7.4 Occupied Bandwidth

Test Standard	:	FCC Part 24.238 & 2.1049
Operating Frequency	:	Up Link : 1850 MHz ~ 1910 MHz Down Link : 1930 MHz ~ 1990 MHz
Channel	:	Low / Mid/ High
RF Power Output	:	5 mW CDMA – Single Channel NADC – Composite Multiple Channel GSM – Composite Multiple Channel

Test Conditon	Measured Occupied Bandwidth (kHz)					
	Up Link			Down Link		
	Low	Mid	High	Low	Mid	High
CDMA	1385	1380	1380	1385	1375	1380
NADC	32.2	32.2	32.2	32.0	32.2	31.8
GSM	332	332	333	333	338	335

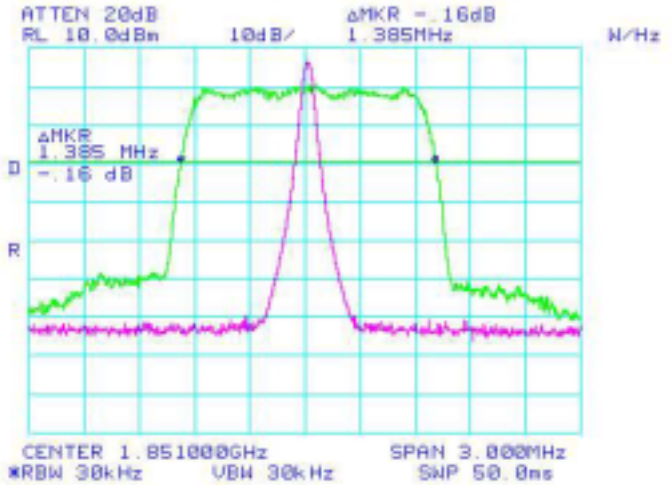
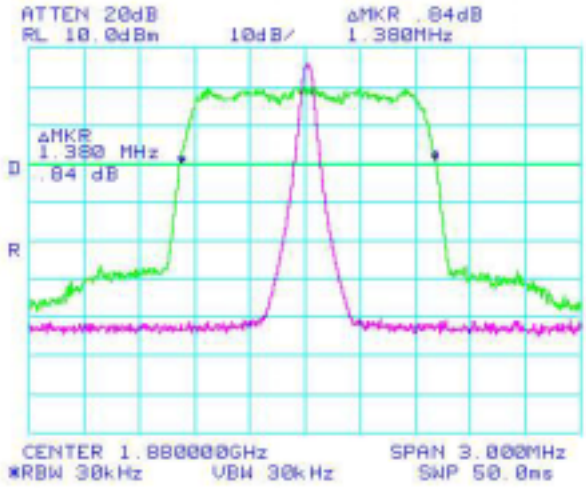
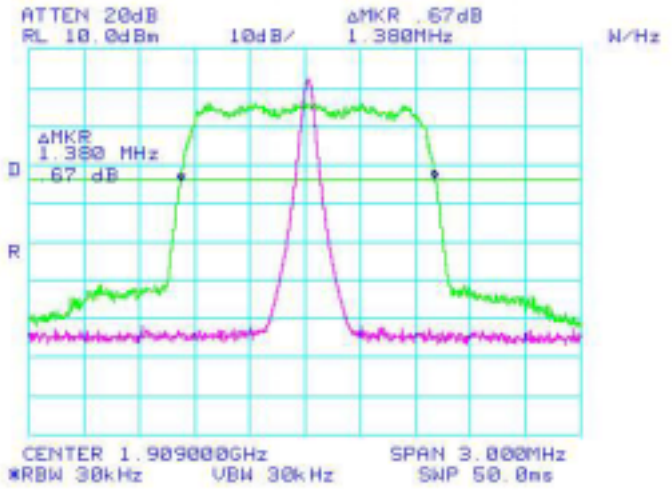
Note :

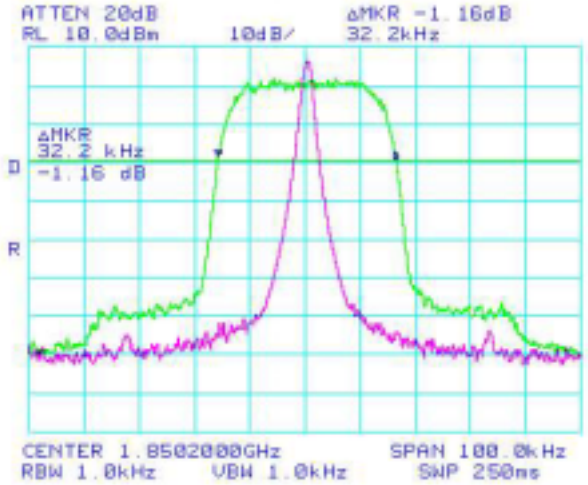
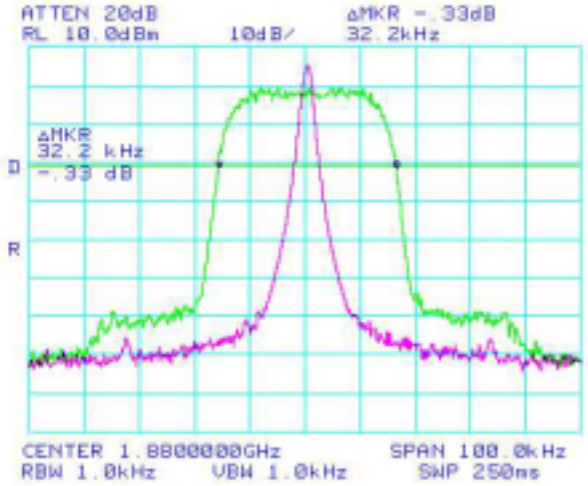
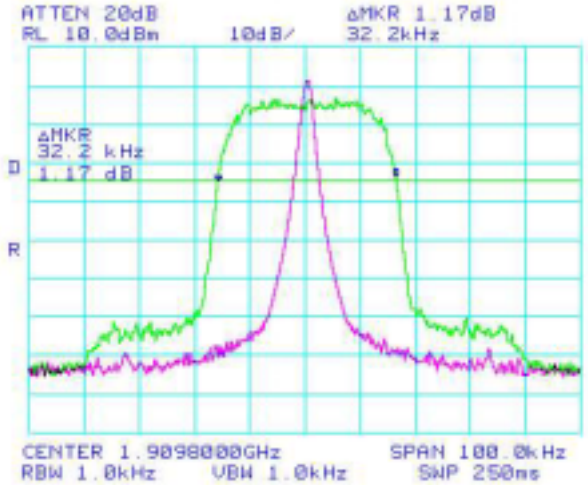
1. *The input to the amplifier is tuned such that the output power is set to its maximum rated power*
2. *The spectrum analyzer for this measurement was set with RBW and VBW, as recorded in the plots.*
3. *The frequency band measurements were performed at the rated supply voltage and ±10% of the rated supply voltage.*
4. *The measurements were performed at the shielded room.with environmental conditions of 27℃, 50%RH*
5. *Frequency Table*

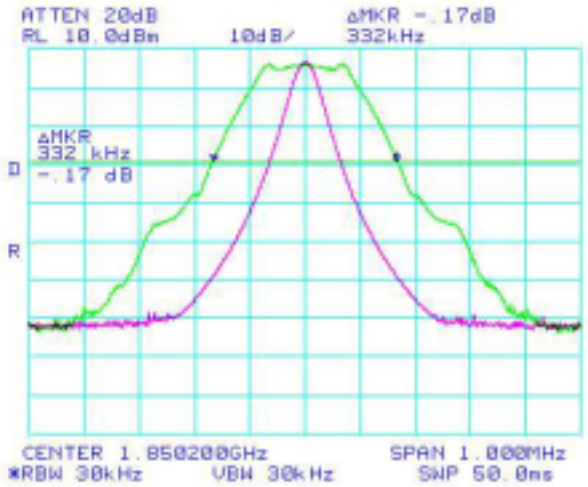
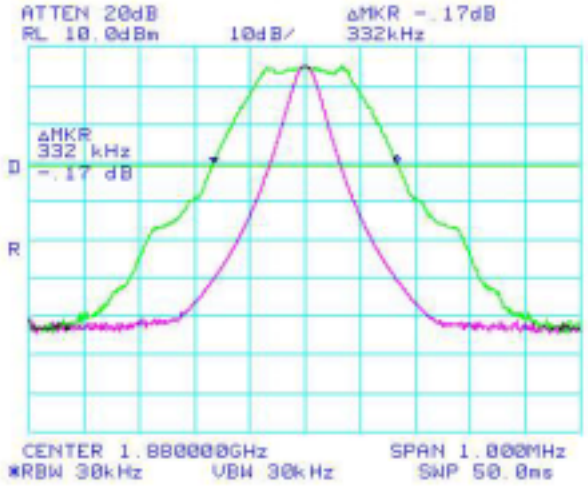
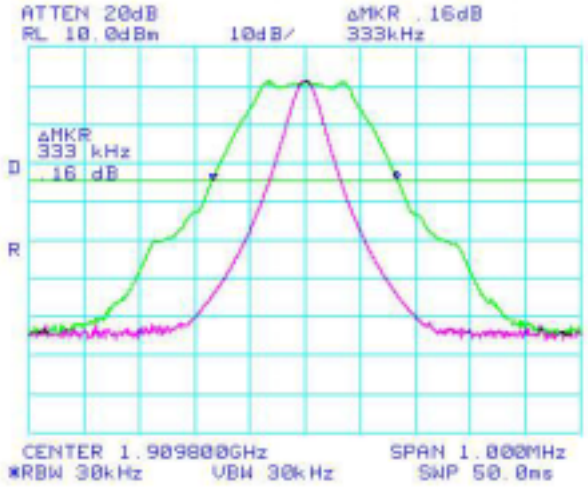
Channel		*Frequency*	
		Up Link	*Down Link*
CDMA	*Low Channel*	*1851.0 MHz*	*1931.0 MHz*
	Middle Channel	*1880.0 MHz*	*1960.0 MHz*
	High Channel	*1909.0 MHz*	*1989.0 MHz*
NADC	*Low Channel*	*1850.2 MHz*	*1930.2 MHz*
	Middle Channel	*1880.0 MHz*	*1960.0 MHz*
GSM	*High Channel*	*1909.8 MHz*	*1989.8 MHz*

Tested by ***Yang, Eun Jung***

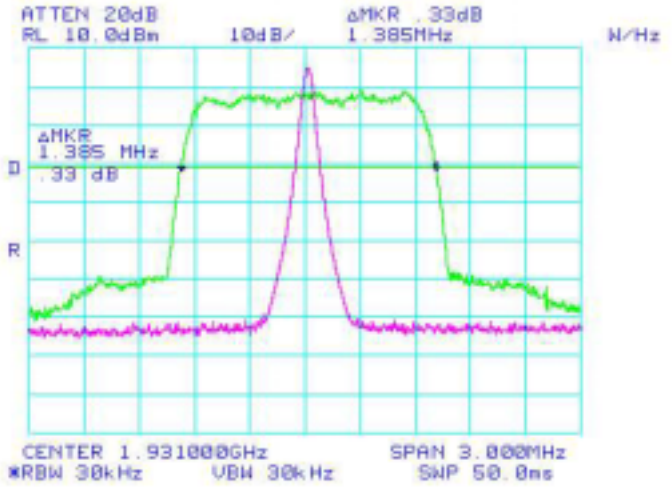
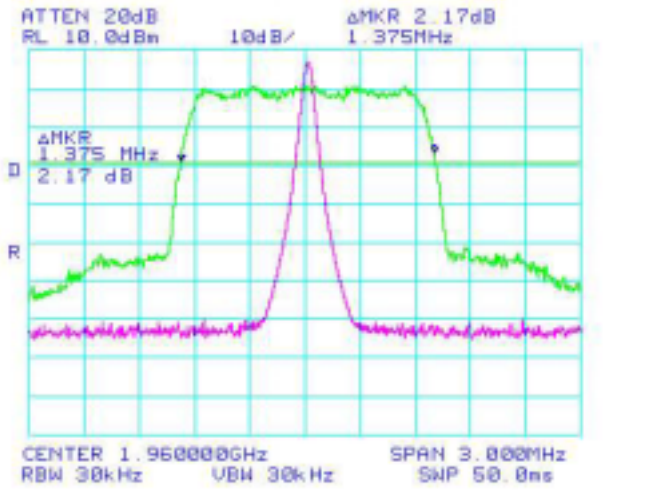
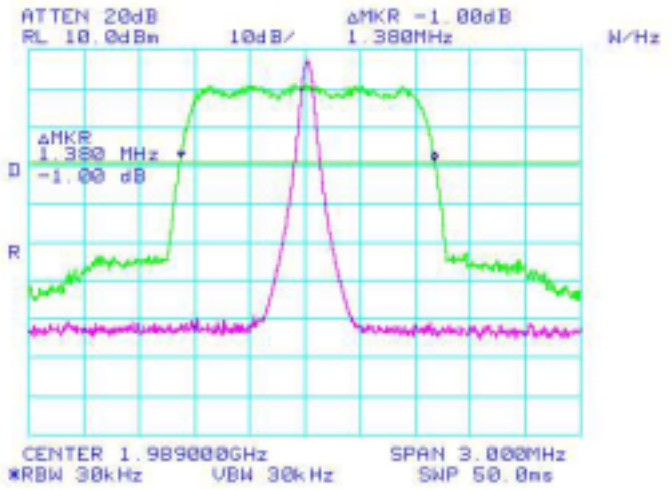
1. Up Link

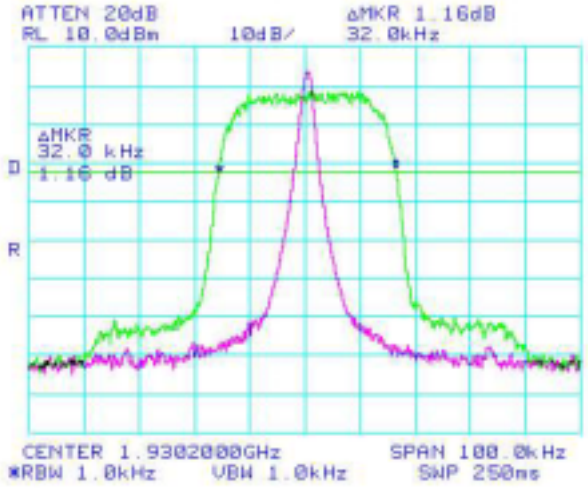
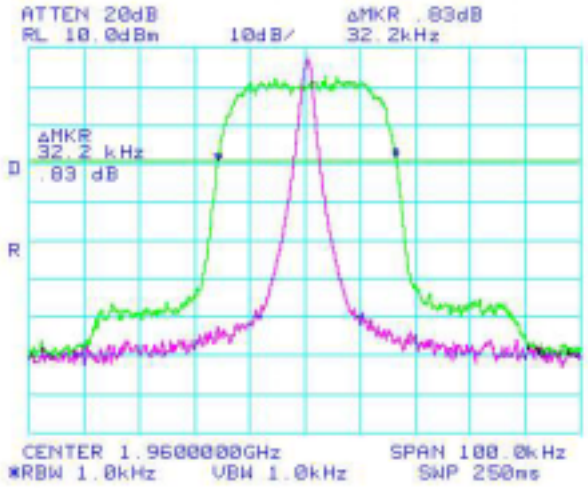
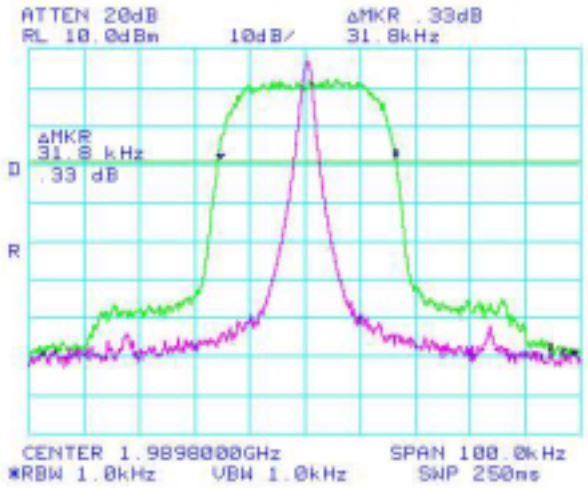
CDMA	
Low Channel 1385 kHz	
Middle Channel 1380 kHz	
High Channel 1380 kHz	

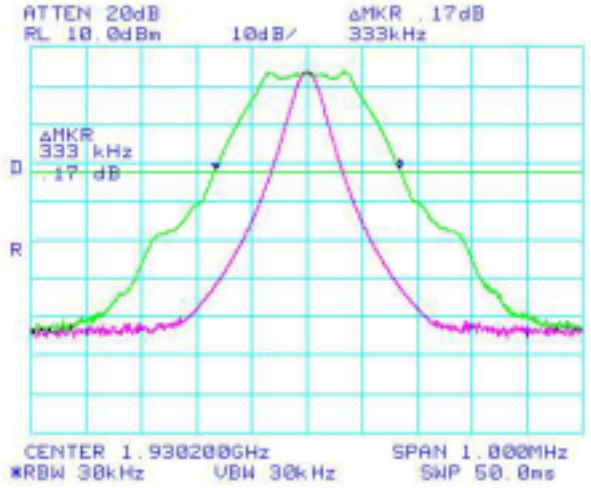
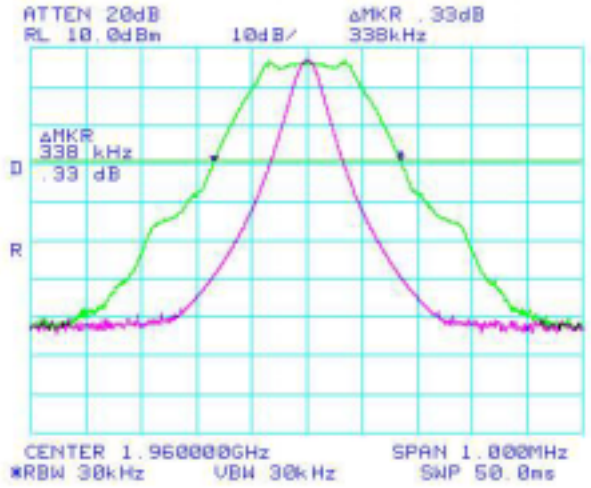
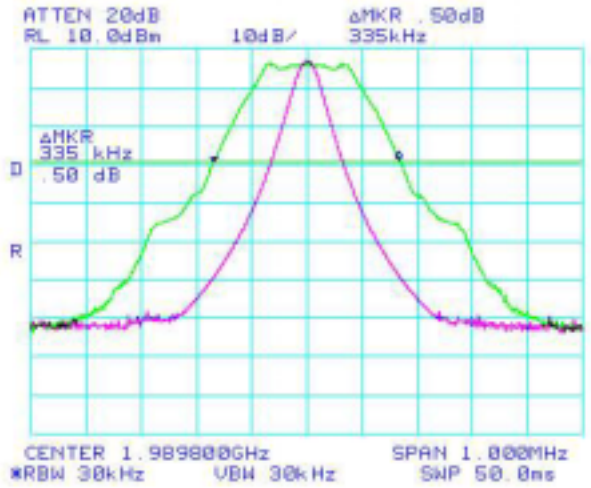
NADC	
Low Channel 32.2 kHz	
Middle Channel 32.2 kHz	
High Channel 32.2 kHz	

GSM	
Low Channel 332 kHz	
Middle Channel 332 kHz	
High Channel 333 kHz	

2. Down Link

CDMA	
Low Channel 1385 kHz	
Middle Channel 1375 kHz	
High Channel 1380 kHz	

NADC	
Low Channel 32.0 kHz	
Middle Channel 32.2 kHz	
High Channel 31.8 kHz	

GSM	
Low Channel 333 kHz	
Middle Channel 338 kHz	
High Channel 335 kHz	

7.5 Spurious Emission at Antenna Terminal

Test Standard	: FCC Part 24.238 & 2.1051
Operating Frequency	: Up Link : 1850 MHz ~ 1910 MHz Down Link : 1930 MHz ~ 1990 MHz
Channel	: Low / Mid/ High
RF Power Output	: 5 mW CDMA – Single Channel NADC – Composite Multiple Channel GSM – Composite Multiple Channel

Data Table

Test Condition	Frequency Range	Limit (dBm)	Measured Emission Level (dBm)					
			Up Link			Down Link		
			Low	Mid	High	Low	Mid	High
CDMA	30MHz < f_0 < 1GHz	-13.00	-	-	-	-	-	-
	1GHz< f_0 <20GHz	-13.00	-45.17	-	-	-34.00	-30.67	-29.67
	Intermodulation	-13.00	-50.00			-46.33		
NADC	30MHz < f_0 < 1GHz	-13.00	-	-	-	-	-	-
	1GHz< f_0 <20GHz	-13.00	-	-	-	-48.00	-44.17	-36.17
	Intermodulation	-13.00	-54.67			-54.67		
GSM	30MHz < f_0 < 1GHz	-13.00	-	-	-	-	-	-
	1GHz< f_0 <20GHz	-13.00	-	-	-	-48.67	-46.50	-39.50
	Intermodulation	-13.00	-46.00			-43.83		

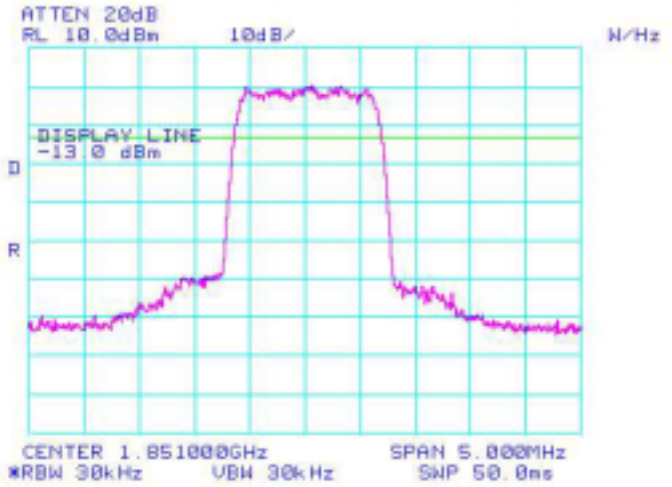
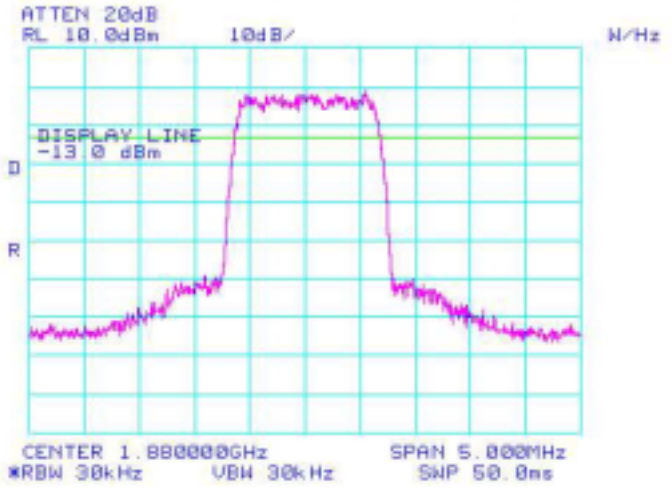
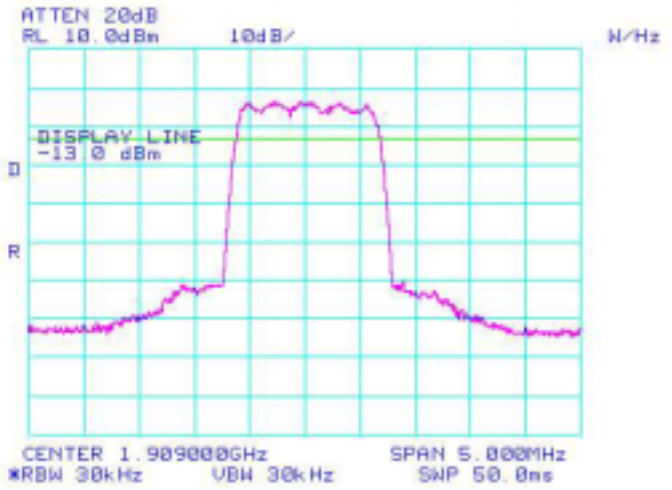
Note :

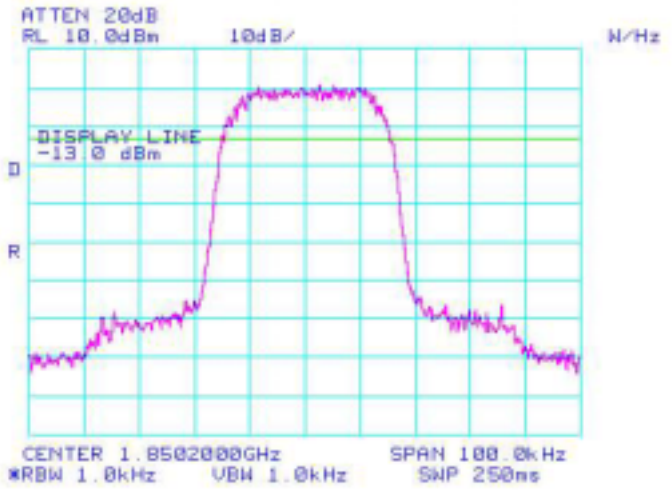
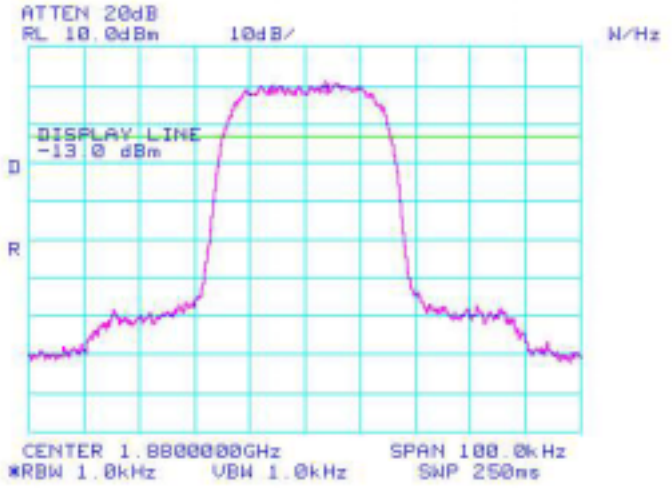
1. *The input to the amplifier is CDMA, NADC, GSM modulated signal tuned such that the output power is set to its maximum rated output power.*
2. *The RF output ports were properly terminated by the RF load and were connected to the RF Power Meter and Spectrum analyzer through the directional coupler.*
3. *The spectrum analyzer for this measurement was set with the RBW 100kHz in the range of 30MHz ~1GHz, and RBW 1MHz in the range of 1GHz~26.5GHz, as recorded in the plots. The VBW was set the same as RBW.*
4. *The measurements were performed at the shielded room.with environmental conditions of 27℃, 50%RH*
5. *Plots were taken with single input at low, mid, and high of the band. Plots were taken of the out-of-band emissions from 30MHz to the 10th harmonic of the carrier frequency.*
6. *For measuring emissions above 0.9 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.*
7. *The emissions shall not be more than 43 + 10 log (P) dBc below the mean power output, which is equivalent to –13 dBm.*
8. *Frequency Table*

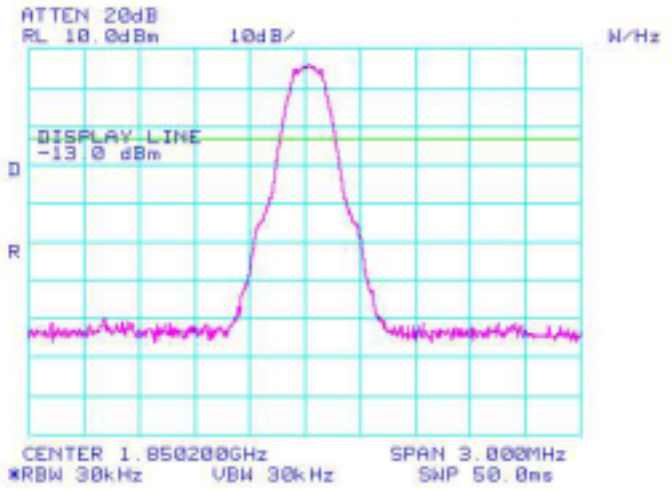
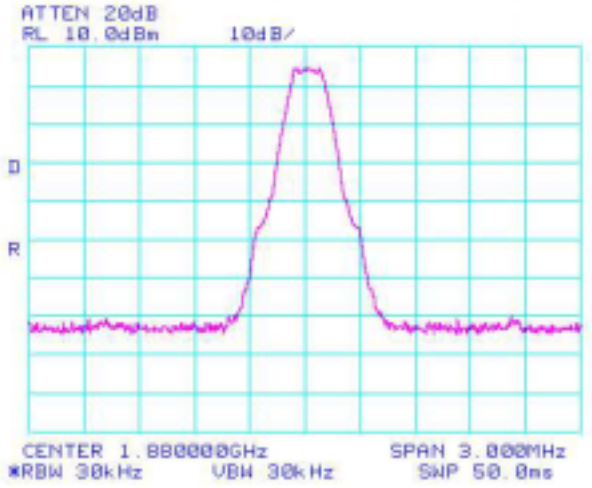
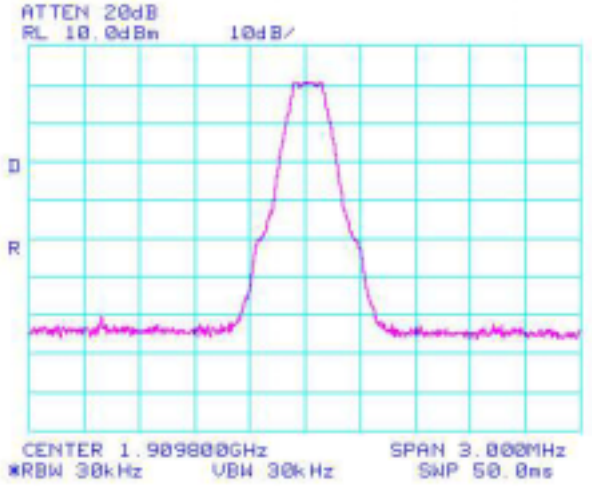
Channel		Frequency	
		Up Link	Down Link
CDMA	Low Channel	1851.0 MHz	1931.0 MHz
	Middle Channel	1880.0 MHz	1960.0 MHz
	High Channel	1909.0 MHz	1989.0 MHz
NADC	Low Channel	1850.2 MHz	1930.2 MHz
	Middle Channel	1880.0 MHz	1960.0 MHz
GSM	High Channel	1909.8 MHz	1989.8 MHz

Tested by ***Yang, Eun Jung***

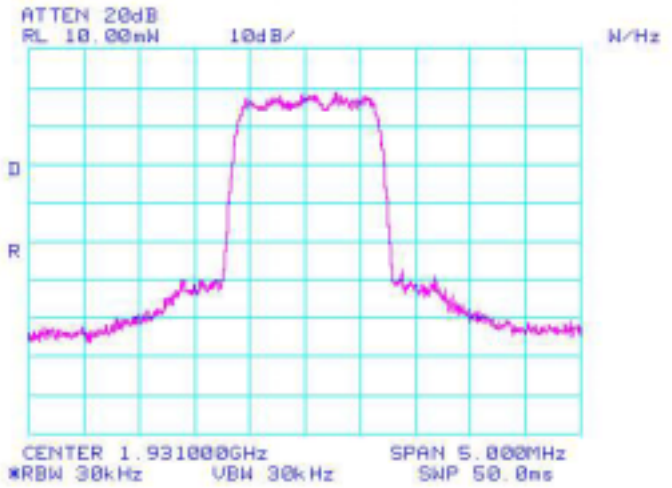
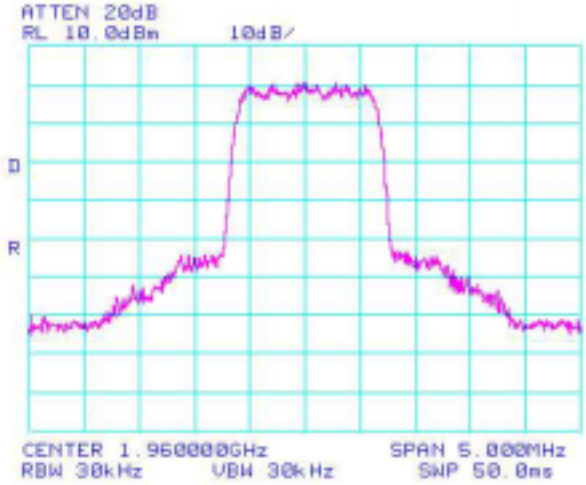
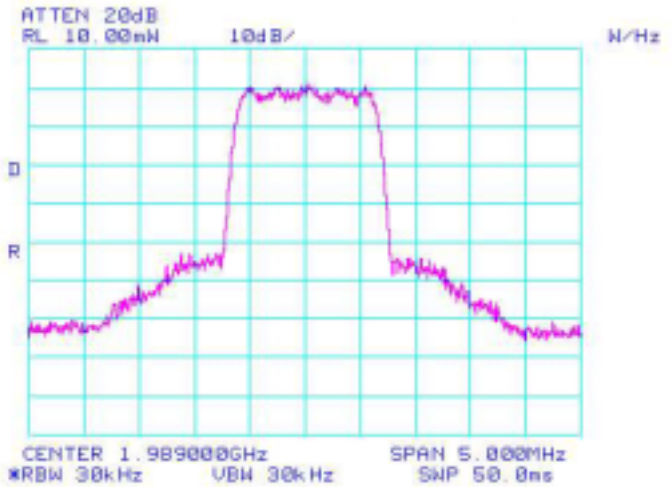
1. Up Link

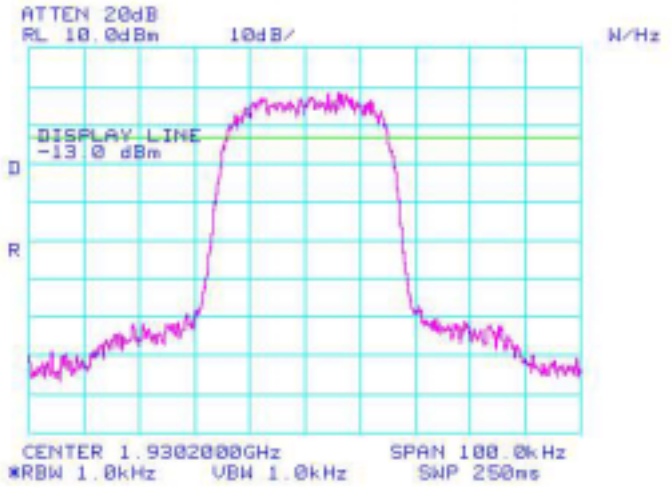
CDMA	
Low Channel In-band Nothing	
Middle Channel In-band Nothing	
High Channel In-band Nothing	

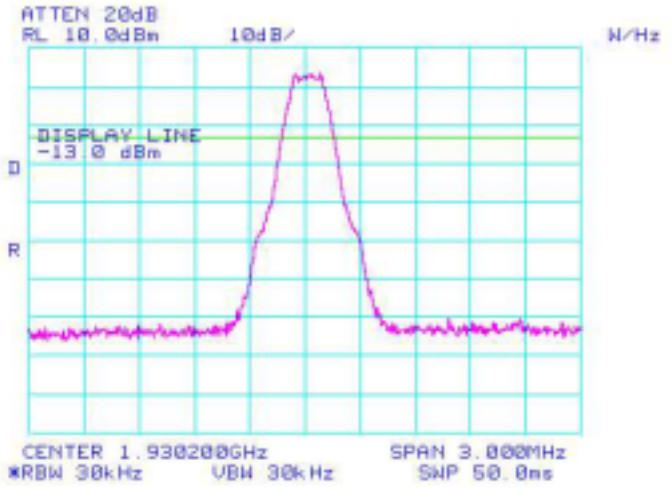
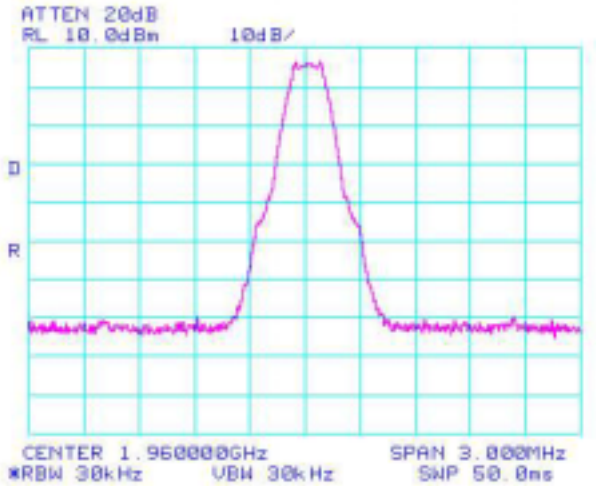
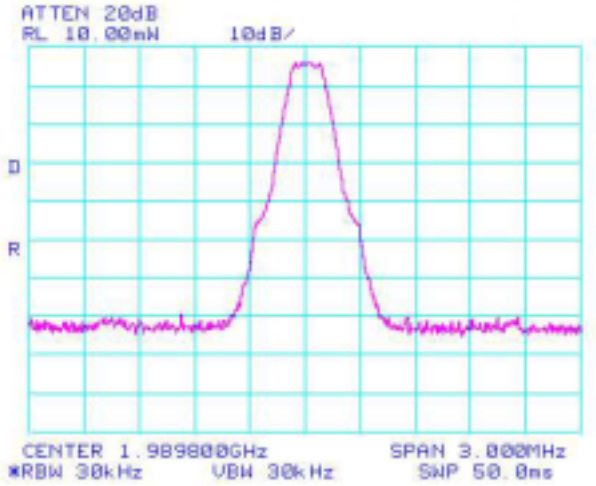
NADC	
Low Channel In-band Nothing	
Middle Channel In-band Nothing	
High Channel In-band Nothing	

GSM	
Low Channel In-band Nothing	
Middle Channel In-band Nothing	
High Channel In-band Nothing	

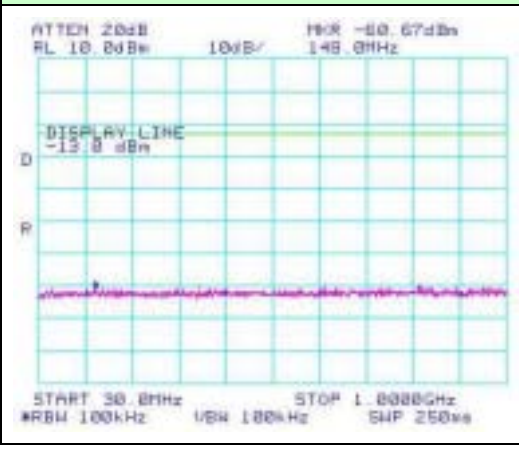
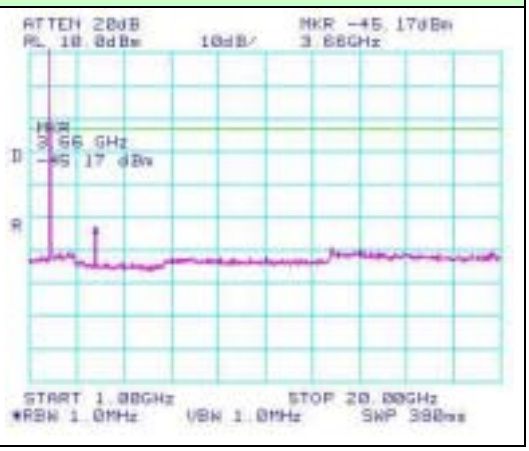
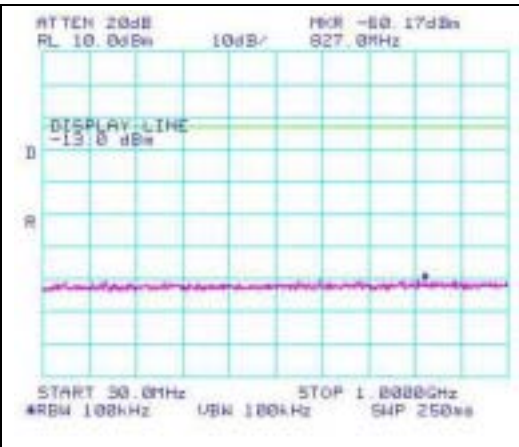
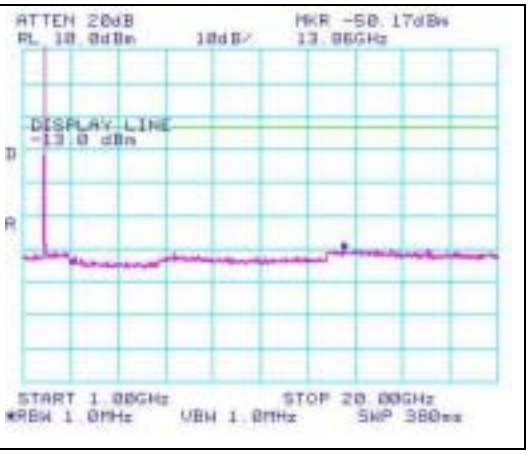
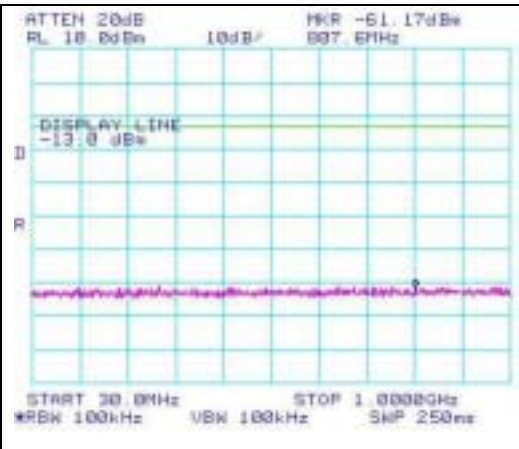
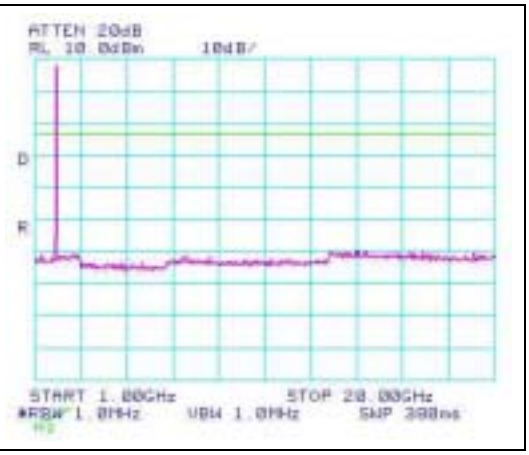
2. Down Link

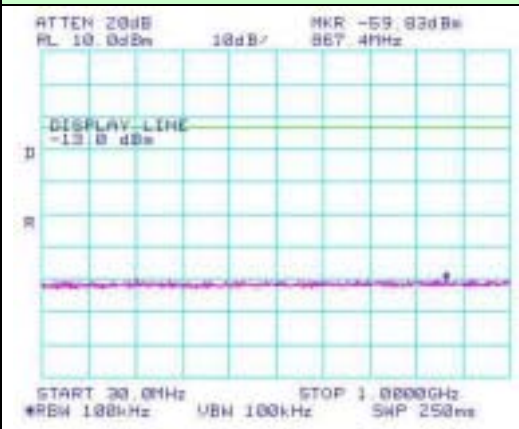
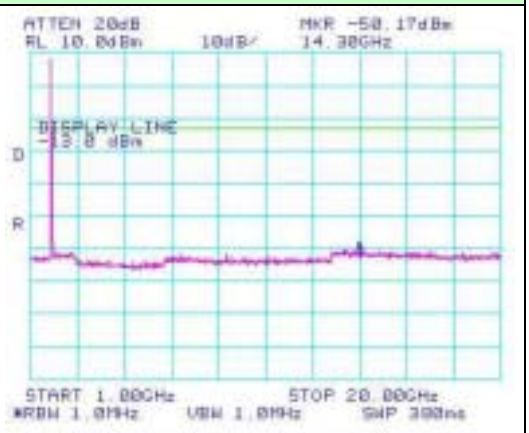
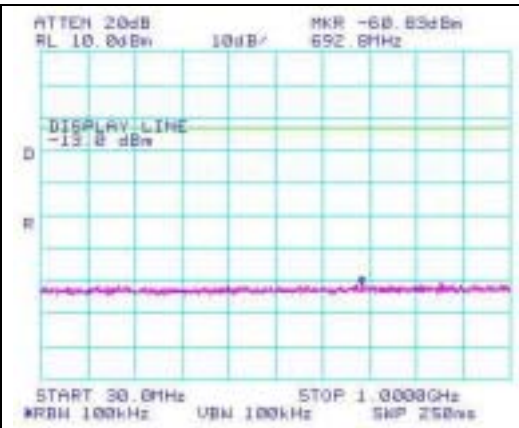
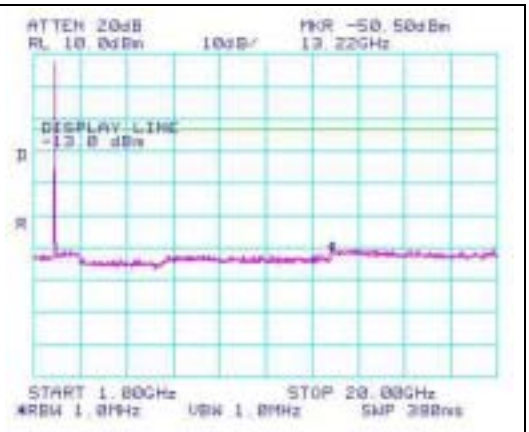
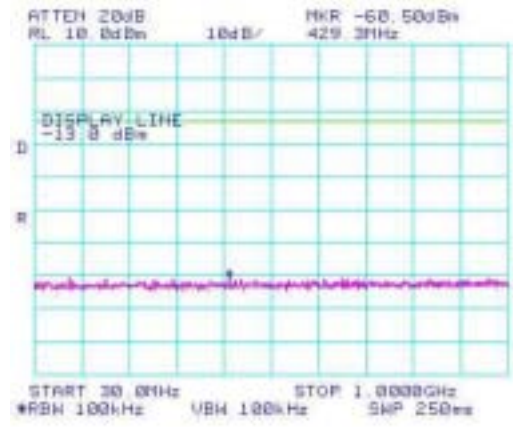
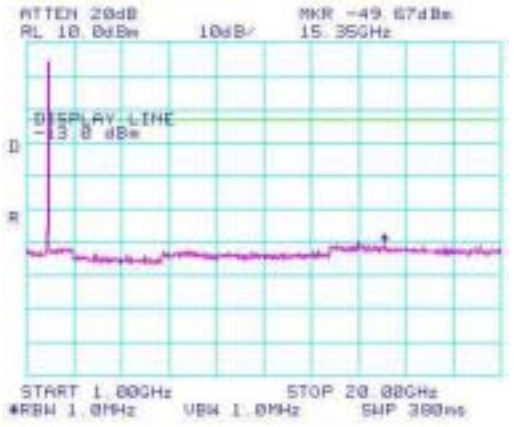
CDMA	
Low Channel In-band Nothing	
Middle Channel In-band Nothing	
High Channel In-band Nothing	

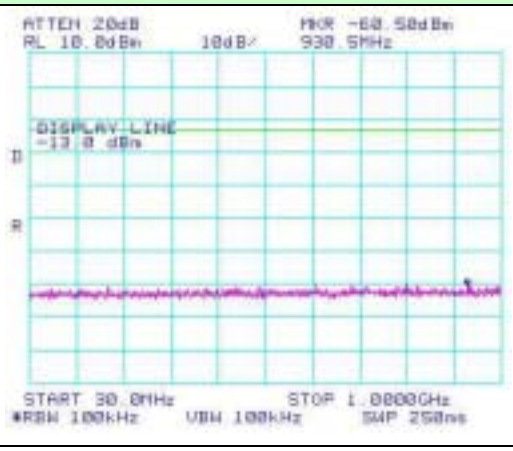
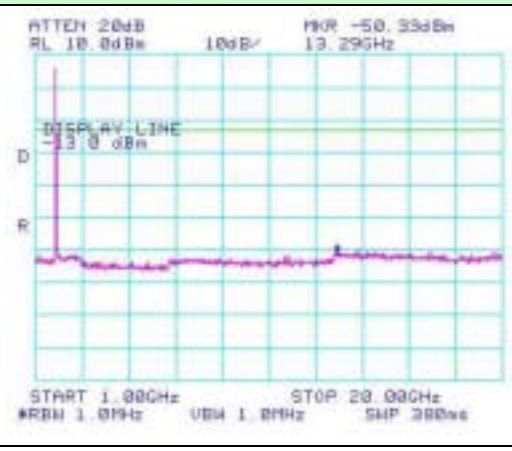
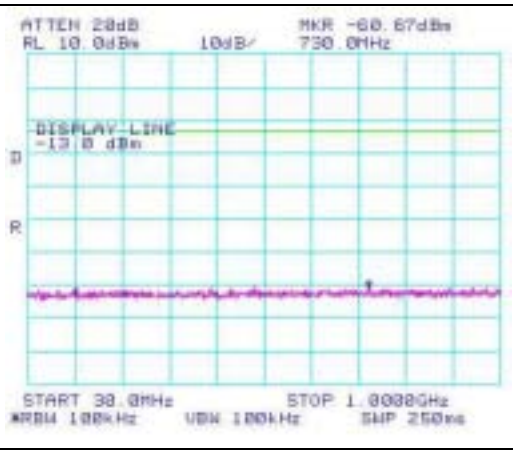
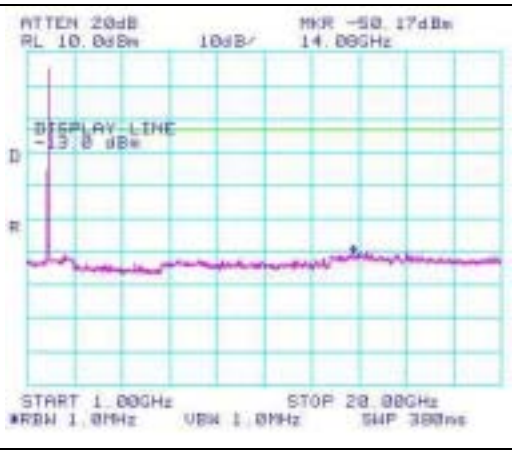
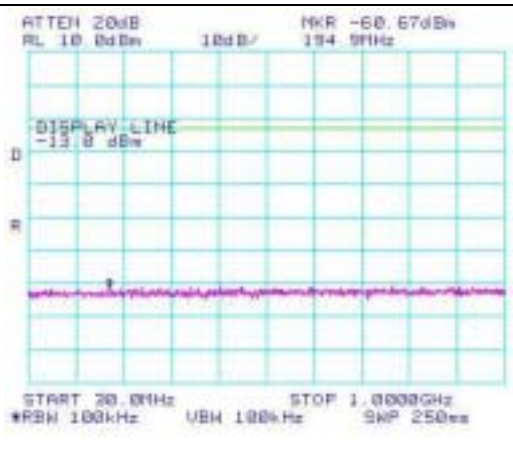
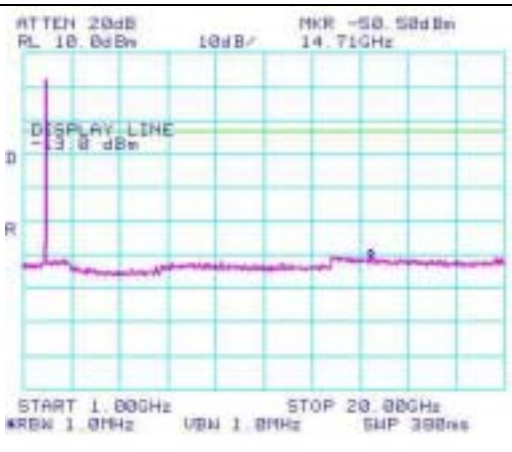
NADC	
Low Channel In-band Nothing	
Middle Channel In-band Nothing	
High Channel In-band Nothing	

GSM	
Low Channel In-band Nothing	
Middle Channel In-band Nothing	
High Channel In-band Nothing	

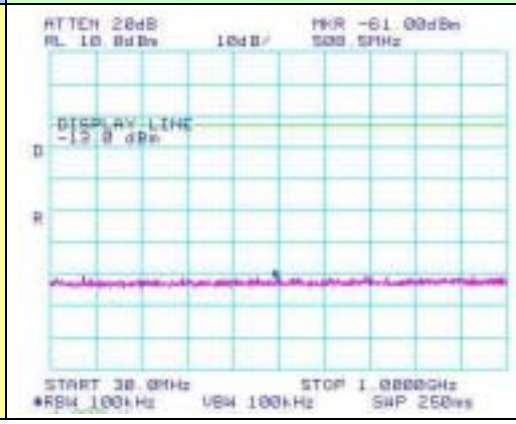
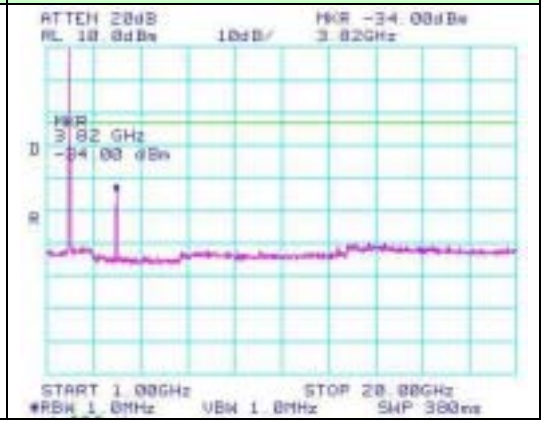
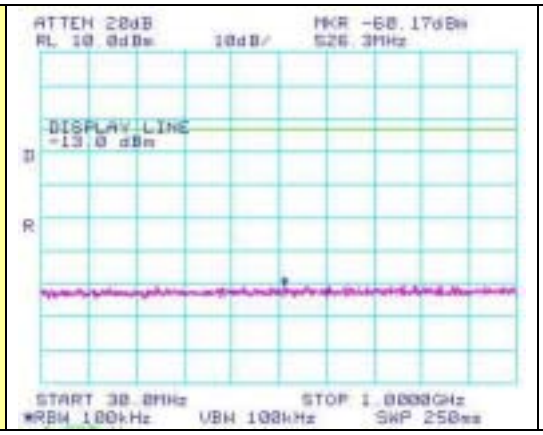
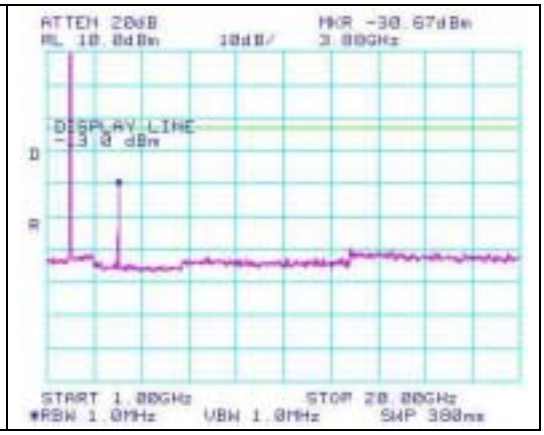
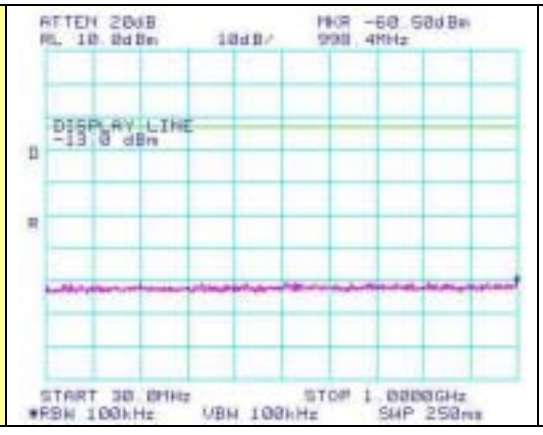
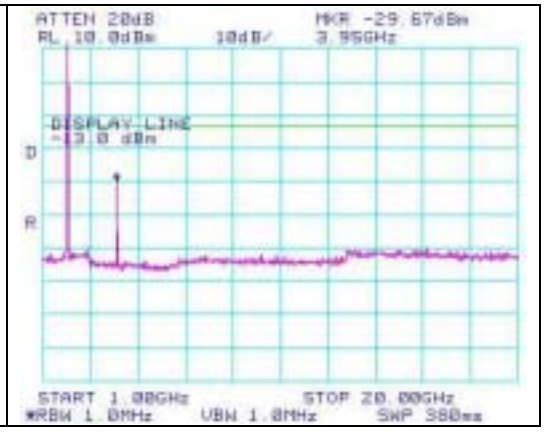
3. Up Link

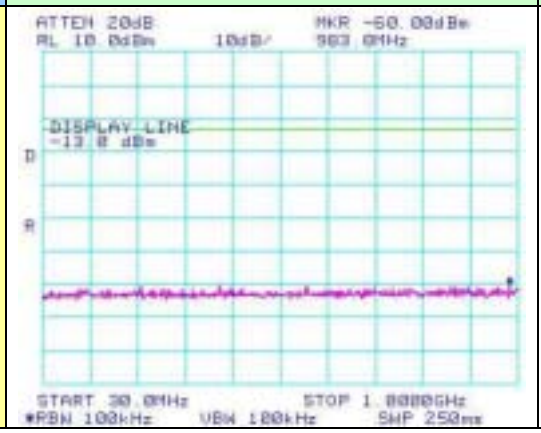
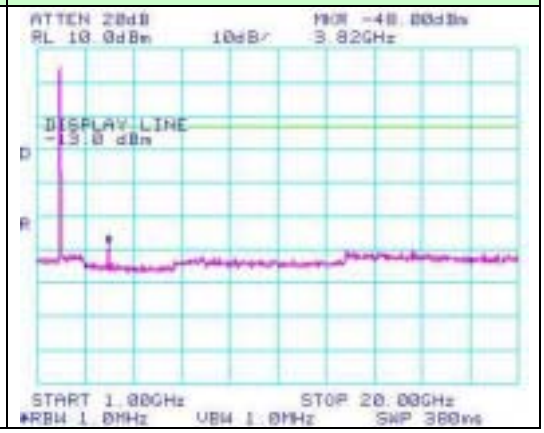
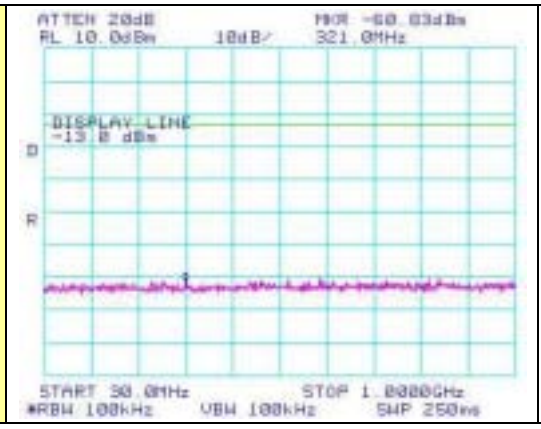
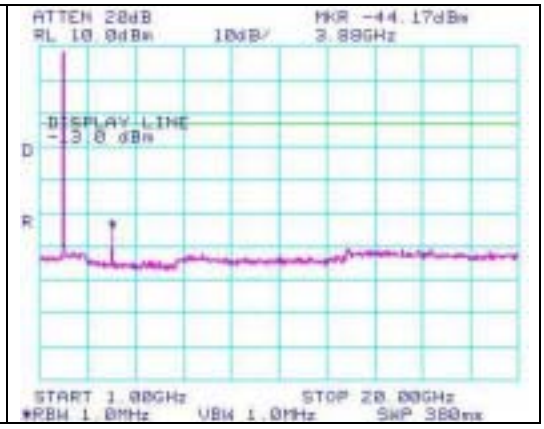
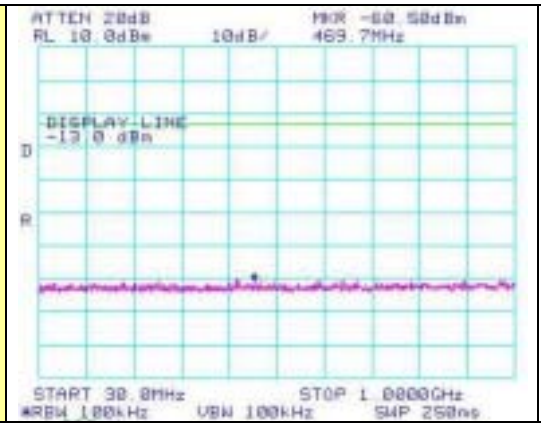
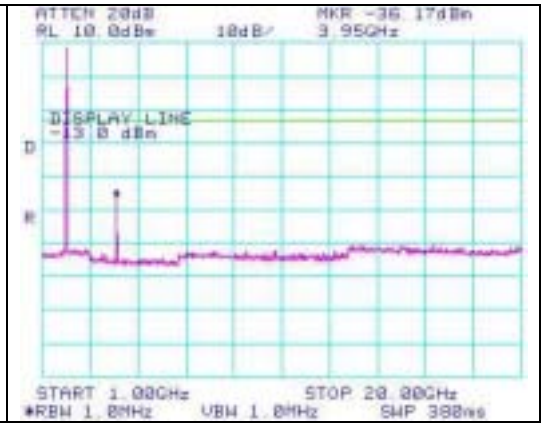
Frequency	30 MHz ~ 1 GHz	1 GHz ~ 20 GHz
CDMA Low Frequency -45.17 dBm		
CDMA Middle Frequency Nothing		
CDMA High Frequency Nothing		

Frequency	30 MHz ~ 1 GHz	1 GHz ~ 20 GHz
NADC Low Frequency Nothing		
NADC Middle Frequency Nothing		
NADC High Frequency Nothing		

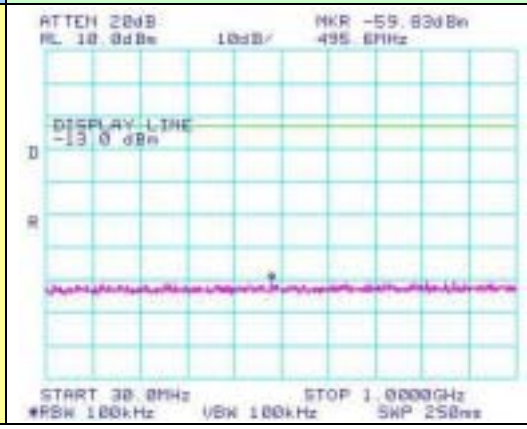
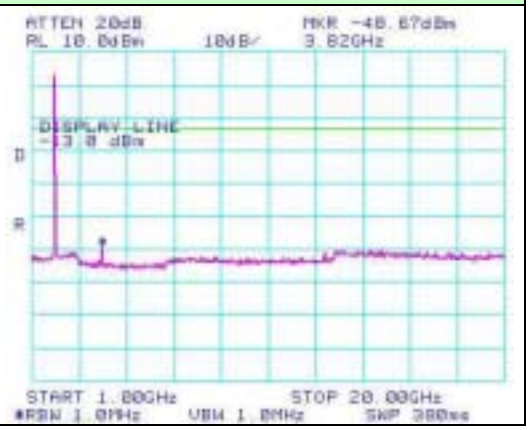
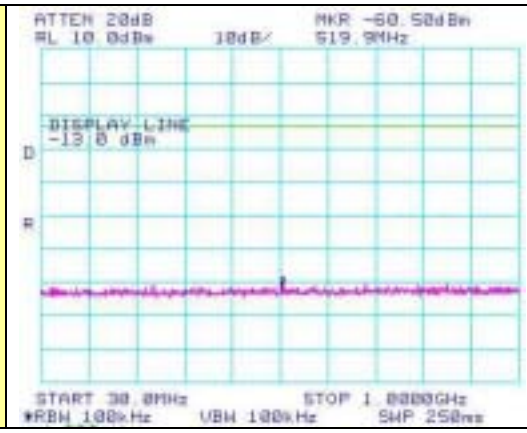
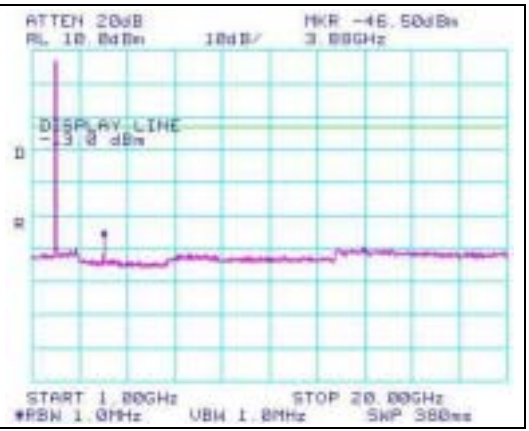
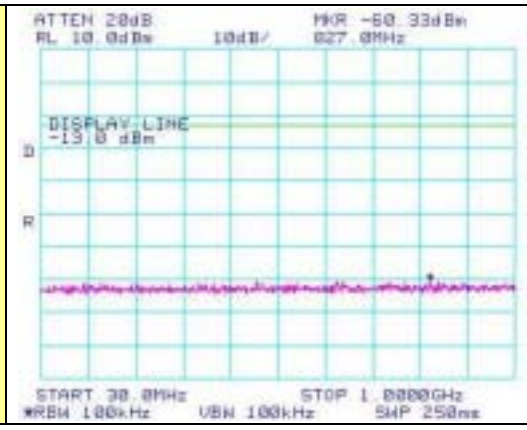
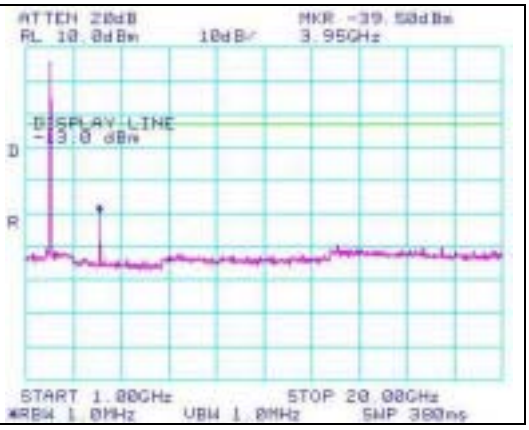
Frequency	30 MHz ~ 1 GHz	1 GHz ~ 20 GHz
GSM Low Frequency Nothing		
GSM Middle Frequency Nothing		
GSM High Frequency Nothing		

4. Down Link

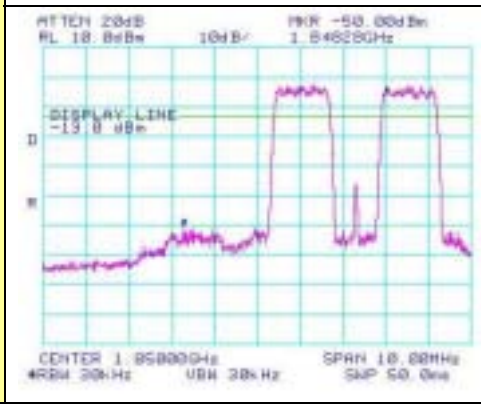
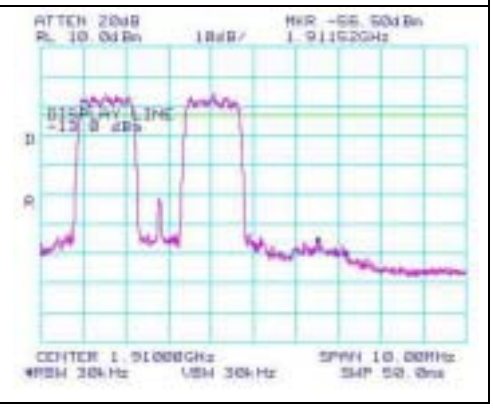
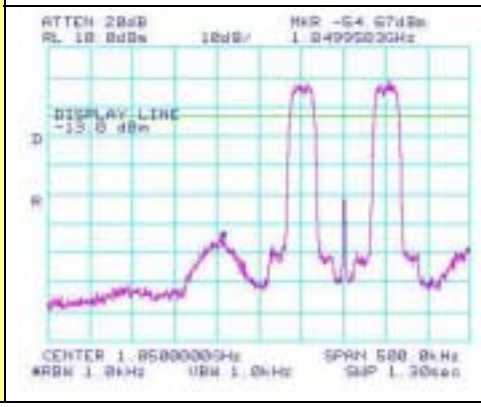
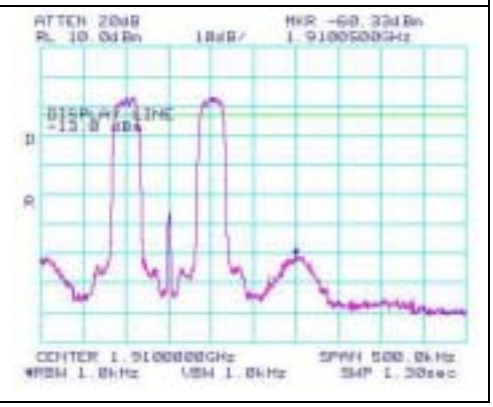
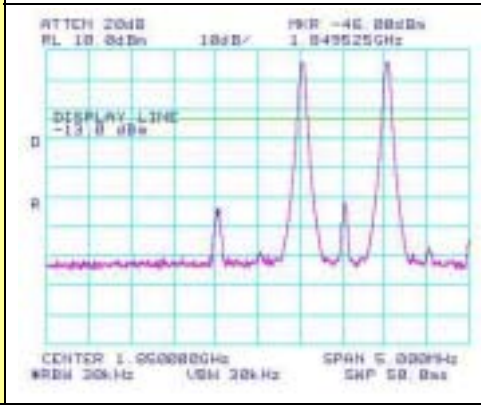
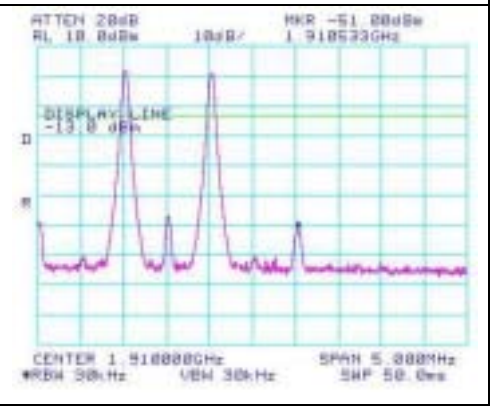
Frequency	30 MHz ~ 1 GHz	1 GHz ~ 20 GHz
CDMA Low Frequency -34.00 dBm		
CDMA Middle Frequency -30.67dBm		
CDMA High Frequency -29.67dBm		

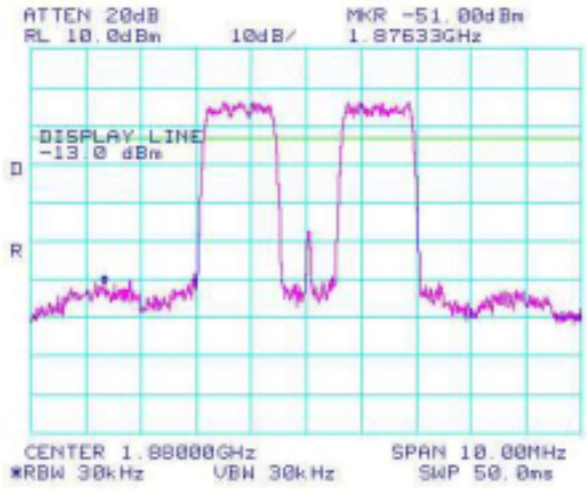
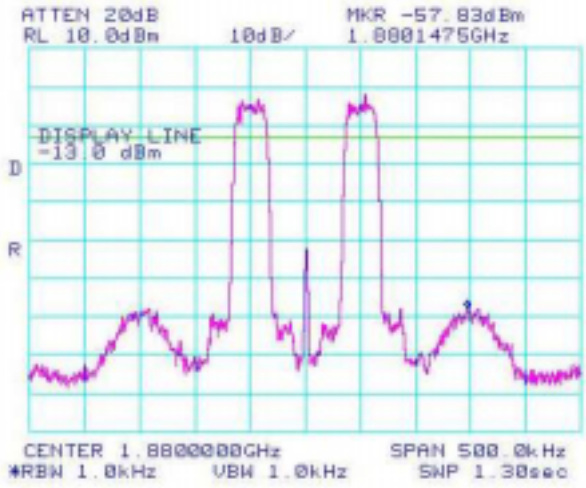
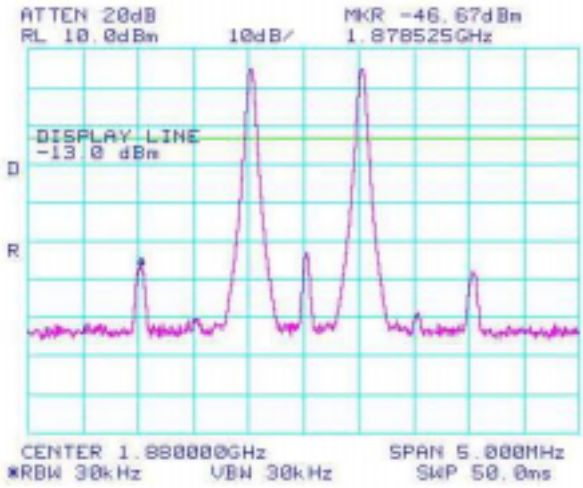
Frequency	30 MHz ~ 1 GHz	1 GHz ~ 20 GHz
NADC Low Frequency -48.00 dBm		
NADC Middle Frequency -44.17dBm		
NADC High Frequency -36.17 dBm		

BWS TECH Inc .
294-9 Jungdae-Dong,
Kwanggu-Si,Kyunggi-Do,
464-800, Korea

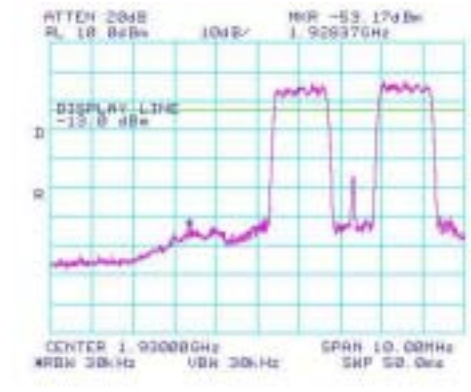
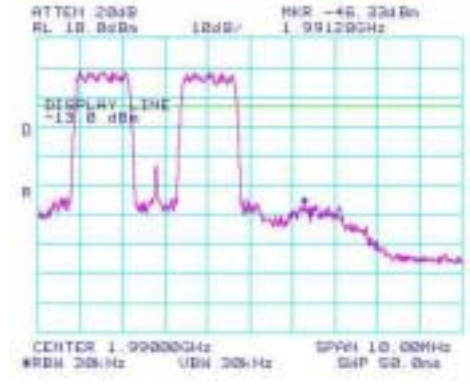
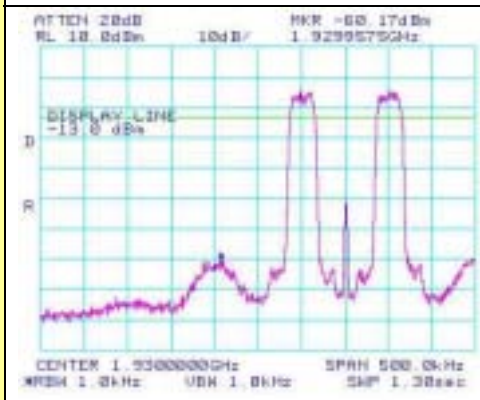
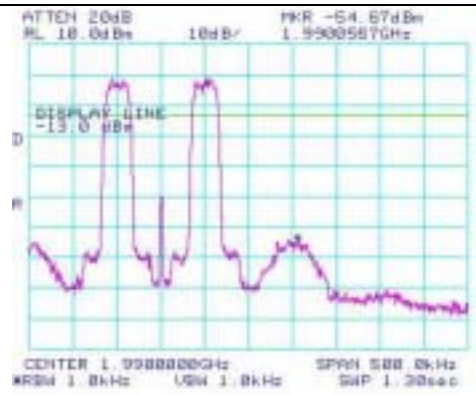
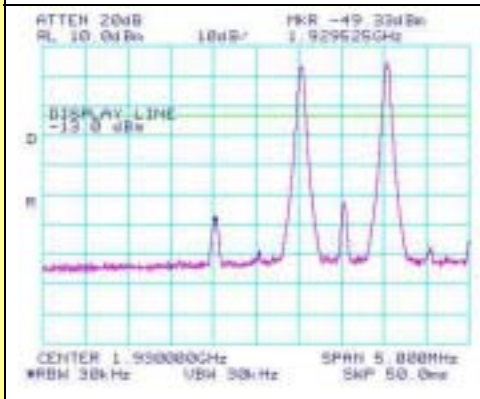
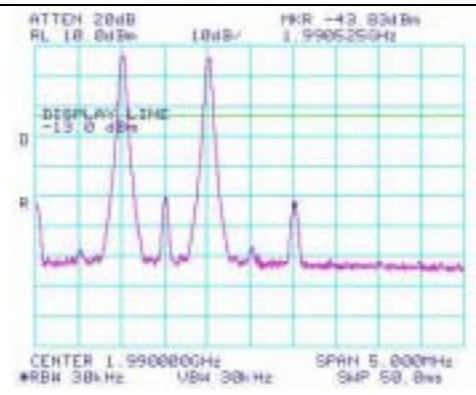
Frequency	30 MHz ~ 1 GHz	1 GHz ~ 20 GHz
GSM Low Frequency -48.67 dBm		
GSM Middle Frequency -46.50 dBm		
GSM High Frequency -39.50 dBm		

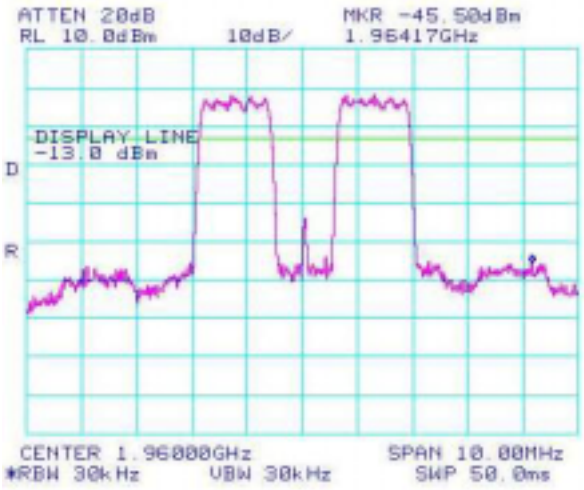
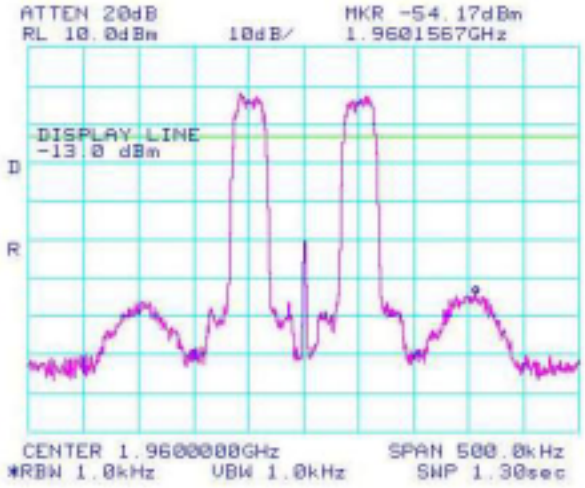
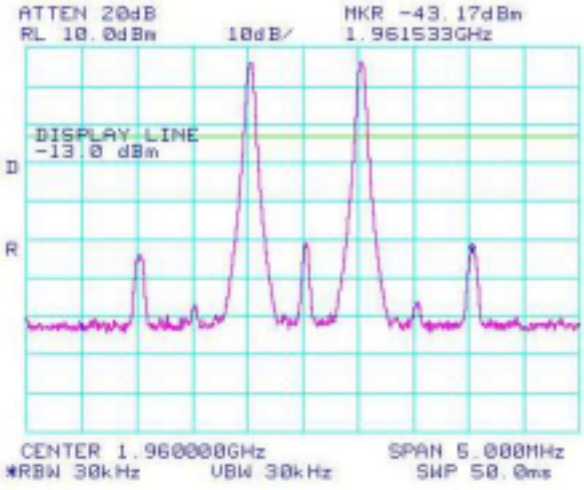
5. Up Link

Intermodulation (1)		
	Lower Edge	Upper Edge
CDMA -50.00 dBm		
NADC -54.67 dBm		
GSM -46.00 dBm		

Intermodulation(2)	
CDMA **1937.50 MHz** **±1.25 MHz** **<< -13dBm**	
NADC **1937.50 MHz** **±50 kHz** **<< -13dBm**	
GSM **1937.50 MHz** **±500 kHz** **<< -13dBm**	

6. Down Link

Intermodulation (1)		
	Lower Edge	Upper Edge
CDMA -46.33 dBm		
NADC -54.67 dBm		
GSM -43.83 dBm		

Intermodulation(2)	
CDMA **1937.50 MHz** **±1.25 MHz** **<< -13dBm**	
NADC **1937.50 MHz** **±50 kHz** **<< -13dBm**	
GSM **1937.50 MHz** **±500 kHz** **<< -13dBm**	

7.6 Field Strength of Spurious Radiation

Test Standard	: FCC Part 24.238 & 2.1053
Operating Frequency	: Up Link : 1850 MHz ~ 1910 MHz Down Link : 1930 MHz ~ 1990 MHz
Channel	: Low / Middle / High
RF Power Output	: 5 mW CDMA – Single Channel NADC – Composite Multiple Channel GSM – Composite Multiple Channel
Distance	: 3 meters

Harmonic	Antenna Polarization (V/H)	ERP (dBm)	Limit (dBm)	Margin (dB)
2nd	-39.8	<< ambient level	-13.0	-26.8
3rd	-76.1	<< ambient level	-13.0	-63.1
4th	-	<< ambient level	-13.0	-
5th	-	<< ambient level	-13.0	-
6th	-	<< ambient level	-13.0	-
7th	-	<< ambient level	-13.0	-
8th	-	<< ambient level	-13.0	-
9th	-	<< ambient level	-13.0	-
10th	-	<< ambient level	-13.0	-

Note :

1. *The spectrum bandwidth was set to RBW 100 kHz (freq. up to 1GHz) and RBW 1 MHz(freq above 1GHz).*
2. *Transmitter was set to the rated power output(5 mW) condition.*
3. *The spectrum was checked from 30 MHz up to the 10th harmonic of the carrier frequency.*
4. *All emission not reported were found to be more than 30dB below the limit.*
5. *The EUT was positioned through 3 orthogonal axis and worst-case are reported.*
6. *ERP measurements were performed using the rated supply voltage condition(DC 7V).*
7. *The limit was applied according to the 43 +10log(P)dBc.*
8. *The measurements were performed at the open-site with environmental conditions of 35℃, 24%RH.*

Tested by ***Yang, Eun Jung***

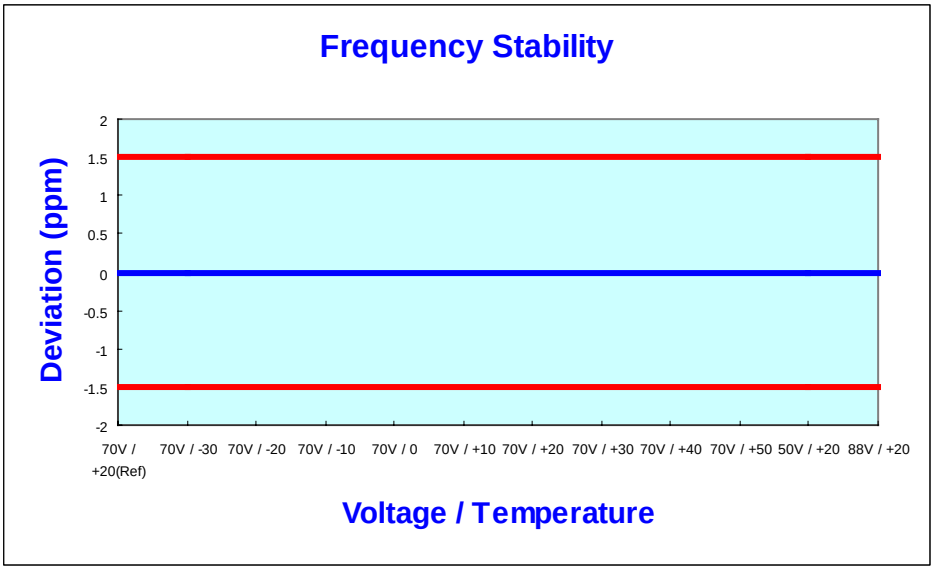
8.7 Frequency Stability

Test Standard	: FCC Part 24.235 & 2.1055
Operating Frequency	: Up Link : 1880.0 MHz Down Link : 1960.0 MHz
Channel	: Middle
RF Power Output	: 5 mW (Non-Modulation Signal)

8.7.1 Up Link

Voltage (%)	Power Supply (Vac)	Temperature (°C)	Frequency (Hz)	Deviation (ppm)
100 %	110	+20(Ref)	1880000000Hz	0
100 %	110	-30	1880000000Hz	0
100 %	110	-20	1880000000Hz	0
100 %	110	-10	1880000000Hz	0
100 %	110	0	1880000000Hz	0
100 %	110	+10	1880000000Hz	0
100 %	110	+20	1880000000Hz	0
100 %	110	+30	1880000000Hz	0
100 %	110	+40	1880000000Hz	0
100 %	110	+50	1880000000Hz	0
85 %	93.5	+20	1880000000Hz	0
115 %	126.5	+20	1880000000Hz	0

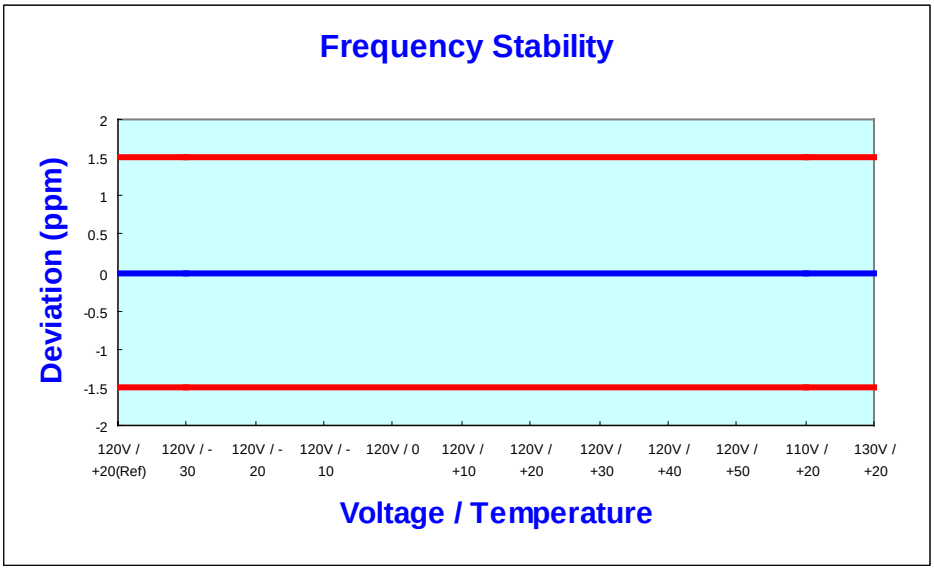
Note :
1. The worst-case temperature & voltage deviation was recorded.
2. Frequency drift of this unit dose not happen.



8.7.2 Down Link

Voltage (%)	Power Supply (Vac)	Temperature (°C)	Frequency (Hz)	Deviation (ppm)
100 %	110	+20(Ref)	1960000000Hz	0
100 %	110	-30	1960000000Hz	0
100 %	110	-20	1960000000Hz	0
100 %	110	-10	1960000000Hz	0
100 %	110	0	1960000000Hz	0
100 %	110	+10	1960000000Hz	0
100 %	110	+20	1960000000Hz	0
100 %	110	+30	1960000000Hz	0
100 %	110	+40	1960000000Hz	0
100 %	110	+50	1960000000Hz	0
85 %	93.5	+20	1960000000Hz	0
115 %	126.5	+20	1960000000Hz	0

Note :
1. *The worst-case temperature & voltage deviation was recorded.*
2. *Frequency drift of this system dose not happen.*



Tested by **Yang, Eun Jung**

8. TEST EQUIPMENT LIST

List of Test Equipments Used for Measurements

Test Equipment	Model	Mfg.	Serial No.	Cal. Due Date
Spectrum Analyzer	8594E	H.P.	3911A08040	05-04-24
Spectrum Analyzer	E7403A	ADVANTEST	61720002	05-08-22
Receiver	ESH3	R & S	892580/014	05-05-21
Signal Generator	E4432B	H.P.	US40053157	05-05-07
Signal Generator	SGT9000	GIGATRONICS	9604010	05-04-11
Power Meter	E4418A	H.P.	GB38272621	05-03-17
Power Sensor	8481A	H.P.	3318A92101	05-03-19
Audio Analyzer	8903B	H.P.	3011A09344	05-04-29
Modulation Analyzer	8901B	H.P.	3028A03124	05-05-07
Synthesized Function Generator	SG-4111	IWATSU	35559	05-05-26
Broadband Power Amplifier	100W 10000M 11	Amplifier Research	18649	05-03-19
Broadband Power Amplifier	75A220	Amplifier Research	15326	05-12-16
Preamplifier	8447E	H.P.	2945A02712	05-08-19
Horn Antenna	BBHA 9120 D	Schwarz Beck	234	05-06-10
Horn Antenna	BBHA 9170	Schwarz Beck	157	05-06-10
Dipole Antenna	VDA6106A / UHA9105	Schaffner-chase	1277	05-09-12
Biconical Antenna	VHA9103	Schwarzbeck	-	05-09-13
Log Periodic Antenna	UPA6109	SCHAFFNER	1076	05-09-13
Attenuator	8325	BIRD	4572	05-05-14
Attenuator	RFA500NMF30	RFA500NMF30	9522	06-01-07
Termination	8173	BIRD	2501	-
Dual directional coupler	772D	H.P.	2839A00395	06-01-07
Dual directional coupler	778D	H.P.	1144A08477	05-10-14
LISN	L3-25	PMM	1110KT0403	05-10-02
LISN	KNW-242C	PMM	8-920-20	05-08-30
Digital Oscilloscope	TDS3032	Tektronix	B081558	05-05-27
Turn-Table	JAC-2	JAEMC	-	-
Antenna Master	JAC-1	Daeil EMC	-	-
Plotter	7550A	H.P	2725A 75529	-
EMC Anechoic Chamber	-	SEMITECH	000815	
Temp/Humidity Chamber	-	Seo jin	-	05-09-01
Thermo Hygrograph	PC-5000TRH-II	SATO	-	05-10-27
BaroMeter	KEIRYOKI	SATO	564021	05-07-18
Slidacs	DeaKyong Slidacs	DeaKyong	-	-