



RF Test Report

Product Name: Micro BTS

Product Model: BTS3902E WCDMA

Report Number: SYBH(R)002062011EB-1

FCC ID: QISBTS3902E-U1900

IC ID: 6369A-3902EUB2

Reliability Laboratory of Huawei Technologies Co., Ltd.

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Applicant: Huawei Technologies Co., Ltd.
Address: Huawei Base, Bantian, Longgang District, Shenzhen 518129, P.R. China
Product Name: Micro BTS
Product Model: BTS3902E WCDMA
Version: V100R001

Date of Receipt Sample: 2011-06-10
Start Date of Test: 2011-06-10
End Date of Test: 2011-06-18

Test Result: Pass



Approved by Senior Engineer:	2011-06-20	Zhang Xinghai	
	Date	Name	Signature

Prepared by:	2011-06-20	Huang Yuanqiu	
	Date	Name	Signature



Modification Record

No.	Last Report No.	Modification Description
1	Not applicable	First report.



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1 General Information

1.1 **Applied Standard**

Applied Rules: 47 CFR FCC Part 2, Subpart J (10-1-09 Edition)
 47 CFR FCC Part 24, Subpart E (10-1-09 Edition)
 IC RSS-Gen (Issue 3, December 2010)
 IC RSS-133 (Issue 5, February 2009)

1.2 **Test Location**

Test Location 1: Reliability Laboratory of Huawei Technologies Co., Ltd.
Address: Huawei Base, Bantian, Longgang District, Shenzhen 518129, P.R. China

1.3 **Test Environment Condition**

Ambient Temperature: 20 – 25 °C
Ambient Relative Humidity: 45 – 55 %
Atmospheric Pressure: 101 kPa



2 Test Summary

Test Case	FCC Part No.	Requirements	Result
PCS Band			
Transmitter Output Power	2.1046 & 24.232	Peak EIRP not exceed 1640 W	Pass
Modulation Characteristics	2.104	Digital modulation	Pass
Occupied Bandwidth	2.104	(Not specified)	Pass
Band Edges Compliance	2.1051 & 24.238	Below -13 dBm/1%*EBW, in 1 MHz range	Pass
Spurious Emission at Antenna Terminals	2.1051 & 24.238	Below -13 dBm/1 kHz, 9 kHz to 150 kHz Below -13 dBm/10 kHz, 150 kHz to 30 MHz Below -13 dBm/1 MHz, 30 MHz to 10 th harmonics	Pass
Field Strength of Spurious Radiation	2.1053 & 24.238	Below -13 dBm/1 MHz	Pass
Frequency Stability	2.1055 & 24.235	Stay within the authorized frequency block	Pass

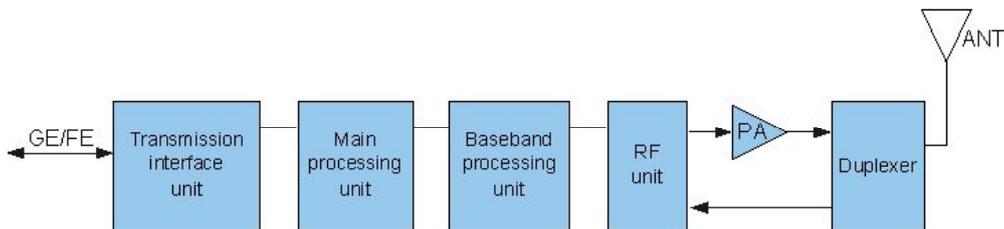
Test Case	IC Standard No.	Requirements	Result
PCS Band			
Transmitter Output Power	RSS-Gen, §4.8; RSS-133, §6.4	Average EIRP not exceed 1640 Watts (EBW ≤1MHz) Average EIRP not exceed 1640 Watts/MHz (EBW > 1MHz) Output power not exceed 100 Watts Peak-to-average ratio not exceed 13 dB	Pass
Modulation Characteristics	RSS-133, §6.2	Digital modulation	Pass
Occupied Bandwidth	RSS-Gen, §4.6	(Not specified)	Pass
Band Edges Compliance	RSS-Gen, §4.9; RSS-133, §6.5	Below -13 dBm/1%*EBW, in 1 MHz range	Pass
Spurious Emission at Antenna Terminals	RSS-Gen, §4.9; RSS-133, §6.5	Below -13 dBm/1 kHz, 9 kHz to 150 kHz Below -13 dBm/10 kHz, 150 kHz to 30 MHz Below -13 dBm/1 MHz, 30 MHz to 5 th harmonics	Pass
Field Strength of Spurious Radiation	RSS-Gen, §4.9; RSS-133, §6.5	Below -13 dBm/1 MHz	Pass
Frequency Stability	RSS-Gen, §4.7; RSS-133, §6.3	Maintained within the tolerances of ±1.0 ppm	Pass
Receiver Spurious Emissions (Conducted)	RSS-Gen, §4.10; RSS-Gen, §6; RSS-133, §6.6	Below 2 nW/4 kHz (-57 dBm/4 kHz), for 30 MHz - 1000 MHz Below 5 nW/MHz (-53 dBm/MHz), for above 1 GHz	Pass

3 Description of the Equipment under Test (EUT)

3.1 General Description

As shown in 01, the BTS3902E is an integrated base station with the following main units: transmission interface unit, main processing unit, baseband processing unit, and RF unit.

01 BTS3902E Structure



The function of each unit is as follows:

- Transmission interface unit

Provide ports for communication with the Evolved Packet Core (EPC) and the operation and maintenance (O&M) channels to LMT or M2000.

- Main processing unit

Manages the entire BTS3902E in a centralized manner in terms of O&M and signaling processing. Also, provides the system clock.

- Baseband processing unit

Schedules and processes the uplink and downlink user-plane data on the Iub interface.

- RF unit

Modulates, demodulates, processes, and combines and divides baseband signals and RF signals.

- Power Amplifier (PA)

Amplifies low-power RF signals.

- Duplexer

Allows a common antenna to receive and transmit signals. It also filters receive and transmit signals.

3.2 EUT Identity

NOTE: Unless otherwise noted in the report, the functional boards installed in the units shall be selected from the below list, but not means all the functional boards listed below shall be installed in one unit.

3.2.1 Board

Board		
Board Name	Hardware Version	Description



Board		
Board Name	Hardware Version	Description
MPW250-A	VER.B	Power Supply
WD5ALMX770 A	VER.A	Transceiver Board
WD61WMBU	VER.B	Baseband Unit
WD5AWMA720	VER.B	Power Amplify



3.3 Technical Description

3.3.1 Supported Frequency Range

Characteristics	Description
Downlink	1930 MHz – 1990 MHz
Uplink	1850 MHz – 1910 MHz

3.3.2 Transmitter / Receiver Characteristics

Characteristics	Description
System Type	UMTS
TX and RX Antenna Ports	2 * TRX,
Multiple Carrier Supported	2
TX Output Power (per Antenna Port)	1 * 5 W (= 37 dBm) 2 *2.5 W (= 2 * 34 dBm = 37 dBm)
Channel Spacing(s) / Bandwidth(s)	UMTS system: 5 MHz
Designation of Emissions	UMTS system: 5M00F9W



3.3.3 Power Supply

Specification	Description
Power Supply Type	Directly Connected to AC Power Supply
Input to EUT (AC power)	AC Voltage Nominal: ~ 100 V to 240 V (50/60 Hz) AC Voltage Range: ~90 V to 290 V (45/65 Hz)



4 General Test Conditions / Configurations

4.1 RF Channels under Test

TX / RX	Multiple Carriers	RF Channel		
		Bottom (B)	Middle (M)	Top (T)
TX	1	Ch.9662/ 1932.4 MHz	Ch.9800/ 1960MHz	Ch.9938/ 1987.6MHz
	2	Ch. 9662/ 1932.4 MHz, Ch.9687 / 1937.4 MHz	Ch. 9800/ 1960MHz, Ch.9825 / 1965 MHz	Ch.9938/ 1987.6MHz Ch.9913/ 1982.6MHz
RX	1	--	Ch.9400 / 1880 MHz	--

4.2 Test Modes

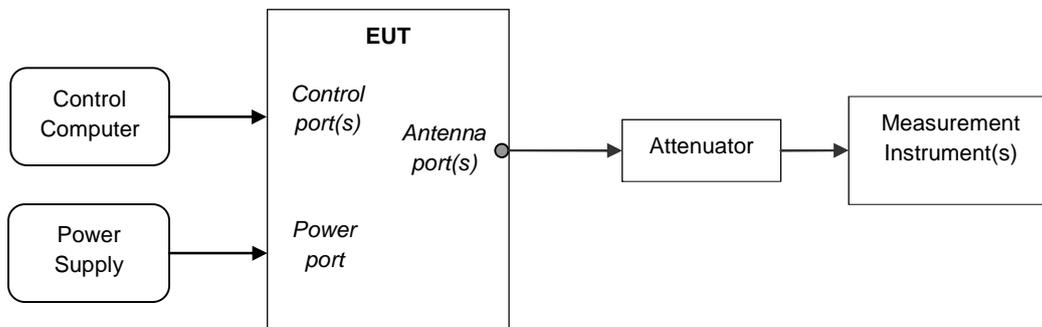
Test Mode	Test Modes Description
TM1	3GPP TS 25.141, clause 6.1.1, Test Model 1, QPSK modulation
TM2	3GPP TS 25.141, clause 6.1.1, Test Model 4, 16QAM modulation
TM3	3GPP TS 25.141, clause 6.1.1, Test Model 5, 16QAM modulation
TM4	3GPP TS 25.141, clause 6.1.1, Test Model 6, 64QAM modulation

4.3 Test Setups

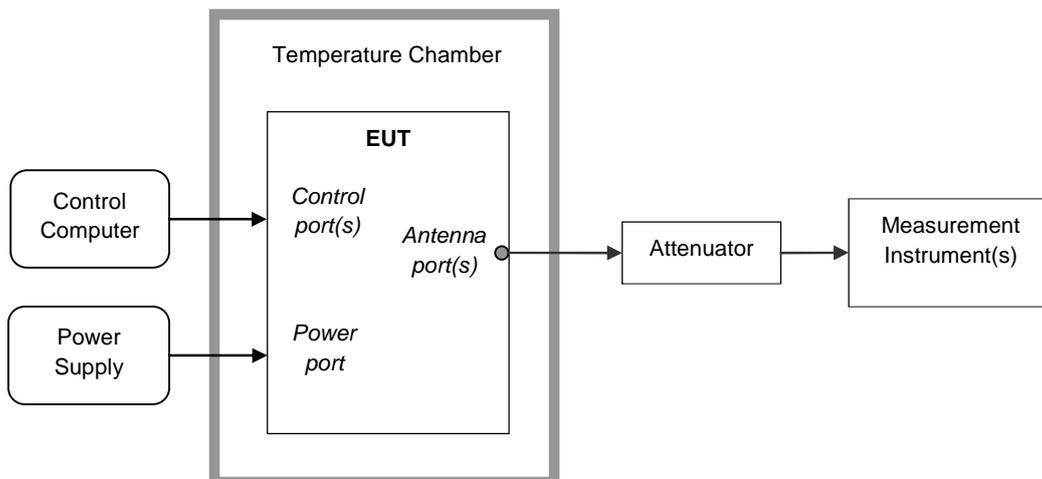
4.3.1 General Test Setup Configurations

Configuration	Description
Test Antenna Ports	Until otherwise declared, all TX tests are ONLY performed at the main Transmitter antenna port (e.g. TRXA, TXA and so on) of the EUT, and all RX tests are ONLY performed at the main Receiver antenna port (e.g. TRXA, RXA and so on) of the EUT.
Multiple RF Sources	Other than the tested RF source of the EUT, other RF source(s) are disabled or shutdown during measurements.

4.3.2 Test Setup 1



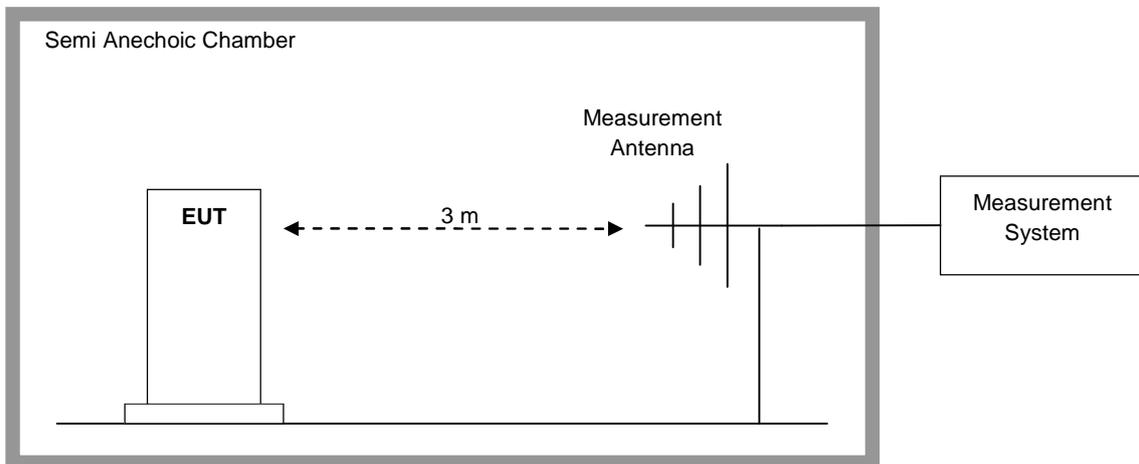
4.3.3 Test Setup 2



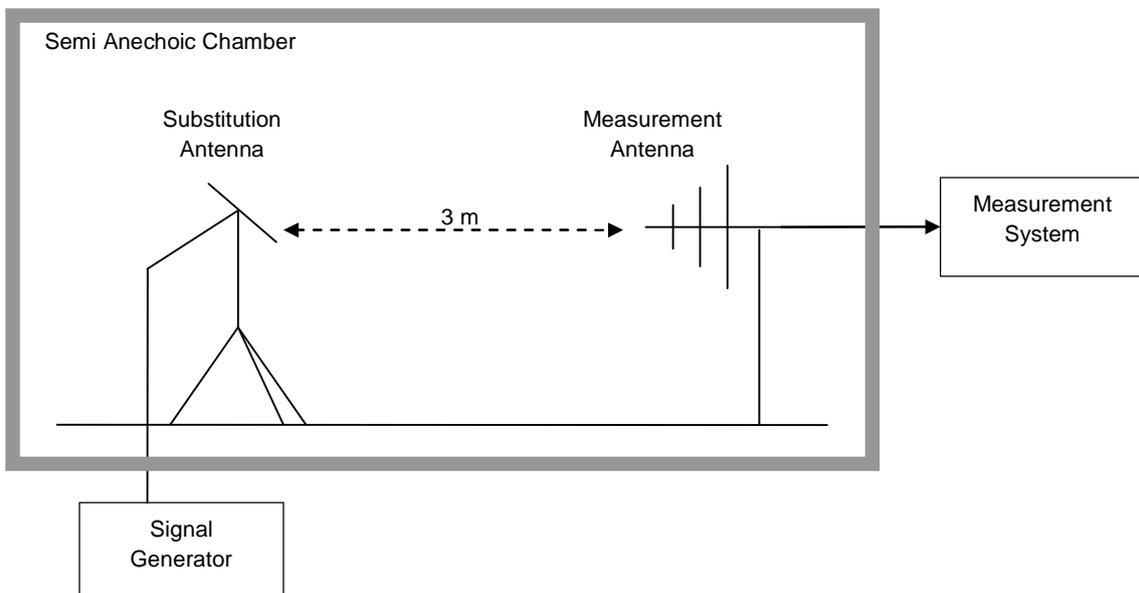
4.3.4 Test Setup 3

NOTE: Effective radiated power (ERP) refers to the radiation power output of the EUT, assuming all emissions are radiated from half-wave dipole antennas.

4.3.4.1 Step 1: Pre-test



4.3.4.2 Step 2: Substitution method to verify the maximum ERP





4.4 Test Conditions

Test Case	Test Conditions	
Transmitter Output Power	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Seup 1
	Multiple Carriers	1 to 2
	RF Channels (TX)	B, M, T
	Test Mode	TM1
Modulation Characteristics	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Seup 1
	Multiple Carriers	1
	RF Channels (TX)	B, M, T
	Test Mode	TM1, TM4, TM5, TM6
Occupied Bandwidth	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Seup 1
	Multiple Carriers	1
	RF Channels (TX)	B, M, T
	Test Mode	TM1
Band Edges Compliance	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Seup 1
	Multiple Carriers	1 to 2
	RF Channels (TX)	B, T
	Test Mode	TM1
Spurious Emission at Antenna Terminals	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Seup 1
	Multiple Carriers	1 to 2
	RF Channels (TX)	B, M, T
	Test Mode	TM1
Field Strength of Spurious Radiation	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Seup 3
	Multiple Carriers	2
	RF Channels (TX)	M
	Test Mode	TM1
Frequency Stability	Test Configuration	(1) -30 °C to +50 °C with step 10 °C at Rated Voltage; (2) 85%, 100% and 115% of Rated Voltage at Ambient Temperature.
	Test Setup	Test Seup 2
	Multiple Carriers	1
	RF Channels (TX)	M
	Test Mode	TM1, TM4
Receiver Spurious Emissions (Conducted)	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Seup 1
	Multiple Carriers	1



Test Case	Test Conditions	
	RF Channels (TX/RX)	M
	Test Mode	TM1



5 Test Results

5.1 Transmitter Output Power

5.1.1 Average Power

Test Mode	Multiple Carriers	RF Channel	Average Power [dBm]	Average Power [W]	Limit [W]	Verdict
TM1	1	B	37.44	5.54	100	Pass
		M	37.27	5.33	100	Pass
		T	37.29	5.35	100	Pass
	2	B	33.84&34.37	5.15	100	Pass
		M	33.77&33.81	4.78	100	Pass
		T	33.83&34.00	4.91	100	Pass

5.1.2 Peak-to-Average Ratio

NOTE: See Annex A.1 for detailed measurement results.

Test Mode	RF Channel	Peak-to-Average Ratio [dB]	Limit [dB]	Verdict
TM1	B	6.68	< 13	Pass
	M	6.71	< 13	Pass
	T	7.09	< 13	Pass

5.1.3 Peak Power

The Peak Transmitter Output Power is calculated by:

Peak power [dBm] = Average power [dB] + Peak-to-Average Ratio [dB].



5.2 Modulation Characteristics

NOTE: See Annex A.2 for detailed measurement results.



5.3 Occupied Bandwidth

NOTE: See Annex A.3 for detailed measurement results.

Test Mode	RF Channel	Occupied Bandwidth [MHz]	Limit [MHz]	Verdict
TM1	B	4.1465	--	Pass
	M	4.1629	--	Pass
	T	4.1516	--	Pass



5.4 Band Edges Compliance

NOTE 1: See Annex A.4 for detailed measurement results.

NOTE 2: The offset of measurement filter -3dB point may be considered when identifying the maximum emission for e.g. the CDMA, WCDMA, LTE, WiMAX systems.

Test Mode	Multiple Carriers	RF Channel	Band Edges Emissions [dBm]	Limit [dBm]	Verdict
TM1	1	B	-19.82	< -13	Pass
		T	-22.09	< -13	Pass
	2	B	-22.86	< -13	Pass
		T	-22.83	< -13	Pass



5.5 Spurious Emission at Antenna Terminals

NOTE: See Annex A.5 for detailed measurement results.

Test Mode	Multiple Carriers	RF Channel	Spurious Emission at Antenna Terminals		Limit [dBm]	Verdict
				[dBm]		
TM1	1	B	9kHz~150kHz	-44.89	< -13	Pass
			150kHz~30MHz	-55.92	< -13	Pass
			30MHz~1GHz	-43.34	< -13	Pass
			1GHz~5GHz	-38.97	< -13	Pass
			5GHz~10GHz	-37.36	< -13	Pass
			1GHz~20GHz	-34.51	< -13	Pass
		M	9kHz~150kHz	-44.97	< -13	Pass
			150kHz~30MHz	-54.34	< -13	Pass
			30MHz~1GHz	-38.80	< -13	Pass
			1GHz~5GHz	-37.09	< -13	Pass
			5GHz~10GHz	-37.27	< -13	Pass
			1GHz~20GHz	-34.44	< -13	Pass
		T	9kHz~150kHz	-53.10	< -13	Pass
			150kHz~30MHz	-56.26	< -13	Pass
			30MHz~1GHz	-42.22	< -13	Pass
			1GHz~5GHz	-37.07	< -13	Pass
			5GHz~10GHz	-35.68	< -13	Pass
			1GHz~20GHz	-32.69	< -13	Pass
	2	B	9kHz~150kHz	-56.65	< -13	Pass
			150kHz~30MHz	-54.51	< -13	Pass
			30MHz~1GHz	-45.88	< -13	Pass
			1GHz~5GHz	-42.76	< -13	Pass
			5GHz~10GHz	-41.19	< -13	Pass
			1GHz~20GHz	-38.42	< -13	Pass
M		9kHz~150kHz	-56.09	< -13	Pass	
		150kHz~30MHz	-53.67	< -13	Pass	
		30MHz~1GHz	-44.45	< -13	Pass	
		1GHz~5GHz	-42.80	< -13	Pass	
		5GHz~10GHz	-41.15	< -13	Pass	
		1GHz~20GHz	-38.32	< -13	Pass	
T	9kHz~150kHz	-56.10	< -13	Pass		
	150kHz~30MHz	-51.76	< -13	Pass		
	30MHz~1GHz	-46.64	< -13	Pass		
	1GHz~5GHz	-42.61	< -13	Pass		
	5GHz~10GHz	-41.22	< -13	Pass		
	1GHz~20GHz	-38.43	< -13	Pass		



5.6 Field Strength of Spurious Radiation

NOTE: See Annex A.6 for detailed measurement results. The margin of result is more than 20 dB.

Test Mode	Multiple Carriers	RF Channel	Field Strength of Spurious Radiation [dBm]	Limit [dBm]	Verdict
TM1	2	M	< -13	< -13	Pass



5.7 Frequency Stability

Frequency Error vs. Temperature:

TM1:

Voltage	Temperature	Frequency Stability [Hz]	Frequency relative to rated [ppm]	Frequency relative to 20 °C [ppm]	Limit [ppm]	Verdict
100% Rated	-30 °C	-2.71	-0.001	-0.001	±1.0 ppm	Pass
	-20 °C	-2.65	-0.001	-0.001	±1.0 ppm	Pass
	-10 °C	-1.24	-0.0006	-0.0006	±1.0 ppm	Pass
	0 °C	2.45	0.001	0.001	±1.0 ppm	Pass
	10 °C	-3.10	-0.0015	-0.0015	±1.0 ppm	Pass
	20 °C	-3.09	-0.0015	0	±1.0 ppm	Pass
	30 °C	-3.69	-0.0018	-0.0018	±1.0 ppm	Pass
	40 °C	1.54	-0.0007	-0.0007	±1.0 ppm	Pass
	50 °C	-0.33	0.00	0.00	±1.0 ppm	Pass

TM4:

Voltage	Temperature	Frequency Stability [Hz]	Frequency relative to rated [ppm]	Frequency relative to 20 °C [ppm]	Limit [ppm]	Verdict
100% Rated	-30 °C	-1.19	-0.0006	-0.0006	±1.0 ppm	Pass
	-20 °C	-5.41	-0.0027	-0.0027	±1.0 ppm	Pass
	-10 °C	-3.54	-0.0018	-0.0018	±1.0 ppm	Pass
	0 °C	1.36	0.0008	0.0008	±1.0 ppm	Pass
	10 °C	-2.54	-0.0013	-0.0013	±1.0 ppm	Pass
	20 °C	-4.68	-0.0023	0	±1.0 ppm	Pass
	30 °C	-3.54	-0.0018	-0.0018	±1.0 ppm	Pass
	40 °C	-2.59	-0.0013	-0.0013	±1.0 ppm	Pass
	50 °C	-3.05	-0.0015	-0.0015	±1.0 ppm	Pass

Frequency Error vs. Voltage:

TM1:

Temperature	% Voltage of Rated	Frequency Stability [Hz]	Frequency relative to rated [ppm]	Frequency relative to 20 °C [ppm]	Limit [ppm]	Verdict
20 °C	85 %	-5.01	-0.0025	-0.0025	±1.0 ppm	Pass
	100 %	-3.09	-0.0018	0	±1.0 ppm	Pass
	115 %	-3.52	-0.0018	-0.0018	±1.0 ppm	Pass

TM4:

Temperature	% Voltage of Rated	Frequency Stability [Hz]	Frequency relative to rated [ppm]	Frequency relative to 20 °C [ppm]	Limit [ppm]	Verdict
20 °C	85 %	-4.34	-0.0022	-0.0022	±1.0 ppm	Pass
	100 %	-4.68	-0.0024	0	±1.0 ppm	Pass



Temperature	% Voltage of Rated	Frequency Stability [Hz]	Frequency relative to rated [ppm]	Frequency relative to 20 °C [ppm]	Limit [ppm]	Verdict
	115 %	-1.40	-0.0007	-0.0007	±1.0 ppm	Pass



5.8 Receiver Spurious Emissions (Conducted)

NOTE: See Annex A.7 for detailed measurement results.

Test Mode	Multiple Carriers	RF Channel	Receiver Spurious Emissions (Conducted) [dBm]	Limit [dBm]	Verdict
TM1	1	M	-78.80	<-57dBm/4kHz	Pass
		M	-60.93	<-53dBm/1MHz	Pass



6 Main Test Instruments

Equipment Name	Manufacturer	Model	Serial Number	Cal. Due
Test Setup 1 & 2				
Spectrum Analyzer	Agilent	N9030A	MY49431033	2012-04-16
Spectrum Analyzer	Agilent	E4440A	MY49420179	2012-05-12
Temperature Chamber	WEISS	WK11-1000	5922609060010	2011-08-16
Vector Signal Generator	SMU200A	R&S	100699	2012-03-21
Attenuator	Huaxiang	WEINSCHL 49/20/33	--	2012-05-08
Notch Filter	WAINWRIGHT	WRCT1850/2170-5/ 40-10EEK	10	---
Test Setup 3				
3m Semi Anechoic Chamber	S+M	---	---	---
EMI Test receiver	R&S	ESU40	100144	2012-05-12
Broadband Antenna	SCHAFFNER	CBL 6112B	2941	2011-12-10
Horn Antenna	R&S	HF906	359287/005	2012-05-07



7 Measurement Uncertainty

For a 95% confidence level ($k=2$), the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Test Item		Extended Uncertainty
Transmitter Output Power	Power (dBm)	U =0.39 dB
Occupied Bandwidth	Magnitude (%)	U=0.2%
Band Edge Compliance	Disturbance Power (dBm)	U=2.0 dB
Conducted Spurious Emissions	Disturbance Power (dBm)	U=2.0 dB
Field Strength of Spurious Radiation	ERP (dBm)	U=4.6 dB (30 MHz – 1GHz) U=3.0 dB (above 1 GHz)
Frequency Stability	Frequency Accuracy (ppm)	U=0.21 ppm



Annex A Measurement Results

Annex A.1 Peak-to-Average Ratio

TM1:

Channel B:

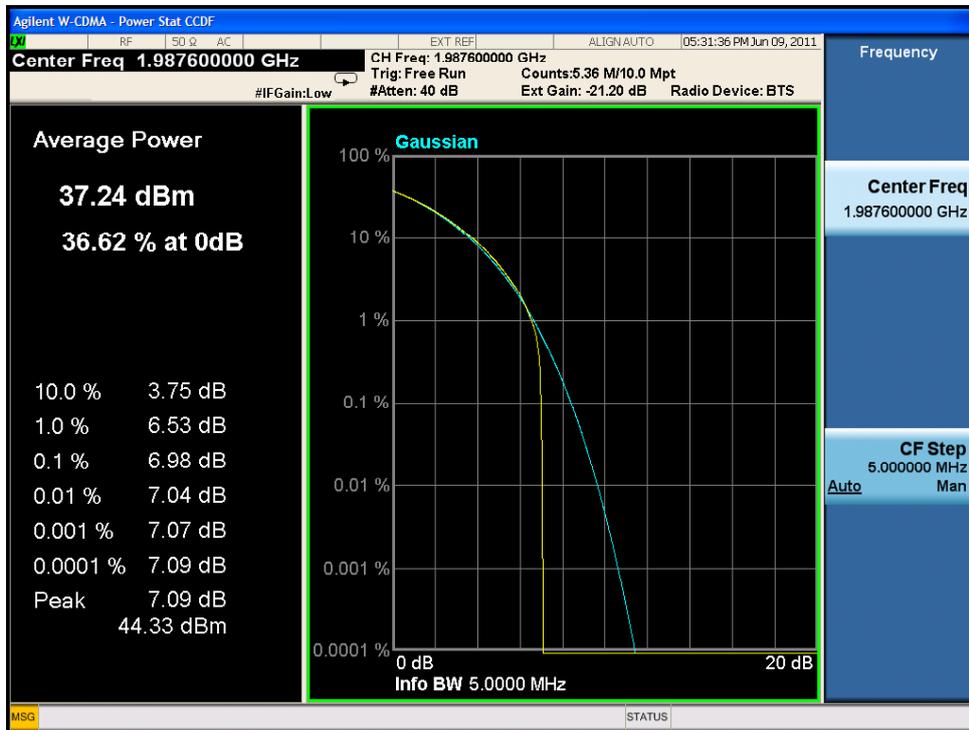


Channel M:





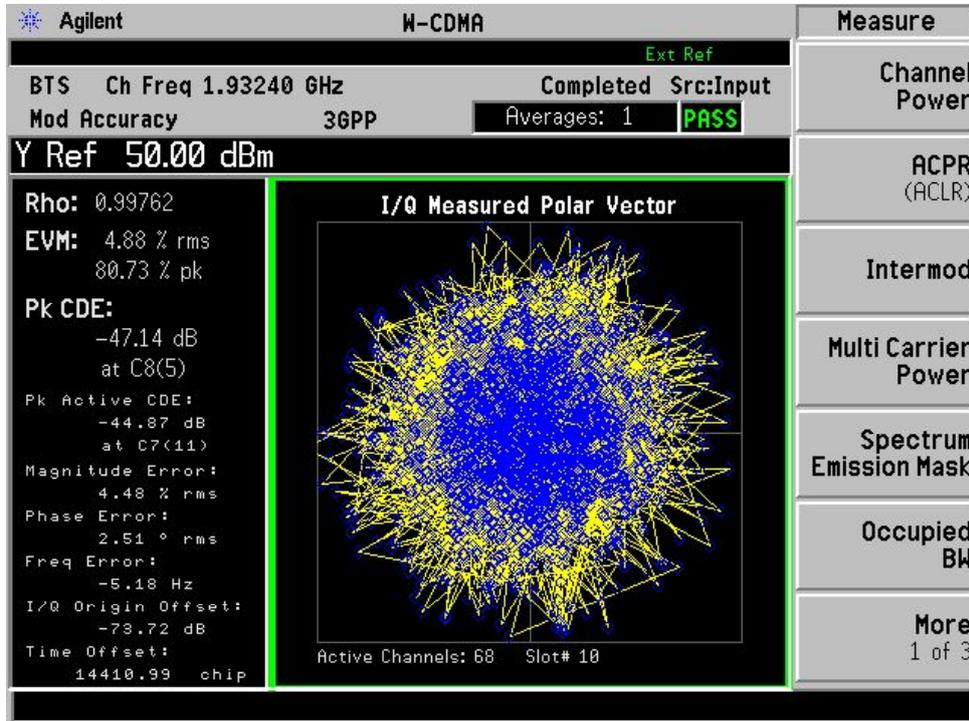
Channel T:



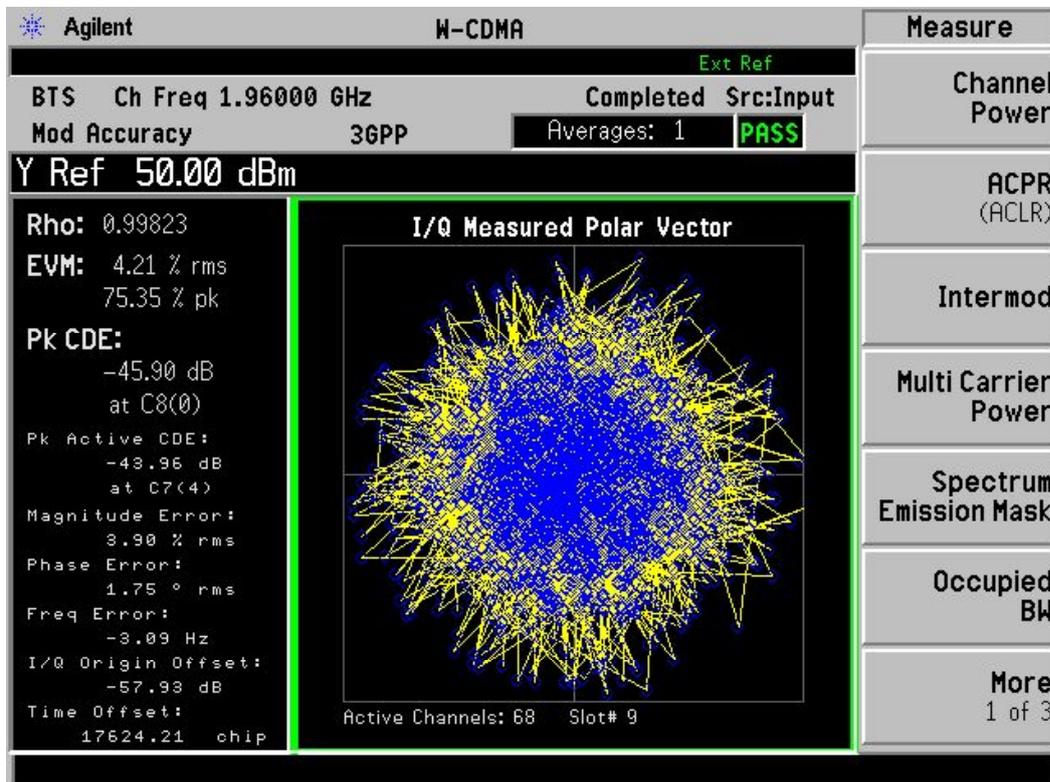
Annex A.2 Modulation Characteristics

TM1:

Channel B:

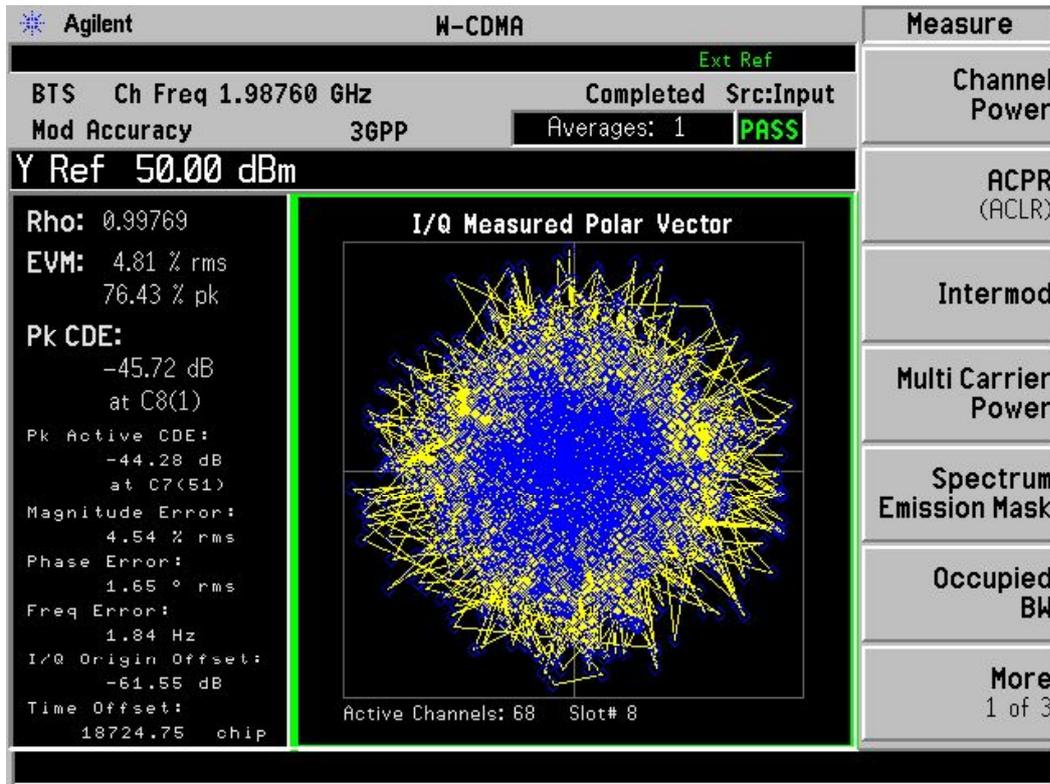


Channel M:



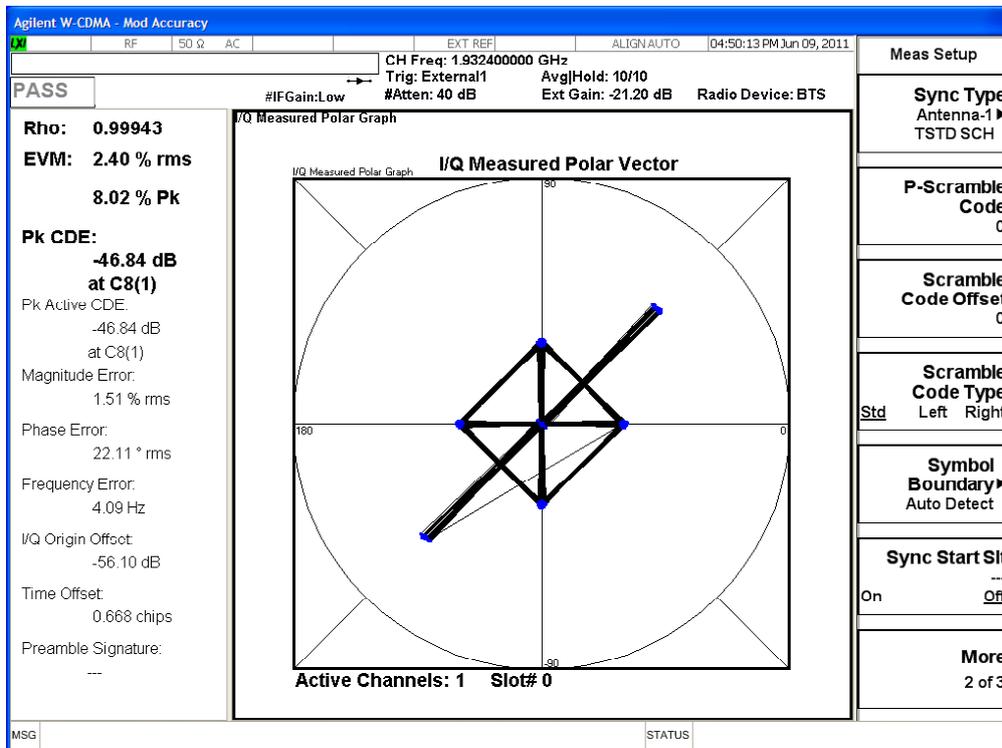


Channel T:



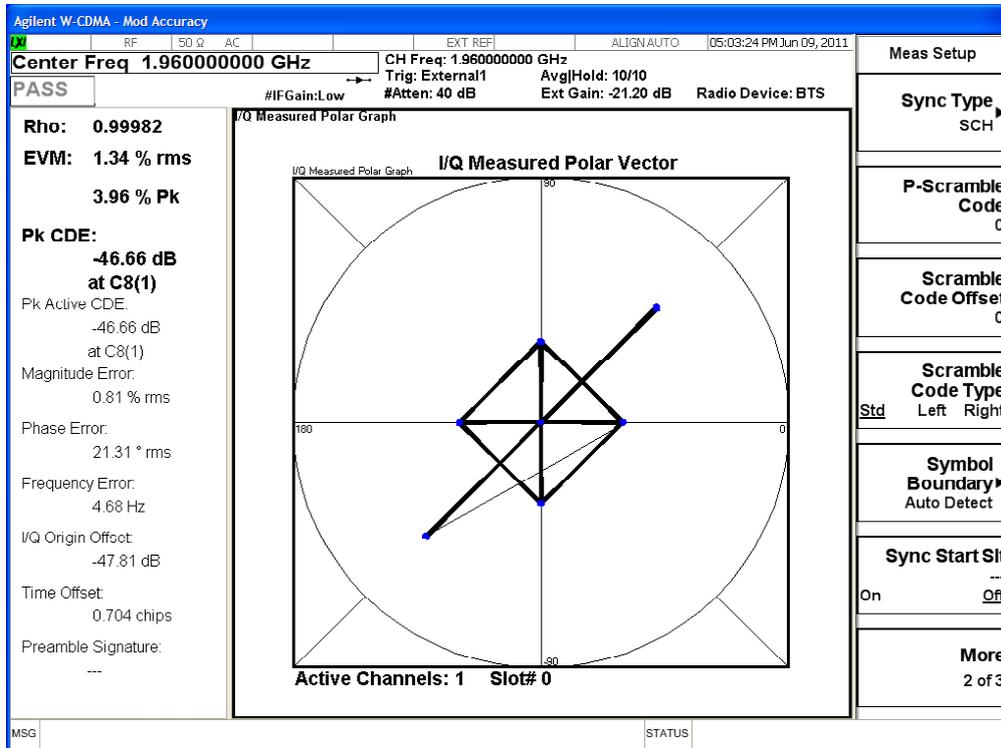
TM4:

Channel B:

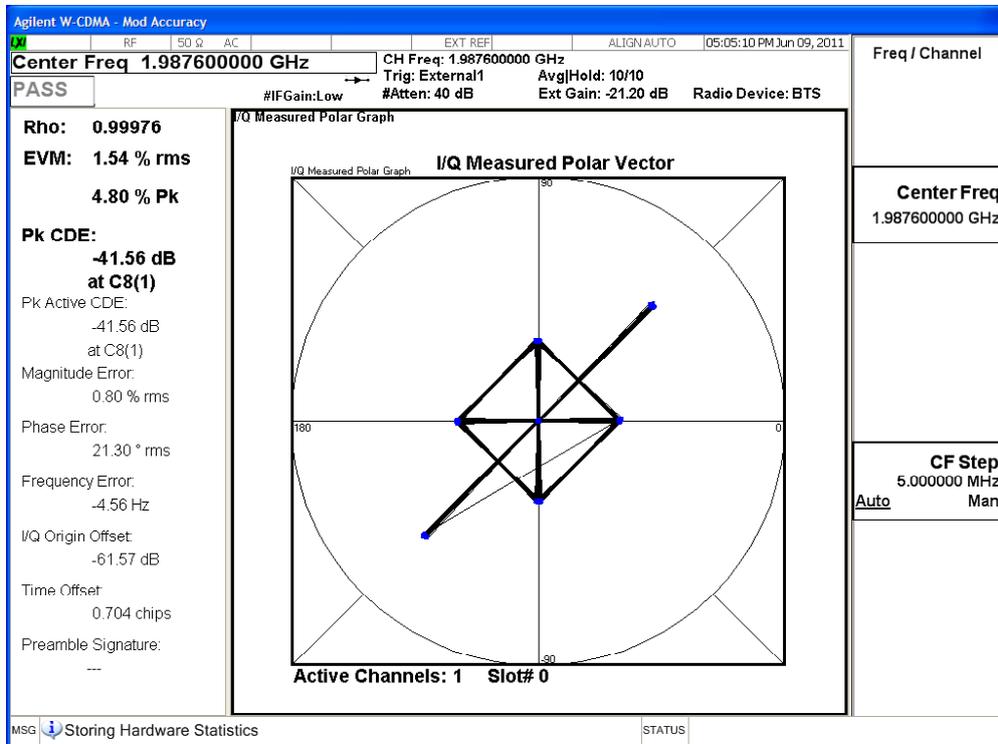




Channel M:



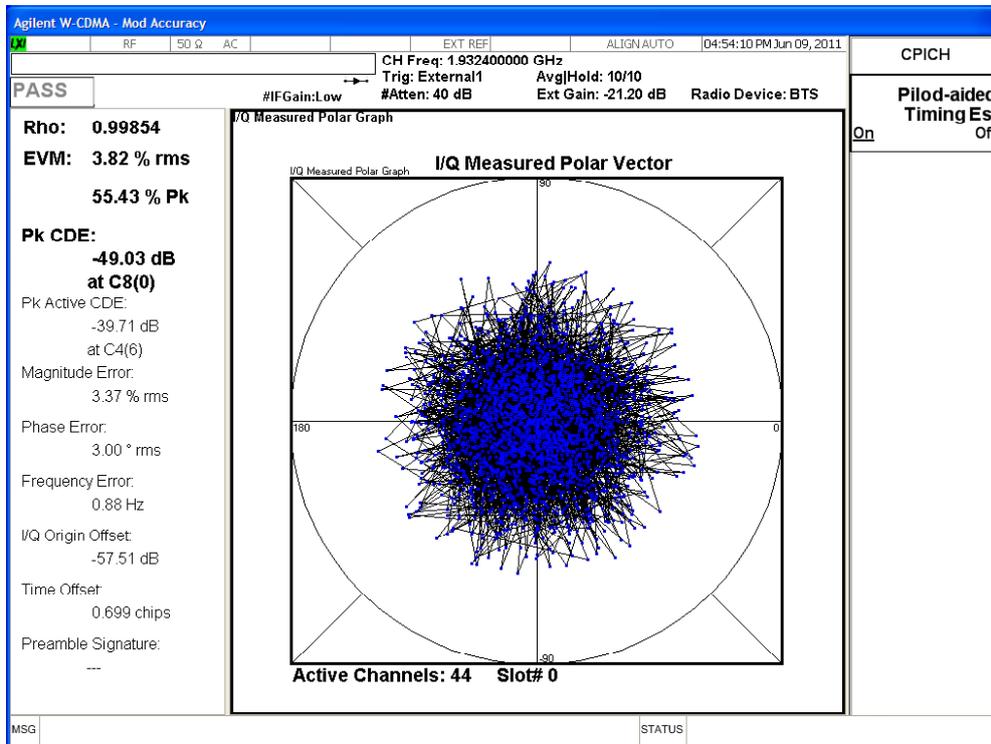
Channel T:



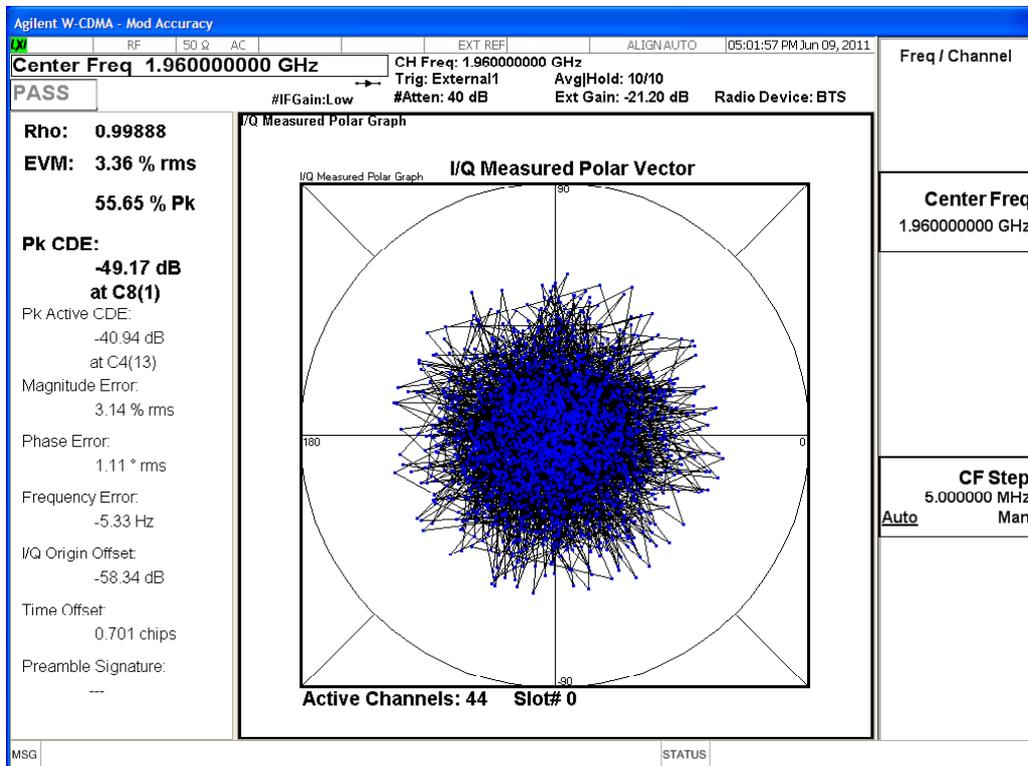


TM5:

Channel B:

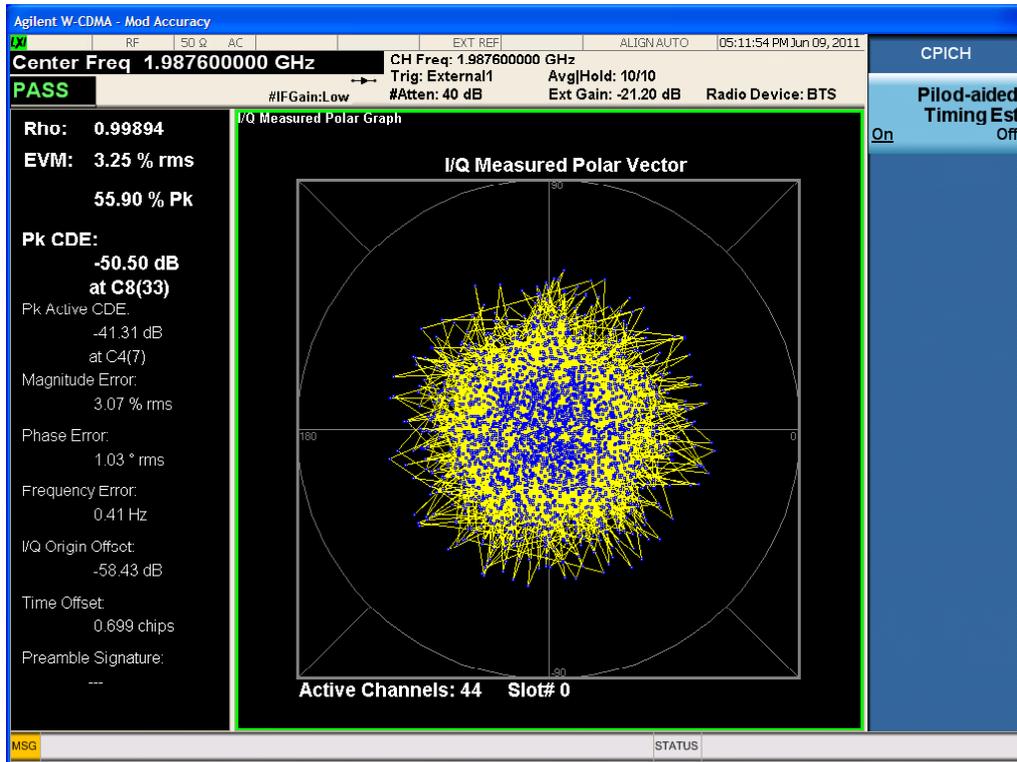


Channel M:



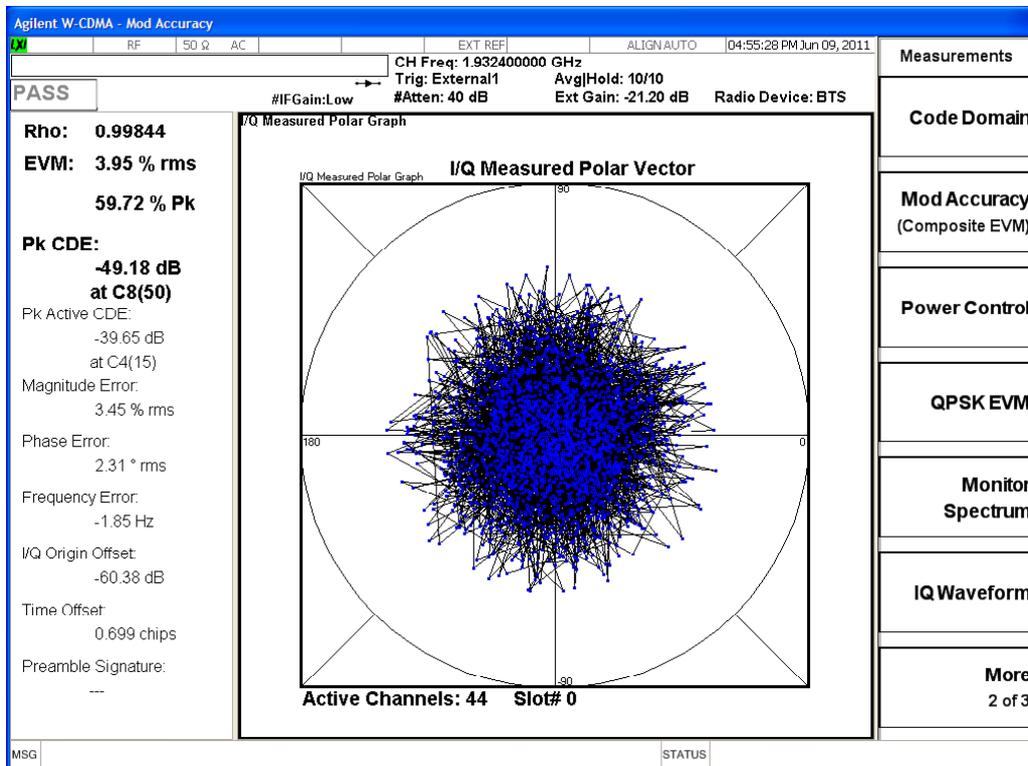


Channel T:



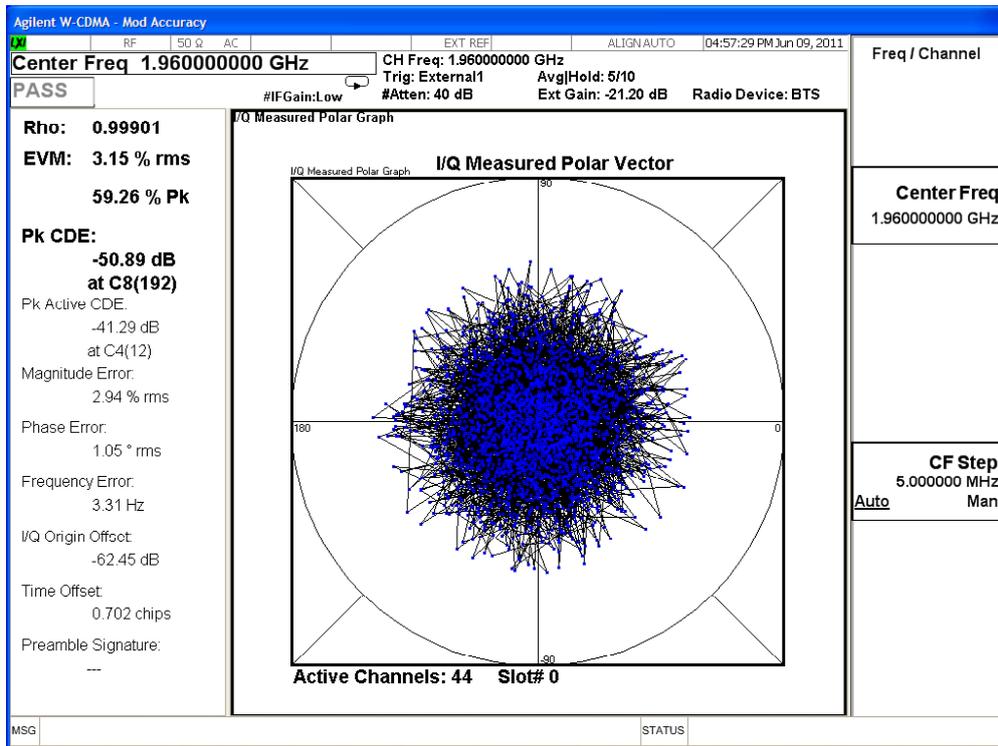
TM6:

Channel B:

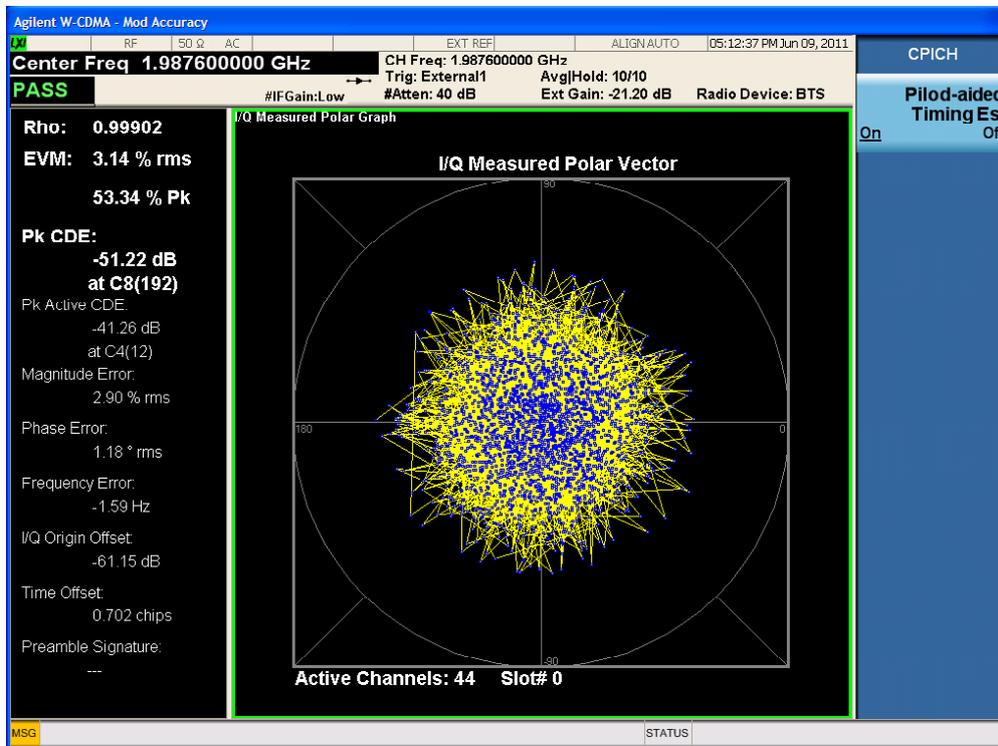




Channel M:



Channel T:

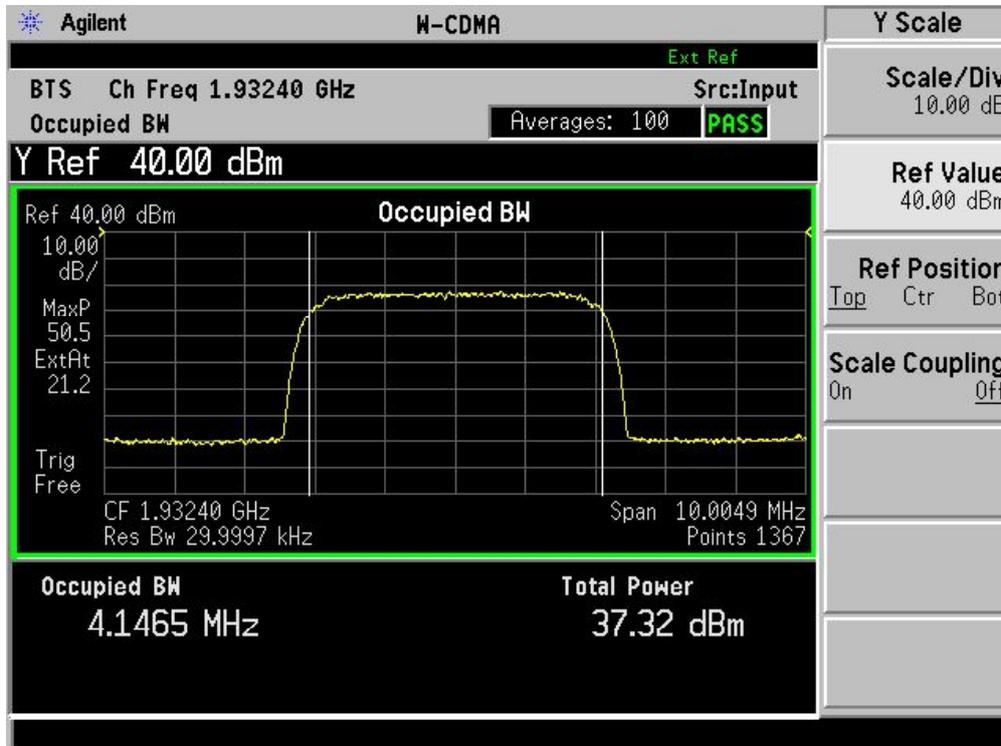




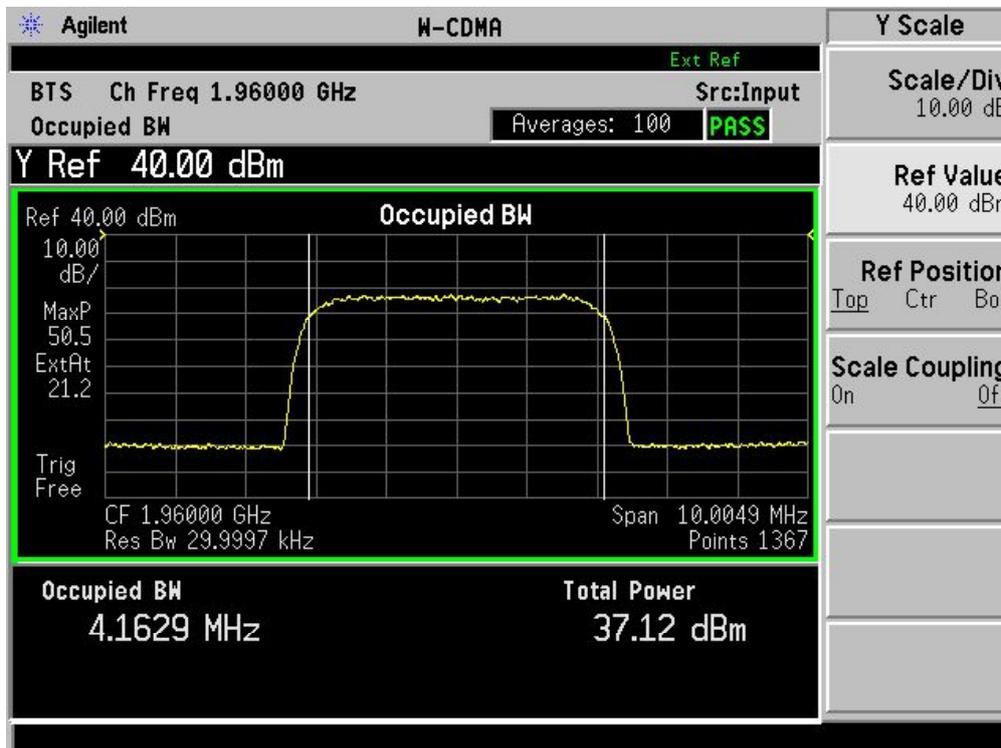
Annex A.3 Occupied Bandwidth

TM1:

Channel B:

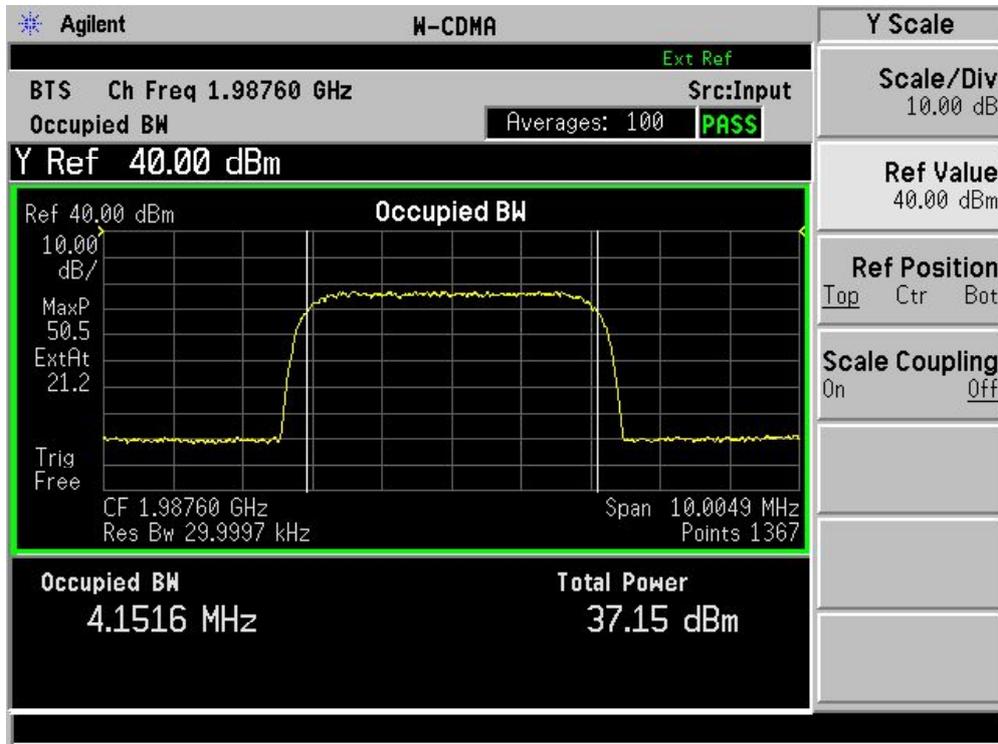


Channel M:





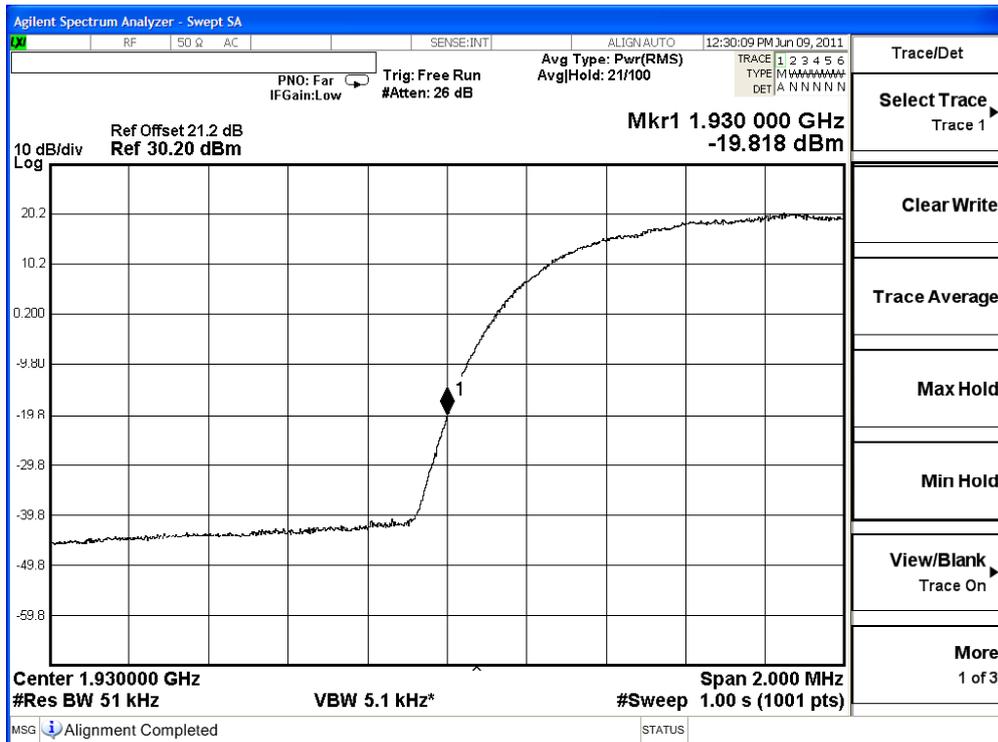
Channel T:



Annex A.4 Band Edges

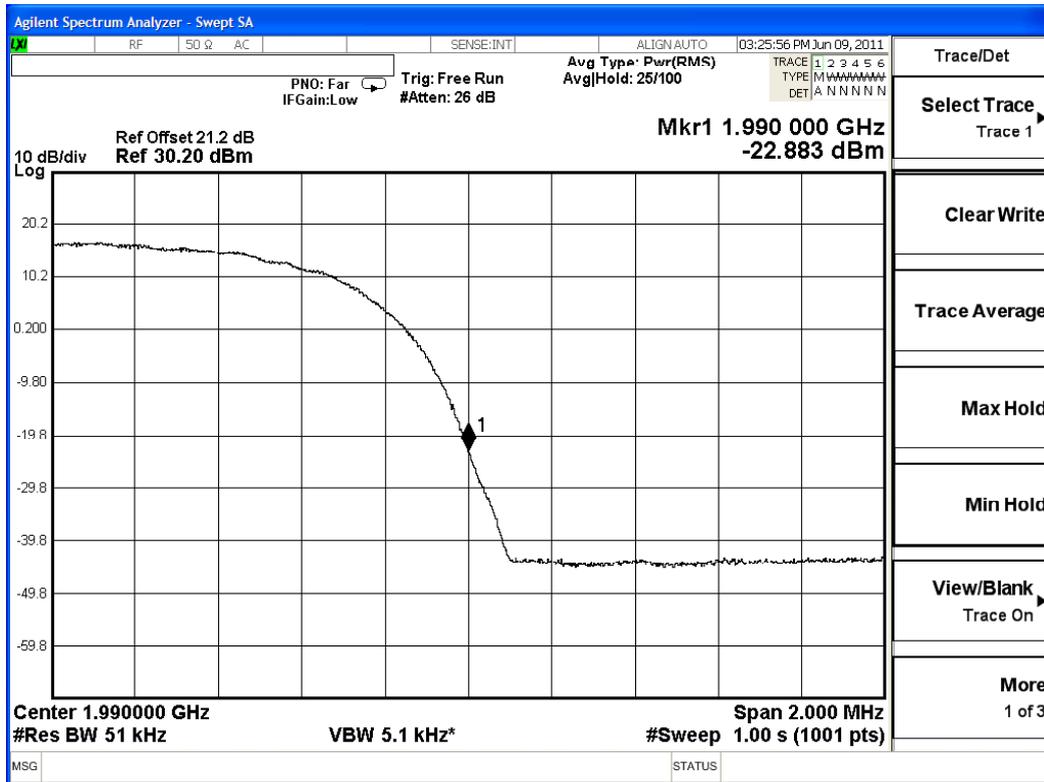
TM1:

Channel B (1 carrier):





Channel T (2 carriers):

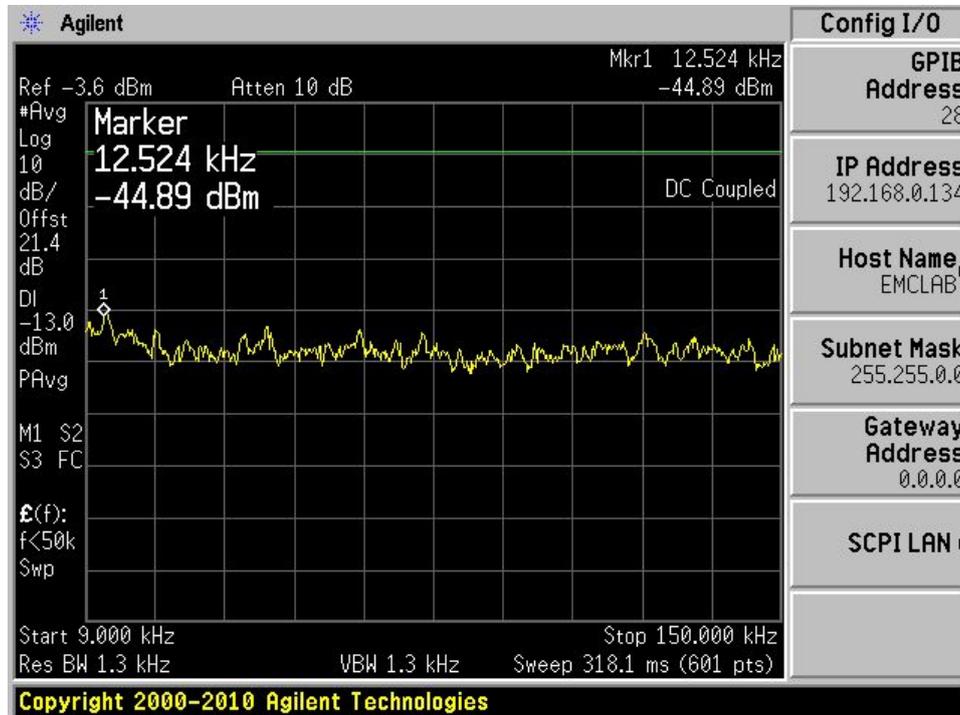




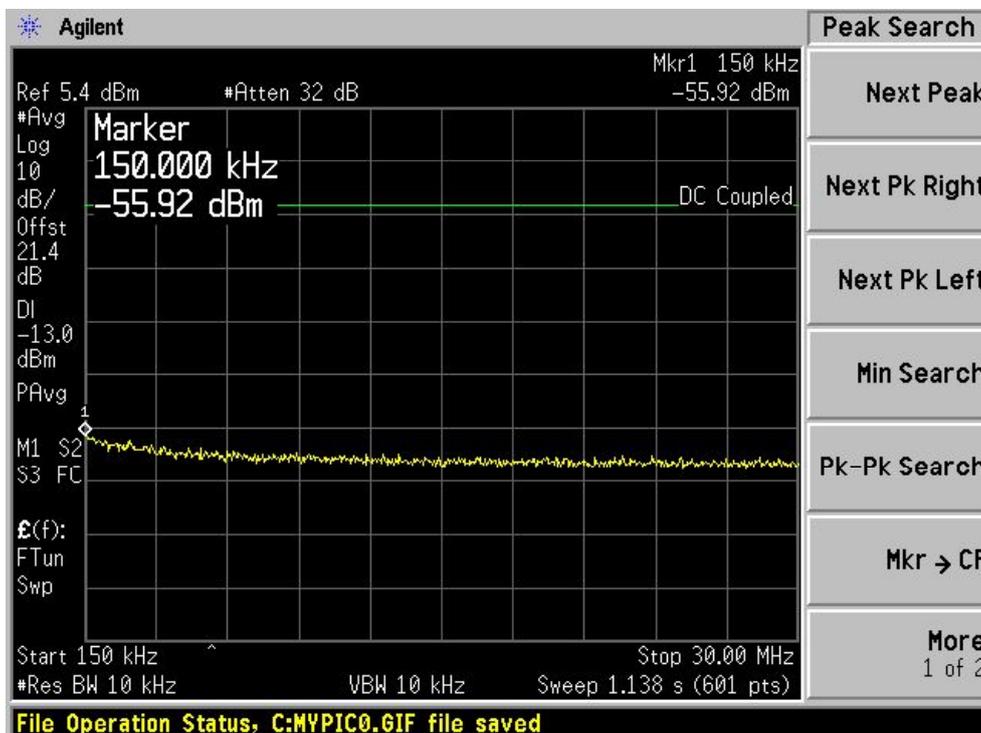
Annex A.5 Spurious Emission at Antenna Terminals

TM1:

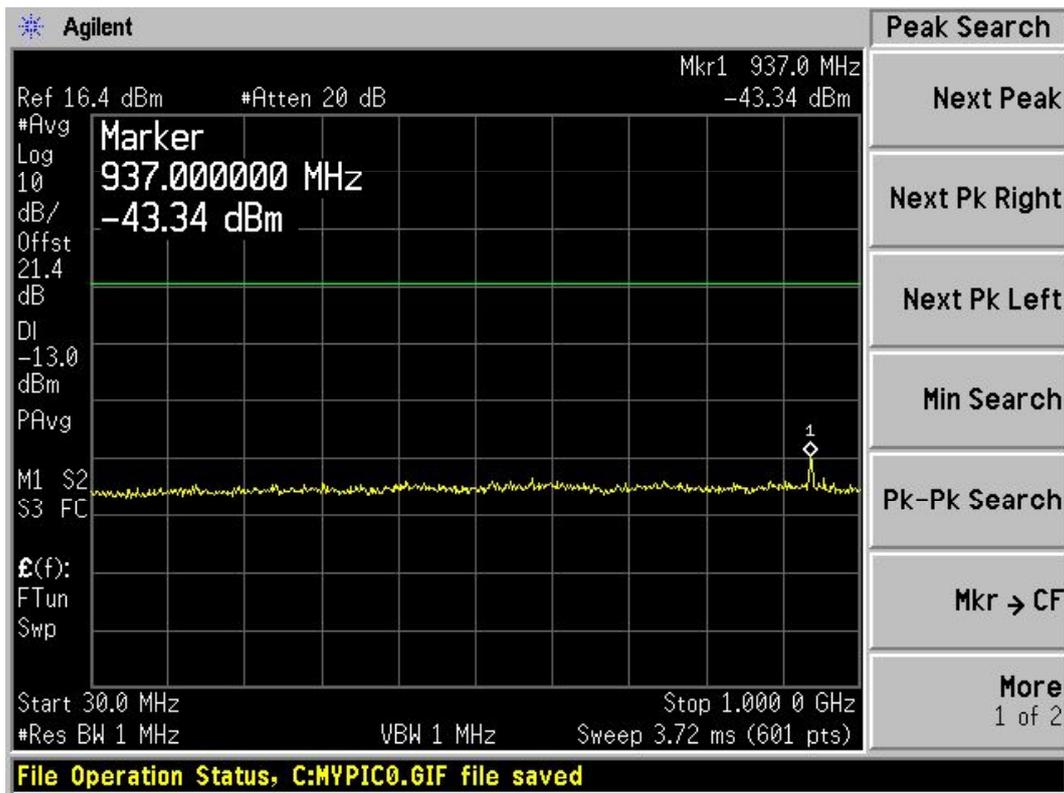
Channel B (1 carrier):



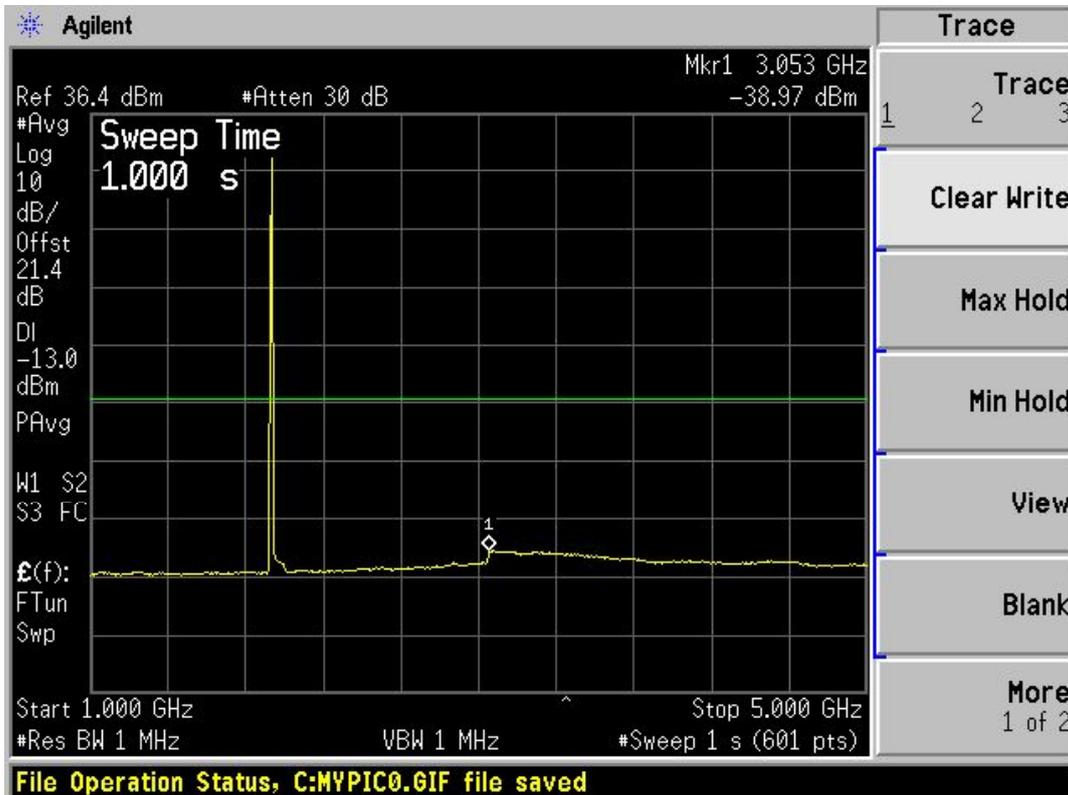
9 kHz~150kHz



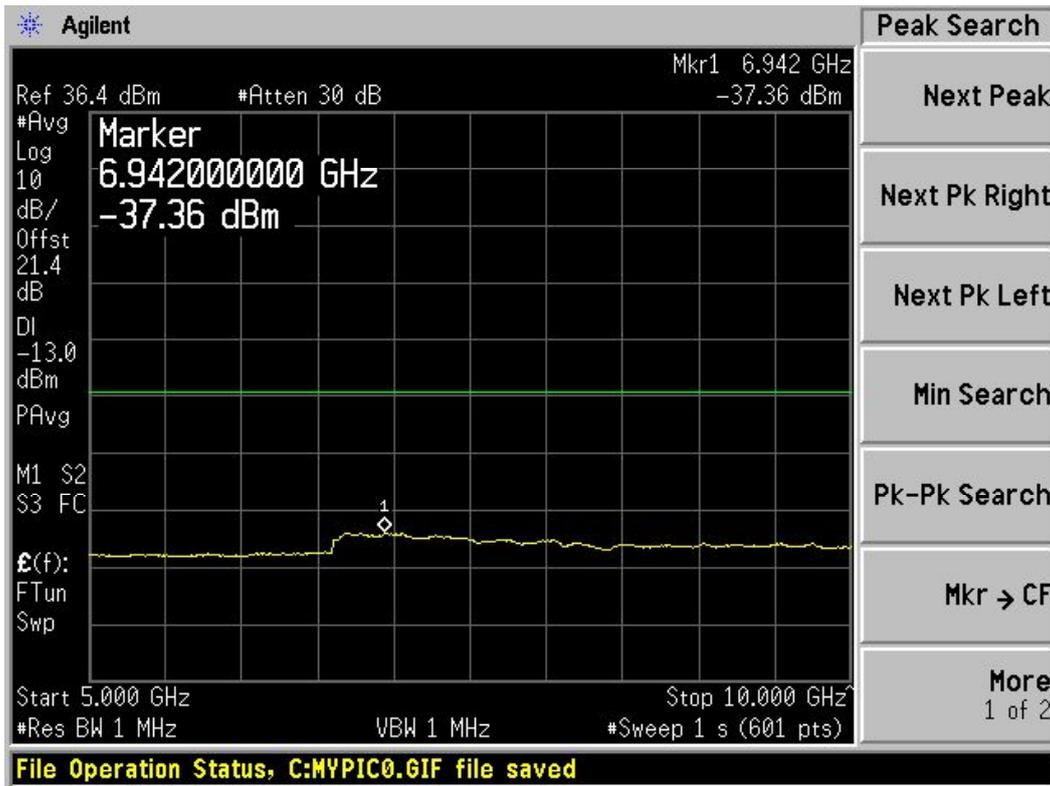
150 kHz~30MHz



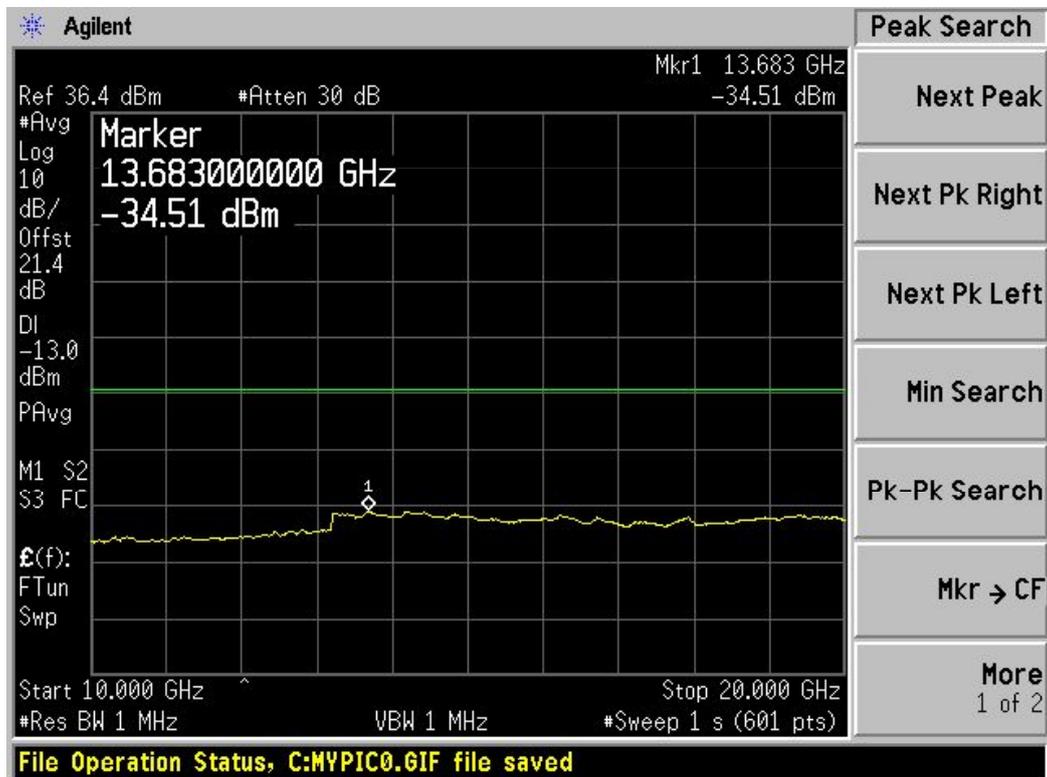
30MHz~1GHz



1GHz~5GHz



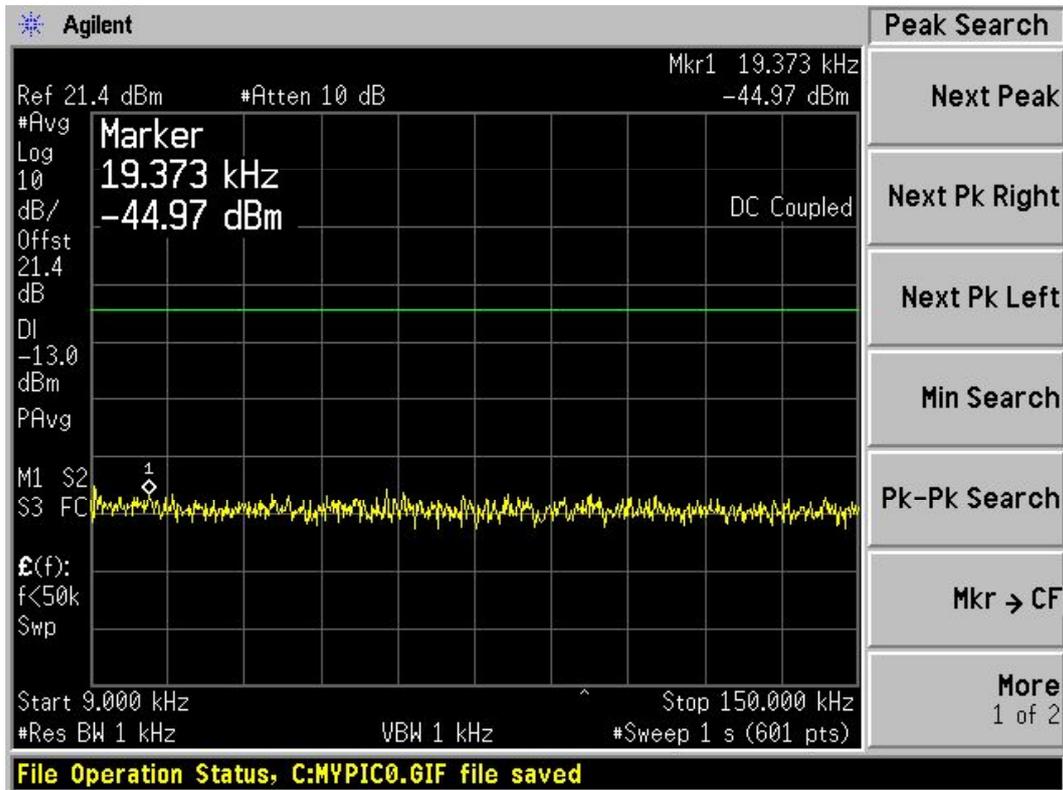
5GHz~10GHz



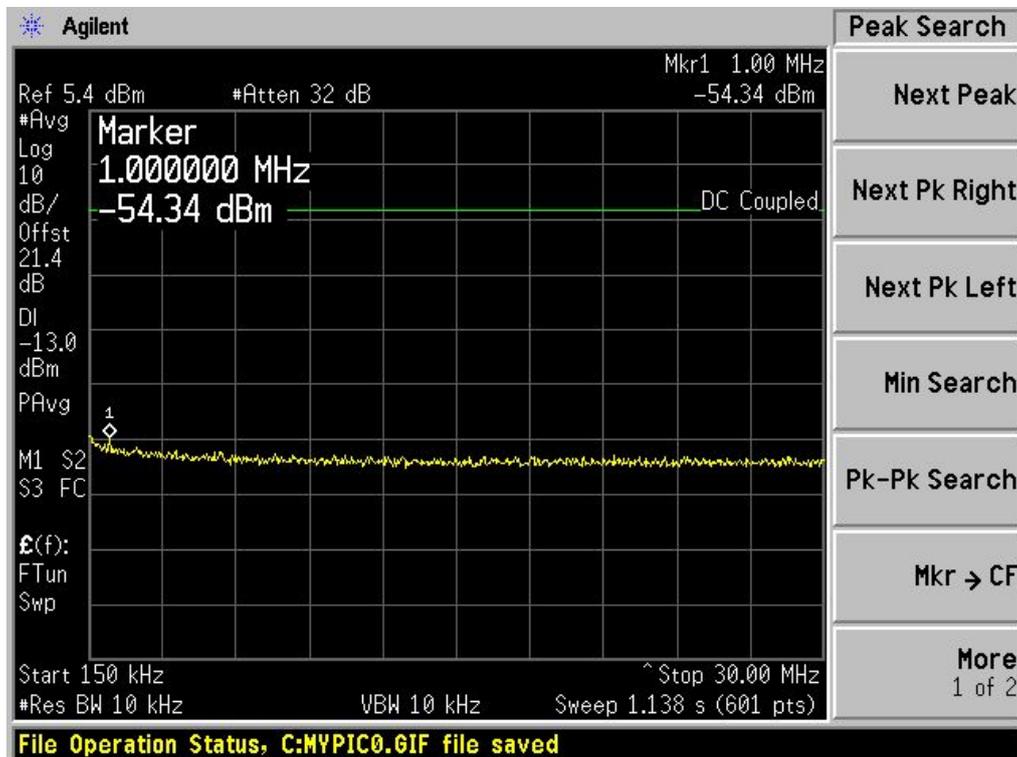
10GHz~20GHz



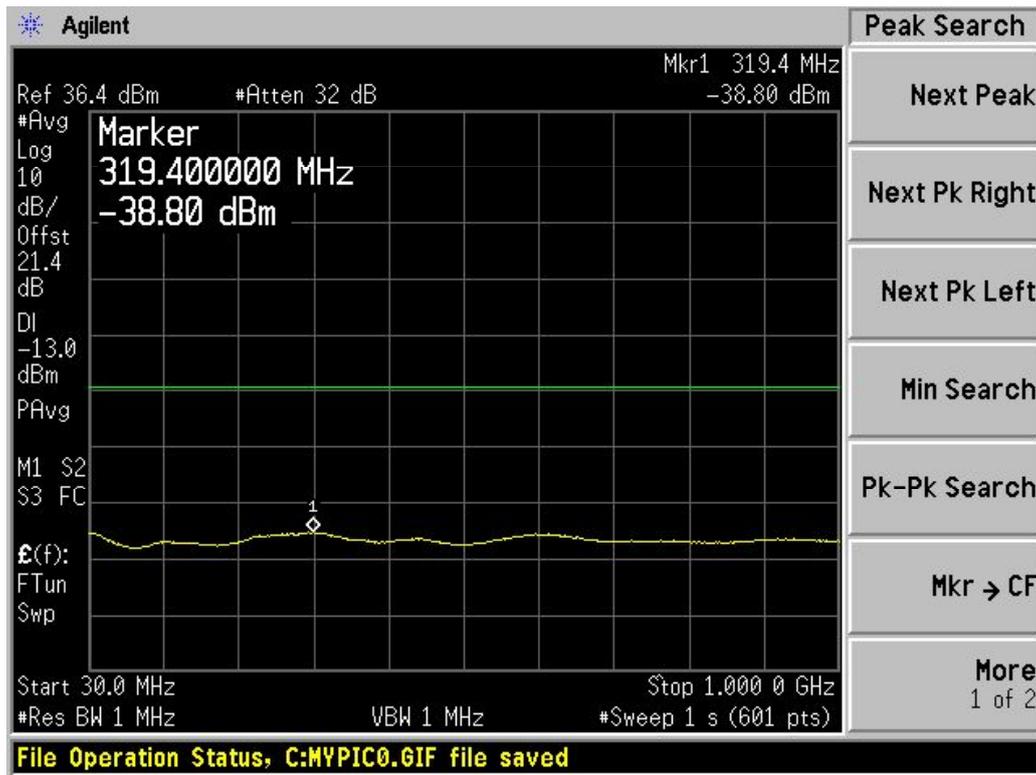
Channel M (1 carrier):



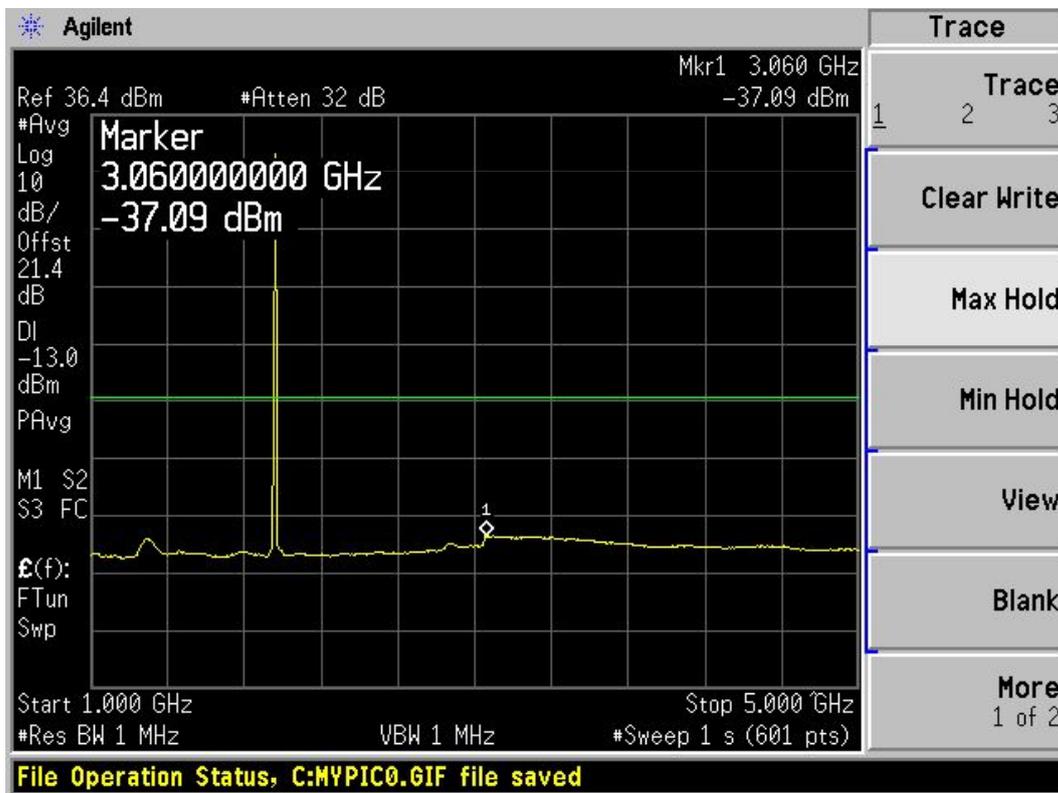
9 kHz~150 kHz



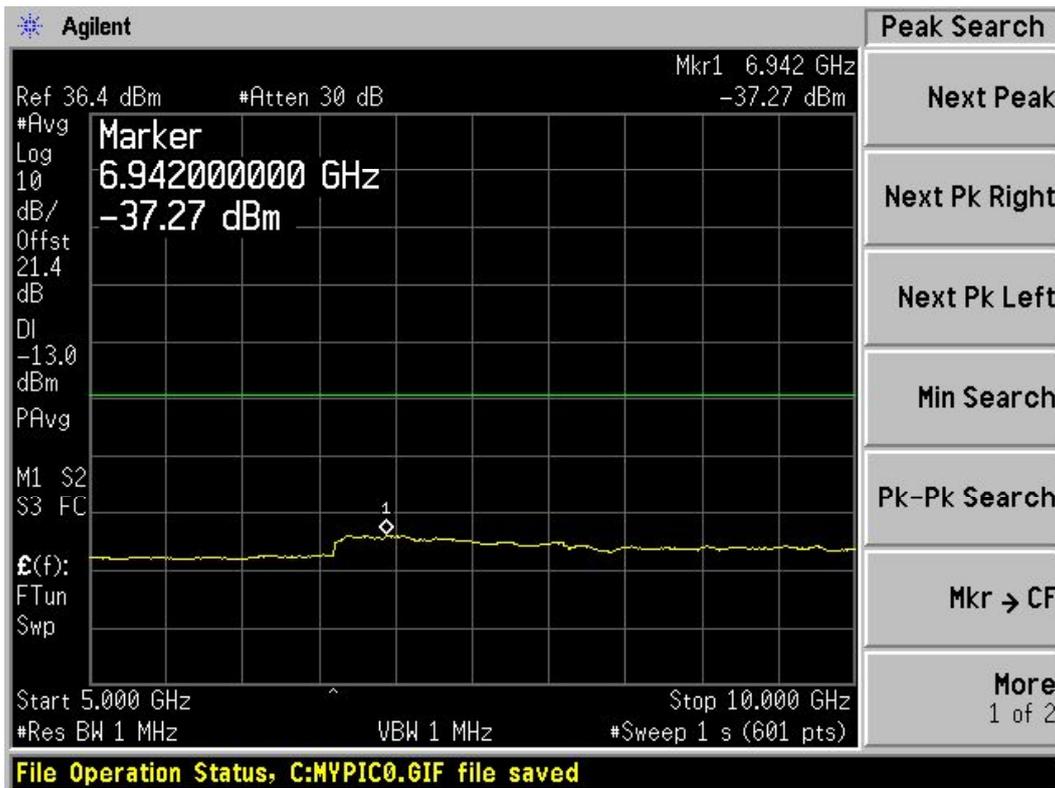
150 kHz~30MHz



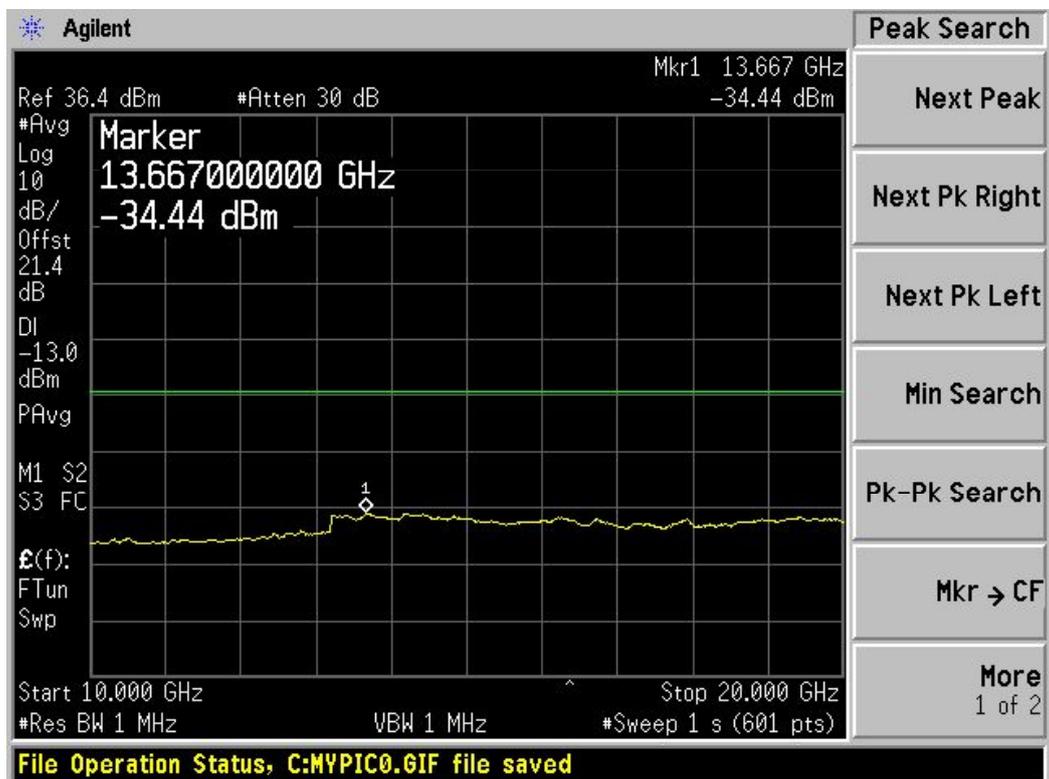
30MHz~1GHz



1GHz~5GHz



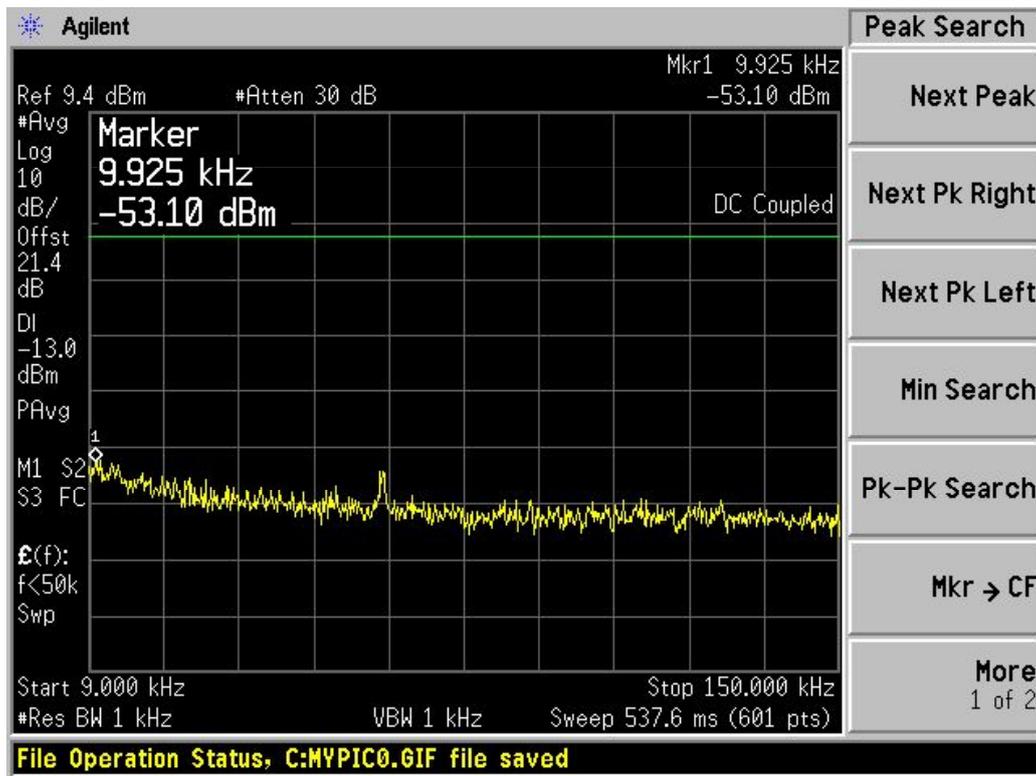
5GHz~10GHz



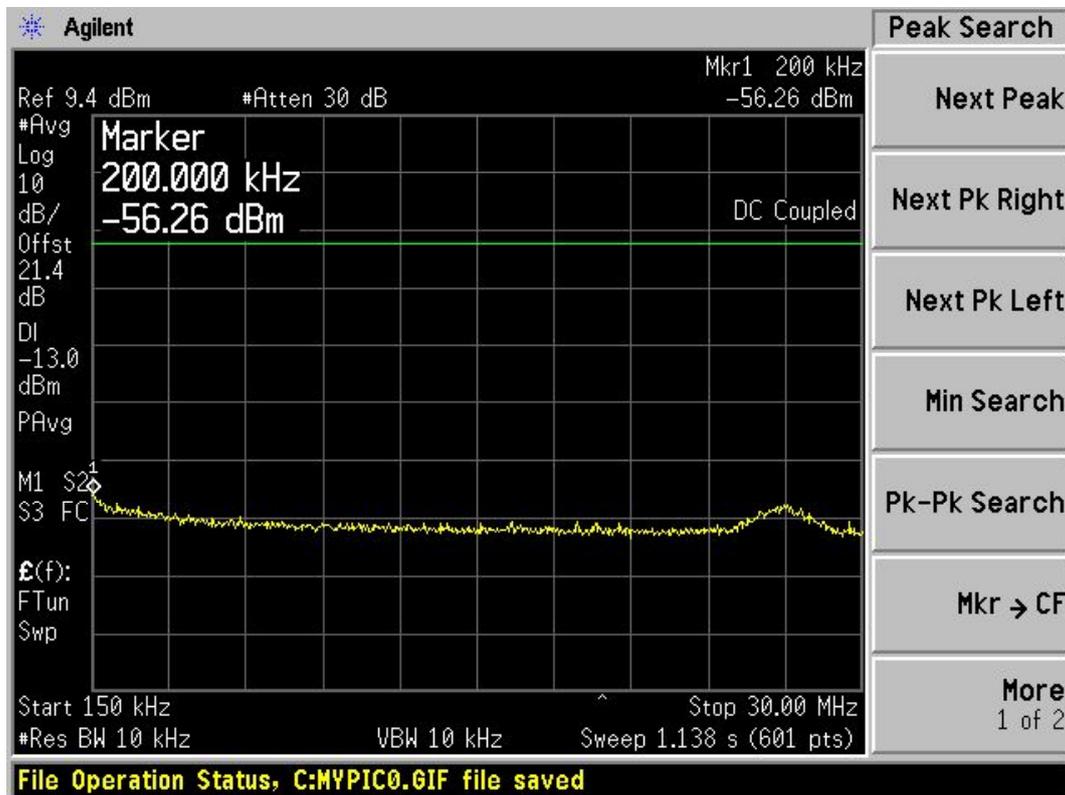
10GHz~20GHz



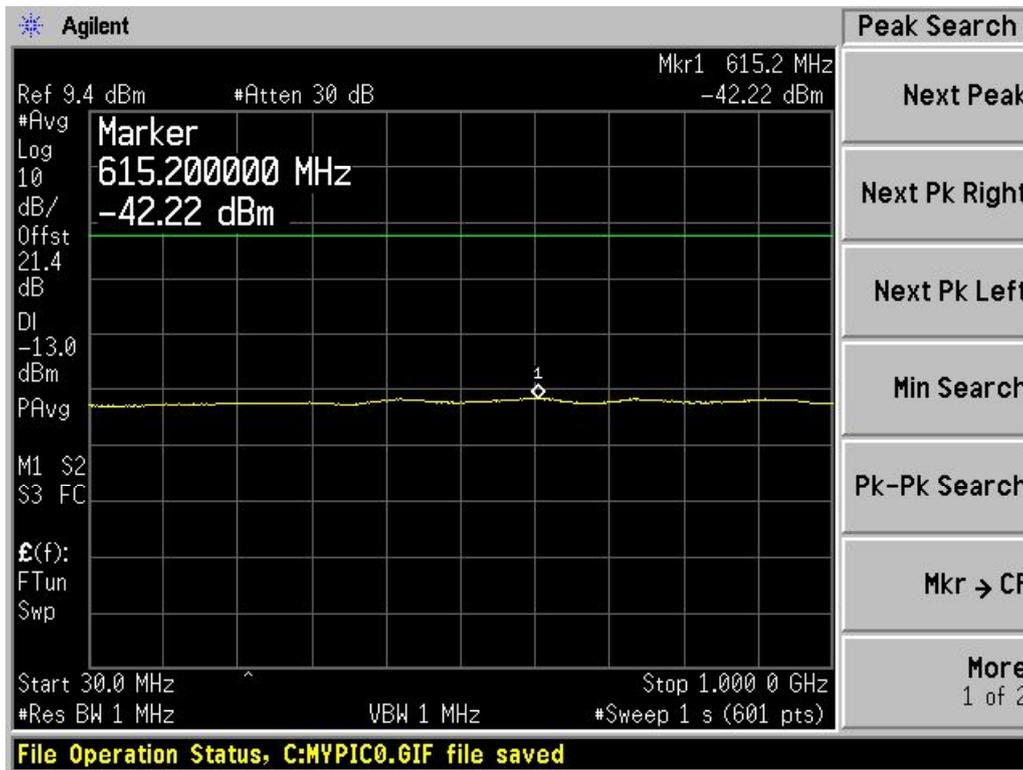
Channel T (1 carrier):



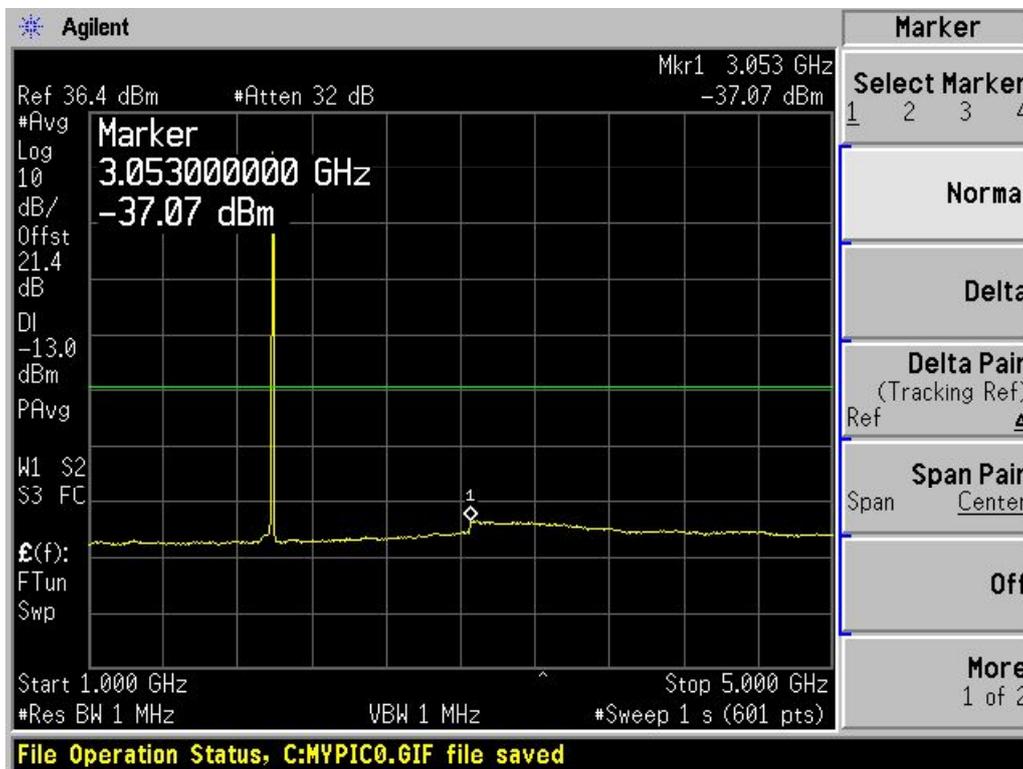
9 kHz~150kHz



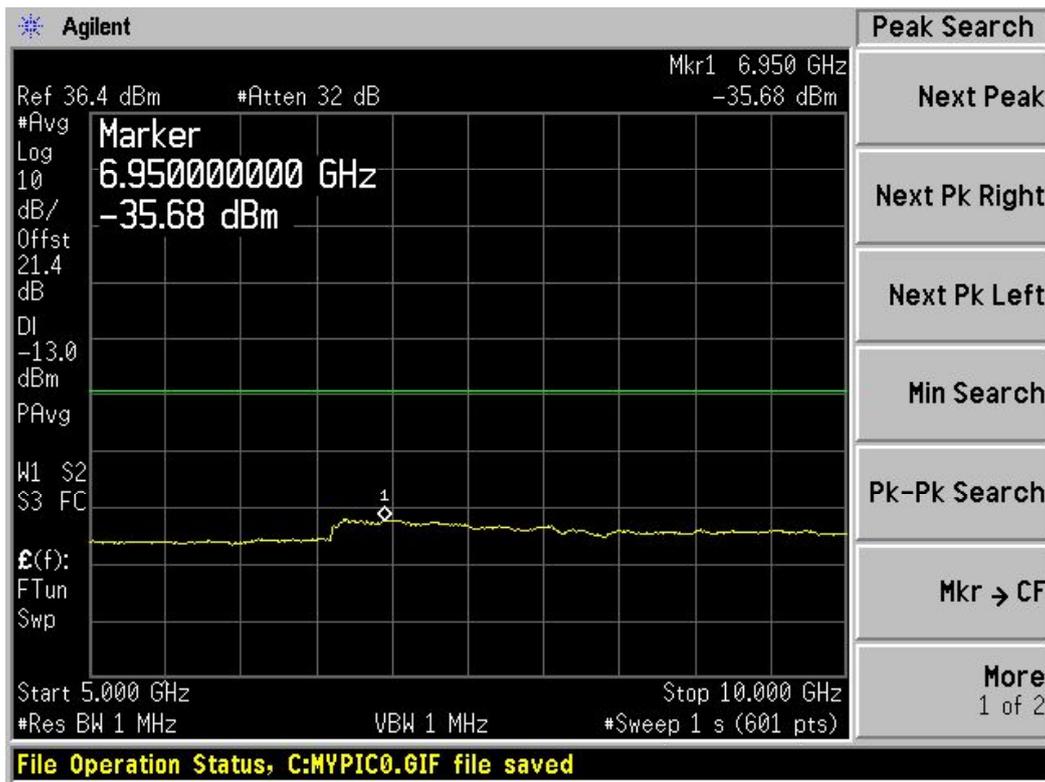
150 kHz~30MHz



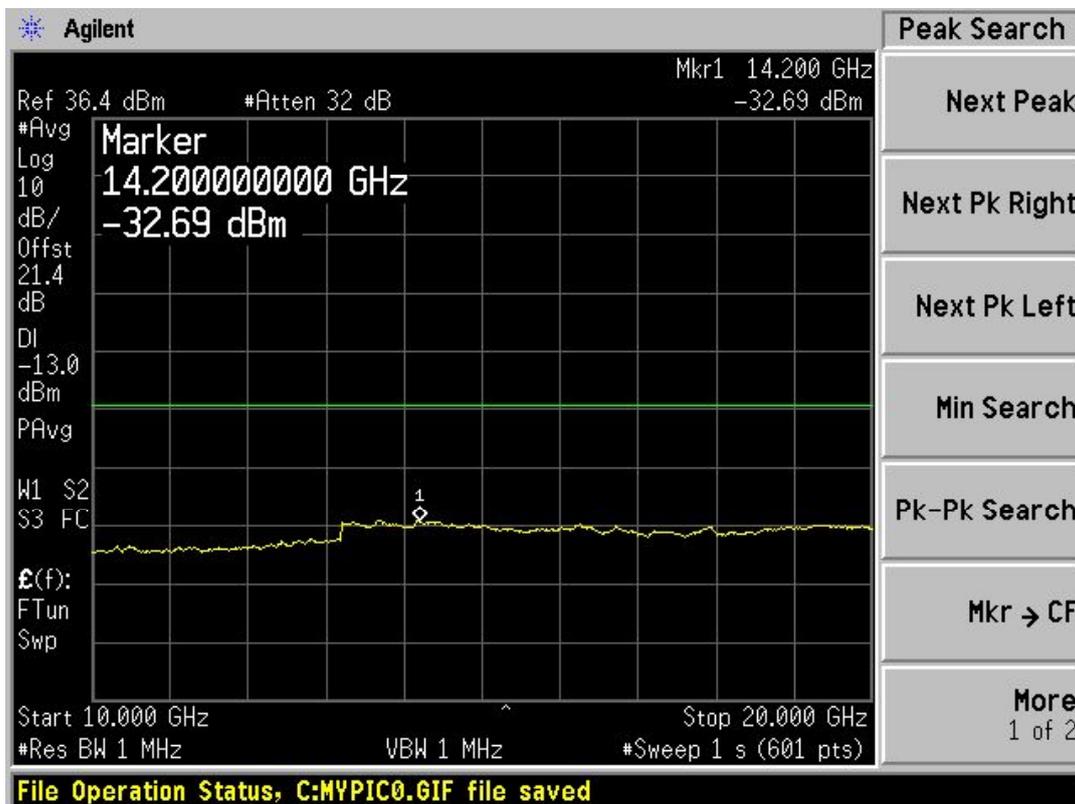
30MHz~1GHz



1GHz~5GHz



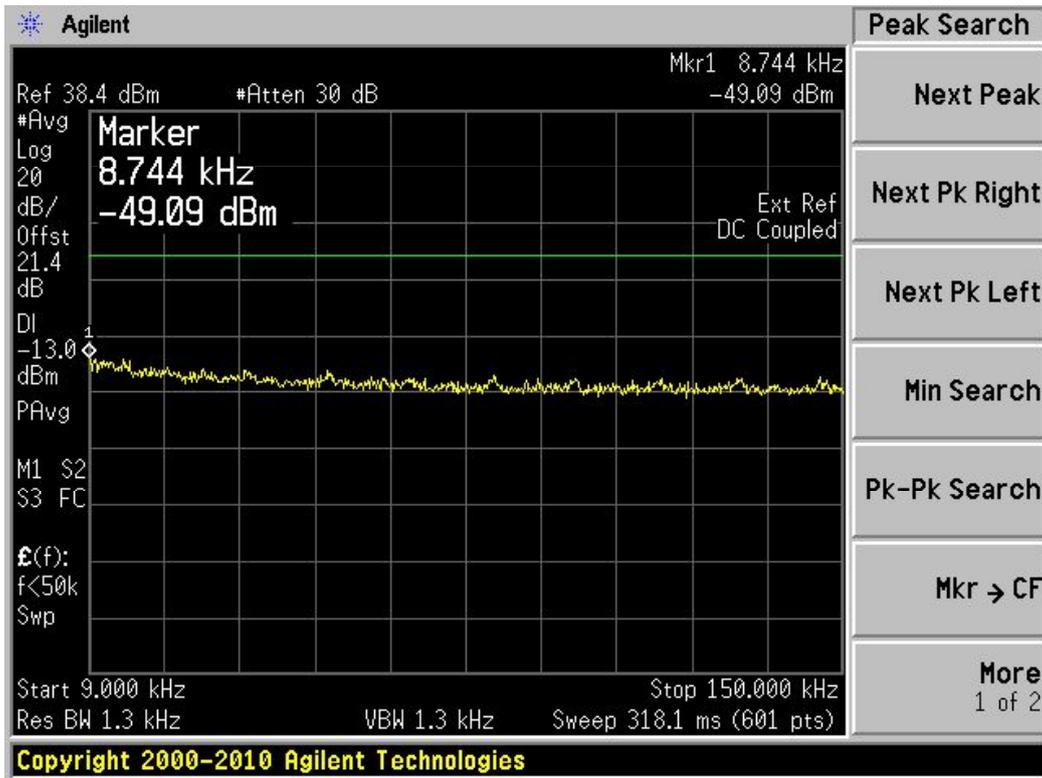
5GHz~10GHz



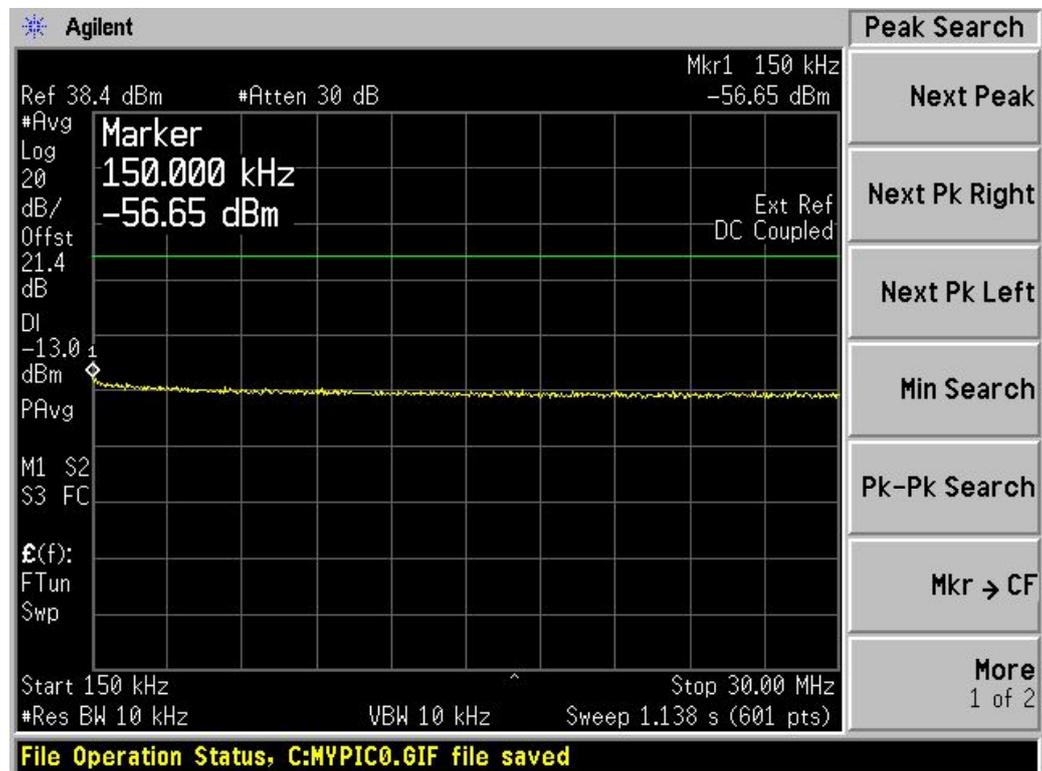
10GHz~20GHz



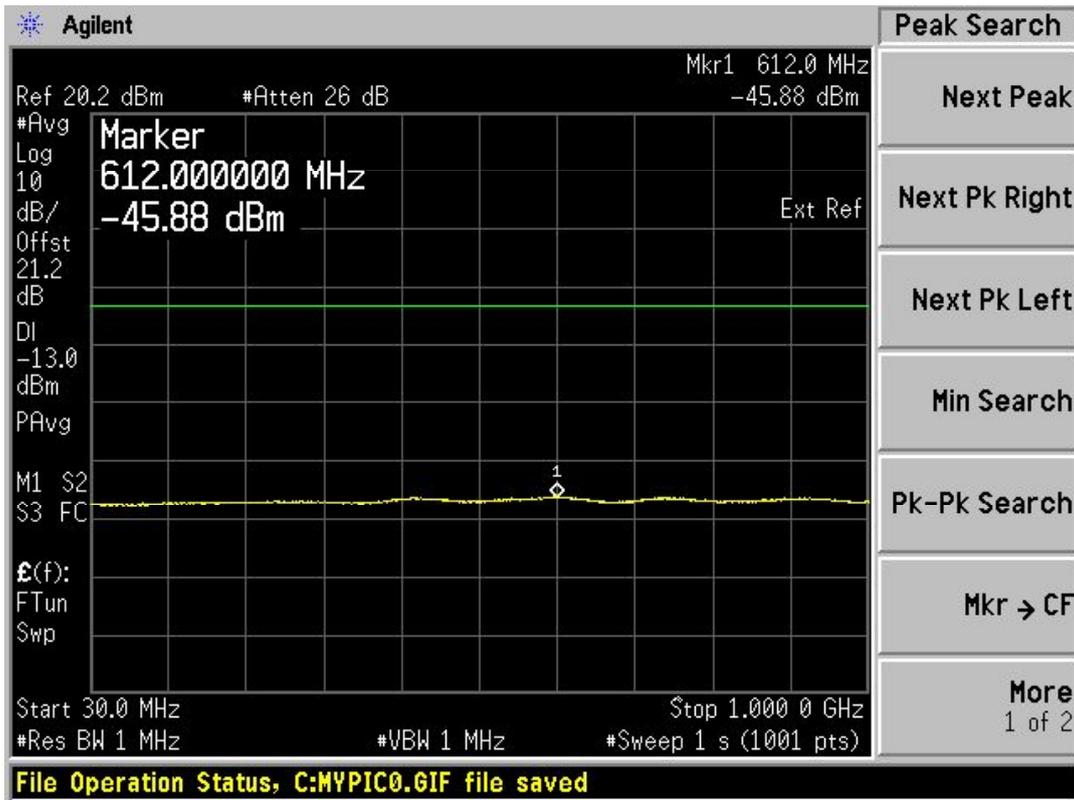
Channel B (2 carriers):



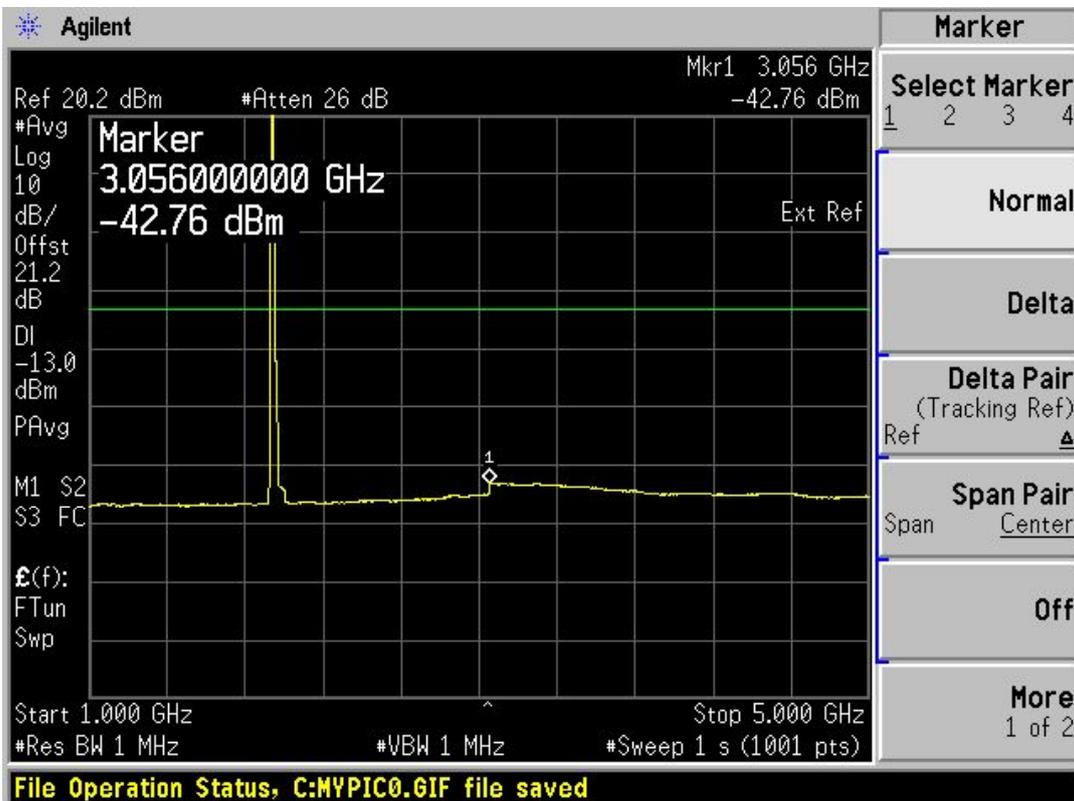
9 kHz~150 kHz



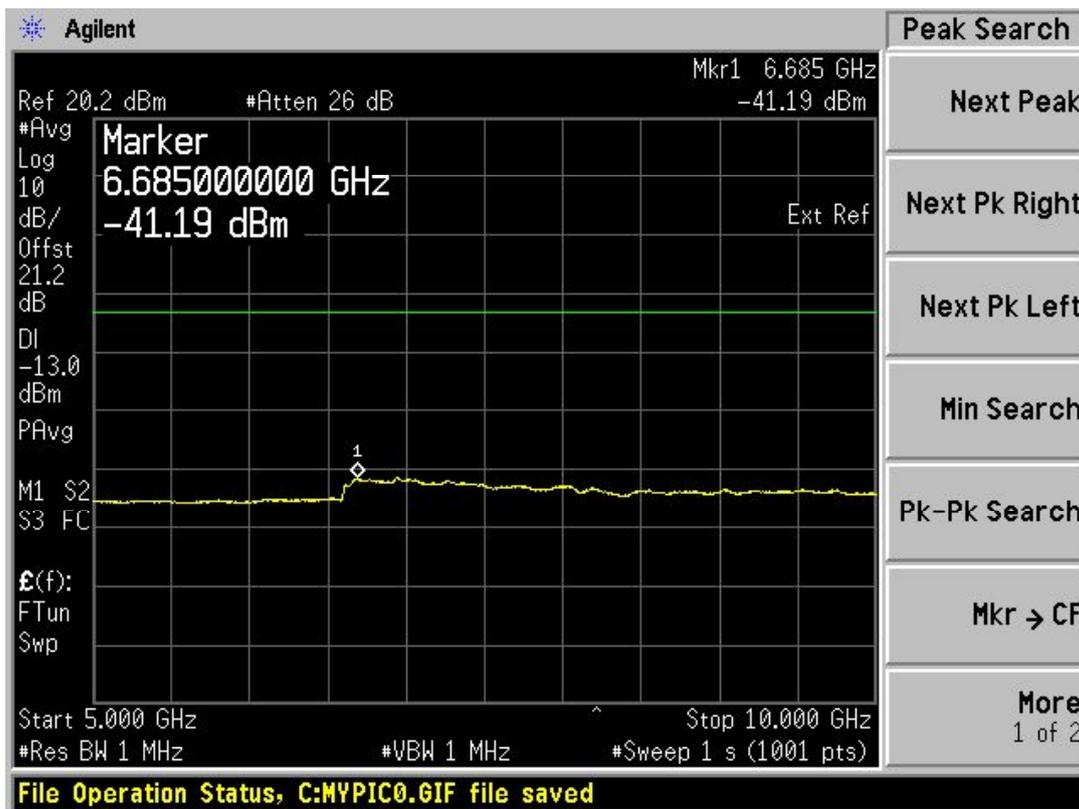
150 kHz~30MHz



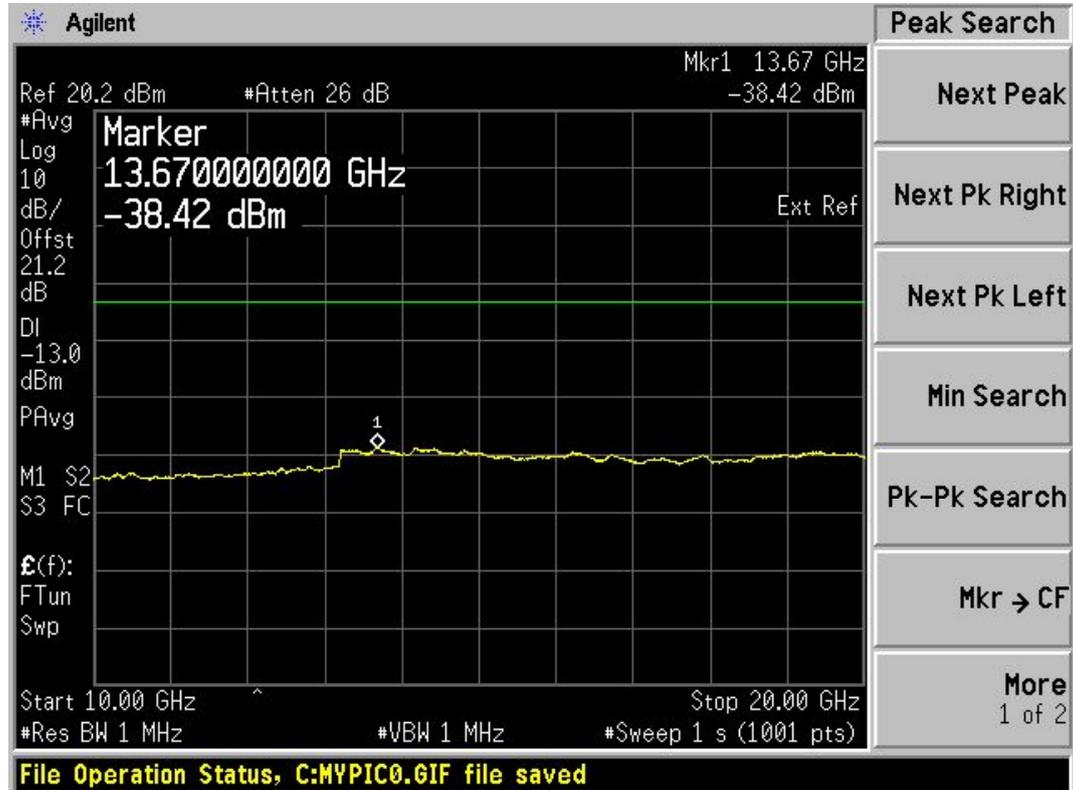
30MHz~1GHz



1GHz~5GHz



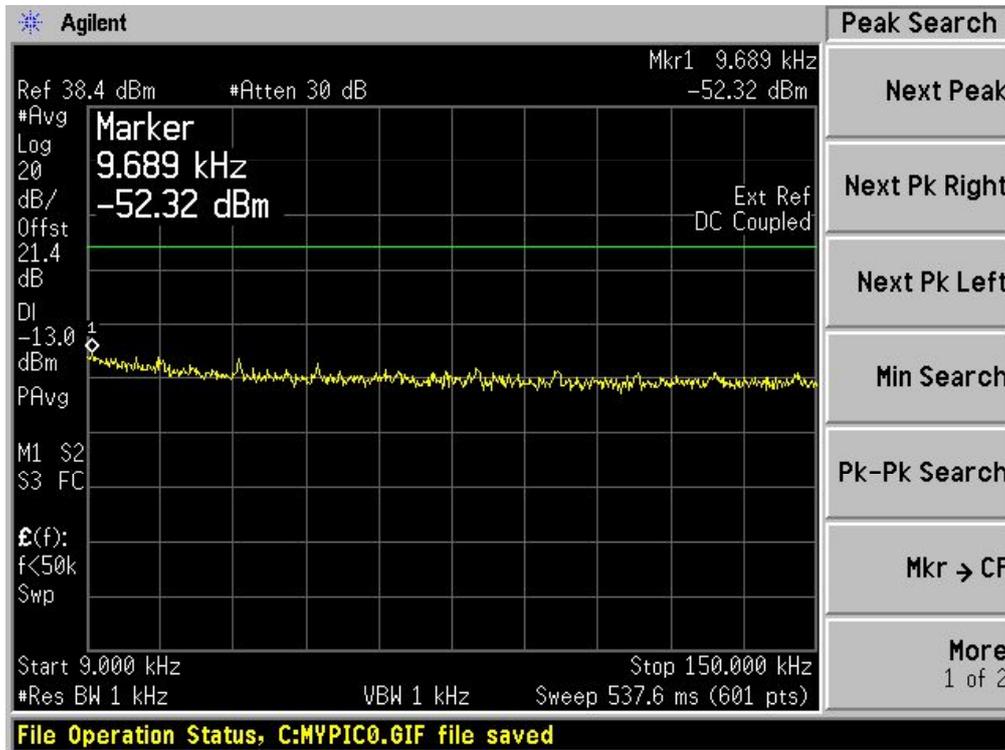
5GHz~10GHz



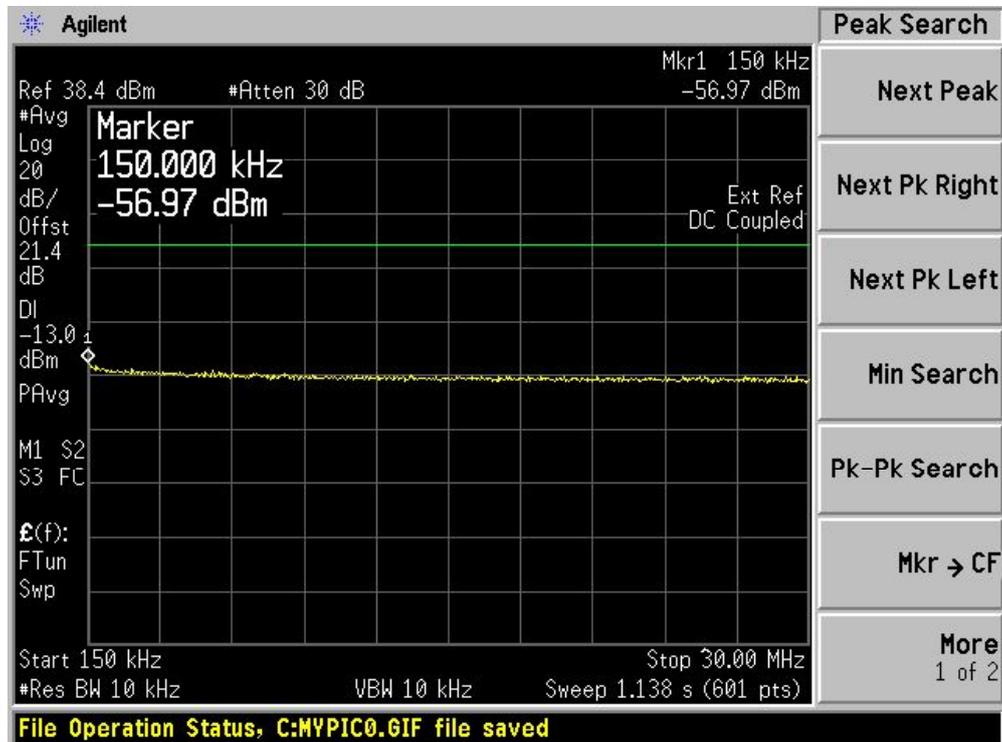
10GHz~20GHz



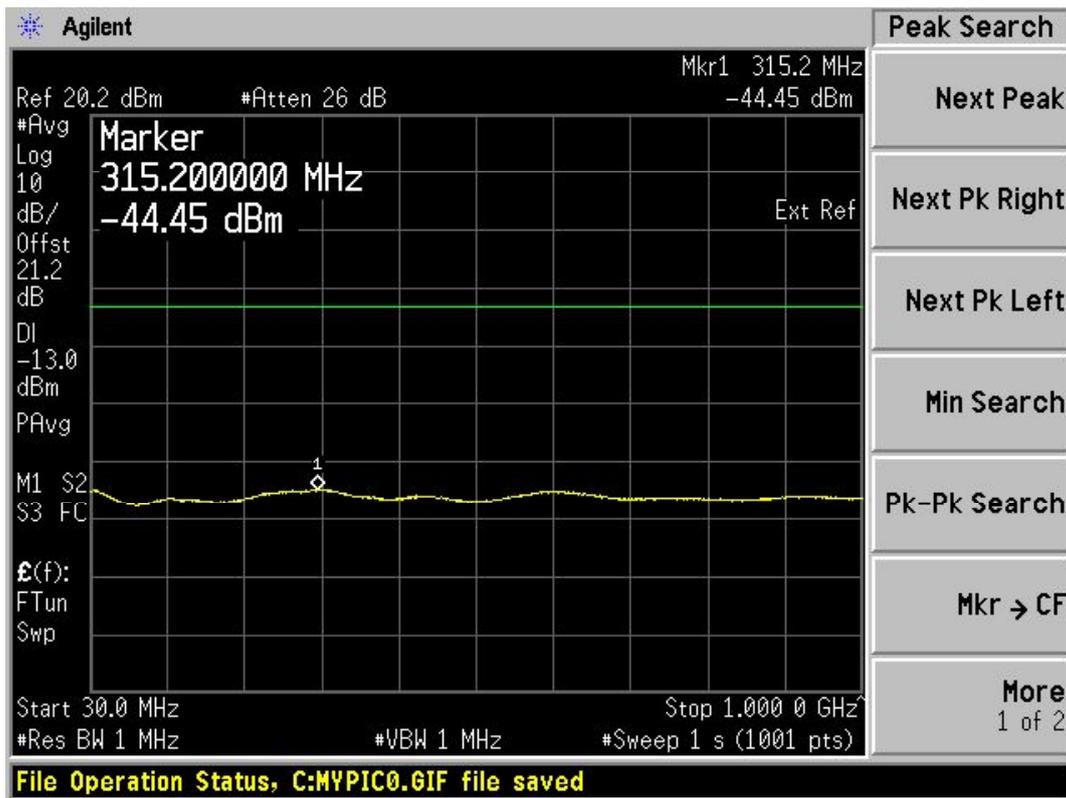
Channel M (2 carriers):



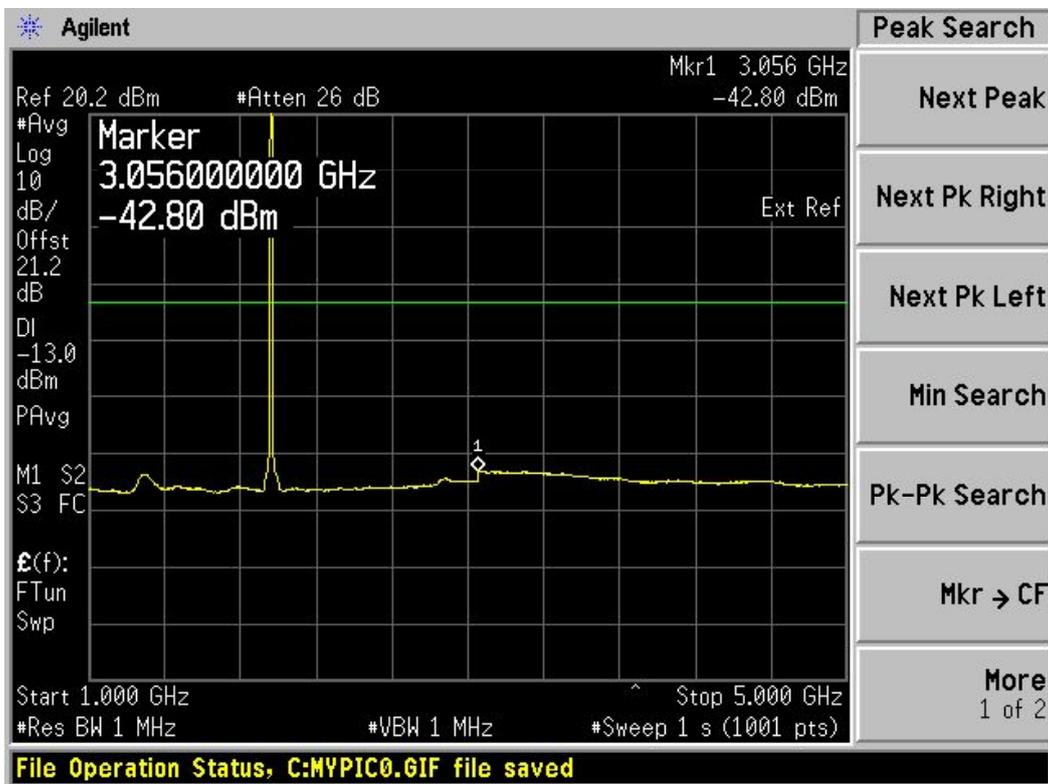
9 kHz~150 kHz



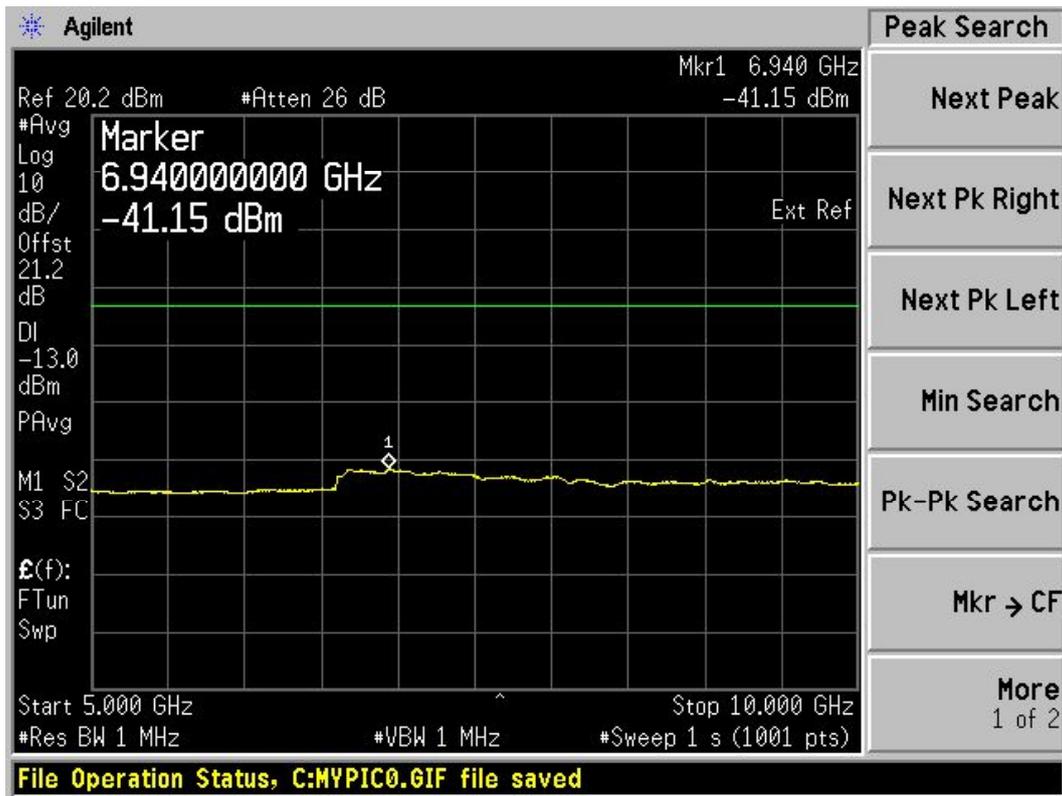
150 kHz~30 MHz



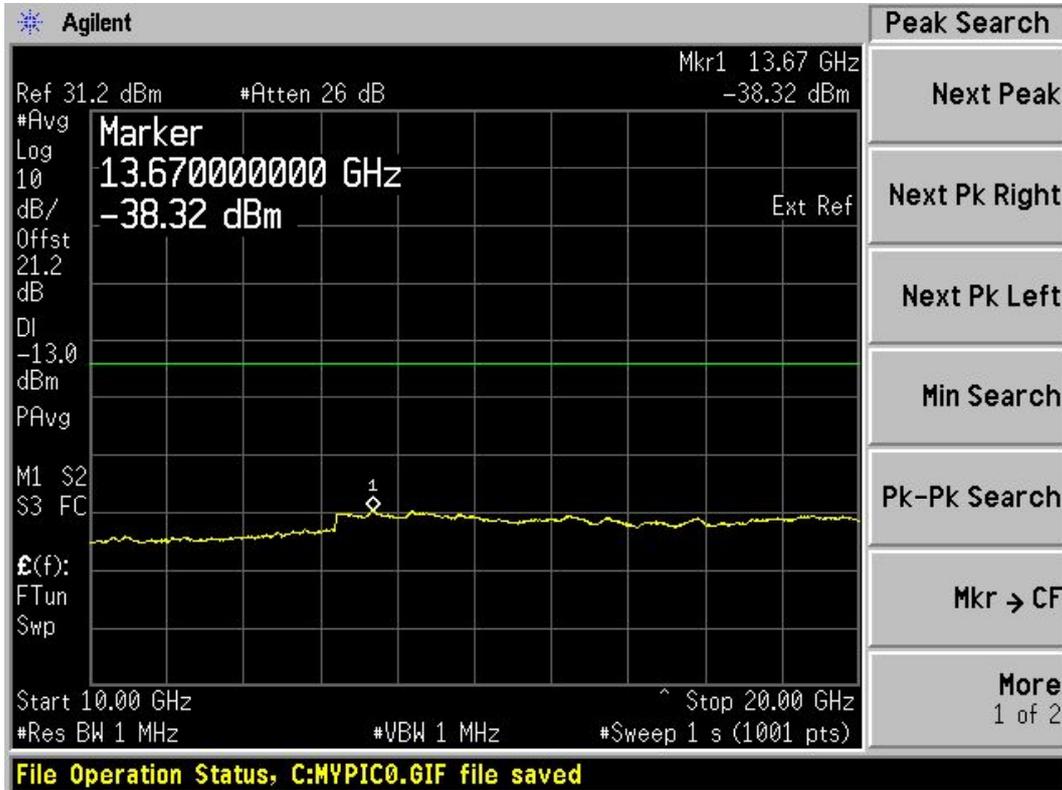
30MHz ~1GHz



1GHz ~5GHz



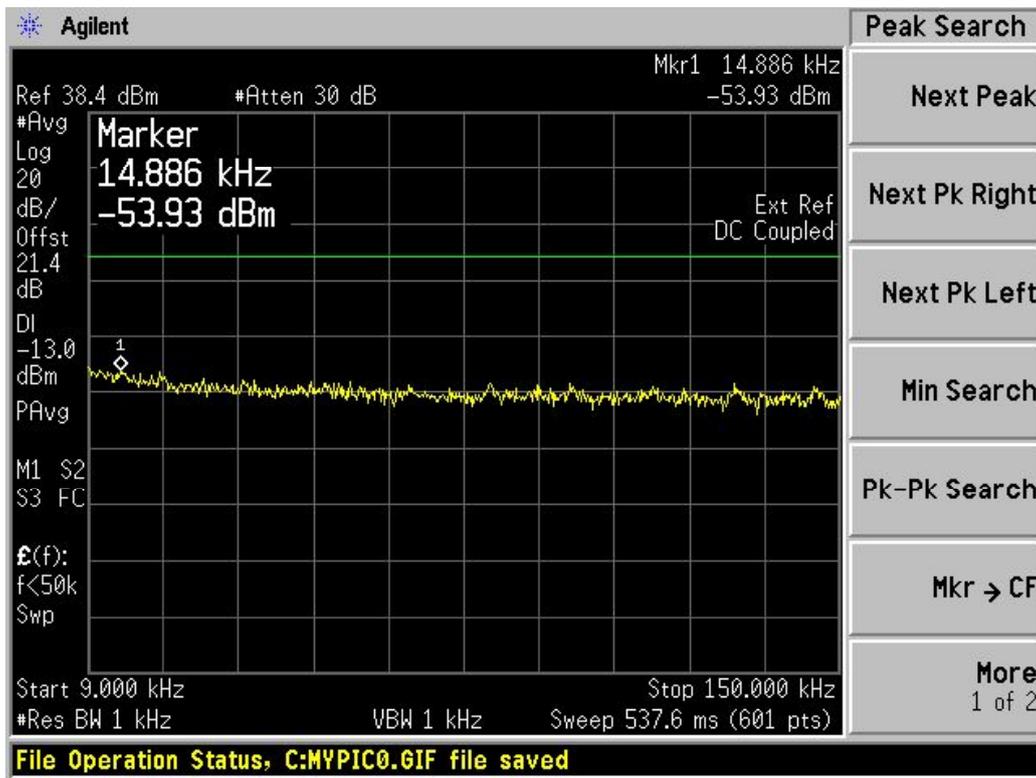
5GHz ~10GHz



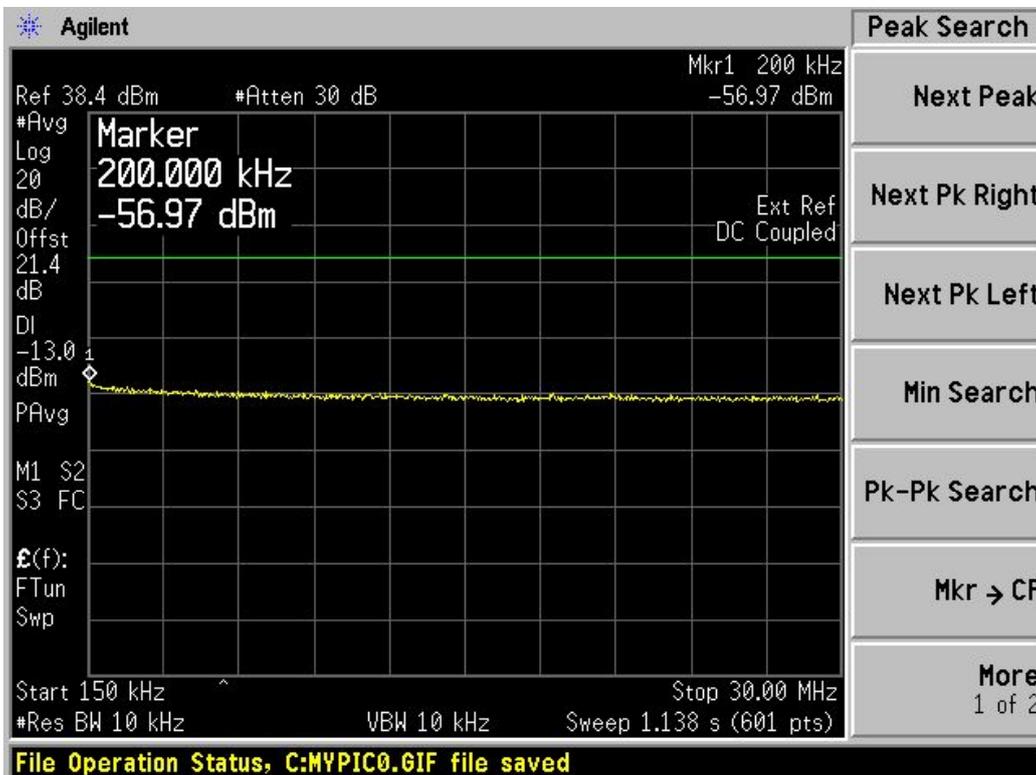
10GHz ~20GHz



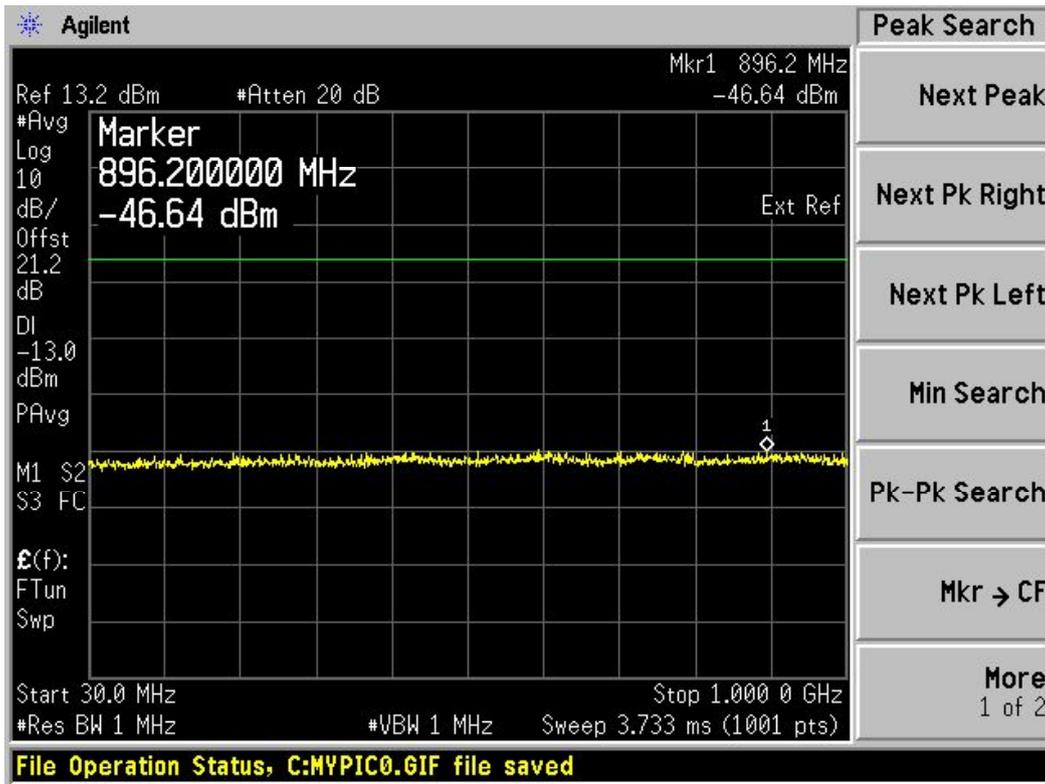
Channel T (2 carriers):



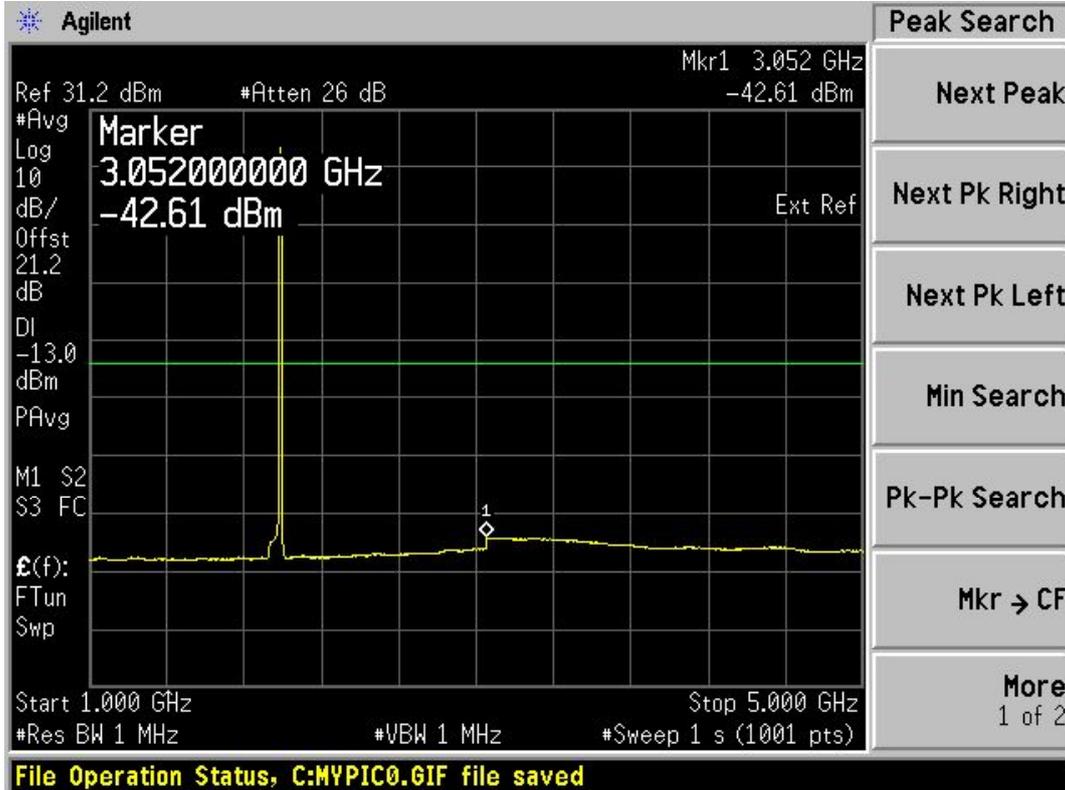
9 kHz ~150 kHz



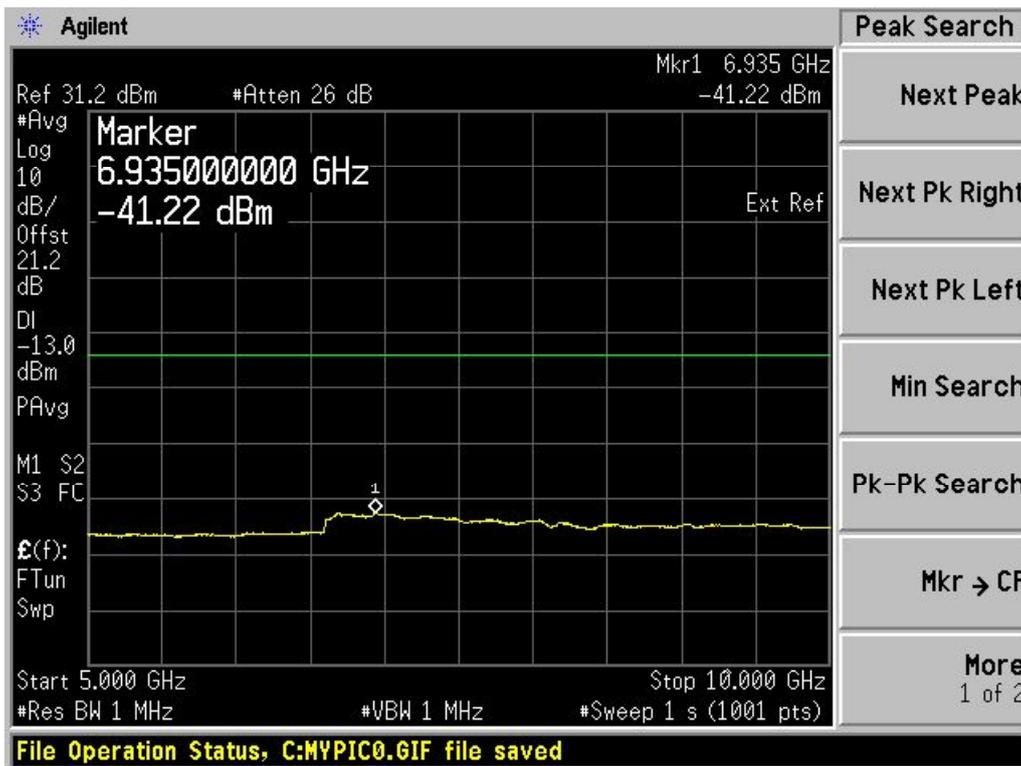
150 kHz ~30MHz



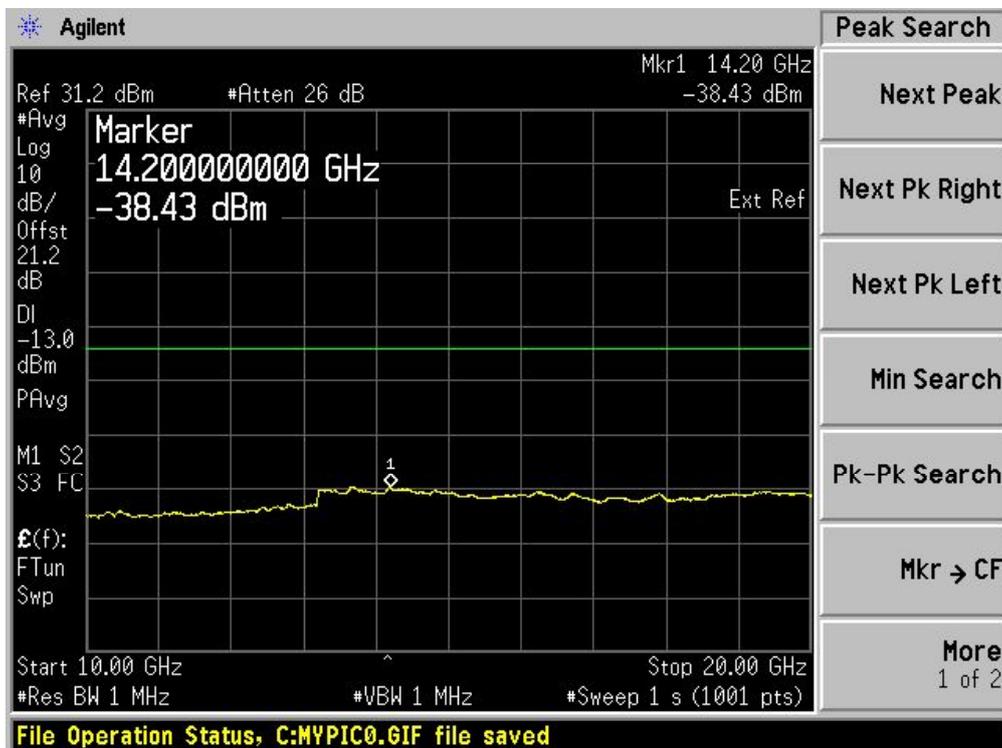
30MHz ~1GHz



1GHz~5GHz



5GHz~10GHz



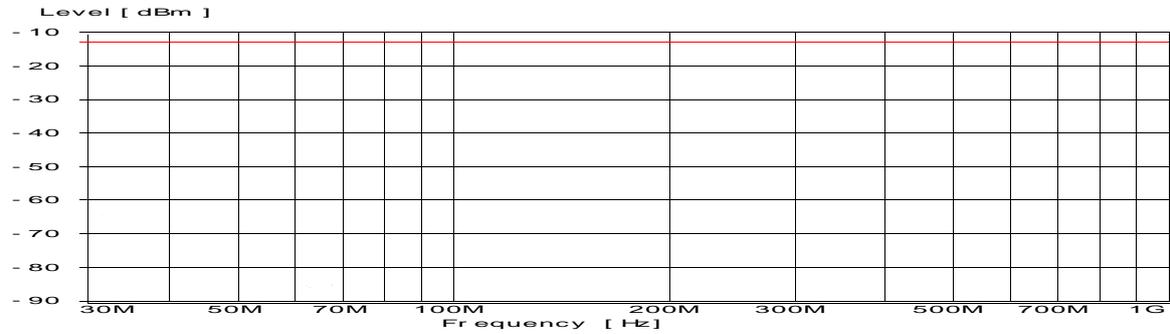
10GHz~20GHz



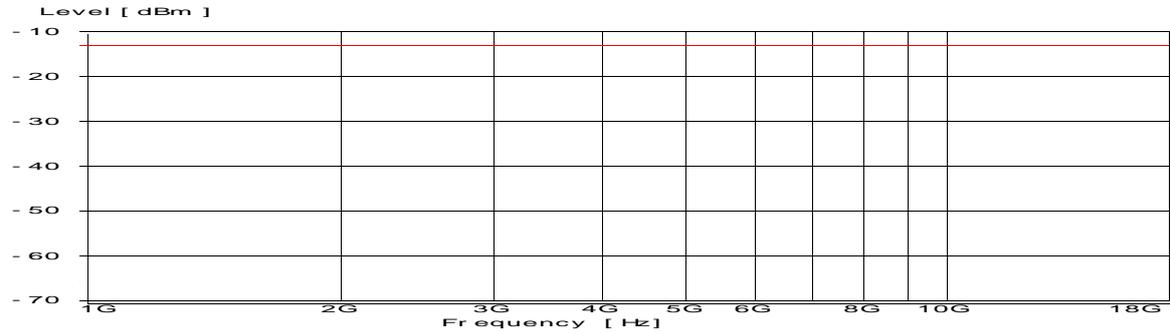
Annex A.6 Field Strength of Spurious Radiation

TM1:

Channel M:



30MHz~1GHz



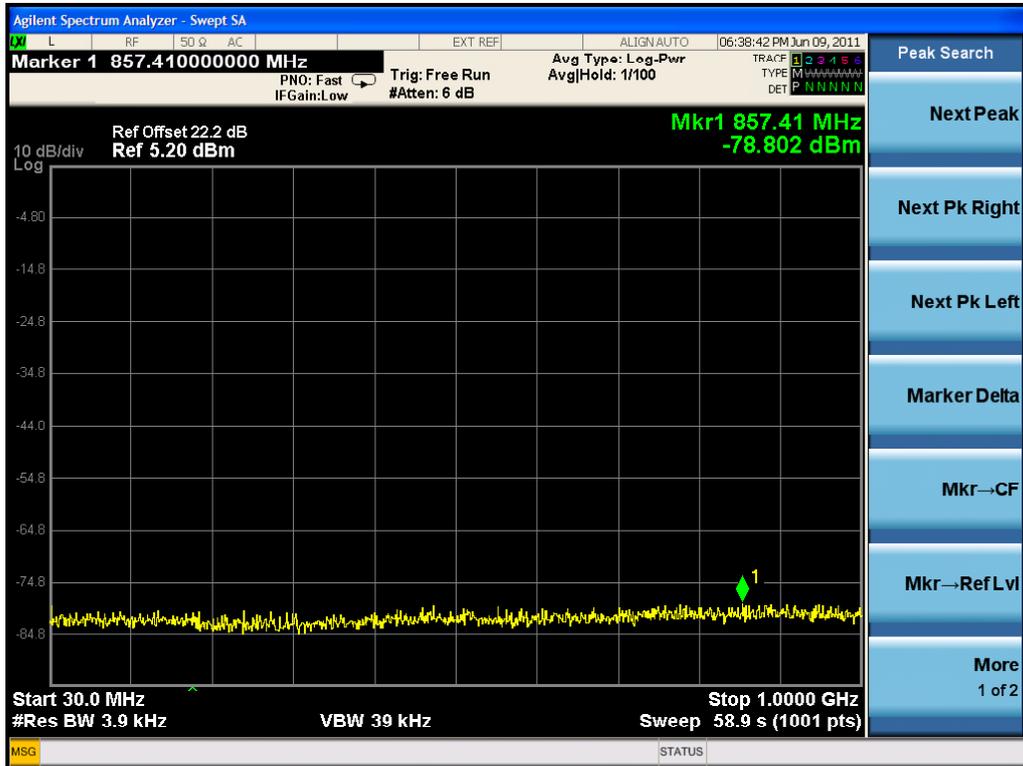
1GHz~20GHz



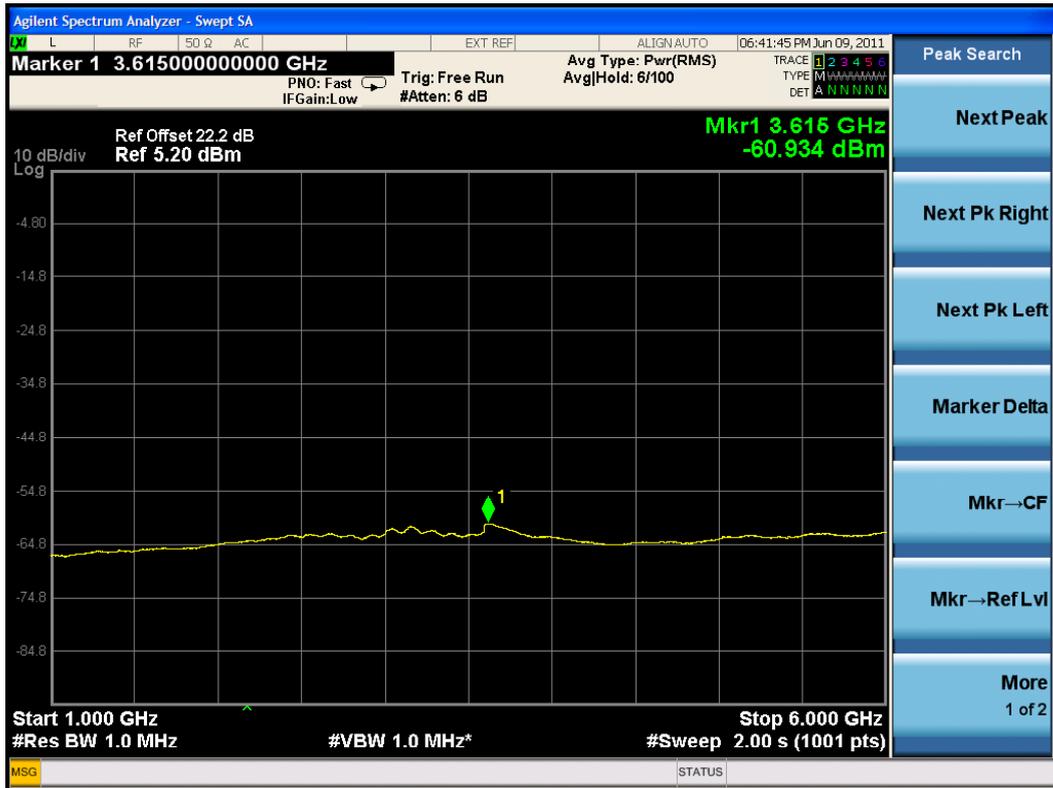
Annex A.7 Receiver Spurious Emissions (Conducted)

TM1:

Channel M:



30MHz~1GHz



1GHz-6GHz

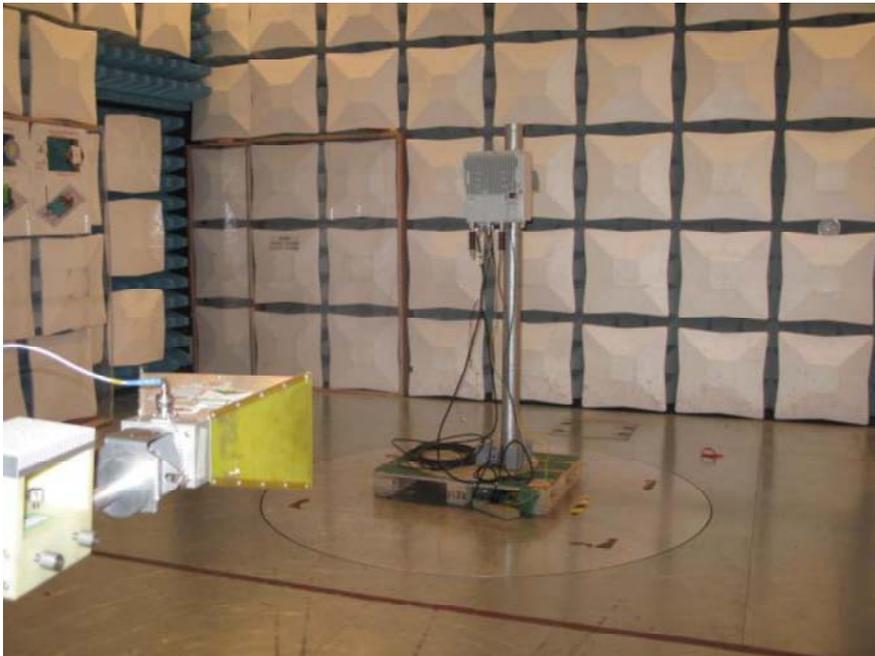
Annex B Photos of Test Setup

Annex B.1 Test Setup 3

Annex B.1.1 Frequency range below 1 GHz



Annex B.1.2 Frequency range above 1 GHz



END