

Telcosat Inc

FCC: Part 2.1033

**Author: Carl Bosnyak
RF Engineering: Hellmut Frauscher P. ENG.
Release date: July 27th 2006**

Test Voltages used.

Module test voltage supplied by the internal power supply unit of the repeater RPT900
PA Power supply details. **Current load** 1.54 Amps@28volts DC maximum

Make, Puls, Model ML30.102

Input voltage AC 100-240V (Wide Range), 47...63 Hz
Admissible limits: AC 85...264V (DC 85...375V)
Input current <0.6A (@ AC 100V, 30W Pout)
<0.25A (@ AC 240V, 30W Pout)
External fusing not required, unit provides internal fuse
(T3A15H, not accessible)
Transient immunity Transient resistance acc. to VDE 0160 / W2

Output voltage

DC 10-12V (set to 10 volts)
(adj. by front panel potentiometer, adj. range guaranteed);
with jumper: 12V $\pm 0.5\%$,
without jumper: 10V $\pm 0.5\%$
Voltage regulation stat. <1% @ Vout = 10V
stat. <1.2% @ Vout = 12V,
dyn. $\pm 2.5\%$ Vout over all

Ripple Noise (Spikes)

<2mVPP (200kHz bandwidth., 50 Ω measurement.)
<10mVPP (20MHz bandwidth., 50 Ω measurement.)
Over-voltage protection. (OVP) <18V

Rated continuous loading at convection cooling:

max. Iout = 3A @ Vout = 10V,
max. Iout = 2.5A @ Vout = 12V,
• power reserve 25%–40% (depending on Vin);
Overload behaviour Straight V/I characteristic (depending on Vin);
Protection Unit is protected against (also permanent)
short-circuit, overload and open-circuit.

Certification Approvals

The PSU complies with all major **safety approvals** for EU (EN 60950, EN 60204-1, EN 50178), USA (UL 60950, E137006, UL508 LISTED, E198865), Canada (CAN/CSA-C22.2 No 60950 [CUR], CAN/CSA-C22.2 No. 14 [CUL]), CB Scheme (IEC 60950). NEC Class 2 Power Supply and Hazardous Location Class I Div. 2 (UL 1604)

Test Voltages used.

PA test voltage supplied by the internal power supply unit of the repeater RPT900
PA Power supply details. **Current load** 1.5 Amps@10volts DC maximum

Make, Puls, Model ML70.00

Input voltage AC 100-120/220-240V (switchable), 47...63Hz
(AC 85...132V / AC 184...264V, DC 220...375V)

Input current <1.6A (@ AC 100V, 72W Pout)
<0.8A (@ AC 220V, 72W Pout)
External fusing Not required, unit provides internal fuse
(T3A15H, not accessible)

Output voltage

Voltage set to 28 volts DC
DC 24-28V adj. by front panel potentiometer;
24.5V $\pm 0.5\%$ at rated load
Voltage regulation stat. <1% Vout
dyn. < $\pm 2\%$ Vout over all

Ripple/Noise <50mVPP (20MHz bandwidth., 50 Ω measurement.)
Over-voltage protection. (OVP) <40V
Rated continuous loading up to 3A @ 24V / 2.6A @ 28V (convection cooling)
Overload behaviour

PULS Overload Design™: No switch-off at
overload/short-circuit, instead: up to $1.5 \cdot I_{rated}$.
So you need no oversizing to start awkward loads.
Protection Unit is protected against (also permanent) short circuit,
overload and open-circuit.

Certification Approvals

The PSU complies with all major **safety approvals** for EU
(EN 60 950, EN 60204-1, EN 50178), USA (UL 60950, UL508 LISTED),
Canada (CAN/CSA-C22.2 No 60950 [CUR], CAN/CSA-C22.2 No. 14 [CUL]),
CB Scheme (IEC 60950). NEC Class 2 Power Supply

DC voltage of Power Amplifier (PA)	28.5 DC volts
Current level of PA	770 Milliamps
Power output of PA	" +30dBm Composite two tones
Input power into the Repeater	" -68dBm composite at maximum gain setting of 95dB

Output power can be adjusted from 0.0dBm to +30dBm internally only, depending on the required application.

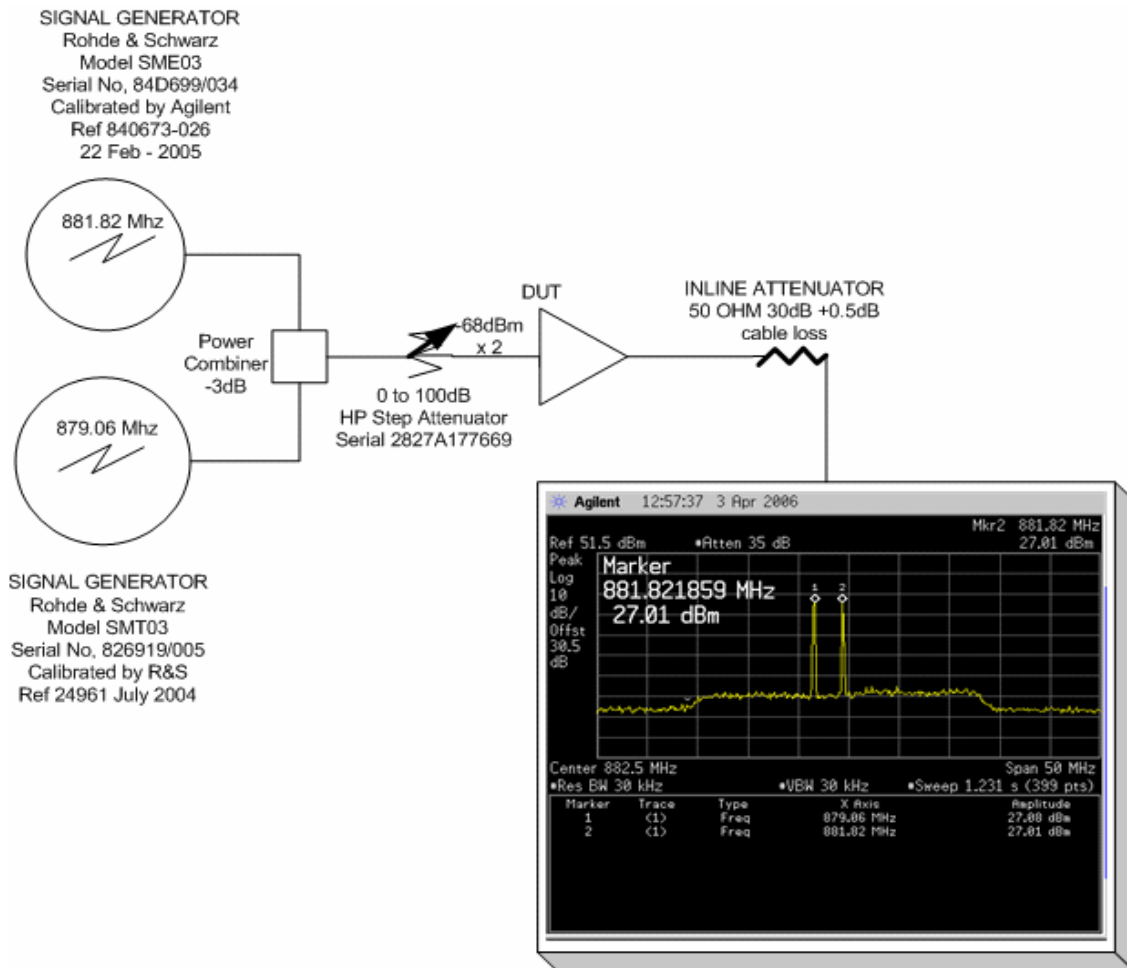
HP Agilent Radar RF pin diodes (Limiter Diodes) protect the receiver front end and IF stages from strong pulsed signal causing saturation.

Carefully adjusted antenna systems in terms of Antenna Isolation and signal levels are required so the system cannot operate in a saturation mode.

FCC: Part 2.1051 Spurious Emissions and I.M.D.

TWO TONE TEST SET-UP CDMA/TDMA/GSM

Input level two tones at -68dBm each, for rated power output 2 tones of +27dBm each. All tests taken at +20 degrees Celsius.

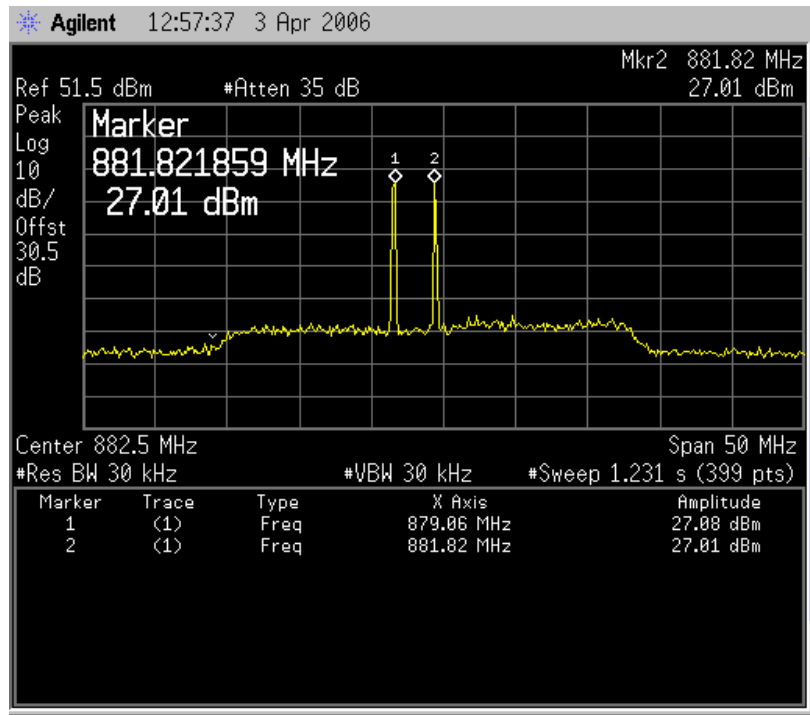


Tests performed in accordance to good engineering practices.

Spectrum analyzer screen shot of the downlink pass band, in-band and immediately adjacent.

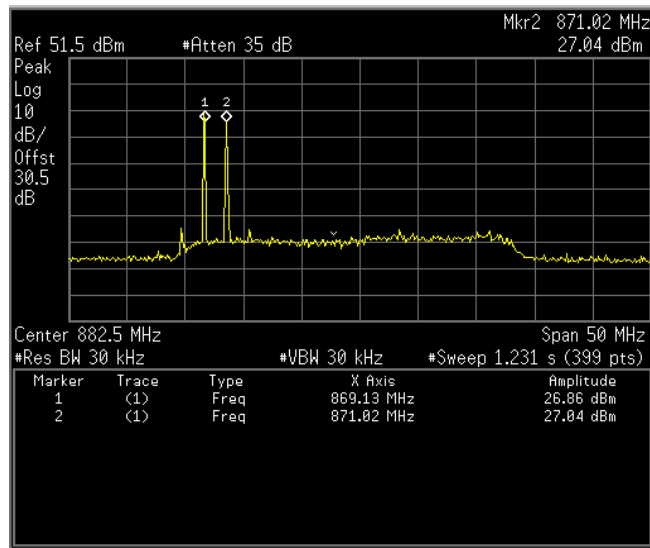
$$\text{Transmit Power 1 watt (P)} = 43 + 10\log(P) =$$

Screen Shot displaying Two Tones in the Middle of the Down-Link Pass-band

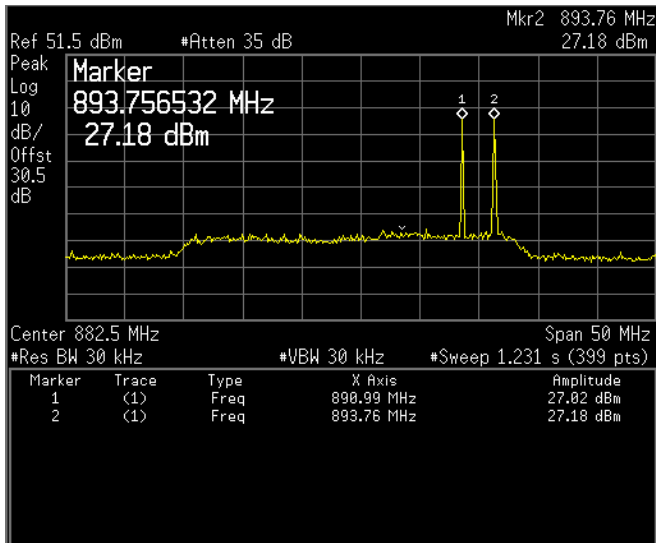


**Typical IMD=> 50dBc @ Rated Power out-put (30dBm Composite)
In-put Signals to splitter, -65dBm + (-3dBm Splitter) to Repeater = 95dBm Gain**

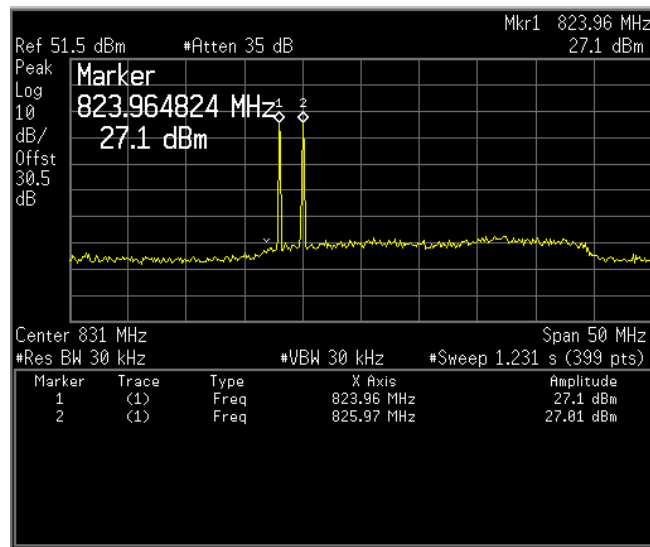
Spectrum analyzer shot of the down-link pass band.



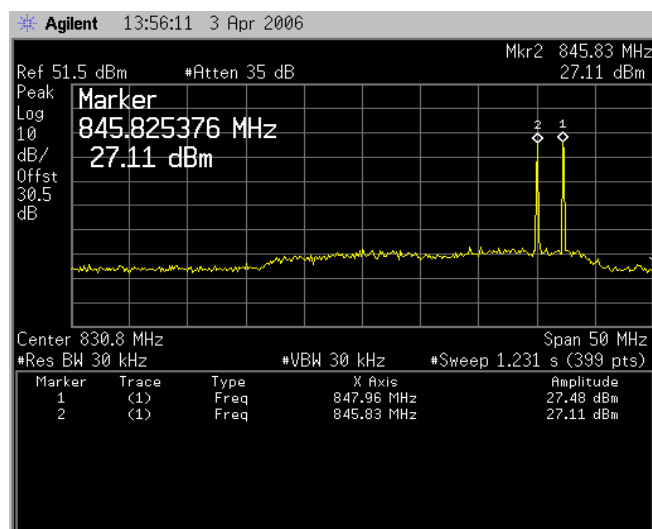
Down-link lower edge of band pass



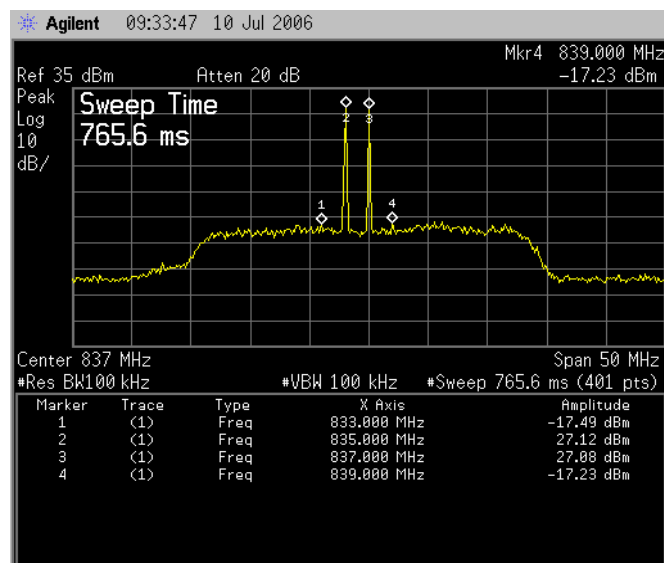
Down-link upper edge of band pass



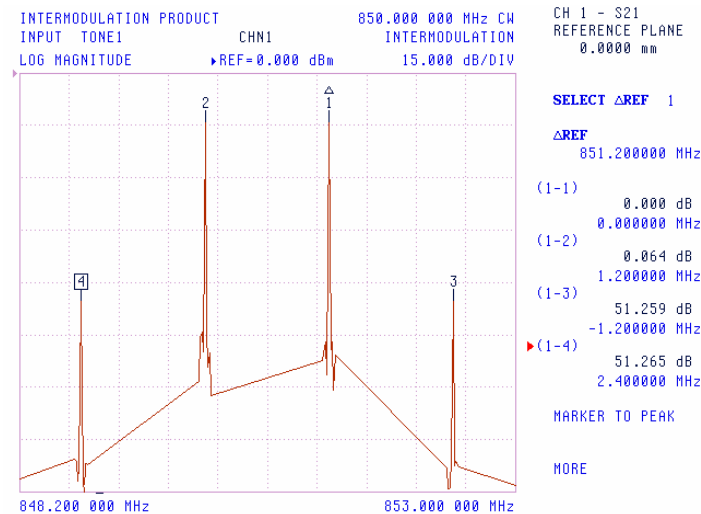
Up-link lower edge of band pass



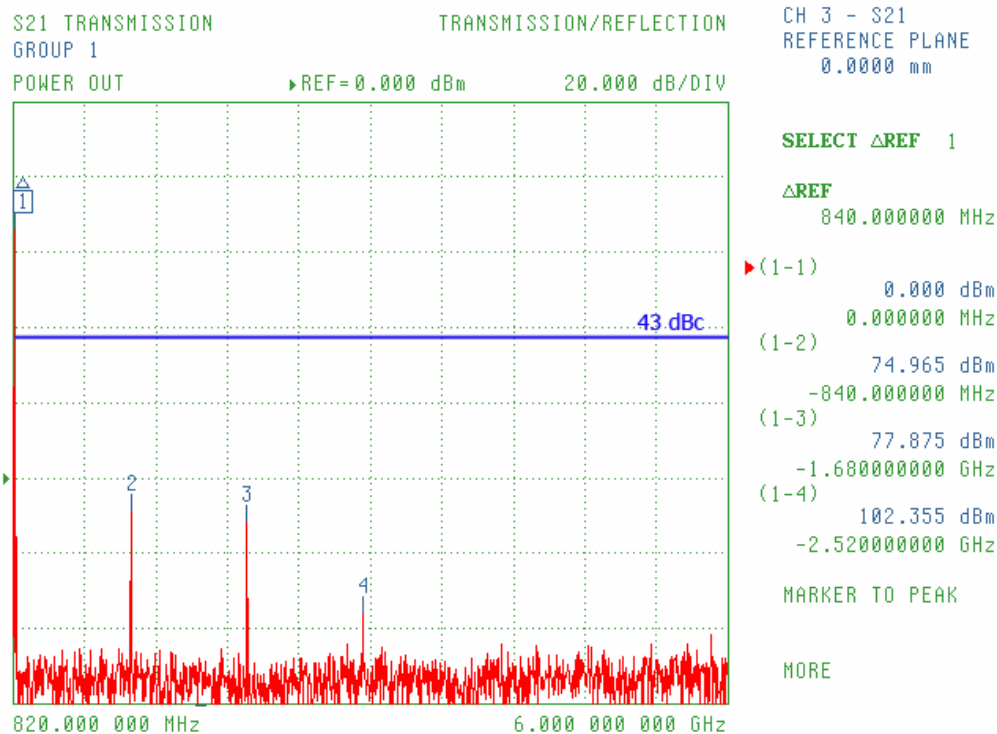
Up-link upper edge of band pass



Plot displaying greater intermodulation products at the enhancer out-put terminals equal to -44.35dBW



**Third Order I.M.D. Performance measured with
Vector Network Analyzer Anritsu model number VNA MS4623B 6 Gigahertz.
Serial number 031601, Calibrated September 2005**

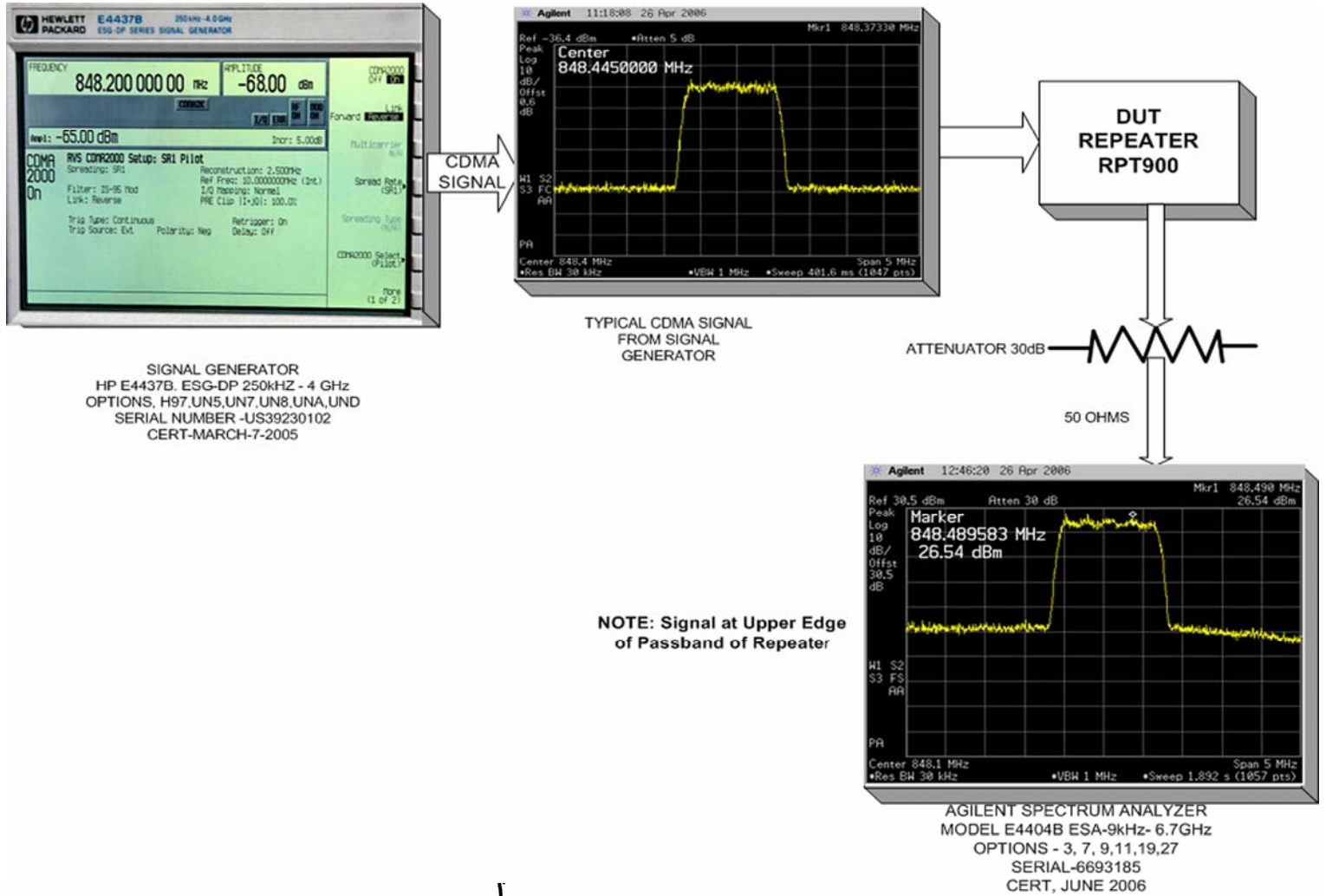


**Spectrum Harmonics to 6 GHz Conducted. Measurements Performed with Vector Network Analyzer
Anritsu model number VNA MS462 at rated power output
Agilent Spectrum Analyzer model E4404B 6 Gigahertz. Serial number 031601**

Third order I.M.D. measurement from the repeater RPT900 reference to +30 dBm rated composite output power

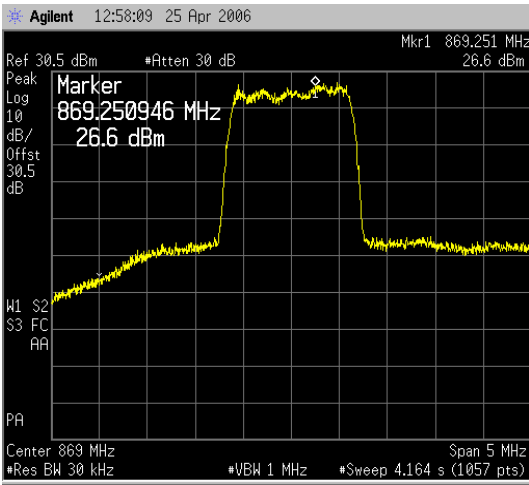
CDMA Performance.

Test Set-up for Repeater RPT900 Measuring CDMA Carrier

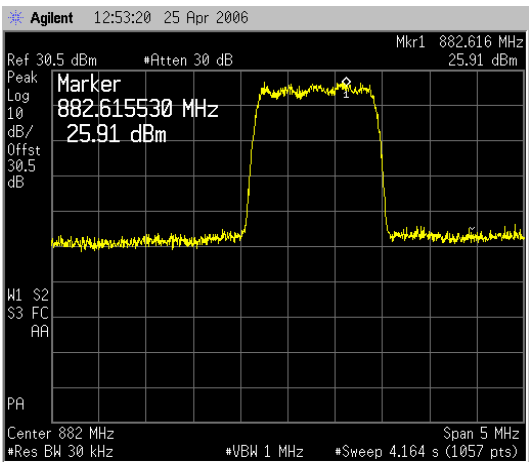


PROFESSIONAL ENGINEER ALBERTA
HELLMUT FRAUSCHER
RPT900
April 26, 2006

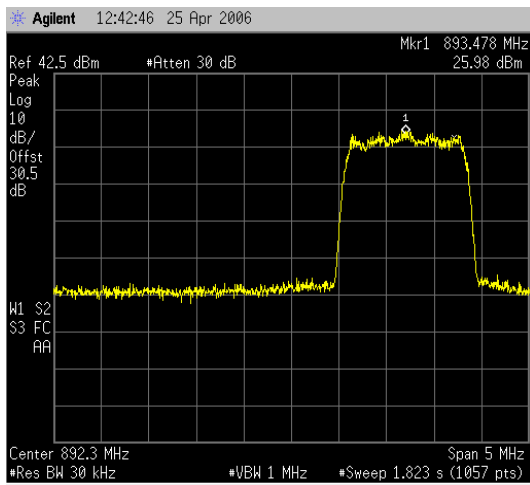
Screen Shots From Agilent E4404B (9kHz - 6.7 GHz) Spectrum Analyzer



Spectrum analyzer screen shot of a 2000 CDMA ISO95 Spreading SR1 at the lower band edge of the Down Link pass band (869 MHz to 894 MHz)

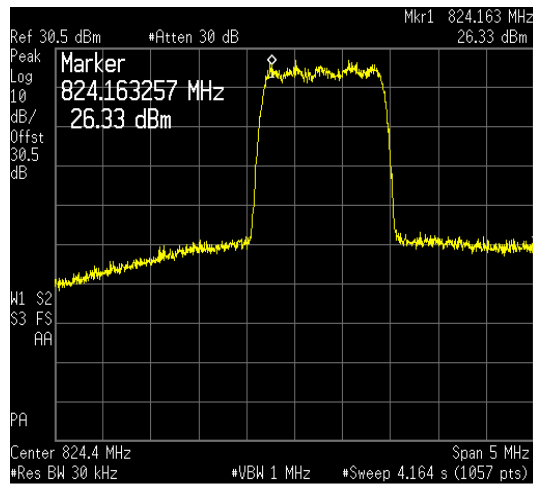


Spectrum analyzer screen shot of a 2000 CDMA ISO95 Spreading SR1 at the center of the Down Link pass band. (869 MHz to 894 MHz)

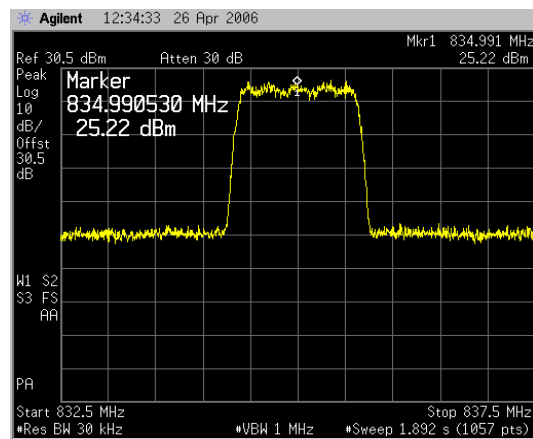


Spectrum analyzer screen shot of a 2000 CDMA ISO95 Spreading SR1 of the upper edge of the Down Link pass band. (869 MHz to 894 MHz)

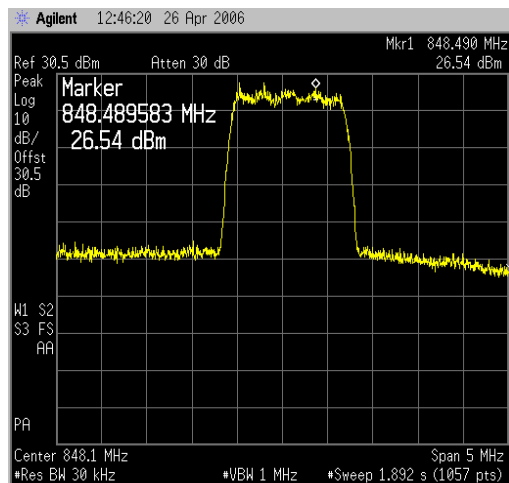
Screen Shots From Agilent E4404B (9kHz - 6.7 GHz) Spectrum Analyzer



Spectrum analyzer screen shot of a 2000 CDMA ISO95 Spreading SR1 at the lower band edge of the Up-Link pass band (824 MHz to 849 MHz)



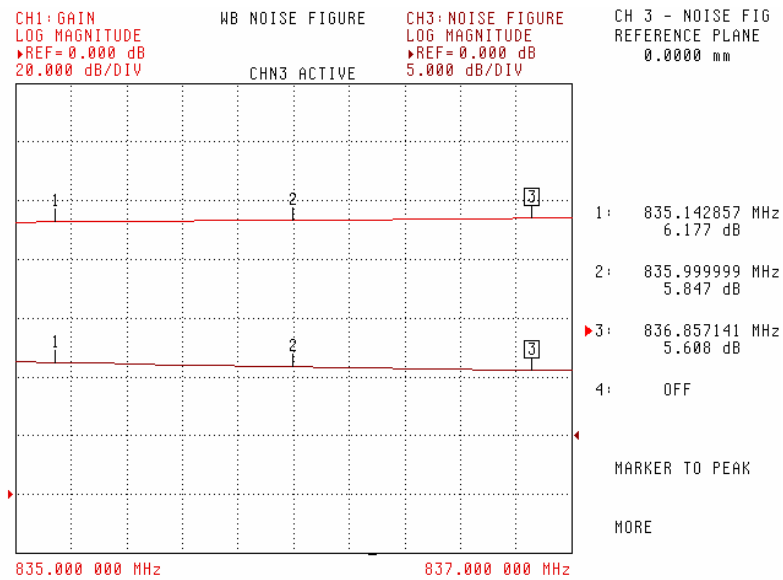
Spectrum analyzer screen shot of a 2000 CDMA ISO95 Spreading SR1 at the center of the Up-Link pass band. (824 MHz to 849 MHz)



Spectrum analyzer screen shot of a 2000 CDMA ISO95 Spreading SR1 at the upper edge of the Up-Link pass band. (824 MHz to 849 MHz)

Noise Figure Measurement Repeater RPT900

Noise Source, Anritsu model NC346B Precision. 0.010 – 18 Gigahertz



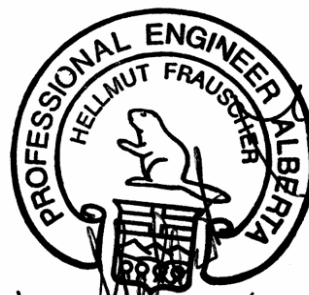
Vector Network Analyzer Anritsu model number VNA MS462
3B 9 kHz to 6 Gigahertz. Serial number 031601

Gain, Noise Figure, IP3 Distribution without in System PA

	Gain (dB)	NF(dB)	IP3	Level @Input (dBm)
BP DIPLEXER	-1.5	1.5	6	-65
RF 2361`	20	1.4	6	-66.5
SAW 1	-3	3	3	-46.5
RF2381	20	8	15	-49.5
MIXER RMS11F	-7	7	13	-23.5
ADA 4643	13.4	4	-16	-10.1
SAW 2-70 MHz	-18	18	-16	-28.5
AD 8367	42.5	6.2		-30.5
ADP-2-1-W	-0.43			12
HMC 307	-6.5	6.5		
HMC 307	-6.5	6.5		
RMS 11F	-7	7	15	-4
SAW 3	-3	3		-11.5
RF2381	22	3	23	-14.5
Total	65 dB	3.2dB		8dBm Output

Calculation = 3.2dB NF

Measurement typical = 5.2dB NF



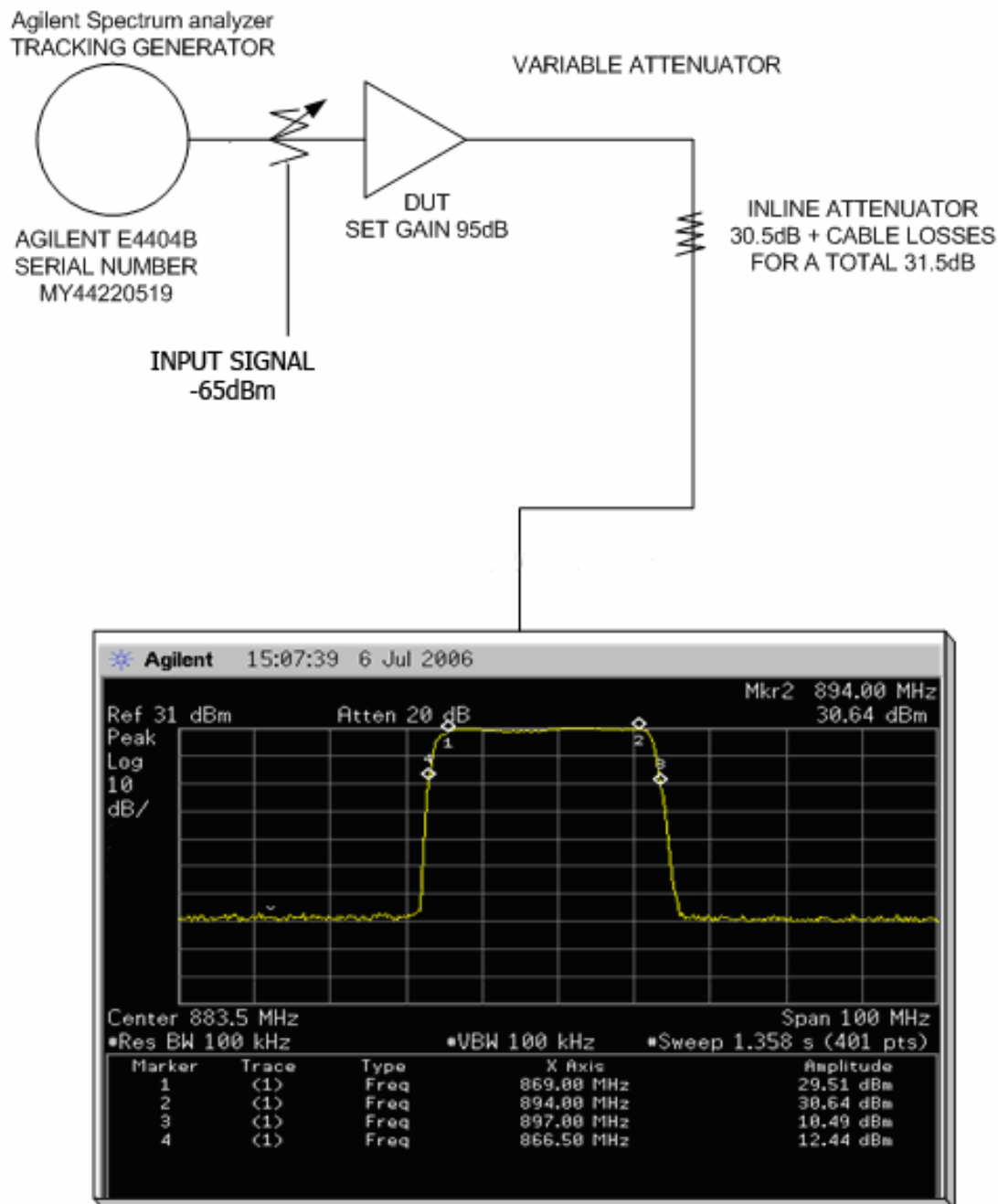
Aug *April 26. 2006*

RSS 131 Measurements

Pass Band Gain & 20 dB Occupied Band Width

Power Sweep

PASSBAND AND BANDWIDTH VERSES FREQUENCY RESPONSE



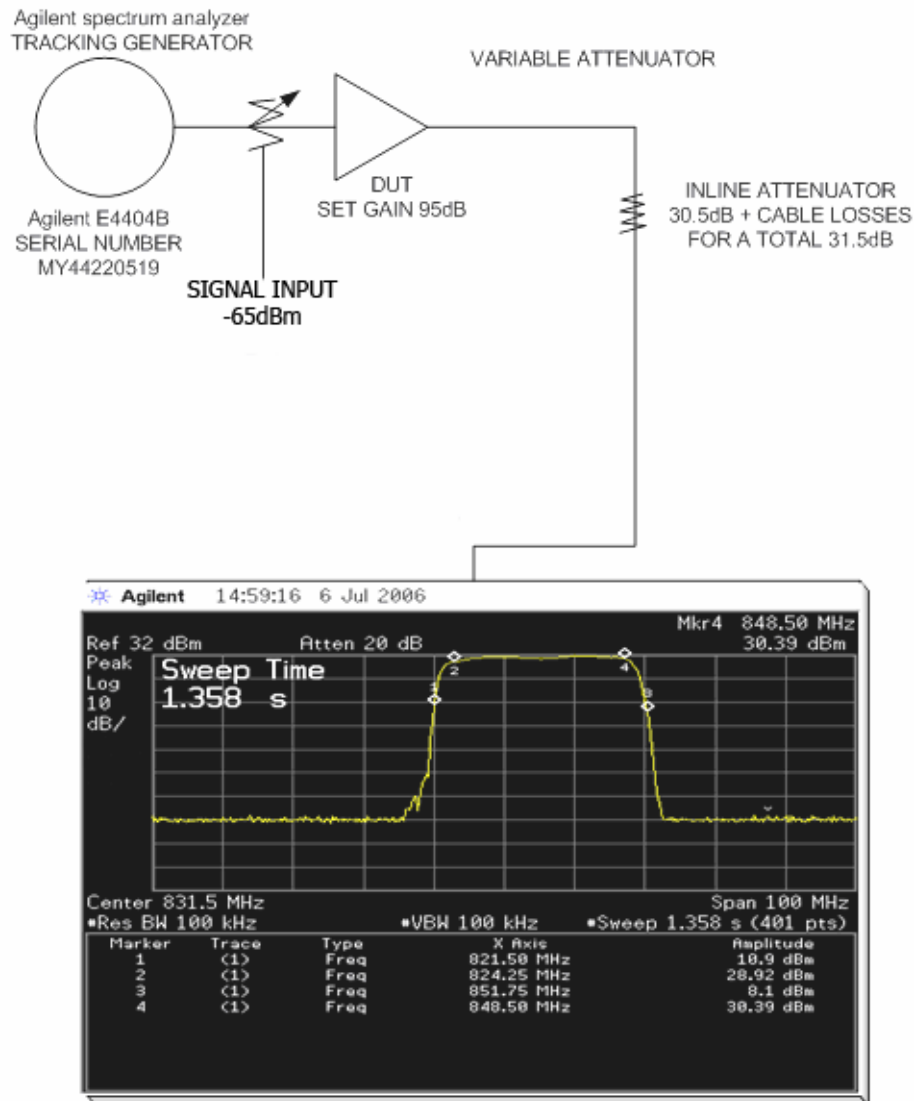
Resolution Band Width 100kHz

RSS 131 Measurements

Pass Band Gain & 20 dB Occupied Band Width

Power Sweep

PASSBAND AND BANDWIDTH VERSES FREQUENCY RESPONSE

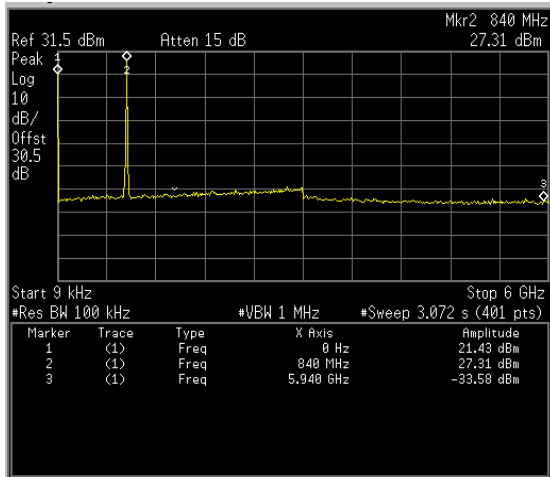


Resolution Band Width 100kHz

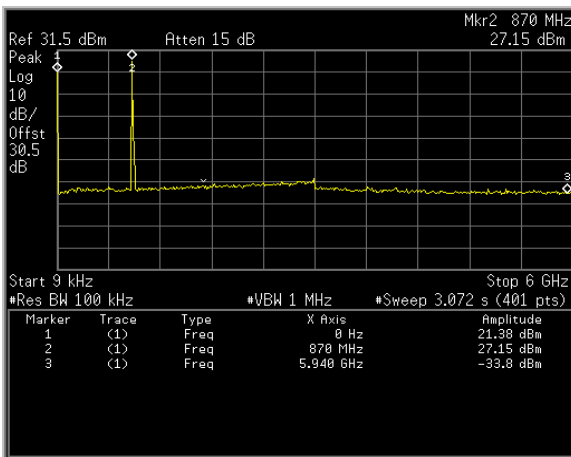
CDMA SIGNAL

Screen Shots From Agilent E4404B (9kHz - 6.7 GHz) Spectrum Analyzer

Conducted Spurious measurements at output terminals of Repeater.



Low-band conducted spurious emissions measured at output terminal of RPT900 repeater at a rated power output of (1watt) CDMA modulated input signal
Start at 9KHz to 6 GHz
RBW 100KHz

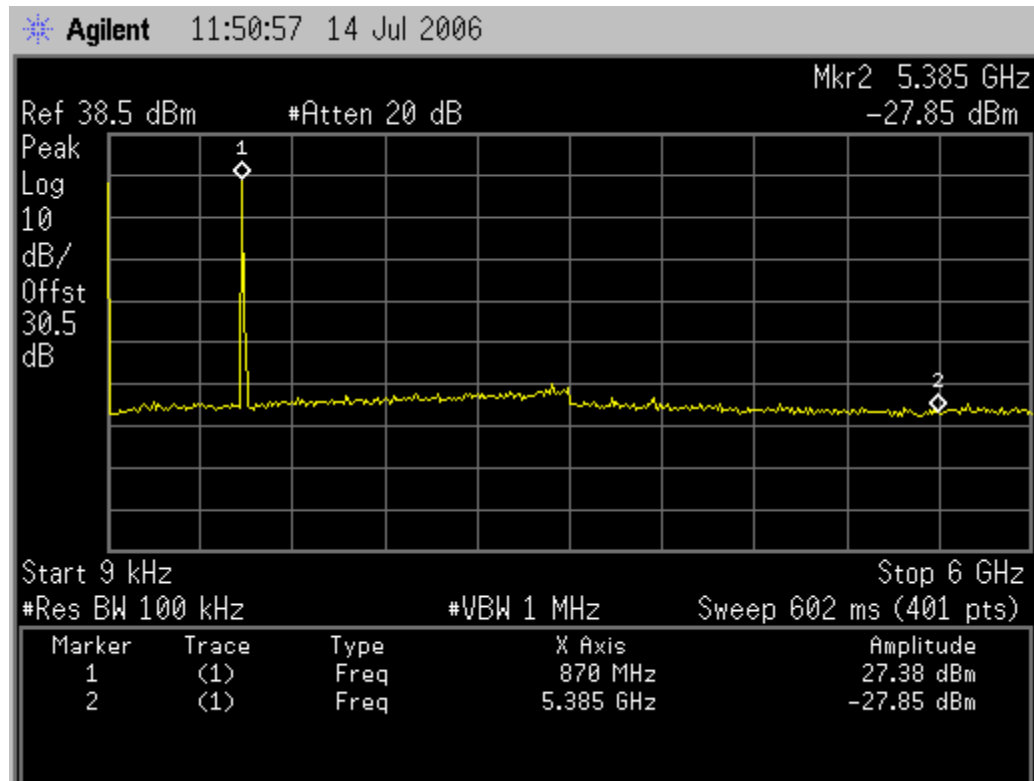


High-band conducted spurious emissions measured at output terminal of RPT900 repeater at a rated power output of (1watt) CDMA modulated input signal.
Start 9 KHz to 6GHz
RBW 100KHz

Resolution Band Width 100 kHz

GSM SIGNAL

Conducted Spurious measurements at output terminal of Repeater

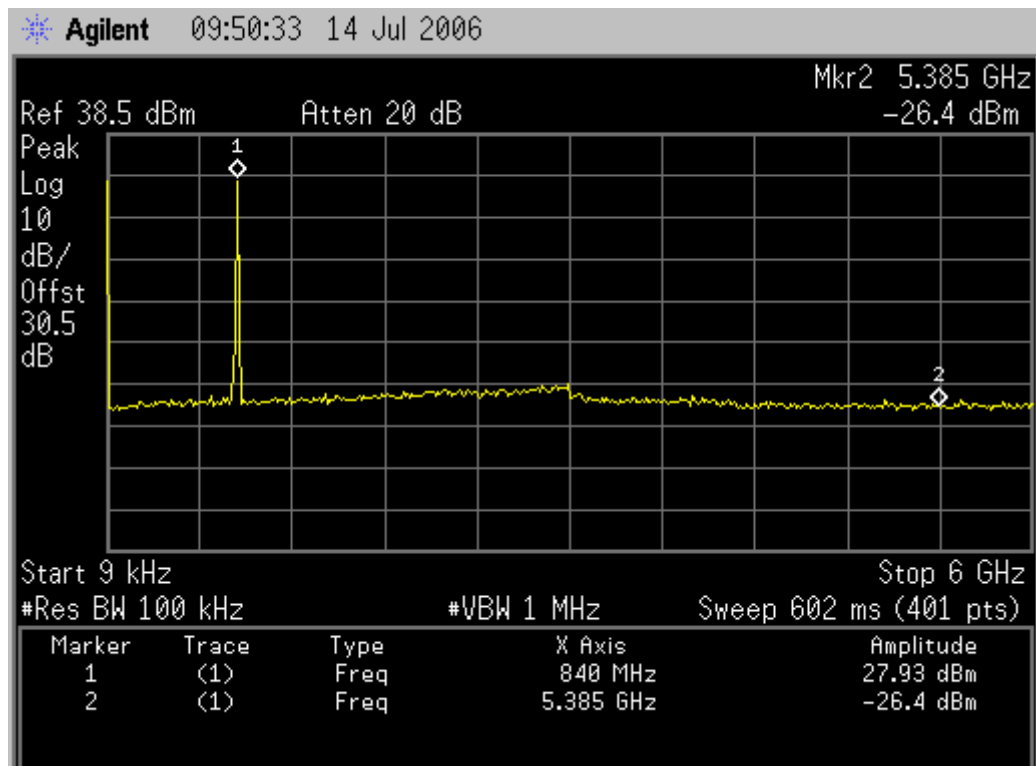


High-band 2 tone GSM conducted spurious emissions measured at output terminal of RPT900 repeater at rated power output of (1 watt) GSM modulated input signal.

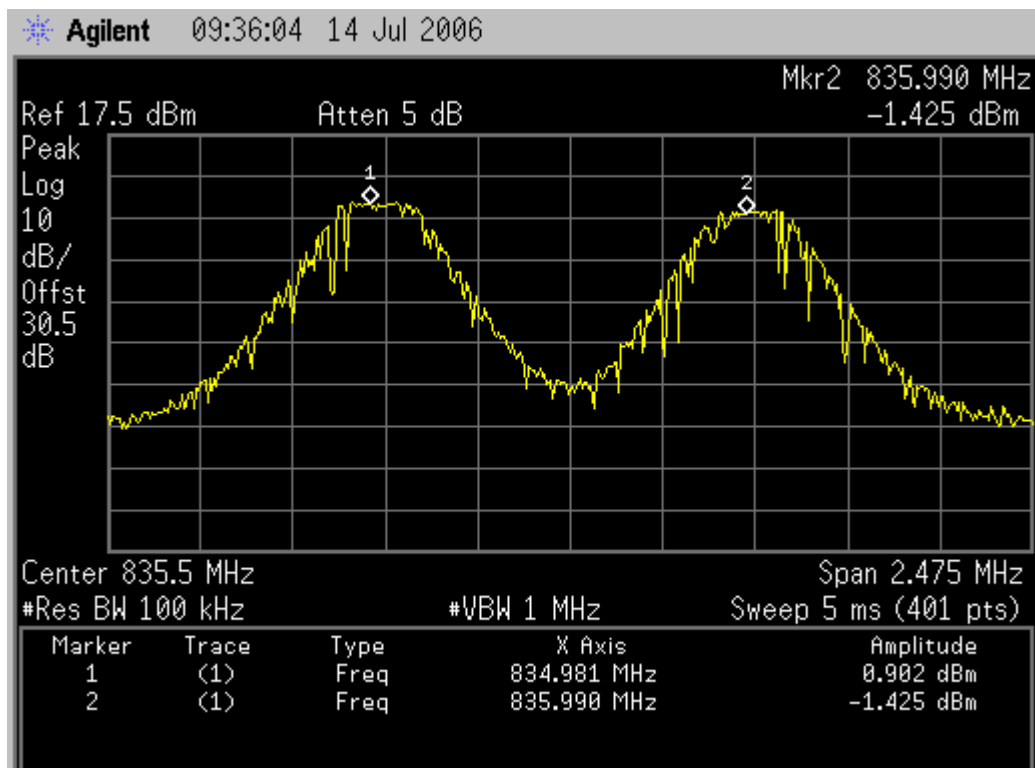
Start 9KHz to 6 GHz – RBW 100KHz

GSM SIGNAL

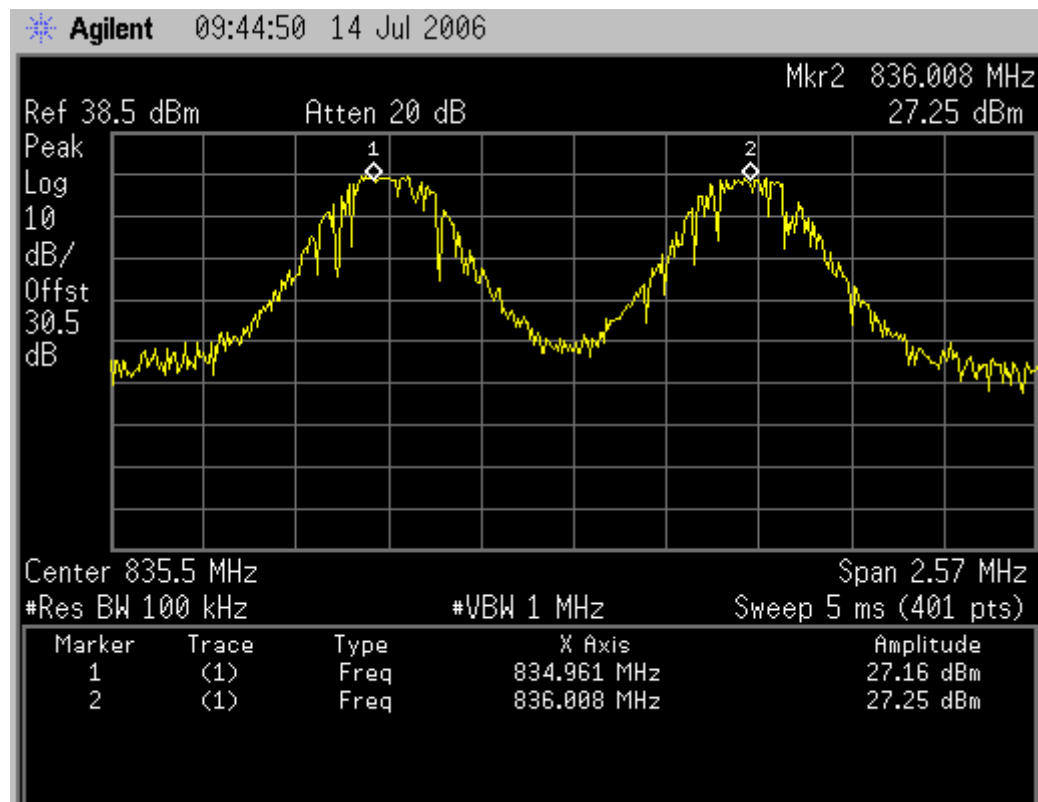
Conducted Spurious measurements at output terminal of Repeater



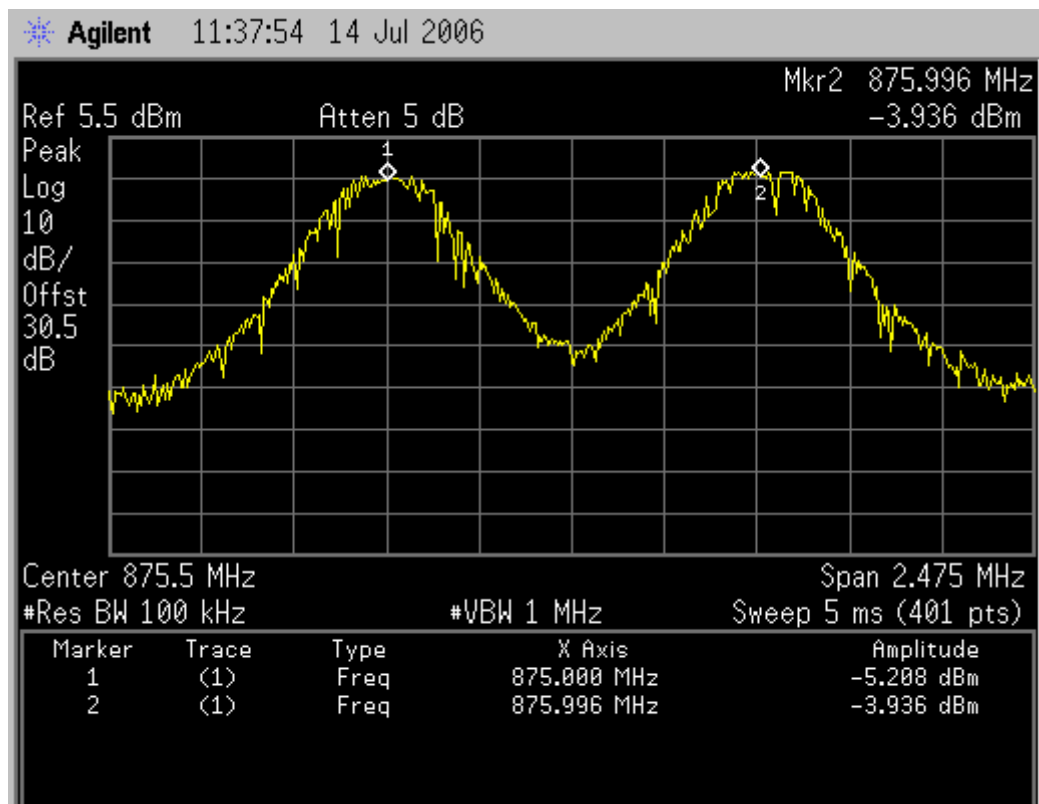
Low-band 2 tone GSM conducted spurious emissions measured at output terminal of RPT900 repeater at rated power output of (1 watt) GSM modulated input signal.
Start 9KHz to 6 GHz – RBW 100KHz



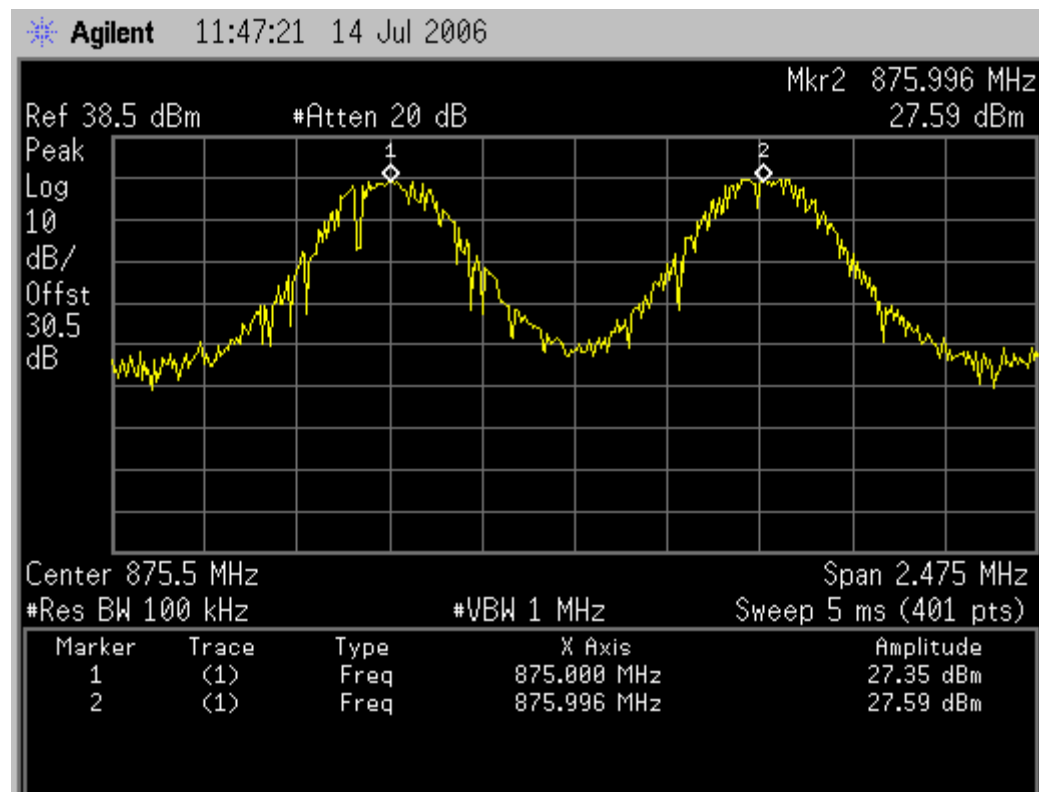
Low Band 2 tone GSM input signal wave form
attenuated to -68dBm each of input of D.U.T



Low Band 2 tone GSM signal out put at rated power output

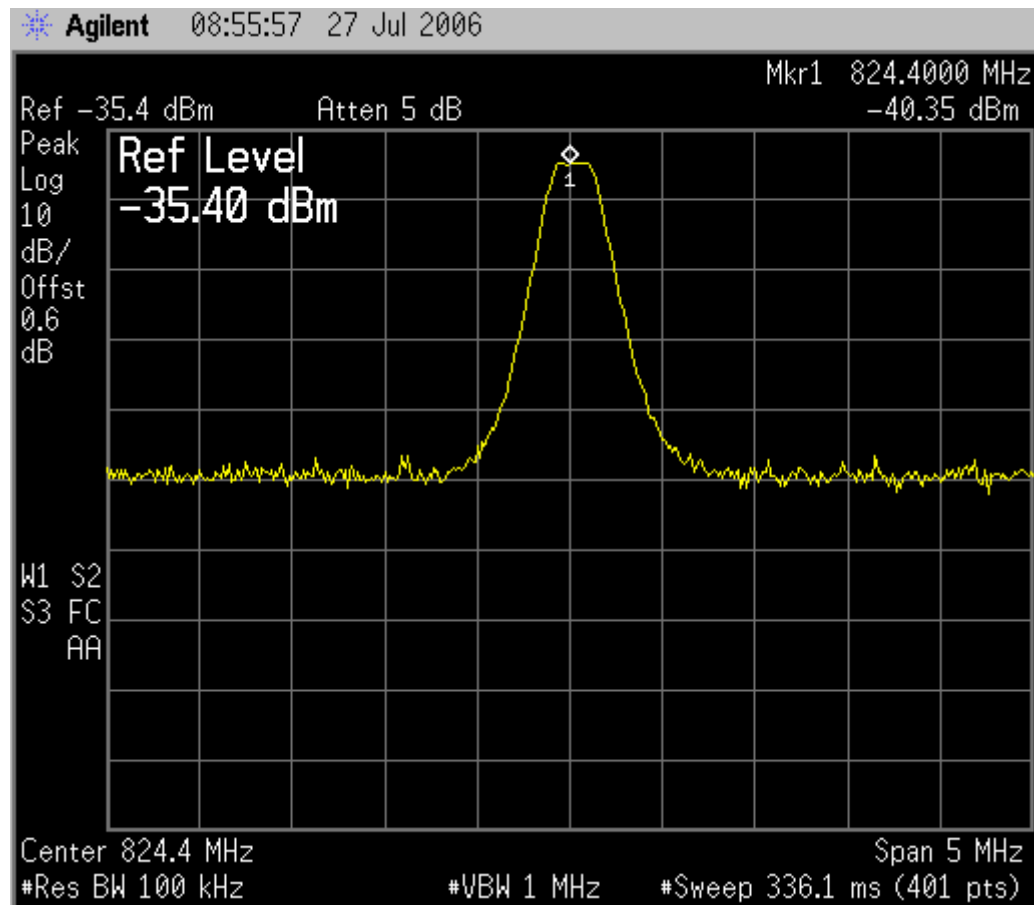


High Band 2 tone GSM input signal wave form
attenuated to -68dBm each of input to D.U.T



Hi-Band 2 tone GSM signal out put at 1 watt power

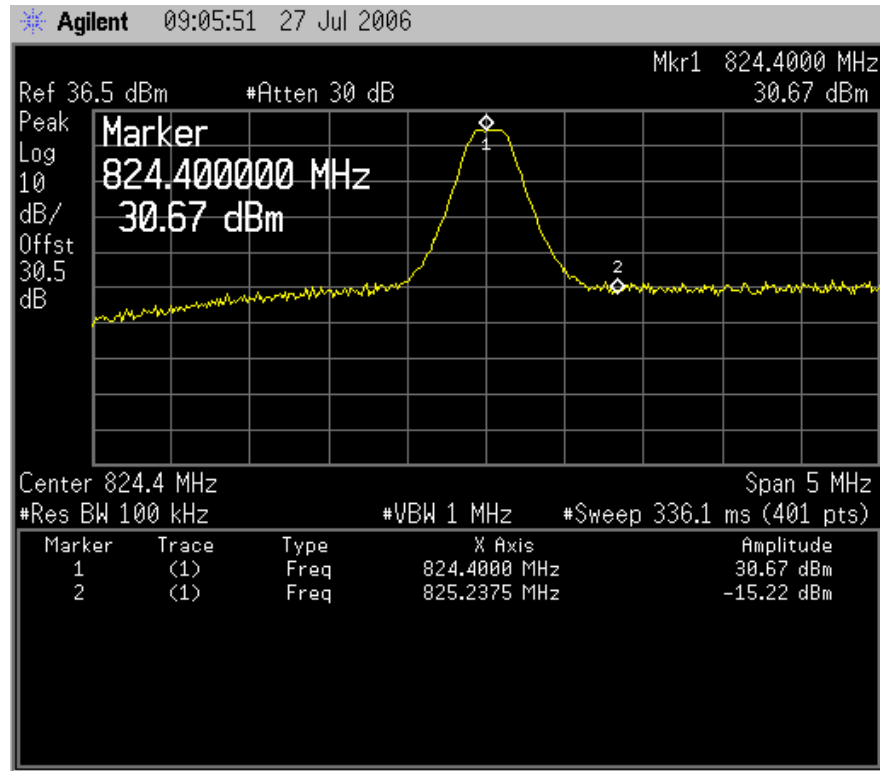
GSM BAND-WIDTH MEASUREMENTS UP-LINK



GSM Signal from Signal Generator model HP E4437B

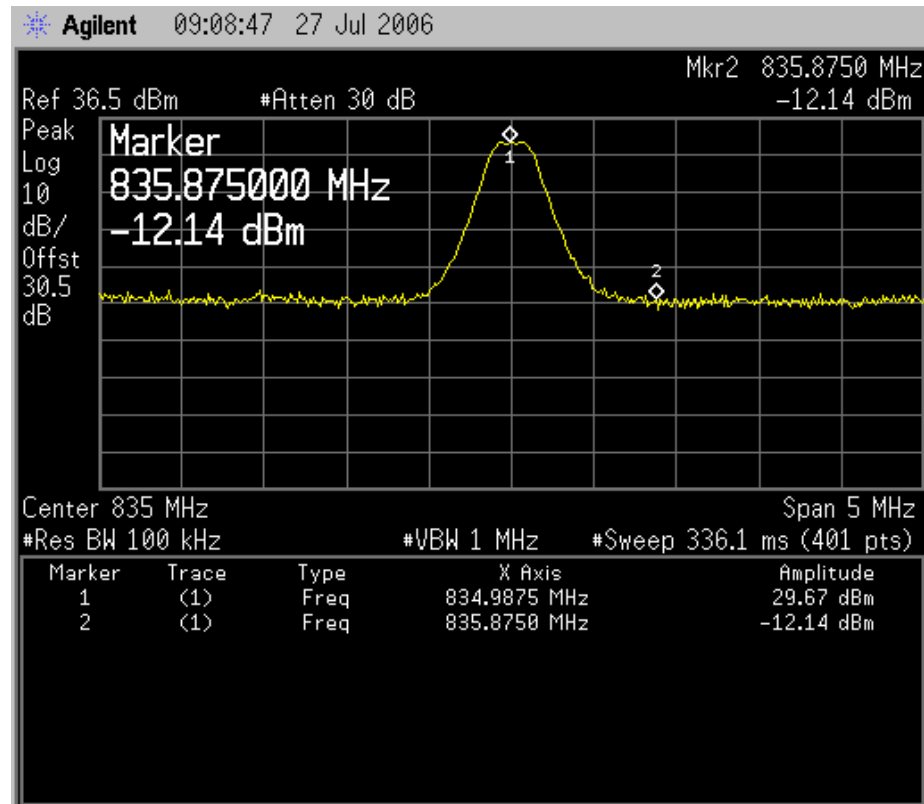
Note: sweep time increased for clarity and measurement purposes.

GSM BAND-WIDTH MEASUREMENTS UP-LINK



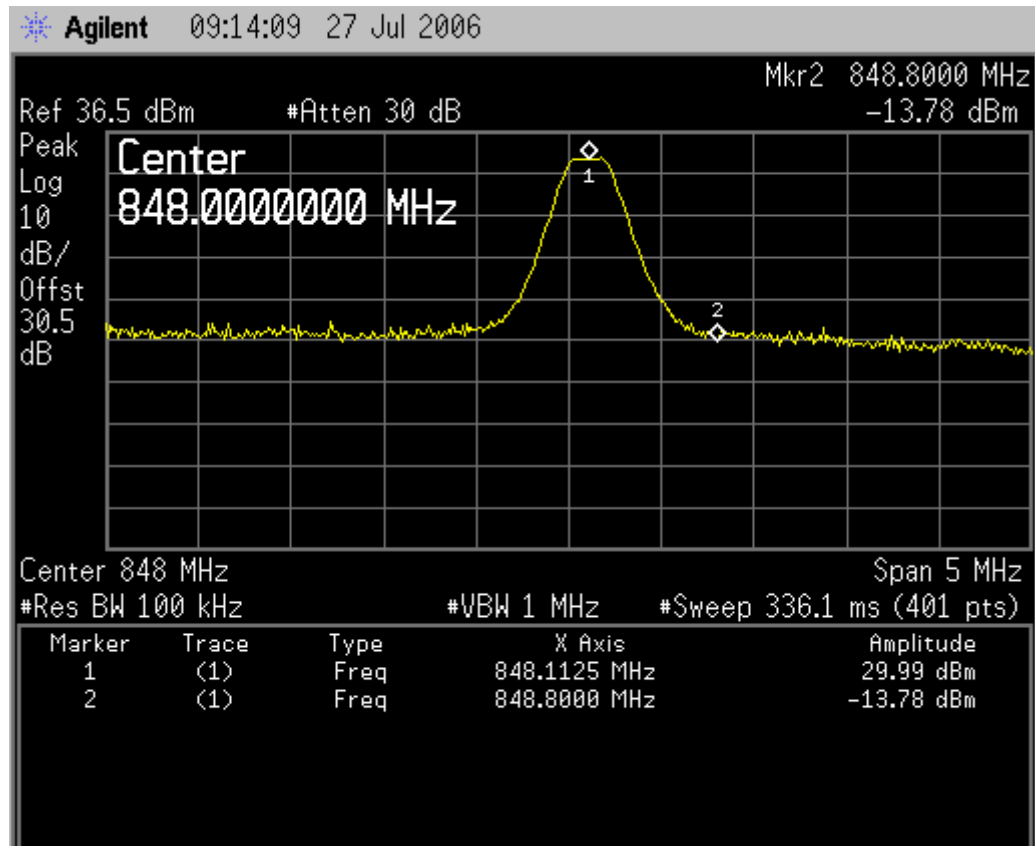
Spectrum analyzer screen shot of a GSM signal at the lower band edge of the Up-link pass band. (824- 849 MHz)

GSM BAND-WIDTH MEASUREMENTS UP-LINK



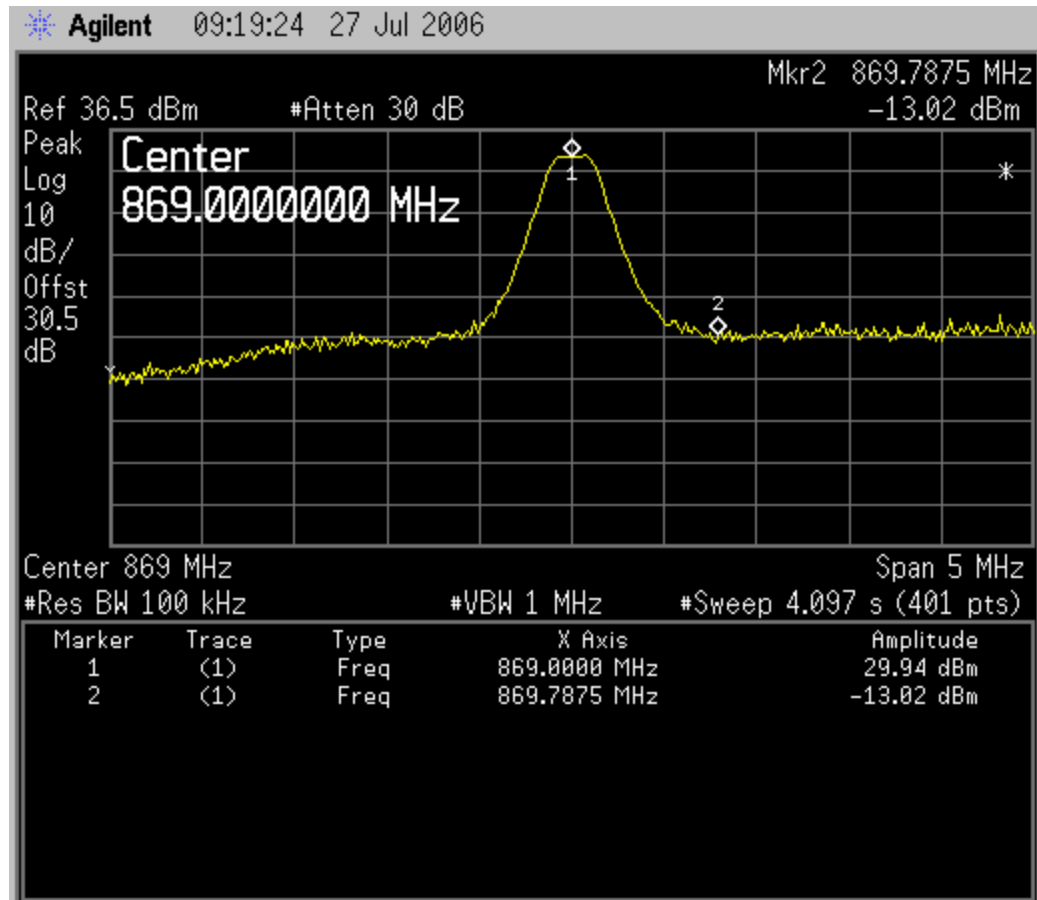
Spectrum analyzer screen shot of a GSM signal at the center of the Up-link pass band. (824- 849 MHz)

GSM BAND-WIDTH MEASUREMENTS UP-LINK



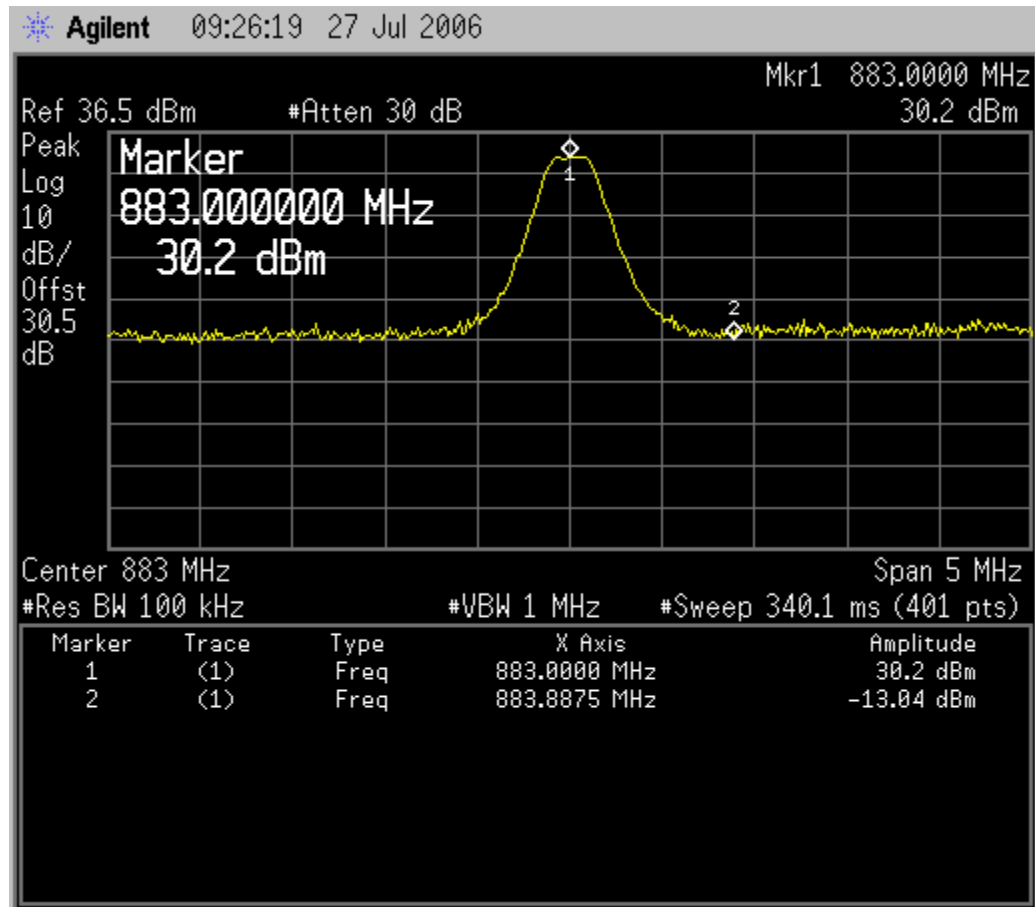
Spectrum analyzer screen shot of a GSM signal at the upper-band edge of the Up-link pass band. (824- 849 MHz)

GSM BAND-WIDTH MEASUREMENTS DOWN-LINK



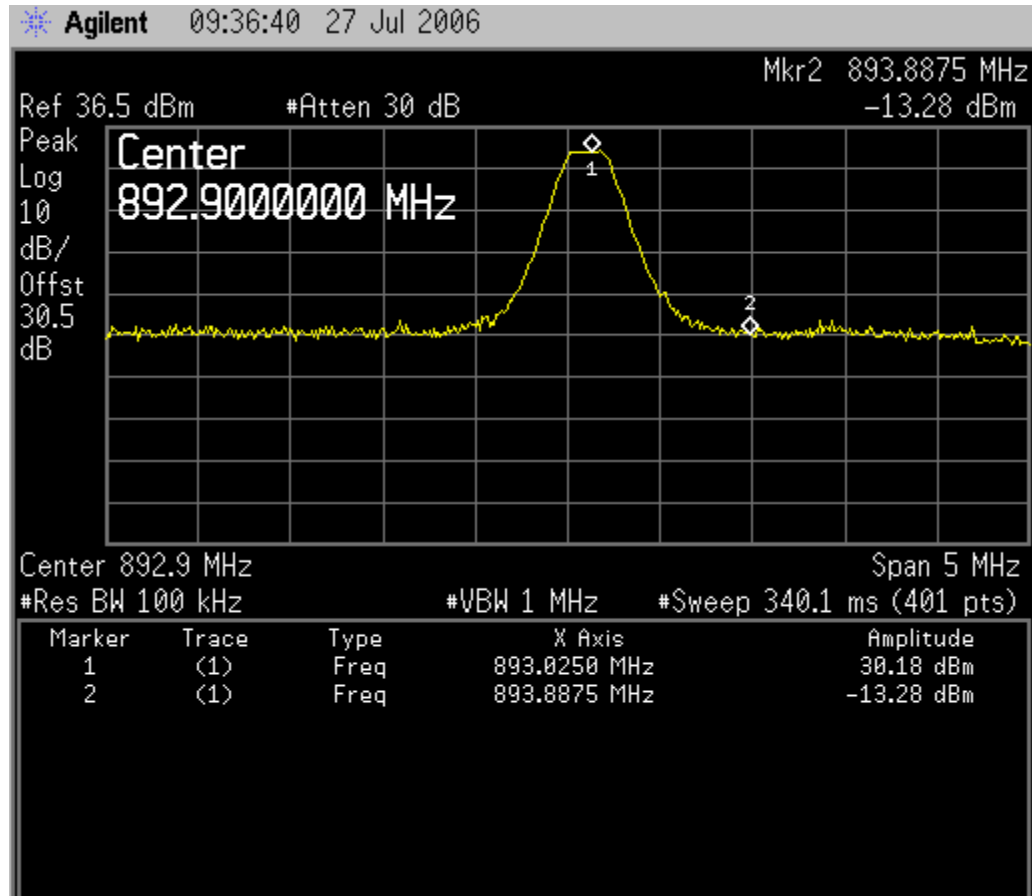
Spectrum analyzer screen shot of a GSM signal at the lower-band edge of the Down-link pass band. (824- 849 MHz)

GSM BAND-WIDTH MEASUREMENTS DOWN-LINK



Spectrum analyzer screen shot of a GSM signal at the center of the Down-link pass band. (869- 894 MHz)

GSM BAND-WIDTH MEASUREMENTS DOWN-LINK



Spectrum analyzer screen shot of a GSM signal at the upper-band edge of the Down-link pass band. (869- 894 MHz)

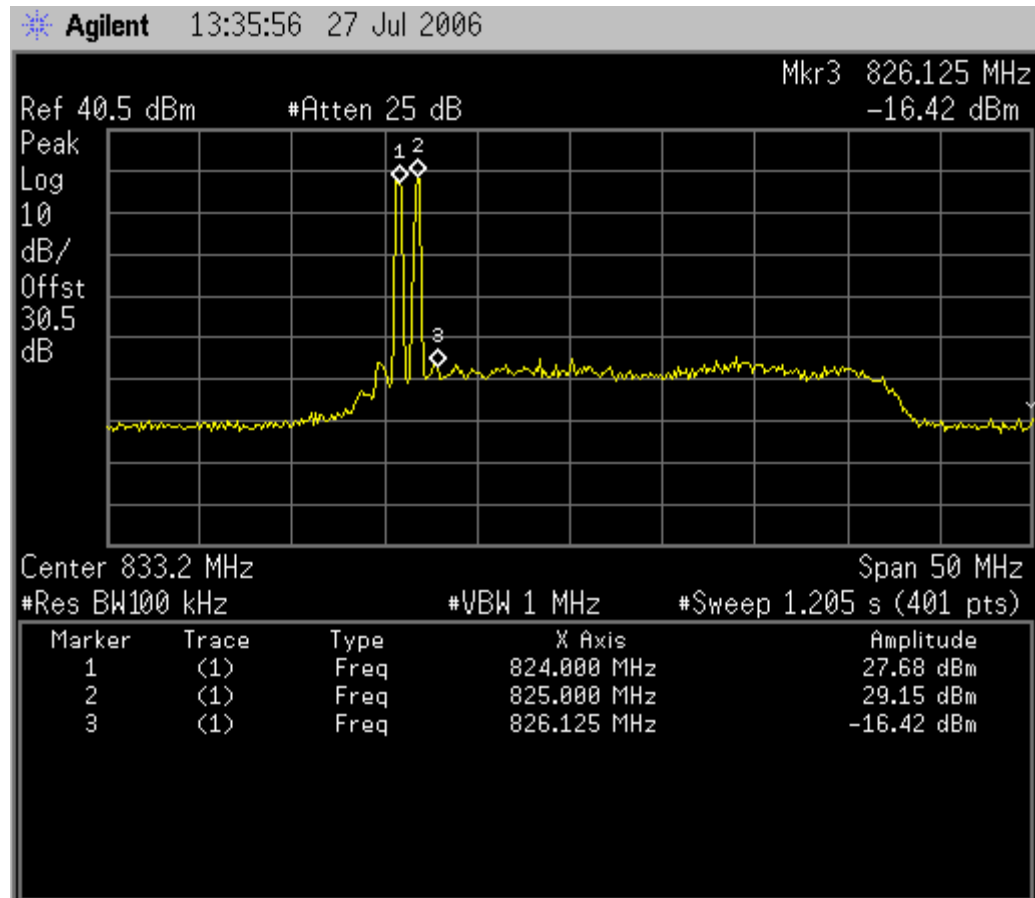
GSM TWO TONE INTERMODULATION MEASUREMENTS

TWO TONE TEST GSM

FCC: Part 2.1051 Spurious Emission and I.M.D.

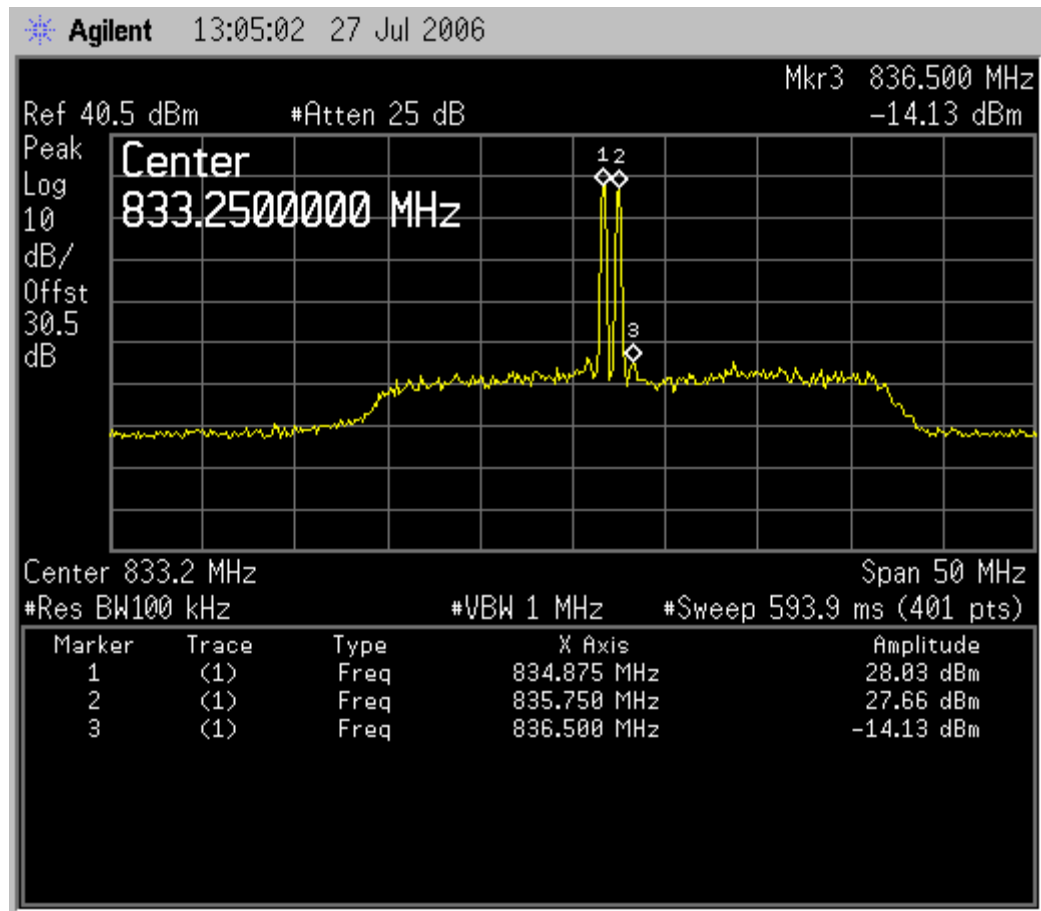
Input level two tones (GSM modulated) at -68dBm each, for rated power output
2 tones of +27dBm.

All tests taken at +20 degrees Celcius



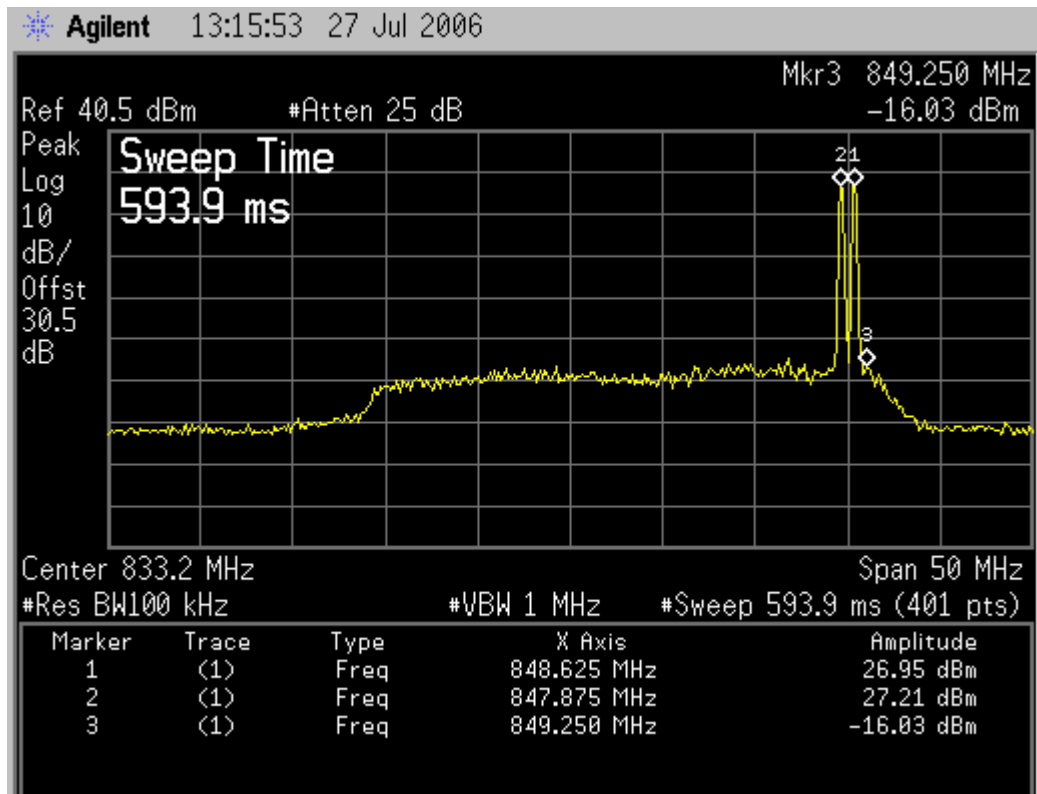
Spectrum analyzer screen shot of a GSM two tone signal at the lower-band edge of the Up-link pass band. (824- 849 MHz)

TWO TONE TEST GSM UP-LINK



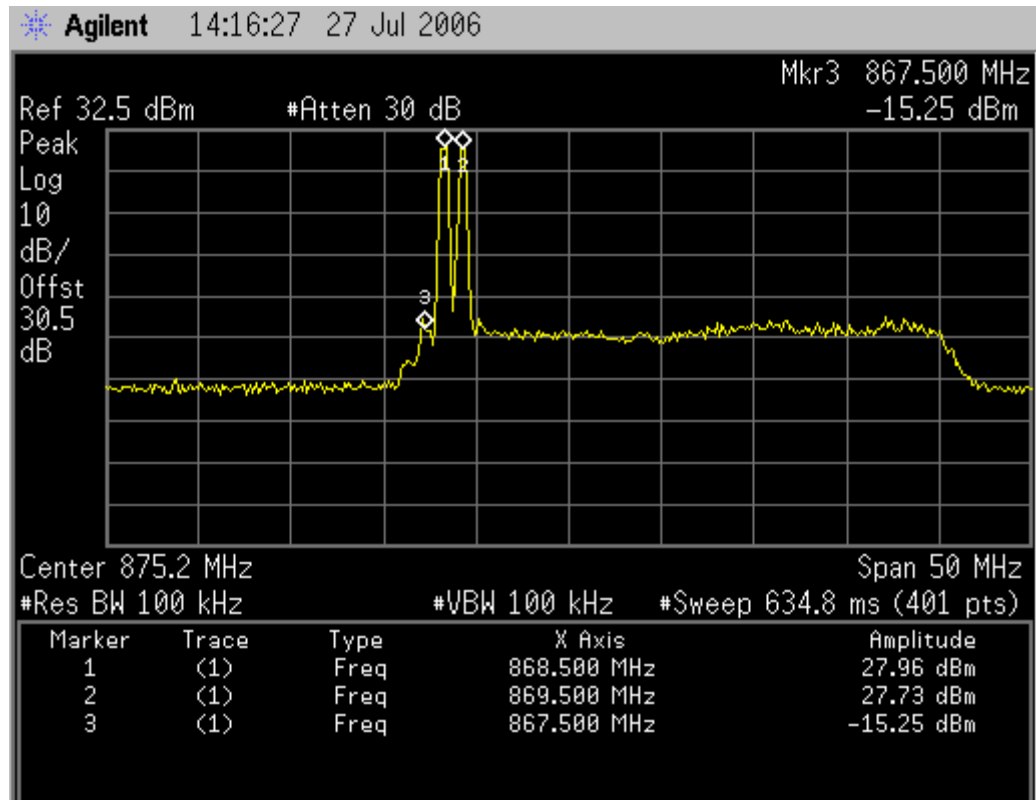
Spectrum analyzer screen shot of a GSM two tone signal at the mid-band edge of the Up-link pass band. (824- 849 MHz)

TWO TONE TEST GSM UP-LINK



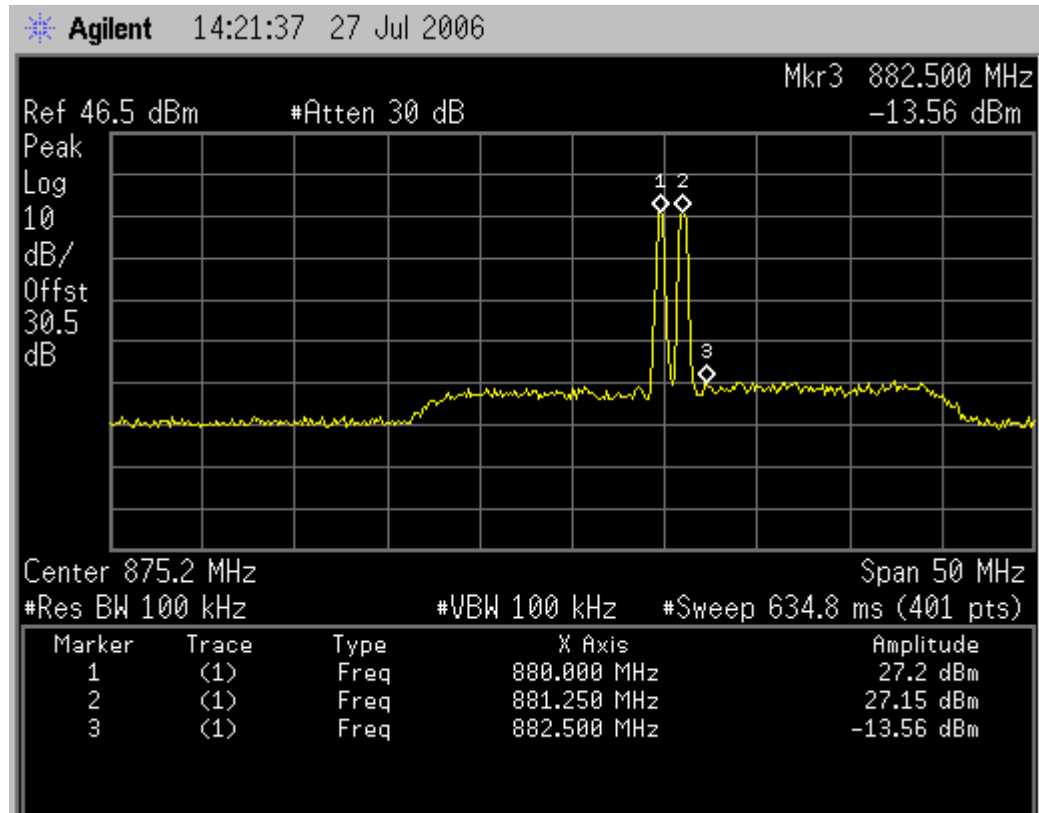
Spectrum analyzer screen shot of a GSM two tone signal at the upper-band edge of the Up-link pass band. (824- 849 MHz)

TWO TONE TEST GSM DOWN-LINK



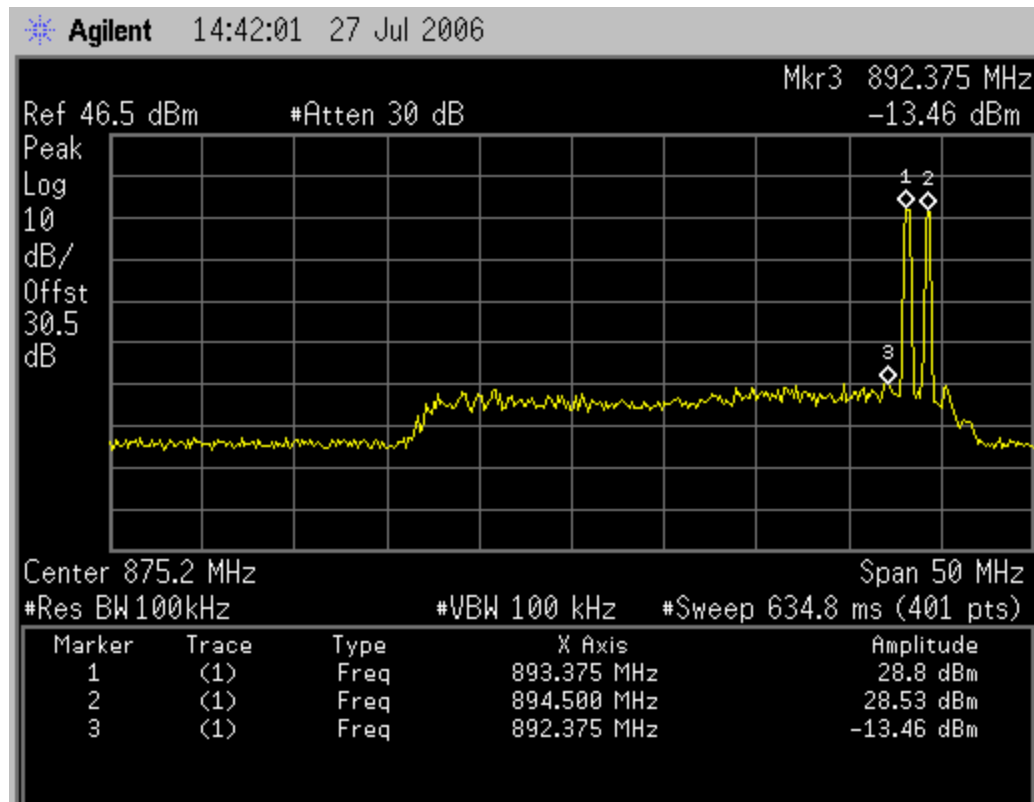
Spectrum analyzer screen shot of a GSM two tone signal at the lower-band edge of the Down-link pass band. (869- 894 MHz)

TWO TONE TEST GSM DOWN-LINK



Spectrum analyzer screen shot of a GSM two tone signal at the center of the Down-link pass band. (869- 894 MHz)

TWO TONE TEST GSM DOWN-LINK



Spectrum analyzer screen shot of a GSM two tone signal at the upper-band edge of the Down-link pass band. (869- 894 MHz)