

6 – SPURIOUS EMISSIONS AT ANTENNA TERMINALS

6.1 Applicable Standards

According to FCC §2.1049 and §22.917(a), on any frequency outside of the authorized operating frequency range, the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB.

6.2 Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 1 MHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

6.3 Test Equipment

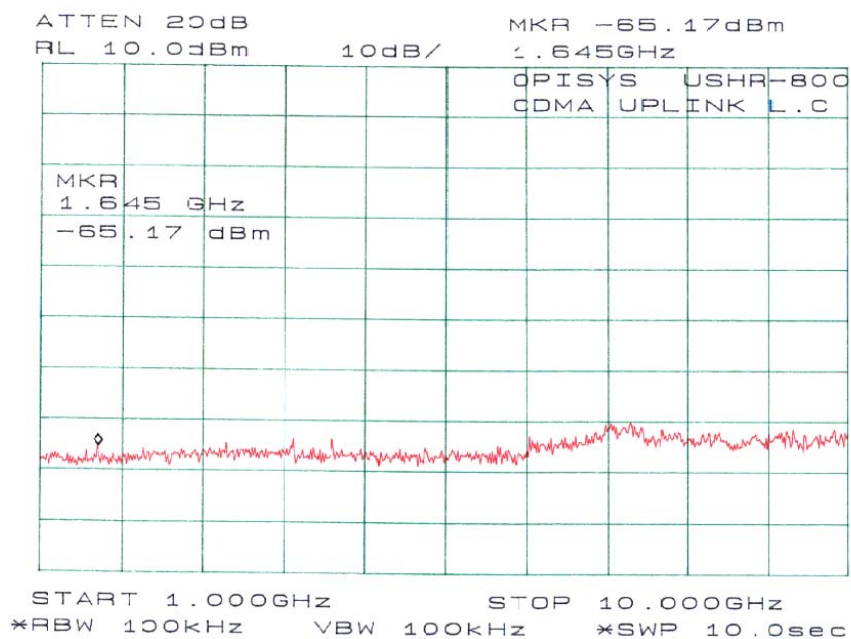
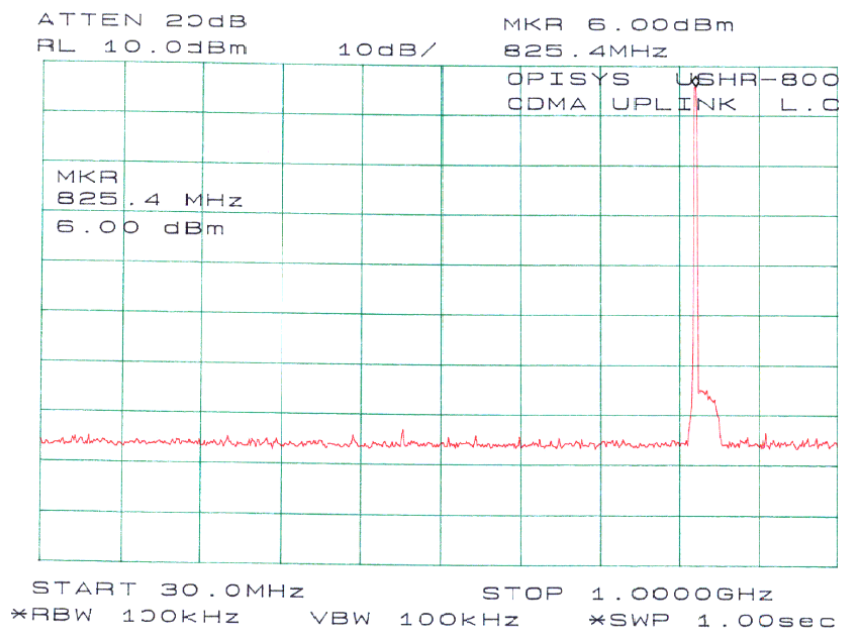
Hewlett Packard HP8566B Spectrum Analyzer
Hewlett Packard HP 7470A Plotter
Rohde & Schwarz SMIQ03B Signal Generator
Rohde & Schwarz AMIQ I/Q Modulation Generator

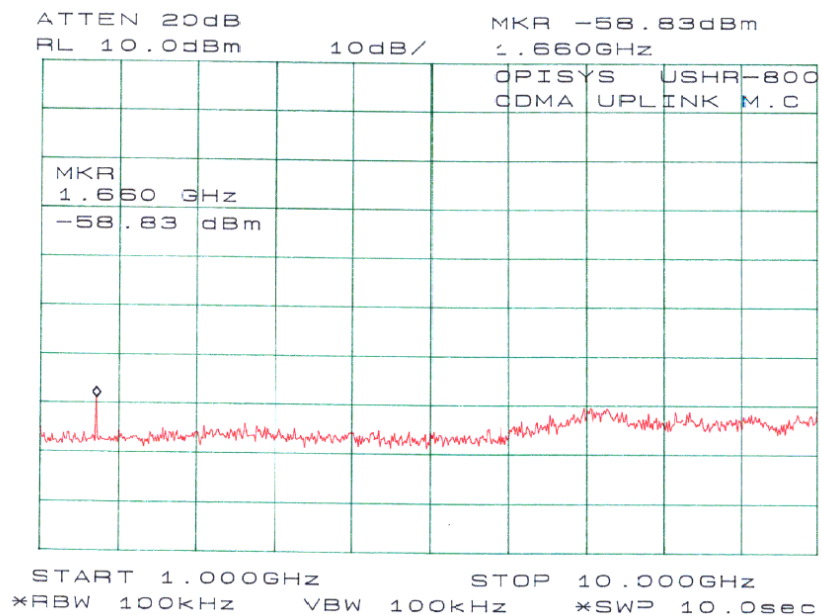
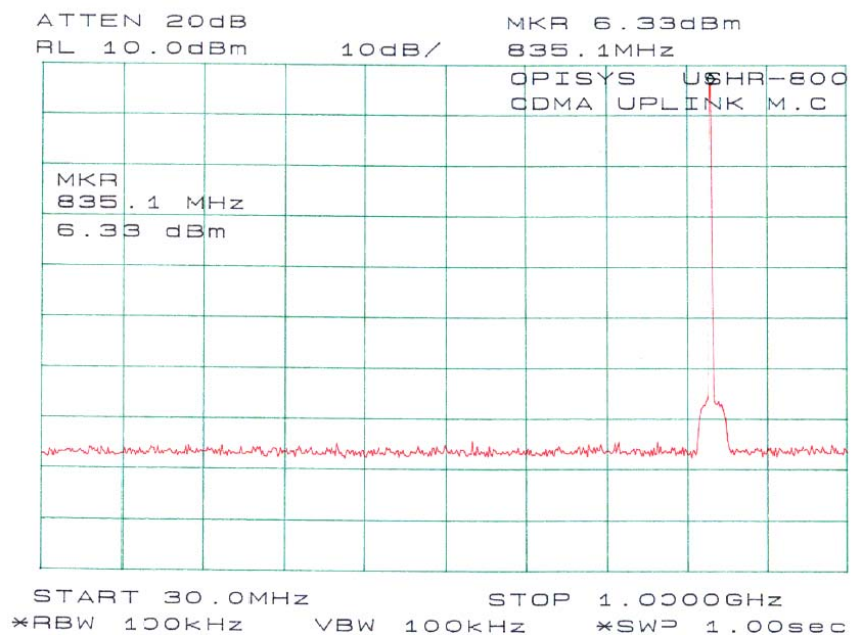
6.4 Test Results

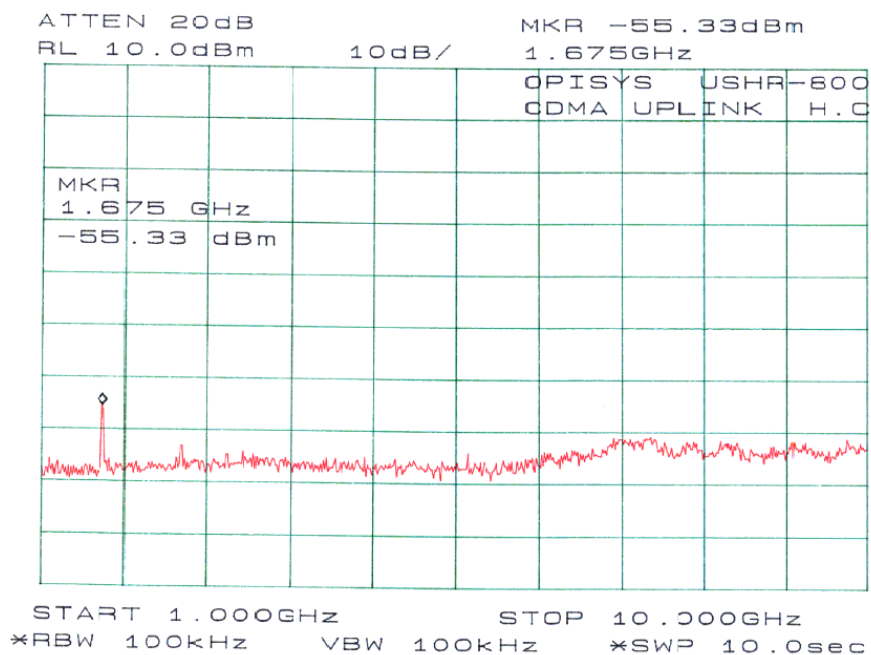
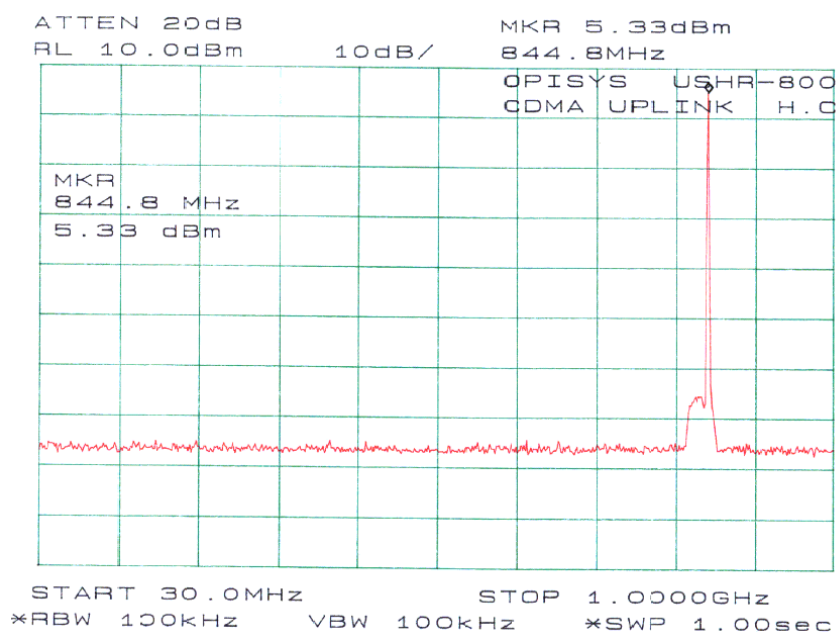
Modulation	Mode	Channel	Measured
CDMA	Up-link	Low	< -13dBm
		Mid	< -13dBm
		High	< -13dBm
	Down-link	Low	< -13dBm
		Mid	< -13dBm
		High	< -13dBm

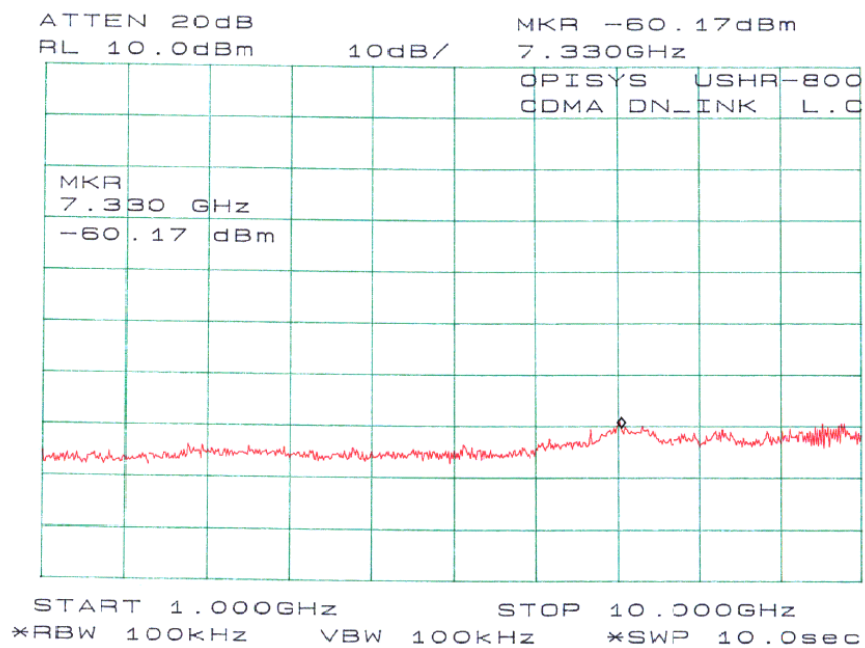
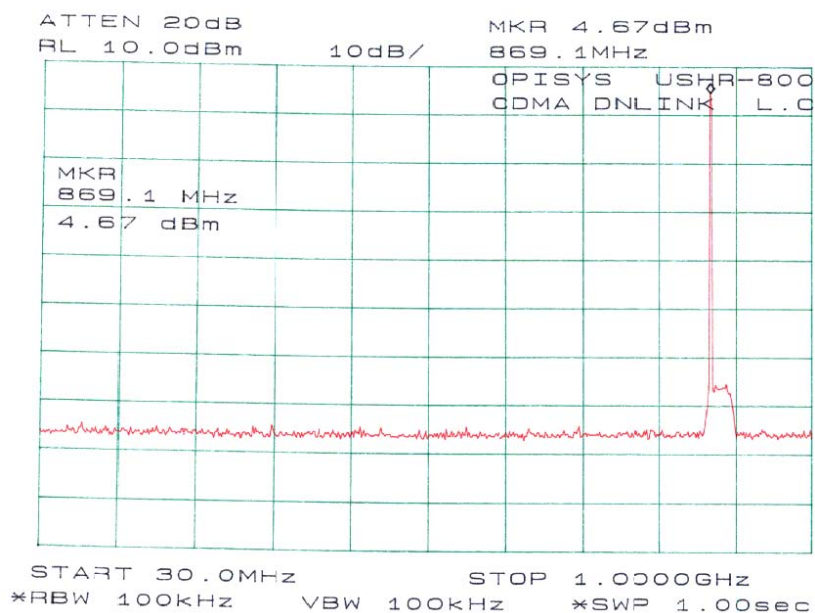
6.5 Plots of Out-of-Band Emissions at Antenna Terminal

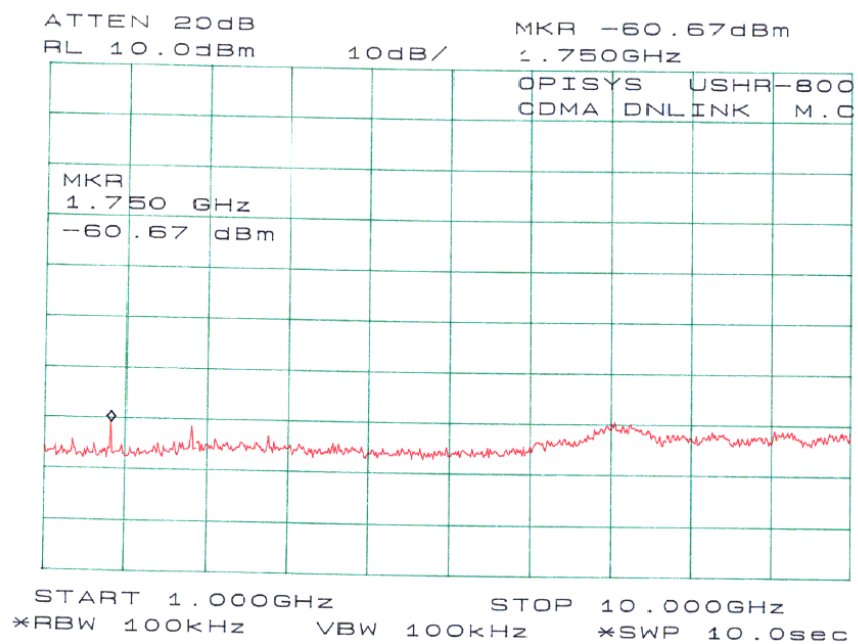
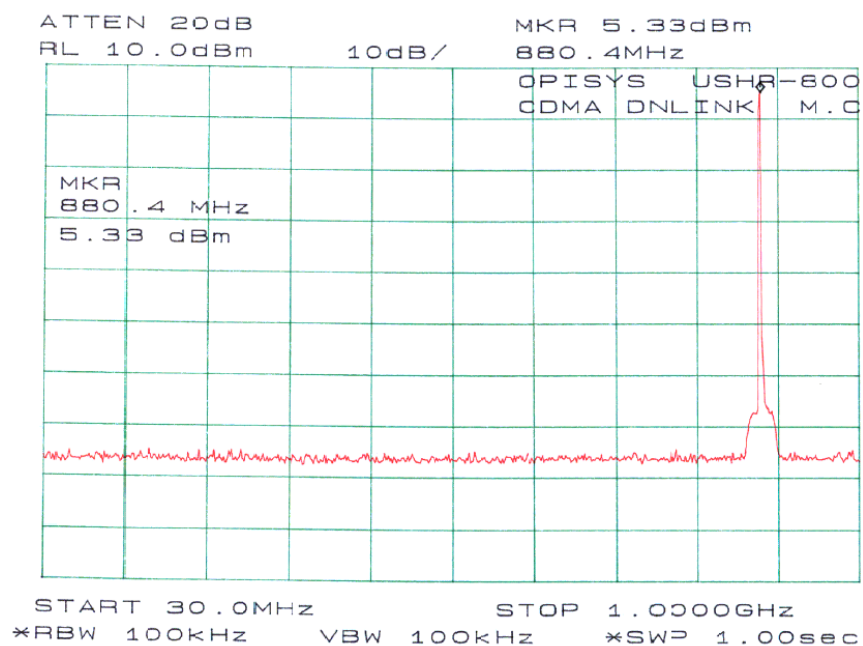
Please refer to plots hereinafter.

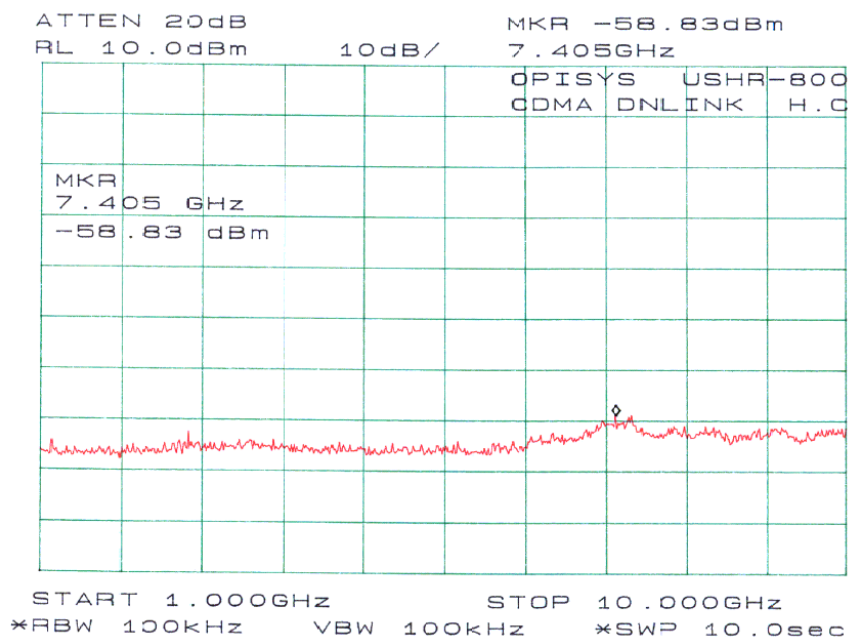
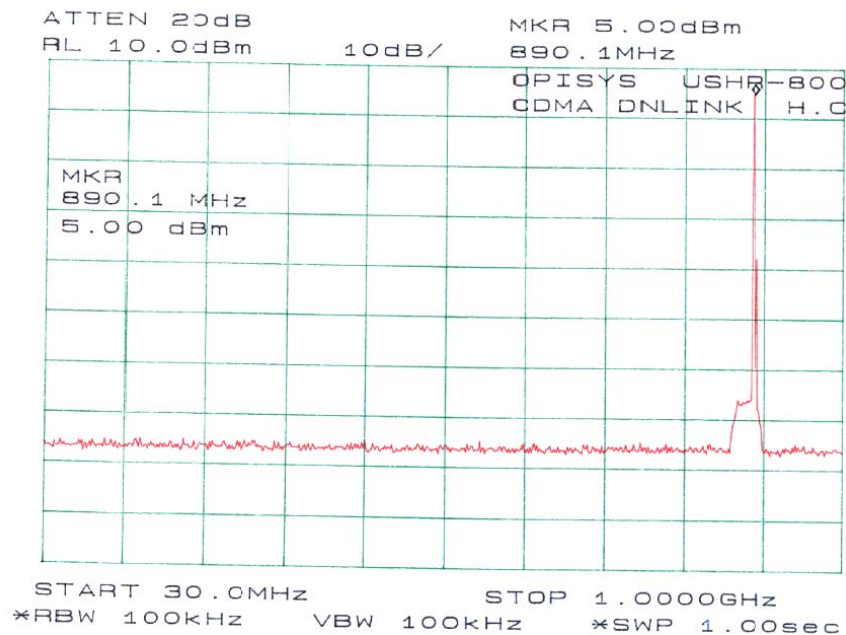












7 - TWO-TONE TEST

7.1 Applicable Standards

According to IS-138A (3.4.4), Intermodulation products must be attenuated below the rated power of the EUT by at least $43 + 10\log(P)$, equivalent to -13 dBm.

7.2 Test Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 1 MHz. Sufficient scans were taken to show any out of band emissions up to 10^{th} harmonic. Two input signals are equal in level (and can be raised equally), were send to the EUT.

7.3 Test Equipment

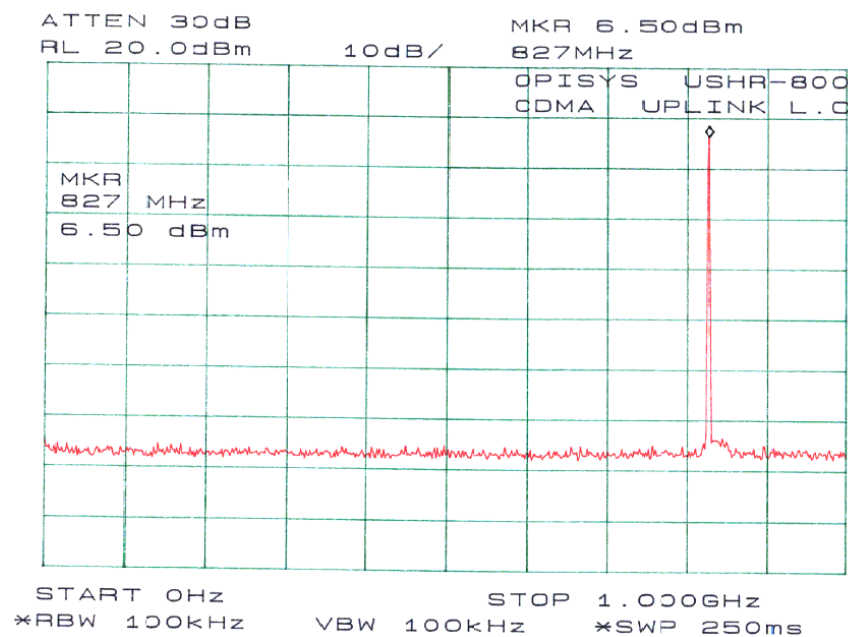
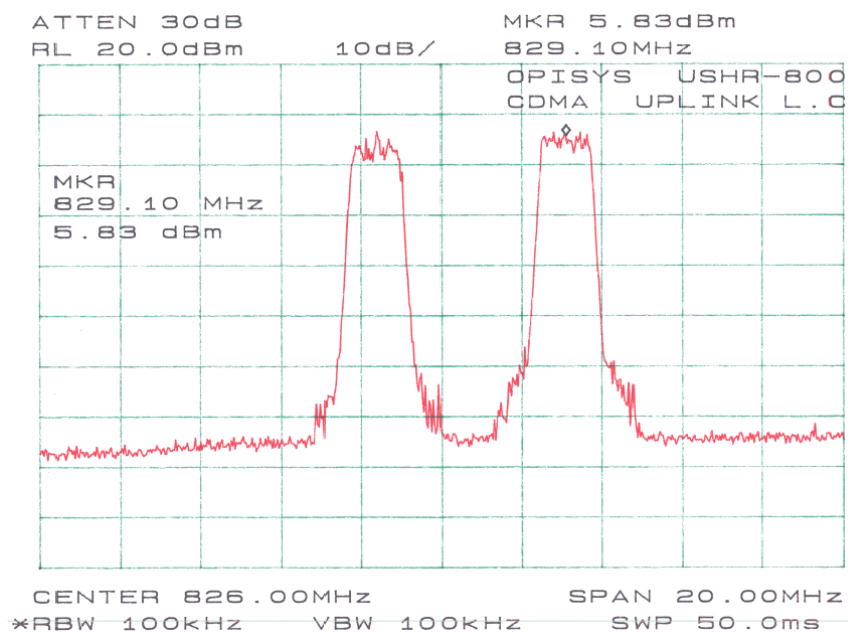
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Rohde & Schwarz SMIQ03B Signal Generator
Rohde & Schwarz AMIQ I/Q Modulation Generator

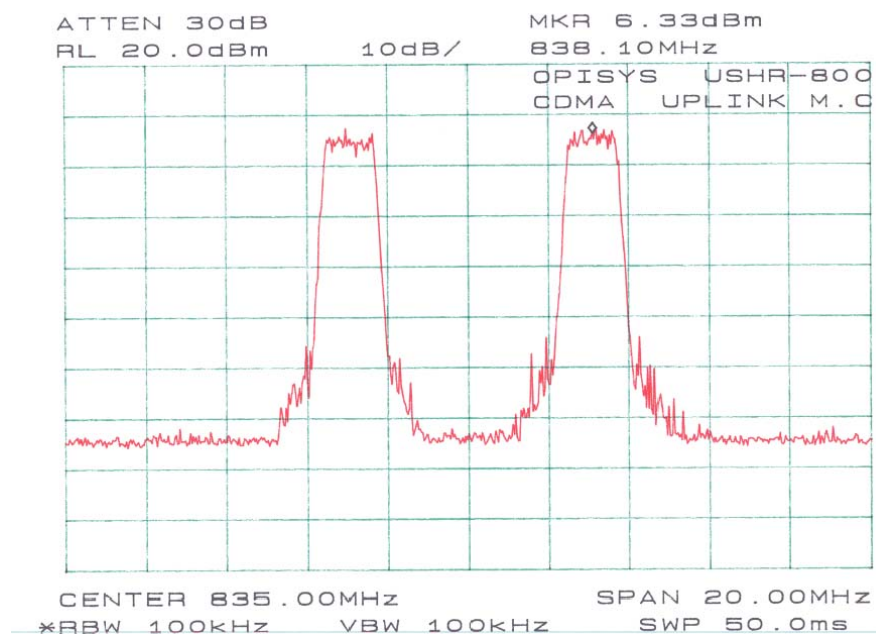
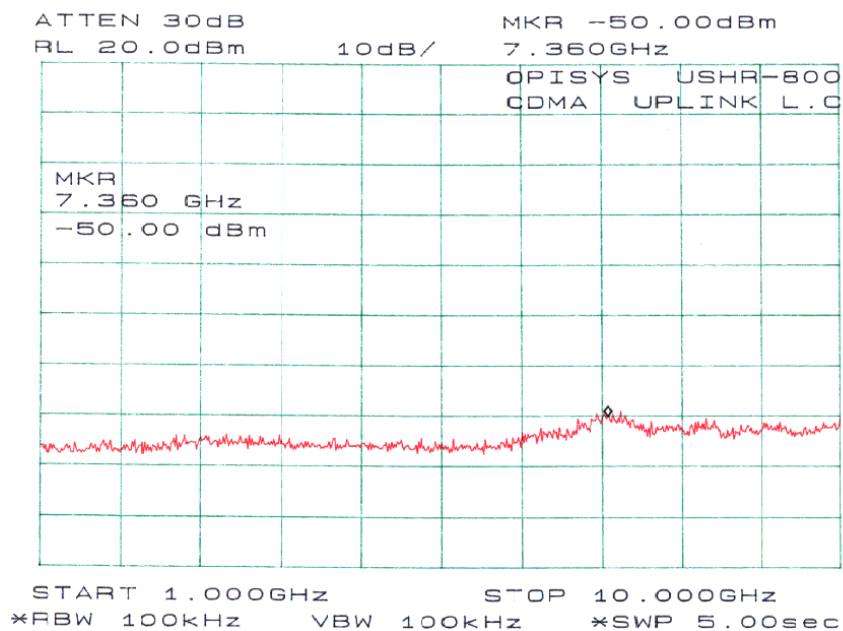
7.4 Test Results

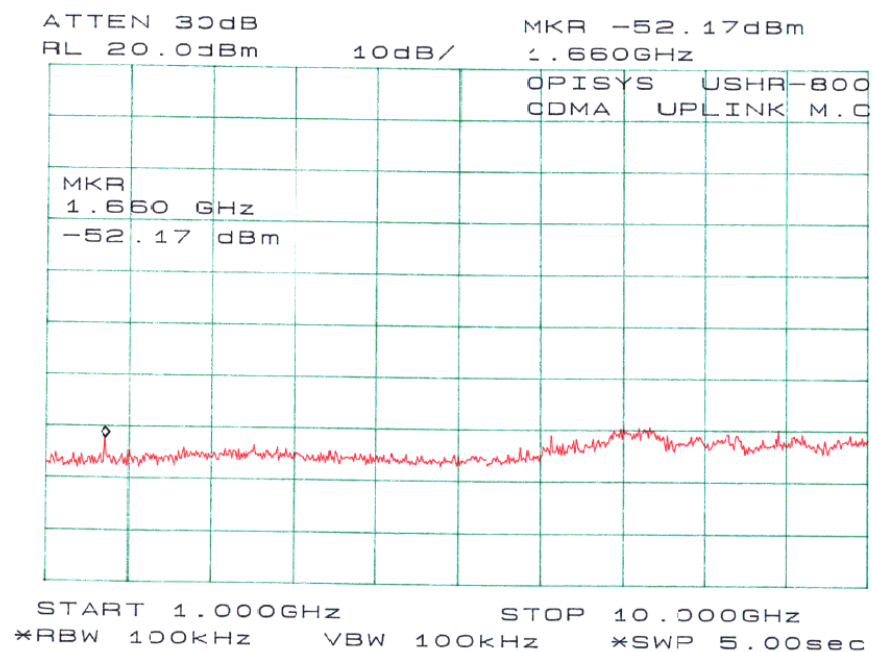
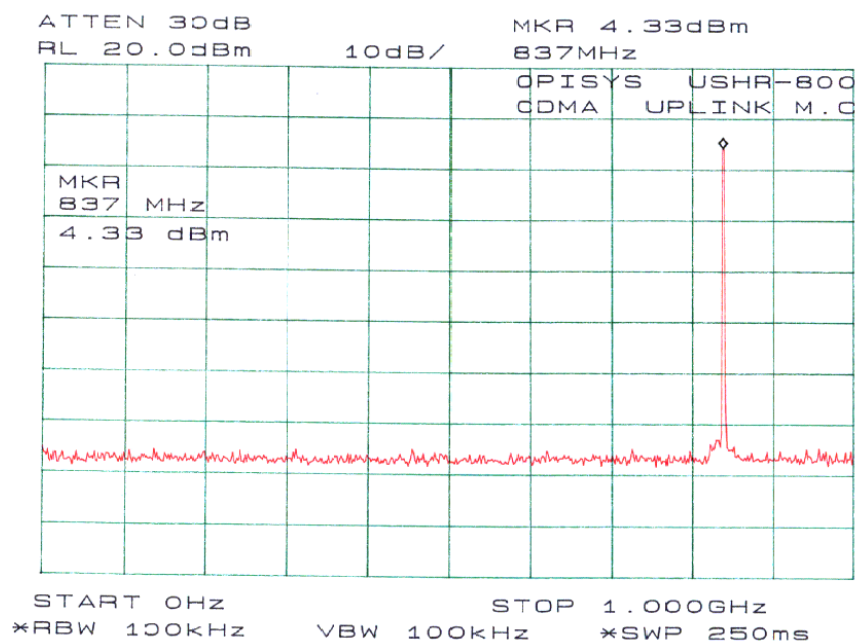
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		Mid	< -13dBm
		High	< -13dBm
	Down-link	Low	< -13dBm
		Mid	< -13dBm
		High	< -13dBm

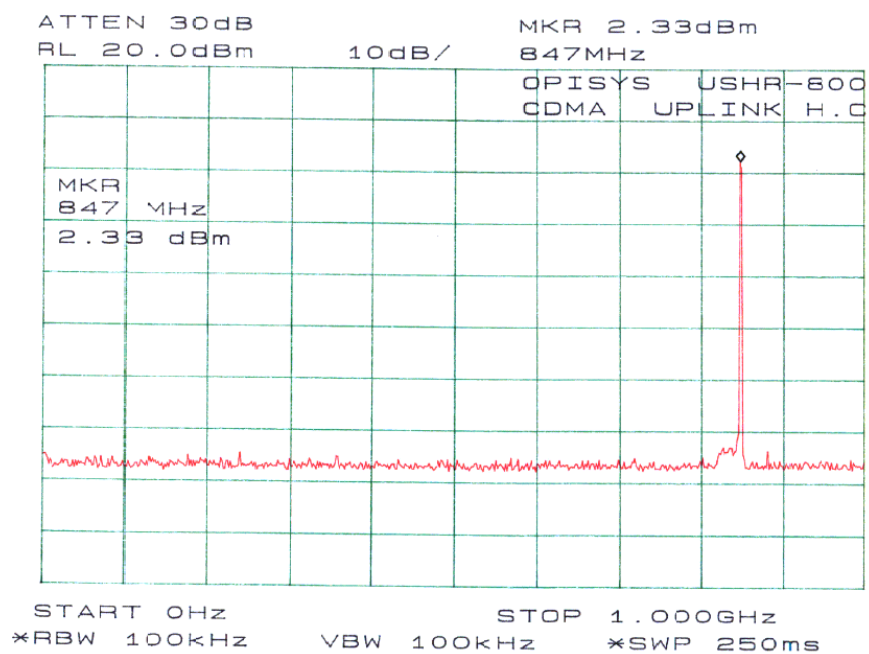
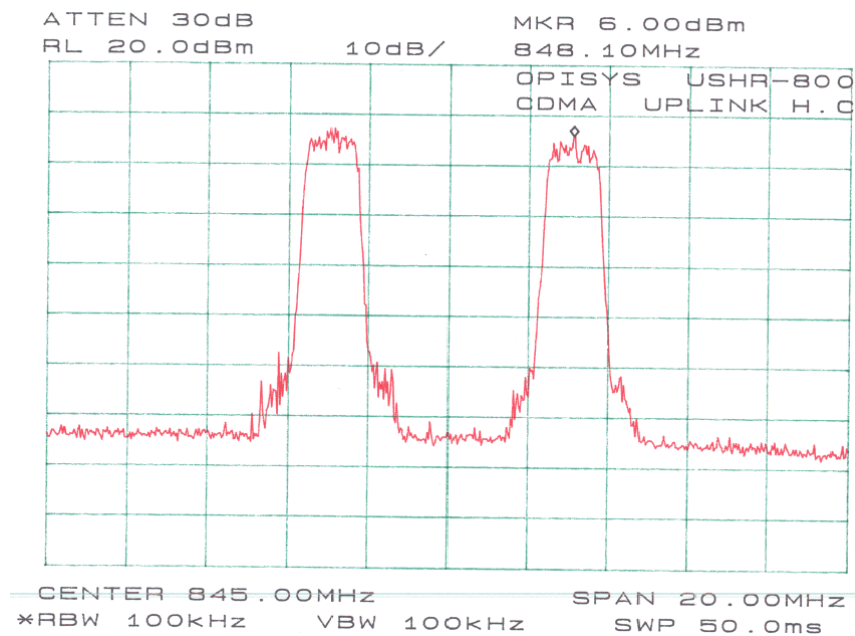
7.5 Plots of Two-Tone Test Result

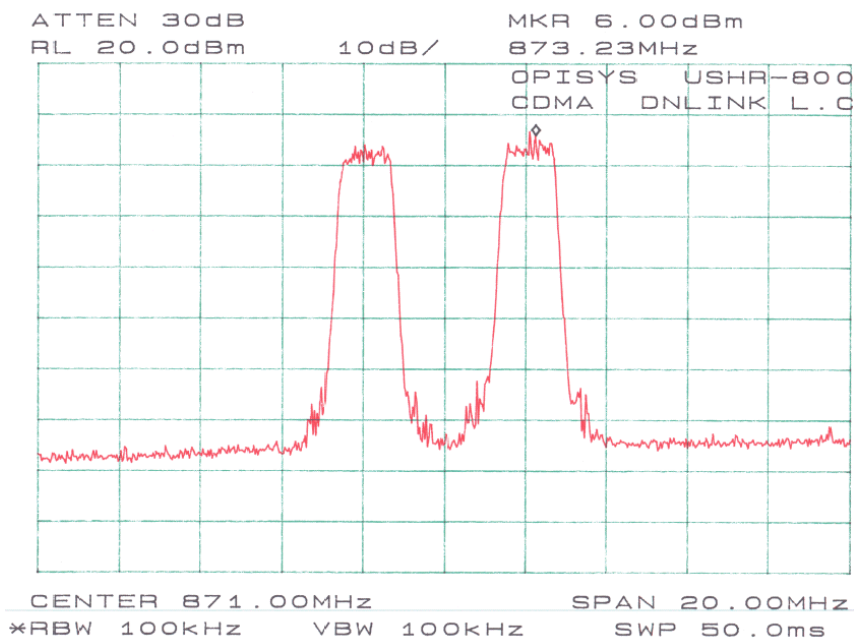
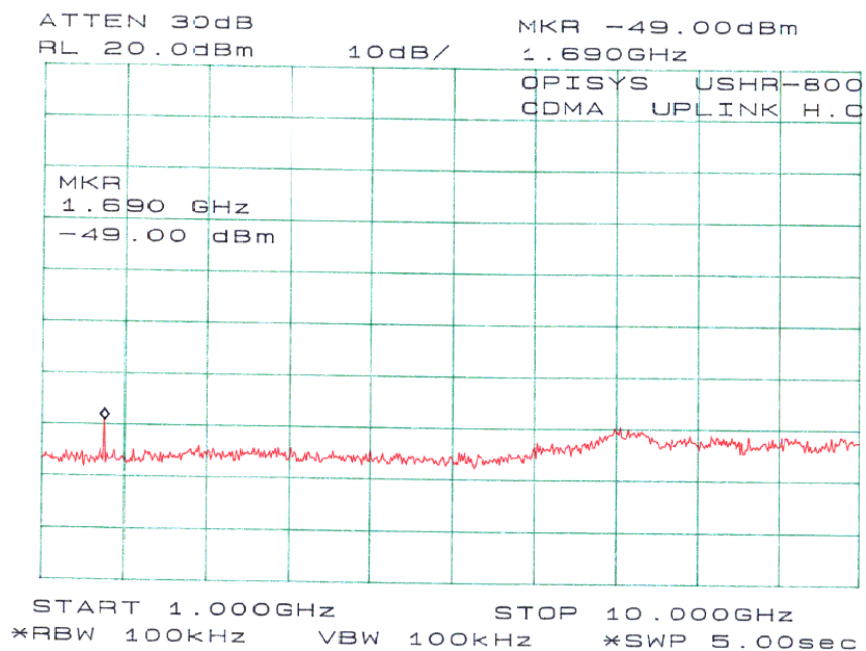
Please refer to plots hereinafter.

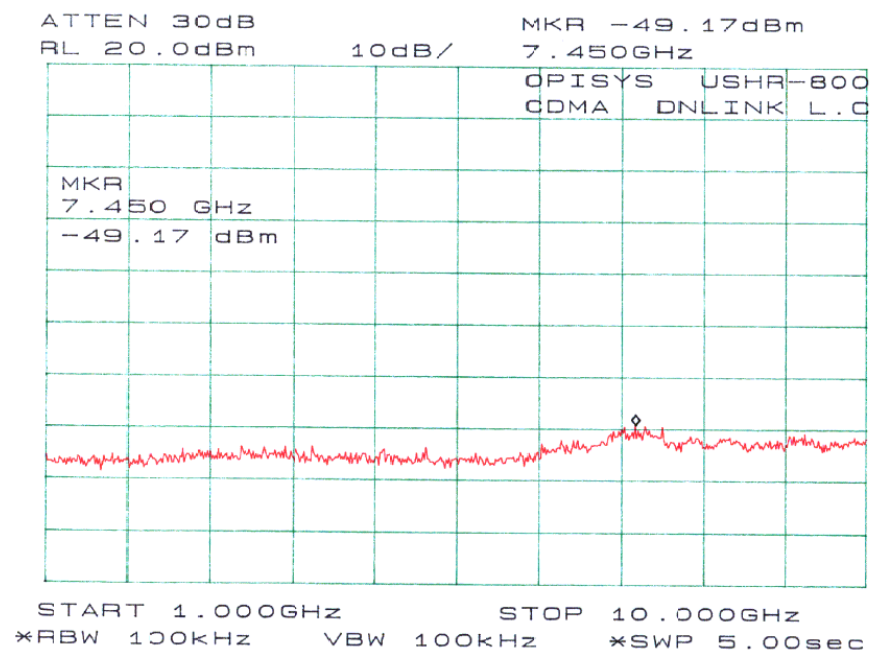
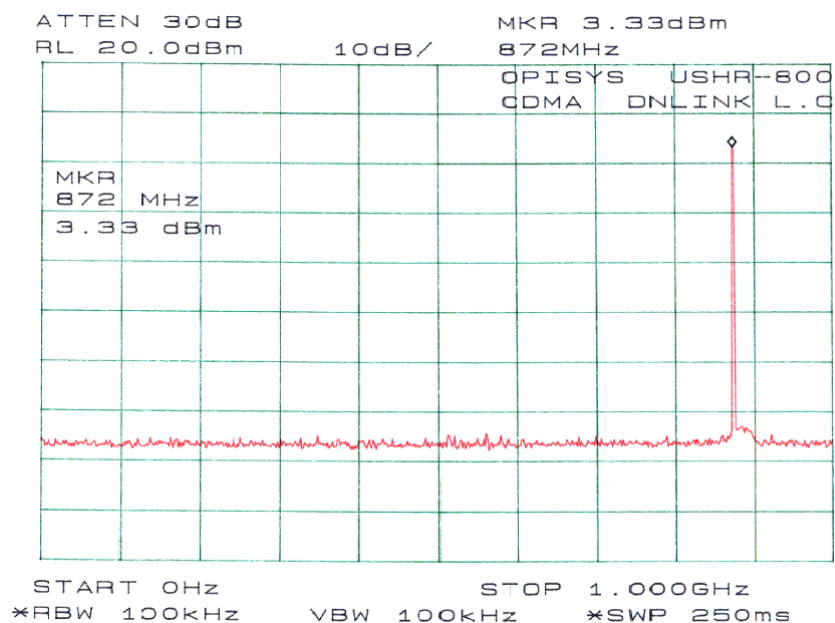


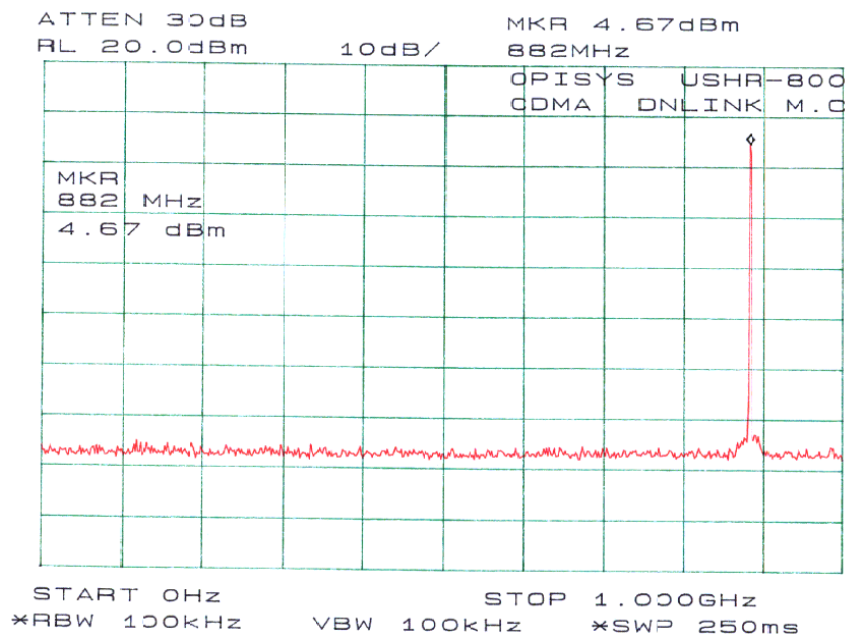
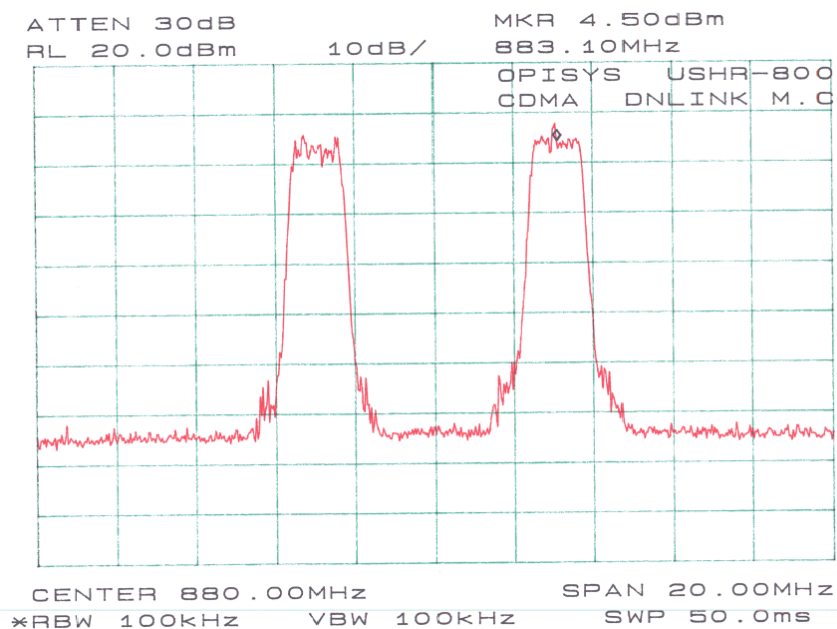


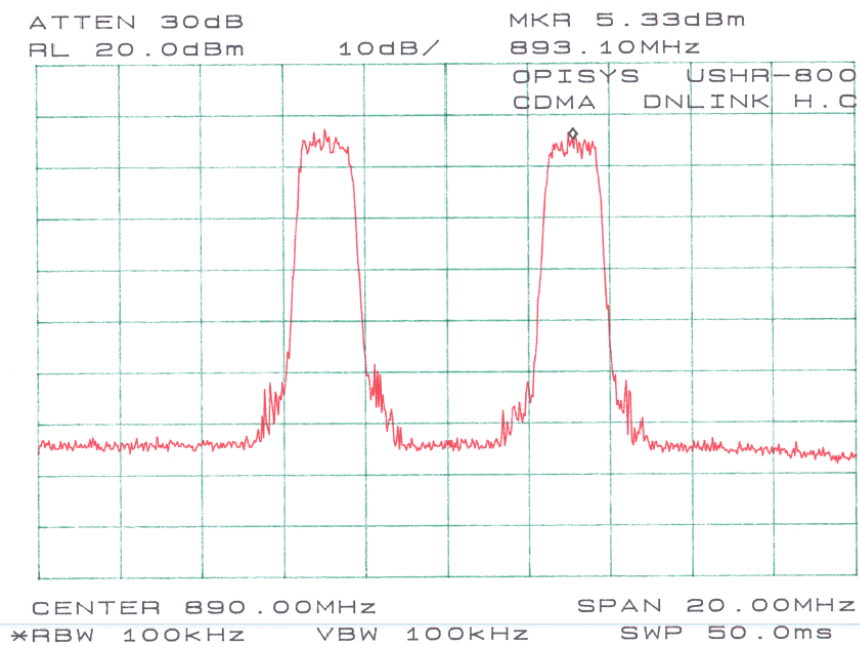
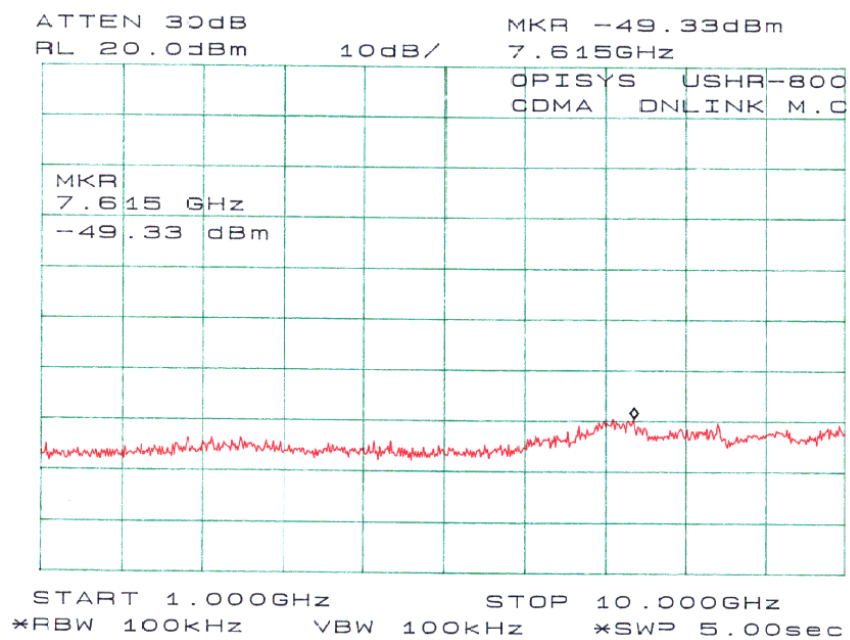


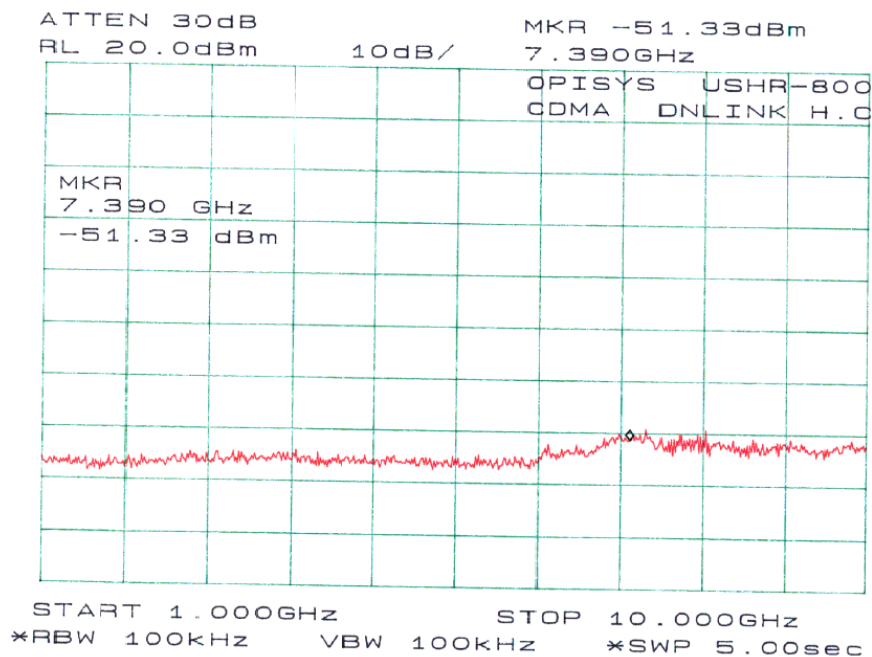
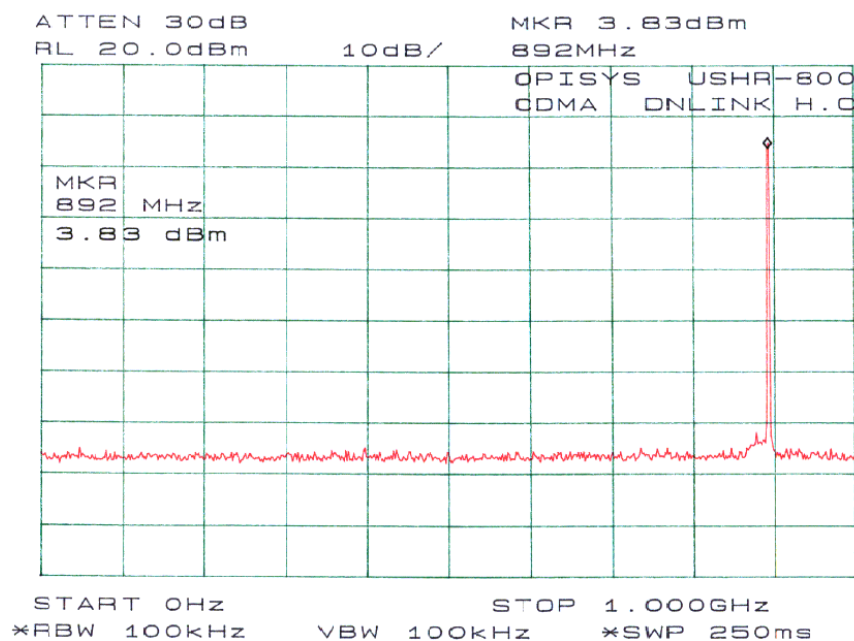












8 – RADIATED SPURIOUS EMISSION

8.1 Test Procedure

Requirements: CFR 47, § 2.1053, § 22.917.

8.2 Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = $10 \lg (\text{TXpwr in Watts}/0.001)$ – the absolute level

Spurious attenuation limit in dB = $43 + 10 \text{Log}_{10} (\text{power out in Watts})$

8.3 Test Equipment

CDI B100/200/300 Biconical Antennas
EMCO Bi-logcon Antenna
EMCO 3115 Horn Antenna
HP 8566B Spectrum Analyzer
Preamplifiers
HP8640 Generator
Non-radiating Load

8.4 Test Result

Up-link:

Low Frequency: -38.2 dBm at 1650 MHz
Middle Frequency: -37.7 dBm at 1670 MHz
High Frequency: -37.9 dBm at 1690 MHz

Down-link:

Low Frequency: -38.4 dBm at 1740 MHz
Middle Frequency: -37.8 dBm at 1760 MHz
High Frequency: -39.0 dBm at 1780 MHz

Up-Link, Low Channel at 825 MHz

EUT					Generator						Standard	
Indicated		Table	Test Antenna		Substitution			Antenna	Cable	Absolute	FCC	FCC
Frequency MHz	Ampl. dBuV/m	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dBm	Polar H/V	Gain Corrected	Loss dBm	Level dB	Limit dBm	Margin DBm
825	101.2	15	1.2	V	825	4.3	V	2.1	0.3	6.1		
825	100.3	210	1.5	H	825	3.7	H	2.1	0.3	5.5		
1650	53.9	30	1.2	V	1650	-57.5	V	6.8	0.5	-51.2	-13	-38.2
2475	48.4	110	1.5	V	2475	-61.5	V	7.6	0.7	-54.6	-13	-41.6
1650	48.7	90	1.5	H	1650	-62.1	H	6.8	0.5	-55.8	-13	-42.8
2475	43.9	160	1.2	H	2475	-64.1	H	7.6	0.7	-57.2	-13	-44.2

Up-link, Mid. Channel at 835 MHz

EUT					Generator						Standard	
Indicated		Table	Test Antenna		Substitution			Antenna	Cable	Absolute	FCC	FCC
Frequency MHz	Ampl. dBuV/m	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dBm	Polar H/V	Gain Corrected	Loss dBm	Level dB	Limit dBm	Margin DBm
835	102.1	230	1.8	V	835	4.8	V	2.1	0.3	6.6		
835	99.8	150	1.2	H	835	3.4	H	2.1	0.3	5.2		
1670	54.2	0	1.5	V	1670	-57	V	6.8	0.5	-50.7	-13	-37.7
2505	48.6	110	1.5	V	2505	-61.2	V	7.6	0.7	-54.3	-13	-41.3
1670	48.5	45	1.8	H	1670	-62.9	H	6.8	0.5	-56.6	-13	-43.6
2505	43.7	170	1.5	H	2505	-64.5	H	7.6	0.7	-57.6	-13	-44.6

Up-Link, High Channel at 845 MHz

EUT					Generator						Standard	
Indicated		Table	Test Antenna		Substitution			Antenna	Cable	Absolute	FCC	FCC
Frequency MHz	Ampl. dBuV/m	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dBm	Polar H/V	Gain Corrected	Loss dBm	Level dB	Limit dBm	Margin DBm
845	101.3	270	1.8	V	845	4.4	V	2.1	0.3	6.2		
845	100.2	180	1.2	H	845	3.5	H	2.1	0.3	5.3		
1690	54.1	30	1.2	V	1690	-57.2	V	6.8	0.5	-50.9	-13	-37.9
2535	48.9	150	1.2	V	2535	-60.8	V	7.6	0.7	-53.9	-13	-40.9
1690	48.7	60	1.5	H	1690	-62.3	H	6.8	0.5	-56	-13	-43
2535	44.2	210	1.2	H	2535	-63.7	H	7.6	0.7	-56.8	-13	-43.8

Down-Link, Low Channel at 870 MHz

EUT					Generator						Standard	
Indicated		Table	Test Antenna		Substitution			Antenna	Cable	Absolute	FCC	FCC
Frequency MHz	Ampl. dBuV/m	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dBm	Polar H/V	Gain Corrected	Loss dBm	Level dB	Limit dBm	Margin DBm
870	101.4	330	1.5	V	870	4.5	V	2.1	0.3	6.3		
870	100.9	0	1.5	H	870	3.6	H	2.1	0.3	5.4		
1740	53.6	30	1.2	V	1740	-57.7	V	6.8	0.5	-51.4	-13	-38.4
1740	49.8	90	1.5	H	1740	-65.4	H	6.8	0.5	-59.1	-13	-46.1
2610	43.5	110	1.5	V	2610	-68.7	V	7.6	0.7	-61.8	-13	-48.8
2610	40.8	160	1.2	H	2610	-70.2	H	7.6	0.7	-63.3	-13	-50.3

Down-Link, Mid. Channel at 880 MHz

EUT					Generator						Standard	
Indicated		Table	Test Antenna		Substitution			Antenna	Cable	Absolute	FCC	FCC
Frequency MHz	Ampl. dBuV/m	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dBm	Polar H/V	Gain Corrected	Loss dBm	Level dB	Limit dBm	Margin DBm
880	104.2	310	1.8	V	880	5.1	V	2.1	0.3	6.9		
880	102.1	180	1.5	H	880	4	H	2.1	0.3	5.8		
1760	54.2	120	1.8	V	1760	-57.1	V	6.8	0.5	-50.8	-13	-37.8
1760	51.9	90	1.8	H	1760	-62.3	H	6.8	0.5	-56	-13	-43
2640	45.2	0	1.2	V	2640	-65.4	V	7.6	0.7	-58.5	-13	-45.5
2640	41.7	330	1.5	H	2640	-68.3	H	7.6	0.7	-61.4	-13	-48.4

Down-Link, High Channel at 890 MHz

EUT					Generator						Standard	
Indicated		Table	Test Antenna		Substitution			Antenna	Cable	Absolute	FCC	FCC
Frequency MHz	Ampl. dBuV/m	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dBm	Polar H/V	Gain Corrected	Loss dBm	Level dB	Limit dBm	Margin DBm
890	103.8	120	1.8	V	890	4.9	V	2.1	0.3	6.7		
890	98.3	250	1.2	H	890	3.3	H	2.1	0.3	5.1		
1780	53.1	180	1.5	V	1780	-58.3	V	6.8	0.5	-52	-13	-39
1780	49.5	160	1.8	H	1780	-65.4	H	6.8	0.5	-59.1	-13	-46.1
2670	43.2	15	1.2	V	2670	-67.8	V	7.6	0.7	-60.9	-13	-47.9
2670	40.3	0	1.5	H	2670	-70.3	H	7.6	0.7	-63.4	-13	-50.4

9 – BAND EDGE TEST

9.1 Applicable Standards

According to FCC §2.1049 and §22.917(b), when measuring the emission limits, carrier frequency shall be adjusted as close to the frequency block edges, both upper and lower.

9.2 Test Procedure

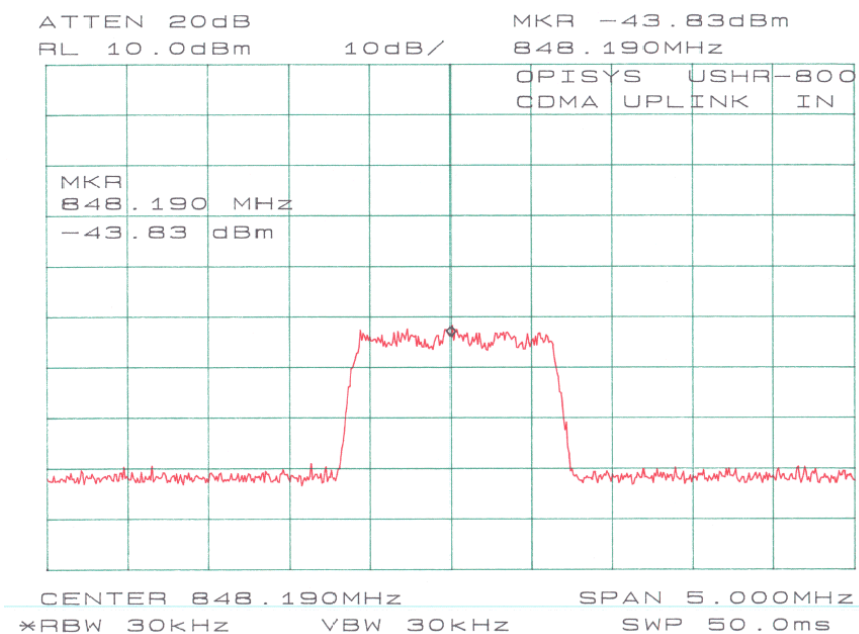
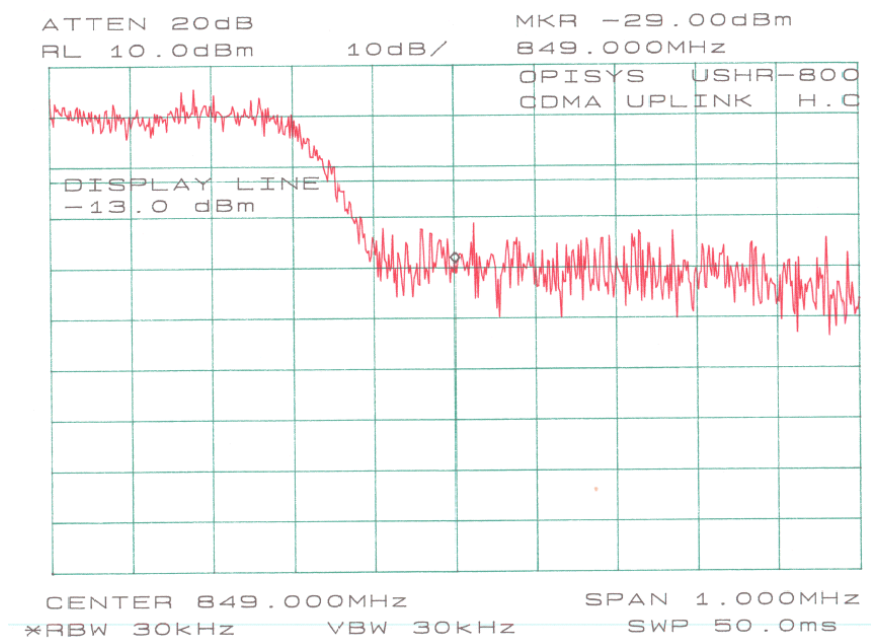
The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. Adjust the carrier frequency as close to the frequency block edges both upper and lower. Sufficient scans were taken to show any out of band-edge emission.

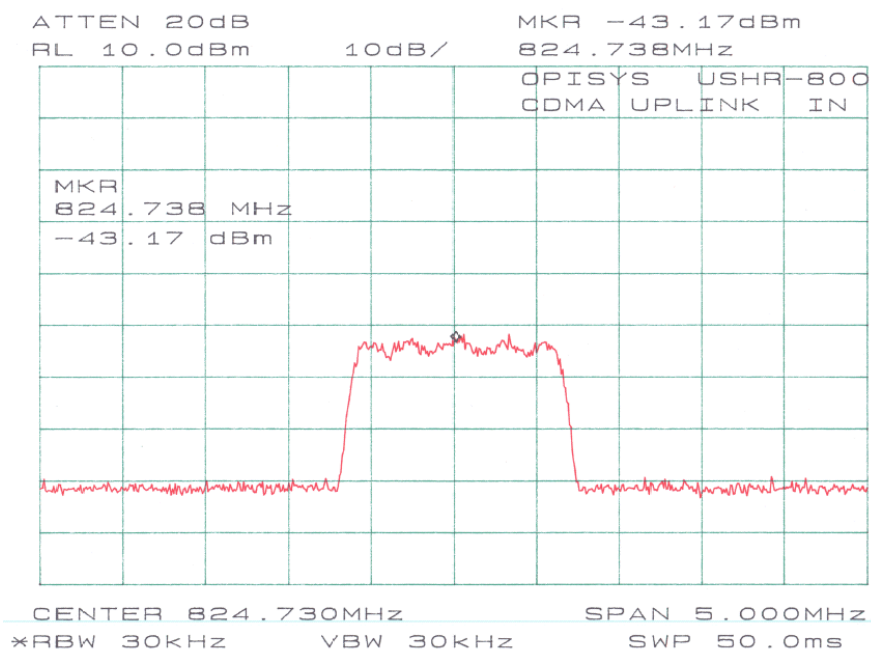
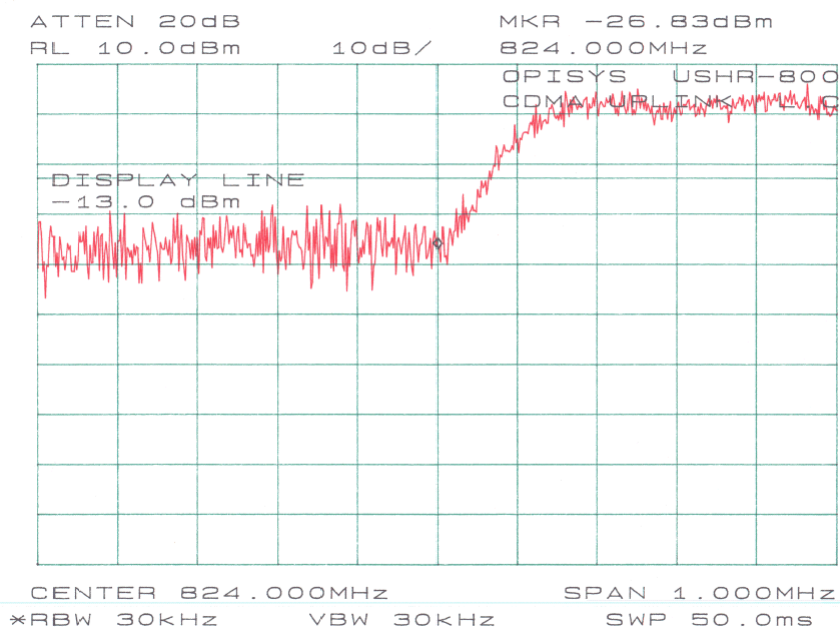
9.3 Test Equipment

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Rohde & Schwarz AMIQ I/Q Modulation Generator

9.4 Plots of Out-of-Band-Edge Emissions at Antenna Terminal

Please refer to plots hereinafter.





10 – Modulation Characteristics

This EUT only is an amplifier, it is not a transmitter. There is no modulating circuit in the EUT and no modulating characteristics measurement required.

11 - FREQUENCY STABILITY

This EUT only is an amplifier, it is not a transmitter. There is no oscillator circuit in the EUT, and no frequency stability measurement required.

12 - CONDUCTED EMISSION

Not Applicable.

13 - RF EXPOSURE

According to §15.247(b)(4) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §1.1310 and §2.1093 RF exposure is calculated.

Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational Population/Controlled Exposure				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1824/f	4.89/f	*(900/f ²)	6
30-300	61.4	0.163	1.0	6
300-1500	/	/	f/300	6
1500-100,000	/	/	5	6

f = frequency in MHz

* = Plane-wave equivalent power density

MPE Prediction

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density

P = power input to antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal: 7.01 (dBm)

Maximum peak output power at antenna input terminal: 5.02 (mW)

Prediction distance: 20 (cm)

Predication frequency: 800 (MHz)

Antenna Gain (typical): 34 (dBi)

antenna gain: 2511.89 (numeric)

Power density at predication frequency at 20 cm: 2.51 (mW/cm²)

MPE limit for uncontrolled exposure at prediction frequency: 2.67 (mW/cm²)

Test Result

The EUT is defined as a mobile device since the predicted power density level at 20 cm is 2.51 mW/cm². This is below the uncontrolled exposure limit of 2.67 mW/cm² at 800 MHz.