



Test Report

Product Name : 1900 MHz Dual-Band Selective Repeater

Model No : TS-OR16RD2-30

FCC ID : U5TTS-OR16RD2

Applicant : Beijing Telestone Technology Co., Ltd.

Address : 6F, Saiou Plaza, NO. 5 Haiying Road ,Fengtai
Science Park, Beijing 100070, China

Date of Receipt : 2007/07/03

Issued Date : 2007/08/16

Report No. : 077078R-HPUSP05V01

The test results relate only to the samples tested.

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This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government.

Test Report Certification

Issued Date: 2007/08/166

Report No.:077078R-HPUSP05V01

**Accredited by NIST (NVLAP)**

NVLAP Lab Code: 200533-0

Product Name : 1900 MHz Dual-Band Selective Repeater

Applicant : Beijing Telestone Technology Co., Ltd.

Address : 6F, Saiou Plaza, NO. 5 Haiying Road, Fengtai
Science Park, Beijing 100070, China

Manufacturer : Beijing Telestone Technology Co., Ltd.

Model No. : TS-OR16RD2-30

Rated Voltage : AC 120V/60Hz

Trade Name : Telestone

Measurement Standard : FCC CFR Title 47 Part 2 Part24

Measurement Reference : TIA/EIA 603-A

Test Result : Complied

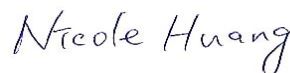
Test results relate only to the samples tested.

The test report shall not be reproduced except in full without the written approval of QuietTek Corporation.

This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government.

Documented By

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(Engineering Adm.
Assistant / Nicole
Huang)

Tested By

:



(Senior Engineer /
Shine Hsu)

Approved By

:



(President / Gene
Chang)

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Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	: 1900 MHz Dual-Band Selective Repeater
Trade Name	: Telestone
Model No.	: TS-OR16RD2-30
FCC ID.	: U5TTS-OR16RD2
TX Frequency	: 1850 ~ 1910 MHz (PCS 1900)
RX Frequency	: 1930 ~ 1990 MHz (PCS 1900)
Antenna Type	: Fixed
Rated Voltage	: AC 120V/60Hz

1.2. Operational Description

The information contained within this report is intended to show verification of compliance of the PCS 1900 1900MHz Repeater to the requirements of 47CFR2 and CFR 24.

The signal from the base station is received via the repeater donor (BS) antenna and is then forwarded through a directional coupler (DC). The signal passes a duplex filter (DPX), is amplified in a low noise amplifier (LNA), and enters the band selective amplifier (BSA), which has two parallel bands.

The first mixer stage on the BSA amplifier, which is controlled by a synthesizer, converts the received frequency down to the IF frequency. The signal is then filtered by a SAW band pass filter and amplified before it is fed to the second mixer stage, controlled by the same synthesizer as the previous one, for converting back to the original frequency. The SAW filter can be adjustable for each BSA has adjustable bandwidth.

A detector on the PA measures continuously the output level. The signal from this detector is used by the automatic level control, ALC, to supervise and, if necessary, reduce the output power to keep it under a setting level.

The output signal passes duplex filter (DPX) and fed to the repeater service (MS) antenna. The uplink signal path, i.e. from the mobile station through the repeater to the base station, is identical to the downlink path the other way round. Only some levels and component values differ.

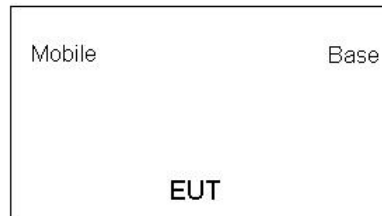
Frequency Band Range:
 1850 – 1910 MHz, Uplink
 1930 – 1990 MHz, Downlink
 Bandwidth: 0.5 – 20 MHz, Programmable
 Gain Adjustment Range: 55 – 85 dB

QuietTek has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

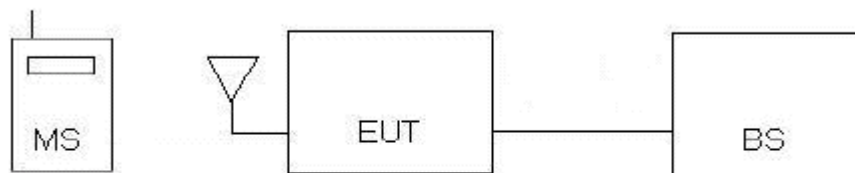
Test Mode:	PCS 1900
	PCS 1900 GPRS

1.3. Configuration of Signal System

(a) Block Diagram



(b) Configuration of measurement



1.4. EUT Setup Procedures

- (1) Setup the EUT and simulators as shown on 1.3
- (2) Turn on the power of all equipments.
- (3) The EUT was set to communicate with BS and MS.
- (4) Repeat the above procedure (3).

1.5. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

Site Description: June 22, 2001 File on
Federal Communications Commission
FCC Engineering Laboratory
7435 Oakland Mills Road
Columbia, MD 21046
Reference 31040/SIT1300F2

July 03, 2001 Accreditation on NVLAP
NVLAP Lab Code: 200533-0

Site Name: Quietek Corporation

Site Address: No. 5-22, Ruei-Shu Valley, Ruei-Ping Tsuen,
Lin-Kou Shiang, Taipei,
Taiwan, R.O.C.
TEL: 886-2-8601-3788 / FAX : 886-2-8601-3789
E-Mail : service@quietek.com

1.6. Type of Emission

1M25F9W

2. RF Power Output

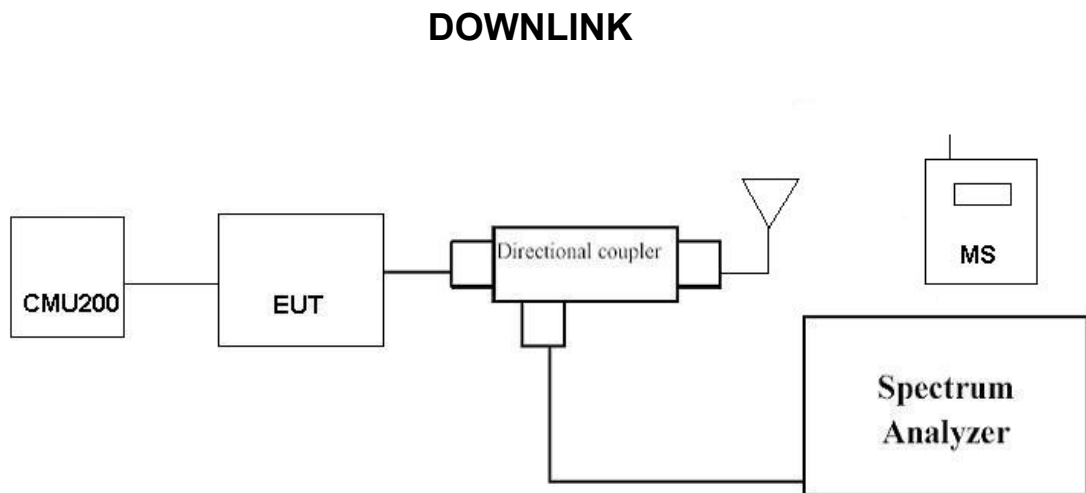
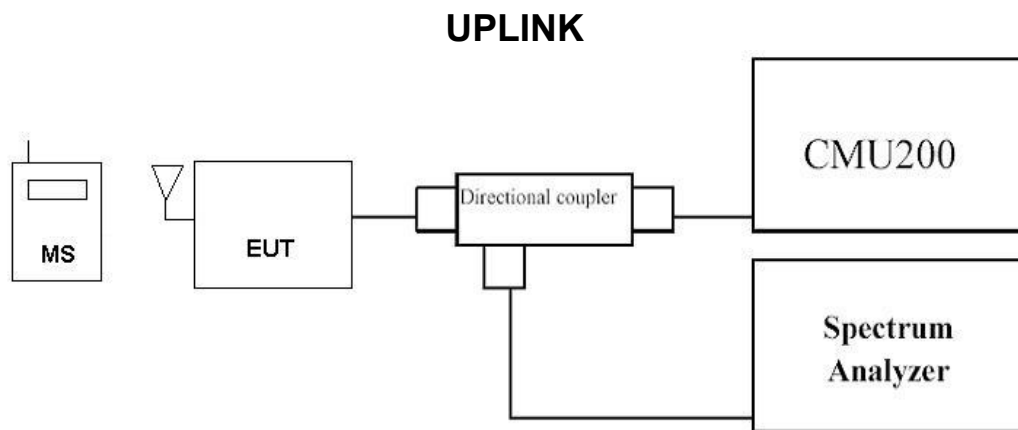
2.1. Test Equipment

The following test equipments are used during the RF power output tests:

Equipment	Manufacturer	Model No./ Serial No.	Last Cal.
Spectrum Analyzer	Advantest	R3182/ 100803470	May, 2007
Universal Radio Communication Tester	R & S	CMU200/ 104846	May, 2007
Directional coupler	Agilent	87300C/ 3239A01864	N/A
Directional coupler	Agilent	778D-012/ 50550	N/A

Note: All equipments upon which need to be calibrated are with calibration period of 1 year.

2.2. Test Setup



2.3. Limits

Limit	< 500 W ERP
-------	-------------

2.4. Test Procedure

As required by 47 CFR 2.1046, RF power output measurements were made at the RF output terminals using an attenuator and spectrum analyzer. This test was performed with carrier modulated by a GSM, modulated signal.

The spectrum analyser RBW and VBW were set to 3MHz and the path loss measured and entered as a reference level offset.

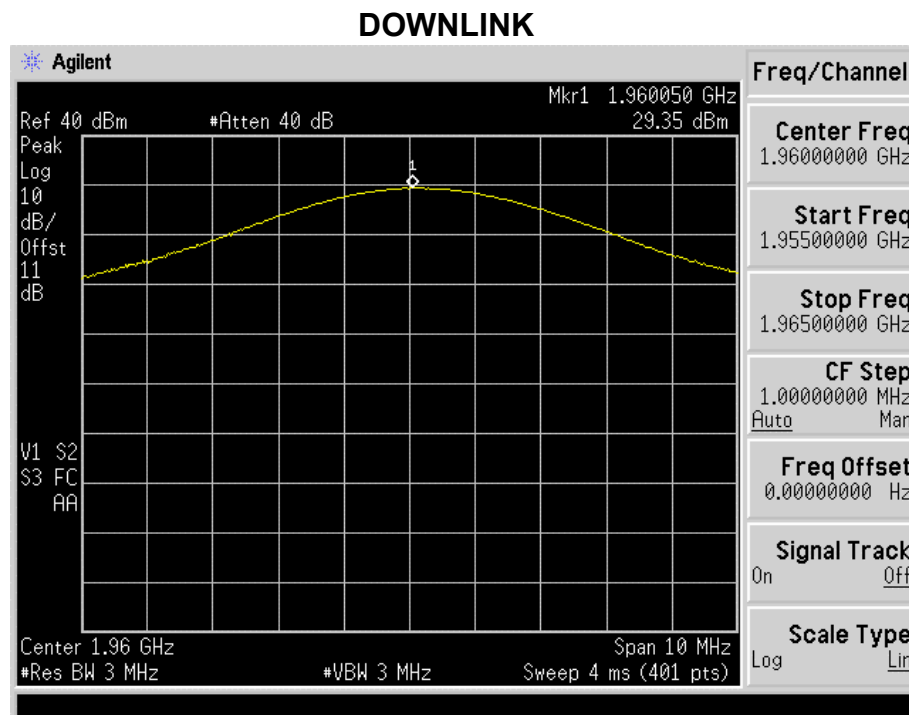
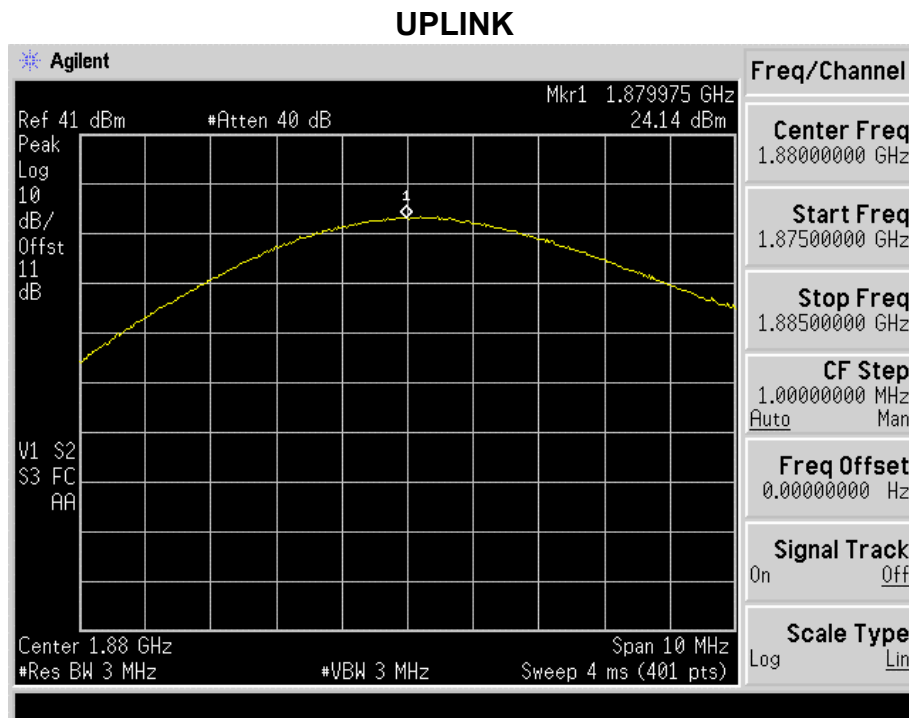
Plots of the RF output Power level of the Digitally modulated carrier, as measured at the RF output of the signal generator and at the RF output terminals of the EUT appear on the following pages.

2.5. Test Specification

According to Part 2.1046, 24.232.

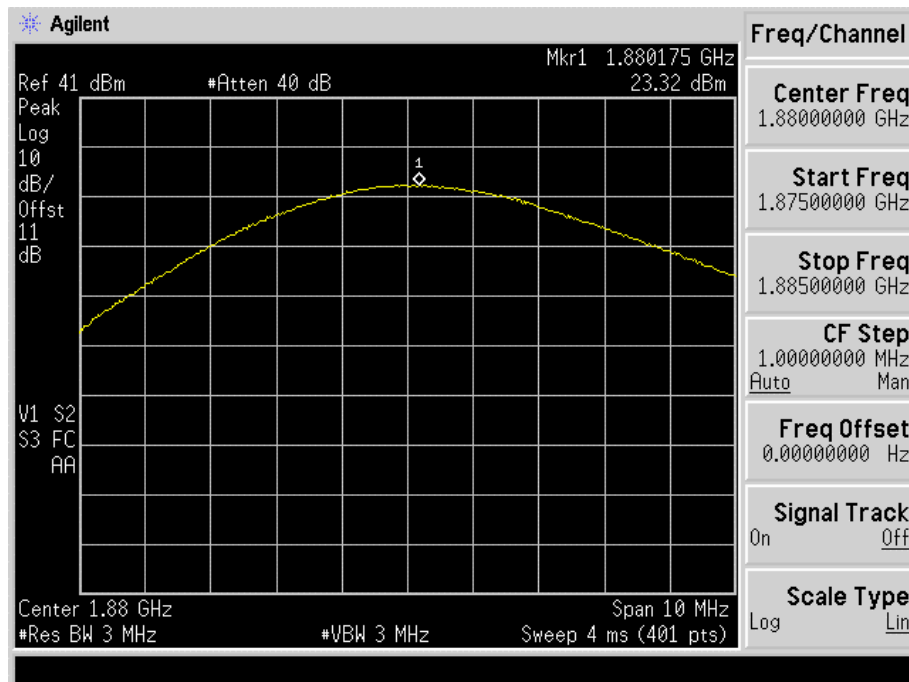
2.6. Test Result of RF Power Output

Product	1900 MHz Dual-Band Selective Repeater		
Test Mode	RF Output Power		
Date of Test	2007/08/14	Test Site	CB4
Test Condition	PCS 1900		

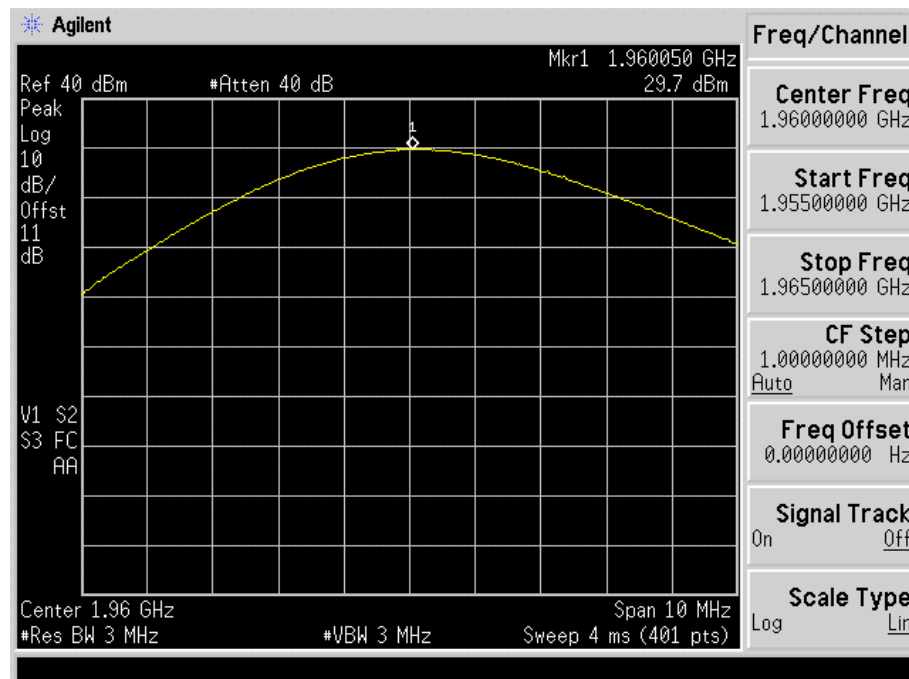


Product	1900 MHz Dual-Band Selective Repeater		
Test Mode	RF Output Power		
Date of Test	2007/08/14	Test Site	CB4
Test Condition	PCS 1900 GPRS		

UPLINK



DOWNLINK



3. Occupied Bandwidth

3.1. Test Equipment

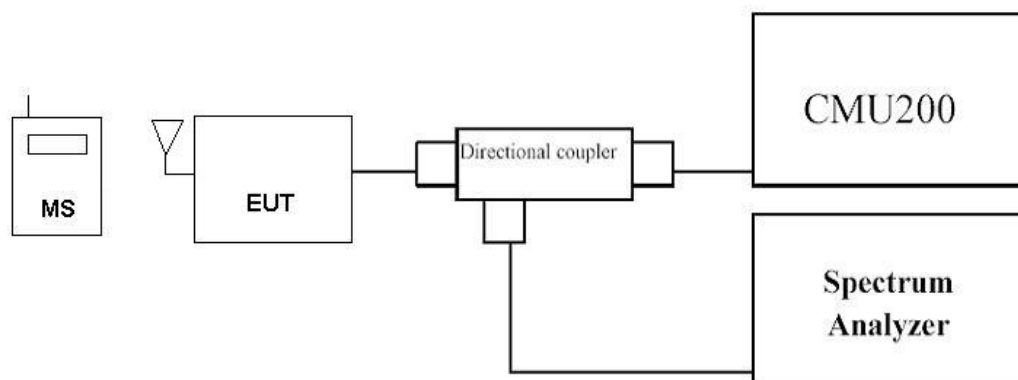
The following test equipments are used during the occupied bandwidth tests:

Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Spectrum Analyzer	Advantest	R3182/ 100803470	May, 2007
Universal Radio Communication Tester	R & S	CMU200/ 104846	May, 2007
Directional coupler	Agilent	87300C/ 3239A01864	N/A
Directional coupler	Agilent	778D-012/ 50550	N/A

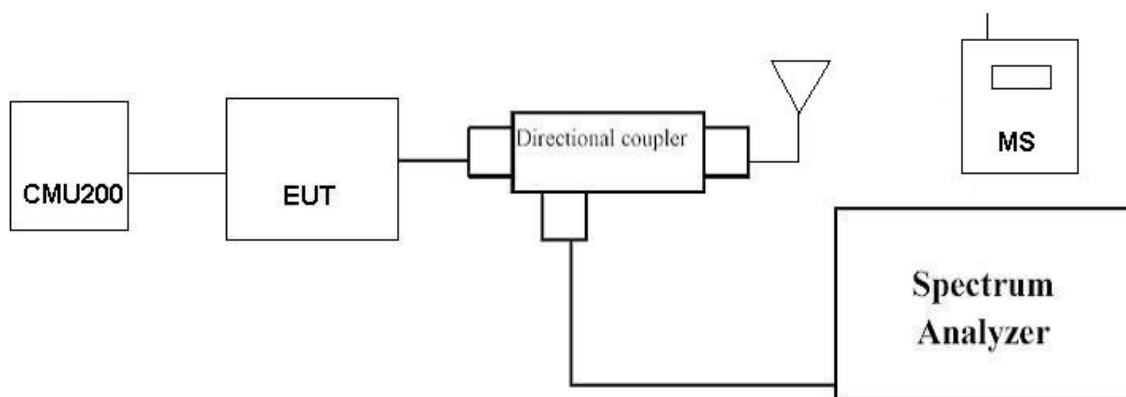
Note: All equipments upon which need to be calibrated are with calibration period of 1 year.

3.2. Test Setup

UPLINK



DOWNLINK



3.3. Test Procedure

The EUT was set to transmit on maximum power, using a resolution bandwidth of 100kHz and a video bandwidth of 300kHz, the -26dBc points were established and the emission bandwidth determined.

The plots below show the resultant display from the Spectrum Analyser.

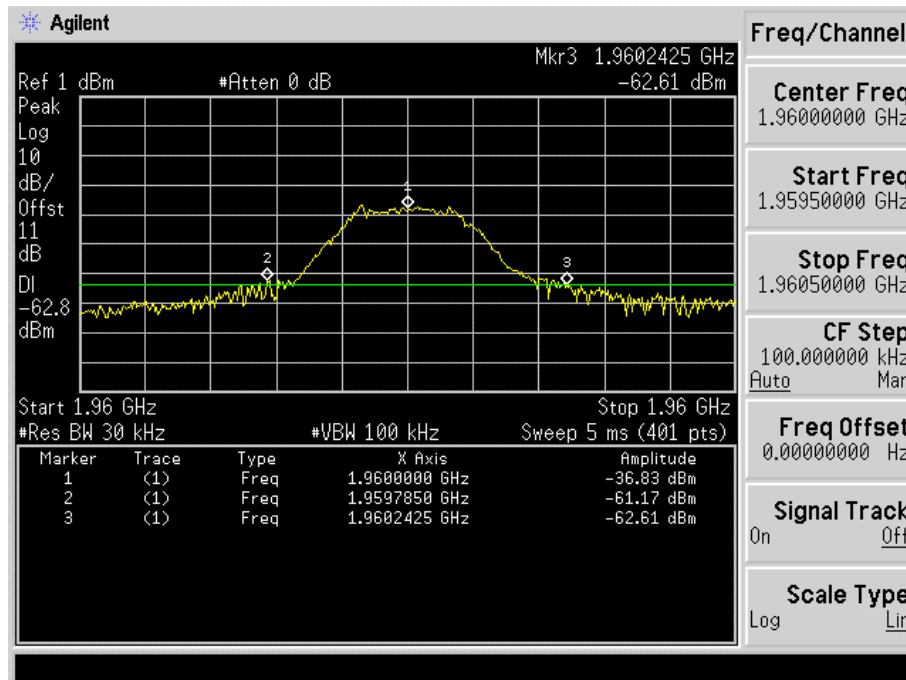
3.4. Test Specification

According to Part 2.1049, 24.238.

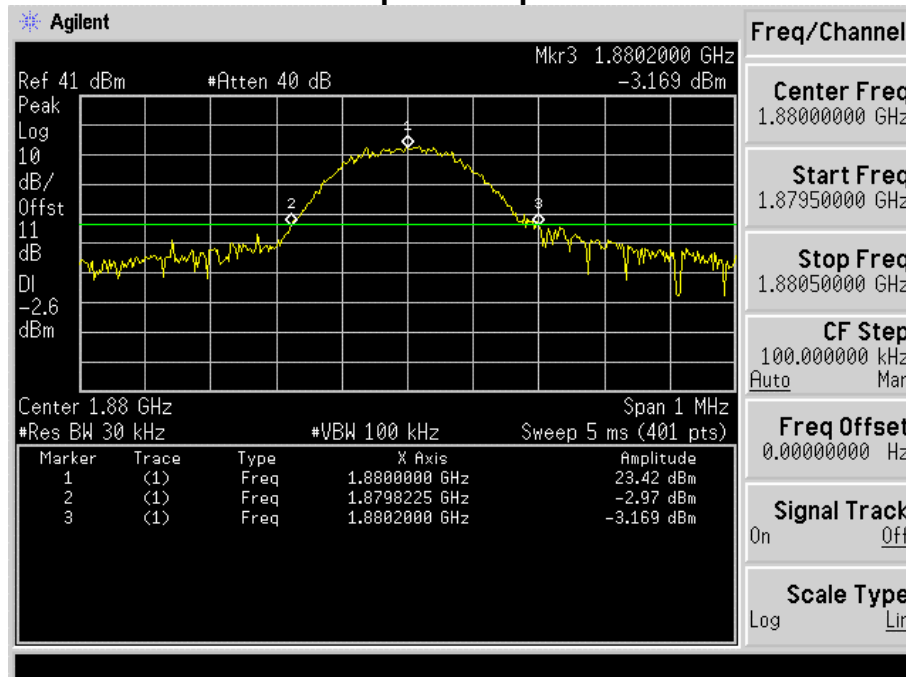
3.5. Test Result of Occupied Bandwidth

Product	1900 MHz Dual-Band Selective Repeater		
Test Mode	Occupied Bandwidth		
Date of Test	2007/08/14	Test Site	CB4
Test Condition	PCS 1900		

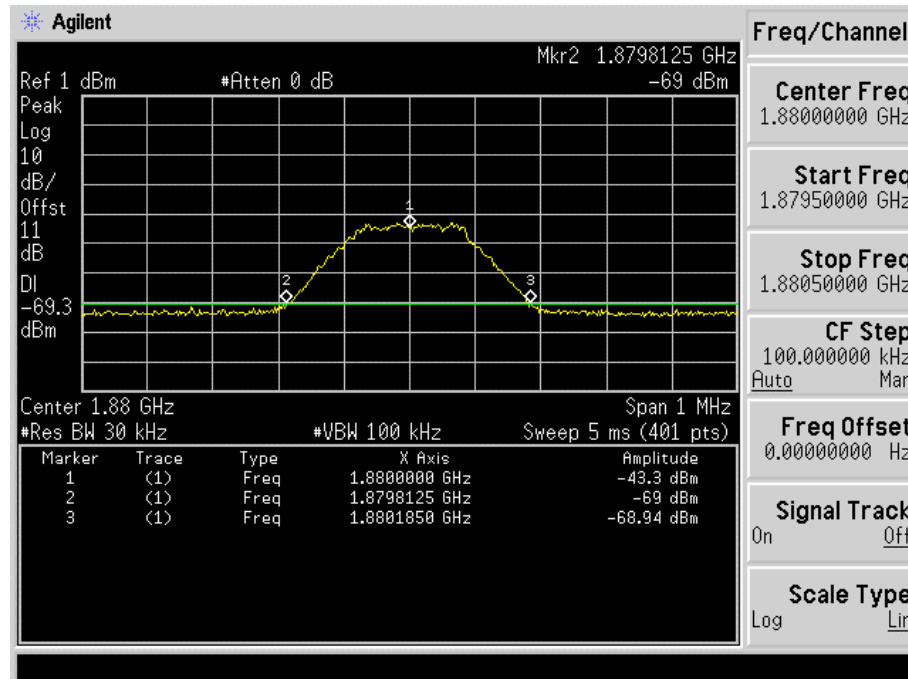
Uplink Input



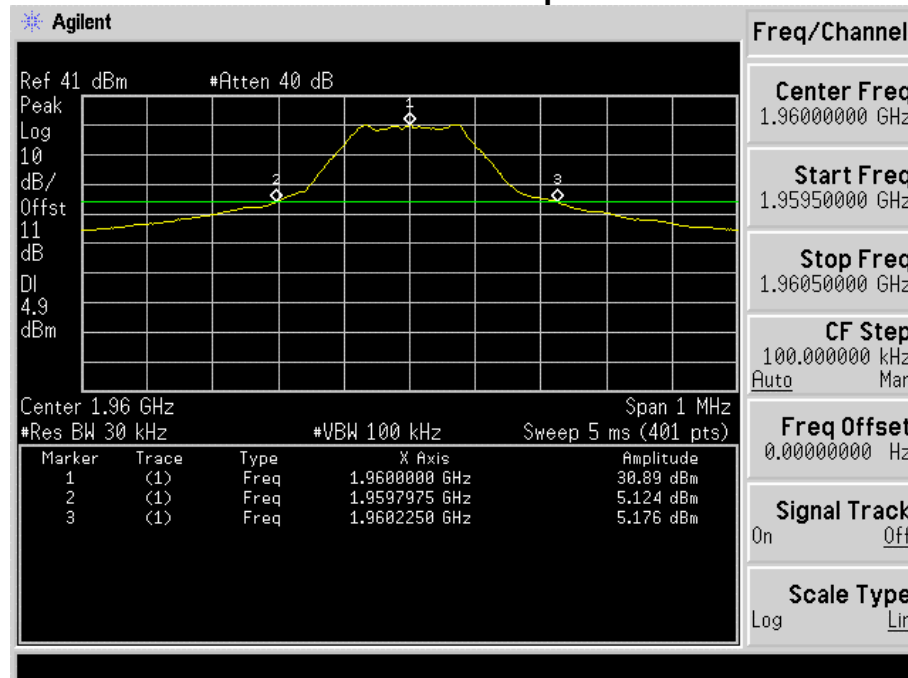
Uplink Output



Downlink Input

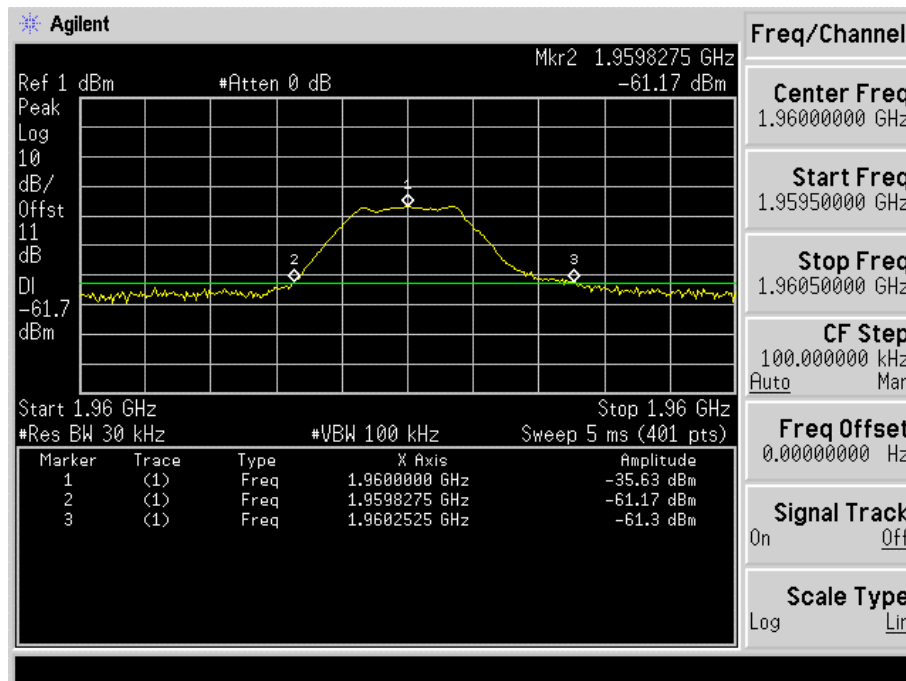


Downlink Output

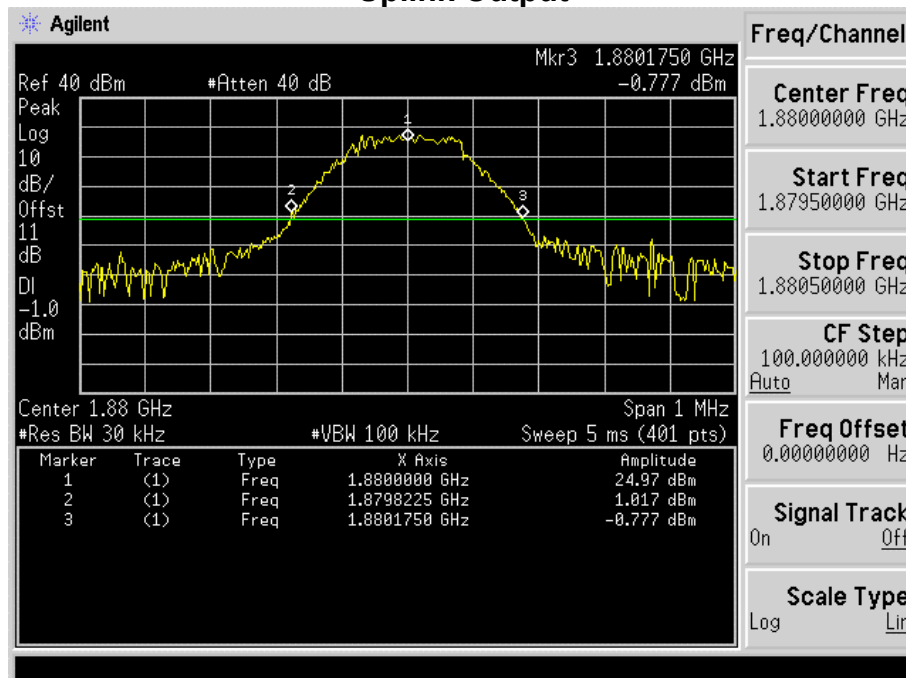


Product	1900 MHz Dual-Band Selective Repeater		
Test Mode	Occupied Bandwidth		
Date of Test	2007/08/14	Test Site	CB4
Test Condition	PCS 1900 GPRS		

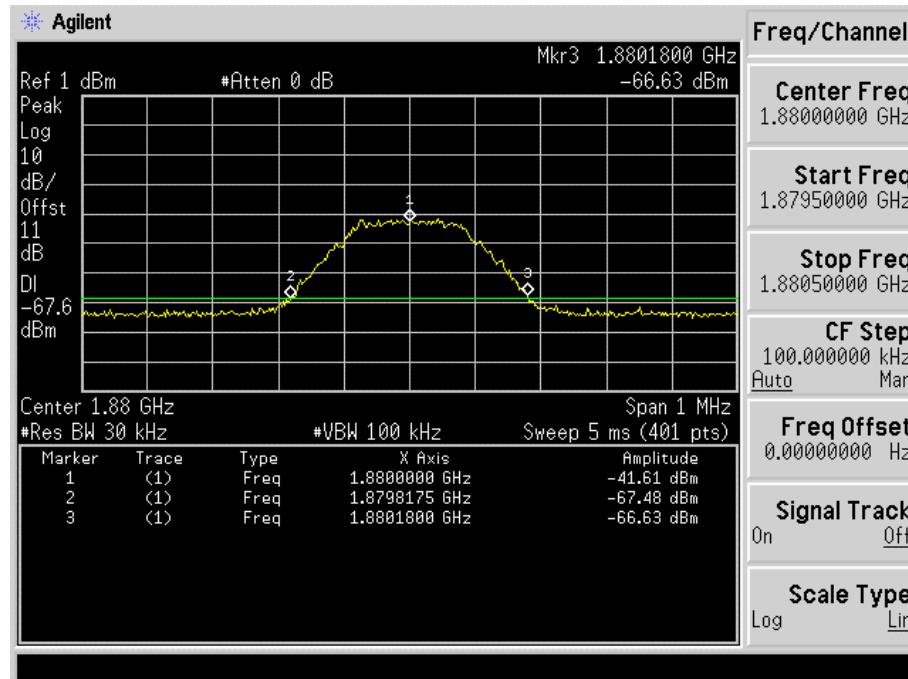
Uplink Input



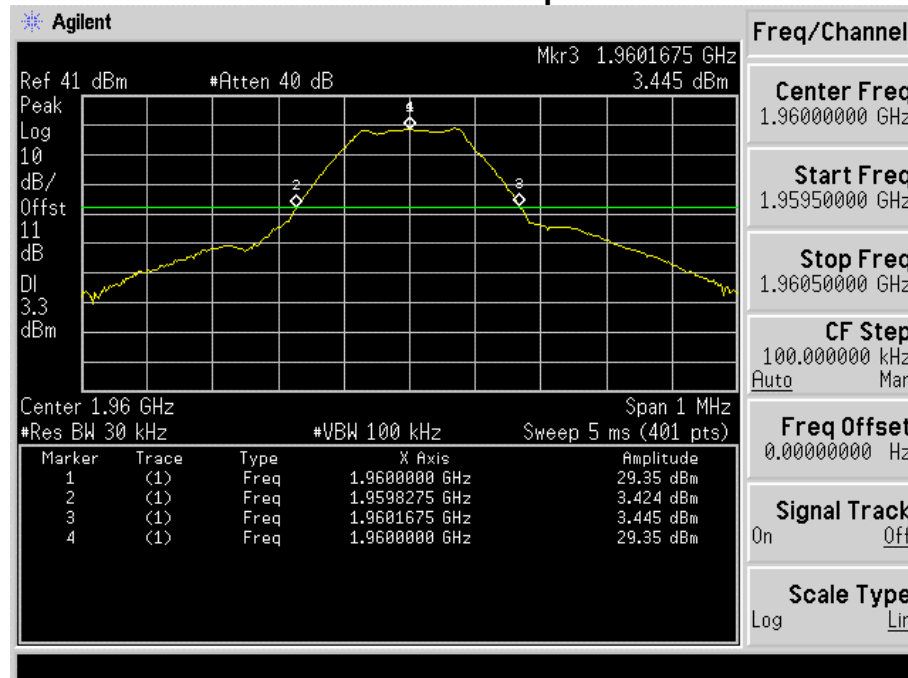
Uplink Output



Downlink Input



Downlink Output



4. Spurious Emission At Antenna Terminals

4.1. Test Equipment

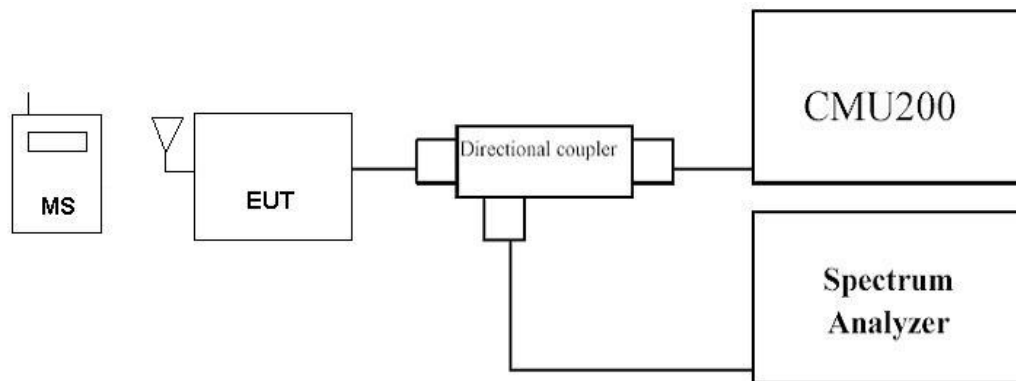
The following test equipments are used during the spurious emission test

Equipment	Manufacturer	Model No./ Serial No.	Last Cal.
Spectrum Analyzer	Advantest	R3182/ 100803470	May, 2007
Universal Radio Communication Tester	R & S	CMU200/ 104846	May, 2007
Directional coupler	Agilent	87300C/ 3239A01864	N/A
Directional coupler	Agilent	778D-012/ 50550	N/A

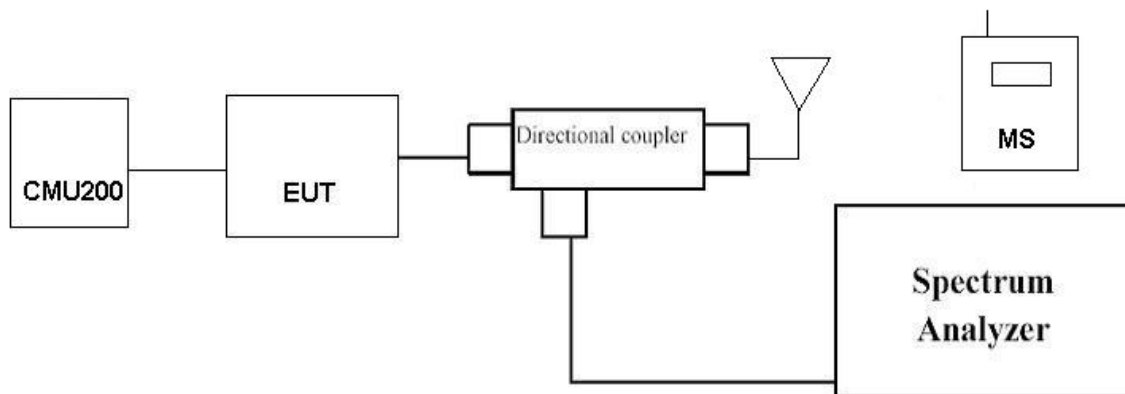
Note: All equipments upon which need to be calibrated are with calibration period of 1 year.

4.2. Setup

UPLINK



DOWNLINK



4.3. Limits

The mean power of emissions must be attenuated below the mean power of the unmodulated carrier on any frequency twice or more than twice the fundamental emission by at least $43 + 10 \log P$. This is equivalent to -13 dBm absolute power.

4.4. Test Procedure

As required by 47 CFR 2.1051, spurious emissions at antenna terminal measurements were made at the RF output terminals using a attenuator and spectrum analyzer set for a 30kHz bandwidth. This test was performed with digitally modulated carrier signals. The digital signal generator was adjusted for continuous transmit on frequencies in both the uplink and downlink frequency bands. The frequency spectrum was investigated from 9 KHz to 20 GHz. For measuring emissions above 2 GHz, a high-pass filter was used to eliminate the fundamental transmit frequency to prevent possible saturation effects on the front end of the spectrum analyzer.

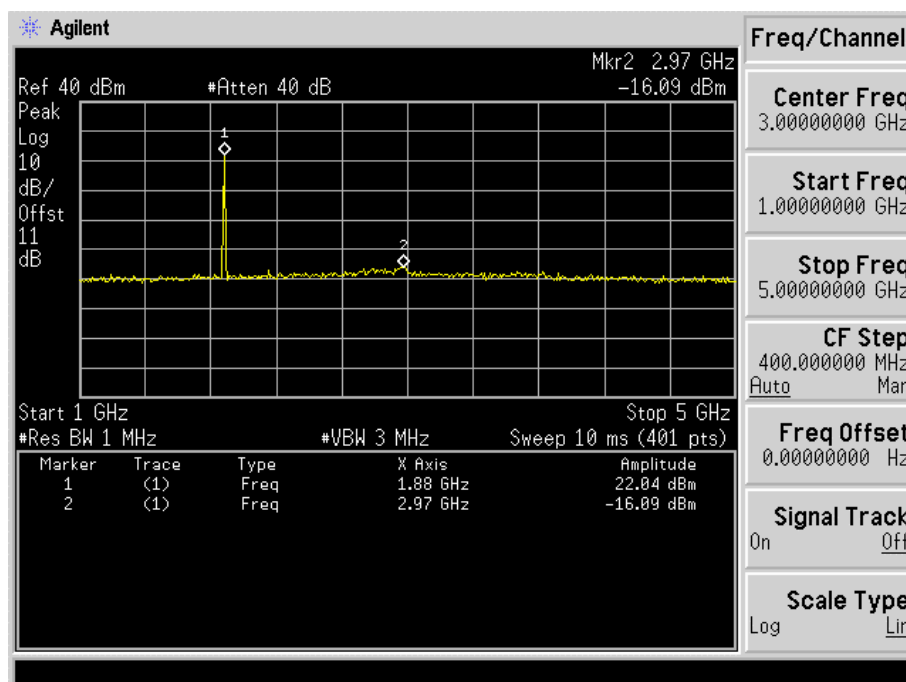
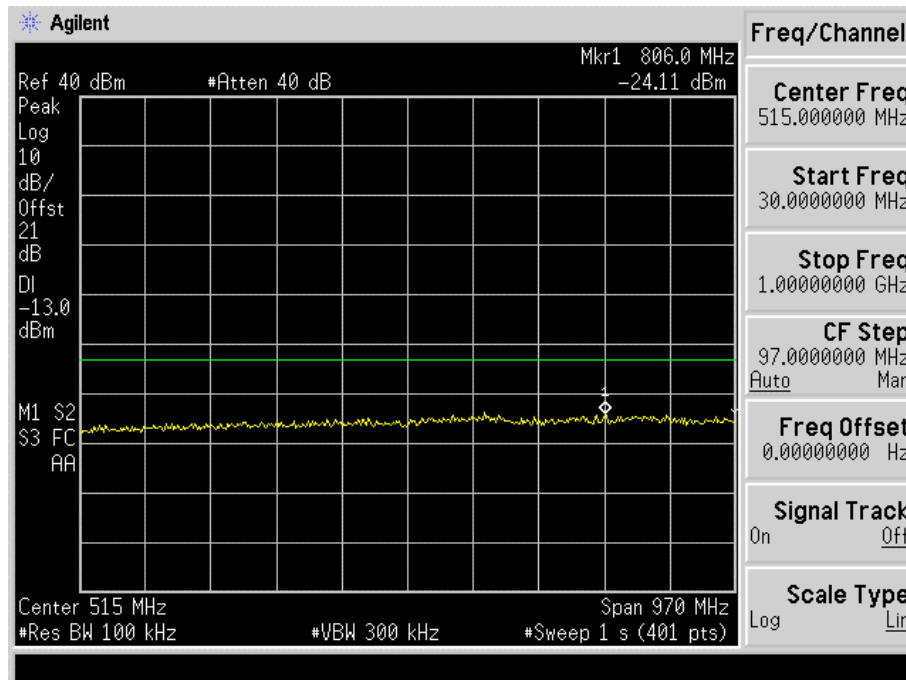
4.5. Test Specification

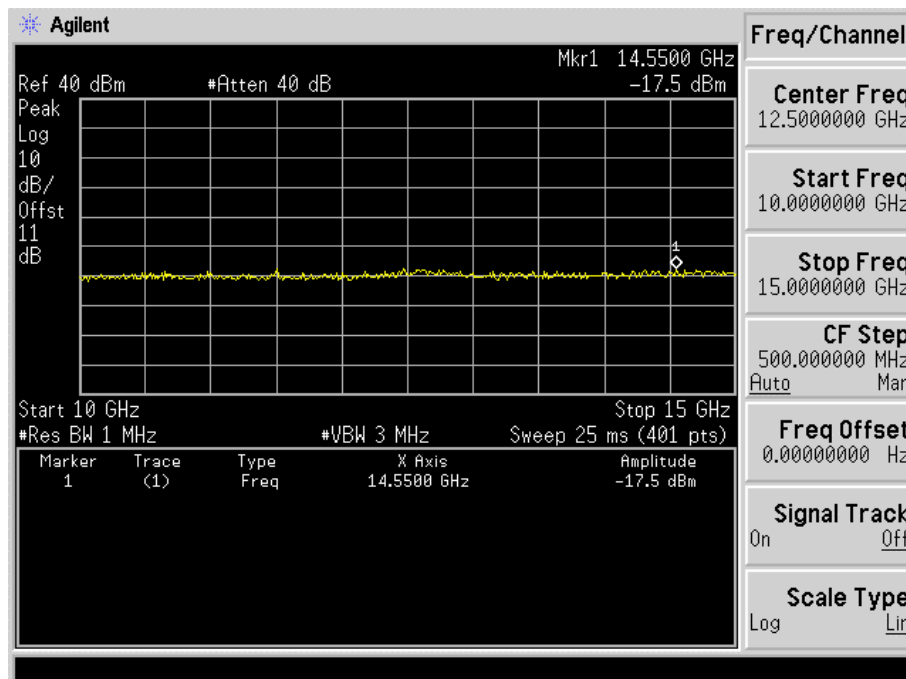
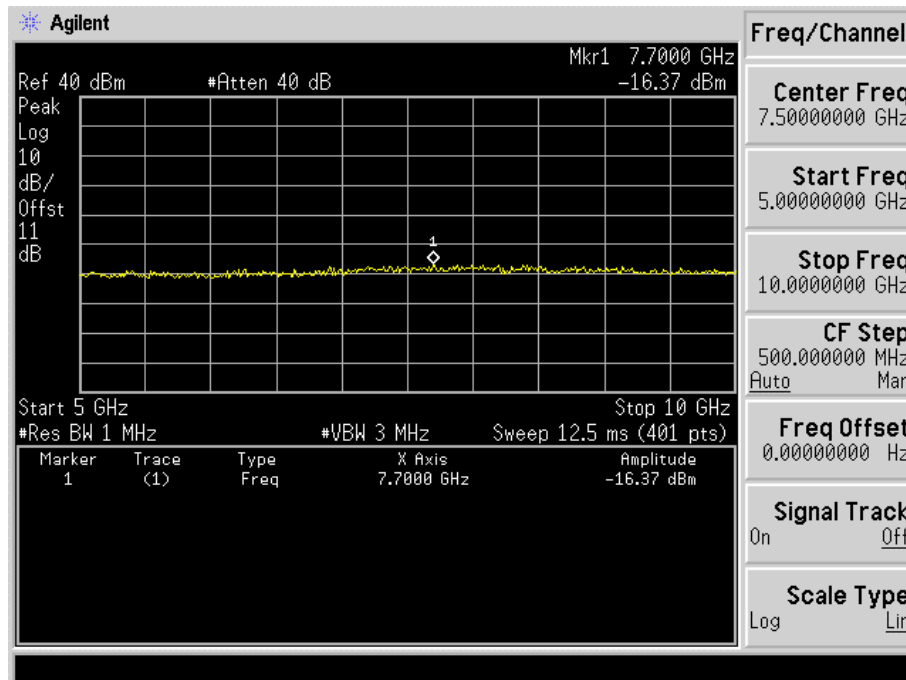
According to Part 2.1051, 24.238.

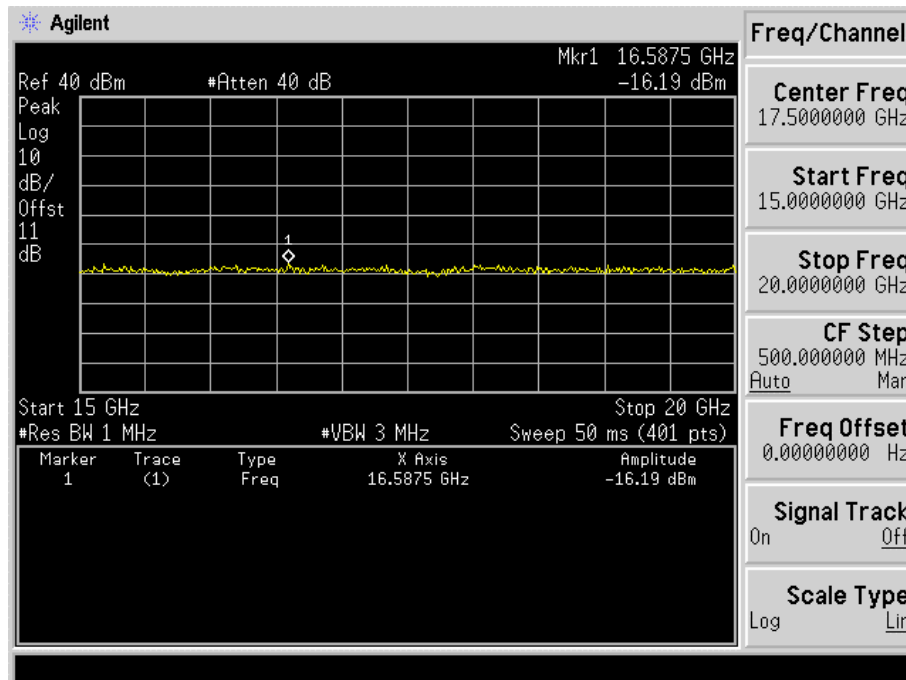
4.6. Test Result of Spurious Emission At Antenna Terminals

Product	1900 MHz Dual-Band Selective Repeater		
Test Mode	Spurious Emission At Antenna Terminals		
Date of Test	2007/08/14	Test Site	CB4
Test Condition	PCS 1900		

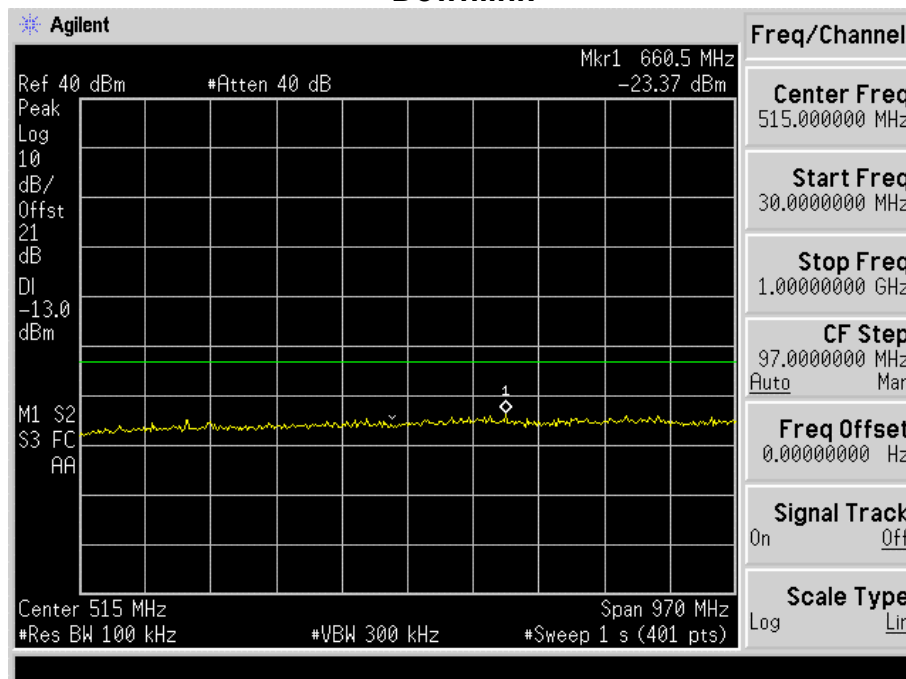
Uplink

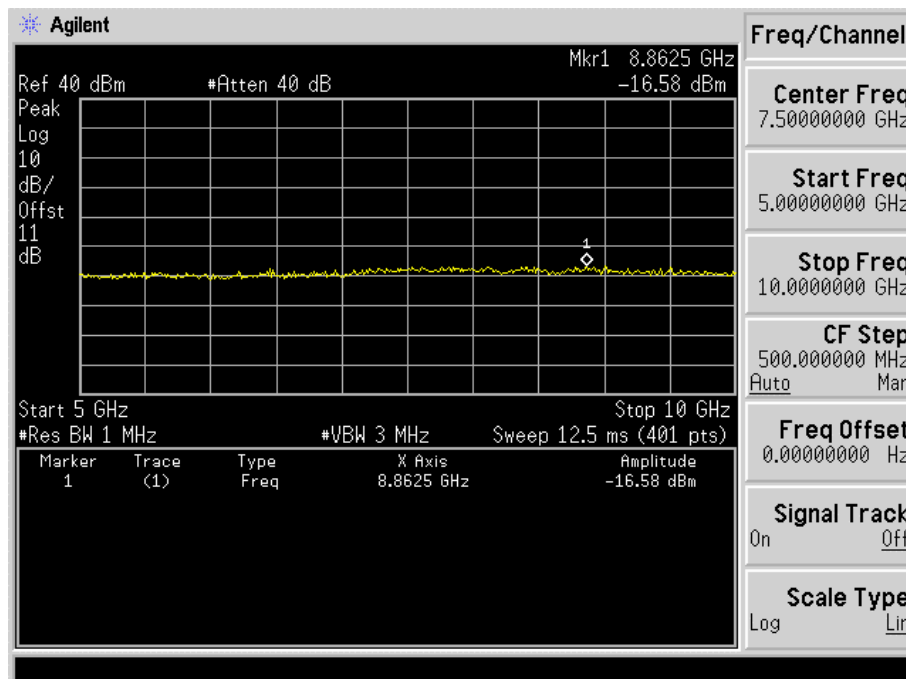
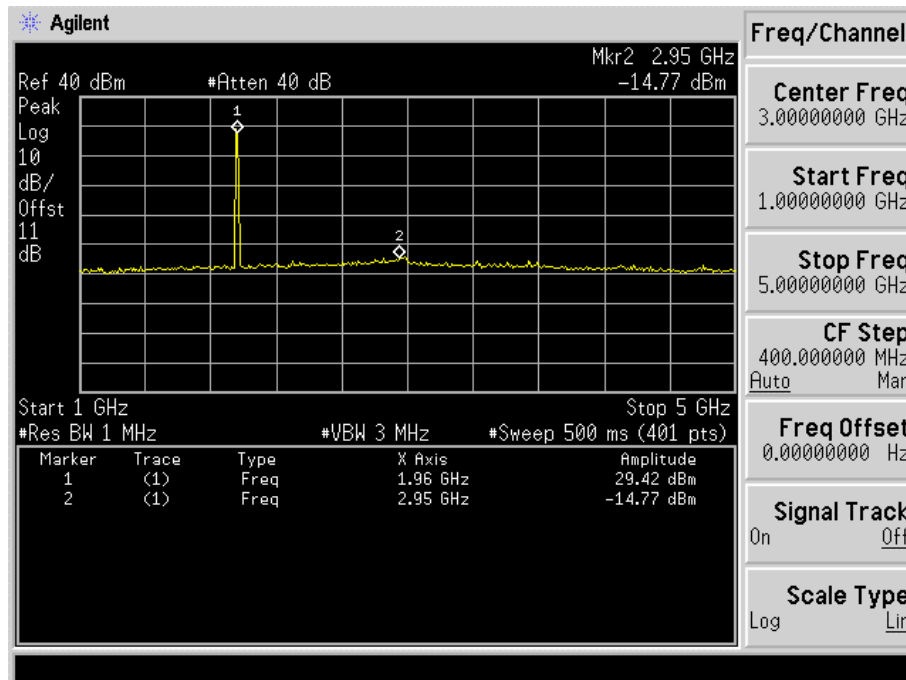


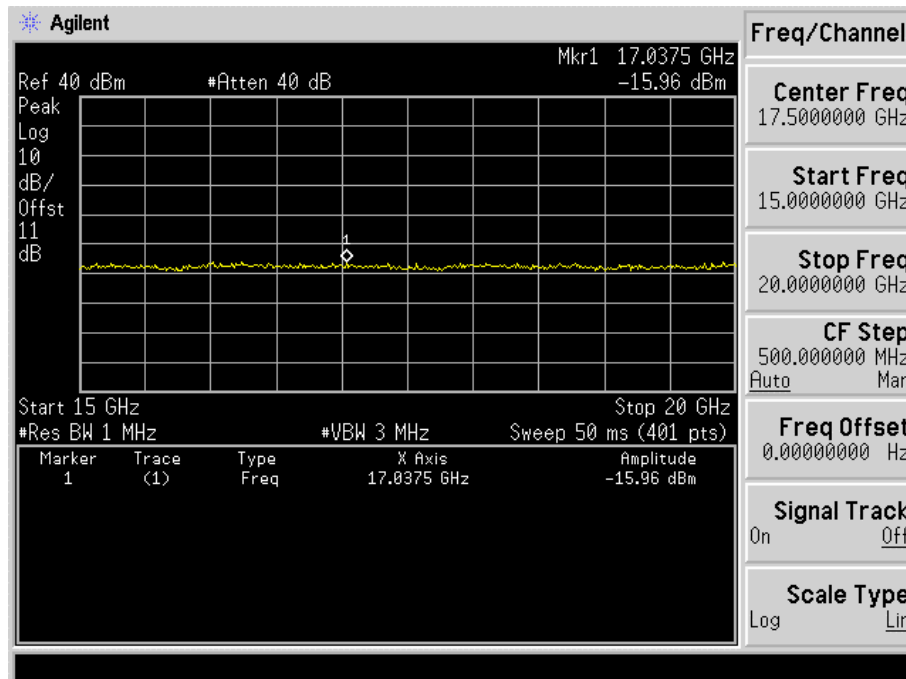
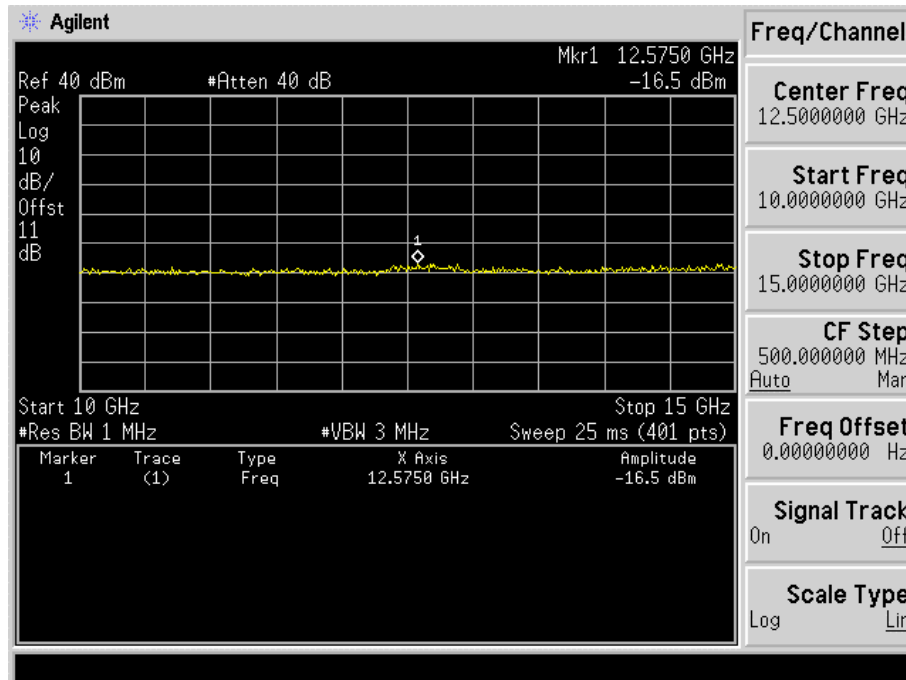




Downlink

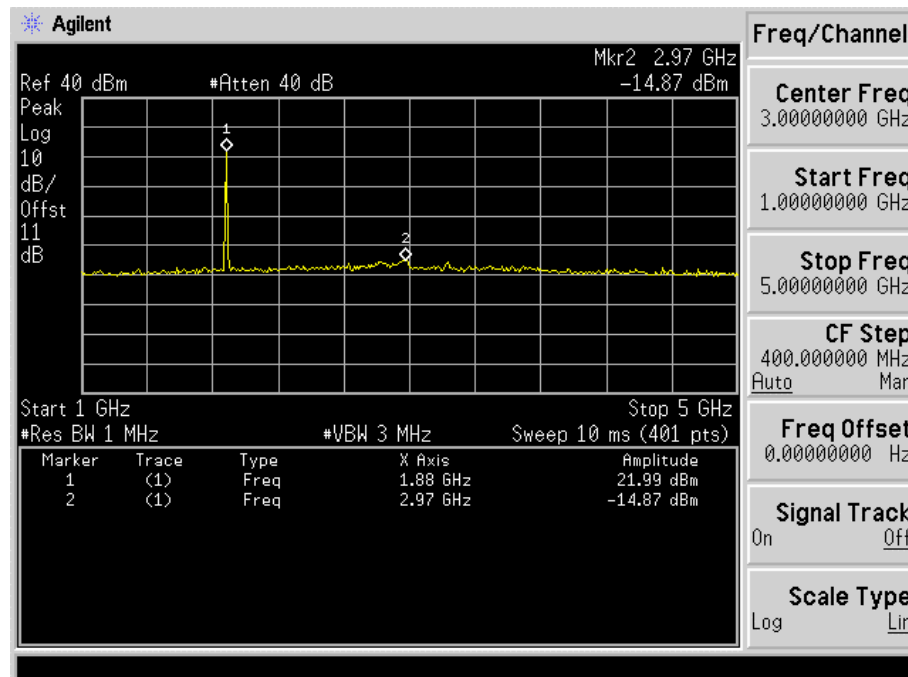
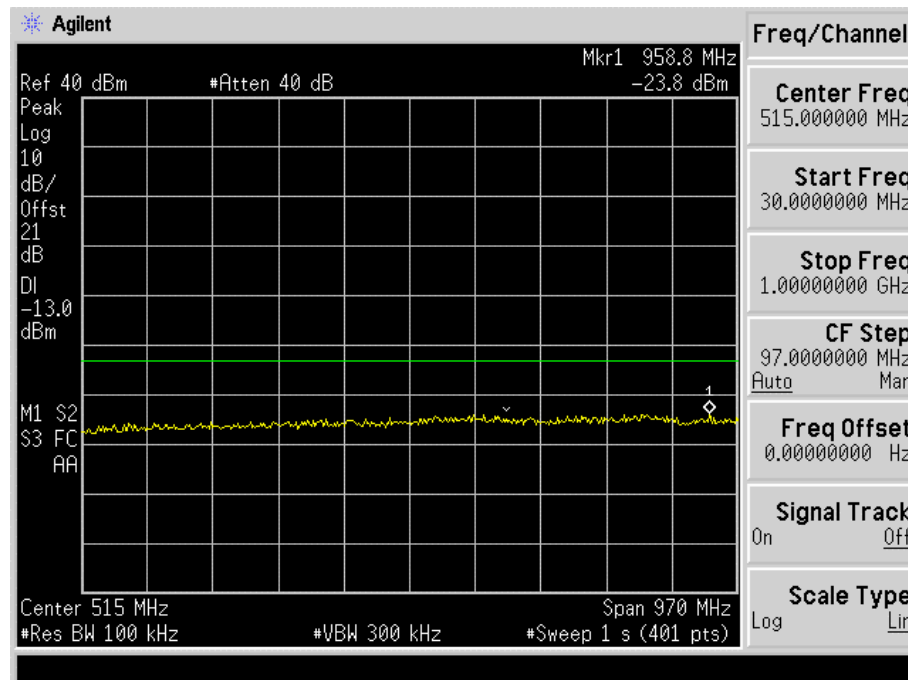


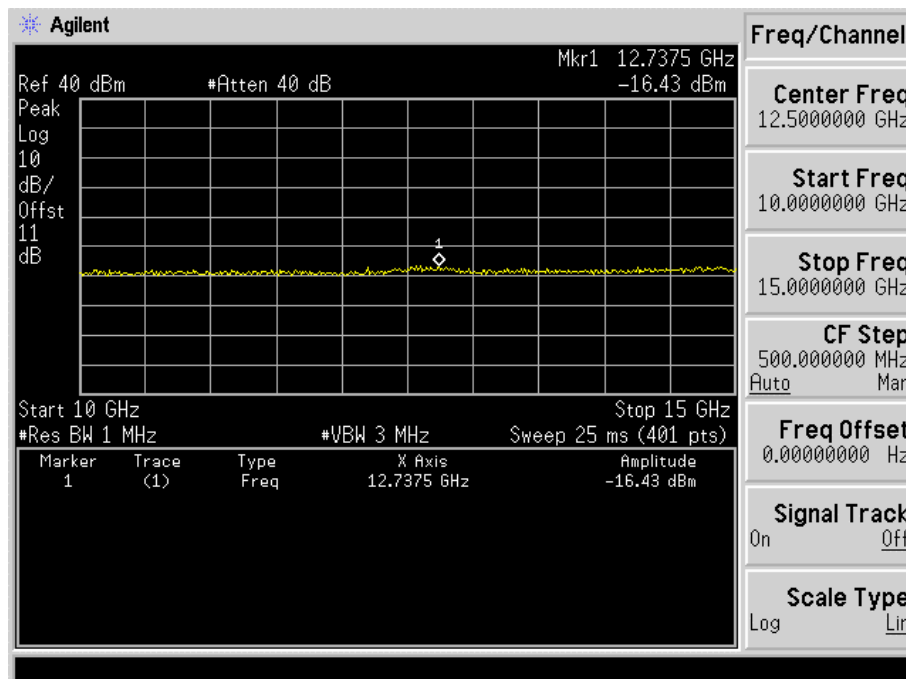
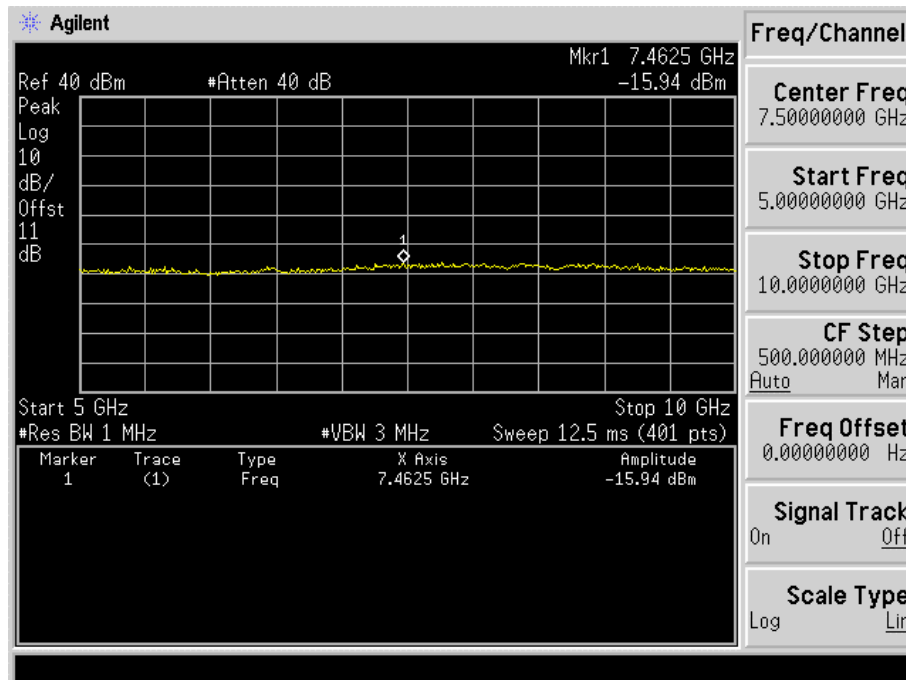


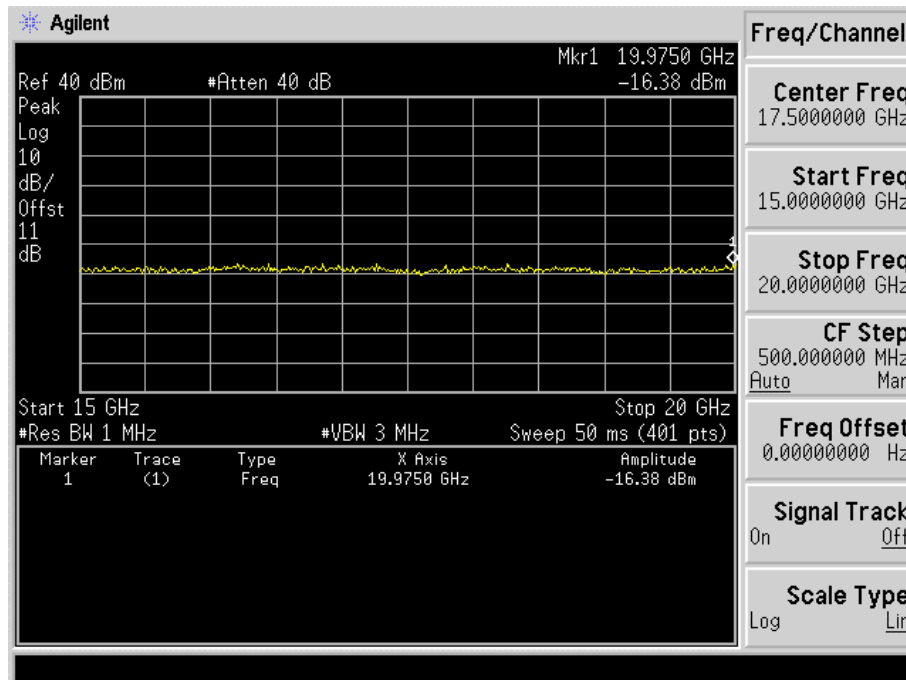


Product	1900 MHz Dual-Band Selective Repeater		
Test Mode	Spurious Emission At Antenna Terminals		
Date of Test	2007/08/14	Test Site	CB4
Test Condition	PCS 1900 GPRS		

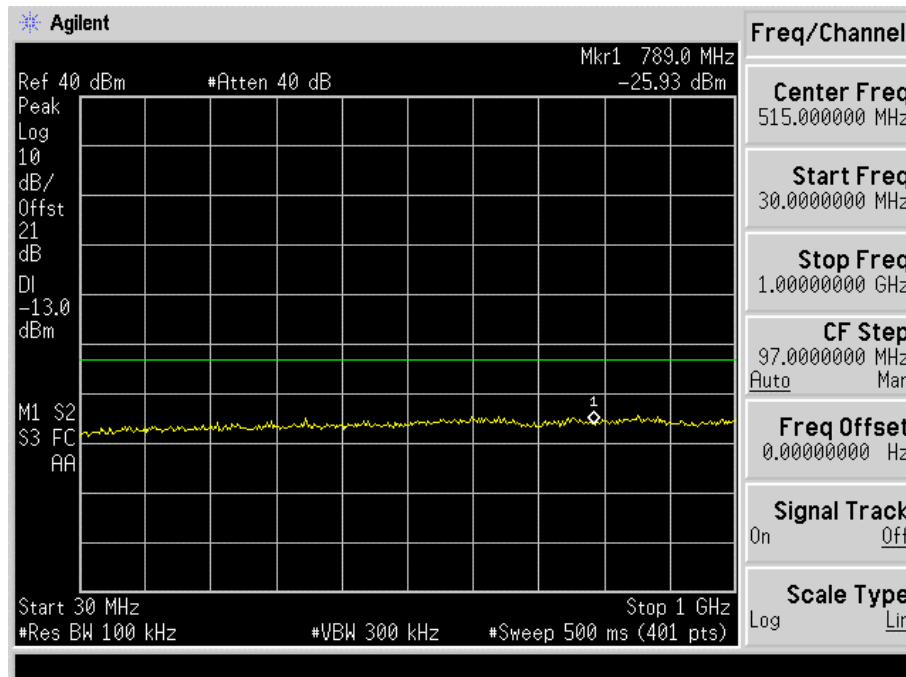
Uplink

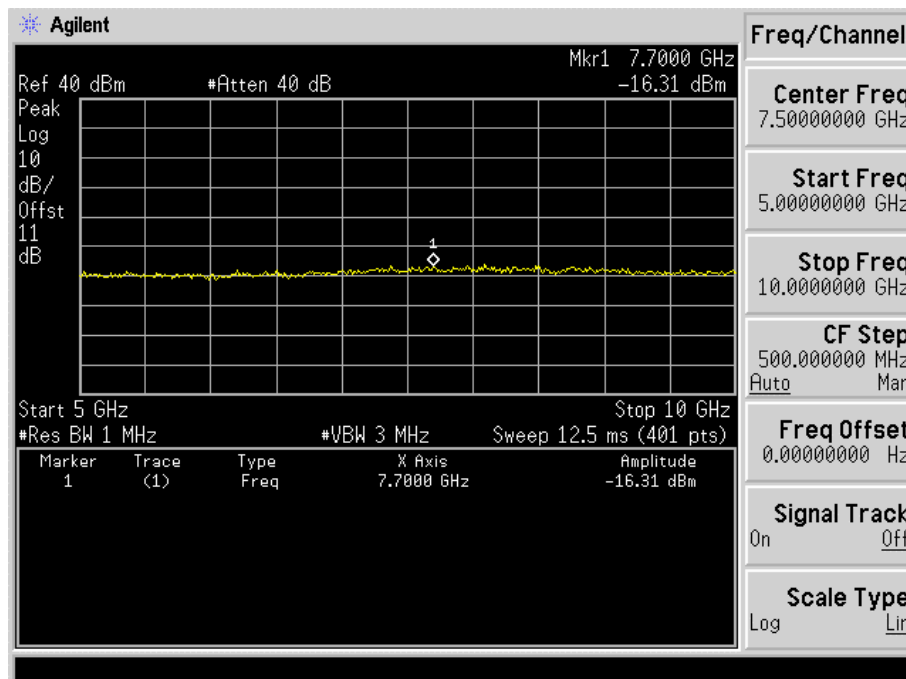
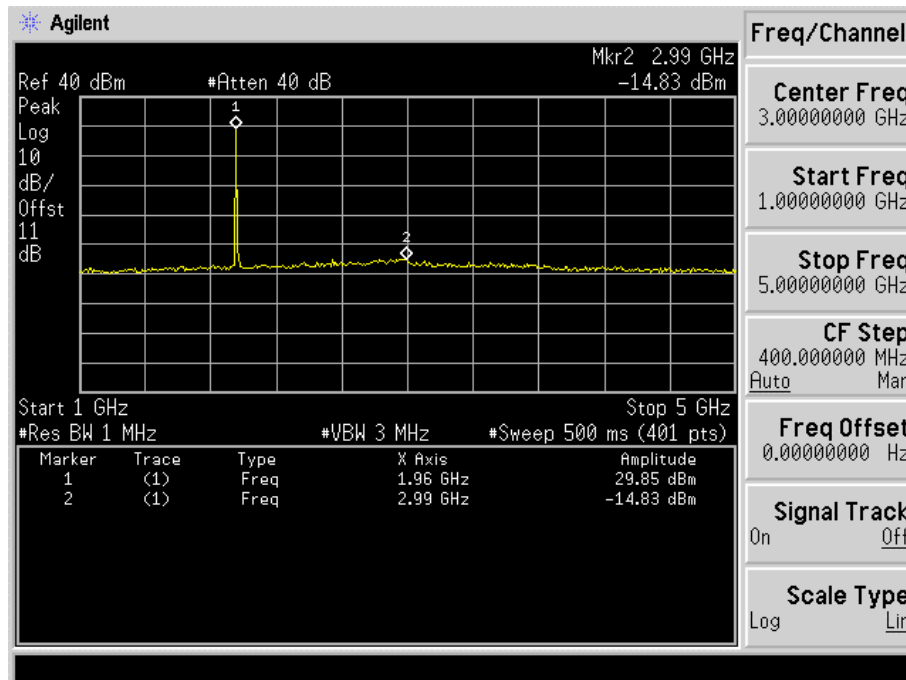


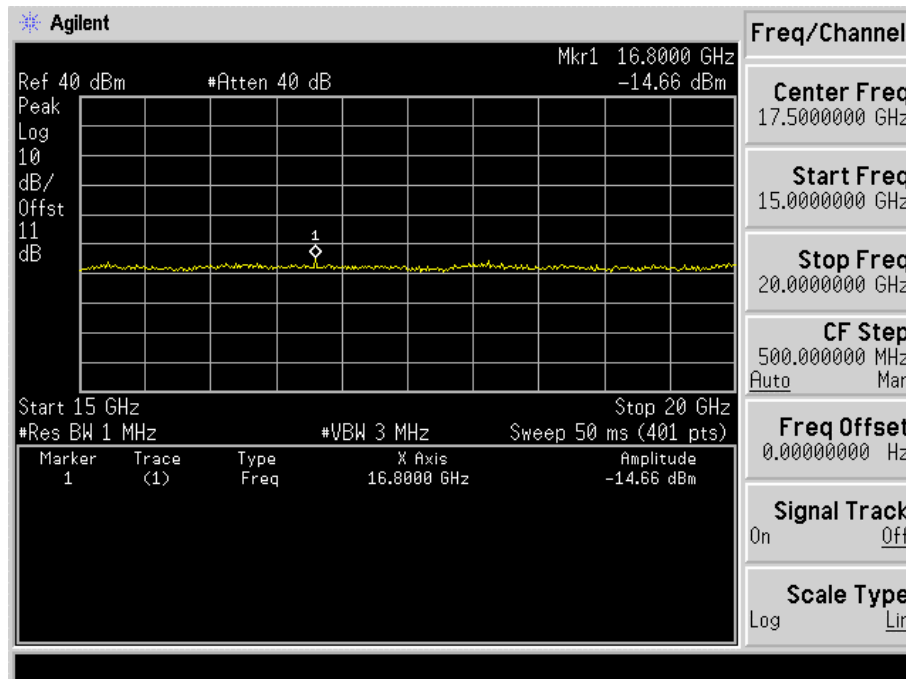
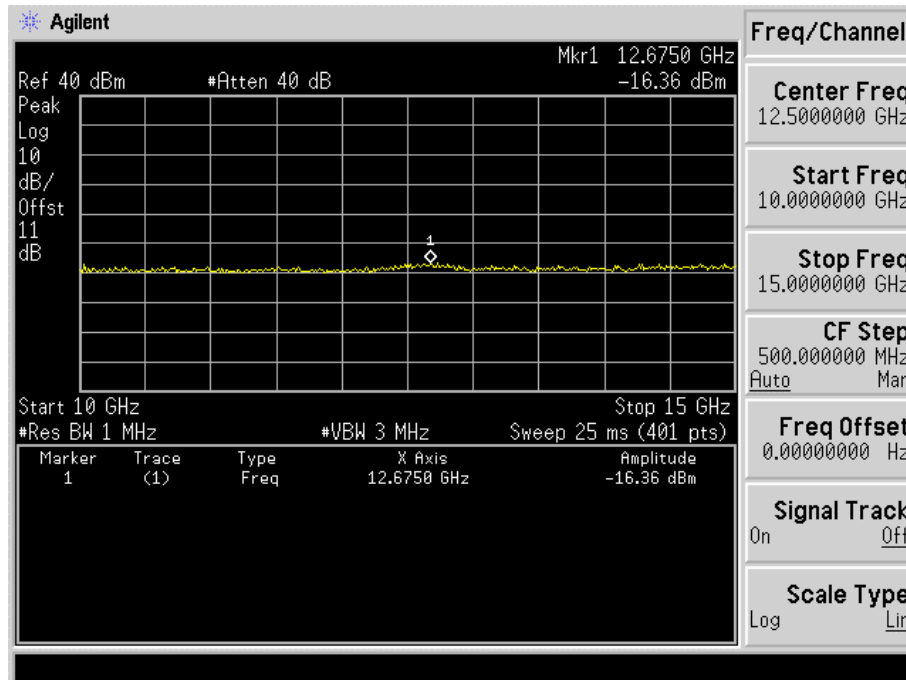




Downlink

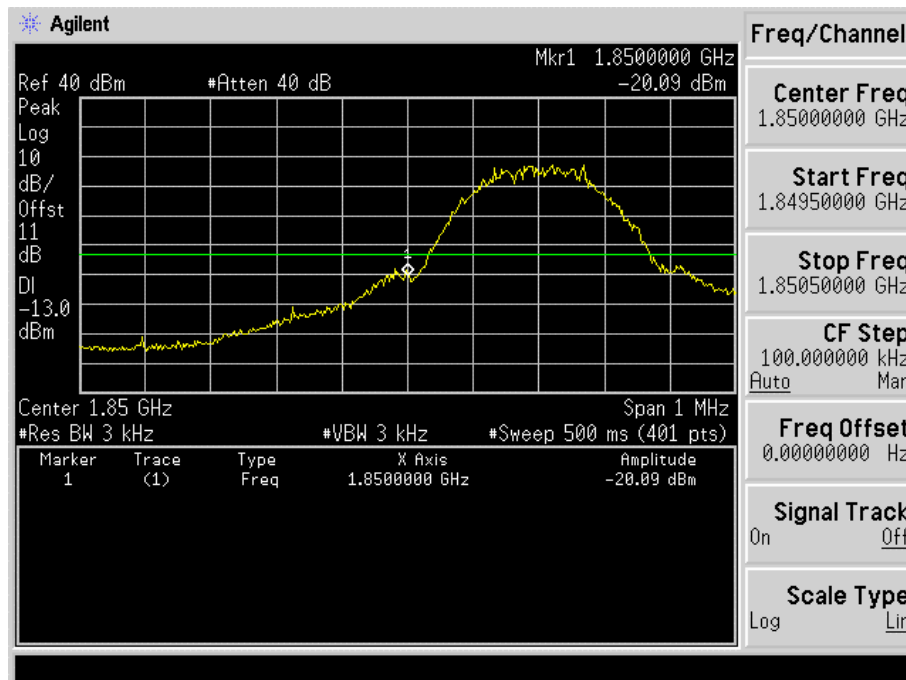




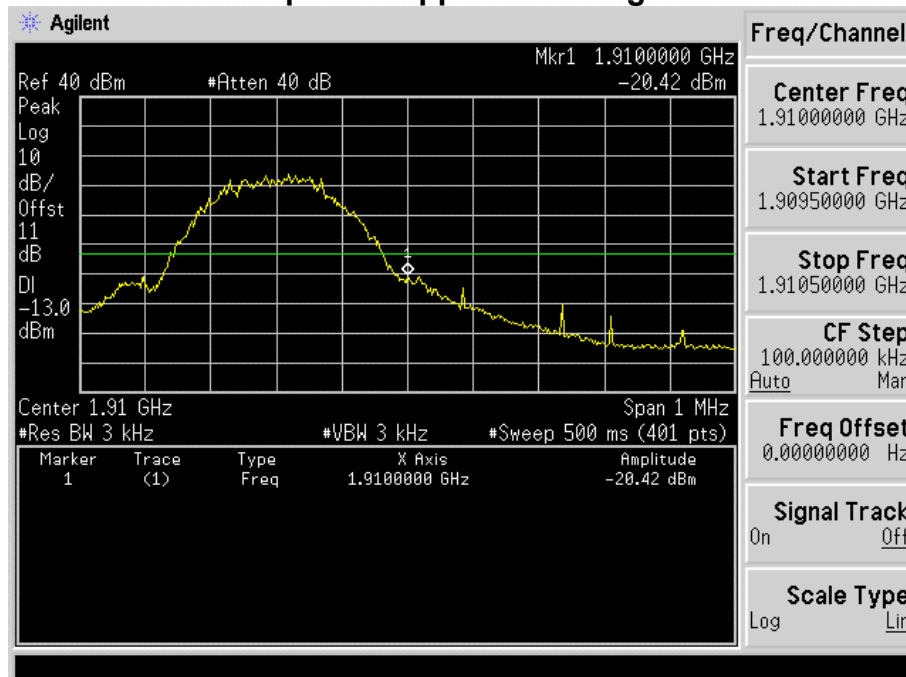


Product	1900 MHz Dual-Band Selective Repeater		
Test Mode	Spurious Emission At Antenna Terminals		
Date of Test	2007/08/14	Test Site	CB4
Test Condition	PCS 1900, Band Edge Test		

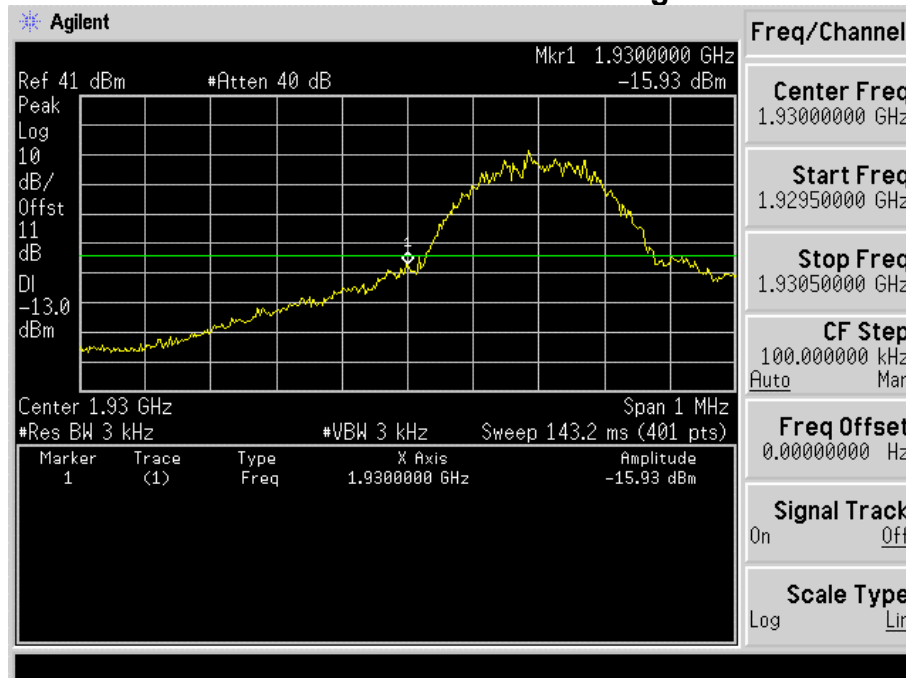
Uplink – Lower Band Edge



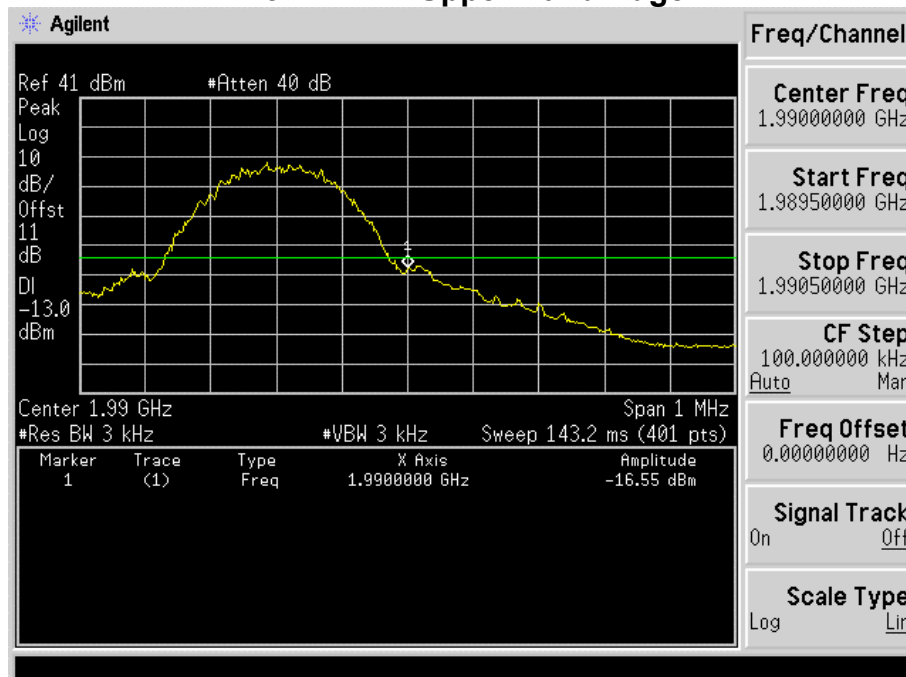
Uplink – Upper Band Edge



Downlink – Lower Band Edge

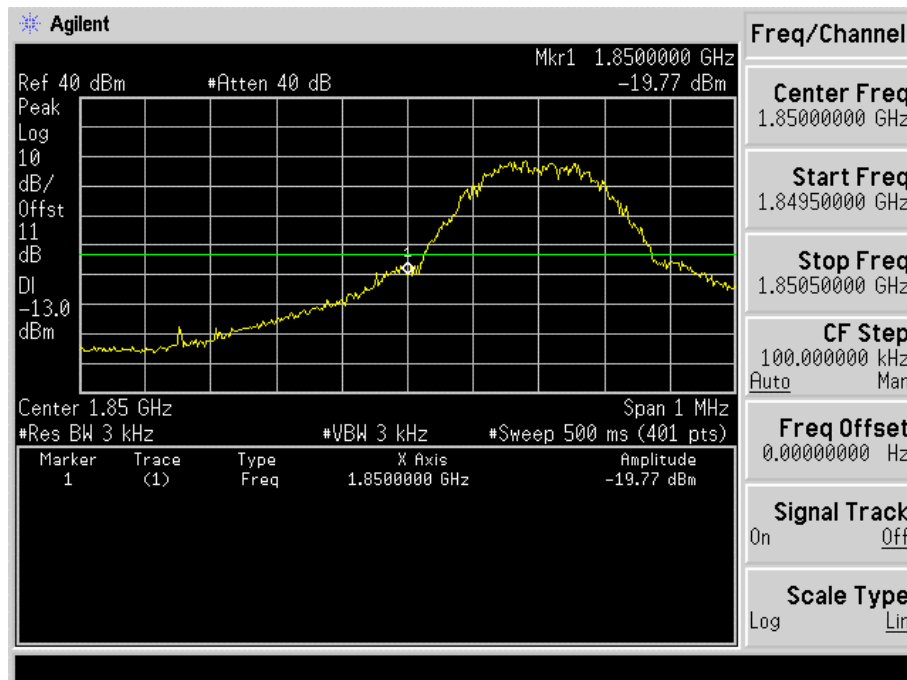


Downlink – Upper Band Edge

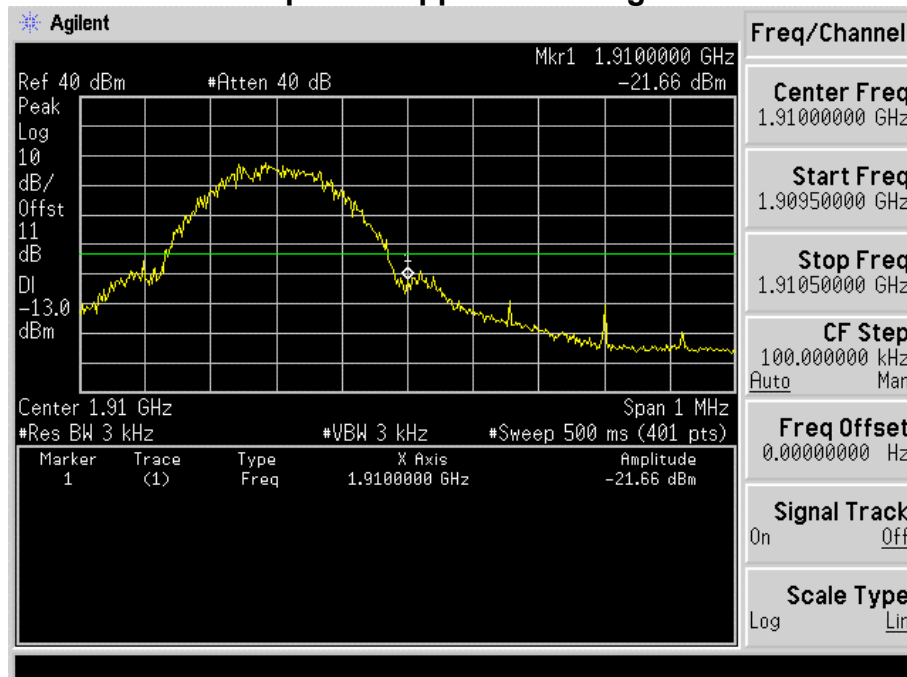


Product	1900 MHz Dual-Band Selective Repeater		
Test Mode	Spurious Emission At Antenna Terminals		
Date of Test	2007/08/14	Test Site	CB4
Test Condition	PCS 1900 GPRS, Band Edge Test		

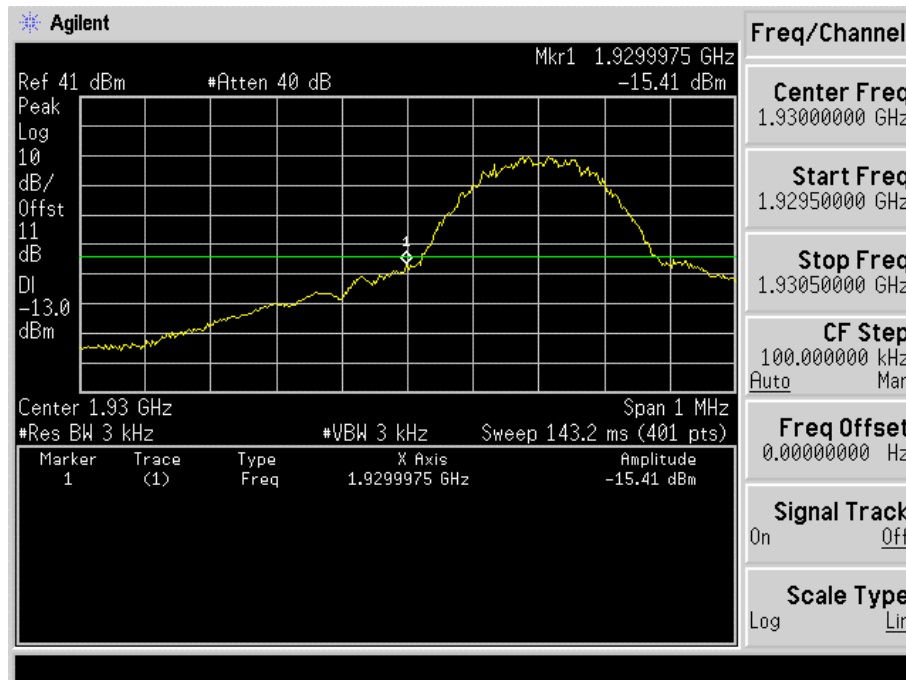
Uplink – Lower Band Edge



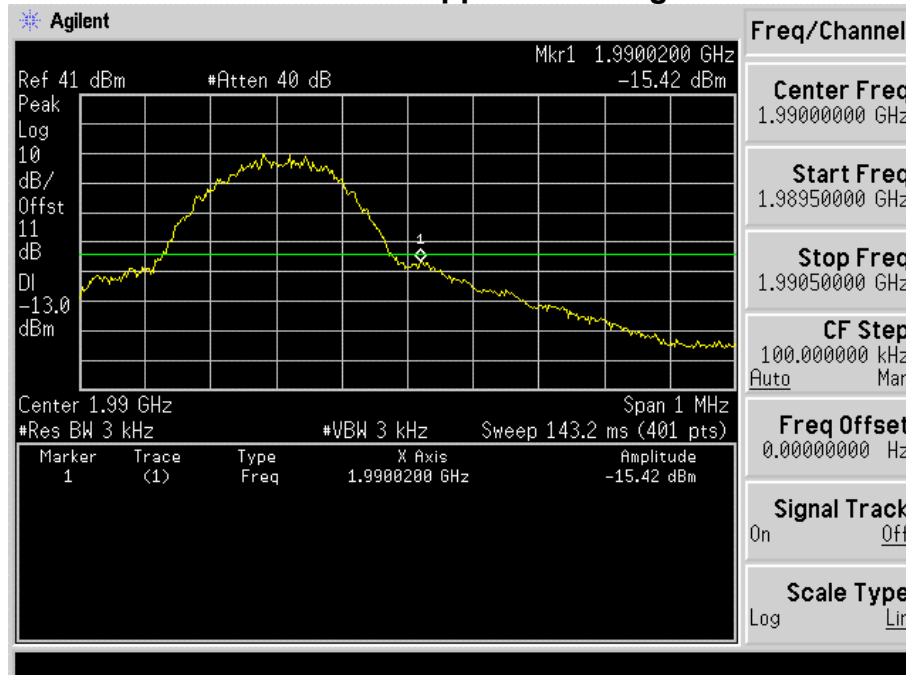
Uplink – Upper Band Edge



Downlink – Lower Band Edge

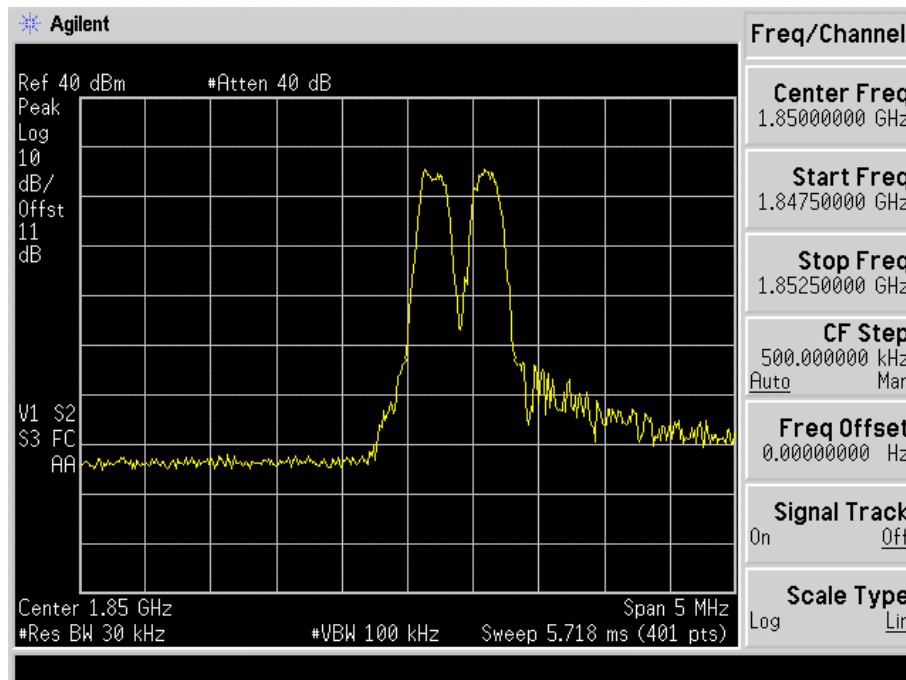


Downlink – Upper Band Edge

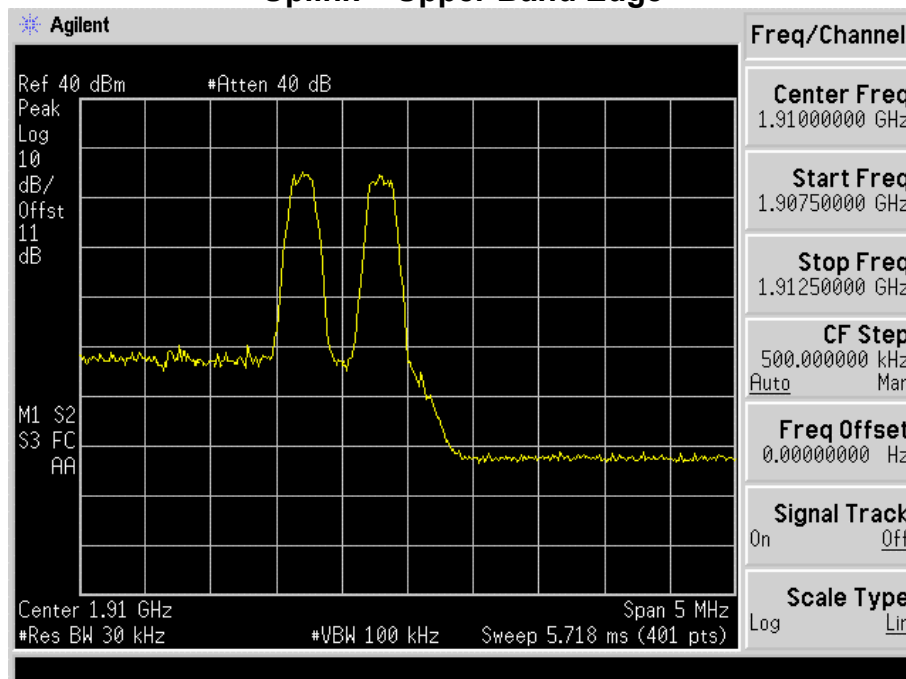


Product	1900 MHz Dual-Band Selective Repeater		
Test Mode	Spurious Emission At Antenna Terminals		
Date of Test	2007/08/14	Test Site	CB4
Test Condition	PCS 1900, Intermodulation Characteristics		

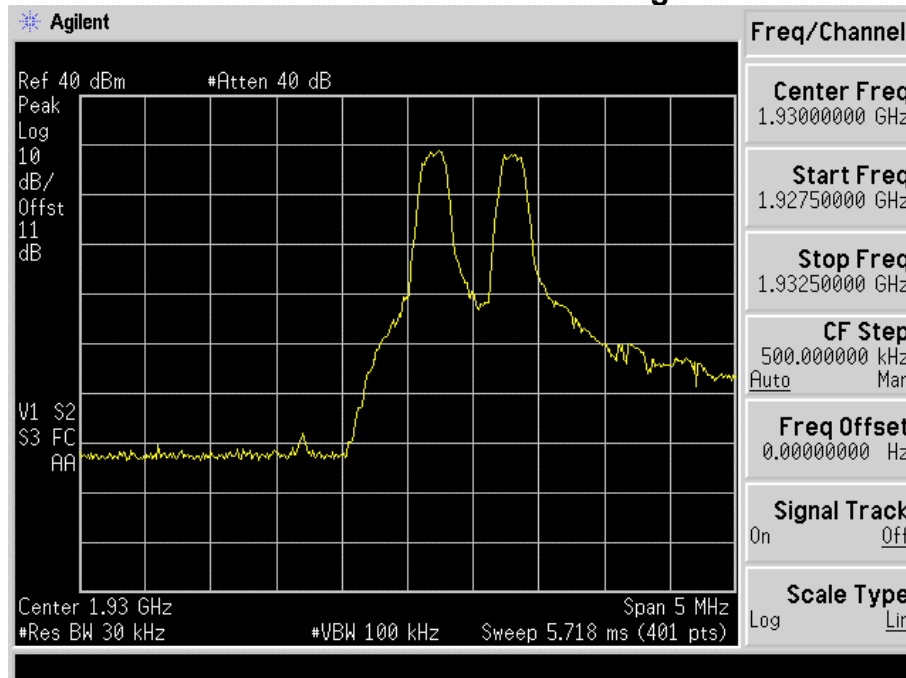
Uplink – Lower Band Edge



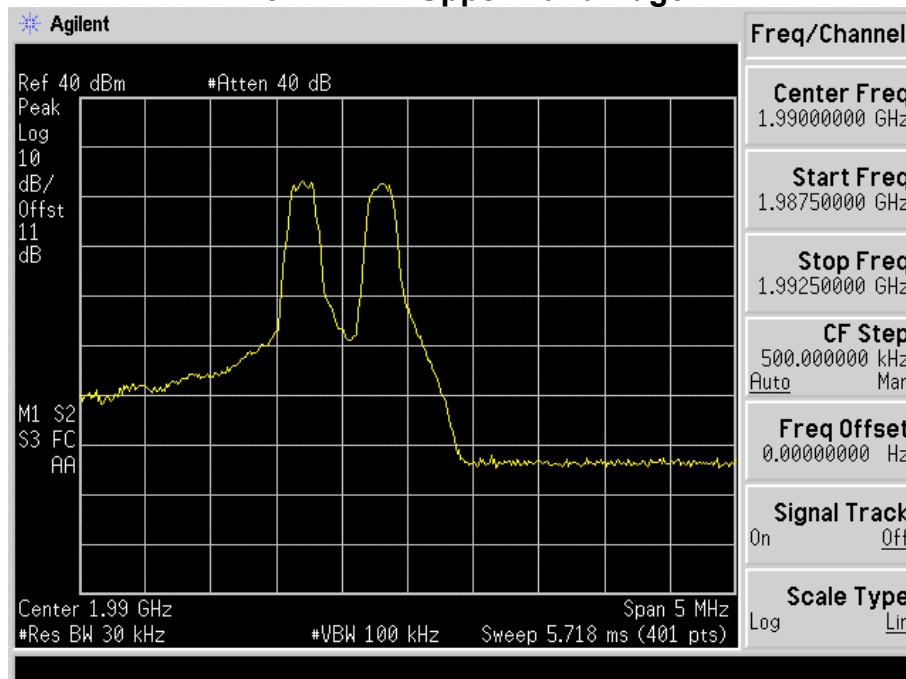
Uplink – Upper Band Edge



Downlink – Lower Band Edge



Downlink – Upper Band Edge

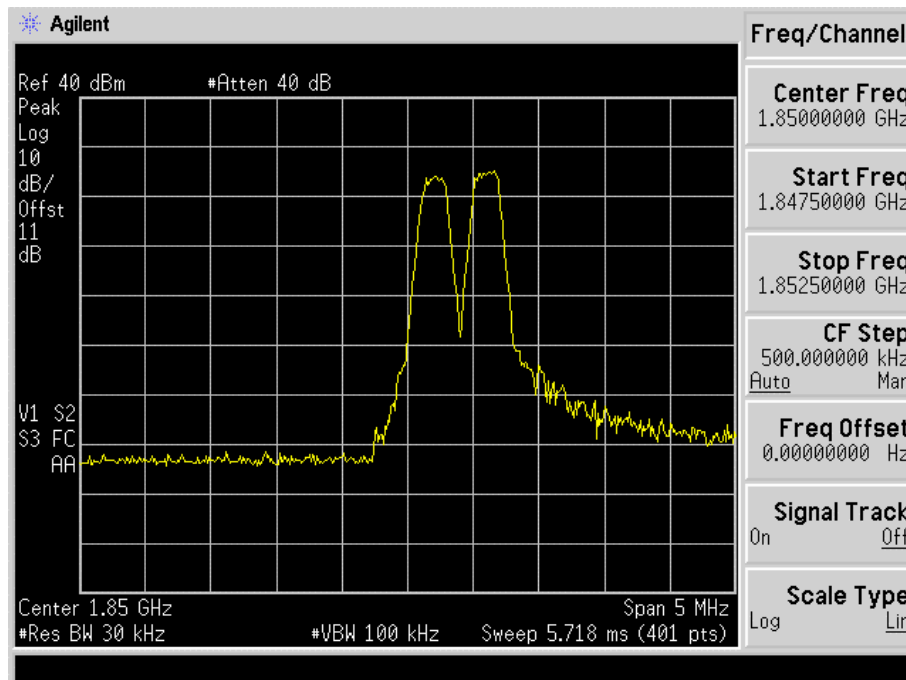


Note:

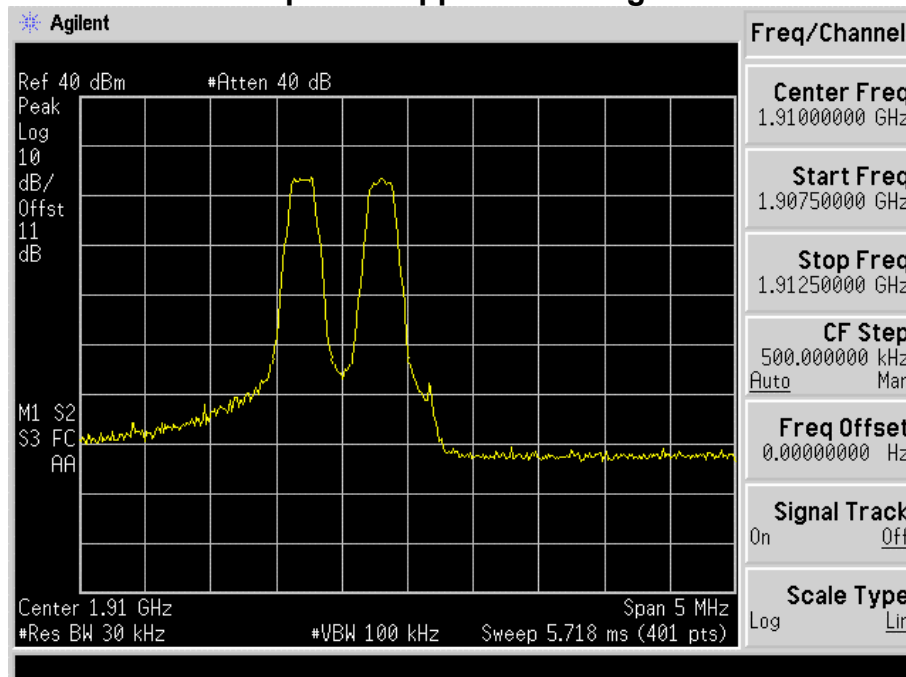
Inband and Out of band Intermodulation

Product	1900 MHz Dual-Band Selective Repeater		
Test Mode	Spurious Emission At Antenna Terminals		
Date of Test	2007/08/14	Test Site	CB4
Test Condition	PCS 1900 GPRS, Intermodulation Characteristics		

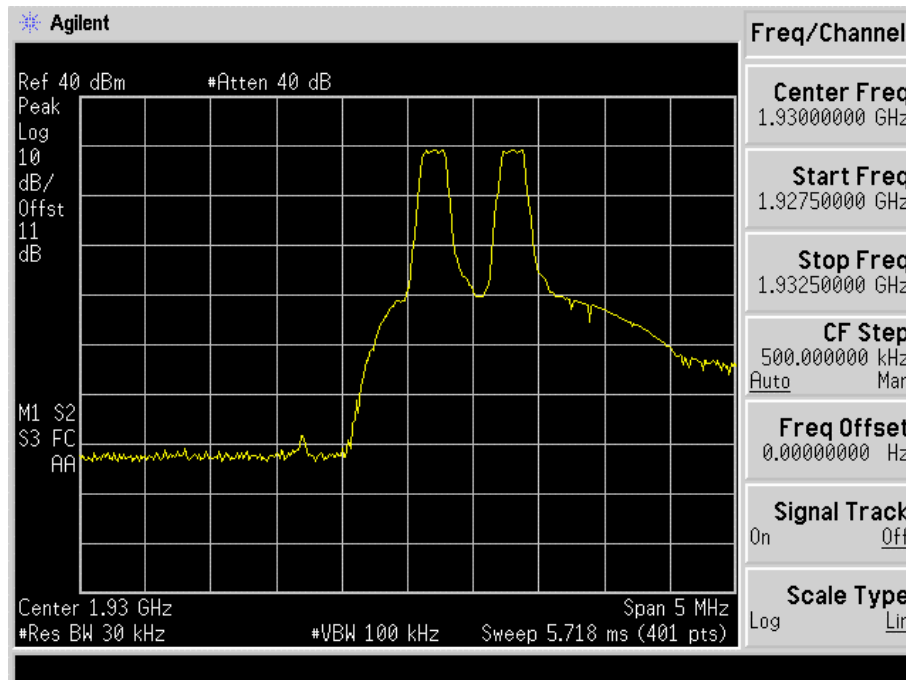
Uplink – Lower Band Edge



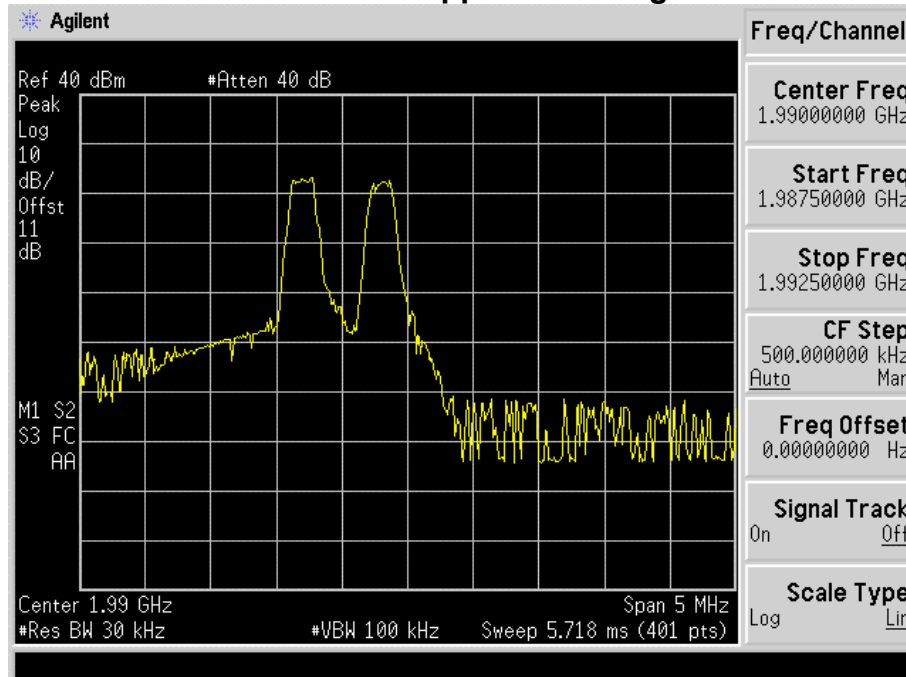
Uplink – Upper Band Edge



Downlink – Lower Band Edge



Downlink – Upper Band Edge



Note:

Inband and Out of band Intermodulation

5. Spurious Emission

5.1. Test Equipment

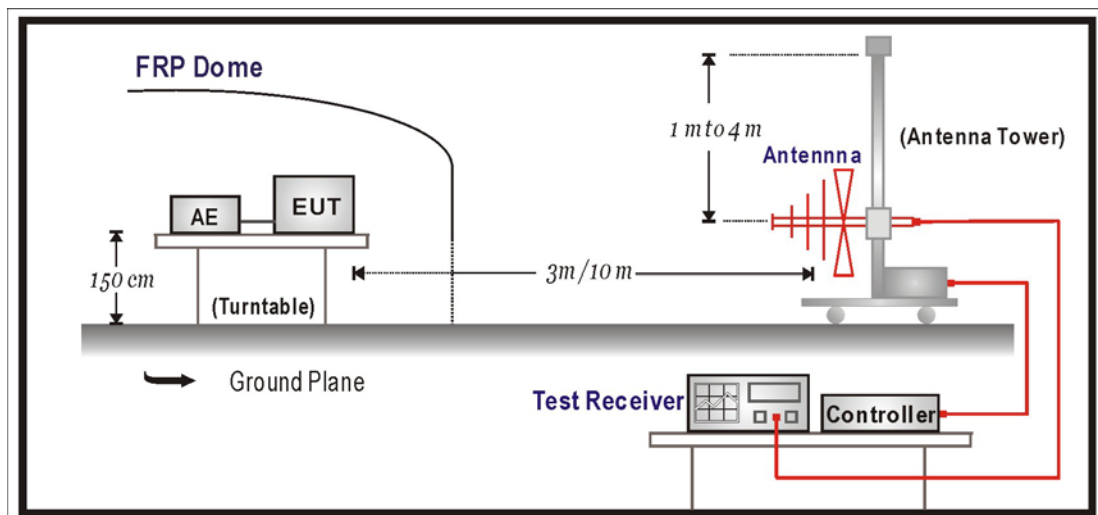
The following test equipments are used during the radiated emission test:

Test Site	Equipment	Manufacturer	Model No./ Serial No.	Last Cal.
☒ OATS 3	Test Receiver	R & S	ESCS 30/ 100122	Feb., 2007
	Universal Radio Communication Tester	R & S	CMU200/ 104846	May, 2007
	Spectrum Analyzer	Advantest	R3162/ 120300652	Feb., 2007
	Pre-Amplifier	QTK	QTK-AMP-03/ 0003	May, 2007
	Bilog Antenna	SCHAFFNER	CBL6112B/ 2697	May, 2007
	Horn Antenna	ETS	3115/ 0005-6160	Jul., 2007
	Pre-Amplifier	QTK	QTK-AMP-01/ 0001	Jul., 2007

Note: 1. All equipments that need to be calibrated are with calibration period of 1 year.
2. Mark "X" test instruments are used to measure the final test results.

5.2. Test Setup

Field strength of spurious radiation.



5.3. Limits

Limit	<-13dBm
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$43 + 10\log(P)$ down on the carrier where P is the power in Watts.

5.4. Test Procedure

In accordance with Part 2.1051, the spurious emissions from the antenna terminal were measured. The transmitter output power was attenuated using a combination of filters and attenuators and the frequency spectrum investigated from 9 kHz to 20 GHz. The EUT was set to transmit on full power. The resolution and video bandwidth was set to 1MHz in accordance with Part 24.238. The spectrum analyzer detector was set to Max Hold. In addition, measurements were made up to the 10th harmonic of the fundamental.

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters. The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to TIA/EIA 603-A on radiated measurement.

5.5. Test Specification

According to Part 2.1051, 2.1053, 24.238.

5.6. Test Result of Spurious Emission

Product	1900 MHz Dual-Band Selective Repeater		
Test Mode	Spurious Emission		
Date of Test	2007/08/14	Test Site	No.3 OATS
Test Condition	PCS 1900	Test Range	9KHz ~20GHz

Frequency	Reading Level	Signal Generator Level	Cable Loss	Antenna Gain	ERP Value	Limit
(MHz)	(dBm)	(dBm)	(dB)	(dBi)	(dBm)	(dBm)

Horizontal Emissions

3760	-65.13	-65.24	1.41	12.6	-54.05	-13
5640	-66.86	-65.62	1.56	13.1	-54.08	-13
7520	-66.13	-65.85	2.01	11.5	-56.36	-13
9400	-65.53	-65.27	2.74	12	-56.01	-13
11287.5	-65.55	-65.92	2.64	12	-56.56	-13
13160	-65.98	-65.14	2.36	13.3	-54.20	-13
15040	-61.34	-44.30	3.16	13.7	-33.76	-13
16925	-62.35	-49.75	3.3	15.3	-37.75	-13
18800	-61.8	-26.33	3.16	8.9	-20.59	-13

Vertical Emissions

3760	-64.95	-65.22	1.41	12.6	-54.03	-13
5640	-66.86	-65.18	1.56	13.1	-53.64	-13
7520	-65.86	-65.58	2.01	11.5	-56.09	-13
9400	-65.59	-65.75	2.74	12	-56.49	-13
11287.5	-66.52	-65.15	2.64	12	-55.79	-13
13160	-66.52	-65.95	2.36	13.3	-55.01	-13
15040	-62.1	-50.14	3.16	13.7	-39.60	-13
16925	-62.84	-53.60	3.3	15.3	-41.60	-13
18800	-61.62	-27.98	3.16	8.9	-22.24	-13

Product	1900 MHz Dual-Band Selective Repeater		
Test Mode	Spurious Emission		
Date of Test	2007/08/14	Test Site	No.3 OATS
Test Condition	PCS 1900 GPRS	Test Range	9KHz ~20GHz

Frequency	Reading Level	Signal Generator Level	Cable Loss	Antenna Gain	ERP Value	Limit
(MHz)	(dBm)	(dBm)	(dB)	(dBi)	(dBm)	(dBm)

Horizontal Emissions

3760	-65.8	-65.05	1.41	12.6	-53.86	-13
5640	-62.24	-57.05	1.56	13.1	-45.51	-13
7520	-61.89	-53.14	2.01	11.5	-43.65	-13
9400	-62.3	-56.54	2.74	12	-47.28	-13
11287.5	-66.37	-65.35	2.64	12	-55.99	-13
13160	-66.79	-65.14	2.36	13.3	-54.20	-13
15040	-62.12	-48.21	3.16	13.7	-37.67	-13
16925	-63.23	-54.89	3.3	15.3	-42.89	-13
18800	-61.73	-25.76	3.16	8.9	-20.02	-13

Vertical Emissions

3760	-61.71	-62.44	1.41	12.6	-51.25	-13
5640	-65.33	-65.55	1.56	13.1	-54.01	-13
7520	-64.97	-64.06	2.01	11.5	-54.57	-13
9400	-66.14	-65.17	2.74	12	-55.91	-13
11287.5	-66.26	-65.68	2.64	12	-56.32	-13
13160	-66.82	-65.47	2.36	13.3	-54.53	-13
15040	-61.27	-43.07	3.16	13.7	-32.53	-13
16925	-63.16	-55.14	3.3	15.3	-43.14	-13
18800	-61.63	-28.00	3.16	8.9	-22.26	-13

Note:

1. Receiver setting (Peak Detector) : RBW:1MHz; VBW:3MHz ◦
2. ERP Value = Signal Generator Level + Antenna Gain - Cable Loss

6. EMI Reduction Method During Compliance Testing

No modification was made during testing.

Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs