Project:	**07CA35087**
File:	**TC8314**
Report:	**07CA35087-FCC**
Date:	**Aug.03, 2007**
Model:	**SKSN-C30-CO**

Electromagnetic Compatibility Test Report

FCC Certification
47 CFR Part 24 Subpart E Broadband PCS

For

SK Telesys Co.,Ltd.

12F, Chorim Bldg. 6-3, Sunae-Dong,
Buandang-Gu, Seongnam, Gyeonggi-Do,
463-825, Korea

UL Korea Ltd.

33rd Fl. Star Tower, 737 Yeoksam-Dong, Kangnam-Gu, Seoul, 135-984, Korea

Report Directory

Test Report Details :

Tests Performed By:	UL Korea Ltd. 33rd FL. Star Tower 737 Yeoksam-dong, Kangnam-ku, Seoul, 135-984, Korea
Test Site:	Estech Co.,Ltd. 97-1, Hoeok-Ri, Majang-Myun, Icheon-City, Kyonggi-Do,467-811, Korea FCC Registration No. : 94696
Tests Performed For:	SK Telesys Co.,Ltd. 12F, Chorim Bldg. 6-3, Sunae-Dong, Buandang-Gu, Seongnam, Gyeonggi-Do, 463-825, Korea
Applicant Contact:	Jae Hyung, Kim
Title:	Manager / RF Development Team
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E-mail:	kjhyung@sktelesys.com
Test Report Number:	07CA35087-FCC
Test Report Date:	August 03, 2007
Equipment Class:	TNB - Licensed Non-Broadcast Station Transmitter
Product Type:	CDMA Repeater
Model Number:	SKSN-C30-CO
FCC ID:	VAWSKSN-C30-CO
Test standards	47 CFR Part 24 Subpart E & Part 15 Subpart B
Sample Serial Number:	Prototype
Sample Receive Date:	2007-07-05
Testing Start Date:	2007-07-05
Date Testing Complete:	2007-07-24
Overall Results:	**Pass**

Summary of Testing:

The following tests were performed on a sample submitted for evaluation of compliance with 47 CFR Part 24 Subpart E and Part 15 Subpart B.

Test #	Test Name Test Requirement/Specification	Compliant	Not Compliant	See Remark
1	Part 15, Subpart B Section 15.109(a)/ CISPR 22:1997 Class A Radiated Emissions - 30 to 1000 MHz Electric Field	X	-	2
2	Part 15, Subpart B Section 15.107(a) / CISPR 22:1997 Class A Conducted Emissions	X	-	2
3	RF Power Output - § 2.1046 , § 24.232	X		
4	Audio Frequency Response - § 2.1047	-	-	1
5	Modulation Limiting - § 2.1047	-	-	1
6	Occupied Bandwidth - § 2.1049	X		
7	Spurious Emission at antenna terminal - § 2.1051 , § 24.238	X		
8	Radiated Spurious Emission - § 2.1053 , § 24.238	X		
9	Frequency Stability - § 2.1055 , § 24.135	X		
10	Out of band Rejection	X		
11	RF Exposure			3

Remarks:

1) Not applicable to this EUT.
2) Emissions Data can also be considered applicable to FCC Part 15 Subpart B Class A.
3) RF Exposure will be addressed at the time of licensing.
4) Modifications to EUT required for compliance: NONE.

Conclusion:

The tests listed in the Summary of Testing section of this report have been performed and the results recorded by UL Korea Ltd. in accordance with the procedures stated in each test requirement and specification. The test list was determined by the Applicant as being applicable to the Equipment Under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.

Tested By:

Kyung Yong, Kim
Senior EMC Engineer
UL Korea Ltd.

Reviewed By:

Jea Woon, Choi
EMC Engineer
UL Korea Ltd.

1. G E N E R A L - Product Description

1.1 Equipment Description

The RF repeater for CDMA is designed to enable users to select their desired bands(at most 20MHz) among the CDMA 65MHz band. The internal structure of a CDMA repeater composes a DL(Down Link) converter and UL(Up Link) converter as one-module for optimum size and efficiency and consists of a PSU(Power Supply Unit), filter unit, NMS module, and PAU(Power Amplifier Unit).

-. Basic model tested : SKSN-C30-C0
-. Model covered : SKSN-C30-CM , SKSN-C30-NO

Items	Standards	
Frequency Range	Uplink : 1850 ~ 1915 MHz ☒Block A : 1850 – 1865MHz ☒Block D : 1865 – 1870 MHz ☒Block B : 1870 – 1885 MHz ☒Block E : 1885 – 1890 MHz ☒Block F : 1890 – 1895 MHz ☒Block C : 1895 – 1910 MHz ☒Block G : 1910 – 1915 MHz	Downlink : 1930~1995 MHz ☒Block A : 1930 – 1945 MHz ☒Block D : 1945 – 1950 MHz ☒Block B : 1950 – 1965 MHz ☒Block E : 1965 – 1970 MHz ☒Block F : 1970 – 1975 MHz ☒Block C : 1975 – 1990 MHz ☒Block G : 1990 – 1995 MHz
Output Power	30 dBm / channel	
Modulation	CDMA	
Emission Designator	F9W	
Amplifier Gain	86 dB	
Input Level	-56 ~ -16dBm	
Gain Control Range	46 dB(1dB/Step±0.5dB or less)	
Input/output connector	50Ω N-Type (Female)	
Cabinet	Indoor type	
Size (H*W*D)	390*326*195 mm	
Working temperature & Humidity	-10℃ ~ 50℃ / 5 % ~ 95%	
Power	108 ~ 127 VAC, 60Hz	

1.2 Equipment

1.3 Equipment Marking Plate

PRODUCT NAME : CDMA Repeater
MODEL : SKSN-C30-CO

S/N : TSKAABBB1234

PRODUCTION DATE : 2007.

MANUFACTURER : SK telesys

MADE IN KOREA

c UL us LISTED
E312829
I.T.E.
3LBK

INPUT : 120V~, 60Hz, 1.6A

FCC ID : VAWSKSN-C30-CO

Customer Service : Call 1-888-758-7002, or
Send e-mail to service@sktelesys.com

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions : (1) This device may not cause harmful interference and (2) This device must accept any interference received, including interference that may cause undesired operation.

2. Test Conditions

2.1 Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
EUT	CDMA Repeater	SK Telesys	SKSN-C37-CO	Indoor metal enclosure
AE	RF Attenuator	Agilent	30 dB	
AE	RF Attenuator	HP	30 dB	

Note:
* **EUT** - Equipment Under Test, **AE** - Auxiliary/Associated Equipment, or **SIM** - Simulator (Not Subjected to Test)

2.2 Input/Output Ports

Port #	Name	Type*	Cable Max. >3m (Y/N)	Cable Shielded (Y/N)	Comments
0	Enclosure	N/E	—	—	Metal cabinet type (indoor purpose)
1	Mains (AC input)	AC	N	N	1m length. Manufacturer provided
2	Antenna port (Donor)	CO	Y	Y	Connected to RF Load & Spectrum
3	Antenna port (Service)	CO	Y	Y	Connected to RF Signal Generator
4	External Ground		N	N	Manufacturer provided
5	Coupling Port	-	-	-	No use : Maintenance purpose only
6	Coupling Port	-	-	-	No use : Maintenance purpose only
7	Mains (DC input)	-	-	-	No use : Not available option

Note:
-. AC = AC Power Port DC = DC Power Port N/E = Non-Electrical
-. CO = Coaxial Port
-. I/O = Signal Input or Output Port (Not Involved in Process Control)
-. TP = Telecommunication Ports
-. All the cable used were provided by the applicant.

2.3 Test Equipments used

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Signal Generator	Agilent	E4432B	US40052949	2007-05-02	2008-05-02
Signal Generator	Agilent	E4436B	US39260374	2006-11-07	2007-11-07
Spectrum Analyzer	Agilent	E4445A	US42220280	2006-10-20	2007-10-20
Signal Generator	Aeroflex	IFR3413	341006/206	2007-05-02	2008-05-02
Fixed Attenuator	Agilent	30 dB	MY41495185	-	-
Fixed Attenuator	Agilent	30 dB	MY41495110	-	-
Fixed Attenuator	HP	30 dB	3318A10568	-	-
Frequency Divider	Wavetek	4PD-2142.5W10EM	71010010	-	-

2.4 Power Interface

Mode #	Voltage (V)	Frequency (DC/AC-Hz)	Phases (#)	Comments
Rated	108~127Vac	60Hz	Single Phase	Nominal voltage
1	120Vac	60Hz	Single Phase	Test voltage
2	108Vac	60Hz	Single Phase	Voltage variation (Norminal-15%)
3	138Vac	60Hz	Single Phase	Voltage variation (Norminal+15%)

2.5 EUT Internal Operating Frequencies

Frequency (MHz)	Description	Frequency (MHz)	Description

Note : The data has not been provided from the applicant.

2.6 EUT Operation Modes

Emission measurement modes

Mode #	Description
1	Transmission mode : RF signal from the CDMA signal generator injected to the service port of the repeater and the amplified RF output signal from the Doner port of the repeater was connected to the RF Load.

RF measurement modes

Mode #	Description
2	Uplink mode : RF signal from the CDMA signal generator injected to the service port of the repeater and the amplified RF output signal from the Doner port of the repeater was connected to the Spectrum analyzer.
3	Downlink mode : RF signal from the CDMA signal generator injected to the Doner port of the repeater and the amplified RF output signal from the Service port of the repeater was connected to the Spectrum analyzer.

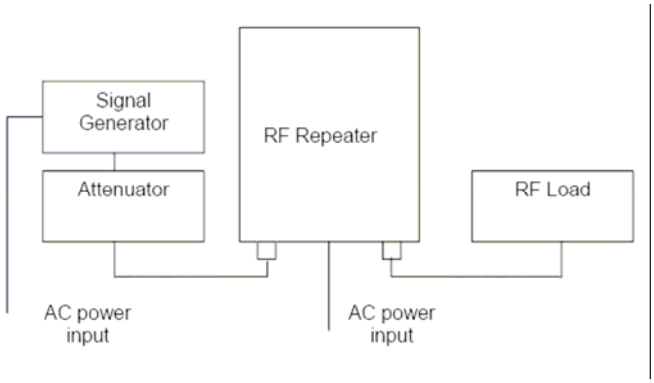
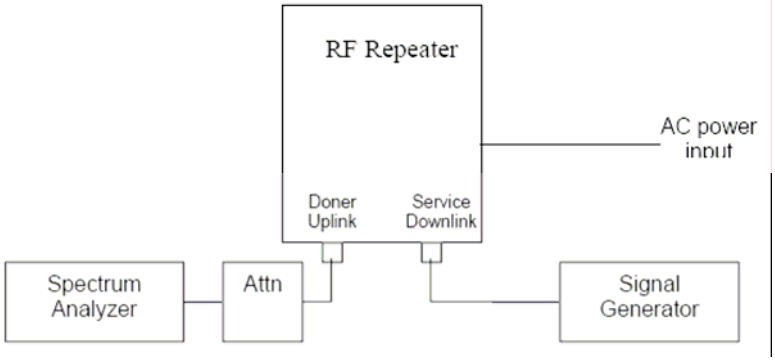
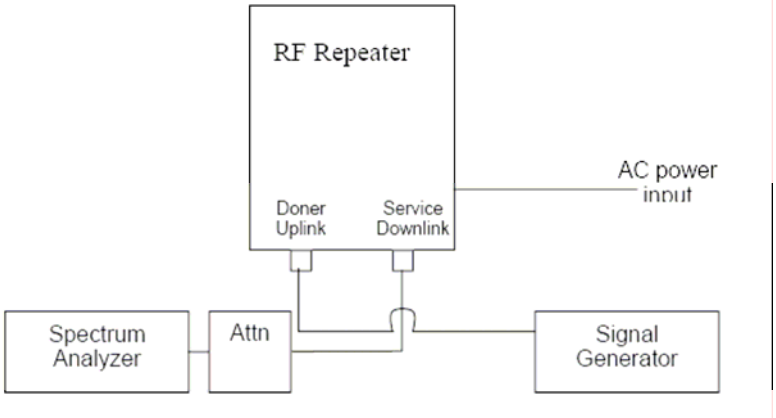
2.7 EUT Operating Frequencies

Mode #	Description
1	Uplink mode : 3 frequencies (Low, Mid, High channel) for assigned frequency band -. Low channel : 1851.25 MHz -. Mid channel : 1887.5 MHz -. High channel : 1913.75 MHz
2	Downlink mode : 3 frequencies (Low, Mid, High channel) for assigned frequency band -. Low channel : 1931.25 MHz -. Mid channel : 1967.5 MHz -. High channel : 1993.75 MHz

2.8 Test Signal Source

The carrier from the signal generator applied to the repeater was a IS-95 CDMA standard signal.
-. Baseband Modulation type : QPSK
-. Baseband Channelization : 1.25 MHz
-. Signal source sample rate : 1.2288 MHz

2.9 EUT Configurations

Mode #	Description
1	 **Test Configuration of EMI Measurement**
2	 **Test Configuration of Conducted Measurement – Up link**
3	 **Test Configuration of Conducted Measurement – Down link**

2.10 Test Lab Environmental Condition

Parameters required prior to the test	Laboratory Ambient Temperature	10 to 40 °C
	Relative Humidity	10 to 90 %
Parameters recorded during the test	Laboratory Ambient Temperature	23 °C
	Relative Humidity	40 %

2.11 Test Specifications

Standard Number	Standard Name	Standard Date
CFR 47 Part 24 Subpart E	Personal Communication Service – Broadband PCS	2006
CFR 47 Part 15 Subpart B	General Technical requirements	2006
ANSI C63.4-2003	Methods of Measurements of Radio-Noise Emission from Low voltage and electrical equipment in the range of 9kHz~40GHz	2003
EIA/TIA-603 Edition C 2004	Land Mobile FM or PM communication equipment measurement and performance standards	2004
FCC 2-11-04	EAB/RF Amplifier, Booster, and Repeater reminder	2004

2.12 Test Laboratory Details

All the testing has been performed by UL Korea engineer at both test laboratories described below. The radiated spurious emission measurements were performed in a 10 meter open site which has been filed to the commission in accordance with section 2.948 at Estech Co. Ltd.

Conducted RF Measurement Test Laboratory : SK Telesys Test Lab (Manufacturer's Test Lab)
Location : 12F, Chorim Bldg. 6-3, Sunae-Dong, Buandang-Gu, Seongnam, Gyeonggi-Do, 463-825, Korea.
Persons who have been presented during the test : Si Hwan, Sung (Research engineer / SK Telesys) JaeHyung, Kim (Manager of R&D office/ SK Telesys), SeungYong, Lee(Engineer of R&D office/ SK Telesys)

Radiated Emission Measurement Test Laboratory : Estech Co., Ltd.
10 m Open Field Test Site (FCC Registration No. : 94696)
97-1, Hoeok-Ri, Majang-Myun, Icheon-City, Kyonggi-Do,467-811, Korea
Persons who have been presented during the test : Jin Mo, Yang (Senior test engineer)

3. Test Results

3.1 Test Conditions and Results – Conducted emissions at mains terminal

Test Description	Measurements were made on a ground plane. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on mains lines were made at the output of the AMN.		
Basic Standard		ANSI C63.4-2003, 47 CFR § 15.107	
Parameters required prior to the test		Laboratory Ambient Temperature	10 to 40 °C
		Relative Humidity	10 to 90 %
Parameters recorded during the test		Laboratory Ambient Temperature	25 °C
		Relative Humidity	35 %
		Frequency range on each side of line	Measurement Point
Fully configured sample scanned over the following frequency range		150kHz to 30MHz	Mains

Limits - Class A

Frequency (MHz)	Limit (dBµV)	
	Quasi-Peak	Average
0.15 to 0.50	79	66
0.50 to 30	73	60

Limits - Class B

Frequency (MHz)	Limit (dBµV)	
	Quasi-Peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Supplementary information: **Class A limit applied.**

Conducted Emissions EUT Configuration Settings

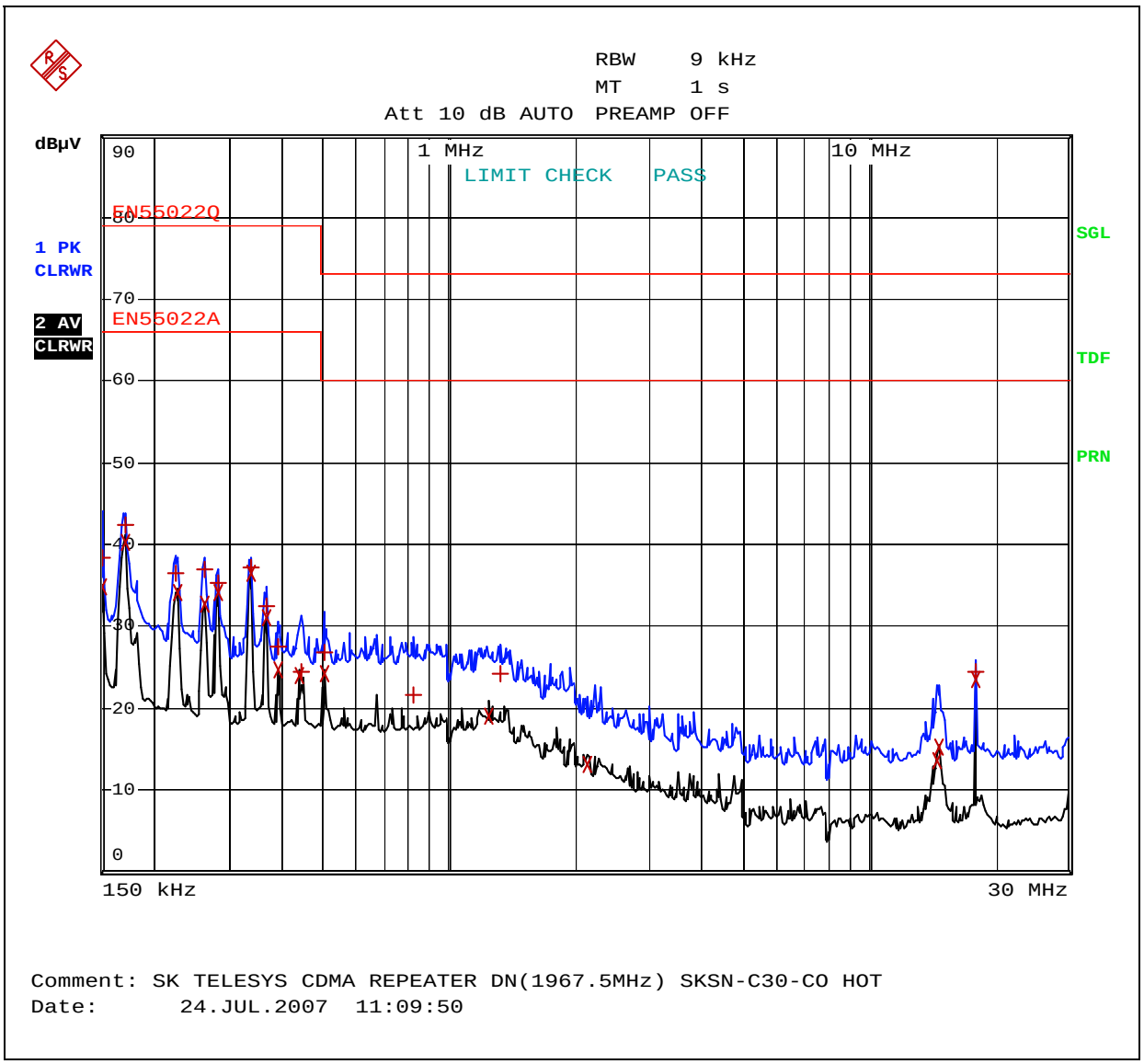
Power Interface Mode # (See Section 2.4)	EUT Configurations Mode # (See Section 2.9)	EUT Operation Mode # (See 2.6)
1	1	1
Supplementary information:		

Conducted Emissions Test Equipment

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Test Receiver	Rohde & Schwarz	ESP17	100185	2006.08.24	2007.08.24
LISN	COM-POWER	ESH3-Z5	838979/010	2007.02.27	2008.02.27
LISN	SCHWARZBECK	NNLA8120A	-	2007.02.27	2008.02.27
Pulse Limiter	Rohde & Schwarz	ESH3Z2	-	-	-

Figure 1 Test Setup for Conducted Emissions

Figure 2 Conducted Emissions Graph – Line Polarity : HOT



Conducted Emissions Graph – Line Polarity : NEUTRAL

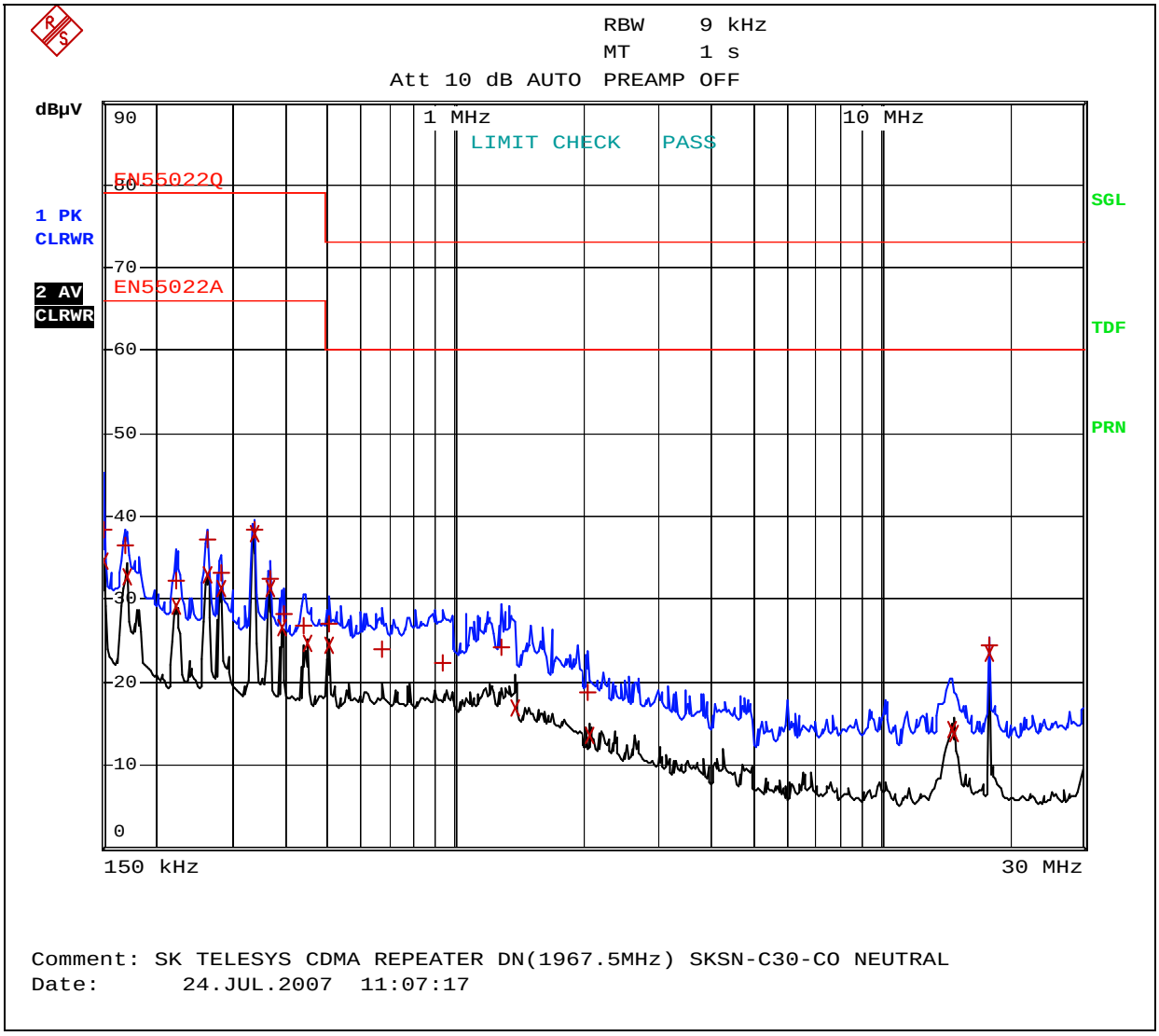


Table 1 Conducted Emissions Test Data

Test Frequency (MHz)	Meter Reading (dBuV)	Detector (Pk/QP/Av) /Polarity	Gain/Loss Factor (dB)	Transducer Factor(dB)	Level (dBuV)	QP Limit (dBuV)	Ave Limit (dBuV)	QP Margin (dB)
0.15	38.82	QP/H	0.0	0.17	38.53	79.0	66.0	40.47
0.17	42.48	QP/H	0.0	0.17	42.70	79.0	66.0	36.30
0.22	36.56	QP/H	0.1	0.18	36.81	73.0	60.0	42.19
0.26	37.13	QP/N	0.1	0.13	37.34	73.0	60.0	32.82
0.34	38.27	QP/N	0.1	0.13	38.46	73.0	60.0	40.54
1.32	24.27	QP/H	0.2	0.20	24.67	73.0	60.0	48.33
18.00	24.55	QP/H	1.1	0.78	26.44	73.0	60.0	46.56

Supplementary information:

-. The emission data reported is the worst case emission data taken at Down link mode @ 1967.5 MHz. All other frequencies have been investigated at preliminary testing and final measurement was made at te worst case emission mode.

3.2 Test Conditions and Results – Radiated Emissions

Test Description	Measurements were made in a 10-meter open field test site that complies to CISPR 16/ANSI C63.4. Preliminary (peak) measurements were performed at semi anechoic chamber with antenna to EUT separation distance of 3 meter. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in both horizontal and vertical polarities. Final measurements (quasi-peak or average as noted) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4-meters. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.	
Basic Standard	ANSI C63.4-2003, 47 CFR § 15.107 Class A	
Parameters required prior to the test	Laboratory Ambient Temperature	10 to 40 °C
	Relative Humidity	10 to 90 %
Parameters recorded during the test	Laboratory Ambient Temperature	28 °C
	Relative Humidity	52 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30MHz – 1GHz	10 meter measurement distance
Limits - Class A		
Frequency (MHz)	Limit (dBμV/m)	
	Quasi-Peak	Results
30 to 230	40	Pass
230 to 1000	47	Pass
Limits - Class B		
Frequency (MHz)	Limit (dBμV/m)	
	Quasi-Peak	Results
30 to 230	30	N/A
230 to 1000	37	N/A
Supplementary information: **Class A limit applied**		

Radiated Emissions EUT Configuration Settings

Power Interface Mode # (See Section 2.4)	EUT Configurations Mode # (See Section 2.9)	EUT Operation Mode # (See Section 2.6)
1	1	1
Supplementary information: The EUT operation frequencies specified in Section 2.6 of this report have been investigated and final measurement reported was performed with down-link mode of 1967.5 MHz carrier frequency as a worst case emission.		

Radiated Emissions Test Equipment

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI test receiver	Rohde & Schwarz	ESVS10	838562/002	2007. 1. 23	2008. 1. 23
Spectrum Analyzer	Advantest	R3261C	61720116	2007. 4. 20	2008. 4. 20
Logbicon Antenna	Schwarzbeck	VULB 9160	3142	2007. 5. 07	2008. 5. 07
Amplifier	Rohde & Schwarz	8447F	2805A02972	2007. 6. 26	2008. 6. 26

Figure 3 Test setup for Radiated Emissions

Table 2 Radiated Emissions Data

LAN communication mode

Test Frequency (MHz)	Meter Reading (dBuV)	Detector (Pk/QP)	Polarity (V/H)	Azimuth (Degrees)	Antenna Height (cm)	Gain/Loss Factor (dB)	Transducer Factor (dB/m)	Emission Level dBuV/m	Class A Limit dBuV/m	Margin (dB)
60.00	21.30	QP	V	60	100	1.23	11.56	34.09	40	5.41
100.00	18.50	QP	H	110	400	1.55	9.34	29.39	43.5	14.11
140.01	19.10	QP	H	70	400	1.84	12.73	33.67	43.5	9.83
160.00	16.20	QP	V	300	100	1.93	12.89	31.02	43.5	12.48
200.00	25.10	QP	V	290	100	2.23	9.61	36.94	43.5	6.56
222.79	19.50	QP	H	70	400	2.42	10.48	32.40	43.5	14.10
752.37	5.70	QP	V	300	100	5.72	21.90	33.32	46.5	13.18
959.69	8.20	QP	H	120	100	6.87	24.10	39.17	46.5	7.33

Supplementary information:
-. Margin = Class A Limit – Emission Level
-. All other emissions not reported were more than 25 dB below the permitted limit.

3.3 Test Conditions and Results – RF Power Output

Test Description	Measurements were made in the laboratory environment. For RF power measurements, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. The EUT was adjusted to produce maximum power rating of the product specification. The measurements were made at the EUT input and output ports in downlink and uplink transmit modes of operation at B,M,T channels.

Basic Standard	47 CFR § 2.1046, § 24.232	
RF Power output Limit		
§ 24.232 (c) Mobile/portable stations are limited to 2 watts EIRP peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.		
Parameters required prior to the test	Laboratory Ambient Temperature	10 to 40 °C
	Relative Humidity	10 to 90 %
Parameters recorded during the test	Laboratory Ambient Temperature	23 °C
	Relative Humidity	40 %

RF output power Configuration Settings

Power Interface Mode # (See Section 2.4)	EUT Configurations Mode # (See Section 2.9)	EUT Operation Mode # (See 2.6)
1	2, 3	2, 3
Supplementary information: None		

Test Equipment

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Signal Generator	Agilent	E4436B	US39260374	2006-11-07	2007-11-07
Spectrum Analyzer	Agilent	E4445A	US42220280	2006-10-20	2007-10-20
Fixed Attenuator	Agilent	30 dB	MY41495185	-	-

Figure 4 Test setup for Conducted Measurement

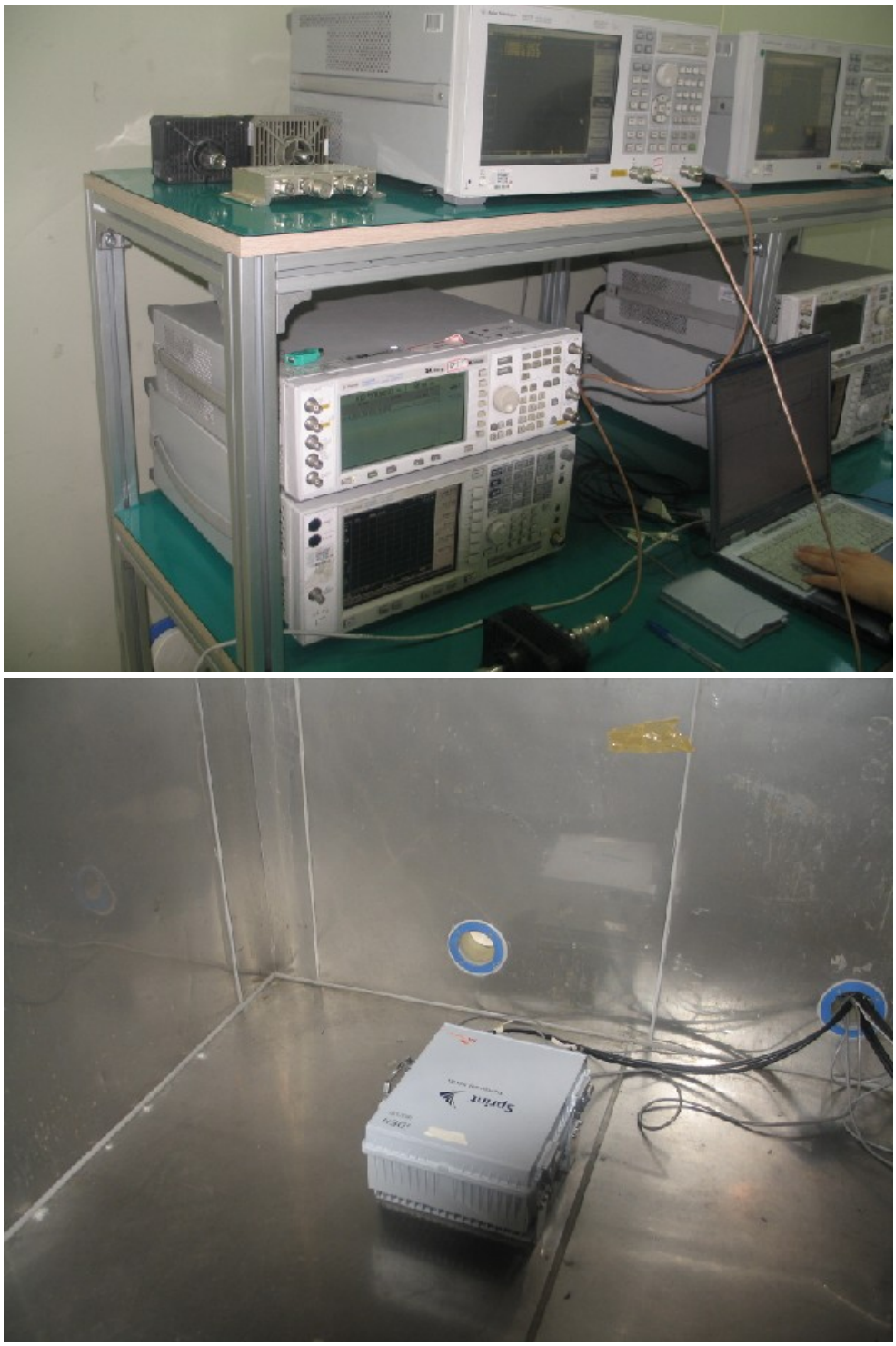
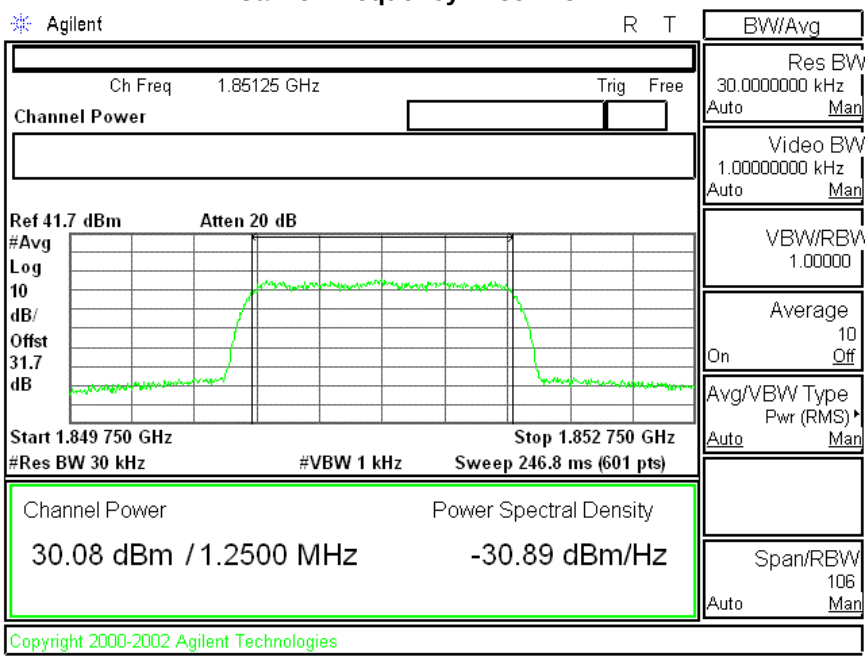


Table 3 RF output power measured data

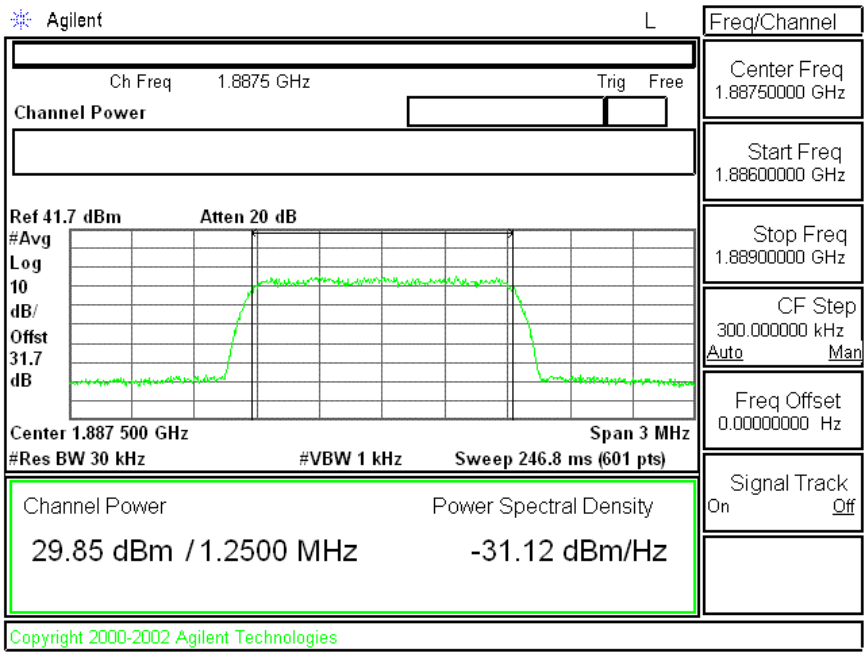
Carrier Band	Frequency (MHz)	Loss offset (dB)	Measured Power (dBm)	Composite power (dBm)	
Uplink	1851.25	31.7	30.08	-	
	1887.50	31.7	29.85	-	
	1913.75	31.7	29.93	-	
Downlink	1931.25	31.7	30.13	-	
	1967.50	31.7	29.85	-	
	1993.75	31.7	29.75	-	
Supplementary information: -. Modulation signal CDMA, Power measurement : Channel power w/ mean value -. Before the measurement, the system calibration for compensation of cable loss and attenuator has been made and included in the test result.					

Figure 5 RF output power graphical data

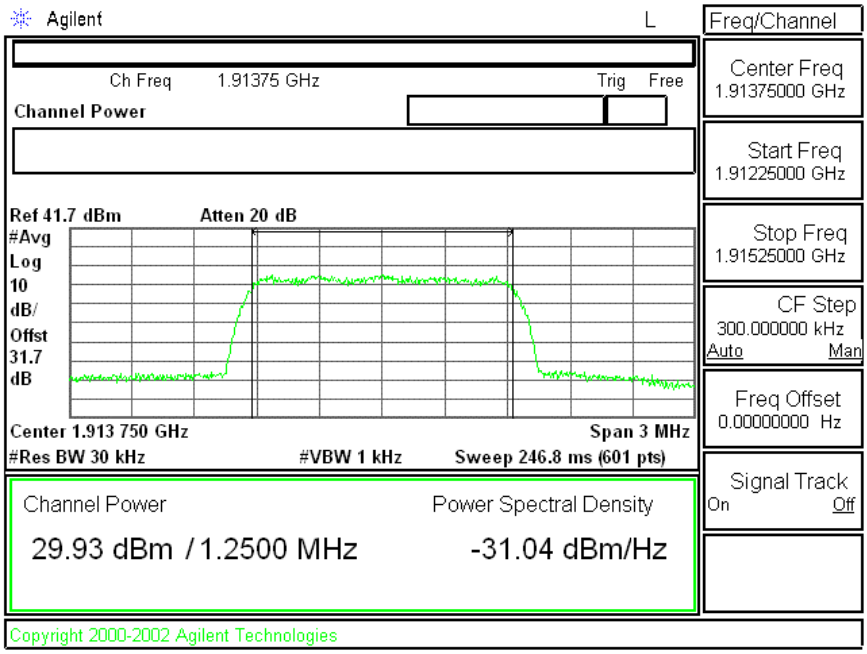
Mode : Output Power – UP Link : B
Carrier Frequency : 1851.25 MHz



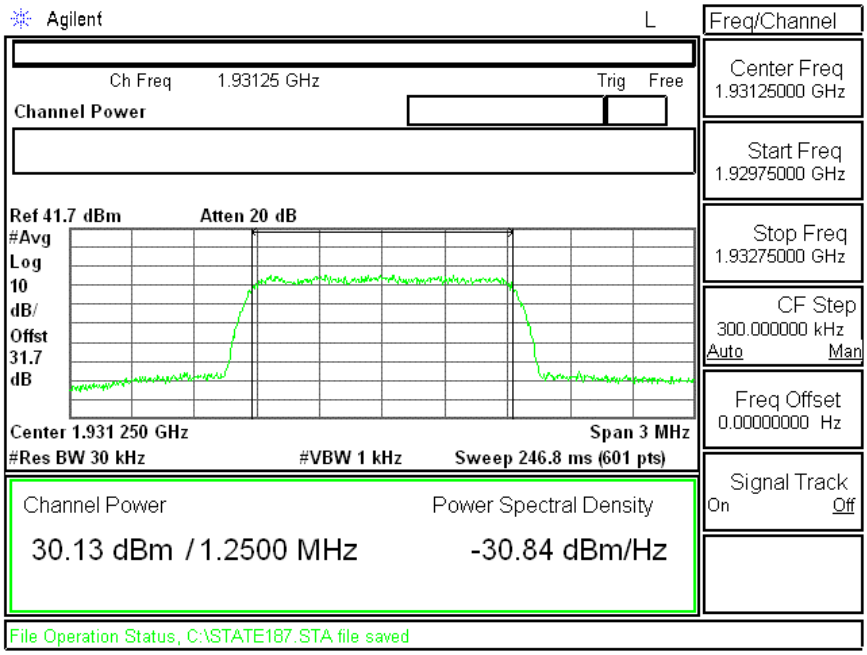
Mode : Output Power – UP Link : M
Carrier Frequency : 1887.50 MHz



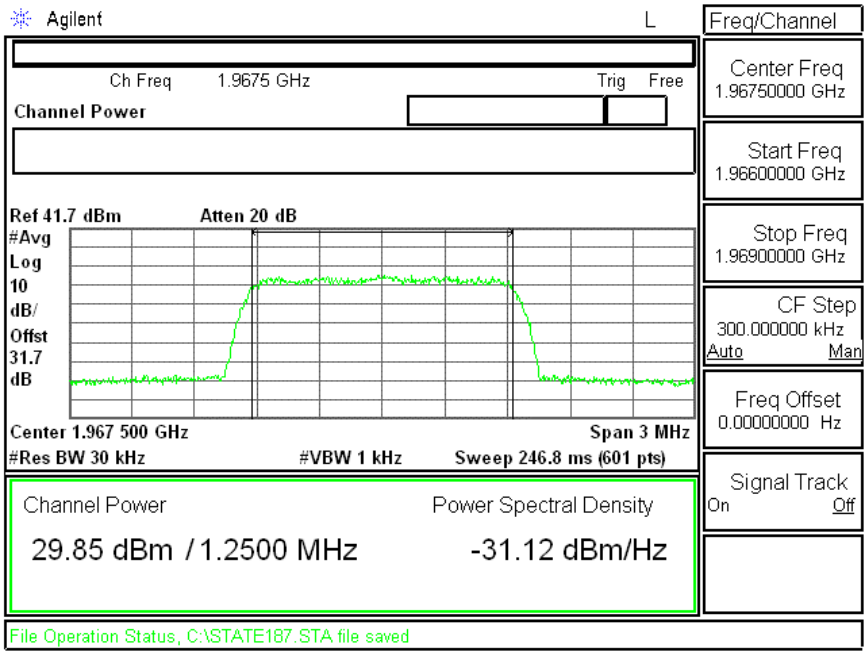
Mode : Output Power – UP Link : T
Carrier Frequency : 1913.75 MHz



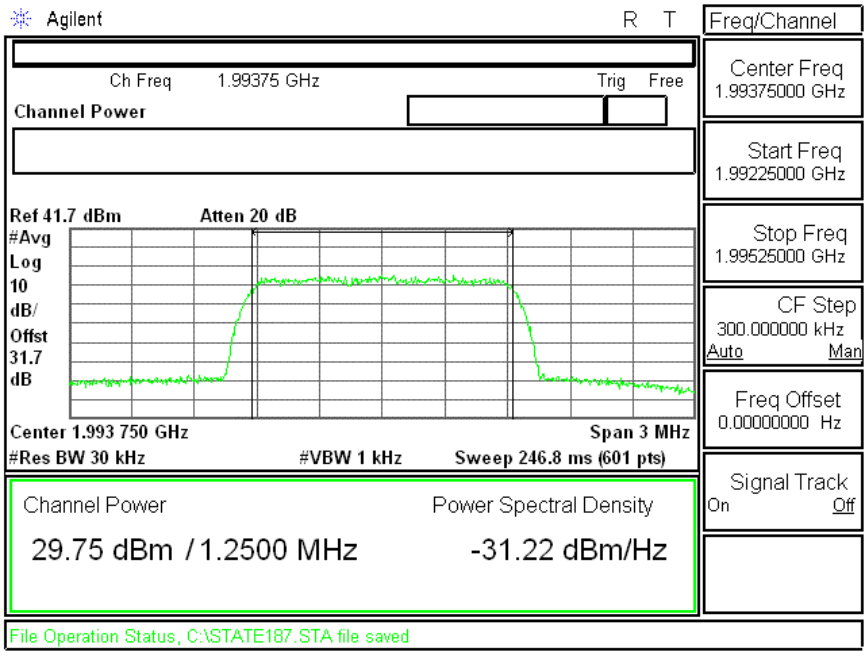
Mode : Output Power – Down Link : B
Carrier Frequency : 1931.25 MHz



Mode : Output Power – Down Link : M
Carrier Frequency : 1967.5 MHz



Mode : Output Power – Down Link : T
Carrier Frequency : 1993.75 MHz



3.4 Test Conditions and Results – Occupied Bandwidth

Test Description	Measurements were made in the laboratory environment. The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. The modulated carrier signal with maximum RF level was applied to the up and down link input of the repeater and resulting output was compared against the original signal.	
Basic Standard	47 CFR § 2.1049,	
Occupied Bandwidth Limits		
According to the FCC 2-11-04/EAB/RF, Input and output signals were compared to verify that there was no any degradation to the signal due to amplification and conversion from the repeater using an RBW of 300 Hz or 1% of the emission bandwidth.		
Parameters required prior to the test	Laboratory Ambient Temperature	10 to 40 °C
	Relative Humidity	10 to 90 %
Parameters recorded during the test	Laboratory Ambient Temperature	23 °C
	Relative Humidity	40 %

Occupied Bandwidth Configuration Settings

Power Interface Mode # (See Section 2.4)	EUT Configurations Mode # (See Section 2.9)	EUT Operation Mode # (See 2.6)
1	2, 3	2, 3
Supplementary information: None		

Occupied Bandwidth Spectrum Analyzer Settings

Span	Resolution Bandwidth	Occupied Bandwidth Requirements	
		dBc	%
5 MHz	30 kHz	-26	99
Supplementary information: 99% bandwidth was applied.			

Table 4 Occupied Bandwidth measured results

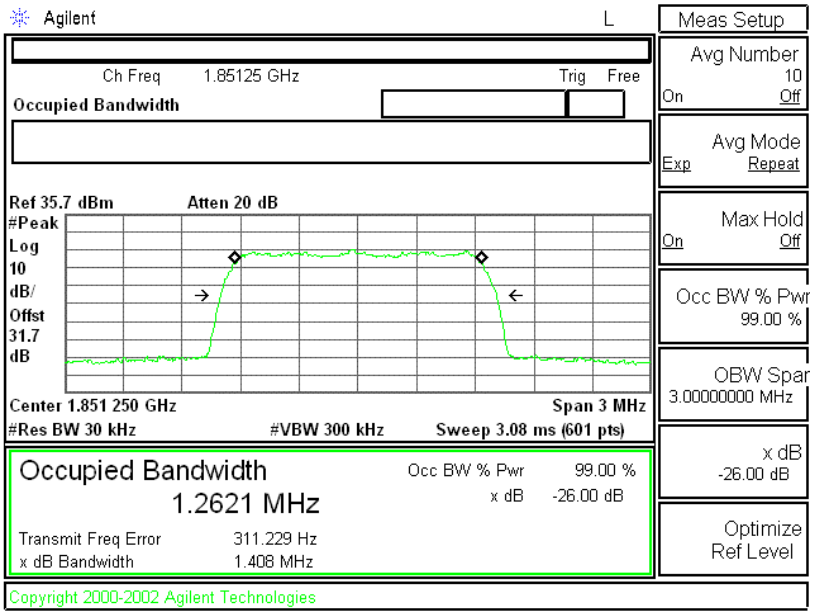
Measured Port	Occupied bandwidth (MHz)		
	Frequency (MHz)	Input port	Output port
Uplink	1851.25	1.26	1.25
	1887.50	1.26	1.26
	1913.75	1.26	1.27
Downlink	1931.25	1.27	1.26
	1967.50	1.26	1.26
	1993.75	1.26	1.26
Supplementary information: -. Modulation signal CDMA modulation applied, 99% bandwidth			

Occupied Bandwidth Test Equipment

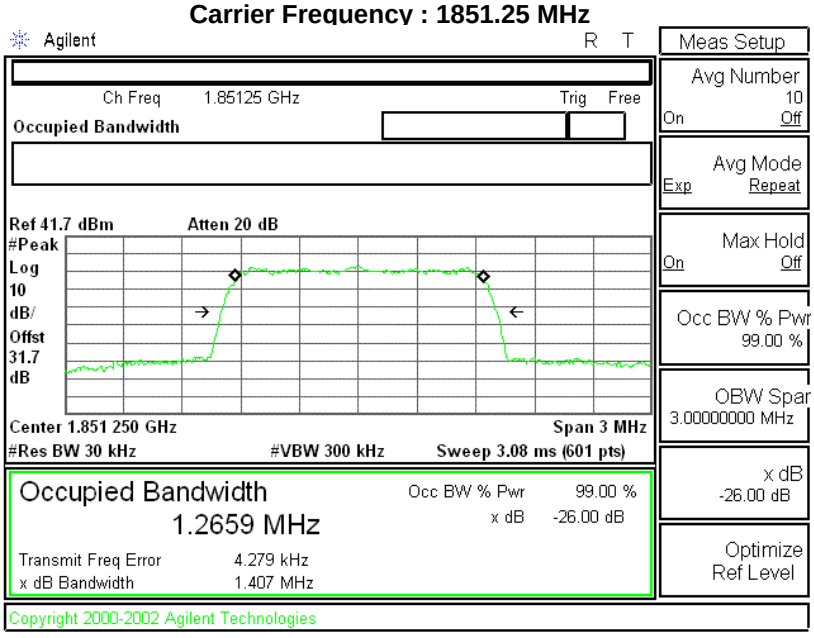
Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Signal Generator	Agilent	E4436B	US39260374	2006-11-07	2007-11-07
Spectrum Analyzer	Agilent	E4445A	US42220280	2006-10-20	2007-10-20
Fixed Attenuator	Agilent	30 dB	MY41495185	-	-
Fixed Attenuator	Agilent	30 dB	MY41495110	-	-
Fixed Attenuator	HP	30 dB	3318A10568	-	-

Figure 6 Occupied Bandwidth Graph

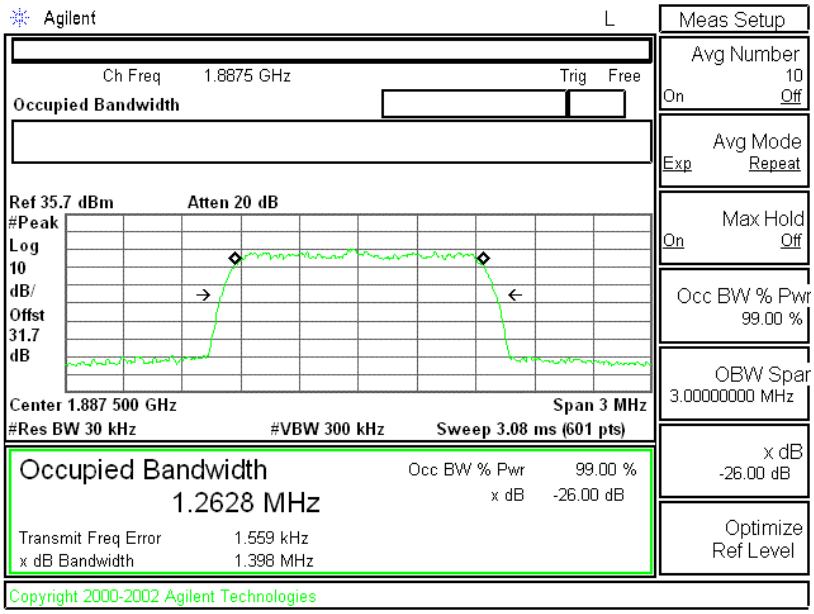
Mode : Uplink – Occupied Bandwidth
Channel : B - Input
Carrier Frequency : 1851.25 MHz



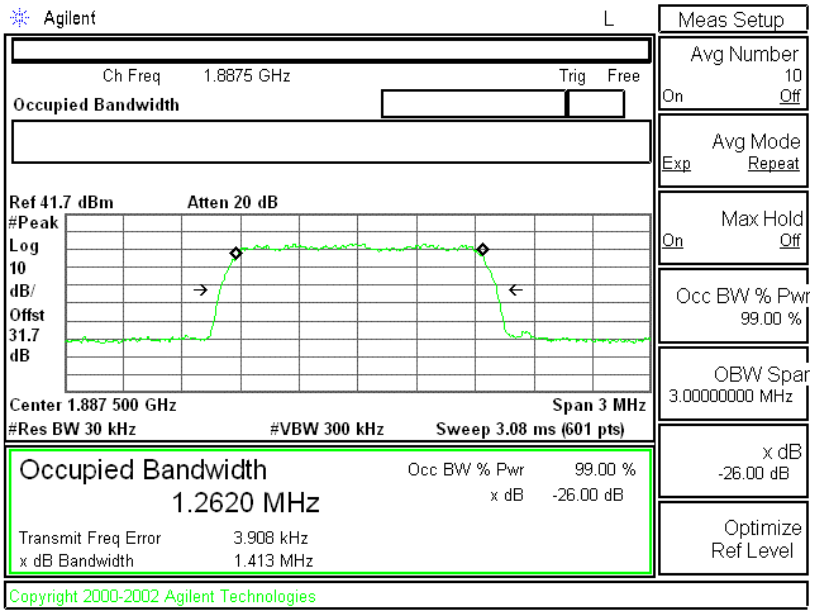
Mode : Uplink – Occupied Bandwidth
Channel : B - Output
Carrier Frequency : 1851.25 MHz



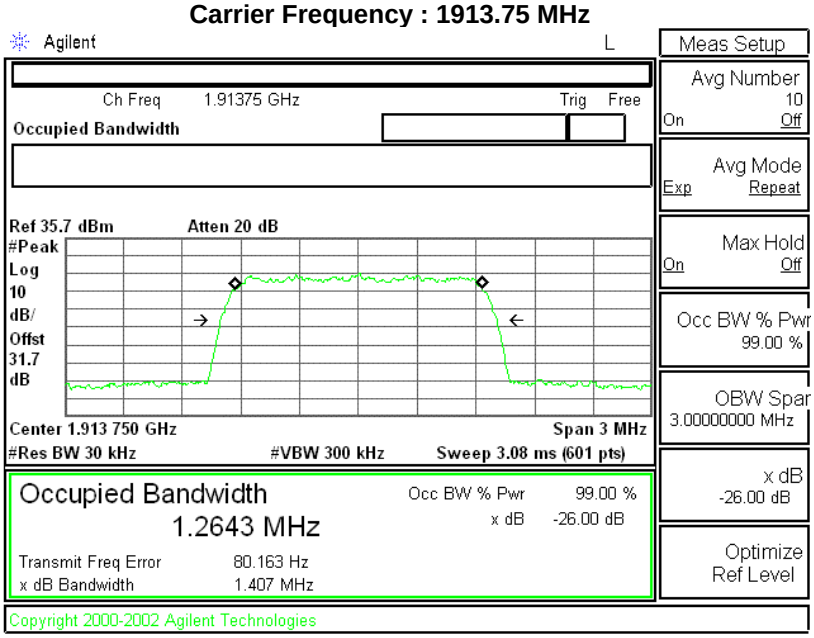
Mode : Uplink – Occupied Bandwidth
Channel : M - Input
Carrier Frequency : 1887.50 MHz



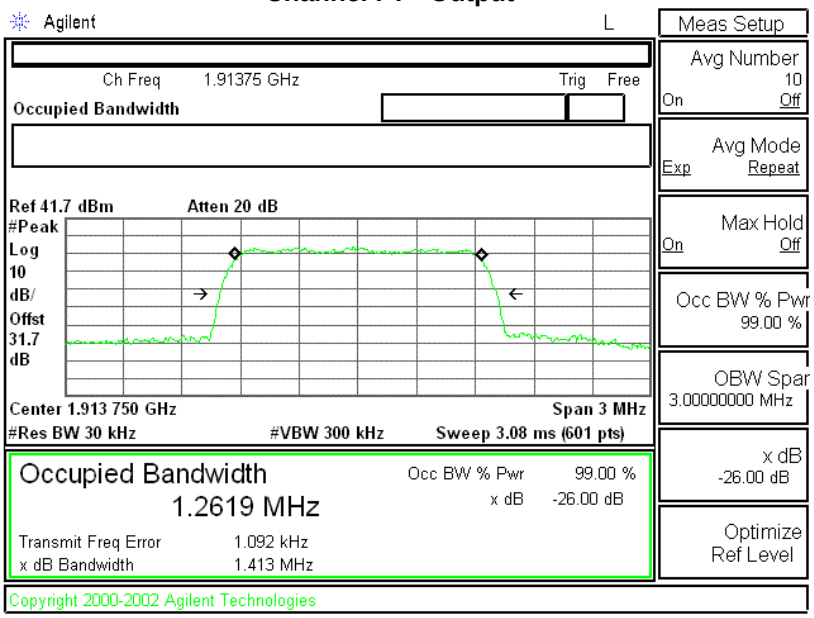
Mode : Uplink – Occupied Bandwidth
Channel : M - Output
Carrier Frequency : 1887.50 MHz



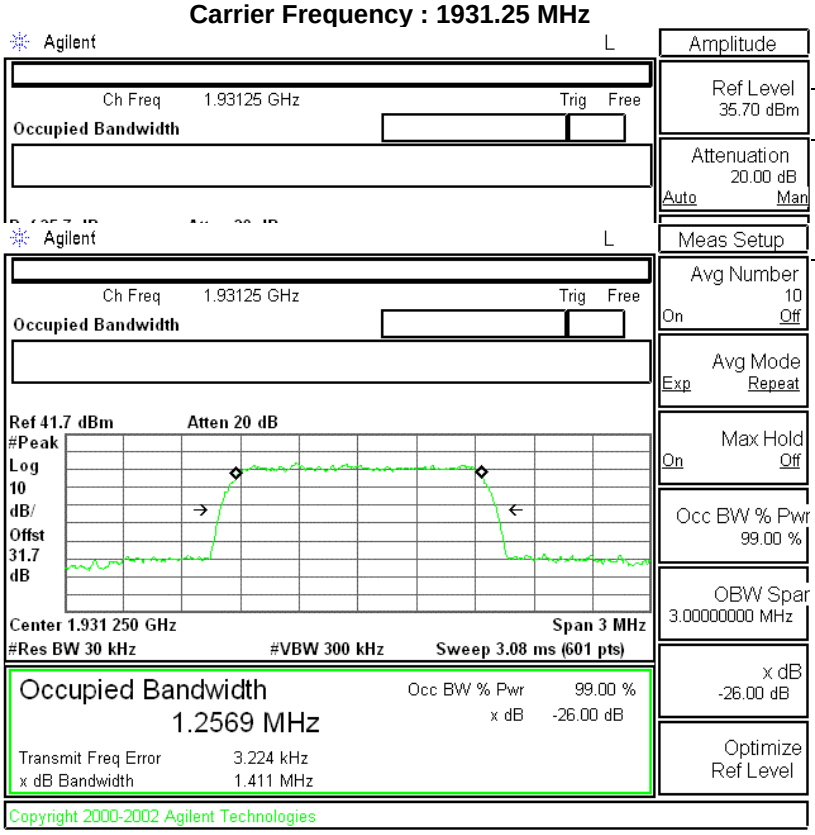
Mode : Uplink – Occupied Bandwidth
Channel : T - Input
Carrier Frequency : 1913.75 MHz



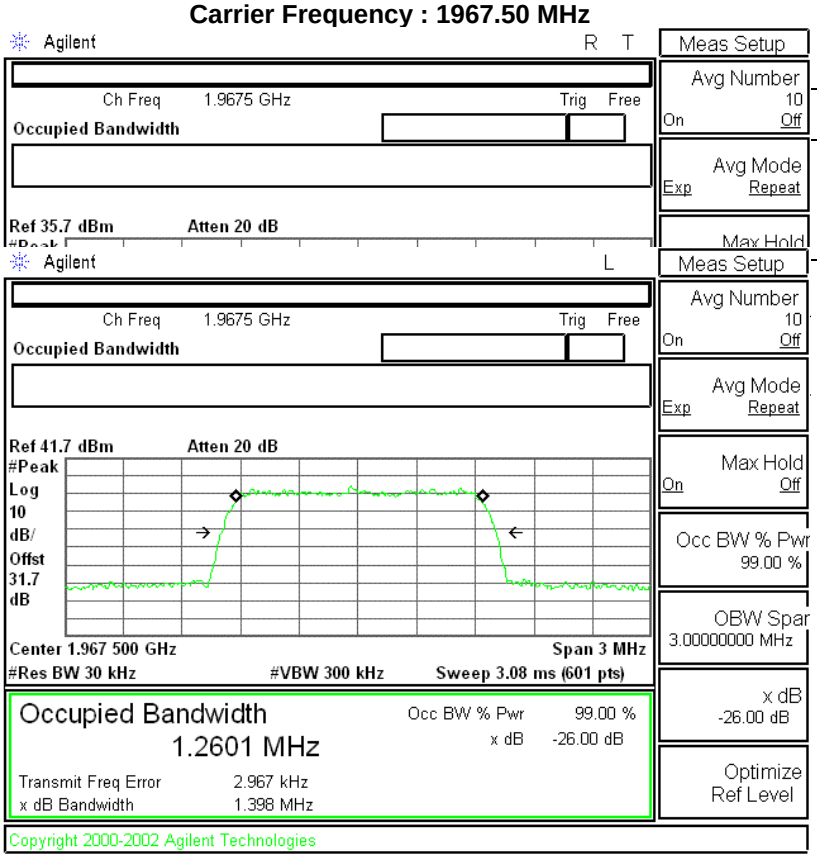
Mode : Uplink – Occupied Bandwidth
Channel : T - Output



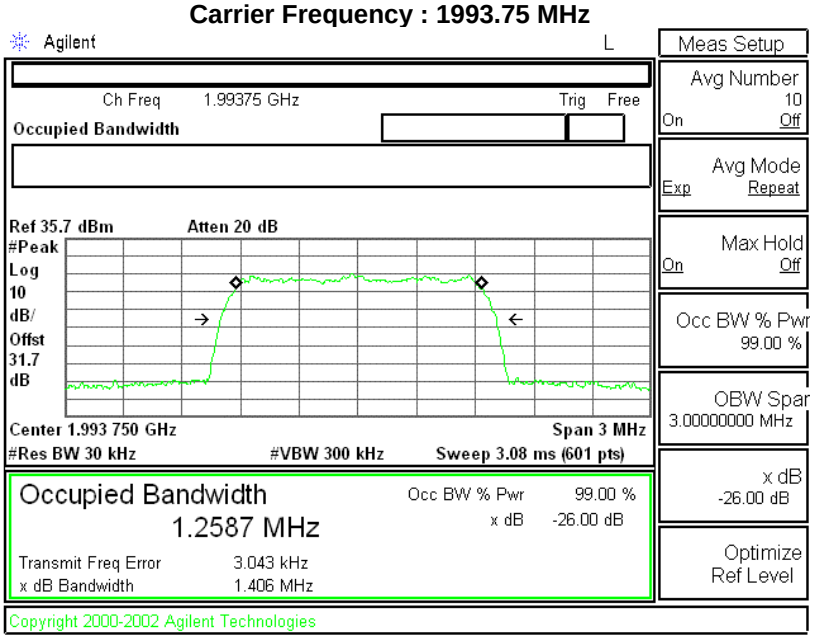
Mode : Downlink – Occupied Bandwidth
Channel : B - Input
Carrier Frequency : 1931.25 MHz



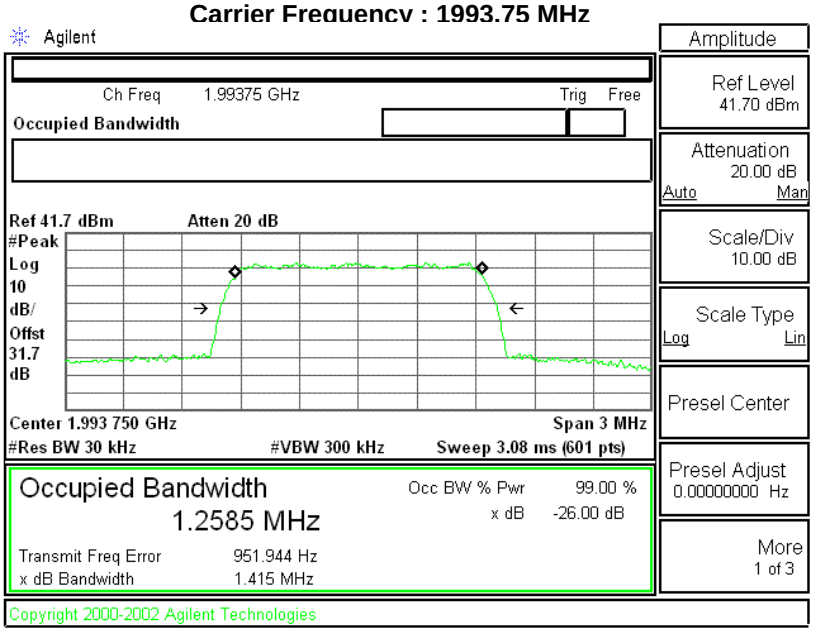
Mode : Downlink – Occupied Bandwidth
Channel : M - Input
Carrier Frequency : 1967.50 MHz



Mode : Downlink – Occupied Bandwidth
Channel : T - Input
Carrier Frequency : 1993.75 MHz



Mode : Downlink – Occupied Bandwidth
Channel : T - Output
Carrier Frequency : 1993.75 MHz



3.5 Test Conditions and Results – Spurious Emission at Antenna Terminal

Test Description	Measurements were made in the laboratory environment. Conducted spurious emission measurement was made using a direct connection between RF output of the EUT and spectrum analyzer. A modulated carrier signal from the generator was applied to the both uplink and down link input port of the EUT. Measurement has been performed with the EUT set to maximum output level at low, mid and high channel frequencies. The spectrum was investigated from 30 MHz to 10th harmonics of carrier. Inter-modulation requirements were performed with two modulated carriers set at 1 MHz deviation. One carrier was set at the band edge of both Uplink and Downlink and other carrier was set at 1 MHz deviation from the first carrier.
Basic Standard	47 CFR § 2.1051, § 24.238
Emission Limits	
§ 24.238 Emission limitations for Broadband PCS equipment (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.	

Emission Mask Configuration Settings

Power Interface Mode # (See Section 2.4)	EUT Configurations Mode # (See Section 2.9)	EUT Operation Mode # (See 2.6)
1	2, 3	2, 3
Supplementary information: None		

Conducted spurious emission Spectrum Analyzer Settings

Frequency Range (MHz)	Resolution Bandwidth	Video Bandwidth
30 MHz ~ 1 GHz	100 kHz	300 kHz
1 GHz ~ 10 GHz	1 MHz	3 MHz
Supplementary information:		

Table 6 Antenna terminal Conducted spurious emission results

Carrier Band	Tuned Frequency (MHz)	Loss offset (dB)	Spurious emission measured (dBm)	Limit (dBm)	Margin (dB)
Uplink	1851.25	32.8	-36.82	-13	23.82
	1887.5	32.8	-36.59	-13	23.59
	1913.75	32.8	-36.29	-13	23.29
Downlink	1931.25	32.8	-36.36	-13	23.36
	1967.5	32.8	-36.74	-13	23.74
	1993.75	32.8	-36.54	-13	23.54
Supplementary information: -. Carrier signal was modulated with CDMA, Power measurement : Peak power measured -. For each tuned carrier frequency, the maximum spurious emission detected was recorded.					

Two carrier Intermodulation

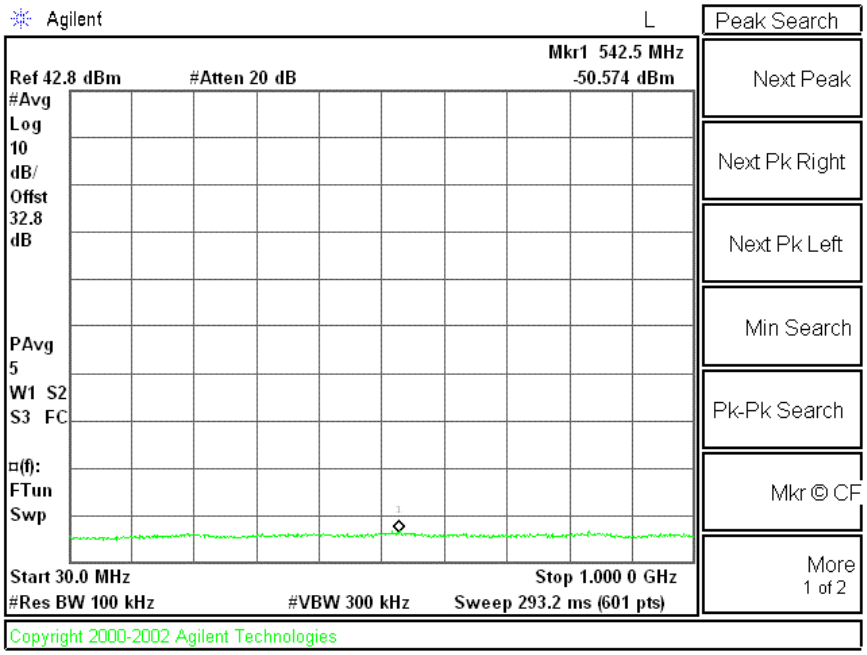
Carrier Band		Tuned Freq. (MHz)	Loss offset (dB)	Spurious emission measured (dBm)	Limit (dBm)	Margin (dB)
Uplink	Lower edge	1851.25	32.8	-30.36	-13	17.36
	Higher edge	1913.75	32.8	-32.98	-13	19.98
Downlink	Lower edge	1931.25	32.8	-26.58	-13	13.58
	Higher edge	1993.75	32.8	-34.72	-13	21.72
Supplementary information: -. Carrier signal was modulated with CDMA, Power measurement : Peak power measured -. For each tuned carrier frequency, the maximum spurious emission detected was recorded.						

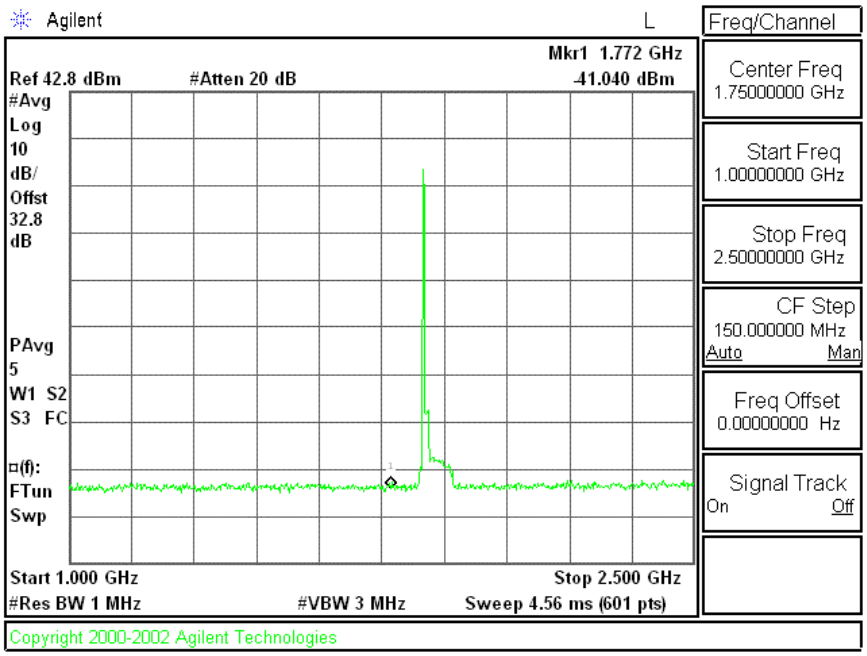
Conducted Spurious Emission Test Equipment

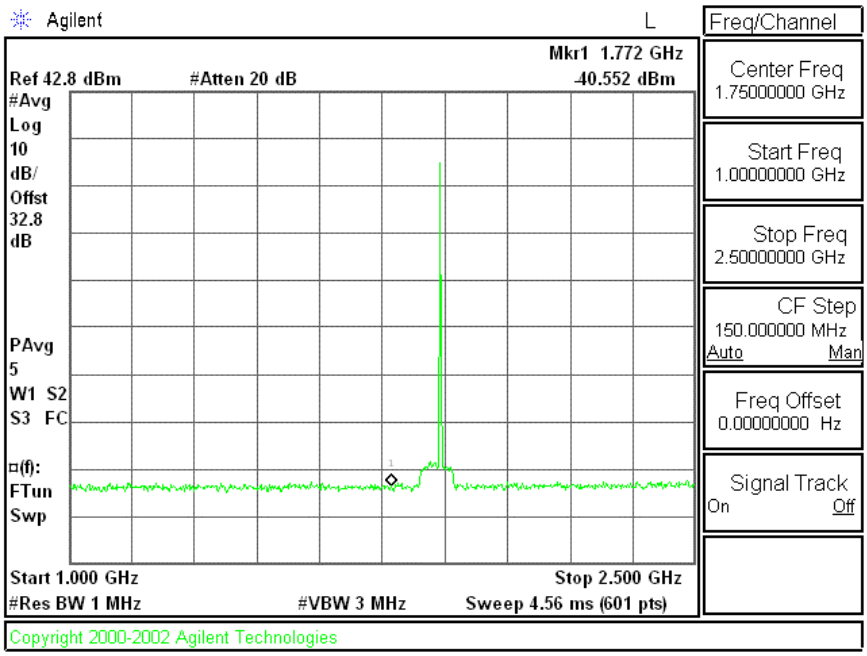
Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Signal Generator	Agilent	E4432B	US40052949	2007-05-02	2008-05-02
Signal Generator	Agilent	E4436B	US39260374	2006-11-07	2007-11-07
Spectrum Analyzer	Agilent	E4445A	US42220280	2006-10-20	2007-10-20
Fixed Attenuator	Agilent	30 dB	MY41495185	-	-
Fixed Attenuator	Agilent	30 dB	MY41495110	-	-
Fixed Attenuator	HP	30 dB	3318A10568	-	-
Frequency Divider	Wavetek	4PD-2142.5W10EM	71010010	-	-

Figure 7 Conducted Spurious Emission plots at Antenna terminal

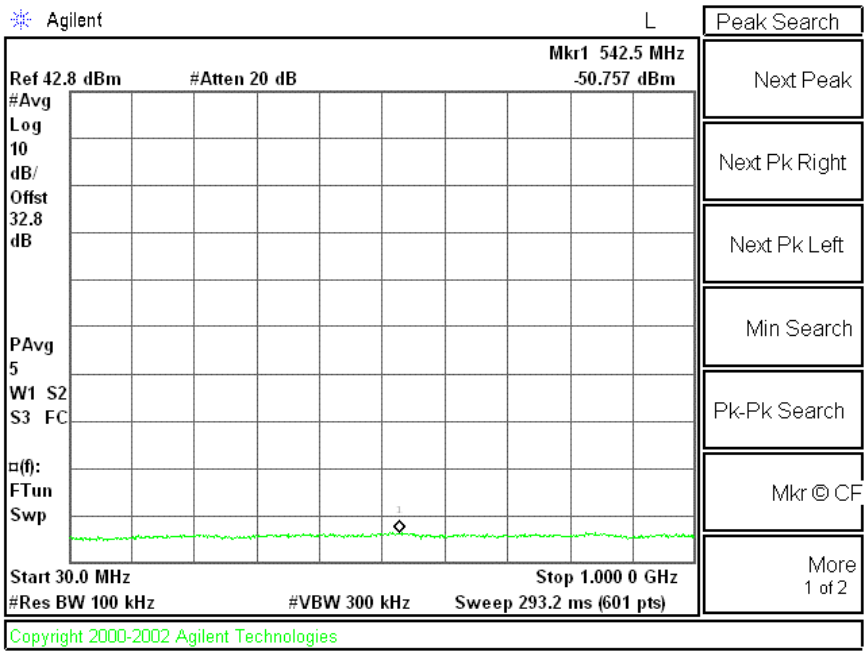
Mode : Up link - B
Channel tuned : 1851.25 MHz

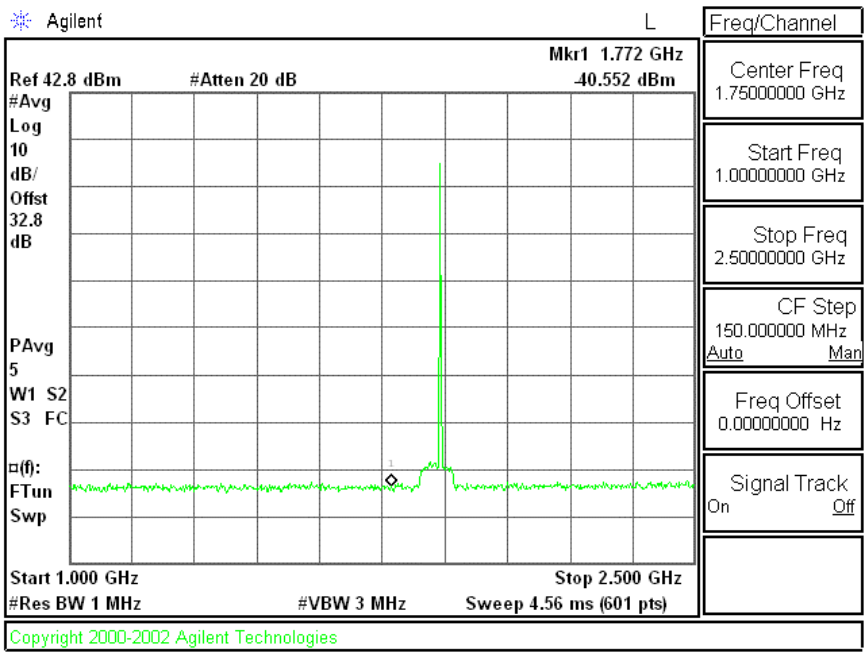


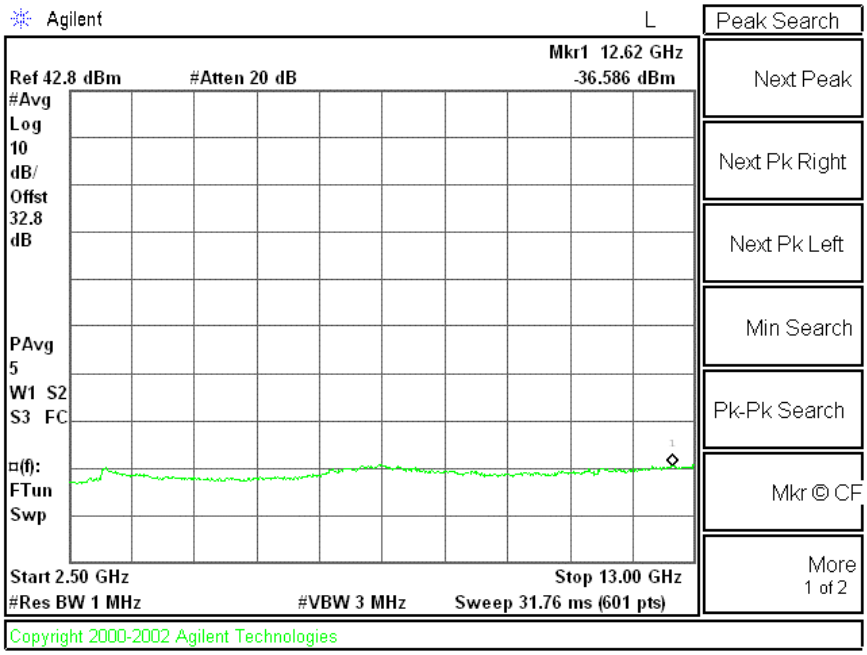




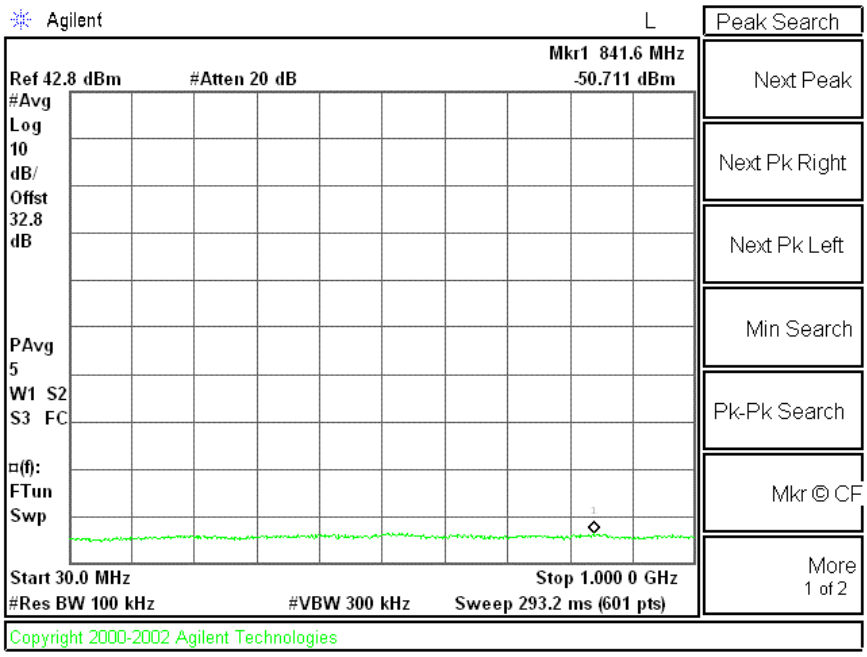
Mode : Up link - M
Channel tuned : 1887.5 MHz

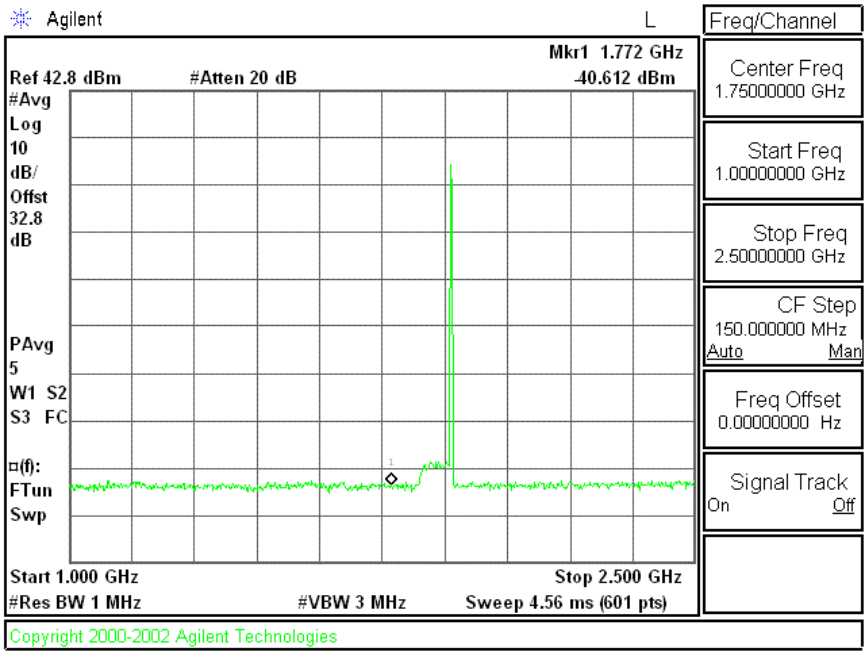


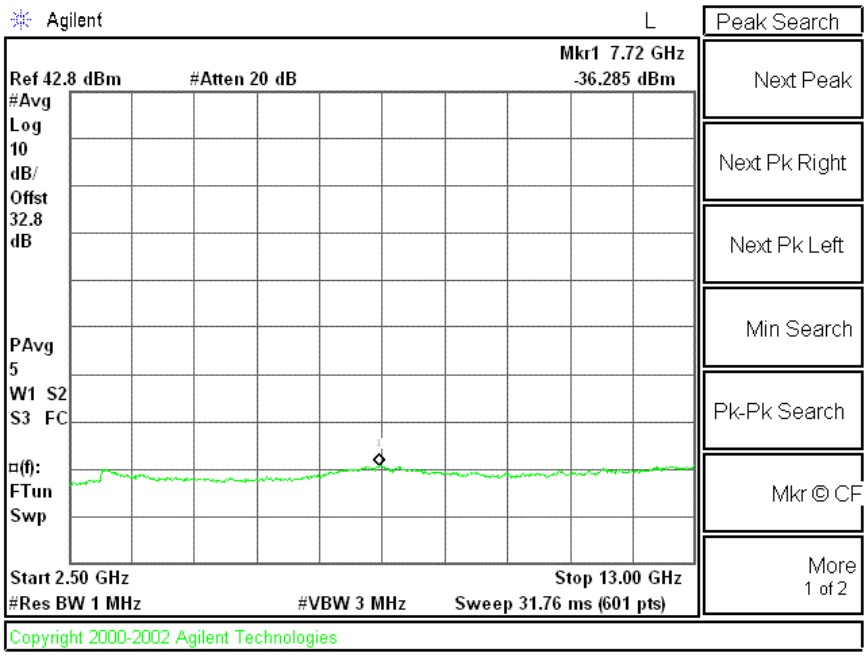

Agilent
L
Freq/Channel
Mkr1 1.772 GHz
Ref 42.8 dBm
#Atten 20 dB
-40.552 dBm
#Avg
Log
10
dB/
Offst
32.8
dB
PAvg
5
W1 S2
S3 FC
¤(f):
FTun
Swp
Center Freq
1.75000000 GHz
Start Freq
1.00000000 GHz
Stop Freq
2.50000000 GHz
CF Step
150.000000 MHz
Auto
Man
Freq Offset
0.00000000 Hz
Signal Track
On
Off
Start 1.000 GHz
Stop 2.500 GHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 4.56 ms (601 pts)
Copyright 2000-2002 Agilent Technologies


Agilent
L
Peak Search
Mkr1 12.62 GHz
Ref 42.8 dBm
#Atten 20 dB
-36.586 dBm
#Avg
Log
10
dB/
Offst
32.8
dB
PAvg
5
W1 S2
S3 FC
¤(f):
FTun
Swp
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr © CF
More
1 of 2
Start 2.50 GHz
Stop 13.00 GHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 31.76 ms (601 pts)
Copyright 2000-2002 Agilent Technologies

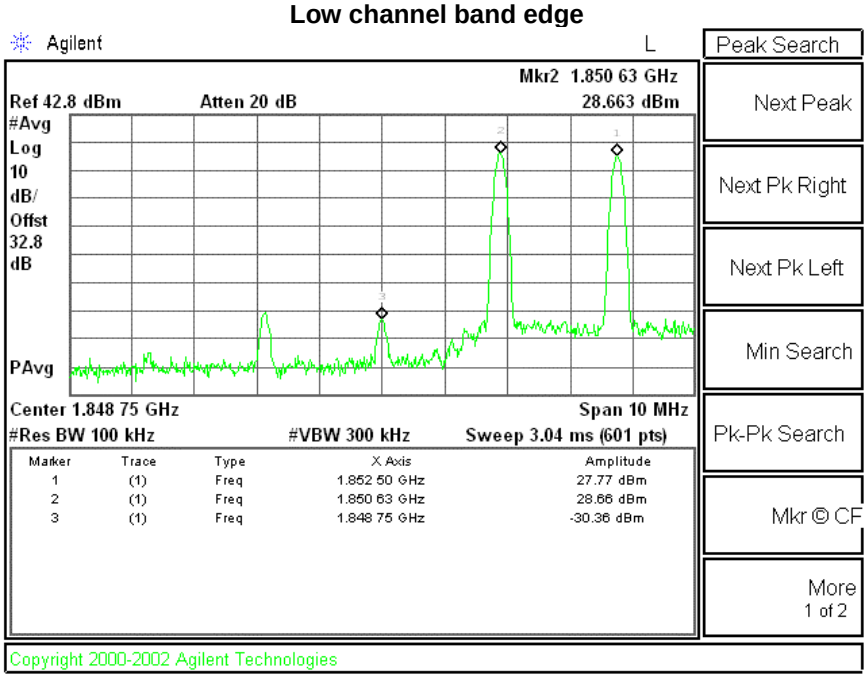
Mode : Up link - T
Channel tuned : 1913.5 MHz



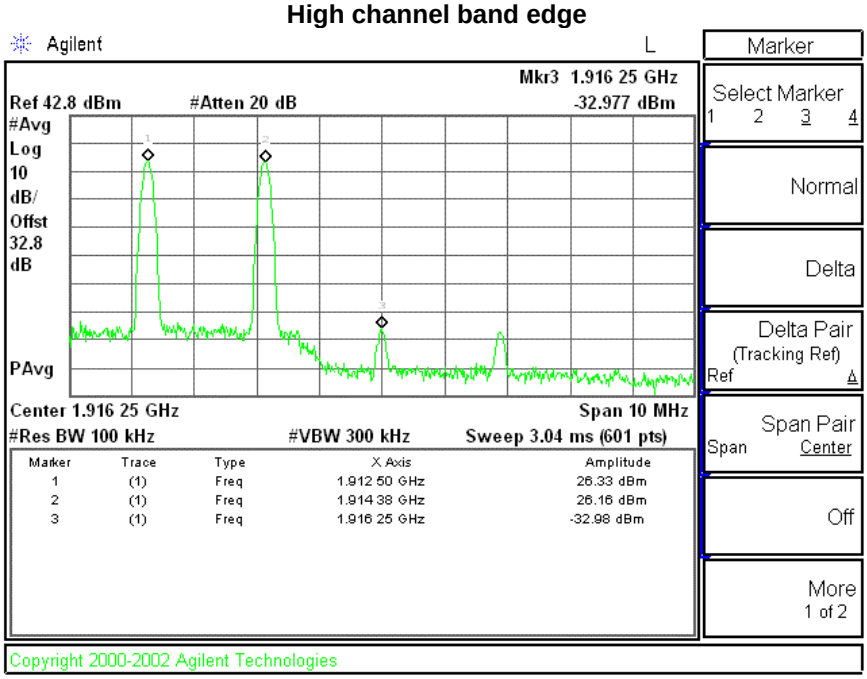



Agilent
L
Peak Search
Mkr1 7.72 GHz
Ref 42.8 dBm
#Atten 20 dB
-36.285 dBm
Next Peak
#Avg
Log
10
dB/
Offst
32.8
dB
Next Pk Right
Next Pk Left
Min Search
PAvg
5
W1 S2
S3 FC
Pk-Pk Search
¤(f):
FTun
Swp
Mkr © CF
More
1 of 2
Start 2.50 GHz
Stop 13.00 GHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 31.76 ms (601 pts)
Copyright 2000-2002 Agilent Technologies

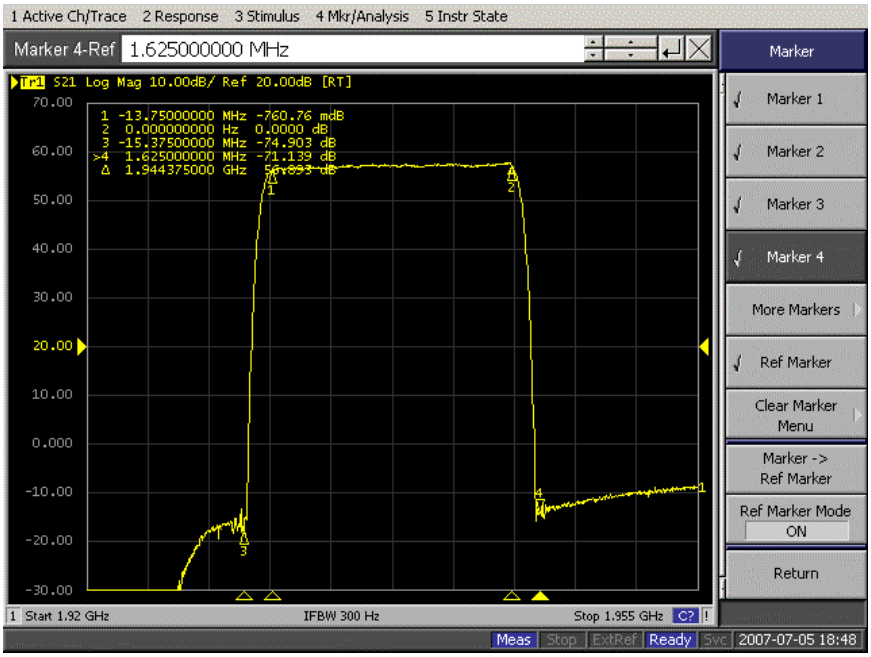
Mode : Uplink – Two Carrier Intermodulation
Low channel band edge

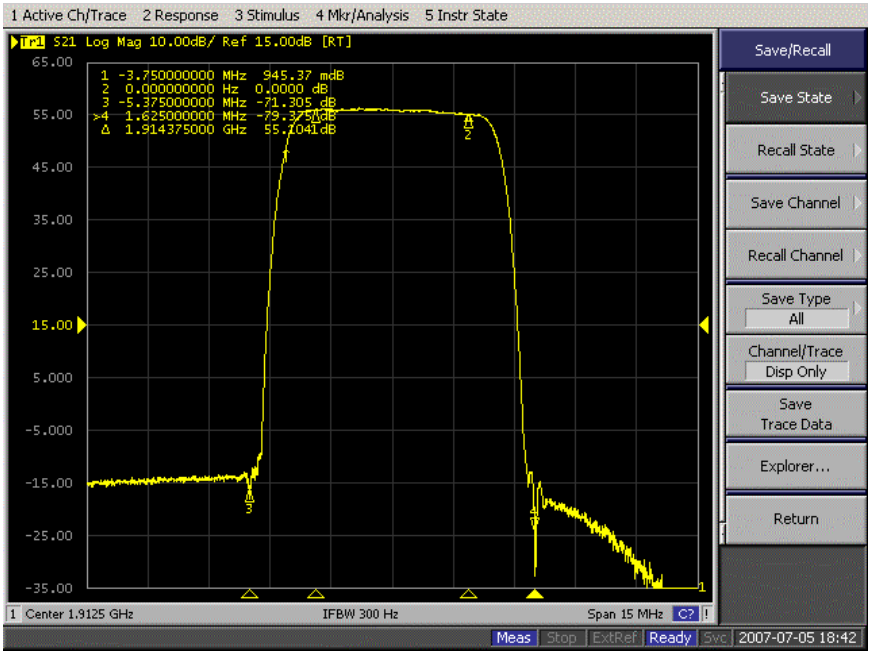


Mode : Uplink – Two Carrier Intermodulation
High channel band edge

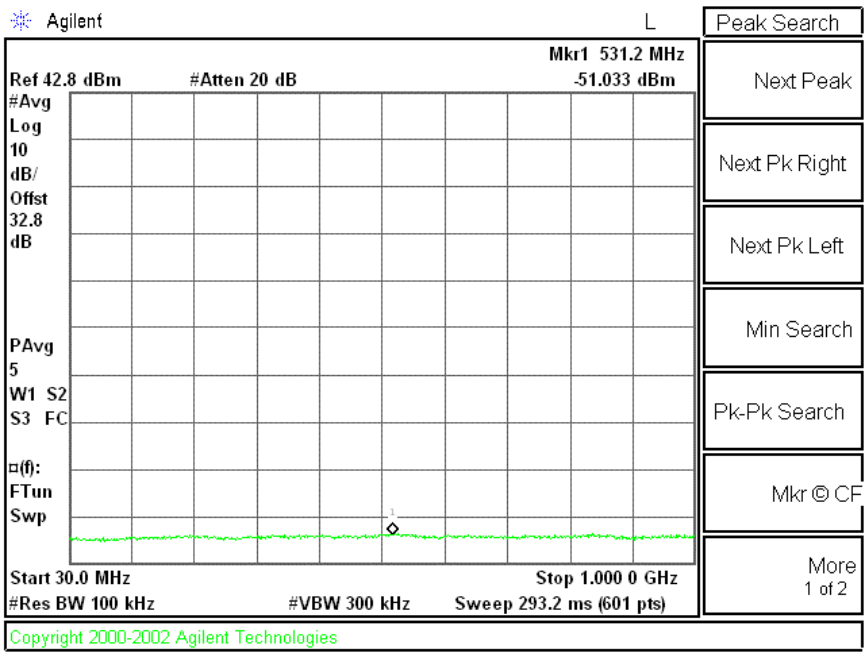


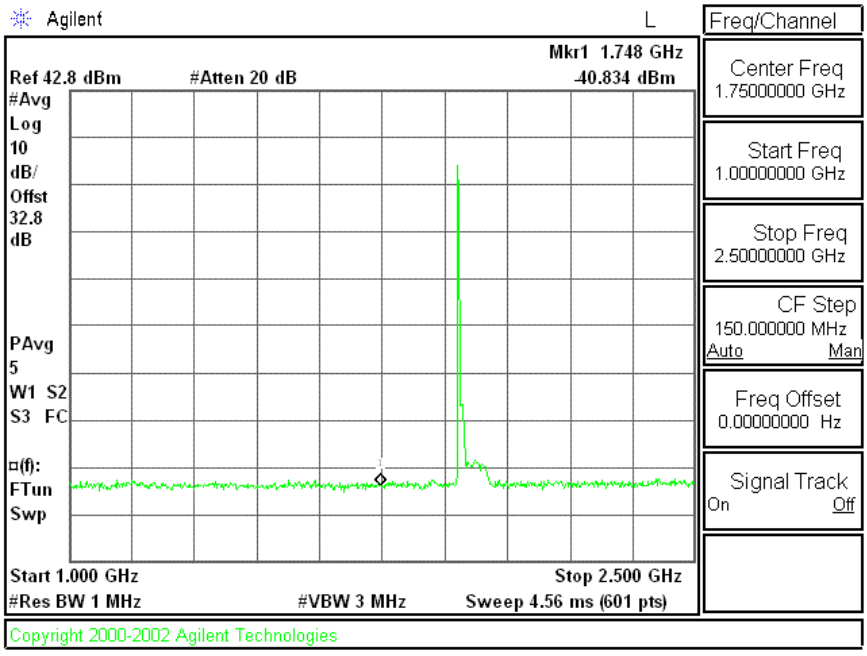
Mode : Uplink – Our of band Filter Rejection

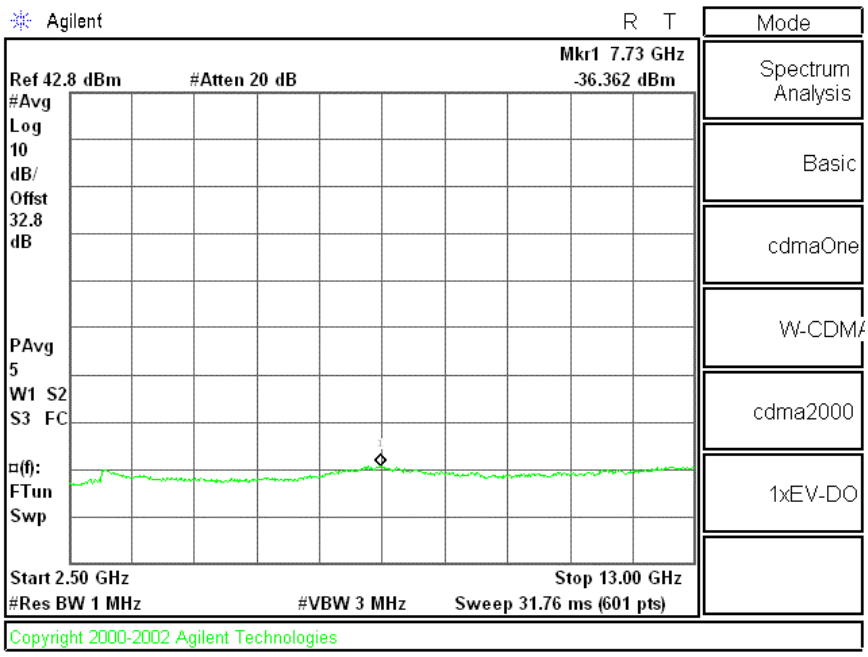




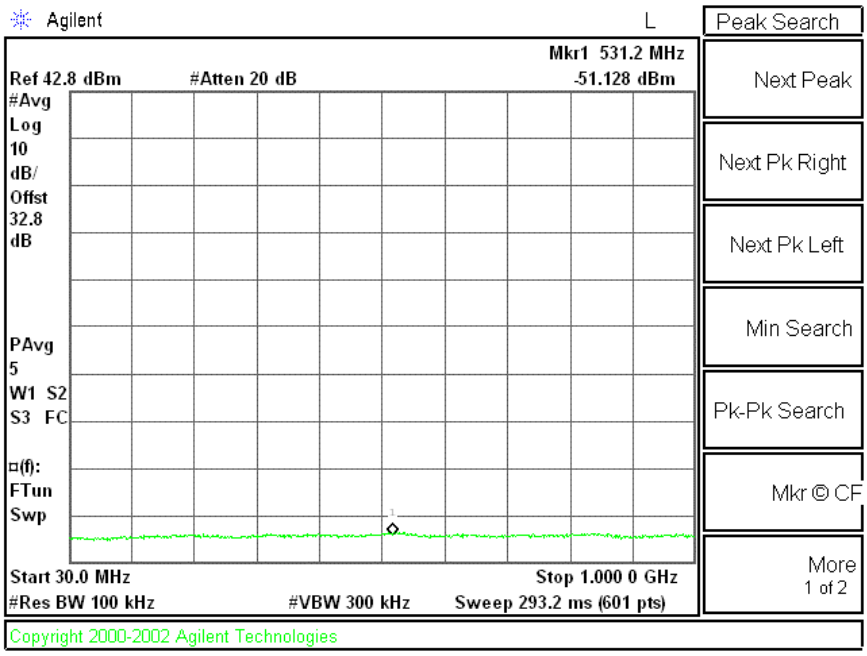
Mode : Down link - B
Channel tuned : 1931.25 MHz

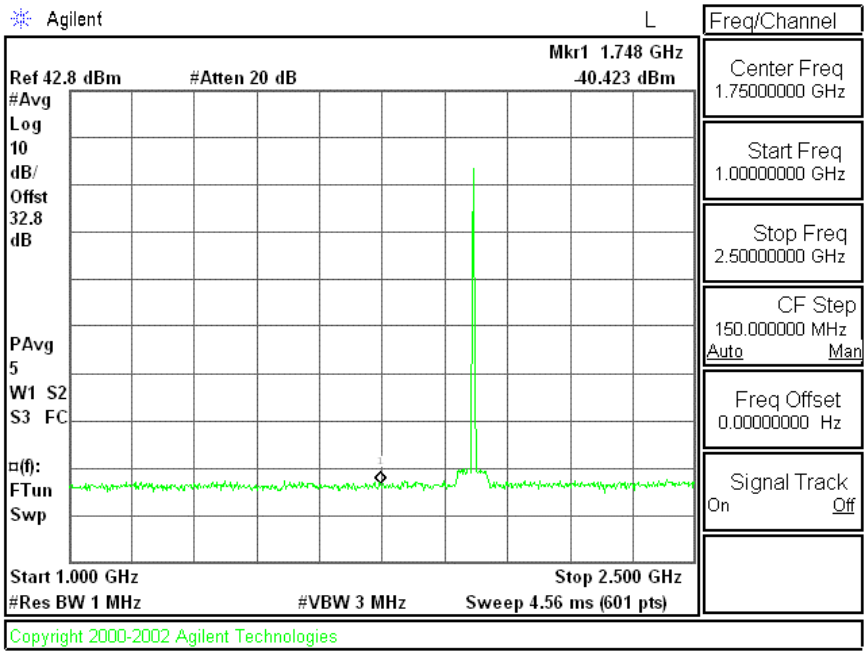


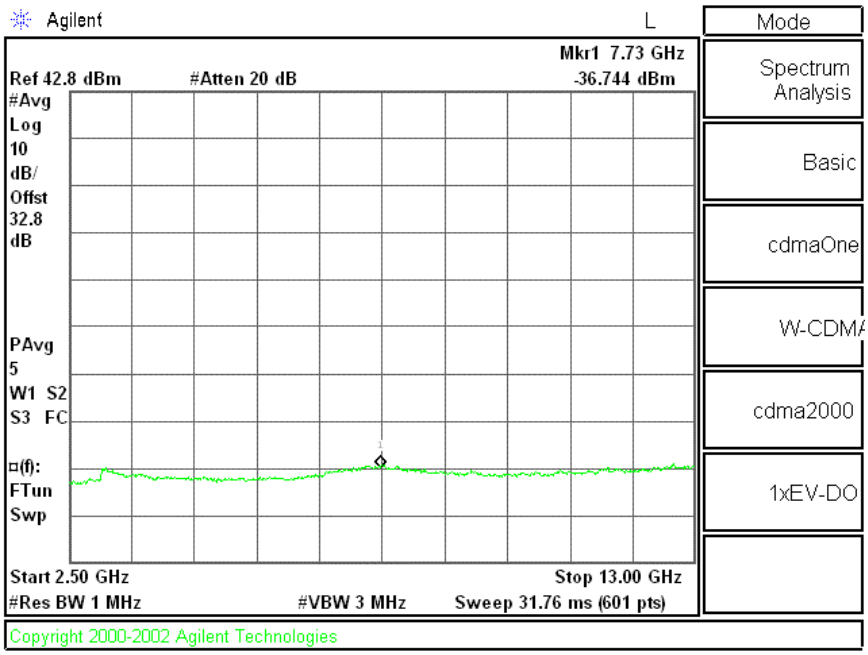




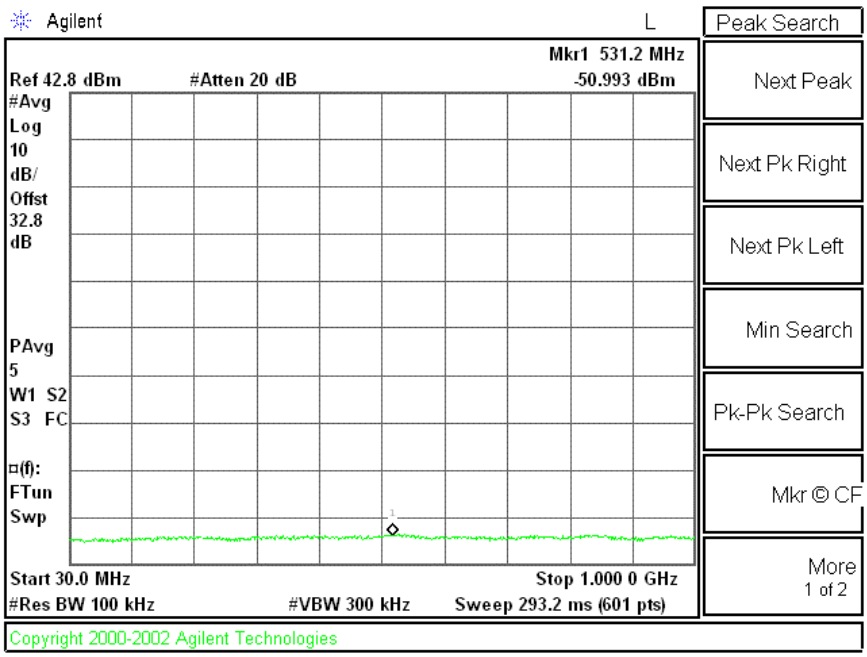
Mode : Down link - M
Channel tuned : 1967.5 MHz

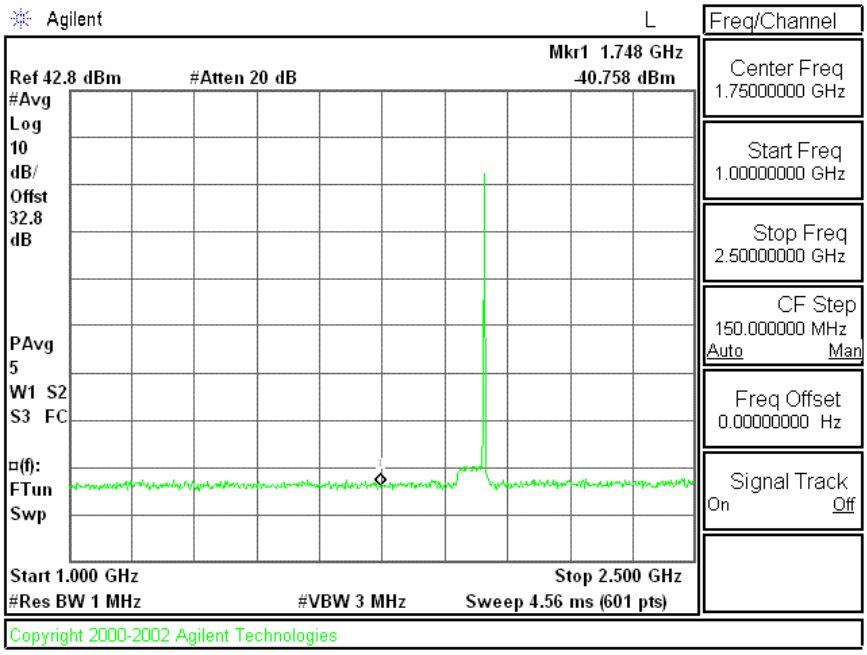


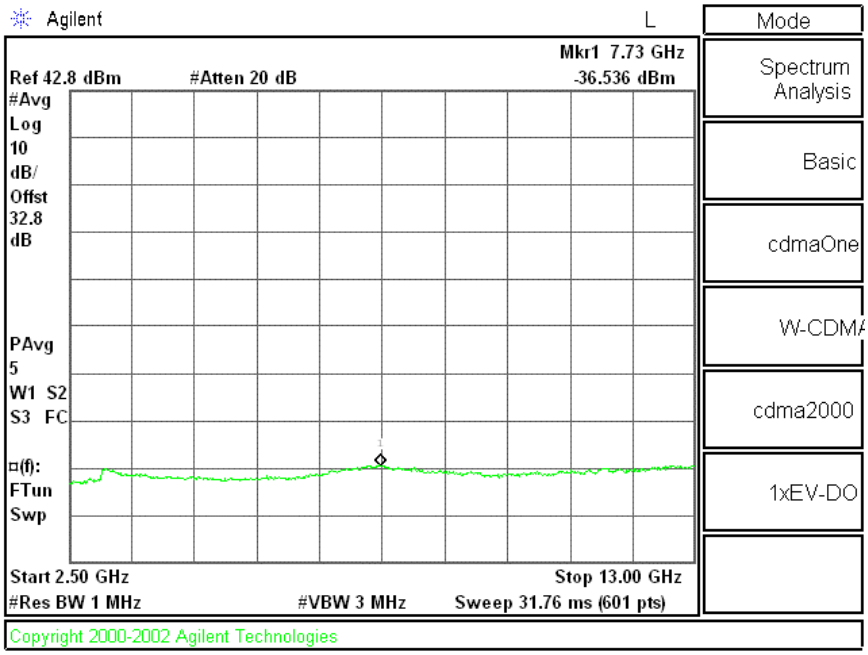

Agilent
L
Mkr1 1.748 GHz
Ref 42.8 dBm
#Atten 20 dB
-40.423 dBm
#Avg
Log
10
dB/
Offst
32.8
dB
PAvg
5
W1 S2
S3 FC
¤(f):
FTun
Swp
Start 1.000 GHz
Stop 2.500 GHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 4.56 ms (601 pts)
Copyright 2000-2002 Agilent Technologies
Freq/Channel
Center Freq
1.75000000 GHz
Start Freq
1.00000000 GHz
Stop Freq
2.50000000 GHz
CF Step
150.000000 MHz
Auto
Man
Freq Offset
0.00000000 Hz
Signal Track
On
Off


Agilent
L
Mkr1 7.73 GHz
Ref 42.8 dBm
#Atten 20 dB
-36.744 dBm
#Avg
Log
10
dB/
Offst
32.8
dB
PAvg
5
W1 S2
S3 FC
¤(f):
FTun
Swp
Start 2.50 GHz
Stop 13.00 GHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 31.76 ms (601 pts)
Copyright 2000-2002 Agilent Technologies
Mode
Spectrum Analysis
Basic
cdmaOne
W-CDMA
cdma2000
1xEV-DO

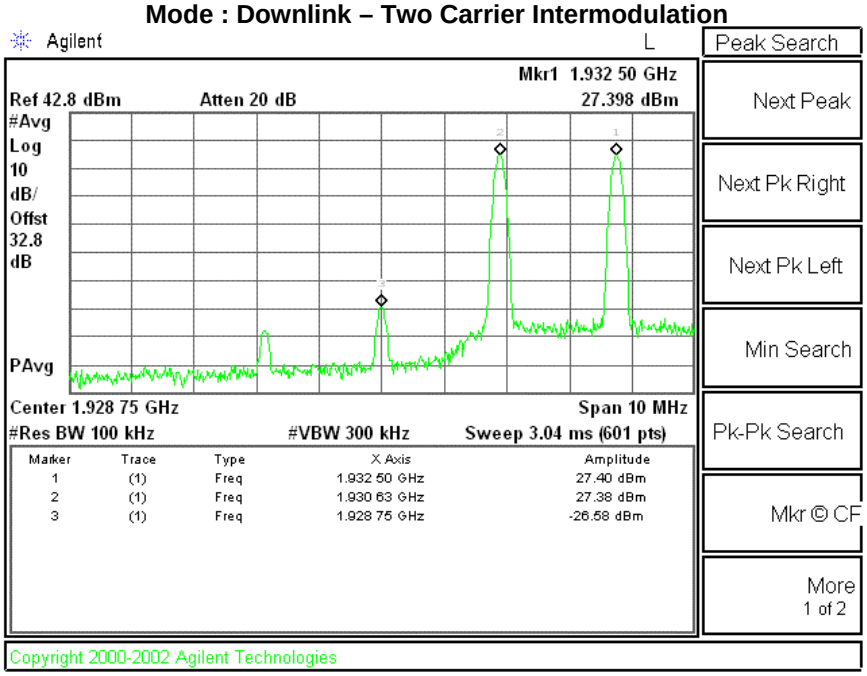
Mode : Down link - T
Channel tuned : 1993.75 MHz



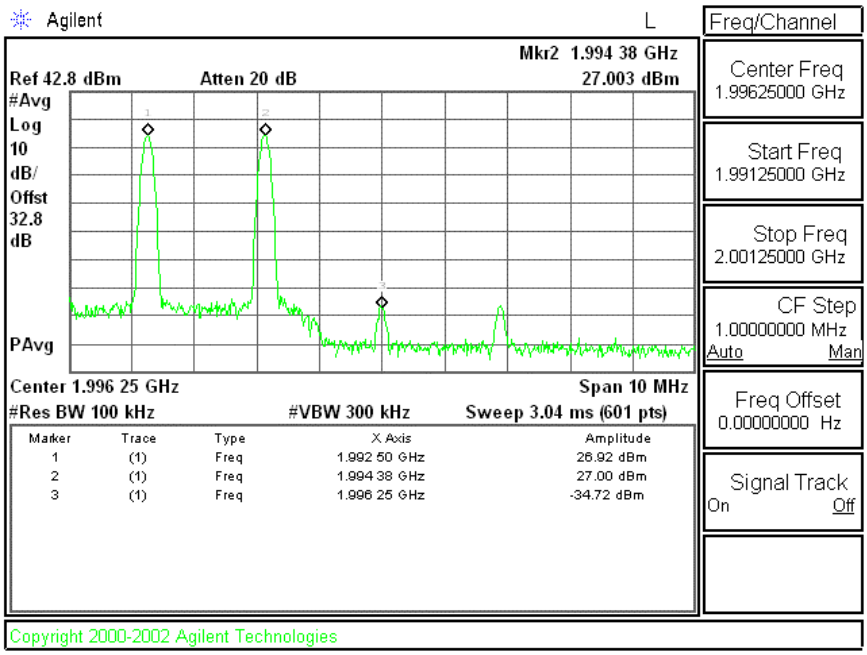



Agilent
L
Mode
Mkr1 7.73 GHz
Ref 42.8 dBm
#Atten 20 dB
-36.536 dBm
#Avg
Log
10
dB/
Offst
32.8
dB
PAvg
5
W1 S2
S3 FC
¤(f):
FTun
Swp
Spectrum Analysis
Basic
cdmaOne
W-CDMA
cdma2000
1xEV-DO
Start 2.50 GHz
Stop 13.00 GHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 31.76 ms (601 pts)
Copyright 2000-2002 Agilent Technologies

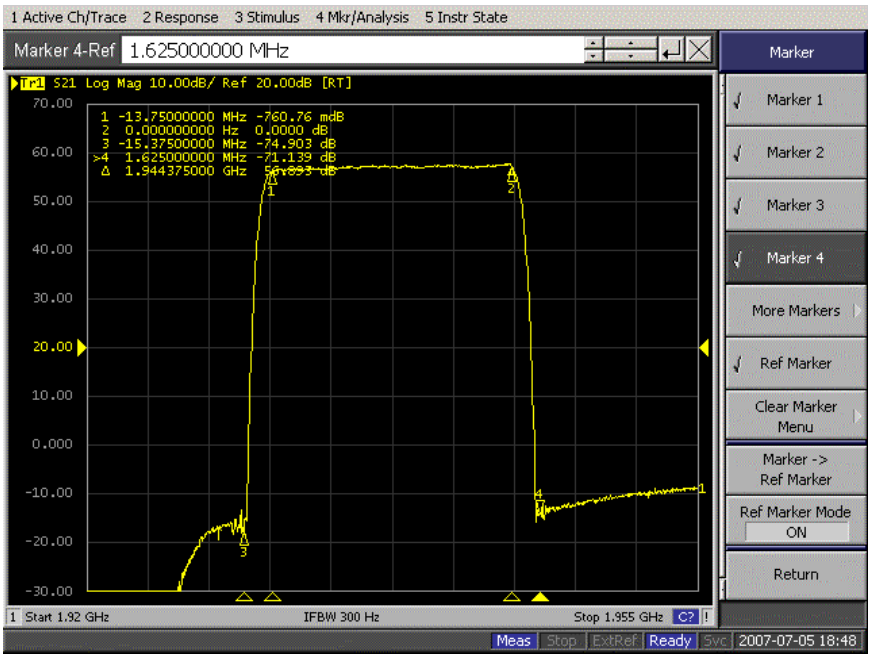
Mode : Downlink – Two Carrier Intermodulation

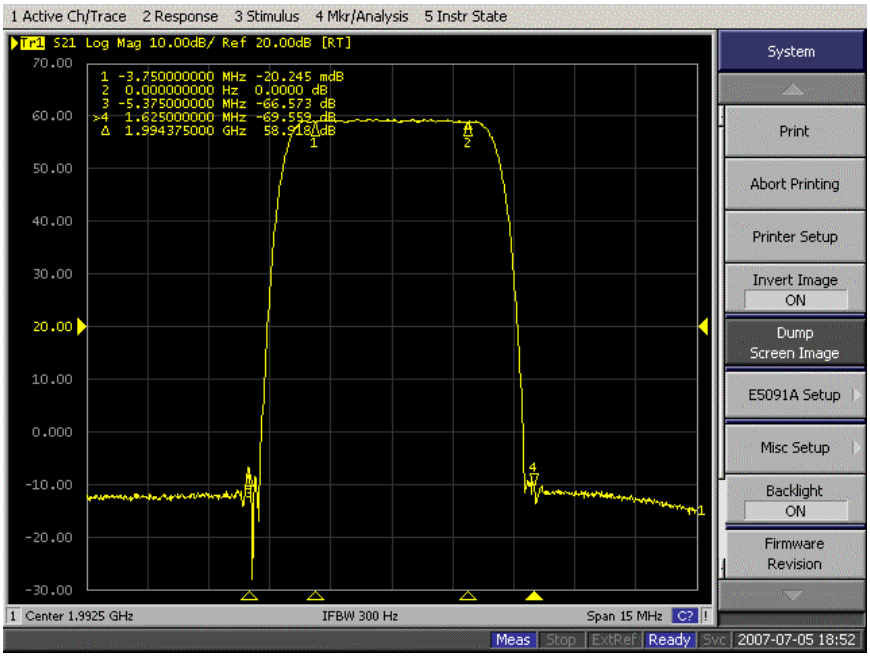


Mode : Downlink – Two Carrier Intermodulation
High channel band edge



Mode : Downlink – Our of band Filter Rejection





3.6 Test Conditions and Results – Radiated Spurious Emission

Test Description	Measurements were made in a 10-meter open field test site that complies to CISPR 16/ANSI C63.4. Preliminary (peak) measurements were performed at semi-anechoic chamber with an antenna to EUT separation distance of 3 meter. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in both horizontal and vertical polarities. The EUT's RF output port was terminated with 50 ohm load. The EUT was set to transmit at low, mid and high channel frequencies with max output power condition. Final measurements (quasi-peak or average as noted) were then performed by rotating the EUT about 360° and adjusting the receive antenna height from 1 to 4-meters in accordance with procedure of substitution method specified in TIA/EIA-603-A-2003. All frequencies up to 10th harmonics were investigated in both horizontal and vertical antenna polarity, where applicable. The maximum EIRP of the emissions were reported.

Basic Standard	§ 2.1053 , § 24.238	
Radiated Spurious Emission LIMITS		
§ 24.238 Emission limitations for Broadband PCS equipment (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.		
Parameters required prior to the test	Laboratory Ambient Temperature	10 to 40 °C
	Relative Humidity	10 to 90 %
Parameters recorded during the test	Laboratory Ambient Temperature	27 °C
	Relative Humidity	47 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	1GHz – 10GHz	(3 meter measurement distance)
Limits – EIRP		
Frequency (MHz)	Limit (dBm EIRP)	
	Peak	Average
Harmonics up to 10th	-13	NA
Supplementary information:		

Ronducted spurious emission Spectrum Analyzer Settings

Frequency Range (MHz)	Resolution Bandwidth	Resolution Bandwidth
1 GHz ~ 10 GHz	1 MHz	3 MHz
Supplementary information: Peak measurement		

Radiated Emissions EUT Configuration Settings

Power Interface Mode # (See Section 2.4)	EUT Configurations Mode # (See Section 2.9)	EUT Operation Mode # (See Section 2.6)
1	3, 4	3, 4
Supplementary information: The EUT operation modes specified in Section 2.7 have been investigated and final measurement.		

Radiated Emissions Test Equipment

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	Agilent	E4407B	US42041281	2007-03-02	2008-03-02
Horn Antenna	Schwarzbeck	BBHA 9120D	469	2007-07-24	2008-07-24
Pre-Amplifier	HP	8449B	3008A00581	2007-03-06	2008-03-06

Figure 8 Test setup for Spurious Radiated Emissions

Table 7 Spurious Radiated Emissions Data Points

Test Frequency (MHz)	Meter Reading (dBuV)	Detector (Pk/QP)	Polarity (V/H)	Azimuth (Degrees)	Antenna Height (cm)	Gain/Loss Factor (dB)	Transducer Factor (dB/m)	Level dBuV/m	Limit 1 dBuV/m	Margin (dB)

Supplementary information:

-. There was no detectable spurious emissions from the EUT. The Uplink and Downlink harmonic emissions were at the noise floor of the spectrum analyzer.

-. No emissions were detected within 20dB below the permitted limit.

3.7 Test Conditions and Results – Frequency Stability

Test Description	For Temperature Frequency Stability, measurements were made with the product placed in an environmental chamber and the temperature varied from –30℃ to +50℃ at the normal supply voltage. The frequency drift of the fundamental frequency was measured with a spectrum analyser. For Power Supply Frequency Stability, measurements were made in a laboratory environment and the supply voltage varied from 85% to 115%. The ambient temperature was 20℃.
Basic Standard	47 CFR § 2.1055, § 24.135, 24.235
Frequency Stability Limits	
§ 24.135 Frequency stability (a) The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±1 ppm of the center frequency over a temperature variation of -30℃ to +50℃ at normal supply voltage, and over a variation in the primary supply voltage of 85 percent to 115 percent of the rated supply voltage at a temperature of 20℃.	

Frequency Stability Configuration Settings

Power Interface Mode # (See Section 2.4)	EUT Configurations Mode # (See Section 2.10)	EUT Operation Mode # (See 2.7)
1,2,3	3, 4	3, 4
Supplementary information: None		

Frequency Stability Test Equipment

Description	Manufacturer	Model	Identifier
Temperature chamber	NeingYoul	NY-THR	13200
Temperature Recorder	Yokogawa	SR-1006	-
Signal Generator	Agilent	E4436B	US39260528
Spectrum Analyzer	Agilent	E4440A	MY44022474
Fixed Attenuator	Agilent		

Table 8 Frequency Stability Test results

Frequency Stability with variation of Ambient Temperature

Carrier Band	Temperature (℃)	Assigned Frequency (Hz)	Measured Frequency (Hz)	Drift (ppm)	Limit (ppm)
Uplink Mid channel tuned 1887.5 MHz	50	1,887,500,000.000	1,887,500,000.005	0.000003	1.0
	40	1,887,500,000.000	1,887,500,000.003	0.000002	1.0
	30	1,887,500,000.000	1,887,500,000.004	0.000002	1.0
	20	1,887,500,000.000	Reference		
	10	1,887,500,000.000	1,887,500,000.003	0.000002	1.0
	0	1,887,500,000.000	1,887,500,000.000	0.000000	1.0
	-10	1,887,500,000.000	1,887,499,999.999	-0.000001	1.0
	-20	1,887,500,000.000	1,887,500,000.002	0.000001	1.0
	-30	1,887,500,000.000	1,887,500,000.008	0.000004	1.0
Downlink Mid channel tuned 1967.5 MHz	50	1,967,500,000.000	1,967,500,000.004	0.000002	1.0
	40	1,967,500,000.000	1,967,500,000.010	0.000005	1.0
	30	1,967,500,000.000	1,967,500,000.009	0.000005	1.0
	20	1,967,500,000.000	Reference		
	10	1,967,500,000.000	1,967,500,000.003	0.000002	1.0
	0	1,967,500,000.000	1,967,500,000.003	0.000002	1.0
	-10	1,967,500,000.000	1,967,500,000.007	0.000004	1.0
	-20	1,967,500,000.000	1,967,500,000.006	0.000003	1.0
	-30	1,967,500,000.000	1,967,500,000.010	0.000005	1.0

Supplementary information:
-. No modulation,
-. Before the testing, the signal generator and spectrum analyzer were synchronized by using the external sync. Frequency measurement was made by spectrum analyzer
-. Reference input voltage : 120Vac

Frequency Stability with variation of Input voltage

Carrier Band	Input voltage (V)	Assigned Frequency (Hz)	Measured Frequency (Hz)	Drift (ppm)	Limit (ppm)
Uplink Mid channel	102 Vac	1,887,500,000.000	1,887,500,000.007	0.000004	1.0
	138 Vac	1,887,500,000.000	1,887,500,000.005	0.000003	1.0
Downlink Mid channel	102 Vac	1,967,500,000.000	1,967,500,000.002	0.000001	1.0
	138 Vac	1,967,500,000.000	1,967,500,000.002	0.000001	1.0

Supplementary information:
-. No modulation,
-. Before the testing, the signal generator and spectrum analyzer were synchronized by using the external sync. Frequency measurement was made by spectrum analyzer
-. Reference temperature : 20℃