013
824.9875	28	4.2	0	-4.18	-0.0051
824.9875	28	4.2	10	0.92	0.0011
824.9875	28	4.2	20	-5.52	-0.0067
824.9875	28	4.2	30	-15.79	-0.0191
824.9875	28	4.2	40	-6.08	-0.0074
824.9875	28	4.2	50	-29.13	-0.0353
824.9875	28	4.2	60	-6.75	-0.0082