
TEST REPORT

Report No.: SRMC2010-H024-E0007

Product Name: CDMA RF Repeater

Product Model: KRC 118 102/AF14

Applicant: Shenzhen Winhap Communications INC.

Manufacture: Shenzhen Winhap Communications INC.

Specification: FCC Part 24E, Part 2

(October 1, 2008 edition)

FCC ID: X7RKRC118102-AF14

The State Radio Monitoring Center

State Radio Spectrum Monitoring and Testing Center

No.80 Beilishi Road Xicheng District Beijing, China

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1. General information

1.1 Notes of the test report

The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written permission of The State Radio Monitoring Center.

The test results relate only to individual items of the samples which have been tested.

1.2 Information about the testing laboratory

Company: The State Radio Monitoring Center
State Radio Spectrum Monitoring and Testing Center
Address: No.80 Beilishi Road, Xicheng District, Beijing China
City: Beijing
Country or Region: China
Contacted person: Wang Junfeng
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Email: wangjf@srrc.org.cn

1.3 Applicant's details

Company: Shenzhen Winhap Communications INC.
Address: Unit 3A, F6.13 Building, Tian'an Cyberpark, Futian District
City: Shenzhen
Country or Region: P.R.China
Grantee Code: X7R
Contacted person: Li Bin
Tel: +86-755-83309999
Fax: +86-755-83892643
Email: libin@winhap.com

1.4 Manufacturer's details

Company: Shenzhen Winhap Communications INC.
Address: Unit 3A, F6.13 Building, Tian'an Cyberpark, Futian District
City: Shenzhen
Country or Region: P.R.China
Grantee Code: X7R
Contacted person: Li Bin
Tel: +86-755-83309999
Fax: +86-755-83892643
Email: libin@winhap.com

1.5 Application details

Date of reception of test sample: 1st Feb 2010

Date of test: 1st Feb 2010 to 24th Feb 2010

1.6 Reference specification

FCC Part 24E, Part 2 (October 1, 2008 edition)

1.7 Information of EUT

1.7.1 General information

Name of EUT	CDMA RF Repeater
FCC ID	X7RKRC118102-AF14
Frequency range	Uplink:1850~1915MHz Downlink:1930~1995MHz
Rated output power	Uplink:23.0dBm Downlink:27.0dBm
Modulation type	OQPSK
Emission Designator	1M25F9W
Duplex mode	FDD
Duplex spacing	80MHz
Maximum Gain	Uplink:80dB Downlink:85dB
Gain Control Range	≥30dB (1dB/Step)
Antenna type	External
Antenna connector	50Ω N-Type (Female)
Power Supply	90 ~ 270Va.c., 45~65Hz
Extreme Temperature	Lowest: -10°C Highest: +50°C
Extreme Voltage	Minimum: 102Va.c. Maximum: 138Va.c. (Note: The Reference input voltage is 120 Va.c.)
HW Version	V0.1
SW Version	GM_V1.0.2_*.HEX


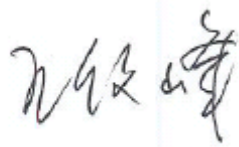

1.7.2 EUT details

Name	Model	IMEI
CDMA RF Repeater	KRC 118 102/AF14	2010010701

2. Test information

2.1 Summary of the test results

No.	Test case	FCC reference	Verdict
1	RF Power Output	2.1046/24.232(c)	Pass
2	Occupied Bandwidth	2.1049	Pass
3	Spurious Emissions at antenna terminals	2.1051/24.238(a)	Pass
4	Band Edges Compliance	2.1051/24.238(a)	Pass
5	Frequency Stability	2.1055/24.135/24.235	Pass
6	Radiated Spurious Emissions	2.1053/24.238(a)	Pass

This Test Report Is Issued by: Mr. Song Qizhu, Director of the test lab 	Checked by: 
Tested by: 	Issued date: 2010.03.03

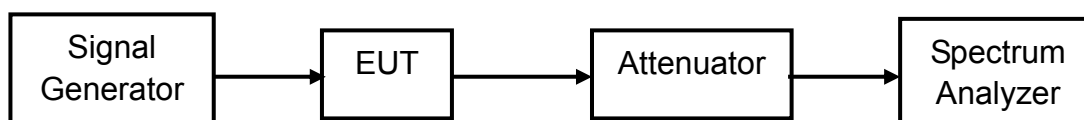
2.2 Test result

2.2.1 RF Power Output-FCC Part2.1046/24.232(c)

Ambient condition:

Temperature	Relative humidity	Pressure
26°C	54%	101.5kPa

Test Setup:



Test procedure:

The EUT was connected to the signal generator and the spectrum analyzer via the main RF connector, and through an appropriate attenuator. The EUT was controlled to transmit its maximum power. Then the maximum channel power of the EUT can be measured by the spectrum analyzer. The loss between the main RF connector of the EUT and the input port of the spectrum analyzer will be taken into consideration.

The measurement will be conducted at the EUT input and output ports in downlink and uplink transmit modes of operation at Bottom, Middle and Top channels.

Test result:

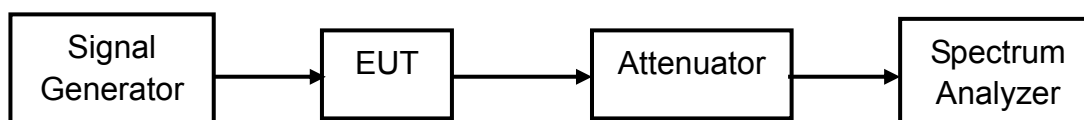
Test Mode (Modulation type)	Direction	Channel (Frequency)	RF Power Output (dBm)
CDMA (OQPSK)	Uplink	Bottom (1851.25MHz)	22.56
		Middle (1887.50MHz)	22.97
		Top (1913.75MHz)	22.08
	Downlink	Bottom (1931.25MHz)	26.66
		Middle (1967.50MHz)	26.42
		Top (1993.75MHz)	26.89
Limit	2W (33dBm)		
Conclusion	Complies		

2.2.2 Occupied Bandwidth-FCC Part2.1049

Ambient condition:

Temperature	Relative humidity	Pressure
26°C	54%	101.5kPa

Test Setup:



Test procedure:

The EUT was connected to the signal generator and the spectrum analyzer via the main RF connector, and through an appropriate attenuator. The EUT was controlled to transmit its maximum power. Then the bandwidth of 99% power can be measured by the spectrum analyzer.

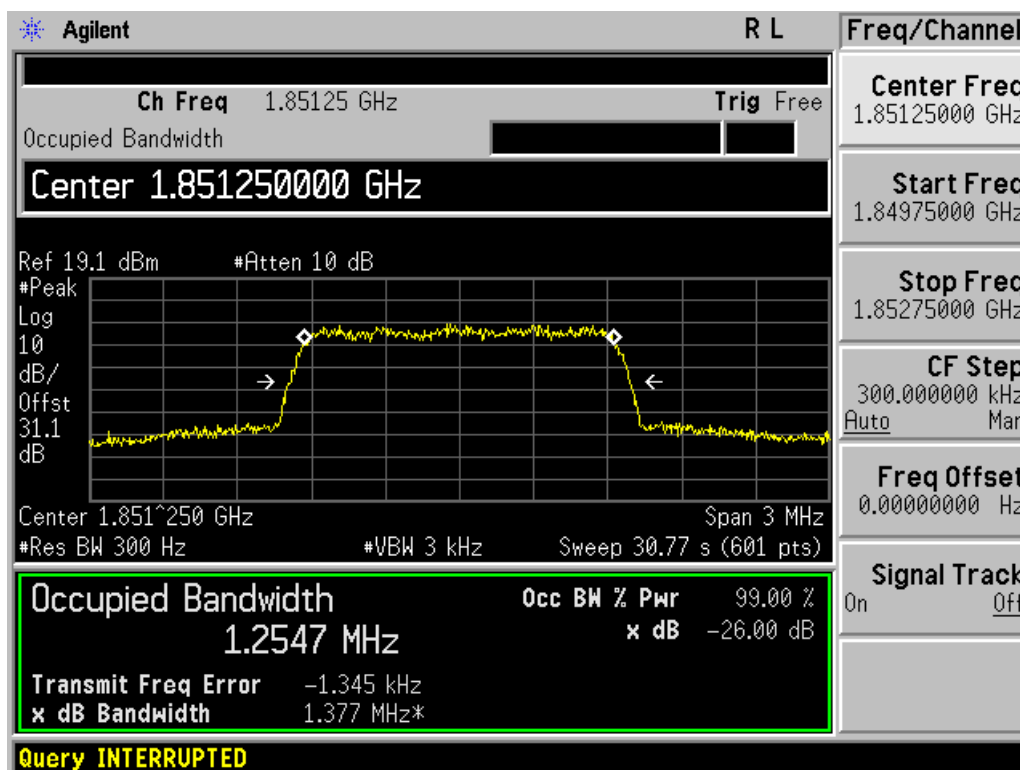
The measurement will be conducted at the EUT input and output ports in downlink and uplink transmit modes of operation at Bottom, Middle and Top channels.

Test result:

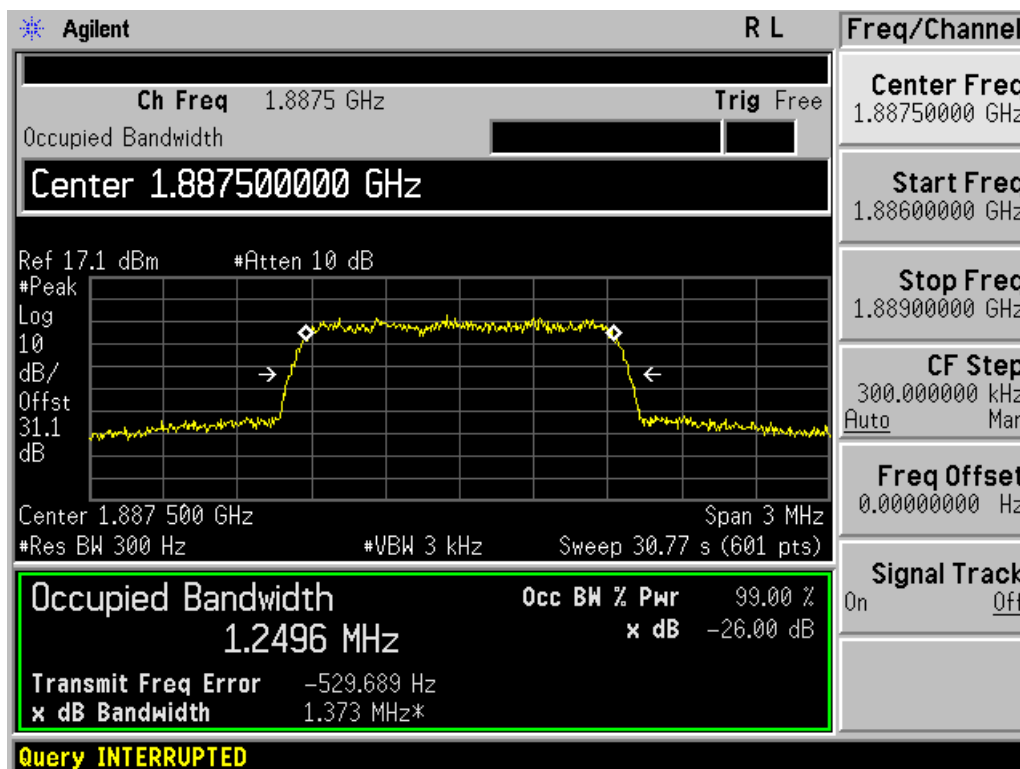
Test Mode (Modulation type)	Direction	Channel (Frequency)	Occupied Bandwidth (99% Power Bandwidth) (MHz)
CDMA (OQPSK)	Uplink	Bottom (1851.25MHz)	1.2547
		Middle (1887.50MHz)	1.2496
		Top (1913.75MHz)	1.2531
	Downlink	Bottom (1931.25MHz)	1.2580
		Middle (1967.50MHz)	1.2545
		Top (1993.75MHz)	1.2556
Limit	There is no specific occupied bandwidth requirements in part2.1049		
Conclusion	Complies		

Test plots:

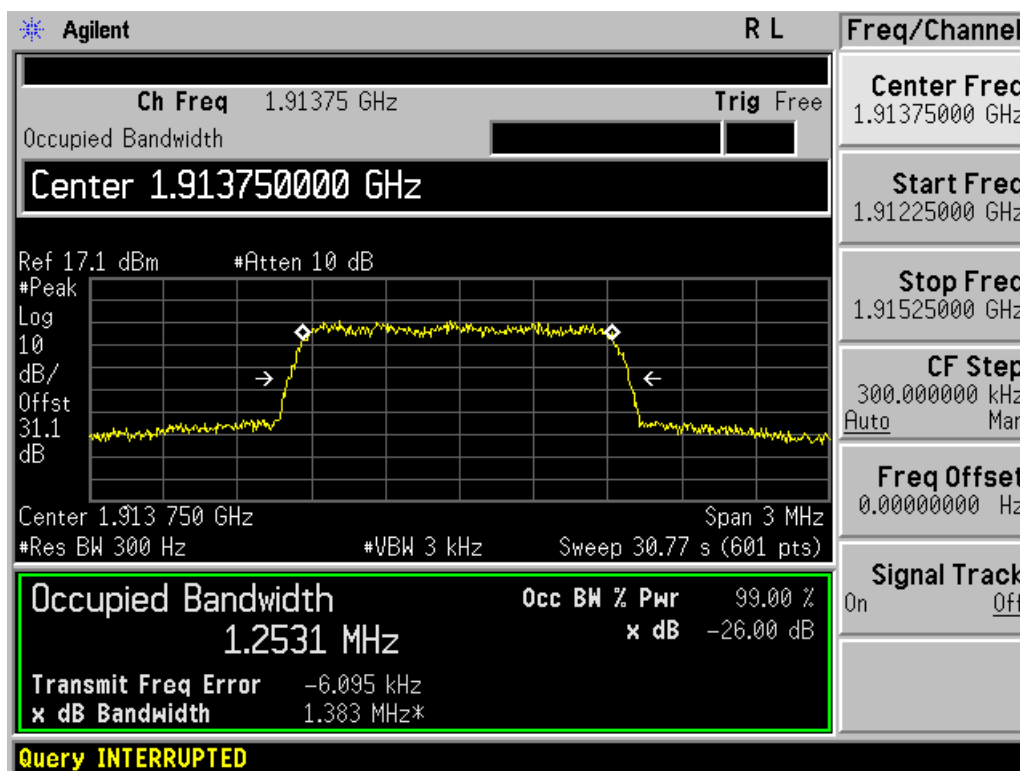
Direction: Uplink



Occupied Bandwidth on Bottom Channel

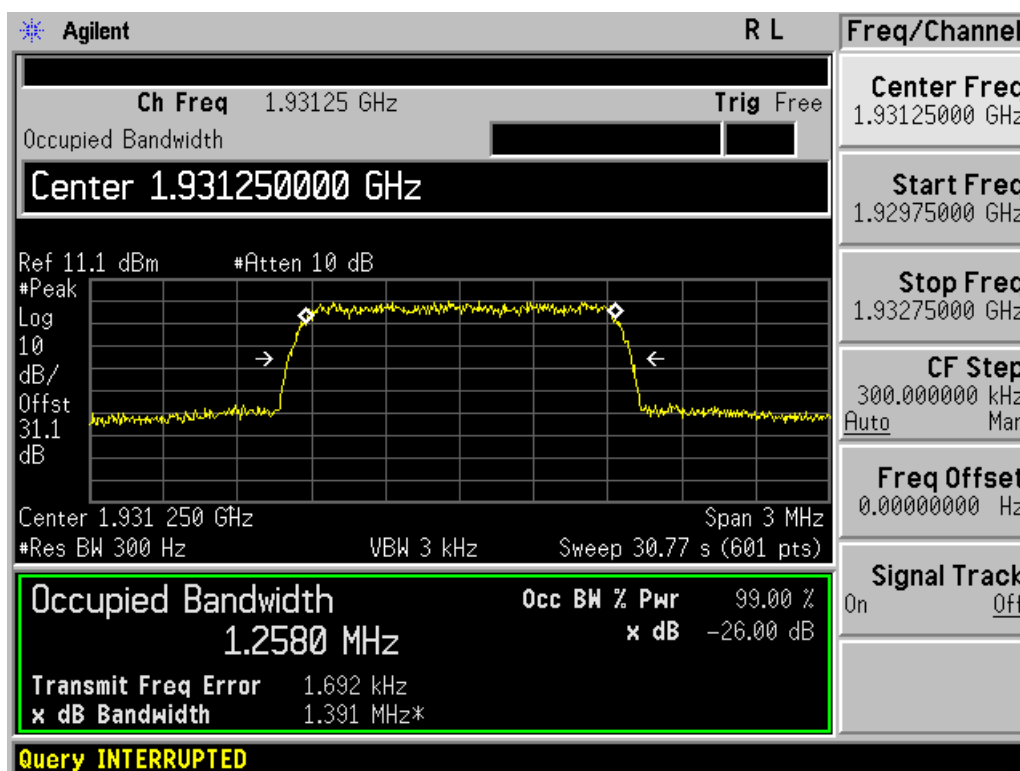


Occupied Bandwidth on Middle Channel

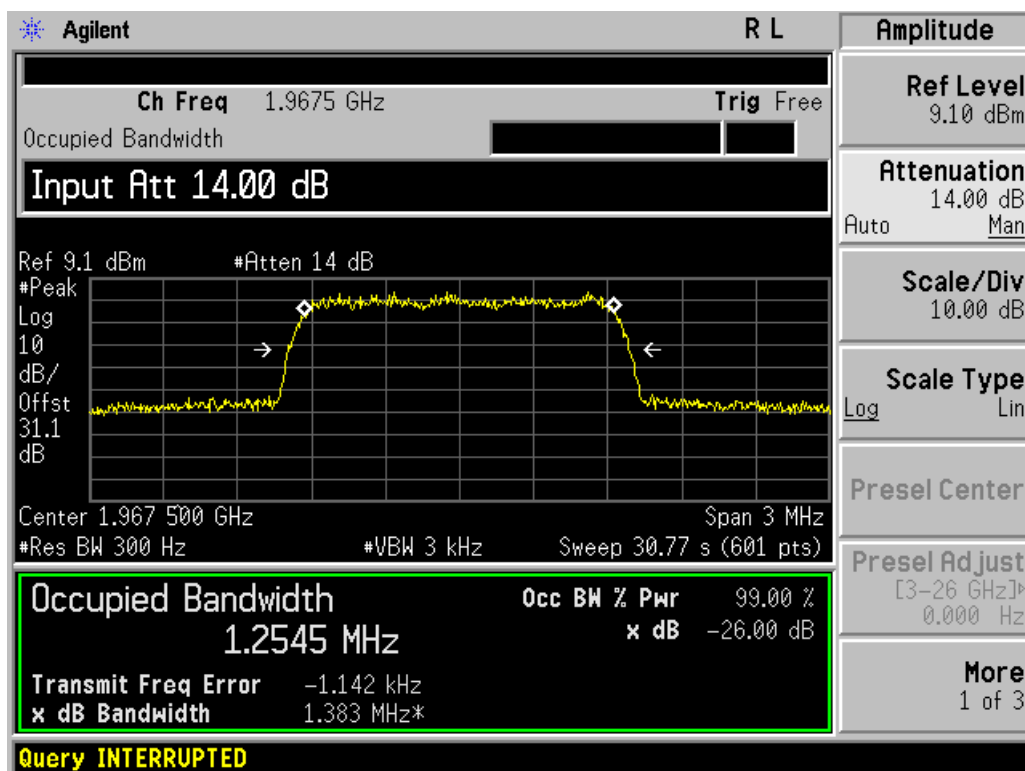


Occupied Bandwidth on Top Channel

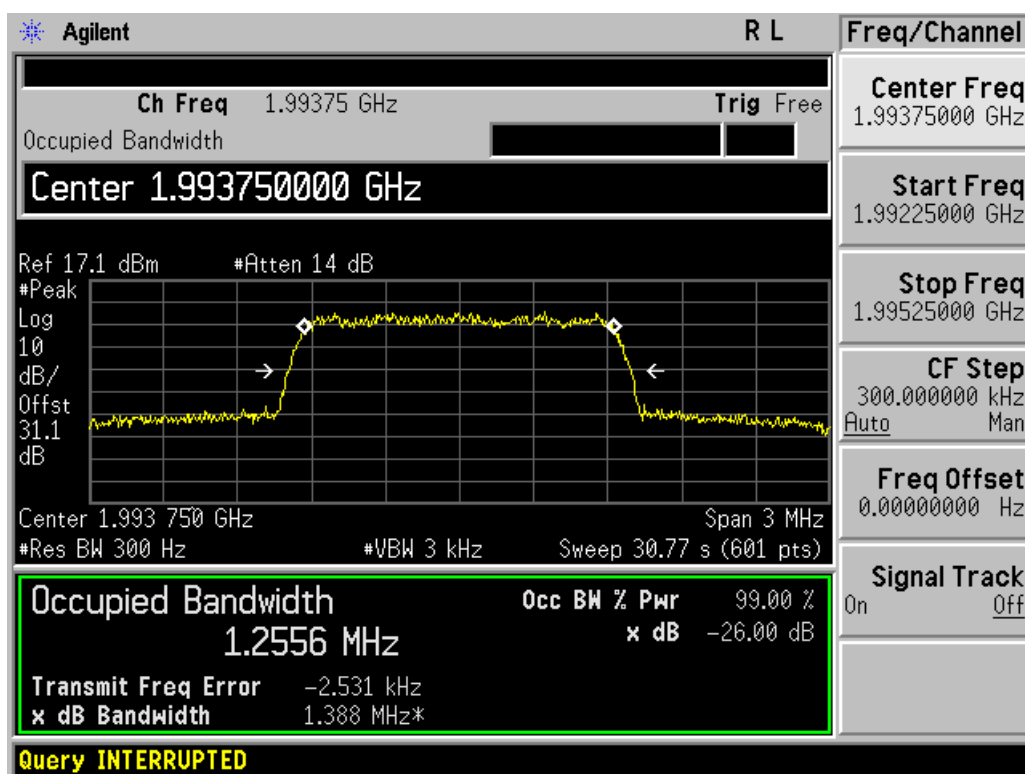
Direction: Downlink



Occupied Bandwidth on Bottom Channel



Occupied Bandwidth on Middle Channel



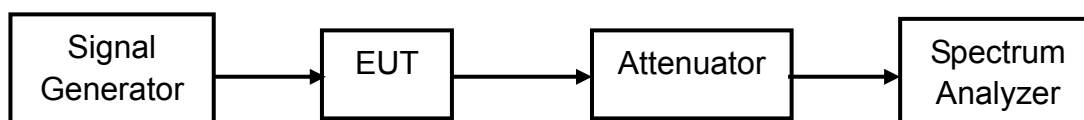
Occupied Bandwidth on Top Channel

2.2.3 Spurious Emissions at antenna terminal-FCC Part2.1051/24.238(a)

Ambient condition:

Temperature	Relative humidity	Pressure
26°C	54%	101.5kPa

Test Setup:



Test procedure:

The EUT was connected to the signal generator and the spectrum analyzer via the main RF connector, and through an appropriate attenuator. The EUT was controlled to transmit its maximum power. Then the maximum unwanted emissions of the EUT can be measured by the spectrum analyzer.

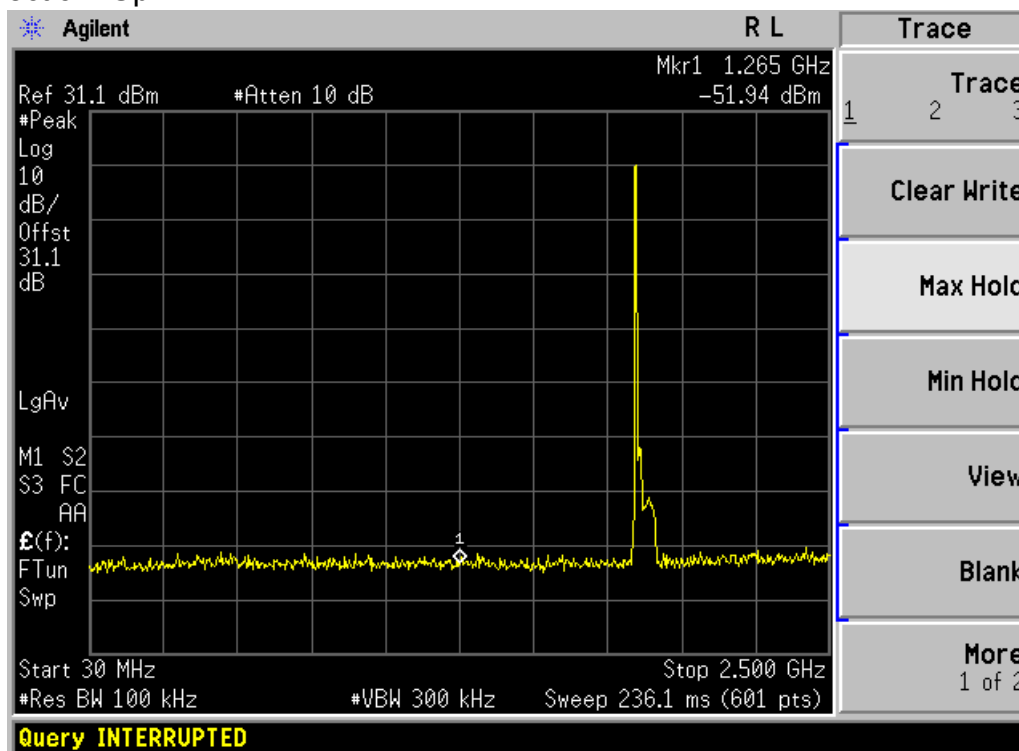
The measurement will be conducted at the EUT input and output ports in downlink and uplink transmit modes of operation at Bottom, Middle and Top channels.

Test result:

Test Mode (Modulation type)	Direction	Channel (Frequency)	Conducted Spurious Emissions
CDMA (OQPSK)	Uplink	Bottom (1851.25MHz)	Refer to test plots
		Middle (1887.50MHz)	Refer to test plots
		Top (1913.75MHz)	Refer to test plots
	Downlink	Bottom (1931.25MHz)	Refer to test plots
		Middle (1967.50MHz)	Refer to test plots
		Top (1993.75MHz)	Refer to test plots
Limit	-13dBm		
Conclusion	Complies		

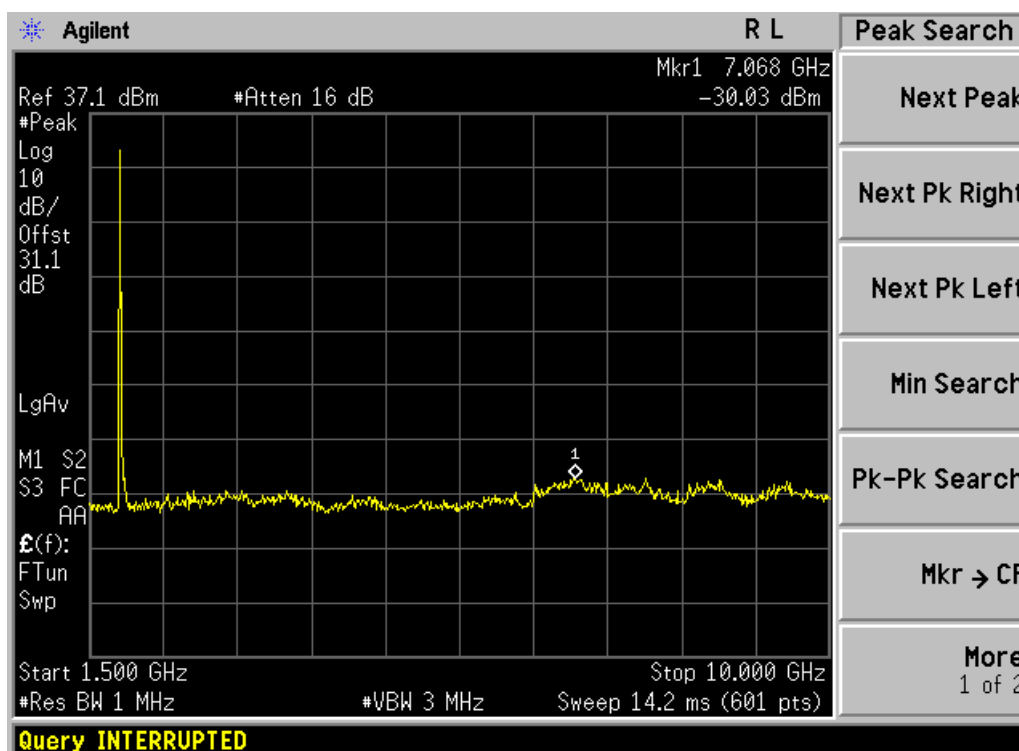
Test plots:

Direction: Uplink



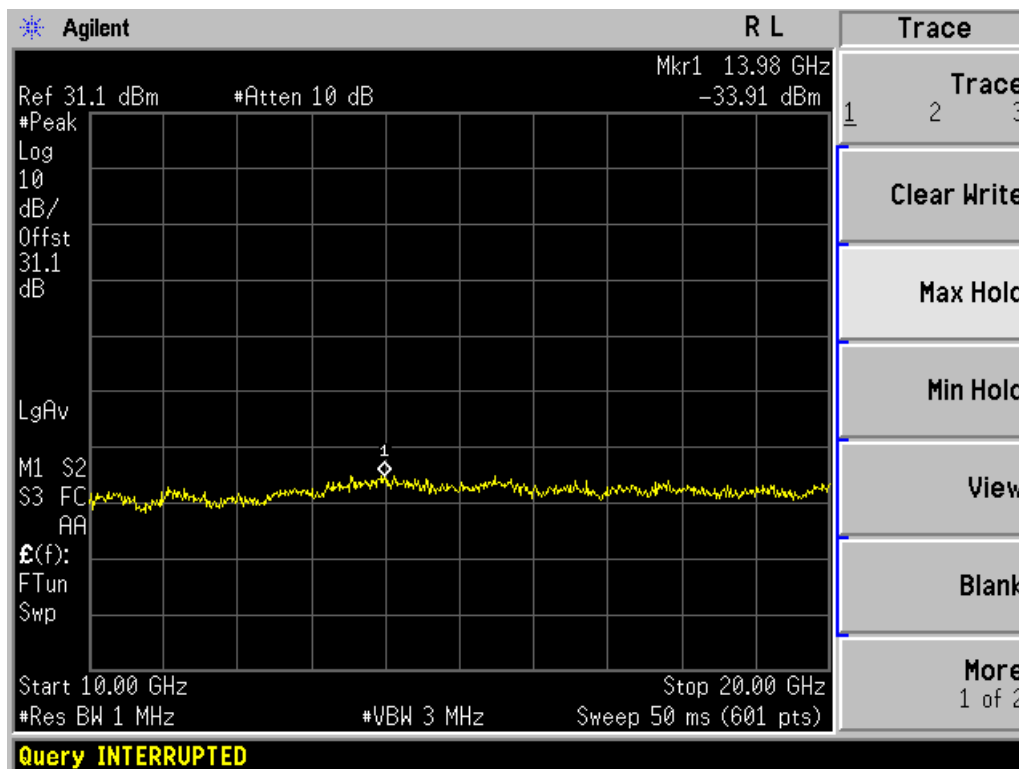
30MHz ~ 2.5GHz Conducted Spurious Emissions on CH Bottom

Note: The signal beyond the limit is carrier.

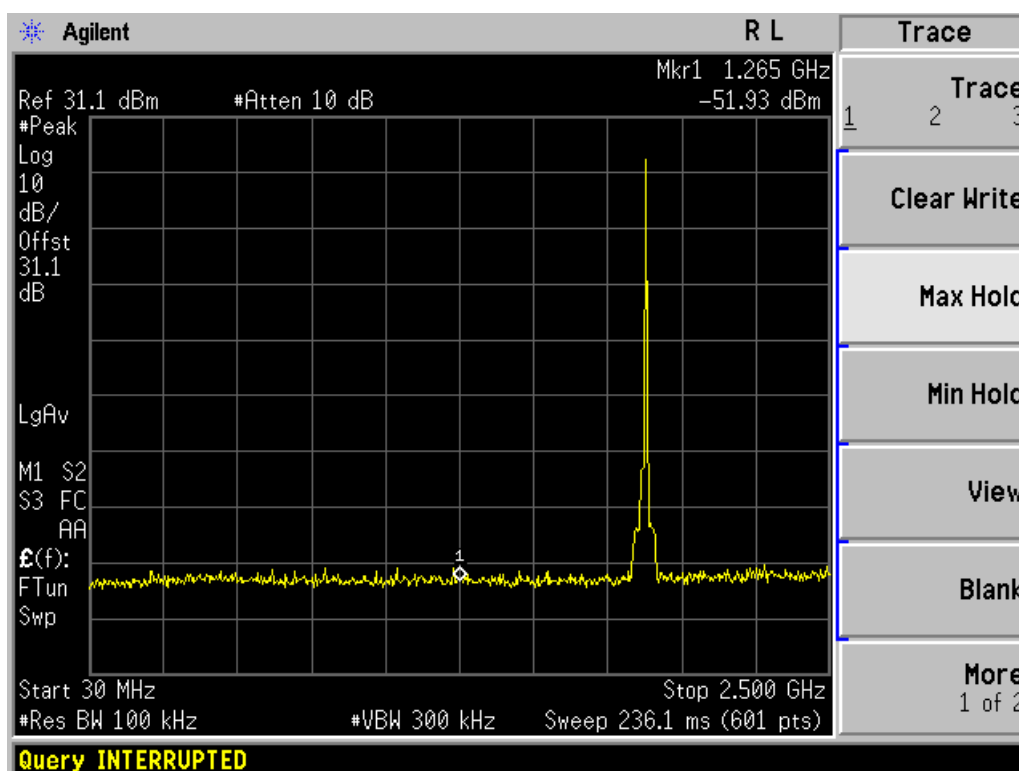


1.5GHz ~ 10GHz Conducted Spurious Emissions on CH Bottom

Note: The signal beyond the limit is carrier.

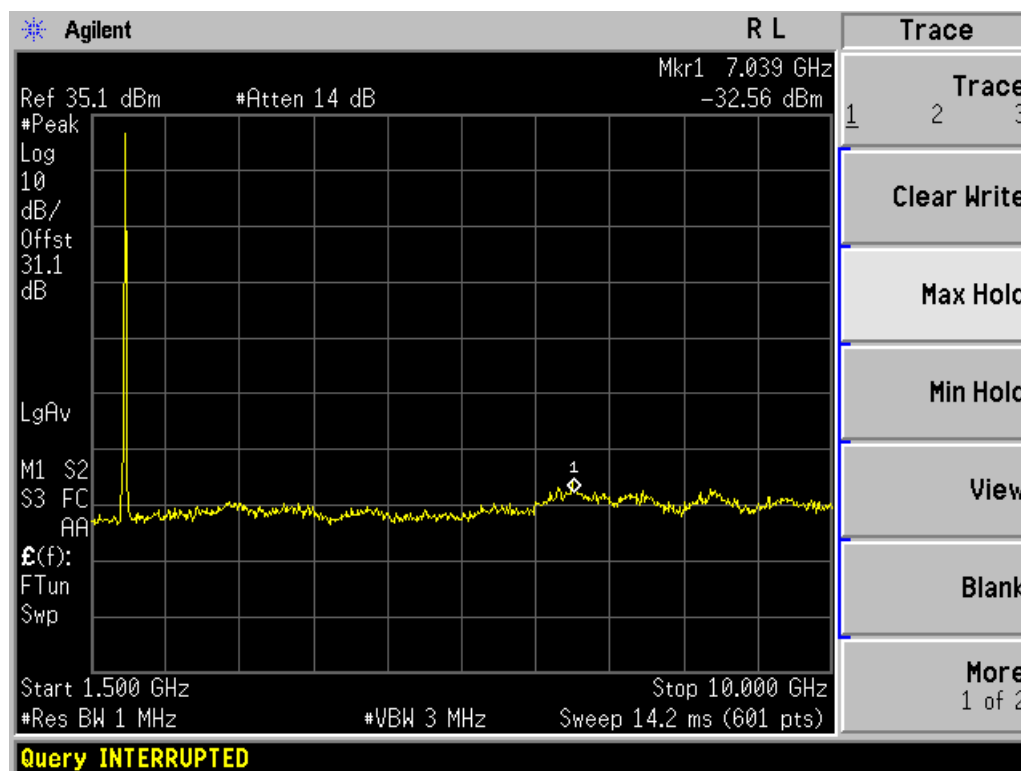


10GHz ~ 20GHz Conducted Spurious Emissions on CH Bottom



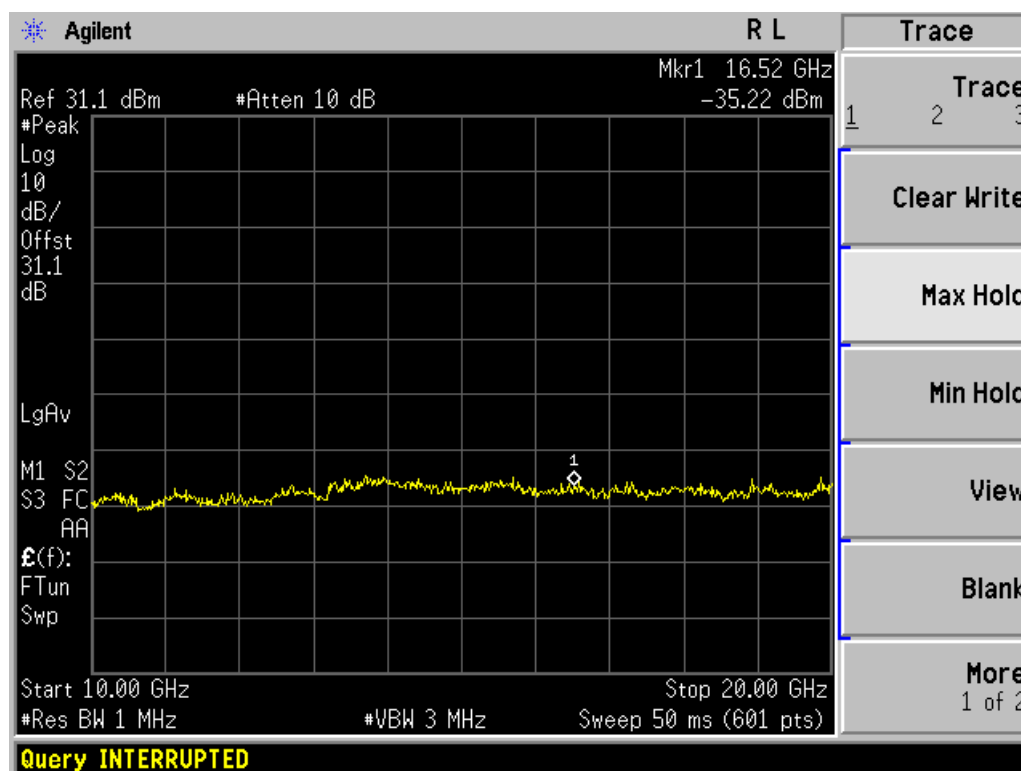
30MHz ~ 2.5GHz Conducted Spurious Emissions on CH Middle

Note: The signal beyond the limit is carrier.

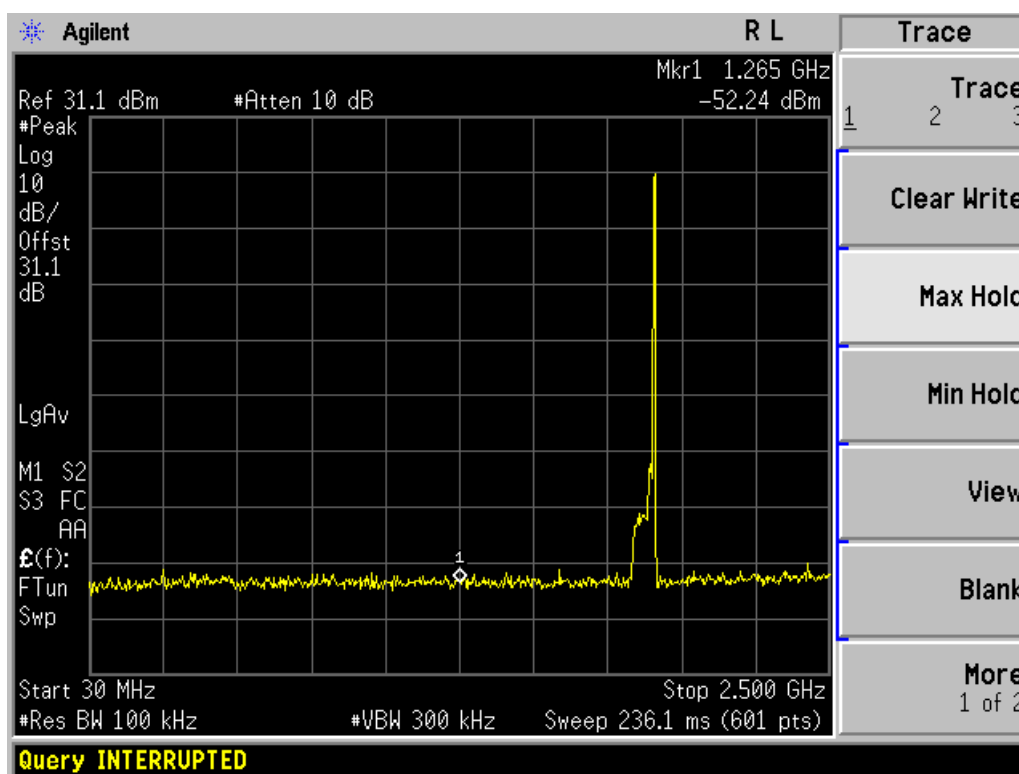


1.5GHz ~ 10GHz Conducted Spurious Emissions on CH Middle

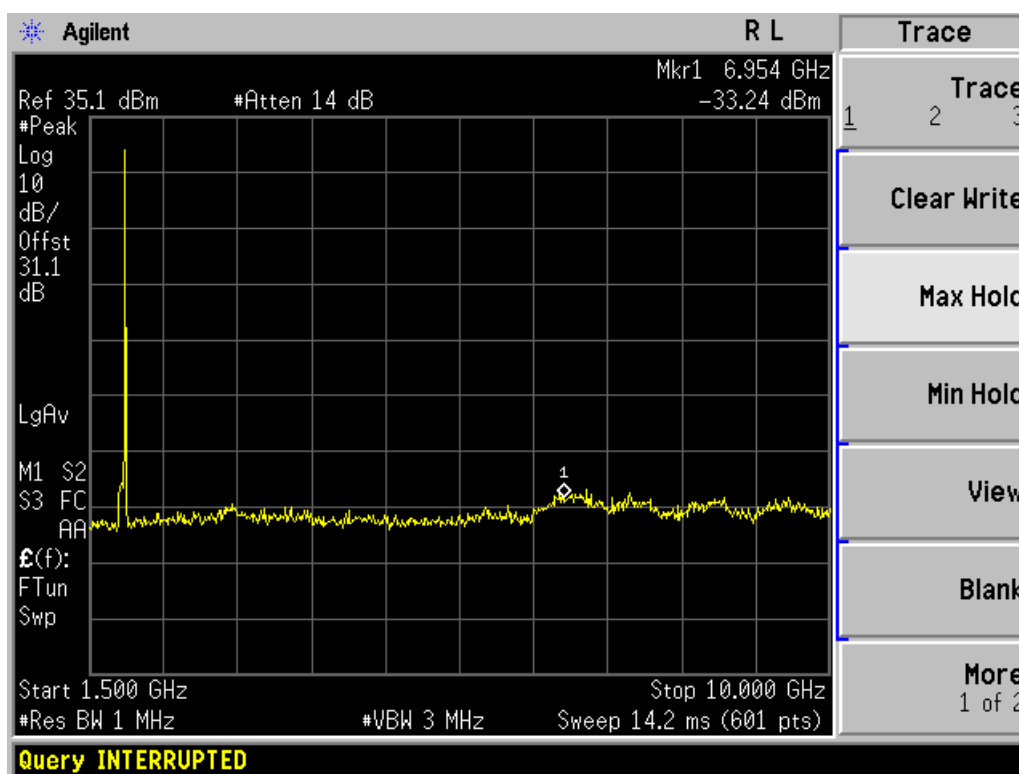
Note: The signal beyond the limit is carrier.



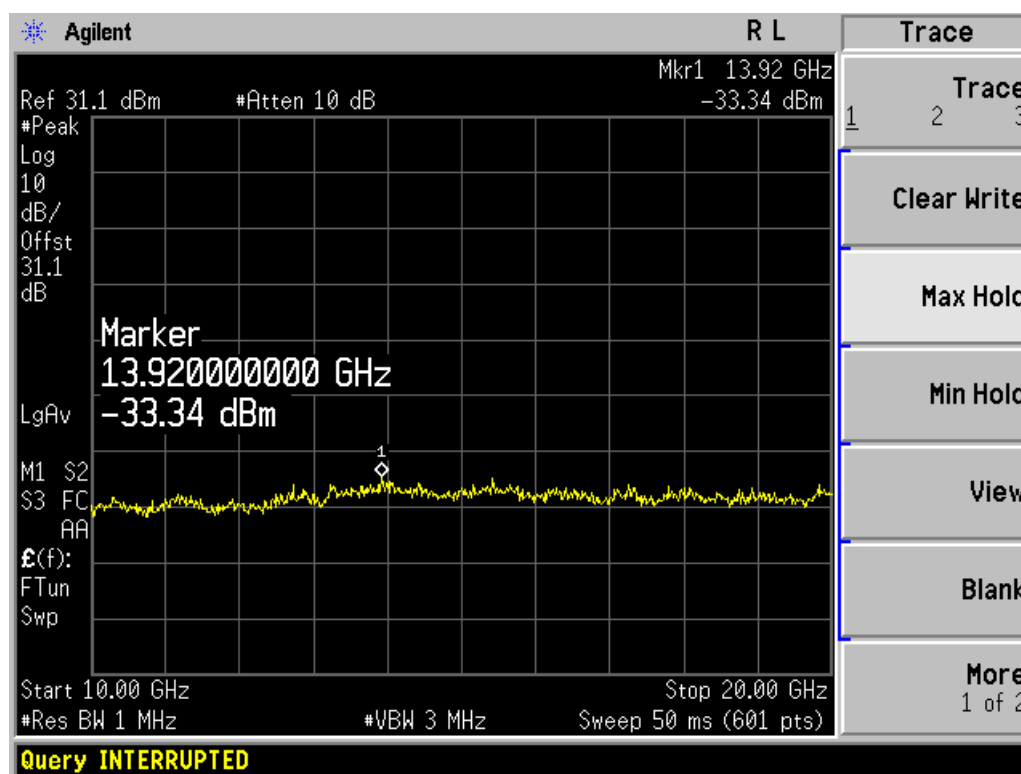
10GHz ~ 20GHz Conducted Spurious Emissions on CH Middle



30MHz ~ 2.5GHz Conducted Spurious Emissions on CH Top
 Note: The signal beyond the limit is carrier.

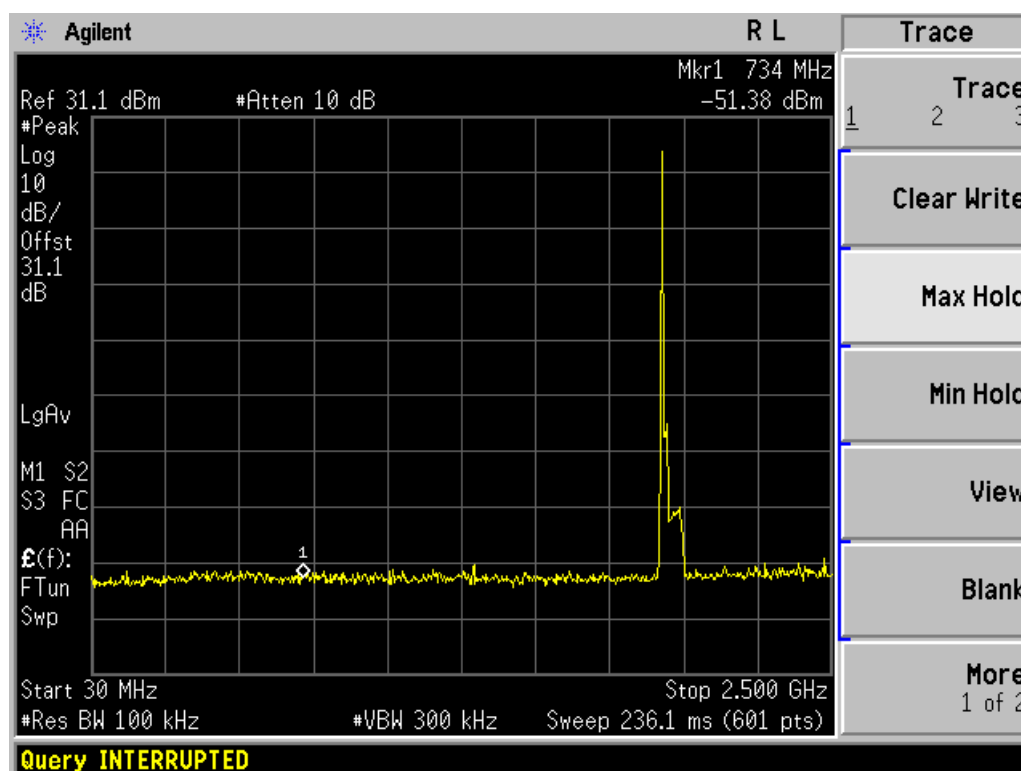


1.5GHz ~ 10GHz Conducted Spurious Emissions on CH Top
 Note: The signal beyond the limit is carrier.



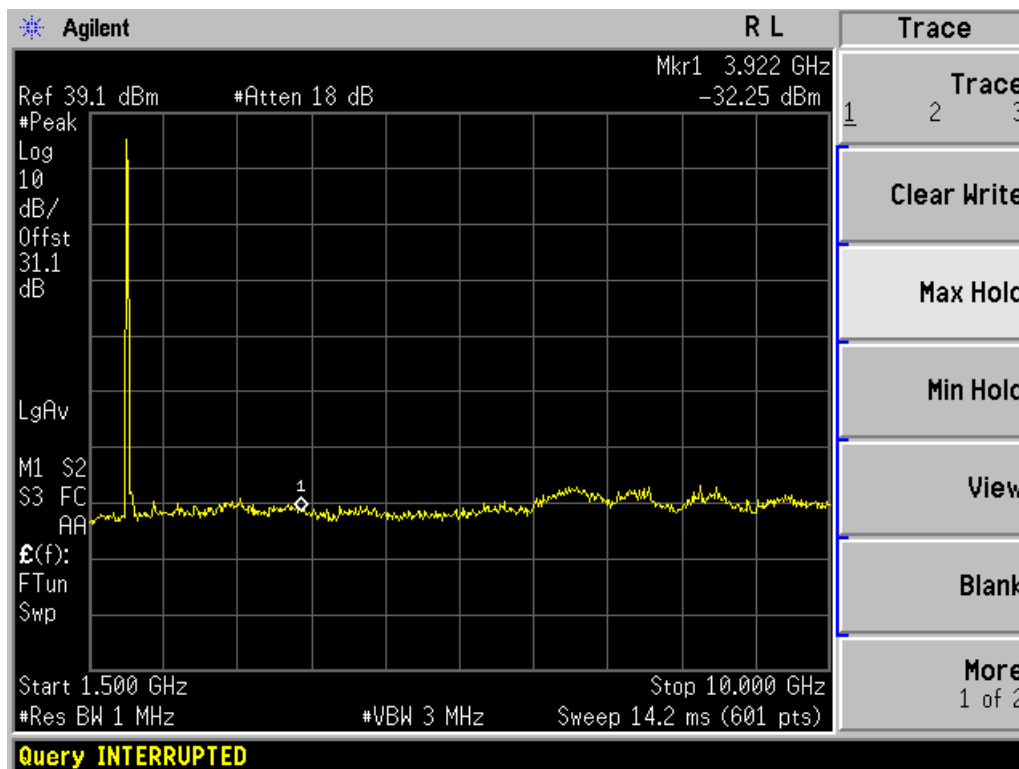
10GHz ~ 20GHz Conducted Spurious Emissions on CH Top

Direction: Downlink



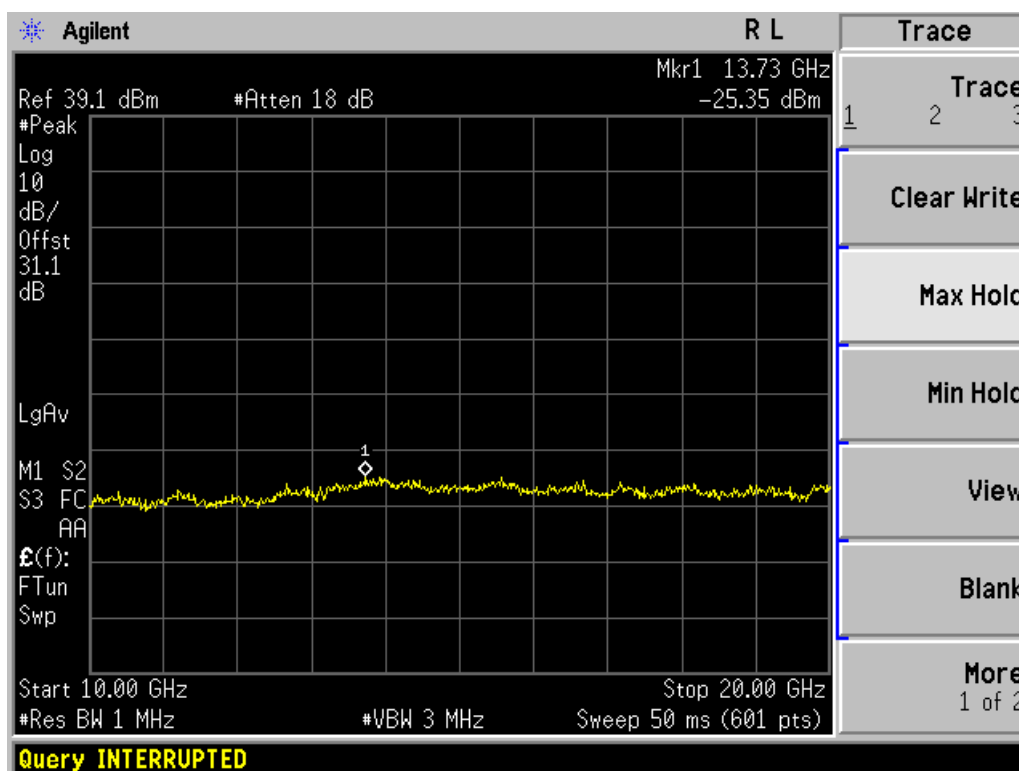
30MHz ~ 2.5GHz Conducted Spurious Emissions on CH Bottom

Note: The signal beyond the limit is carrier.

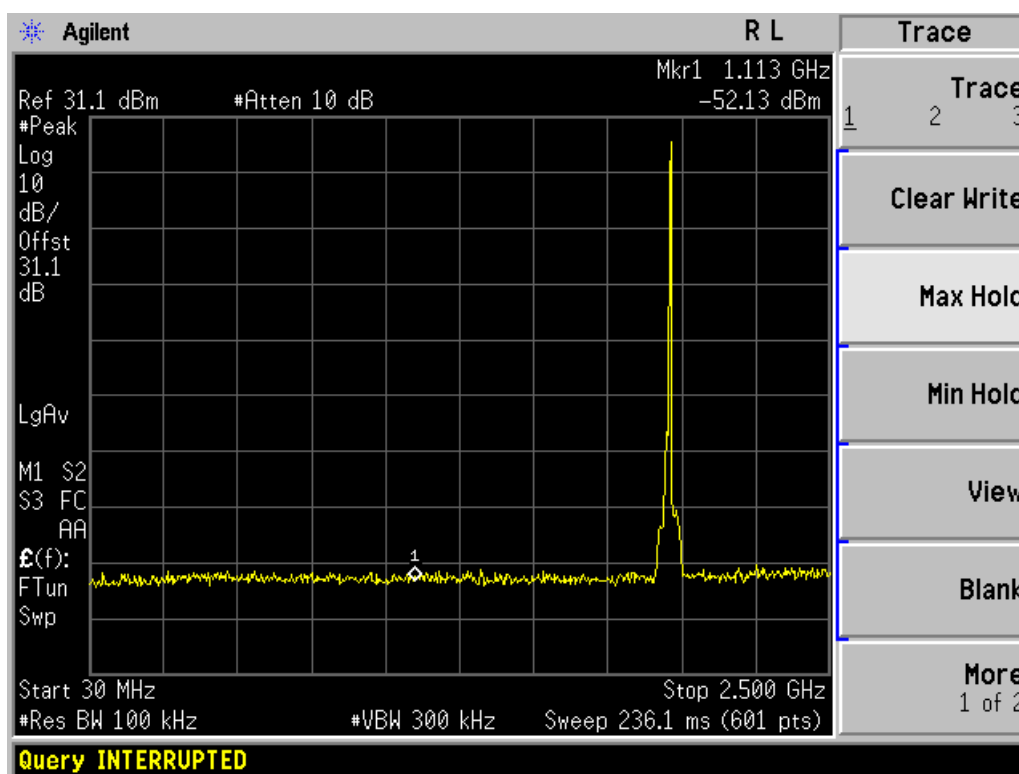


1.5GHz ~ 10GHz Conducted Spurious Emissions on CH Bottom

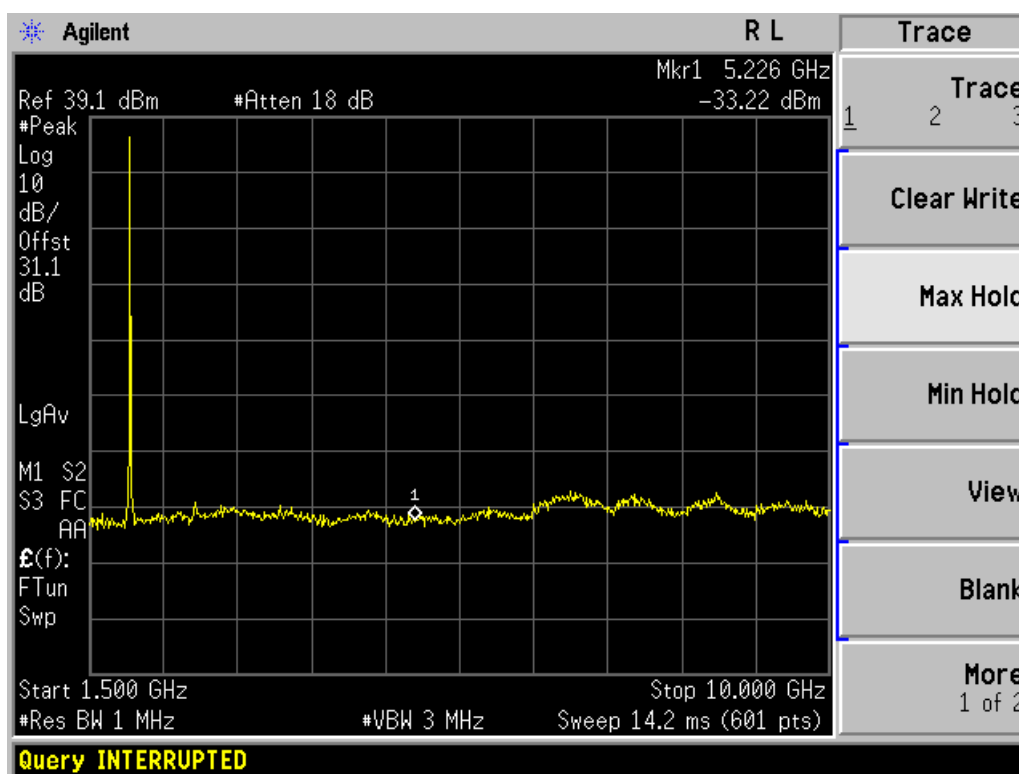
Note: The signal beyond the limit is carrier.



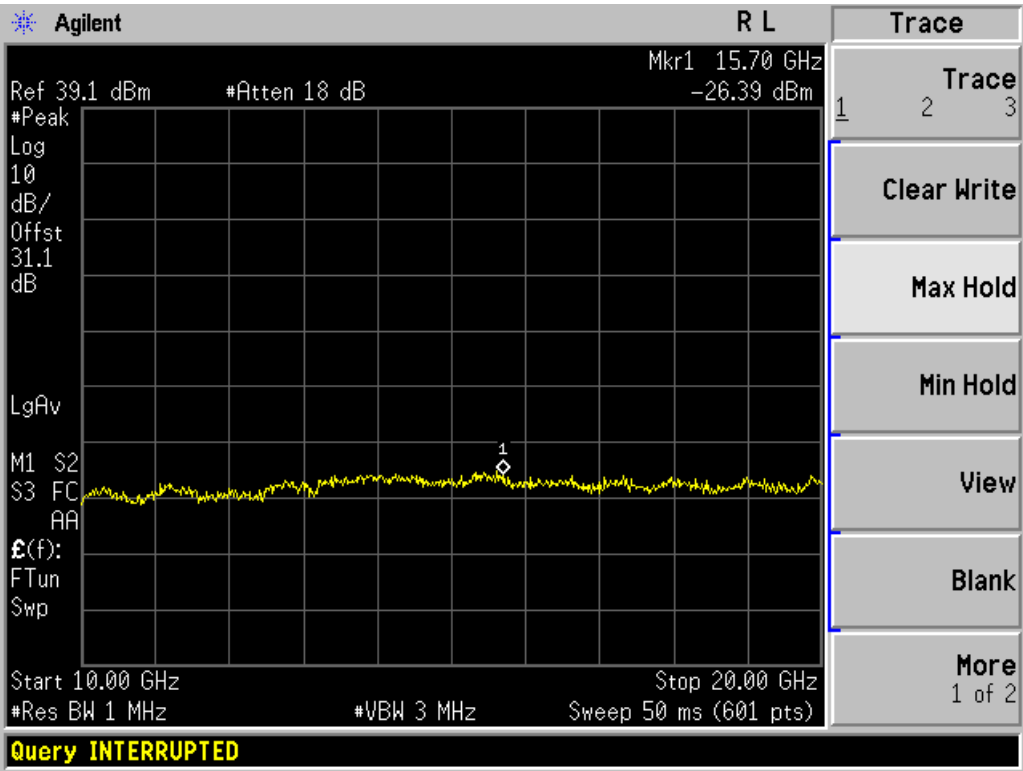
10GHz ~ 20GHz Conducted Spurious Emissions on CH Bottom



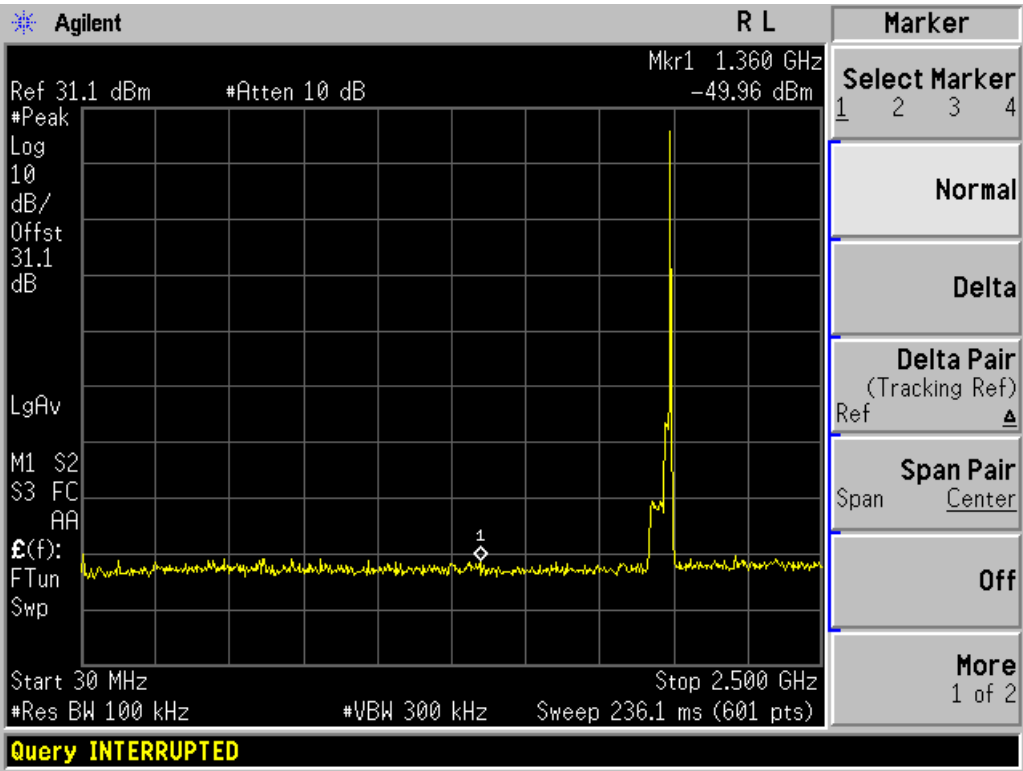
30MHz ~ 2.5GHz Conducted Spurious Emissions on CH Middle
 Note: The signal beyond the limit is carrier.



1.5GHz ~ 10GHz Conducted Spurious Emissions on CH Middle
 Note: The signal beyond the limit is carrier.

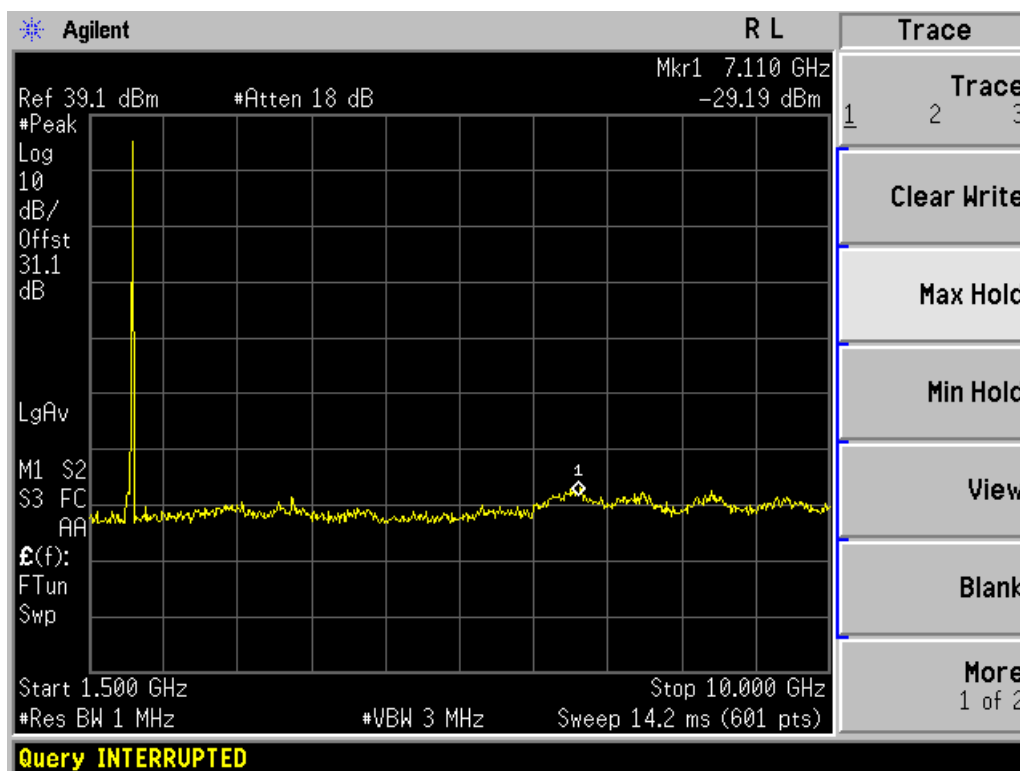


10GHz ~ 20GHz Conducted Spurious Emissions on CH Middle



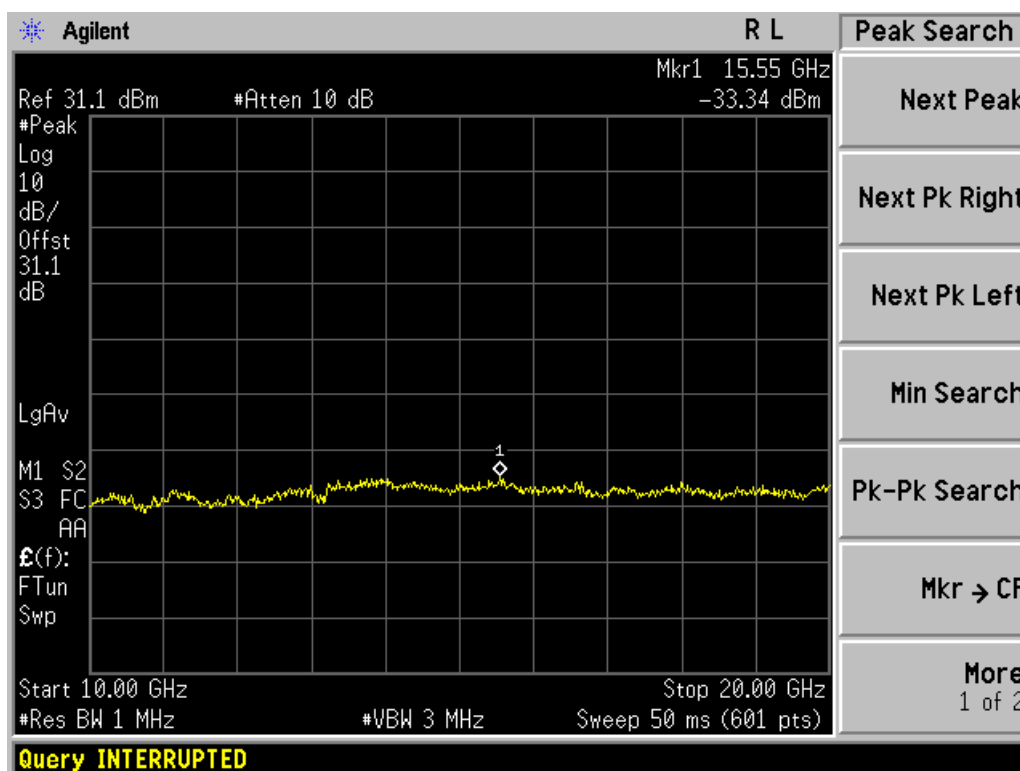
30MHz ~ 2.5GHz Conducted Spurious Emissions on CH Top

Note: The signal beyond the limit is carrier.



1.5GHz ~ 10GHz Conducted Spurious Emissions on CH Top

Note: The signal beyond the limit is carrier.



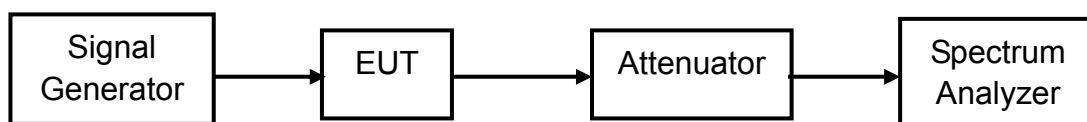
10GHz ~ 20GHz Conducted Spurious Emissions on CH Top

2.2.4 Band Edges Compliance-FCC Part2.1051/24.238(a)

Ambient condition:

Temperature	Relative humidity	Pressure
26°C	54%	101.5kPa

Test Setup:



Test procedure:

The EUT was connected to the signal generator and the spectrum analyzer via the main RF connector, and through an appropriate attenuator. The EUT was controlled to transmit its maximum power. Then the maximum band edge emissions of the EUT can be measured by the spectrum analyzer.

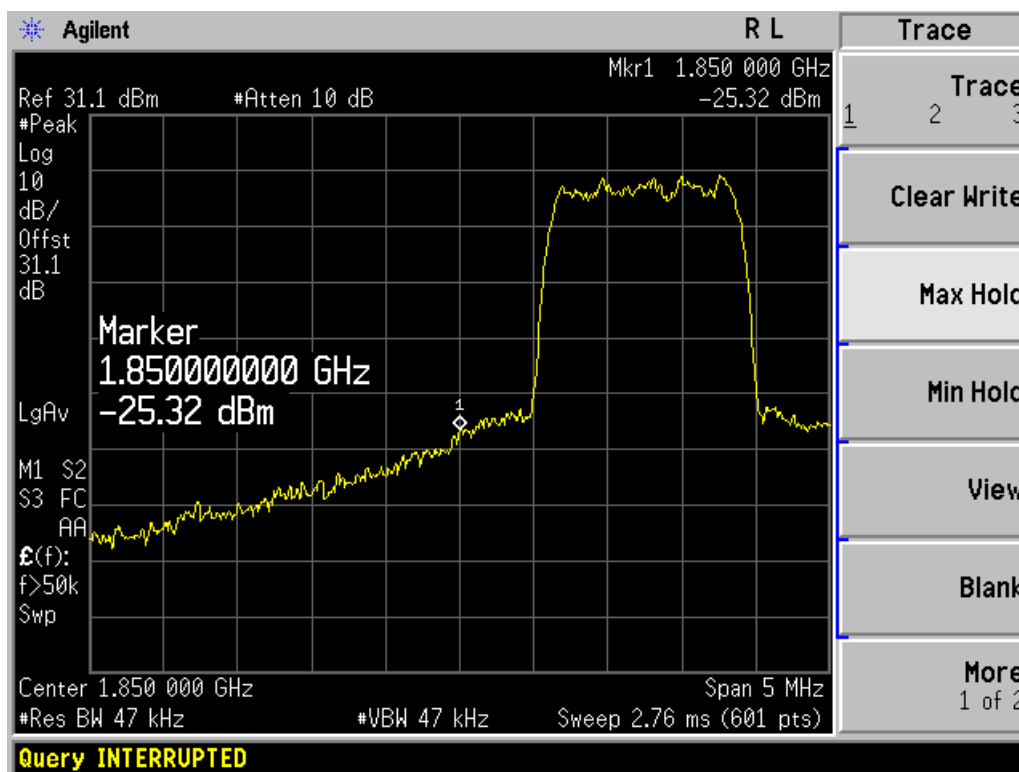
The measurement will be conducted at the EUT input and output ports in downlink and uplink transmit modes of operation at Bottom and Top channels.

Test result:

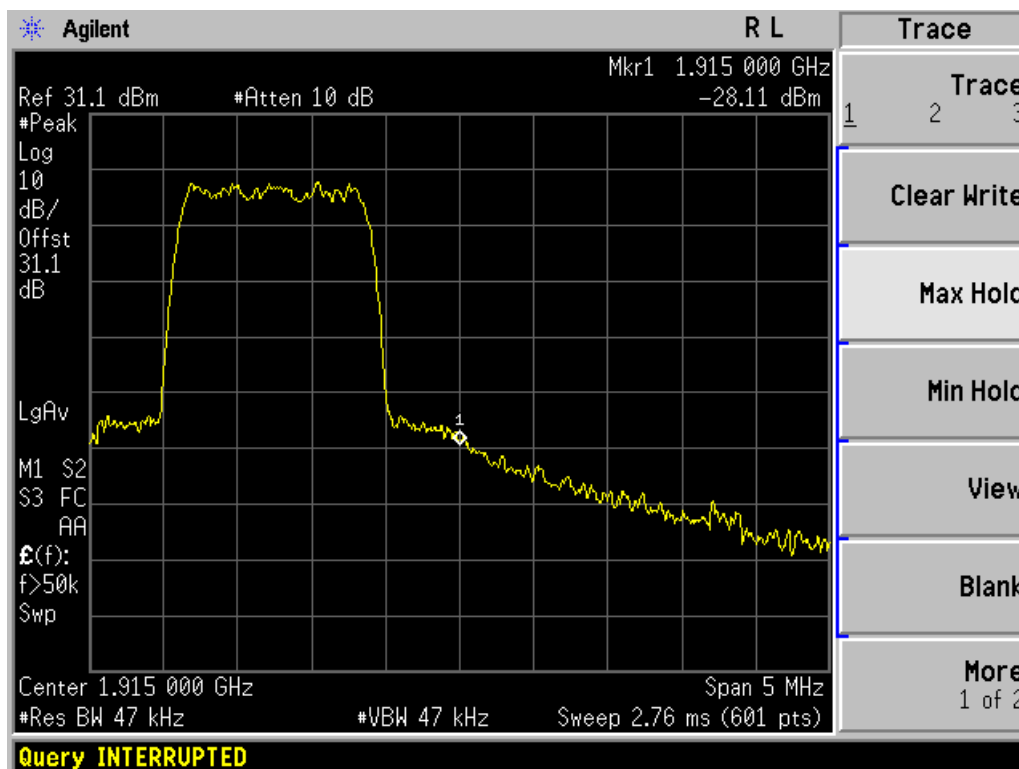
Test Mode (Modulation type)	Direction	Channel (Frequency)	Band Edge Power
CDMA (OQPSK)	Uplink	Bottom (1851.25MHz)	Refer to test plots
		Top (1913.75MHz)	Refer to test plots
	Downlink	Bottom (1931.25MHz)	Refer to test plots
		Top (1993.75MHz)	Refer to test plots
Limit	-13dBm		
Conclusion	Complies		

Test plots:

Direction: Uplink

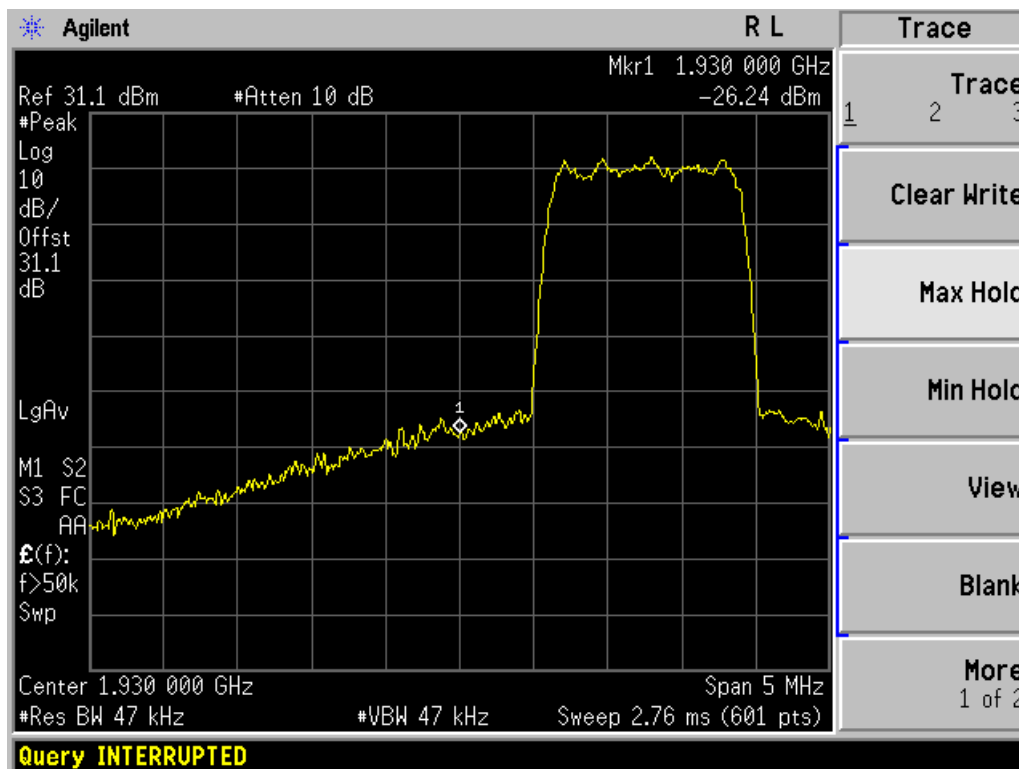


Band Edge Compliance on CH Bottom

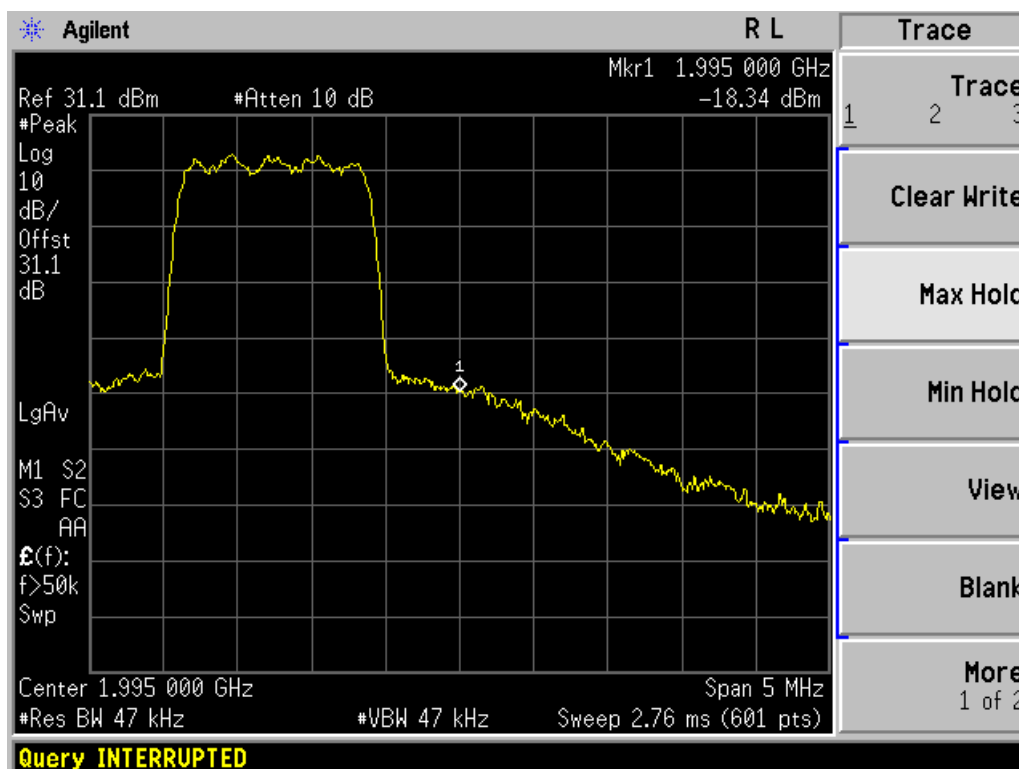


Band Edge Compliance on CH Top

Direction: Downlink



Band Edge Compliance on CH Bottom



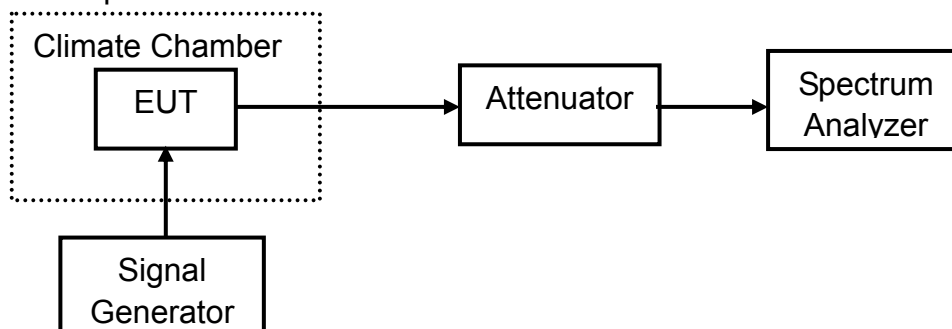
Band Edge Compliance on CH Top

2.2.5 Frequency Stability-FCC Part2.1055/Part24.135/Part24.235

Ambient condition:

Temperature	Relative humidity	Pressure
26°C	54%	101.5kPa

Test Setup:



Test Procedure:

The EUT was connected to the signal generator and the spectrum analyzer via the main RF connector, and through an appropriate attenuator. The EUT was controlled to transmit carrier signal. Then the frequency error of the EUT can be measured by the spectrum analyzer. The temperature inside the climate chamber is varied from -10° C to +50° C in 10° C step size. And also the power supply voltage to the EUT is varied from 85 to 115 percent of the nominal value.

The measurement will be conducted at the EUT input and output ports in downlink and uplink transmit modes of operation at Bottom, Middle and Top channels.

Test result:

Test conditions		Frequency error (ppm)					
		Uplink direction channels			Downlink direction channels		
Voltage (Va.c.)	Temp (°C)	Bottom	Middle	Top	Bottom	Middle	Top
120	-10	0.06	-0.02	0.06	0.06	-0.02	0.06
	0	-0.07	-0.01	0.06	0.03	-0.01	0.06
	10	0.05	0.00	0.08	-0.09	-0.03	-0.04
	20	-0.06	0.01	0.07	0.00	0.02	0.07
	30	-0.04	0.00	-0.04	0.02	0.01	0.07
	40	0.06	-0.01	0.05	-0.04	-0.01	-0.04
	50	0.05	-0.01	-0.04	-0.05	-0.05	0.03
102 (85% Rated)	20	-0.08	0.05	0.05	-0.06	-0.03	0.06
138 (115% Rated)	20	0.06	0.01	0.06	-0.03	-0.04	0.04
Limit		1.0ppm					
Conclusion		Complies					

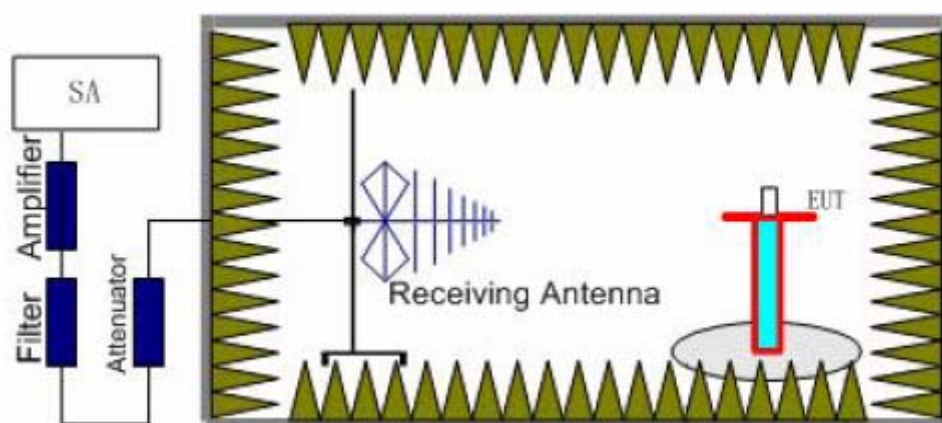
Note: The EUT can't operate normally below -10 °C

2.2.6 Radiated Spurious Emissions-FCC Part2.1053/24.238(a)

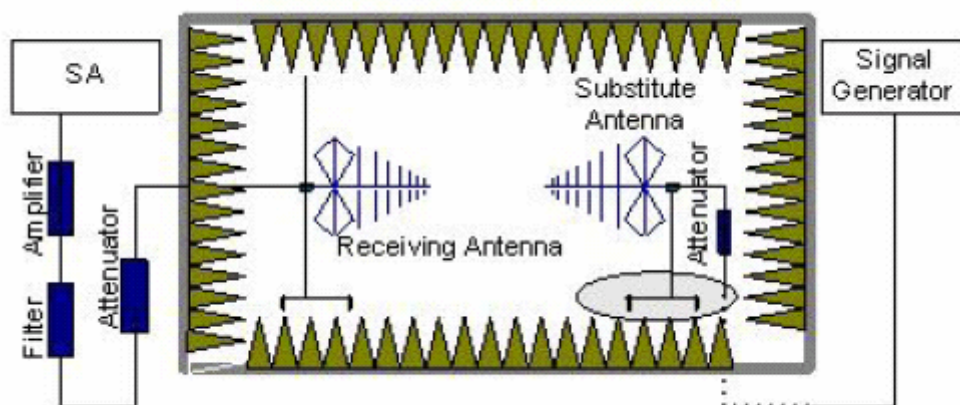
Ambient condition

Temperature	Relative humidity	Pressure
26°C	54%	101.5kPa

Test Setup:



Step 1



Step 2

Test procedure:

Step 1:

The measurement is carried out in the fully anechoic chamber. EUT was placed on a 2.4 meter high non-conductive table at a 3 meter test distance from the test receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT. The height of receiving antenna is 2.4m and varies in certain range to find the maximum power value. The EUT was controlled to transmit its maximum power. The measurement is carried out

using a spectrum analyzer or receiver. Then the antenna height and turn table rotation is adjusted till the maximum power value is founded on spectrum analyzer or receiver. A notch filter is necessary in the band near to the carrier frequency. A high pass filter is needed to avoid the distortion of the testing equipment in the band above the carrier frequency.

Step 2:

A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.

Calculation procedure:

The data of cable loss, antenna gain and air loss has been calibrated in full testing frequency range before the testing.

The power of the Radiated Spurious Emissions is calculated by adding the cable loss, antenna gain and air loss. The basic equation with a sample calculation is as followed:

$$P = P_R + L_C + L_A - G$$

Where

P: Power of the Radiated Spurious Emissions (dBm)

P_R : reading of the receiver (dBm)

L_C : Cable Lose (dB)

L_A : Air loss (dB)

G: Antenna Gain (dBi)

Assumed the reading of the receiver is -60dBm. A cable lose of 10dB, an air lose of 30dB and an antenna gain of 11dBi are added.

$$P = P_R + L_C + L_A - G = -60 + 10 + 30 - 11 = -31 \text{ dBm}$$

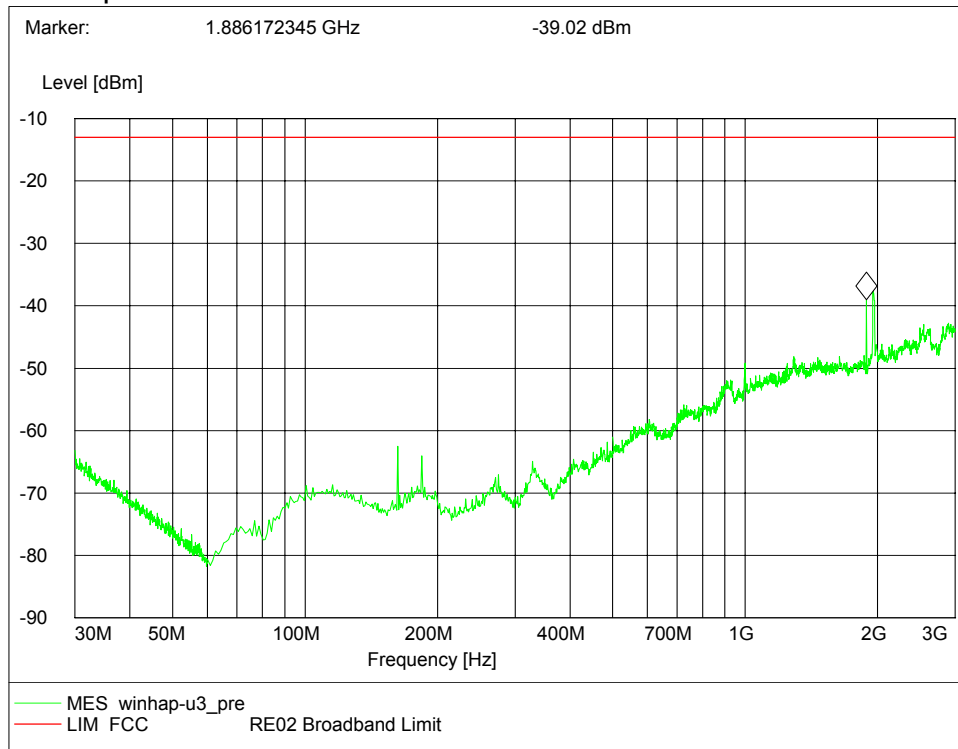
The measurement will be conducted in downlink and uplink transmit modes of operation at Middle channel.

Test result:

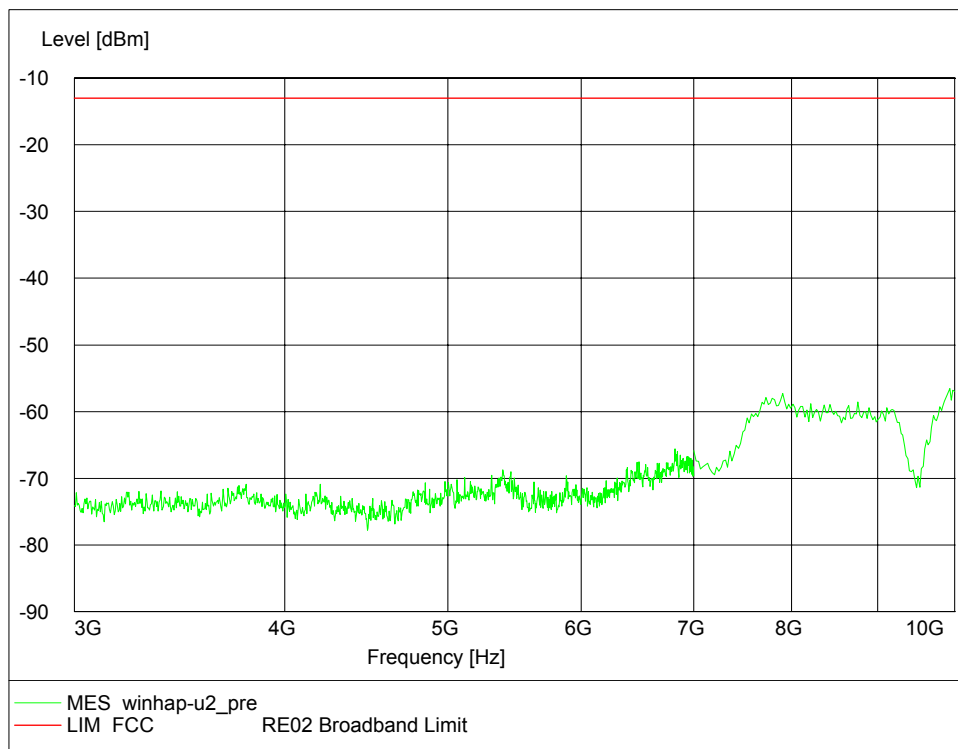
Test Result:			
Test Mode (Modulation type)	Frequency by plot range	Radiated Spurious Emissions	
		Uplink direction	Downlink direction
CDMA (OQPSK)	30MHz ~ 3GHz	Refer to test plots	Refer to test plots
	3GHz ~ 10GHz		
	10GHz ~ 18GHz		
	18GHz ~ 20GHz		
Limit		-13dBm	
Conclusion		Complies	

Test plots:

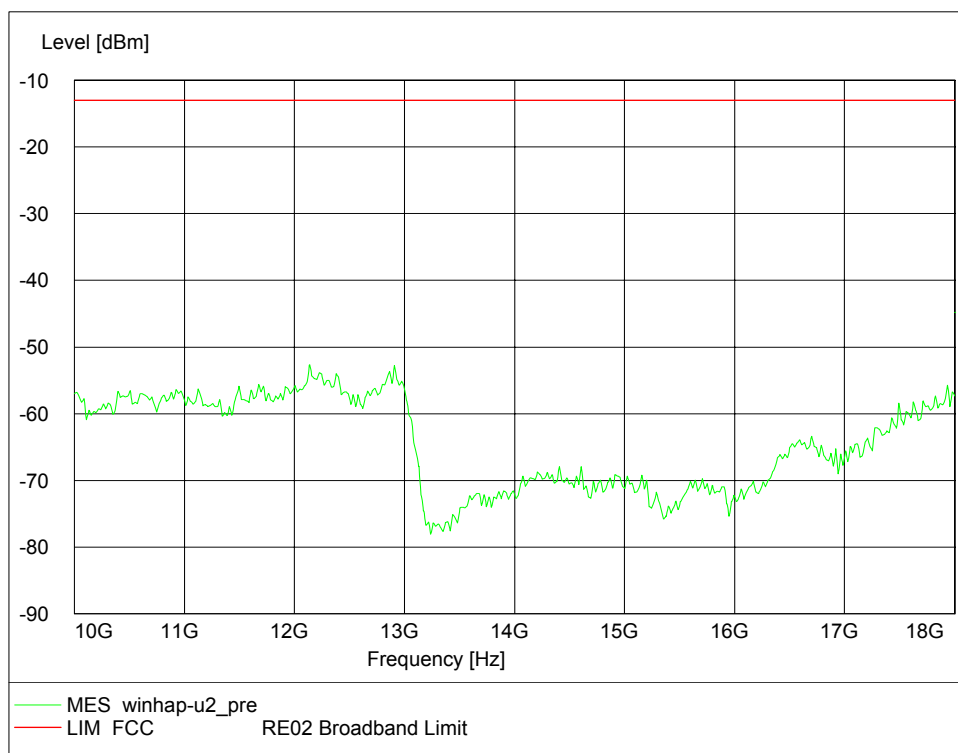
Direction: Uplink



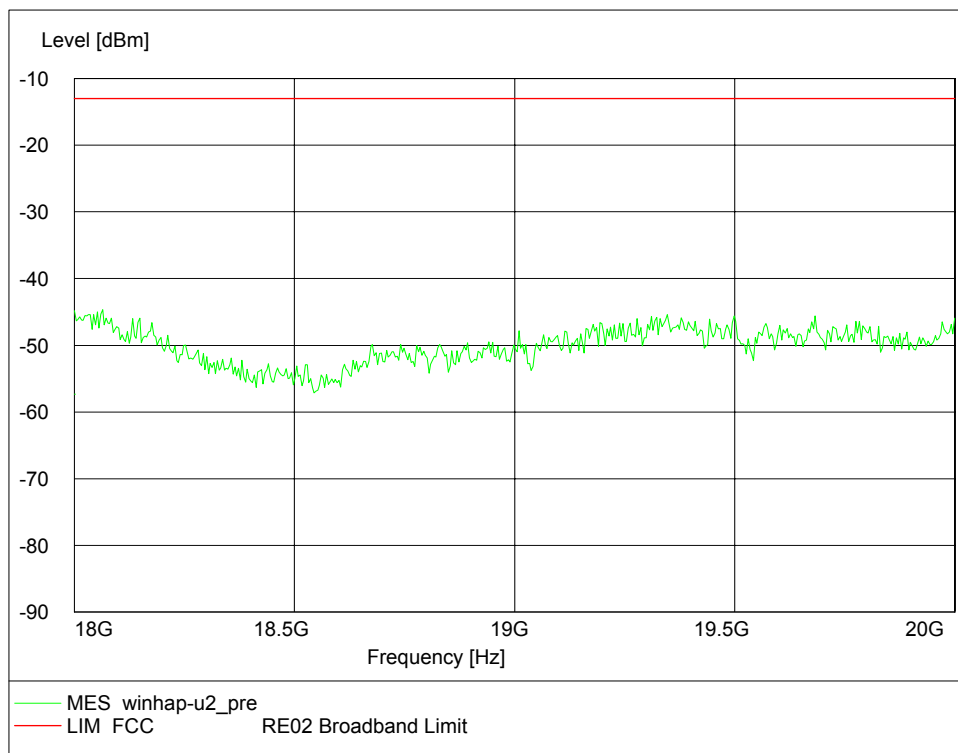
30MHz ~ 3GHz Radiated Spurious Emissions on CH Middle



3GHz ~ 10GHz Radiated Spurious Emissions on CH Middle

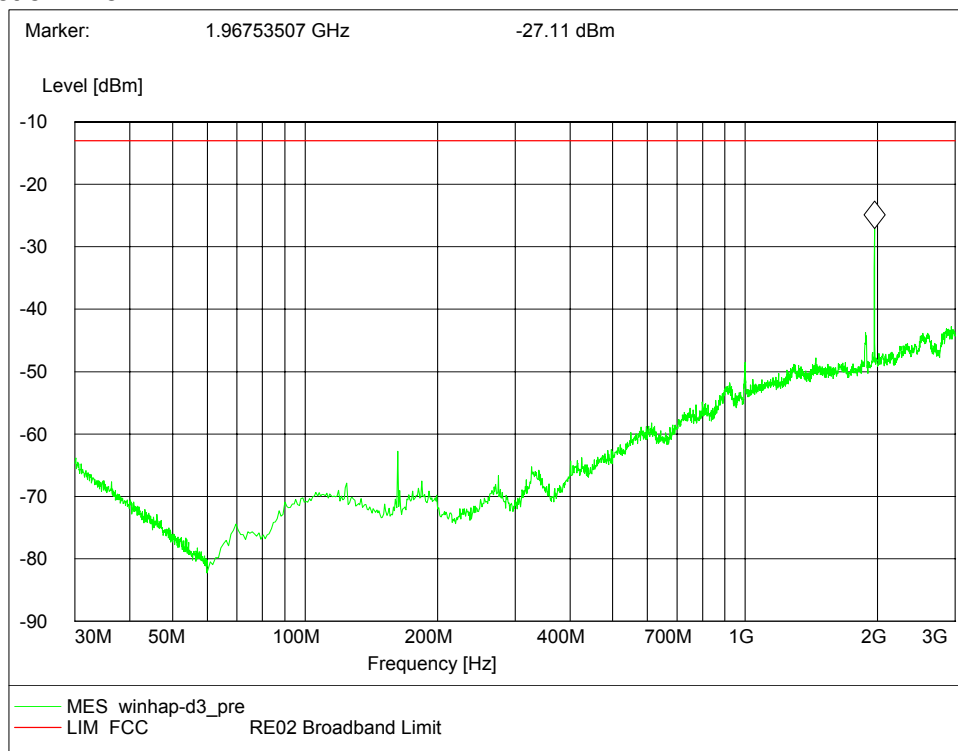


10GHz ~ 18GHz Radiated Spurious Emissions on CH Middle

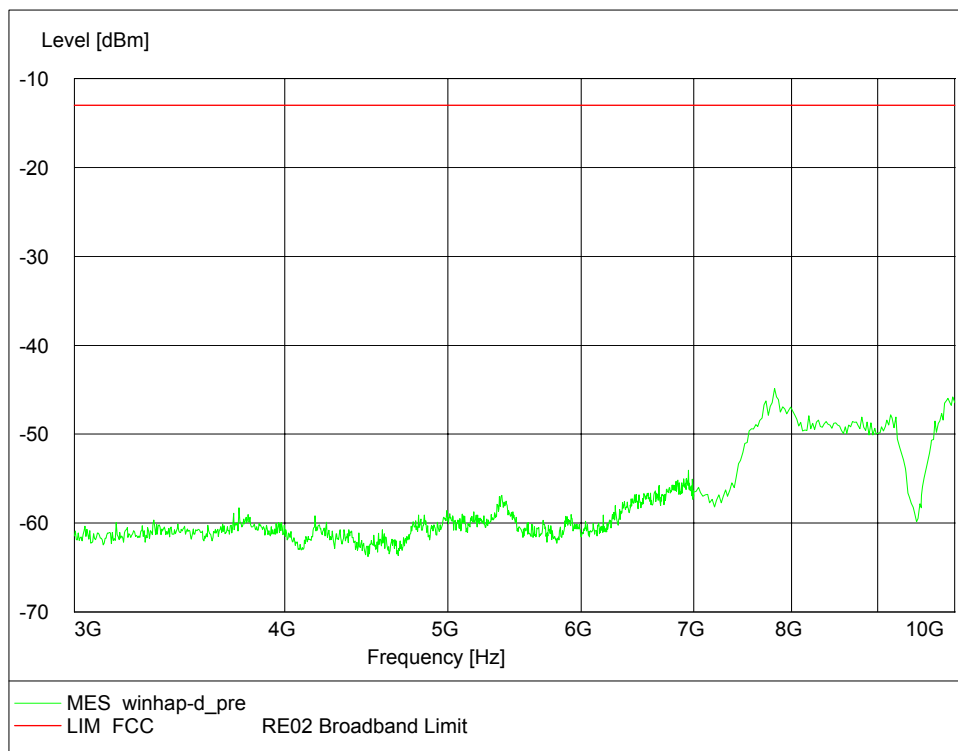


18GHz ~ 20GHz Radiated Spurious Emissions on CH Middle

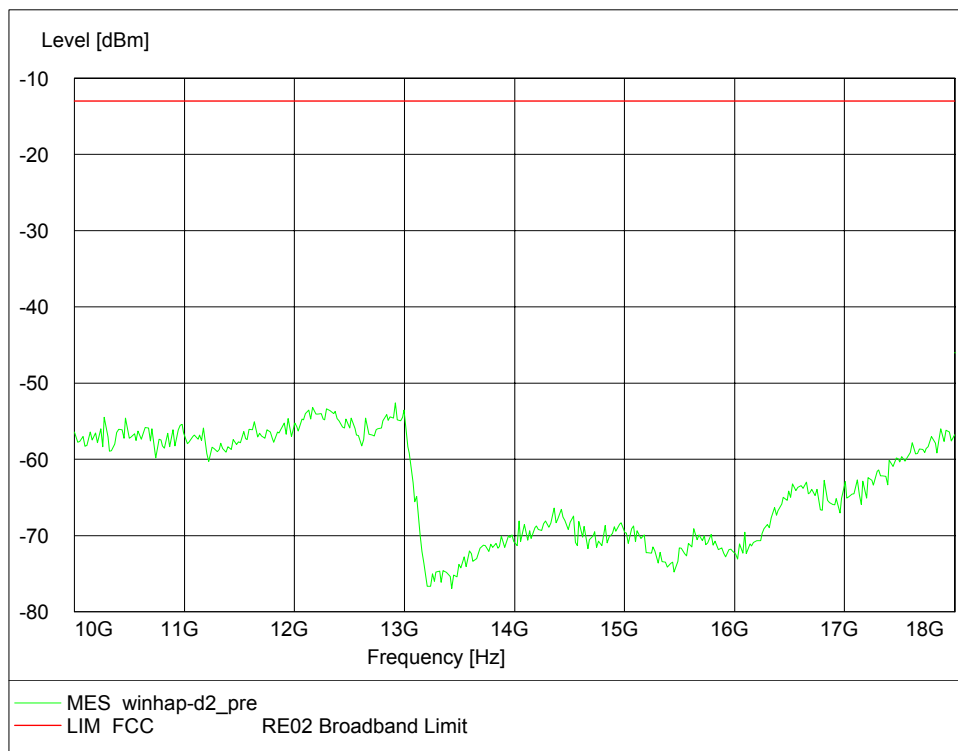
Direction: Downlink



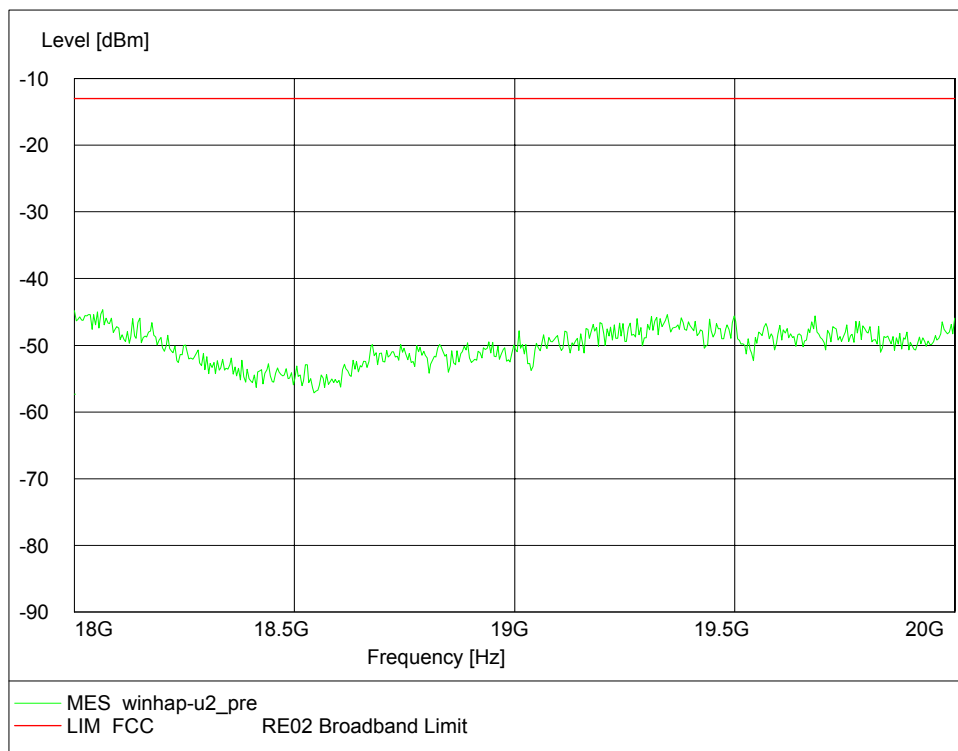
30MHz ~ 3GHz Radiated Spurious Emissions on CH Middle



3GHz ~ 10GHz Radiated Spurious Emissions on CH Middle



10GHz ~ 18GHz Radiated Spurious Emissions on CH Middle



18GHz ~ 20GHz Radiated Spurious Emissions on CH Middle

2.3. List of test equipments

No.	Name/Model	Manufacturer	S/N	Calibration Due Date
1	PSA E4440A Spectrum Analyzer	Agilent	MY41000183	Mar. 2010
2	66-30-33 Power Attenuator	Aeroflex / Weinschel	BV7049	Sep. 2010
3	SEWTH-Z-08 Climatic Chamber	ESPEC	7020030020	Aug. 2010
4	9.080m×5.255m×3.525m Shielding room	FRANKONIA	-----	Aug. 2010
5	ESI 40 EMI test receiver	R&S	100015	Aug. 2010
6	SMR 20 Signal generator	R&S	100086	Aug. 2010
7	12.65m*8.03m*7.50m Fully-Anechoic Chamber	FRANKONIA	-----	Aug. 2010
8	HL562 Ultra log test antenna	R&S	100016	Aug. 2010
9	ESH3-Z2 Pulse limiter	R&S	10002	Aug. 2010
10	ESH3-Z5 Attenuator	R&S	100020	Aug. 2010
11	HF 906 Double-Ridged Waveguide Horn Antenna	R&S	100030	Aug. 2010
12	MA260 Antenna Master	FRANKONIA	-----	Aug. 2010
13	E4438C Signal generator	Agilent	MY47270108	Aug. 2010

Appendix

Appendix1 Test Setup