ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 27 SUBPART C & SUBPART L CLASS II PC REPORT

For

Product Name:	**NB106-N NGFF WWAN MODULE**
Brand Name:	**NVIDIA**
Model Name:	**NB106-N**
Model Difference:	**N/A**
FCC ID:	**VOB-E1729**
Report No.:	**ER/2014/30002**
Issue Date:	**Mar. 21, 2014**
FCC Rule Part:	**2, 27C & L**
Prepared for:	**NVIDIA Corporation** **2701 San Tomas Expressway, Santa Clara, California, United States 95050**
Prepared by:	**SGS Taiwan Ltd.** **Electronics & Communication Laboratory** **No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803**

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CERTIFICATION OF COMPLIANCE

Applicant:	NVIDIA Corporation 2701 San Tomas Expressway, Santa Clara, California, United States 95050
Product Description:	NB106-N NGFF WWAN MODULE
Brand Name:	NVIDIA
FCC ID:	VOB-E1729
Model No:	NB106-N
Model Difference:	N/A
File Number:	ER/2014/30002
Date of test:	Mar. 04, 2014 ~ Mar. 07, 2014
Date of EUT Received:	Mar. 04, 2014

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in TIA/EIA-603-C-2004 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rule PART 27 subpart C & subpart L.

The test results of this report relate only to the tested sample identified in this report.

Test By:	Marcus Tseng	***Date:***	Mar. 21, 2014
	Marcus Tseng / Engineer		
Prepared By:	Violetta Tang	***Date:***	Mar. 21, 2014
	Violetta Tang / Clerk		
Approved By:	Jim Chang	***Date:***	Mar. 21, 2014
	Jim Chang / Supervisor		

Version

Version No.	Date	Description
00	Mar. 21, 2014	Initial creation of document

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1. GENERAL INFORMATION

1.1 Description

General Information of NB106-N NGFF WWAN MODULE:

Product Name:	NB106-N NGFF WWAN MODULE
Brand Name:	NVIDIA
Model Name:	NB106-N
Model Difference:	N/A
Hardware Version:	699-81729-0000-001
Software Version:	E1729_4.05_0.6
Power Supply:	3.7Vdc from Power Supply

WCDMA:

Cellular Phone Standards Frequency Range and Power	Operating Frequency		Rated Power
	WCDMA/HSUPA/HSDPA Band IV	1712.4MHz - 1752.6MHz	23dBm
IMEI:	00440001743785		
Class II Permissive change:	1. Add Band IV 2. Change model no to NB106-N 3. To add capacitors & resistors 2nd source		
Type of Emission Listed in Test Report/Original Grant:	22H(GMSK): 824.2 - 848.8 MHz: 243KGXW 24E(GMSK): 1850.2 – 1909.8 MHz: 242KGXW 22H(8PSK): 824.2 - 848.8 MHz: 249KG7W 24E(8PSK): 1850.2 – 1909.8 MHz: 244KG7W 22H(WCDMA): 826.4 - 846.6 MHz: 4M14F9W 24E(WCDMA): 1852.4 – 1907.5 MHz: 4M15F9W 27(QPSK): 709.0 – 711.0 MHz: 8M98G7D 27(16QAM): 709.0 – 711.0 MHz: 8M97D7W 27(QPSK): 829.0 – 844.0 MHz: 9M01G7D 27(16QAM): 829.0 – 844.0 MHz: 9M01D7W 27(QPSK): 1720.0 – 1745.0 MHz: 18M0G7D 27(16QAM): 1720.0 – 1745.0 MHz: 18M0D7W 27(QPSK): 1860.0 – 1900.0 MHz: 18M0G7D 27(16QAM): 1860.0 – 1900.0 MHz: 18M0D7W 27(QPSK): 2510.0 – 2560.0 MHz: 18M0G7D 27(16QAM): 2510.0 – 2560.0 MHz: 18M0D7W 27(WCDMA): 1712.4 – 1752.6 MHz: 4M15F9W		

Transmit power (Conducted Power) Listed in Test Report/Original Grant:	22H(GMSK): 824.2 - 848.8 MHz: 0.66W 24E(GMSK): 1850.2 – 1909.8 MHz: 0.45W 22H(8PSK): 824.2 - 848.8 MHz: 0.55W 24E(8PSK): 1850.2 – 1909.8 MHz: 0.41W 22H(WCDMA): 826.4 - 846.6 MHz: 0.31W 24E(WCDMA): 1852.4 – 1907.5 MHz: 0.35W 27(QPSK): 709.0 – 711.0 MHz: 0.28W 27(16QAM): 709.0 – 711.0 MHz: 0.29W 27(QPSK): 829.0 – 844.0 MHz: 0.37W 27(16QAM): 829.0 – 844.0 MHz: 0.41W 27(QPSK): 1720.0 – 1745.0 MHz: 0.37W 27(16QAM): 1720.0 – 1745.0 MHz: 0.41W 27(QPSK): 1860.0 – 1900.0 MHz: 0.90W 27(16QAM): 1860.0 – 1900.0 MHz: 1.06W 27(QPSK): 2510.0 – 2560.0 MHz: 0.21W 27(16QAM): 2510.0 – 2560.0 MHz: 0.24W 27(WCDMA): 1712.4 – 1752.6 MHz: 0.28W

This test report applies for WCDMA/HSUPA/HSDPA Band IV.

Final Amplifier Voltage and Current Information:

Test Mode	DC voltage (V)	DC current (mA)
WCDMA BIV	3.7	510
HSUPA BIV	3.7	545
HSDPA BIV	3.7	530

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: VOB-E1729** filing to comply with Section Part27 subpart C & subpart L of the FCC CFR 47 Rules.

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures document of TIA/EIA 603C and FCC CFR 47.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057.

TS 151 010-1 is used to set, and measure the output power.

The Output power Procedure of KDB941225 (SAR Measurement Procedures for 3G devices,WCDMA / HSPA) was used for EUT and Base station setting.

KDB971168 D01 Power Meas license Digital System v01 as the supplemental guideline to conduct the measurement, including Peak to Power Average Ratio, Average Power over the fundamental signal BW (EIRP/ERP) and Signal Bandwidth.

1.4 Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei Country, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2009. FCC Registration Number is: 990257, Canada Registration Number: 4620A-4

The 10 m Open Area Test Sites located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 29, Pau-Tou-Tsuo Valley Chia-Pau Tsuen, Linkou Hsiang, Taipei county, which is constructed and calibrated to meet the CISPR 22/EN 55022 requirements. SGS Site No. 1(3 &10 meters) and FCC Registration Number: 94644.

1.5 Special Accessories

No special accessories were used during testing.

1.6 Equipment Modifications

There were no modifications incorporated into the EUT.

2. SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The EUT (Transmitter) was operated in the continuous transmission mode employed with the simulator of the Base Station that fixates at test default channels to fix the Tx frequency which was for the purpose of the measurements.

2.3 Test Procedure

2.3.1 Conducted Measurement at Antenna Port:

According to measurement procured TIA/EIA 603C, the EUT is placed on a turn table which is 0.8 m above ground plane. A low loss of RF cable was used to connect the antenna port of EUT to measurement equipment.

2.3.2 Radiated Emissions (ERP/EIRP):

According to measurement procured TIA/EIA 603C and RSS-Gen Issue 3, The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both Horizontal and Vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna according to the requirements in Section 8 and 13 of ANSI C63.4:2009.

2.4 Measurement Equipment Used:

Conducted Emission (measured at antenna port) Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Power Meter	Anritsu	ML2495A	1005007	01/13/2014	01/12/2015
Power Sensor	Anritsu	MA2411B	917032	01/13/2014	01/12/2015
Spectrum Analyzer	Agilent	E4446A	MY51100003	05/30/2013	05/29/2014
Spectrum Analyzer	Agilent	E4440A	US41160416	03/15/2013	03/14/2014
Radio Communication Analyzer	R & S	CMU200	102189	06/17/2013	06/16/2014
Radio Communication Analyzer	Anritsu	MT8820C	6200995019	10/21/2013	10/20/2014
Temperature Chamber	TERCHY	MHG-120LF	911009	05/06/2013	05/05/2014
DC Block	Mini-Circuits	BLK-18-S+	1	02/27/2014	02/26/2015
Attenuator	Mini-Circuit	BW-S10W2+	002	02/27/2014	02/26/2015
Splitter	Agilent	11636B	N/A	02/27/2014	02/26/2015
DC Power Supply	Agilent	E3640A	KR93300208	07/24/2013	07/23/2014

ERP, EIRP MEASUREMENT EQUIPMENT List 966 Chamber					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Spectrum Analyzer	Agilent	E4446A	MY51100003	05/30/2013	05/29/2014
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	01/20/2014	01/19/2015
Spectrum Analyzer	R&S	FSV-30	101398	10/22/2013	10/21/2014
Bilog Antenna	SCHWAZBECK	VULB9168	378	01/02/2014	01/02/2015
Bilog Antenna	SCHWAZBECK	VULB9160	3158	11/27/2013	11/26/2014
Horn antenna	ETS.LINDGREN	3117	123995	05/31/2013	05/30/2014
Horn antenna	ETS.LINDGREN	3117	123991	01/20/2014	01/19/2015
Horn Antenna	Schwarzbeck	BBHA9170	184	01/23/2014	01/22/2015
Horn Antenna	Schwarzbeck	BBHA9170	185	07/19/2013	07/18/2014
Network Analyze	Anritsu	MS4644A	1216312	05/23/2013	05/22/2014
Signal Generator	Agilent	E4438C	MY45093613	07/30/2013	07/29/2014
Pre-Amplifier	Agilent	8447D	1937A02834	01/03/2014	01/02/2015
Pre-Amplifier	Agilent	8449B	3008A00578	01/03/2014	01/02/2015
Pre-Amplifier	EMC Instruments Corp.	EMC184045	980135	01/24/2014	01/23/2015
Attenuator	Mini-Circuit	BW-S10W2+	004	02/27/2014	02/26/2015
Radio Communication Analyzer	R & S	CMU200	102189	06/17/2013	06/16/2014
Radio Communication Analyzer	Anritsu	MT8820C	6200995019	10/21/2013	10/20/2014
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	HD	MA240-N	240/657	N.C.R	N.C.R
Controller	HD	HD100	N/A	N.C.R	N.C.R
Low Loss Cable	HUBER+SUHNER	966_Tx	10m	01/03/2014	01/02/2015
Low Loss Cable	HUBER+SUHNER	966_Rx	3m	01/03/2014	01/02/2015
Filter 800-1000	Micro-Tronics	EWT	M2	02/27/2014	02/26/2015
Filter 1800-2000	Micro-Tronics	EWT	M2	02/27/2014	02/26/2015
Filter 1700-1800	Micro-Tronics	BRC15751	001	02/27/2014	02/26/2015
1GHz High Pass Filter	Micro-Tronics	HPM50108	32	02/27/2014	02/26/2015
2GHz High Pass Filter	Micro-Tronics	HPM50110	36	02/27/2014	02/26/2015
3m Site NSA	SGS	966 chamber	N/A	07/15/2013	07/14/2014

2.5 Configuration of Tested System

Fig. 2-1 Configuration of Tested System (Fixed Channel)

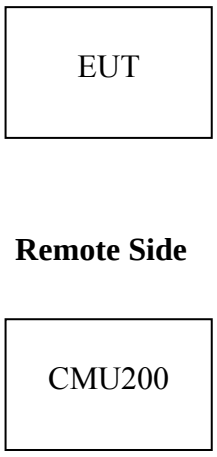


Table 2-1 Equipment Used in

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1.	Universal Radio Communication Analyzer	R&S	CMU200	102189	shielded	Un-shielded

3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§2.1046(a)	RF Power Output	Compliant
§2.1046(a) §27.50(d)(4)	ERP/ EIRP measurement	Compliant
§2.1049(h)	99% Occupied Bandwidth	Compliant
§2.1051 §27.53(g) §27.50(c)(5) §27.53(h) §27.53(m)(4)(6)	Out of Band Emissions at Antenna Terminals and Band Edge	Compliant
§2.1053 §27.50(c)(5) §27.53(g) §27.53(h) §27.53(m)(4)	Field Strength of Spurious Radiation	Compliant
§27.53(d) (5)	Peak to Average Ratio	Compliant
§2.1055(a)(1) §27.54	Frequency Stability vs. Temperature	Compliant
§2.1055(d)(1) §27.54	Frequency Stability vs. Voltage	Compliant

Max ERP/EIRP measurement result:

	dBm		W
WCDMA Band IV	23.02	EIRP	0.200
HSDPA Band IV	24.47	EIRP	0.280
HSUPA Band IV	23.64	EIRP	0.231

4. DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.

Set EUT power control “all up bits” for all test modes through base station.

WCDMA/HSPA BIV:

Channel Low: UAFRCN 1312 at 1712.4MHz, Channel Mid: UAFRCN 1413 at 1732.6MHz, Channel High: UAFRCN 1513 at 1752.6MHz.

The field strength of spurious radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for WCDMA/HSUPA/HSDPA Band IV with power adaptor.
The worst-case is E2 mode for each type of band.

The evaluation of Test Mode as configured in UE presented on the Test Report:

WCDMA/HSPA:

Radiated Spurious Emission

The Measurement Data of field strength of spurious emission with respect to supported configuration of given application (Transmission Band, Modulation Scheme, Resource Block) have been pre-scanned, and the result that yields in the highest emission close to the limit are presented on the test report.

HSPA is the worst-case found in the pre-scanned measurement, and only data that yields the worst case is revealed on the test report.

5. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
RF Power Output	+/- 1.42 dB
ERP/ EIRP measurement	Vertical Polarization = +/- 4.74dB Horizontal Polarization =+/- 4.62dB
99% Occupied Bandwidth	+/- 123.36 Hz
Out of Band Emissions at Antenna Terminals and Band Edge	+/- 1.55 dB
Peak to Average Ratio	+/- 1.55 dB
Frequency Stability vs. Temperature	+/- 123.36 Hz
Frequency Stability vs. Voltage	+/- 123.36 Hz
Temperature	+/- 0.8 °C
Humidity	+/- 4.7 %
DC / AC Power Source	DC= +/- 1%, AC=+/- 0.2%

Radiated Spurious Emission:

Measurement uncertainty (Polarization : **Vertical**)	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

Measurement uncertainty (Polarization : **Horizontal**)	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

6. RF POWER OUTPUT/ MAXMUM POWER REDUCTION MEASUREMENT

6.1 Standard Applicable:

According to FCC §2.1046.

Part 27, 50(d)(4) portable stations are limited to 1W

3GPP Power limitation for HSDPA and HSUPA

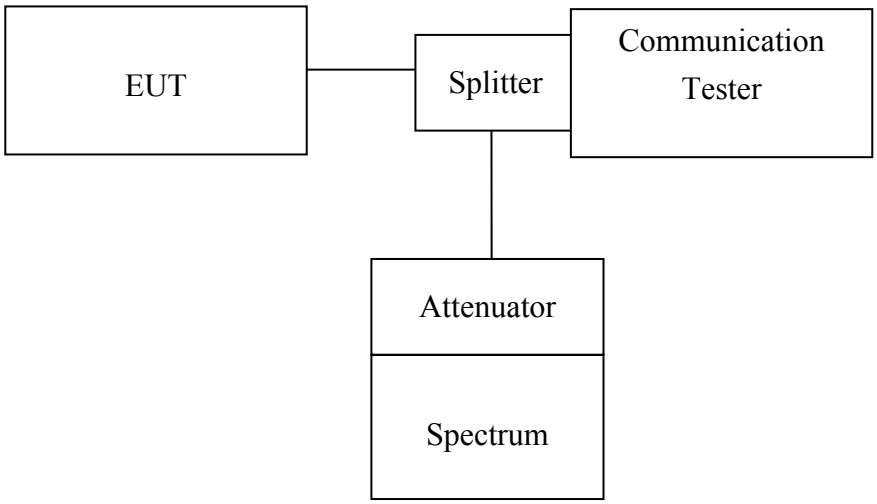
Maximum Output Powers for HSDPA

Sub-test in table C.10.1.4	Power Class 3		Power Class 4	
	Power (dBm)	Tol (dB)	Power (dBm)	Tol (dB)
1	+24	+1.7/-3.7	+21	+2.7/-2.7
2	+24	+1.7/-3.7	+21	+2.7/-2.7
3	+23.5	+2.2/-3.7	+20.5	+3.2/-2.7
4	+23.5	+2.2/-3.7	+20.5	+3.2/-2.7

Maximum Output Powers for HSUPA

Sub-test in table C.11.1.3	Power Class 3		Power Class 4	
	Power (dBm)	Tol (dB)	Power (dBm)	Tol (dB)
1	+24	+1.7/-6.7	+21	+2.7/-5.7
2	+22	+3.7/-5.2	+19	+4.7/-4.2
3	+23	+2.7/-5.2	+20	+3.7/-4.2
4	+22	+3.7/-5.2	+19	+4.7/-4.2
5	+24	+1.7/-6.7	+21	+2.7/-5.7

6.2 Test Set-up:



Note: *Measurement setup for testing on Antenna connector*

6.3 Measurement Procedure:

The transmitter output was connected to a calibrated attenuator, the other end of which was connected to a power meter. Transmitter output was read off the power meter in dBm. The power output at the transmitter antenna port was determined by adding the value of the attenuator to the power meter reading. TS 151 010-1 is reference to conduct the test measurement of output power.

The Procedure of KDB941225 (SAR Measurement Procedures for 3G devices, (WCDMA/HSPA) was used for EUT and Base station setting. RMC 12.2kps is used for this testing, and KDB 971168 D01 Power Meas License Digital System as the supplemental test methodology to adjust the proper setting obtaining the measurement results

Necessary Communication complying with 27.5(d)(4)

Set CMU200 (base-station simulator) MS Signal with packet data submenu; SLOT Configuration

Set appropriate level to verify if or not power on mobile station's link with simulator still exists.

6.4 Measurement Equipment Used:

Refer to section 2.4 in this report

6.5 Measurement Result:

6.5.1 RF Conducted Output Power

6.5.1.1.: WCDMA mode

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 V8.4.0 specification. The EUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7). RMC 12.2kps is used for this testing.

Results:

EUT Mode	Frequency (MHz)	CH	Peak Power (dBm)	Avg. Power (dBm)
WCDMA Band IV	1712.4	1312	25.42	22.29
	1732.6	1412	**25.57**	22.48
	1752.6	1513	25.52	22.33

EUT Mode	Frequency (MHz)	CH	Peak Power (dBm)	Avg. Power (dBm)
HSDPA Band IV	1712.4	1312	26.55	23.26
	1732.6	1412	**26.67**	23.44
	1752.6	1513	25.96	22.50

EUT Mode	Frequency (MHz)	CH	Peak Power (dBm)	Avg. Power (dBm)
HSUPA Band IV	1712.4	1312	25.96	22.52
	1732.6	1412	**26.51**	23.08
	1752.6	1513	26.42	22.88

Note: The results above reflect max power with all up bits.
Cable loss offset Low Band: 0.30dB
Cable loss offset High Band: 0.85dB

6.5.1.2: HSDPA Release 6 mode

The following 4 Sub-Tests were completed according to the test requirements outlined in section 5.2A of the 3GPP TS34.121-1 V8.4.0 specification. All TX RMS power requirements for Power Class 3 were met according to table 5.2AA.5 and 5.2B.5 All UE channels and power ratio's are set according to table C10.1.4 & C11.1.3 in the 3GPP TS34.121-1 V8.4.0. RMC 12.2kps is used for this testing.

HSDPA SUB-TEST Setting

Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH(FOR HSDPA)

Sub-test	β_c	β_d	β_d *(SF)*	β_c/β_d	β_{HS} (*Note1, Note 2*)	CM (dB) *(Note 3)*	MPR (dB) *(Note 3)*	RMC (Kbps)
1	2/15	15/15	64	2/15	4/15	0.0	0.0	12.2
2	12/15 *(Note 4)*	15/15 *(Note 4)*	64	12/15 *(Note 4)*	24/15	1.0	0.0	12.2
3	15/15	8/15	64	15/8	30/15	1.5	0.5	12.2
4	15/15	4/15	64	15/4	30/15	1.5	0.5	12.2

Note: The recommended HSDPA MPRs are implemented as per following sub-tests.

Results:

Mode	Sub-test	Avg. Power (dBm) Channel			Power Class 3 Limitation (dBm)	Comments
		1312	1412	1513		
HSDPA (BIV)	1	22.51	22.73	22.52	20.3dBm – 25.7dBm	Pass
	2	22.22	22.37	22.20	20.3dBm – 25.7dBm	Pass
	3	22.05	22.25	22.29	19.8dBm – 25.7dBm	Pass
	4	22.10	22.29	22.09	19.8dBm – 25.7dBm	Pass

6.5.1.3: HSPA (HSDPA & HSUPA) Release 6 mode

The following 5 Sub-Tests were completed according to the test requirements outlined in section 5.2A of the 3GPP TS34.121-1 V8.4.0 specification. All TX RMS power requirements for Power Class 3 were met according to table 5.2AA.5 and 5.2B.5 All UE channels and power ratio's are set according to table C11.1.3 in the 3GPP TS34.121-1 V8.4.0. RMC 12.2kps is used for this testing

HSPA SUB-TEST Setting

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH(FOR HSUPA)

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS}	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (Codes)	CM (dB)	MPR (dB)	AG Index	E-TFCI	RMC (Kbps)
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	4	1	1.0	0.0	20	75	12.2
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67	12.2
3	15/15	9/15	64	15/9	30/15	30/15	$\beta_{ed}1$: 47/15 $\beta_{ed}2$: 47/15	4 4	2	2.0	1.0	15	92	12.2
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71	12.2
5	15/15 (Note 4)	15/15 (Note 4)	64	15/15 (Note 4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81	12.2

Note: The recommended HSUPA MPRs are implemented as per following sub-tests.

Results:

Mode	Sub-test	Avg. Power (dBm) Channel			Power Class 3 Limitation (dBm)	Comments
		1312	1412	1513		
HSUPA(BIV)	1	22.25	22.41	22.24	18.8dBm – 25.7dBm	Pass
	2	20.31	20.49	20.28	16.8dBm – 25.7dBm	Pass
	3	21.22	21.47	21.27	17.8dBm – 25.7dBm	Pass
	4	20.36	20.55	20.36	16.8dBm – 25.7dBm	Pass
	5	22.11	22.24	22.13	18.8dBm – 25.7dBm	Pass

WCDMA/HSDPA band IV

The EUT output power was controlled by simulator. Set Communication Tester CMU200 function key "UE Power Control" and enter max rated power 24dBm. The EUT is going to be set to max output power to 24dBm. Then record the read (see page 19 for measurement data).

The min. power was measures by a function key "minimum power" then record the read. It is -52.5dBm. The power variation can be 0.1dB step by setting.

7. ERP/EIRP MEASUREMENT

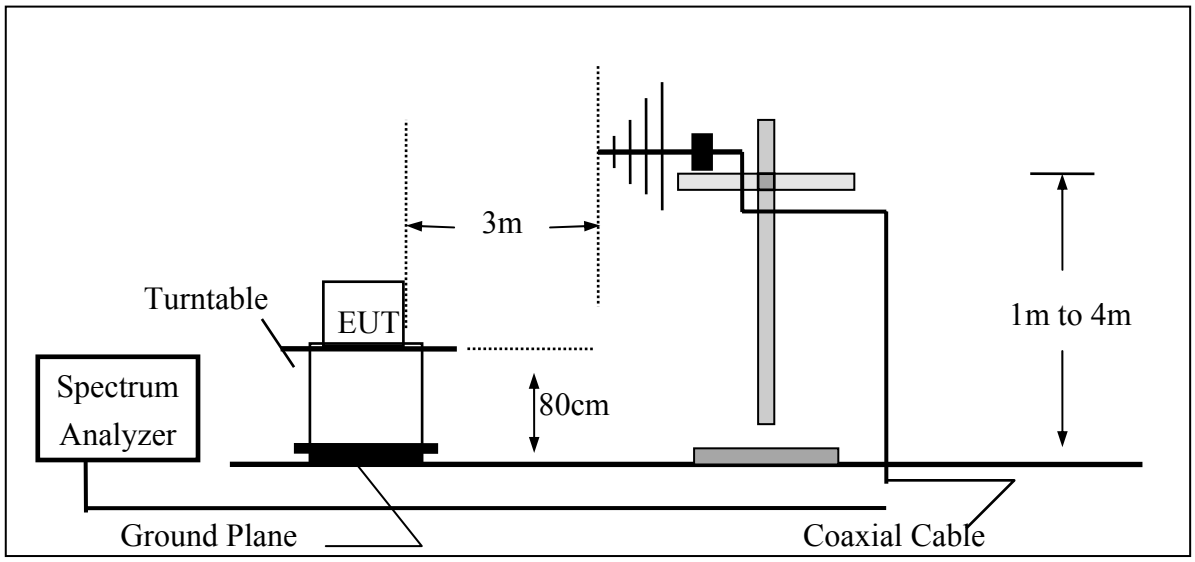
7.1 Standard Applicable

According to FCC §2.1046

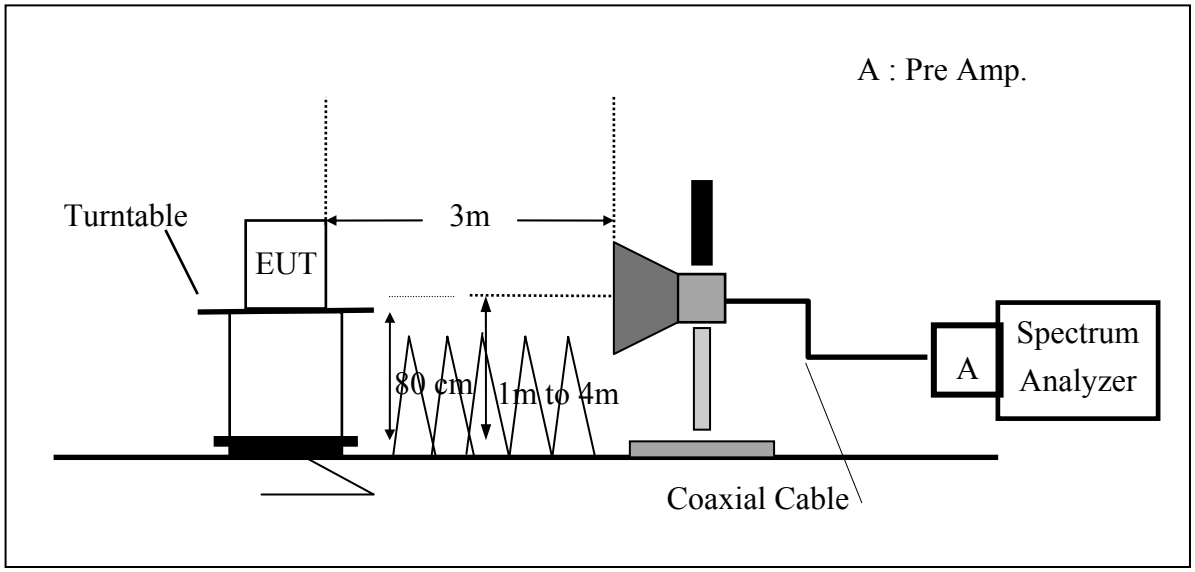
FCC 27.50(d)(4) Fixed, mobile, and portable (hand-held) stations are limited to 1W EIRP.

7.2 Test SET-UP (Block Diagram of Configuration)

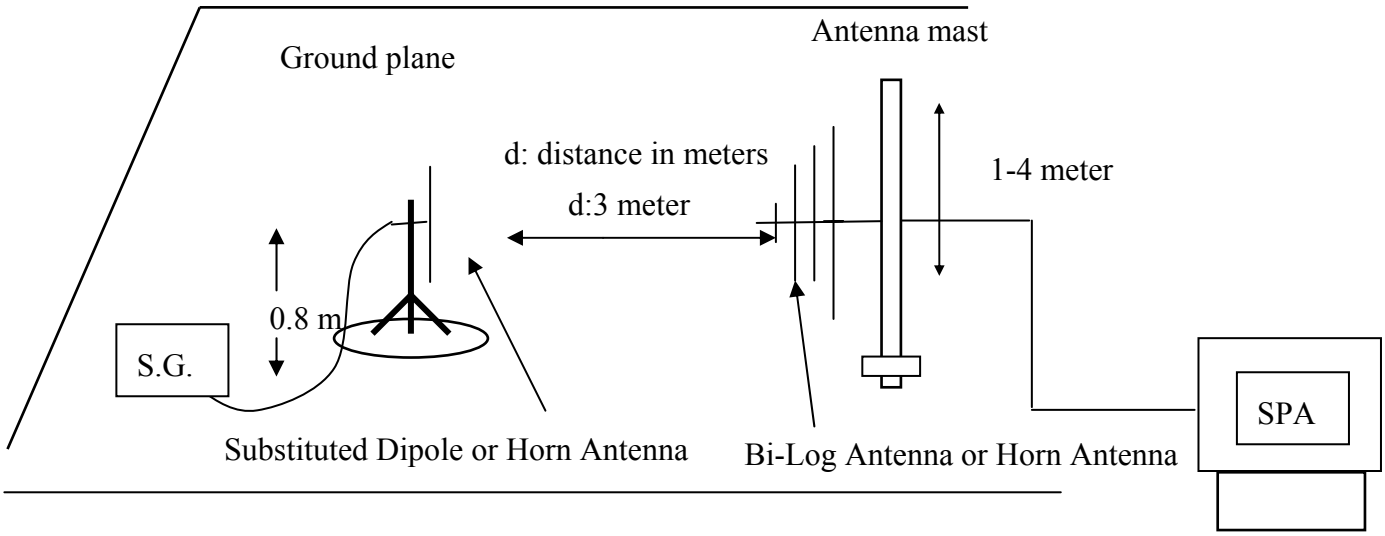
(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Power Test Set-UP Frequency Over 1 GHz



(C) Substituted Method Test Set-UP



7.3 Measurement Procedure

The EUT was placed on a non-conductive turntable using a non-conductive support. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and EMI spectrum analyzer.

During the measurement, the EUT was communication with the station. The highest emission was recorded with the rotation of the turntable and the lowering of the test antenna from 4m to 1m. The reading was recorded and the field strength (E in dBuV/m) was calculated.

EIRP in frequency band 1710-1755MHz was measured using a substitution method. The EUT was replaced by a horn antenna connected, the S.G. output was recorded and EIRP was calculated as follows:

ERP = S.G. output (dBm) + Antenna Gain (dBd) – Cable Loss (dB)
EIRP = S.G. output (dBm) + Antenna Gain (dBi) – Cable Loss (dB)

Spectrum setting:

1. Detector = Peak, marker the highest value of the detector by maximum hold, set RBW wide enough to capture the entire signal of emission, and VBW > =3xRBW.

Or,

2. KDB 971168 D01 Power Meas License Digital Systems v01 is adopted, and the procedure as lists under item 4, Measurement of the Average Power over the Fundamental Signal Bandwidth, is followed to set correspondingly for the acquisition of proper measurement data.

Set frequency = nominal signal center frequency;
Set span = 2 X occupied BW;
Set RBW ≈ 1~5% of the span, not to exceed 1 MHz
Set VBW = 3 x RBW;
Select average power (RMS) detector
Set sweep time and number of measurement points to achieve a minimum of 1 millisecond/pt integration time (ex. Point = 601points, then sweet time = 601*10^-3 = 6s
Activate trace averaging routine over a minimum of 10 sweeps;
Activate marker/span pair and set span = signal or channel bandwidth;
Activate the band/interval power marker function;
Record the band power level;

Record adjusted value as the average signal power level. Then activate the occupied bandwidth measurement function.

7.4 Measurement Equipment Used:

Refer to section 2.4 in this report

7.5 Measurement Result:

EUT			Measurement					
Operation Band	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	EIRP	Limit
	MHz		V/H	dBm	dBi	dB	dBm	dBm
WCDMA Band IV	1712.4	1312	V	19.43	5.46	-4.5	20.39	33.00
			H	22.07	5.46	-4.5	**23.02**	33.00
	1732.6	1413	V	19.63	5.40	-4.53	20.50	33.00
			H	21.15	5.40	-4.53	22.03	33.00
	1752.6	1513	V	21.55	5.34	-4.55	22.35	33.00
			H	21.07	5.34	-4.55	21.86	33.00

EUT			Measurement					
Operation Band	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	EIRP	Limit
	MHz		V/H	dBm	dBi	dB	dBm	dBm
HSDPA Band IV	1712.4	1312	V	20.77	5.46	-4.5	21.72	33.00
			H	23.51	5.46	-4.5	**24.47**	33.00
	1732.6	1413	V	21.10	5.40	-4.53	21.97	33.00
			H	22.87	5.40	-4.53	23.74	33.00
	1752.6	1513	V	23.16	5.34	-4.55	23.95	33.00
			H	22.55	5.34	-4.55	23.34	33.00

EUT			Measurement					
Operation Band	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	EIRP	Limit
	MHz		V/H	dBm	dBi	dB	dBm	dBm
HSUPA Band IV	1712.4	1312	V	20.51	5.46	-4.5	21.46	33.00
			H	22.61	5.46	-4.5	23.57	33.00
	1732.6	1413	V	20.88	5.40	-4.53	21.75	33.00
			H	22.76	5.40	-4.53	**23.64**	33.00
	1752.6	1513	V	22.76	5.34	-4.55	23.56	33.00
			H	22.15	5.34	-4.55	22.95	33.00

Remark：

(1) The RBW,VBW of SPA for frequency

RBW= 5MHz , VBW= 8MHz

8. OCCUPIED BANDWIDTH MEASUREMENT

8.1. Standard Applicable:

According to §FCC 2.1049

8.2. Test Set-up:

Refer to section 6.2 in this report

8.3. Measurement Procedure:

The EUT's output RF connector was connected with a short cable to the spectrum analyzer, RBW was set to about 1% of emission BW, VBW= 3 times RBW, -20dBc display line was placed on the screen (or 20dB bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace. Then set RBW to 99% bandwidth, RBW= 1%, VBW= 3 RBW, with span > 2 * Signal BW, set % Power = 99%.

NOTE: For the plot of bandwidth measurement, the marker of the 99% bandwidth is diamond-shape while the marker of the 20dB BW is arrow-mark

8.4. Measurement Equipment Used:

Refer to section 2.4 in this report

8.5. Measurement Result:

Refer to next page.

99% Bandwidth

EUT Mode	Frequency (MHz)	CH	99% Bandwidth (MHz)
WCDMA IV	1712.40	1312	4.1300
	1732.60	1413	**4.1492**
	1752.60	1513	4.1343

EUT Mode	Frequency (MHz)	CH	99% Bandwidth (MHz)
HSDPA IV	1712.40	1312	4.1312
	1732.60	1413	**4.1363**
	1752.60	1513	4.1309

EUT Mode	Frequency (MHz)	CH	99% Bandwidth (MHz)
HSUPA IV	1712.40	1312	4.1283
	1732.60	1413	**4.1397**
	1752.60	1513	4.1253

99% Bandwidth Test Data

Figure 8-1: WCDMA IV Channel Low

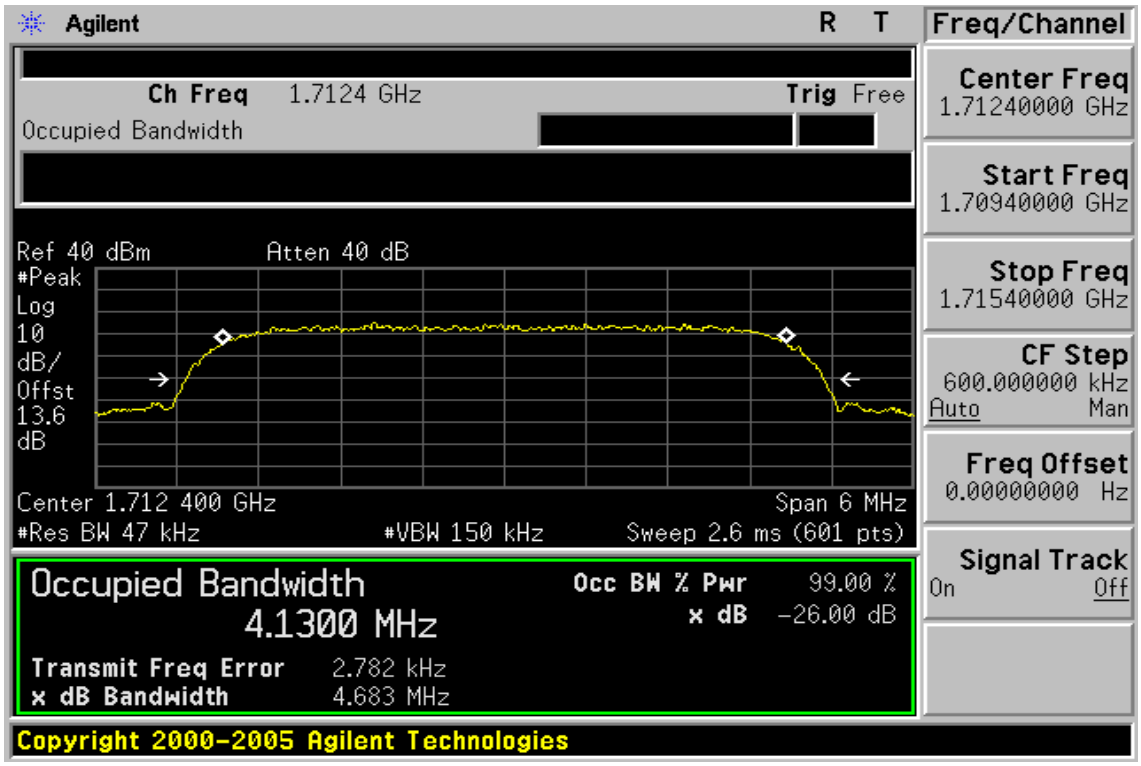


Figure 8-2: WCDMA IV Channel Mid

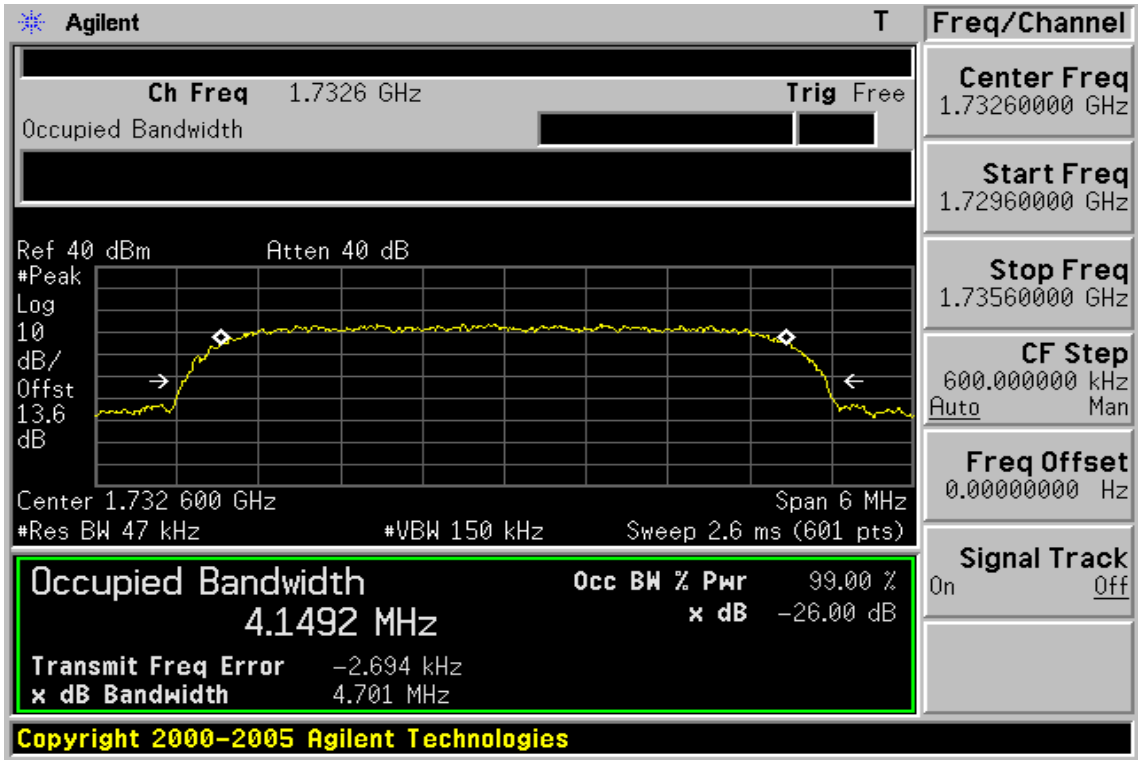


Figure 8-3: WCDMA IV Channel High

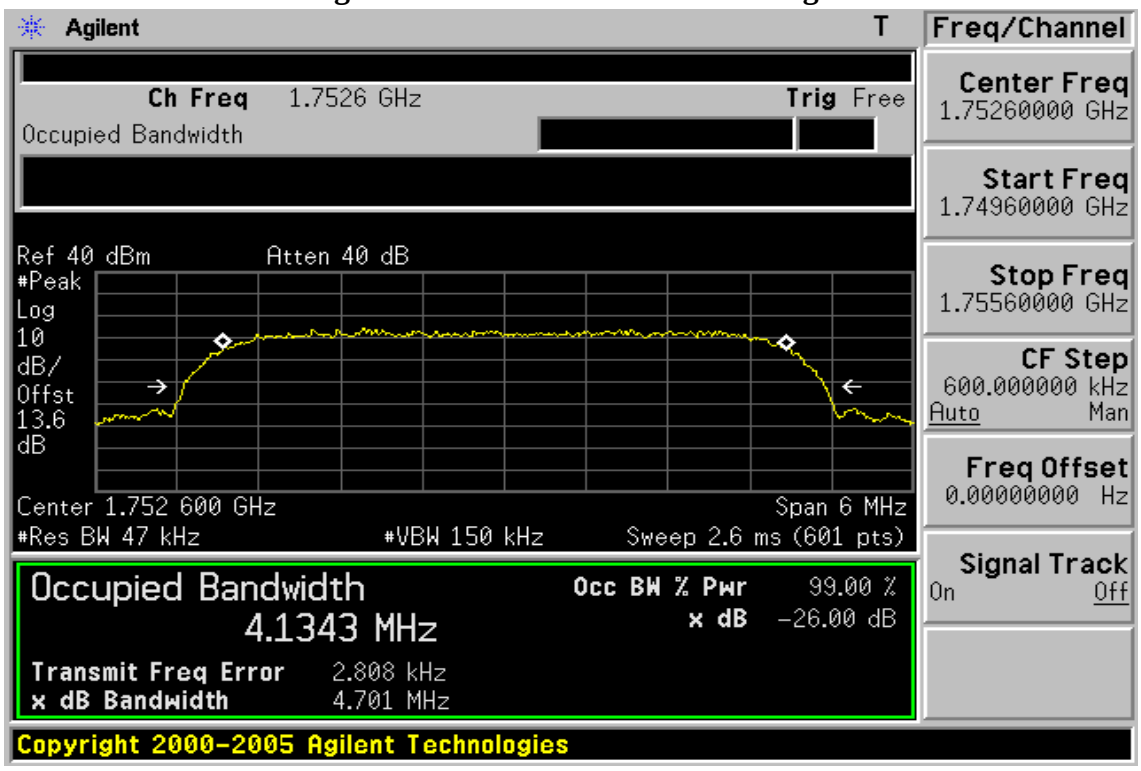


Figure 8-4: HSDPA IV Channel Low

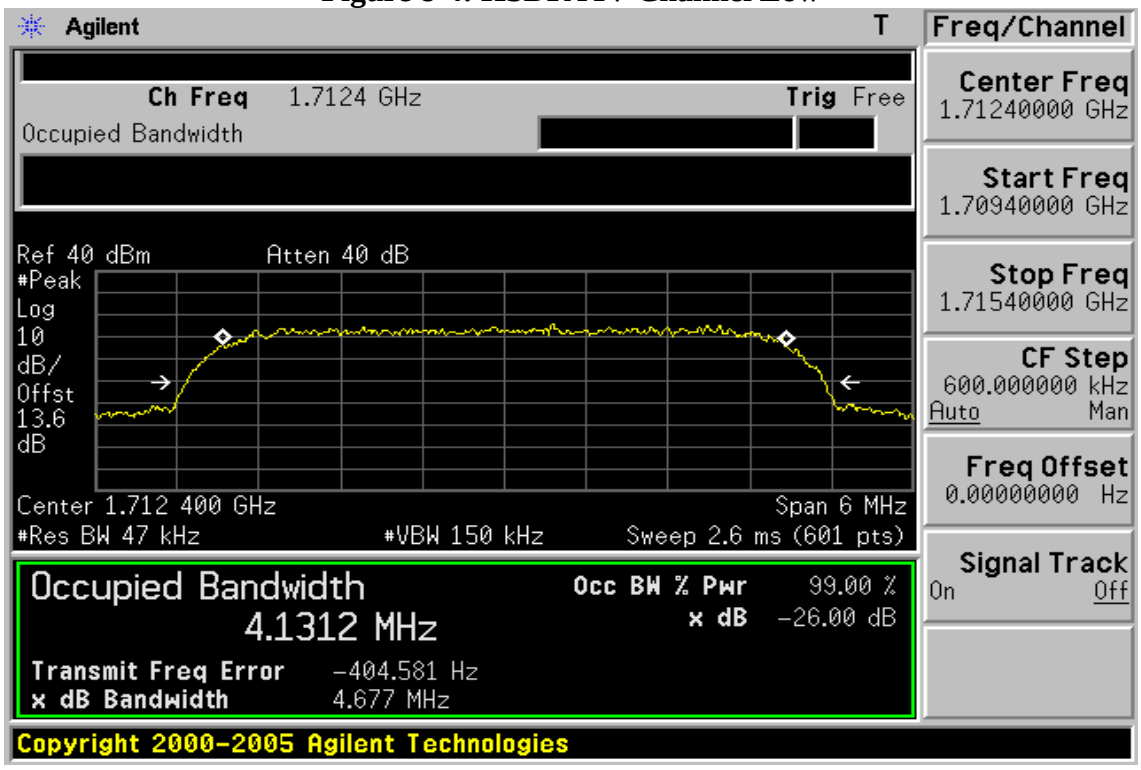


Figure 8-5: HSDPA IV Channel Mid

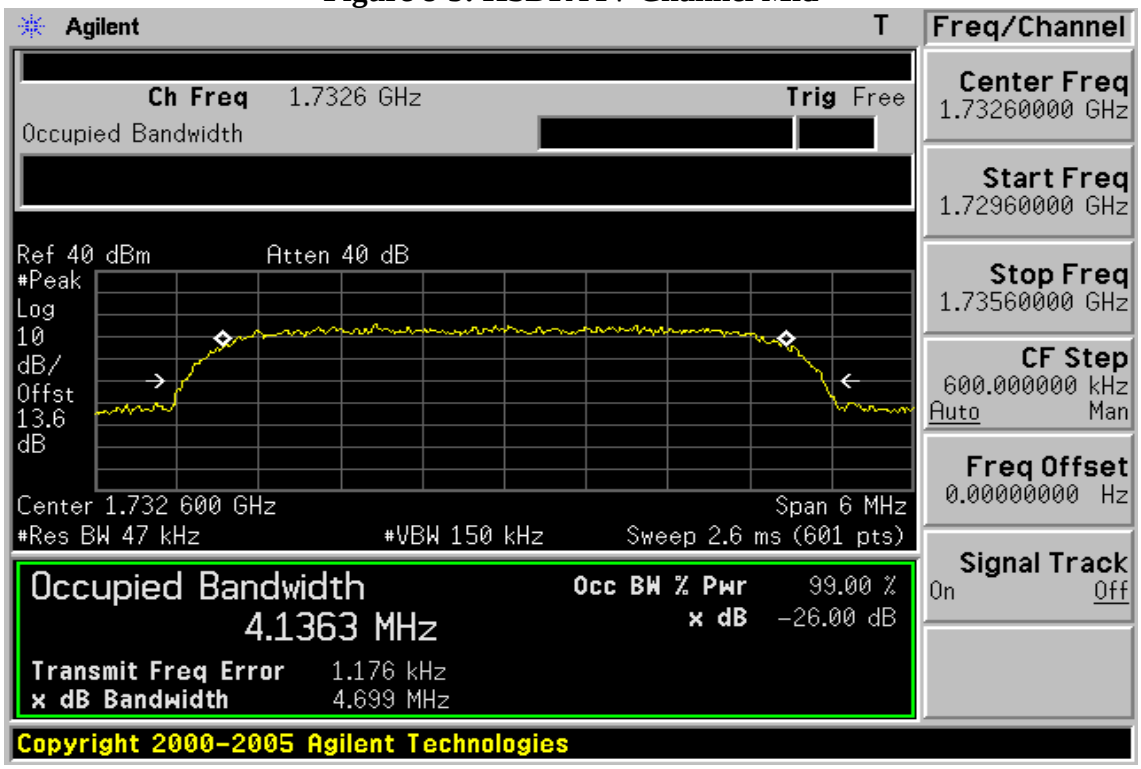


Figure 8-6: HSDPA IV Channel High

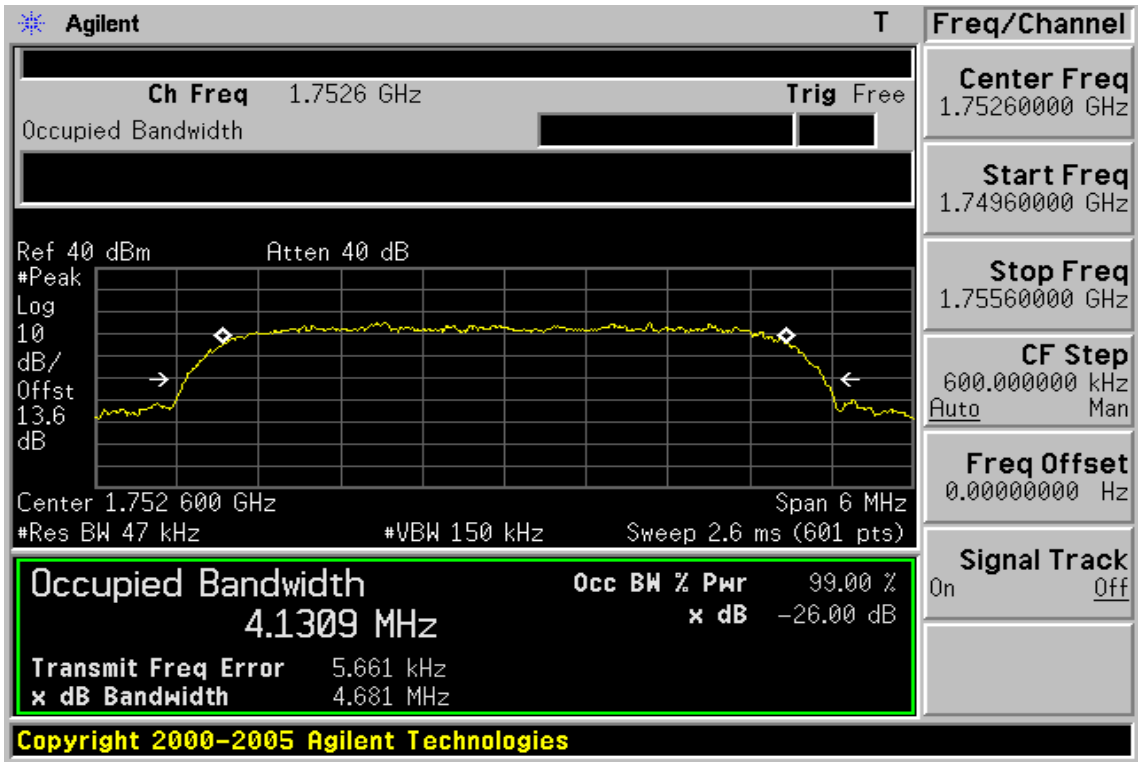


Figure 8-7: HSUPA IV Channel Low

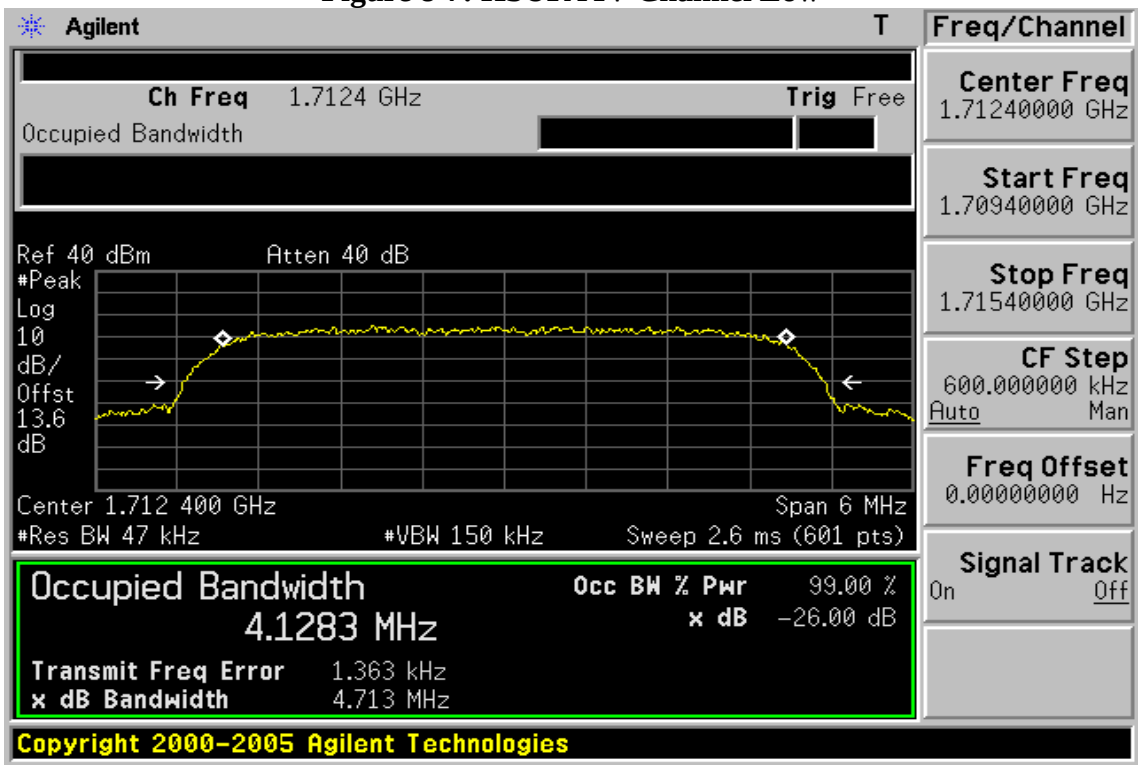


Figure 8-8: HSUPA IV Channel Mid

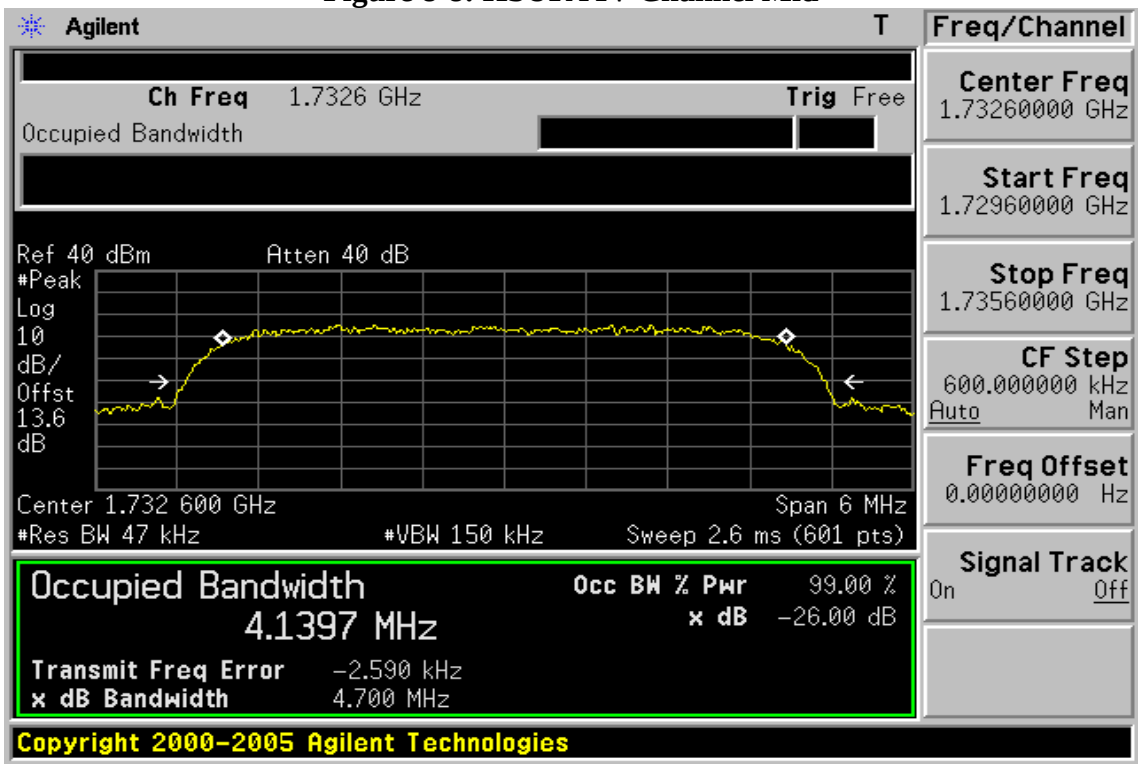
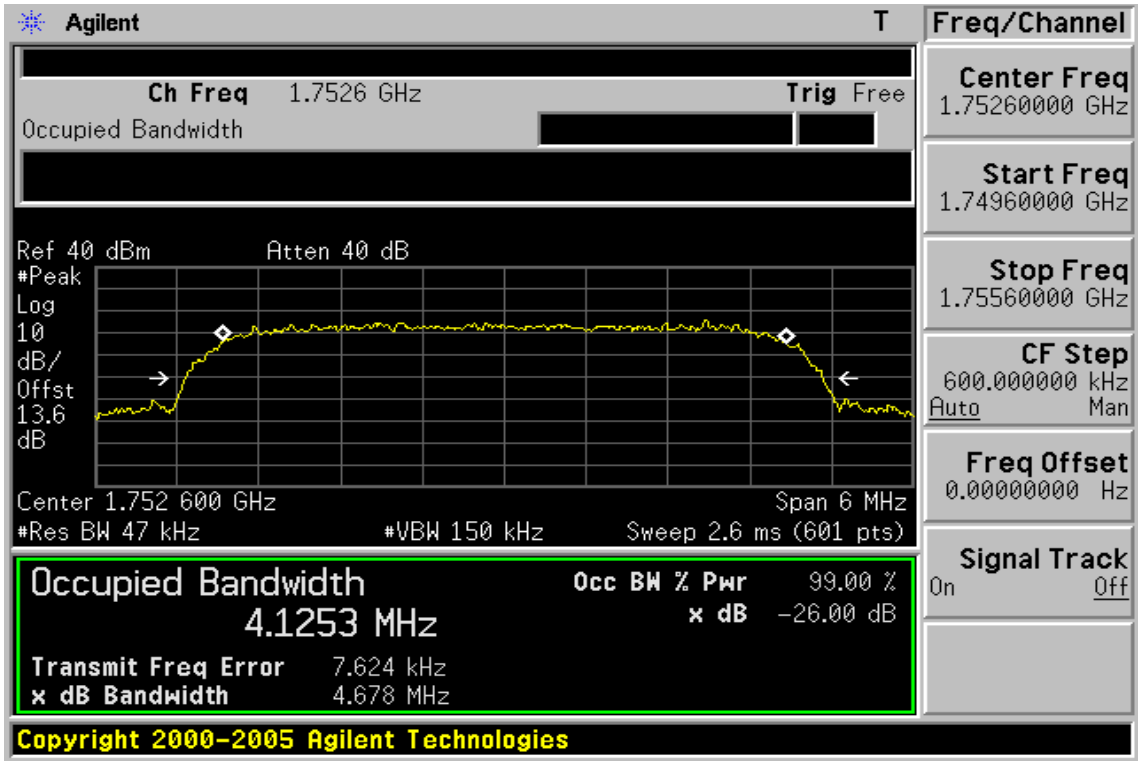


Figure 8-9: HSUPA IV Channel High



9. OUT OF BAND EMISSION AT ANTENNA TERMINALS

9.1. Standard Applicable:

According to FCC §2.1051.

Out-of-Band Emission

FCC §27.53(g)(h) the magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specified in the instruction manual and/ or alignment procedure, shall not be less than 43 + 10 log (mean output power in watts) dBc below the mean power output outside a license's frequency block (-13dBm). §27.53 (m) (4) shall not be less than 55 +10log(mean output power in watt) dBc below the mean power output outside a license's frequency block (-25dBm).

100KHz Bandedge:

FCC §27.53(g)

Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

FCC §27.53(h)

Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

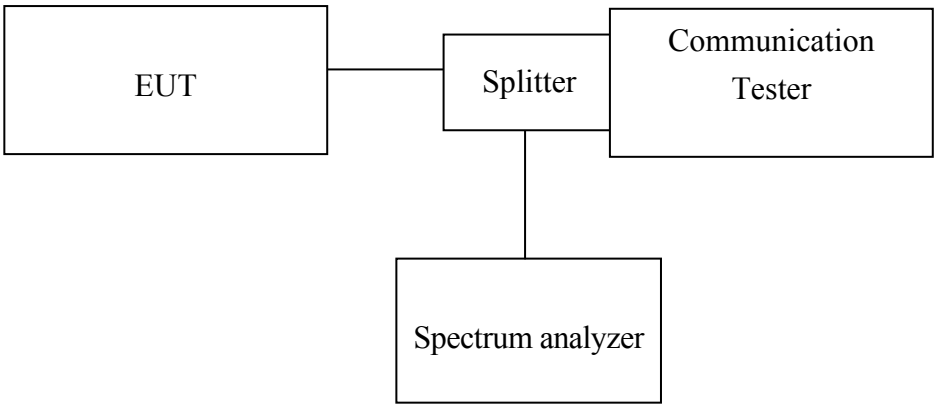
FCC §27.53(m) (4) (6)

For mobile digital stations, the attenuation factor shall be not less than 43 + 10 log (P) dB at the channel edge and 55 + 10 log (P) dB at 5.5 megahertz from the channel edges. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees

Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. With respect to television operations, measurements must be made of the separate visual and aural operating powers at sufficiently frequent intervals to ensure compliance with the rules.

9.2. Test SET-UP:

Out of band emission& Band Edge



9.3. Measurement Procedure:

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

For the out of band: Set the RBW, VBW = 1MHz, Start=30MHz, Stop= 10 th harmonic. Limit = -13dBm.

Band Edge Requirements: In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to measure the out of band Emissions. Limit, -13dBm.

h) For operations in the 1710–1755 MHz band, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 43 + 10 log10 (P) dB. Limit, -13dBm

(1) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. Limit, -13dBm

Conducted Emission:

1. To connect Antenna Port of EUT to Spectrum.
2. Set RBW = 1MHz & VBW = 1MHz on Spectrum.
3. Sweep the frequency to determine spurious emission as seen on spectrum from span of 30 to 1G, 1G to 2.5G, 2.5G to 7.5G, 7.5G to 10G ,10G to 15G and 15G to 20GHz
4. Via Software, combine 6 spans of frequency range into one plot

9.4. Measurement Equipment Used:

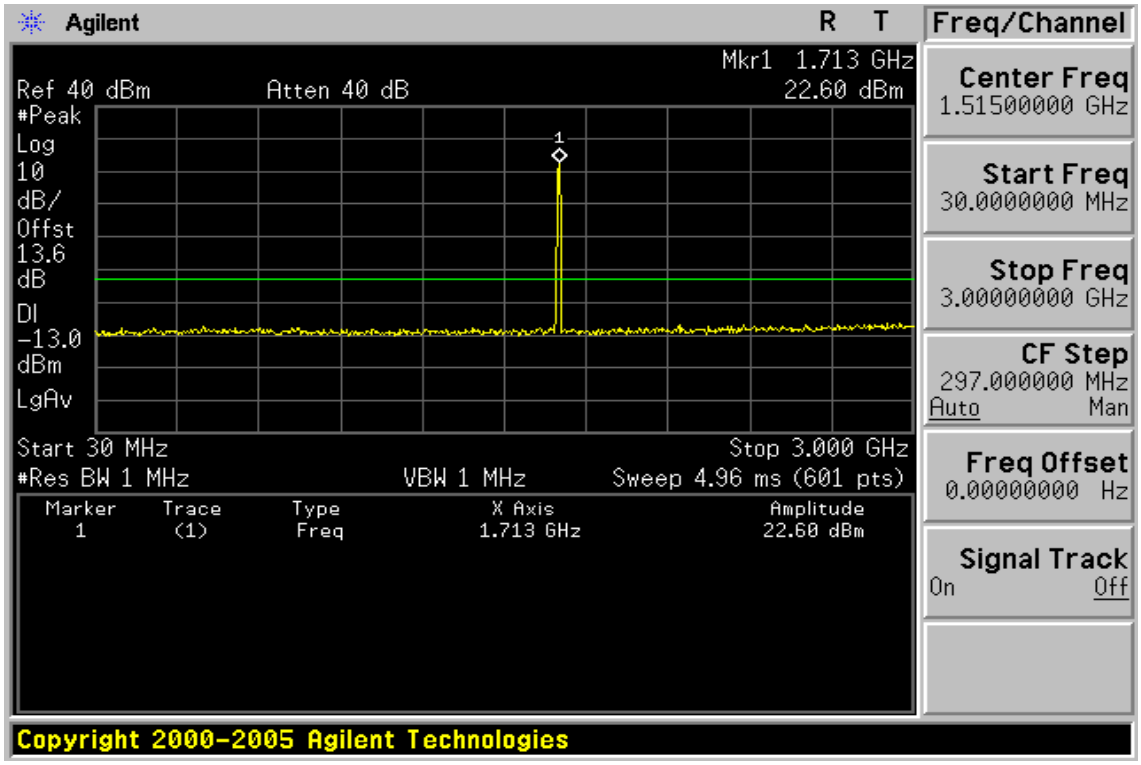
Refer to section 2.4 in this report

9.5. Measurement Result:

Refer to next pages.

NOTE: the occurrence of the spike on the conducted emission is the signal of the fundamental emission.

Figure 9-1: Out of Band emission at antenna terminals – WCDMA IV Channel Lowest



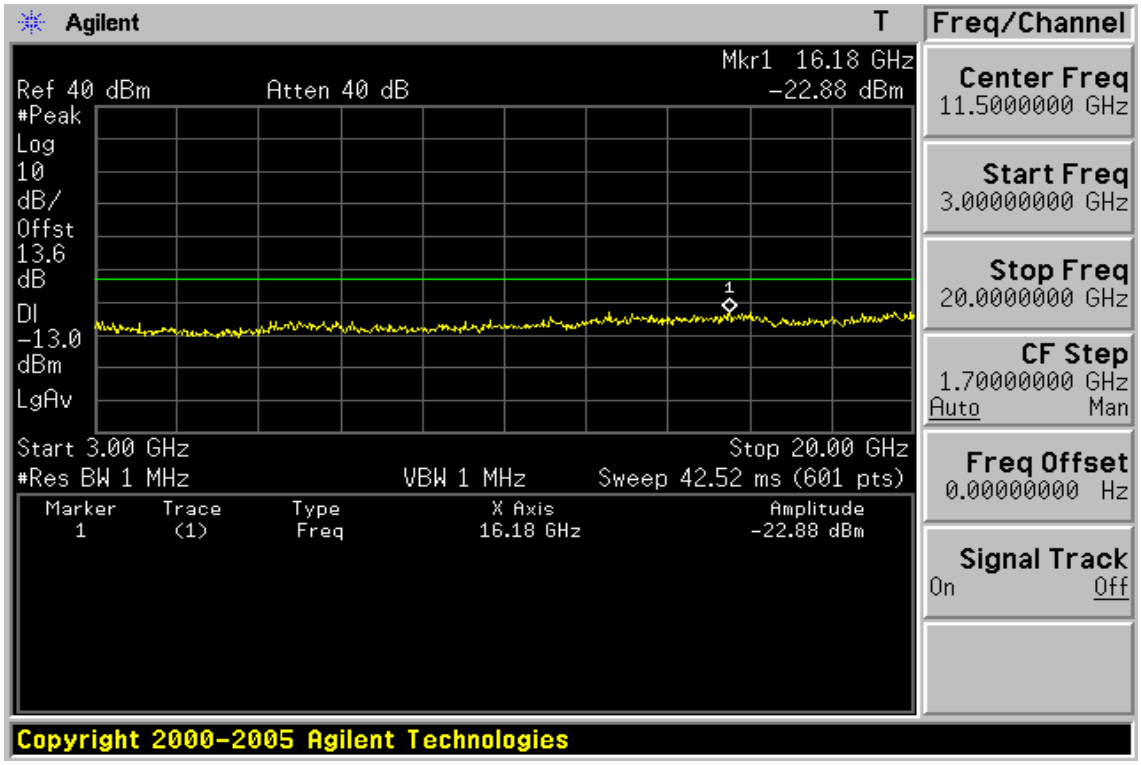
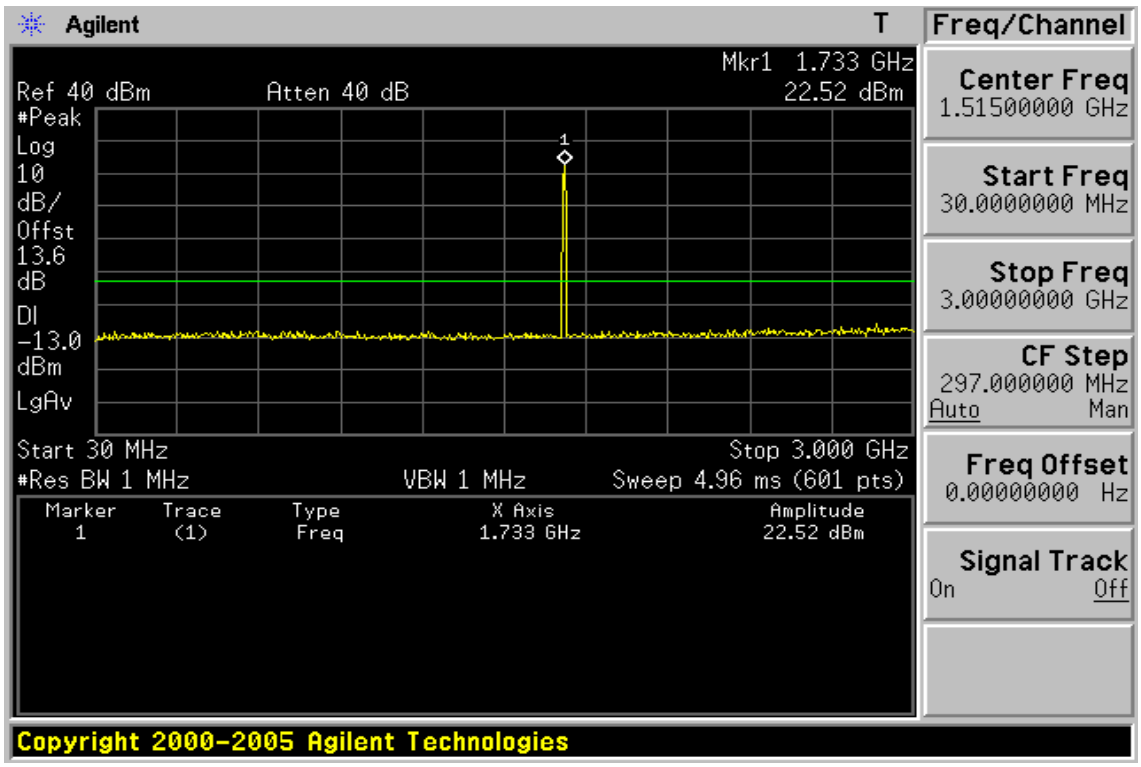


Figure 9-2: Out of Band emission at antenna terminals – WCDMA IV Channel Mid



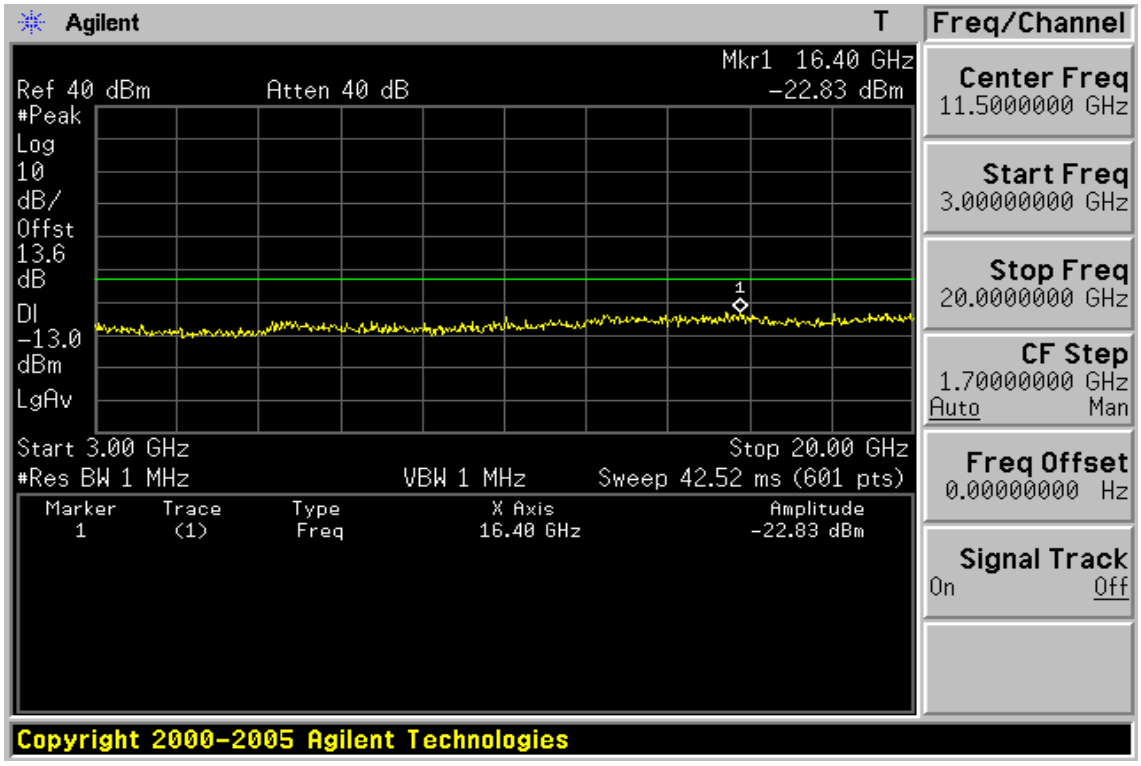
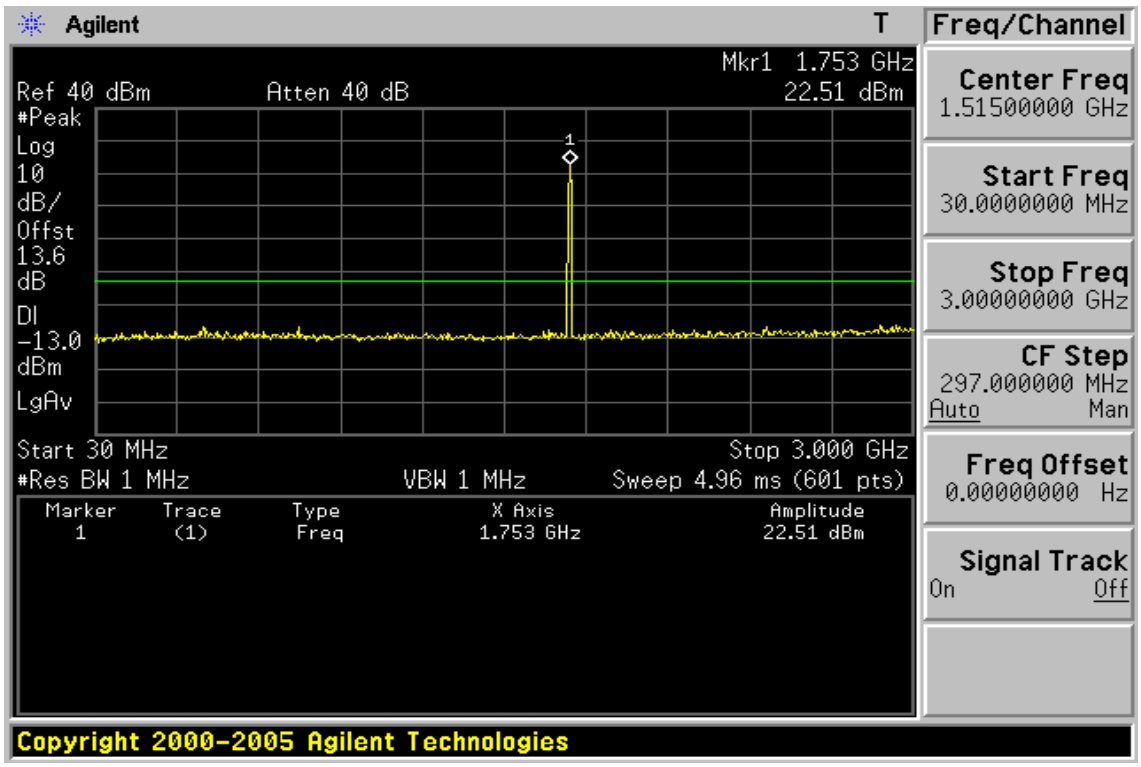


Figure 9-3: Out of Band emission at antenna terminals – WCDMA IV Channel Highest



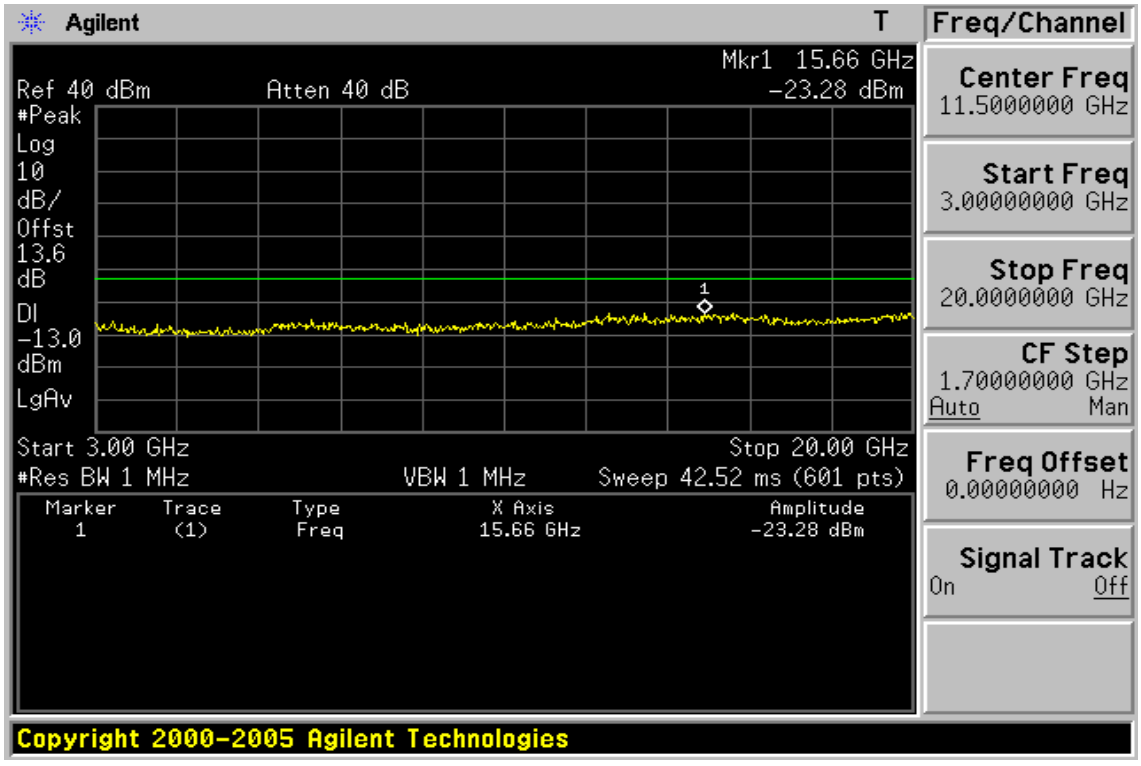


Figure 9-4: Band edge emission at antenna terminals – WCDMA IV Channel Lowest

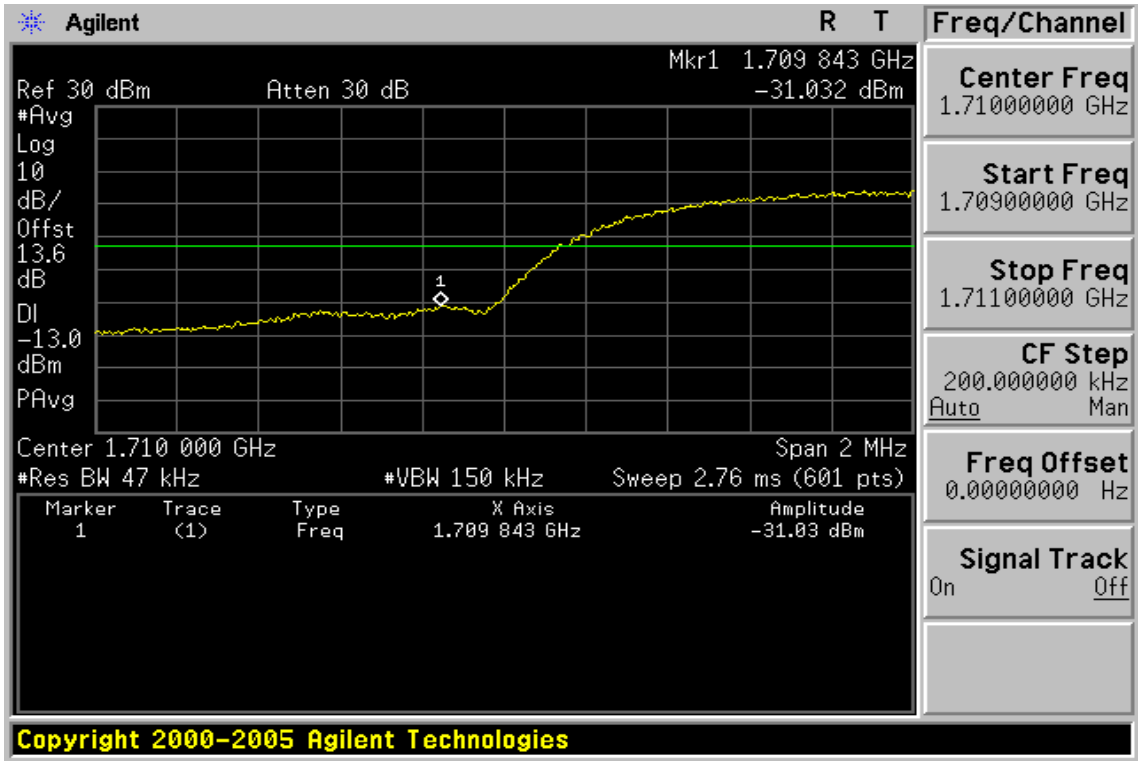
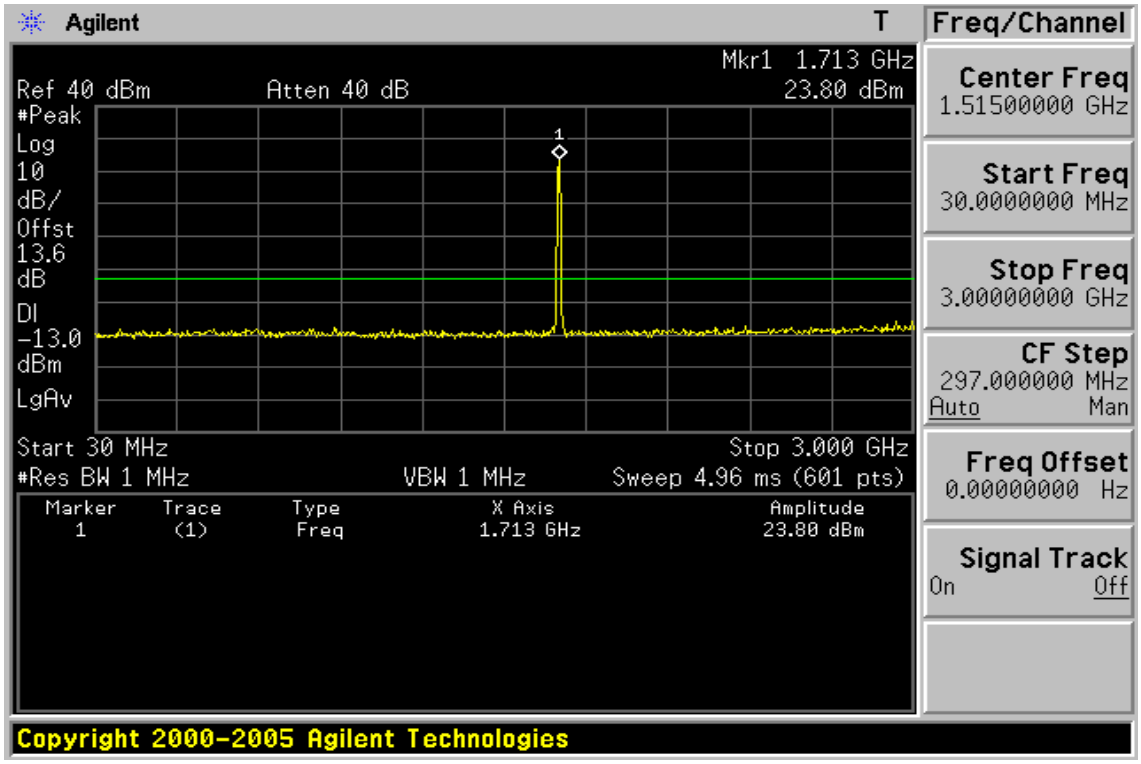


Figure 9-5: Band edge emission at antenna terminals – WCDMA IV Channel Highest

Figure 9-6: Out of Band emission at antenna terminals – HSDPA IV Channel Lowest



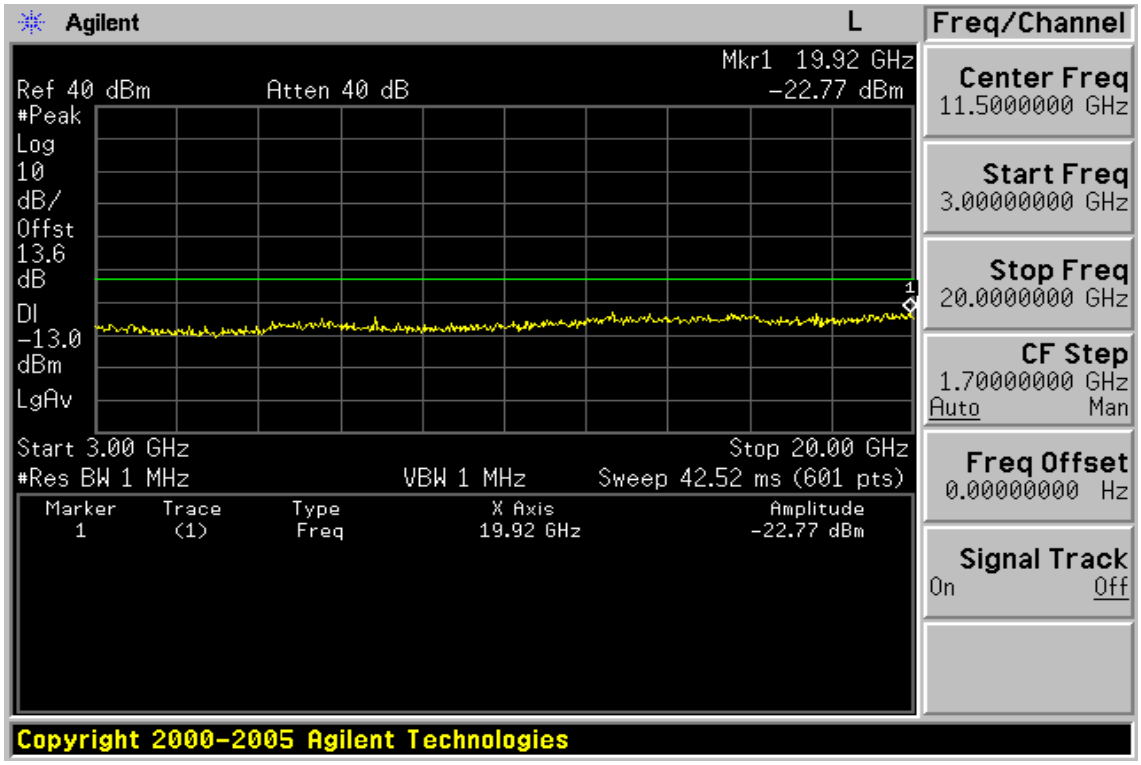
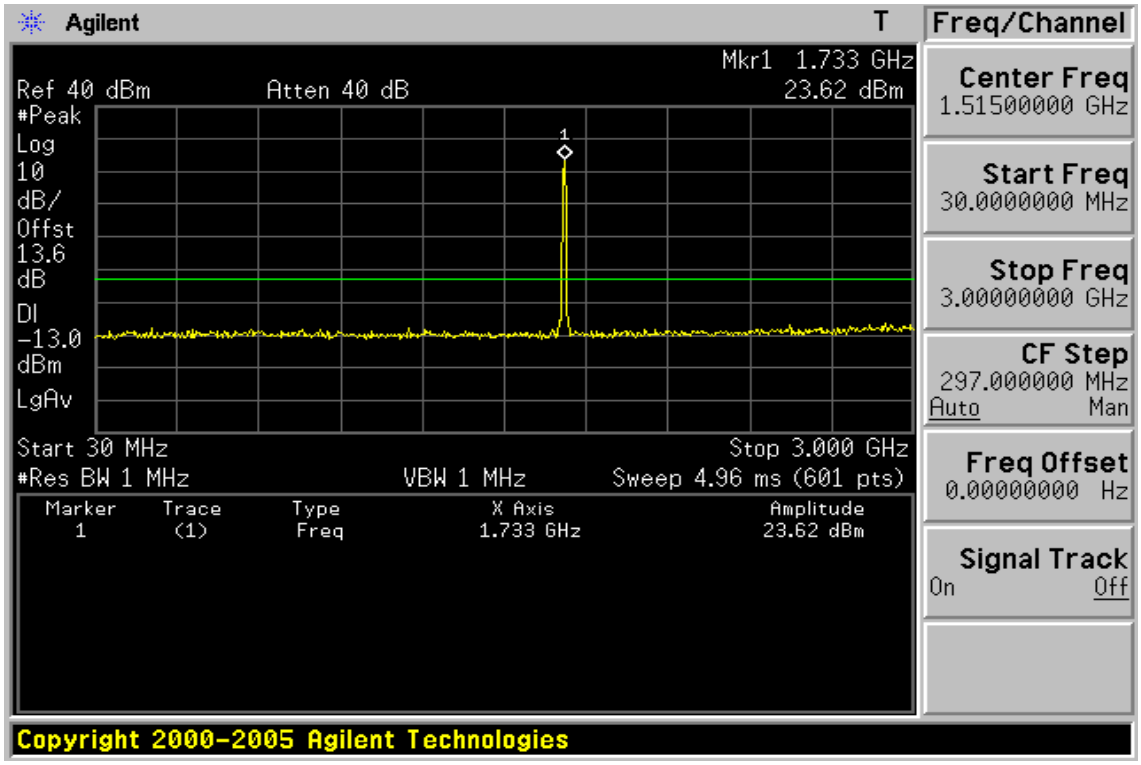


Figure 9-7: Out of Band emission at antenna terminals –HSDPA IV Channel Mid



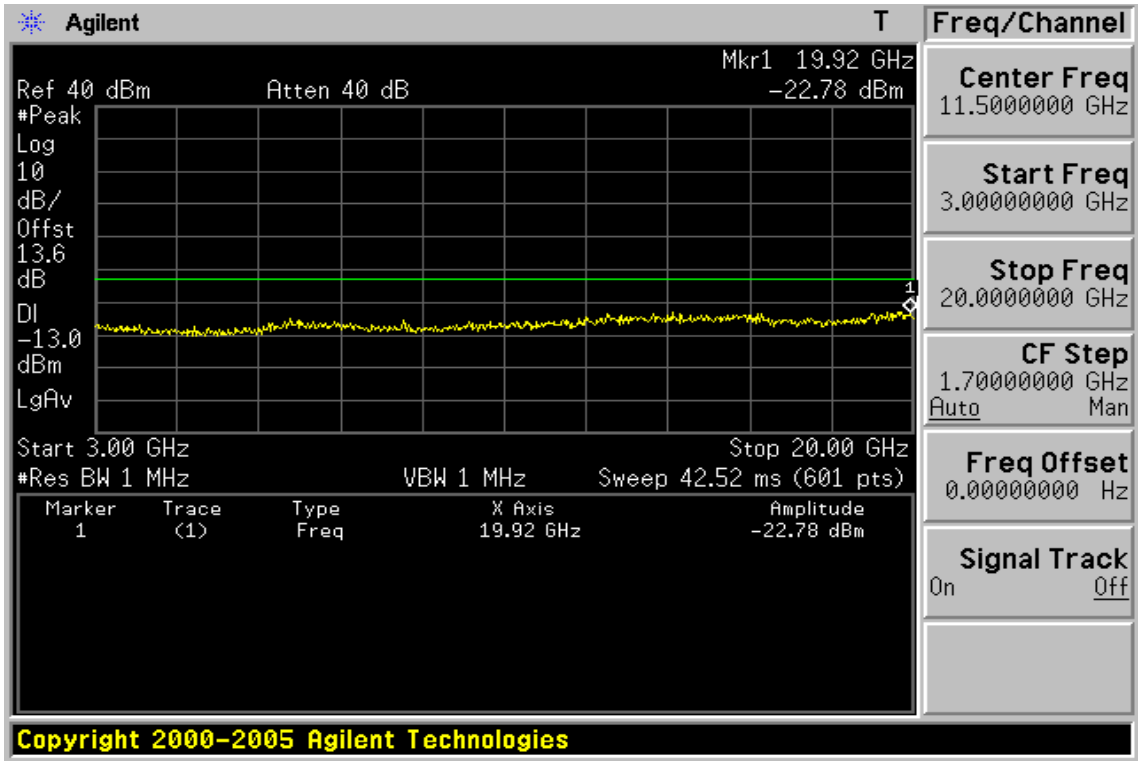
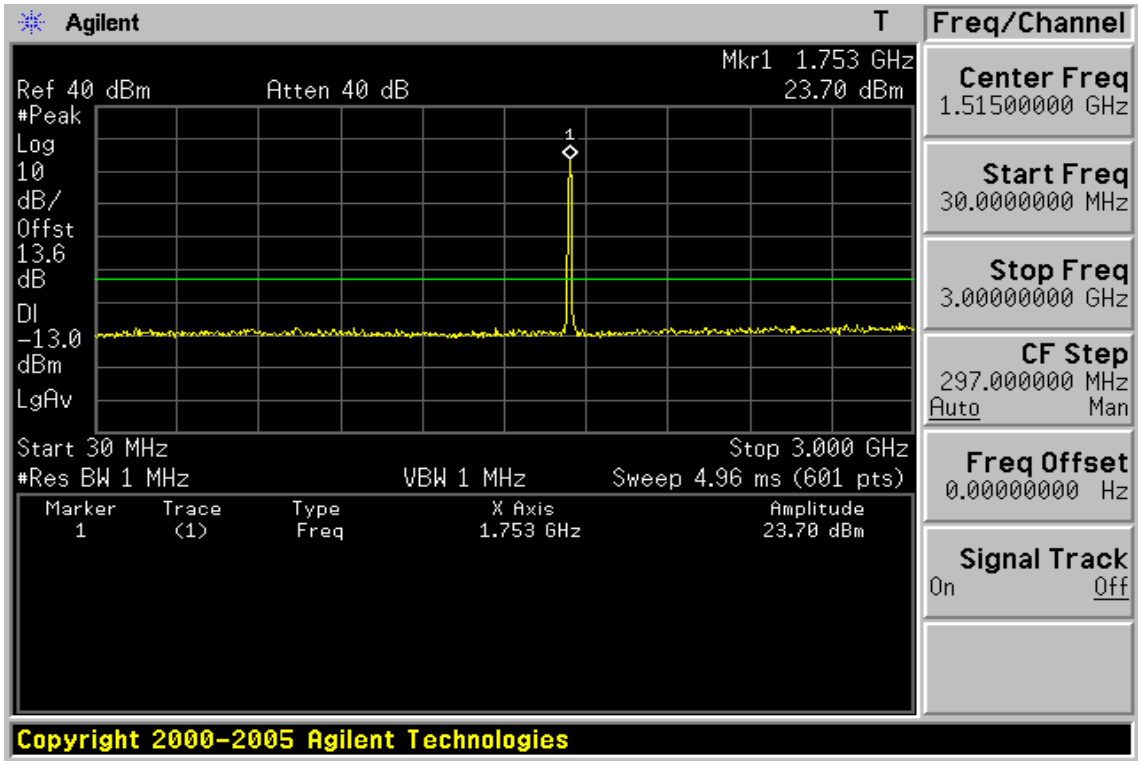


Figure 9-8: Out of Band emission at antenna terminals –HSDPA IV Channel Highest



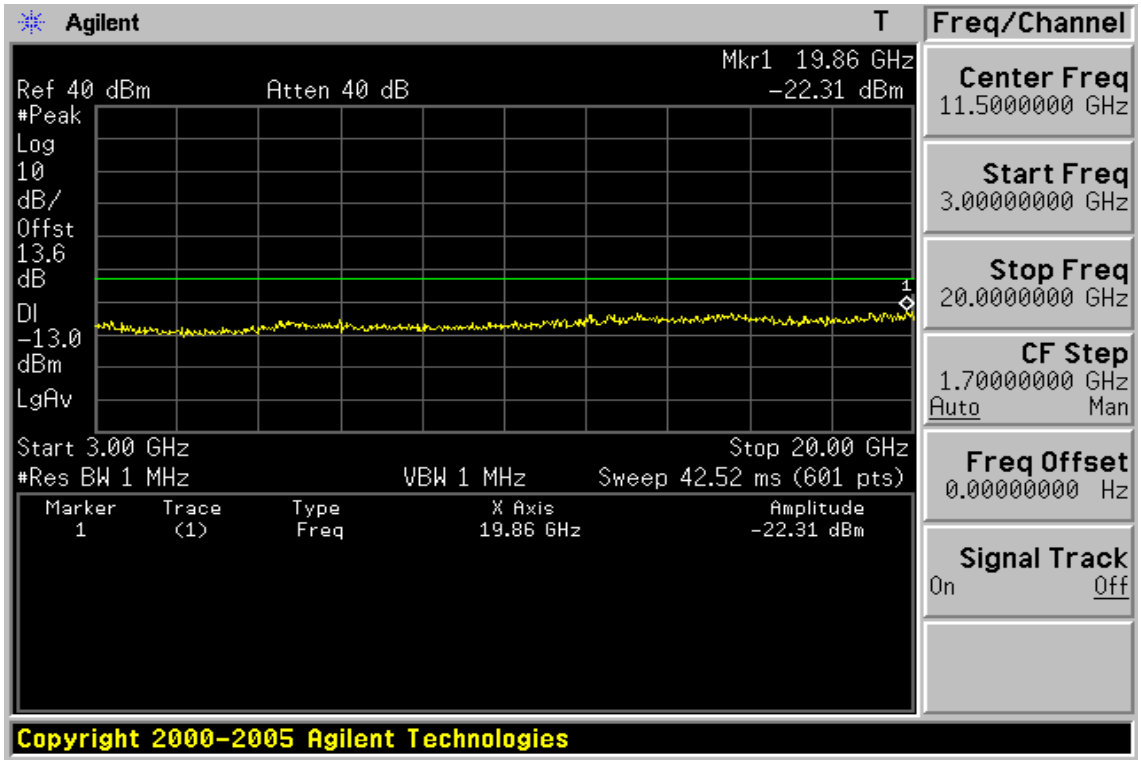


Figure 9-9: Band edge emission at antenna terminals –HSDPA IV Channel Lowest

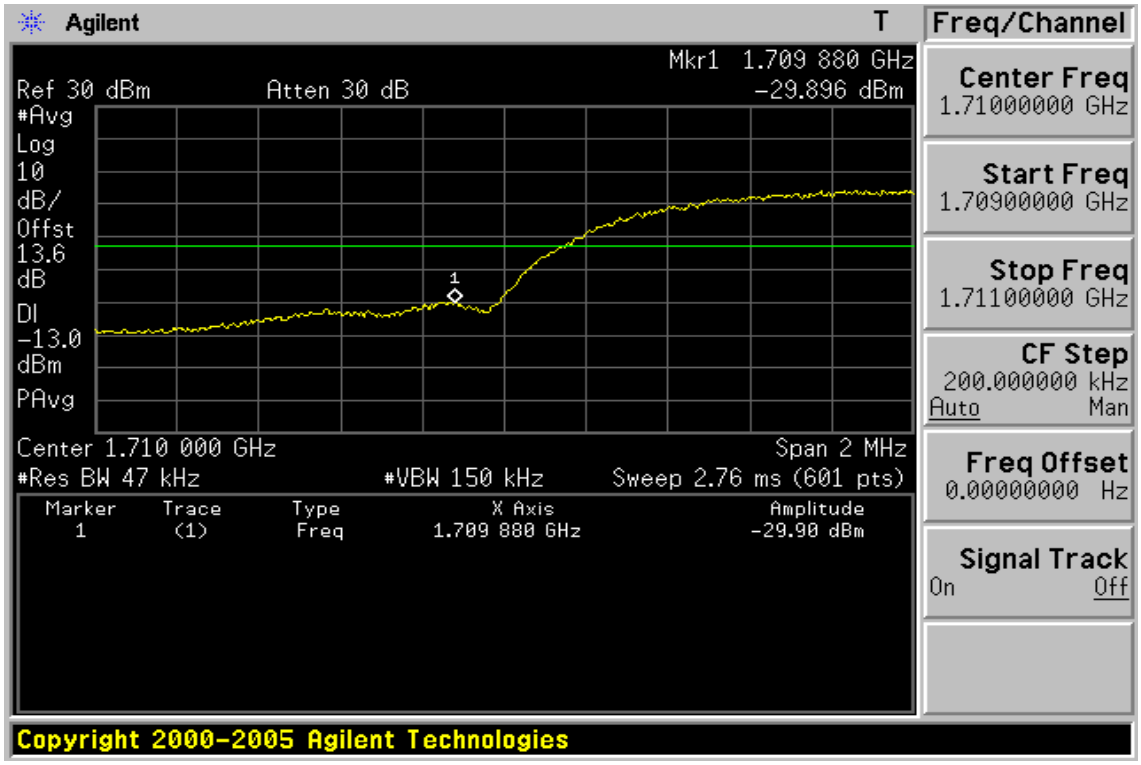
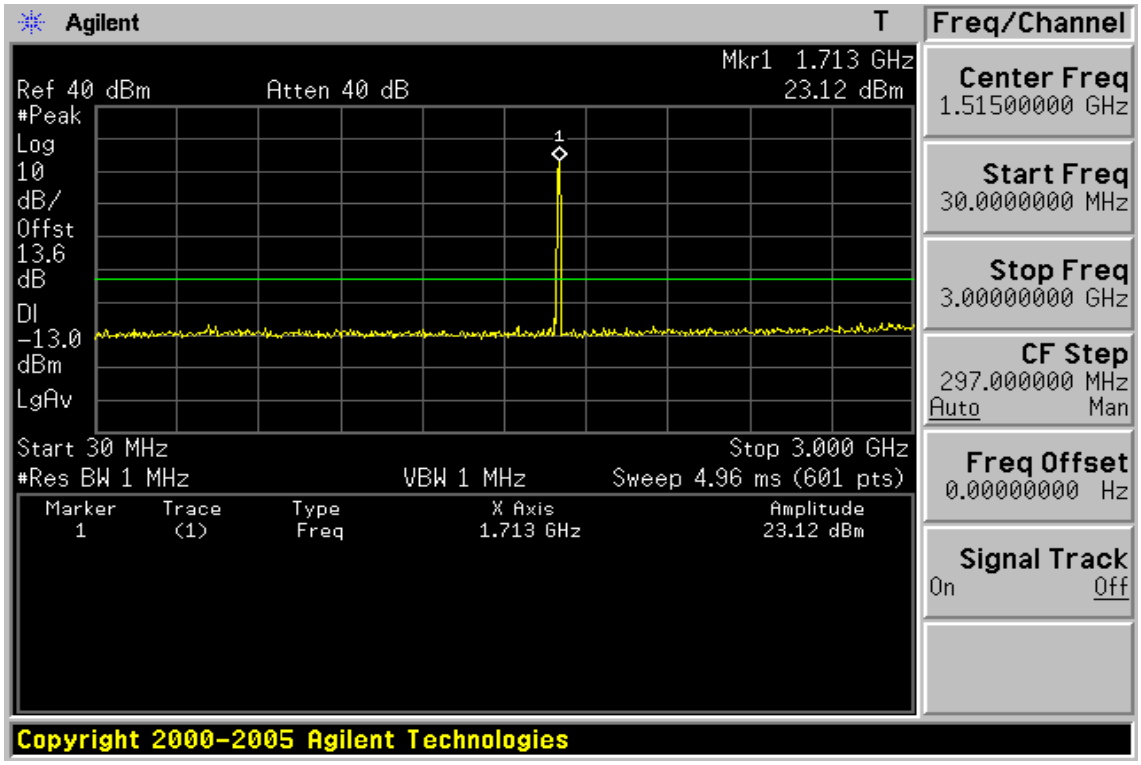


Figure 9-10: Band edge emission at antenna terminals –HSDPA IV Channel Highest

Figure 9-11: Out of Band emission at antenna terminals –HSUPA IV Channel Lowest



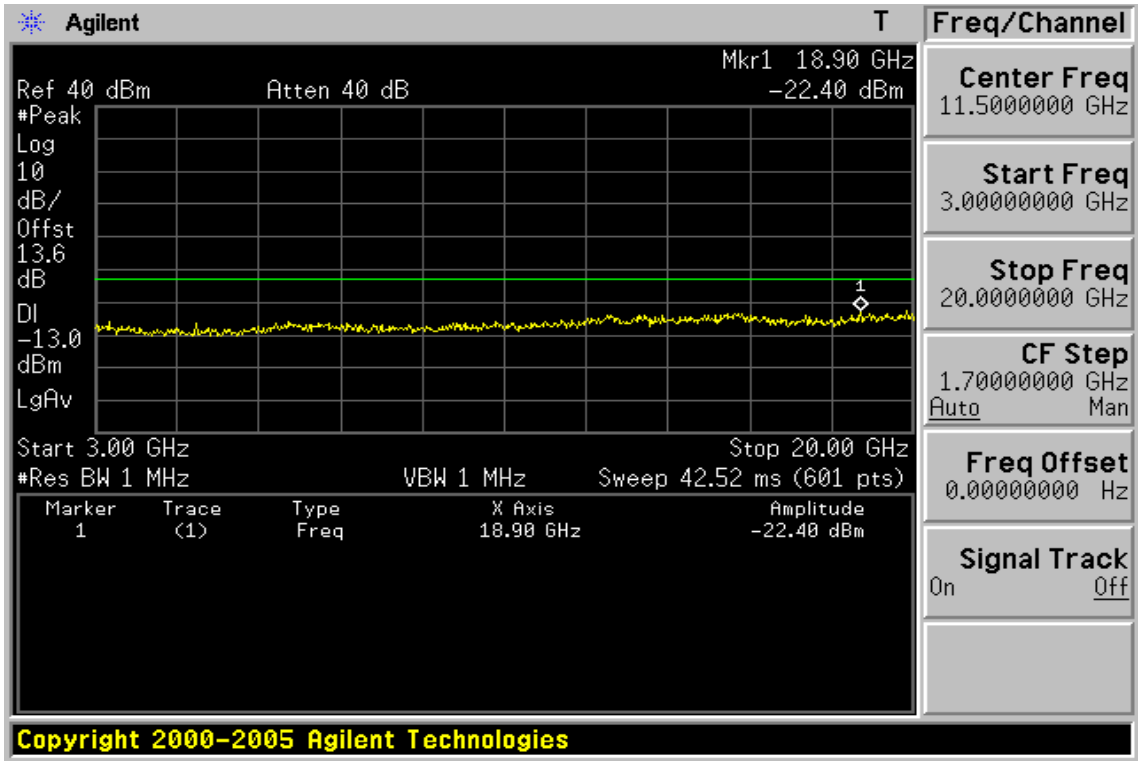
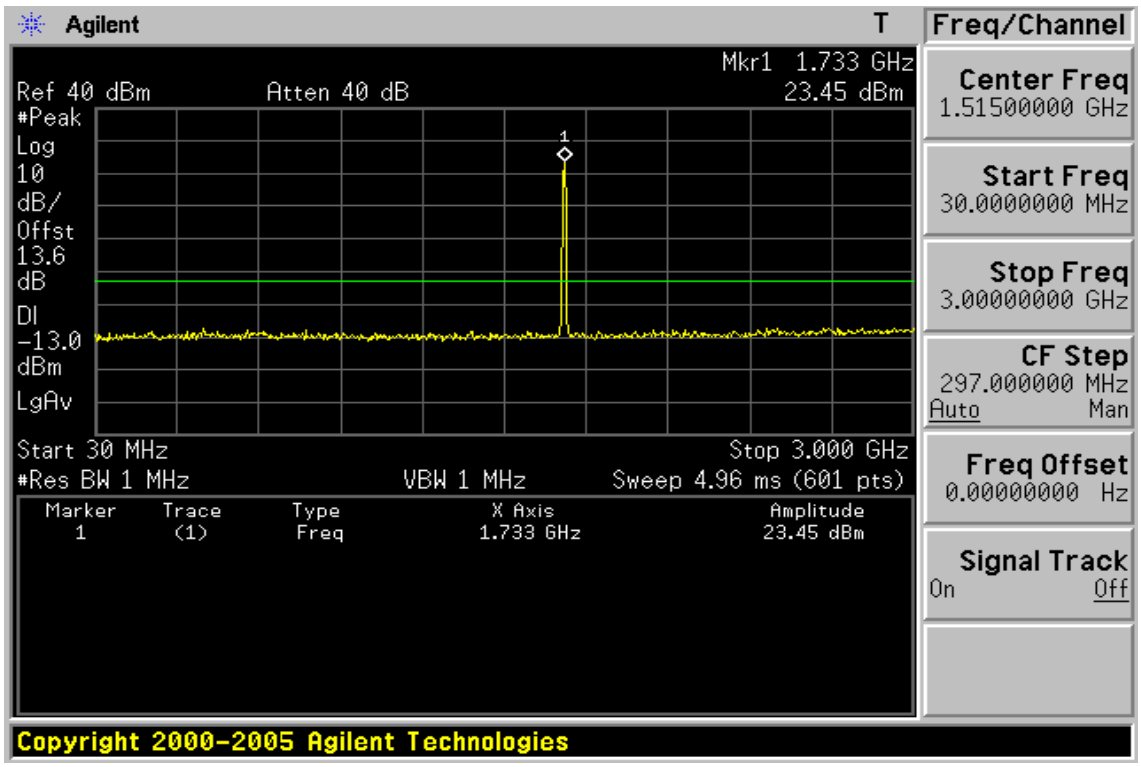


Figure 9-12 Out of Band emission at antenna terminals –HSUPA IV Channel Mid



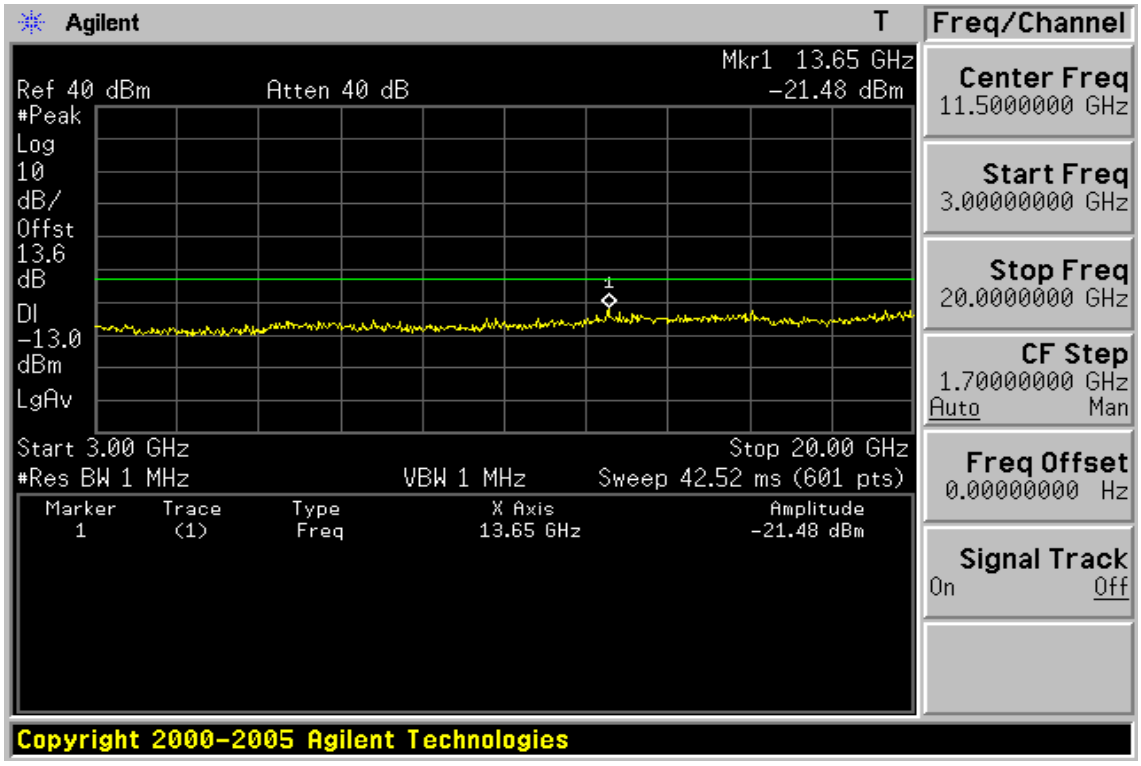
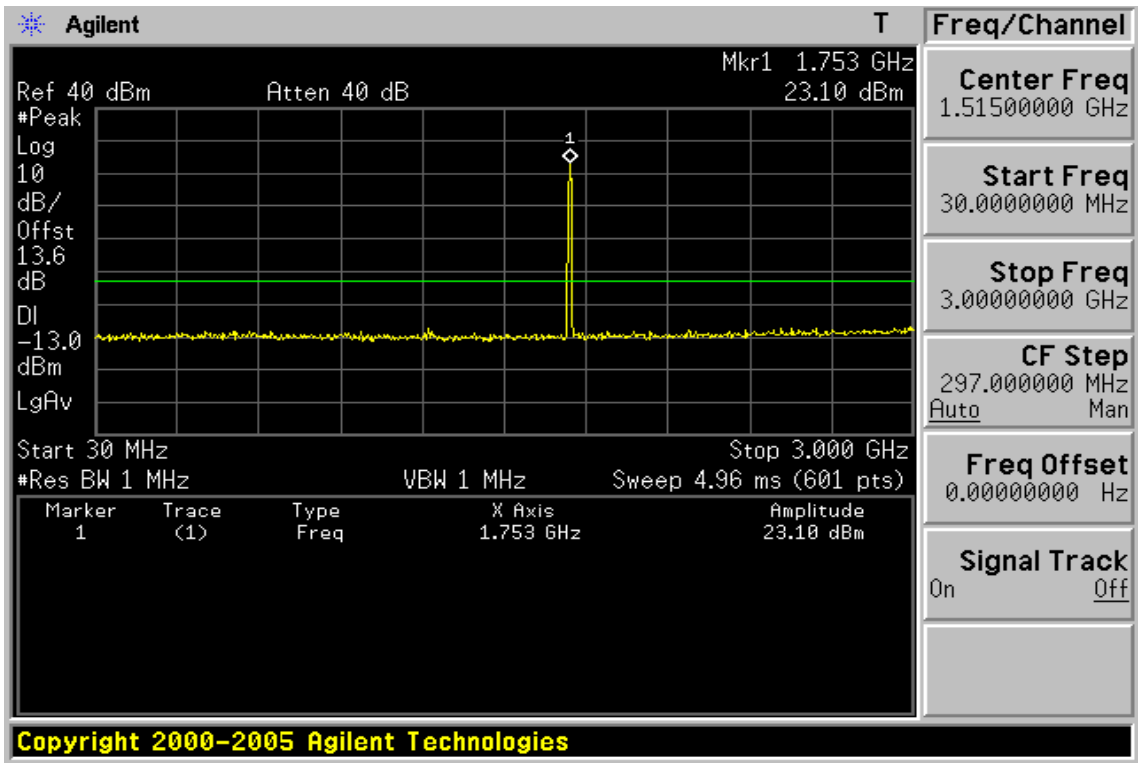


Figure 9-13: Out of Band emission at antenna terminals –HSUPA IV Channel Highest



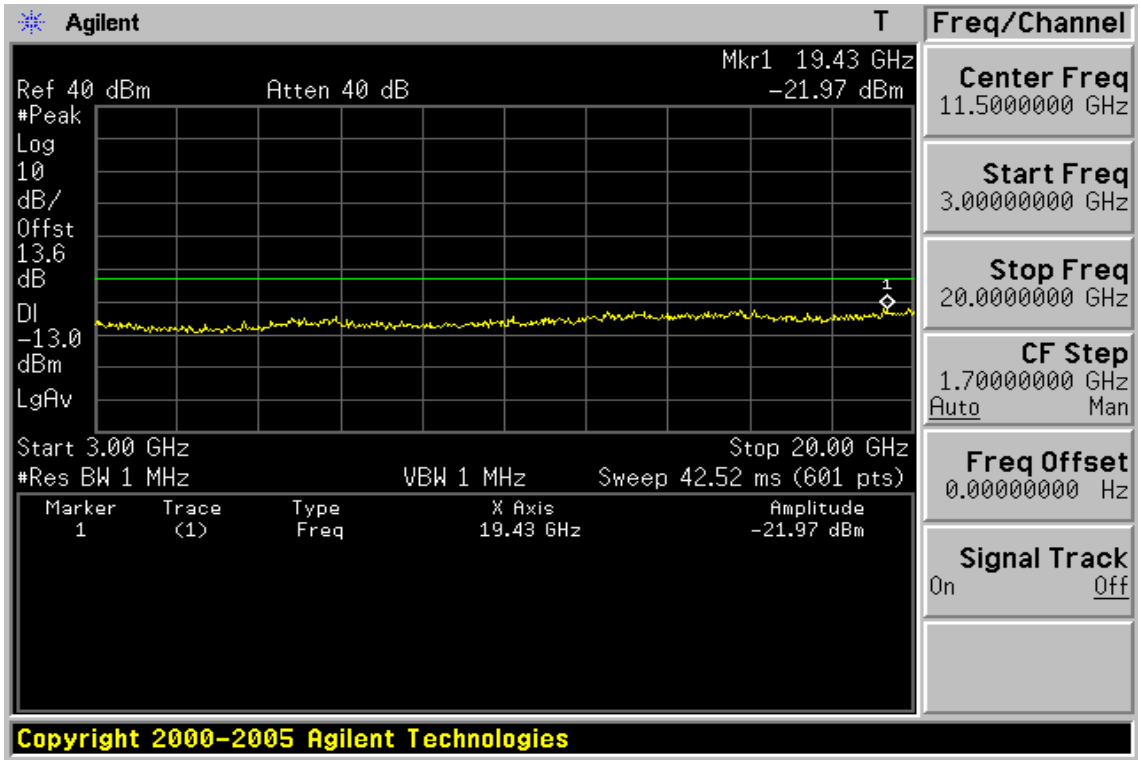


Figure 9-14: Band edge emission at antenna terminals –HSUPA IV Channel Lowest

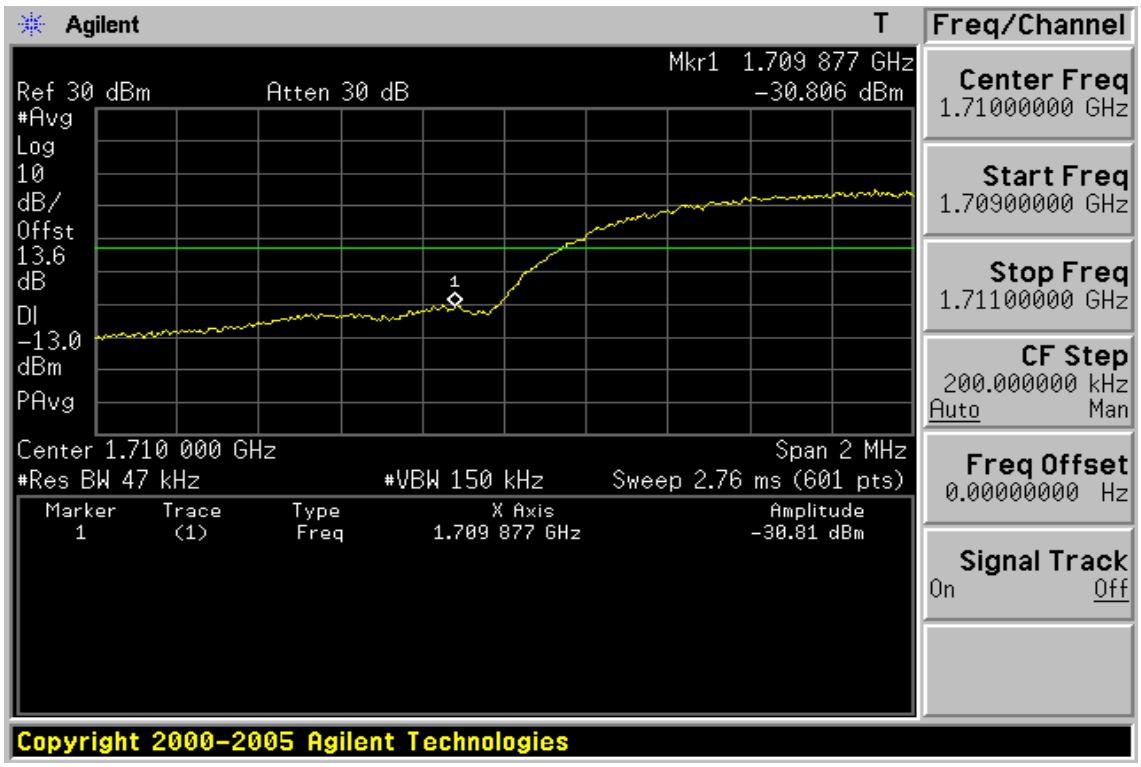


Figure 9-15: Band edge emission at antenna terminals –HSUPA IV Channel Highest

10. FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT

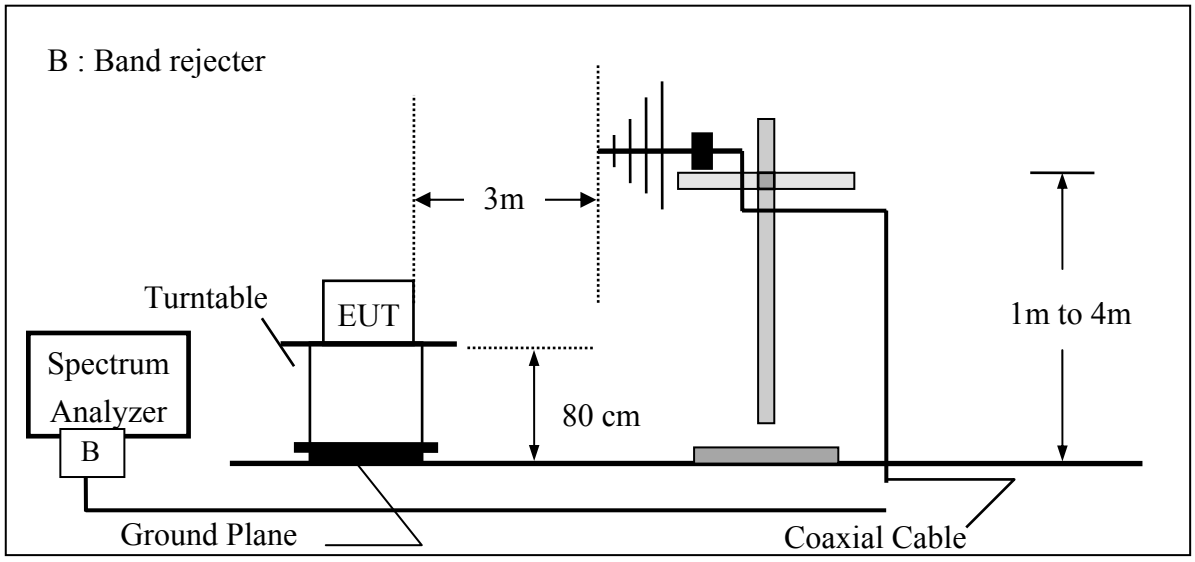
10.1 Standard Applicable

According to FCC §2.1053

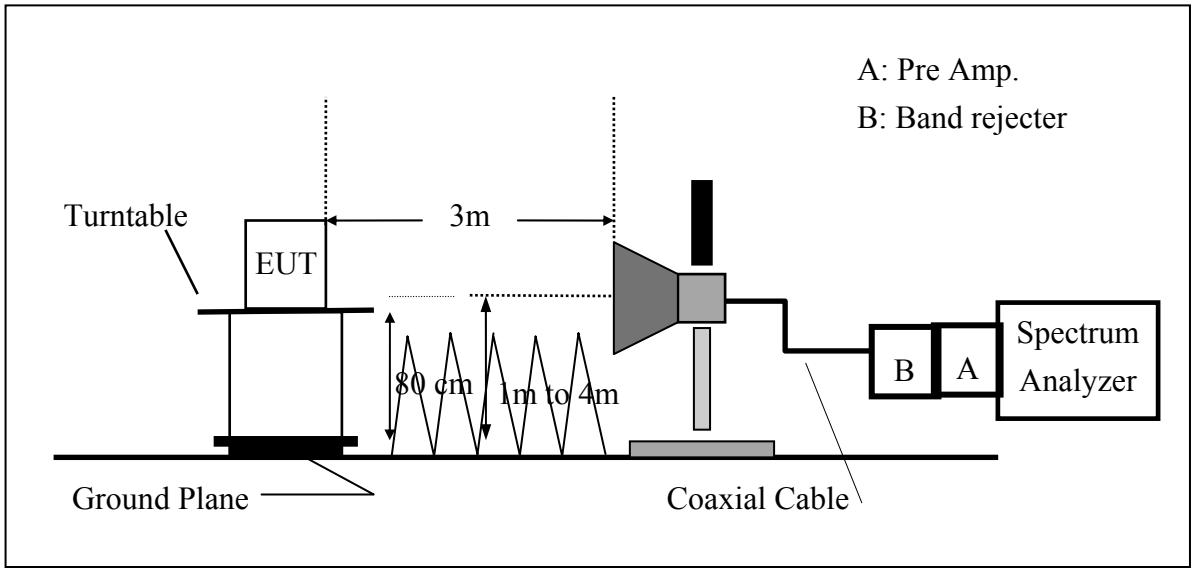
FCC §27.53(g) (h) the magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specified in the instruction manual and/ or alignment procedure, shall not be less than 43 + 10 log (mean output power in watts) dBc below the mean power output outside a license's frequency block (-13dBm). §27.53 (m) (4) shall not be less than 55 +10log(mean output power in watt) dBc below the mean power output outside a license's frequency block (-25dBm).

10.2 EUT Setup (Block Diagram of Configuration)

Radiated Emission Test Set-Up, Frequency Below 1000MHz



Radiated Emission Test Set-UP Frequency Over 1 GHz



10.3 Measurement Procedure

The EUT was placed on a non-conductive; the measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

The frequency range up to tenth harmonic was investigated for each of three fundamental frequencies (low, middle and high channels). Once spurious emission was identified, the power of the emission was determined using the substitution method.

The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and the spurious emissions frequency.

ERP = S.G. output (dBm) + Antenna Gain(dBd) – Cable Loss (dB)

EIRP = S.G. output (dBm) + Antenna Gain(dBi) – Cable Loss (dB)

The setting of the measurement spectrum is set as follows: Detector = Peak, RBW/VBW = 100K for below 1GHz, and RBW/VBW = 1MHz for above 1GHz.

10.4 Measurement Equipment Used:

Refer to section 2.4 for details

10.5 Measurement Result

Radiated Spurious Emission Measurement Result: HSDPA IV Mode

Operation Band	:HSDPA BIV	Test Date	:2014-03-05
ARFCN	:CH 1312	Temp./Humi.	:21.5 deg_C / 64 RH
Fundamental Frequency	:1712.4 MHz	Engineer	:Tin
Operation Mode	:TX LOW		
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Freq.	Note	EIRP	SG Output Level	Antenna Gain	Cable Loss	Limit	Safe Margin
MHz	F/H/E/S	dBm	dBm	dBi	dB	dBm	dB
82.38	S	-64.38	-62.52	-0.81	-1.05	-13.00	-51.38
287.05	S	-70.04	-73.76	5.55	-1.83	-13.00	-57.04
416.06	S	-69.43	-73.19	5.88	-2.12	-13.00	-56.43
751.68	S	-64.01	-66.99	5.84	-2.85	-13.00	-51.01
808.91	S	-63.92	-67.02	6.08	-2.98	-13.00	-50.92
917.55	S	-63.41	-65.92	5.80	-3.29	-13.00	-50.41
3424.80	H	-40.93	-42.37	7.99	-6.55	-13.00	-27.93
5137.20	H	---					
6849.60	H	---					
8562.00	H	---					
10274.40	H	---					
11986.80	H	---					
13699.20	H	---					
15411.60	H	---					
17124.00	H	---					

EIRP(dBm) = SG Level(dBm) + Antenna Gain(dBd) + Cable Loss(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.
"---" : denotes Noise Floor.

Operation Band	:HSDPA BIV	Test Date	:2014-03-05
ARFCN	:CH 1312	Temp./Humi.	:21.5 deg_C / 64 RH
Fundamental Frequency	:1712.4 MHz	Engineer	:Tin
Operation Mode	:TX LOW		
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Freq.	Note	EIRP	SG Output Level	Antenna Gain	Cable Loss	Limit	Safe Margin
MHz	F/H/E/S	dBm	dBm	dBi	dB	dBm	dB
94.02	S	-73.36	-73.53	1.37	-1.20	-13.00	-60.36
262.80	S	-70.64	-74.57	5.68	-1.75	-13.00	-57.64
466.50	S	-70.77	-74.27	5.77	-2.26	-13.00	-57.77
581.93	S	-67.88	-71.06	5.75	-2.57	-13.00	-54.88
706.09	S	-64.08	-67.33	6.00	-2.75	-13.00	-51.08
913.67	S	-63.25	-65.77	5.80	-3.28	-13.00	-50.25
3424.80	H	-54.68	-56.12	7.99	-6.55	-13.00	-41.68
5137.20	H	---					
6849.60	H	---					
8562.00	H	---					
10274.40	H	---					
11986.80	H	---					
13699.20	H	---					
15411.60	H	---					
17124.00	H	---					

EIRP(dBm) = SG Level(dBm) + Antenna Gain(dBd) + Cable Loss(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.
"---" : denotes Noise Floor.

Operation Band	:HSDPA BIV	Test Date	:2014-03-05
ARFCN	:CH 1413	Temp./Humi.	:21.5 deg_C / 64 RH
Fundamental Frequency	:1732.6 MHz	Engineer	:Tin
Operation Mode	:TX MID		
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Freq.	Note	EIRP	SG Output Level	Antenna Gain	Cable Loss	Limit	Safe Margin
MHz	F/H/E/S	dBm	dBm	dBi	dB	dBm	dB
100.81	S	-71.67	-71.40	0.94	-1.20	-13.00	-58.67
287.05	S	-70.67	-74.39	5.55	-1.83	-13.00	-57.67
436.43	S	-70.38	-73.97	5.76	-2.18	-13.00	-57.38
602.30	S	-65.74	-68.73	5.61	-2.62	-13.00	-52.74
783.69	S	-63.15	-66.24	6.01	-2.92	-13.00	-50.15
901.06	S	-63.04	-65.58	5.81	-3.26	-13.00	-50.04
3465.20	H	-44.67	-46.19	8.10	-6.59	-13.00	-31.67
5197.80	H	---					
6930.40	H	---					
8663.00	H	---					
10395.60	H	---					
12128.20	H	---					
13860.80	H	---					
15593.40	H	---					
17326.00	H	---					

EIRP(dBm) = SG Level(dBm) + Antenna Gain(dBd) + Cable Loss(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.
"---" : denotes Noise Floor.

Operation Band	:HSDPA BIV	Test Date	:2014-03-05
ARFCN	:CH 1413	Temp./Humi.	:21.5 deg_C / 64 RH
Fundamental Frequency	:1732.6 MHz	Engineer	:Tin
Operation Mode	:TX MID		
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Freq.	Note	EIRP	SG Output Level	Antenna Gain	Cable Loss	Limit	Safe Margin
MHz	F/H/E/S	dBm	dBm	dBi	dB	dBm	dB
182.29	S	-73.18	-75.05	3.34	-1.47	-13.00	-60.18
337.49	S	-69.86	-74.09	6.18	-1.95	-13.00	-56.86
409.27	S	-70.52	-74.33	5.92	-2.10	-13.00	-57.52
640.13	S	-64.25	-67.58	5.99	-2.67	-13.00	-51.25
767.20	S	-63.12	-66.16	5.92	-2.88	-13.00	-50.12
947.62	S	-63.05	-65.50	5.78	-3.33	-13.00	-50.05
3465.20	H	-54.78	-56.30	8.10	-6.59	-13.00	-41.78
5197.80	H	---					
6930.40	H	---					
8663.00	H	---					
10395.60	H	---					
12128.20	H	---					
13860.80	H	---					
15593.40	H	---					
17326.00	H	---					

EIRP(dBm) = SG Level(dBm) + Antenna Gain(dBd) + Cable Loss(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.
"---" : denotes Noise Floor.

Operation Band	:HSDPA BIV	Test Date	:2014-03-05
ARFCN	:CH 1513	Temp./Humi.	:21.5 deg_C / 64 RH
Fundamental Frequency	:1752.6 MHz	Engineer	:Tin
Operation Mode	:TX HIGH		
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Freq.	Note	EIRP	SG Output Level	Antenna Gain	Cable Loss	Limit	Safe Margin
MHz	F/H/E/S	dBm	dBm	dBi	dB	dBm	dB
100.81	S	-72.00	-71.74	0.94	-1.20	-13.00	-59.00
290.93	S	-70.31	-74.07	5.60	-1.84	-13.00	-57.31
456.80	S	-70.78	-74.27	5.72	-2.24	-13.00	-57.78
571.26	S	-68.35	-71.65	5.84	-2.55	-13.00	-55.35
704.15	S	-63.35	-66.61	6.01	-2.75	-13.00	-50.35
765.26	S	-63.71	-66.74	5.91	-2.88	-13.00	-50.71
3505.20	H	-49.81	-51.39	8.21	-6.62	-13.00	-36.81
5257.80	H	---					
7010.40	H	---					
8763.00	H	---					
10515.60	H	---					
12268.20	H	---					
14020.80	H	---					
15773.40	H	---					
17526.00	H	---					

EIRP(dBm) = SG Level(dBm) + Antenna Gain(dBd) + Cable Loss(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.
“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.
“---“ : denotes Noise Floor.

Operation Band	:HSDPA BIV	Test Date	:2014-03-05
ARFCN	:CH 1513	Temp./Humi.	:21.5 deg_C / 64 RH
Fundamental Frequency	:1752.6 MHz	Engineer	:Tin
Operation Mode	:TX HIGH		
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Freq.	Note	EIRP	SG Output Level	Antenna Gain	Cable Loss	Limit	Safe Margin
MHz	F/H/E/S	dBm	dBm	dBi	dB	dBm	dB
145.43	S	-72.17	-70.43	-0.37	-1.37	-13.00	-59.17
247.28	S	-70.40	-74.27	5.57	-1.70	-13.00	-57.40
373.38	S	-70.80	-74.93	6.15	-2.02	-13.00	-57.80
520.82	S	-68.64	-72.20	5.97	-2.41	-13.00	-55.64
696.39	S	-63.66	-66.96	6.03	-2.74	-13.00	-50.66
951.50	S	-61.98	-64.32	5.68	-3.34	-13.00	-48.98
3505.20	H	-53.70	-55.29	8.21	-6.62	-13.00	-40.70
5257.80	H	---					
7010.40	H	---					
8763.00	H	---					
10515.60	H	---					
12268.20	H	---					
14020.80	H	---					
15773.40	H	---					
17526.00	H	---					

EIRP(dBm) = SG Level(dBm) + Antenna Gain(dBd) + Cable Loss(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.
"---" : denotes Noise Floor.

11. FREQUENCY STABILITY V.S. TEMPERATURE MEASUREMENT

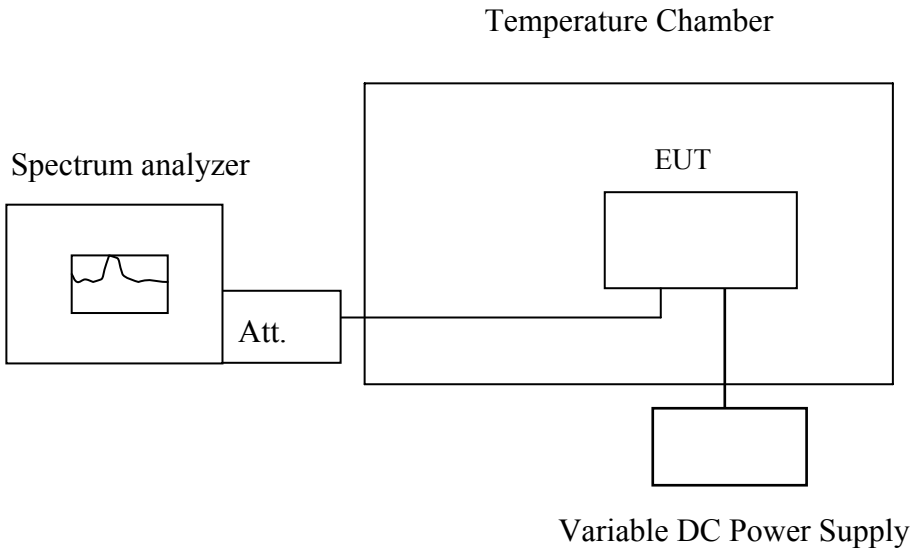
11.1. Standard Applicable:

According to FCC §2.1055(a) (1)

Frequency Tolerance: +/-2.5ppm for 1700MHz band

The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations

11.2. Test Set-up:



Note: Measurement setup for testing on Antenna connector

11.3. Measurement Procedure:

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to –30°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.

11.4. Measurement Equipment Used:

Refer to section 2.4 in this report.

11.5. Measurement Result:

Reference Frequency: WCDMA Mid Channel 1732.6 MHz				
Limit: +/- 2.5 ppm = 4331 Hz				
Power Supply	Environment	Frequency	Delta (Hz)	Limit (Hz)
Vdc	Temperature (°C)	(Hz)		
3.7	50	173259989	-4	4331
3.7	40	173259993	0	4331
3.7	30	173259991	-2	4331
3.7	20	173259993	0	4331
3.7	10	173260005	12	4331
3.7	0	173259997	4	4331
3.7	-10	173259992	-1	4331
3.7	-20	173260002	9	4331
3.7	-30	173260006	13	4331

Note: The battery is rated 3.7Vdc.

12. FREQUENCY STABILITY V.S. VOLTAGE MEASUREMENT

12.1. Standard Applicable:

According to FCC §2.1055(d) (2)

Frequency Tolerance: +/-2.5ppm for 1700MHz band

The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations.

12.2. Test Set-up:

Refer to section 11.2 in this report

12.3. Measurement Procedure:

Set chamber temperature to 25℃. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation (+/- 15%) and endpoint as declared by the manufacturer, record the maximum frequency change.

12.4. Measurement Equipment Used:

Refer to section 2.4 in this report

12.5. Measurement Result:

Reference Frequency: WCDMA Mid Channel 1732.6 MHz				
Limit: +/- 2.5 ppm = 4331 Hz				
Power Supply	Environment	Frequency	Delta (Hz)	Limit (Hz)
Vdc	Temperature (℃)	(Hz)		
4.1	20	173259990	-3	4331
3.7	20	173259993	0	4331
3.3	20	173260014	21	4331
shutdown point				
2.7	20	173260015	22	4331

13. PEAK TO AVERAGE RATIO

13.1. Standard Applicable:

According FCC FCC 27.53 (d) (5) – The peak-to-average ration (PAR) of the transmission may not exceed 13dB.

13.2. Test SET-UP (Block Diagram of Configuration):

Refer to section 2.4 in this report

13.3. Measurement Procedure:

KDB 971168 D01 is employed as the following procedure is proper adjusted accordingly:

Set resolution/measurement bandwidth ≥ signal's occupied bandwidth; & internal =1ms

Set the number of counts to a value that stabilizes the measured CCDF curve.

13.4. Measurement Equipment Used:

Refer to section 2.4 in this report

13.5. Measurement Result:

Refer to next page for plots

Figure 13-1: WCDMA Band IV Channel Low

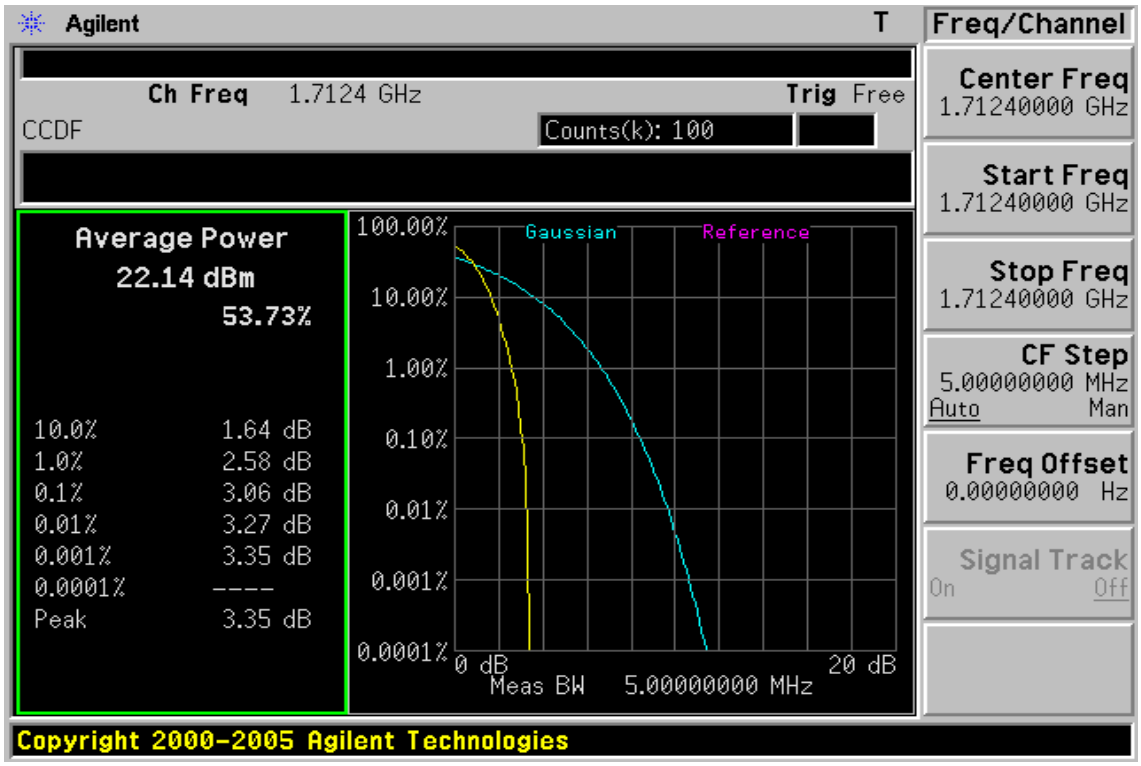


Figure 13-2: WCDMA Band IV Channel Mid

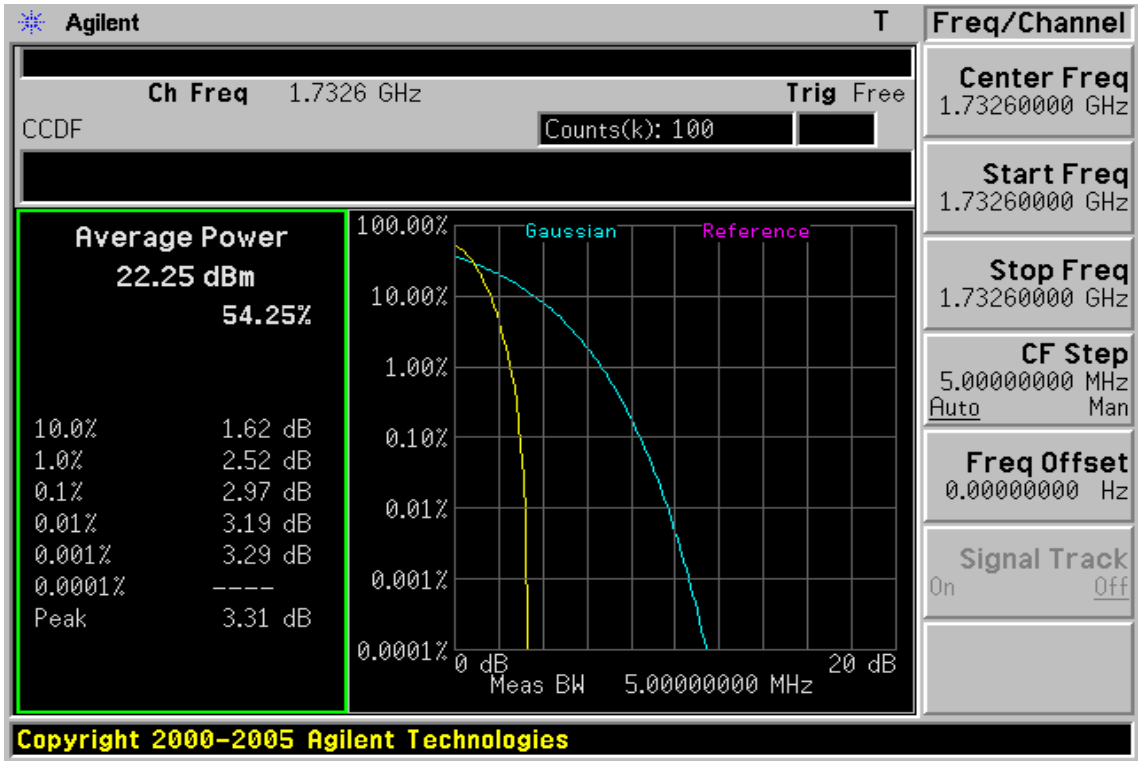


Figure 13-3: WCDMA Band IV Channel High

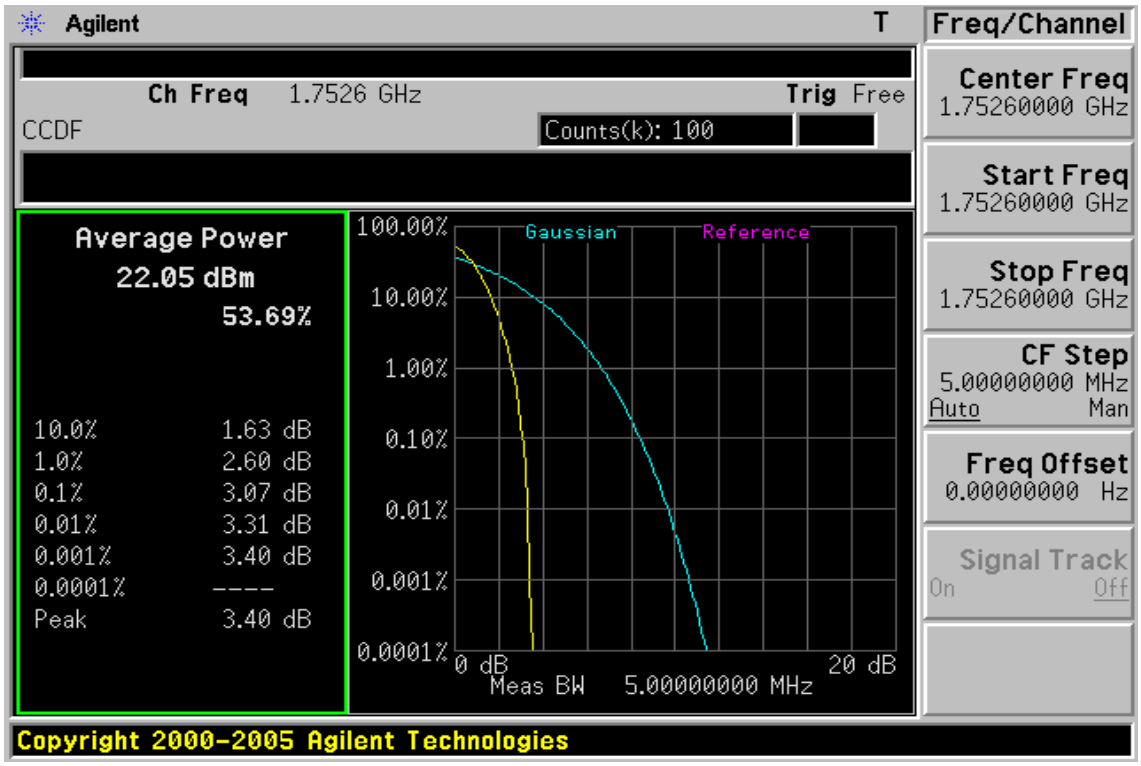


Figure 13-4: HSDPA Band IV Channel Low

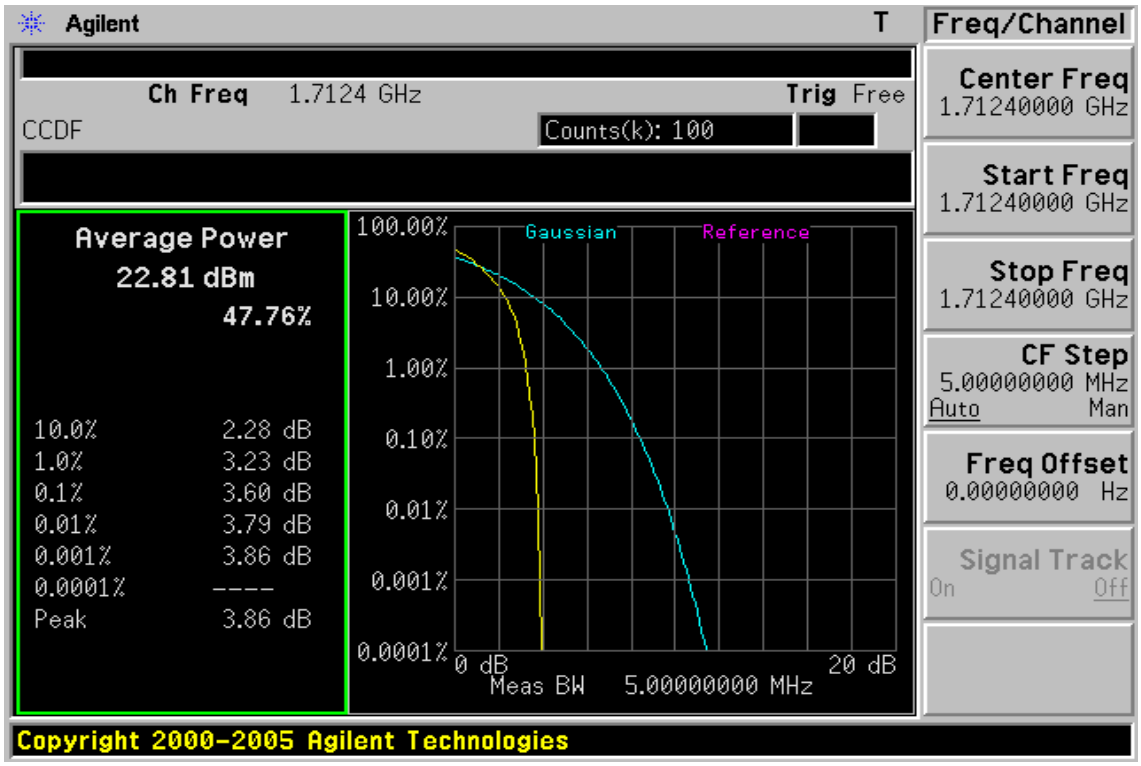


Figure 13-5: HSDPA Band IV Channel Mid

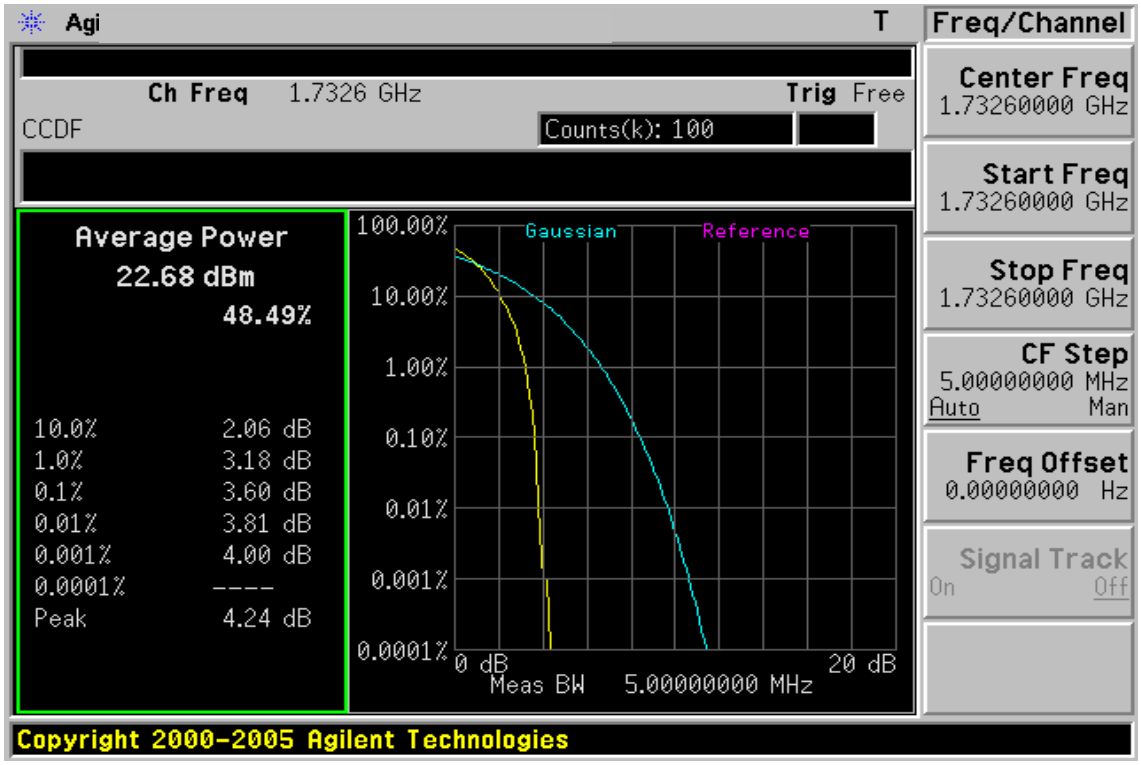


Figure 13-6: HSDPA Band IV Channel High

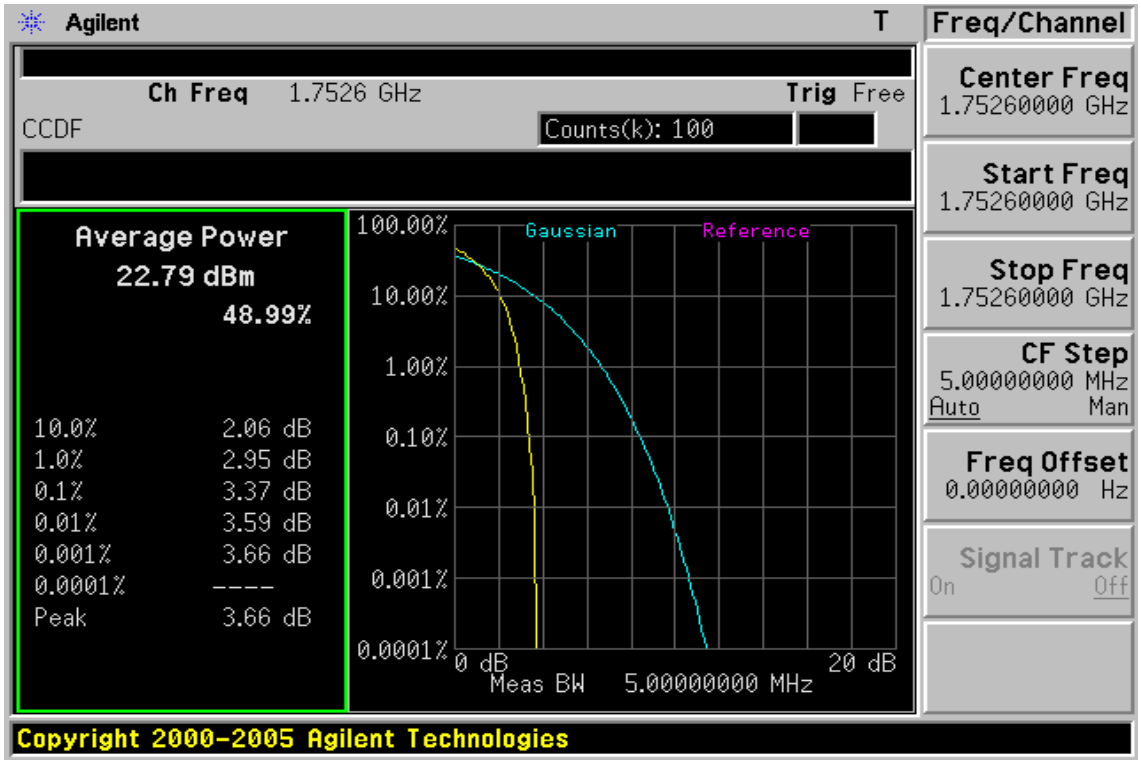


Figure 13-7: HSUPA Band IV Channel Low

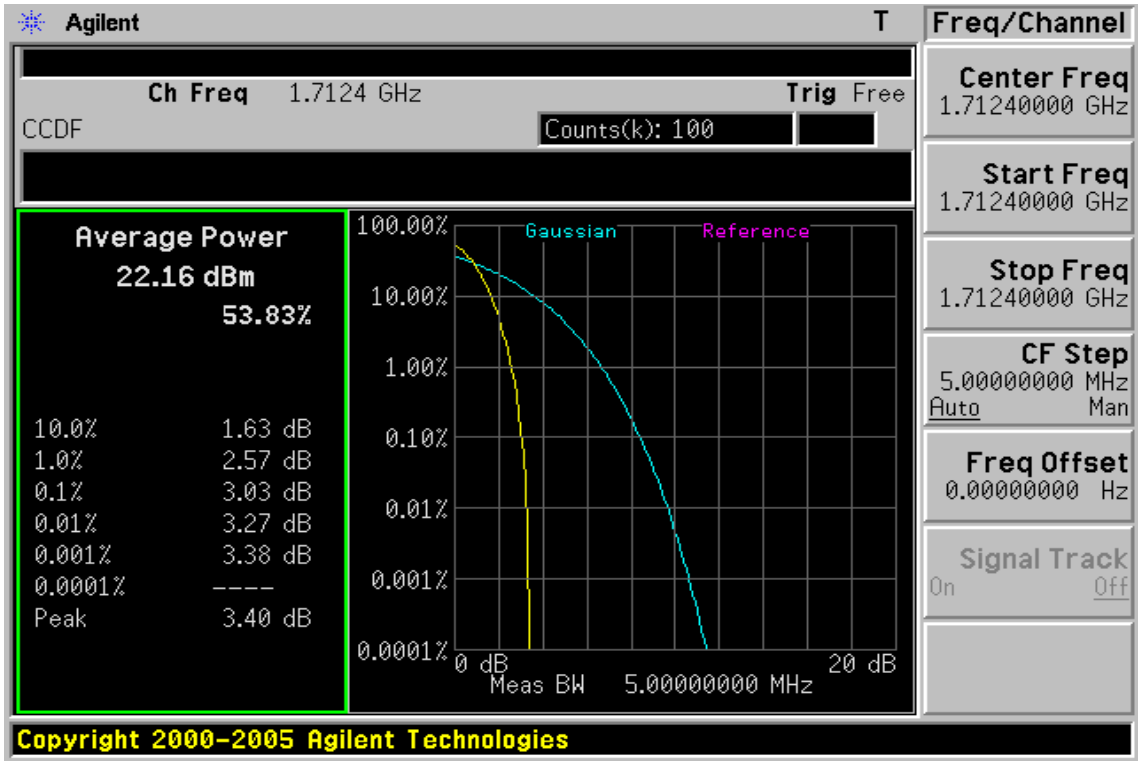


Figure 13-8: HSUPA Band IV Channel Mid

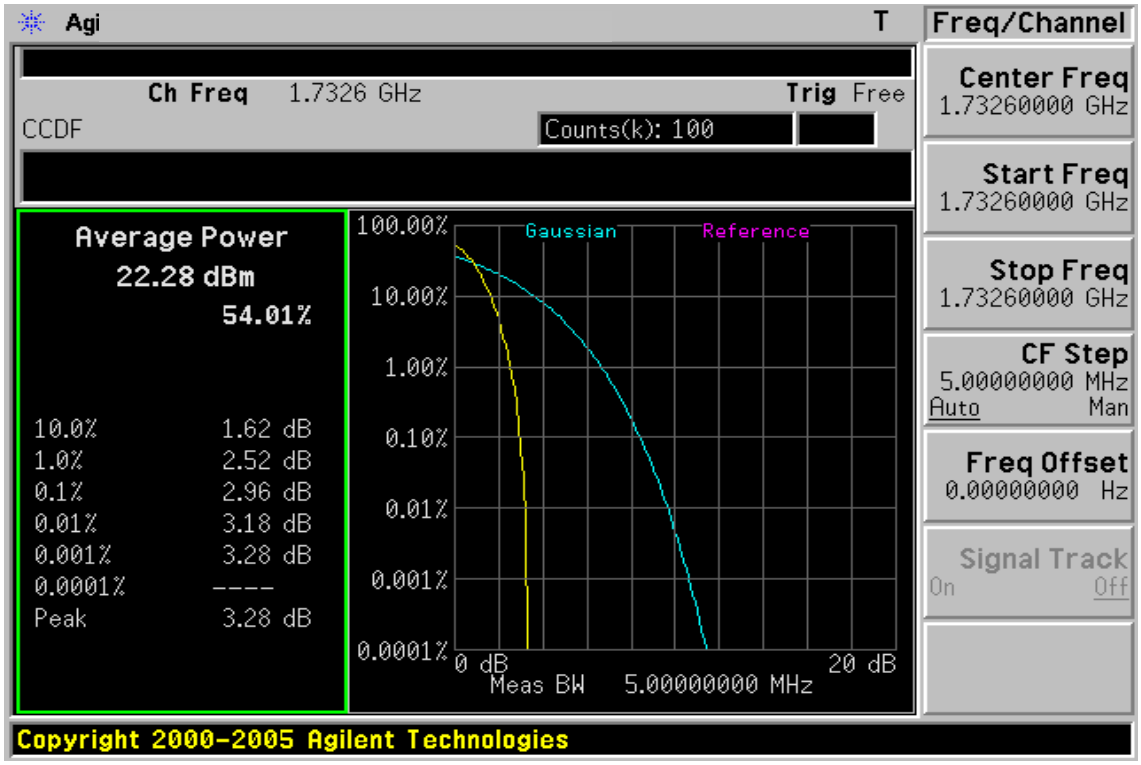
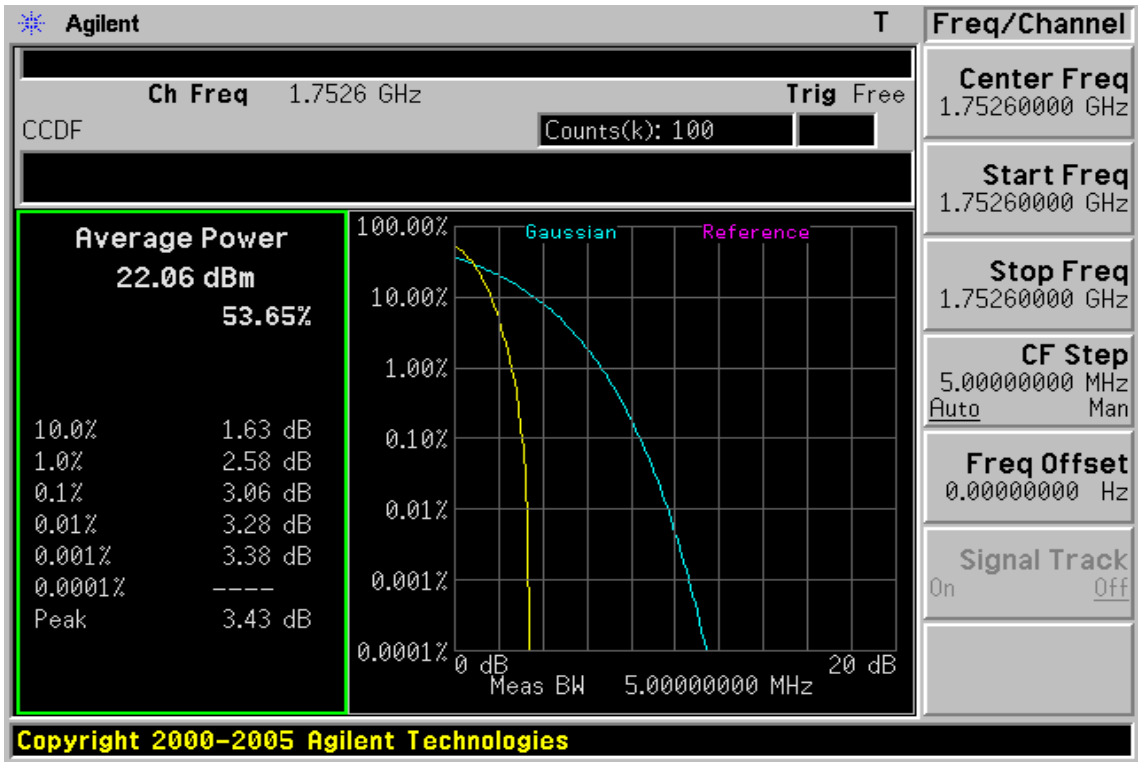


Figure 13-9: HSUPA Band IV Channel High



14. MAXIMUM PERMISSIBLE EXPOSURE (MPE)

14.1. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended to comply with § 2.1091 radiofrequency radiation exposure evaluation: mobile devices of the FCC CFR 47 Rules, CFR 1.1310 (b) Radio frequency Radiation Exposure Requirement.

14.2. Special Accessories

Not available for this EUT intended for grant.

14.3. Equipment Modifications

Not available for this EUT intended for grant.

14.4. Limitation

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	F/1500	30
1500-15000	/	/	1.0	30

F = frequency in MHz

* = Plane-wave equipment power density

14.5. Maximum Permissible Exposure (MPE) Evaluation

The evaluation and calculation as deduces below presents only worst-case that produces highest value of the result:

Operation Configuration of the Worst-Case picked up to evaluate: **HSDPA IV**

Operation in HSDPA IV band (1712.4 – 1752.6 MHz)

The EIRP of NB106-N NGFF WWAN MODULE in HSDPA IV band is 24.47dBm max. The resulted power density at a distance of 20 cm can be deducted as follows:

EUT			Measurement					
Operation Band	**Fundamental Frequency**	**CH**	**Antenna Pol.**	**S.G. Output**	**Antenna Gain**	**Cable Loss**	**EIRP**	**Limit**
	MHz		**V/H**	**dBm**	**dBi**	**dB**	**dBm**	**dBm**
HSDPA Band IV	1712.4	1312	V	20.77	5.46	-4.5	21.72	33.00
			H	23.51	5.46	-4.5	**24.47**	33.00
	1732.6	1413	V	21.10	5.40	-4.53	21.97	33.00
			H	22.87	5.40	-4.53	23.74	33.00
	1752.6	1513	V	23.16	5.34	-4.55	23.95	33.00
			H	22.55	5.34	-4.55	23.34	33.00

EIRP = 24.47dBm = 279.898mW

Power Density = EIRP*Duty Cycle/($4\pi R^2$)

= 279.898*1/($4*\pi*20^2$) = 0.05571mW/cm^2

where Duty Cycle is 1 for HSDPA IV band operation and R is 20 cm.

The MPE limit for General Population/Uncontrolled Exposure is referred to in section 14.4, and it is,

MPE limit = 1.0mW/cm^2

The resulted power density is below the limit of MPE, and therefore NB106-N NGFF WWAN MODULE in HSDPA IV band is compliant with the FCC rules on RF exposure.

15. The Derivation of Maximum Allowable Gain

15.1. The Justification How Gain is Derived:

This submittal(s) (test report) is intended to comply with Section Part 27, subpart C & subpart L of the FCC CFR 47 Rules. As per FCC's ruling part, 1.1310, the power density limit for General Population/Uncontrolled Exposure is f/1500 mW/cm2 through 300MHz to 1500MHz, and 1.0 mW/cm2 through 1.5 GHz to 100 GHz, respectively. Since this related application is characterized as mobile application as defined by FCC, the MPE is obtained at 20cm in determination for its compliance with the power density limit.
The formula listing as follows is applied in determination of Power Density:

$S = (P*G) / (4\pi *R^2)$

Where,

S = Power Density

P = Conducted Output Power Measured at Antenna Port

G = Gain of Maximum Transmitting Antenna (linear gain)

R = Separating Distance from Transmitting Antenna

This related radio application is classified as mobile device in operation of general population / uncontrolled exposure condition.

Limitation

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm2)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f2)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	F/1500	30
1500-15000	/	/	1.0	30

F = frequency in MHz

* = Plane-wave equipment power density

15.2. Maximum Linear Gain Determination using MPE

Re-arrange the formula of Power Density in terms of maximum gain,

It yields,

G = S*(4 π *R^2) - P

Where,

S = F/1500 mW/cm2 (300-1500Mhz) or 1.0 mW/cm2 (1.5GHz-100GHz)

P = Conducted Output Power Measured at Antenna Port with respect to applied band.

G = Maximum Linear Gain

R = 20cm

Maximum Linear Gain Determination using ERP/EIRP

As per 27.50 (d)(4) ERP/EIRP is limited as 1W. Maximum allowable gain that complies with them can be obtained by the following relationship.

EIRP/ERP = Maximum Allowable Gain + Maximum Burst Power as measured at antenna terminal

Re-arrange the above equation in terms of Maximum Allowable Gain, *It yields,*

Maximum Allowable Gain = EIRP/ERP – Maximum Burst Power as measured at antenna terminal

Maximum Source-based Time Average power for WCDMA/HSPA mode:

Refer to page 20, 23.44dBm for HSDPA Band IV

15.3. The Computation of Maximum Allowable Linear Gain using MPE limit

Operation in WCDMA Band IV (1712.4 – 1752.6MHz)

Given the maximum source-based time-averaged power as 23.44dBm, and MPE limit as 1.0mW/cm^2.
Therefore, antenna gain is calculated as 13.57dBi

15.4. The Computation of Maximum Allowable Linear Gain using ERP/EIRP limit

Operation in WCDMA Band IV (1712.4 – 1752.6MHz)

Given the maximum burst averaged power as 23.44dBm, and EIRP limit as 1W
Therefore, antenna gain is calculated as 6.56dBi

~ End of Report ~